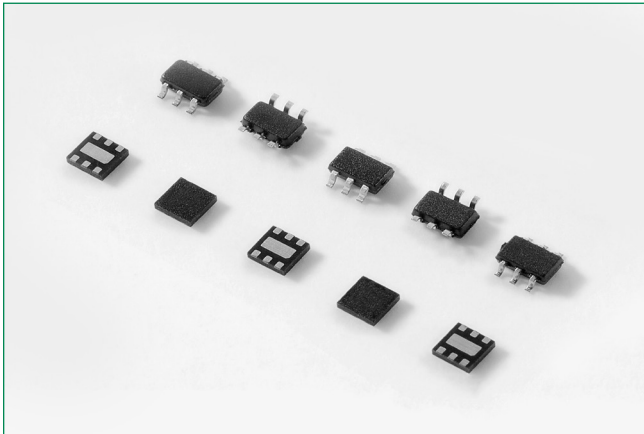


SP3002 Series

Low Capacitance ESD Protection



Additional Information



Resources

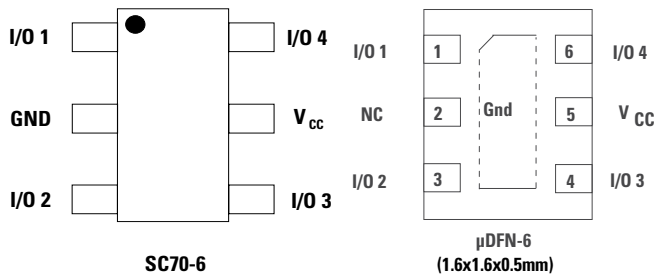


Accessories

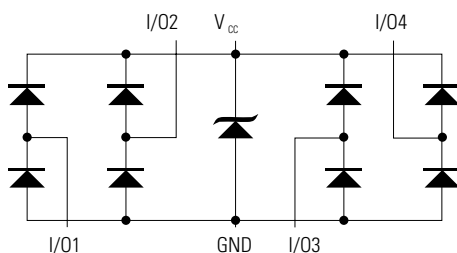


Samples

Pinout



Functional Block Diagram



Description

The SP3002 has ultra low capacitance rail-to-rail diodes with an additional zener diode fabricated in a proprietary silicon avalanche technology to protect each I/O pin providing 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 (Level 4) specified in the IEC 61000-4-2 international standard without performance degradation. Their very low loading capacitance also makes them ideal for protecting high speed signal pins such as HDMI, DVI, USB2.0, and IEEE 1394.

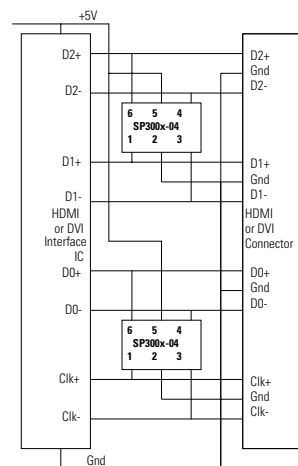
Features & Benefits

- Low capacitance of 0.85 pF (TYP) per I/O
- ESD protection of ±12kV contact discharge, ±15kV air discharge, (IEC 61000-4-2)
- EFT protection, IEC 61000-4-4, 40A (5/50ns)
- Low leakage current of 0.5μA (MAX) at 5V
- Small packaging options saves board space
- Lightning Protection, IEC 61000-4-5, 2nd edition 4.5A (8/20μs)
- Halogen free, lead free and RoHS compliant
- AEC-Q101 qualified

Applications

- Computer Peripherals
- Mobile Phones
- PDAs
- Digital Cameras
- Network Hardware/Ports
- Test Equipment
- Medical Equipment

Application Example



A single 4 channel SP300x-04 device can be used to protect four of the data lines in a HDMI/DVI interface. Two (2) SP300x-04 devices provide protection for the main data lines. Low voltage ASIC HDMI/DVI drivers can also be protected with the SP300x-04, the +V_{CC} pins on the SP300x-04 can be substituted with a suitable bypass capacitor or in some backdrive applications the +V_{CC} of the SP300x-04 can be floated or NC.

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.

SP3002 Series

Low Capacitance ESD Protection

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current ($t_p=8/20\mu s$)	4.5	A
T_{OP}	Operating Temperature	-40 to 125	°C
T_{STOR}	Storage Temperature	-55 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

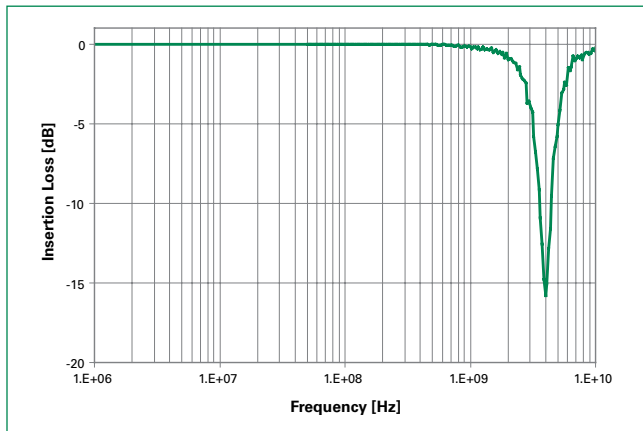
Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

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

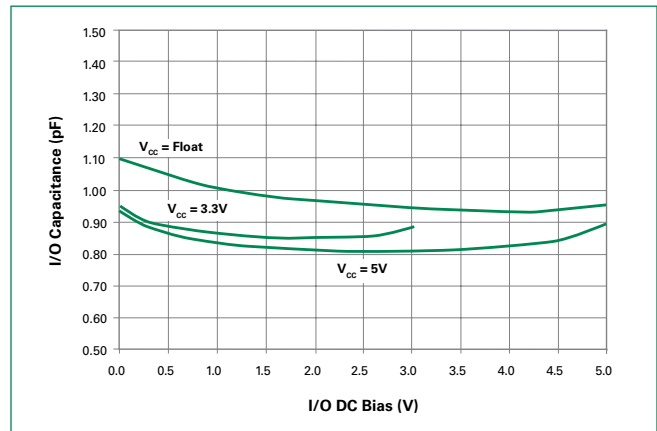
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	$I_R \leq 1\mu A$			6.0	V
Reverse Leakage Current	I_{LEAK}	$V_R=5V$			0.5	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s, Fwd$		9.5	11.0	V
		$I_{PP}=2A, t_p=8/20\mu s, Fwd$		10.6	13.0	V
ESD Withstand Voltage ¹	V_{ESD}	IEC61000-4-2 (Contact)	± 12			kV
		IEC61000-4-2 (Air)	± 15			kV
Diode Capacitance ¹	$C_{I/O-GND}$	Reverse Bias=0V	0.95	1.1	1.25	pF
		Reverse Bias=1.65V	0.7	0.85	1.0	pF
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V		0.5		pF

Note: 1. Parameter is guaranteed by design and/or device characterization.

Insertion Loss (S21) I/O to GND



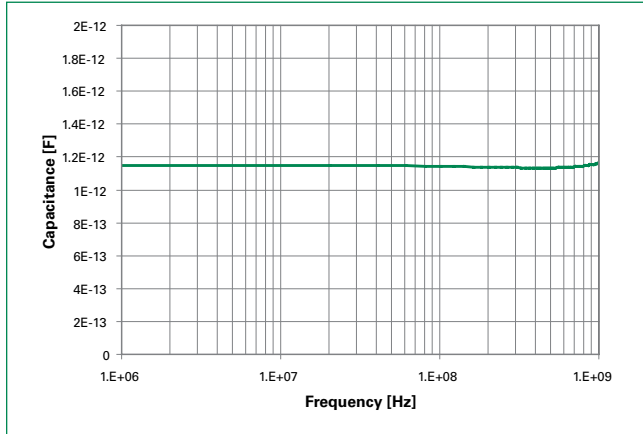
Capacitance vs. Bias Voltage



SP3002 Series

Low Capacitance ESD Protection

Capacitance vs. Frequency

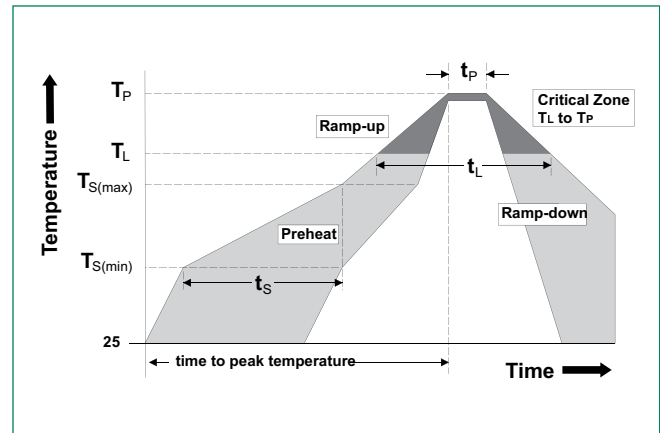


Product Characteristics

Lead Plating	SC70: Matte Tin μDFN: Pre-Plated Frame
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substrate Material	Silicon
Body Material	Molded Epoxy
Flammability	UL Recognized compound meeting flammability rating V-0

Soldering Parameters

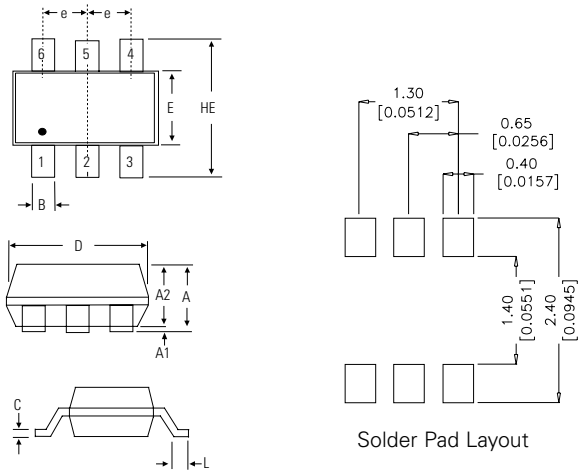
Reflow Condition	Pb – Free assembly	
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 120 secs
Average ramp up rate (Liquidus) Temp (T_L) to peak	3°C/second max	
$T_{s(max)}$ to T_L - Ramp-up Rate	3°C/second max	
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Temperature (t_L)	60 – 150 seconds
Peak Temperature (T_p)	260 ^{+0/-5} °C	
Time within 5°C of actual peak Temperature (t_p)	30 seconds	
Ramp-down Rate	6°C/second max	
Time 25°C to peak Temperature (T_p)	8 minutes Max.	
Do not exceed	260°C	



SP3002 Series

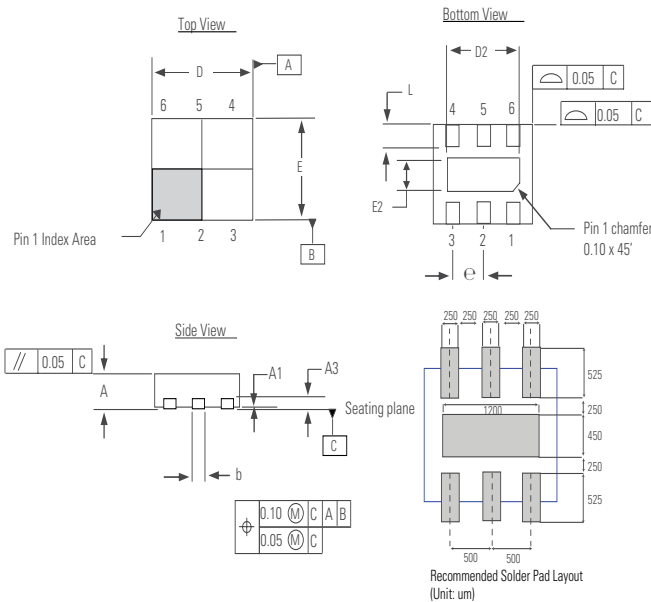
Low Capacitance ESD Protection

Package Dimensions — SC70-6



Package	SC70-6			
Pins	6			
JEDEC	MO-203			
Symbol	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 — μ DFN-6 (1.6x1.6x0.5mm)

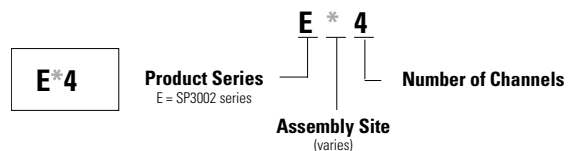


Package	μ DFN-6 (1.6x1.6x0.5mm)			
JEDEC	MO-229			
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.45	0.55	0.018	0.022
A1	0.00	0.05	0.000	0.002
A3	0.127 Ref		0.005 Ref	
b	0.20	0.30	0.008	0.012
D	1.50	1.70	0.060	0.067
D2	1.05	1.30	0.042	0.052
E	1.50	1.70	0.060	0.067
E2	0.40	0.65	0.016	0.026
e	0.50 Ref		0.020 Ref	
L	0.25	0.40	0.010	0.016

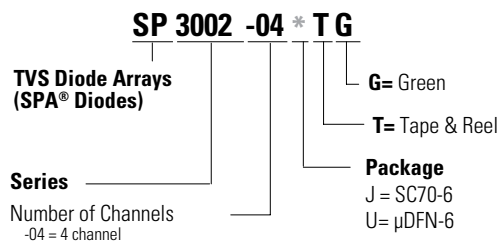
Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SP3002-04JTG	SC70-6	E*4	3000
SP3002-04UTG	μ DFN-6 (1.6x1.6x0.5mm)	E*4	3000

Part Marking System



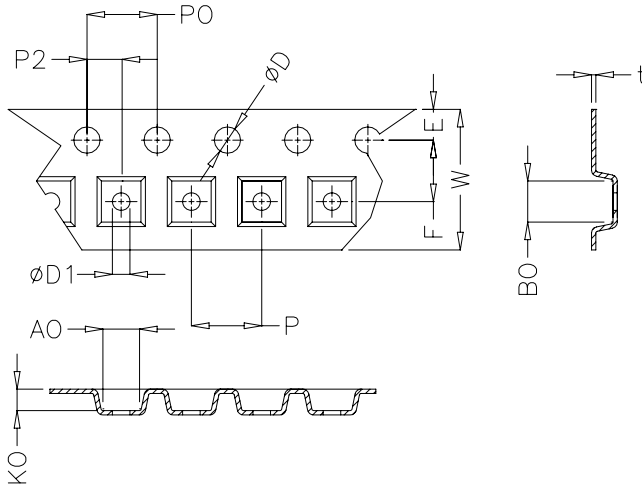
Part Numbering System



SP3002 Series

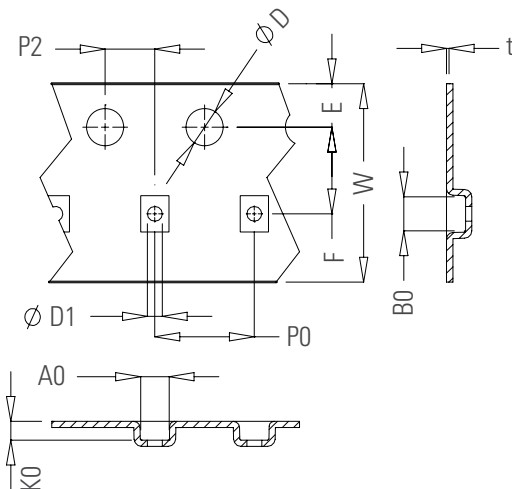
Low Capacitance ESD Protection

Embossed Carrier Tape & Reel Specification – SC70-6



Symbol	Millimetres		Inches	
	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
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	0.052
t	0.27 Max		0.010 Max	

Embossed Carrier Tape & Reel Specification – μ DFN-6 (1.6x1.6x0.5mm)



Symbol	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.06	0.07
F	3.45	3.55	0.14	0.14
D1	1.00	1.25	0.04	0.05
D	1.50 MIN		0.06 MIN	
P0	3.90	4.10	0.15	0.16
10P0	40.0± 0.20		1.57±0.01	
W	7.90	8.30	0.31	0.33
P2	1.95	2.05	0.08	0.08
A0	1.78	1.88	0.07	0.07
B0	1.78	1.88	0.07	0.07
K0	0.84	0.94	0.03	0.04
t	0.25 TYP		0.01 TYP	

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.