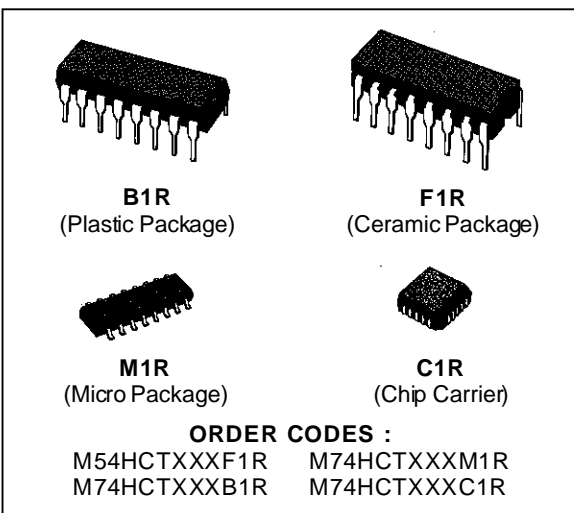# SGS-THOMSON MICROELECTRONICS

M54HCT157/158
M74HCT157/158

HCT157 QUAD 2 CHANNEL MULTIPLEXER
HCT158 QUAD 2 CHANNEL MULTIPLEXER (INV.)

- HIGH SPEED
  t_{PD} = 21 ns (TYP.) AT V_{CC} = 5 V
- LOW POWER DISSIPATION
  I_{CC} = 4 μA (MAX.) AT T_A = 25 °C
- COMPATIBLE WITH TTL OUTPUTS
  V_{IH} = 2V (MIN.) V_{IL} = 0.8V (MAX)
- OUTPUT DRIVE CAPABILITY
  10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
  $|IOH|$ = I_{OL} = 4 mA (MIN.)
- BALANCED PROPAGATION DELAYS
  t_{PLH} = t_{PHL}
- PIN AND FUNCTION COMPATIBLE
  WITH 54/74LS157/158

B1R
(Plastic Package)

F1R
(Ceramic Package)

M1R
(Micro Package)

C1R
(Chip Carrier)

ORDER CODES :
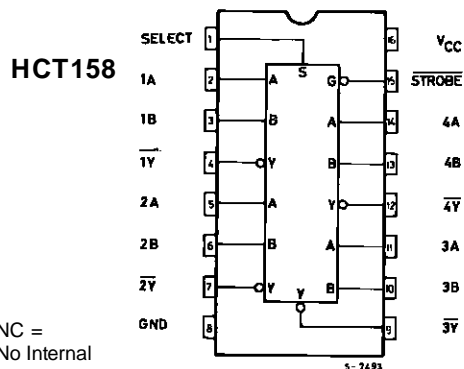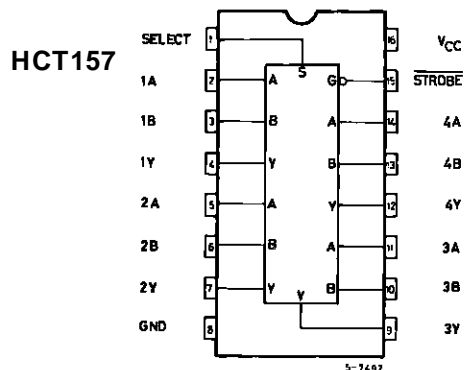M54HCTXXXF1R   M74HCTXXXM1R
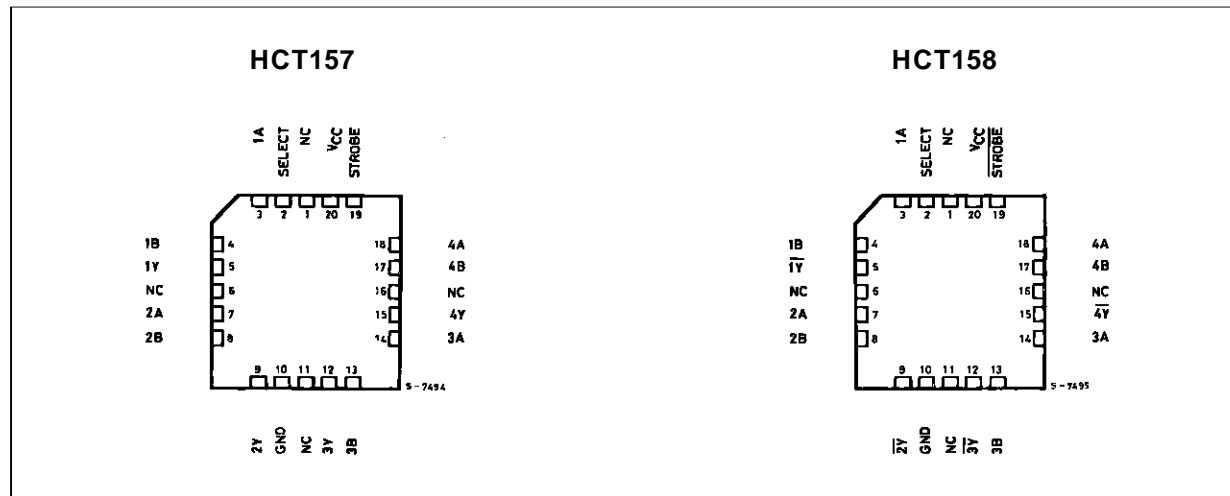M74HCTXXXB1R   M74HCTXXXC1R

DESCRIPTION

The M54/74HCT157 and the M54/74HCT158 are high speed CMOS QUAD 2-CHANNEL MULTI-PLEXERs fabricated with silicon gate C^{2}MOS technology. They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

These devices consist of four 2-input digital multi-plexers with common select and strobe inputs. The HCT158 is an inverting multiplexer while the HCT157 is a non-inverting multiplexer. When the STROBE input is held High, selection of data is in-hibited and all the outputs become Low in the M74HCT157 and High in the M74HCT158. The SE-LECT decoding determines whether the A or B in-puts get routed to their corresponding Y outputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage. M54/74HCT devices are designed to directly inter-face HSC^{2}MOS systems with TTL and NMOS com-ponents. They are also plug in replacements for LSTTL devices giving a reduction of power con-sumption.

PIN CONNECTIONS (top view)

HCT157

SELECT	1	16	V_{CC}
1A	2	15	STROBE
1B	3	14	4A
1Y	4	13	4B
2A	5	12	4Y
2B	6	11	3A
2Y	7	10	3B
GND	8	9	3Y

HCT158

SELECT	1	16	V_{CC}
1A	2	15	STROBE
1B	3	14	4A
$\overline{1Y}$	4	13	4B
2A	5	12	$\overline{4Y}$
2B	6	11	3A
$\overline{2Y}$	7	10	3B
GND	8	9	$\overline{3Y}$

NC =
No Internal
Connection

CHIP CARRIER

HCT157

1A SELECT NC Vcc STROBE
3 2 1 20 19

1B [4 18] 4A
1Y [5 17] 4B
NC [6 16] NC
2A [7 15] 4Y
2B [8 14] 3A

9 10 11 12 13
S-7494

2Y GND NC 3Y 3B

HCT158

1A SELECT NC Vcc STROBE
3 2 1 20 19

1B [4 18] 4A
$\overline{1Y}$ [5 17] 4B
NC [6 16] NC
2A [7 15] $\overline{4Y}$
2B [8 14] 3A

9 10 11 12 13
S-7495

$\overline{2Y}$ GND NC $\overline{3Y}$ 3B

INPUT AND OUTPUT EQUIVALENT CIRCUIT
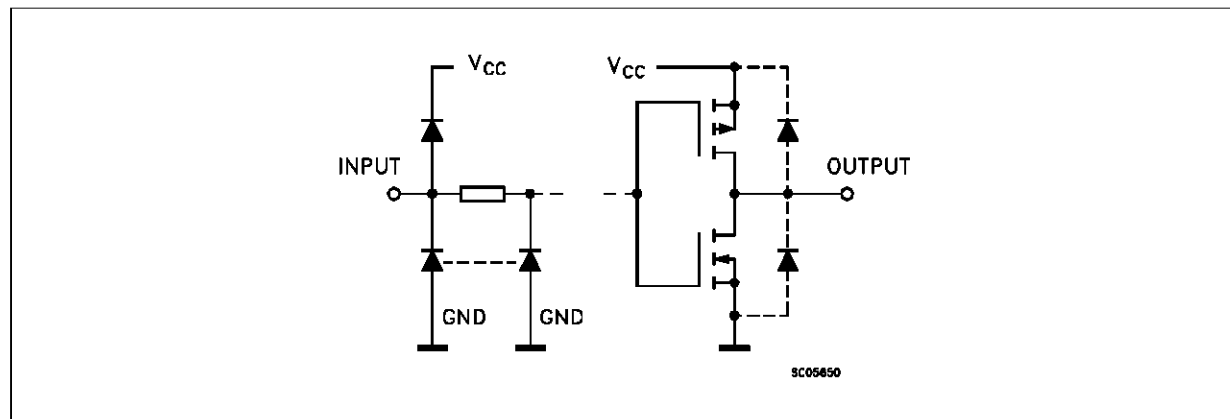
PIN DESCRIPTION (for HCT157)

PIN No	SYMBOL	NAME AND FUNCTION
1	SELECT	Common Data Select Input
2, 5, 11, 14	1A to 4A	Data Inputs From Source A
3, 6, 10, 13	1B to 4B	Data Inputs From Source B
4, 7, 9, 12	1Y to 4Y	Multiplexer Output
15	$\overline{STROBE}$	Strobe Input
8	GND	Ground (0V)
16	Vcc	Positive Supply Voltage

PIN DESCRIPTION (for HCT158)

PIN No	SYMBOL	NAME AND FUNCTION
1	SELECT	Common Data Select Input
2, 5, 11, 14	1A to 4A	Data Inputs From Source A
3, 6, 10, 13	1B to 4B	Data Inputs From Source B
4, 7, 9, 12	$\overline{1Y}$ to $\overline{4Y}$	Multiplexer Output
15	$\overline{STROBE}$	Strobe Input
8	GND	Ground (0V)
16	Vcc	Positive Supply Voltage

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TRUTH TABLE

INPUTS				OUTPUTS	
$\overline{\text{STROBE}}$	SELECT	A	B	Y (HCT157)	$\overline{Y}$ (HCT158)
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

X: DON'T CARE

IEC LOGIC SYMBOL

LOGIC DIAGRAM

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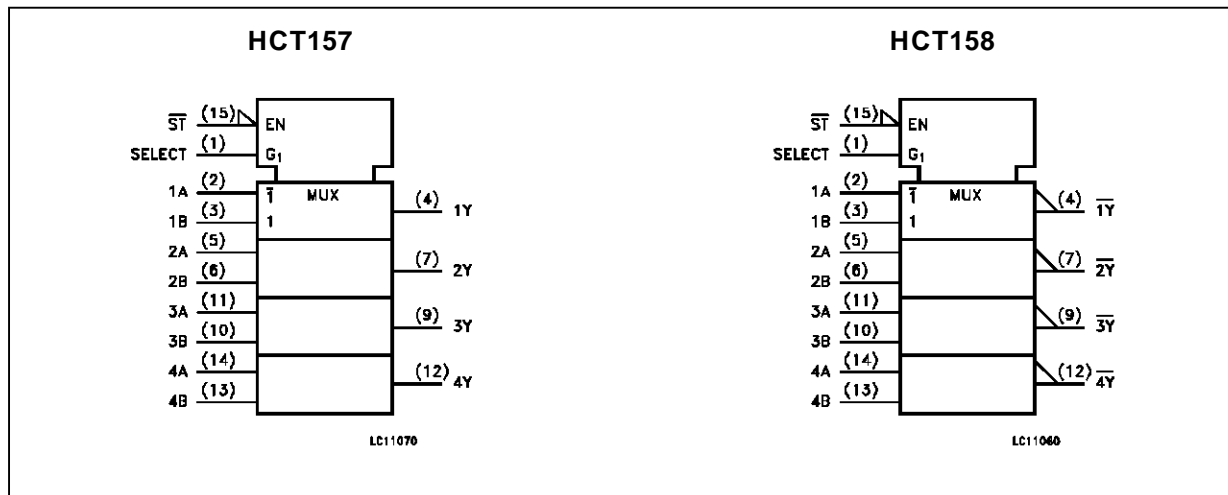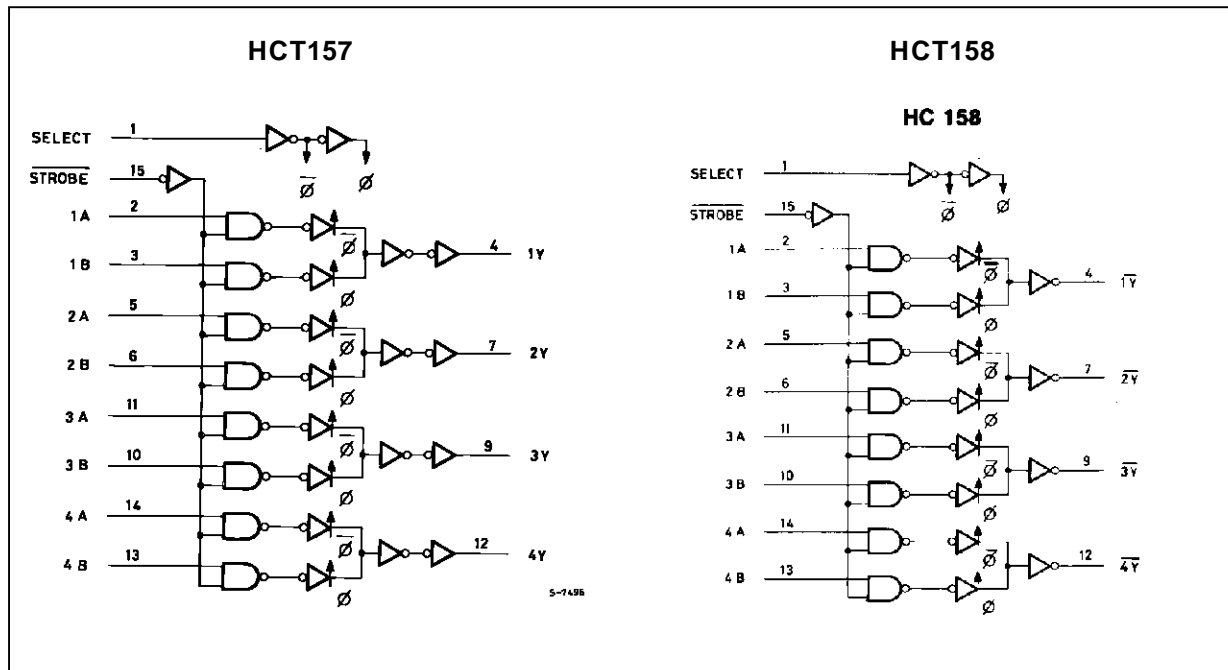
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7	V
V_I	DC Input Voltage	-0.5 to V_{CC} + 0.5	V
V_O	DC Output Voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to +150	^oC
T_L	Lead Temperature (10 sec)	300	^oC

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.
(*) 500 mW: $\cong$ 65 ^oC derate to 300 mW by 10mW/^oC: 65 ^oC to 85 ^oC

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	4.5 to 5.5	V
V_I	Input Voltage	0 to V_{CC}	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature: **M54HC** Series **M74HC** Series	-55 to +125 -40 to +85	^oC ^oC
t_r, t_f	Input Rise and Fall Time (V_{CC} = 4.5 to 5.5V)	0 to 500	ns

DC SPECIFICATIONS

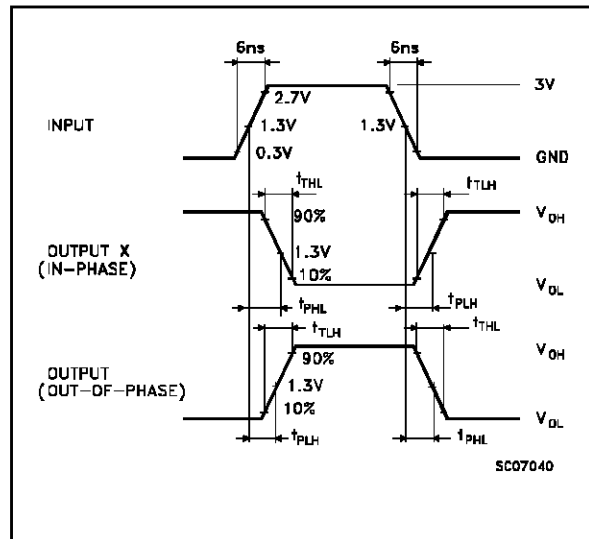| Symbol	Parameter	V_{CC} (V)	Test Conditions		$T_A = 25\,^oC$ 54HC and 74HC			-40 to 85 ^oC 74HC		-55 to 125 ^oC 54HC		Unit
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	4.5 to 5.5			2.0			2.0		2.0		V
V_{IL}	Low Level Input Voltage	4.5 to 5.5					0.8		0.8		0.8	V
V_{OH}	High Level Output Voltage	4.5	$V_I = V_{IH}$ or V_{IL}	$I_O=$-20 μA	4.4	4.5		4.4		4.4		V
				$I_O=$-4.0 mA	4.18	4.31		4.13		4.10		
V_{OL}	Low Level Output Voltage	4.5	$V_I = V_{IH}$ or V_{IL}	$I_O=$ 20 μA		0.0	0.1		0.1		0.1	V
				$I_O=$ 4.0 mA		0.17	0.26		0.33		0.4	
I_I	Input Leakage Current	5.5	$V_I = V_{CC}$ or GND				±0.1		±1		±1	μA
I_{CC}	Quiescent Supply Current	5.5	$V_I = V_{CC}$ or GND				4		40		80	μA
ΔI_{CC}	Additional worst case supply current	5.5	Per Input pin $V_I = 0.5V$ or $V_I = 2.4V$ Other Inputs at V_{CC} or GND $I_O= 0$				2.0		2.9		3.0	mA

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input t_r = t_f = 6 ns)

Symbol	Parameter	Test Conditions		Value							Unit
		V_{CC} (V)		T_A = 25 ^{o}C 54HC and 74HC			-40 to 85 ^{o}C 74HC		-55 to 125 ^{o}C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	4.5			8	15		19		22	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B - Y)	4.5			16	25		31		38	ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT - Y)	4.5			19	30		38		45	ns
t_{PLH} t_{PHL}	Propagation Delay Time (STROBE - Y)	4.5			17	27		34		41	ns
C_{IN}	Input Capacitance				5	10		10		10	pF
C_{PD} (*)	Power Dissipation Capacitance	HCT157			50						pF
		HCT158			60						pF

(*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operting current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4$ (per channel)

## SWITCHING CHARACTERISTICS TEST CIRCUIT

TEST CIRCUIT I_{CC} (Opr.)

INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST.

SGS-THOMSON MICROELECTRONICS
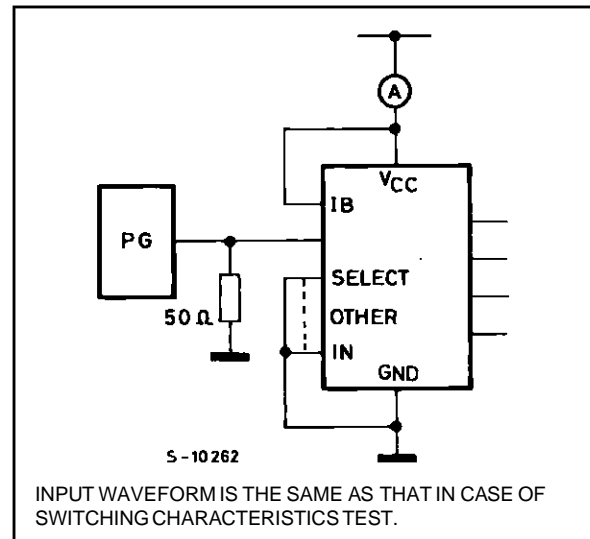
Plastic DIP16 (0.25) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	**TYP.**	**MAX.**	**MIN.**	**TYP.**	**MAX.**
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050

P001C

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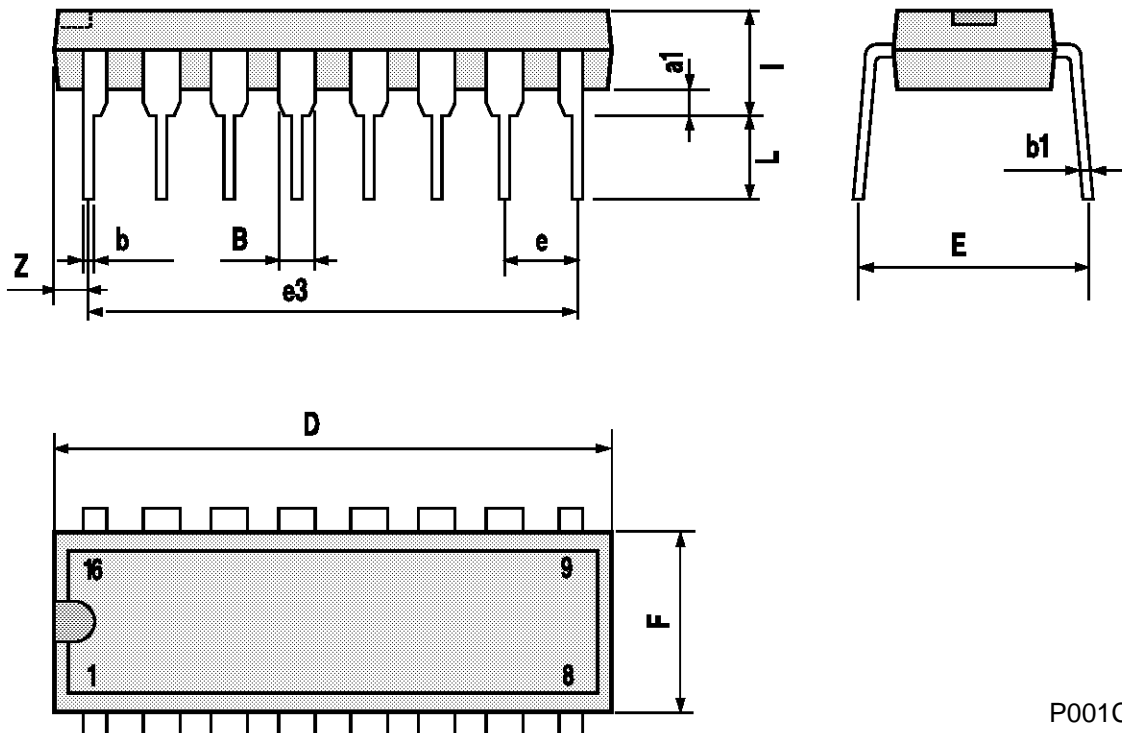
Ceramic DIP16/1 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200

P053D

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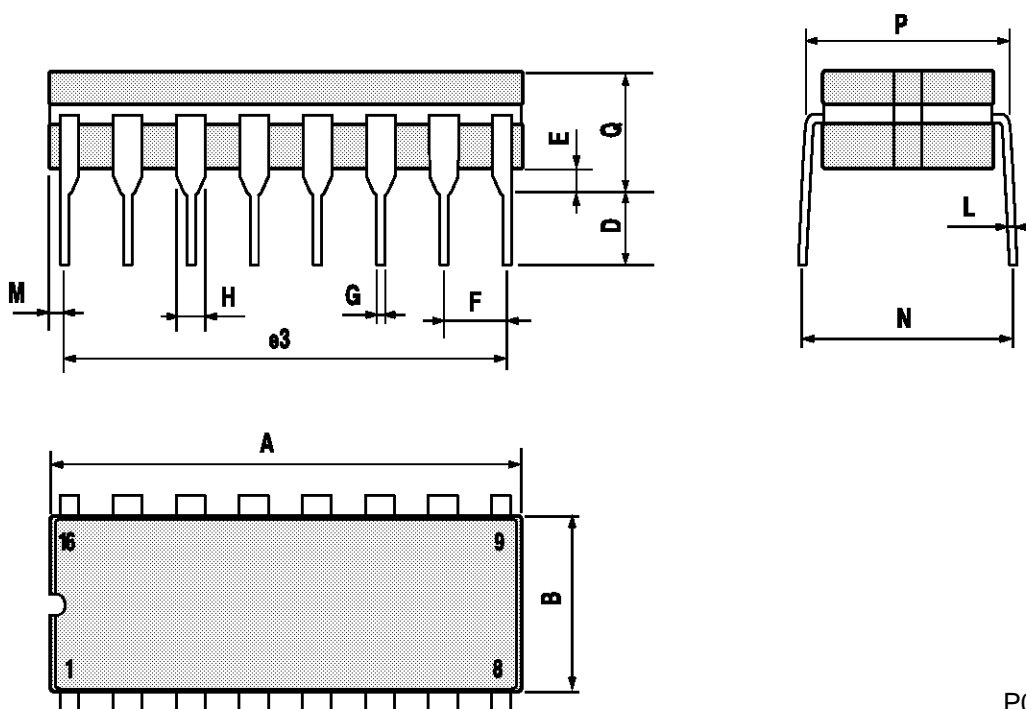
SO16 (Narrow) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					

P013H

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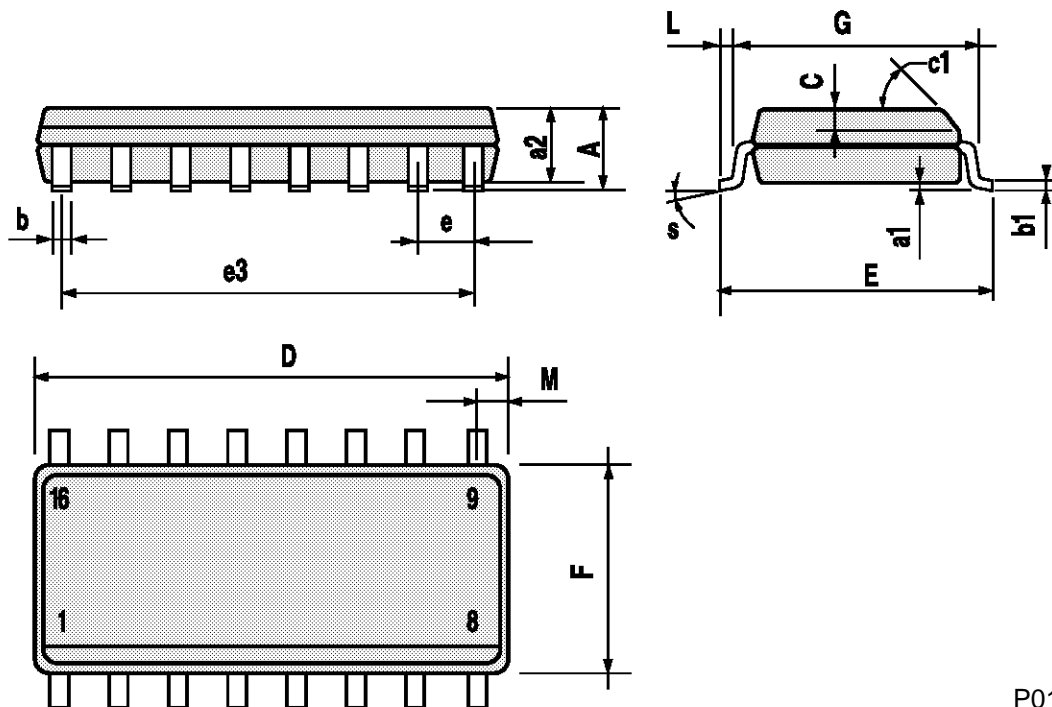
PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	

P027A

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