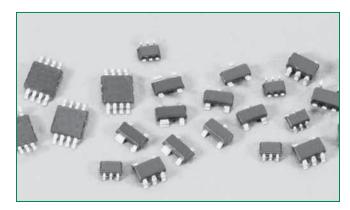
# SP05 Series - 30pF 30kV Unidirectional TVS Array

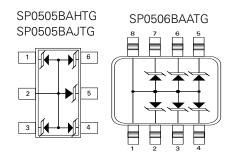








#### **Pinout**



#### **Description**

This surface mount family of arrays suppresses ESD and other transient overvoltage events. Used to meet the International Electrotechnical Compatibility (IEC transient immunity standards IEC 61000-4-2 for Electrostatic Discharge Requirements), these devices can help protect sensitive digital or analog input circuits on data, signal, or control lines with voltage levels up to 5VDC.

The monolithic silicon arrays are comprised of specially designed structures for transient voltage suppression (TVS). The size and shape of these structures have be tailored for transient protection. The low capacitance and clamp voltage are ideal for high speed signal line protection.

#### **Features**

- An Array of 2, 3, 4, 5 or 6 TVS Avalanche Diodes in a ultra small SC70, SOT-23, SOT-143 or MSOP packages
- ESD Capability Standards
  - IEC 61000-4-2, Direct Discharge ....... 30kV (Level 4)
  - IEC 61000-4-2, Air Discharge...... 30kV (Level 4)
  - MIL STD 883 3015.7.....30kV
- Input Protection for Applications Up to 5VDC
- Fast Response Time .....<1ns
- Low Input Capacitance......30pF Typical
- Operating Temperature Range.....-40°C to 85°C

#### **Applications**

- Mobile phone handsets
- Personal Digital Assistants (PDA)
- Portable handheld equipment (Laptop, Palmtop computers)
- Computer port, keyboard (USB1.1)
- Digital still cameras
- Digital video cameras
- MP3 players

Life Support Note:

#### Not Intended for Use in Life Support or Life Saving Applications

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

#### **Absolute Maximum Ratings**

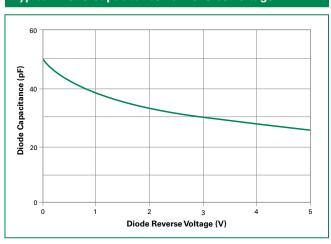
Parameter	Rating	Units
Storage Temperature Range	-65 to + 150	°C
Package Power Dissipation SC70 SOT23-3, SOT23-5, SOT23-6, SOT143 MSOP	0.2 0.225 0.5	W W W

# Electrical Characteristics T<sub>A</sub> = +25°C, Unless Otherwise Specified

Parameter	Test Conditions	Min	Тур	Max	Units
Reverse Standoff Voltage	I <sub>R</sub> ≤ 1μA	-	-	5.5	V
Reverse Standoff Leakage Current	V = 5.0V		1	100	nA
Signal Clamp Voltage					
Positive	I = 1mA	7.0	7.8	8.5	V
Negative	I = 10mA	-1.2	-0.8	-0.4	V
Clamp Voltage during ESD					
MIL-STD-883 Method 3015 (HBM) test					
+ 8kV			12		V
- 8kV			-8		V
ESD Test Level (1)					
IEC-61000-4-2, Contact discharge		30			kV
MIL-STD-883 Method 3015 (HBM)		30			kV
Capacitance	2.5V @ 1MHz		30		pF
Turn on/off Time			<1		ns
Temperature Range					
Operating		-40		85	°C
Storage		-65		150	°C
Diode Dynamic Resistance					
Forward Conduction			1.0		Ω
Reverse Conduction			1.4		Ω

(1) ESD voltage applied between channel pins and ground, one pin at a time; all other channel pins are open; all ground pins are grounded.

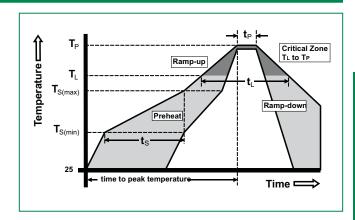
#### Typical Diode Capacitance vs. Reverse Voltage



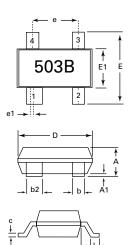


#### **Soldering Parameters**

Reflow Co	ndition	Pb – Free assembly
	-Temperature Min (T <sub>s(min)</sub> )	150°C
Pre Heat	-Temperature Max (T <sub>s(max)</sub> )	200°C
	-Time (min to max) (t <sub>s</sub> )	60 – 180 secs
Average ramp up rate (Liquidus) Temp (T <sub>1</sub> ) to peak		5°C/second max
T <sub>S(max)</sub> to T <sub>L</sub>	- Ramp-up Rate	5°C/second max
Reflow	-Temperature (T <sub>L</sub> ) (Liquidus)	217°C
nellow	-Temperature (t <sub>L</sub> )	60 – 150 seconds
PeakTemp	erature (T <sub>P</sub> )	260+0/-5 °C
Time within 5°C of actual peak Temperature (t <sub>p</sub> )		20 - 40 seconds
Ramp-down Rate		5°C/second max
Time 25°C to peak Temperature (T <sub>P</sub> )		8 minutes Max.
Do not exc	ceed	260°C

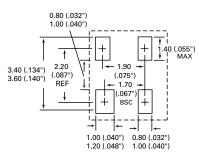


### Package Dimensions — SOT143



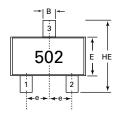
### SP0503BAHTG - SOT143-4

Recommended Pad Layout



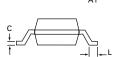
Package	SOT143-4			
Pins		4	4	
JEDEC		TO-	253	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	0.8	1.22	0.03	0.048
<b>A</b> 1	0.05	0.15	0.002	0.006
b	0.30	0.50	0.012	0.020
b2	0.76	0.89	0.030	0.035
С	0.08	0.20	0.003	0.008
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.082	0.104
E1	1.20	1.40	0.047	0.055
е	1.92	BSC	0.076	BSC
e1	0.20 BSC		0.008	BSC
L	0.4	0.6	0.016	0.024
L1	0.550	REF	0.022	REF

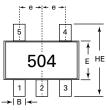
# Package Dimensions — SC70



SP0502BAJTG - SC70-3

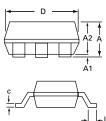
Package	SC70-3			
Pins		;	3	
JEDEC		MO	-203	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	0.80	1.10	0.031	0.043
<b>A</b> 1	0.00	0.10	0.00	0.004
A2	0.70	1.00	0.028	0.039
В	0.15	0.30	0.006	0.012
С	0.08	0.25	0.003	0.010
D	1.85	2.25	0.073	0.089
E	1.15	1.35	0.045	0.053
е	0.66 BSC 0.026 BSC			
HE	2.00	2.40	0.079	0.094
L	0.26	0.46	0.010	0.018

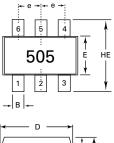


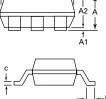


SP0504BAJTG - SC70-5

Package	SC70-5			
Pins		į	5	
JEDEC		МО	-203	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	0.80	1.10	0.031	0.043
A1	0.00	0.10	0.00	0.004
A2	0.70	1.00	0.028	0.039
В	0.15	0.30	0.006	0.012
С	0.08	0.25	0.003	0.010
D	1.85	2.25	0.073	0.089
E	1.15	1.35	0.045	0.053
е	0.65 BSC 0.026 BSC			BSC
HE	2.00	2.40	0.079	0.094
L	0.26	0.46	0.010	0.018

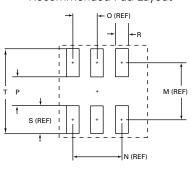






# SP0505BAJTG - SC70-6

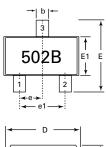
Recommended Pad Layout



Package		SC	70-6	
Pins				
JEDEC		MO	-203	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	0.80	1.10	0.031	0.043
A1	0.00	0.10	0.00	0.004
A2	0.70	1.00	0.028	0.039
В	0.15	0.30	0.006	0.012
С	0.08	0.25	0.003	0.010
D	1.85	2.25	0.073	0.089
E	1.15	1.35	0.045	0.053
е	0.65	BSC	0.026 BSC	
HE	2.00	2.40	0.079	0.094
L	0.26	0.46	0.010	0.018
M	-	1.60	-	0.063
N	-	1.30	-	0.051
0	-	0.65	-	0.026
Р	-	0.70	-	0.028
R	-	0.35	-	0.014
S	-	0.90	-	0.035
Т	-	2.50	-	0.098



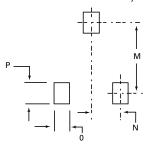
### Package Dimensions — SOT23



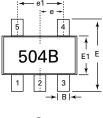


### SP0502BAHT - SOT23-3

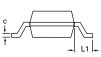
Recommended Pad Layout



Package	SOT23-3			
Pins		;	3	
JEDEC		TO-	236	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	0.89	1.12	0.035	0.044
<b>A</b> 1	0.01	0.1	0.0004	0.004
b	0.3	0.5	0.012	0.020
С	0.08	0.2	0.003	0.008
D	2.8	3.04	0.110	0.120
E	2.1	2.64	0.083	0.104
E1	1.2	1.4	0.047	0.055
е	0.95	BSC	0.038 BSC	
e1	1.90	BSC	0.075	5 BSC
L1	0.54 REF		0.02	I REF
M		2.29		.090
N		0.95		0.038
0		0.78		.030TYP
P		0.78		.030TYP

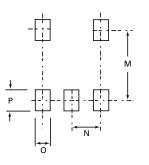




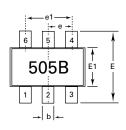


## SP0504BAHTG - SOT23-5

Recommended Pad Layout



Package	SOT23-5			
Pins		!	5	
JEDEC		MO	-178	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	-	1.45	-	0.057
A1	0	0.15	0	0.006
b	0.3	0.5	0.012	0.020
С	0.08	0.22	0.003	0.009
D	2.75	3.05	0.108	0.120
E	2.6	3.0	0.102	0.118
E1	1.45	1.75	0.057	0.069
е	0.95	BSC	0.038 BSC	
e1	1.90 BSC		0.075	BSC
L1	0.60 REF		0.024	1 REF
M		2.59		.102
N		0.95		.038
0		0.69		.027TYP
Р		0.99		.039TYP

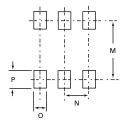






# SP0505BAHTG - SOT23-6

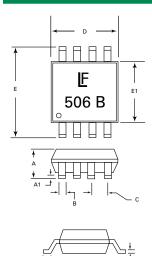
Recommended Pad Layout



Package	SOT23-6			
Pins	6			
JEDEC			- -178	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
Α	-	1.45	-	0.057
A1	0	0.15	0	0.006
b	0.3	0.5	0.012	0.020
С	0.08	0.22	0.003	0.009
D	2.75	3.05	0.108	0.120
E	2.6	3.0	0.102	0.118
E1	1.45	1.75	0.057	0.069
е	0.95	BSC	0.038 BSC	
e1	1.90	BSC	0.075	BSC
L1	0.60 REF		0.024	1 REF
M		2.59		.102
N		0.95		0.038
0		0.69		.027TYP
Р		0.99		.039TYP

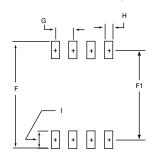
General Purpose ESD Protection - SP05 Series

#### Package Dimensions — MSOP



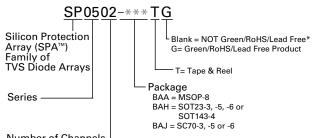
#### SP0506BAATG - MSOP-8

Recommended Pad Layout



Package	MSOP			
Pins	8			
JEDEC		MO	-187	
	Millin	neters	Inc	hes
	Min	Max	Min	Max
D	2.90	3.10	0.114	.122
E	4.78	4.98	.188	.196
E1	2.90	3.10	.114	.122
Α	0.87	1.17	.034	.046
A1	0.05	0.25	.002	0.010
В	-	0.30TYP	-	0.012TYP
С	-	0.65TYP	-	0.026TYP
L1	0.52	0.54	0.020	0.021
L2	-	0.18TYP	-	.007TYP
F	-	5.28	-	.208
F1	-	4.24	-	.167
G	-	0.65	-	0.026
Н	-	0.38	-	.015

### **Part Numbering System**



### Number of Channels

02 = 2 channel (SC70-3, SOT23 packages)

03 = 3 channel (SOT143 package) 04 = 4 channel (SC70-5, SOT23-5 package) 05 = 5 channel (SC70-6, SOT23-6 packages)

06 = 6 channel (MSOP-8 package)

#### **Ordering Information**

\*NOTE: To order NON-Green/RoHS/Lead Free version of product, remove "G" at the end of part number.

Part Number	СН	Package Type	Quantity Per Reel
SP0502BAHTG	2	SOT23-3	3000
SP0503BAHTG	3	SOT143-4	3000
SP0504BAHTG	4	SOT23-5	3000
SP0505BAHTG	5	SOT23-6	3000
SP0506BAATG	6	MSOP-8	4000
SP0502BAJTG	2	SC70-3	3000
SP0504BAJTG	4	SC70-5	3000
SP0505BAJTG	5	SC70-6	3000

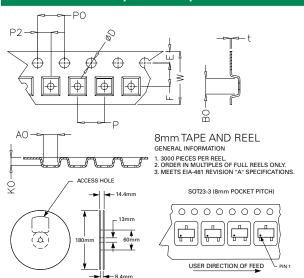
#### **Product Characteristics**

Lead Plating	"G" Green version - Matte Tin (Sn)		
Lead Material	Copper / Iron Alloy		
Lead Coplanarity	0.004 inches (0.102mm)		
Substitute Material	Silicon		
Body Material	Molded Epoxy		
Flammability	UL 94 V-0		

- 1. All dimensions are in millimeters.
- 2. Dimensions include solder plating.
- 3. Dimensions are exclusive of mold flash & metal burr.
- 4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
- 5. Package surface matte finish VDI 11-13.

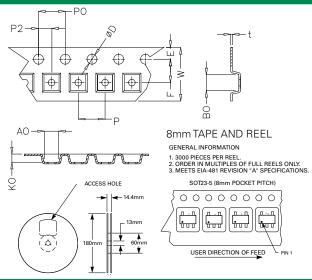


#### Embossed Carrier Tape & Reel Specification — SOT23-3



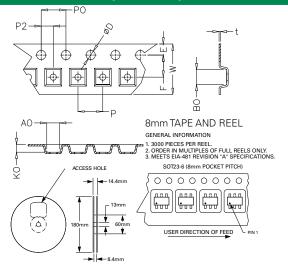
	8.4:11:			
Symbol	Millimetres		Inches	
Cymbol	Min	Max	Min	Max
E	1.65	1.85	0.065	0.073
F	3.40	3.60	0.134	0.142
P2	1.90	2.10	0.075	0.083
D	1.40	1.60	0.055	0.063
P0	3.90	4.10	0.154	0.161
W	7.70	8.30	0.303	0.327
P	3.90	4.10	0.154	0.161
A0	3.05	3.25	0.120	0.128
В0	2.67	2.87	0.105	0.113
K0	1.12	1.32	0.044	0.052
t	0.22	0.24	0.009	0.009

#### Embossed Carrier Tape & Reel Specification — SOT23-5



Symbol	Millimetres		Inches	
Syllibol	Min	Max	Min	Max
E	1.65	1.85	0.065	0.073
F	3.40	3.60	0.134	0.142
P2	1.90	2.10	0.075	0.083
D	1.40	1.60	0.055	0.063
P0	3.90	4.10	0.154	0.161
w	7.70	8.30	0.303	0.327
Р	3.90	4.10	0.154	0.161
Α0	3.05	3.25	0.120	0.128
В0	2.67	2.87	0.105	0.113
K0	1.12	1.32	0.044	0.052
t	0.22	0.24	0.009	0.009

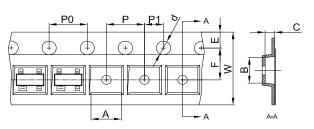
#### Embossed Carrier Tape & Reel Specification — SOT23-6

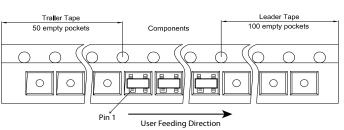


Symbol	Millimetres		Inches	
Syllibol	Min	Max	Min	Max
E	1.65	1.85	0.065	0.073
F	3.40	3.60	0.134	0.142
P2	1.90	2.10	0.075	0.083
D	1.40	1.60	0.055	0.063
P0	3.90	4.10	0.154	0.161
W	7.70	8.30	0.303	0.327
P	3.90	4.10	0.154	0.161
Α0	3.05	3.25	0.120	0.128
В0	2.67	2.87	0.105	0.113
K0	1.12	1.32	0.044	0.052
t	0.22	0.24	0.009	0.009

General Purpose ESD Protection - SP05 Series

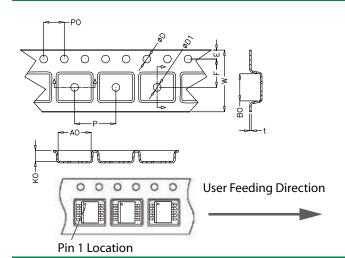
# Embossed Carrier Tape & Reel Specification — SOT143-4





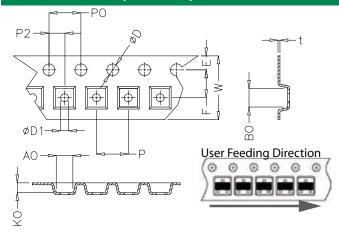
0	Millimetres		Incl	hes
Symbol	Min	Max	Min	Max
Α	3.09	3.09	0.122	0.130
В	2.70	2.90	1.106	0.114
С	1.21	1.41	0.048	0.056
d	1.40	1.60	0.055	0.102
E	1.65	0.85	0.065	0.073
F	3.45	3.65	0.133	0.142
P0	4.10	3.90	0.154	0.161
Р	4.10	3.90	0.154	0.161
P1	1.90	2.10	0.075	0.083
w	7.90	8.10	0.311	0.319

### Embossed Carrier Tape & Reel Specification — MSOP-8



	Millimetres		Inches	
	Min	Max	Min	Max
Е	1.65	1.85	0.065	0.073
F	5.40	5.60	0.213	0.220
D	1.50	1.60	0.059	0.063
D1	1.50 Min		0.059 Min	
P0	3.90	4.10	0.154	0.161
W	11.70	12.30	0.461	0.484
Р	7.90	8.10	0.311	0.319
A0	5.20	5.40	0.205	0.213
В0	3.30	3.40	0.126	0.134
K0	1.20	1.40	0.047	0.055
t	0.30 +/- 0.05		0.012+/	<i>'</i> - 0.002

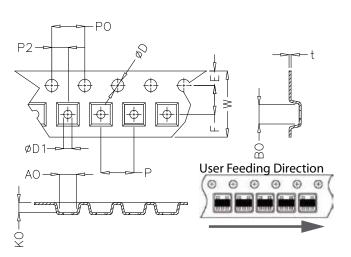
### Embossed Carrier Tape & Reel Specification — SC70-3



Symbol	Millimetres		Inches	
Syllibol	Min	Max	Min	Max
E	1.65	1.85	0.064	0.073
F	3.45	3.55	0.135	0.139
P2	1.95	2.05	0.077	0.081
D	1.40	1.60	0.055	0.063
D1	1.00	1.25	0.039	0.049
P0	3.90	4.10	0.154	0.161
W	7.70	8.10	0.303	0.318
Р	3.90	4.10	0.153	0.161
A0	2.14	2.34	0.084	0.092
В0	2.24	2.44	0.088	0.096
K0	1.12	1.32	0.044	0.052
t	0.27 Max		0.010	Max

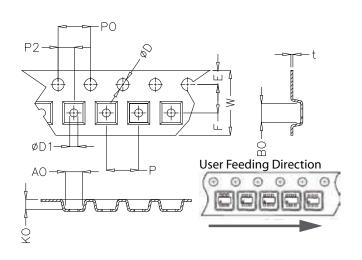


## **Embossed Carrier Tape & Reel Specification — SC70-5**



Cymbal	Millimetres		Inches	
Symbol	Min	Max	Min	Max
E	1.65	1.85	0.064	0.073
F	3.45	3.55	0.135	0.139
P2	1.95	2.05	0.077	0.081
D	1.40	1.60	0.055	0.063
D1	1.00	1.25	0.039	0.049
P0	3.90	4.10	0.154	0.161
W	7.70	8.10	0.303	0.318
Р	3.90	4.10	0.153	0.161
A0	2.14	2.34	0.084	0.092
В0	2.24	2.44	0.088	0.096
K0	1.12	1.32	0.044	0.052
t	0.27 Max		0.010	Max

### Embossed Carrier Tape & Reel Specification — SC70--6



Cumphal	Millimetres		Inches	
Symbol	Min	Max	Min	Max
E	1.65	1.85	0.064	0.073
F	3.45	3.55	0.135	0.139
P2	1.95	2.05	0.077	0.081
D	1.40	1.60	0.055	0.063
D1	1.00	1.25	0.039	0.049
P0	3.90	4.10	0.154	0.161
W	7.70	8.10	0.303	0.318
Р	3.90	4.10	0.153	0.161
A0	2.14	2.34	0.084	0.092
В0	2.24	2.44	0.088	0.096
K0	1.12	1.32	0.044	0.052
t	0.27 Max		0.010	Max