

SP4020 Series

2.5pF, 30A Discrete TVS Diode



Web Resources



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Pinout



Description

The SP4020 components integrate low capacitance steering diodes with one or two avalanche breakdown diodes for unidirectional or bidirectional protection, respectively, to protect against ESD and lightning induced surge events. These devices can safely absorb up to 30A per IEC 61000-4-5, 2nd Edition ($t_p=8/20\mu s$) without performance degradation and a minimum $\pm 30kV$ ESD per IEC 61000-4-2 International Standard. The low loading capacitance and high surge capability make it ideal for protecting telecommunication ports such as Ethernet and other high speed data interfaces.

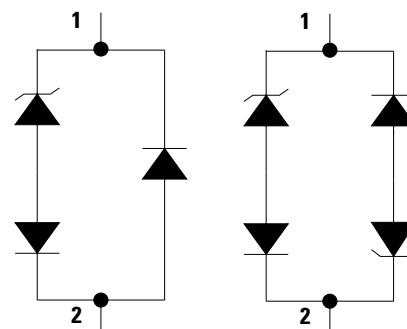
Features & Benefits

- ESD, IEC 61000-4-2, $\pm 30kV$ contact, $\pm 30kV$ air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, 30A (8/20 as defined in IEC 61000-4-5 2nd edition)
- Low capacitance of 2.5pF (@ $V_R=0V$)
- Low leakage current of 0.1 μA at 3.3V
- Unidirectional and Bidirectional configuration
- Small SOD323 package fits 0805 footprints
- Moisture Sensitivity Level (MSL-1)
- AEC-Q101 Qualified
- Halogen-Free, Lead-Free and RoHS-Compliant

Applications

- 10/100/1000 Ethernet
- T1/E1/T3/E3
- USB 1.1/2.0
- USB 3.0/3.1
- Power Ports
- Computers and Peripherals
- Instrumentation
- Medical Equipment

Functional Block Diagram



Unidirectional
SP4020-01FTG

Bidirectional
SP4020-01FTG-C

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.

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current ($t_p=8/20\mu s$)	30	A
P_{PK}	Peak Pulse Power ($t_p=8/20\mu s$)	750	W
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 component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

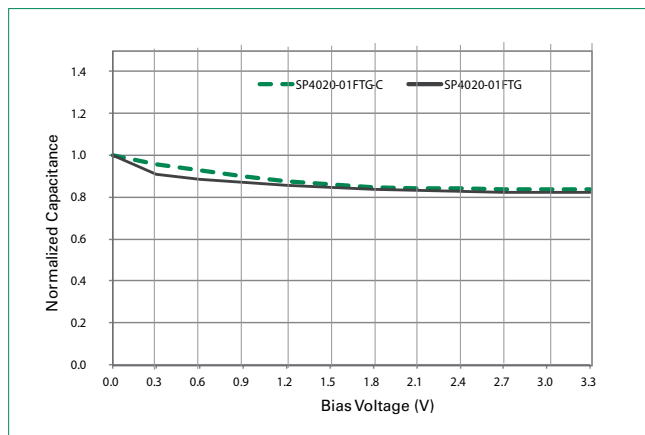
Electrical Characteristics ($T_{OP}=25^\circ C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Breakdown Voltage	V_{BR}	$I_R=2\mu A$	3.5			V
Reverse Standoff Voltage	V_{RWM}	$I_R=1\mu A$			3.3	V
Reverse Leakage Current	I_{LEAK}	$V_R=3.3V$		0.1	0.5	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A, t_p=8/20\mu s$		6.6		V
		$I_{PP}=10A, t_p=8/20\mu s$		14.2		V
		$I_{PP}=24A, t_p=8/20\mu s$		21.8		V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p=100ns$, I/O to GND		0.40		Ω
ESD Withstand Voltage ¹	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 30			kV
		IEC 61000-4-2 (Air Discharge)	± 30			kV
Diode Capacitance ¹	C_D	Reverse Bias=0V, $f=1MHz$		2.5		pF

Note:

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

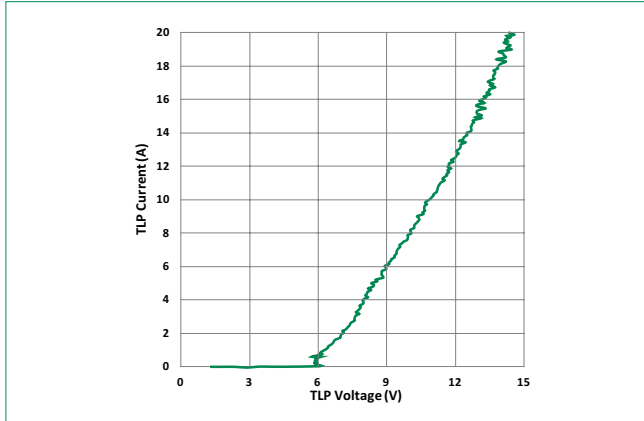
Normalized Capacitance vs. Bias Voltage



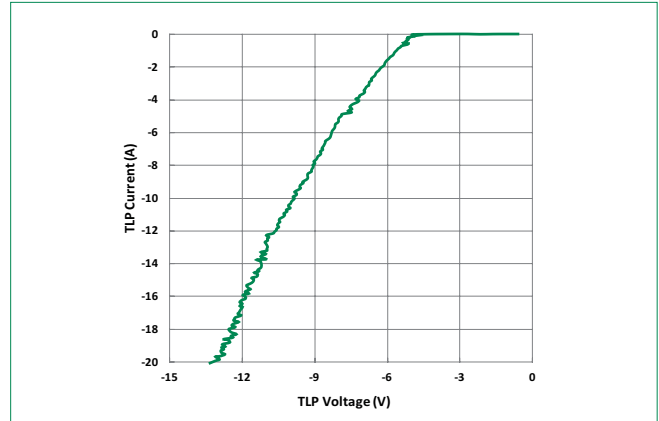
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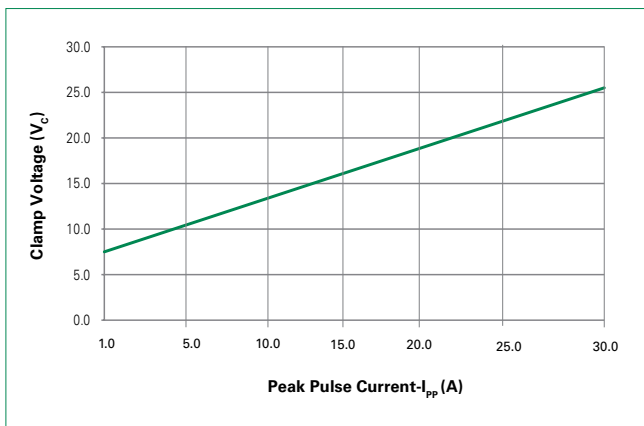
Positive Transmission Line Pulsing (TLP) Plot



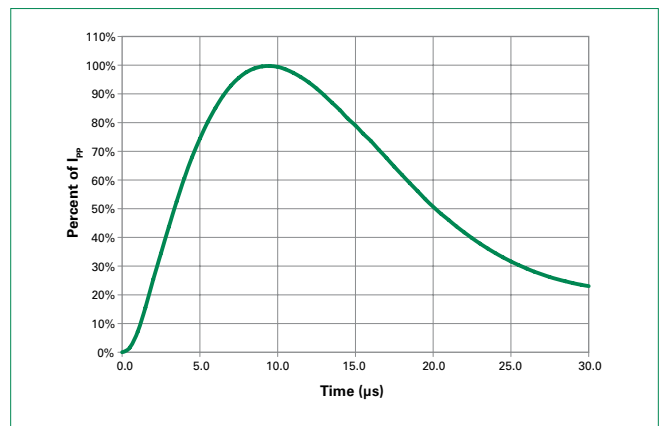
Negative Transmission Line Pulsing (TLP) Plot



Clamping Voltage vs. IPP



8/20 Pulse Waveform

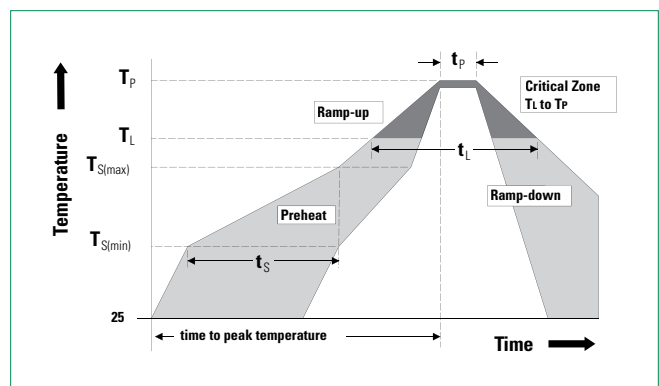


Soldering Parameters

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

Product Characteristics

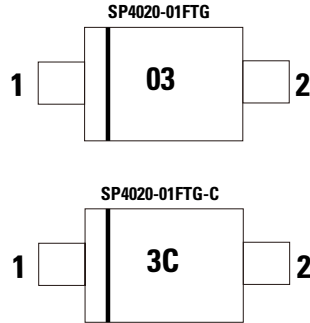
Lead Plating	Matte Tin
Lead Material	Alloy 42
Lead Coplanarity	0.0004 inches (0.102mm)
Substrate Material	Silicon
Body Material	Molded Compound
Flammability	UL Recognized compound meeting flammability rating V-0



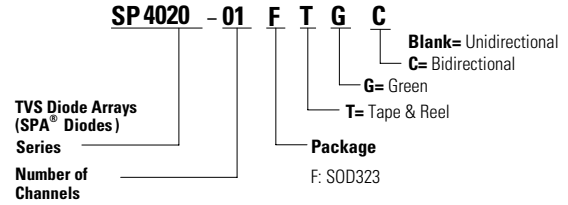
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Part Marking System



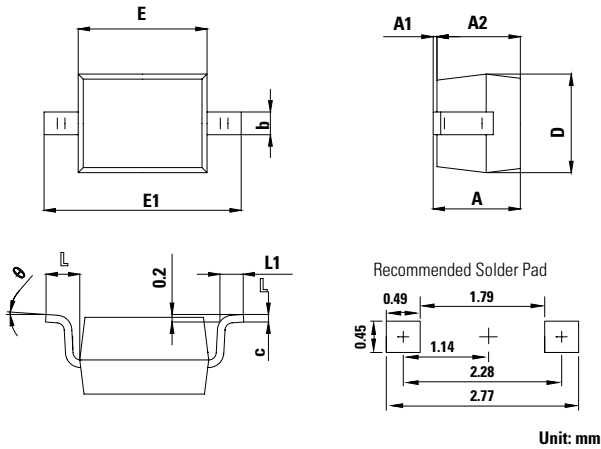
Part Numbering System



Ordering Information

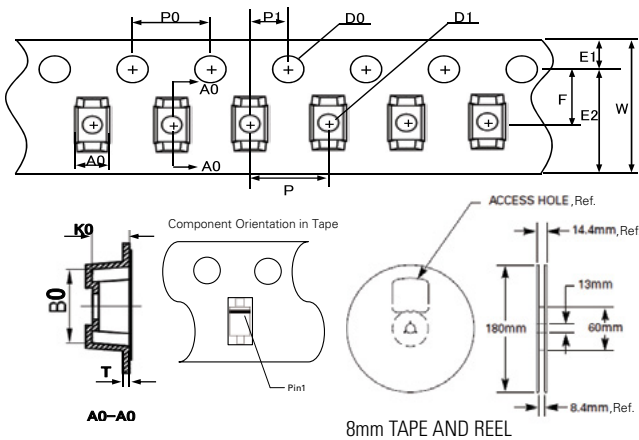
Part Number	Package	Min. Order Qty.
SP4020-01FTG	SOD323	3000
SP4020-01FTG-C	SOD323	3000

Package Dimensions -SOD323



Symbol	SOD323			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.8	1.00	0.031	0.039
A1	0.00	0.10	0.000	0.004
A2	0.80	0.90	0.031	0.035
b	0.25	0.35	0.010	0.014
c	0.08	0.15	0.003	0.006
D	1.20	1.40	0.047	0.055
E	1.60	1.80	0.063	0.071
E1	2.50	2.75	0.098	0.108
L1	0.22	0.40	0.009	0.016

Embossed Carrier Tape & Reel Specification — SOD323



Symbol	Millimeters
A0	1.46+/-0.10
B0	2.90+/-0.10
W	8.0+0.3/-0.10
D0	1.50+0.10
D1	0.45min/1.15max
E1	1.75+/-0.10
E2	-
F	3.50+/-0.10
P0	4.00+/-0.10
P	4.00+/-0.10
P1	2.00+/-0.05
K0	1.25+/-0.10
T	0.254+/-0.02

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