

## 4-Channel LCD EMI Filter Array Plus 4-Channel ESD Protection Array

### Features

- Four channels of combined EMI/RFI filtering plus ESD protection
- Four additional channels of ESD-only protection
- Better than 30dB attenuation (typical) at 1 GHz
- $\pm 15\text{kV}$  ESD protection on all channels (IEC 61000-4-2 Level 4, contact discharge)
- $\pm 30\text{kV}$  ESD protection on all channels (HBM)
- Chip Scale Package features extremely low lead inductance for optimum filter and ESD performance
- 15-bump, 2.960mm X 1.330mm footprint Chip Scale Package (CSP)
- RoHS-compliant, lead-free finishing

### Applications

- LCD data lines in mobile handsets
- EMI filtering and ESD protection for both data and I/O ports
- Mobile Handsets
- Handheld PCs / PDAs
- Notebook Computers

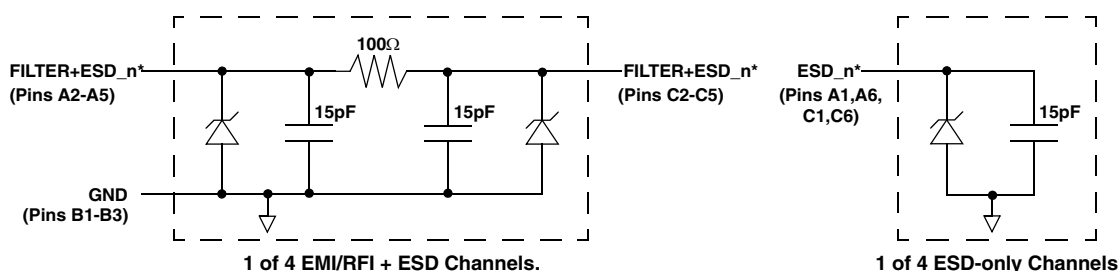
### Product Description

The CSPEMI607G is a multi-channel array consisting of four low-pass filters with integrated ESD protection and four ESD-only protection channels that are designed to reduce EMI/RFI emissions on LCD data lines in mobile handsets. The CSPEMI607G has component values of 15pF-100 $\Omega$ -15pF. These devices include ESD protection diodes on every pin and provide a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The ESD diodes connected to the filter ports safely dissipate ESD strikes of  $\pm 15\text{kV}$ , exceeding the maximum requirement of the IEC 61000-4-2 international standard. Using the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD, the pins are protected for contact discharges at greater than  $\pm 30\text{kV}$ .

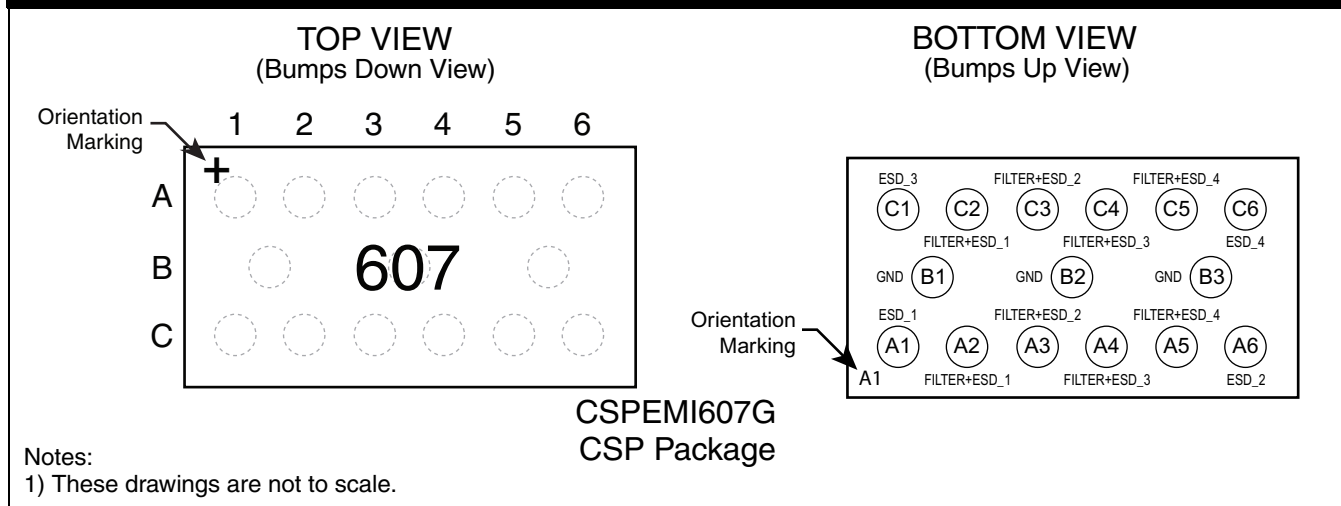
This device is particularly well-suited for portable electronics (e.g. wireless handsets, PDAs, notebook computers) because of its small package and easy-to-use pin assignments. In particular, the CSPEMI607G is ideal for EMI filtering and protecting data lines from ESD for the LCD display in mobile handsets.

The CSPEMI607G is available in space-saving, low-profile chip-scale packages with lead-free finishing.

### Electrical Schematic



\* See Package/Pinout Diagram for expanded pin information

**PACKAGE / PINOUT DIAGRAMS**

**PIN DESCRIPTIONS**

PIN(s)	NAME	DESCRIPTION
A1	ESD_1	ESD Channel 1
A2	FILTER+ESD_1	Filter + ESD Channel 1
A3	FILTER+ESD_2	Filter + ESD Channel 2
A4	FILTER+ESD_3	Filter + ESD Channel 3
A5	FILTER+ESD_4	Filter + ESD Channel 4
A6	ESD_2	ESD Channel 2
B1-B3	GND	Device Ground
C1	ESD_3	ESD Channel 3
C2	FILTER+ESD_1	Filter + ESD Channel 1
C3	FILTER+ESD_2	Filter + ESD Channel 2
C4	FILTER+ESD_3	Filter + ESD Channel 3
C5	FILTER+ESD_4	Filter + ESD Channel 4
C6	ESD_4	ESD Channel 4

**Ordering Information**
**PART NUMBERING INFORMATION**

Bumps	Package	Lead-free Finish	
		Ordering Part Number <sup>1</sup>	Part Marking
15	CSP	CSPEMI607G	607

Note 1: Parts are shipped in Tape and Reel form unless otherwise specified.

## Specifications

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNITS
Storage Temperature Range	-65 to +150	°C
DC Power per Resistor	100	mW
DC Package Power Rating	500	mW

### STANDARD OPERATING CONDITIONS

PARAMETER	RATING	UNITS
Operating Temperature Range	-40 to +85	°C

### ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
R	Resistance		80	100	120	Ω
C	Capacitance	At 2.5VDC, 1Mhz, 30mVAC	12	15	18	pF
V <sub>DIODE</sub>	Diode Standoff Voltage	I <sub>DIODE</sub> =10μA	5.5			V
I <sub>LEAK</sub>	Diode Leakage Current (reverse bias)	V <sub>DIODE</sub> =+3.3V		100	300	nA
V <sub>SIG</sub>	Signal Voltage Positive Clamp Negative Clamp	I <sub>LOAD</sub> = 10mA	5.6 -1.5	6.8 -0.8	9.0 -0.4	V V
V <sub>ESD</sub>	In-system ESD Withstand Voltage a) Human Body Model, MIL-STD-883, Method 3015 b) Contact Discharge per IEC 61000-4-2 Level 4	Notes 2 and 3	±30 ±15			kV kV
R <sub>DYN</sub>	Dynamic Resistance Positive Negative			1.6 0.44		Ω Ω
V <sub>CLAMP</sub>	Clamping voltage during ESD discharge, MIL-STD-883 (Method 3015), 8kV Positive Negative			12 -7		V V
f <sub>C</sub>	Cut-off Frequency Z <sub>SOURCE</sub> =50Ω, Z <sub>LOAD</sub> =50Ω	R=100Ω, C=15pF		120		MHz

Note 1: T<sub>A</sub>=25°C unless otherwise specified.

Note 2: ESD applied to input and output pins with respect to GND, one at a time.

Note 3: These parameters are guaranteed by design and characterization.

## Performance Information

Typical Filter Performance ( $T_A=25^\circ\text{C}$ , DC Bias=0V, 50 Ohm Environment)

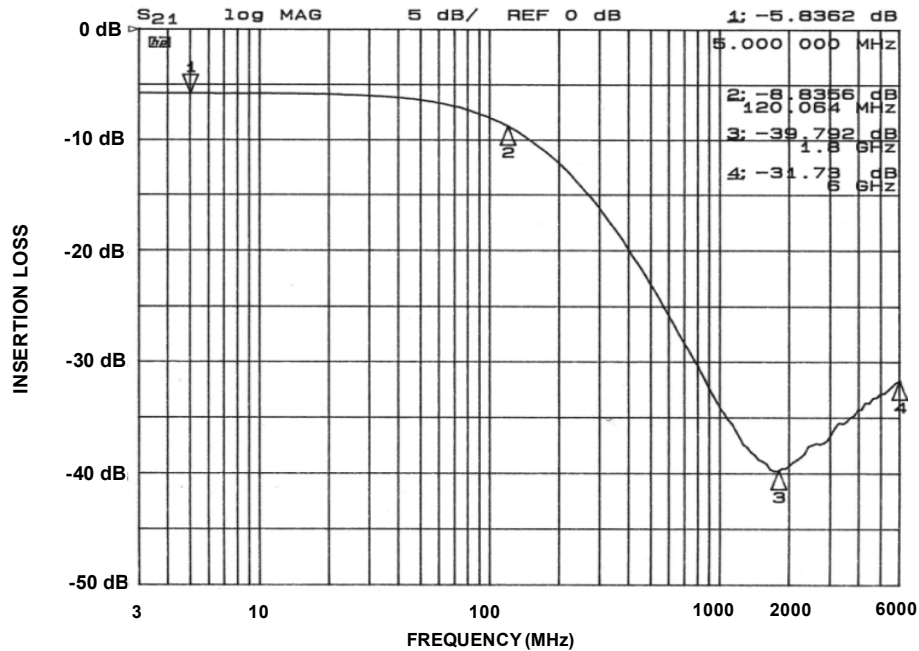
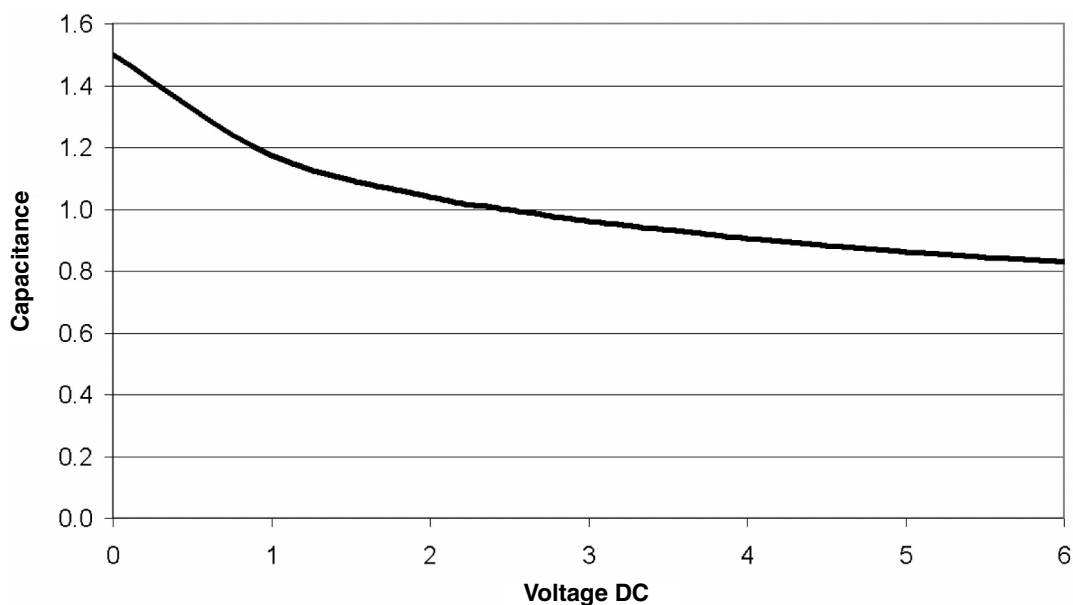


Figure 1. Insertion Loss VS. Frequency (Typical)

### Performance Information (cont'd)



**Figure 2. Filter Capacitance vs. Input Voltage  
(Normalized to Capacitance at 2.5VDC and 25°C)**

## Application Information

Refer to Application Note AP-217, "The Chip Scale Package", for a detailed description of Chip Scale Packages offered by California Micro Devices.

### PRINTED CIRCUIT BOARD RECOMMENDATIONS

PARAMETER	VALUE
Pad Size on PCB	0.275mm
Pad Shape	Round
Pad Definition	Non-Solder Mask defined pads
Solder Mask Opening	0.325mm Round
Solder Stencil Thickness	0.125mm - 0.150mm
Solder Stencil Aperture Opening (laser cut, 5% tapered walls)	0.330mm Round
Solder Flux Ratio	50/50 by volume
Solder Paste Type	No Clean
Pad Protective Finish	OSP (Entek Cu Plus 106A)
Tolerance — Edge To Corner Ball	$\pm 50\mu\text{m}$
Solder Ball Side Coplanarity	$\pm 20\mu\text{m}$
Maximum Dwell Time Above Liquidous (183°C)	60 seconds
Maximum Soldering Temperature for a Lead-free Device using Lead-free Solder Paste	260°C

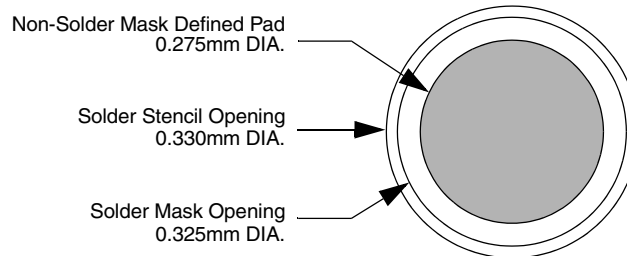


Figure 3. Recommended Non-Solder Mask Defined Pad Illustration

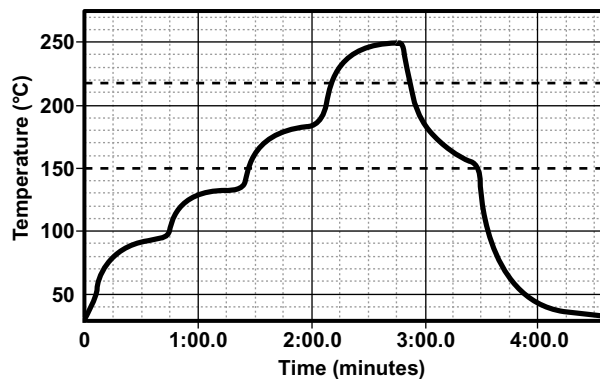


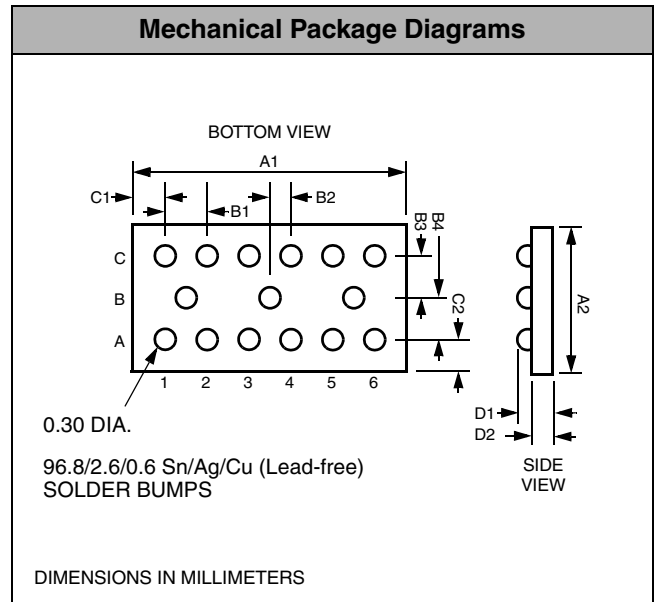
Figure 4. Lead-free (SnAgCu) Solder Ball Reflow Profile

## Mechanical Details

### CSP Mechanical Specifications

CSPEMI607G devices are packaged in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information on CSP packaging, see the California Micro Devices CSP Package Information document.

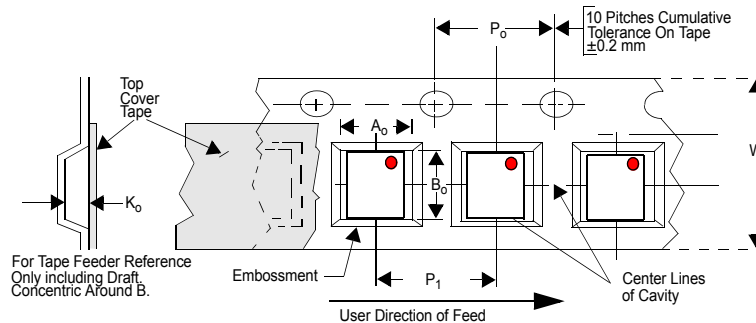
PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	15					
Dim	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A1	2.915	2.960	3.005	0.1148	0.1165	0.1183
A2	1.285	1.330	1.375	0.0506	0.0524	0.0541
B1	0.495	0.500	0.505	0.0195	0.0197	0.0199
B2	0.245	0.250	0.255	0.0096	0.0098	0.0100
B3	0.430	0.435	0.440	0.0169	0.0171	0.0173
B4	0.430	0.435	0.440	0.0169	0.0171	0.0173
C1	0.180	0.230	0.280	0.0071	0.0091	0.0110
C2	0.180	0.230	0.280	0.0071	0.0091	0.0110
D1	0.571	0.615	0.659	0.0225	0.0242	0.0259
D2	0.355	0.380	0.405	0.0140	0.0150	0.0159
# per tape and reel	3500 pieces					
Controlling dimension: millimeters						



**Package Dimensions for  
CSPEMI607G Chip Scale Package**

### CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) $B_0 \times A_0 \times K_0$	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	$P_0$	$P_1$
CSPEMI607G	2.96 X 1.33 X 0.615	3.10 X 1.45 X 0.74	8mm	178mm (7")	3500	4mm	4mm



**Figure 5. Tape and Reel Mechanical Data**