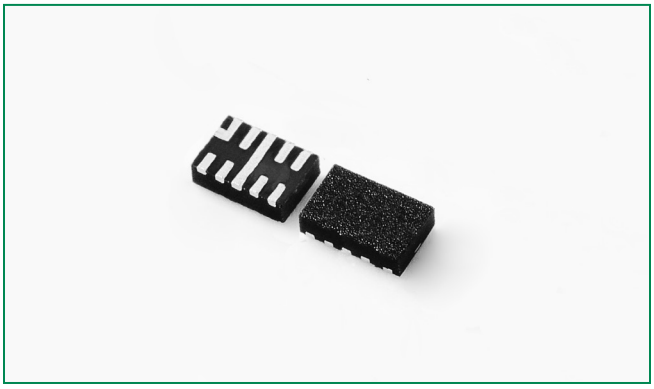
TVS Diode Arrays (SPA® Diodes)

Low Capacitance ESD Protection - SP5003 Series

SP5003 Series 4 Channel Common Mode Filter

AUTOMOTIVE GRADE | RoHS | Pb GREEN

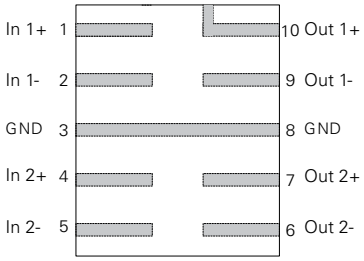


Description

The SP5003 Series is a highly integrated Common Mode Filter (CMF) providing both ESD protection and EMI common mode noise filtering for systems using high speed differential serial interfaces, such as MIPI D-PHY or HDMI.

The SP5003 Series can protect and filter two differential line pairs in a small RoHS-compliant TDFN-10 package, with cost and space savings over discrete solutions.

Pinout

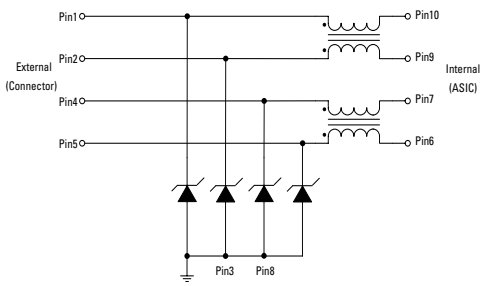


Note :This drawing is not to scale.

Features

- Large differential bandwidth > 4.0 GHz
- High Common Mode Stop Band Attenuation: > 16 dB at 900 MHz
- Common Mode Imped ance: Zc: 32Ω at 100 MHz
- TDFN-10 2.50mm × 2.00mm × 0.75mm package with 0.50mm lead pitch
- ±15kV ESD protection per channel (IEC 61000-4-2 Level 4, contact discharge)
- RoHS-compliant, Lead-free packaging
- AEC-Q101 qualified
- Moisture Sensitivity Level (MSL-1)

Functional Block Diagram



Applications

- HDMI/DVI Display in Mobile Phones
- MIPI D-PHY (CSI-2, DSI, etc) in Mobile Phones and Digital Still Cameras

Revised: 08/30/17

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{DC}	DC Current Per Line	100	mA
P_{DC}	DC Package Power Rating	0.5	Watts
T_{OP}	Operating Temperature	-40 to 125	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

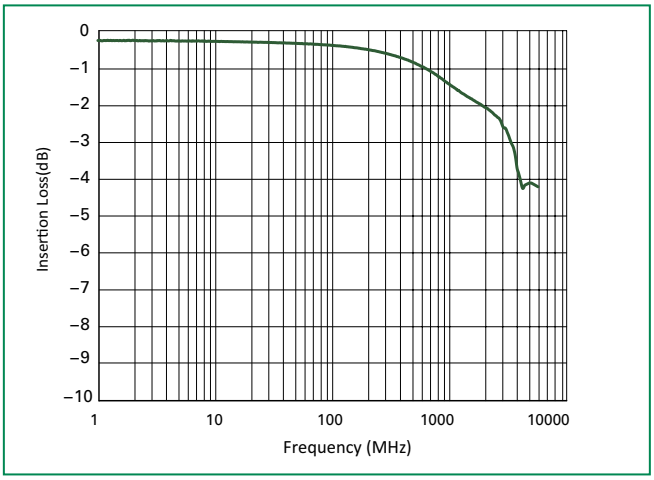
CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics (T_{OP}=25°C)

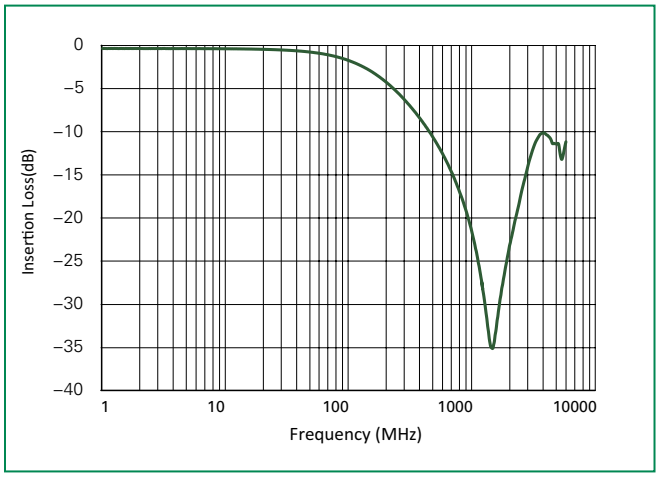
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Channel Resistance	R_{CH}	Pins 1–10, 2–9, 4–7 and 5–6		3.5	5.0	Ω
Total Channel Capacitance	C_{TOTAL}	$V_{I/O}$ = 1.65VDC Reverse Bias; f=1MHz, 30mV_{AC}		0.8	1.3	pF
Reverse Standoff Voltage	V_{RWM}				5.0	V
Breakdown Voltage	V_{BR}	I_T=1mA	6.0	8.0	10.0	V
Forward Voltage at I_F	V_F	I_F=1mA	0.4	0.7	1.5	V
Reverse Leakage Current	I_{LEAK}	V_{Leak}=+3.3V		0.01	0.10	µA
Dynamic Resistance[2,3]	R_{DYN}	Positive (tp=8/20µs)		1.36		Ω
		Negative (tp=8/20µs)		0.6		
		TLP, tp=100ns, I/O to GND		0.42		
ESD Withstand Voltage[1,2]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±15			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Differential Mode Cutoff Frequency[2]	F_{3dB}	Z_{SOURCE}=50 Ω, Z_{LOAD}50 Ω		4.0		GHz
Common Mode Impedance	Z_C	@100MHz		32		Ω
Common Mode Stop Band Attenuation[2]	F_{atten}	f=900MHz		16		dB

Notes: [1] ESD zapping at I/O pins (1,2,4,5) with respect to GND.
[2] Guaranteed by design.
[3] Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

Differential Mode Attenuation vs. Frequency



Common Mode Attenuation vs. Frequency



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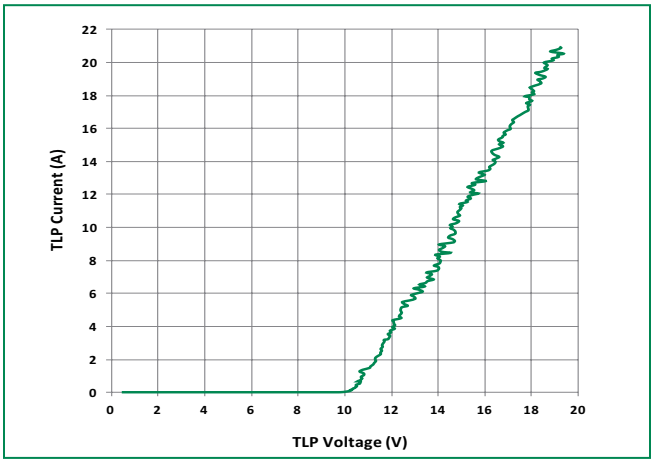
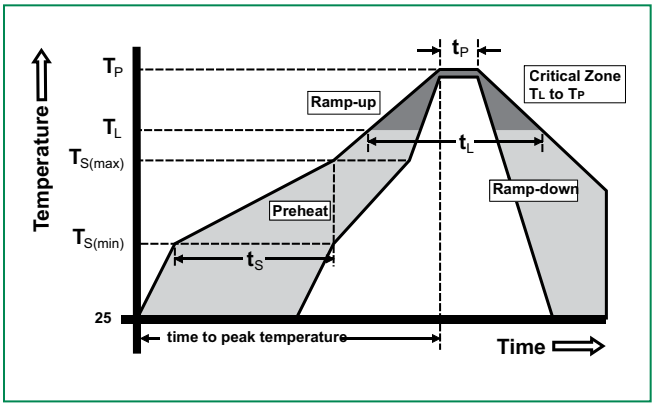
Transmission Line Pulsing (TLP) Plot





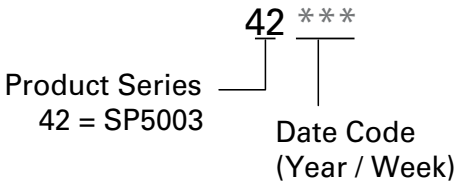
Soldering Parameters

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)		$260^{+0/-5}$ °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

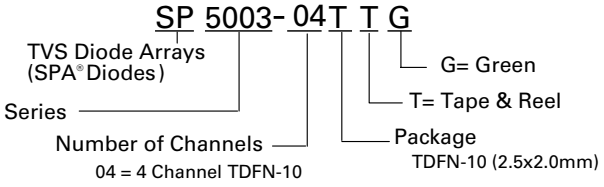
Ordering Information

Part Number	Package	Size	Marking	Min. Order Qty.
SP5003-04TTG	TDFN-10	2.5x2.0mm	42***	3000

Part Marking System



Part Numbering System



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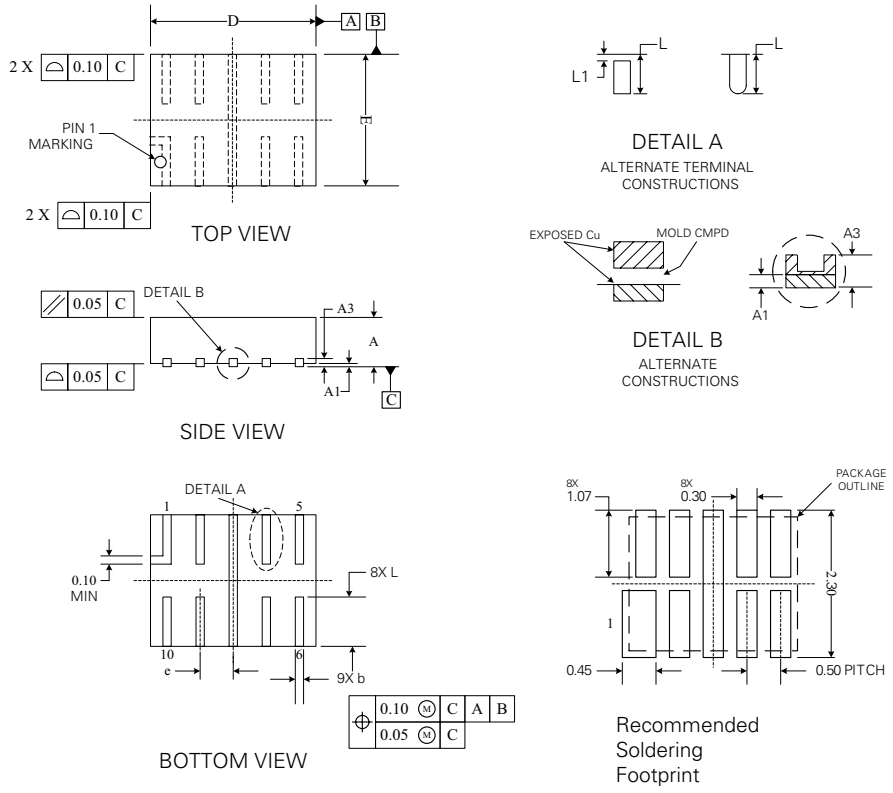
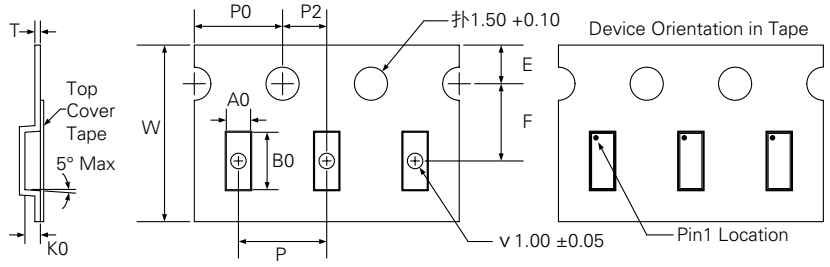
Package Dimensions —TDFN-10



	TDFN-10			
	JEDEC MO-229			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.70	0.80	0.028	0.031
A1	0.00	0.05	0.000	0.002
A3	0.2 REF		0.008 REF	
b	0.15	0.25	0.006	0.010
D	2.50 BSC		0.098 BSC	
E	2.00 BSC		0.079 BSC	
e	0.50 BSC		0.020 BSC	
L	0.70	0.90	0.028	0.035
L1	0.05	0.15	0.002	0.006

Tape & Reel Specification –TDFN-10



Symbol	Dimensions
	Millimetres
E	1.75+/- 0.10
F	3.5 +/- 0.05
P	4.0 +/- 0.10
P0	4.0 +/- 0.10
P2	2.0 +/- 0.05
W	8.00 +0.30/- 0.10
A0	2.19 +/- 0.05
B0	2.77 +/- 0.05
K0	1.05 +/- 0.05
T	0.25+/- 0.02