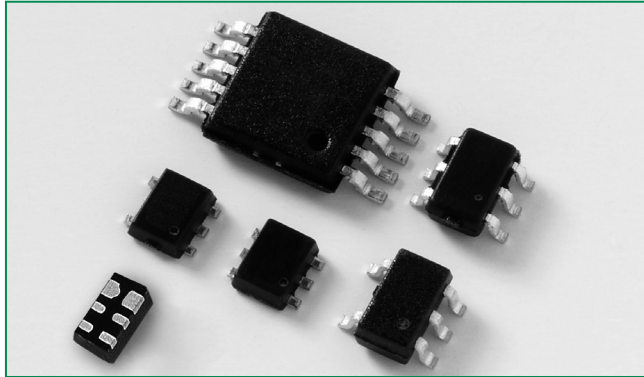
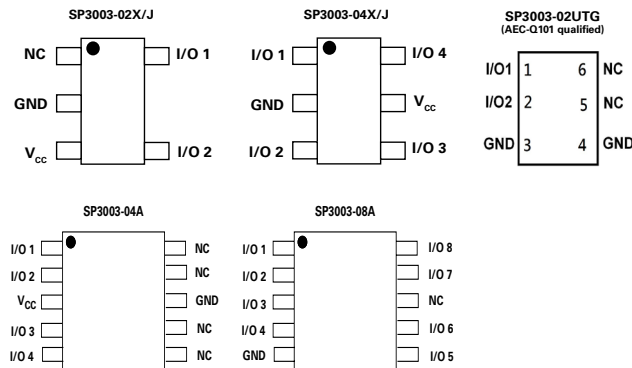


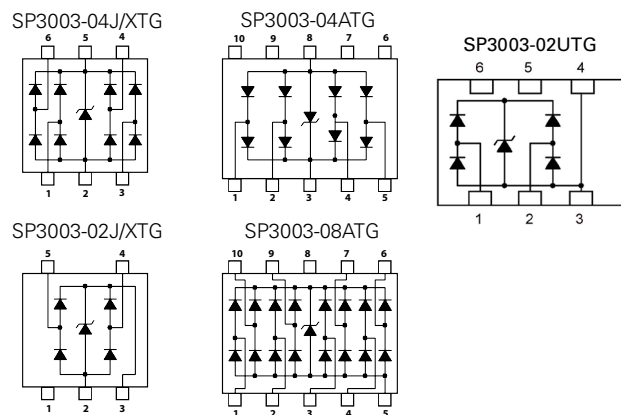
SP3003 Series 0.65pF Diode Array



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 SP3003 has ultra low capacitance rail-to-rail diodes with an additional zener diode fabricated in a proprietary silicon avalanche technology to protect each I/O pin providing a high level of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). These robust diodes can safely absorb repetitive ESD strikes at the maximum level specified in the IEC 61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation. Their very low loading capacitance also makes them ideal for protecting high speed signal pins such as HDMI, DVI, USB2.0, and IEEE 1394.

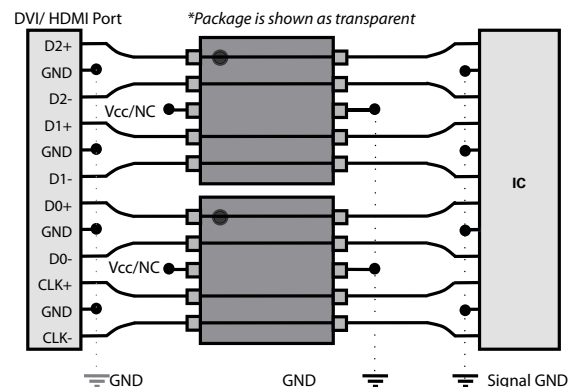
Features

- ESD protection of ±8kV contact discharge, ±15kV air discharge, (IEC61000-4-2)
- EFT protection, IEC61000-4-4, 40A (5/50ns)
- Lightning Protection, IEC61000-4-5, 2.5A (8/20μs)
- Low capacitance of 0.65pF (TYP) per I/O
- Low leakage current of 0.5μA (MAX) at 5V
- Complete line of small packaging helps save board space (SC70, SOT553, SOT563, MSOP10, μDFN-6L)
- AEC-Q101 qualified (μDFN package)

Applications

- LCD/ PDP TVs
- DVD Players
- Desktops
- MP3/ PMP
- Digital Cameras
- Set Top Boxes
- Mobile Phones
- Notebooks
- Computer Peripherals

Application Example



A single, 4 channel SP3003-04 device can be used to protect four (4) of the data lines in a HDMI/DVI interface so two (2) SP3003-04 devices provide protection for all eight (8) TMDS lines.

Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|------------|----------------------------------|------------|-------|
| I_{PP} | Peak Current ($t_p=8/20\mu s$) | 2.5 | A |
| 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

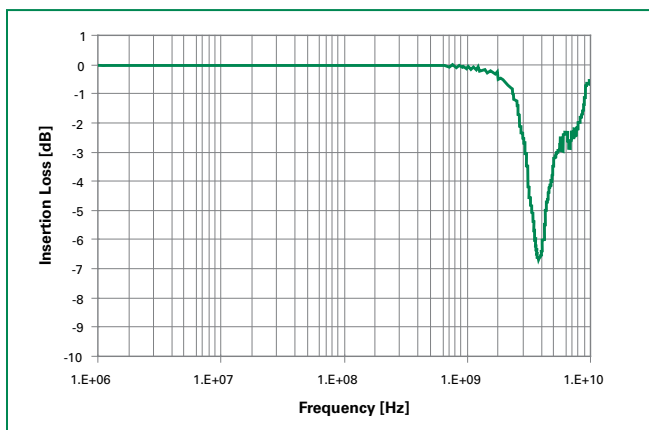
| Parameter | Rating | Units |
|---|------------|-------|
| Storage Temperature Range | -55 to 150 | °C |
| Maximum Junction Temperature | 150 | °C |
| Maximum Lead Temperature (Soldering 20-40s) | 260 | °C |

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

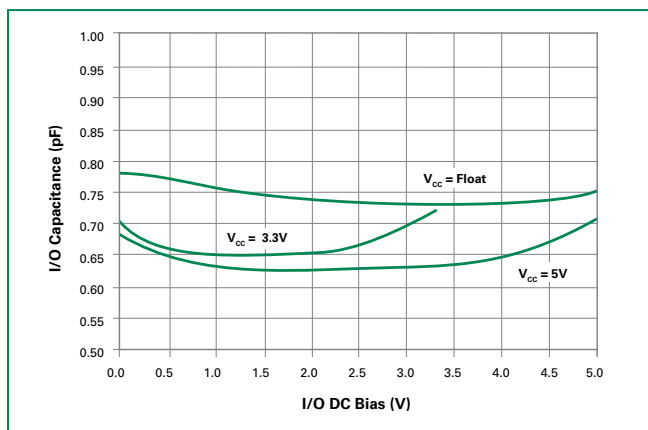
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|---------------|---------------------------------|----------|------|------|---------|
| Reverse Standoff Voltage | V_{RWM} | $I_R \leq 1\mu A$ | | | 6 | V |
| Reverse Leakage Current | I_{LEAK} | $V_R=5V$ | | | 0.5 | μA |
| Clamp Voltage ¹ | V_C | $I_{PP}=1A, t_p=8/20\mu s, Fwd$ | | 10.0 | 12.0 | V |
| | | $I_{PP}=2A, t_p=8/20\mu s, Fwd$ | | 11.8 | 15.0 | V |
| ESD Withstand Voltage ¹ | V_{ESD} | IEC61000-4-2 (Contact) | ± 8 | | | kV |
| | | IEC61000-4-2 (Air) | ± 15 | | | kV |
| Diode Capacitance ¹ | $C_{I/O-GND}$ | Reverse Bias=0V | 0.7 | 0.8 | 0.95 | pF |
| | | Reverse Bias=1.65V | 0.55 | 0.65 | 0.8 | pF |
| Diode Capacitance ¹ | $C_{I/O-I/O}$ | Reverse Bias=0V | | 0.35 | | pF |

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

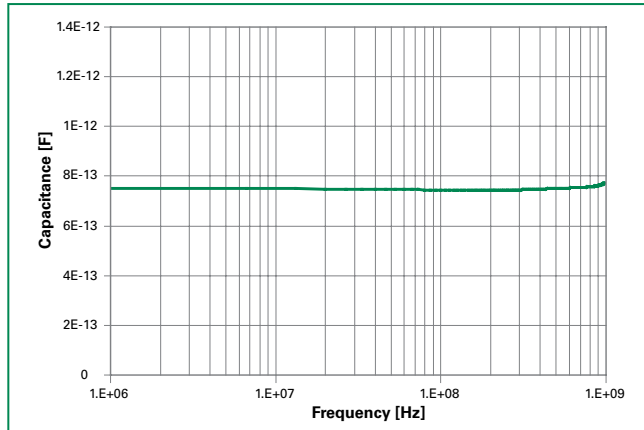
Insertion Loss (S21) I/O to GND



Capacitance vs. Bias Voltage



Capacitance vs. Frequency



Product Characteristics

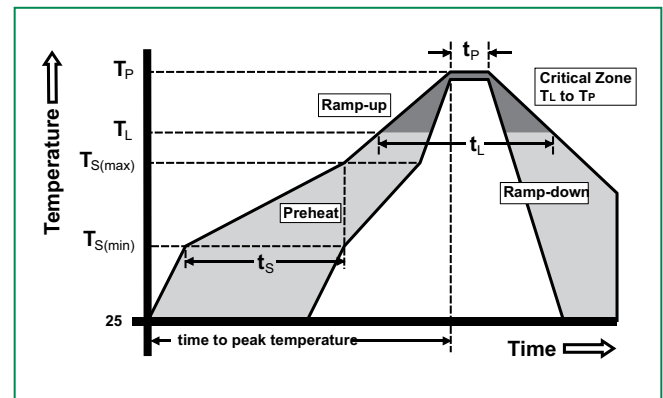
| | |
|----------------------------|--|
| Lead Plating | Matte Tin (SC70-x, MSOP-10) Pre-Plated Frame (SOT5x3, μ DFN-6) |
| Lead Material | Copper Alloy |
| Lead Coplanarity | 0.0004 inches (0.102mm) |
| Substitute Material | Silicon |
| Body Material | Molded Epoxy |
| Flammability | UL 94 V-0 |

Notes :

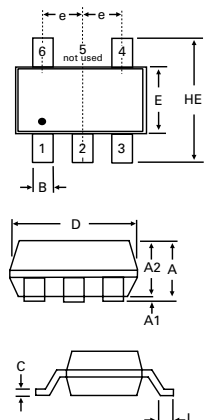
1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Bto is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.

Soldering Parameters

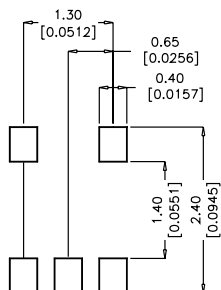
| | | |
|--|------------------------------------|--------------------|
| Reflow Condition | | Pb – Free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 180 secs |
| Average ramp up rate (Liquidus) Temp (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 |



Package Dimensions — SC70-5

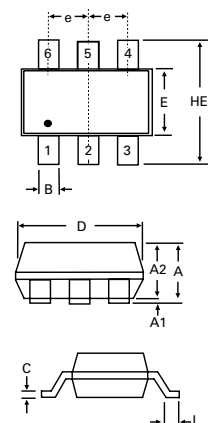


Recommended Solder Pad Layout

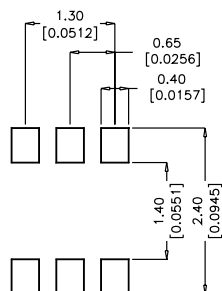


| Package | SC70-5 | | | |
|-----------|-------------|------|-----------|-------|
| Pins | 5 | | | |
| JEDEC | MO-203 | | | |
| | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| A | 0.80 | 1.10 | 0.031 | 0.043 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.70 | 1.00 | 0.028 | 0.039 |
| B | 0.15 | 0.30 | 0.006 | 0.012 |
| c | 0.08 | 0.25 | 0.003 | 0.010 |
| D | 1.85 | 2.25 | 0.073 | 0.089 |
| E | 1.15 | 1.35 | 0.045 | 0.053 |
| e | 0.65 BSC | | 0.026 BSC | |
| HE | 2.00 | 2.40 | 0.079 | 0.094 |
| L | 0.26 | 0.46 | 0.010 | 0.018 |

Package Dimensions — SC70-6

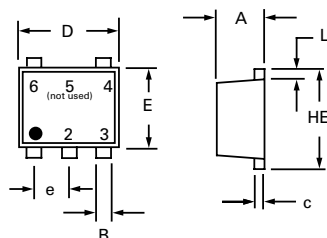


Recommended Solder Pad Layout

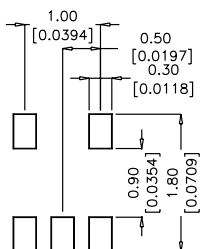


| Package | SC70-6 | | | |
|-----------|-------------|------|-----------|-------|
| Pins | 6 | | | |
| JEDEC | MO-203 | | | |
| | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| A | 0.80 | 1.10 | 0.031 | 0.043 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.70 | 1.00 | 0.028 | 0.039 |
| B | 0.15 | 0.30 | 0.006 | 0.012 |
| c | 0.08 | 0.25 | 0.003 | 0.010 |
| D | 1.85 | 2.25 | 0.073 | 0.089 |
| E | 1.15 | 1.35 | 0.045 | 0.053 |
| e | 0.65 BSC | | 0.026 BSC | |
| HE | 2.00 | 2.40 | 0.079 | 0.094 |
| L | 0.26 | 0.46 | 0.010 | 0.018 |

Package Dimensions — SOT553



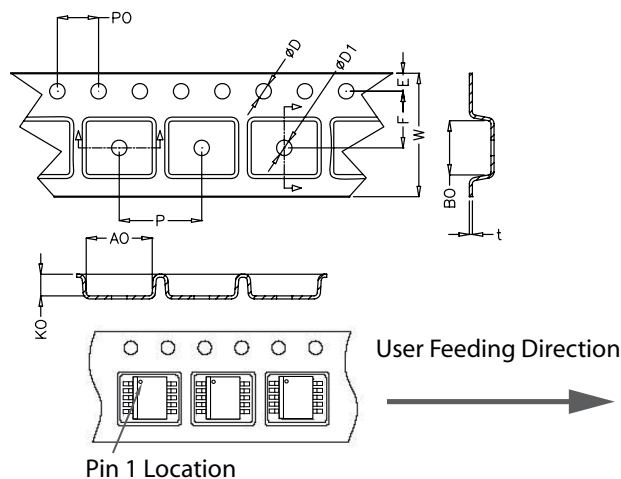
Recommended Solder Pad Layout



| Package | SOT 553 | | | |
|-----------|-------------|------|-----------|-------|
| Pins | 5 | | | |
| | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| A | 0.50 | 0.60 | 0.020 | 0.024 |
| B | 0.17 | 0.27 | 0.007 | 0.011 |
| c | 0.08 | 0.18 | 0.003 | 0.007 |
| D | 1.50 | 1.70 | 0.059 | 0.067 |
| E | 1.10 | 1.30 | 0.043 | 0.051 |
| e | 0.50 BSC | | 0.020 BSC | |
| L | 0.10 | 0.30 | 0.004 | 0.012 |
| HE | 1.50 | 1.70 | 0.059 | 0.067 |

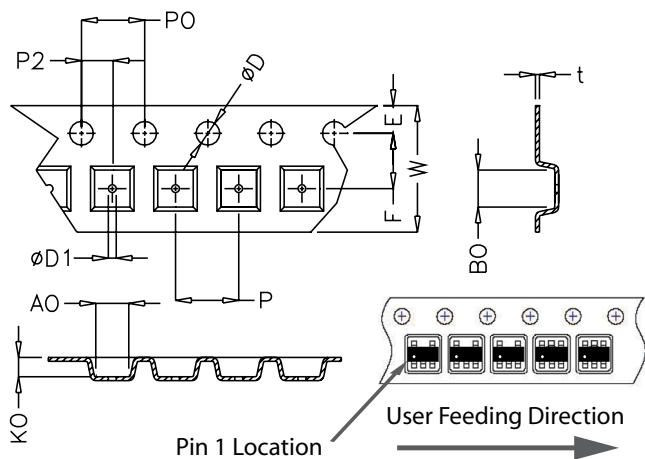
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Revised: 01/26/15

Embossed Carrier Tape & Reel Specification — MSOP-10



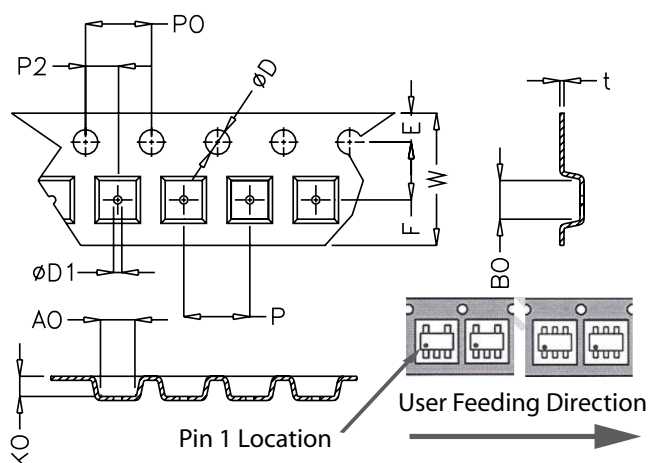
| | Millimetres | | Inches | |
|-------------|-------------|-------|---------------|-------|
| | Min | Max | Min | Max |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 5.40 | 5.60 | 0.213 | 0.220 |
| D | 1.50 | 1.60 | 0.059 | 0.063 |
| D1 | 1.50 Min | | 0.059 Min | |
| P0 | 3.90 | 4.10 | 0.154 | 0.161 |
| 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 | |

Embossed Carrier Tape & Reel Specifications — SC70-5 and SC70-6



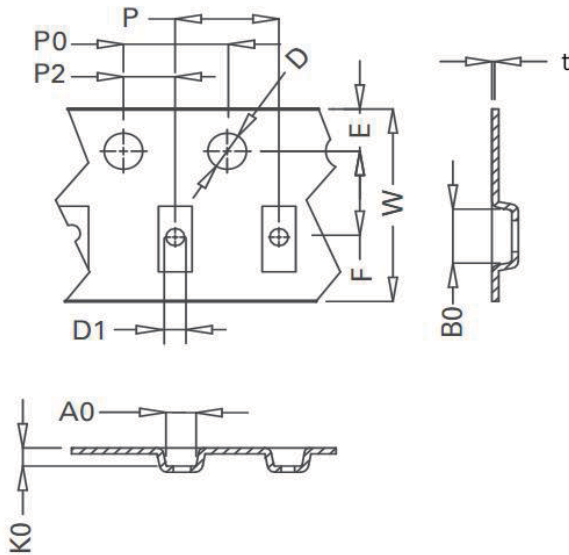
| | Millimetres | | Inches | |
|-------------|-------------|------|---------------|-------|
| | Min | Max | Min | Max |
| E | 1.65 | 1.85 | 0.064 | 0.073 |
| F | 3.45 | 3.55 | 0.135 | 0.139 |
| P2 | 1.95 | 2.05 | 0.077 | 0.081 |
| D | 1.40 | 1.60 | 0.055 | 0.063 |
| D1 | 1.00 | 1.25 | 0.039 | 0.049 |
| P0 | 3.90 | 4.10 | 0.154 | 0.161 |
| 10P0 | 40.0 ± 0.20 | | 1.574 ± 0.008 | |
| W | 7.70 | 8.10 | 0.303 | 0.318 |
| P | 3.90 | 4.10 | 0.153 | 0.161 |
| A0 | 2.14 | 2.34 | 0.084 | 0.092 |
| B0 | 2.24 | 2.44 | 0.088 | 0.960 |
| K0 | 1.12 | 1.32 | 0.044 | 0.052 |
| t | 0.27 max | | 0.010 max | |

Embossed Carrier Tape & Reel Specifications — SOT553 and SOT563



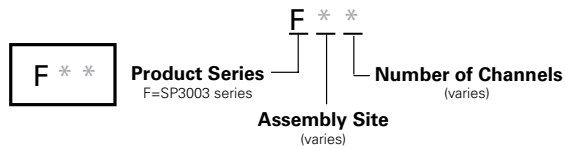
| | Millimetres | | Inches | |
|-------------|-------------|------|---------------|-------|
| | Min | Max | Min | Max |
| E | 1.65 | 1.85 | 0.064 | 0.073 |
| F | 3.45 | 3.55 | 0.135 | 0.139 |
| P2 | 1.95 | 2.05 | 0.076 | 0.081 |
| D | 1.40 | 1.60 | 0.055 | 0.063 |
| D1 | 0.45 | 0.55 | 0.017 | 0.021 |
| P0 | 3.90 | 4.10 | 0.154 | 0.161 |
| 10P0 | 40.0 ± 0.20 | | 1.574 ± 0.008 | |
| W | 7.70 | 8.10 | 0.303 | 0.318 |
| P | 3.90 | 4.10 | 0.153 | 0.161 |
| A0 | 1.73 | 1.83 | 0.068 | 0.072 |
| B0 | 1.73 | 1.83 | 0.068 | 0.072 |
| K0 | 0.64 | 0.74 | 0.025 | 0.029 |
| t | 0.22 max | | 0.009 max | |

Embossed Carrier Tape & Reel Specification — μ DFN-6L



| | Millimetres | | Inches | |
|-------------|-------------|------|-------------|-------|
| | Min | Max | Min | Max |
| E | 1.65 | 1.85 | 0.064 | 0.073 |
| F | 3.45 | 3.55 | 0.135 | 0.139 |
| P2 | 1.95 | 2.05 | 0.076 | 0.081 |
| D | 1.40 | 1.60 | 0.055 | 0.063 |
| D1 | 0.45 | 0.55 | 0.017 | 0.021 |
| P0 | 3.90 | 4.10 | 0.154 | 0.161 |
| 10P0 | 40.0±0.20 | | 1.574±0.008 | |
| W | 7.90 | 8.30 | 0.311 | 0.319 |
| P0 | 3.90 | 4.10 | 0.154 | 0.161 |
| A0 | 1.15 | 1.25 | 0.045 | 0.049 |
| B0 | 1.75 | 1.85 | 0.069 | 0.073 |
| K0 | 0.65 | 0.75 | 0.026 | 0.03 |
| t | 0.22 max | | 0.009 max | |

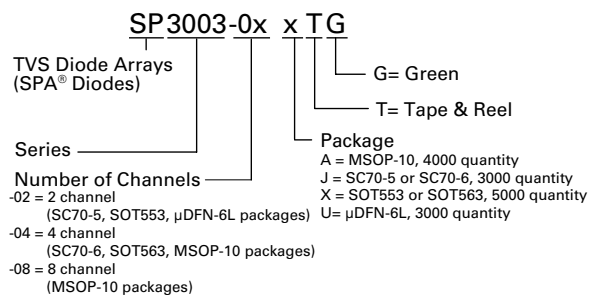
Part Marking System



Ordering Information

| Part Number | Package | Marking | Min. Order Qty. |
|--------------|--------------|---------|-----------------|
| SP3003-02JTG | SC70-5 | F * 2 | 3000 |
| SP3003-02UTG | μ DFN-6L | FH2 | 3000 |
| SP3003-02XTG | SOT553 | F * 2 | 3000 |
| SP3003-04ATG | MSOP-10 | F * 4 | 4000 |
| SP3003-04JTG | SC70-6 | F * 4 | 3000 |
| SP3003-04XTG | SOT563 | F * 4 | 3000 |
| SP3003-08ATG | MSOP-10 | F * 8 | 4000 |

Part Numbering System



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