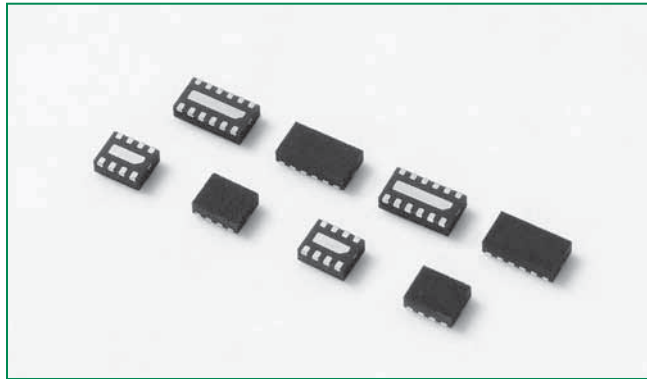
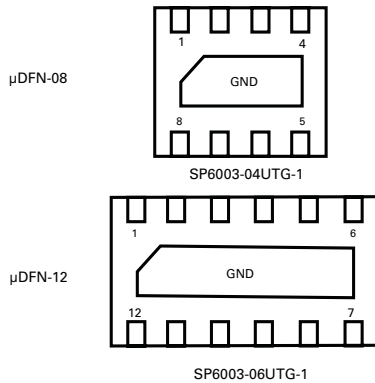


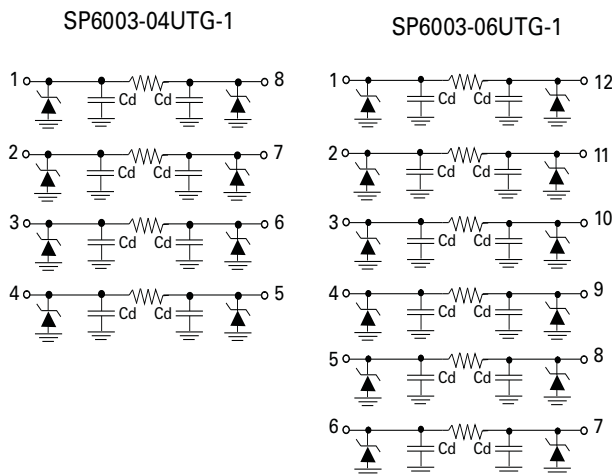
# SP6003 Series 7pF EMI Filter Array with ESD Protection



## Pinout



## Functional Block Diagram



## Description

Littelfuse's SP6003 integrates 4 and 6 EMI filters (C-R-C) into a small, low-profile  $\mu$ DFN package with each filter providing greater than -20dB attenuation at 1GHz. Additionally, each I/O is capable of shunting  $\pm 15$ kV ESD strikes (IEC61000-4-2, contact discharge) away from sensitive electronic components. The performance of this small, slim design makes it extremely suitable for mobile handsets, PDA's, and notebook computers.

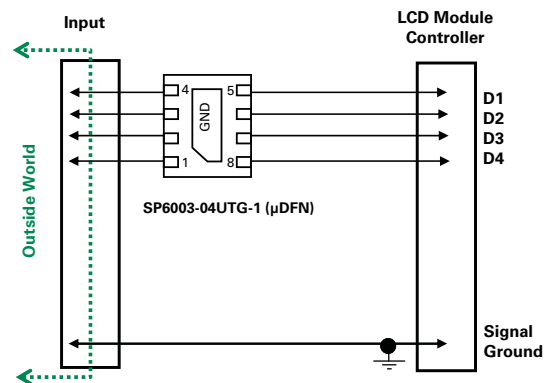
## Features

- EMI filtering of frequencies from 800MHz to 3GHz
- Greater than -20dB attenuation (TYP) at 1GHz
- ESD, IEC61000-4-2,  $\pm 15$ kV contact,  $\pm 30$ kV air
- Small, low-profile  $\mu$ DFN (JEDEC MO-229) package (TYP 0.5mm height)

## Applications

- Keypad Interface for Portable Electronics
- LCD and Camera Display Interfaces for Handsets
- Connector Interfaces for Handsets
- PDA's
- Digital Cameras
- Notebook Computers

## Application Example



**Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
T <sub>OP</sub>	Operating Temperature	-40 to 85	°C
T <sub>STOR</sub>	Storage Temperature	-60 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<sub>OP</sub>=25°C)**

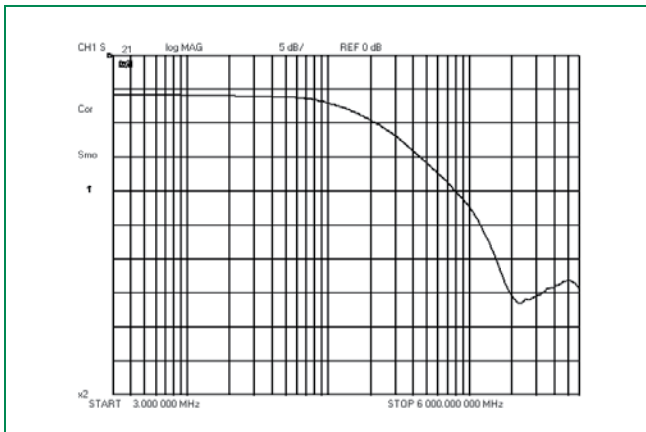
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V <sub>RWM</sub>				6.0	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>R</sub> =1mA	7.0	7.8	8.5	V
Reverse Leakage Current	I <sub>LEAK</sub>	V <sub>RWM</sub> =5V		0.1	1.0	µA
Resistance	R <sub>A</sub>	I <sub>R</sub> =10mA	85	100	115	Ω
Diode Capacitance <sup>1,2</sup>	C <sub>D</sub>	V <sub>R</sub> =2.5V, f=1MHz		7		pF
Line Capacitance <sup>1,2</sup>	C <sub>L</sub>	V <sub>R</sub> =2.5V, f=1MHz	11	14	17	pF
ESD Withstand Voltage <sup>1</sup>	V <sub>ESD</sub>	IEC61000-4-2 (Contact Discharge)	±15			kV
		IEC61000-4-2 (Air Discharge)	±30			kV
Cutoff Frequency <sup>3</sup>	F <sub>-3dB</sub>	Above this frequency, appreciable attenuation occurs		175		MHz

Notes: <sup>1</sup> Parameter is guaranteed by design and/or device characterization.

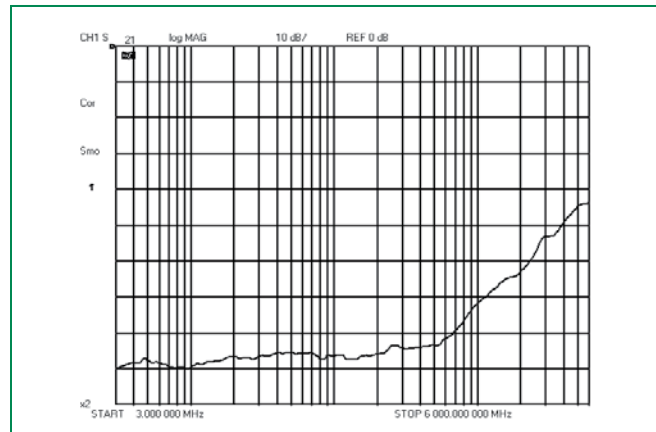
<sup>2</sup> Total line capacitance is two times the diode capacitance (C<sub>D</sub>).

<sup>3</sup> 50Ω source and 50Ω load termination

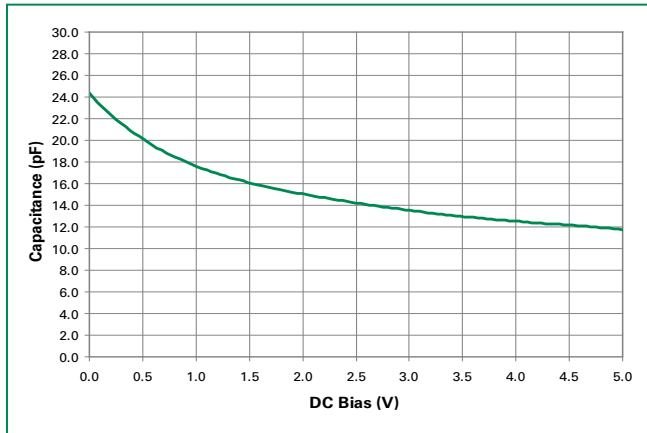
**Insertion Loss (S21)**



**Analog Crosstalk (S41)**



**Line Capacitance vs. DC Bias**

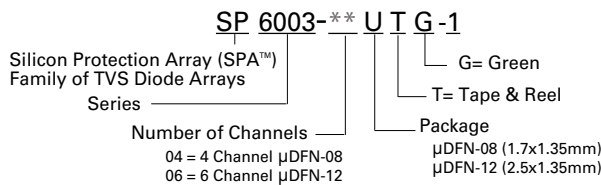


**Product Characteristics**

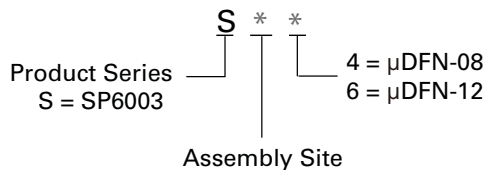
<b>Lead Plating</b>	Pre-Plated Frame
<b>Lead Material</b>	Copper Alloy
<b>Lead Coplanarity</b>	0.0004 inches (0.102mm)
<b>Substitute Material</b>	Silicon
<b>Body Material</b>	Molded Epoxy
<b>Flammability</b>	UL 94 V-0

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

**Part Numbering System**

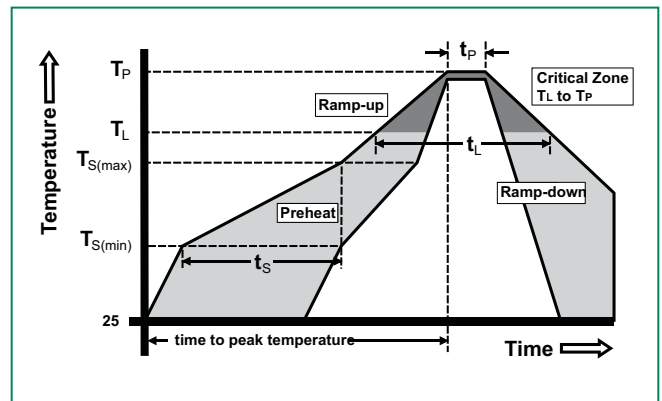


**Part Marking System**



**Soldering Parameters**

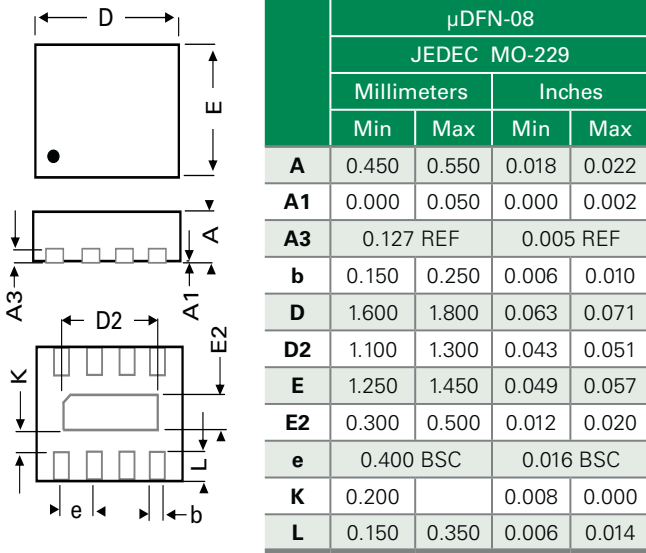
Reflow Condition	Pb – Free assembly	
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus) Temp ( $T_L$ ) to peak	3°C/second max	
$T_{s(max)}$ to $T_L$ - Ramp-up Rate	3°C/second max	
Reflow	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )	260 <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	



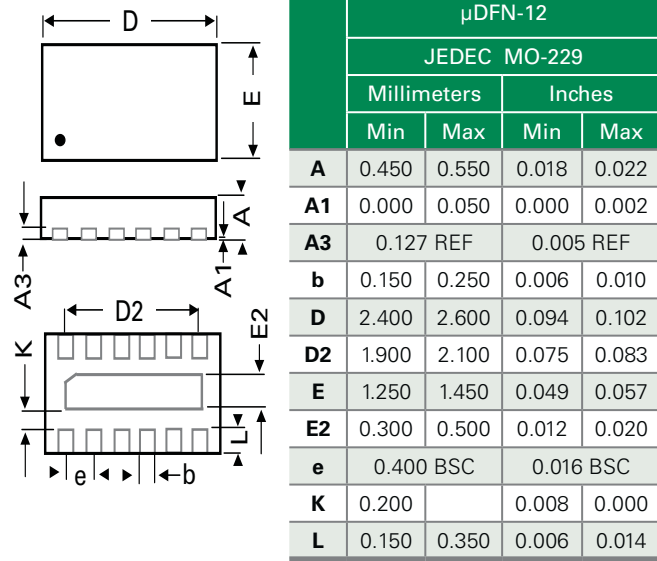
**Ordering Information**

Part Number	Package	Size	Marking	Min. Order Qty.
SP6003-04UTG-1	μDFN-08	1.7x1.35mm	S*4	3000
SP6003-06UTG-1	μDFN-12	2.5x1.35mm	S*6	3000

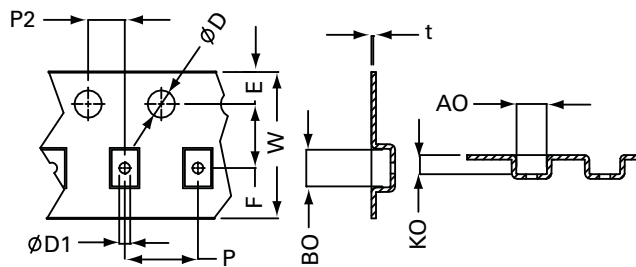
**Package Dimensions – μDFN-08**



**Package Dimensions – μDFN-12**

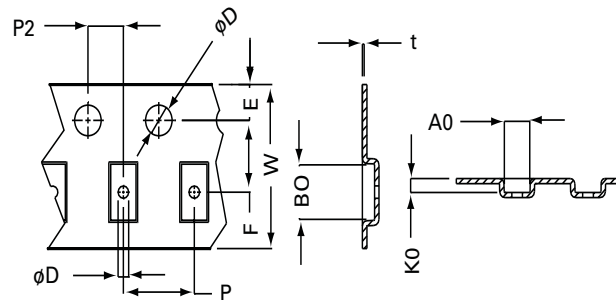


**Embossed Carrier Tape & Reel Specification – μDFN-08**



	Millimetres		Inches	
	Min	Max	Min	Max
<b>E</b>	1.65	1.85	0.065	0.073
<b>F</b>	3.45	3.55	0.136	0.140
<b>D1</b>	1.00	-	0.040	-
<b>D</b>	1.50 min		0.059 min	
<b>P</b>	3.90	4.10	0.154	0.161
<b>10P</b>	40.0 +/- 0.20		1.575 +/- 0.008	
<b>W</b>	7.70	8.30	0.303	0.327
<b>P2</b>	1.95	2.05	0.077	0.081
<b>A0</b>	1.55	1.75	0.061	0.069
<b>B0</b>	1.90	2.1	0.075	0.083
<b>K0</b>	0.95	1.15	0.037	0.045
<b>t</b>	0.30 max		0.012 max	

**Embossed Carrier Tape & Reel Specification – μDFN-12**



	Millimetres		Inches	
	Min	Max	Min	Max
<b>E</b>	1.65	1.85	0.065	0.073
<b>F</b>	3.45	3.55	0.136	0.140
<b>D1</b>	0.55	0.65	0.021	0.025
<b>D</b>	1.50 min		0.059 min	
<b>P</b>	3.90	4.10	0.154	0.161
<b>10P</b>	40.0 +/- 0.20		1.575 +/- 0.008	
<b>W</b>	7.90	8.30	0.311	0.327
<b>P2</b>	1.95	2.05	0.077	0.081
<b>A0</b>	1.33	1.53	0.052	0.060
<b>B0</b>	2.63	2.83	0.103	0.111
<b>K0</b>	0.58	0.78	0.023	0.031
<b>t</b>	0.22 max		0.009 max	