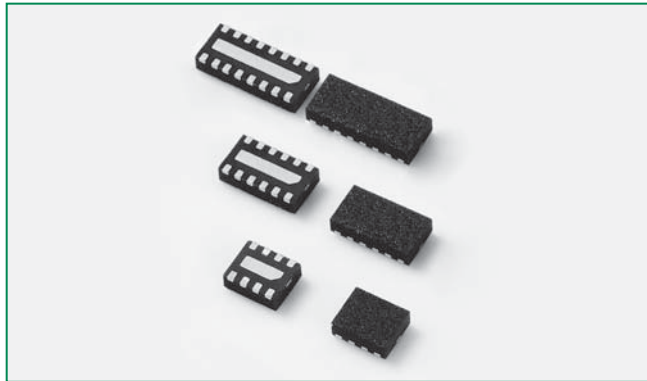
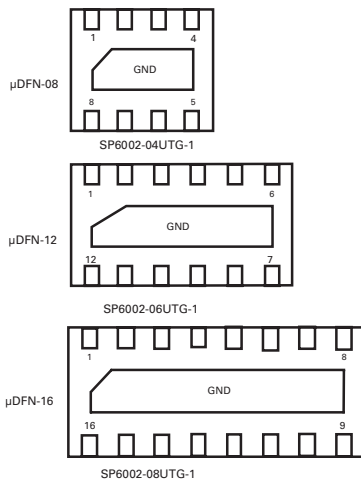


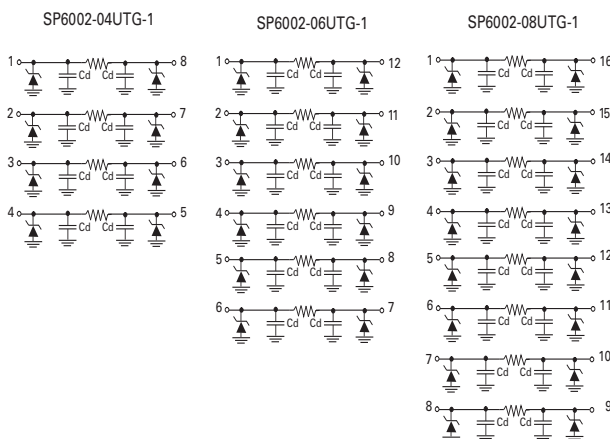
**SP6002 Series 15pF 15kV EMI Filter Array**



**Pinout**



**Functional Block Diagram**



**Description**

The Littelfuse SP6002 SPA series integrates 4, 6 and 8 EMI filters (C-R-C) into a small, low-profile µDFN package with each filter providing greater than -30dB attenuation at 800MHz. Additionally, each I/O is capable of shunting ±15kV 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, PDAs and notebook computers.

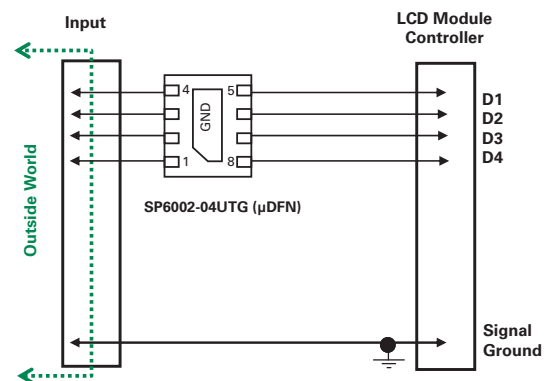
**Features**

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

**Applications**

- Keypad interface for portable electronics
- LCD and camera display interfaces for handsets
- Connector interfaces for portable electronics
- Mobile phone
- Smartphone
- Portable navigation device

**Application Example**



**Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
T <sub>OP</sub>	Operating Temperature	-40 to 125	°C
T <sub>STOR</sub>	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<sub>OP</sub>=25°C)**

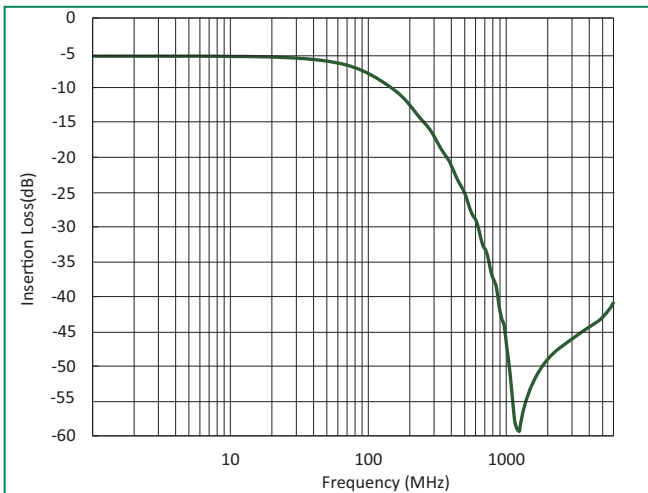
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V <sub>RWM</sub>				5.0	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>R</sub> =1mA		7.0		V
Reverse Leakage Current	I <sub>LEAK</sub>	V <sub>RWM</sub> =5V		0.1	1.0	µA
Resistance	R <sub>A</sub>	I <sub>R</sub> =10mA	80	100	120	Ω
Diode Capacitance <sup>1,2</sup>	C <sub>D</sub>	V <sub>R</sub> =2.5V, f=1MHz		15		pF
Line Capacitance <sup>1,2</sup>	C <sub>L</sub>	V <sub>R</sub> =2.5V, f=1MHz	24	30	36	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		100		MHz

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

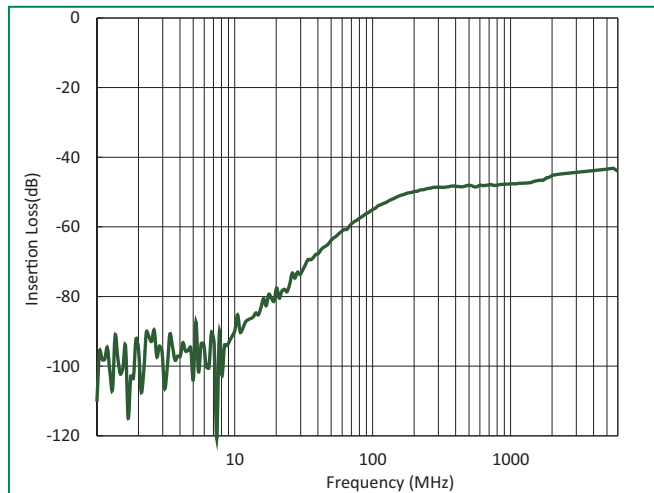
<sup>2</sup> Total line capacitance is two times the diode capacitance (C<sub>D</sub>).

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

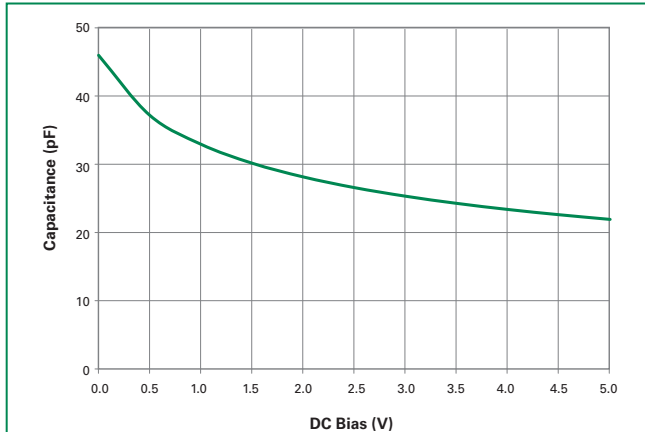
**Insertion Loss (S21)**



**Analog Crosstalk (S41)**



## Line Capacitance vs. DC Bias



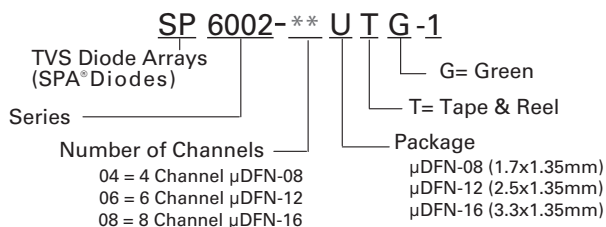
## Product Characteristics

<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

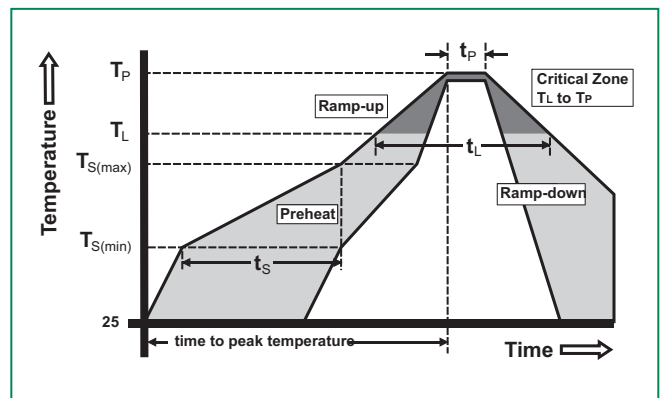


## Ordering Information

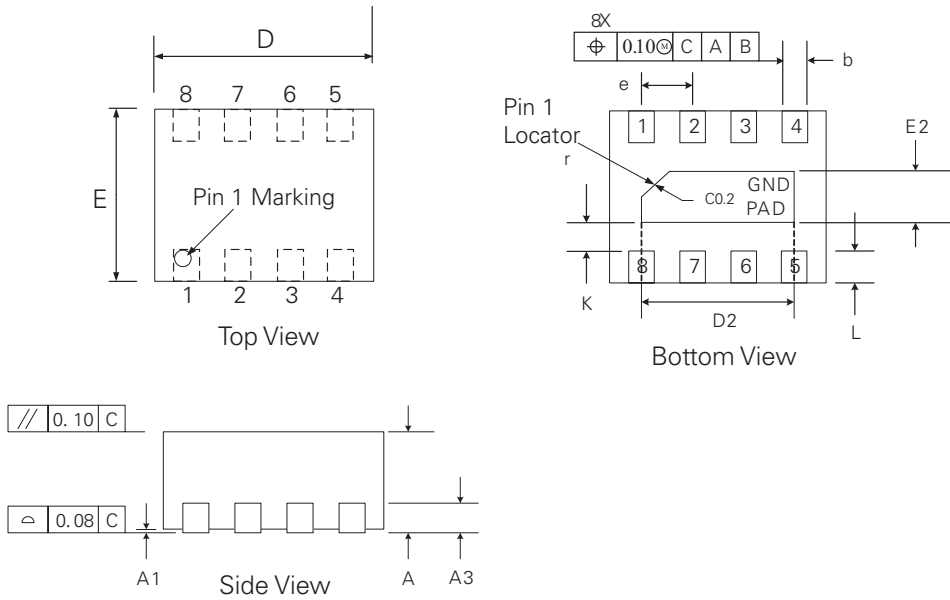
Part Number	Package	Size	Marking	Min. Order Qty.
SP6002-04UTG-1	μDFN-08	1.7x1.35mm	C12	3000
SP6002-06UTG-1	μDFN-12	2.5x1.35mm	C126	3000
SP6002-08UTG-1	μDFN-16	3.3x1.35mm	C128YYWW	3000

## 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	

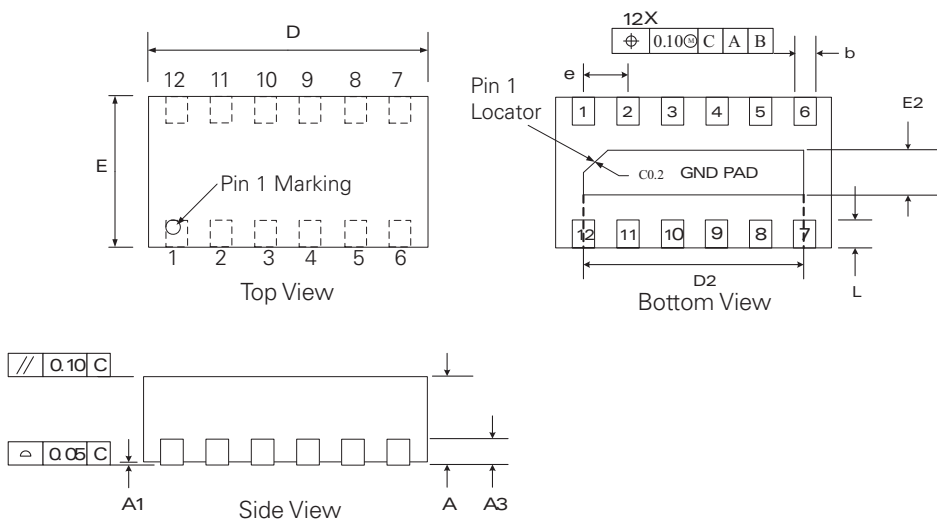


**Package Dimensions –  $\mu$ DFN-08**



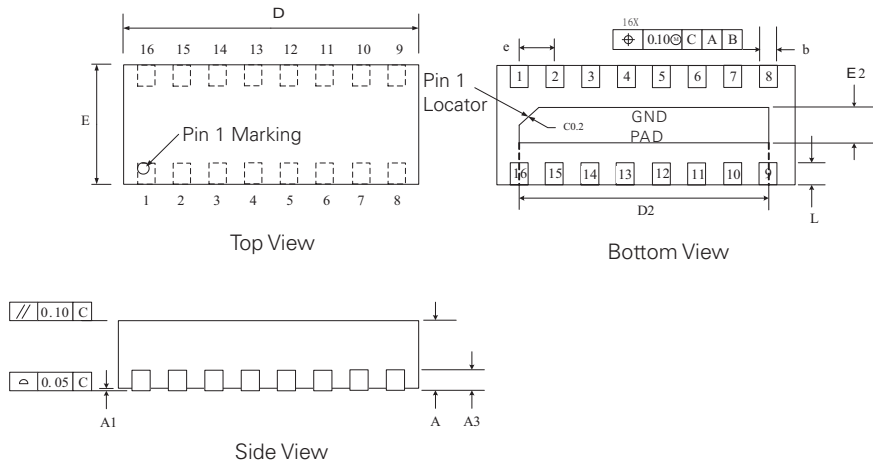
	$\mu$ DFN-08			
	JEDEC MO-229			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.45	0.55	0.018	0.022
<b>A1</b>	0.00	0.05	0.000	0.002
<b>A3</b>	0.152 REF		0.006 REF	
<b>b</b>	0.15	0.25	0.006	0.010
<b>D</b>	1.60	1.80	0.063	0.071
<b>D2</b>	1.10	1.30	0.043	0.051
<b>E</b>	1.25	1.45	0.049	0.057
<b>E2</b>	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

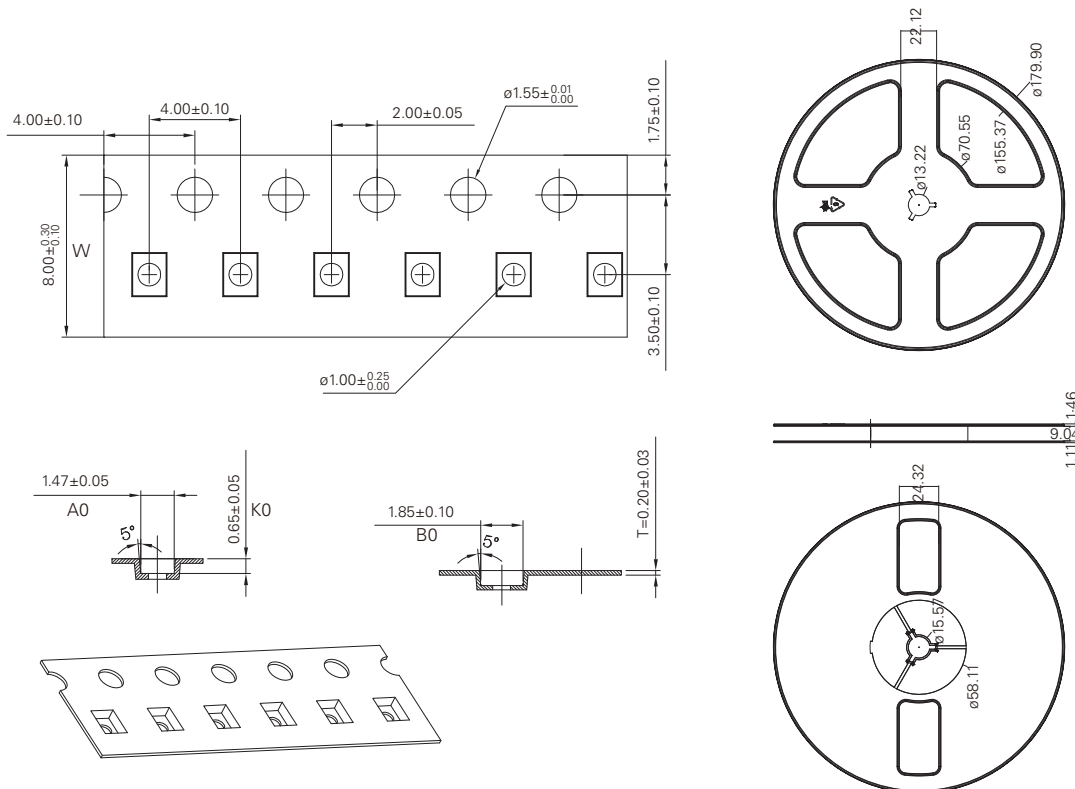
**Package Dimensions —  $\mu$ DFN-16**



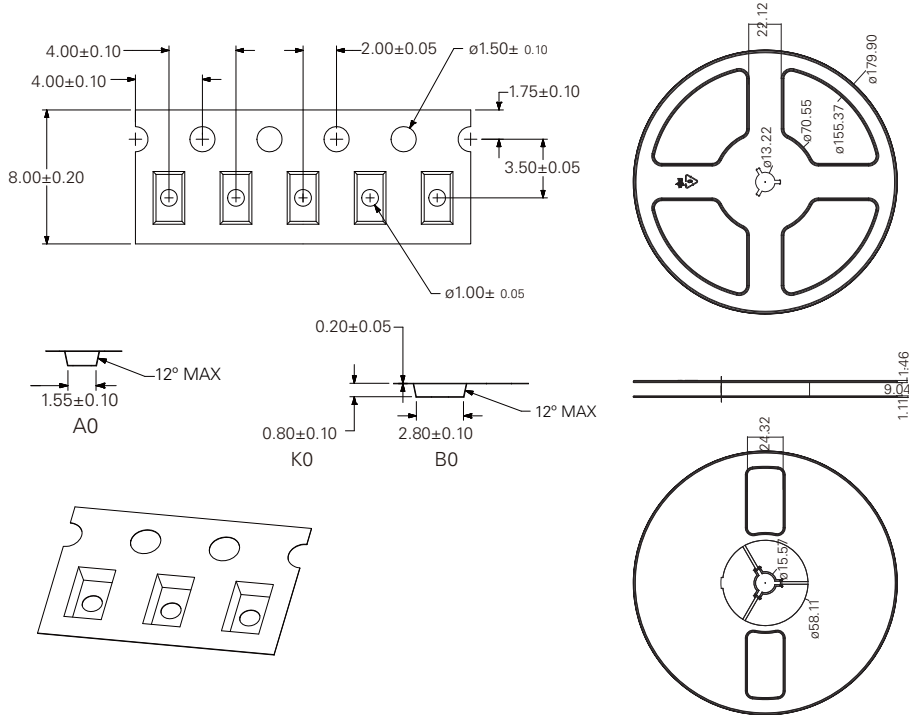
	$\mu$ DFN-16			
	JEDEC MO-229			
	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.45	0.55	0.018	0.022
<b>A1</b>	0.00	0.05	0.00	0.002
<b>A3</b>	0.102 REF		0.04 REF	
<b>b</b>	0.15	0.25	0.006	0.010
<b>D</b>	3.20	3.40	0.126	0.134
<b>D2</b>	2.70	2.90	0.106	0.114
<b>E</b>	1.25	1.45	0.049	0.057
<b>E2</b>	0.30	0.50	0.012	0.020
<b>e</b>	0.40 BSC		0.016 BSC	
<b>L</b>	0.15	0.35	0.006	0.014

SP6002

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



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



**Embossed Carrier Tape & Reel Specification —  $\mu$ DFN-16**

