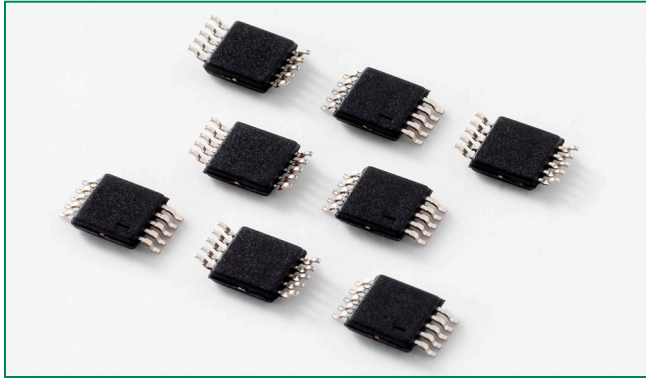


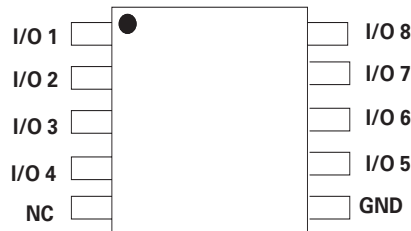
HF **RoHS** **Pb** **GREEN** **SP4060 Lead-Free/Green Series**



Description

The SP4060 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 20A per IEC61000-4-5 ($t_p=8/20\mu s$) without performance degradation and a minimum $\pm 30kV$ ESD per IEC61000-4-2 International Standard. Their low loading capacitance also makes them ideal for protecting high speed signal pins.

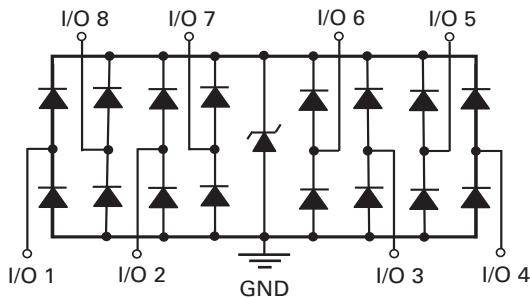
Pinout



Features

- ESD, IEC61000-4-2, $\pm 30kV$ contact, $\pm 30kV$ air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning, IEC61000-4-5, 20A (8/20 μs)
- Low capacitance of 4.4pF (TYP) per I/O
- Low leakage current of 1 μA (MAX) at 2.5V

Functional Block Diagram



Applications

- LCD/PD TVs
- Desktops
- Game Consoles
- Set Top Boxes
- Notebooks

Lead-Free/Green SP4060

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.

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current ($t_p=8/20\mu s$)	20.0	A
P_{PK}	Peak Pulse Power ($t_p=8/20\mu s$)	300	W
T_{OP}	Operating Temperature	-40 to 85	°C
T_{STOR}	Storage Temperature	-50 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

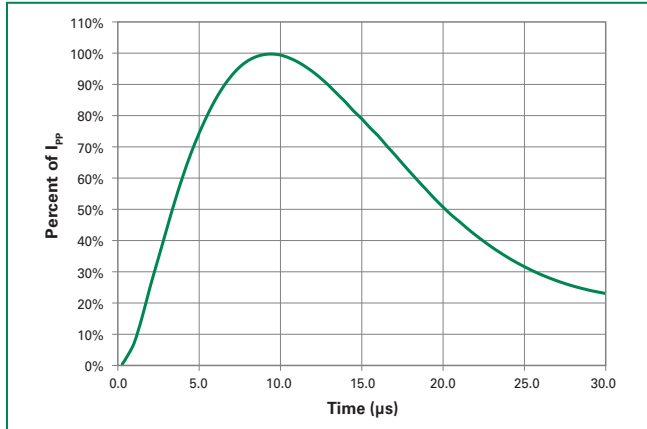
Parameter	Rating	Units
Storage Temperature Range	-65 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 10s)	260	°C

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

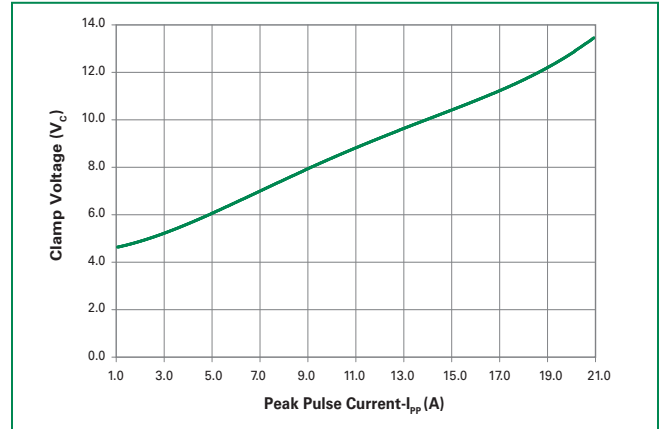
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}				2.5	V
Snap Back Voltage	V_{SB}	$I_{SB}=50mA$	2.0			V
Reverse Leakage Current	I_{LEAK}	$V_R=2.5V$, I/O to GND		0.5	1.0	μA
Clamp Voltage ¹	V_C	$I_{PP}=1A$, $t_p=8/20\mu s$, Fwd		4.5	5.5	V
		$I_{PP}=5A$, $t_p=8/20\mu s$, Fwd		6.0	7.2	V
		$I_{PP}=10A$, $t_p=8/20\mu s$, Fwd		8.0	9.6	V
		$I_{PP}=20A$, $t_p=8/20\mu s$, Fwd		12.5	15.0	V
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		4.4	5.0	pF
Diode Capacitance ¹	$C_{I/O-I/O}$	Reverse Bias=0V		2.2		pF

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

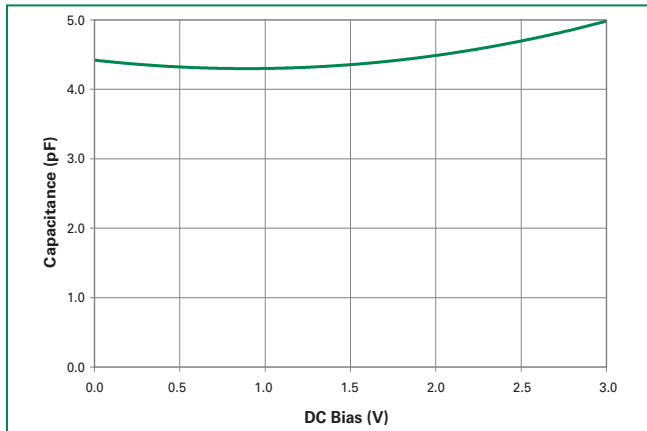
Pulse Waveform



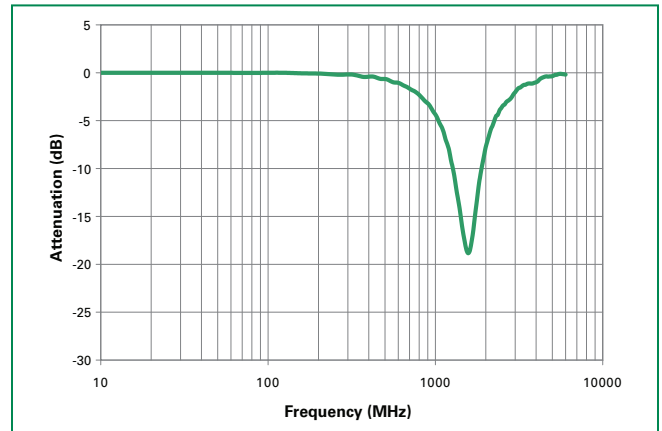
Clamping Voltage vs. I_{pp}



Capacitance vs. Bias

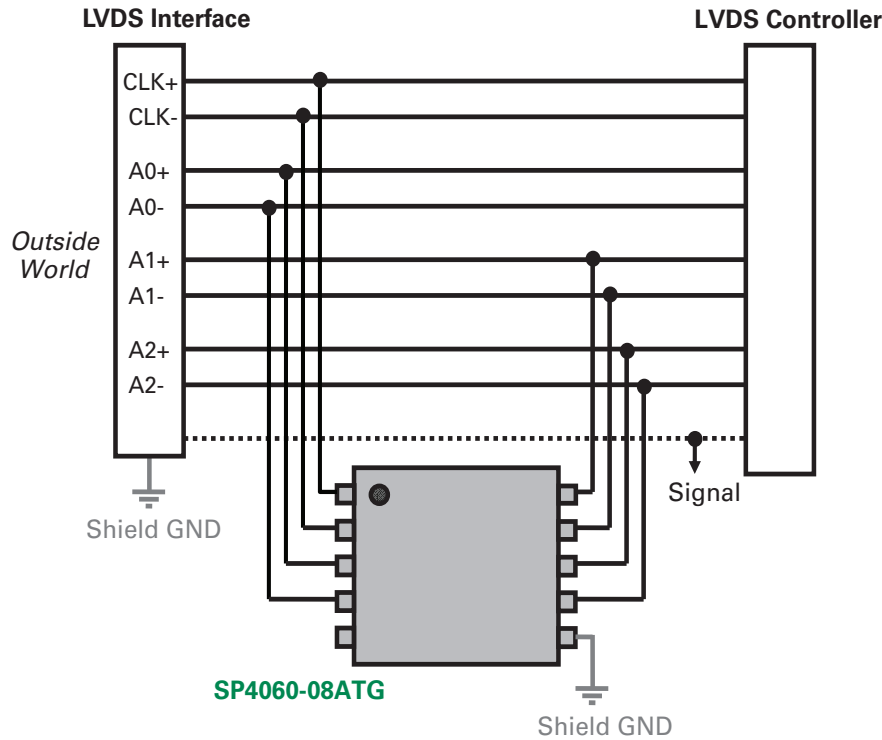


Insertion Loss (S21) I/O to GND



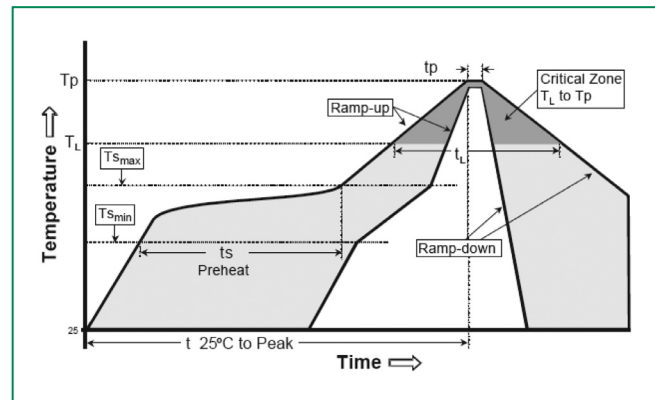
Lead-Free/Green SP4060

Application Example

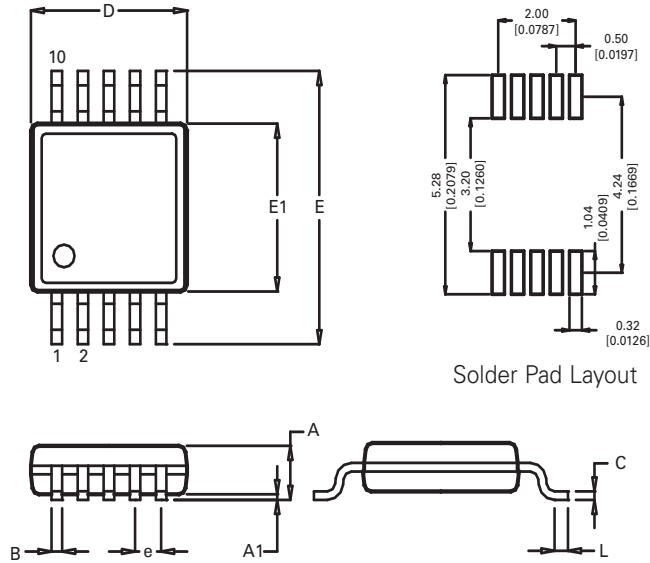


Soldering Parameters

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

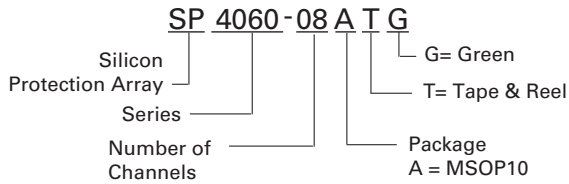


Package Dimensions - MSOP10



Package	MSOP10			
Pins	10			
	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

Part Numbering System



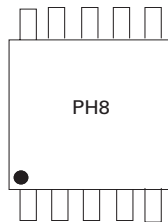
Product Characteristics

Lead Plating	Pre-Plated Frame
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-223 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.

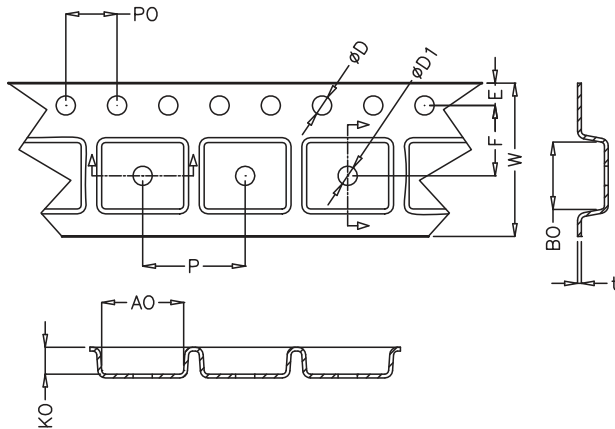
Part Marking System



Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SP4060-08ATG	MSOP10	PH8	4000

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
10P0	40.0+/- 0.20		1.574+/-0.008	
W	11.90	12.10	0.469	0.476
P	7.90	8.10	0.311	0.319
A0	5.20	5.40	0.205	0.213
B0	3.20	3.40	0.126	0.134
K0	1.20	1.40	0.047	0.055
t	0.30 +/- 0.05		0.012+/- 0.002	