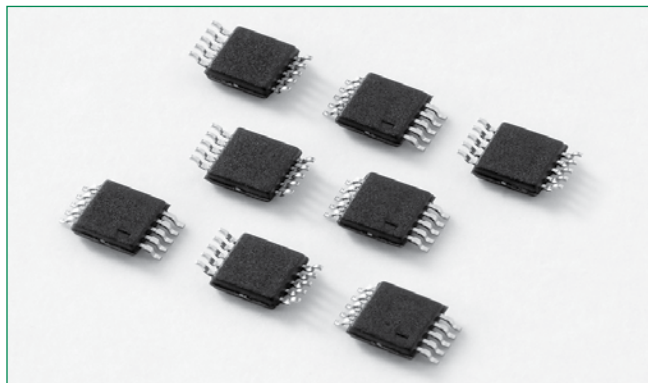
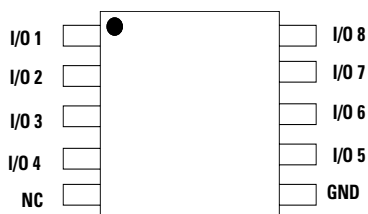


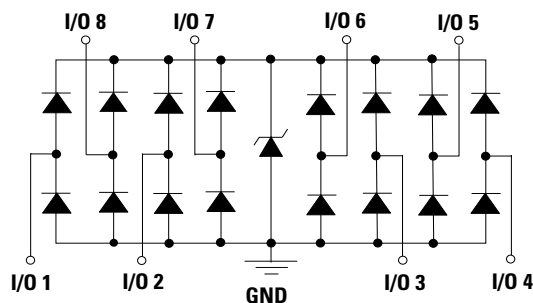
## SP4065 Series 3.3V 20A Diode Array



### Pinout



### Functional Block Diagram



### 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 expressly indicated.

### Description

The SP4065 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 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 highspeed signal pins.

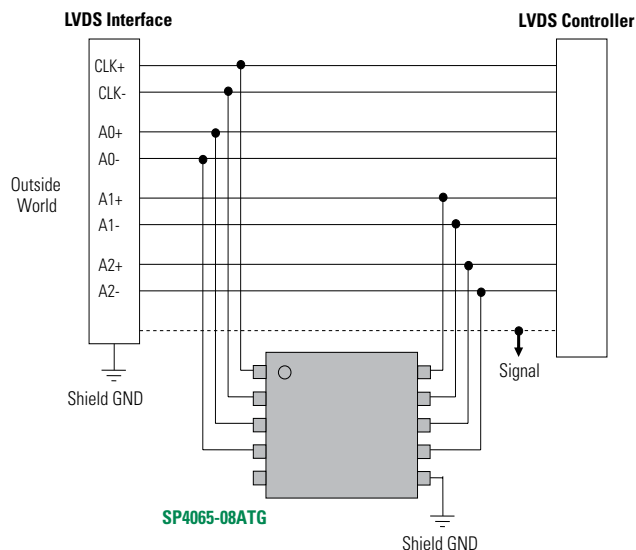
### Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5, 2nd Edition 20A (8/20μs)
- Low capacitance of 4.4pF (TYP) per I/O
- Low leakage current of 1μA (MAX) at 3.3V
- Halogen free, Lead-free and RoHS compliant
- Moisture Sensitivity Level (MSL - Level 1)

### Applications

- LCD/LED TVs
- Desktops
- Game Consoles
- Set Top Boxes
- Notebooks
- 1Gb Ethernet
- Network Hardware
- Small Cells

### Application Example



### 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 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    |

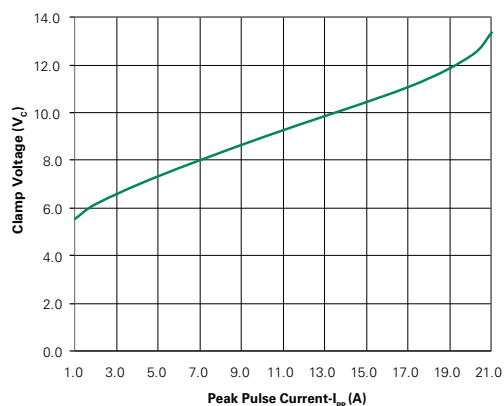
### Electrical Characteristics ( $T_{OP}=25^{\circ}C$ )

| Parameter                          | Symbol        | Test Conditions                           | Min      | Typ  | Max | Units    |
|------------------------------------|---------------|-------------------------------------------|----------|------|-----|----------|
| Reverse Standoff Voltage           | $V_{RWM}$     |                                           |          |      | 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 | $\mu A$  |
| Clamp Voltage <sup>1</sup>         | $V_C$         | $I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd       |          | 5.5  |     | V        |
|                                    |               | $I_{PP}=5A$ , $t_p=8/20\mu s$ , Fwd       |          | 7.0  |     | V        |
|                                    |               | $I_{PP}=10A$ , $t_p=8/20\mu s$ , Fwd      |          | 9.0  |     | V        |
|                                    |               | $I_{PP}=20A$ , $t_p=8/20\mu s$ , Fwd      |          | 13.5 |     | V        |
| Dynamic Resistance                 | $R_{DYN}$     | $(V_{C2} - V_{C1}) / (I_{PP2} - I_{PP1})$ |          | 0.4  |     | $\Omega$ |
| ESD Withstand Voltage <sup>1</sup> | $V_{ESD}$     | IEC61000-4-2 (Contact)                    | $\pm 30$ |      |     | kV       |
|                                    |               | IEC61000-4-2 (Air)                        | $\pm 30$ |      |     | kV       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-GND}$ | Reverse Bias=0V                           |          | 4.4  | 5.0 | pF       |
| Diode Capacitance <sup>1</sup>     | $C_{I/O-I/O}$ | Reverse Bias=0V                           |          | 2.2  |     | pF       |

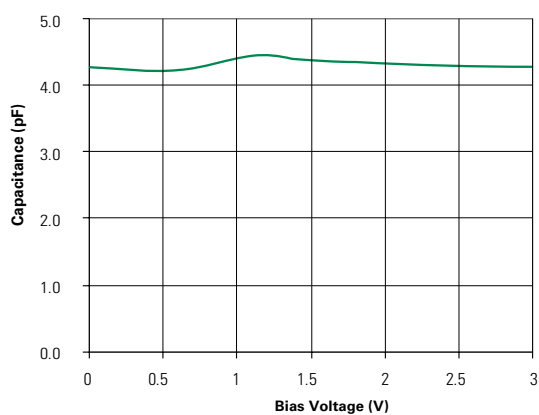
**Note:**

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

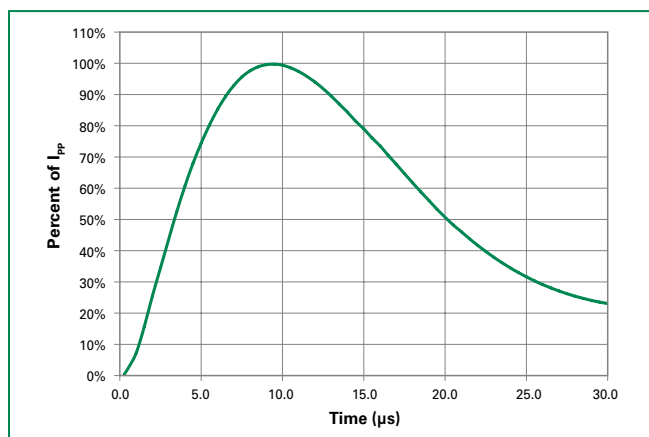
### Clamping Voltage vs. $I_{PP}$



### Capacitance vs. Bias



### 8/20μs Pulse Waveform



### Product Characteristics

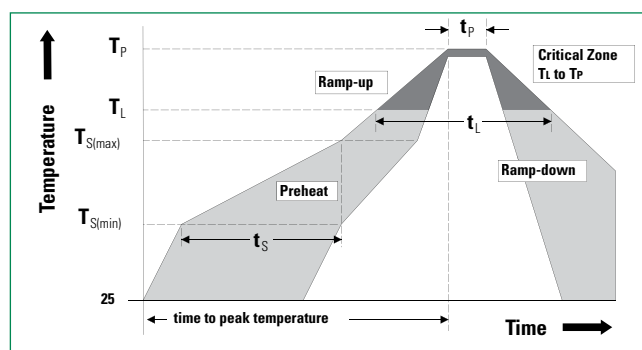
|                           |                               |
|---------------------------|-------------------------------|
| <b>Lead Plating</b>       | Pre-Plated Frame              |
| <b>Lead Material</b>      | Copper Alloy                  |
| <b>Lead Coplanarity</b>   | 0.0004 inches (0.102mm)       |
| <b>Substrate material</b> | Silicon                       |
| <b>Body Material</b>      | Molded Epoxy, rated UL 94 V-0 |

#### Notes :

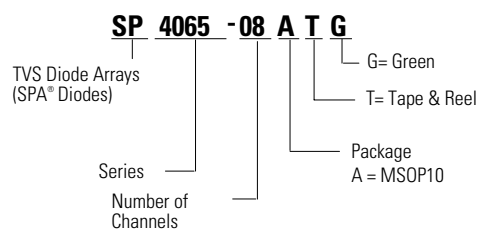
1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.

### Soldering Parameters

|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <b>Reflow Condition</b>                                                |                                    | Pb – Free assembly      |
| <b>Pre Heat</b>                                                        | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                                        | - Time (min to max) ( $t_s$ )      | 60 – 180 secs           |
| <b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b> |                                    | 3°C/second max          |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 3°C/second max          |
| <b>Reflow</b>                                                          | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|                                                                        | - Temperature ( $t_L$ )            | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_p</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>   |                                    | 20 – 40 seconds         |
| <b>Ramp-down Rate</b>                                                  |                                    | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>                |                                    | 8 minutes Max.          |
| <b>Do not exceed</b>                                                   |                                    | 260°C                   |



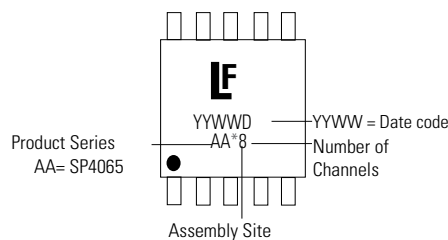
### Part Numbering System



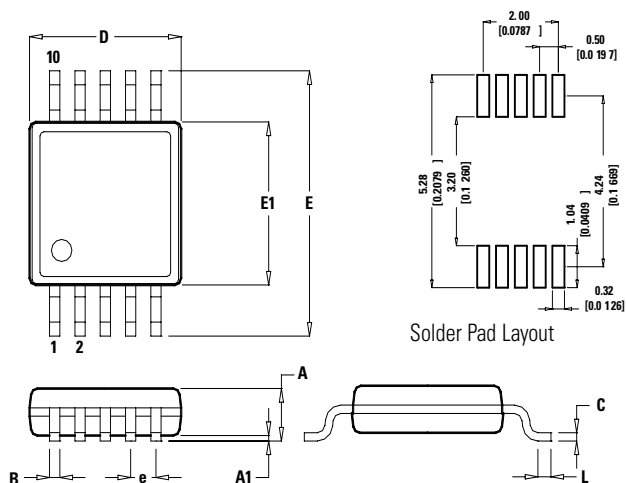
### Ordering Information

| Part Number  | Package | Min. Order Qty. |
|--------------|---------|-----------------|
| SP4065-08ATG | MSOP-10 | 4000            |

### Part Marking System

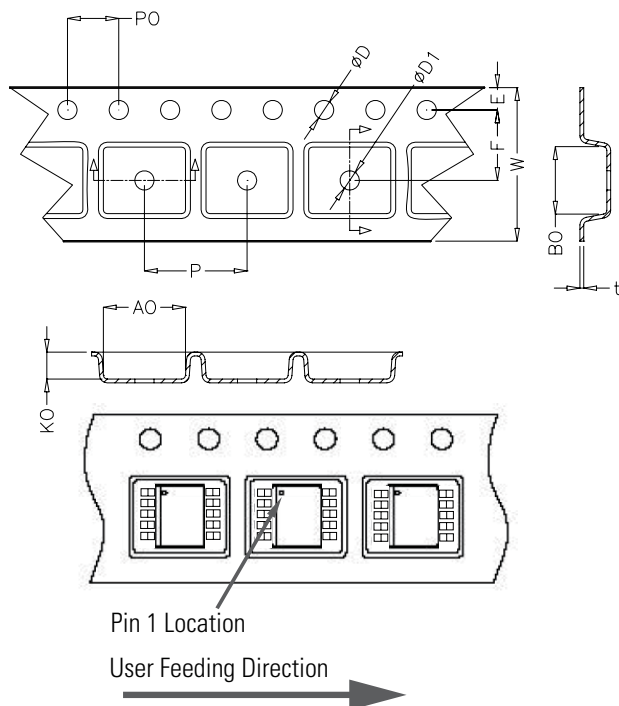


## Package Dimensions — MSOP-10



| Package | MSOP        |      |           |       |
|---------|-------------|------|-----------|-------|
| Pins    | 10          |      |           |       |
| JEDEC   | MO-187      |      |           |       |
| Symbol  | 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



| Symbol | Millimetres   |       | Inches          |       |
|--------|---------------|-------|-----------------|-------|
|        | Min           | Max   | Min             | Max   |
| E      | 1.65          | 1.85  | 0.065           | 0.073 |
| e      | 0.5           |       | 0.02            |       |
| 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 |       |

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