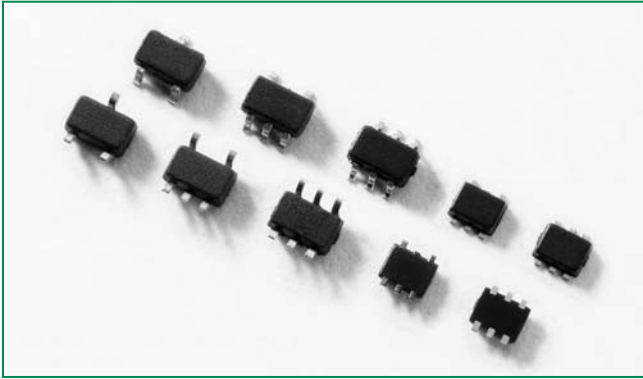




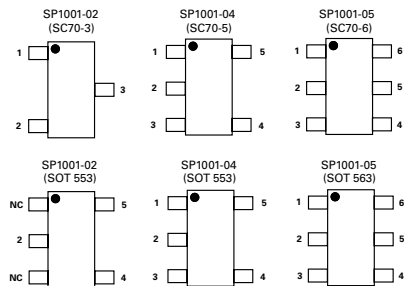
SP1001 Lead-Free/Green Series



Description

Zener diodes fabricated in a proprietary silicon avalanche technology protect each I/O pin to provide a high level of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes at the maximum level specified in the IEC 61000-4-2 international standard (Level 4, 8kV contact discharge) without performance degradation. Their very low loading capacitance also makes them ideal for protecting high-speed signal pins.

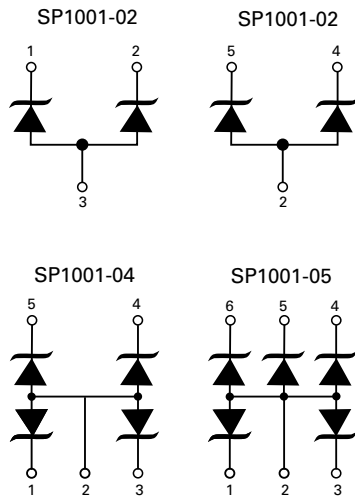
Pinout



Features

- Low capacitance of 8pF (TYP) per I/O
- ESD protection of 8kV contact discharge, 15kV air discharge, (Level 4, IEC61000-4-2)
- EFT protection, IEC61000-4-4, 40A (5/50 ns)
- Low leakage current of 0.5μA (MAX) at 5V
- Small package saves board space
- Lightning Protection, IEC61000-4-5, 2.5A (8/μs)

Functional Block Diagram



Applications

- Computer Peripherals
- Mobile Phones
- Digital Cameras
- Desktops/Notebooks
- LCD/PDPTVs
- Set Top Boxes
- DVD Players
- MP3/PMP

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_P	Peak Current ($t_p=8/20\mu s$)	2	A
T_{OP}	Operating Temperature	-40 to 85	°C
T_{STOR}	Storage Temperature	-60 to 150	°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Thermal Information

Parameter	Rating	Units
Storage Temperature Range	-65 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 10s)	300	°C

Electrical Characteristics ($T_{OP} = 25^\circ\text{C}$)

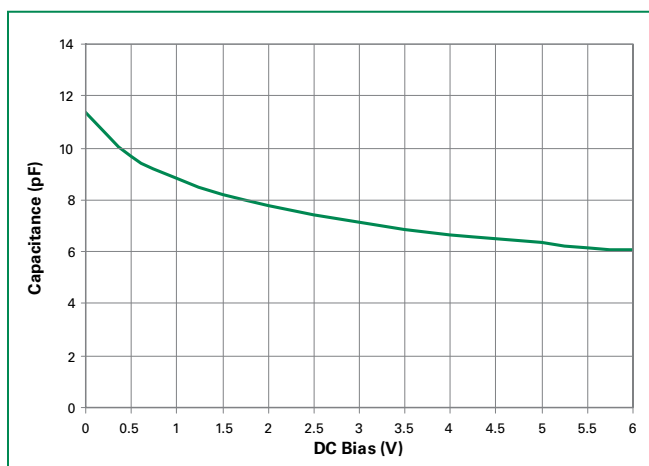
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Forward Voltage Drop	V_F	$I_F=10\text{mA}$	0.7	0.9	1.2	V
Reverse Voltage Drop	V_R	$I_R=10\text{mA}$	6.0	6.7	8.0	V
Reverse Standoff	V_{RWM}	$I_R \leq 1\mu\text{A}$			5.5	V
Reverse Leakage Current	I_{LEAK}	$V_R=5\text{V}$			0.5	μA
Clamp Voltage ¹	V_C	$I_{PP}=1\text{A}$, $t_p=8/20\mu s$, Fwd		8.0	11.0	V
		$I_{PP}=2\text{A}$, $t_p=8/20\mu s$, Fwd		9.7	13.0	V
ESD Withstand Voltage ^{1,2}	V_{ESD}	IEC61000-4-2 (Contact)	± 8			kV
		IEC61000-4-2 (Air)	± 15			kV
Diode Capacitance ¹	C_D	Reverse Bias=0V		12		pF
		Reverse Bias=2.5V		8		pF
		Reverse Bias=5V		7		pF

Notes:

¹ Parameter is guaranteed by device characterization

² A minimum of 1,000 ESD pulses are applied at 1s intervals between the anode and common cathode of each diode

Capacitance vs. Reverse Bias

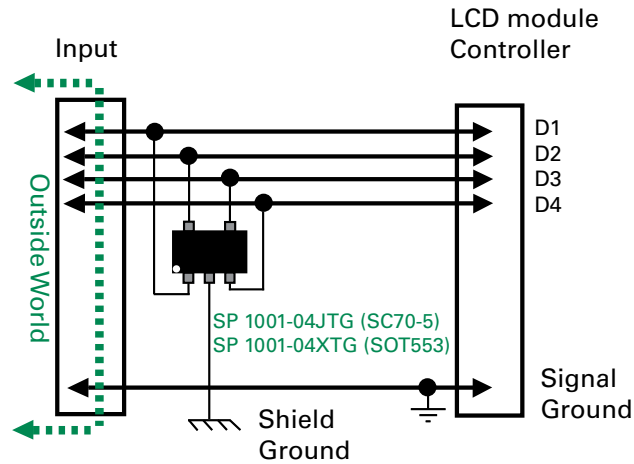


Design Consideration

Because of the fast rise-time of the ESD transient, placement of ESD devices is a key design consideration. To achieve optimal ESD suppression, the devices should be placed on the circuit board as close to the source of the ESD transient as possible. Install the ESD suppressors

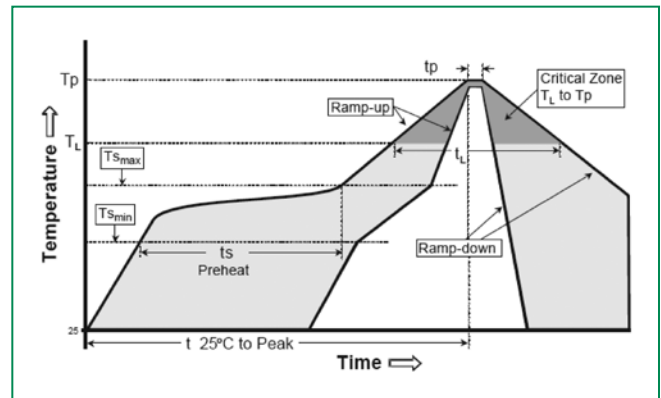
directly behind the connector so that they are the first board-level circuit component encountered by the ESD transient. They are connected from signal/data line to ground.

Application Example

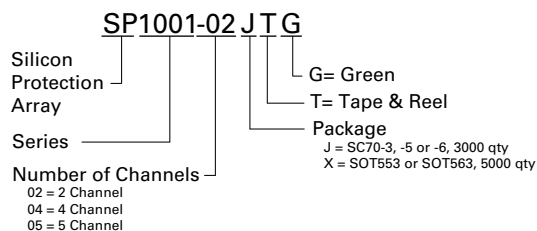


Soldering Parameters

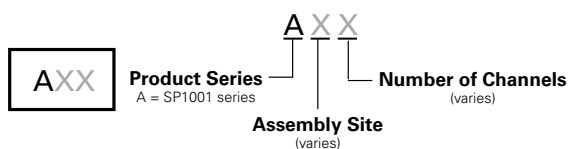
Reflow Condition		Pb – Free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 180 secs
Average ramp up rate (Liquidus) Temp (T_L) to peak		3°C/second max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Temperature (t_L)	60 – 150 seconds
Peak Temperature (T_p)		250 ^{+0/-5} °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_p)		8 minutes max.
Do not exceed		260°C



Part Numbering System



Part Marking System



Product Characteristics

Lead Plating	Matte Tin
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substitute Material	Silicon
Body Material	Molded Epoxy
Flammability	UL94-V-0

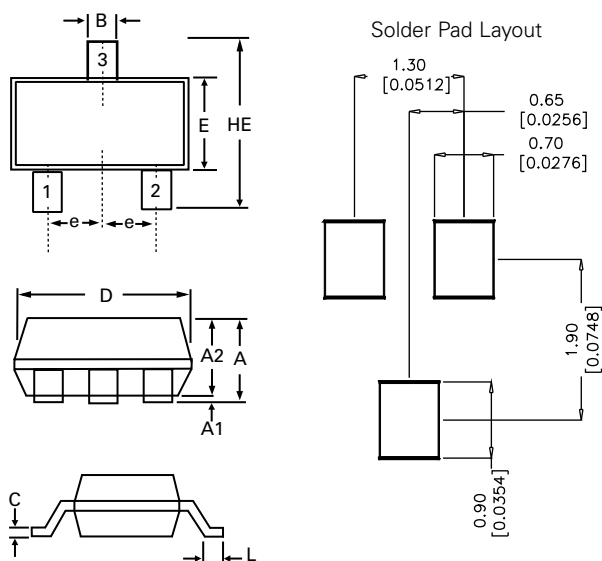
Notes :

1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. All specifications comply to JEDEC SPEC MO-203 Issue A
5. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
6. Package surface matte finish VDI 11-13.

Ordering Information

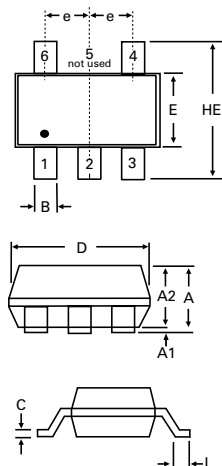
Part Number	Package	Marking	Min. Order Qty.
SP1001-02JT G	SC70-3	AX2	3000
SP1001-02XTG	SOT553	AX2	5000
SP1001-04JT G	SC70-5	AX4	3000
SP1001-04XTG	SOT553	AX4	5000
SP1001-05JT G	SC70-6	AX5	3000
SP1001-05XTG	SOT563	AX5	5000

Package Dimensions - SC70-3

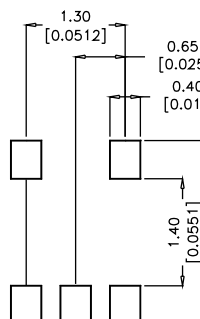


Package	SC70-3			
Pins	3			
JEDEC	MO-203 Issue A			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.80	1.10	0.031	0.043
A1	0.00	0.10	0.000	0.004
A2	0.70	1.00	0.028	0.039
B	0.15	0.30	0.006	0.012
c	0.08	0.25	0.003	0.010
D	1.85	2.25	0.073	0.089
E	1.15	1.35	0.045	0.053
e	0.66 BSC		0.026 BSC	
HE	2.00	2.40	0.079	0.094
L	0.26	0.46	0.010	0.018

Package Dimensions - SC70-5

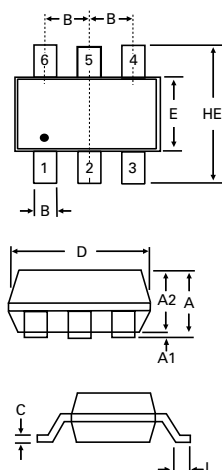


Solder Pad Layout

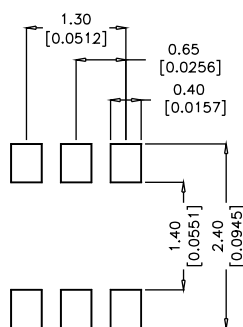


Package	SC70-5			
Pins	5			
JEDEC	MO-203 Issue A			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.80	1.10	0.031	0.043
A1	0.00	0.10	0.000	0.004
A2	0.70	1.00	0.028	0.039
B	0.15	0.30	0.006	0.012
c	0.08	0.25	0.003	0.010
D	1.85	2.25	0.073	0.089
E	1.15	1.35	0.045	0.053
e	0.65 BSC		0.026 BSC	
HE	2.00	2.40	0.079	0.094
L	0.26	0.46	0.010	0.018

Package Dimensions - SC70-6

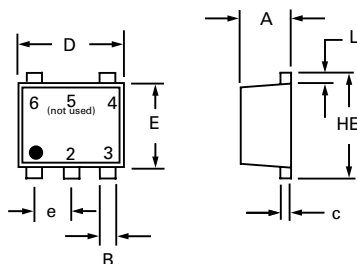


Solder Pad Layout

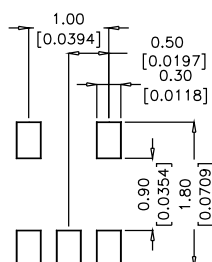


Package	SC70-6			
Pins	6			
JEDEC	MO-203 Issue A			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.80	1.10	0.031	0.043
A1	0.00	0.10	0.000	0.004
A2	0.70	1.00	0.028	0.039
B	0.15	0.30	0.006	0.012
c	0.08	0.25	0.003	0.010
D	1.85	2.25	0.073	0.089
E	1.15	1.35	0.045	0.053
e	0.65 BSC		0.026 BSC	
HE	2.00	2.40	0.079	0.094
L	0.26	0.46	0.010	0.018

Package Dimensions - SOT553

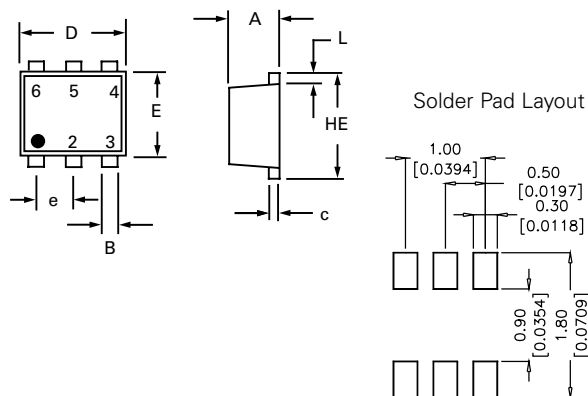


Solder Pad Layout



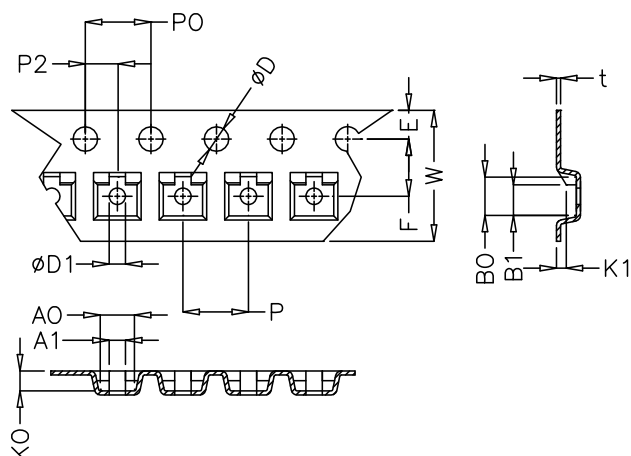
Package	SOT 553			
Pins	5			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.50	0.60	0.020	0.024
B	0.17	0.27	0.007	0.011
c	0.08	0.018	0.003	0.007
D	1.50	1.70	0.059	0.067
E	1.10	1.30	0.043	0.051
e	0.50 BSC		0.014 BSC	
L	0.10	0.30	0.004	0.012
HE	1.50	1.70	0.059	0.067

Package Dimensions - SOT563



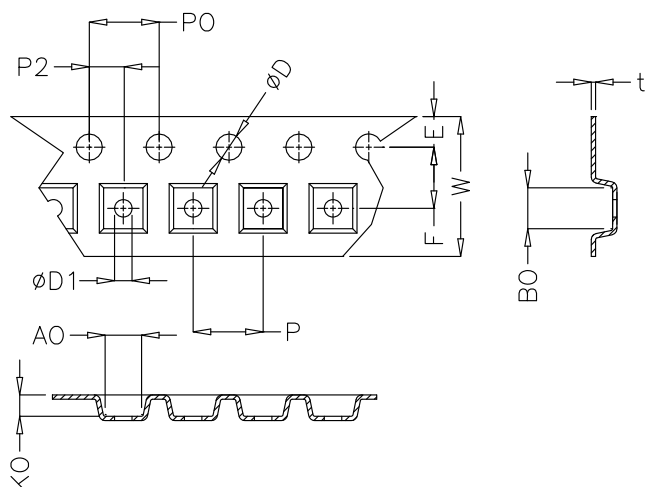
Package	SOT 563			
Pins	6			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.50	0.60	0.020	0.024
B	0.17	0.27	0.007	0.011
c	0.08	0.18	0.003	0.007
D	1.50	1.70	0.059	0.067
E	1.10	1.30	0.043	0.051
e	0.50 BSC		0.020 BSC	
L	0.10	0.30	0.004	0.012
HE	1.50	1.70	0.059	0.067

Embossed Carrier Tape & Reel Specification - SC70-3



Dimensions				
	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.065	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
10P0	40.0 +/- 0.20		1.574 +/- 0.008	
W	7.70	8.10	0.303	0.318
P	3.90	4.10	0.153	0.161
A0	2.30	2.50	0.090	0.098
A1	1.00 Ref		0.039 Ref	
B0	2.30	2.50	0.090	0.098
B1	1.90 Ref		0.074	
K0	1.10	1.30	0.043	0.051
K1	0.60 Ref		0.023 Ref	
t	0.27 max		0.010	

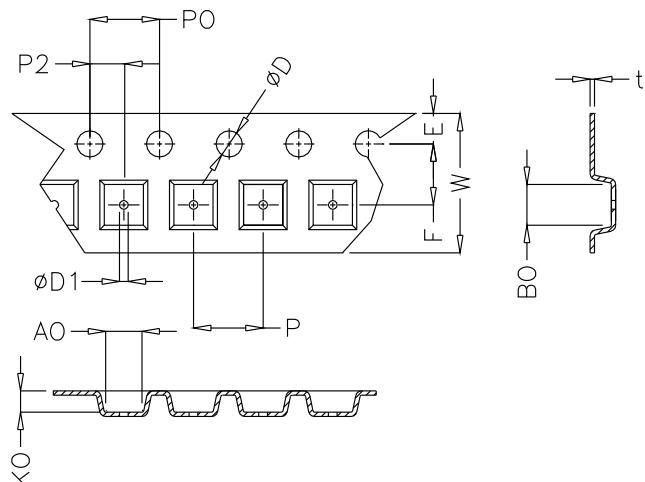
Embossed Carrier Tape & Reel Specification - SC70-5 and SC70-6



Dimensions

	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.065	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
10P0	40.0 +/- 0.20		1.574 +/- 0.008	
W	7.70	8.10	0.303	0.318
P	3.90	4.10	0.153	0.161
A0	2.14	2.34	0.084	0.092
B0	2.24	2.44	0.088	0.096
K0	1.12	1.32	0.044	0.051
t	0.27 max		0.010 max	

Embossed Carrier Tape & Reel Specification - SOT553 and SOT563



Dimensions

	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.065	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	0.45	0.55	0.017	0.021
P0	3.90	4.1	0.154	0.161
10P0	40.0 +/- 0.20		1.574 +/- 0.008	
W	7.70	8.10	0.303	0.318
P	3.90	4.10	0.153	0.161
A0	1.73	1.83	0.068	0.072
B0	1.73	1.83	0.068	0.072
K0	0.64	0.74	0.025	0.029
t	0.22 max		0.010 max	

Lead-Free/Green SP1001