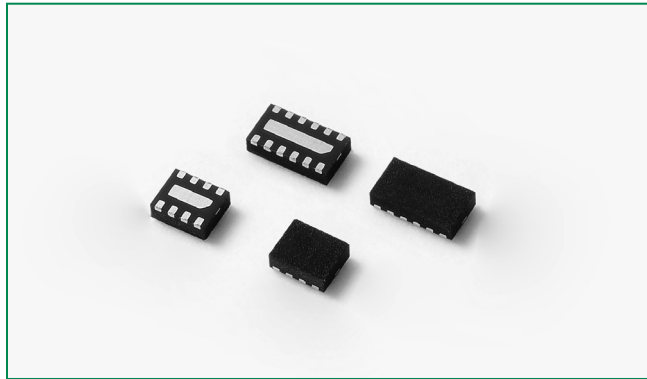


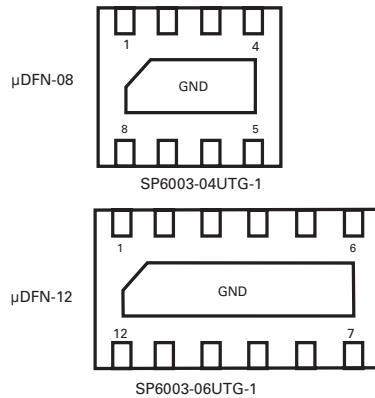
# SP6003 Series 7pF EMI Filter Array with ESD Protection



## 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  $\pm 12$ 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.

## Pinout



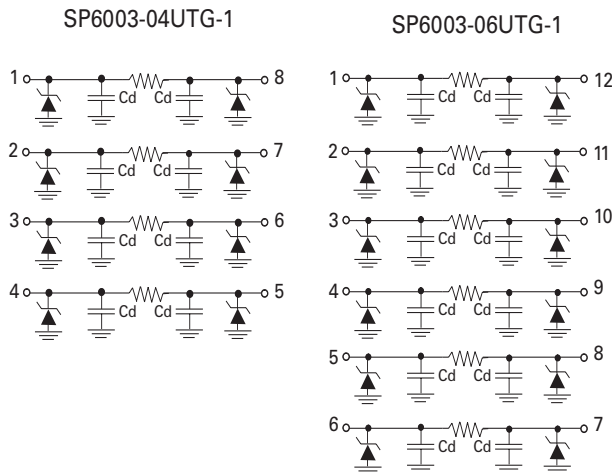
## Features

- EMI filtering of frequencies from 800MHz to 3GHz
- Greater than -20dB attenuation (TYP) at 1GHz
- ESD, IEC61000-4-2,  $\pm 12$ kV contact,  $\pm 15$ kV air
- Small, low-profile  $\mu$ DFN (JEDEC MO-229) package (TYP 0.5mm height)

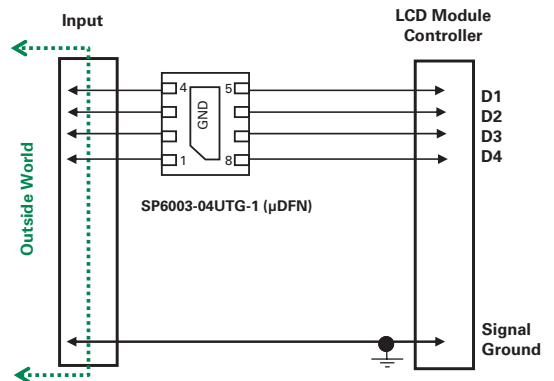
## Applications

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

## Functional Block Diagram



## Application Example



### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$T_{OP}$	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 10s)	260	°C

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

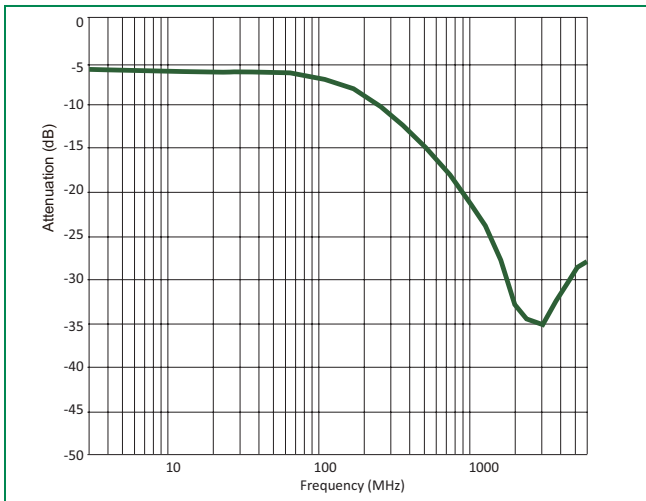
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$				5.0	V
Breakdown Voltage	$V_{BR}$	$I_R=1\text{mA}$		7.0		V
Reverse Leakage Current	$I_{LEAK}$	$V_{RWM}=5\text{V}$		0.1	1.0	$\mu\text{A}$
Resistance	$R_A$	$I_R=10\text{mA}$	80	100	120	$\Omega$
Diode Capacitance <sup>1,2</sup>	$C_D$	$V_R=2.5\text{V}, f=1\text{MHz}$		7		pF
Line Capacitance <sup>1,2</sup>	$C_L$	$V_R=2.5\text{V}, f=1\text{MHz}$	11	14	17	pF
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC61000-4-2 (Contact Discharge)	$\pm 12$			kV
		IEC61000-4-2 (Air Discharge)	$\pm 15$			kV
Cutoff Frequency <sup>3</sup>	$F_{-3dB}$	Above this frequency, appreciable attenuation occurs		250		MHz

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

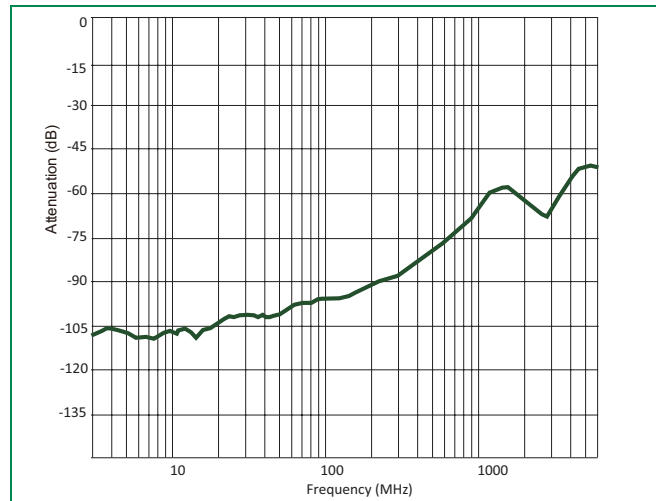
<sup>2</sup> Total line capacitance is two times the diode capacitance ( $C_D$ ).

<sup>3</sup> 50 $\Omega$  source and 50 $\Omega$  load termination

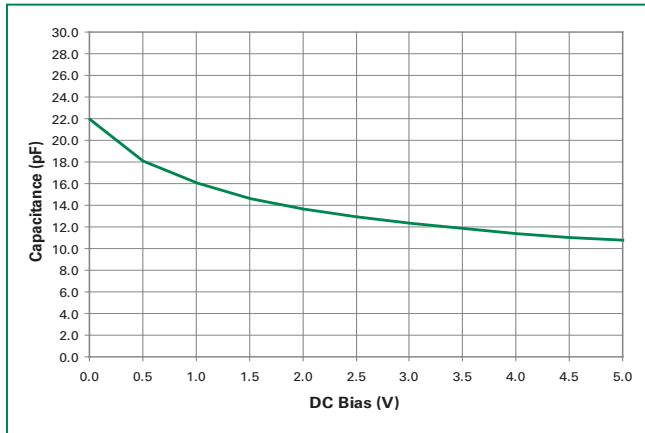
### Insertion Loss (S21)



### Analog Crosstalk (S41)



**Line Capacitance vs. DC Bias**



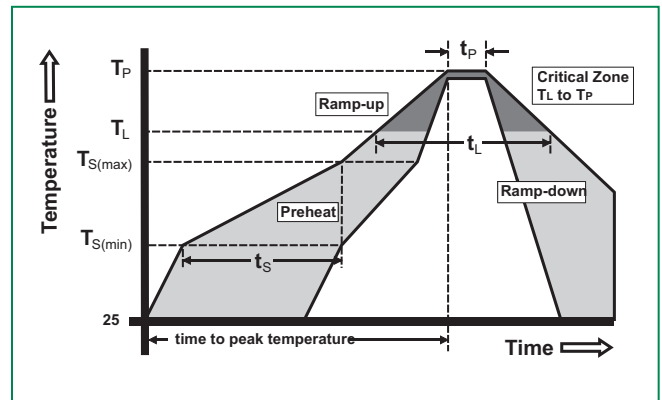
**Product Characteristics**

<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

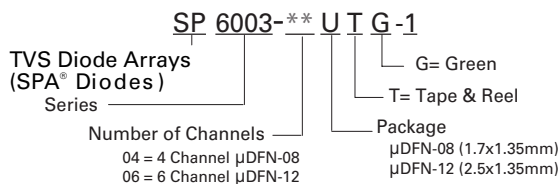
- Notes :
1. All dimensions are in millimeters
  2. Dimensions include solder plating.
  3. Dimensions are exclusive of mold flash & metal burr.
  4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
  5. Package surface matte finish VDI 11-13.

**Soldering Parameters**

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



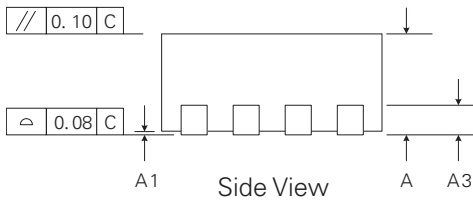
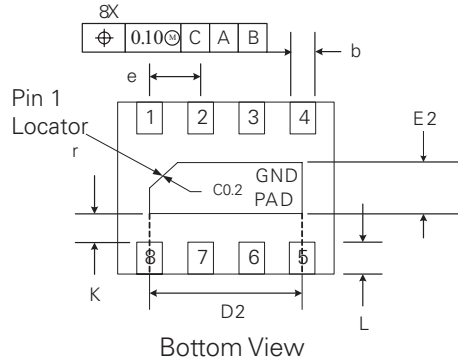
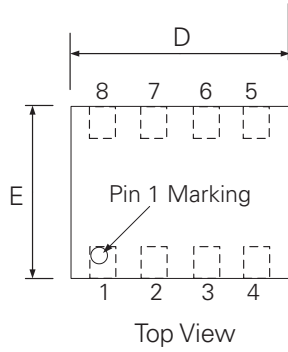
**Part Numbering System**



**Ordering Information**

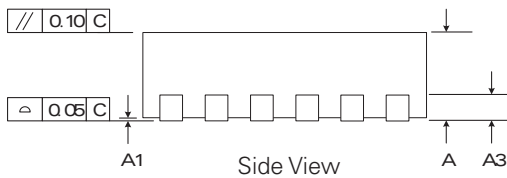
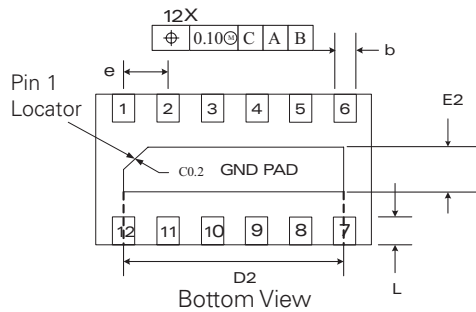
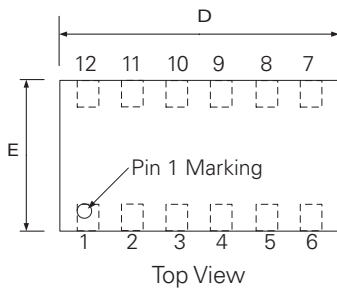
Part Number	Package	Size	Marking	Min. Order Qty.
SP6003-04UTG-1	$\mu$ DFN-08	1.7x1.35mm	C114	3000
SP6003-06UTG-1	$\mu$ DFN-12	2.5x1.35mm	C116YVWW	3000

**Package Dimensions —  $\mu$ DFN-08**



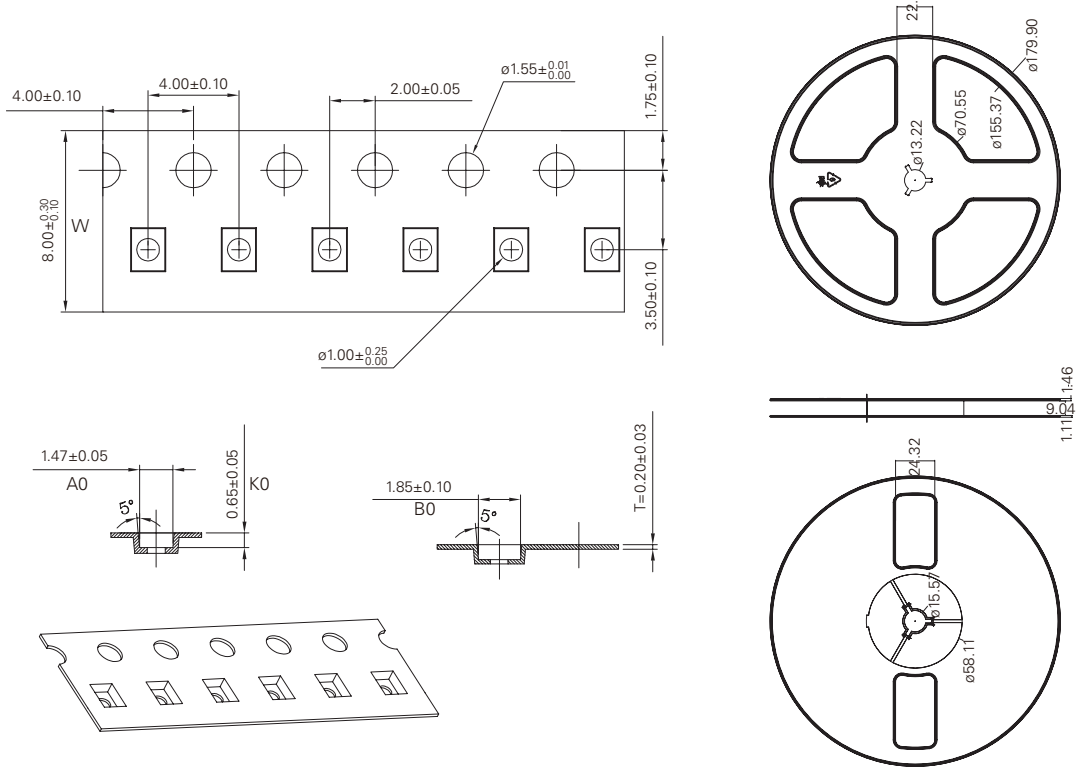
	$\mu$ DFN-08			
	JEDEC MO-229			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.45	0.55	0.018	0.022
<b>A1</b>	0.00	0.05	0.000	0.002
<b>A3</b>	0.152 REF		0.006 REF	
<b>b</b>	0.15	0.25	0.006	0.010
<b>D</b>	1.60	1.80	0.063	0.071
<b>D2</b>	1.10	1.30	0.043	0.051
<b>E</b>	1.25	1.45	0.049	0.057
<b>E2</b>	0.30	0.50	0.012	0.020
<b>e</b>	0.400 BSC		0.016 BSC	
<b>K</b>	0.20		0.008	
<b>L</b>	0.15	0.35	0.006	0.014

**Package Dimensions —  $\mu$ DFN-12**



	$\mu$ DFN-12			
	JEDEC MO-229			
	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>	0.102 REF		0.004 REF	
<b>b</b>	0.15	0.25	0.006	0.010
<b>D</b>	2.40	2.60	0.095	0.103
<b>D2</b>	1.90	2.10	0.075	0.083
<b>E</b>	1.25	1.45	0.050	0.058
<b>E2</b>	0.30	0.50	0.012	0.020
<b>e</b>	0.400 BSC		0.016 BSC	
<b>L</b>	0.15	0.35	0.006	0.014

**Embossed Carrier Tape & Reel Specification —  $\mu$ DFN-08**



SP6003

**Embossed Carrier Tape & Reel Specification —  $\mu$ DFN-12**

