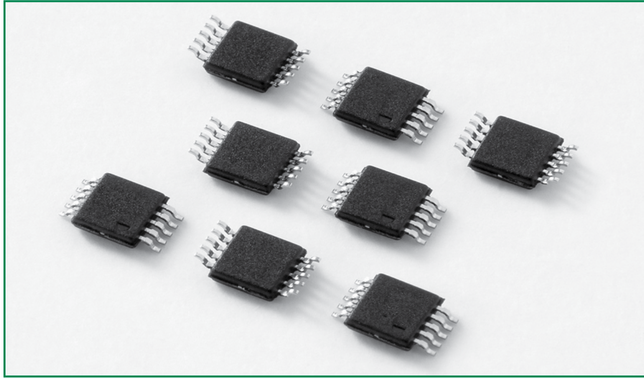
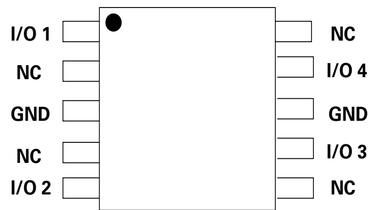
SP4045 Series 1.5pF 24A Diode Array (HDBaseT)



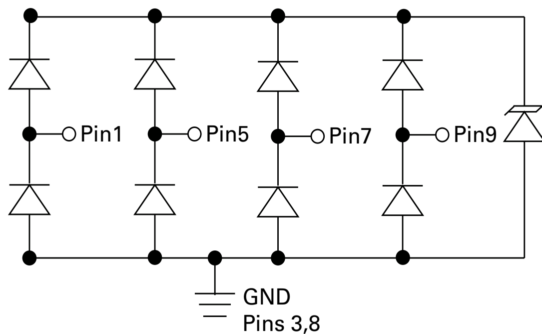
Description

The SP4045 integrates low capacitance diodes with an additional zener diode to protect each I/O pin against ESD and high surge events. This robust device can safely absorb up to 24A per IEC 61000-4-5 2nd edition (tp=8/20μs) without performance degradation and a minimum ±30kV ESD per IEC 61000-4-2 International Standard. Their low loading capacitance also makes them ideal for protecting high speed signal pins.

Pinout



Functional Block Diagram



Features

- Signal-integrity-preservingl straight through routing
- Low leakage current of 1μA (MAX) at 3.3V
- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 24A (8/20μs)
- Low capacitance of 1.5pF (TYP) per I/O
- AEC-Q101 qualified
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL Level-1)

Applications

- HDBaseT Protector
- 10/100/1000 Ethernet
- 2.5 and 5 Gigabit Ethernet
- T1/E1 Secondary Protection
- T3/E3 Secondary Protection
- A/V Equipment
- Automotive Ethernet

Additional Information

Datasheet

Resources

Samples

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 indicated.

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20μs)	24	A
P_{PK}	Peak Pulse Power (t_p=8/20μs)	600	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 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

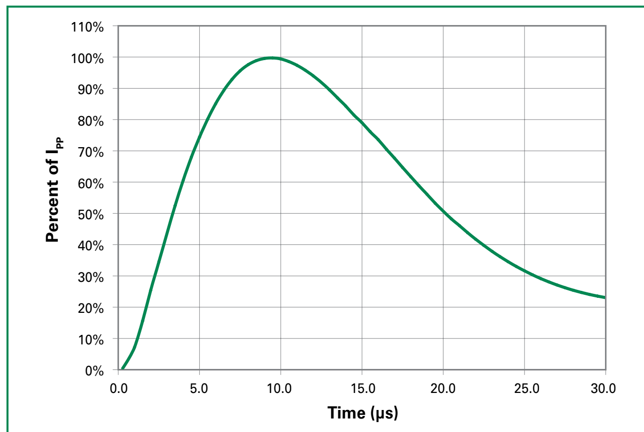
Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

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

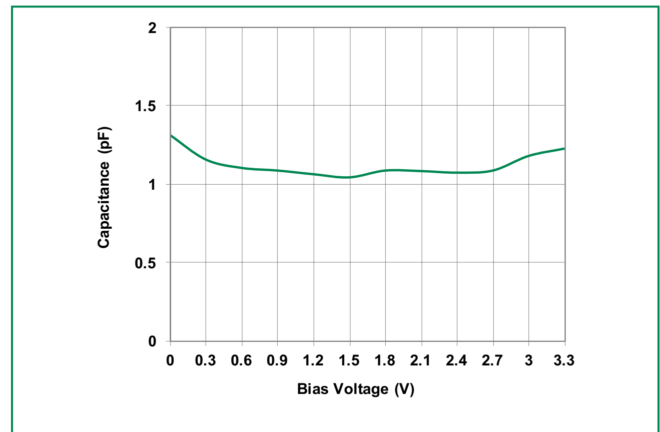
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}				3.3	V
Snap Back Voltage	V_{SB}	I_{SB}=50mA	2.8			V
Reverse Leakage Current	I_{LEAK}	V_R=3.3V, I/O to GND		0.5	1.0	μA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20μs, Fwd		6.0		V
		I_{PP}=2A, t_p=8/20μs, Fwd		7.0		V
Dynamic Resistance [2]	R_{DYN}	TLP t_p=100ns, Pin 1 to Pin 2		0.3		Ω
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact)	±30			kV
		IEC61000-4-2 (Air)	±30			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V		1.5		pF

Note: 1. Parameter is guaranteed by design and/or device characterization.
2. Transmission Line Pulse (TLP) test setting : Std.TDR(50Ω),tp=100ns, tr=0.2ns ITLP and VTLP averaging window: star t1=70ns to end t2=80ns

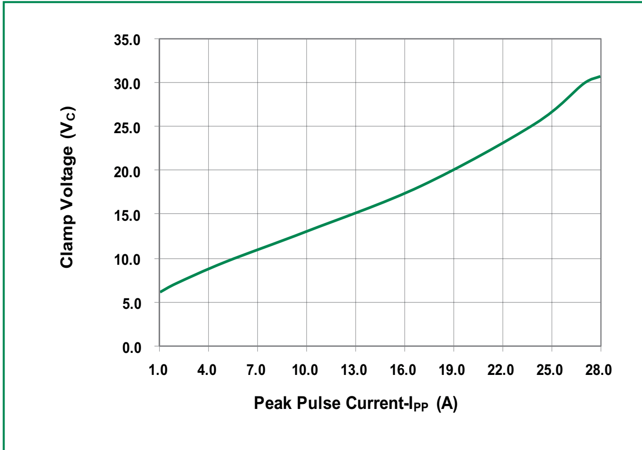
8/20μs Pulse Waveform



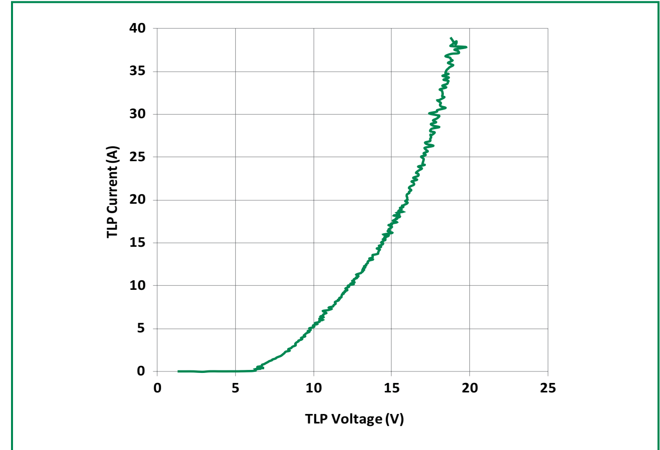
Capacitance vs. Reverse Bias



Clamping Voltage vs. I_{PP}

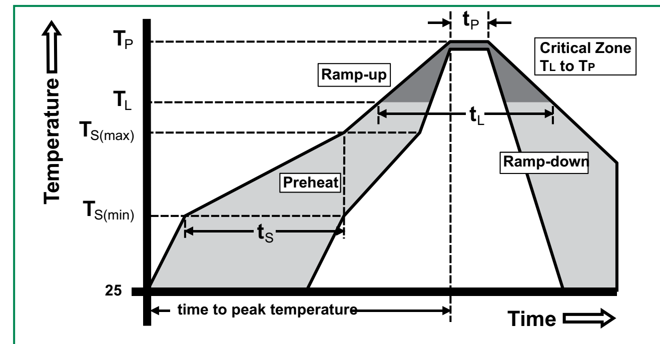


Transmission Line Pulsing (TLP) Plot (Pin 1 to Pin2)



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



Product Characteristics

Lead Plating	Pre-Plated Frame
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substrate material	Silicon
Body Material	V-0 per UL 94 Molded Epoxy

Notes :

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.

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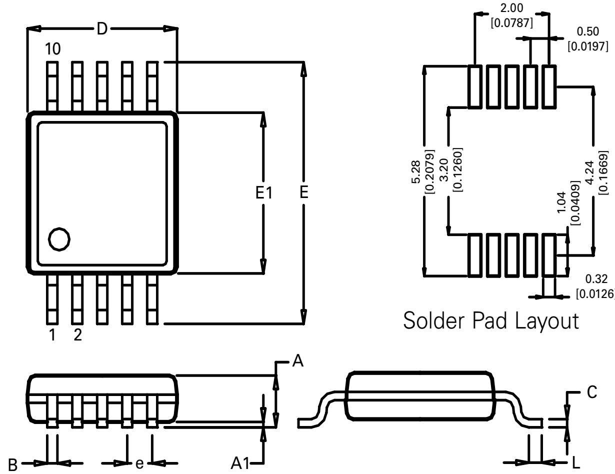
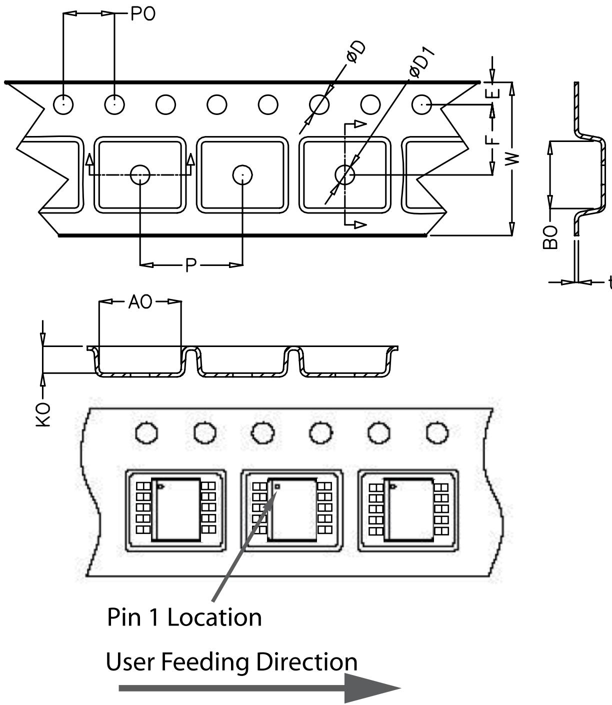
Package Dimensions — MSOP-10



Solder Pad Layout

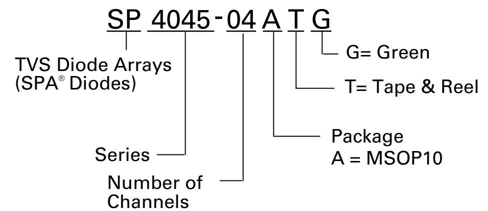
Package	MSOP			
Pins	10			
JEDEC	MO-187			
	Millimeters		Inches	
DIM	Min	Max	Min	Max
A	-	1.10	-	0.043
A1	0.00	0.15	0.000	0.006
B	0.17	0.27	0.007	0.011
c	0.08	0.23	0.003	0.009
D	2.90	3.10	0.114	0.122
E	4.67	5.10	0.184	0.200
E1	2.90	3.10	0.114	0.122
e	0.50 BSC		0.020 BSC	
L	0.40	0.80	0.016	0.032

Embossed Carrier Tape & Reel Specification — MSOP-10

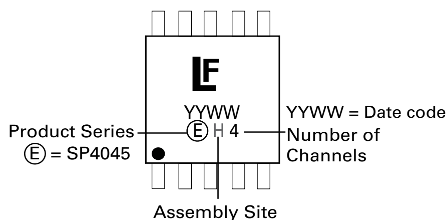


	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.065	0.073
F	5.40	5.60	0.213	0.220
D	1.50	1.60	0.059	0.063
D1	1.50 Min		0.059 Min	
P0	3.90	4.10	0.154	0.161
W	11.70	12.30	0.460	0.484
P	7.90	8.10	0.311	0.319
A0	5.20	5.40	0.205	0.213
B0	3.20	3.50	0.126	0.138
K0	1.20	1.50	0.047	0.059
t	0.30 +/- 0.05		0.012+/- 0.002	

Part Numbering System



Part Marking System



Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SP4045-04ATG	MSOP-10	Ⓔ H4	4000

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