

# PRODUCT SELECTION GUIDE 2016

SMD RESISTORS + MLCC

SMD CERAMIC EMI FILTER CAPACITORS - X2Y®

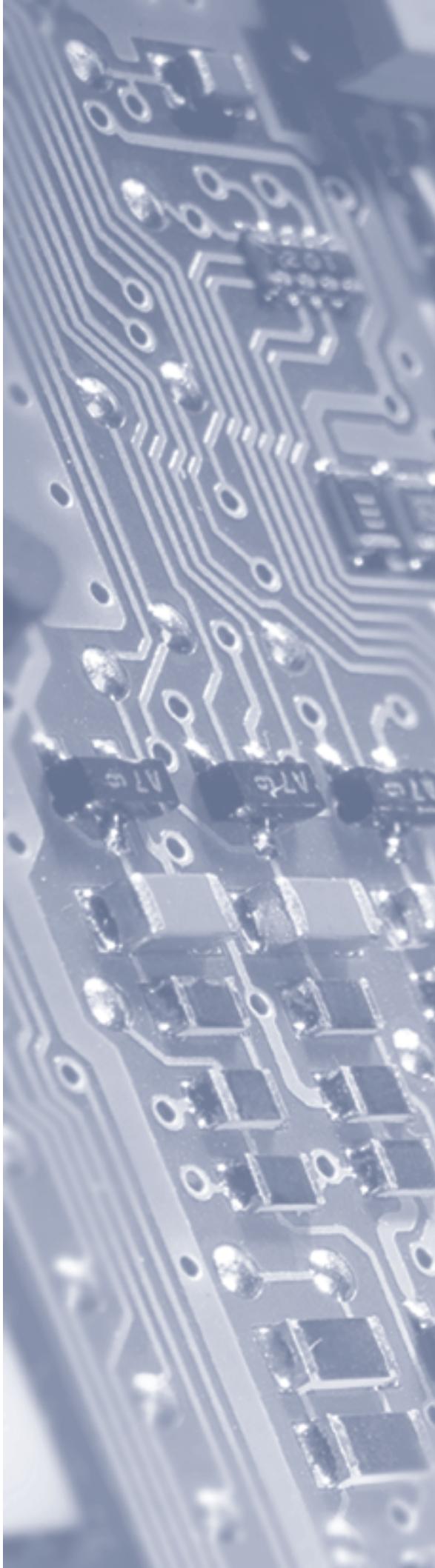
WIRELESS COMPONENTS

MULTILAYER CHIP VARISTORS



[www.yageo.com](http://www.yageo.com)

**YAGEO**  
**Phicomp**





## Part numbering system and ordering

You can order components from this catalogue in two ways. Both ways give logistic and packing information.

- **Clear text ordering code**

This unique number is an easily-readable code.

- 15 digits code (PHYCOMP CTC )
- 14 to 17 digits code (GLOBAL PART NUMBER for both Yageo and Phycomp branded products)

- **12 digits ordering code**

This unique 12NC number forms the basis of the Phycomp logistic system.

You will find details for ordering in the "*Ordering*" section next to each selection chart.

Minimum shipment quantities, prices and delivering details can be obtained from the Yageo sales organization in your country or from one of our franchised distributors.

## Case size codes

Throughout this catalogue, inch-based codes are used for the component sizes. According to IEC 60384-10, amendment 2 of September 2000 for MLCCs, and IEC 60115-8, amendment 1 of July 2000 for R-chip. Values for length and width should be in millimeters rather than in inches. To distinguish between inch-based codes and metric-based codes, metric-based codes will temporarily have the suffix "M". The table right next shows the relation between inch-based case sizes versus the recommended metric case size designators. Please note that HF products use metric case size only.

Case size designation and cross-reference					
Inch-based	Metric	Inch-based	Metric	Inch-based	Metric
0050	0201M	0606	1616M	1224	3250M
0075	03015M	0612	1632M	1225	3264M
01005	0402M	0616	1640M	1812	4532M
0201	0603M	0805	2012M	2007	5320M
0202	0605M	0815	2037M	2010	5025M
0402	1005M	0830	2075M	2220	5750M
0404	1010M	1008	2520M	2512	6432M
0408	1020M	1206	3216M	3014	7836M
0508	1220M	1210	3225M	4527	11070M
0603	1608M	1218	3245M		

## Contact us

Founded in 1977, the Yageo Corporation has become a world-class provider of passive-component services with capabilities on a global scale, including production and sales facilities in Asia, Europe and America. The corporation is uniquely positioned to provide one-stop-shopping, offering its complete product portfolio of resistors, capacitors and inductors in both commodity and specialty versions, plus design-in capability, distribution, e-commerce connection and logistics. Yageo markets its products under the product brand names Yageo, Phycomp and Vitrohm. All products can be obtained from our Yageo sales offices, of which contact details can be found on the backcover of this catalogue. For most up-to-date information, as well as contact details of our franchise distributors, please refer to our website: [www.yageo.com](http://www.yageo.com)



# Table of Contents

Chip Resistors General Information	8
Specification overview	8
Ordering information - Global part number	15
Ordering information - North America	18
IEC publication 63, SPQ, last digit of 12NC	19
Chip Resistors Selection Charts	20
RC - Thick film chip resistors	20
RC - Thick film general purpose chip resistors, 0075 to 2512	20
RC_P ,Total lead free thick film general purpose chip resistor	25
RC_P ,Total lead free thick film general purpose chip resistor,01005 to 2512	25
RE - Thick film precision grade chip resistors	29
RE - Thick film precision grade chip resistors, 0201 to 1206	29
RT - Thin film high precision high stability chip resistors	32
RT - Thin film high precision high stability chip resistors, 0201 to 2512	32
YC/TC - Thick film array / network chip resistors	36
YC/TC - Thick film array / network chip resistors	36
YC/TC - Arrays, convex / concave / flat	38
YC - Network, T-type / L-type	39
RL - Thick film low ohmic chip resistors	40
RL - Thick film low ohmic chip resistors, 0402 to 2512	40
RL - Thick film low ohmic, high power chip resistors, 0805 / 1206	44
PT - Thick film low ohmic low T. C. R. chip resistors	45
PT - Thick film low ohmic low T. C. R. chip resistors, 0402 to 2512	45
PA/PE - Current sensors - low T. C. R. chip resistors	48
PA/PE - Current sensors - low T. C. R. chip resistors, 0201 to 2512	48
PE - Current sensors - low T. C. R. chip resistors, wide termination	51
PE - Current sensors - low T. C. R. chip resistors, wide termination, 0508 to 0612	51
PS - Current sensors - low T. C. R. chip resistors, 4 termination	53
PS - Current sensors - low T. C. R. chip resistors, 4 termination, 0306 to 0612	53
PU - Shunt chip resistors	55
PU - Shunt chip resistors, 3921, 5931	55
AR - NiAu termination chip resistors	57
AR - NiAu termination chip resistors, 0402 to 1206	57
SR - Surge chip resistors	60
SR - Surge chip resistors, 0402 to 2512	60
RV - High voltage chip resistors	63
RV - High voltage chip resistors, 0603 to 2512	63
TR - Trimmable chip resistors	66
TR - Trimmable chip resistors, 0402 to 1206	66
AF - Sulfur resistant chip resistors	69
AF - Sulfur resistant chip resistors, 0201 to 2512	69
AF - Sulfur resistant chip resistors, Arrays	72
AC - Automotive grade chip resistors	75
AC - Automotive grade chip resistors, 0201 to 2512	75
AC - Automotive grade sulfur-resistant chip resistors, wide termination	77
AC - Automotive grade sulfur-resistant chip resistors, wide termination, 0612 to 1225	78
AA - Automotive grade sulfur-resistant chip resistors	81
AA - Automotive grade sulfur-resistant chip resistors, 0201 to 2512	81

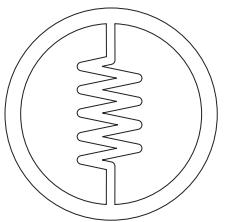
# Table of Contents

	ATV - RF attenuator chip resistors	84
	ATV - RF attenuator chip resistors, 0404	84
	AT - Automotive grade Thin film high precision high stability chip resistors	87
	AT - Automotive grade Thin film high precision high stability chip resistors, 0402 to 1206	87
Chip Resistors Engineering Design Kits		90
	Engineering design kits	90
	Engineering design books	90
MLCC General Information		92
	Specification overview	92
	Ordering information - Global part number	93
	Thickness classes and packing quantities for all series	95
MLCC Selection Charts		96
	NP0 - General purpose	96
	NP0 - General purpose 16 to 50V, 01005 to 0603	97
	NP0 - General purpose 16 to 50V, 0805 to 1812	99
	NP0 - Medium & High voltage	101
	NP0 - Medium voltage, 0402 to 0805	102
	NP0 - Medium voltage, 1206 to 1812	103
	NP0 - High voltage, 0805 to 1210	104
	NP0 - High voltage, 1808 / 1812	105
	NP0 - High frequency	106
	NP0 - High frequency, 0201 to 0805	106
	X7R - General purpose & High capacitance	108
	X7R - General purpose & High capacitance, 01005 to 0402	109
	X7R - General purpose & High capacitance, 0603 / 0805	110
	X7R - General purpose & High capacitance, 1206 to 2220	111
	X7R - Medium & High voltage	112
	X7R - Medium voltage & High voltage, 0402 to 0805	113
	X7R - Medium voltage & High voltage, 1206 / 1210	114
	X7R - Medium voltage & High voltage, 1808 / 1812	115
	X7R / X5R - Low inductance	116
	X7R/ X5R - Low inductance, 0204 to 0612	116
	NP0 / X7R - Soft termination	118
	NP0 - Soft termination, 0402 to 0805	119
	NP0 - Soft termination, 1206 / 1210	120
	NP0 - Soft termination, 1808 / 1812	121
	X7R - Soft termination, 0402 / 0603	122
	X7R - Soft termination, 0805	123
	X7R - Soft termination, 1206	124
	X7R - Soft termination, 1210	125
	X7R - Soft termination, 1808	126
	X7R - Soft termination, 1812	127
	X5R - General purpose & High capacitance	128
	X5R - General purpose & High capacitance, 01005 to 0402	129
	X5R - General purpose & High capacitance, 0603 / 0805	130
	X5R - General purpose & High capacitance, 1206	131
	X5R - General purpose & High capacitance, 1210	132



# Table of Contents

	Y5V - General purpose & High capacitance	133
	Y5V - General purpose & High capacitance 6.3 to 50V, 0402	134
	Y5V - General purpose & High capacitance 6.3 to 50V, 0603 / 0805	135
	Y5V - General purpose & High capacitance 6.3 to 50V, 1206 / 1210	136
	Automotive grade MLCCs	137
	NP0 - Automotive grade, 0402 to 0805	138
	NP0 - Automotive grade, 1206 / 1210	139
	X7R - Automotive grade, 0402 / 0603	140
	X7R - Automotive grade, 0805	141
	X7R - Automotive grade, 1206	142
	X7R - Automotive grade, 1210 / 1812	143
	NPO / X7R - Automotive grade 4C Arrays, 0508 / 0612	144
	Safety certification MLCCs	145
	NPO - High voltage SC type, 1808 / 1812	146
	X7R - High voltage SC type, 1808 / 1812	146
	Arrays	147
	NPO / X7R / Y5V / X5R- 4C Arrays, 0508 / 0612	147
	NPO - 4C Arrays, 0508 / 0612	149
	X7R / X5R - 4C Arrays, 0508 / 1612	150
	Y5V - 4C Arrays, 0612	151
MLCC Engineering Design Kits		152
	Sample kits	152
X2Y® Product Selection Charts		154
	SMD ceramic EMI filter capacitors X2Y® series	154
	Ordering information	155
Wireless Components Selection Charts		160
	Introduction	160
	Key features of Wireless Components	161
	Product Information	162
	Antenna - 2.4 GHz	162
	Antenna - 2.4 / 5 GHz	163
	Antenna - 5 GHz / Cellular WWAN / Short Range	164
	Antenna - GPS	165
	Antenna - GPS / Glonass / Active Antenna	167
	Antenna - GPS+BD / Others	168
	Filters	169
	Ordering Information	174
Wireless Components Engineering Design Kits		175
	Sample Kits	175
MLV Product Selection Charts		178
	Specification for 0402	179
	Specification for 0603	180
	Specification for 0805	181
	Specification for 1206	182
	Ordering information for 0402 to 1206	183



SURFACE-MOUNT CHIP RESISTORS



# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp. range	Resistance range	Tolerance	T. C. R.
RC0075xR-07xxxxL	RC	0075	1/50W	10V	-55°C to 125°C	10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±1% ±5%	10Ω ≤ R < 100Ω -200/+600ppm/°C 100Ω ≤ R ≤ 1MΩ ±200ppm/°C
RC0100xR-07xxxxL		01005	1/32W	15V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max./Min.:10MΩ/1Ω ±1% Max.: 22MΩ ±5% Max./Min.:470KΩ/33Ω ±0.5%	1Ω ≤ R < 10Ω -200/+600ppm/°C 10Ω ≤ R < 100Ω +300ppm/°C 100Ω ≤ R ≤ 10MΩ +200ppm/°C 10MΩ < R ≤ 22MΩ +250ppm/°C
RC0201xR-07xxxxL		0201	1/20W	25V		1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1,±0.5% Max.: 10MΩ ±1%,±5%	1Ω ≤ R ≤ 10Ω -100/+350 ppm/°C 10Ω < R ≤ 10MΩ ±200 ppm/°C
RC0402xR-07xxxxL		0402	1/16W	50V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.:10MΩ ±1% Max.:22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C
RC0603xR-07xxxxL		0603	1/10W	75V		1Ω ≤ R ≤ 100MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.:10MΩ ±1% Max.:22MΩ ±5% Max./Min.:100MΩ/24MΩ ±10%,±20%	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C 24MΩ ≤ R ≤ 100MΩ ±300ppm/°C
RC0805xR-07xxxxL		0805	1/8W	150V		1Ω ≤ R ≤ 100MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.:10MΩ ±1% Max.:22MΩ ±5% Max./Min.:100MΩ/24MΩ ±10%,±20%	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C 24MΩ ≤ R ≤ 100MΩ ±300ppm/°C
RC1206xR-07xxxxL		1206	1/4W	200V		1Ω ≤ R ≤ 100MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.:10MΩ ±1% Max.:22MΩ ±5% Max./Min.:100MΩ/24MΩ ±10%,±20%	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C 24MΩ ≤ R ≤ 100MΩ ±300ppm/°C
RC1210xR-07xxxxL		1210	1/2W	200V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.: 10MΩ ±1% Max.:22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C
RC1218xK-07xxxxL		1218	1W	200V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.:1MΩ ±1%,±5%	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 1MΩ ±100ppm/°C
RC2010xK-07xxxxL		2010	3/4W	200V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.: 10MΩ ±1% Max.:22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C
RC2512xK-07xxxxL		2512	1W	200V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.1%,±0.5% Max.: 10MΩ ±1% Max.:22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C
RC0402xR-7WxxxxL	RC_P	0402	1/8W	50V	-55°C to 155°C	1Ω ≤ R ≤ 1MΩ	±1% ±5%	±200 ppm/°C
RC0603xR-7WxxxxL		0603	1/5W	75V				
RC0805xR-7WxxxxL		0805	1/4W	150V				
RC1206xR-7WxxxxL		1206	1/2W	200V				
RC2512xR-7WxxxxL		2512	2W	200V				
RC0100xR-07xxxxP		01005	1/32W	15V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.5% Max.: 1MΩ ±1%,±5%	1Ω ≤ R ≤ 10Ω -200/+600ppm/°C 10Ω ≤ R ≤ 100Ω ±370ppm/°C 100Ω ≤ R ≤ 1MΩ ±250ppm/°C
RC0201xR-07xxxxP		0201	1/20W	25V		1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.5% Max.: 10MΩ ±1%,±5%	1Ω ≤ R ≤ 10Ω -100/+500ppm/°C 10Ω ≤ R ≤ 100Ω ±300ppm/°C 100Ω ≤ R ≤ 10MΩ ±200ppm/°C
RC0402xR-07xxxxP		0402	1/16W	50V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max./Min.: 1MΩ/10Ω ±0.5% Max.: 22MΩ ±5% Max.: 10MΩ ±1%	1Ω ≤ R ≤ 10Ω ±350ppm/°C 10Ω ≤ R ≤ 100Ω ±200ppm/°C 100Ω ≤ R ≤ 10MΩ ±150ppm/°C 10MΩ ≤ R ≤ 22MΩ ±200ppm/°C
RC0603xR-07xxxxP		0603	1/10W	75V				
RC0805xR-07xxxxP		0805	1/8W	150V				
RC1206xR-07xxxxP		1206	1/4W	200V				
RC1210xR-07xxxxP		1210	1/2W	200V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	Max./Min.:1MΩ/10Ω ±0.5% Max.: 1MΩ ±1%,±5%	1Ω ≤ R ≤ 10Ω ±300ppm/°C 10Ω ≤ R ≤ 100Ω ±100ppm/°C 100Ω ≤ R ≤ 10MΩ ±100ppm/°C 10MΩ ≤ R ≤ 22MΩ ±200ppm/°C
RC1218xK-07xxxxP		1218	1W	200V				
RC2010xK-07xxxxP		2010	3/4W	200V				
RC2512xK-07xxxxP		2512	1W	200V				

Note: "!" is the symbol for new product

# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp range	Resistance range	Tolerance	T. C. R.	
RE0201xRE07xxxxL	RE	0201	1/20W	25V	-55°C to 155°C	10Ω ≤ R ≤ 1MΩ	±0.1% ±0.5% ±1%	±50 ppm/°C	
RE0402xRE07xxxxL		0402	1/16W	50V		10Ω ≤ R ≤ 1MΩ			
RE0603xRE07xxxxL		0603	1/10W	75V		10Ω ≤ R ≤ 1MΩ			
RE0805xRE07xxxxL		0805	1/8W	150V		10Ω ≤ R ≤ 1MΩ			
RE1206xRE07xxxxL		1206	1/4W	200V		10Ω ≤ R ≤ 1MΩ			
RT0201xRx07xxxxL	RT	0201	1/20W	25V	-55°C to 155°C	22Ω ≤ R ≤ 75KΩ	±0.1%, ±0.25%, ±0.5%, ±1%	±5 ppm/°C ±10 ppm/°C ±15 ppm/°C ±25 ppm/°C ±50 ppm/°C	
RT0402xRx07xxxxL		0402	1/16W	50V		4.7Ω ≤ R ≤ 240KΩ	±0.05% ±0.1% ±0.25% ±0.5% ±1%		
RT0603xRx07xxxxL		0603	1/10W	75V		1Ω ≤ R ≤ 1MΩ			
RT0805xRx07xxxxL		0805	1/8W	150V		1Ω ≤ R ≤ 1.5MΩ			
RT1206xRx07xxxxL		1206	1/4W	200V	-55°C to 125°C	1Ω ≤ R ≤ 1.5MΩ			
RT1210xRx07xxxxL		1210	1/4W			4.7Ω ≤ R ≤ 1MΩ			
RT2010xKx07xxxxL		2010	1/2W			4.7Ω ≤ R ≤ 1MΩ			
RT2512xKx07xxxxL		2512	3/4W			4.7Ω ≤ R ≤ 1MΩ			
YC102-xR-07xxxxL	YC	2*0201	1/32W	15V	-55°C to 125°C	10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±1% ±5%	±200 ppm/°C	
YC104-xR-07xxxxL		4*0201	1/32W	12.5V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±1% ±5%		
YC122-xR-07xxxxL		2*0402	1/16W	50V	-55°C to 155°C	1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±1% ±5%	1Ω ≤ R < 10Ω ±250 ppm/°C 10Ω ≤ R ≤ 1MΩ ±200 ppm/°C	
YC124-xR-07xxxxL		4*0402	1/16W	25V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ			
YC162-xR-07xxxxL		2*0603	1/16W	50V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ			
YC164-xR-07xxxxL		4*0603	1/16W	50V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ			
YC248-xR-07xxxxL		8*0602	1/16W	50V		10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ			
YC324-xK-07xxxxL		4*1206	1/8W	200V		10Ω ≤ R ≤ 1MΩ			
TC122-xR-07xxxxL	TC	2*0402	1/16W	50V	-55°C to 125°C	10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±1% ±5%	±200 ppm/°C	
TC124-xR-07xxxxL		4*0402	1/16W	50V	-55°C to 125°C				
TC164-xR-07xxxxL		4*0603	1/16W	50V	-55°C to 155°C				
YC158TJR-07xxxxL	YC158	10P8R (0612)	1/16W	25V	-55°C to 155°C	10Ω ≤ R ≤ 100KΩ	±5%	±200 ppm/°C	
YC358xJx-07xxxxL	YC358	10P8R (1225)	1/16W	50V		10Ω ≤ R ≤ 330KΩ		±200 ppm/°C	

Note: "!" is the symbol for new product



# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp. range	Resistance range	Tolerance	T. C. R.
RL0402xR-07xxxxL	RL	0402	1/16W	(PxR) <sup>1/2</sup>	-55°C to 155°C	50mΩ ≤ R < 1Ω	±1% ±2% ±5%	See page 41, table "T. C. R. - RL series"
RL0603xR-07xxxxL		0603	1/10W			10mΩ ≤ R < 1Ω		
RL0805xR-07xxxxL		0805	1/8W			10mΩ ≤ R < 1Ω		
RL1206xR-07xxxxL		1206	1/4W			10mΩ ≤ R < 1Ω		
RL1210xR-07xxxxL		1210	1/2W			10mΩ ≤ R < 1Ω		
RL1218xK-07xxxxL		1218	1W			10mΩ ≤ R < 1Ω		
RL2010xK-07xxxxL		2010	3/4W			10mΩ ≤ R < 1Ω		
RL2512xK-07xxxxL		2512	1W			10mΩ ≤ R < 1Ω		
RL0805xR-7WxxxxL		0805	1/4W		-55°C to 125°C	10mΩ ≤ R < 1Ω		
RL1206xR-7WxxxxL		1206	1/2W		10mΩ ≤ R < 1Ω			
PT0402xR-07xxxxL	PT	0402	1/16W	(PxR) <sup>1/2</sup>	-55°C to 155°C	50mΩ ≤ R < 1Ω	±1% ±2% ±5%	See page 46, table "T.C.R. - PT series"
PT0603xR-07xxxxL		0603	1/10W			50mΩ ≤ R < 1Ω		
PT0805xR-07xxxxL		0805	1/8W			50mΩ ≤ R < 1Ω		
PT1206xR-07xxxxL		1206	1/4W			50mΩ ≤ R < 1Ω		
PT2010xK-07xxxxL		2010	3/4W			100mΩ ≤ R < 1Ω		
PT2512xK-07xxxxL		2512	1W			100mΩ ≤ R < 1Ω		
PT0402xR-7WxxxxL		0402	1/8W			50mΩ ≤ R < 1Ω		
PT0603xR-7WxxxxL		0603	1/5W			50mΩ ≤ R < 1Ω		
PT0805xR-7WxxxxL		0805	1/4W			50mΩ ≤ R < 1Ω		
PT1206xR-7WxxxxL		1206	1/2W			50mΩ ≤ R < 1Ω		
PT2010xK-7WxxxxL		2010	1W			100mΩ ≤ R < 1Ω		
PT2512xK-7WxxxxL		2512	2W			100mΩ ≤ R < 1Ω		
PT0603xR-7TxxxxL		0603	1/3W			50mΩ ≤ R ≤ 68mΩ		

Note: “!“ is the symbol for new product

# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp. range	Resistance range	Tolerance	T. C. R.		
!PA2512xKF07xxxxE	PA	2512	1W	(PxR) <sup>1/2</sup>	-55°C to 170°C	1mΩ ≤ R ≤ 50mΩ	±1% ±5%	±100 ppm/°C		
!PA2512xKF7WxxxxE			2W							
!PA2512xKF7TxxxxE			3W							
!PA1206xRF07xxxxL		1206	1/4W	(PxR) <sup>1/2</sup>	-55°C to 170°C	1mΩ ≤ R ≤ 5mΩ	±1% ±5%	±100 ppm/°C		
!PA1206xRF7WxxxxL			1/2W							
!PA1206xRF47xxxxL			1W							
!PE0508xRx07xxxxL	PE (Wide)	0508	1.2W	(PxR) <sup>1/2</sup>	-55°C to 155°C	5mΩ ≤ R ≤ 100mΩ	±1% ±5%	±50 ppm/°C ±75 ppm/°C ±100 ppm/°C		
!PE0612xKx07xxxxL		0612	1W			1mΩ ≤ R ≤ 100mΩ				
!PE0612xKx7WxxxxL			2W							
!PE0201xRx07xxxxL	PE	0201	1/20W	(PxR) <sup>1/2</sup>	-55°C to 125°C	50mΩ ≤ R ≤ 200mΩ	Min.: 51mΩ ± 0.5% ±1% ±5%	50mΩ ≤ R ≤ 70mΩ ±350 ppm/°C 70mΩ < R ≤ 200mΩ ±100 ppm/°C ±100 ppm/°C		
!PE0201xRx7WxxxxL			1/10W							
!PE0402xRx07xxxxL		0402	1/16W			10mΩ ≤ R ≤ 910mΩ				
!PE0402xRx7WxxxxL			1/8W							
!PE0402xRx7TxxxxL			1/6W							
!PE0402xRx47xxxxL			1/4W							
!PE0603xRx07xxxxL		0603	1/10W			5m, 10m, 20mΩ ≤ R ≤ 910mΩ				
!PE0603xRx7WxxxxL			1/5W							
!PE0603xRx7TxxxxL			1/3W							
!PE0603xRx47xxxxL			2/5W							
!PE0603xRx57xxxxL			1/2W							
!PE0805xRx07xxxxL		0805	1/8W		-55°C to 170°C	5mΩ ≤ R ≤ 910mΩ				
!PE0805xRx7WxxxxL			1/4W							
!PE0805xRx7TxxxxL			1/3W							
!PE0805xRx47xxxxL			1/2W							
!PE1206xRx07xxxxL		1206	1/4W			5mΩ ≤ R ≤ 910mΩ				
!PE1206xRx7WxxxxL			1/2W							
!PE1206xRx47xxxxL			1W							
!PE2010xKx07xxxxL		2010	1/2W			5mΩ ≤ R ≤ 100mΩ				
!PE2010xKx7WxxxxL			1W							
!PE2512xKx07xxxxL		2512	1W			6mΩ ≤ R ≤ 100mΩ				
!PE2512xKx7WxxxxL			2W							
!PS0306xRx07xxxxL	PS (4 Termination)	0306	1/8W	(PxR) <sup>1/2</sup>	-55°C to 125°C	3mΩ ≤ R ≤ 100mΩ	±1% ±5%	±75 ppm/°C ±100 ppm/°C		
!PS0306xRx7WxxxxL			1/4W							
!PS0306xRx7TxxxxL			1/2W							
!PS0612xKx07xxxxL		0612	1W	(PxR) <sup>1/2</sup>	0.5mΩ ≤ R ≤ 10mΩ -55°C to 150°C 12mΩ ≤ R ≤ 100mΩ -55°C to 125°C	0.5mΩ, 0.75mΩ 1mΩ ≤ R ≤ 100mΩ		0.5mΩ ≤ R ≤ 1mΩ ±150ppm/°C 10mΩ ≤ R ≤ 13mΩ ±200ppm/°C 2mΩ ≤ R ≤ 9mΩ ±100ppm/°C 14mΩ ≤ R ≤ 100mΩ ±100ppm/°C		

Note: “!“ is the symbol for new product



# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp. range	Resistance range	Tolerance	T. C. R.				
!PU3921xKxxxxxxL	PU	3921	3W 5W 9W	(PxR) <sup>1/2</sup>	-55°C to 170°C	0.2mR/ 0.3mR/ 0.5mR/ 1mR/ 2mR/ 3mR/ 4mR	±1% ±5%	0.2mR ±325ppm/°C 0.3mR/ 0.5mR ±175ppm/°C 1mR~4mR ±75ppm/°C				
					-55°C to 275°C	0.5mR/ 1mR/ 2mR/ 3mR/ 4mR						
					-55°C to 170°C	2mR/ 3mR/ 4mR						
					-55°C to 170°C	0.2mR/ 0.3mR/ 0.5mR/ 1mR						
!PU5931xKxxxxxxL		5931	5W 7W 10W		-55°C to 170°C	0.2mR/ 0.3mR/ 0.5mR/ 1mR/ 2mR/ 3mR/ 4mR	±1% ±5%	0.2mR ±225ppm/°C 0.3mR/ 0.5mR ±175ppm/°C 1mR~4mR ±75ppm/°C				
					-55°C to 275°C	0.3mR/ 0.5mR/ 1mR/ 2mR/ 3mR/ 4mR						
					-55°C to 170°C	1mR/ 2mR/ 3mR/ 4mR						
					-55°C to 170°C	0.2mR/ 0.3mR/ 0.5mR						
AR0402xR-07xxxxL	AR	0402	1/16W	50V	-55°C to 155°C	1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	±1% ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C				
AR0603xR-07xxxxL		0603	1/10W	50V								
AR0805xR-07xxxxL		0805	1/8W	150V								
AR1206xR-07xxxxL		1206	1/4W	200V								
SR0402xR-07xxxxL	SR	0402	1/16W	50V	-55°C to 155°C	1Ω ≤ R ≤ 100KΩ	±0.5% ±1% ±5% ±10% ±20%	±200 ppm/°C				
SR0402xR-7WxxxxL			1/8W									
SR0603xR-07xxxxL		0603	1/10W	75V								
SR0603xR-7WxxxxL			1/5W									
!SR0603xR-7TxxxxL			1/4W									
SR0805xR-07xxxxL		0805	1/8W	150V								
SR0805xR-7WxxxxL			1/4W									
!SR0805xR-7TxxxxL			1/3W									
SR1206xR-07xxxxL		1206	1/4W	200V								
SR1206xR-7WxxxxL			1/2W									
SR1210xR-07xxxxL		1210	1/2W	200V								
SR1210xR-7WxxxxL			3/4W	200V								
SR1218xK-07xxxxL		1218	1W	200V								
SR2010xK-07xxxxL		2010	3/4W	200V								
SR2512xK-07xxxxL		2512	1W	200V								
RV0603xR-07xxxxL	RV	0603	1/10W	350V	-55°C to 155°C	47Ω ≤ R ≤ 10MΩ	±0.5%, ±1%, ±5%	±200 ppm/°C				
RV0805xR-07xxxxL		0805	1/8W	400V		47Ω ≤ R ≤ 22MΩ	Max.: 22MΩ ±5%, ±1% Max.: 10MΩ ±0.5%					
RV1206xR-07xxxxL		1206	1/4W	500V		47Ω ≤ R ≤ 27MΩ	Max.: 27MΩ ±5%, ±1% Max.: 10MΩ ±0.5%					
RV2010xK-07xxxxL		2010	3/4W			47Ω ≤ R ≤ 22MΩ	Max.: 22MΩ ±5%, ±1% Max.: 10MΩ ±0.5%					
RV2512xK-07xxxxL		2512	1W			47Ω ≤ R ≤ 16MΩ	Max.: 16MΩ ±5%, ±1% Max.: 10MΩ ±0.5%					
TR0402xR-07xxxxL	TR	0402	1/16W	50V	-55°C to 125°C	1Ω ≤ R ≤ 10MΩ	+0/-10% +0/-20% +0/-30%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 1MΩ ±100 ppm/°C 1MΩ < R ≤ 10MΩ ±200 ppm/°C				
TR0603xR-07xxxxL		0603	1/16W									
TR0805xR-07xxxxL		0805	1/8W	150V	-55°C to 155°C							
TR1206xR-07xxxxL		1206	1/4W	200V								

Note: “!“ is the symbol for new product

# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp. range	Resistance range	Tolerance	T. C. R.	
!AF0201xR-07xxxxL	AF	0201	1/20W	25V	-55°C to 125°C	1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	±1%, ±5%, ±0.5%	1Ω ≤ R ≤ 10Ω -100/+350 ppm/°C 10Ω < R ≤ 10MΩ ±200 ppm/°C	
AF0402xR-07xxxxL		0402	1/16W	50V	-55°C to 155°C	1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max:10MΩ ±0.5%, ±1% Max:22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C	
AF0603xR-07xxxxL		0603	1/10W	75V					
AF0805xR-07xxxxL		0805	1/8W	150V		1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ			
AF1206xR-07xxxxL		1206	1/4W	200V		±1%, ±5%, ±0.5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100 ppm/°C		
AF1210xR-07xxxxL		1210	1/2W	200V					
AF1218xK-07xxxxL		1218	1W	200V				1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	
AF2010xK-07xxxxL		2010	3/4W	200V		1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ			
AF2512xK-07xxxxL		2512	1W	200V					
AF122-xR-07xxxxL		2*0402	1/16W	50V	-55°C to 155°C	1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	Max.: 1MΩ ±5% Max./Min.: 1MΩ/10Ω ±1%	1Ω ≤ R ≤ 10Ω ±250 ppm/°C 10Ω < R ≤ 1MΩ ±200 ppm/°C	
AF124-xR-07xxxxL		4*0402	1/16W	25V			±1%, ±5%		
!AF162-xR-07xxxxL		2*0603	1/16W	50V		1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	±1%, ±5%		
!AF164-xR-07xxxxL		4*0603	1/16W	50V			±1%, ±5%	±250 ppm/°C	
AC0201xR-07xxxxL	AC	0201	1/20W	25V	-55°C to 155°C	1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	Max.: 10MΩ ±5%, ±1% Max./Min.: 1MΩ/10Ω ±0.5%	1Ω ≤ R ≤ 10Ω -100/+350ppm/°C 10Ω < R ≤ 10MΩ ±200ppm/°C	
AC0402xR-07xxxxL		0402	1/16W	50V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max.: 10MΩ ±0.5%, ±1% Max.: 22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C	
AC0603xR-07xxxxL		0603	1/10W	75V					
AC0805xR-07xxxxL		0805	1/8W	150V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 1MΩ ±100 ppm/°C	
AC1206xR-07xxxxL		1206	1/4W	200V					
AC1210xR-07xxxxL		1210	1/2W	200V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max.: 10MΩ ±0.5%, ±1% Max.: 22MΩ ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200 ppm/°C	
AC1218xK-07xxxxL		1218	1W	200V					
AC2010xK-07xxxxL		2010	3/4W	200V		1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 1MΩ ±100 ppm/°C	
AC2512xK-07xxxxL		2512	1W	200V					
!AC0402xR-7WxxxxL		0402	1/8W	50V		1Ω ≤ R ≤ 10MΩ	±0.5%, ±1%, ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	
!AC0603xR-7WxxxxL		0603	1/5W	75V					
!AC0805xR-7WxxxxL		0805	1/4W	150V					
!AC1206xR-7WxxxxL		1206	1/2W	200V					
!AC1210xR-7WxxxxL		1210	1W	200V					
!AC1218xR-7WxxxxL		1218	1.5W	200V					
!AC2010xR-7WxxxxL		2010	1.25W	200V					
!AC2512xR-7WxxxxL		2512	2W	200V					
!AC0612xR-07xxxxL	AC wide	0612	3/4W	200V		1Ω ≤ R ≤ 1MΩ	±0.5%, ±1%, ±5%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 1MΩ ±100ppm/°C	
!AC1020xR-07xxxxL		1020	1W	200V					
!AC1225xR-07xxxxL		1225	2W	200V					

Note: " ! " is the symbol for new product



# Chip Resistors General Information

## Specification overview

Global part number	Series	Size	Power rating	Max. voltage	Operating Temp. range	Resistance range	Tolerance	T. C. R.
!AA0201xR-07xxxxL	AA	0201	1/20W	25V	-55°C to 155°C	1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	1Ω ≤ R ≤ 10Ω -100/+400ppm/°C 10Ω < R ≤ 10MΩ ±300ppm°C
!AA0402xR-07xxxxL		0402	1/16W	50V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max:22MΩ ±5% Max:10MΩ ±0.5%, ±1%	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 10MΩ ±150 ppm/°C 10MΩ ≤ R ≤ 22MΩ ±200 ppm/°C
!AA0603xR-07xxxxL		0603	1/10W	75V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	
!AA0805xR-07xxxxL		0805	1/8W	150V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max:22MΩ ±5% Max:10MΩ ±0.5%, ±1%	
!AA1206xR-07xxxxL		1206	1/4W	200V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max:22MΩ ±5% Max:10MΩ ±0.5%, ±1%	
!AA1210xR-07xxxxL		1210	1/2W	200V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	
!AA1218xK-07xxxxL		1218	1W	200V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	
!AA2010xK-07xxxxL		2010	3/4W	200V		1Ω ≤ R ≤ 22MΩ Jumper < 50mΩ	Max:22MΩ ±5% Max:10MΩ ±0.5%, ±1%	
!AA2512xK-07xxxxL		2512	1W	200V		1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±0.5%, ±1%, ±5%	
ATV321xR-07xxxxL	ATV	0404	40mW	50V	-55°C to 125°C	-1dB to -20dB	±0.3dB ±0.5dB ±1.0dB ±2.0dB	---
!AT0402xRx07xxxxL	AT	0402	1/16W	50V	-55°C to 155°C	10Ω ≤ R ≤ 100KΩ	±0.1% ±0.25% ±0.5% ±1%	±25 ppm/°C ±50 ppm/°C
		0603	1/10W	75V		10Ω ≤ R ≤ 330KΩ		
		0805	1/8W	150V		10Ω ≤ R ≤ 1MΩ		
		1206	1/4W	200V		10Ω ≤ R ≤ 1MΩ		

Note: " ! " is the symbol for new product

# Chip Resistors General Information

## Ordering information - Global part number

Global part number - Single resistor <sup>(3)</sup>														
R	C	0	4	0	2	J	R	—	7	D	1	0	R	L
Series name (code 1-2)	RC	0	4	0	2	J	R	—	7	D	1	0	R	L
RC = Thick film general purpose														Default code <sup>(1/2)</sup> (code 17)
RE = Thick film precision grade														Resistance (code 12-16)
RT = Thin film high precision high stability														0R = Jumper
RL = Thick film low ohmic														0U5 = 0.0005Ω
PT = Thick film low ohmic low T. C. R.														0R1 = 0.1Ω
PA/PE = Current sensor - low T. C. R.														1R = 1Ω
PS = Current sensor - low T.C.R, 4 termination														10R = 10Ω
TR = Trimmable														100R = 100Ω
SR = Surge														1K = 1 000Ω
AR = NiAu termination														1M = 1 000 000Ω
RV = High voltage														100M = 100 000 000Ω
AF = Sulfur resistant														
AC = Automotive grade														
AT = Thin film automotive grade														
AA = Sulfur resistant automotive grade														
PU = Shunt resistor														
Size code (code 3-6)	0	4	0	2		J	R	—	7	D	1	0	R	L
(inch / metric)														
0075 = 0.3 x 0.1	0	4	0	2		J	R	—	7	D	1	0	R	L
0100 = 0.4 x 0.2	0	4	0	2		J	R	—	7	D	1	0	R	L
0201 = 0.6 x 0.3	0	4	0	2		J	R	—	7	D	1	0	R	L
0402 = 1.0 x 0.5	0	4	0	2		J	R	—	7	D	1	0	R	L
0603 = 1.6 x 0.8	0	4	0	2		J	R	—	7	D	1	0	R	L
0612 = 1.6 x 3.2	0	4	0	2		J	R	—	7	D	1	0	R	L
0805 = 2.0 x 1.25	0	4	0	2		J	R	—	7	D	1	0	R	L
0830 = 2.0 x 7.5	0	4	0	2		J	R	—	7	D	1	0	R	L
1206 = 3.2 x 1.6	0	4	0	2		J	R	—	7	D	1	0	R	L
1210 = 3.2 x 2.6	0	4	0	2		J	R	—	7	D	1	0	R	L
1218 = 3.2 x 4.5	0	4	0	2		J	R	—	7	D	1	0	R	L
2010 = 5.0 x 2.5	0	4	0	2		J	R	—	7	D	1	0	R	L
2512 = 6.35 x 3.2	0	4	0	2		J	R	—	7	D	1	0	R	L
3921 = 10.0 x 5.2	0	4	0	2		J	R	—	7	D	1	0	R	L
5931 = 15.0 x 7.75	0	4	0	2		J	R	—	7	D	1	0	R	L
Tolerance (code 7)	0	4	0	2		J	R	—	7	D	1	0	R	L
L = ±0.01%	0	4	0	2		J	R	—	7	D	1	0	R	L
W = ±0.05%	0	4	0	2		J	R	—	7	D	1	0	R	L
B = ±0.1%	0	4	0	2		J	R	—	7	D	1	0	R	L
C = ±0.25%	0	4	0	2		J	R	—	7	D	1	0	R	L
D = ±0.5%	0	4	0	2		J	R	—	7	D	1	0	R	L
F = ±1%	0	4	0	2		J	R	—	7	D	1	0	R	L
G = ±2%	0	4	0	2		J	R	—	7	D	1	0	R	L
J = ±5% (for RC/AR/AF/AC Jumper ordering)	0	4	0	2		J	R	—	7	D	1	0	R	L
K = ±10% (for TR = 0/-10%)	0	4	0	2		J	R	—	7	D	1	0	R	L
M = ±20% (for TR = 0/-20%)	0	4	0	2		J	R	—	7	D	1	0	R	L
N = ±30% (for TR = 0/-30%)	0	4	0	2		J	R	—	7	D	1	0	R	L
— for RL/PT Jumper ordering	0	4	0	2		J	R	—	7	D	1	0	R	L

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

3. Global Part Number is the preferred clear text code for ordering Yageo and Phycomp branded products.



# Chip Resistors General Information

## Ordering information - Global part number

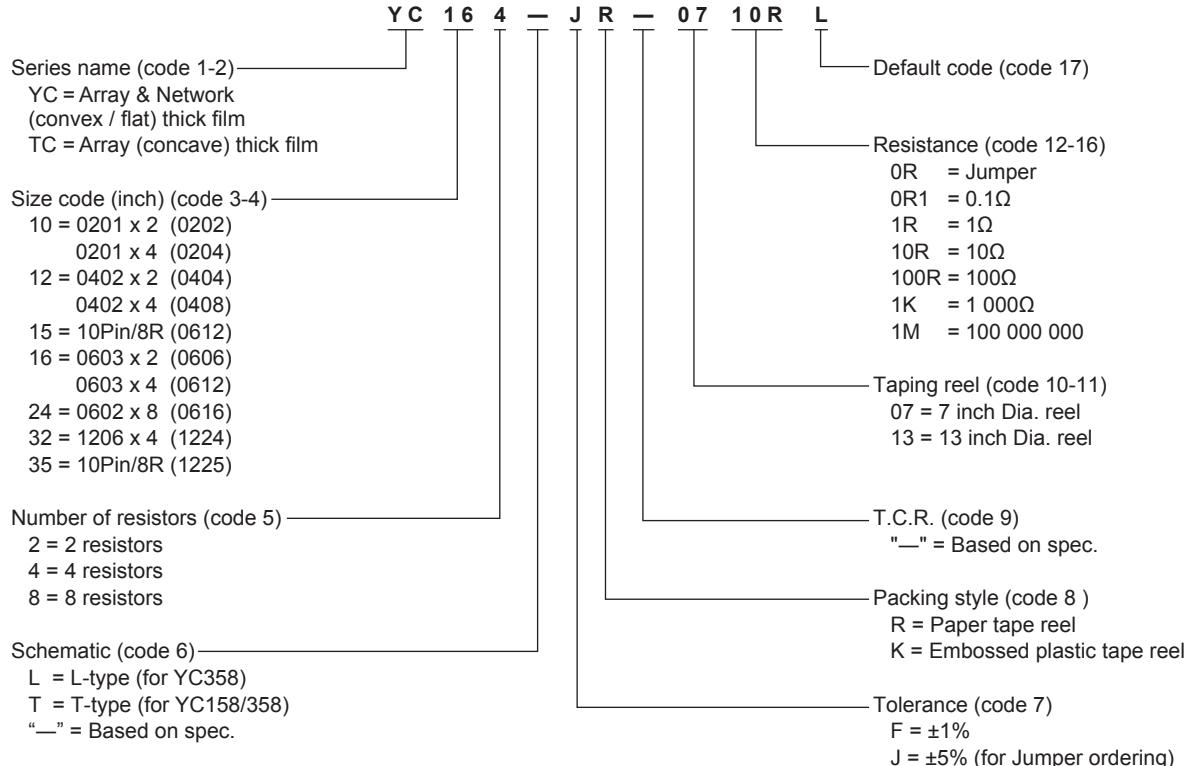
### Global part number - Power enhancement

RL	0805	J	R	—	7W	0R015	L	
Series name (code 1-2)								Default code (code 17)
RC = Thick film general purpose								
AC = Automotive grade chip resistor								
RL = Thick film low ohmic								
PT = Thick film low ohmic low T. C. R.								
PA/PE = Current sensor - low T. C. R.								
PS = Current sensor - low T.C.R, 4 termination								
PU = Shunt resistor								
Size code (code 3-6)								Resistance (code 12-16)
(inch / metric)								
0306 = 0.8 x 1.6								0U5 = 0.0005Ω
0508 = 1.25 x 2.0								0R01 = 0.01Ω
0612 = 1.6 x 3.2								0R1 = 0.1Ω
0805 = 2.0 x 1.25								1R = 1Ω
1206 = 3.2 x 1.6								10R = 10Ω
2010 = 5.0 x 2.5								100R = 100Ω
Tolerance (code 7)								1K = 1000Ω
B = ±0.1%								1M = 1000000Ω
D = ±0.5%								100M = 100000000Ω
F = ±1%								
G = ±2%								
J = ±5%								
Packing style (code 8 )								T. C. R. (code 9)
R = Paper tape reel								E = ±50 ppm/°C
K = Embossed plastic tape reel								M = ±75 ppm/°C
								F = ±100 ppm/°C
								G = ±200 ppm/°C
								“—” = Based on spec.
								(— for thick film only)

# Chip Resistors General Information

## Ordering information - Global part number

### Global part number - Arrays & Networks





# Chip Resistors General Information

## Ordering information - North America

### Phycomp CTC ordering code - North America

Ordering example: 9C06031A10R0FKHFT = R-Chip 0603, 10R0, 1%, 5K reel

1-2	3-6	7-8	9-12	13	14	15-16	17
<b>XX</b>	<b>XXXX</b>	<b>XX</b>	<b>XXXX</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>X</b>
Series name (code 1-2)							Packing style (code 17 )
9C = Phycomp thick film chip resistors							T = 5K paper
9T = Phycomp thin film chip resistors							3 = 10K paper
Size code (standard resistors, code 3-6)							4 = 20K paper
0201 0201 (0603)							5 = 4K blister
0402 0402 (1005)							6 = 5K blister
0603 0603 (1608)							7 = 50K paper
0805 0805 (2012)							P = 25K bulk case
1206 1206 (3216)							
1210 1210 (3225)							
1218 1218 (3248)							
2010 2010 (5025)							
2512 2512 (6432)							
AC34 0603 (1608) 4R concave array							
AV34 0603 (1608) 4R convex array							
AV22 0402 (1005) 2R convex array							
AV24 0402 (1005) 4R convex array							
AV28 0402 (1005) 8R convex array							
RN31 10P8R in 1206 convex network							
FR01 1206 (3216) Fusible							
FR21 0603 (1608) Fusible							
SR01 1206 (3216) Surge							
VR01 1206 (3216) High voltage 5%							
VR02 1206 (3216) High voltage 1%							
VR11 0805 (2012) High voltage 5%							
VR12 0805 (2012) High voltage 1%							
VR21 2512 (6432) High voltage 5%							
MR22 2512 (6432) Current sensor - low T. C. R.							
MF22 2512 (6432) Current sensor - low T. C. R.							
V321 0404 (1010) RF attenuator							
Power rating (code 7-8)							
1A 1/16W 0.063W (0402)							
1A 1/10W 0.10W (0603)							
2A 1/8W 0.125W (0805)							
3A 1/4W 0.25W (1206)							
5A 1/2W 0.5W (1210)							
7A 1/20W 0.05W (0201)							
8A 1/32W 0.03125W (RN31)							
12 3/4W 0.75W (2010)							
1W 1W 1W (1218/2512)							
2W 2W 2W							
Resistance value (code 9-12)							
0R00 = Jumper							
R0XX < 0.1Ω							
XXXX = 0.1Ω - 0.976Ω							
XRXX = 1Ω - 9.76Ω							
XXRX = 10Ω - 97.6Ω							
XXX0 = 100Ω - 976Ω							
XXX1 = 1K - 9.76K							
XXX2 = 10K - 97.6K							
XXX3 = 100K - 9.78K							
XXX4 = 1M - 9.76M							
XXX5 = 10M - 97.6M							
XXX6 = 100M+							
XXDB = 1 - 20DB							

# Chip Resistors General Information

IEC publication 63, SPQ, last digit of 12NC

Standard of values in a decade according to "IEC publication 63"												
E24 series	10	11	12	13	15	16	18	20	22	24	27	30
	33	36	39	43	47	51	56	62	68	75	82	91
E96 series	100	102	105	107	110	113	115	118	121	124	127	130
	133	137	140	143	147	150	154	158	162	165	169	174
	178	182	187	191	196	200	205	210	215	221	226	232
	237	243	249	255	261	267	274	280	287	294	301	309
	316	324	332	340	348	357	365	374	383	392	402	412
	422	432	442	453	464	475	487	499	511	523	536	549
	562	576	590	604	619	634	649	665	681	698	715	732
	750	768	787	806	825	845	866	887	909	931	953	976

Packing quantities												
Size code	Tape width	178mm / Ø7" reel			330mm / Ø13" reel			Weight		Volume		
		Paper	Embossed	Paper	Embossed	g/100pcs	mm <sup>3</sup>					
0100	8mm	20000	---	---	---	---	0.007	0.0104				
0201	8mm	10000 / 20000	---	80000	---	---	0.016	0.041				
0075	4mm	40000	---	---	---	---						
0306	4mm	5000	---	---	---	---						
0508	8mm	5000	---	---	---	---						
1020	12mm	---	4000	---	---	---						
1225	12mm	---	4000	---	---	---						
0402	8mm	10000 / 20000	---	50000	---	---	0.058	0.175				
0603	8mm	5000	---	20000	---	---	0.192	0.576				
0612	8mm	4000	4000	---	---	---	0.862	2.728				
0805	8mm	4000 / 5000	---	20000	---	---	0.450	1.250				
1206	8mm	4000 / 5000	---	20000	---	---	0.862	2.728				
1210	8mm	5 000	---	20000	---	---	1.471	4.030				
1218	12mm	---	4000	---	---	---	2.703	7.590				
2010	12mm	---	4000	---	16000	---	2.273	6.875				
2512	12mm	---	4000	---	---	---	3.704	10.827				
YC102	8mm	10000	---	---	---	---	0.052	---				
YC104	8mm	10000	---	---	---	---	0.099	---				
AF/YC122	8mm	10000	---	50000	---	---	0.100	---				
TC122	8mm	10000	---	50000	---	---	0.112	---				
ATV321	8mm	10000	---	---	---	---	0.100	---				
AF/YC124	8mm	10000	---	40000	---	---	0.281	---				
TC124	8mm	10000	---	40000	---	---	0.311	---				
AF/YC162	8mm	5000	---	---	---	---	0.376	---				
AF/YC164	8mm	5000	---	20000	---	---	0.833	---				
TC164	8mm	5000	---	20000	---	---	1.030	---				
YC158	8mm	5000	---	20000	---	---	0.855	---				
YC248	12mm	5000	4000	---	---	---	0.885	---				
YC324	12mm	---	4000	---	---	---	2.703	---				
YC358	12mm	---	4000	---	---	---	3.333	---				

## 12NC Ordering information

The first 8 or 9 digits of the 12 digit catalogue number are given under section "Phycomp worldwide - Traditional type" on following pages.

The remaining 4 or 3 digits represent the resistance value with the last digit indicating the multiplier as shown in table on the right.

Example:

0.001 Ω = 0010 or 010  
 0.02 Ω = 0200 or 200  
 0.3 Ω = 3007 or 307  
 1 Ω = 1008 or 108  
 33 kΩ = 3303 or 333  
 10 MΩ = 1006 or 106

Last digit of 12NC	
Resistance	Last digit
0.001 to 0.0976 Ω	0
0.1 to 0.976 Ω	7
1 to 9.76 Ω	8
10 to 97.6 Ω	9
100 to 976 Ω	1
1 to 9.76 kΩ	2
10 to 97.6 kΩ	3
100 to 976 kΩ	4
1 to 9.76 MΩ	5
10 to 97.6 MΩ	6



# Chip Resistors Selection Charts

RC - Thick film general purpose chip resistors, 0075 to 2512



## Features

- Extremely thin and light (0075 & 0100)
- Highly reliable construction
- Compatible with all soldering processes
- Highly stable in auto-placement surface mounting applications
- Jumper is available
- Available in 8mm tape & reel per IEC 60286-3 (EIA -RS 481)

Derating curve	Construction																																							
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>RC0075-RC0201 (%)</th> <th>RC0402-RC2512 (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td><td>100</td></tr> <tr><td>-40</td><td>100</td><td>100</td></tr> <tr><td>0</td><td>100</td><td>100</td></tr> <tr><td>20</td><td>100</td><td>100</td></tr> <tr><td>40</td><td>100</td><td>100</td></tr> <tr><td>60</td><td>100</td><td>100</td></tr> <tr><td>70</td><td>100</td><td>100</td></tr> <tr><td>80</td><td>90</td><td>85</td></tr> <tr><td>100</td><td>75</td><td>65</td></tr> <tr><td>120</td><td>50</td><td>40</td></tr> <tr><td>140</td><td>25</td><td>20</td></tr> <tr><td>155</td><td>20</td><td>15</td></tr> </tbody> </table>	Ambient Temperature (°C)	RC0075-RC0201 (%)	RC0402-RC2512 (%)	-55	100	100	-40	100	100	0	100	100	20	100	100	40	100	100	60	100	100	70	100	100	80	90	85	100	75	65	120	50	40	140	25	20	155	20	15	
Ambient Temperature (°C)	RC0075-RC0201 (%)	RC0402-RC2512 (%)																																						
-55	100	100																																						
-40	100	100																																						
0	100	100																																						
20	100	100																																						
40	100	100																																						
60	100	100																																						
70	100	100																																						
80	90	85																																						
100	75	65																																						
120	50	40																																						
140	25	20																																						
155	20	15																																						

Dimensions	Dimensions																																																																														
	<table border="1"> <thead> <tr> <th>Type</th> <th>L</th> <th>W</th> <th>H</th> <th><math>l_1</math></th> <th><math>l_2</math></th> </tr> </thead> <tbody> <tr><td>RC0075</td><td><math>0.30 \pm 0.01</math></td><td><math>0.15 \pm 0.01</math></td><td><math>0.10 \pm 0.01</math></td><td><math>0.08 \pm 0.03</math></td><td><math>0.08 \pm 0.03</math></td></tr> <tr><td>RC01005</td><td><math>0.40 \pm 0.02</math></td><td><math>0.20 \pm 0.02</math></td><td><math>0.13 \pm 0.02</math></td><td><math>0.10 \pm 0.03</math></td><td><math>0.10 \pm 0.03</math></td></tr> <tr><td>RC0201</td><td><math>0.60 \pm 0.03</math></td><td><math>0.30 \pm 0.03</math></td><td><math>0.23 \pm 0.03</math></td><td><math>0.10 \pm 0.05</math></td><td><math>0.15 \pm 0.05</math></td></tr> <tr><td>RC0402</td><td><math>1.00 \pm 0.05</math></td><td><math>0.50 \pm 0.05</math></td><td><math>0.35 \pm 0.05</math></td><td><math>0.20 \pm 0.10</math></td><td><math>0.25 \pm 0.10</math></td></tr> <tr><td>RC0603</td><td><math>1.60 \pm 0.10</math></td><td><math>0.80 \pm 0.10</math></td><td><math>0.45 \pm 0.10</math></td><td><math>0.25 \pm 0.15</math></td><td><math>0.25 \pm 0.15</math></td></tr> <tr><td>RC0805</td><td><math>2.00 \pm 0.10</math></td><td><math>1.25 \pm 0.10</math></td><td><math>0.50 \pm 0.10</math></td><td><math>0.35 \pm 0.20</math></td><td><math>0.35 \pm 0.20</math></td></tr> <tr><td>RC1206</td><td><math>3.10 \pm 0.10</math></td><td><math>1.60 \pm 0.10</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.20</math></td><td><math>0.40 \pm 0.20</math></td></tr> <tr><td>RC1210</td><td><math>3.10 \pm 0.10</math></td><td><math>2.60 \pm 0.15</math></td><td><math>0.50 \pm 0.10</math></td><td><math>0.45 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>RC1218</td><td><math>3.10 \pm 0.10</math></td><td><math>4.60 \pm 0.10</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.20</math></td><td><math>0.40 \pm 0.20</math></td></tr> <tr><td>RC2010</td><td><math>5.00 \pm 0.10</math></td><td><math>2.50 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>RC2512 (1W)</td><td><math>6.35 \pm 0.10</math></td><td><math>3.10 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.60 \pm 0.20</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>RC2512 (2W)</td><td><math>6.35 \pm 0.10</math></td><td><math>3.10 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.60 \pm 0.20</math></td><td><math>1.15 \pm 0.20</math></td></tr> </tbody> </table>	Type	L	W	H	$l_1$	$l_2$	RC0075	$0.30 \pm 0.01$	$0.15 \pm 0.01$	$0.10 \pm 0.01$	$0.08 \pm 0.03$	$0.08 \pm 0.03$	RC01005	$0.40 \pm 0.02$	$0.20 \pm 0.02$	$0.13 \pm 0.02$	$0.10 \pm 0.03$	$0.10 \pm 0.03$	RC0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.10 \pm 0.05$	$0.15 \pm 0.05$	RC0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.35 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$	RC0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$	RC0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$	RC1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$	RC1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$	RC1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$	RC2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$	RC2512 (1W)	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$	RC2512 (2W)	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$1.15 \pm 0.20$
Type	L	W	H	$l_1$	$l_2$																																																																										
RC0075	$0.30 \pm 0.01$	$0.15 \pm 0.01$	$0.10 \pm 0.01$	$0.08 \pm 0.03$	$0.08 \pm 0.03$																																																																										
RC01005	$0.40 \pm 0.02$	$0.20 \pm 0.02$	$0.13 \pm 0.02$	$0.10 \pm 0.03$	$0.10 \pm 0.03$																																																																										
RC0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.10 \pm 0.05$	$0.15 \pm 0.05$																																																																										
RC0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.35 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$																																																																										
RC0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$																																																																										
RC0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$																																																																										
RC1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$																																																																										
RC1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$																																																																										
RC1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$																																																																										
RC2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$																																																																										
RC2512 (1W)	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$																																																																										
RC2512 (2W)	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$1.15 \pm 0.20$																																																																										

# Chip Resistors Selection Charts

## RC - Thick film general purpose chip resistors, 0075 to 2512

Electrical characteristics								
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R. ( ppm/°C)	Jumper criteria (unit: A)
RC0075	1/50W	-55°C to +125°C	10V	25V	25V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 100Ω -200/+600ppm°C 100Ω ≤ R ≤ 1MΩ ±200ppm°C	Rated current 0.5 Max. current 1.0
RC0100	1/32W	-55°C to +125°C	15V	30V	30V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 33Ω ≤ R ≤ 470KΩ Jumper < 50mΩ	1Ω ≤ R < 10Ω -200/+600ppm°C 10Ω ≤ R < 100Ω +300ppm°C 100Ω ≤ R ≤ 10MΩ +200ppm°C 10MΩ < R ≤ 22MΩ +250ppm°C	Rated current 0.5 Max. current 1.0
RC0201	1/20W	-55°C to +125°C	25V	50V	50V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	10Ω < R ≤ 10MΩ ±200ppm°C 1Ω ≤ R ≤ 10Ω -100/+350ppm°C	Rated current 0.5 Max. current 1.0
RC0402	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 10Ω < R ≤ 10MΩ ±100ppm°C 10MΩ < R ≤ 22MΩ ±200ppm°C	Rated current 1.0 Max. current 2.0
	1/8W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ	1Ω ≤ R < 1MΩ ±200ppm°C	-- --
RC0603	1/10W	-55°C to +155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 10Ω < R ≤ 10MΩ ±100ppm°C 10MΩ < R ≤ 22MΩ ±200ppm°C	Rated current 1.0 Max. current 2.0
	1/5W	-55°C to +155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ	1Ω ≤ R ≤ 1MΩ ±200ppm°C	-- --
RC0805	1/8W	-55°C to +155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ E24 ±10%,20% 24MΩ ≤ R ≤ 100MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 10Ω < R ≤ 10MΩ ±100ppm°C 10MΩ < R ≤ 22MΩ ±200ppm°C 24MΩ < R ≤ 100MΩ ±300ppm°C	Rated current 2.0 Max. current 5.0
	1/4W	-55°C to +155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ	1Ω ≤ R ≤ 1MΩ ±200ppm°C	-- --
RC1206	1/4W	-55°C to +155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ E24 ±10%,20% 24MΩ ≤ R ≤ 100MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 10Ω < R ≤ 10MΩ ±100ppm°C 10MΩ < R ≤ 22MΩ ±200ppm°C 24MΩ < R ≤ 100MΩ ±300ppm°C	Rated current 2.0 Max. current 10.0
	1/2W	-55°C to +155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ	1Ω ≤ R ≤ 1MΩ ±200ppm°C	-- --
RC1210	1/2W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 10Ω < R ≤ 10MΩ ±100ppm°C 10MΩ < R ≤ 22MΩ ±200ppm°C	Rated current 2.0 Max. current 10.0
RC1218	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 11Ω ≤ R ≤ 1MΩ ±100ppm°C	Rated current 6.0 Max. current 10.0
RC2010	3/4W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.1%;±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm°C 10Ω < R ≤ 10MΩ ±100ppm°C 10MΩ < R ≤ 22MΩ ±200ppm°C	Rated current 2.0 Max. current 10.0
RC2512	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 1M E24/E96 ±1% 1Ω ≤ R ≤ 1M	1Ω ≤ R ≤ 1MΩ ±200ppm°C	Rated current 2.0 Max. current 10.0
	2W	-55°C to +155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 1M E24/E96 ±1% 1Ω ≤ R ≤ 1M	1Ω ≤ R ≤ 1MΩ ±200ppm°C	-- --



# Chip Resistors Selection Charts

RC - Thick film general purpose chip resistors, 0075 to 2512

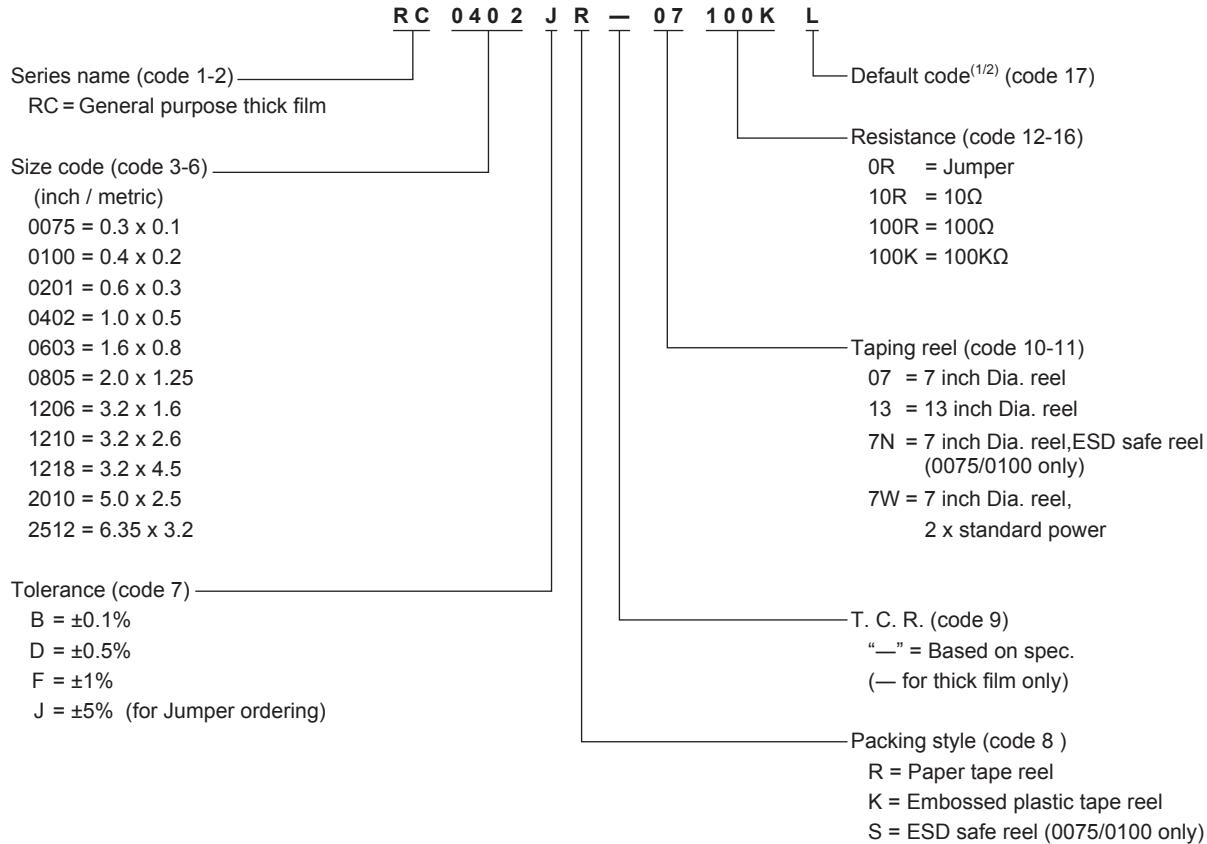
Environmental characteristics				
Performance test		Test method	Procedure	Requirements
Life		MIL-STD-202 -method 108A	1000 hours at $70 \pm 2^\circ\text{C}$ applied RCWV 1.5 hours on, 0.5 hours off, still air required	0075/ 01005: $\pm(3\% +50\text{m}\Omega)$ $< 100\text{m}\Omega$ for jumper Others: $\pm(1\% +50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(3\% +50\text{m}\Omega)$ for 5% tol. $< 100\text{m}\Omega$ for jumper
High temperature exposure		MIL-STD-202 -method 108A	1000 hours at maximum operating temperature depending on specification, unpowered	0075/ 01005: $\pm(1\% +50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(1\% +50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(2\% +50\text{m}\Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper
Moisture resistance		MIL-STD-202 -method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with $25^\circ\text{C} / 65^\circ\text{C} 95\%$ R.H	0075/ 01005: $\pm(2.0\% +50\text{m}\Omega)$ $< 100\text{m}\Omega$ for jumper Others: $\pm(0.5\% +50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(2\% +50\text{m}\Omega)$ for 5% tol. $< 100\text{m}\Omega$ for jumper
Thermal shock		MIL-STD-202 -method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	0075/ 01005: $\pm(1\% +50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(0.5\% +50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(1\% +50\text{m}\Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper
Solderability	Wetting	J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at $245 \pm 3^\circ\text{C}$ Dipping time: $3 \pm 0.5$ seconds	Well tinned ( $\geq 95\%$ covered) No visible damage
	Resistance to soldering heat	MIL-STD-202 -method 210F	Lead-free solder, $260^\circ\text{C}$ , 10 seconds immersion time	0075/ 01005: $\pm(1\% +50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(0.5\% +50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(1\% +0.05 \Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper No visible damage
Short time overload		IEC 60115 -1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	0075/ 01005: $\pm(2\% +50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(1\% +50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(2\% +50\text{m}\Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper No visible damage

# Chip Resistors Selection Charts

## RC - Thick film general purpose chip resistors, 0075 to 2512

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: RC0402JR-07100KL



**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only



# Chip Resistors Selection Charts

**RC - Thick film general purpose chip resistors, 0075 to 2512**

Phycomp worldwide - Traditional type									
General purpose thick film / RC series									
Size: inch (mm)	0201 (0603)		0402 (1005)		0603 (1608)		0805 (2012)		
Power	1/20 W		1/16 W		1/10 W		1/8 W		
Tolerance	+5%	+1%	+5%	+1%	+5%	+1%	+5%	+1%	
Resistance	E24	E24 / E96	E24	E24 / E96	E24	E24 / E96	E24	E24 / E96	
Packing	paper tape		paper tape		paper tape		paper tape		
Quantity	5 000	---	---	---	2322 702 60...L	2322 704 6....L	2322 730 61...L	2322 734 6....L	
	10 000	2322 803 70...L	2322 806 7....L	2322 705 70...L	2322 706 7....L	2322 702 70...L	2322 704 7....L	2322 730 71...L	2322 734 7....L
	20 000	2322 806 80...L	2322 806 8....L	---	---	2322 702 81...L	2322 704 8....L	2322 730 81...L	2322 734 8....L
	50 000	2322 803 60...L	2322 806 6....L	2322 705 87...L	2322 706 8....L	---	---	---	---
Jumper	5 000	---	---	---	2322 702 96001L	---	2322 730 91002L	---	
	10 000	2322 803 91001L	---	2322 705 91001L	---	2322 702 97001L	---	2322 730 91003L	---
	20 000	---	---	---	2322 702 92002L	---	2322 730 92002L	---	
	50 000	---	---	2322 705 91007L	---	---	---	---	

**For ordering rules:** See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

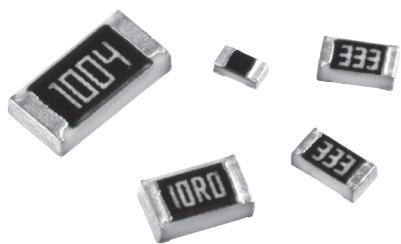
Phycomp worldwide - Traditional type								
General purpose thick film / RC series								
Size: inch (mm)	1206 (3216)		1210 (3225)		1218 (3248)		2010 (5025)	
Power	1/4 W		1/2 W		1 W		3/4 W	
Tolerance	+5%	+1%	+5%	+1%	+5%	+1%	+5%	+1%
Resistance	E24	E24 / E96	E24	E24 / E96	E24	E24 / E96	E24	E24 / E96
Packing	paper tape		paper tape		blister tape		blister tape	
Quantity	4 000	---	---	---	2322 735 64...L	2322 735 7....L	2322 760 60...L	2322 761 6....L
	5 000	2322 711 61...L	2322 724 6....L	2390 735 70...L	2390 735 3....L	---	---	---
	10 000	2322 711 51...L	2322 724 7....L	---	---	---	---	---
	20 000	2322 711 81...L	2322 724 8....L	2390 735 71...L	2390 735 5....L	---	---	---
Jumper	4 000	---	---	---	2322 735 90007L	---	2322 760 90003L	---
	5 000	2322 711 91032L	---	2390 735 90001L	---	---	---	---
	10 000	2322 711 91005L	---	---	---	---	---	---
	20 000	2322 711 92004L	---	---	---	---	---	---

**For ordering rules:** See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America								
Regional code for ordering Phycomp branded products. Please see page 15 for details.								

# Chip Resistors Selection Charts

RC\_P ,Total lead free thick film general purpose chip resistor,01005 to 2512



## Features

- Highly reliable electrode construction
- Compatible with all soldering processes
- Highly stable in auto-placement surface mounting applications
- Barrier layer end termination
- Lead free (Pb<1000ppm) without RoHS exemptions (7C-1)

Derating curve	Construction																					
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>RC0100-RC0201 (%)</th> <th>RC0402-RC2512 (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td><td>100</td></tr> <tr><td>70</td><td>100</td><td>100</td></tr> <tr><td>80</td><td>90</td><td>85</td></tr> <tr><td>100</td><td>70</td><td>60</td></tr> <tr><td>125</td><td>0</td><td>0</td></tr> <tr><td>155</td><td>0</td><td>0</td></tr> </tbody> </table>	Ambient Temperature (°C)	RC0100-RC0201 (%)	RC0402-RC2512 (%)	-55	100	100	70	100	100	80	90	85	100	70	60	125	0	0	155	0	0	
Ambient Temperature (°C)	RC0100-RC0201 (%)	RC0402-RC2512 (%)																				
-55	100	100																				
70	100	100																				
80	90	85																				
100	70	60																				
125	0	0																				
155	0	0																				

Dimensions	Dimensions																																																																		
	<table border="1"> <thead> <tr> <th>Type</th> <th>L</th> <th>W</th> <th>H</th> <th><math>l_1</math></th> <th><math>l_2</math></th> </tr> </thead> <tbody> <tr><td>RC01005</td><td><math>0.40 \pm 0.02</math></td><td><math>0.20 \pm 0.02</math></td><td><math>0.13 \pm 0.02</math></td><td><math>0.10 \pm 0.03</math></td><td><math>0.10 \pm 0.03</math></td></tr> <tr><td>RC0201</td><td><math>0.60 \pm 0.03</math></td><td><math>0.30 \pm 0.03</math></td><td><math>0.23 \pm 0.03</math></td><td><math>0.10 \pm 0.05</math></td><td><math>0.15 \pm 0.05</math></td></tr> <tr><td>RC0402</td><td><math>1.00 \pm 0.05</math></td><td><math>0.50 \pm 0.05</math></td><td><math>0.35 \pm 0.05</math></td><td><math>0.20 \pm 0.10</math></td><td><math>0.25 \pm 0.10</math></td></tr> <tr><td>RC0603</td><td><math>1.60 \pm 0.10</math></td><td><math>0.80 \pm 0.10</math></td><td><math>0.45 \pm 0.10</math></td><td><math>0.25 \pm 0.15</math></td><td><math>0.25 \pm 0.15</math></td></tr> <tr><td>RC0805</td><td><math>2.00 \pm 0.10</math></td><td><math>1.25 \pm 0.10</math></td><td><math>0.50 \pm 0.10</math></td><td><math>0.35 \pm 0.20</math></td><td><math>0.35 \pm 0.20</math></td></tr> <tr><td>RC1206</td><td><math>3.10 \pm 0.10</math></td><td><math>1.60 \pm 0.10</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.20</math></td><td><math>0.40 \pm 0.20</math></td></tr> <tr><td>RC1210</td><td><math>3.10 \pm 0.10</math></td><td><math>2.60 \pm 0.15</math></td><td><math>0.50 \pm 0.10</math></td><td><math>0.45 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>RC1218</td><td><math>3.10 \pm 0.10</math></td><td><math>4.60 \pm 0.10</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.20</math></td><td><math>0.40 \pm 0.20</math></td></tr> <tr><td>RC2010</td><td><math>5.00 \pm 0.10</math></td><td><math>2.50 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>RC2512</td><td><math>6.35 \pm 0.10</math></td><td><math>3.10 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.60 \pm 0.20</math></td><td><math>0.50 \pm 0.20</math></td></tr> </tbody> </table>	Type	L	W	H	$l_1$	$l_2$	RC01005	$0.40 \pm 0.02$	$0.20 \pm 0.02$	$0.13 \pm 0.02$	$0.10 \pm 0.03$	$0.10 \pm 0.03$	RC0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.10 \pm 0.05$	$0.15 \pm 0.05$	RC0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.35 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$	RC0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$	RC0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$	RC1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$	RC1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$	RC1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$	RC2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$	RC2512	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$
Type	L	W	H	$l_1$	$l_2$																																																														
RC01005	$0.40 \pm 0.02$	$0.20 \pm 0.02$	$0.13 \pm 0.02$	$0.10 \pm 0.03$	$0.10 \pm 0.03$																																																														
RC0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.10 \pm 0.05$	$0.15 \pm 0.05$																																																														
RC0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.35 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$																																																														
RC0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$																																																														
RC0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$																																																														
RC1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$																																																														
RC1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$																																																														
RC1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$																																																														
RC2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$																																																														
RC2512	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$																																																														



# Chip Resistors Selection Charts

**RC\_P ,Total lead free thick film general purpose chip resistor,01005 to 2512**

Electrical characteristics								
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R. ( ppm/°C )	Jumper criteria (unit: A)
RC0100	1/32W	-55°C to +125°C	15V	30V	30V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R < 10Ω -200/+600ppm°C 10Ω ≤ R < 100Ω +370ppm°C 100Ω ≤ R ≤ 1MΩ +250ppm°C	Rated current 0.5 Max. current 1.0
RC0201	1/20W	-55°C to +125°C	25V	50V	50V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω -100/+500ppm°C 10Ω ≤ R ≤ 100Ω ±300ppm°C 100Ω ≤ R ≤ 10MΩ ±200ppm°C	Rated current 0.5 Max. current 1.0
RC0402	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±350ppm°C 10Ω ≤ R ≤ 100Ω ±200ppm°C 100Ω ≤ R ≤ 10MΩ ±150ppm°C 10MΩ ≤ R ≤ 22MΩ ±200ppm°C	Rated current 1.0 Max. current 2.0
RC0603	1/10W	-55°C to +155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±300ppm°C 10Ω ≤ R ≤ 100Ω ±200ppm°C 100Ω ≤ R ≤ 10MΩ ±150ppm°C 10MΩ ≤ R ≤ 22MΩ ±200ppm°C	Rated current 1.0 Max. current 2.0
RC0805	1/8W	-55°C to +155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±300ppm°C 10Ω ≤ R ≤ 100Ω ±150ppm°C 100Ω ≤ R ≤ 10MΩ ±100ppm°C 10MΩ ≤ R ≤ 22MΩ ±200ppm°C	Rated current 2.0 Max. current 5.0
RC1206	1/4W	-55°C to +155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±300ppm°C 10Ω ≤ R ≤ 100Ω ±100ppm°C 100Ω ≤ R ≤ 10MΩ ±100ppm°C 10MΩ ≤ R ≤ 22MΩ ±200ppm°C	Rated current 2.0 Max. current 10.0
RC1210	1/2W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	10Ω ±300ppm°C 10Ω ≤ R ≤ 100Ω ±100ppm°C 100Ω ≤ R ≤ 10MΩ ±100ppm°C 10MΩ ≤ R ≤ 22MΩ ±200ppm°C	Rated current 2.0 Max. current 10.0
RC1218	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 6.0 Max. current 10.0
RC2010	3/4W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 2.0 Max. current 10.0
RC2512	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 2.0 Max. current 10.0

# Chip Resistors Selection Charts

## RC\_P ,Total lead free thick film general purpose chip resistor,01005 to 2512

Environmental characteristics				
Performance test		Test method	Procedure	Requirements
Life		MIL-STD-202 -method 108A	1000 hours at $70 \pm 2^\circ\text{C}$ applied RCWV 1.5 hours on, 0.5 hours off, still air required	01005: $\pm(3\% + 50\text{m}\Omega)$ $< 100\text{m}\Omega$ for jumper Others: $\pm(1\% + 50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(3\% + 50\text{m}\Omega)$ for 5% tol. $< 100\text{m}\Omega$ for jumper
High temperature exposure		MIL-STD-202 -method 108A	1000 hours at maximum operating temperature depending on specification, unpowered	01005: $\pm(1\% + 50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(1\% + 50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(2\% + 50\text{m}\Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper
Moisture resistance		MIL-STD-202 -method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with $25^\circ\text{C} / 65^\circ\text{C} 95\%$ R.H	01005: $\pm(2.0\% + 50\text{m}\Omega)$ $< 100\text{m}\Omega$ for jumper Others: $\pm(0.5\% + 50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(2\% + 50\text{m}\Omega)$ for 5% tol. $< 100\text{m}\Omega$ for jumper
Thermal shock		MIL-STD-202 -method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	01005: $\pm(1\% + 50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(0.5\% + 50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(1\% + 50\text{m}\Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper
Solderability	Wetting	J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at $245 \pm 3^\circ\text{C}$ Dipping time: $3 \pm 0.5$ seconds	Well tinned ( $\geq 95\%$ covered) No visible damage
	Resistance to soldering heat	MIL-STD-202 -method 210F	Lead-free solder, $260^\circ\text{C}$ , 10 seconds immersion time	01005: $\pm(1\% + 50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(0.5\% + 50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(1\% + 0.05 \Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper No visible damage
Short time overload		IEC 60115 -1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	01005: $\pm(2\% + 50\text{m}\Omega)$ $< 50\text{m}\Omega$ for jumper Others: $\pm(1\% + 50\text{m}\Omega)$ for 0.1%/0.5%/1% tol. $\pm(2\% + 50\text{m}\Omega)$ for 5% tol. $< 50\text{m}\Omega$ for jumper No visible damage

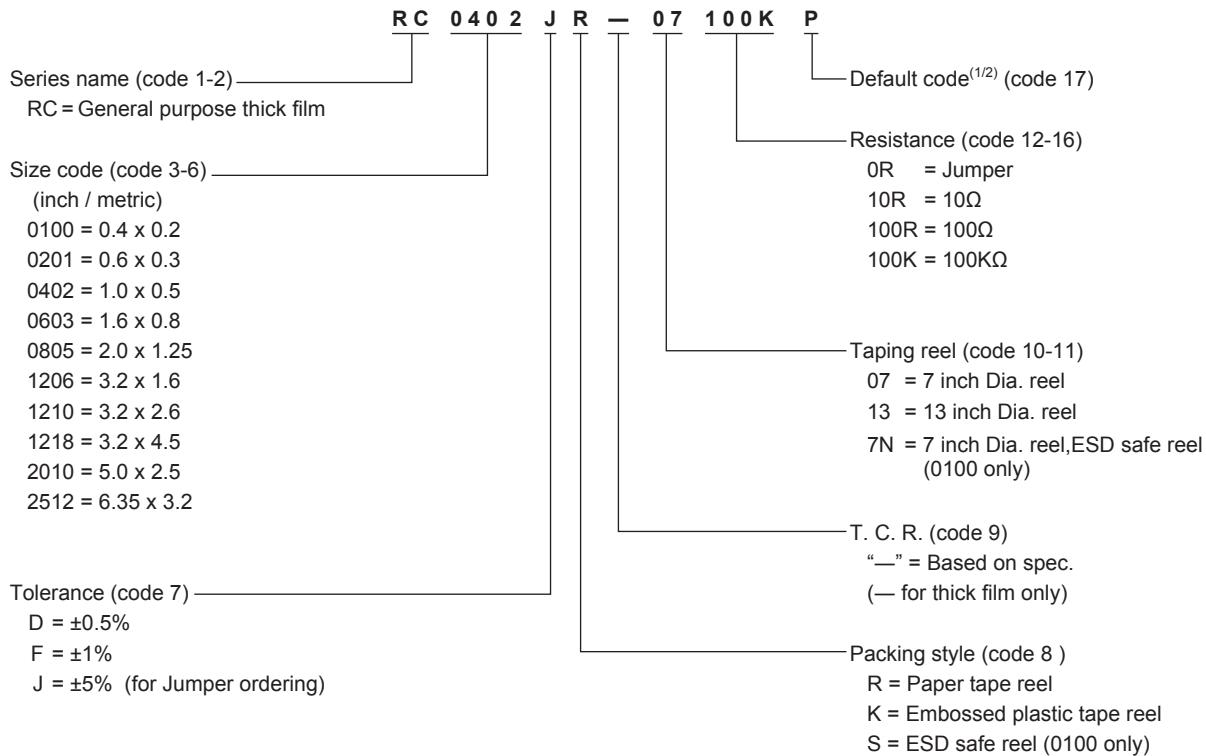


# Chip Resistors Selection Charts

RC\_P ,Total lead free thick film general purpose chip resistor,01005 to 2512

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: RC0402JR-07100KP



Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

# Chip Resistors Selection Charts

RE - Thick film precision grade chip resistors, 0201 to 1206



## Features

- Narrow tolerance
- Low T. C. R.
- Highly reliable construction
- Compatible with all soldering processes
- Suitable for auto-placement surface mounting applications
- Available in 8mm tape & reel per EIA RS481

Derating curve	Construction								
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"><caption>Data points estimated from Derating curve graph</caption><thead><tr><th>Ambient Temperature (C)</th><th>Rated Power (%)</th></tr></thead><tbody><tr><td>-55 to 70</td><td>100</td></tr><tr><td>70</td><td>100</td></tr><tr><td>155</td><td>55</td></tr></tbody></table>	Ambient Temperature (C)	Rated Power (%)	-55 to 70	100	70	100	155	55	
Ambient Temperature (C)	Rated Power (%)								
-55 to 70	100								
70	100								
155	55								

Dimensions																																				
<table border="1"><caption>Dimensions (unit: mm)</caption><thead><tr><th>Type</th><th>L</th><th>W</th><th>H</th><th>I<sub>1</sub></th><th>I<sub>2</sub></th></tr></thead><tbody><tr><td>RE0201</td><td>0.60 ±0.03</td><td>0.30 ±0.03</td><td>0.23 ±0.03</td><td>0.10 ±0.05</td><td>0.15 ±0.05</td></tr><tr><td>RE0402</td><td>1.00 ±0.05</td><td>0.50 ±0.05</td><td>0.32 ±0.05</td><td>0.20 ±0.10</td><td>0.25 ±0.10</td></tr><tr><td>RE0603</td><td>1.60 ±0.10</td><td>0.80 ±0.10</td><td>0.45 ±0.10</td><td>0.25 ±0.15</td><td>0.25 ±0.15</td></tr><tr><td>RE0805</td><td>2.00 ±0.10</td><td>1.25 ±0.10</td><td>0.50 ±0.10</td><td>0.35 ±0.20</td><td>0.35 ±0.20</td></tr><tr><td>RE1206</td><td>3.10 ±0.10</td><td>1.60 ±0.10</td><td>0.55 ±0.10</td><td>0.45 ±0.20</td><td>0.40 ±0.20</td></tr></tbody></table>	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>	RE0201	0.60 ±0.03	0.30 ±0.03	0.23 ±0.03	0.10 ±0.05	0.15 ±0.05	RE0402	1.00 ±0.05	0.50 ±0.05	0.32 ±0.05	0.20 ±0.10	0.25 ±0.10	RE0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15	RE0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20	RE1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20
Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>																															
RE0201	0.60 ±0.03	0.30 ±0.03	0.23 ±0.03	0.10 ±0.05	0.15 ±0.05																															
RE0402	1.00 ±0.05	0.50 ±0.05	0.32 ±0.05	0.20 ±0.10	0.25 ±0.10																															
RE0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15																															
RE0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20																															
RE1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20																															



# Chip Resistors Selection Charts

**RE - Thick film precision grade chip resistors, 0201 to 1206**

Electrical characteristics							
Type	Power $P_{70}$	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R.
RE0201	1/20W	-55°C to +155°C	25V	50V	50V	E24/E96 $\pm 0.1\%, \pm 0.5\%, \pm 1\%$ $10\Omega \leq R \leq 1M\Omega$	$\pm 50 \text{ ppm}/^\circ\text{C}$
RE0402	1/16W	-55°C to +155°C	50V	100V	100V		
RE0603	1/10W	-55°C to +155°C	75V	150V	150V		
RE0805	1/8W	-55°C to +155°C	150V	300V	300V		
RE1206	1/4W	-55°C to +155°C	200V	400V	500V		

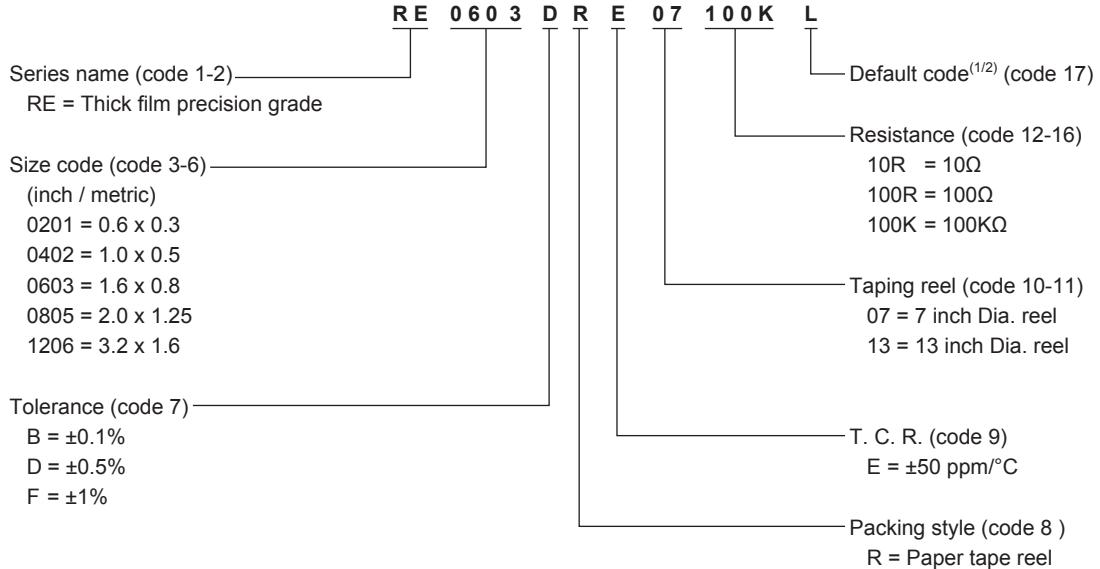
Environmental characteristics							
Performance test		Test method	Procedure			Requirements	
Life		MIL-STD-202 -method 108A	1000 hours at $70 \pm 2^\circ\text{C}$ applied RCWV 1.5 hours on, 0.5 hours off, still air required			$\pm(3\% + 50m\Omega)$	
High temperature exposure		MIL-STD-202 -method 108A	1000 hours at maximum operating temperature depending on specification, unpowered			$\pm(3\% + 50m\Omega)$	
Moisture resistance		MIL-STD-202 -method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with $25^\circ\text{C} / 65^\circ\text{C} 95\% \text{R.H}$			$\pm(3\% + 50m\Omega)$	
Thermal shock		MIL-STD-202 -method 107G	$-55/+125^\circ\text{C}$ Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air			$\pm(1\% + 50m\Omega)$	
Solderability	Wetting	IPC/JEDECJ- STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at $245 \pm 3^\circ\text{C}$ Dipping time: $3 \pm 0.5$ seconds			Well tinned ( $\geq 95\%$ covered) No visible damage	
	Resistance to soldering heat	MIL-STD-202 -method 210F	Lead-free solder, $260^\circ\text{C}$ , 10 seconds immersion time			$\pm(0.5\% + 50m\Omega)$ No visible damage	
Short time overload		IEC 60115 -1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature			$\pm(1\% + 50m\Omega)$ No visible damage	

# Chip Resistors Selection Charts

## RE - Thick film precision grade chip resistors, 0201 to 1206

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: RE0603DRE07100KL



Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

3. RE series products are available by "Global part number" only

Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.



# Chip Resistors Selection Charts

RT - Thin film high precision high stability chip resistors, 0201 to 2512



## Features

- High precision - High stability
- Low T. C. R. / low noise
- High accuracy ( $\pm 0.05\%$ ,  $\pm 0.1\%$ ,  $\pm 0.25\%$ ,  $\pm 0.5\%$ ,  $\pm 1\%$ )

Derating curve	Construction
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p>	

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
	RT0201	0.60 $\pm 0.03$	0.30 $\pm 0.03$	0.23 $\pm 0.03$	0.10 $\pm 0.05$	0.15 $\pm 0.05$
	RT0402	1.00 $\pm 0.10$	0.50 $\pm 0.05$	0.30 $\pm 0.05$	0.20 $\pm 0.10$	0.25 $\pm 0.10$
	RT0603	1.60 $\pm 0.10$	0.80 $\pm 0.10$	0.45 $\pm 0.10$	0.25 $\pm 0.15$	0.25 $\pm 0.15$
	RT0805	2.00 $\pm 0.10$	1.25 $\pm 0.10$	0.50 $\pm 0.10$	0.35 $\pm 0.20$	0.35 $\pm 0.20$
	RT1206	3.10 $\pm 0.10$	1.60 $\pm 0.10$	0.55 $\pm 0.10$	0.45 $\pm 0.20$	0.40 $\pm 0.20$
	RT1210	3.10 $\pm 0.10$	2.60 $\pm 0.15$	0.55 $\pm 0.10$	0.50 $\pm 0.20$	0.50 $\pm 0.20$
	RT2010	5.00 $\pm 0.10$	2.50 $\pm 0.15$	0.55 $\pm 0.10$	0.60 $\pm 0.20$	0.50 $\pm 0.20$
	RT2512	6.35 $\pm 0.10$	3.20 $\pm 0.15$	0.55 $\pm 0.10$	0.60 $\pm 0.20$	0.50 $\pm 0.20$

# Chip Resistors Selection Charts

RT - Thin film high precision high stability chip resistors, 0201 to 2512

Electrical characteristics												
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	T.C.R. (ppm/°C)	Resistance Range (E24/E96) & tolerance					
							±0.05%	±0.1%	±0.25%	±0.5%	±1.0%	
RT0201	1/20W	-55 °C to +125 °C	25V	50V	50V	±50	--	22 ~75K	22 ~75K	22 ~75K	22 ~75K	
						±25	--	22~75K	22~75K	22~75K	22~75K	
						±15	--	--	--	--	--	
						±10	--	--	--	--	--	
						±5	--	--	--	--	--	
RT0402	1/16W	-55 °C to +155 °C	50V	100V	75V	±50	20~12K	4.7~240K	4.7~240K	4.7~240K	4.7~240K	
						±25	20~12K	4.7~240K	4.7~240K	4.7~240K	4.7~240K	
						±15	20~12K	20~70K	20~70K	--	--	
						±10	20~12K	20~70K	20~70K	--	--	
						±5	20~10K	20~10K	20~10K	--	--	
RT0603	1/10W		75V	150V	100V	±50	4.7~100K	1~1M	1~1M	1~1M	1~1M	
						±25	4.7~100K	1~1M	1~1M	1~1M	1~1M	
						±15	4.7~100K	4.7~332K	4.7~332K	--	--	
						±10	4.7~100K	4.7~332K	4.7~332K	--	--	
						±5	20~30K	20~30K	20~30K	--	--	
RT0805	1/8W		150V	300V	200V	±50	4.7~200K	1~1.5M	1~1.5M	1~1.5M	1~1.5M	
						±25	4.7~200K	1~1.5M	1~1.5M	1~1.5M	1~1.5M	
						±15	4.7~200K	4.7~800K	4.7~800K	--	--	
						±10	4.7~200K	4.7~800K	4.7~800K	--	--	
						±5	20~50K	20~50K	20~50K	--	--	
RT1206	1/4W		200V	400V	300V	±50	5.6~500K	1~1.5M	1~1.5M	1~1.5M	1~1.5M	
						±25	5.6~500K	1~1.5M	1~1.5M	1~1.5M	1~1.5M	
						±15	5.6~500K	5.6~1M	5.6~1M	--	--	
						±10	5.6~500K	5.6~1M	5.6~1M	--	--	
						±5	20~100K	20~100K	20~100K	--	--	
RT1210	1/4W		200V	400V	400V	±50	4.7~1M	4.7~1M	4.7~1M	4.7~1M	4.7~1M	
						±25	4.7~1M	4.7~1M	4.7~1M	4.7~1M	4.7~1M	
						±15	100~100K	4.7~100K	4.7~100K	--	--	
						±10	100~100K	4.7~100K	4.7~100K	--	--	
						±5	--	--	--	--	--	
RT2010	1/2W		200V	400V	400V	±50	4.7~1M	4.7~1M	4.7~1M	4.7~1M	4.7~1M	
						±25	4.7~1M	4.7~1M	4.7~1M	4.7~1M	4.7~1M	
						±15	100~100K	4.7~100K	4.7~100K	--	--	
						±10	100~100K	4.7~100K	4.7~100K	--	--	
						±5	--	--	--	--	--	
RT2512	3/4W		200V	400V	400V	±50	4.7~1M	4.7~1M	4.7~1M	4.7~1M	4.7~1M	
						±25	4.7~1M	4.7~1M	4.7~1M	4.7~1M	4.7~1M	
						±15	100~100K	4.7~100K	4.7~100K	--	--	
						±10	100~100K	4.7~100K	4.7~100K	--	--	
						±5	--	--	--	--	--	



# Chip Resistors Selection Charts

**RT - Thin film high precision high stability chip resistors, 0201 to 2512**

Environmental characteristics			
Performance test	Test method	Procedure	Requirements
Life	MIL-STD-202 Method 108A	1000 hours at $70 \pm 2^\circ\text{C}$ applied RCWV 1.5 hours on, 0.5 hours off, still air required	$\pm(0.5\% + 50\text{m}\Omega)$
High temperature exposure	MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered	$\pm(0.5\% + 50\text{m}\Omega)$
Moisture resistance	MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with $25^\circ\text{C} / 65^\circ\text{C}$ 95% R.H	$\pm(0.5\% + 50\text{m}\Omega)$
Thermal shock	MIL-STD-202 Method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	$\pm(0.5\% + 50\text{m}\Omega)$
Short time overload	IEC 60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	$\pm(0.5\% + 50\text{m}\Omega)$ No visible damage
Solderability	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, $260^\circ\text{C}$ , 10 seconds immersion time $\pm(0.5\% + 50\text{m}\Omega)$ No visible damage
	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at $245 \pm 3^\circ\text{C}$ Dipping time: $3 \pm 0.5$ seconds Well tinned ( $\geq 95\%$ covered) No visible damage

Global part number - Preferred type for ordering Yageo / Phycomp branded products							
Ordering example: RT0603DRE07100KL							
Series name (code 1-2)	RT	0603	D	R	E	07	100K L
RT = High precision - High stability thin film							Default code <sup>(1/2)</sup> (code 17)
Size code (code 3-6)							Resistance (code 12-16)
(inch / metric)							10R = $10\Omega$ 100R = $100\Omega$ 10K = $10\text{K}\Omega$ 100K = $100\text{K}\Omega$
0201 = $0.6 \times 0.3$							
0402 = $1.0 \times 0.5$							
0603 = $1.6 \times 0.8$							
0805 = $2.0 \times 1.25$							
1206 = $3.2 \times 1.6$							
1210 = $3.2 \times 2.6$							
2010 = $5.0 \times 2.5$							
2512 = $6.35 \times 3.2$							
Tolerance (code 7)							Taping reel (code 10-11)
W = $\pm 0.05\%$							07 = 7 inch Dia. reel
B = $\pm 0.1\%$							13 = 13 inch Dia. reel
C = $\pm 0.25\%$							
D = $\pm 0.5\%$							
F = $\pm 1\%$							
							T. C. R. (code 9)
							A = $\pm 5 \text{ ppm}/^\circ\text{C}$
							B = $\pm 10 \text{ ppm}/^\circ\text{C}$
							C = $\pm 15 \text{ ppm}/^\circ\text{C}$
							D = $\pm 25 \text{ ppm}/^\circ\text{C}$
							E = $\pm 50 \text{ ppm}/^\circ\text{C}$
							Packing style (code 8 )
							R = Paper tape reel
							K = Embossed plastic tape reel

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

# Chip Resistors Selection Charts

## RT - Thin film high precision high stability chip resistors, 0201 to 2512

Phycomp worldwide - Traditional type												
High precision - High stability												
Size: inch (mm)	0402 (1005)				0603 (1608)							
Power	1/16 W				1/10 W							
Tolerance	±1%	±0.5%	±0.25%	±0.1%	±1%	±0.5%	±0.25%	±0.1%				
Resistance	E24 / E96				E24 / E96							
Packing	paper tape				paper tape							
Quantity	TC25 5 000	---	---	---	---	2390 604 7....L	2390 604 6....L	2390 604 5....L	2390 604 4....L			
	TC50 5 000	---	---	---	---	2390 404 7....L	2390 404 6....L	2390 404 5....L	2390 404 4....L			
	TC25 10 000	2390 607 7....L	2390 607 6....L	2390 607 5....L	2390 607 4....L	---	---	---	---			
	TC50 10 000	2390 407 7....L	2390 407 6....L	2390 407 5....L	2390 407 4....L	---	---	---	---			

For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp worldwide - Traditional type													
High precision - High stability													
Size: inch (mm)	0805 (2012)				1206 (3216)				1210 (3225)				
Power	1/8 W				1/4 W				1/2 W				
Tolerance	±1%	±0.5%	±0.25%	±0.1%	±1%	±0.5%	±0.25%	±0.1%	±1%	±0.5%	±0.25%	±0.1%	
Resistance	E24 / E96				E24 / E96				E24 / E96				
Packing	paper tape				paper tape				paper tape				
Quantity	TC10 5 000	2390 801 7....L	2390 801 6....L	2390 801 5....L	2390 801 4....L	2390 811 7....L	2390 811 6....L	2390 811 5....L	2390 811 4....L	2390 812 7....L	2390 812 6....L	2390 812 5....L	2390 812 4....L
	TC15 5 000	2390 701 7....L	2390 701 6....L	2390 701 5....L	2390 701 4....L	2390 711 7....L	2390 711 6....L	2390 711 5....L	2390 711 4....L	2390 712 7....L	2390 712 6....L	2390 712 5....L	2390 712 4....L
	TC25 5 000	2390 601 7....L	2390 601 6....L	2390 601 5....L	2390 601 4....L	2390 611 7....L	2390 611 6....L	2390 611 5....L	2390 611 4....L	2390 612 7....L	2390 612 6....L	2390 612 5....L	2390 612 4....L
	TC50 5 000	2390 401 7....L	2390 401 6....L	2390 401 5....L	2390 401 4....L	2390 411 7....L	2390 411 6....L	2390 411 5....L	2390 411 4....L	2390 412 7....L	2390 412 6....L	2390 412 5....L	2390 412 4....L

For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp worldwide - Traditional type												
High precision - High stability												
Size: inch (mm)	2010 (5025)				2512 (6432)							
Power	1/2 W				3/4 W							
Tolerance	±1%	±0.5%	±0.25%	±0.1%	±1%	±0.5%	±0.25%	±0.1%				
Resistance	E24 / E96				E24 / E96							
Packing	blister tape				blister tape							
Quantity	TC10 4 000	2390 815 7....L	2390 815 6....L	2390 815 5....L	2390 815 4....L	2390 818 7....L	2390 818 6....L	2390 818 5....L	2390 818 4....L			
	TC15 4 000	2390 731 7....L	2390 731 6....L	2390 731 5....L	2390 731 4....L	2390 735 7....L	2390 735 6....L	2390 735 5....L	2390 735 4....L			
	TC25 4 000	2390 615 7....L	2390 615 6....L	2390 615 5....L	2390 615 4....L	2390 618 7....L	2390 618 6....L	2390 618 5....L	2390 618 4....L			
	TC50 4 000	2390 415 7....L	2390 415 6....L	2390 415 5....L	2390 415 4....L	2390 418 7....L	2390 418 6....L	2390 418 5....L	2390 418 4....L			

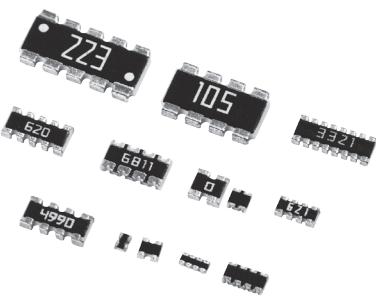
For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America											
Regional code for ordering Phycomp branded products. Please see page 13 for details.											

Thin film product range against tolerance / T. C. R. (ordering code)																			
Tolerance	±0.05% (W)					±0.1% (B)					±0.25% (C)		±0.5% (D)		±1% (F)				
T. C. R. (ppm/°C)	±5 (A)	±10 (B)	±15 (C)	±25 (D)	±50 (E)	±5 (A)	±10 (B)	±15 (C)	±25 (D)	±50 (E)	±5 (A)	±10 (B)	±15 (C)	±25 (D)	±50 (E)	±25 (D)	±50 (E)	±25 (D)	±50 (E)
RT0201							22R - 75K		22R - 75K						22R - 75K		22R - 75K		
RT0402	20R-10K		20R-12K		20R-12K		20R-10K		20R-70K		4.7R-240K		4.7R-240K		20R-10K		20R-70K		
RT0603	20-30K		4.7R-100K		4.7R-100K		20-30K		4.7R-332K		4.7R-332K		1R-1M		20-30K		4.7R-332K		
RT0805	20-50K		4.7R-200K		4.7R-200K		20-50K		4.7R-800K		4.7R-800K		1R-1.5M		20-50K		4.7R-800K		
RT1206	20-100K		5.6R-500K		5.6R-500K		20-100K		5.6R-1M		1R-1.5M		20-100K		5.6R-1M		1R-1.5M		
RT1210			100R-100K		4.7R-1M				4.7R-100K		4.7R-1M		4.7R-100K		4.7R-1M		4.7R-1M		
RT2010			100R-100K		4.7R-1M				4.7R-100K		4.7R-1M		4.7R-100K		4.7R-1M		4.7R-1M		
RT2512			100R-100K		4.7R-1M				4.7R-100K		4.7R-1M		4.7R-100K		4.7R-1M		4.7R-1M		

# Chip Resistors Selection Charts

YC/TC - Thick film array / network chip resistors

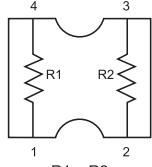


## Features

- Integrated discrete chip resistors from 2 to 8 pcs
- More efficient in pick & place application
- Low assembly costs
- Reduced size of final equipment
- Higher component and equipment reliability

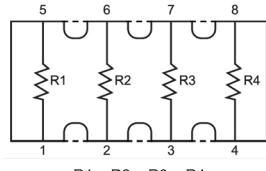
### Schematics

**YC102/122/162**



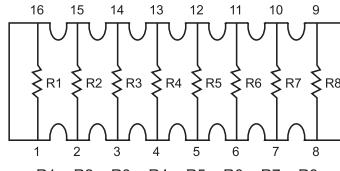
$$R1 = R2$$

**YC104/124/164/324<sup>(1)</sup>**



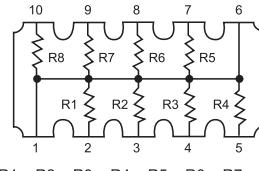
$$R1 = R2 = R3 = R4$$

**YC248**



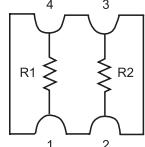
$$R1 = R2 = R3 = R4 = R5 = R6 = R7 = R8$$

**YC358 (L-Type)**



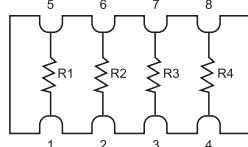
$$R1 = R2 = R3 = R4 = R5 = R6 = R7 = R8$$

**TC122**



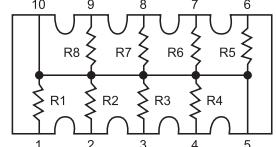
$$R1 = R2$$

**TC124/164**



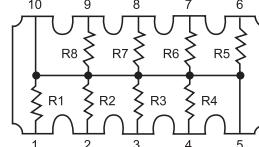
$$R1 = R2 = R3 = R4$$

**YC158**



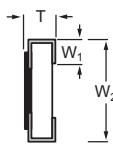
$$R1 = R2 = R3 = R4 = R5 = R6 = R7 = R8$$

**YC358 (T-Type)**



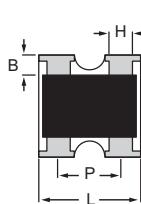
$$R1 = R2 = R3 = R4 = R5 = R6 = R7 = R8$$

### Dimensions

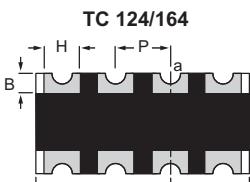
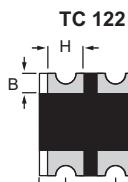
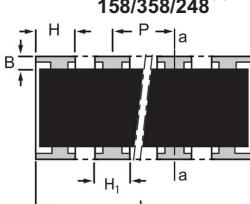


Side view for all types

**YC 102/122/162**



**YC 104/124/164/324<sup>(1)</sup>  
158/358/248**



Type	H / H <sub>1</sub>	B	P	L	T	W <sub>1</sub>	W <sub>2</sub>
YC102	H: 0.30 ±0.10	0.15 ±0.10	0.50 ±0.05	0.80 ±0.10	0.35 ±0.10	0.15 ±0.10	0.60 ±0.10
YC104	H: 0.20 ±0.10	0.15 ±0.05	0.40 ±0.10	1.40 ±0.10	0.35 ±0.10	0.15 ±0.10	0.60 ±0.10
YC122	H: 0.21 +0.10/-0.05	0.20 ±0.10	0.67 ±0.05	1.00 ±0.10	0.30 ±0.10	0.25 ±0.10	1.00 ±0.10
YC124	H: 0.45 ±0.05 H <sub>1</sub> : 0.30 ±0.05	0.20 ±0.15	0.50 ±0.05	2.00 ±0.10	0.45 ±0.10	0.30 ±0.15	1.00 ±0.10
YC162	H: 0.30 ±0.10	0.30 ±0.10	0.80 ±0.05	1.60 ±0.10	0.40 ±0.10	0.30 ±0.10	1.60 ±0.10
YC164	H: 0.65 ±0.05 H <sub>1</sub> : 0.50 ±0.15	0.30 ±0.15	0.80 ±0.05	3.20 ±0.15	0.60 ±0.10	0.30 ±0.15	1.60 ±0.15
YC248	H: 0.45 ±0.05 H <sub>1</sub> : 0.30 ±0.05	0.30 ±0.15	0.50 ±0.05	4.00 ±0.20	0.45 ±0.10	0.40 ±0.15	1.60 ±0.15
YC324	H: 1.10 ±0.15 H <sub>1</sub> : 0.90 ±0.15	0.50 ±0.20	1.27 ±0.05	5.08 ±0.20	0.60 ±0.10	0.50 ±0.15	3.20 ±0.20
TC122	H: 0.30 ±0.05	0.25 ±0.15	0.50 ±0.05	1.00 ±0.10	0.30 ±0.10	0.25 ±0.15	1.00 ±0.10
TC124	H: 0.30 ±0.10	0.20 ±0.10	0.50 ±0.05	2.00 ±0.10	0.40 ±0.10	0.25 ±0.10	1.00 ±0.10
TC164	H: 0.60 ±0.15	0.30 ±0.15	0.80 ±0.05	3.20 ±0.15	0.60 ±0.10	0.30 ±0.15	1.60 ±0.15
YC158	H: 0.45 ±0.05 H <sub>1</sub> : 0.32 ±0.05	0.30 ±0.15	0.64 ±0.05	3.20 ±0.20	0.60 ±0.10	0.35 ±0.15	1.60 ±0.15
YC358	H: 1.10 ±0.15 H <sub>1</sub> : 0.90 ±0.15	0.50 ±0.15	1.27 ±0.05	6.40 ±0.20	0.60 ±0.10	0.50 ±0.15	3.20 ±0.20

Note: 1. YC104 is flat type

# Chip Resistors Selection Charts

YC/TC - Thick film array / network chip resistors

Electrical characteristics								
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R.	Jumper criteria (unit: A)
YC102	1/32W	-55°C to +125°C	15V	30V	30V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±200 ppm/°C	Rated current 0.5 Max. current 1.0
YC104	1/32W	-55°C to +125°C	12.5V	25V	25V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 0.5 Max. current 1.0
YC122	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±250 ppm/°C 10Ω ≤ R ≤ 1MΩ ±200 ppm/°C	Rated current 0.5 Max. current 1.0
YC124	1/16W	-55°C to +155°C	25V	50V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 1.0 Max. current 2.0
YC162	1/16W	-55°C to +155°C	50V	100V	100V	E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ E24 ±5% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 1.0 Max. current 2.0
YC164	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±200 ppm/°C	Rated current 1.0 Max. current 2.0
YC248	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 2.0 Max. current 10.0
YC324	1/8W	-55°C to +155°C	200V	500V	500V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ		-- --
TC122	1/16W	-55°C to +125°C	50V	100V	100V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±200 ppm/°C	Rated current 1.0 Max. current 1.5
TC124	1/16W	-55°C to +125°C	50V	100V	100V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±(2% +50mΩ) < 100mΩ for jumper	Rated current 1.0 Max. current 1.5
TC164	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ		Rated current 1.0 Max. current 2.0
YC158	1/16W	-55°C to +155°C	25V	50V	50V	E24 ±5% 10Ω ≤ R ≤ 100KΩ		-- --
YC358	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 10Ω ≤ R ≤ 330KΩ	±(1% +50mΩ) < 50mΩ for jumper	-- --

Environmental characteristics								
Performance test		Test method		Procedure				Requirements
Life		MIL-STD-202 Method 108A		1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required				±(2% +50mΩ) < 100mΩ for jumper
High temperature exposure		MIL-STD-202 Method 108A		1000 hours at maximum operating temperature depending on specification, unpowered				±(1% +50mΩ) < 50mΩ for jumper
Moisture resistance		MIL-STD-202 Method 106G		Each temperature / humidity cycle is defined as 8 hours(method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H				±(2% +50mΩ) < 100mΩ for jumper
Thermal shock		MIL-STD-202 Method 107G		-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air				±(1% +50mΩ) for others < 50mΩ for jumper
Solderability	Wetting	J-STD-002B test B		Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds				Well tinned (≥95% covered)
	Resistance to soldering heat	MIL-STD-202 method 210F		Lead-free solder, 260°C, 10 seconds immersion time				±(1% +50mΩ) < 50mΩ for jumper No visible damage
Short time overload		IEC 60115 -1 4.13		2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature				±(2% +50mΩ) < 50mΩ for jumper No visible damage



# Chip Resistors Selection Charts

## YC/TC - Arrays, convex / concave / flat

Global part number - Arrays											
Ordering example: YC122-JR-07100KL											
YC	12	2	—	J	R	—	07	100K	L/T		
Series name (code 1-2)											Default code (code 17) T = YC102 only
YC = Array & Network (convex / flat) thick film											Resistance (code 12-16) 0R = Jumper 10R = 10Ω 100R = 100Ω 100K = 100KΩ
TC = Array (concave) thick film											Taping reel (code 10-11) 07 = 7 inch Dia. reel 13 = 13 inch Dia. reel
Size code (inch) (code 3-4)											T. C. R. (code 9) — = Based on spec.
10 = 0201 x 2 (0202) 0201 x 4 (0204)											Packing style (code 8 ) R = Paper tape reel K = Embossed plastic tape reel
12 = 0402 x 2 (0404) 0402 x 4 (0408)											
16 = 0603 x 2 (0606) 0603 x 4 (0612)											
24 = 0602 x 8 (0616)											
32 = 1206 x 4 (1224)											
Number of resistors (code 5)											Tolerance (code 7) F = ±1% J = ±5% (for Jumper ordering)
2 = 2 resistors 4 = 4 resistors 8 = 8 resistors											

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

Phycomp worldwide - Traditional type											
Array thick film chip resistors											
Size: inch / mm	2 X 0402 / 1 X 1		4 X 0402 / 2 X 1		8 X 0602 / 4.0 X 1.6		4 X 0603 / 3.2 X 1.3				4 X1206 / 5.2 X 3.1
Power	1/16 W		1/16 W		1/16 W		1/16 W				1/8 W
Tolerance	+5%	+1%	+5%	+1%	+5%	+1%	+5%	+1%	+5%	+1%	+5%
Type	R-array / R-network (convex)	R-array / R-network (concave)	R-array / R-network (concave)	R-array / R-network (convex)							
Resistance	E24	E24 / E96	E24	E24 / E96	E24						
Packing	paper tape		paper tape		paper tape		paper tape				blister tape
Quantity	4 000	--	--	--	--	--	--	--	--	--	2350 039 10...L
	5 000	--	--	--	2350 053 10...L	2350 043 1...L	2350 035 10...L	2350 025 1...L	2350 034 10...L	2350 024 1...L	--
	10 000	2350 013 11...L	2350 013 2...L	2350 033 11...L	2350 023 2....L	--	--	--	--	--	--
Jumper	5 000	--	--	--	2350 053 91001L	--	2350 035 91001L	--	2350 034 91001L	--	--
	10 000	2350 013 91001L	--	2350 033 91001L	--	--	--	--	--	--	--

For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America											
Regional code for ordering Phycomp branded products. Please see page 15 for details.											

# Chip Resistors Selection Charts

YC/TC - Network, T-type / L-type

Global part number - Networks											
Ordering example: YC158TJR-07100KL											
Series name (code 1-2)	Y	C	15	8	T	J	R	—	07	100K	L
YC = Array & Network (convex) thick film											Default code (code 17)
Size code (inch) (code 3-4)											Resistance (code 12-16)
15 = 10Pin/8R (0612)											0R = Jumper
35 = 10Pin/8R (1225)											10R = 10Ω
Number of resistors (code 5)											100R = 100Ω
8 = 8 resistors											100K = 100KΩ
Schematic (code 6)											Taping reel (code 10-11)
L = L-type (for YC358)											07 = 7 inch Dia. reel
T = T-type (for YC158/358)											13 = 13 inch Dia. reel
											T. C. R. (code 9)
											“—” = Based on spec.
											Packing style (code 8 )
											R = Paper tape reel
											K = Embossed plastic tape reel
											Tolerance (code 7)
											J = ±5%

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

Phycomp worldwide - Traditional type			
Network thick film chip resistors			
Size: inch (mm)	<b>0612 (1632)</b>		<b>1225 (3264)</b>
Power	1/16 W		1/16 W
Tolerance	+5%		+5%
Type	T-type 10 Pin / 8R PIN 5 and PIN 10 no resistance	T-type 10 Pin / 8R PIN 5 and PIN 10 no resistance	L-type 10 Pin / 8R PIN 1 and PIN 6 no resistance
Resistance	E24	E24	E24
Packing	paper tape		blister tape
Quantity	4 000	2350 201 10...L	2350 200 10...L
	5 000	2350 230 10...L	---

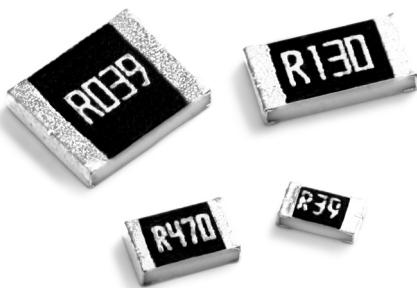
For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America	
Regional code for ordering Phycomp branded products. Please see page 15 for details.	



# Chip Resistors Selection Charts

RL - Thick film low ohmic chip resistors, 0402 to 2512



## Features

- Current sensing of desktop & notebook PC
- Resistance values down to  $0.01\Omega$
- Highly reliable electrode construction

Derating curve	Construction
<p>Maximum dissipation (<math>P</math>) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <p>Normal Power: Range: <math>-55^{\circ}\text{C}</math> to <math>+155^{\circ}\text{C}</math>  Double Power: Range: <math>-55^{\circ}\text{C}</math> to <math>+125^{\circ}\text{C}</math></p>	

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
	RL0402	$1.00 \pm 0.10$	$0.50 \pm 0.05$	$0.35 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$
	RL0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$
	RL0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$
	RL1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.45 \pm 0.20$
	RL1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.55 \pm 0.10$	$0.50 \pm 0.20$	$0.50 \pm 0.20$
	RL1218	$3.05 \pm 0.15$	$4.60 \pm 0.20$	$0.55 \pm 0.10$	$0.45 \pm 0.25$	$0.50 \pm 0.25$
	RL2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$
	RL2512	$6.35 \pm 0.10$	$3.20 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$

# Chip Resistors Selection Charts

## RL - Thick film low ohmic chip resistors, 0402 to 2512

Electrical characteristics						T. C. R. ( ppm/°C)
Type	Power P <sub>70</sub>	Operating Temp. range	Resistance range & tolerance			Jumper criteria
RL0402	1/16W	-55°C to +155°C	E24 ±1%, ±2%, ±5%	50mΩ ≤ R < 1Ω	See following table "T.C.R.- RL series"	Max. resistance 20mΩ Rated current 1.5A
RL0603	1/10W	-55°C to +155°C		10mΩ ≤ R < 1Ω		Max. resistance 20mΩ Rated current 2A
RL0805	1/8W	-55°C to +155°C		10mΩ ≤ R < 1Ω		Max. resistance 20mΩ Rated current 2.5A
	1/4W	-55°C to +125°C		10mΩ ≤ R < 1Ω		-- --
RL1206	1/4W	-55°C to +155°C		10mΩ ≤ R < 1Ω		Max. resistance 20mΩ Rated current 3.5A
	1/2W	-55°C to +125°C		10mΩ ≤ R < 1Ω		-- --
RL1210	1/2W	-55°C to +155°C		10mΩ ≤ R < 1Ω		-- --
RL1218	1W	-55°C to +155°C		10mΩ ≤ R < 1Ω		-- --
RL2010	3/4W	-55°C to +155°C		10mΩ ≤ R < 1Ω		-- --
RL2512	1W	-55°C to +155°C		10mΩ ≤ R < 1Ω		-- --

Note: The partial values of 25 / 40 / 50 / 60 / 250 / 400 / 500 mΩ are also available

T. C. R. - RL series						
Type	Operating Temp. range	Resistance range	T. C. R.			
			50mΩ≤R<100mΩ	100mΩ≤R<500mΩ	500mΩ≤R<1Ω	
RL0402	-55°C to +125°C	50mΩ≤R<1Ω	±1000 ppm/°C	±800 ppm/°C	±300 ppm/°C	
		10mΩ≤R≤36mΩ	36mΩ≤R≤91mΩ	91mΩ≤R≤500mΩ	500mΩ≤R<1Ω	
RL0603	-55°C to +125°C	10mΩ≤R<1Ω	±1500 ppm/°C	±1200 ppm/°C	±800 ppm/°C	±300 ppm/°C
		10mΩ≤R≤18mΩ	18mΩ≤R≤47mΩ	47mΩ≤R≤91mΩ	91mΩ≤R≤360mΩ	360mΩ≤R≤500mΩ
RL0805	-55°C to +125°C	10mΩ≤R<1Ω	±1500 ppm/°C	±1200 ppm/°C	±1000 ppm/°C	±600 ppm/°C
RL1206			±1500 ppm/°C	±1000 ppm/°C	±800 ppm/°C	±300 ppm/°C
RL1210			±1500 ppm/°C	±1000 ppm/°C	±800 ppm/°C	±600 ppm/°C
			10mΩ≤R≤30mΩ	30mΩ≤R≤56mΩ	56mΩ≤R≤180mΩ	180mΩ≤R<1Ω
RL1218	-55°C to +125°C	10mΩ≤R<1Ω	±2000 ppm/°C	±1000 ppm/°C	±700 ppm/°C	±250 ppm/°C
			10mΩ≤R≤18mΩ	18mΩ≤R≤47mΩ	47mΩ≤R≤91mΩ	91mΩ≤R≤360mΩ
RL2010	-55°C to +125°C	10mΩ≤R<1Ω	±1500 ppm/°C	±1200 ppm/°C	±1000 ppm/°C	±600 ppm/°C
RL2512			±1500 ppm/°C	±1200 ppm/°C	±800 ppm/°C	±300 ppm/°C

Environmental characteristics						
Performance test		Test method	Procedure			Requirements
Life		MIL-STD-202 Method 108A	1000 hours at 70°C ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required			±(2%+0.5mΩ)
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered			±(1%+0.5mΩ)
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H			±(2%+0.5mΩ)
Thermal shock		MIL-STD-202 Method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air			±(1%+0.5mΩ)
Solderability	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds			Well tinned (≥95% covered) No visible damage
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, 260°C, 10 seconds immersion time			±(1%+0.5mΩ) No visible damage
Short time overload		IEC 60115 -1 4.13	RL standard power: 6.25 times of rated power for 5 seconds at room temperature RL high power: 5 times of rated power for 5 seconds at room temperature			±(2%+0.5mΩ) No visible damage



# Chip Resistors Selection Charts

RL - Thick film low ohmic chip resistors, 0402 to 2512

Global part number - Preferred type
Ordering example: RL0603JR-070R01L
<p>RL 0603 JR — 07 0R01 L</p> <p>Series name (code 1-2) — RL = Thick Film Low ohmic</p> <p>Size code (code 3-6) — (inch / metric) 0402 = 1.0 x 0.5 0603 = 1.6 x 0.8 0805 = 2.0 x 1.25 1206 = 3.2 x 1.6 1210 = 3.2 x 2.6 1218 = 3.2 x 4.5 2010 = 5.0 x 2.5 2512 = 6.35 x 3.2</p> <p>Tolerance (code 7) — F = ±1% G = ±2% J = ±5% "—" = Jumper ordering</p> <p>Default code<sup>(1/2)</sup> (code 17) — Resistance (code 12-16) 0R01 = 0.01Ω 0R1 = 0.1Ω 0R2 = 0.2Ω</p> <p>Taping reel (code 10-11) 07 = 7 inch Dia. reel 13 = 13 inch Dia. reel</p> <p>T. C. R. (code 9) "—" = Based on spec. — for thick film only</p> <p>Packing style (code 8 ) — R = Paper tape reel K = Embossed plastic tape reel</p>

**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
2. Letter L is system default code for ordering only

# Chip Resistors Selection Charts

RL - Thick film low ohmic chip resistors, 0402 to 2512

## Phycomp worldwide - Traditional type

Low ohmic chip resistors									
Size: inch (mm)	0402 (1005)		0603 (1608)		0805 (2012)		1206 (3216)		
Power	1/16 W		1/10 W		1/8 W		1/4 W		
Tolerance	+5%	+1%	+5%	+1%	+5%	+1%	+5% +1%		
Resistance	E24	E24	E24	E24	E24	E24	E24 E24		
Packing	paper tape		paper tape		paper tape		paper tape		
Quantity	5 000	---	---	2350 512 10...L	2350 512 12...L	2350 511 10...L	2350 511 12...L	2350 510 10...L	2350 510 12...L
	10 000	2350 513 20...L	2350 513 22...L	---	---	---	---	---	---

For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

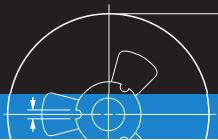
## Phycomp worldwide - Traditional type

Low ohmic chip resistors									
Size: inch (mm)	1210 (3225)		1218 (3248)		2010 (5025)		2512 (6432)		
Power	1/2 W		1 W		3/4 W		1 W		
Tolerance	+5%	+1%	+5%	+1%	+5%	+1%	+5% +1%		
Resistance	E24	E24	E24	E24	E24	E24	E24 E24		
Packing	paper tape		blister tape		blister tape		blister tape		
Quantity	4 000	---	---	2322 735 64...L	2322 735 7....L	2322 760 90..0L/60..7L	2322 761 90..0L/6..7L	2322 762 90..0L/60..7L	2322 763 90..0L/6..7L
	5 000	2390 735 90..0L/60..7L	2390 735 3....L	--	--	--	--	--	--

For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

## Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.

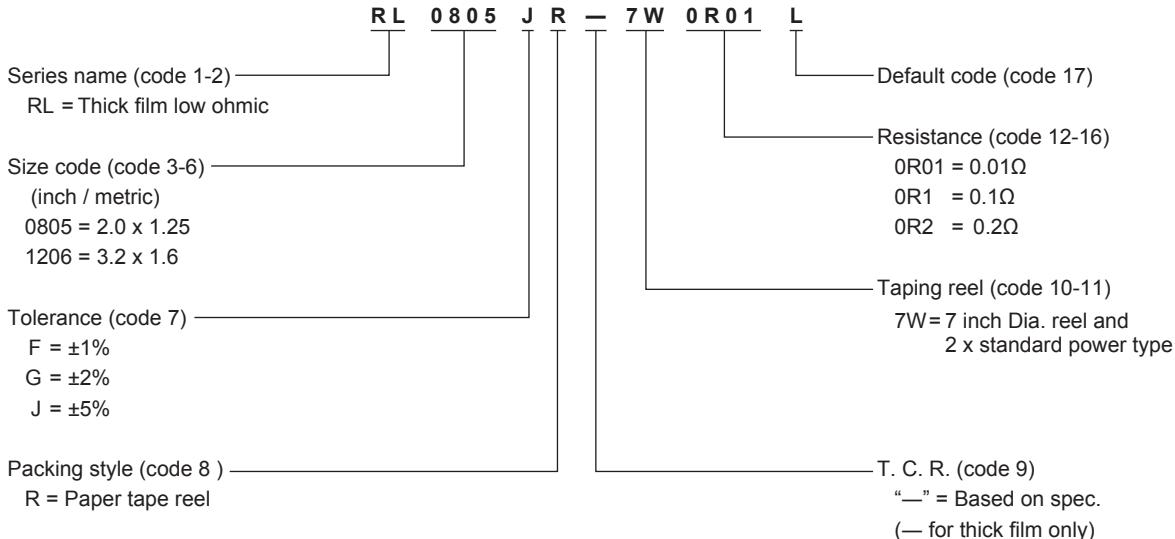


# Chip Resistors Selection Charts

## RL - Thick film low ohmic, high power chip resistors, 0805 / 1206

Global part number - Preferred type

Ordering example: RL0805JR-7W0R01L



**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

Phycomp worldwide - Traditional type

### Low ohmic high power chip resistors

Size: inch (mm)	0805 (2012)		1206 (3216)	
Power	1/4 W			1/2 W
Tolerance	+5%	+1%	+5%	+1%
Resistance	E24	E24 / E96	E24	E24 / E96
Packing	paper tape			paper tape
Quantity	5 000	2350 511 15...L	2350 511 17...L	2350 519 01...L
				2350 519 1....L

**For ordering rules:** See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.

# Chip Resistors Selection Charts

PT - Thick film low ohmic low T. C. R. chip resistors, 0402 to 2512



## Features

- Excellent T. C. R.
- Precision current sensing control
- Excellent performance for current sensing applications
- Low ohmic and high power

Derating curve	Construction																		
<p>Maximum dissipation (<math>P</math>) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Approximate data points from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Rated Power (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td></tr> <tr><td>0</td><td>100</td></tr> <tr><td>60</td><td>70</td></tr> <tr><td>70</td><td>70</td></tr> <tr><td>100</td><td>40</td></tr> <tr><td>120</td><td>20</td></tr> <tr><td>140</td><td>0</td></tr> <tr><td>155</td><td>0</td></tr> </tbody> </table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	60	70	70	70	100	40	120	20	140	0	155	0	
Ambient Temperature (°C)	Rated Power (%)																		
-55	100																		
0	100																		
60	70																		
70	70																		
100	40																		
120	20																		
140	0																		
155	0																		

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
 unit: mm	PT0402	1.00 ±0.10	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10
	PT0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
	PT0805	2.00 ±0.10	1.25 ±0.10	0.55 ±0.10	0.35 ±0.20	0.35 ±0.20
	PT1206 (50mΩ ≤ R < 75mΩ & 91mΩ ≤ R < 1Ω)	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.45 ±0.20
	PT1206 (75mΩ ≤ R < 91mΩ)	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.75 ±0.20	0.45 ±0.20
	PT2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20
	PT2512	6.35 ±0.10	3.20 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20

**Note:** For relevant physical dimensions, please refer to above construction outlines  
Please contact our sales offices, distributors and representatives in your region before ordering



# Chip Resistors Selection Charts

PT - Thick film low ohmic low T. C. R. chip resistors, 0402 to 2512

Electrical characteristics						
Type	Power P <sub>70</sub>	Operating Temp. range	Max. working voltage	Tolerance	Resistance range & T. C. R.	Jumper criteria
PT0402	1/16W				50mΩ ≤ R < 68mΩ ±600 ppm/°C 68mΩ ≤ R < 100mΩ ±300 ppm/°C 100mΩ ≤ R < 1Ω ±200 ppm/°C	Max. resistance 10mΩ Rated current 3A
	1/8W				50mΩ 0/+400 ppm/°C 50mΩ < R < 68mΩ 0/+350 ppm/°C 68mΩ ≤ R < 100mΩ 0/+300 ppm/°C 100mΩ ≤ R < 1Ω ±200 ppm/°C	Max. resistance 8mΩ Rated current 5A
PT0603	1/10W			E24 ±2%, ±5% E24/E96 ±1%	50mΩ 0/+400 ppm/°C 50mΩ < R < 68mΩ 0/+350 ppm/°C 68mΩ ≤ R < 100mΩ 0/+300 ppm/°C	Max. resistance 8mΩ Rated current 5A
	1/5W				50mΩ 0/+400 ppm/°C 50mΩ < R < 68mΩ 0/+350 ppm/°C 68mΩ ≤ R < 100mΩ 0/+300 ppm/°C	Max. resistance 8mΩ Rated current 5A
	1/3W				50mΩ 0/+350 ppm/°C 50mΩ < R < 68mΩ 0/+300 ppm/°C 68mΩ ≤ R < 100mΩ 0/+250 ppm/°C 100mΩ ≤ R < 1Ω ±100 ppm/°C	Max. resistance 5mΩ Rated current 6A
PT0805	1/8W				50mΩ 0/+350 ppm/°C 50mΩ < R < 68mΩ 0/+300 ppm/°C 68mΩ ≤ R < 100mΩ 0/+250 ppm/°C 100mΩ ≤ R < 1Ω ±100 ppm/°C	Max. resistance 5mΩ Rated current 6A
	1/4W				50mΩ ≤ R < 75mΩ ±350ppm 75mΩ ≤ R ≤ 100mΩ ±100ppm 100mΩ < R < 1Ω ±75ppm	Max. resistance 5mΩ Rated current 10A
PT1206	1/4W				100mΩ ±100 ppm/°C	Max. resistance --- Rated current ---
	1/2W				100mΩ < R < 1Ω ±75 ppm/°C	Max. resistance --- Rated current ---
PT2010	3/4W				100mΩ ±100 ppm/°C	Max. resistance --- Rated current ---
	1W				100mΩ < R < 1Ω ±75 ppm/°C	Max. resistance --- Rated current ---
PT2512	1W				100mΩ ±100 ppm/°C	Max. resistance --- Rated current ---
	2W				100mΩ < R < 1Ω ±75 ppm/°C	Max. resistance --- Rated current ---

Environmental characteristics						
Performance test		Test method	Procedure			Requirements
Life		MIL-STD-202 Method 108A	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required			±(1% +0.5mΩ) < 20mΩ for jumper
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered			±(1% +0.5mΩ) < 20mΩ for jumper
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H			±(0.5% +0.5mΩ) < 20mΩ for jumper
Thermal shock		MIL-STD-202 Method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air			±(1% +0.5mΩ) < 10mΩ for jumper
Solderability	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds			Well tinned (≥95% covered) No visible damage
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, 260°C, 10 seconds immersion time			±(0.5% +0.5mΩ) No visible damage < 10mΩ for jumper
Short time overload		IEC 60115 -1 4.13	PT standard power: 6.25 times of rated power for 5 seconds at room temperature PT high power: 5 times of rated power for 5 seconds at room temperature PT jumper: 2.5 times of rated current for 5 seconds at room temperature			±(1% +0.5mΩ) No visible damage < 10mΩ for jumper

# Chip Resistors Selection Charts

## PT - Thick film low ohmic low T. C. R. chip resistors, 0402 to 2512

Global part number - Preferred type
Ordering example: PT2512FK-070R01L
<p>PT 2512 FK — 07 0R01 L</p> <p>Series name (code 1-2) — PT = Thick film low ohmic low T. C. R.</p> <p>Size code (code 3-6) — (inch / metric) 0402 = 1.0 x 0.5 0603 = 1.6 x 0.8 0805 = 2.0 x 1.25 1206 = 3.2 x 1.6 2010 = 5.0 x 2.5 2512 = 6.35 x 3.2</p> <p>Tolerance (code 7) — F = ± 1% G = ± 2% J = ± 5% — for Jumper ordering</p> <p>Packing style (code 8) — R = Paper tape reel K = Embossed plastic tape reel</p> <p>Default code<sup>(1/2)</sup> (code 17) — Resistance (code 12-16) 0R = Jumper 0R1 = 0.1Ω 0R2 = 0.2Ω</p> <p>Taping reel (code 10-11) 07 = 7 inch Dia. reel 13 = 13 inch Dia. reel 7W = 7 inch Dia. reel and 2 x standard power type 7T = 7 inch Dia. reel and 3 x standard power type 3W = 13 inch Dia. reel and 2 x standard power type</p> <p>T. C. R. (code 9) — = Based on spec.</p>

**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
2. Letter L is system default code for ordering only  
3. PT series products are available by "Global part number" only

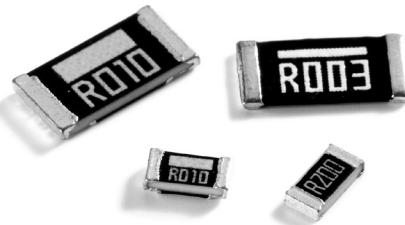
### Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.



# Chip Resistors Selection Charts

PA/PE - Current sensors - low T. C. R. chip resistors, 0201 to 2512



## Features

- Excellent T. C. R. compared to thick film low ohmic
- Precision current sensing control
- Excellent performance for current sensing applications
- Ultra low ohmic down to  $0.0005\Omega$

Derating curve	Construction																								
<p>Maximum dissipation (<math>P</math>) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>PA series (%)</th> <th>PE series (%)</th> </tr> </thead> <tbody> <tr><td>60</td><td>100</td><td>100</td></tr> <tr><td>80</td><td>100</td><td>90</td></tr> <tr><td>100</td><td>90</td><td>70</td></tr> <tr><td>120</td><td>80</td><td>50</td></tr> <tr><td>140</td><td>70</td><td>30</td></tr> <tr><td>160</td><td>60</td><td>15</td></tr> <tr><td>170</td><td>50</td><td>0</td></tr> </tbody> </table>	Ambient Temperature (°C)	PA series (%)	PE series (%)	60	100	100	80	100	90	100	90	70	120	80	50	140	70	30	160	60	15	170	50	0	<p><b>PA series</b></p> <p><b>PE series</b></p> <p>Note: construction will be adjusted to resistance value.</p>
Ambient Temperature (°C)	PA series (%)	PE series (%)																							
60	100	100																							
80	100	90																							
100	90	70																							
120	80	50																							
140	70	30																							
160	60	15																							
170	50	0																							

Dimensions						
PA series						
Type	Resistance range	L	W	H	I <sub>1</sub>	I <sub>2</sub>
PA1206	1mΩ	$3.20 \pm 0.25$	$1.60 \pm 0.25$	$0.65 \pm 0.25$	$1.04 \pm 0.25$	$1.04 \pm 0.25$
	$2m\Omega \leq R \leq 5m\Omega$	$3.20 \pm 0.25$	$1.60 \pm 0.25$	$0.65 \pm 0.25$	$0.63 \pm 0.25$	$0.63 \pm 0.25$
PA2512	$1m\Omega \leq R \leq 4m\Omega$	$6.35 \pm 0.25$	$3.18 \pm 0.25$	$0.63 \pm 0.25$	$2.21 \pm 0.25$	$2.21 \pm 0.25$
	$5m\Omega \leq R \leq 6m\Omega$	$6.35 \pm 0.25$	$3.18 \pm 0.25$	$0.63 \pm 0.25$	$1.19 \pm 0.25$	$1.19 \pm 0.25$
	$7m\Omega \leq R \leq 50m\Omega$	$6.35 \pm 0.25$	$3.18 \pm 0.25$	$0.63 \pm 0.25$	$0.76 \pm 0.25$	$0.76 \pm 0.25$
PE series						
Type	Resistance range	L	W	H	unit: mm	
PE0201	$50m\Omega \leq R \leq 200m\Omega$	$0.60 \pm 0.03$	$0.31 \pm 0.04$	$0.27 \pm 0.04$	$0.14 \pm 0.06$	
PE0402	$10m\Omega \leq R \leq 910m\Omega$	$1.00+0.10/-0.15$	$0.50+0.10/-0.15$	$0.35 \pm 0.15$	$0.25 \pm 0.10$	
PE0603	$20m\Omega \leq R \leq 50m\Omega$	$1.60 \pm 0.20$	$0.76 \pm 0.25$	$0.35 \pm 0.25$	$0.38 \pm 0.25$	
	$51m\Omega \leq R \leq 910m\Omega$	$1.52 \pm 0.25$	$0.76 \pm 0.25$	$0.45 \pm 0.10$	$0.38 \pm 0.25$	
PE0805	$20 m\Omega \leq R \leq 50m\Omega$	$2.03 \pm 0.25$	$1.27 \pm 0.25$	$0.35 \pm 0.25$	$0.38 \pm 0.25$	
	$51m\Omega \leq R \leq 910m\Omega$			$0.55 \pm 0.10$	$0.35 \pm 0.20$	
PE1206	5mΩ	$3.20 \pm 0.25$	$1.60 \pm 0.25$	$0.64 \pm 0.25$	$0.64 \pm 0.25$	
	$6m\Omega \leq R \leq 910m\Omega$				$0.51 \pm 0.25$	
PE2010	$5m\Omega \leq R \leq 6m\Omega$	$5.08 \pm 0.25$	$2.54 \pm 0.25$	$0.64 \pm 0.25$	$1.47 \pm 0.25$	
	$7m\Omega \leq R \leq 100m\Omega$				$0.51 \pm 0.25$	
PE2512	$6m\Omega \leq R \leq 100m\Omega$	$6.35 \pm 0.25$	$3.18 \pm 0.25$	$0.64 \pm 0.25$	$0.76 \pm 0.25$	

# Chip Resistors Selection Charts

## PA/PE - Current sensors - low T. C. R. chip resistors, 0201 to 2512

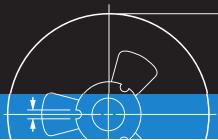
Electrical characteristics								
Type	Technology	Size	Power P70	Operating Temp. range	Max. working voltage	Tolerance	Resistance range	T. C. R.
PE	Metal Foil	0201	1/20W	-55°C to 125°C	(PxR)^1/2	$\pm 0.5\% \text{ R} > 50m\Omega$ $\pm 1\%$ $\pm 5\%$	50mΩ ≤ R ≤ 200mΩ	50mΩ ≤ R ≤ 70mΩ $\pm 350\text{ppm}/^\circ\text{C}$ 70mΩ < R ≤ 200mΩ $\pm 100\text{ppm}/^\circ\text{C}$
			1/10W					
		0402	1/16W	-55°C to 125°C	(PxR)^1/2	$\pm 0.5\% \text{ R} > 50m\Omega$ $\pm 1\%$ $\pm 5\%$	10mΩ ≤ R ≤ 910mΩ	$\pm 100 \text{ ppm}/^\circ\text{C}$
			1/8W					
			1/6W					
			1/4W					
		0603	1/10W	-55°C to 170°C	(PxR)^1/2	$\pm 0.5\% \text{ R} > 50m\Omega$ $\pm 1\%$ $\pm 5\%$	5m, 10m, 20mΩ ≤ R ≤ 910mΩ	$\pm 75 \text{ ppm}/^\circ\text{C}$ $\pm 100 \text{ ppm}/^\circ\text{C}$
			1/5W					
			1/3W					
			2/5W					
			1/2W					
		0805	1/8W	-55°C to 170°C	(PxR)^1/2	$\pm 0.5\% \text{ R} > 50m\Omega$ $\pm 1\%$ $\pm 5\%$	5mΩ ≤ R ≤ 910mΩ	$\pm 50\text{ppm}/^\circ\text{C}$ $\pm 75\text{ppm}/^\circ\text{C}$ $\pm 100\text{ppm}/^\circ\text{C}$
			1/4W					
			1/3W					
			1/2W					
		1206	1/4W	-55°C to 170°C	(PxR)^1/2	$\pm 0.5\% \text{ R} > 50m\Omega$ $\pm 1\%$ $\pm 5\%$	5mΩ ≤ R ≤ 910mΩ	$\pm 50\text{ppm}/^\circ\text{C}$ $\pm 75\text{ppm}/^\circ\text{C}$ $\pm 100\text{ppm}/^\circ\text{C}$
			1/2W					
			1W					
		2010	1/2W	-55°C to 170°C	(PxR)^1/2	$\pm 0.5\% \text{ R} > 50m\Omega$ $\pm 1\%$ $\pm 5\%$	5mΩ ≤ R < 100mΩ	$\pm 50\text{ppm}/^\circ\text{C}$ $\pm 75\text{ppm}/^\circ\text{C}$ $\pm 100\text{ppm}/^\circ\text{C}$
			1W					
			1W					
		2512	2W					

Note: Please contact with sales offices, distributors and representatives in your region before ordering

Electrical characteristics								
Type	Technology	Size	Power P70	Operating Temp. range	Max. working voltage	Tolerance	Resistance range	Min. T. C. R.
PA	Metal Plate	1206	1/4W	-55°C to 170°C	(PxR)^1/2	$\pm 1\%, \pm 5\%$	1mΩ ≤ R ≤ 5mΩ	$\pm 100 \text{ ppm}/^\circ\text{C}$
			1/2W					
			1W					
		2512	1W	-55°C to 170°C	(PxR)^1/2	$\pm 1\%, \pm 5\%$	1mΩ ≤ R ≤ 50mΩ	$\pm 100 \text{ ppm}/^\circ\text{C}$
			2W					
			3W					

Note: Please contact with sales offices, distributors and representatives in your region before ordering

Environmental characteristics								
Performance test		Test method	Procedure					Requirements
Life		MIL-STD-202 Method 108A	1000 hours at $70 \pm 2^\circ\text{C}$ applied RCWV 1.5 hours on, 0.5 hours off, still air required					$\pm(1\% + 0.5\text{m}\Omega)$
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered					$\pm(1\% + 0.5\text{m}\Omega)$
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with $25^\circ\text{C} / 65^\circ\text{C} 95\% \text{ R.H.}$					$\pm(0.5\% + 0.5\text{m}\Omega)$
Thermal shock		MIL-STD-202 Method 107G	$-55/+125^\circ\text{C}$ Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air					$\pm(0.5\% + 0.5\text{m}\Omega)$
Solderability	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at $245 \pm 3^\circ\text{C}$ Dipping time: $3 \pm 0.5$ seconds					Well tinned ( $\geq 95\%$ covered)
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, $260^\circ\text{C}$ , 10 seconds immersion time					$\pm(0.5\% + 0.5\text{m}\Omega)$ No visible damage
Short time overload		IEC 60115 -1 4.13	5 times of rated power for 5 seconds at room temperature					$\pm(0.5\% + 0.5\text{m}\Omega)$ No visible damage

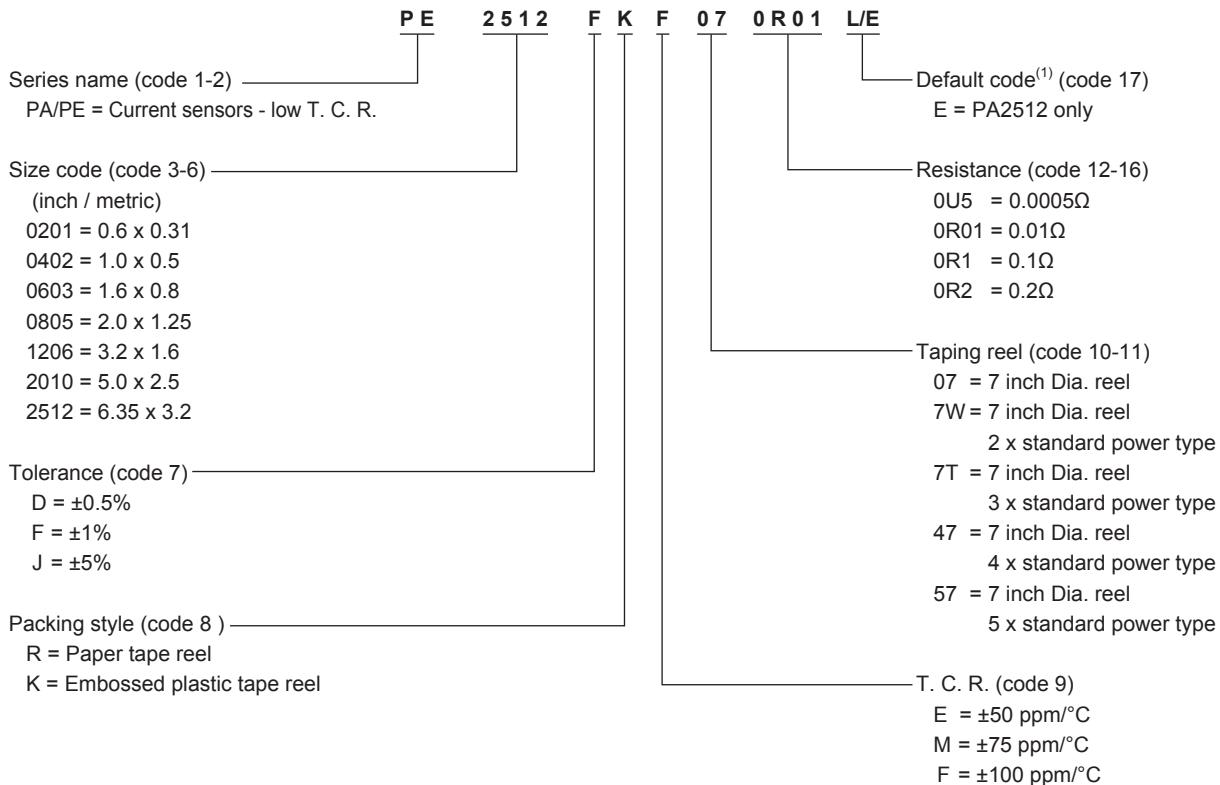


# Chip Resistors Selection Charts

PA/PE - Current sensors - low T. C. R. chip resistors, 0201 to 2512

Global part number - Preferred type

Ordering example: PE2512FKF070R01L



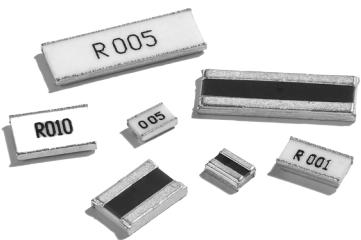
**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.

# Chip Resistors Selection Charts

PE - Current sensors - low T. C. R. chip resistors, wide termination, 0508 to 0612



## Features

- Excellent T. C. R. compared to thick film low ohmic
- Precision current sensing control
- Excellent performance for current sensing applications
- Low ohmic and high power

Derating curve	Construction																										
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Rated Power (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td></tr> <tr><td>0</td><td>100</td></tr> <tr><td>20</td><td>100</td></tr> <tr><td>40</td><td>100</td></tr> <tr><td>60</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>80</td><td>95</td></tr> <tr><td>100</td><td>80</td></tr> <tr><td>120</td><td>65</td></tr> <tr><td>140</td><td>50</td></tr> <tr><td>160</td><td>35</td></tr> <tr><td>170</td><td>17</td></tr> </tbody> </table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	20	100	40	100	60	100	70	100	80	95	100	80	120	65	140	50	160	35	170	17	 <p>PE0508/ 0612</p>
Ambient Temperature (°C)	Rated Power (%)																										
-55	100																										
0	100																										
20	100																										
40	100																										
60	100																										
70	100																										
80	95																										
100	80																										
120	65																										
140	50																										
160	35																										
170	17																										

Dimensions						
Type	Resistance range	L	W	H	I <sub>1</sub>	I <sub>2</sub>
PE0508	$3 \text{ m}\Omega \leq R \leq 100 \text{ m}\Omega$	$1.35 \pm 0.20$	$2.10 \pm 0.20$	$0.65 \pm 0.20$	---	$0.43 \pm 0.15$
PE0612	1mΩ	$1.60 \pm 0.20$	$0.32 \pm 0.20$	$0.60 \pm 0.15$	---	$0.55 \pm 0.20$
	$2\text{m}\Omega \leq R \leq 4\text{m}\Omega$	$1.60 \pm 0.20$	$0.32 \pm 0.20$	$0.60 \pm 0.15$	---	$0.40 \pm 0.20$
	$5\text{m}\Omega \leq R \leq 100\text{m}\Omega$	$1.60 \pm 0.20$	$0.32 \pm 0.20$	$0.60 \pm 0.15$	---	$0.30 \pm 0.15$



# Chip Resistors Selection Charts

**PE - Current sensors - low T. C. R. chip resistors, wide termination, 0508 to 0612**

Electrical characteristics							
Type	Technology	Size	Power P <sub>70</sub>	Operating Temp. range	Max. working voltage	Tolerance	Resistance range & T. C. R.
PE	Foil	0508	1.2W	-55°C to +155°C	(PxR) <sup>1/2</sup>	±1% ±5%	5mΩ ≤ R ≤ 100mΩ ±50ppm/°C ±75ppm/°C ±100ppm/°C
		0612	1W	-55°C to +155°C	(PxR) <sup>1/2</sup>	±1% ±5%	1mΩ ≤ R ≤ 100mΩ ±50ppm/°C ±75 ppm/°C ±100 ppm/°C
			2W				

**Note:** Please contact with sales offices, distributors and representatives in your region before ordering

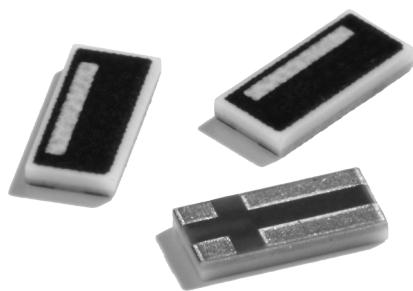
Environmental characteristics							
Performance test		Test method	Procedure				Requirements
Life		MIL-STD-202 Method 108A	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required				±(1% +0.5mΩ)
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered				±(1% +0.5mΩ)
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H				±(0.5% +0.5mΩ)
Solderability	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds				Well tinned (≥95% covered)
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, 260°C, 10 seconds immersion time				±(0.5% +0.5mΩ) No visible damage
Short time overload		IEC 60115-1 4.13	5 times of rated power for 5 seconds at room temperature				±(0.5% +0.5mΩ) No visible damage

Global part number - Preferred type							
Ordering example: PE0612FKF070R01L							
Series name (code 1-2) —	PE	0612	F	K	F	07	0R01 L
PE = current sensors - low T. C. R., wide termination							Default code <sup>(1)</sup> (code 17)
Size code (code 3-6) (inch / metric)							Resistance (code 12-16) 0R01 = 0.01Ω 0R02 = 0.02Ω
0508 = 1.35 x 2.1 0612 = 1.6 x 3.2							Taping reel (code 10-11) 07 = 7 inch Dia. reel 7W = 7 inch Dia. reel
Tolerance (code 7)	F = ±1% J = ±5%						2 x standard power type
Packing style (code 8 )	K = Embossed plastic tape reel R = Paper tape reel						T. C. R. (code 9) E = ±50 ppm/°C M = ±75 ppm/°C F = ±100 ppm/°C

**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

# Chip Resistors Selection Charts

PS - Current sensors - low T.C.R. chip resistors, 4 termination, 0306 to 0612



## Features

- Excellent T. C. R. compared to thick film low ohmic
- Precision current sensing control
- Excellent performance for current sensing applications
- Ultra-low resistance and narrow tolerance are suitable for current detection

Derating curve	Construction
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <p>PS0306 / PS0612</p>	<p>PS0306 / PS0612</p>

Dimensions									
Type	Resistance range	L	W	B1/S1	B2/S2	B3/S3	B4	B5	t
PS0306	$5m\Omega \leq R \leq 100m\Omega$	$0.80 \pm 0.15$	$1.60 \pm 0.20$	$1.10 \pm 0.20$	$0.25 \pm 0.10$	$0.25 \pm 0.10$	$0.20 \pm 0.10$	$0.40 \pm 0.20$	$0.50 \pm 0.20$
PS0612	$0.5m\Omega \leq R \leq 1m\Omega$	$3.20 \pm 0.20$	$1.60 + 0.15/-0.20$	$2.20 \pm 0.20$	$0.50 \pm 0.20$	$0.50 \pm 0.20$	$0.45 \pm 0.20$	$0.70 \pm 0.20$	$0.70 \pm 0.20$
	$2m\Omega \leq R \leq 10m\Omega$	$3.20 \pm 0.20$							$0.60 \pm 0.20$
	$12m\Omega \leq R \leq 100m\Omega$	$3.20 \pm 0.20$							$0.50 \pm 0.20$



# Chip Resistors Selection Charts

**PS - Current sensors - low T.C.R. chip resistors, 4 termination, 0306 to 0612**

Electrical characteristics								
Type	Technology	Size	Power P <sub>70</sub>	Operating Temp. range	Max. working voltage	Tolerance	Resistance range & T. C. R.	
PS	Metal Foil 4 termination	0306	1/4W	-55°C to 125°C	(PxR) <sup>1/2</sup>	±1%, ±5%	5mΩ ≤ R ≤ 100mΩ ±75 ppm/°C	±100 ppm/°C
			1/3W				3mΩ ≤ R < 5mΩ ±150 ppm/°C	
		0612	1W	0.5mΩ ~ 10mΩ -55°C to +150°C 12mΩ ~ 100mΩ -55°C to +125°C			0.5mΩ ≤ R ≤ 1mΩ ±150ppm/°C 2mΩ ≤ R ≤ 9mΩ ±100ppm/°C 14mΩ ≤ R ≤ 100mΩ ±100ppm/°C 10mΩ ≤ R ≤ 13mΩ ±200ppm/°C	

**Note:** Please contact with sales offices, distributors and representatives in your region before ordering

Environmental characteristics								
Performance test		Test method	Procedure					Requirements
Life		MIL-STD-202 Method 108A	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required					±(1% +0.5mΩ)
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered					±(1% +0.5mΩ)
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H					±(0.5% +0.5mΩ)
Solderability	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds					Well tinned (≥95% covered)
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, 260°C, 10 seconds immersion time					±(0.5% +0.5mΩ) No visible damage
Short time overload		IEC 60115-1 4.13	5 times of rated power for 5 seconds at room temperature					±(0.5% +0.5mΩ) No visible damage

Global part number - Preferred type								
Ordering example: PS0612FKF070R01L								
PS	0612	F	K	F	07	0R01	L	
Series name (code 1-2)								Default code <sup>(1/2)</sup> (code 17)
PS = current sensors - low T.C.R., 4 termination								
Size code (code 3-6) (inch / metric)								Resistance (code 12-16) 0U5 = 0.0005Ω 0R01 = 0.01Ω 0R02 = 0.02Ω
0306 = 0.8 x 1.6								
0612 = 1.6 x 3.2								
Tolerance (code 7)								Taping reel (code 10-11) 07 = 7 inch Dia. reel 7W = 7 inch Dia. reel 2 x standard power type 7T = 7 inch Dia. reel 3 x standard power type
F = ±1%								
J = ±5%								
Packing style (code 8)								T. C. R. (code 9) M = ±75 ppm/°C F = ±100 ppm/°C L = ±150 ppm/°C G = ±200 ppm/°C
R = Paper tape reel								
K = Embossed plastic tape reel								

**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. PS series 4 termination type products are available by "Global part number" only

# Chip Resistors Selection Charts

PU - Shunt chip resistors, 3921 / 5931

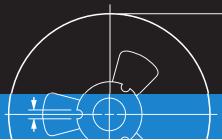


## Features

- Resistance value down to  $0.0002\Omega$  and high power to 10(W)
- $85^{\circ}\text{C}/85\%$  for high temperature & high humidity
- Welded metal plate construction

Derating curve	Construction																
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{\text{amb}}</math>).</p> <p>Normal Temperature Range: <math>-55^{\circ}\text{C}</math> to <math>+170^{\circ}\text{C}</math> High Temperature Range: <math>-55^{\circ}\text{C}</math> to <math>+275^{\circ}\text{C}</math></p> <p>Graph 1 (Normal Range):</p> <table border="1"> <thead> <tr> <th>Ambient Temperature (C)</th> <th>Power rating ratio (%)</th> </tr> </thead> <tbody> <tr><td>-65</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>170</td><td>0</td></tr> </tbody> </table> <p>Graph 2 (High Range):</p> <table border="1"> <thead> <tr> <th>Ambient Temperature (C)</th> <th>Power rating ratio (%)</th> </tr> </thead> <tbody> <tr><td>-65</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>275</td><td>0</td></tr> </tbody> </table>	Ambient Temperature (C)	Power rating ratio (%)	-65	100	70	100	170	0	Ambient Temperature (C)	Power rating ratio (%)	-65	100	70	100	275	0	<p>PU3921/PU5931</p>
Ambient Temperature (C)	Power rating ratio (%)																
-65	100																
70	100																
170	0																
Ambient Temperature (C)	Power rating ratio (%)																
-65	100																
70	100																
275	0																

Dimensions							
Type	L	W	H	T	a	b	I
PU3921	$10.0 \pm 0.25$	$5.25 \pm 0.25$	$0.5 \pm 0.1$	$2.00 \pm 0.25$	$2.75 \pm 0.25$	$6.25 \pm 0.25$	$5.5 \pm 0.25$
PU5931	$15.0 \pm 0.25$	$7.75 \pm 0.25$	$0.5 \pm 0.1$	$4.0 \pm 0.25$	$5.25 \pm 0.25$	$8.75 \pm 0.25$	$5.5 \pm 0.25$



# Chip Resistors Selection Charts

PU - Shunt chip resistors, 3921 / 5931

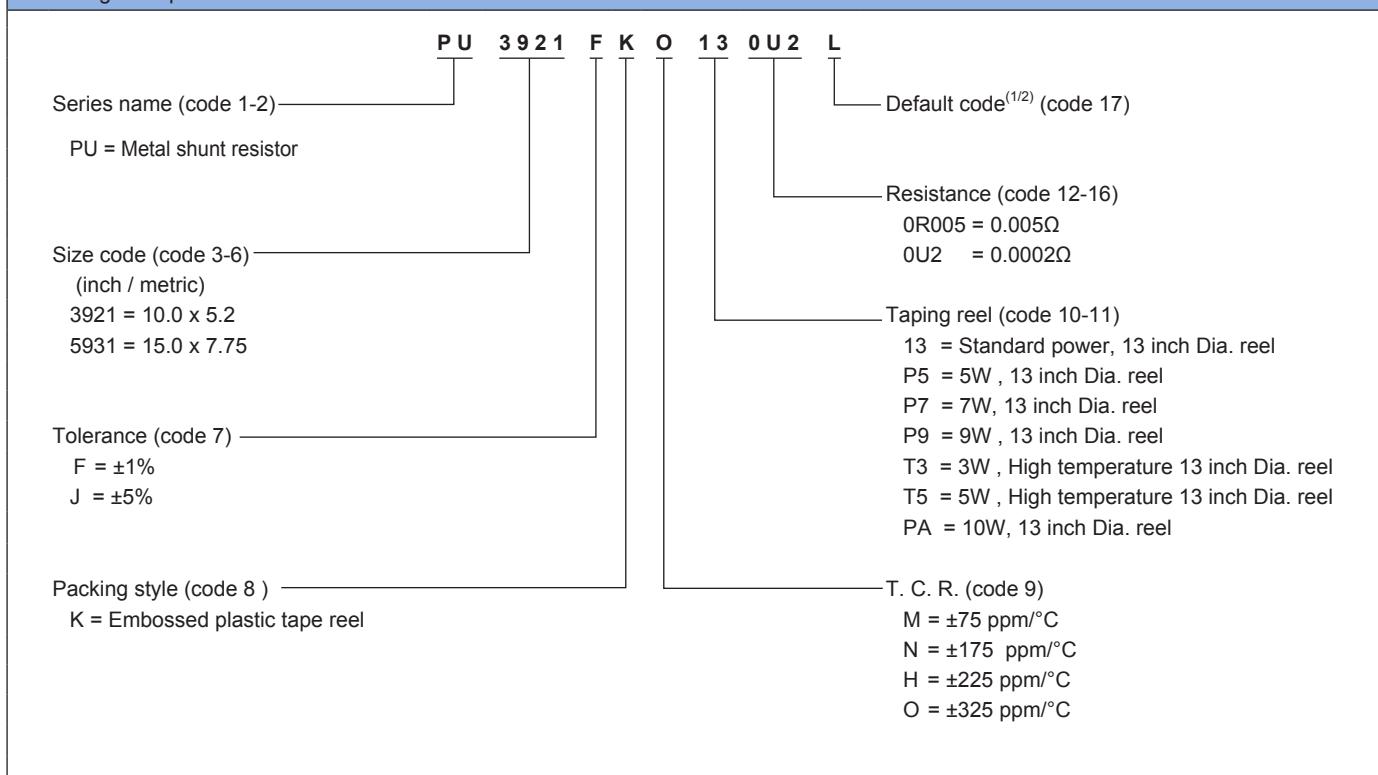
Electrical characteristics								
Type	Size	Power P <sub>70</sub>	Max voltage	Operating Temp. range	Resistance range	Tolerance	TCR	
PU	3921	3W	(PxR) <sup>1/2</sup>	-55°C to 170°C	0.2mR/ 0.3mR/ 0.5mR/ 1mR/ 2mR/3mR/4mR	±1%,±5%	0.2mR ±325ppm/°C	
				-55°C to 275°C	0.5mR/1mR/ 2mR/3mR/4mR		0.3mR/ 0.5mR ±175ppm/°C	
		5W		-55°C to 170°C	2mR/3mR/4mR		1mR~4mR ±75ppm/°C	
		9W			0.2mR/ 0.3mR/ 0.5mR/1mR			
	5931	5W		-55°C to 170°C	0.2mR/ 0.3mR/ 0.5mR/ 1mR/ 2mR/3mR/4mR	±1%,±5%	0.2mR ±225ppm/°C	
				-55°C to 275°C	0.3mR/0.5mR/1mR/2mR/3mR/4mR		0.3mR/ 0.5mR ±175ppm/°C	
		7W		-55°C to 170°C	1mR/2mR/3mR/4mR		1mR~4mR ±75ppm/°C	
		10W			0.2mR/ 0.3mR/ 0.5mR			

**Note:** Please contact with sales offices, distributors and representatives in your region before ordering.

Environmental characteristics				
Performance test		Test method	Procedure	Requirements
Life		MIL-STD-202 Method 108A	1000 hours at $70 \pm 2^\circ\text{C}$ applied RCWV 1.5 hours on, 0.5 hours off, still air required	$\pm(1\% + 0.5\text{m}\Omega)$
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered	$\pm(1\% + 0.5\text{m}\Omega)$
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with $25^\circ\text{C} / 65^\circ\text{C}$ 95% R.H	$\pm(0.5\% + 0.5\text{m}\Omega)$
Solderability	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, $260^\circ\text{C}$ , 10 seconds immersion time	$\pm(0.5\% + 0.5\text{m}\Omega)$ No visible damage
Short time overload		IEC 60115-1 4.13	5 times of rated power for 5 seconds at room temperature	$\pm(0.5\% + 0.5\text{m}\Omega)$ No visible damage

## Global part number - Preferred type

Ordering example: PU3921FKO130U2L



**Note:** 1. All of our RSMD products are RoHS compliant. "LEP" of the internal 2D reel label mentions "Lead Free Process".

1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label  
2. PII series 4 termination type products are available by "Global part number" only.

# Chip Resistors Selection Charts

AR - NiAu termination chip resistors, 0402 to 1206



## Features

- New NiAu terminations provide special application for hybrid board gluing
- Competitive with NiAu terminations
- Special use in high temperature environment
- Higher component and equipment reliability

Derating curve	Construction																		
<p>Maximum dissipation (<math>P</math>) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"><caption>Data points estimated from the derating curve graph</caption><thead><tr><th>Ambient Temperature (°C)</th><th>Rated Power (%)</th></tr></thead><tbody><tr><td>-55</td><td>100</td></tr><tr><td>0</td><td>100</td></tr><tr><td>65</td><td>100</td></tr><tr><td>70</td><td>90</td></tr><tr><td>100</td><td>60</td></tr><tr><td>120</td><td>40</td></tr><tr><td>140</td><td>20</td></tr><tr><td>155</td><td>15</td></tr></tbody></table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	65	100	70	90	100	60	120	40	140	20	155	15	
Ambient Temperature (°C)	Rated Power (%)																		
-55	100																		
0	100																		
65	100																		
70	90																		
100	60																		
120	40																		
140	20																		
155	15																		

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
	AR0402	1.00 ±0.05	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10
	AR0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
	AR0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
	AR1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20



# Chip Resistors Selection Charts

AR - NiAu termination chip resistors, 0402 to 1206

Electrical characteristics									
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R. ( ppm/°C)	Jumper criteria (unit: A)	
AR0402	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	10Ω < R ≤ 10MΩ ±100 ppm/°C 1Ω ≤ R ≤ 10Ω ±200 ppm/°C	Rated current 1.0	Max. current 2.0
AR0603	1/10W	-55°C to +155°C	50V	100V	100V			Rated current 1.0	Max. current 2.0
AR0805	1/8W	-55°C to +155°C	150V	300V	300V			Rated current 2.0	Max. current 5.0
AR1206	1/4W	-55°C to +155°C	200V	500V	500V			Rated current 2.0	Max. current 10.0

Environmental characteristics				
Performance test		Test method	Procedure	Requirements
Life		MIL-STD-202 -method 108A	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required	±(2% +50mΩ) < 100mΩ for jumper
High temperature exposure		MIL-STD-202 -method 108A	1000 hours at maximum operating temperature depending on specification, unpowered	±(1% +50mΩ) < 50mΩ for jumper
Moisture resistance		MIL-STD-202 -method 106F	Each temperature / humidity cycle is defined as 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H	±(2% +50mΩ) < 100mΩ for jumper
Thermal shock		MIL-STD-202 -method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(0.5% +50mΩ) for 10K to 10M ±(1% +50mΩ) for others < 50mΩ for jumper
Solderability	Wetting	J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds	Well tinned (≥95% covered) No visible damage
	Resistance to soldering heat	MIL-STD-202 -method 107G	Lead-free solder, 260°C, 10 seconds immersion time	±(1% +50mΩ) < 50mΩ for jumper No visible damage
Short time overload		MIL-R-55342D -para 4.7.5	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	±(2% +50mΩ) < 50mΩ for jumper No visible damage

## Chip Resistors Selection Charts

## **AR - NiAu termination chip resistors, 0402 to 1206**

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: AR0603JR-07100KL

Series name (code 1-2) — AR  
AR = NiAu termination

Size code (code 3-6) —  
(inch / metric)  
0402 = 1.0 x 0.5  
0603 = 1.6 x 0.8  
0805 = 2.0 x 1.25  
1206 = 3.2 x 1.6

Tolerance (code 7) —  
F =  $\pm 1\%$   
J =  $\pm 5\%$  (for Jumper ordering)

Default code<sup>(1/2)</sup> (code 17) — 07 — 100K — L

Resistance (code 12-16)  
0R = Jumper  
10R =  $10\Omega$   
100R =  $100\Omega$   
100K =  $100\text{K}\Omega$

Taping reel (code 10-11)  
07 = 7 inch Dia. reel

T. C. R. (code 9)  
“—” = Based on spec.  
(— for thick film only)

Packing style (code 8)  
R = Paper tape reel

**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
2. Letter L is system default code for ordering only

Phycomp worldwide - Traditional type									
Chip resistors with Ni/Au terminations									
Size: inch (mm)	0402 (1005)		0603 (1608)		0805 (2012)		1206 (3216)		
Power	1/16 W		1/10 W		1/8 W		1/4 W		
Tolerance	+5%	+1%	+5%	+1%	+5%	+1%	+5%	+1%	
Resistance	E24	E24 / E96	E24	E24 / E96	E24	E24 / E96	E24	E24 / E96	
Packing	paper tape		paper tape		paper tape		paper tape		
Quantity	5 000	---	---	2322 702 11...L	2322 704 1....L	2322 730 11...	2322 734 1....L	2322 711 11...L	2322 729 1....L
	10 000	2322 705 12...L	2322 706 2....	---	---	---	---	---	---
Jumper	5 000	---	---	2322 702 19001L	---	2322 730 19001L	---	2322 711 19001L	---
	10 000	2322 705 19001 L	---	---	---	---	---	---	---

**For ordering rules:** See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 13 for details.



# Chip Resistors Selection Charts

SR - Surge chip resistors, 0402 to 2512



## Features

- Reduced size of final equipment
- Higher component and equipment reliability
- Excellent performance at pulse loading

Derating curve	Construction																
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Rated Power (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td></tr> <tr><td>0</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>100</td><td>60</td></tr> <tr><td>120</td><td>40</td></tr> <tr><td>140</td><td>20</td></tr> <tr><td>155</td><td>15</td></tr> </tbody> </table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	70	100	100	60	120	40	140	20	155	15	<p>All size range except SR2512 with D/F tol</p> <p>SR2512 (D/F tol)</p>
Ambient Temperature (°C)	Rated Power (%)																
-55	100																
0	100																
70	100																
100	60																
120	40																
140	20																
155	15																

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
	SR0402	1.00 ±0.05	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10
	SR0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
	SR0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
	SR1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20
	SR1210	3.10 ±0.10	2.60 ±0.15	0.50 ±0.10	0.45 ±0.15	0.50 ±0.20
	SR1218	3.10 ±0.10	4.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20
	SR2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.55 ±0.15	0.50 ±0.20
	SR2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20

# Chip Resistors Selection Charts

SR - Surge chip resistors, 0402 to 2512

Electrical characteristics							
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R.
SR0402	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±0.5%,±1%,±5%,±10%,±20% E96 ±0.5%,±1%	1Ω ≤ R ≤ 100KΩ ±200 ppm/°C
	1/8W	-55°C to +155°C	50V	100V	100V		
SR0603	1/10W	-55°C to +155°C	75V	150V	150V		
	1/5W	-55°C to +155°C	75V	150V	150V		
SR0805	1/4W	-55°C to +155°C	75V	150V	150V		
	1/8W	-55°C to +155°C	150V	300V	300V		
SR1206	1/4W	-55°C to +155°C	150V	300V	300V		
	1/2W	-55°C to +155°C	200V	400V	500V		
SR1210	1/2W	-55°C to +155°C	200V	400V	500V		
	3/4W	-55°C to +155°C	200V	400V	400V		
SR1218	1W	-55°C to +155°C	200V	400V	500V		
SR2010	3/4W	-55°C to +155°C	200V	400V	500V		
SR2512	1W	-55°C to +155°C	200V	400V	500V		

Environmental characteristics							
Performance test		Test method	Procedure			Requirements	
Life		MIL-STD-202 -method 108	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required			±(3% +50mΩ)	
High temperature exposure		IEC 60068-2-2	1000 hours at maximum operating temperature depending on specification, unpowered			±(3% +50mΩ)	
Solderability	Wetting	J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds			Well tinned (≥95% covered) No visible damage	
	Resistance to soldering heat	MIL-STD-202 -method 210F	Lead-free solder, 260°C, 10 seconds immersion time			±(1% +50mΩ) No visible damage	
Short time overload		IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature			±(2% +50mΩ) No visible damage	

Pulse-Load behavior							
±5%,±10%,±20%				±0.5%,±1%			

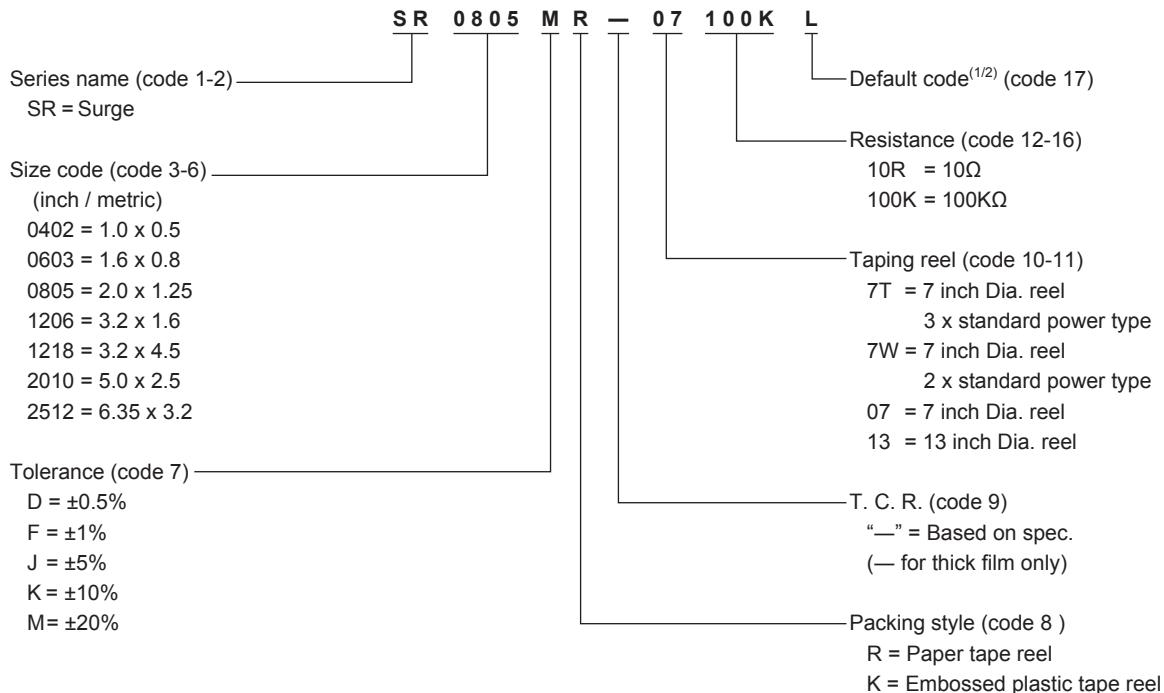


# Chip Resistors Selection Charts

## SR - Surge chip resistors, 0402 to 2512

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: SR0805MR-07100KL



**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
 2. Letter L is system default code for ordering only

### Phycomp worldwide - Traditional type

Surge chip resistors						
Size: inch (mm)	0805 (2012)	1206 (3216)	1218 (3248)	2512 (6432)		
Power	1/8 W	1/4 W	1 W	1 W		
Tolerance	+10%	+5%	+10%	+5%	+10%	+20%
Resistance	E24	E24	E24	E24	E24	E24
Packing	paper tape	paper tape	paper tape	paper tape	paper tape	paper tape
Quantity	4 000	---	---	2350 557 10...L	2350 556 11...L	2350 556 10...L
	5 000	2350 554 12..L	2350 550 10...L	---	---	---
						2350 556 13...L

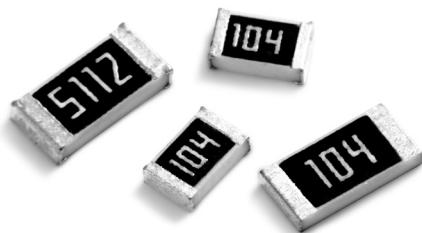
**For ordering rules:** See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

### Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.

# Chip Resistors Selection Charts

RV - High voltage chip resistors, 0603 to 2512



## Features

- Higher maximum working voltage compared to RC series
- Reliable electrode construction
- Compatible with lead containing and lead-free soldering processes
- Highly stable in auto-placement surface mounting

Derating curve	Construction																
<p>Maximum dissipation (<math>P</math>) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <p>Rated Power (%)</p> <p>Ambient Temperature (°C)</p> <table border="1"><caption>Approximate data points from the derating curve graph</caption><thead><tr><th>Ambient Temperature (°C)</th><th>Rated Power (%)</th></tr></thead><tbody><tr><td>-55</td><td>100</td></tr><tr><td>0</td><td>100</td></tr><tr><td>70</td><td>100</td></tr><tr><td>100</td><td>60</td></tr><tr><td>120</td><td>40</td></tr><tr><td>140</td><td>20</td></tr><tr><td>155</td><td>15</td></tr></tbody></table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	70	100	100	60	120	40	140	20	155	15	
Ambient Temperature (°C)	Rated Power (%)																
-55	100																
0	100																
70	100																
100	60																
120	40																
140	20																
155	15																

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
	RV0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
	RV0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
	RV1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.40 ±0.20	0.45 ±0.20
	RV2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.45 ±0.15	0.50 ±0.20
	RV2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20



# Chip Resistors Selection Charts

## RV - High voltage chip resistors, 0603 to 2512

Electrical characteristics							
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R.
RV0603	1/10W	-55°C to +155°C	350V	500V	500V	E24 ±5% E24/E96 ±1% 47Ω ≤ R ≤ 10MΩ	±200 ppm/°C
RV0805	1/8W	-55°C to +155°C	400V	800V	800V	E24 ±5% 47Ω ≤ R ≤ 22MΩ E24/E96 ±1% 47Ω ≤ R ≤ 22MΩ E24/E96 ±0.5% 47Ω ≤ R ≤ 10MΩ	
RV1206	1/4W	-55°C to +155°C	500V	1000V	1000V	E24 ±5% 47Ω ≤ R ≤ 27MΩ E24/E96 ±1% 47Ω ≤ R ≤ 27MΩ E24/E96 ±0.5% 47Ω ≤ R ≤ 10MΩ	
RV2010	3/4W	-55°C to +155°C	500V	1000V	1000V	E24 ±5% 47Ω ≤ R ≤ 22MΩ E24/E96 ±1% 47Ω ≤ R ≤ 22MΩ E24/E96 ±0.5% 47Ω ≤ R ≤ 10MΩ	
RV2512	1W	-55°C to +155°C	500V	1000V	1000V	E24 ±5% 47Ω ≤ R ≤ 16MΩ E24/E96 ±1% 47Ω ≤ R ≤ 16MΩ E24/E96 ±0.5% 47Ω ≤ R ≤ 10MΩ	

Environmental characteristics							
Performance test		Test method	Procedure			Requirements	
Life		MIL-STD-202 Method 108A	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required			±(2% +50mΩ)	
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered			±(1% +50mΩ)	
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H			±(2% +50mΩ)	
Thermal shock		MIL-STD-202 Method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air			±(0.5% +50mΩ) for 10K to 10M ±(1% +50mΩ) for others	
Solderability	Wetting	IEC 60115 -1 4.13	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds			Well tinned (≥95% covered) No visible damage	
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, 260°C, 10 seconds immersion time			±(1% +50mΩ) No visible damage	
Short time overload		J-STD-002B test B	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature			±(2% +50mΩ) No visible damage	

# Chip Resistors Selection Charts

## RV - High voltage chip resistors, 0603 to 2512

Global part number - Preferred type for ordering Yageo / Phycomp branded products									
Ordering example: RV0805JR-07100KL									
Series name (code 1-2)	RV	0805	J	R	—	07	100K	L	
RV = High voltage								Default code <sup>(1/2)</sup> (code 17)	
Size code (code 3-6)								Resistance (code 12-16)	
(inch / metric)								100K = 100KΩ	
0603 = 1.6 x 0.8								1M = 1MΩ	
0805 = 2.0 x 1.25									
1206 = 3.2 x 1.6									
2010 = 5.0 x 2.5									
2512 = 6.35 x 3.2									
Tolerance (code 7)								Taping reel (code 10-11)	
D = ±0.5%								07 = 7 inch Dia. reel	
F = ±1%									
J = ±5%									
								T. C. R. (code 9)	
								“—” = Based on spec.	
								(— for thick film only)	
								Packing style (code 8 )	
								R = Paper tape reel	
								K = Embossed plastic tape reel	

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

Phycomp worldwide - Traditional type					
High voltage chip resistors					
Size: inch (mm)	0805 (2012)		1206 (3216)		2512 (6432)
Power	1/8 W		1/4 W		1 W
Tolerance	+5%	+1%	+5%	+1%	+5%
Resistance	E24	E24 / E96	E24	E24 / E96	E24
Packing	paper tape		paper tape		blister tape
Quantity	4 000	---	---	---	2322 762 98...L
	5 000	2322 792 61...L	2322 793 6....L	2322 790 61...L	2322 791 6....L

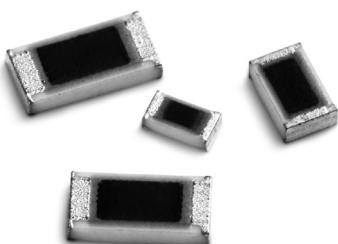
For ordering rules: See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

Phycomp CTC ordering code - Traditional type - North America					
Regional code for ordering Phycomp branded products. Please see page 15 for details.					

# Chip Resistors Selection Charts



TR - Trimmable chip resistors, 0402 to 1206



## Features

- Reduced size of final equipment
- Higher component and equipment reliability
- Low noise, when not trimmed
- Flexible for resistance trimming

Derating curve	Construction								
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points from Derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Maximum dissipation (%)</th> </tr> </thead> <tbody> <tr><td>70</td><td>100</td></tr> <tr><td>125</td><td>0</td></tr> <tr><td>155</td><td>0</td></tr> </tbody> </table> <p>Rated Power (%)</p> <p>Ambient Temperature (°C)</p>	Ambient Temperature (°C)	Maximum dissipation (%)	70	100	125	0	155	0	<p>overcoat</p> <p>resistive layer</p> <p>inner electrode</p> <p>termination</p> <p>ceramic substrate</p>
Ambient Temperature (°C)	Maximum dissipation (%)								
70	100								
125	0								
155	0								

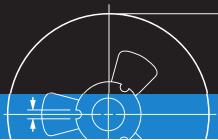
Dimensions																														
<p>unit: mm</p> <table border="1"> <thead> <tr> <th>Type</th> <th>L</th> <th>W</th> <th>H</th> <th>I<sub>1</sub></th> <th>I<sub>2</sub></th> </tr> </thead> <tbody> <tr><td>TR0402</td><td>1.00 ±0.10</td><td>0.50 ±0.05</td><td>0.35 ±0.05</td><td>0.20 ±0.10</td><td>0.25 ±0.10</td></tr> <tr><td>TR0603</td><td>1.60 ±0.10</td><td>0.80 ±0.10</td><td>0.45 ±0.10</td><td>0.25 ±0.15</td><td>0.25 ±0.15</td></tr> <tr><td>TR0805</td><td>2.00 ±0.10</td><td>1.25 ±0.10</td><td>0.50 ±0.10</td><td>0.35 ±0.20</td><td>0.35 ±0.20</td></tr> <tr><td>TR1206</td><td>3.10 ±0.10</td><td>1.60 ±0.10</td><td>0.55 ±0.10</td><td>0.45 ±0.20</td><td>0.40 ±0.20</td></tr> </tbody> </table>	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>	TR0402	1.00 ±0.10	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10	TR0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15	TR0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20	TR1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20
Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>																									
TR0402	1.00 ±0.10	0.50 ±0.05	0.35 ±0.05	0.20 ±0.10	0.25 ±0.10																									
TR0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15																									
TR0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20																									
TR1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20																									

# Chip Resistors Selection Charts

TR - Trimmable chip resistors, 0402 to 1206

Electrical characteristics							
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R. ( ppm/°C)
TR0402	1/16W	-55°C to +125°C	50V	100V	100V	E24 +0/-10%, +0/-20%, +0/-30% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200 ppm/°C 10Ω < R ≤ 1MΩ ±100 ppm/°C 1MΩ < R ≤ 10MΩ ±200 ppm/°C
TR0603	1/16W	-55°C to +125°C	50V	100V	100V		
TR0805	1/8W	-55°C to +155°C	150V	300V	500V		
TR1206	1/4W	-55°C to +155°C	200V	500V	500V		

Environmental characteristics							
Performance test		Test method	Procedure			Requirements	
Life		MIL-STD-202 Method 108A	1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required			±(1% +50mΩ)	
High temperature exposure		MIL-STD-202 Method 108A	1000 hours at maximum operating temperature depending on specification, unpowered			±(1% +50mΩ)	
Moisture resistance		MIL-STD-202 Method 106G	Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H			±(2% +50mΩ)	
Thermal shock		MIL-STD-202 Method 107G	-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air			±(1% +50mΩ)	
Solderability	Wetting	J-STD-002B test B	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds			Well tinned (≥95% covered) No visible damage	
	Resistance to soldering heat	MIL-STD-202 method 210F	Lead-free solder, 260°C, 10 seconds immersion time			±(1% +50mΩ) No visible damage	
Short time overload		IEC 60115 -1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature			±(1% +50mΩ) No visible damage	

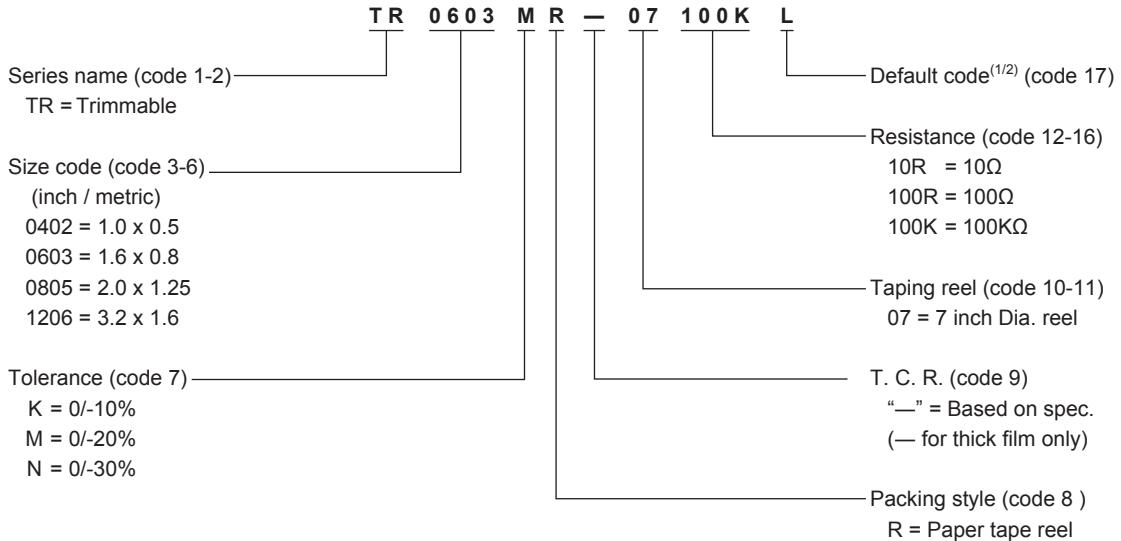


# Chip Resistors Selection Charts

## TR - Trimmable chip resistors, 0402 to 1206

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: TR0603MR-07100KL



**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

### Phycomp worldwide - Traditional type

Trimmable chip resistors				
Size: inch (mm)	0402 (1005)	0603 (1608)	0805 (2012)	1206 (3216)
Power	1/16 W	1/10 W	1/8 W	1/4 W
Tolerance	E24	E24	E24	E24
Resistance	paper tape	paper tape	paper tape	paper tape
Packing	2350 503 21...L	2350 502 11...L	2350 501 11...L	2350 500 11...L
Quantity 5 000 0/-20%	2350 503 20...L	2350 502 10...L	2350 511 10...L	2350 500 10...L
5 000 0/-30%	on request	on request	on request	2322 724 94...L
Europe 5 000	2322 792 61...L	2322 793 6....L	2322 791 6....L	---

**For ordering rules:** See page 14 for E24 / E96 values and the last 4 or 3 digits of the 12NC catalogue number

### Phycomp CTC ordering code - Traditional type - North America

Regional code for ordering Phycomp branded products. Please see page 15 for details.

# Chip Resistors Selection Charts

AF - Sulfur resistant chip resistors, 0201 to 2512



## Features

- Superior resistance against sulfur containing atmosphere
- Highly reliable electrode construction
- Compatible with all soldering processes
- Highly stable in auto-placement surface mounting applications
- Halogen free product and production

Derating curve	Construction
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <p>AF0201 Range: -55 °C to + 125 °C AF0402 - AF2512 Range: -55 °C to + 155 °C</p>	

Dimensions	Dimensions (mm)	Table of Dimensions																																																												
		<table border="1"> <thead> <tr> <th>Type</th><th>L</th><th>W</th><th>H</th><th>I<sub>1</sub></th><th>I<sub>2</sub></th></tr> </thead> <tbody> <tr> <td>AF0201</td><td>0.60 ±0.03</td><td>0.30 ±0.03</td><td>0.23 ±0.03</td><td>0.12 ±0.05</td><td>0.15 ±0.05</td></tr> <tr> <td>AF0402</td><td>1.00 ±0.05</td><td>0.50 ±0.05</td><td>0.32 ±0.05</td><td>0.20 ±0.10</td><td>0.25 ±0.10</td></tr> <tr> <td>AF0603</td><td>1.60 ±0.10</td><td>0.80 ±0.10</td><td>0.45 ±0.10</td><td>0.25 ±0.15</td><td>0.25 ±0.15</td></tr> <tr> <td>AF0805</td><td>2.00 ±0.10</td><td>1.25 ±0.10</td><td>0.50 ±0.10</td><td>0.35 ±0.20</td><td>0.35 ±0.20</td></tr> <tr> <td>AF1206</td><td>3.10 ±0.10</td><td>1.60 ±0.10</td><td>0.55 ±0.10</td><td>0.45 ±0.20</td><td>0.40 ±0.20</td></tr> <tr> <td>AF1210</td><td>3.10 ±0.10</td><td>2.60 ±0.15</td><td>0.50 ±0.10</td><td>0.45 ±0.15</td><td>0.50 ±0.20</td></tr> <tr> <td>AF1218</td><td>3.10 ±0.10</td><td>4.60 ±0.10</td><td>0.55 ±0.10</td><td>0.45 ±0.20</td><td>0.40 ±0.20</td></tr> <tr> <td>AF2010</td><td>5.00 ±0.10</td><td>2.50 ±0.15</td><td>0.55 ±0.10</td><td>0.55 ±0.15</td><td>0.50 ±0.20</td></tr> <tr> <td>AF2512</td><td>6.35 ±0.10</td><td>3.10 ±0.15</td><td>0.55 ±0.10</td><td>0.60 ±0.20</td><td>0.50 ±0.20</td></tr> </tbody> </table>	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>	AF0201	0.60 ±0.03	0.30 ±0.03	0.23 ±0.03	0.12 ±0.05	0.15 ±0.05	AF0402	1.00 ±0.05	0.50 ±0.05	0.32 ±0.05	0.20 ±0.10	0.25 ±0.10	AF0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15	AF0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20	AF1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20	AF1210	3.10 ±0.10	2.60 ±0.15	0.50 ±0.10	0.45 ±0.15	0.50 ±0.20	AF1218	3.10 ±0.10	4.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20	AF2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.55 ±0.15	0.50 ±0.20	AF2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20
Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>																																																									
AF0201	0.60 ±0.03	0.30 ±0.03	0.23 ±0.03	0.12 ±0.05	0.15 ±0.05																																																									
AF0402	1.00 ±0.05	0.50 ±0.05	0.32 ±0.05	0.20 ±0.10	0.25 ±0.10																																																									
AF0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15																																																									
AF0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20																																																									
AF1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20																																																									
AF1210	3.10 ±0.10	2.60 ±0.15	0.50 ±0.10	0.45 ±0.15	0.50 ±0.20																																																									
AF1218	3.10 ±0.10	4.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20																																																									
AF2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.55 ±0.15	0.50 ±0.20																																																									
AF2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20																																																									



# Chip Resistors Selection Charts

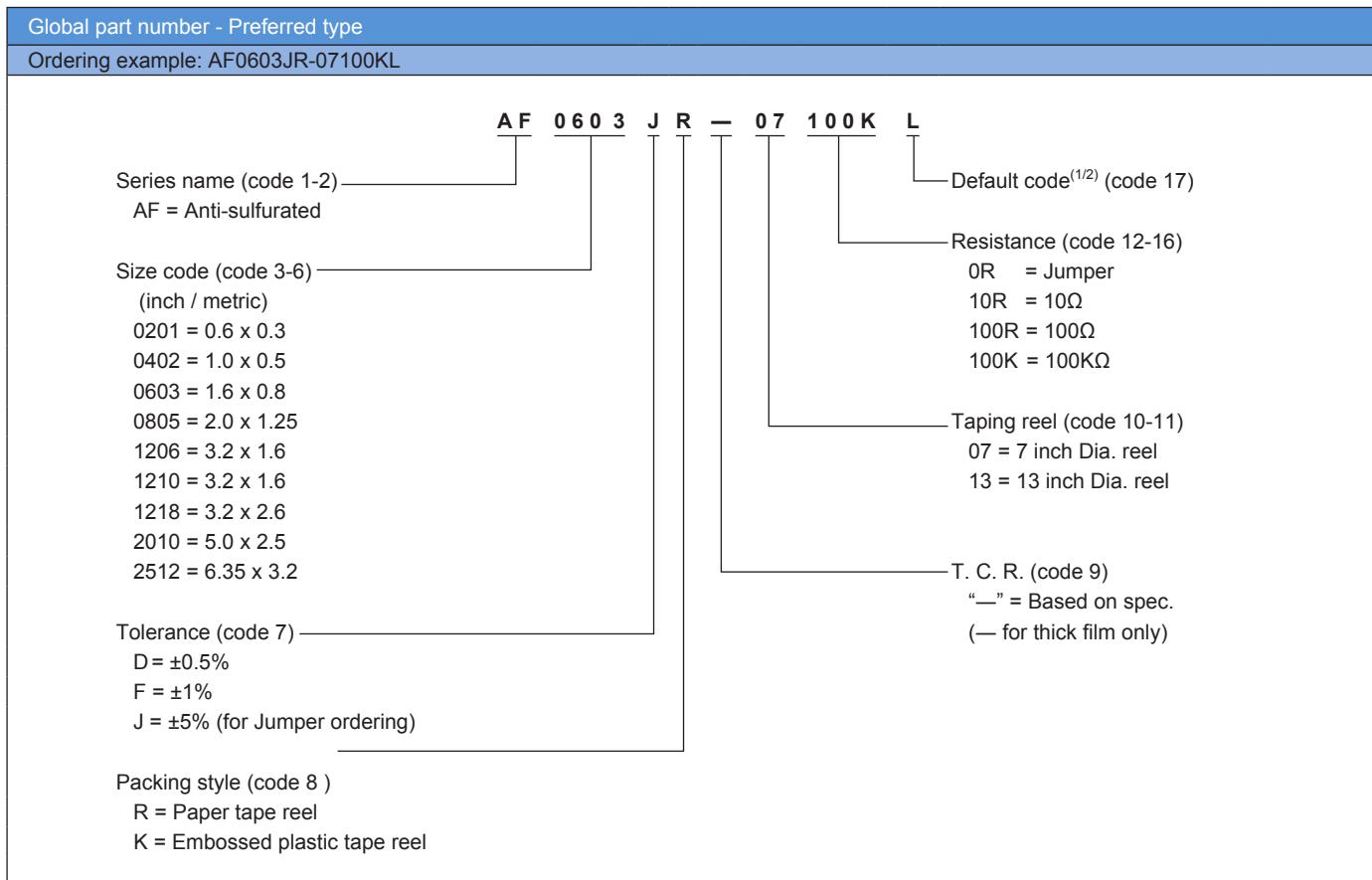
## AF - Sulfur resistant chip resistors, 0201 to 2512

Electrical characteristics										
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance		T. C. R. ( ppm/°C)		Jumper criteria (unit: A)
AF0201	1/20W	-55°C to +125°C	25V	50V	50V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω -100/+350ppm/°C 10Ω < R ≤ 10MΩ ±200ppm/°C	1Ω ≤ R ≤ 10Ω -100/+350ppm/°C 10Ω < R ≤ 10MΩ ±200ppm/°C	1Ω ≤ R ≤ 10Ω -100/+350ppm/°C 10Ω < R ≤ 10MΩ ±200ppm/°C	Rated current 0.5 Max. current 1.0
AF0402	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ				Rated current 1.0 Max. current 2.0
AF0603	1/10W	-55°C to +155°C	75V	150V	150V					Rated current 1.0 Max. current 2.0
AF0805	1/8W	-55°C to +155°C	150V	300V	300V					Rated current 2.0 Max. current 5.0
AF1206	1/4W	-55°C to +155°C	200V	400V	500V					Rated current 2.0 Max. current 10.0
AF1210	1/2W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C			Rated current 2.0 Max. current 10.0
AF1218	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ				Rated current 2.0 Max. current 10.0
AF2010	3/4W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ				Rated current 2.0 Max. current 10.0
AF2512	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ				Rated current 2.0 Max. current 10.0

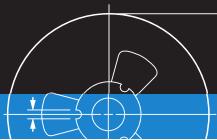
Environmental characteristics											
Performance test		Test method		Procedure					Requirements		
Life		MIL-STD-202 Method 108		1000 hours at 70 ±2°C applied RCWV 1.5 hours on, 0.5 hours off, still air required					±(1% +50mΩ) < 100mΩ for jumper		
High temperature exposure		MIL-STD-202 Method 108		1000 hours at maximum operating temperature depending on specification, unpowered					±(1% +50mΩ) < 100mΩ for jumper		
Moisture resistance		MIL-STD-202 Method 106		Each temperature / humidity cycle is defined as 8 hours (method 106G), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H					±(0.5% +50mΩ) for 1% tol. ±(1% +50mΩ) for 5% tol. < 100mΩ for jumper		
Thermal shock		MIL-STD-202 Method 107		-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air					±(0.5% +50mΩ) for 1% tol. ±(1% +50mΩ) for 5% tol. < 100mΩ for jumper		
Solderability	Wetting	J-STD-002B testB		Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds					Well tinned (≥95% covered) No visible damage		
	Resistance to soldering heat	MIL-STD-202 Method 215		Lead-free solder, 260°C, 10 seconds immersion time					±(1% +50mΩ) No visible damage		
Short time overload		IEC60115-1 4.13		2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature					±(1% +50mΩ) No visible damage		
Anti-FOS		ASTM-B-809-95		Sulfur (saturated vapor) 1000 hours, 90±2°C, Rating with no power					±(1% +50mΩ)		
		ASTM-B-809-95* * Modified		Sulfur 750 hours, 105°C, Rating with no power					±(4% +50mΩ)		

# Chip Resistors Selection Charts

AF - Sulfur resistant chip resistors, 0201 to 2512

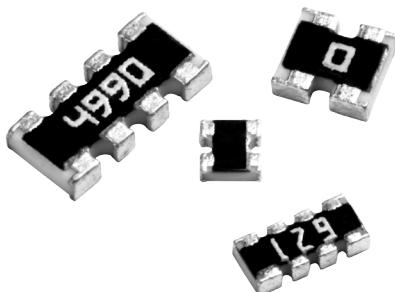


**Note:** 1. All our RSMD products meet RoHS Compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
2. Letter L is system default code for order only  
3. AF series products are available by "Global part number" only



# Chip Resistors Selection Charts

## AF - Sulfur resistant chip resistors, Arrays

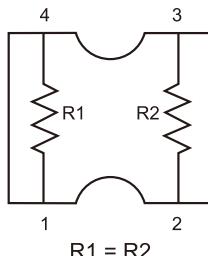


### Features

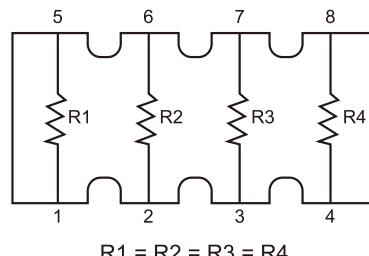
- Superior resistance against sulfur containing atmosphere
- Highly reliable electrode construction
- Compatible with all soldering processes
- Highly stable in auto-placement surface mounting applications
- Halogen free product and production

### Schematics

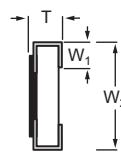
**AF122 /AF162**



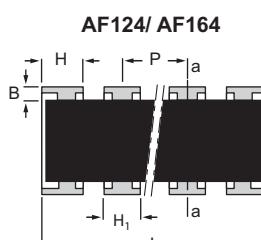
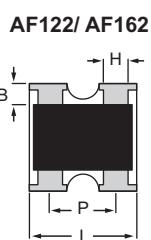
**AF124 /AF164**



### Dimensions



Side view for all types



unit: mm

Type	H / H1	B	P	L	T	W1	W2
AF122	$0.30 \pm 0.10/-0.05$	$0.24 \pm 0.10$	$0.67 \pm 0.05$	$1.00 \pm 0.10$	$0.30 \pm 0.10$	$0.25 \pm 0.10$	$1.00 \pm 0.10$
AF124	$H : 0.45 \pm 0.05$ $H1 : 0.30 \pm 0.05$	$0.25 \pm 0.15$	$0.50 \pm 0.05$	$2.00 \pm 0.10$	$0.45 \pm 0.10$	$0.30 \pm 0.15$	$1.00 \pm 0.10$
AF162	$0.35 \pm 0.10$	$0.30 \pm 0.10$	$0.80 \pm 0.05$	$1.6 \pm 0.10$	$0.40 \pm 0.10$	$0.30 \pm 0.10$	$1.6 \pm 0.10$
AF164	$H: 0.65 \pm 0.05$ $H1: 0.50 \pm 0.15$	$0.30 \pm 0.15$	$0.80 \pm 0.05$	$3.2 \pm 0.15$	$0.60 \pm 0.10$	$0.30 \pm 0.15$	$1.6 \pm 0.15$

# Chip Resistors Selection Charts

## AF - Sulfur resistant chip resistors, Arrays

Electrical characteristics									
Type	Power rating	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R.	Jumper criteria (unit: A)	
AF122	1/16W	-55°C to 155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R < 10Ω ±250ppm/°C 10Ω ≤ R < 1MΩ ±200ppm/°C	Rated current 0.5A Max. current 1.0A	
AF124	1/16W	-55°C to 155°C	25V	50V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R < 10Ω ±250ppm/°C 10Ω ≤ R < 1MΩ ±200ppm/°C	Rated current 1.0A Max. current 2.0A	
AF162	1/16W	-55°C to 155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R < 10Ω ±250ppm/°C 10Ω ≤ R < 1MΩ ±200ppm/°C	Rated current 1.0A Max. current 2.0A	
AF164	1/16W	-55°C to 155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	±250ppm/°C	Rated current 1.0A Max. current 2.0A	

Environmental characteristics									
Performance test		Test method		Procedure				Requirements	
Life		MIL-STD-202 -method 108		1000 hours at 70 ±5°C applied RCWV 1.5 hours on, 0.5 hours off, still air required				±(2% +50mΩ) < 100mΩ for jumper	
High temperature exposure		MIL-STD-202 -method 108		1000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 125±3 °C				±(1% +50mΩ) < 50mΩ for jumper	
Moisture resistance		MIL-STD-202 -method 106		Each temperature / humidity cycle is defined as 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H				±(2% +50mΩ) < 50mΩ for jumper	
Thermal shock		MIL-STD-202 -method 107		-55/+125 °C Note: Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air				±(1% +50mΩ) for others < 50mΩ for jumper	
Solderability	Wetting	J-STD-002B testB		Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds				Well tinned (≥95% covered)	
	Resistance to soldering heat	MIL-STD-202 Method 210		Lead-free solder, 260°C, 10 seconds immersion time				±(1% +50mΩ) < 50mΩ for jumper No visible damage	
Short time overload		IEC60115-1 4.13		2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature				±(2% +50mΩ) < 50mΩ for jumper No visible damage	
Anti-FOS		ASTM-B-809-95		Sulfur (saturated vapor) 1000 hours, 90±2°C, Rating with no power				±(1% +50mΩ)	
		ASTM-B-809-95* *Modified		Sulfur 750 hours, 105°C, Rating with no power				±(4% +50mΩ)	

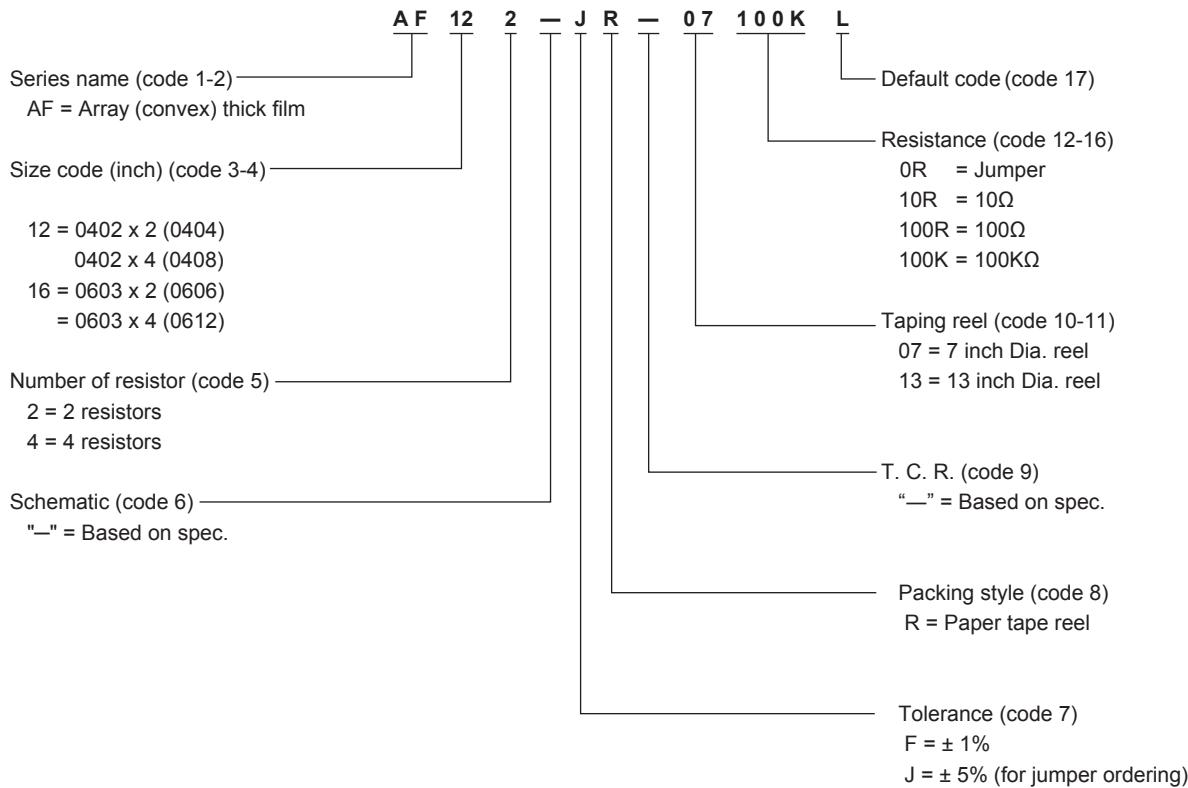


# Chip Resistors Selection Charts

## AF - Sulfur resistant chip resistors, Arrays

Global part number - Array

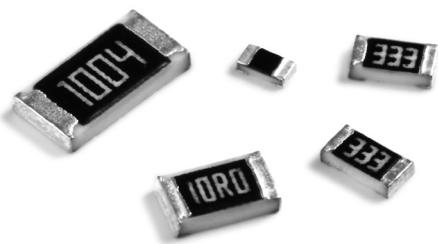
Ordering example: AF122-JR-07100KL



**Note:** 1. All our RSMD products meet RoHS Compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
2. Letter L is system default code for order only

# Chip Resistors Selection Charts

AC - Automotive grade chip resistors, 0201 to 2512

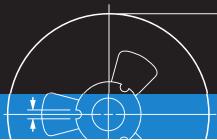


## Features

- AEC-Q200 qualified
- Production part approval process (PPAP) support
- High reliability
- High quality level

Derating curve	Construction																		
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from Derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Rated Power (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td></tr> <tr><td>0</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>80</td><td>80</td></tr> <tr><td>100</td><td>60</td></tr> <tr><td>120</td><td>40</td></tr> <tr><td>140</td><td>20</td></tr> <tr><td>155</td><td>15</td></tr> </tbody> </table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	70	100	80	80	100	60	120	40	140	20	155	15	<p>All size range except AC2010/ 2512 double power</p> <p>AC2010/ 2512 double power</p>
Ambient Temperature (°C)	Rated Power (%)																		
-55	100																		
0	100																		
70	100																		
80	80																		
100	60																		
120	40																		
140	20																		
155	15																		

Dimensions																																																																		
<table border="1"> <caption>Dimensions (unit: mm)</caption> <thead> <tr> <th>Type</th> <th>L</th> <th>W</th> <th>H</th> <th><math>l_1</math></th> <th><math>l_2</math></th> </tr> </thead> <tbody> <tr><td>AC0201</td><td><math>0.60 \pm 0.03</math></td><td><math>0.30 \pm 0.03</math></td><td><math>0.23 \pm 0.03</math></td><td><math>0.12 \pm 0.05</math></td><td><math>0.15 \pm 0.05</math></td></tr> <tr><td>AC0402</td><td><math>1.00 \pm 0.05</math></td><td><math>0.50 \pm 0.05</math></td><td><math>0.32 \pm 0.05</math></td><td><math>0.20 \pm 0.10</math></td><td><math>0.25 \pm 0.10</math></td></tr> <tr><td>AC0603</td><td><math>1.60 \pm 0.10</math></td><td><math>0.80 \pm 0.10</math></td><td><math>0.45 \pm 0.10</math></td><td><math>0.25 \pm 0.15</math></td><td><math>0.25 \pm 0.15</math></td></tr> <tr><td>AC0805</td><td><math>2.00 \pm 0.10</math></td><td><math>1.25 \pm 0.10</math></td><td><math>0.50 \pm 0.10</math></td><td><math>0.35 \pm 0.20</math></td><td><math>0.35 \pm 0.20</math></td></tr> <tr><td>AC1206</td><td><math>3.10 \pm 0.10</math></td><td><math>1.60 \pm 0.10</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.20</math></td><td><math>0.40 \pm 0.20</math></td></tr> <tr><td>AC1210</td><td><math>3.10 \pm 0.10</math></td><td><math>2.60 \pm 0.15</math></td><td><math>0.50 \pm 0.10</math></td><td><math>0.45 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>AC1210 7W</td><td><math>3.10 \pm 0.10</math></td><td><math>2.60 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>AC1218</td><td><math>3.10 \pm 0.10</math></td><td><math>4.60 \pm 0.10</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.45 \pm 0.20</math></td><td><math>0.40 \pm 0.20</math></td></tr> <tr><td>AC2010</td><td><math>5.00 \pm 0.10</math></td><td><math>2.50 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.55 \pm 0.15</math></td><td><math>0.50 \pm 0.20</math></td></tr> <tr><td>AC2512</td><td><math>6.35 \pm 0.10</math></td><td><math>3.10 \pm 0.15</math></td><td><math>0.55 \pm 0.10</math></td><td><math>0.60 \pm 0.20</math></td><td><math>0.50 \pm 0.20</math></td></tr> </tbody> </table>	Type	L	W	H	$l_1$	$l_2$	AC0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.12 \pm 0.05$	$0.15 \pm 0.05$	AC0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.32 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$	AC0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$	AC0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$	AC1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$	AC1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$	AC1210 7W	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.55 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$	AC1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$	AC2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.55 \pm 0.15$	$0.50 \pm 0.20$	AC2512	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$
Type	L	W	H	$l_1$	$l_2$																																																													
AC0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.12 \pm 0.05$	$0.15 \pm 0.05$																																																													
AC0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.32 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$																																																													
AC0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$																																																													
AC0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$																																																													
AC1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$																																																													
AC1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$																																																													
AC1210 7W	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.55 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$																																																													
AC1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$																																																													
AC2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.55 \pm 0.15$	$0.50 \pm 0.20$																																																													
AC2512	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$																																																													



# Chip Resistors Selection Charts

AC - Automotive grade chip resistors, 0201 to 2512

Electrical characteristics								
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R. ( ppm/°C )	Jumper criteria (unit: A)
AC0201	1/20W	-55°C to 155°C	25V	50V	50V	E24 ±1%, ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω -100/+350ppm/°C 10Ω < R ≤ 10MΩ ±200ppm/°C	Rated Current 0.5A Max. Current 1.0A
AC0402	1/16W	-55°C to 155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 1A Max. Current 2A
	1/8W	-55°C to 155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---
AC0603	1/10W	-55°C to 155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 1A Max. Current 2A
	1/5W	-55°C to 155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---
AC0805	1/8W	-55°C to 155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 2A Max. Current 5A
	1/4W	-55°C to 155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---
AC1206	1/4W	-55°C to 155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 2A Max. Current 10A
	1/2W	-55°C to 155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---
AC1210	1/2W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 2A Max. Current 10A
	1W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---
AC1218	1W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 1MΩ ±100ppm/°C	Rated Current 6A Max. Current 10A
	1.5W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 1MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 1MΩ ±100ppm/°C	---
AC2010	3/4W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 2A Max. Current 10A
	1.5W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---
AC2512	1W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%, ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C 10MΩ < R ≤ 22MΩ ±200ppm/°C	Rated Current 2A Max. Current 10A
	2W	-55°C to 155°C	200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1%, 0.5% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω ±200ppm/°C 10Ω < R ≤ 10MΩ ±100ppm/°C	---

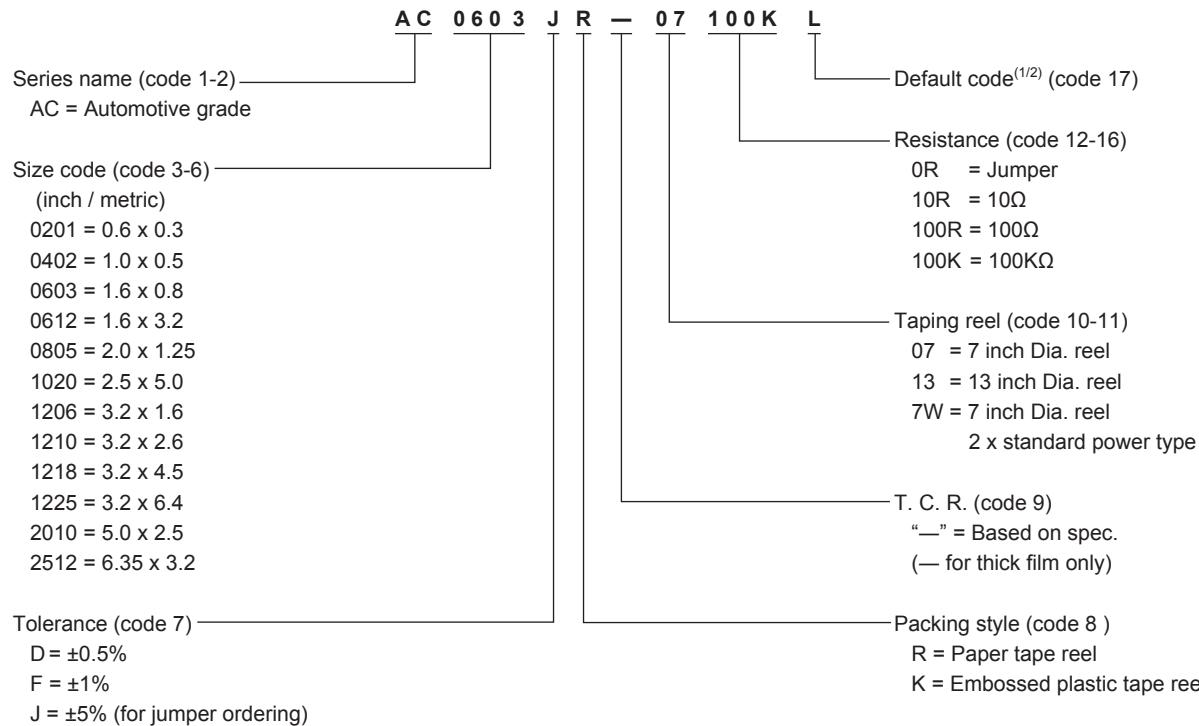
# Chip Resistors Selection Charts

AC - Automotive grade chip resistors, 0201 to 2512

Environmental characteristics			
Performance test	Test method	Procedure	Requirements
Life	AEC-Q200-REV C-Test 8 MIL-STD-202 Method 108	1000 hours at 125°C applied RCWV 1.5 hours on, 0.5 hours off	± (1%+50mΩ ) for D/F tol ± (3%+50mΩ ) for J tol <100 mΩ for Jumper
High temperature exposure	AEC-Q200 Test 3 MIL-STD-202 Method 108	1000 hours at TA = 155 °C, unpowered	± (1%+50mΩ ) for D/F tol ± (2%+50mΩ ) for J tol <50 mΩ for Jumper
Moisture resistance	AEC-Q200 Test 6 MIL-STD-202 Method 106	Each temperature / humidity cycle is defined as 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H.	± (0.5%+50mΩ ) for D/F tol ± (2%+50mΩ ) for J tol <100 mΩ for Jumper
Biased humidity	AEC-Q200 Test 7 MIL-STD-202 Method 103	1000 hours; + 85°C 85% R.H.; 10% of operating power Measured at 24 ±2 hours after test	± (1%+50mΩ ) for D/F tol ± (3%+50mΩ ) for J tol <100 mΩ for Jumper
Thermal shock	AEC-Q200 Test 16 MIL-STD-202 Method 107	-55/+125 °C Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	± (0.5%+50mΩ ) for D/F tol ± (1%+50mΩ ) for J tol <50 mΩ for Jumper
Solderability	Wetting	AEC-Q200 Test 18 J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds
	Resistance to soldering heat	AEC-Q200 Test 15 MIL-STD-202 Method 215	Lead-free solder, 260°C, 10 seconds immersion time
Short time overload	IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	± (1%+50mΩ ) for D/F tol ± (2%+50mΩ ) for J tol <50 mΩ for Jumper

## Global part number - Preferred type

Ordering example: AC0603JR-07100KL



Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

3. AC series products are available by "Global part number" only





# Chip Resistors Selection Charts

AC - Automotive grade chip resistors, wide termination , 0612 to 1225



## Features

- AEC-Q200 qualified
- Production part approval process (PPAP) support
- High reliability
- High quality level

Derating curve	Construction												
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from the derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Rated Power (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td></tr> <tr><td>0</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>100</td><td>70</td></tr> <tr><td>155</td><td>15</td></tr> </tbody> </table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	70	100	100	70	155	15	
Ambient Temperature (°C)	Rated Power (%)												
-55	100												
0	100												
70	100												
100	70												
155	15												

Dimensions																								
<table border="1"> <caption>Dimensions (unit: mm)</caption> <thead> <tr> <th>Type</th> <th>L</th> <th>W</th> <th>H</th> <th><math>l_1</math></th> <th><math>l_2</math></th> </tr> </thead> <tbody> <tr> <td>AC0612</td> <td><math>1.60 \pm 0.20</math></td> <td><math>3.20 \pm 0.20</math></td> <td><math>0.55 \pm 0.10</math></td> <td><math>0.18 \pm 0.15</math></td> <td><math>0.40 \pm 0.15</math></td> </tr> <tr> <td>AC1020</td> <td><math>2.50 \pm 0.20</math></td> <td><math>5.00 \pm 0.20</math></td> <td><math>0.55 \pm 0.10</math></td> <td><math>0.25 \pm 0.20</math></td> <td><math>0.90 \pm 0.20</math></td> </tr> <tr> <td>AC1225</td> <td><math>3.20 \pm 0.20</math></td> <td><math>6.40 \pm 0.20</math></td> <td><math>0.55 \pm 0.10</math></td> <td><math>0.45 \pm 0.20</math></td> <td><math>0.75 \pm 0.20</math></td> </tr> </tbody> </table>	Type	L	W	H	$l_1$	$l_2$	AC0612	$1.60 \pm 0.20$	$3.20 \pm 0.20$	$0.55 \pm 0.10$	$0.18 \pm 0.15$	$0.40 \pm 0.15$	AC1020	$2.50 \pm 0.20$	$5.00 \pm 0.20$	$0.55 \pm 0.10$	$0.25 \pm 0.20$	$0.90 \pm 0.20$	AC1225	$3.20 \pm 0.20$	$6.40 \pm 0.20$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.75 \pm 0.20$
Type	L	W	H	$l_1$	$l_2$																			
AC0612	$1.60 \pm 0.20$	$3.20 \pm 0.20$	$0.55 \pm 0.10$	$0.18 \pm 0.15$	$0.40 \pm 0.15$																			
AC1020	$2.50 \pm 0.20$	$5.00 \pm 0.20$	$0.55 \pm 0.10$	$0.25 \pm 0.20$	$0.90 \pm 0.20$																			
AC1225	$3.20 \pm 0.20$	$6.40 \pm 0.20$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.75 \pm 0.20$																			

# Chip Resistors Selection Charts

AC - Automotive grade chip resistors, wide termination , 0612 to 1225

Electrical characteristics								
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance	T. C. R. ( ppm/°C)	Jumper criteria (unit: A)
AC0612	3/4W	-55°C to 155°C	200V	400V	500V	E24/E96 ±0.5%,±1% 1Ω≤R≤1MΩ Jumper < 50mΩ	1Ω≤R≤10Ω ±200 ppm/°C 10Ω<R≤1MΩ ±100 ppm/°C	Rated Current 2A Max. Current 10A
AC1020	1W	-55°C to 155°C	200V	400V	500V			
AC1225	2W	-55°C to 155°C	200V	400V	500V			



# Chip Resistors Selection Charts

**AC - Automotive grade chip resistors, wide termination , 0612 to 1225**

Environmental characteristics				
Performance test		Test method	Procedure	Requirements
Life		AEC-Q200-REV C-Test 8 MIL-STD-202 Method 108	1000 hours at 125°C applied RCWV 1.5 hours on, 0.5 hours off	± (1%+50mΩ ) for D/F tol ± (3%+50mΩ ) for J tol <100 mΩ for Jumper
High temperature exposure		AEC-Q200 Test 3 MIL-STD-202 Method 108	1000 hours at maximum operating temperature depending on specification	± (1%+50mΩ ) for D/F tol ± (2%+50mΩ ) for J tol <50 mΩ for Jumper
Moisture resistance		AEC-Q200 Test 6 MIL-STD-202 Method 106	Each temperature / humidity cycle is defined as 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H.	± (0.5%+50mΩ ) for D/F tol ± (2%+50mΩ ) for J tol <100 mΩ for Jumper
Biased humidity		AEC-Q200 Test 7 MIL-STD-202 Method 103	1000 hours; + 85°C 85% R.H.; 10% of operating power Measured at 24 ±2 hours after test	± (1%+50mΩ ) for D/F tol ± (3%+50mΩ ) for J tol <100 mΩ for Jumper
Thermal shock		AEC-Q200 Test 16 MIL-STD-202 Method 107	-55/+125 °C Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	± (0.5%+50mΩ ) for D/F tol ± (1%+50mΩ ) for J tol <50 mΩ for Jumper
Solderability	Wetting	AEC-Q200 Test 18 J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds	Well tinned (≥95% covered) No visible damage
	Resistance to soldering heat	AEC-Q200 Test 15 MIL-STD-202 Method 215	Lead-free solder, 260°C, 10 seconds immersion time	± (0.5%+50mΩ ) for D/F tol ± (1%+50mΩ ) for J tol <50 mΩ for Jumper No visible damage
Short time overload		IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	± (1%+50mΩ ) for D/F tol ± (2%+50mΩ ) for J tol <50 mΩ for Jumper

Global part number - Preferred type							
Ordering example: AC0612FR-07100KL							
Series name (code 1-2)	AC	0612	J	R	—	07	100 K L
AC = Automotive grade wide termination							Default code <sup>(1/2)</sup> (code 17)
Size code (code 3-6)							Resistance (code 12-16)
(inch / metric)							0R = Jumper
0612 = 1.6 x 3.2							10R = 10Ω
1020 = 2.5 x 5.0							100R = 100Ω
1225 = 3.2 x 6.4							100K = 100KΩ
Tolerance (code 7)	D = ±0.5%	F = ±1%	J = ±5% (for jumper ordering)				Taping reel (code 10-11)
Packing style (code 8)	R = Paper tape reel	K = Embossed plastic tape reel					07 = 7 inch Dia. reel
							13 = 13 inch Dia. reel
							T. C. R. (code 9)
							“—” = Based on spec.
							(— for thick film only)

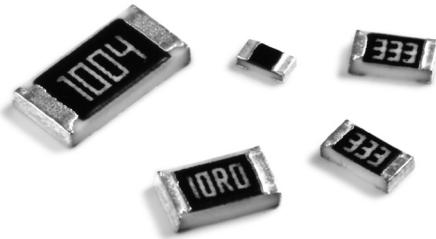
Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

2. Letter L is system default code for ordering only

3. AC wide series products are available by "Global part number" only

# Chip Resistors Selection Charts

AA - Automotive grade sulfur-resistant chip resistors, 0201 to 2512



## Features

- AEC-Q200 qualified
- Production part approval process (PPAP) support
- High reliability
- High quality level

Derating curve	Construction																
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points from Derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Rated Power (%)</th> </tr> </thead> <tbody> <tr><td>-55</td><td>100</td></tr> <tr><td>0</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>70</td><td>80</td></tr> <tr><td>100</td><td>60</td></tr> <tr><td>130</td><td>40</td></tr> <tr><td>155</td><td>0</td></tr> </tbody> </table>	Ambient Temperature (°C)	Rated Power (%)	-55	100	0	100	70	100	70	80	100	60	130	40	155	0	
Ambient Temperature (°C)	Rated Power (%)																
-55	100																
0	100																
70	100																
70	80																
100	60																
130	40																
155	0																

Dimensions									
AA0201/ 0402		AA0603/0805/1206 1210/2010/2512		AA1218					
Side view for all type									
unit: mm									
Type	L	W	H	$l_1$	$l_2$				
AA0201	$0.60 \pm 0.03$	$0.30 \pm 0.03$	$0.23 \pm 0.03$	$0.12 \pm 0.05$	$0.15 \pm 0.05$				
AA0402	$1.00 \pm 0.05$	$0.50 \pm 0.05$	$0.32 \pm 0.05$	$0.20 \pm 0.10$	$0.25 \pm 0.10$				
AA0603	$1.60 \pm 0.10$	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.25 \pm 0.15$	$0.25 \pm 0.15$				
AA0805	$2.00 \pm 0.10$	$1.25 \pm 0.10$	$0.50 \pm 0.10$	$0.35 \pm 0.20$	$0.35 \pm 0.20$				
AA1206	$3.10 \pm 0.10$	$1.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$				
AA1210	$3.10 \pm 0.10$	$2.60 \pm 0.15$	$0.50 \pm 0.10$	$0.45 \pm 0.15$	$0.50 \pm 0.20$				
AA1218	$3.10 \pm 0.10$	$4.60 \pm 0.10$	$0.55 \pm 0.10$	$0.45 \pm 0.20$	$0.40 \pm 0.20$				
AA2010	$5.00 \pm 0.10$	$2.50 \pm 0.15$	$0.55 \pm 0.10$	$0.55 \pm 0.15$	$0.50 \pm 0.20$				
AA2512	$6.35 \pm 0.10$	$3.10 \pm 0.15$	$0.55 \pm 0.10$	$0.60 \pm 0.20$	$0.50 \pm 0.20$				



# Chip Resistors Selection Charts

**AA - Automotive grade sulfur-resistant chip resistors, 0201 to 2512**

Electrical characteristics												
Type	Power P <sub>70</sub>	Operating Temp. range	MWV	RCOV	DWV	Resistance range & tolerance		T. C. R. ( ppm/°C)	Jumper criteria (unit: A)			
AA0201	1/20W	-55°C to 155°C	25V	50V	50V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5%,±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ		1Ω ≤ R ≤ 10Ω -100/+400ppm/°C 10Ω < R ≤ 10MΩ ±300ppm/°C	Rated Current 0.5A Max. Current 1.0A			
AA0402	1/16W		50V	100V	100V							
AA0603	1/10W		75V	150V	150V							
AA0805	1/8W		150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%,±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ						
AA1206	1/4W		200V	400V	500V							
AA1210	1/2W		200V	500V	500V							
AA1218	1W		200V	500V	500V						E24 ±5% 1Ω ≤ R ≤ 1MΩ E24/E96 ±0.5%,±1% 1Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	
AA2010	3/4W		200V	500V	500V							
AA2512	1W		200V	500V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±0.5%,±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ						

# Chip Resistors Selection Charts

## AA - Automotive grade sulfur-resistant chip resistors, 0201 to 2512

Environmental characteristics				
Performance test		Test method	Procedure	Requirements
Life		AEC-Q200 Test 8 MIL-STD-202 Method 108	1000 hours at 125°C applied RCWV 1.5 hours on, 0.5 hours off	±(1% +50mΩ) < 100mΩ for jumper
High temperature exposure		AEC-Q200 Test 3 MIL-STD-202 Method 108	1000 hours at maximum operating temperature depending on specification	±(1% +50mΩ) < 50mΩ for jumper
Moisture resistance		AEC-Q200 Test 6 MIL-STD-202 Method 106	Each temperature / humidity cycle is defined as 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H.	±(0.5% +50mΩ) for 1% tol. ±(2% +50mΩ) for 5% tol. < 100mΩ for jumper
Biased humidity		AEC-Q200 Test 7 MIL-STD-202 Method 103	1000 hours; + 85°C 85% R.H.; 10% of operating power Measured at 24 ±2 hours after test	±(3% +50mΩ) < 100mΩ for jumper
Thermal shock		AEC-Q200 Test 16 MIL-STD-202 Method 107	-55/+125 °C Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(1% +50mΩ) < 50mΩ for jumper
Solderability	Wetting	AEC-Q200 Test 18 J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds	Well tinned (≥95% covered) No visible damage
	Resistance to soldering heat	AEC-Q200 Test 15 MIL-STD-202 Method 210	Lead-free solder, 260°C, 10 seconds immersion time	±(0.5%+50mΩ) for 1% tol. ±(1%+50mΩ) for 5% tol. <50 mΩ for Jumper No visible damage
Short time overload		IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature	±(1%+50mΩ) <50 mΩ for Jumper
FOS	ASTM-B-809-5		Sulfur (saturated vapor) 1000 hours, 90±2°C, Rating with no power	±(1%+50mΩ )
	ASTM-B-809-5* * Modified		Sulfur 750 hours, 105°C, Rating with no power	±(4%+50mΩ )

Global part number - Preferred type				
Ordering example: AA0603JR-07100KL				
AA	0603	JR	—	07 100K L

Series name (code 1-2) \_\_\_\_\_

AA = Automotive grade

Size code (code 3-6)  
(inch / metric)  
0201 = 0.6 x 0.3  
0402 = 1.0 x 0.5  
0603 = 1.6 x 0.8  
0805 = 2.0 x 1.25  
1206 = 3.2 x 1.6  
1210 = 3.2 x 2.6  
1218 = 3.2 x 4.5  
2010 = 5.0 x 2.5  
2512 = 6.35 x 3.2

Tolerance (code 7) \_\_\_\_\_

D = ±0.5%  
F = ±1%  
J = ±5% (for jumper ordering)

Default code<sup>(1/2)</sup> (code 17) \_\_\_\_\_

Resistance (code 12-16)  
0R = Jumper  
10R = 10Ω  
100R = 100Ω  
100K = 100KΩ

Taping reel (code 10-11)  
07 = 7 inch Dia. reel  
13 = 13 inch Dia. reel

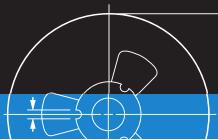
T. C. R. (code 9)  
“—” = Based on spec.  
— for thick film only

Packing style (code 8)  
R = Paper tape reel  
K = Embossed plastic tape reel

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

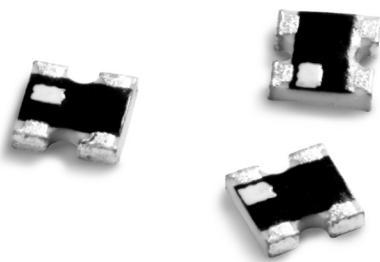
2. Letter L is system default code for ordering only

3. AA series products are available by "Global part number" only



# Chip Resistors Selection Charts

ATV - RF attenuator chip resistors, 0404



## Features

- Reduce system size
- Low assembly cost
- Higher component and system reliability
- Suitable for applications of mobile phones, receivers, battery chargers, palmtop computers and tablets

Derating curve	Construction	Schematics								
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <table border="1"> <caption>Data points estimated from Derating curve graph</caption> <thead> <tr> <th>Ambient Temperature (°C)</th> <th>Maximum dissipation (P) (%)</th> </tr> </thead> <tbody> <tr><td>60</td><td>100</td></tr> <tr><td>70</td><td>70</td></tr> <tr><td>125</td><td>0</td></tr> </tbody> </table>	Ambient Temperature (°C)	Maximum dissipation (P) (%)	60	100	70	70	125	0	<p>The rectangular marker designates input pin 1</p>	<p><b>ATV 321</b></p>
Ambient Temperature (°C)	Maximum dissipation (P) (%)									
60	100									
70	70									
125	0									

Dimensions																
<p>unit: mm</p> <table border="1"> <thead> <tr> <th>Type</th> <th>L</th> <th>W</th> <th>T</th> <th>A</th> <th>B</th> <th>P</th> <th>D</th> </tr> </thead> <tbody> <tr> <td>ATV321</td> <td><math>1.00 \pm 0.10</math></td> <td><math>1.00 \pm 0.10</math></td> <td><math>0.35 \pm 0.05</math></td> <td><math>0.33 \pm 0.10</math></td> <td><math>0.15 \pm 0.10</math></td> <td><math>0.65 \pm 0.10</math></td> <td><math>0.25 \pm 0.10</math></td> </tr> </tbody> </table>	Type	L	W	T	A	B	P	D	ATV321	$1.00 \pm 0.10$	$1.00 \pm 0.10$	$0.35 \pm 0.05$	$0.33 \pm 0.10$	$0.15 \pm 0.10$	$0.65 \pm 0.10$	$0.25 \pm 0.10$
Type	L	W	T	A	B	P	D									
ATV321	$1.00 \pm 0.10$	$1.00 \pm 0.10$	$0.35 \pm 0.05$	$0.33 \pm 0.10$	$0.15 \pm 0.10$	$0.65 \pm 0.10$	$0.25 \pm 0.10$									

# Chip Resistors Selection Charts

ATV - RF attenuator chip resistors, 0404

Electrical characteristics							
Type	Power P <sub>70</sub>	Operating Temp. range	MPV	VSWR (Max.)	Impedance	Attenuation range & tolerance	Frequency range
ATV321	40mW	-55°C to +125°C	50V	1.3	50Ω	-1dB to -5dB ±0.3 dB	-1dB to -10dB DC to 2.5 GHz
						-6dB to -10dB ±0.5 dB	
						-15dB ±1.0 dB	-15dB to -20dB DC to 2.0 GHz
						-20dB ±2.0 dB	

Environmental characteristics							
Performance test		Test method	Procedure				Requirements
Life		MIL-STD-202 -method 108A	1000 hours at 70 ±5°C applied RCWV 1.5 hours on, 0.5 hours off, still air required				Max.: ±0.3 dB
Humidity (steady state)		JIS C 5202 7.5	1000 hours, 40 ±2°C, 93(+2/-3)% RH RCWV applied for 1.5 hours on and 0.5 hour off				Max.: ±0.3 dB
Moisture resistance		MIL-STD-202 -method 106F	Each temperature / humidity cycle is defined as 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25°C / 65°C 95% R.H				Max.: ±0.3 dB
Thermal shock		MIL-STD-202 -method 107G	LCT / UCT, number of cycles required is 300 Maximum transfer time is 20 seconds				Max.: ±0.3 dB
Solderability	Wetting	J-STD-002B testB	Electrical test not required. Magnification 50X Lead-free solder bath at 245 ±3°C Dipping time: 3 ±0.5 seconds				Well tinned (≥95% covered)
	Resistance to soldering heat	MIL-STD-202 -method 210F	Lead-free solder, 260°C, 10 seconds immersion time				Max.: ±0.1 dB
Short time overload		MIL-R-55342D -para 4.7.5	2.5 times RCWV or maximum overload voltage whichever is less for 5 seconds at room temperature				Max.: ±0.3 dB

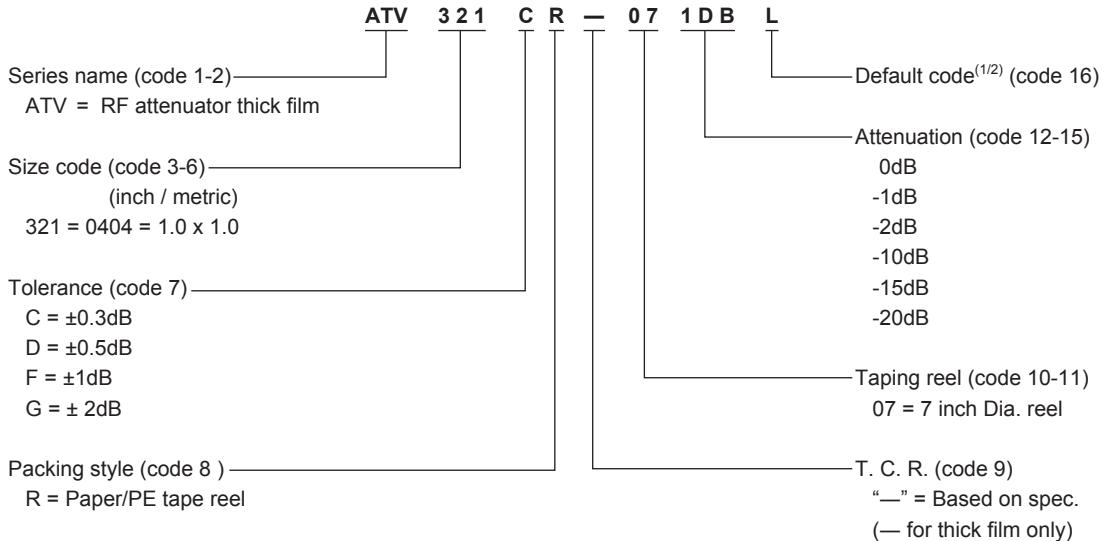


# Chip Resistors Selection Charts

## ATV - RF attenuator chip resistors, 0404

Global part number - Preferred type for ordering Yageo / Phycomp branded products

Ordering example: ATV321CR-071DBL



**Note:** 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"  
2. Letter L is system default code for ordering only

### Phycomp worldwide - Traditional type

Packing	paper tape
Quantity	10 000
Remark	For last three digits, see following table "Attenuation codes"

**Note:** L = Default code

### Phycomp CTC ordering code - Traditional type - North America

Packing	paper tape
Quantity	9CV3218AXXXX-PF3
Remark	For last 9th to 13th digits, see following table "Attenuation codes"

### Attenuation codes

Value (dB)	Tolerance (dB)	Standard	
		Phycomp worldwide code (12NC)	Phycomp North America code (NA code)
1	±0.3	012	01DBC
2	±0.3	022	02DBC
3	±0.3	032	03DBC
4	±0.3	042	04DBC
5	±0.3	052	05DBC
6	±0.5	063	06DBD
7	±0.5	073	07DBD
8	±0.5	083	08DBD
9	±0.5	093	09DBD
10	±0.5	103	10DBD
15	±1.0	154	15DBF
20	±2.0	205	20DBG

# Chip Resistors Selection Charts

AT - Automotive grade thin film high precision high stability chip resistors, 0402 to 1206



## Features

- High precision - High stability
- Low T. C. R. / low noise
- High accuracy ( $\pm 0.1\%$ ,  $\pm 0.25\%$ ,  $\pm 0.5\%$ ,  $\pm 1\%$ )
- Superior resistance against sulfur containing atmosphere
- AEC-Q200 qualified

Derating curve	Construction														
<p>Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (<math>T_{amb}</math>).</p> <p>Detailed description: The graph plots Power (P) in percent of rated power on the y-axis (0 to 100) against Ambient Temperature (T<sub>amb</sub>) in degrees Celsius on the x-axis (-55 to 155). A horizontal line is at 100% until 70°C, then a straight line slopes down to 0% at 155°C.</p> <table border="1"><caption>Data points estimated from derating curve graph</caption><thead><tr><th>T<sub>amb</sub> (°C)</th><th>P (% P<sub>rated</sub>)</th></tr></thead><tbody><tr><td>-55</td><td>100</td></tr><tr><td>0</td><td>100</td></tr><tr><td>50</td><td>100</td></tr><tr><td>70</td><td>100</td></tr><tr><td>100</td><td>50</td></tr><tr><td>155</td><td>0</td></tr></tbody></table>	T <sub>amb</sub> (°C)	P (% P <sub>rated</sub> )	-55	100	0	100	50	100	70	100	100	50	155	0	<p>Detailed description: A cross-section of the resistor shows a multi-layer structure. From top to bottom, it includes a marking layer, two protective coats, a resistive layer, two inner electrodes, a termination layer (Ni / matte tin), another inner electrode, and finally a ceramic substrate at the bottom.</p>
T <sub>amb</sub> (°C)	P (% P <sub>rated</sub> )														
-55	100														
0	100														
50	100														
70	100														
100	50														
155	0														

Dimensions	Type	L	W	H	I <sub>1</sub>	I <sub>2</sub>
<p>Detailed description: A 3D perspective drawing of a resistor with its dimensions labeled. L is the length, W is the width, H is the height, and I<sub>1</sub> and I<sub>2</sub> are side widths. The unit is given as mm.</p>	AT0402	1.00 $\pm 0.10$	0.50 $\pm 0.05$	0.30 $\pm 0.05$	0.20 $\pm 0.10$	0.25 $\pm 0.10$
	AT0603	1.60 $\pm 0.10$	0.80 $\pm 0.10$	0.45 $\pm 0.10$	0.25 $\pm 0.15$	0.25 $\pm 0.15$
	AT0805	2.00 $\pm 0.10$	1.25 $\pm 0.10$	0.50 $\pm 0.10$	0.35 $\pm 0.20$	0.35 $\pm 0.20$
	AT1206	3.10 $\pm 0.10$	1.60 $\pm 0.10$	0.55 $\pm 0.10$	0.45 $\pm 0.20$	0.40 $\pm 0.20$



# Chip Resistors Selection Charts

AT - Automotive grade thin film high precision high stability chip resistors, 0402 to 1206

Electrical characteristics											
Type	Power rating	Operating Temp. range	MWV	RCOV	DWV	Resistance Range (E24/E96) & tolerance				T. C. R. (ppm/°C)	
						±0.1%	±0.25%	±0.5%	±1.0%		
AT0402	1/16W	-55 °C to +155 °C	50V	100V	100V	10Ω~100KΩ				±25 ±50	
AT0603	1/10W		75V	150V	100V	10Ω~330KΩ					
AT0805	1/8W		150V	300V	300V	10Ω~1MΩ					
AT1206	1/4W		200V	400V	500V						

Environmental characteristics										
Performance test		Test method	Procedure							Requirements
Life/ Endurance		AEC-Q200 Test 8 MIL-STD-202 Method 108	1000 hours at 70± 5 °C, RCWV applied for 1.5 hours on, 0.5 hour off, still air required							± (0.1%+50mΩ )
			1000 hours at 125 °C, derated voltage applied for 1.5 hours on, 0.5 hour off, still air required							± (0.3%+50mΩ )
High Temperature Exposure temperature		AEC-Q200 Test 3 MIL-STD-202 Method 108	1000 hours at Tamb = 125 °C, unpowered							± (0.1%+50mΩ )
			1000 hours at Tamb = 155 °C, unpowered							± (0.3%+50mΩ )
Moisture Resistance		AEC-Q200 Test 6 MIL-STD-202 Method 106	Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d. with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered Parts mounted on test-boards, without condensation on parts							± (0.1%+50mΩ )
Thermal Shock		AEC-Q200 Test 16 MIL-STD-202 Method 107	-55/+125 °C Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air –Air							± (0.1%+50mΩ ) No visible damage
Short time overload		IEC60115-1 4.13	2.5 times of rated voltage or maximum overload voltage, the less of the above, for 5 sec at room temperature							± (0.05%+50mΩ )
Solderability	Wetting	AEC-Q200 Test 18 J-STD-002	Electrical Test not required Magnification 50X SMD conditions: (a) Method B, aging 4 hours at 155 °C dry heat, dipping at 235± 3 °C for 5± 0.5 seconds. (b) Method B, steam aging 8 hours, dipping at 215± 3 °C for 5± 0.5 seconds. (c) Method D, steam aging 8 hours, dipping at 260± 3 °C for 7± 0.5 seconds							Well tinned (>95% covered) No visible damage
	Resistance to soldering heat	AEC-Q200 Test 15 MIL-STD-202 Method 210	Condition B, no pre-heat of samples Lead-free solder, 260± 5 °C, 10± 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol							± (0.05%+50mΩ )
FOS	ASTM-B-809-5	Sulfur (saturated vapor) 1000 hours, 90±2°C, Rating with no power							± (1%+50mΩ )	
	ASTM-B-809-5* * Modified	Sulfur 750 hours, 105°C, Rating with no power							± (4%+50mΩ )	

# Chip Resistors Selection Charts

## AT - Automotive grade thin film high precision high stability chip resistors, 0402 to 1206

Global part number - Preferred type for ordering Yageo / Phycomp branded products							
Ordering example: AT0603DRE07100KL							
	AT	0603	D	R	E	07	100K
Series name (code 1-2)	AT	0603	D	R	E	07	100K
AT = Automotive grade thin film high precision high stability							L
Size code (code 3-6) (inch / metric)							Default code <sup>(1/2)</sup> (code 17)
0402 = 1.0 x 0.5							Resistance (code 12-16)
0603 = 1.6 x 0.8							10R = 10Ω
0805 = 2.0 x 1.25							100R = 100Ω
1206 = 3.2 x 1.6							10K = 10KΩ
Tolerance (code 7)	B	±0.1%					100K = 100KΩ
C	±0.25%						
D	±0.5%						
F	±1%						
							Taping reel (code 10-11)
							07 = 7 inch Dia. reel
							T. C. R. (code 9)
							D = ±25 ppm/°C
							E = ±50 ppm/°C
							Packing style (code 8 )
							R = Paper tape reel

Note: 1. All of our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"

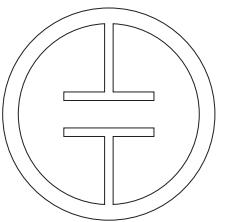
2. Letter L is system default code for ordering only



# Chip Resistors Engineering Design Kits

## Engineering design kits/ Engineering design books

Thick film chip resistors							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
RC0100-R-SKE24L	100	80	RC0100, ±1% & ±5%, E24 & E96, RoHS compliant, + Jumper	0100	F/J	1/32W	0R, 1R-3M32
RC0201-R-SKE24L	100	120	RC0201, ±1% & ±5%, E24 & E96, RoHS compliant, + Jumper	0201	F/J	1/20W	0R, 1R-10M
RC0201FR-SKE96L	100	200	RC0201, ±1%, E96, RoHS compliant	0201	F	1/20W	1R-10M
RC0402JR-SKE24L	100	120	RC0402, ±5%, E24, RoHS compliant, + Jumper	0402	J	1/16W	0R, 1R-22M
RC0402FR-SKE96L	100	200	RC0402, ±1%, E96, RoHS compliant	0402	F	1/16W	1R-10M
RC0603JR-SKE24L	50	120	RC0603, ±5%, E24, RoHS compliant, + Jumper	0603	J	1/10W	0R, 1R-22M
RC0603FR-SKE96L	50	200	RC0603, ±1%, E96, RoHS compliant	0603	F	1/10W	1R-10M
RC0805JR-SKE24L	50	120	RC0805, ±5%, E24, RoHS compliant, + Jumper	0805	J	1/8W	0R, 1R-22M
RC0805FR-SKE96L	50	200	RC0805, ±1%, E96, RoHS compliant	0805	F	1/8W	1R-10M
RC1206JR-SKE24L	50	120	RC1206, ±5%, E24, RoHS compliant, + Jumper	1206	J	1/4W	0R, 1R-22M
RC1206FR-SKE96L	50	200	RC1206, ±1%, E96, RoHS compliant	1206	F	1/4W	1R-10M
RC0000-R-SK001L	50 - 100	570	RC0201-RC1206, ±1% & ±5%, RoHS compliant, + Jumper	0201 - 1206	F/J	---	0R, 10R-1M
Thick film array chip resistors (convex)							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
YC12X-JR-SK001L	100	75	YC124/122, ±5%, RoHS compliant, + Jumper	0402x2 0402x4	J	1/16W	0R, 1R-1M
Engineering design kit for current sensing application							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
CS0201-R-SB001L	10	60	PA/PE/RL/PT, ±5%, ±1%, E24 & E96, RoHS compliant	0201~2512	F/J	---	1m-820m
CS0402-R-SK001L	30	160	RL0402-RL2512, ±1% & ±5%, RoHS compliant	0402 - 2512	F/J	---	100m - 910m
Engineering design kit for general purpose							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
RC0402-R-SK001L	50 - 100	472	Chip resistor / MLCC	0402 - 1206	---	---	---
Engineering design book for thin film chip resistor							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
RT0402-R-SB001L	10	60	RT0402-RT1206, ±0.1%, RoHS compliant	0402 - 1206	B	---	10R-1M
RT0201-R-SB001L	10	60	RT0201-RT0402, ±0.1%, RoHS compliant	0201 - 0402	B	---	10R-120K
AT0402-R-SB001L	10	60	AT0402~AT1206, ±0.1~±1%, E24 & E96, RoHS compliant	0402~1206	B/D/F	1/4W	10R~1M
Engineering design book for automotive application							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
AC0402-R-SB001L	10	60	AC0402-AC1206, ±1%, RoHS compliant	0402 - 1206	F	---	10R-1M
AA0201-R-SB001L	10	60	Automotive Grade: AC/AA/AT/PE/PA/RL/PT, ±0.1~±5%, E24 & E96, RoHS compliant, +Jumper	0201~2512	B/D/F/J	---	---
Engineering design book for Thick film chip resistors							
Yageo Part Number	Resistor pieces	Resistor values	Description	Size	Tolerance	Max. power	Resistance range
RC0805-R-SBE24L	10	60	RC0805, ±1% & ±5%, RoHS compliant, High power	0805	F	1/4W	1R-1M
RC1206-R-SBE24L	10	60	RC1206, ±1% & ±5%, RoHS compliant, High power	1206	F	1/2W	1R-1M
RC0201-R-SB001P	10	60	Total Lead Free: RC0201~1206, ±1%, + Jumper	0201~1206	F	---	0R, 1R-10M



SMD CERAMIC MULTILAYER CAPACITORS



# MLCC General Information

## Specification overview

Specification overview					
Description	TC code	Series	Capacitance range	Voltage range	Size
Discrete	NPO	General purpose	0.47 pF to 22 nF	10V to 50 V	01005, 0201, 0402, 0603, 0805, 1206, 1210, 1812
		Medium and High voltage	10 pF to 22 nF	100 V to 3000 V	0402, 0603, 0805, 1206, 1210, 1808, 1812
		High frequency	0.2 pF to 100 pF	16V to 250 V	0201, 0402, 0603, 0805
	X7R	General purpose & High capacitance	100 pF to 47 $\mu$ F	6.3 V to 50 V	01005, 0201, 0402, 0603, 0805, 1206, 1210, 1812, 2220
		Medium and High voltage	100 pF to 2.2 $\mu$ F	100 V to 3000 V	0603, 0805, 1206, 1210, 1812
		Low inductance	10 nF to 220 nF	10 V to 50 V	0204, 0306, 0508, 0612
	X5R	General purpose & High capacitance	100 pF to 100 $\mu$ F	6.3 V to 50 V	01005, 0201, 0402, 0603, 0805, 1206, 1210, 1812
	Y5V	General purpose & High capacitance	10 nF to 47 $\mu$ F	6.3 V to 50 V	0201, 0402, 0603, 0805, 1206, 1210
	Automotive grade products	NP0	Automotive grade	10 pF to 10 nF	50 V to 630 V
		X7R	Automotive grade	100 pF to 2.2 $\mu$ F	16 V to 630 V
Safety certification products	NP0	High voltage SC type	2.0 pF to 470 pF	X1/Y2, X2/Y3	1808, 1812
	X7R	High voltage SC type	150 pF to 1.5 nF	X1/Y2, X2/Y3	1808, 1812
Soft-termination Series	NP0	Soft-termination series	0.47pF to 22nF	100V to 3KV	0402, 0603, 0805, 1206, 1210, 1808, 1812
	X7R	Soft-termination series	100pF to 2.2uF	16V to 3KV	0402, 0603, 0805, 1206, 1210, 1808, 1812
C-Arrays	NP0	4C arrays	10 pF to 470 pF	50 V	0508, 0612
	X7R	4C arrays	180 pF to 100 nF	16 V to 50 V	0508, 0612
	Y5V	4C arrays	10 nF to 100 nF	25 V	0612
	X5R	4C arrays	100 nF to 2.2 uF	10 V	0508, 0612

# MLCC General Information

## Ordering information - Global part number

Global part number
Ordering example: CC0201KRX7R8BB102
<p>CC 0201 K R X7R 8 B B 102</p> <p>Series name (code 1-2) —————— C C    0 2 0 1    K R    X 7 R    8    B B    1 0 2 Capacitance value (code 15-17)</p> <p>CA = 4 x Capacitors array CC = Multilayer chip capacitors CL = Low inductance capacitors CQ = High frequency capacitors SC = Safety certification capacitors AC = Automotive grade capacitors CS = Soft termination capacitors</p> <p>Size code (code 3-6) —————— 0100 0201 0402 0603 0805 1206 1210 1808 1812 2220 0204 0306 0508 0612</p> <p>Capacitance tolerance (code 7) —————— A = <math>\pm 0.05</math> pF (CQ series only) B = <math>\pm 0.1</math> pF C = <math>\pm 0.25</math> pF D = <math>\pm 0.5</math> pF F = <math>\pm 1\%</math> G = <math>\pm 2\%</math> J = <math>\pm 5\%</math> K = <math>\pm 10\%</math> M = <math>\pm 20\%</math> Z = -20% to +80%</p> <p>Packing style (code 8) —————— R = Paper / PE tape reel Ø7 inch P = Paper / PE tape reel Ø13 inch K = Embossed plastic tape reel Ø7 inch F = Embossed plastic tape reel Ø13 inch C = Bulk case</p> <p>TC material (code 9-11) —————— NPO X5R X7R Y5V X6S</p> <p>(2 significant digits+number of zeros; the 3rd digit signifies the multiplying factor, and letter R is decimal point)</p> <p>0 = <math>x 1</math> 1 = <math>x 10^1</math> 2 = <math>x 10^2</math> 3 = <math>x 10^3</math> 4 = <math>x 10^4</math> 5 = <math>x 10^5</math> 6 = <math>x 10^6</math> 7 = <math>x 10^7</math> X X R = Special capacitance (X X: capacitance before decimal point)</p> <p>Process code (code 14) N = NP0 B = Class 2 product</p> <p>Termination (code 13) B = Ni-Barrier</p> <p>Rated voltage (code 12) 4 = 4 V 5 = 6.3 V 6 = 10 V 7 = 16 V 8 = 25 V G = 35 V 9 = 50 V 0 = 100 V A = 200 V Y = 250 V B = 500 V Z = 630 V C = 1 kV D = 2 kV E = 3 kV T = X2 / Y3 for TUV / UL W = X1 / Y2 for TUV / UL U = X1 for UL (X7R, 1812)</p>



# MLCC Selection Charts

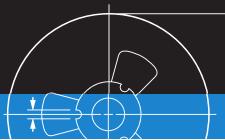
## Ordering information - Global part number

Global part number
Ordering example: CCxxxxKRX5RxBBxxx (for Low profile)
<p style="text-align: center;"><b>CC 1 05 9 K R X7R 8 B B 102</b></p> <p>Series name (code 1-2) ————— CC = Multilayer chip capacitors</p> <p>Number of cap (code 3) ————— 4 = 4 cap 2 = 2 cap 1 = Single</p> <p>Size code (code 4-5) 01 = 0201 02 = 0402 03 = 0603 05 = 0805 06 = 1206, 0306 08 = 1808, 0508 10 = 1210 12 = 1812, 0612</p> <p>Thickness (code 6) 3 = 0.3 mm 4 = 0.45 mm 5 = 0.5 mm 6 = 0.6 mm 8 = 0.8 mm 9 = 0.85 mm A = 1.0 mm B = 1.25 mm C = 1.6 mm D = 2.0 mm E = 2.5 mm F = 1.7 mm M = 1.15 mm N = 1.35 mm Q = 1.5 mm R = 1.8 mm</p> <p>Capacitance tolerance (code 7) B = <math>\pm 0.1 \mu F</math> C = <math>\pm 0.25 \mu F</math> D = <math>\pm 0.5 \mu F</math> F = <math>\pm 1\%</math> G = <math>\pm 2\%</math> J = <math>\pm 5\%</math> K = <math>\pm 10\%</math> M = <math>\pm 20\%</math> Z = -20% to +80%</p> <p>Packing style (code 8) R = Paper / PE tape reel Ø7 inch P = Paper / PE tape reel Ø13 inch K = Embossed plastic tape reel Ø7 inch F = Embossed plastic tape reel Ø13 inch C = Bulk case</p> <p>Capacitance value (code 15-17) 102 = 1 000 pF (2 significant digits+number of zeros; the 3rd digit signifies the multiplying factor, and letter R is decimal point) 0 = x 1 1 = x 10<sup>1</sup> 2 = x 10<sup>2</sup> 3 = x 10<sup>3</sup> 4 = x 10<sup>4</sup> 5 = x 10<sup>5</sup> 6 = x 10<sup>6</sup> 7 = x 10<sup>7</sup></p> <p>X X R = Special capacitance (X: capacitance before decimal point)</p> <p>Process code (code 14) N = NP0 B = Class 2 product</p> <p>Termination (code 13) B = Ni-Barrier</p> <p>Rated voltage (code 12) 5 = 6.3 V 6 = 10 V 7 = 16 V 8 = 25 V 9 = 50 V 0 = 100 V A = 200 V B = 500 V C = 1 kV D = 2 kV E = 3 kV G = 35 V Y = 250 V Z = 630 V</p> <p>TC material (code 9-11) X5R X7R</p>

# MLCC General Information

## Thickness classes and packing quantities for all series

Thickness classes and packing quantities							
Description	Size code	Thickness classification (mm)	Quantity per reel				
			Tape width	180 mm / 7"		330 mm / 13"	
				Paper	Blister	Paper	Blister
Discrete capacitors	01005	0.2 ±0.02	8 mm	20000	---	---	---
		0.3 ±0.03 / ±0.05		15000	---	50000	---
	0402	0.5 ±0.05 / ±0.15 / ±0.20		10000	---	50000	50000
		0.8 ±0.1 / ±0.2		4000	---	15000	15000
		0.6 ±0.1		4000	---	20000	10000
		0.85 / 1.0 ±0.1		4000	---	15000	8000
		1.25 ±0.2		---	3000	---	10000
	1206	0.6 ±0.1		4000	---	20000	---
		0.85 ±0.1		4000	---	15000	---
		1.00 / 1.15 ±0.1		---	3000	---	10000
		1.25 ±0.2		---	3000	---	10000
		1.6 ±0.15		---	2500	---	8000
		1.6 ±0.2 / ±0.3		---	2000	---	8000
		0.6 / 0.7 ±0.1		---	4000	---	15000
	1210	0.85 ±0.1		---	4000	---	10000
		1.0 ±0.15		---	3000	---	10000
		1.15 ±0.1		---	3000	---	10000
		1.15 ±0.15		---	3000	---	10000
		1.25 ±0.2		---	3000	---	10000
		1.5 ±0.1		---	2000	---	8000
		1.6 / 1.9 ±0.2		---	2000	---	5000
		2.0 ±0.2		---	2000 / 1000	---	---
		2.5 ±0.2 / ±0.3		---	1000 / 500	---	---
		1.15 ±0.15		---	3000	---	---
1808	1812	1.25 ±0.2	12 mm	---	3000	---	---
		1.35 ±0.15		---	2000	---	---
		1.5 ±0.1		---	2000	---	---
		1.6 ±0.2		---	2000	---	8000
		2.0 ±0.2		---	2000	---	---
		0.6 / 0.85 ±0.1		---	2000	---	---
	1812	1.15 ±0.1		---	1000	---	---
		1.15 ±0.15		---	1000	---	---
		1.25 ±0.2		---	1000	---	8000
		1.35 ±0.15		---	1000	---	---
		1.5 ±0.1		---	1000	---	---
		1.6 ±0.2		---	1000	---	---
		2.0 ±0.2		---	1000	---	---
		0.85 ±0.1		---	1500	---	---
Low inductance	0508	1.15 ±0.1		---	1500	---	---
		0.3 ±0.1	8 mm	10000	---	---	---
		0.5 ±0.1		4000	---	15000	---
		0.85 ±0.1		4000	---	15000	---
Arrays	0612	0.85 ±0.1		4000	---	15000	---
		0.6 ±0.1		4000	---	20000	---
	0508	0.8 ±0.1		4000	---	15000	---
		0.6 ±0.1		4000	---	15000	---



# MLCC Selection Charts

NPO - General purpose 16 to 50V, 01005 to 1812



## Features

- Ultra-stable on capacitance
- Tight tolerance available
- High reliability
- Low ESR
- Good frequency performance
- No aging of capacitance

Temperature characteristic	Construction

Case dimensions	Discrete capacitors - General purpose						
	Case size designation		Dimensions in mm				
	Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max	L <sub>4</sub> min
	01005	0402M	0.4 ±0.02	0.2 ±0.02	0.07	0.14	0.14
	0201	0603M	0.6 ±0.03	0.3 ±0.03	0.10	0.20	0.20
	0402	1005M	1.0 ±0.05	0.5 ±0.05	0.15	0.30	0.40
	0603	1608M	1.6 ±0.10	0.8 ±0.10	0.20	0.60	0.40
	0805	2012M	2.0 ±0.10 <sup>(1)</sup>	1.25 ±0.10 <sup>(1)</sup>	0.25	0.75	0.55
			2.0 ±0.20 <sup>(2)</sup>	1.25 ±0.20 <sup>(2)</sup>	0.25	0.75	0.55
	1206	3216M	3.2 ±0.15 <sup>(1)</sup>	1.6 ±0.15 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ±0.30 <sup>(2)</sup>	1.6 ±0.20 <sup>(2)</sup>	0.25	0.75	1.40
	1210	3225M	3.2 ±0.20 <sup>(1)</sup>	2.5 ±0.20 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ±0.40 <sup>(2)</sup>	2.5 ±0.30 <sup>(2)</sup>	0.25	0.75	1.40
	1812	4532M	4.5 ±0.20 <sup>(1)</sup>	3.2 ±0.20 <sup>(1)</sup>	0.25	0.75	2.20
			4.5 ±0.40 <sup>(2)</sup>	3.2 ±0.40 <sup>(2)</sup>	0.25	0.75	2.20

Note: 1. Dimension for size 0805 to 1812, C ≤ 1 nF

2. Dimension for size 0805 to 1812, C > 1 nF

# MLCC Selection Charts

NPO - General purpose 16 to 50V, 01005 to 0603

NPO											
Capacitance	General purpose										
	01005		0201			0402			0603		
	10 V	16 V	16 V	25 V	50 V	16 V	25 V	50 V	16 V	25 V	50 V
0.22 pF			0.3 ±0.03	0.3 ±0.03	0.3 ±0.03						
0.47 pF			0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
0.5 pF	0.2 ±0.02	0.2 ±0.02									
0.56 pF			0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
0.6 pF	0.2 ±0.02	0.2 ±0.02									
0.68 pF			0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
0.7 pF	0.2 ±0.02	0.2 ±0.02									
0.8 pF	0.2 ±0.02	0.2 ±0.02									
0.82 pF			0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
0.9 pF	0.2 ±0.02	0.2 ±0.02									
1 pF											
1.2 pF											
1.5 pF											
1.8 pF											
2.2 pF											
2.7 pF											
3.3 pF											
3.9 pF											
4.7 pF											
5.6 pF											
6.8 pF											
8.2 pF											
10 pF	0.2 ±0.02	0.2 ±0.02	0.3 ±0.03	0.3 ±0.03	0.3 ±0.03						
12 pF											
15 pF											
18 pF											
22 pF											
27 pF											
33 pF											
39 pF											
47 pF											
56 pF											
68 pF											
82 pF											
100 pF											
120 pF											
150 pF											
180 pF											
220 pF											
270 pF											
330 pF											
390 pF											
470 pF											
560 pF											
680 pF											
820 pF											
1000 pF						0.5 ±0.05	0.5 ±0.05	0.5 ±0.05			
Tape width						8 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

NPO - General purpose 16 to 50V, 01005 to 0603

NP0										
Capacitance	General purpose									
	01005		0201			0402			0603	
	16 V	16 V	25 V	50 V	16 V	25 V	50 V	16 V	25 V	50 V
1.2 nF										
1.5 nF										
1.8 nF										
2.2 nF								0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
2.7 nF										
3.3 nF										
3.9 nF										
4.7 nF										
5.6 nF										
6.8 nF										
8.2 nF										
10 nF								0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
12 nF										
15 nF										
18 nF										
22 nF										
33 nF										
39 nF										
Tape width	8 mm									

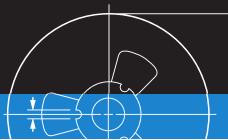
Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## NPO - General purpose 16 to 50V, 0805 to 1812

NPO								
Capacitance	General purpose							
	0805			1206			1210	
	16 V	25 V	50 V	16 V	25 V	50 V	25 V	50 V
0.22 pF								
0.47 pF								
0.56 pF								
0.68 pF								
0.82 pF								
1 pF								
1.2 pF								
1.5 pF								
1.8 pF								
2.2 pF								
2.7 pF								
3.3 pF								
3.9 pF								
4.7 pF								
5.6 pF								
6.8 pF								
8.2 pF								
10 pF								
12 pF								
15 pF								
18 pF								
22 pF	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1		
27 pF								
33 pF								
39 pF								
47 pF								
56 pF								
68 pF								
82 pF								
100 pF								
120 pF								
150 pF								
180 pF								
220 pF							1.25 ±0.2	1.25 ±0.2
270 pF								
330 pF								
390 pF								
470 pF								
560 pF								
680 pF								
820 pF								
1000 pF								
Tape width	8 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

NPO - General purpose 16 to 50V, 0805 to 1812

NP0									
Capacitance	General purpose								
	0805			1206			1210		1812
	16 V	25 V	50 V	16 V	25 V	50 V	25 V	50 V	50 V
1.2 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
1.5 nF									
1.8 nF									
2.2 nF									
2.7 nF									
3.3 nF	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
3.9 nF									
4.7 nF									
5.6 nF									
6.8 nF									
8.2 nF	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	2.0 ±0.2	2.0 ±0.2	2.0 ±0.2
10 nF									
12 nF									
15 nF									
18 nF									
22 nF	33 nF	39 nF	47 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2
33 nF									
39 nF									
47 nF									
56 nF									
68 nF	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2
82 nF									
100 nF									
Tape width	8 mm								

Note: Values in shaded cells indicate thickness class (unit: mm)



### Features

- Capable of operating at high voltage levels
- For high frequency snubber
- Decoupling / smoothing function

Temperature characteristic	Construction

Dimensions							
Discrete capacitors - Medium and High voltage							
	Case size designation		Dimensions in mm				
	Inch-based	Metric	$L_1$	$W$	$L_2 / L_3 \text{ min}$	$L_2 / L_3 \text{ max}$	$L_4 \text{ min}$
	0402	1005M	$1.0 \pm 0.05$	$0.5 \pm 0.05$	0.15	0.30	0.40
	0603	1608M	$1.6 \pm 0.10$	$0.8 \pm 0.10$	0.20	0.60	0.40
	0805	2012M	$2.0 \pm 0.20$	$1.25 \pm 0.20$	0.25	0.75	0.55
	1206	3216M	$3.2 \pm 0.30$	$1.6 \pm 0.20$	0.25	0.75	1.40
	1210	3225M	$3.2 \pm 0.40$	$2.5 \pm 0.30$	0.25	0.75	1.40
	1808	4520M	$4.5 \pm 0.40$	$2.0 \pm 0.30$	0.25	0.75	2.20
	1812	4532M	$4.5 \pm 0.40$	$3.2 \pm 0.30$	0.25	0.75	2.20



# MLCC Selection Charts

## NPO - Medium voltage, 0402 to 0805

NPO								
Capacitance	Medium voltage							
	0402		0603		0805			
	100 V	100 V	250 V	100 V	250 V	500 V	630 V	1000 V
1 pF	0.5 ±0.05	0.8 ±0.1	0.8 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.85 ±0.1	
1.2 pF								
1.5 pF								
1.8 pF								
2.2 pF								
2.7 pF								
3.3 pF								
3.9 pF								
4.7 pF								
5.6 pF								
6.8 pF								
8.2 pF								
10 pF								
12 pF								
15 pF								
18 pF								
22 pF								
27 pF								
33 pF								
39 pF								
47 pF								
56 pF								
68 pF								
82 pF								
100 pF								
120 pF								
150 pF								
180 pF								
220 pF								
270 pF								
330 pF								
390 pF								
470 pF								
560 pF								
680 pF								
820 pF								
1000 pF								
1.2 nF	0.85 ±0.1	1.25 ±0.2	1.25 ±0.2	0.85 ±0.1	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	
1.5 nF								
1.8 nF								
2.2 nF								
2.7 nF								
3.3 nF	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	
3.9 nF								
4.7 nF								
5.6 nF								
6.8 nF								
8.2 nF								
10 nF								
Tape width	8 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## NPO - Medium voltage, 1206 to 1812

NPO												
Capacitance	Medium voltage											
	1206				1210				1812			
	100 V	250 V	500 V	630 V	100 V	250 V	500 V	630 V	100 V	250 V	500 V	630 V
1 pF	0.6 ±0.1	0.6 ±0.1	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
1.2 pF												
1.5 pF												
1.8 pF												
2.2 pF												
2.7 pF												
3.3 pF												
3.9 pF												
4.7 pF												
5.6 pF												
6.8 pF												
8.2 pF												
10 pF												
12 pF												
15 pF												
18 pF												
22 pF												
27 pF												
33 pF												
39 pF												
47 pF												
56 pF												
68 pF												
82 pF												
100 pF												
120 pF												
150 pF												
180 pF												
220 pF												
270 pF												
330 pF												
390 pF												
470 pF												
560 pF												
680 pF												
820 pF												
1000 pF												
1.2 nF												
1.5 nF												
1.8 nF												
2.2 nF												
2.7 nF												
3.3 nF												
3.9 nF												
4.7 nF												
5.6 nF												
6.8 nF												
8.2 nF												
10 nF												
22 nF												
Tape width	8 mm											

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## NPO - High voltage, 0805 to 1210

NP0					
Capacitance	High voltage				
	0805	1206		1210	
	1000 V	1000 V	2000 V	1000 V	2000 V
10 pF					
12 pF					
15 pF					
18 pF					
22 pF					
27 pF	0.85 ±0.1				
33 pF					
39 pF					
47 pF			1.25 ±0.2		
56 pF					
68 pF					
82 pF					1.25 ±0.2
100 pF		1.25 ±0.2			
120 pF					
150 pF					
180 pF				1.25 ±0.2	
220 pF					
270 pF					
330 pF					
390 pF					
470 pF					
560 pF					
680 pF					
820 pF					
1000 pF					
1.2 nF					
1.5 nF					
1.8 nF					
2.2 nF					
2.7 nF					
3.3 nF					
3.9 nF					
4.7 nF					
5.6 nF					
6.8 nF					
8.2 nF					
10 nF					
12 nF					
15 nF					
18 nF					
22 nF					
33 nF					
Tape width			8 mm		

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

NPO - High voltage, 1808 / 1812

NPO						
Capacitance	High voltage					
	1808			1812		
	1000 V	2000 V	3000 V	1000 V	2000 V	3000 V
10 pF						
12 pF						
15 pF						
18 pF						
22 pF						
27 pF						
33 pF						
39 pF						
47 pF						
56 pF						
68 pF						
82 pF						
100 pF						
120 pF						
150 pF						
180 pF						
220 pF						
270 pF						
330 pF						
390 pF						
470 pF						
560 pF						
680 pF						
820 pF						
1000 pF	1.25 ±0.2					
1.2 nF						
1.5 nF						
1.8 nF						
2.2 nF						
2.7 nF						
3.3 nF						
3.9 nF						
4.7 nF						
5.6 nF						
6.8 nF						
8.2 nF						
10 nF						
12 nF						
15 nF						
18 nF						
22 nF						
33 nF						
Tape width	12 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

NPO - High frequency, 0201 to 0805

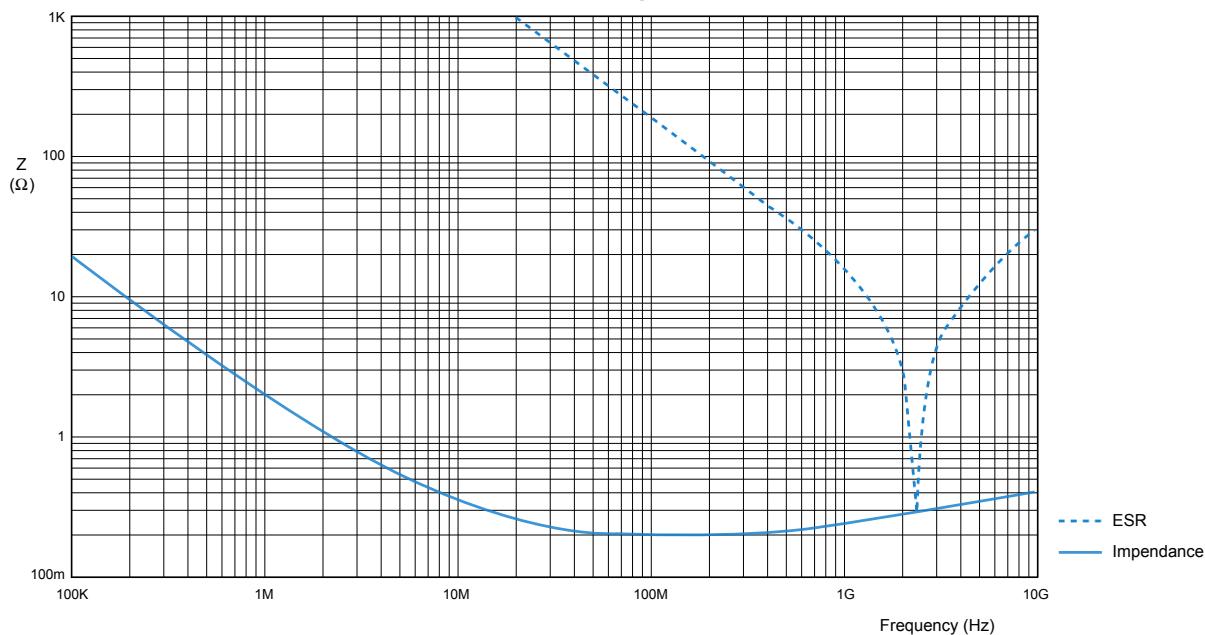


## Features

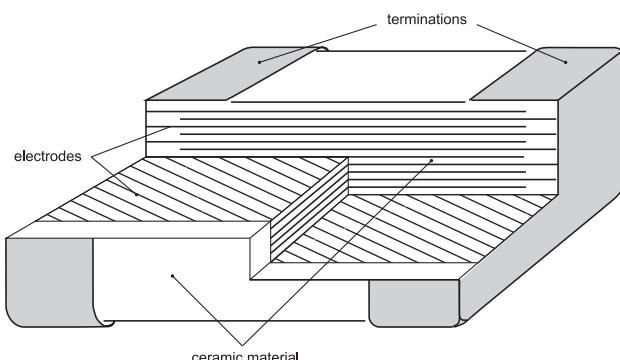
- Lowest ESR in high frequency
- Ultra small
- Noise filtering

### ESR characteristic

Impedance and ESR @ 20°C

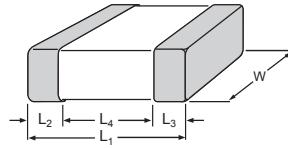


### Construction



# MLCC Selection Charts

## NPO - High frequency, 0201 to 0805

Case dimensions							
Discrete capacitors - High Frequency							
	Case size designation		Dimensions in mm				
	Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max	L <sub>4</sub> min
	0201	0603M	0.6 ±0.03	0.3 ±0.03	0.10	0.20	0.20
	0402	1005M	1.0 ±0.05	0.5 ±0.05	0.15	0.30	0.40
	0603	1608M	1.6 ±0.10	0.8 ±0.10	0.20	0.60	0.40
	0805	2012M	2.0 ±0.10	1.25 ±0.10	0.25	0.75	0.55

NP0						
High frequency						
Capacitance	0201		0402			
	25 V	50 V	16 V	25 V	50 V	
0.2 pF						
0.3 pF						
0.4 pF						
0.5 pF						
0.6 pF						
0.7 pF						
0.8 pF						
0.9 pF						
1 pF						
1.2 pF						
1.5 pF	0.3 ±0.03	0.3 ±0.03				
1.8 pF						
2.2 pF						
2.7 pF						
3.3 pF						
3.9 pF						
4.7 pF						
5.6 pF						
6.8 pF						
8.2 pF						
10 pF						
12 pF						
15 pF						
18 pF						
22 pF						
27 pF						
33 pF						
39 pF						
47 pF						
Tape width	8 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)

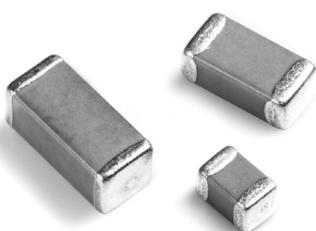
NP0						
High frequency						
Capaci-	0603			0805		
	50 V	100 V	250 V	50 V	100 V	250 V
0.2 pF						
0.3 pF						
0.4 pF						
0.5 pF						
0.6 pF						
0.7 pF						
0.8 pF						
0.9 pF						
1 pF						
1.2 pF						
1.5 pF						
1.8 pF						
2.2 pF						
2.7 pF						
3.3 pF	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1			
3.9 pF						
4.7 pF						
5.6 pF						
6.8 pF						
8.2 pF						
10 pF						
12 pF						
15 pF						
18 pF						
22 pF						
27 pF						
33 pF						
39 pF						
47 pF						
56 pF						
68 pF						
82 pF						
100 pF						
Tape width	8 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

X7R - General purpose & High capacitance, 01005 to 2220



## Features

- Semi-stable on capacitance and high K
- High volumetric efficiency
- Highly reliable in high temperature application
- High insulation resistance

Temperature characteristic		Construction

Case dimensions							
Discrete capacitors - General purpose & High capacitance							
	Case size designation		Dimensions in mm				
	Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max	
	01005	0402M	0.4 ± 0.02	0.2 ± 0.02	0.07	0.14	0.14
	0201	0603M	0.6 ± 0.03	0.3 ± 0.03	0.10	0.20	0.20
			0.6 ± 0.05	0.3 ± 0.05	0.10	0.20	0.20
	0402	1005M	1.0 ± 0.05 <sup>(1)</sup>	0.5 ± 0.05 <sup>(1)</sup>	0.15	0.30	0.40
	0603	1608M	1.6 ± 0.10 <sup>(1)</sup>	0.8 ± 0.10 <sup>(1)</sup>	0.20	0.60	0.40
			1.6 ± 0.15 <sup>(2)</sup>	0.8 ± 0.15 <sup>(2)</sup>	0.20	0.60	0.40
	0805	2012M	2.0 ± 0.10 <sup>(1)</sup>	1.25 ± 0.10 <sup>(1)</sup>	0.25	0.75	0.55
			2.0 ± 0.20 <sup>(2)</sup>	1.25 ± 0.20 <sup>(2)</sup>	0.25	0.75	0.55
	1206	3216M	3.2 ± 0.15 <sup>(1)</sup>	1.6 ± 0.15 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ± 0.30 <sup>(2)</sup>	1.6 ± 0.20 <sup>(2)</sup>	0.25	0.75	1.40
	1210	3225M	3.2 ± 0.20 <sup>(1)</sup>	2.5 ± 0.20 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ± 0.40 <sup>(2)</sup>	2.5 ± 0.30 <sup>(2)</sup>	0.25	0.75	1.40
	1808	4520M	4.5 ± 0.40	2.0 ± 0.30	0.25	0.75	2.20
	1812	4532M	4.5 ± 0.20 <sup>(1)</sup>	3.2 ± 0.20 <sup>(1)</sup>	0.25	0.75	2.20
			4.5 ± 0.40 <sup>(2)</sup>	3.2 ± 0.40 <sup>(2)</sup>	0.25	0.75	2.20
	2220	5750M	5.7 ± 0.40	5.0 ± 0.30	0.25	0.75	3.40

Note: 1. Dimension for size 0603, C < 10 µF; 0805 to 1812, C ≤ 100 nF

2. Dimension for size 0402, C ≥ 4.7 µF; 0603, C = 1 µF, 50V; 0805 to 1812, C > 100 nF

# MLCC Selection Charts

## X7R - General purpose & High Capacitance , 01005 to 0402

X7R												
General purpose & High Capacitance												
Capacitance	01005		0201					0402				
	6.3 V/10V	16 V	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
10 pF												
15 pF												
22 pF												
33 pF												
47 pF												
68 pF												
100 pF	0.2 ±0.02	0.2 ±0.02						0.3 ±0.03				
150 pF												
220 pF												
330 pF												
470 pF												
680 pF												
1.0 nF												
1.5 nF												
2.2 nF												
3.3 nF												
4.7 nF												
6.8 nF												
10 nF												
15 nF												
22 nF												
33 nF												
47 nF												
68 nF												
100 nF												
150 nF												
220 nF									0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05
330 nF												
470 nF									0.5 ±0.05	0.5 ±0.05		
680 nF												
1000 nF									0.5 ±0.05			
2.2 µF												
4.7 µF												
10 µF												
22 µF												
47 µF												
100 µF												
Tape width	8 mm											

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## X7R - General purpose & High capacitance, 0603 / 0805

X7R										
General purpose & High Capacitance										
Capacitance	0603					0805				
	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
10 pF										
15 pF										
22 pF										
33 pF										
47 pF										
68 pF										
100 pF										
150 pF										
220 pF										
330 pF										
470 pF										
680 pF										
1.0 nF										
1.5 nF										
2.2 nF										
3.3 nF										
4.7 nF										
6.8 nF										
10 nF										
15 nF										
22 nF										
33 nF										
47 nF										
68 nF										
100 nF										
150 nF										
220 nF										
330 nF										
470 nF										
680 nF										
1000 nF										
2.2 µF										
4.7 µF										
10 µF										
22 µF										
47 µF										
100 µF										
Tape width	8 mm									

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## X7R - General purpose & High capacitance, 1206 to 2220

X7R												
General purpose & High Capacitance												
Capacitance	1206					1210					1812	2220
	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V	50 V	50 V
10 pF												
15 pF												
22 pF												
33 pF												
47 pF												
68 pF												
100 pF												
150 pF												
220 pF												
330 pF												
470 pF												
680 pF												
1.0 nF												
1.5 nF												
2.2 nF												
3.3 nF												
4.7 nF												
6.8 nF												
10 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1
15 nF												
22 nF												
33 nF												
47 nF												
68 nF												
100 nF												
150 nF												
220 nF												
330 nF												
470 nF												
680 nF												
1000 nF	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.6 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.6 ±0.2	1.15 ±0.1
2.2 µF												
4.7 µF												
10 µF	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2			1.9 ±0.2	1.9 ±0.2	1.9 ±0.2	1.9 ±0.2	2.5 ±0.3	
22 µF												
47 µF												
100 µF												
Tape width	8 mm											

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

X7R - Medium & High voltage, 0402 to 1812



## Features

- Capable of operating at high voltage levels
- For high frequency snubber
- Decoupling / smoothing function

Temperature characteristic	Construction

Dimensions							
Discrete capacitors - Medium and High voltage							
	Case size designation		Dimensions in mm				
	Inch-based	Metric	$L_1$	$W$	$L_2 / L_3 \text{ min}$	$L_2 / L_3 \text{ max}$	$L_4 \text{ min}$
	0402	1005M	$1.0 \pm 0.05$	$0.5 \pm 0.05$	0.15	0.30	0.40
	0603	1608M	$1.6 \pm 0.10$	$0.8 \pm 0.10$	0.20	0.60	0.40
	0805	2012M	$2.0 \pm 0.20$	$1.25 \pm 0.20$	0.25	0.75	0.55
	1206	3216M	$3.2 \pm 0.30$	$1.6 \pm 0.20$	0.25	0.75	1.40
	1210	3225M	$3.2 \pm 0.40$	$2.5 \pm 0.30$	0.25	0.75	1.40
	1808	4520M	$4.5 \pm 0.40$	$2.0 \pm 0.30$	0.25	0.75	2.20
	1812	4532M	$4.5 \pm 0.40$	$3.2 \pm 0.30$	0.25	0.75	2.20

# MLCC Selection Charts

## X7R - Medium and High voltage, 0402 to 0805

X7R								
Capacitance	Medium voltage & High voltage							
	0402		0603		0805			
	100 V	100 V	250 V	100 V	250 V	500 V	630 V	1000 V
100 pF	0.5 ±0.05	0.8 ±0.1						
150 pF								
220 pF								
330 pF								
470 pF								
680 pF								
1.0 nF			0.8 ±0.1	0.6 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1
1.5 nF								
2.2 nF								
3.3 nF								
4.7 nF								
6.8 nF								
10 nF								
15 nF								
22 nF								
33 nF	0.85 ±0.1	1.25 ±0.2						
47 nF								
68 nF								
100 nF								
150 nF								
220 nF								
330 nF								
470 nF								
680 nF								
1000 nF								
2.2 µF								
4.7 µF								
10 µF								
22 µF								
47 µF								
100 µF								
Tape width	12 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## X7R - Medium & High voltage, 1206/ 1210

X7R												
Medium voltage & High voltage												
Capacitance	1206						1210					
	100 V	250 V	500 V	630 V	1000 V	2000 V	100 V	250 V	500 V	630 V	1000 V	2000 V
100 pF												
150 pF												
220 pF												
330 pF												
470 pF												
680 pF												
1.0 nF												
1.5 nF												
2.2 nF												
3.3 nF	0.85 ±0.1				1.25 ±0.2	1.25 ±0.2						
4.7 nF												
6.8 nF												
10 nF												
15 nF												
22 nF												
33 nF												
47 nF												
68 nF												
100 nF	1.25 ±0.2											
150 nF												
220 nF												
330 nF	1.6 ±0.2											
470 nF												
680 nF												
1000 nF	1.6 ±0.2											
2.2 µF												
4.7 µF												
10 µF												
22 µF												
47 µF												
100 µF												
Tape width	12 mm											

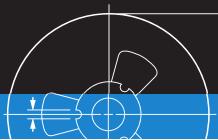
Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## X7R - Medium and High voltage, 1808/ 1812

X7R										
Medium voltage & High voltage										
Capacitance	1808			1812						
	1000 V	2000 V	3000 V	100 V	250 V	500 V	630 V	1000 V	2000 V	3000 V
100 pF										
150 pF										
220 pF										
330 pF										
470 pF										
680 pF										
1.0 nF										
1.5 nF										
2.2 nF										
3.3 nF										
4.7 nF										
6.8 nF										
10 nF										
15 nF										
22 nF										
33 nF										
47 nF										
68 nF										
100 nF										
150 nF										
220 nF										
330 nF										
470 nF										
680 nF										
1000 nF										
2.2 µF										
4.7 µF										
10 µF										
22 µF										
47 µF										
100 µF										
Tape width	12 mm									

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

X7R / X5R - Low inductance, 0204 to 0612



## Features

- Good solution for anti resonance reduction with controlled ESR
- Suitable for high speed IC decoupling due to low inductance type

Temperature characteristic	Construction

Dimensions							
Discrete capacitors - Low inductance types only							
	Case size designation		Dimensions in mm				
	Inch-based	Metric	L <sub>1</sub>	W	T	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max
	0204	0510M	0.5 ± 0.10	1.0 ± 0.10	0.30 ± 0.10	0.10	0.30
	0306	0816M	0.8 ± 0.15	1.6 ± 0.20	0.50 ± 0.10	0.10	0.30
	0508	1220M	1.25 ± 0.20	2.0 ± 0.20	0.85 ± 0.10	0.13	0.46
	0612	1632M	1.6 ± 0.20	3.2 ± 0.20	0.85 ± 0.10	0.13	0.46

# MLCC Selection Charts

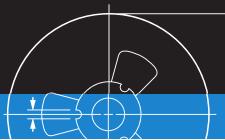
## X7R / X5R - Low inductance, 0204 to 0612

X7R							
Low Inductance series							
Capacitance	0306	0508			0612		
	10 V	10 V	16 V	25 V	16 V	25 V	50 V
10 nF		0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1
22 nF							
47 nF							
100 nF	0.5 ±0.1						
220 nF						1.15 ±0.1	1.15 ±0.1
470 nF							
1000 nF							
Tape width		8 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)

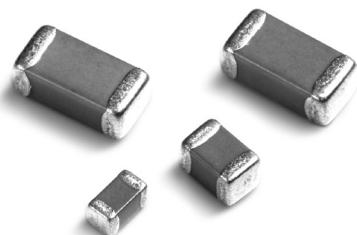
X5R	
Low Inductance series	
Capacitance	0204
	10 V
10 nF	0.3±0.1
22 nF	
47 nF	
100 nF	
Tape width	8 mm

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

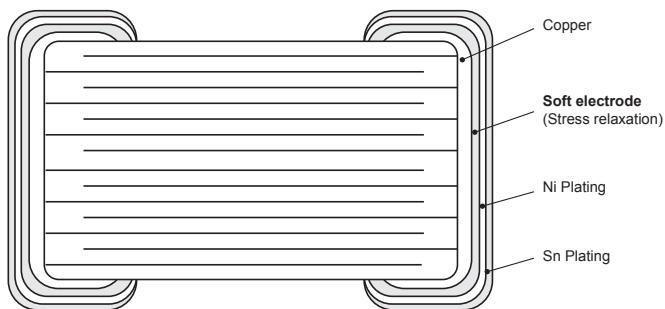
NPO / X7R - Soft termination, 0402 to 1812



## Features

- Flexible termination system
- Improved resistance to thermal stresses
- Increased mechanical performance

### Construction



### Dimensions

Discrete capacitors - Soft termination

	Case size designation		Dimensions in mm				
	Inch-based	Metric	L1	W	L2 / L3 min	L2 / L3 max	L4 min
	0402	1005M	1.0 ±0.15	0.5 ±0.15	0.10	0.30	0.20
	0603	1608M	1.6 ±0.20	0.8 ±0.15	0.20	0.50	0.40
	0805	2012M	2.0 ±0.30	1.25 ±0.20	0.25	0.75	0.55
	1206	3216M	3.2 ±0.40	1.6 ±0.20	0.25	0.85	1.40
	1210	3225M	3.2 ±0.40	2.5 ±0.30	0.25	0.85	1.40
	1808	4520M	4.5 ±0.40	2.0 ±0.30	0.25	0.85	2.20
	1812	4532M	4.5 ±0.40	3.2 ±0.20	0.25	0.85	2.20

# MLCC Selection Charts

NPO - Soft termination, 0402 to 0805

NPO								
Capacitance	Soft termination							
	0402		0603		0805			
	100 V	100 V	250 V	100 V	250 V	500 V	630 V	1000 V
1 pF								
1.2 pF								
1.5 pF								
1.8 pF								
2.2 pF								
2.7 pF								
3.3 pF								
3.9 pF								
4.7 pF								
5.6 pF								
6.8 pF								
8.2 pF								
10 pF								
12 pF								
15 pF								
18 pF								
22 pF								
27 pF								
33 pF								
39 pF								
47 pF								
56 pF								
68 pF								
82 pF								
100 pF								
120 pF								
150 pF								
180 pF								
220 pF								
270 pF								
330 pF								
390 pF								
470 pF								
560 pF								
680 pF								
820 pF								
1000 pF								
1.2 nF								
1.5 nF								
1.8 nF								
2.2 nF								
2.7 nF								
3.3 nF								
3.9 nF								
4.7 nF								
5.6 nF								
6.8 nF								
8.2 nF								
10 nF								
Tape width	8 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

NPO - Soft termination, 1206 / 1210

NP0												
Capacitance	Soft termination											
	1206						1210					
	100 V	250 V	500 V	630 V	1000 V	2000 V	100 V	250 V	500 V	630 V	1000 V	2000 V
1 pF	0.6 ±0.15	0.6 ±0.15	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
1.2 pF												
1.5 pF												
1.8 pF												
2.2 pF												
2.7 pF												
3.3 pF												
3.9 pF												
4.7 pF												
5.6 pF												
6.8 pF												
8.2 pF												
10 pF												
12 pF												
15 pF												
18 pF												
22 pF												
27 pF												
33 pF												
39 pF												
47 pF												
56 pF												
68 pF												
82 pF												
100 pF												
120 pF												
150 pF												
180 pF												
220 pF												
270 pF												
330 pF												
390 pF												
470 pF												
560 pF												
680 pF												
820 pF												
1000 pF												
1.2 nF												
1.5 nF												
1.8 nF												
2.2 nF												
2.7 nF												
3.3 nF												
3.9 nF												
4.7 nF												
5.6 nF												
6.8 nF												
8.2 nF												
10 nF												
22 nF												
Tape width	8 mm											

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

NPO - Soft termination, 1808 / 1812

NP0										
Capacitance	Soft termination									
	1808			1812						
	1 KV	2 KV	3 KV	100 V	250 V	500 V	630 V	1000 V	2000 V	3000 V
10 pF			1.6 ±0.2							1.25 ±0.2
12 pF										
15 pF										
18 pF										
22 pF										
27 pF										
33 pF										
39 pF										
47 pF										
56 pF										
68 pF										
82 pF										
100 pF										
120 pF	1.25 ±0.2	1.25 ±0.2								
150 pF										
180 pF										
220 pF										
270 pF										
330 pF										
390 pF										
470 pF										
560 pF										
680 pF										
820 pF										
1000 pF										
1.2 nF										
1.5 nF										
1.8 nF										
2.2 nF										
2.7 nF										
3.3 nF										
3.9 nF										
4.7 nF										
5.6 nF										
6.8 nF										
8.2 nF										
10 nF										
22 nF										
Tape width	12mm									

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

X7R - Soft termination, 0402 / 0603

X7R									
Capacitance	Soft termination								
	0402				0603				
	16 V	25 V	50 V	100 V	16 V	25 V	50 V	100 V	250 V
100 pF	0.5 ±0.15	0.5 ±0.15	0.5 ±0.15	0.5 ±0.15	0.8 ±0.15	0.8 ±0.15	0.8 ±0.15	0.8 ±0.15	0.8 ±0.15
150 pF									
220 pF									
330 pF									
470 pF									
680 pF									
1.0 nF									
1.5 nF									
2.2 nF									
3.3 nF									
4.7 nF									
6.8 nF									
10 nF									
15 nF									
22 nF									
33 nF									
47 nF									
68 nF									
100 nF									
150 nF									
220 nF									
330 nF									
470 nF									
680 nF									
1000 nF									
2.2 µF									
4.7 µF									
10 µF									
22 µF									
47 µF									
100 µF									
Tape width	8 mm								

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## X7R - Soft termination, 0805

X7R								
Capacitance	Soft termination							
	0805							
16 V	25 V	50 V	100 V	250 V	500 V	630 V	1000 V	
100 pF								
150 pF	0.6 ±0.15	0.6 ±0.15	0.6 ±0.15	0.6 ±0.15	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15
220 pF								
330 pF								
470 pF								
680 pF								
1.0 nF								
1.5 nF								
2.2 nF	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
3.3 nF								
4.7 nF								
6.8 nF								
10 nF								
15 nF								
22 nF								
33 nF	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
47 nF								
68 nF								
100 nF								
150 nF	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2					
220 nF								
330 nF								
470 nF								
680 nF								
1000 nF								
2.2 µF								
4.7 µF								
10 µF								
22 µF								
47 µF								
100 µF								
Tape width	8 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## X7R - Soft termination, 1206

X7R									
Capacitance	Soft termination								
	16 V	25 V	50 V	100 V	250 V	500 V	630 V	1000 V	2000 V
100 pF									
150 pF									
220 pF									
330 pF									
470 pF									
680 pF									
1.0 nF									
1.5 nF									
2.2 nF									
3.3 nF									
4.7 nF									
6.8 nF	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
10 nF									
15 nF									
22 nF									
33 nF									
47 nF									
68 nF									
100 nF						1.25 ±0.2	1.6 ±0.2	1.6 ±0.2	
150 nF						1.25 ±0.2	1.6 ±0.2	1.6 ±0.2	
220 nF						1.25 ±0.2	1.6 ±0.2	1.6 ±0.2	
330 nF	1.6 ±0.2	1.6 ±0.2							
470 nF									
680 nF	1.15 ±0.2	1.15 ±0.2							
1000 nF									
2.2 µF	1.6 ±0.2	1.6 ±0.2							
4.7 µF									
10 µF									
22 µF									
47 µF									
100 µF									
Tape width	12 mm								

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

X7R - Soft termination, 1210

X7R									
Capacitance	Soft termination								
	16 V	25 V	50 V	100 V	250 V	500 V	630 V	1000 V	2000 V
100 pF									
150 pF									
220 pF									
330 pF									
470 pF									
680 pF									
1.0 nF									
1.5 nF									
2.2 nF	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15				
3.3 nF									
4.7 nF									
6.8 nF									
10 nF									
15 nF									
22 nF									
33 nF									
47 nF									
68 nF									
100 nF									
150 nF									
220 nF					1.15 ±0.2	1.25 ±0.2			
330 nF									
470 nF	1.15 ±0.2	1.15 ±0.2	1.25 ±0.2	2.0 ±0.2					
680 nF									
1000 nF	1.25 ±0.2	1.25 ±0.2							
2.2 µF									
4.7 µF									
10 µF									
22 µF									
47 µF									
100 µF									
Tape width	12 mm								

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## X7R - Soft termination, 1808

X7R			
Capacitance	Soft termination		
	1000 V	2000 V	3000 V
100 pF			
150 pF			
220 pF			
330 pF	1.35 ±0.2	1.35 ±0.2	1.6 ±0.2
470 pF			2.0 ±0.2
680 pF			
1.0 nF			
1.5 nF			
2.2 nF		1.6 ±0.2	
3.3 nF			
4.7 nF			
6.8 nF	1.6 ±0.2		
10 nF			
15 nF			
22 nF			
33 nF			
47 nF			
68 nF			
100 nF			
150 nF			
220 nF			
330 nF			
470 nF			
680 nF			
1000 nF			
2.2 µF			
4.7 µF			
10 µF			
22 µF			
47 µF			
100 µF			
Tape width	12 mm		

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## X7R - Soft termination, 1812

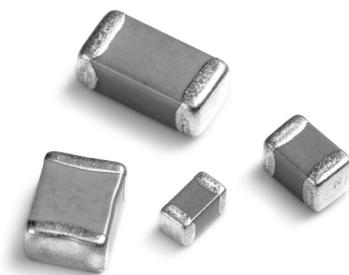
X7R							
Capacitance	Soft termination						
	50 V	100 V	250 V	500 V	630 V	1000 V	2000 V
100 pF							
150 pF							
220 pF							
330 pF							
470 pF							
680 pF							
1.0 nF							
1.5 nF							
2.2 nF	0.85 ±0.15	0.85 ±0.15	0.85 ±0.15	1.25 ±0.2	1.35 ±0.2	1.35 ±0.2	1.35 ±0.2
3.3 nF							
4.7 nF							
6.8 nF							
10 nF							
15 nF							
22 nF							
33 nF							1.6 ±0.2
47 nF			1.25 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	
68 nF							
100 nF	1.15 ±0.2	1.25 ±0.2	1.25 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	
150 nF							
220 nF			1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	
330 nF							
470 nF			1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2	
680 nF							
1000 nF							
2.2 µF							
4.7 µF							
10 µF							
22 µF							
47 µF							
100 µF							
Tape width	12 mm						

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

X5R - General purpose & High capacitance, 01005 to 1210



## Features

- Semi-stable on capacitance and high K
- High volumetric efficiency
- Highly reliable in high temperature application
- High insulation resistance

Temperature characteristic	Construction

Case dimensions	Case size designation		Dimensions in mm				
	Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max	L <sub>4</sub> min
	01005	0402M	0.4 ±0.02	0.2 ±0.02	0.07	0.14	0.14
	0201	0603M	0.6 ±0.03 <sup>(1)</sup>	0.3 ±0.03 <sup>(1)</sup>	0.10	0.20	0.20
			0.6 ±0.05 <sup>(2)</sup>	0.3 ±0.05 <sup>(2)</sup>	0.10	0.20	0.20
	0402	1005M	1.0 ±0.05 <sup>(1)</sup>	0.5 ±0.05 <sup>(1)</sup>	0.15	0.30	0.40
			1.0 ±0.15 <sup>(2)</sup>	0.5 ±0.15 <sup>(2)</sup>	0.15	0.30	0.40
			1.0 ±0.20 <sup>(3)</sup>	0.5 ±0.20 <sup>(3)</sup>	0.15	0.30	0.40
	0603	1608M	1.6 ±0.10 <sup>(1)</sup>	0.8 ±0.10 <sup>(1)</sup>	0.20	0.60	0.40
			1.6 ±0.20 <sup>(2)</sup>	0.8 ±0.20 <sup>(2)</sup>	0.20	0.60	0.40
	0805	2012M	2.0 ±0.10 <sup>(1)</sup>	1.25 ±0.10 <sup>(1)</sup>	0.25	0.75	0.55
			2.0 ±0.20 <sup>(2)</sup>	1.25 ±0.20 <sup>(2)</sup>	0.25	0.75	0.55
	1206	3216M	3.2 ±0.15 <sup>(1)</sup>	1.6 ±0.15 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ±0.30 <sup>(2)</sup>	1.6 ±0.20 <sup>(2)</sup>	0.25	0.75	1.40
	1210	3225M	3.2 ±0.20 <sup>(1)</sup>	2.5 ±0.20 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ±0.40 <sup>(2)</sup>	2.5 ±0.30 <sup>(2)</sup>	0.25	0.75	1.40

Note: 1. Dimension for size 0201, C < 1 µF; 0402, C < 4.7 µF; 0603, C < 10 µF; 0805 to 1812, C ≤ 100 nF

2. Dimension for size 0201, C ≥ 1 µF; 0402, C = 2.2 µF, 16V/25V and C = 4.7 µF ; 0603, C ≥ 10 µF; 0805 to 1812, C > 100 nF

3. Dimension for size 0402, C ≥ 10 µF

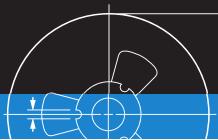
# MLCC Selection Charts

## X5R - General purpose & High capacitance, 01005 to 0402

X5R													
Capacitance	General purpose & High capacitance												
	01005		0201					0402					
	6.3 V	10 V	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V	
100 pF	0.2 ±0.02	0.2 ±0.02											
150 pF													
220 pF	0.2 ±0.02	0.2 ±0.02											
330 pF													
470 pF	0.2 ±0.02	0.2 ±0.02											
680 pF													
1.0 nF	0.2 ±0.02	0.2 ±0.02											
1.5 nF													
2.2 nF	0.2 ±0.02	0.2 ±0.02	0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.3 ±0.03						0.5 ±0.05
3.3 nF													
4.7 nF	0.2 ±0.02	0.2 ±0.02											
6.8 nF													
10 nF	0.2 ±0.02	0.2 ±0.02											
15 nF													
22 nF	0.2 ±0.02												
33 nF													
47 nF	0.2 ±0.02												
68 nF													
100 nF	0.2 ±0.02		0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.3 ±0.03	0.3 ±0.03						
150 nF													
220 nF	0.2 ±0.02		0.3 ±0.03	0.3 ±0.03									0.5 ±0.05
330 nF													
470 nF			0.3 ±0.03										0.5 ±0.1
680 nF													0.5 ±0.1
1 000 nF			0.3 ±0.05	0.3 ±0.05				*					0.5 ±0.05
2.2 µF			0.3 ±0.05					*					0.5 ±0.15
4.7 µF									0.5 ±0.15*	0.5 ±0.15			
10 µF									0.5 ±0.2	0.5 ±0.2			
22 µF									0.5 ±0.2				
Tape width	8 mm												

Note: Values in shaded cells indicate thickness class (unit: mm)

\*: 0402 low profile, T=0.3+/-0.03mm.



# MLCC Selection Charts

## X5R - General purpose & High capacitance, 0603 / 0805

X5R																		
Capacitance	General purpose & High capacitance																	
	0603						0805											
	4 V	6.3 V	10 V	16 V	25 V	50 V	4 V	6.3 V	10 V	16 V	25 V	50 V						
100 pF	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1						
150 pF																		
220 pF																		
330 pF																		
470 pF																		
680 pF																		
1.0 nF																		
1.5 nF																		
2.2 nF																		
3.3 nF																		
4.7 nF																		
6.8 nF																		
10 nF																		
15 nF																		
22 nF																		
33 nF																		
47 nF																		
68 nF																		
100 nF																		
150 nF																		
220 nF																		
330 nF																		
470 nF																		
680 nF																		
1 000 nF	*	*	*	*	*	0.8 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2							
2.2 µF	*	*	*															
4.7 µF			0.8 ±0.15		0.8 ±0.15													
10 µF	0.8 ±0.2	0.8 ±0.2	0.8 ±0.2	0.8 ±0.2	0.8 ±0.2													
22 µF																		
47 µF																		
100 µF							1.25 ±0.2											
Tape width	8 mm																	

Note: Values in shaded cells indicate thickness class (unit: mm)

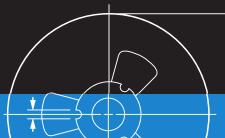
\*:0603 low profile, T=0.5±/-0.05mm; 0805 low profile, T=0.85±/-0.1mm

# MLCC Selection Charts

## X5R - General purpose & High capacitance, 1206

X5R					
Capacitance	General purpose & High capacitance				
	1206				
6.3 V	10 V	16 V	25 V	50 V	
100 pF					
150 pF					
220 pF					
330 pF					
470 pF					
680 pF					
1.0 nF					
1.5 nF					
2.2 nF					
3.3 nF					
4.7 nF					0.85 ±0.1
6.8 nF					
10 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	
15 nF					
22 nF					
33 nF					
47 nF					
68 nF					
100 nF					
150 nF					1.15 ±0.1
220 nF					
330 nF					
470 nF					1.0 ±0.1
680 nF					
1 000 nF	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.6 ±0.2
2.2 µF					
4.7 µF					1.6 ±0.2
10 µF	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2		1.6 ±0.3
22 µF					
47 µF					
100 µF	1.6 ±0.3				
Tape width	8 mm				

Note: Values in shaded cells indicate thickness class (unit: mm)

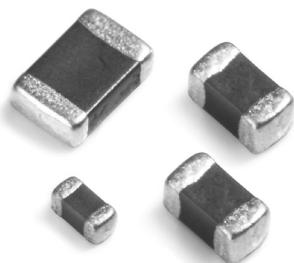


# MLCC Selection Charts

## X5R - General purpose & High capacitance, 1210

X5R					
Capacitance	General purpose & High capacitance				
	1210				
6.3 V	10 V	16 V	25 V	50 V	
100 pF					
150 pF					
220 pF					
330 pF					
470 pF					
680 pF					
1.0 nF					
1.5 nF					
2.2 nF					
3.3 nF					
4.7 nF					
6.8 nF					
10 nF					
15 nF					
22 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1
33 nF					
47 nF					
68 nF					
100 nF					
150 nF					
220 nF					
330 nF					
470 nF	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.25 ±0.2
680 nF					
1 000 nF	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	
2.2 µF					
4.7 µF	1.9 ±0.2	1.9 ±0.2	1.9 ±0.2	1.9 ±0.2	1.9 ±0.2
10 µF					
22 µF	2.5 ±0.2	2.5 ±0.2	2.5 ±0.2	2.5 ±0.3	
47 µF					
100 µF	2.5 ±0.3	2.5 ±0.3	2.5 ±0.3		
220 µF					
Tape width			8 mm		

Note: Values in shaded cells indicate thickness class (unit: mm)



### Features

- High volumetric efficiency
- Non-polar construction

Temperature characteristic	Construction

Case dimensions	Discrete capacitors - General purpose & High capacitance						
	Case size designation		Dimensions in mm				
	Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max	L <sub>4</sub> min
	0402	1005M	1.0 ±0.05 <sup>(1)</sup>	0.5 ±0.05 <sup>(1)</sup>	0.15	0.30	0.40
			1.0 ±0.20 <sup>(2)</sup>	0.5 ±0.20 <sup>(2)</sup>	0.15	0.30	0.40
	0603	1608M	1.6 ±0.10 <sup>(1)</sup>	0.8 ±0.10 <sup>(1)</sup>	0.20	0.60	0.40
			1.6 ±0.15 <sup>(2)</sup>	0.8 ±0.15 <sup>(2)</sup>	0.20	0.60	0.40
	0805	2012M	2.0 ±0.10 <sup>(1)</sup>	1.25 ±0.10 <sup>(1)</sup>	0.25	0.75	0.55
			2.0 ±0.20 <sup>(2)</sup>	1.25 ±0.20 <sup>(2)</sup>	0.25	0.75	0.55
	1206	3216M	3.2 ±0.15 <sup>(1)</sup>	1.6 ±0.15 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ±0.30 <sup>(2)</sup>	1.6 ±0.20 <sup>(2)</sup>	0.25	0.75	1.40
	1210	3225M	3.2 ±0.20 <sup>(1)</sup>	2.5 ±0.20 <sup>(1)</sup>	0.25	0.75	1.40
			3.2 ±0.40 <sup>(2)</sup>	2.5 ±0.30 <sup>(2)</sup>	0.25	0.75	1.40

Note: 1. Dimension for size 0402, C < 4.7 µF; 0603, C < 10 µF; 0805 to 1210, C ≤ 100 nF

2. Dimension for size 0402, C ≥ 4.7 µF; 0603, C ≥ 10 µF; 0805 to 1210, C > 100 nF



# MLCC Selection Charts

## Y5V - General purpose & High capacitance 6.3 to 50V, 0402

Y5V					
Capacitance	General purpose & High capacitance				
	6.3 V	10 V	16 V	25 V	50 V
10 nF					0.5 ±0.05
22 nF					
47 nF					
100 nF	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	0.5 ±0.05	
220 nF					
470 nF					
1 000 nF					
Tape width	8 mm				

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## Y5V - General purpose & High capacitance 6.3 to 50V, 0603 / 0805

Y5V										
Capacitance	General purpose & High capacitance									
	0603					0805				
	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
10 nF	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1
22 nF					0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	
47 nF									0.85 ±0.1	
100 nF					1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	
220 nF									1.25 ±0.2	
470 nF					1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	
1 000 nF									1.25 ±0.2	
2.2 µF					1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	
4.7 µF									1.25 ±0.2	
10 µF						1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2
22 µF										
Tape width	8 mm									

Note: Values in shaded cells indicate thickness class (unit: mm)

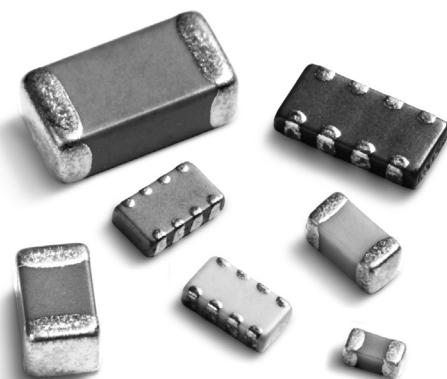


# MLCC Selection Charts

Y5V - General purpose & High capacitance 6.3 to 50V, 1206 / 1210

Y5V										
Capacitance	1206					1210				
	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
	10 nF									
22 nF										
47 nF	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1					
100 nF										
220 nF										
470 nF										
1 000 nF										
2.2 µF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1					
4.7 µF					1.15 ±0.1					
10 µF			1.15 ±0.1	1.6 ±0.2		1.5 ±0.1	1.5 ±0.1	1.5 ±0.1	1.5 ±0.1	1.5 ±0.1
22 µF	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2			1.6 ±0.2	1.6 ±0.2	1.6 ±0.2		
47 µF										
Tape width	8 mm									

Note: Values in shaded cells indicate thickness class (unit: mm)



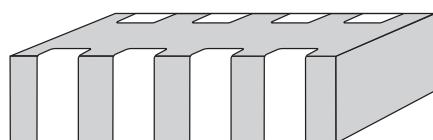
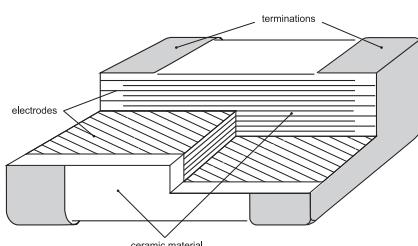
### Features

- AEC-Q200 qualified
- MSL class: MSL 1
- J-STD-020D and TS-16949 compliant
- Halogen free epoxy
- RoHS compliant

### Applications

- All general purpose applications
- Entertainment applications
- Comfort / security applications
- Information applications

#### Construction



#### Dimensions

##### Discrete capacitors - Automotive grade

	Case size designation		Dimensions in mm				
	Inch-based	Metric	L1	W	L2 / L3 min	L2 / L3 max	L4 min
0402	1005M	1.0 ±0.05	0.5 ±0.05	0.15	0.30	0.40	
0603	1608M	1.6 ±0.20	0.8 ±0.10	0.20	0.60	0.40	
0805	2012M	2.0 ±0.20	1.25 ±0.20	0.25	0.75	0.55	
1206	3216M	3.2 ±0.30	1.6 ±0.20	0.25	0.75	1.40	
1210	3225M	3.2 ±0.30	2.5 ±0.20	0.25	0.75	1.40	
1812	4532M	4.5 ±0.40	3.2 ±0.30	0.25	0.75	2.20	

#### Dimensions

##### 4C arrays

	Case size designation		Dimensions in mm						
	Inch-based	Metric	L	W	T <sub>min</sub>	T <sub>max</sub>	A	B	P
0508 (4 x 0402)	1220M (4 x 1005)	2.0 ±0.15	1.25 ±0.15	0.50	0.70	0.28 ±0.10	0.2 ±0.10	0.5 ±0.10	
0612 (4 x 0603)	1632M (4 x 1608)	3.2 ±0.15	1.60 ±0.15	0.70 <sup>(1)</sup>	0.90 <sup>(1)</sup>	0.4 ±0.10	0.3 ±0.20	0.8 ±0.10	

Note: 1. Available for NPO and X7R



# MLCC Selection Charts

NPO - Automotive grade, 0402 to 0805

NP0							
Capacitance	Automotive Grade						
	0402		0603			0805	
	50 V	50 V	100V	250V	50 V	100 V	250 V
10 pF	0.5 ±0.05	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1
12 pF							
15 pF							
18 pF							
22 pF							
27 pF							
33 pF							
39 pF							
47 pF							
56 pF							
68 pF							
82 pF							
100 pF							
120 pF							
150 pF							
180 pF							
220 pF							
270 pF							
330 pF							
390 pF							
470 pF							
560 pF							
680 pF							
820 pF							
1 000 pF							
1.2 nF							
1.5 nF							
1.8 nF							
2.2 nF							
2.7 nF							
3.3 nF							
3.9 nF							
4.7 nF							
5.6 nF							
6.8 nF							
8.2 nF							
10 nF							
Tape width	8mm						

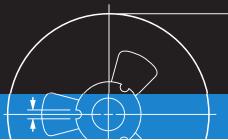
Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

NPO - Automotive grade, 1206 / 1210

NPO									
Capacitance	Automotive Grade					1210			
	50 V	100 V	250 V	500 V	630 V	50 V	100 V	250 V	500 V
10 pF									
12 pF									
15 pF									
18 pF									
22 pF									
27 pF									
33 pF									
39 pF									
47 pF									
56 pF									
68 pF									
82 pF									
100 pF									
120 pF									
150 pF									
180 pF									
220 pF									
270 pF									
330 pF									
390 pF									
470 pF									
560 pF									
680 pF									
820 pF									
1 000 pF									
1.2 nF									
1.5 nF									
1.8 nF									
2.2 nF									
2.7 nF									
3.3 nF									
3.9 nF									
4.7 nF									
5.6 nF									
6.8 nF									
8.2 nF									
10 nF									
Tape width	8mm								

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## X7R - Automotive grade, 0402 / 0603

X7R									
Capacitance	Automotive grade								
	0402				0603				
	10 V	16 V	25 V	50 V	10 V	16 V	25 V	50 V	100V
100 pF									
150 pF									
180 pF									
220 pF									
330 pF									
390 pF									
470 pF									
680 pF									
1 000 pF									
1.5 nF									
2.2 nF									
3.3 nF									
4.7 nF									
6.8 nF									
10 nF									
15 nF									
18 nF									
22 nF									
27 nF									
33 nF									
47 nF									
68 nF									
100 nF									
150 nF									
220 nF									
270 nF									
330 nF									
390 nF									
470 nF									
680 nF									
1000 nF									
2.2 $\mu$ F									
4.7 $\mu$ F									
10 $\mu$ F									
Tape width	8mm								

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

## X7R - Automotive grade, 0805

X7R							
Capacitance	Automotive grade						
	0805						
10 V	16 V	25 V	50 V	100 V	250 V	500 V	
1 000 pF							
1.5 nF							
2.2 nF							
3.3 nF							
4.7 nF							
6.8 nF							
10 nF							
15 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	1.25 ±0.2	
18 nF							
22 nF							
27 nF							
33 nF							
47 nF							
68 nF			1.25 ±0.2	1.25 ±0.2			
100 nF							
150 nF				0.85 ±0.1			
220 nF				1.25 ±0.2			
270 nF							
330 nF							
390 nF							
470 nF							
680 nF							
1000 nF							
2.2 µF							
4.7 µF							
10 µF							
Tape width	8mm						

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

## X7R - Automotive grade, 1206

X7R									
Capacitance	Automotive grade								
	6.3 V	10 V	16 V	25V	50V	100V	250 V		
100 pF									
150 pF									
180 pF									
220 pF									
330 pF									
390 pF									
470 pF									
680 pF									
1 000 pF									
1.5 nF									
2.2 nF									
3.3 nF									
4.7 nF									
6.8 nF									
10 nF									
15 nF									
18 nF									
22 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	1.25 ±0.2		
27 nF									
33 nF									
47 nF									
68 nF									
100 nF					1.15 ±0.1	1.25 ±0.2			
150 nF									
220 nF					1.6 ±0.2	1.6 ±0.2			
270 nF									
330 nF									
390 nF									
470 nF	1.0 ±0.1	1.0 ±0.1	1.0 ±0.1	1.0 ±0.1	1.15 ±0.1	1.25 ±0.2			
680 nF	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1	1.15 ±0.1					
1000 nF									
2.2 µF									
4.7 µF									
10 µF									
Tape width	8mm								

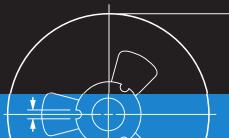
Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

X7R - Automotive grade, 1210 / 1812

X7R									
Capacitance	Automotive grade								
	1210							1812	
	6.3 V	10 V	16 V	25V	50V	100V	250 V	50 V	100 V
100 nF	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	0.85 ±0.1	1.25 ±0.2		
150 nF					1.25 ±0.2				
220 nF									
270 nF					1.15 ±0.2				
330 nF									
390 nF	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2	1.25 ±0.2				
470 nF								1.6 ±0.2	1.6 ±0.2
680 nF									
1000 nF									
2.2 µF									
4.7 µF									
10 µF									
Tape width	12mm								

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

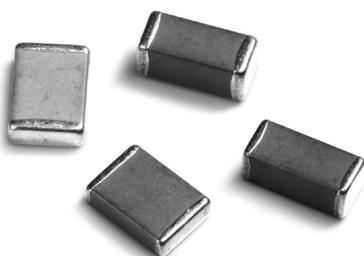
NPO/ X7R - Automotive grade 4-C Arrays, 0508, 0612

NPO		
Capacitance	4-C arrays	
	0508	0612
	6.3 V	10 V
10 pF		
12 pF		
15 pF		
18 pF		
22 pF		
33 pF	0.6 ±0.1	
39 pF		
47 pF		
56 pF		
68 pF		0.8 ±0.1
82 pF		
100 pF		
120 pF		
150 pF		
180 pF		
220 pF		
330 pF		
390 pF		
470 pF		
Tape width	8mm	

Note: Values in shaded cells indicate thickness class (unit: mm)

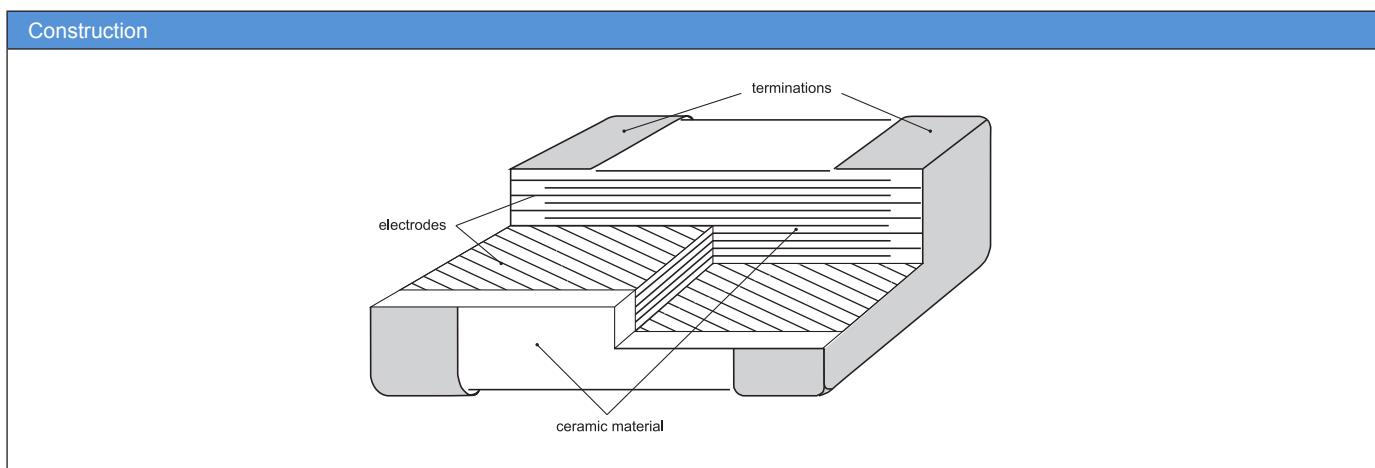
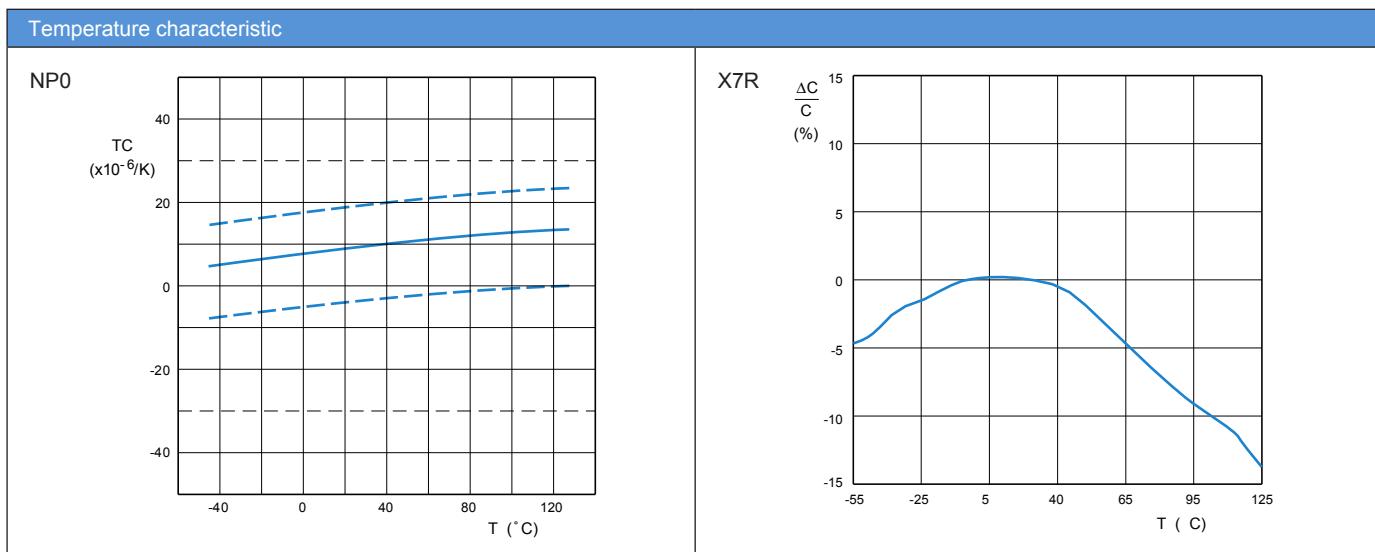
X7R						
Capacitance	4-C arrays					
	0508			0612		
	16 V	25 V	50 V	16 V	25 V	50 V
220 pF						
330 pF						
470 pF						
680 pF						
1 nF	0.6 ±0.1	0.6 ±0.1	0.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.8 ±0.1
1.2 nF						
1.5 nF						
1.8 nF						
2.2 nF						
2.7 nF						
3.3 nF						
4.7 nF						
5.6 nF						
6.8 nF						
8.2 nF						
10 nF						
12 nF						
15 nF						
18 nF						
22 nF						
27 nF						
33 nF						
47 nF						
56 nF						
68 nF						
82 nF						
100 nF						
Tape width	8mm					

Note: Values in shaded cells indicate thickness class (unit: mm)



### Features

- Capable of operating at high voltage levels
- For high frequency snubber
- Decoupling/ Smoothing function
- TUV certificate No.: 50031668
- UL certificate No.: E238900



**Dimensions**

Discrete capacitors - High voltage SC type

	Case size designation		Dimensions in mm			
	Inch-based	Metric	L <sub>1</sub>	W	L <sub>2</sub> / L <sub>3</sub> min	L <sub>2</sub> / L <sub>3</sub> max
	1808	4520M	4.8 ±0.30	2.0 ±0.30	0.25	0.75
	1812	4532M	4.8 ±0.30	3.2 ±0.30	0.25	0.75



# MLCC Selection Charts

## NPO - High voltage SC type, 1808 / 1812

NP0				
Capacitance	1808		1808	1812
	X1/Y2 for TUV	X1/Y2 for UL	X2/Y3 for TUV/UL	X1/Y2 for TUV/UL
2 pF				
3.3 pF				
4.7 pF				
5 pF				
10 pF				
12 pF				
15 pF				
18 pF	1.6 ±0.2	1.6 ±0.2		
22 pF				
27 pF				
33 pF				
39 pF				
47 pF				
56 pF				
68 pF				
82 pF				
100 pF	2.0 ±0.2	2.0 ±0.2		
120 pF				
150 pF				
180 pF				
220 pF				
240 pF				
270 pF				
330 pF				
390 pF				
430 pF				
470 pF				
560 pF				
680 pF				
820 pF				
1 000 pF				
Tape width	12 mm			

Note: Values in shaded cells indicate thickness class (unit: mm)

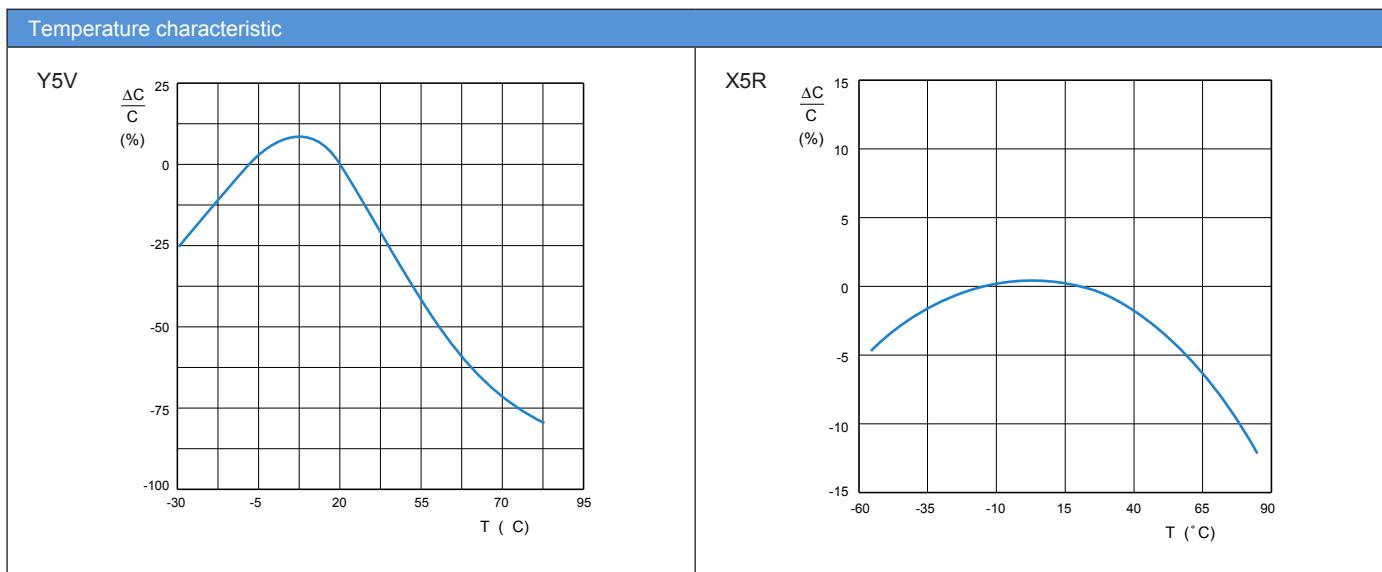
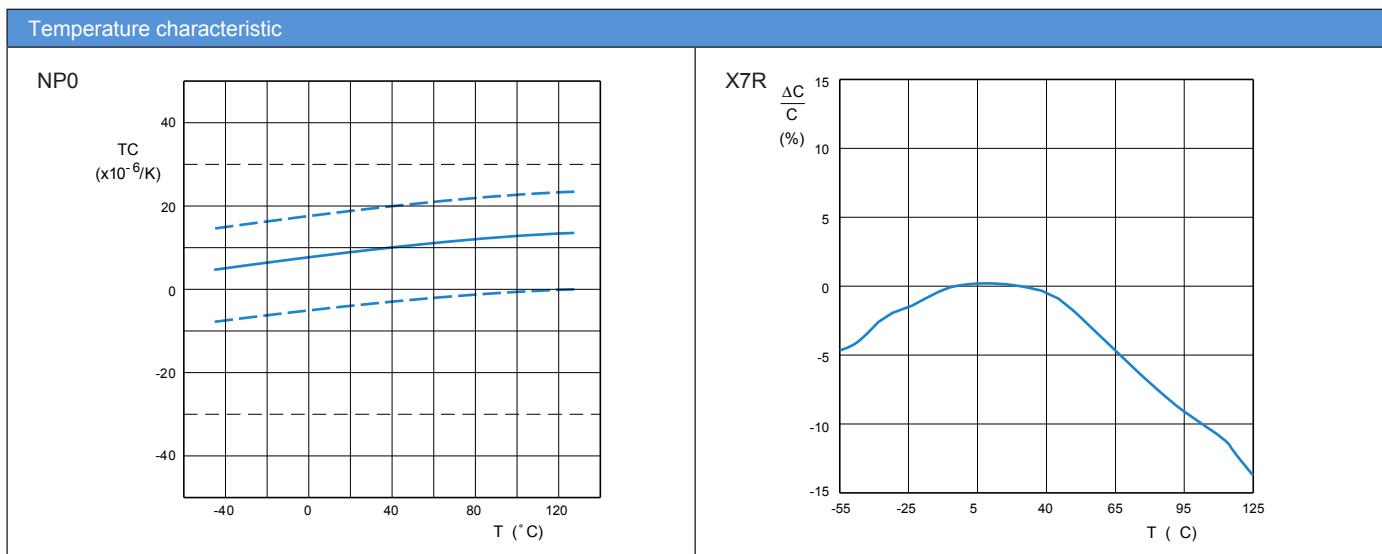
X7R			
Capacitance	1808		1812
	X1/Y2 for TUV/UL	X2/Y3 for TUV/UL	X1/Y2 for TUV
150 pF	1.6 ±0.2		
180 pF			
220 pF			
240 pF	1.6 ±0.2	1.6 ±0.2	1.6 ±0.2
270 pF			
330 pF			
390 pF			
430 pF			
470 pF			
560 pF			
680 pF			
820 pF			
1 000 pF			
1.2 nF			
1.5 nF			
Tape width	12 mm		

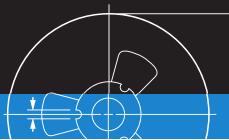
Note: Values in shaded cells indicate thickness class (unit: mm)



### Features

- Less than 50% board space of an equivalent discrete component
- High volumetric efficiency
- Increased throughput, by time saved in mounting





# MLCC Selection Charts

NP0 / X7R / Y5V / X5R - 4C Arrays, 0508 / 0612

Dimensions								
4C arrays								
		Case size designation		Dimensions in mm				
Inch-based	Metric	L	W	T <sub>min</sub>	T <sub>max</sub>	A	B	P
0508 (4 x 0402)	1220M (4 x 1005)	2.0 ±0.15	1.25 ±0.15	0.50	0.70	0.28 ±0.10	0.2 ±0.10	0.5 ±0.10
0612 (4 x 0603)	1632M (4 x 1608)	3.2 ±0.15	1.60 ±0.15	0.70 <sup>(1)</sup> 0.50 <sup>(2)</sup>	0.90 <sup>(1)</sup> 0.70 <sup>(2)</sup>	0.4 ±0.10	0.3 ±0.20	0.8 ±0.10

Note: 1. Available for NP0 and X7R

2. Available for Y5V

# MLCC Selection Charts

NPO - 4C Arrays, 0508 / 0612

NP0				
Capacitance	4C arrays			
	0508		0612	
	50 V	100 V	50 V	100 V
10 pF				
15 pF				
18 pF				
22 pF				
27 pF				
47 pF				
100 pF				
150 pF				
180 pF				
220 pF				
270 pF				
330 pF				
390 pF				
470 pF				
560 pF				
680 pF				
820 pF				
1 000 pF				
Tape width	8 mm			

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Selection Charts

X7R / X5R - 4C Arrays, 0508 / 0612

X5R		
Capacitance	4C arrays	
	0508	0612
	10 V	10 V
100 nF		
120 nF		
150 nF	0.6 ±0.1	
180 nF		
220 nF		
270 nF		
330 nF		
470 nF		
560 nF	0.85 ±0.1	
680 nF		
820 nF		
1000 nF		
2.2 uF		
Tape width	8 mm	

Note: Values in shaded cells indicate thickness class (unit: mm)

X7R						
Capacitance	4C arrays					
	0508			0612		
	16 V	25 V	50 V	16 V	25 V	50 V
1 nF			0.6 ±0.1			
1.2 nF						
1.5 nF						
1.8 nF						
2.2 nF						
2.7 nF						
3.3 nF						
4.7 nF						
5.6 nF						
6.8 nF						
8.2 nF						
10 nF						
12 nF						
15 nF						
18 nF						
22 nF						
27 nF						
33 nF						
47 nF						
56 nF						
68 nF						
82 nF						
100 nF						
220 nF						
470 nF						
Tape width	8 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLCC Selection Charts

Y5V - 4C Arrays, 0612

Y5V	
4C arrays	
Capacitance	0612
	25 V
10 nF	
22 nF	
47 nF	0.6 ±0.1
100 nF	
Tape width	8 mm

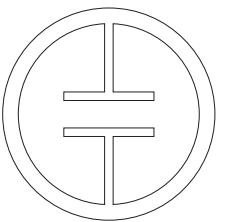
Note: Values in shaded cells indicate thickness class (unit: mm)



# MLCC Engineering Design Kits

## Sample kits

Sample book (small)	Description	Size	Volt.	Cap range
CC0402000000SB000	CC0402 Commodity	0402	≤ 50V	<1uF
CC0603000000SB000	CC0603 Commodity	0603	≤ 50V	<1uF
CC0805000000SB000	CC0805 Commodity	0805	≤ 50V	<1uF
CC1206000000SB000	CC1206 Commodity	1206	≤ 50V	<1uF
CQ0201000000SB000	HiQ 0201	0201	25V	0.2pF to 10pF
CQ0402000000SB000	HiQ 0402	0402	50V	0.2pF to 33pF
CQ0603000000SB000	HiQ 0603	0603	50V	0.2pF to 47pF
CQ0805000000SB000	HiQ 0805	0805	250V	0.2pF to 100pF
HV777S000000000000	Hi-Votage sample book	0805 to 1206	100V to 630V	47pF to 1uF
AC7777000000SB000	AC sample book	0402 to 1206	16V to 100V	10pF to 1uF
HC8888000000SB000	Hi-Cap Series	0201 to 1210	6.3V to 25V	1uF to 220uF
HCV8888000000SB000	HCV Series	0402 to 1210	6.3V to 100V	1uF to 22uF
SS1111000000SB000	CC Small Size series	01005 + 0201	6.3V to 50V	0.5pF to 2.2uF
CS8888000000SB000	Soft termination Series	0402 to 1206	16V to 1000V	100pF to 1uF



SMD CERAMIC EMI FILTER CAPACITORS  
X2Y® PRODUCTS



# X2Y® Product Selection Charts

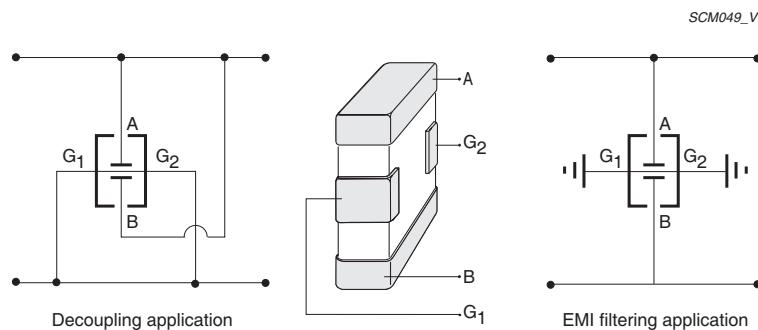
## SMD ceramic EMI filter capacitors X2Y® series



### Features

- Broadband Filtering and Decoupling: X2Y® is effective up to 10 GHz and frequencies beyond
- Ultra Low ESL: Noise cancellation within X2Y® makes ESL reducing from nanohenry to picohenry levels
- Bypass: Unlike feedthrough capacitors, X2Y® is in bypass, so no DC current limitations
- Matched Y-caps: Two tightly matched line to ground capacitors in one device
- Superior Balance: Temperature and voltage variations balanced of two Y-caps
- Aging Reliability: Aging effects are equal on two Y-caps

Circuit of typical applications



Benefits	Applications
<ul style="list-style-type: none"><li>• Fewer Components in Filtering: One X2Y® can replace multiple inductors and/or capacitors</li><li>• Superior Performance in Filtering: One X2Y® can eliminate both differential and common mode noises</li><li>• Fewer Components in Decoupling: Up to 1:7 replacement of MLCC in power delivering system bypass networks</li><li>• Superior Performance in Decoupling: Large or small, X2Y® components exhibit ultra low ESL</li><li>• Total Cost Savings: Assembly cost savings through reduced component count and placement costs</li><li>• Board Level Design Advantages: Dramatically reduces via drills, which blocks routing</li></ul>	<ul style="list-style-type: none"><li>• EMI filtering on DC motors</li><li>• Filtered connectors (airbag connectors, RJ-45 connectors)</li><li>• High speed data-line filtering</li><li>• Decoupling of supply-lines in high speed digital circuits</li><li>• Broadband filtering</li><li>• Amplifier decoupling and EMI suppression</li><li>• IC Decoupling, on-package, on-PCB</li><li>• DC power line filtering</li><li>• Data line filtering</li><li>• EMI suppression for DC motors</li><li>• Sensors</li><li>• Audio</li></ul>

# X2Y® Product Selection Charts

## Ordering information

X7R					
Size	Y-Capacitor		Voltage rating (V)	Thickness (mm)	Global part number
	Capacitance (nF)	Tolerance (%)			
0603	1	20%	100	0.65	CX 0603 MR X7R 0BB 102
	1.5	20%	100	0.65	CX 0603 MR X7R 0BB 152
	2.2	20%	100	0.65	CX 0603 MR X7R 0BB 222
	4.7	20%	100	0.65	CX 0603 MR X7R 0BB 472
	5.6	20%	100	0.65	CX 0603 MR X7R 0BB 562
	10	20%	50 / 63	0.65	CX 0603 MR X7R 9BB 103
	15	20%	25	0.65	CX 0603 MR X7R 8BB 153
	18	20%	25	0.65	CX 0603 MR X7R 8BB 183
	22	20%	25	0.65	CX 0603 MR X7R 8BB 223
	39	20%	16	0.65	CX 0603 MR X7R 7BB 393
	47	20%	16	0.65	CX 0603 MR X7R 7BB 473
	56	20%	16	0.65	CX 0603 MR X7R 7BB 563
	100	20%	10	0.65	CX 0603 MR X7R 6BB 104
	180	20%	10	0.65	CX 0603 MR X7R 6BB 184
	220	20%	10	0.65	CX 0603 MR X7R 6BB 224
	270	20%	10	0.65	CX 0603 MR X7R 6BB 274
	330	20%	10	0.65	CX 0603 MR X7R 6BB 334
0805	1	20%	100	0.85	CX 0805 MR X7R 0BB 102
	1.5	20%	100	0.85	CX 0805 MR X7R 0BB 152
	2.2	20%	100	0.85	CX 0805 MR X7R 0BB 222
	4.7	20%	100	0.85	CX 0805 MR X7R 0BB 472
	5.6	20%	100	0.85	CX 0805 MR X7R 0BB 562
	10	20%	100	0.85	CX 0805 MR X7R 0BB 103
	15	20%	50 / 63	0.85	CX 0805 MR X7R 9BB 153
	18	20%	50 / 63	0.85	CX 0805 MR X7R 9BB 183
	22	20%	50 / 63	0.85	CX 0805 MR X7R 9BB 223
	47	20%	16	0.85	CX 0805 MR X7R 7BB 473
	56	20%	16	0.85	CX 0805 MR X7R 7BB 563
	100	20%	16	0.85	CX 0805 MR X7R 7BB 104
	180	20%	10	0.85	CX 0805 MR X7R 6BB 184
1206	10	20%	100	1.2	CX 1206 MK X7R 0BB 103
	15	20%	100	1.2	CX 1206 MK X7R 0BB 153
	18	20%	100	1.2	CX 1206 MK X7R 0BB 183
	22	20%	100	1.2	CX 1206 MK X7R 0BB 223
	33	20%	100	1.2	CX 1206 MK X7R 0BB 333
	39	20%	50 / 63	1.2	CX 1206 MK X7R 9BB 393
	47	20%	50 / 63	1.2	CX 1206 MK X7R 9BB 473
	56	20%	50 / 63	1.2	CX 1206 MK X7R 9BB 563
	100	20%	50 / 63	1.2	CX 1206 MK X7R 9BB 104
	180	20%	16	1.2	CX 1206 MK X7R 7BB 184
	220	20%	16	1.2	CX 1206 MK X7R 7BB 224
	270	20%	16	1.2	CX 1206 MK X7R 7BB 274
	330	20%	16	1.2	CX 1206 MK X7R 7BB 334
	390	20%	16	1.2	CX 1206 MK X7R 7BB 394
	470	20%	10	1.2	CX 1206 MK X7R 6BB 474



# X2Y® Product Selection Charts

## Ordering information

X5R					
Size	Y-Capacitor		Voltage rating (V)	Thickness (mm)	Global part number
	Capacitance (nF)	Tolerance ( %)			
0603	180	20%	10	0.65	CX 0603 MR X5R 6BB 184
	220	20%	10	0.65	CX 0603 MR X5R 6BB 224
	330	20%	10	0.65	CX 0603 MR X5R 6BB 334
	390	20%	10	0.65	CX 0603 MR X5R 6BB 394
	470	20%	10	0.65	CX 0603 MR X5R 6BB 474

Note: 1. Special values are available on request

Thickness classes and packing quantities		
Thickness Classification (mm)	Quantity per reel	
	8 mm tape width	
	Ø180mm / 7"	
	0603 - 1410	
0.60 ±0.10	Paper	Blister
	4 000	---
	4 000	---
	---	3 000
	---	2 000
1.90 ±0.20	---	2 000

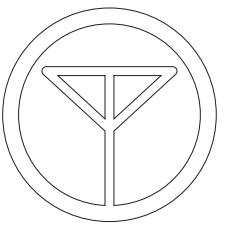
Note: 1. Special values are available on request

# X2Y® Product Selection Charts

## Ordering information

Global part number
Ordering example: CX0603MKX7R6BB104
<p style="text-align: center;"> <b>C X    0 6 0 3    M K    X 7 R    6    B    B    1 0 4</b> </p> <p>Series name (code 1-2) ————— CX = X2Y®-series</p> <p>Size code (code 3-6) —————</p> <p>EIA mm 0603 (1608M) 0805 (2012M) 1206 (3216M) 1210 (3225M) 1410 (3625M)</p> <p>Capacitance tolerance (code 7) ————— M = ±20%</p> <p>Packing style (code 8) —————</p> <p>R = Paper tape reel Ø7" K = Embossed plastic tape reel Ø7"</p> <p>TC material (code 9-11) —————</p> <p>NP0 X7R X5R</p> <p>Capacitance value (code 15-17) 104 = 100 000 pF (2 significant digits+number of zeros; the 3rd digit signifies the multiplying factor, and letter R is decimal point)</p> <p>0 = x 1 1 = x 10<sup>1</sup> 2 = x 10<sup>2</sup> 3 = x 10<sup>3</sup> 4 = x 10<sup>4</sup> 5 = x 10<sup>5</sup> 6 = x 10<sup>6</sup></p> <p>Process code (code 14) B = BME</p> <p>Termination (code 13) B = Ni-barrier</p> <p>Rated voltage (code 12)</p> <p>5 = 6.3 V 6 = 10 V 7 = 16 V 8 = 25 V 9 = 50 V 0 = 100 V </p>





WIRELESS COMPONENTS



# Wireless Components Product Selection Charts

## Introduction

### Introduction

Yageo produces a comprehensive range of wireless components, including metal/PCB/FPCB antenna, patch antenna (ceramic bulk), active antenna (LNA circuit), chip antenna, and RF components (filter/balancer).

Our products cover a wide variety of wireless communication protocols, including Bluetooth & IEEE 802.11b/g, WPAN (Wireless Personal Area Network), WLAN (Wireless Local Area Network), WMAN (Wireless Metropolitan Area Network), WWAN (Wireless Wide Area Network) and LTE (Long Term Evolution).

### Wireless Components

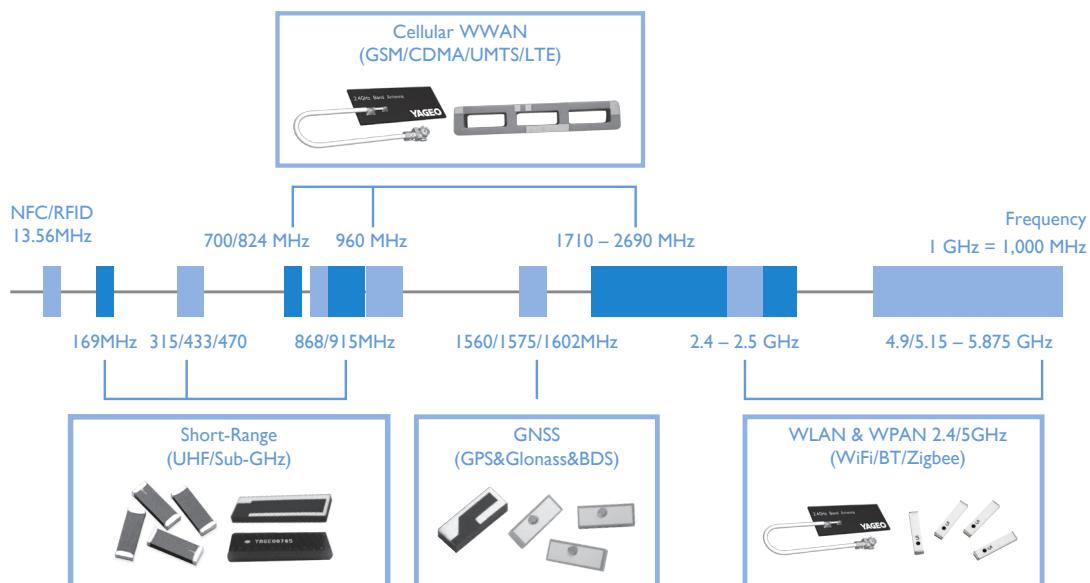
#### Antenna

Metal	PCB	FPCB	LTCC / Ceramic	Patch / Ceramic

#### LTCC Balun/ Filter/ Balun + Filter (Combo) / X2Y

Balun	Filter	Diplexer	Balanced Filter	X2Y Filter

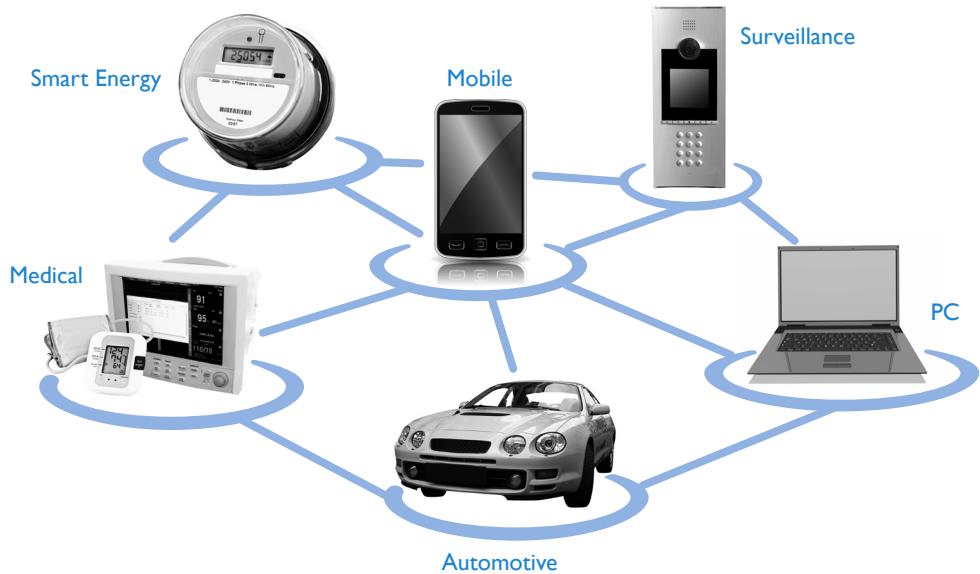
### Yageo Antenna Portfolio



# Wireless Components Selection Charts

## Introduction

Portable devices, home appliances, industrial/medical equipment will be equipped with wireless connectivity for Peer-to-Peer data exchange. More wireless components are needed.



### Key features of wireless components

#### Compact

- Maximize performance with the smallest size required
- The smallest 2.4/5 GHz antenna: PCB 18.4x7.5 mm / LTCC 1.6x0.8 mm

#### Multi-Band & High Efficiency

- WWAN: Quad-band (850/900/1800/1900 MHz) to Penta-band (850/900/1800/1900/2100 MHz)
- Support 4G cellular network LTE 700 MHz (Band 12,13,17), 2300/2600 MHz
- Multi-band 2.3/2.4/2.7 & 5 GHz supporting WLAN/WiMAX/LTE
- Operating in dual navigational systems GPS & Glonass: 1575 – 1606 MHz

#### High Reliability

- Operating temperature range: -40°C ~ 105°C
- Operating humidity 95% RH at 40°C
- Vibration verification

#### Easy Installation

- Reliable adhesive tape, surface mount, and flexible cable/connector selection



# Wireless Components Selection Charts

## Antenna - 2.4 GHz

### 2.4 GHz

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1204F001R2400A 1204 2.4GHz PIFA Chip Ante	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 6.66 dBi(Typ.)	<b>Size (mm) :</b> 12*4*2.0 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT9520LL06R2400A 9520 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.85 dBi(Typ.)	<b>Size (mm) :</b> 9.5*2.0*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT8010LL04R2400A 8010 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 5.88 dBi(Typ.)	<b>Size (mm) :</b> 8.0*1.0*1.0 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT7836A003R2400A 7836 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 3.93 dBi(Typ.)	<b>Size (mm) :</b> 7.8*3.6*0.5 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT7020LL05R2400A 7020 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.62 dBi(Typ.)	<b>Size (mm) :</b> 7.0*2.0*0.8 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5320LL45R2400A 5320 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 5.5 dBi(Typ.)	<b>Size (mm) :</b> 5.3*2.0*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5320LL24R2400A 5320 2.4GHz PIFA Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.78 dBi(Typ.)	<b>Size (mm) :</b> 5.3*2.0*1.25 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5010LL04R2400A 5010 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.28 dBi(Typ.)	<b>Size (mm) :</b> 5.0*1.0*1.0 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT3216LL00R2400A 3216 2.4Ghz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 5 dBi(Typ.)	<b>Size (mm) :</b> 3.2*1.6*1.3 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT3216A063R2400A 3216 2.4GHz PIFA Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.69 dBi(Typ.)	<b>Size (mm) :</b> 3.2*1.6*0.5 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT3012LL04R2400A 3012 2.4GHz Chip Antenna	<b>Freq. Range:</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.84 dBi(Typ.)	<b>Size (mm) :</b> 3.0*1.2*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT2012LL13R2400A 2012 2.4GHz PIFA Chip Antenna	<b>Freq. Range :</b> 2400~2500 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.72 dBi(Typ.)	<b>Size (mm) :</b> 2.0*1.2*1.0 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>

\* VSWR depends on the environment

# Wireless Components Selection Charts

Antenna - 2.4 / 5 GHz

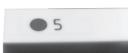
## 2.4 GHz

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1608LL14R2400A 1608 2.4GHz PIFA Chip Antenna	<b>Freq. Range :</b> 2400~2500 MHz <b>VSWR :</b> 3.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.0 dBi(Typ.)	<b>Size (mm) :</b> 1.6*0.8*0.4 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANTX200P001B24003 2.4GHz PCB Antenna - mini	<b>Freq. Range :</b> 2400 MHz <b>VSWR :</b> 2.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 4.8 dBi(Typ.)	<b>Size (mm) :</b> 18.4*7.5*0.55 <b>Operating Temp.:</b> -40 ~ 80°C <b>RoHS Compliance</b>

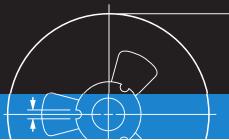
## 2.4 GHz / GPS

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1003LL15R1524A 1003 2.4GHz+GPS PIFA Chip Antenna	<b>Freq. Range :</b> 1575 / 2400 MHz <b>VSWR :</b> 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.15 dBi / 2.90 dBi(Typ.)	<b>Size (mm) :</b> 10*3*1.5 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5320LL07R1524A / 5320 2.4GHz+GPS PIFA Chip Antenna	<b>Freq. Range :</b> 1575 / 2400 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.47 dBi / 2.04 dBi(Typ.)	<b>Size (mm) :</b> 5.3*2.0*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>

## 2.4 / 5 GHz

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1003LL05R2455A 1003 2.4+5GHz Chip Antenna	<b>Freq. Range :</b> 2400~2500/ 5150~5875 MHz <b>VSWR :</b> 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.45 dBi / 1.55dBi(Typ.)	<b>Size (mm) :</b> 10*3*1.6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5320LL04R2455A 5320 2.4+5GHz Chip Antenna	<b>Freq. Range :</b> 2400~2500/ 5150~5875 MHz <b>VSWR :</b> 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.72 dBi / 3.85dBi(Typ.)	<b>Size (mm) :</b> 5.3*2.0*1.4 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5320LL24R2455A 5320 2.4+5GHz PIFA Chip Antenna	<b>Freq. Range :</b> 2400~2500/ 5150~5875 MHz <b>VSWR :</b> 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.17 dBi / 3.51dBi(Typ.)	<b>Size (mm) :</b> 5.3*2.0*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT1608LL14R2455A 1608 2.4+5GHz Chip Antenna	<b>Freq. Range :</b> 2400 - 2500/5150 - 5875 MHz <b>VSWR :</b> 6/3.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 3.11 / 3.43 dBi(Typ.)	<b>Size (mm) :</b> 1.6*0.8*0.4 <b>Operating Temp.:</b> -40~105°C <b>RoHS Compliance</b>
	ANT3216A063R2455A 3216 2.4+5GHz Chip Antenna	<b>Freq. Range :</b> 2400 - 2500/5150 - 5875 MHz <b>VSWR :</b> 2 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.59 / 2.23 dBi(Typ.)	<b>Size (mm) :</b> 3.05*1.55*0.55 <b>Operating Temp.:</b> -40~105°C <b>RoHS Compliance</b>
	ANTX200P002B24553 2.4+5GHz PCB Antenna	<b>Freq. Range :</b> 2400 - 2500/5150 - 5875MHz <b>VSWR :</b> 2.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.3 dBi(Typ.)	<b>Size (mm) :</b> 40*43*0.55 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANTX100P001B24553 2.4+5GHz PCB Antenna	<b>Freq. Range :</b> 2400~2500/ 5150~5875 MHz <b>VSWR :</b> 2.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 5.1 dBi(Typ.)	<b>Size (mm) :</b> 50*10*0.9 <b>Operating Temp.:</b> -40 ~ 80°C <b>RoHS Compliance</b>

\* VSWR depends on the environment



# Wireless Components Product Selection Charts

## Antenna - 5 GHz/ Cellular WWAN / Short Range

### 5 GHz

Model	Part No./ Description	Electrical Data	Mechanical Data
ANT3216LL05R5000A 3216 5GHz Chip Antenna	<b>Freq. Range :</b> 5150~5875 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 5.71 dBi(Typ.)	<b>Size (mm) :</b> 3.2*1.6*1.3 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	

### Cellular WWAN

Model	Part No./ Description	Electrical Data	Mechanical Data
ANT2112A010B0918A 2112 Cellular-Band Chip Antenna	<b>Freq. Range :</b> 824~960 / 1710~1990 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 0.5 ~ 1 dBi(Typ.)	<b>Size (mm) :</b> 21*12*0.5 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANT3505B002TWPENS 3505 Penta-band Antenna	<b>Freq. Range :</b> 824~960 / 1710~2170 MHz <b>VSWR :</b> 2.8 / 3.5 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.9 dBi(Typ.)	<b>Size (mm) :</b> 35*5*6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANT1204LL00R0918A 1204 Cellular-Band Chip Antenna	<b>Freq. Range :</b> 900/1800 MHz <b>VSWR :</b> 3.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> N/A	<b>Size (mm) :</b> 12*4*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANTX100P001BWPEN3 Penta-band PCB Antenna	<b>Freq. Range :</b> 824~960 / 1710~2170 MHz <b>VSWR :</b> 2.5 Max ( Low Band ) 3.5 Max ( High Band ) <b>Polarization:</b> Linear <b>Peak Gain :</b> 4.2 dBi(Typ.)	<b>Size (mm) :</b> 50*20*0.55 <b>Operating Temp.:</b> -40 ~ 80°C <b>Cable :</b> Φ1.13 / 100mm <b>Connector:</b> I-PEX <b>Mounting:</b> Adhesive Tape <b>RoHS Compliance</b>	
ANT4005B000RWHEXS 4005 LTE Antenna	<b>Freq. Range :</b> 698 - 960/1710 - 2690 MHz <b>VSWR :</b> 3.0 Max ( Low Band ) <b>Polarization:</b> Linear <b>Peak Gain :</b> 3.2 / 4.0 dBi(Typ.)	<b>Size (mm) :</b> 40*5*6 <b>Operating Temp.:</b> -40 ~ 80°C <b>RoHS Compliance</b>	

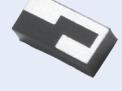
### Short-Range

Model	Part No./ Description	Electrical Data	Mechanical Data
ANT1204LL05R0915A 1204 915MHz Chip Antenna	<b>Freq. Range :</b> 915 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 3.32 dBi(Typ.)	<b>Size (mm) :</b> 12*4*1.6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANT1204LL08R0870A 1204 870MHz Chip Antenna	<b>Freq. Range :</b> 870 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 0.5 dBi(Typ.)	<b>Size (mm) :</b> 12*4*1.6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANT1204LL17R0870A 1204 870MHz PIFA Chip Antenna	<b>Freq. Range :</b> 870 MHz <b>VSWR :</b> 2.8 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.05 dBi(Typ.)	<b>Size (mm) :</b> 12*4*1.0 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANT7020LL05R0870A 7020 870MHz Chip Antenna	<b>Freq. Range :</b> 870 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> N/A	<b>Size (mm) :</b> 7.0*2.0*0.7 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	
ANT1204F002R0433A 1204 433MHz Chip Antenna	<b>Freq. Range :</b> 315/ 433 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 0.79 dBi(Typ.)	<b>Size (mm) :</b> 12*4*1.6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>	

\* VSWR depends on the environment

# Wireless Components Selection Charts

## Antenna - Short-Range/ GPS

Short-Range			
Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1204LL20R0433A 1204 433MHz Chip Antenna	<b>Freq. Range :</b> 315/ 433 MHz <b>VSWR :</b> 3.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 0.83 dBi(Typ.)	<b>Size (mm) :</b> 12*4*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT2405F001R0169A 2405 169MHz Chip Antenna	<b>Freq. Range :</b> 169 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> N/A	<b>Size (mm):</b> 24*5*1.6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT1204F005R0915A 1204 915MHz Chip Antenna	<b>Freq. Range :</b> 915 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.59 dBi(Typ.)	<b>Size (mm) : </b> 12*4*1.6 <b>Operating Temp.:</b> -40 ~ 85°C <b>RoHS Compliance</b>
	ANT1204F007R0870A 1204 870MHz Chip Antenna	<b>Freq. Range :</b> 870 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 1.67 dBi(Typ.)	<b>Size (mm) : </b> 12*4*1.6 <b>Operating Temp.:</b> -40 ~ 85°C <b>RoHS Compliance</b>
GPS			
Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT8010LL05R1575A 8010 GPS Chip Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 0.67 dBi(Typ.)	<b>Size (mm):</b> 8.0*1.0*1.0 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT6230LL01R1575A 6230 GPS Chip Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 2.52 dBi(Typ.)	<b>Size (mm):</b> 6.2*3.0*1.25 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT5320LL14R1575A 5320 GPS PIFA Chip Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 3.16 dBi(Typ.)	<b>Size (mm):</b> 5.3*2.0*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT3216LL15R1575A 3216 GPS PIFA Chip Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> 7.32 dBi(Typ.)	<b>Size (mm):</b> 3.2*1.6*1.2 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT3216A063R1575A 3216 GPS Chip Antenna	<b>Freq. Range:</b> 1575 MHz <b>Peak Gain:</b> 1 dBic(Typ.) <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear	<b>Size (mm):</b> 3.05*1.55*0.55 <b>Operating Temp. :</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1010B00FT1575S 10104 GPS Patch Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> -3 dBic(Typ.)	<b>Size (mm):</b> 10*10*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1212B00DT1575S 12124 GPS Patch Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> -1 dBic(Typ.)	<b>Size (mm):</b> 12*12*4 <b>Operating Temp.:-</b> 40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1515B00DT1575S 15154 GPS Patch Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 1.5 dBic(Typ.)	<b>Size (mm):</b> 15*15*4 <b>Operating Temp.:-</b> 40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1515B00FT1575S 15154 GPS Patch Ant	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 2.0 dBic(Typ.)	<b>Size (mm):</b> 15*15*4 <b>Operating Temp.:-</b> 40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>

\* VSWR depends on the environment



# Wireless Components Selection Charts

## Antenna - GPS

### GPS

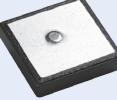
Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1818B00AT1575S 18182 GPS Patch Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 2 dBic(Typ.)	<b>Size (mm):</b> 18*18*2 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> SMD <b>RoHS Compliance</b>
	ANT1818B00BT1575S 18184 GPS Patch Antenna	<b>Freq. Range :</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 2 dBic(Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> SMD <b>RoHS Compliance</b>
	ANT1818B00CT1575S 18182 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 2 dBic(Typ.)	<b>Size (mm):</b> 18*18*2 <b>Operating Temp. :</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1818B00DT1575S 18184 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 4 dBic(Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1818B00ET1575S 18182 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 2 dBic(Typ.)	<b>Size (mm):</b> 18*18*2 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT2525B00AT1575S 25252 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 5 dBic(Typ.)	<b>Size (mm):</b> 25*25*2 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> SMD <b>RoHS Compliance</b>
	ANT2525B00BT1575S 25254 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 5.5 dBic(Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> SMD <b>RoHS Compliance</b>
	ANT2525B00CT1575S 25252 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 4.5 dBic(Typ.)	<b>Size (mm):</b> 25*25*2 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT2525B00DT1575S 25254 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 5 dBic(Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT2525B00ET1575S 25252 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 4.5 dBic(Typ.)	<b>Size (mm):</b> 25*25*2 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT2525B00FT1575S 25254 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain:</b> 5 dBic(Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1606B00DT1575S 16064 GPS Patch Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain:</b> -0.5 dBic(Typ.)	<b>Size (mm):</b> 16*6*4 <b>Operating Temp. : -40 ~ 105°C</b> <b>Mounting:</b> PIN <b>RoHS Compliance</b>

\* VSWR depends on the environment

# Wireless Components Selection Charts

## Antenna - GPS / Glonass / Active Antenna/ GPS+BD

### GPS+Glonass

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1818B00BT1516S 18184 Gps+Glonass Patch Antenna	<b>Freq. Range:</b> 1575 / 1602 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain:</b> 1.89 / 2.59 dBi(Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> SMD <b>RoHS Compliance</b>
	ANT1818B00DT1516S 18184 Gps+Glonass Patch Antenna	<b>Freq. Range:</b> 1575 / 1602 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain:</b> 2.65 / 2.79 dBi (Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT2525B00BT1516S 25254 Gps+Glonass Patch Antenna	<b>Freq. Range:</b> 1575 / 1602 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain:</b> 3.44 / 4.10 dBi (Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> SMD <b>RoHS Compliance</b>
	ANT2525B00DT1516S 25254 Gps+Glonass Patch Antenna	<b>Freq. Range:</b> 1575 / 1602 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain:</b> 3.5 / 3.8 dBi (Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>

### Active GPS

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT2525JB08B1575A 25256.9 GPS Active Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> RHCP <b>LNA Gain:</b> 16 dB (Typ.) <b>Antenna Gain:</b> 5.5 dBi(Typ.)	<b>Size (mm):</b> 25*25*6.9 <b>Cable</b> * (mm): 1.13*75 <b>Operating Temp.:</b> -30 ~ 85°C <b>RoHS Compliance</b>
	ANT1515JB27B1575A 15156.5 GPS Active Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> RHCP <b>LNA Gain:</b> 20.5 dB (Typ.) <b>Antenna Gain:</b> 1.0 dBi(Typ.)	<b>Size (mm):</b> 15*15*6.5 <b>Cable</b> * (mm): 1.13*100 <b>Operating Temp.:</b> -30 ~ 85°C <b>RoHS Compliance</b>
	ANT1606JB12B1575A 20066.4 GPS Active Antenna	<b>Freq. Range:</b> 1575 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>LNA Gain:</b> 20 dB (Typ.) <b>Antenna Gain:</b> 0.35 dBi (Typ.)	<b>Size (mm):</b> 20*6*6.4 <b>Cable</b> * (mm): 1.37*93 <b>Operating Temp.:</b> -30 ~ 85°C <b>RoHS Compliance</b>

### Active GPS+Glonass

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT8010JLC1B1516A 22061.9 GPS+Glonass Active Antenna	<b>Freq. Range:</b> 1575/1602 MHz <b>VSWR</b> * : 2.0 (Max) <b>Polarization:</b> Linear <b>LNA Gain:</b> 20 / 20 dB (Typ.) <b>Antenna Gain:</b> 5.88 dBi(Typ.)	<b>Size (mm):</b> 22*6*1.9 <b>Cable</b> * (mm): 1.13*100 <b>Operating Temp.:</b> -30 ~ 85°C <b>RoHS Compliance</b>

\* VSWR depends on the environment / \* Cable/Connector is customizable



# Wireless Components Selection Charts

## Antenna - GPS+BD/ Others

### GPS+BD

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT2525B00FT15BDS 25254 GPS+BD Patch Antenna	<b>Freq. Range :</b> 1575/1561 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 7 dBic(Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1818B00FT15BDS I8184 GPS+BD Patch Antenna	<b>Freq. Range :</b> 1575/1561 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 5.6 dBic(Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1515B00FT15BDS I5154 GPS+BD Patch Antenna	<b>Freq. Range :</b> 1575/1561 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 4.8 dBic(Typ.)	<b>Size (mm):</b> 15*15*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1212B00FT15BDS I2124 GPS+BD Patch Antenna	<b>Freq. Range :</b> 1575/1561 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 2.5 dBic(Typ.)	<b>Size (mm):</b> 12*12*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>

### GNSS

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT1204LL04RGNSSA I204 GNSS Chip Antenna	<b>Freq. Range :</b> 1559 - 1610 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 2.32 dBic(Typ.)	<b>Size (mm):</b> 12*4*1.1 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT2525B00FTGNSSS 25254 GNSS Patch Antenna	<b>Freq. Range :</b> 1559 - 1610 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 5.16 dBic(Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1818B00FTGNSSS I8184 GNSS Patch Antenna	<b>Freq. Range :</b> 1559 - 1610 MHz <b>VSWR :</b> 3.5 (Max) <b>Polarization:</b> RHCP <b>Peak Gain :</b> 3 dBic(Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>

### FM

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT2405F001R0098A 2405 FM Chip Antenna	<b>Freq. Range :</b> 88 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> N/A	<b>Size (mm):</b> 24*5*1.6 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>
	ANT1105LF00R0098A 1105 FM (Ferrite) Chip Antenna	<b>Freq. Range :</b> 88 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> Linear <b>Peak Gain :</b> N/A	<b>Size (mm):</b> 11*5*1.3 <b>Operating Temp.:</b> -40 ~ 105°C <b>RoHS Compliance</b>

### SDARS

Model	Part No./ Description	Electrical Data	Mechanical Data
	ANT2525B00FT2300S 25254 SDARS Patch Antenna	<b>Freq. Range :</b> 2320~2345 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> LHCP <b>Peak Gain :</b> 7.7 dBic(Typ.)	<b>Size (mm):</b> 25*25*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT2020B00FT2300S 20204 SDARS Patch Antenna	<b>Freq. Range :</b> 2320~2345 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> LHCP <b>Peak Gain :</b> 6 dBic(Typ.)	<b>Size (mm):</b> 20*20*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>
	ANT1818B00FT2300S I8184 SDARS Patch Antenna	<b>Freq. Range :</b> 2320~2345 MHz <b>VSWR :</b> 2.0 (Max) <b>Polarization:</b> LHCP <b>Peak Gain :</b> 7.6 dBic(Typ.)	<b>Size (mm):</b> 18*18*4 <b>Operating Temp.:</b> -40 ~ 105°C <b>Mounting:</b> PIN <b>RoHS Compliance</b>

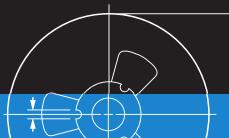
\* VSWR depends on the environment

# Wireless Components Selection Charts

## Filters

Filter (BPF)			
Model	Part No./ Description	Electrical Data	Mechanical Data
	BPF2520LL03R2400A 2520 2.4G BPF Type03	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 1.5dB(Max) <b>VSWR<sup>*</sup>:</b> 2.0dB(Max)	<b>Attenuation</b> 40dB Min @ 880~960MHz 30dB Min @ 1710~1785MHz 30dB Min @ 1850~1910MHz 20dB Min @ 4800~5000MHz 30dB Min @ 7200~7500MHz
	BPF2520LL04R2400A 2520 2.4G BPF Type04	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 1.8dB(Max) <b>VSWR<sup>*</sup>:</b> 2.0dB(Max)	<b>Attenuation</b> 45dB Min @ 750~960MHz 35dB Min @ 1710~1785MHz 35dB Min @ 1920~1990MHz 20dB Min @ 4800~5000MHz 30dB Min @ 7200~7500MHz
	BPF2012LL19R2400A 2012 2.4G BPF Type19	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 2.8dB(Max) <b>VSWR<sup>*</sup>:</b> 2.0dB(Max)	<b>Attenuation</b> 45dB Min @ 750~960MHz 35dB Min @ 1710~1785MHz 35dB Min @ 1920~1990MHz 20dB Min @ 4800~5000MHz 30dB Min @ 7200~7500MHz
	BPF2012LL03R2400A 2012 2.4G BPF Type03	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 2.3dB(Max) <b>VSWR<sup>*</sup>:</b> 2.0dB(Max)	<b>Attenuation</b> 40dB Min @ 1000~1600MHz 40dB Min @ 4900MHz 25dB Min @ 7500MHz
	BPF2012LL03R5000A 2012 5G BPF Type03	<b>Freq. Range:</b> 4900-5900 MHz <b>Insertion Loss:</b> 2.2dB (Max) <b>VSWR<sup>*</sup>:</b> 2.0 (Max)	<b>Attenuation:</b> 25dB Min @ 6850~7150MHz 20dB Min @ 7500~9000MHz
	BPF2012LL12R5000A 2012 5G BPF Type12	<b>Freq. Range:</b> 5149-5875 MHz <b>Insertion Loss:</b> 2.2dB (Max) <b>VSWR<sup>*</sup>:</b> 2.0 (Max)	<b>Attenuation:</b> 30dB Min @ 500~4000MHz 20dB Min @ 4600MHz
	BPF2012LL01R5000A 2012 5G BPF Type01	<b>Freq. Range:</b> 4900-5950 MHz <b>Insertion Loss:</b> 1.5dB (Max) <b>VSWR<sup>*</sup>:</b> 2.0 (Max)	<b>Attenuation:</b> 30dB Min @ 1280~3000MHz 25dBMin @ 3300~4000MHz 25dBMin @ 9800~11900MHz
	BPF2012LL05R5000A 2012 5G BPF Type05	<b>Freq. Range:</b> 5150-5850 MHz <b>Insertion Loss:</b> 1.8dB (Max) <b>VSWR<sup>*</sup>:</b> 2.0 (Max)	<b>Attenuation:</b> 30dB Min @ 2400~2500MHz 20dB Min @ 4700MHz
	BPF2012LM47R2400A 2012 2.4G BPF Type47	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 1.8dB(Max) <b>VSWR<sup>*</sup>:</b> 2.0dB(Max)	<b>Attenuation</b> 30dB Min @ 824~915MHz 30dB Min @ 1545~1605MHz 35dB Min @ 1710~1990MHz 30dB Min @ 2170MHz 30dB Min @ 4800~5000MHz 25dB Min @ 7200~7500MHz
	BPF1608LM17R2400A 1608 2.4G BPF Type17	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 2.7dB(Max) <b>VSWR<sup>*</sup>:</b> 2.0dB(Max)	<b>Attenuation</b> 38dB Min @ 880~915MHz 35dB Min @ 1710~1850MHz 35dB Min @ 1850~1910MHz 35dB Min @ 1920~1990MHz 25dB Min @ 2110~2170MHz 30dB Min @ 4800~5000MHz 30dB Min @ 7200~7500MHz

\* VSWR depends on the environment



# Wireless Components Selection Charts

## Filter

### Filter (BPF)

Model	Part No./ Description	Electrical Data	Mechanical Data	
	BPF1608LM02R2400A 1608 2.4G BPF Type02	<b>Freq. Range:</b> 2400-2500 MHz <b>Insertion Loss:</b> 1.7 dB (Max) <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation:</b> 30dB Min @ 880~960 MHz 20dB Min @ 1710~1990 MHz 8.5dB Min@ 2170 MHz 20dB Min @ 4800~5000 MHz 25dB Min @ 7200~7500 MHz	<b>Size(mm):</b> 1.6*0.8*0.6 <b>Operating Temp.:</b> -40~85°C <b>RoHS Compliance</b>
	BPF1608LM11R2400A 1608 2.4G BPF Type11	<b>Freq. Range:</b> 2400-2500 MHz <b>Insertion Loss:</b> 1.8 dB (Max.) <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation:</b> 20dB Min @ 1710~1990 MHz 6.5dB Min @ 2110~2170 MHz 25dB Min @ 4800~5000 MHz 20dB Min @ 7200~7500 MHz	<b>Size(mm):</b> 1.6*0.8*0.6 <b>Operating Temp.:</b> -40~85°C <b>RoHS Compliance</b>

### Filter (LPF)

Model	Part No./ Description	Electrical Data	Mechanical Data	
	LPF2012LM59RWPENA 2012 LTE LPF Type59	<b>Freq. Range:</b> 800-2025 MHz <b>Insertion Loss:</b> 0.5dB Max @ 800~1000MHz 0.8dB Max @ 1700~1910MHz 1.5dB Max @ 2120~2025MHz <b>VSWR</b> * : 1.5 (Max)	<b>Attenuation</b> 26dB Min @ 2300~6100MHz 35dB Min @ 3400~3820MHz	<b>Size(mm):</b> 2.0*1.25*0.9 <b>Operating Temp.:</b> -40~85°C <b>RoHS Compliance</b>
	LPF1608LL53R2400A 1608 2.4G LPF Type53	<b>Freq. Range:</b> 2400-2500 MHz <b>Insertion Loss:</b> 0.48dB (Max) <b>VSWR</b> * : 1.5 (Max)	<b>Attenuation:</b> 35dB Min @ 4800~5000 MHz 27dB Min @ 7200~7500 MHz	<b>Size(mm):</b> 1.6*0.8*0.65 <b>Operating Temp.:</b> -40~85°C <b>RoHS Compliance</b>
	LPF1608LL52R2500A 1608 Wimax LPF Type52	<b>Freq. Range:</b> 2300-2700MHz <b>Insertion Loss:</b> 1.25dB(Max) <b>VSWR</b> * : 1.5dB(Max)	<b>Attenuation:</b> 35dB Min @ 4800~5390MHz 25dB Min @ 7200~8085MHz	<b>Size(mm):</b> 1.6*0.8*0.65 <b>Operating Temp.:</b> -40~105 °C <b>RoHS Compliance</b>
	LPF1608LL54RWHEXA 1608 LTE LPF Type54	<b>Freq. Range:</b> 699-2690MHz <b>Insertion Loss:</b> 0.25dB(Max) <b>VSWR</b> * : 1.5dB(Max)	<b>Attenuation:</b> 23dB Min @ 5150~5960MHz	<b>Size(mm):</b> 1.6*0.8*0.6 <b>Operating Temp.:</b> -40~85 °C <b>RoHS Compliance</b>
	LPF1608LL55R0709A 1608 LTE LPF Type55	<b>Freq. Range:</b> 698-960 MHz <b>Insertion Loss:</b> 0.6dB Max @ 698~830MHz 0.7dB Max @ 830~900MHz 0.75dB Max @ 900~915MHz 0.9dB Max @ 915~960MHz <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation</b> 30dB Min @ 1554~1830MHz 35dB Min @ 2097~2745MHz	<b>Size(mm):</b> 1.6*0.8*0.6 <b>Operating Temp.:</b> -40~85°C <b>RoHS Compliance</b>
	LPF1608LL56RWHEXA 1608 LTE LPF Type56	<b>Freq. Range:</b> 600-2700MHz <b>Insertion Loss:</b> 0.5dB(Max) <b>VSWR</b> * : 2.0dB(Max)	<b>Attenuation:</b> 30dB Min @ 4800~8000MHz 25dB Min @ 8500~12500MHz	<b>Size(mm):</b> 1.6*0.8*0.65 <b>Operating Temp.:</b> -40~85 °C <b>RoHS Compliance</b>
	LPF1608LL57R2400A 1608 2.4G LPF Type57	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 0.6dB(Max) <b>VSWR</b> * : 2.0dB(Max)	<b>Attenuation:</b> 35dB Min @ 4800~5000MHz 30dB Min @ 7200~7500MHz	<b>Size(mm):</b> 1.6*0.8*0.65 <b>Operating Temp.:</b> -40~85 °C <b>RoHS Compliance</b>
	LPF1005LL50R2400A I005 2.4G LPF Type50	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 0.5dB(Max) <b>VSWR</b> * : 2.0dB(Max)	<b>Attenuation:</b> 25dB Min @ 4800~5000MHz 20dB Min @ 7200~7500MHz	<b>Size(mm):</b> 1.0*0.5*0.35 <b>Operating Temp.:</b> -40~85 °C <b>RoHS Compliance</b>
	LPF1005LL51R2400A I005 2.4G LPF Type51	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 0.5dB(Max) <b>VSWR</b> * : 2.0dB(Max)	<b>Attenuation:</b> 25dB Min @ 4800~5000MHz 20dB Min @ 7200~7500MHz	<b>Size(mm):</b> 1.0*0.5*0.35 <b>Operating Temp.:</b> -40~85 °C <b>RoHS Compliance</b>

\* VSWR depends on the environment

# Wireless Components Selection Charts

## Filters

Filter (Diplexer)			
Model	Part No./ Description	Electrical Data	Mechanical Data
	DPX2012LL87R2455A 2012 2.4/5GHz Diplexer Type85	<b>Freq. Range:</b> 2400-2500MHz/ 4900-5950MHz <b>Insertion Loss:</b> Low: 0.6dB High: 0.9dB <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation</b> <b>Low Band:</b> 20dB(Min).@4800~5000MHz 20dB(Min).@7200~7500MHz <b>High Band:</b> 20dB(Min).@824~915MHz 20dB(Min).@1800~2500MHz
	DPX2012LL85R2455A 2012 2.4/5GHz Diplexer Type85	<b>Freq. Range:</b> 2400-2500MHz/ 4900-5900MHz <b>Insertion Loss:</b> Low : 0.7dB/ High: 0.9dB <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation:</b> 20dB Min @ 4900~5900 MHz 20dB Min @ 2400~2500 MHz
	DPX2012LL89R2455A 2012 2.4/5GHz Diplexer Type89	<b>Freq. Range:</b> 2400-2500MHz/ 4900-5950MHz <b>Insertion Loss:</b> Low : 0.5dB/ High: 0.65dB <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation:</b> 20dB Min.,2f0 @4800~5000 MHz 20dB Min.,3f0 @7200~7500 MHz 20dB Min. @ 824~915 MHz 20dB Min. @1800~2500 MHz
	DPX1608LL80R2455A 1608 2.4/5GHz Diplexer Type80	<b>Freq. Range:</b> 2400-2500MHz/ 4900-6000MHz <b>Insertion Loss:</b> Low: 0.7dB/ High: 0.8dB <b>VSWR</b> *: Low: 2.0dB(Max)/ High: 1.7dB(Max)	<b>Attenuation:</b> <b>Low Band:</b> 20dB(Min). @4800~5000MHz 20dB(Min). @7200~7500MHz <b>High Band:</b> 28dB(Min). @860~960MHz 23dB(Min). @1545~1605MHz 23dB(Min). @1710~1990MHz 28dB(Min). @2170MHz 8dB(Min). @8100MHz 15dB(Min). @8820~9800MHz 27dB(Min). @9800~11800MHz
	DPX1608LL85R2455A 1608 2.4/5GHz Diplexer Type85	<b>Freq. Range:</b> 2400-2500MHz/ 4900-5950MHz <b>Insertion Loss:</b> Low: 0.6dB/ High: 1.2dB <b>VSWR</b> * : 2.0 (Max)	<b>Attenuation:</b> <b>Low Band:</b> 20dB(Min).@4800-5000MHz <b>High Band:</b> 28dB(Min).@30-2700MHz 10dB(Min).@9800-11900MHz 5dB(Min).@14700-17850MHz
	DPX1608LL87R1524A 1608 1.575/2.4GHz Diplexer Type87	<b>Freq. Range:</b> 1570-1610MHz/ 2400-2500 MHz/4900-6000 MHz <b>Insertion Loss:</b> Low: 0.6dB/ High: 0.7dB/0.6dB <b>VSWR</b> * : 2.0 dB (Max)	<b>Attenuation:</b> <b>Low Band:</b> 15 dB(Min) @2400~2500MHz 15 dB(Min) @4900~6000MHz <b>High Band:</b> 15 dB(Min) @1570~1610MHz

\* VSWR depends on the environment



# Wireless Components Selection Charts

## Filter

### Filter (Triplexer)

Model	Part No./ Description	Electrical Data	Mechanical Data
	TPX2012LL90R1525A 2012 1.575/2.4/5GHz Triplexer Type90	<b>Freq. Range:</b> 1570-1610MHz/ 2400-2500MHz/4900-5950MHz <b>Insertion Loss:</b> Low: 0.8dB/ Mid.: 0.7dB/ High: 0.8dB	<b>Attenuation:</b> <b>Low Band:</b> 20dB(Min). @2400~2500MHz 20dB(Min). @4800~6000MHz <b>Mid Band:</b> 17.5dB(Min). @4800~5000MHz 10dB(Min). @1545~1605MHz 10dB(Min). @9600~10000MHz <b>High Band:</b> 27dB(Min). @860~960MHz 25dB(Min). @1545~1605MHz 25dB(Min). @1710~1990MHz 30dB(Min). @2170MHz 8dB(Min). @8100MHz 15dB(Min). @8820~9800MHz 27dB(Min). @9800~10760MHz 25dB(Min). @10760~11800MHz
	TPX2012LL95R1525A 2012 1.575/2.4/5GHz Triplexer Type95	<b>VSWR*:</b> Low: 2.0dB(Max)/ Mid.: 2.0dB(Max) High: 1.6dB(Max)	<b>Size(mm):</b> 2.0*1.2*0.9 <b>Operating Temp.:</b> -40~85°C <b>RoHS Compliance</b>

\* VSWR depends on the environment

### Balun

Model	Part No./ Description	Electrical Data	Mechanical Data
	BLN1608LL01R5000A 1608 5G Balun Type01, 50100	<b>Freq. Range:</b> 4900-5950MHz <b>Insertion Loss:</b> 1.2 dB (Max) <b>VSWR*:</b> 2.0 (Max)	<b>Unbalanced Impedance:</b> 50Ω <b>Balanced Impedance:</b> 100Ω <b>Phase Difference:</b> $180 \pm 10$ degree <b>Amplitude Difference:</b> 1.5 dB (Max)
	BLN1608LL01R2400A 1608 2.4G Balun Type01, 50100	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 1.1 dB (Max) <b>VSWR*:</b> 2.0 (Max)	<b>Unbalanced Impedance:</b> 50Ω <b>Balanced Impedance:</b> 100Ω <b>Phase Difference:</b> $180 \pm 10$ degree <b>Amplitude Difference:</b> 2 dB (Max)
	BLN1608LL30R2400A 1608 2.4G Balun Type30 5050	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 1.2dB(Max) <b>VSWR*:</b> 2.0dB(Max)	<b>Unbalanced Impedance:</b> 50Ω <b>Balanced Impedance:</b> 50Ω <b>Phase Difference:</b> $180 \pm 10$ degree <b>Amplitude Difference:</b> 2 dB (Max)

\* VSWR depends on the environment

# Wireless Components Selection Charts

Filters

## Balance Filter (Combo)

Model	Part No./ Description	Electrical Data	Mechanical Data
	BLF2012LL98R2400A 2012 2.4G Combo Type98	<b>Freq. Range:</b> 2400-2500MHz <b>Insertion Loss:</b> 3.5dB (Max) <b>VSWR<sup>*</sup>:</b> 2.0 (Max) <b>Unbalanced Impedance:</b> 50Ω <b>Balanced Impedance:</b> Conjugate match to CSR BC03/04 series <b>Phase Difference:</b> 180 ±5 degree @25°C <b>Amplitude Balance:</b> 1.0 dB (Max)	<b>Attenuation:</b> 40dB Min@880~960MHz 25dB Min@1300~1600MHz 35dB Min@4800~5000MHz 30dB Min@7200~7500MHz



## Coupler

Model	Part No./ Description	Electrical Data	Mechanical Data
	CPL451171509HEX4K 1608 WWAN&LTE Coupler Type09	<b>Freq. Range:</b> 689.5-960.5MHz 1700-2100MHz/2300-2700MHz <b>Insertion Loss:</b> 0.25dB(Max)/ 0.3dB(Max)/ 0.4dB(Max) <b>VSWR<sup>*</sup>:</b> 1.4dB(Max)	<b>Coupling:</b> 23~28dB@689.5-960.5MHz 19.5~22.5dB@1700-2100MHz 19.5~24.5dB@2300-2700MHz
	CPL1608LL12WHEXA 1608 WWAN&LTE Coupler Type12	<b>Freq. Range:</b> 689-960MHz 1710-2170MHz/2300-2690MHz <b>Insertion Loss:</b> 0.2dB(Max)/ 0.25dB(Max)/ 0.3dB(Max) <b>VSWR<sup>*</sup>:</b> 1.45dB(Max)	<b>Coupling:</b> 23~27dB@689-960MHz 21.5~26.5dB@1710-2170MHz 22.5~27.5dB@2300-2690MHz



\* VSWR depends on the environment



# Wireless Components Selection Charts

## Product information - Ordering Information

### Explanation of ordering code - New

Ordering example : ANT3216A063R2400A

ANT 3216 A 063 R 2400 A

#### Product Type (code 1)

- ANT: Antenna
- BPF: Band-Pass Filter
- LPF: Low-Pass Filter
- BLN: Balun
- BLF: Balun Filter
- DPX: Diplexer

#### (1) Size (mm) - SMD (LTCC) (code 2)

- 3216: 3.2 x 1.6 mm
- 2012: 2.0 x 1.2 mm
- 2520: 2.5 x 2.0 mm

#### (2) Connector - Cable length (mm) Stand-alone (code 2)

Ex: X100 – IPEX connector, 100 mm cable length  
X: IPEX, M: MMCX, S: SMA, Z: Stripped  
100: 100 mm cable length

#### Type (code 3)

- L, F, A: Chip antenna / Filter / Balun
- B: Bulk antenna
- P: PCB
- X: FPCB
- S: Metal
- E: External
- J: Integrated antenna

#### Factory Control Code / Cable Type (code 7)

#### Frequency Band (MHz)(code 6)

- 2400: 2.4 – 2.5 GHz;
- 2455: 2.4&5 GHz
- 1575: GPS; 1516: GPS+Glonass
- 0433: 433 MHz
- 0870: 868 MHz
- 0918: 900/1800 MHz
- WQUD: 850/900/1800/1900 MHz
- WPEN: 850/900/1800/1900/2100 MHz

#### Packing Style (code 5)

- R: Tape & Reel
- T: Tray
- B: Bulk

#### Serial No. (code 4)

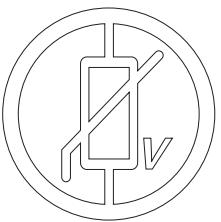
# Wireless components Engineering Design Kits

Sample Kits

M2M Application : Antenna Ordering code ANTSB000000020150		
Product Series	PART NUMBER	Frequency Range (MHz)
2.4GHz	ANT8010LL04R2400A	2400 - 2500
	ANT3216A063R2400A	2400 - 2500
	ANT3216LL00R2400A	2400 - 2500
	ANT2012LL13R2400A	2400 - 2500
	ANT1608LL14R2400A	2400 - 2500
	ANTX200P001B24003	2400 - 2500
2.4/5 GHz	ANT5320LL04R2455A	2400 - 2500
		5150 - 5875
	ANT5320LL24R2455A	2400 - 2500
		5150 - 5875
	ANT3216A063R2455A	2400 - 2500
		5150 - 5875
	ANT1608LL14R2455A	2400 - 2500
		5150 - 5875
	ANTX100P001B24553	2400 - 2500
		5150 - 5875
GPS	ANTX200P002B24553	2400 - 2500
		5150 - 5875
	ANT8010LL05R1575A	1575
	ANT5320LL14R1575A	1575
	ANT3216LL15R1575A	1575
	ANT1212B00DT1575S	1575
	ANT1515B00FT1575S	1575
GNSS	ANT1818B00AT1575S	1575
	ANT2525B00DT1575S	1575
GPS & GLONASS	ANT1204LL04RGNSSA	1559 - 1610
	ANT2525B00FTGNSSS	1559 - 1610
2.4GHz + GPS	ANT5320LL14R1516A	1575 / 1602
	ANT8010LL05R1516A	1575 / 1602
	ANT1818B00BT1516S	1575 / 1602
	ANT2525B00DT1516S	1575 / 1602
2.4GHz + GPS	ANT5320LL17R1524A	1575 / 2400
Cellular WWAN	ANT2112A010B0918A	900 / 1800
	ANT1204LL00R0918A	900 / 1800
	ANT3505B002TWPENS	824 - 960
		1710 - 2170
	ANT4005B000RVHEXS	698 - 960
		1710 - 2690
	ANTX100P001BWPN3	824 - 960
		1710 - 2170
Short-Range	ANT2405F001R0169A	169
	ANT1204F002R0433A	315/433
	ANT1204LL20R0433A	315/433
	ANT1204LL08R0870A	870/915
	ANT1204F007R0870A	870/915
SDARS	ANT2525B00FT2300S	2320 - 2345
Active GPS	ANT1818JB30B1575A	1575

WiFi /BT Application : Chip Antenna & Filter Ordering code ANTSB000000020151		
Freq.	Frequency Range (MHz)	PART NUMBER
Chip Antenna		
2.4 GHz	2400 - 2500	ANT8010LL04R2400A
	2400 - 2500	ANT3216A063R2400A
	2400 - 2500	ANT3216LL00R2400A
	2400 - 2500	ANT2012LL13R2400A
	2400 - 2500	ANT1608LL14R2400A
2.4/5 GHz	2400 - 2500	ANT5320LL04R2455A
	5150 - 5875	ANT5320LL24R2455A
	2400 - 2500	ANT5320LL15R1575A
	5150 - 5875	ANT3216A063R2455A
	2400 - 2500	ANT1608LL14R2455A
	5150 - 5875	ANT1608LL15R1575A
	1575	ANT8010LL05R1575A
	1575	ANT5320LL14R1575A
GPS & GLONASS	1575 / 1602	ANT8010LL05R1516A
	1575 / 1602	ANT5320LL14R1516A
2.4GHz + GPS	1575 / 2400	ANT5320LL17R1524A
Band-Pass Filter		
2.45 GHz	2400 - 2500	BPF2012LL03R2400A
	2400 - 2500	BPF1608LM02R2400A
Low-Pass Filter		
2.45 GHz	2400 - 2500	LPF1608LL53R2400A
Diplexer / Triplexer		
2.4/5 GHz	2400 - 2500	DPX1608LL80R2455A
	2400 - 2500	DPX1608LL85R2455A
GPS/2.4	1575 / 2400	DPX1608LL87R1524A
	1575 / 2400 / 5000	TPX2012LL90R1525A
GPS/2.4/5 GHz	1575 / 2400 / 5000	TPX2012LL95R1525A
	2400 - 2500	BLN1608LL30R2400A
Balun		
2.45 GHz	2400 - 2500	BLN1608LL01R2400A
	2400 - 2500	BLN1608LL01R5000A
Combo		
2.45 GHz	2400 - 2500	BLF2012LL98R2400A



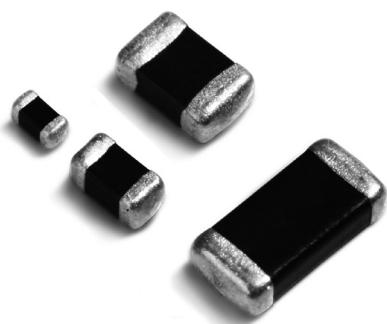


MULTILAYER CHIP VARISTORS



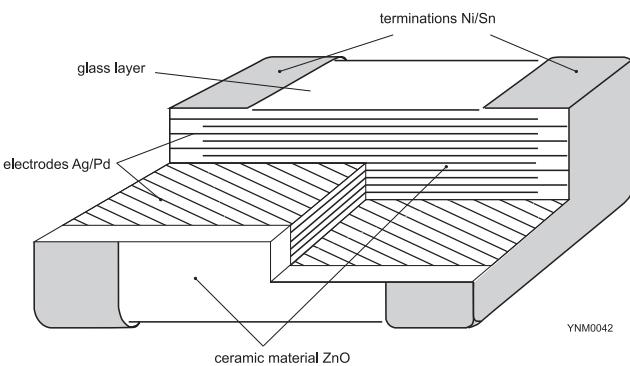
# MLV Product Selection Charts

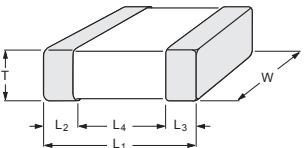
## Multilayer Chip Varistors, 0402 to 1206



### Features

- Excellent clamping voltage
- Excellent energy dissipation capability
- Quick response time (<1n sec)
- Adjustable capacitance values
- High reliability
- High transient current capability
- Symmetrical voltage-current characteristics

Construction
 <p>YNM0042</p>

Case dimensions	Case size designation	Dimensions in mm					
	Inch-based	L <sub>1</sub>	W	T	L <sub>2</sub> / L <sub>2 min</sub>	L <sub>2</sub> / L <sub>3 max</sub>	L <sub>4 min</sub>
	0402	1.0 ±0.10	0.5 ±0.10	0.5 ±0.10	0.15	0.30	0.40
	0603	1.6 ±0.15	0.8 ±0.10	0.8 ±0.10	0.20	0.60	0.40
	0805	2.0 ±0.20	1.25 ±0.10	0.85 ±0.10	0.25	0.75	0.55
	1206	3.2 ±0.15	1.6 ±0.15		0.25	0.75	1.40

Thickness classification and packing quantities		
Type	Thickness classification (mm)	8 mm tape width per reel
		180 mm / 7"
		Paper
0402	0.50 ±0.10	10 000
0603	0.80 ±0.10	4 000
0805	0.85 ±0.10	4 000
1206	0.85 ±0.10	4 000

# MLV Product Selection Charts

## Specification for 0402

MLV									
General purpose									
0402									
Maximum working voltage	5.5 V	5.5 V	9 V	14 V	14 V	18 V	18 V	18 V	30 V
Varistor voltage tolerance (code 8)	10 ~ 14 V (S)	7.2 ~ 10.8V (M)	10.2~13.8V (L)	18~24 V (S)	16.2~19.8V (K)	24~34 V (S)	50~80 V (S)	21.6~26.4 V (K)	50~80 V (S)
1 pF									
3 pF							0.5 ±0.10		0.5 ±0.10
5 pF									
10 pF									
15 pF									
22 pF									
27 pF									
33 pF									
40 pF									
50 pF									
82 pF								0.5 ±0.10	
100 pF									
120 pF									
160 pF									
200 pF									
250 pF									
300 pF									
360 pF									
470 pF									
480 pF									
650 pF									
900 pF									
Tape width	8 mm								

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLV Product Selection Charts

## Specification for 0603

MLV								
General purpose								
0603								
Maximum working voltage	5.5 V	5.5 V	9 V	9 V	14 V	14 V	18 V	30 V
Varistor voltage tolerance (code 8)	10 ~ 14 V (S)	7.2 ~ 10.8 V (M)	14~ 18 V (S)	9.6 ~ 14.4 V (M)	18 ~ 24 V (S)	16.2 ~ 19.8 V (K)	24 ~ 32 V (S)	50 ~ 80 V (S)
1 pF								
3 pF								0.80 ±0.10
5 pF								
9 pF								
10 pF								
15 pF								
22 pF								
33 pF								
50 pF								
82 pF								
100 pF								
120 pF								
160 pF								
180 pF								
200 pF								
250 pF								
300 pF								
350 pF								
360 pF								
470 pF								
650 pF								
680 pF								
800 pF								
900 pF								
Tape width	8 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLV Product Selection Charts

## Specification for 0805

MLV								
General purpose								
0805								
Maximum working voltage	5.5 V	9 V	14 V	16 V	18 V	26 V	30 V	38 V
Varistor voltage tolerance (code 8)	7.2 ~ 10.8 V (M)	10.8 ~ 14.6 V (L)	16.3 ~ 20.7 V (K)	20 ~ 27 V (S)	19.27 ~ 28.8 V (M)	29.7 ~ 36.3 V (K)	36.9 ~ 45.1 V (K)	45 ~ 58 V (S)
100 pF	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10
160 pF								
250 pF								
400 pF								
500 pF								
600 pF								
900 pF								
1.1 nF								
3.3 nF								
Tape width	8 mm							

Note: Values in shaded cells indicate thickness class (unit: mm)



# MLV Product Selection Charts

## Specification for 1206

MLV						
General purpose						
1206						
Maximum working voltage	5.5 V	14 V	18 V	26 V	30 V	38 V
working voltage	7.2 ~ 10.8 V (M)	16.3 ~ 20.7 V (K)	19.27 ~ 28.8 V (M)	29.7 ~ 36.3 V (K)	36.9 ~ 45.1 V (K)	45 ~ 58 V (S)
100 pF		0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10	0.85 ±0.10
160 pF						
250 pF						
400 pF						
500 pF						
600 pF						
800 pF						
900 pF						
1.1 nF						
3.3 nF						
Tape width	8 mm					

Note: Values in shaded cells indicate thickness class (unit: mm)

# MLV Product Selection Charts

## Ordering information for 0402 to 1206

Global part number
Ordering example: VRS0402KR55R680N
<p style="text-align: center;">V R   S   0 4 0 2   K   R   5 5 R   6 8 0   N</p> <p>Series name (code 1-2) ————— VR = Varistor</p> <p>Chip type (code 3) ————— S = Single chip</p> <p>Size code (code 4-7) —————</p> <p>0402 0603 0805 1206</p> <p>Varistor voltage tolerance (code 8) —————</p> <p>K = ±10 % L = ±15 % M = ±20 % S = Special range</p> <p>Packing style (code 9) —————</p> <p>R = paper tape reel Ø7 inch</p> <p>Capacitance tolerance (code 16)</p> <p>K = ± 10 % L = ± 15 % M = ± 20 % N = ± 30 %</p> <p>Capacitance value (code 13-15)</p> <p>680 = 68 pF (2 significant digits+number of zeros; the 3rd digit signifies the multiplying factor, and letter R is decimal point) 0 = x 1 1 = x 10<sup>1</sup></p> <p>Maximum working voltage (code 10-12)</p> <p>33R = 3.3 V 55R = 5.5 V 090 = 9 V 110 = 11 V 120 = 12 V 140 = 14 V 150 = 15 V 160 = 16 V 180 = 18 V 190 = 19 V 220 = 22 V 260 = 26 V 300 = 30 V 310 = 31 V 380 = 38 V</p>



**Note:**

**Note:**



## **YAGEO - A GLOBAL COMPANY**

### **ASIA**

#### **Suzhou, China**

Tel. +86 512 6825 5568  
Fax. +86 512 6825 5386

#### **Shanghai, China**

Tel. +86 21 64858697

#### **Dongguan, China**

Tel. +86 769 8772 0275  
Fax. +86 769 8791 0053

#### **Shenzhen, China**

Tel. +86 755 8652 3739

#### **Tokyo, Japan**

Tel. +81 3 6809 3972  
Fax. +81 3 6809 3982

#### **Seongnam, Korea**

Tel. +82 31 712 4797  
Fax. +82 31 712 5866

#### **Singapore**

Tel. +65 6244 7800  
Fax. +65 6244 4943

#### **Kuala Lumpur, Malaysia**

Tel. +60 3 8063 8864  
Fax. +60 3 8063 7376

#### **Penang, Malaysia**

Tel. +60 4 3973049  
Fax. +60 4 3973050

#### **Taipei, Taiwan**

Tel. +886 2 6629 9999  
Fax. +886 2 6628 8886

### **EUROPE**

#### **Munich, Germany**

Tel. +49 8990 7784 380  
Fax. +49 8990 7784 379

#### **Milan, Italy**

Tel. +39 02 6129 1017  
Fax. +39 02 6601 7490

#### **Roermond, Benelux**

Tel. +31 475 385 555  
Fax. +31 475 385 589

#### **Szombathely, Hungary**

Tel. +36 94 517 702  
Fax. +36 94 517 701

#### **Moscow, Russian Federation**

Tel. +7 965 408 18 11  
Fax. +7 498 610 07 07

### **NORTH AMERICA**

#### **San Jose, U.S.A.**

Tel. +1 408 240 6200  
Fax. +1 408 240 6201

#### **Mexico**

Tel. +52 33 31330631  
Fax. +1 408 240 6201

For a complete listing of all Yageo sales offices, distributors, and representatives, please visit "contact us" at

[www.yageo.com](http://www.yageo.com)

© YAGEO Corporation

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.  
The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.  
No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent or other industrial or intellectual property rights.