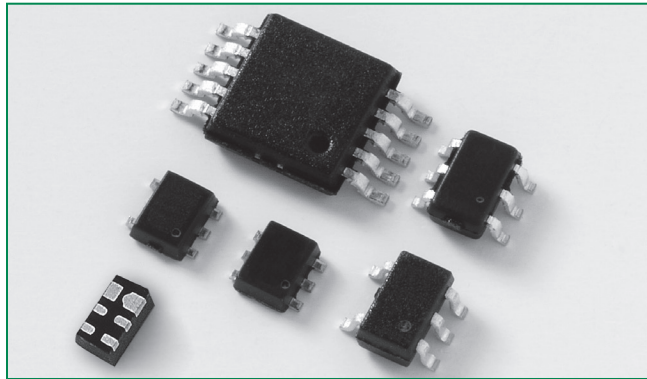
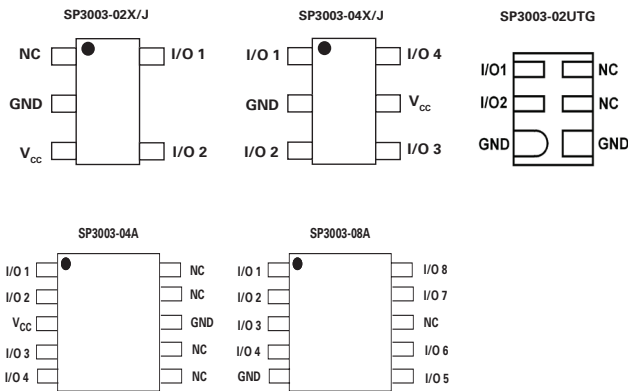


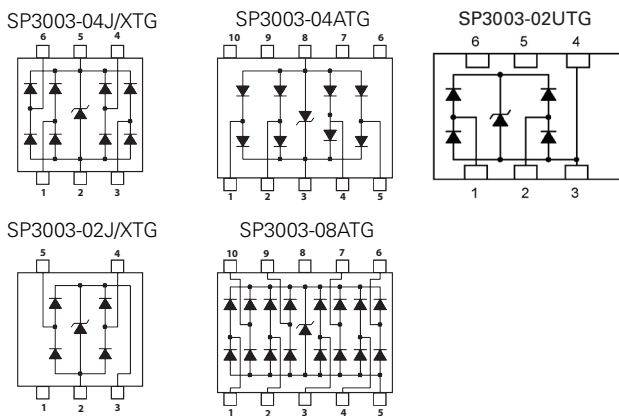
### SP3003 Series 0.65pF Diode Array



#### Pinout



#### Functional Block Diagram



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.

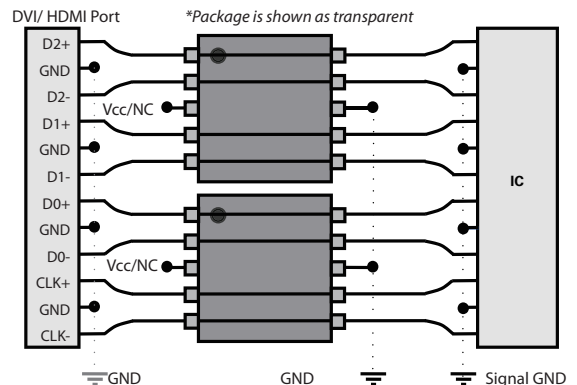
#### Features

- 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)

#### 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.

SP3003

**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 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**

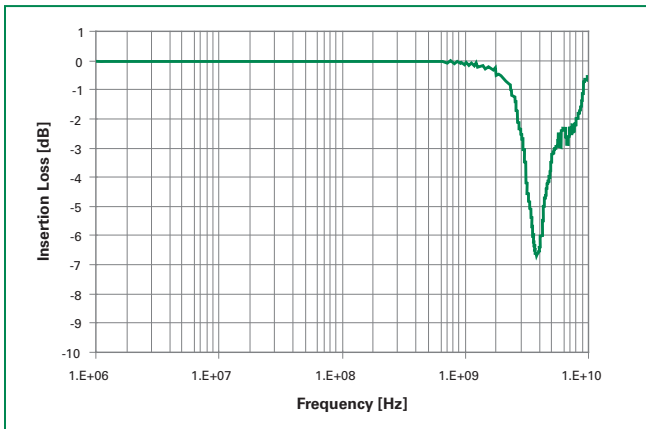
Parameter	Rating	Units
Storage Temperature Range	-65 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

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

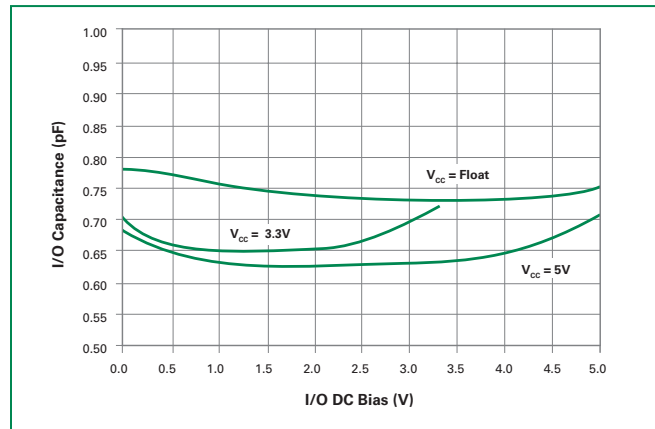
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu A$			6	V
Reverse Leakage Current	$I_{LEAK}$	$V_R=5V$			0.5	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, Fwd$		10.0	12.0	V
		$I_{PP}=2A, t_p=8/20\mu s, Fwd$		11.8	15.0	V
ESD Withstand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

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

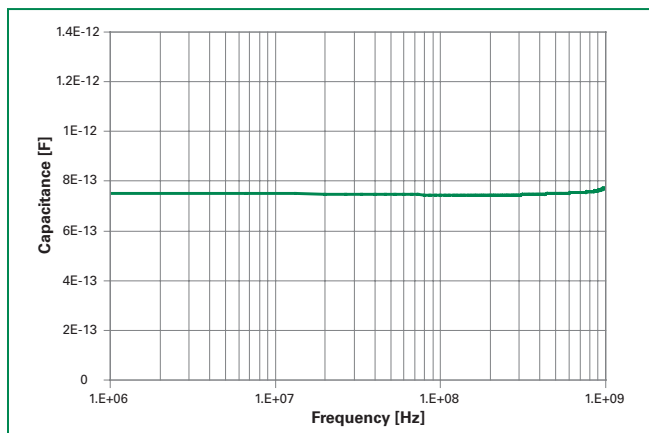
**Insertion Loss (S21) I/O to GND**



**Capacitance vs. Bias Voltage**



**Capacitance vs. Frequency**



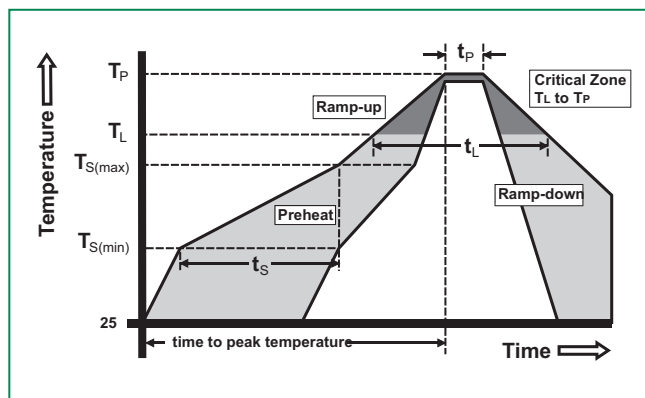
**Product Characteristics**

<b>Lead Plating</b>	Matte Tin (SC70-x, MSOP-10) Pre-Plated Frame (SOT5x3, $\mu$ DFN-6)
<b>Lead Material</b>	Copper Alloy
<b>Lead Coplanarity</b>	0.0004 inches (0.102mm)
<b>Substitute Material</b>	Silicon
<b>Body Material</b>	Molded Epoxy
<b>Flammability</b>	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.

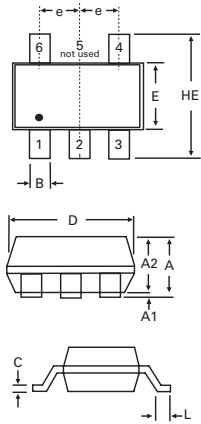
**Soldering Parameters**

<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
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
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )		260 <sup>+0/-5</sup> °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

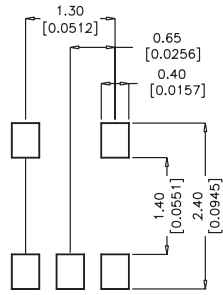


SP3003

**Package Dimensions — SC70-5**

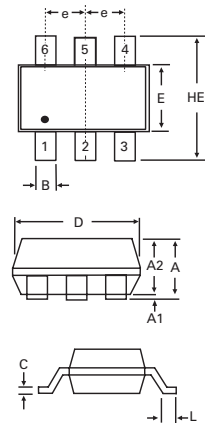


Recommended Solder Pad Layout

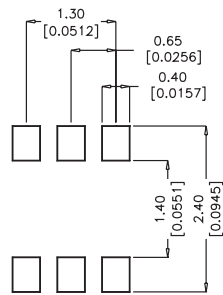


Package	SC70-5			
Pins	5			
JEDEC	MO-203			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.80	1.10	0.031	0.043
<b>A1</b>	0.00	0.10	0.000	0.004
<b>A2</b>	0.70	1.00	0.028	0.039
<b>B</b>	0.15	0.30	0.006	0.012
<b>c</b>	0.08	0.25	0.003	0.010
<b>D</b>	1.85	2.25	0.073	0.089
<b>E</b>	1.15	1.35	0.045	0.053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

**Package Dimensions — SC70-6**

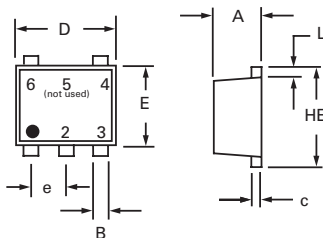


Recommended Solder Pad Layout

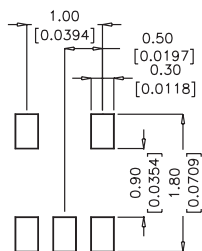


Package	SC70-6			
Pins	6			
JEDEC	MO-203			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.80	1.10	0.031	0.043
<b>A1</b>	0.00	0.10	0.000	0.004
<b>A2</b>	0.70	1.00	0.028	0.039
<b>B</b>	0.15	0.30	0.006	0.012
<b>c</b>	0.08	0.25	0.003	0.010
<b>D</b>	1.85	2.25	0.073	0.089
<b>E</b>	1.15	1.35	0.045	0.053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

**Package Dimensions — SOT553**

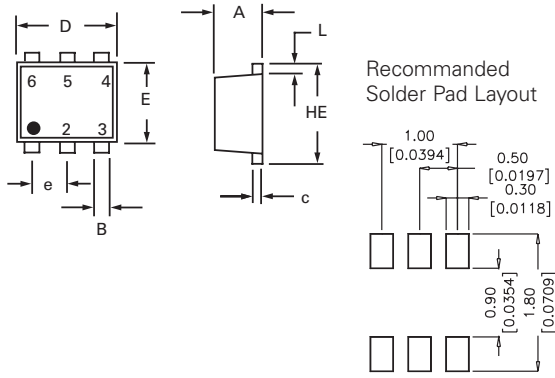


Recommended Solder Pad Layout



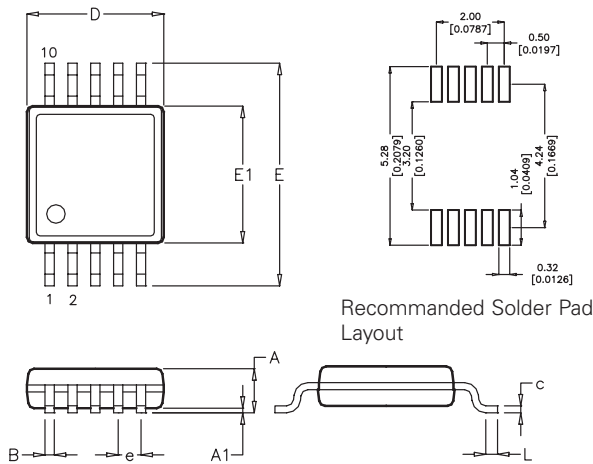
Package	SOT 553			
Pins	5			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.50	0.60	0.020	0.024
<b>B</b>	0.17	0.27	0.007	0.011
<b>c</b>	0.08	0.18	0.003	0.007
<b>D</b>	1.50	1.70	0.059	0.067
<b>E</b>	1.10	1.30	0.043	0.051
<b>e</b>	0.50 BSC		0.020 BSC	
<b>L</b>	0.10	0.30	0.004	0.012
<b>HE</b>	1.50	1.70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

**Package Dimensions – SOT563**



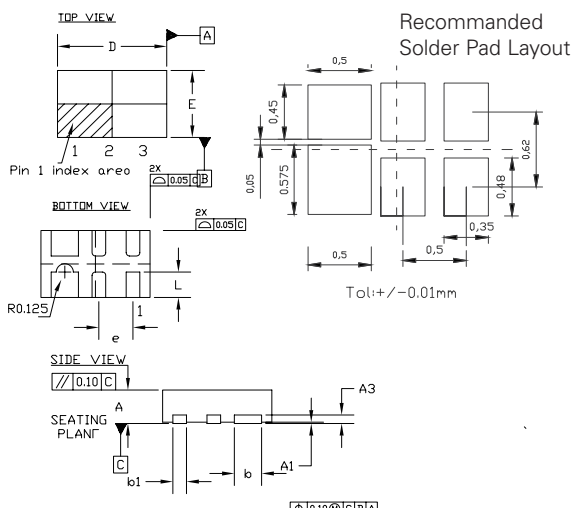
Package	SOT 563			
Pins	6			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.50	0.60	0.020	0.024
<b>B</b>	0.17	0.27	0.007	0.011
<b>c</b>	0.08	0.18	0.003	0.007
<b>D</b>	1.50	1.70	0.059	0.067
<b>E</b>	1.10	1.30	0.043	0.051
<b>e</b>	0.50 BSC		0.020 BSC	
<b>L</b>	0.10	0.30	0.004	0.012
<b>HE</b>	1.50	1.70	0.059	0.067

**Package Dimensions – MSOP10**



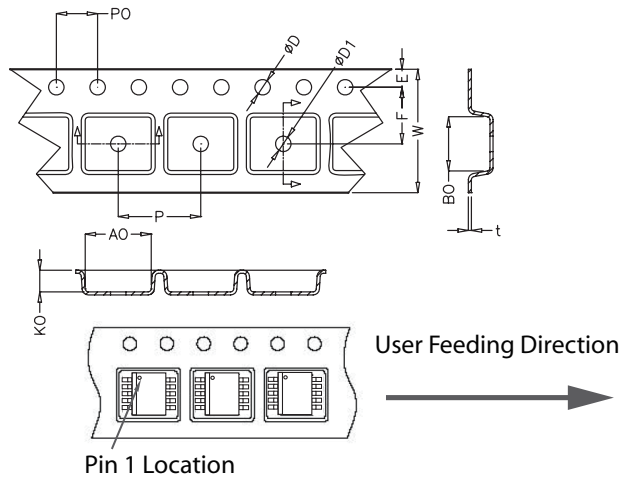
Package	MSOP10			
JEDEC	MO-187			
Pins	10			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	-	1.10	-	0.043
<b>A1</b>	0.00	0.15	0.000	0.006
<b>B</b>	0.17	0.27	0.007	0.011
<b>c</b>	0.08	0.23	0.003	0.009
<b>D</b>	2.90	3.10	0.114	0.122
<b>E</b>	4.67	5.10	0.184	0.200
<b>E1</b>	2.90	3.10	0.114	0.122
<b>e</b>	0.50 BSC		0.020 BSC	
<b>HE</b>	0.40	0.80	0.016	0.031

**Package Dimensions – μDFN-6L**



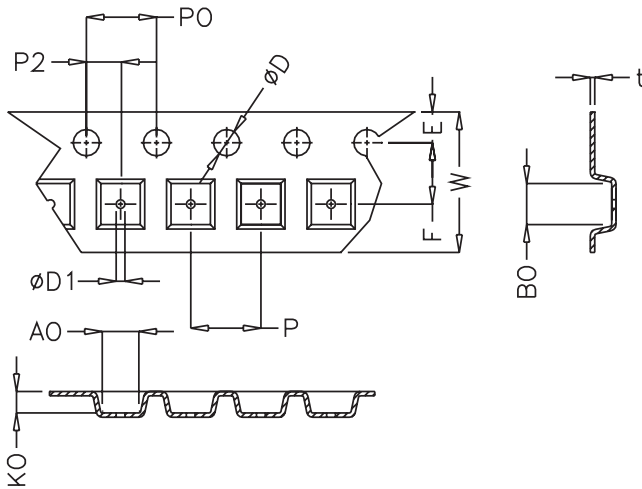
Package	μDFN-6L			
JEDEC	MO-229			
Pins	6			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.45	0.55	0.018	0.022
<b>A1</b>	0.00	0.05	0.000	0.002
<b>A3</b>	0.125REF		0.005REF	
<b>b</b>	0.35	0.45	0.014	0.018
<b>b1</b>	0.15	0.25	0.006	0.010
<b>D</b>	1.55	1.65	0.062	0.065
<b>D2</b>	-	-	-	-
<b>E</b>	0.95	1.05	0.038	0.042
<b>E2</b>	-	-	-	-
<b>e</b>	0.50REF		0.020REF	
<b>L</b>	0.33	0.43	0.013	0.017

**Embossed Carrier Tape & Reel Specification – MSOP-10**



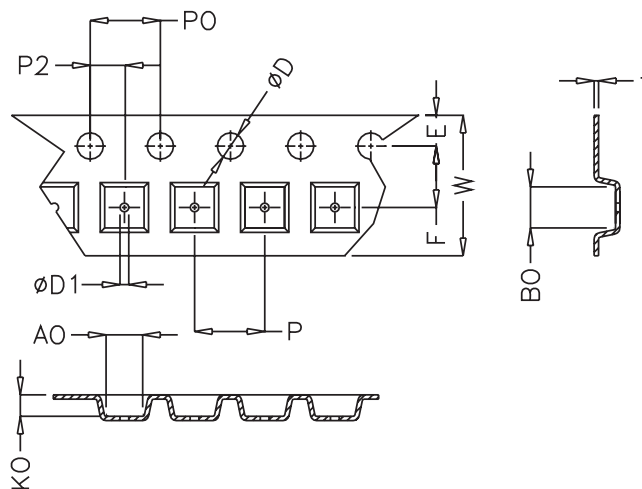
	Millimetres		Inches	
	Min	Max	Min	Max
<b>E</b>	1.65	1.85	0.065	0.073
<b>F</b>	5.40	5.60	0.213	0.220
<b>D</b>	1.50	1.60	0.059	0.063
<b>D1</b>	1.50 Min		0.059 Min	
<b>P0</b>	3.90	4.10	0.154	0.161
<b>10P0</b>	40.0+/- 0.20		1.574+/-0.008	
<b>W</b>	11.90	12.10	0.469	0.476
<b>P</b>	7.90	8.10	0.311	0.319
<b>A0</b>	5.20	5.40	0.205	0.213
<b>B0</b>	3.20	3.40	0.126	0.134
<b>K0</b>	1.20	1.40	0.047	0.055
<b>t</b>	0.30 +/- 0.05		0.012+/- 0.002	

**Embossed Carrier Tape & Reel Specifications – SC70-5 and SC70-6**



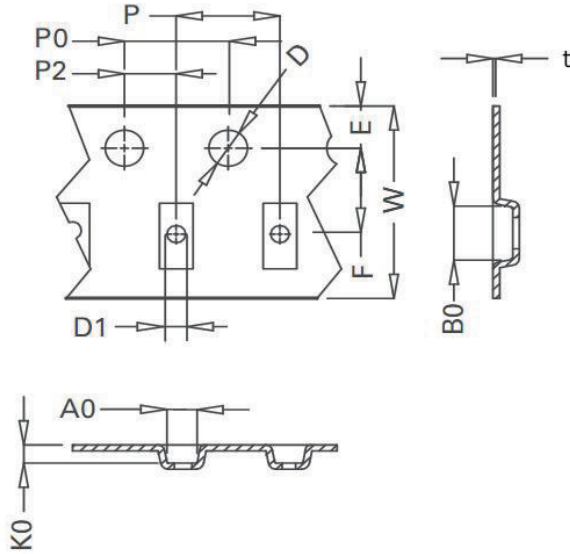
	Millimetres		Inches	
	Min	Max	Min	Max
<b>E</b>	1.65	1.85	0.064	0.073
<b>F</b>	3.45	3.55	0.135	0.139
<b>P2</b>	1.95	2.05	0.077	0.081
<b>D</b>	1.40	1.60	0.055	0.063
<b>D1</b>	1.00	1.25	0.039	0.049
<b>P0</b>	3.90	4.10	0.154	0.161
<b>10P0</b>	40.0+/- 0.20		1.574+/-0.008	
<b>W</b>	7.70	8.10	0.303	0.318
<b>P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

**Embossed Carrier Tape & Reel Specifications – SOT553 and SOT563**



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

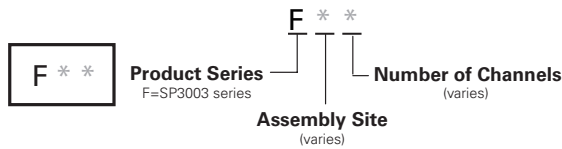
**Embossed Carrier Tape & Reel Specification – μDFN-6L**



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

**SP3003**

**Part Marking System**



**Ordering Information**

Part Number	Package	Marking	Min. Order Qty.
SP3003-02JTG	SC70-5	F * 2	3000
SP3003-02UTG	μDFN-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**

