

# CSPEMI606/608

## LCD EMI Filter Array with ESD Protection

### Description

The CSPEMI606 and CSPEMI608 are EMI filter arrays with ESD protection, which integrate six and eight Pi-filters (C-R-C), respectively. The CSPEMI606/608 has component values of 15 pF – 100 Ω – 15 pF. These devices include ESD protection diodes on every pin, which 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 are designed and characterized to safely dissipate ESD strikes of ±15 kV, beyond 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 ±30 kV.

These devices are particularly well suited for portable electronics (e.g. wireless handsets, PDAs, notebook computers) because of their small package format and easy-to-use pin assignments. They are ideal for EMI filtering and protecting data lines from ESD for the LCD display in clamshell handsets. The CSPEMI606 and CSPEMI608 are available in space-saving, low-profile chip-scale packages.

### Features

- Six and Eight Channels of EMI Filtering
- ±15 kV ESD Protection on each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- ±30 kV ESD Protection on each Channel (HBM)
- Better than 30 dB of Attenuation at 1 GHz to 3 GHz
- 15-Bump, 2.960 mm x 1.330 mm Footprint Chip Scale Package (CSPEMI606)
- 20-Bump, 4.000 mm x 1.458 mm Footprint Chip Scale Package (CSPEMI608)
- Chip Scale Package Features Extremely Low Lead Inductance for Optimum Filter and ESD Performance
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- LCD Data Lines in Clamshell Wireless Handsets
- EMI Filtering & ESD Protection for High-Speed I/O Data Ports
- Wireless Handsets / Cell Phones
- Notebook Computers
- PDAs / Handheld PCs
- EMI Filtering for High-Speed Data Lines



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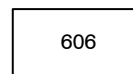


WLCSP15  
CASE 567BS

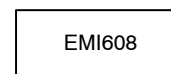


WLCSP20  
CASE 567BZ

### MARKING DIAGRAM



CSPEMI606  
15-Bump CSP



CSPEMI608  
20-Bump CSP

606 = CSPEMI606

EMI608 = CSPEMI608

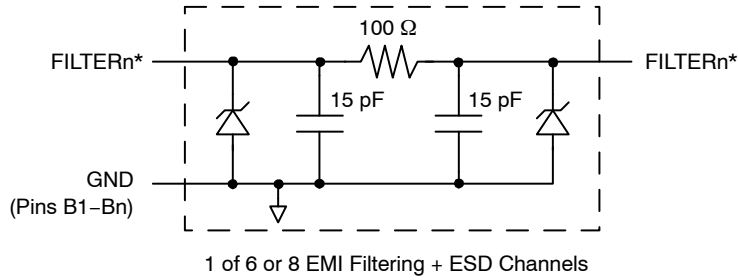
### ORDERING INFORMATION

Device	Package	Shipping†
CSPEMI606G	CSP-15 (Pb-Free)	3500/Tape & Reel
CSPEMI608G	CSP-20 (Pb-Free)	3500/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# CSPEMI606/608

## ELECTRICAL SCHEMATIC



\*See Package/Pinout Diagrams for expanded pin information.

## PACKAGE / PINOUT DIAGRAMS

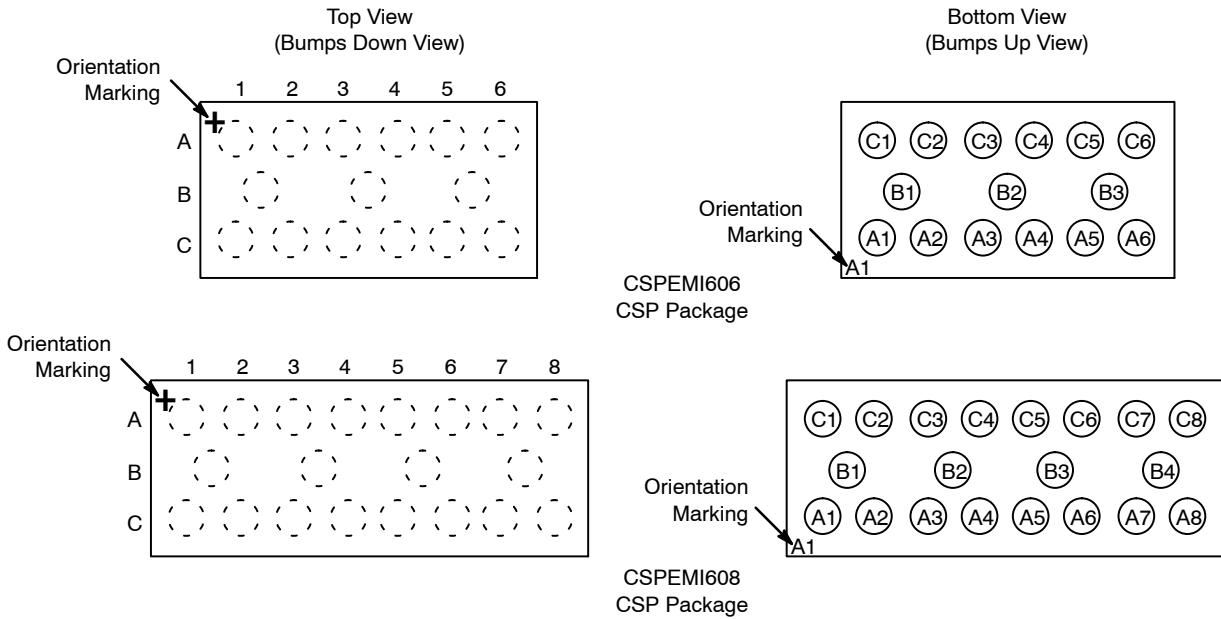


Table 1. PIN DESCRIPTIONS

Pin(s)		Name	Description	Pin(s)		Name	Description
CSPEMI606	CSPEMI608			CSPEMI606	CSPEMI608		
A1	A1	FILTER1	Filter Channel 1	C1	C1	FILTER1	Filter Channel 1
A2	A2	FILTER2	Filter Channel 2	C2	C2	FILTER2	Filter Channel 2
A3	A3	FILTER3	Filter Channel 3	C3	C3	FILTER3	Filter Channel 3
A4	A4	FILTER4	Filter Channel 4	C4	C4	FILTER4	Filter Channel 4
A5	A5	FILTER5	Filter Channel 5	C5	C5	FILTER5	Filter Channel 5
A6	A6	FILTER6	Filter Channel 6	C6	C6	FILTER6	Filter Channel 6
-	A7	FILTER7	Filter Channel 7	-	C7	FILTER7	Filter Channel 7
-	A8	FILTER8	Filter Channel 8	-	C8	FILTER8	Filter Channel 8
B1-B3	B1-B4	GND	Device Ground				

# CSPEMI606/608

## SPECIFICATIONS

**Table 2. 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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Table 3. STANDARD OPERATING CONDITIONS**

Parameter	Rating	Units
Operating Temperature Range	-40 to +85	°C

**Table 4. ELECTRICAL OPERATING CHARACTERISTICS** (Note 1)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
R	Resistance		80	100	120	Ω
C	Capacitance	At 2.5 V DC, 1 MHz, 30 mV AC	12	15	18	pF
V <sub>DIODE</sub>	Diode Standoff Voltage	I <sub>DIODE</sub> = 10 μA		6.0		V
I <sub>LEAK</sub>	Diode Leakage Current (reverse bias)	V <sub>DIODE</sub> = 3.3 V			200	nA
V <sub>SIG</sub>	Signal Voltage Positive Clamp Negative Clamp	I <sub>LOAD</sub> = 10 mA	5.6 -1.5	6.8 -0.8	9.0 -0.4	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 4)	±30 ±15			kV
V <sub>CL</sub>	Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8 kV Positive Transients Negative Transients	(Notes 2, 3 and 4)		+12 -7		V
f <sub>C</sub>	Cut-off Frequency Z <sub>SOURCE</sub> = 50 Ω, Z <sub>LOAD</sub> = 50 Ω	R = 100 Ω, C = 15 pF		120		MHz

1. T<sub>A</sub> = 25°C unless otherwise specified.
2. ESD applied to input and output pins with respect to GND, one at a time.
3. Clamping voltage is measured at the opposite side of the EMI filter to the ESD pin. For example, if ESD is applied to Pin A1, then clamping voltage is measured at Pin C1.
4. Unused pins are left open.

# CSPEMI606/608

## PERFORMANCE INFORMATION

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

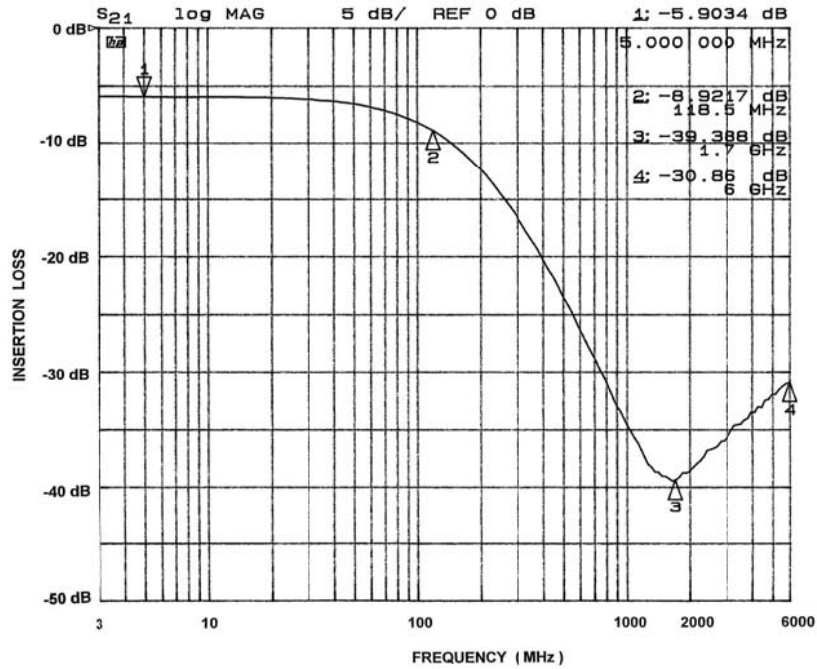


Figure 1. Insertion Loss vs. Frequency (A1-C1 to GND B1)

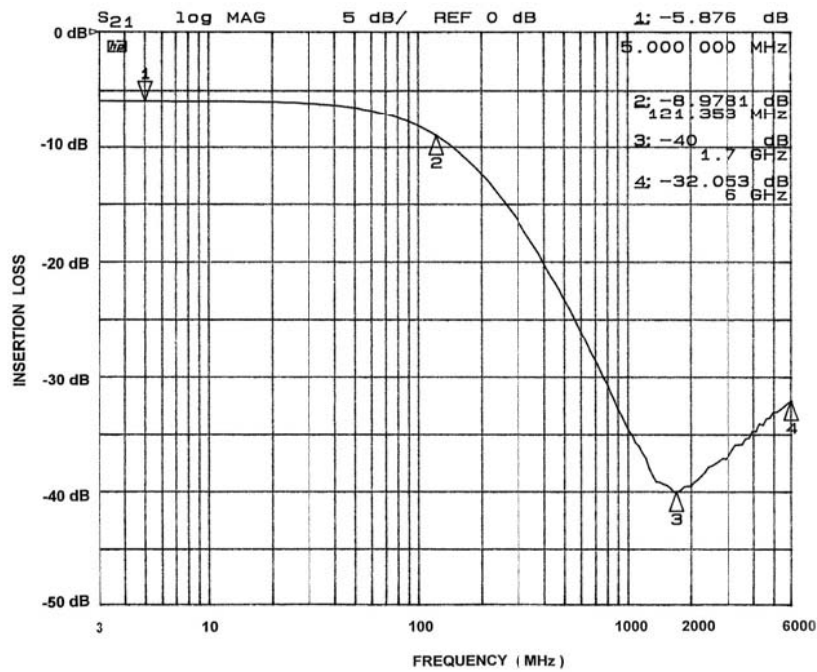


Figure 2. Insertion Loss vs. Frequency (A2-C2 to GND B1)

PERFORMANCE INFORMATION (Cont'd)

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

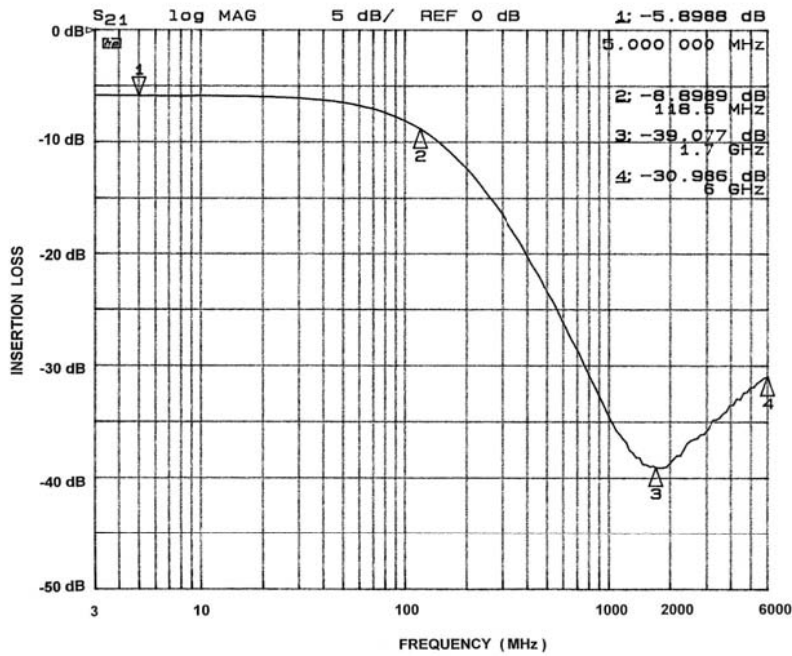


Figure 3. Insertion Loss vs. Frequency (A3-C3 to GND B2)

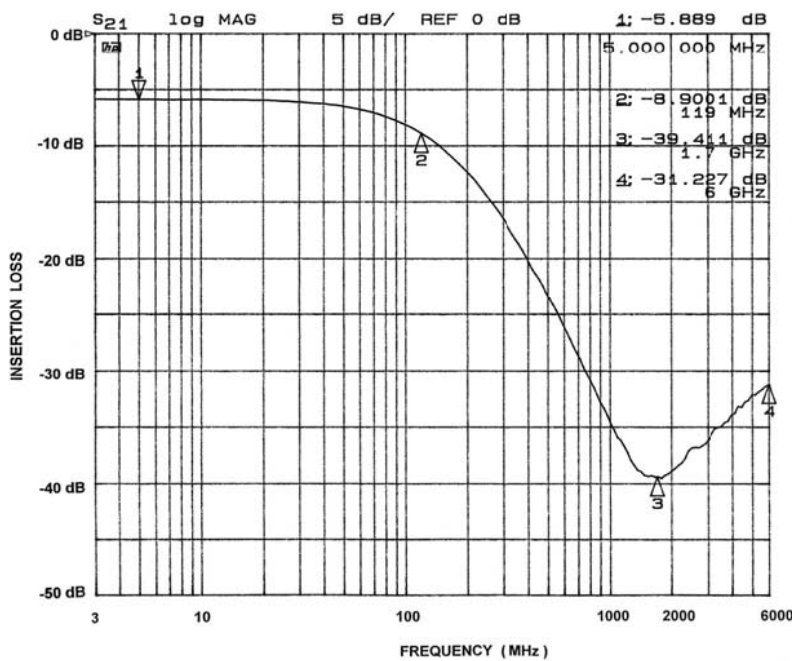


Figure 4. Insertion Loss vs. Frequency (A4-C4 to GND B2)

PERFORMANCE INFORMATION (Cont'd)

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

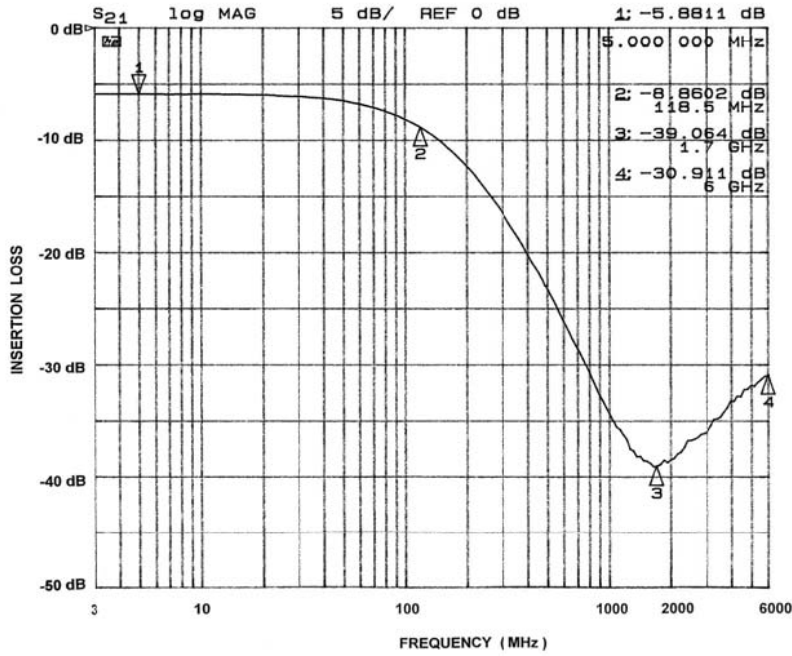


Figure 5. Insertion Loss vs. Frequency (A5-C5 to GND B3)

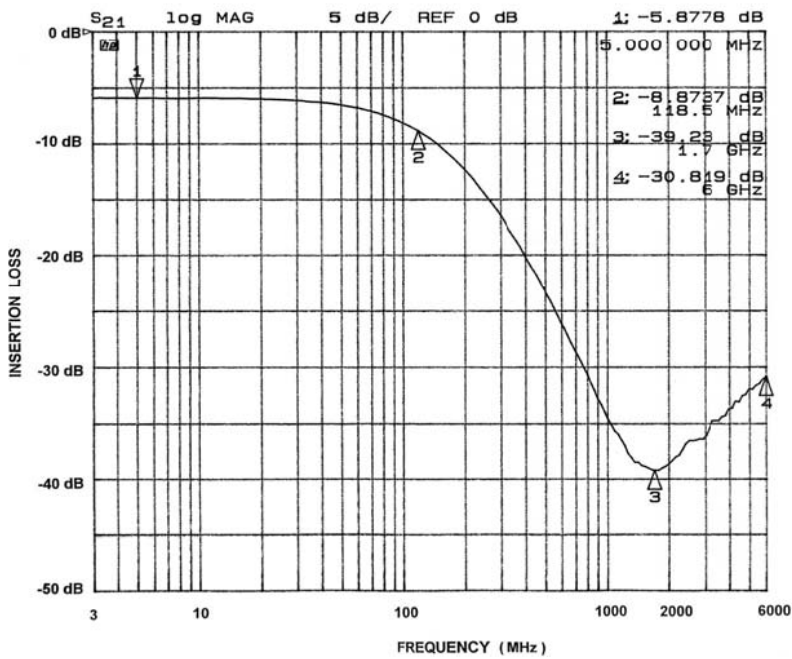


Figure 6. Insertion Loss vs. Frequency (A6-C6 to GND B3)

# CSPEMI606/608

## PERFORMANCE INFORMATION (Cont'd)

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

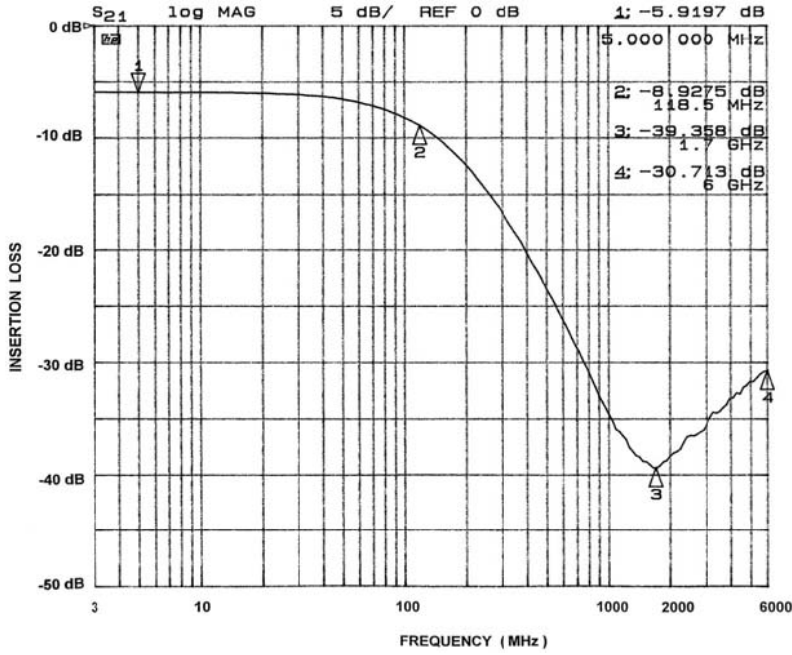


Figure 7. Insertion Loss vs. Frequency  
(A7-C7 to GND B4, CSPEMI608 Only)

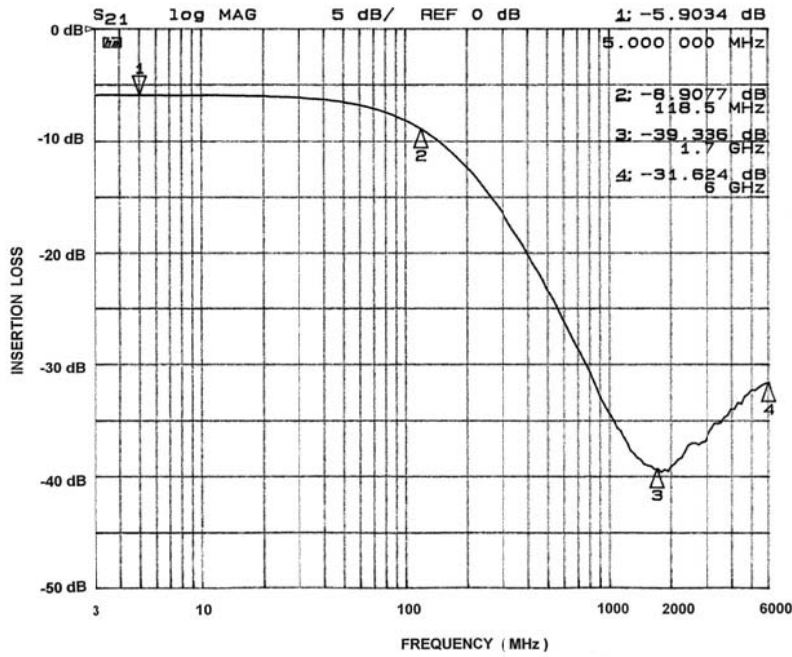


Figure 8. Insertion Loss vs. Frequency  
(A8-C8 to GND B4, CSPEMI608 Only)

PERFORMANCE INFORMATION (Cont'd)

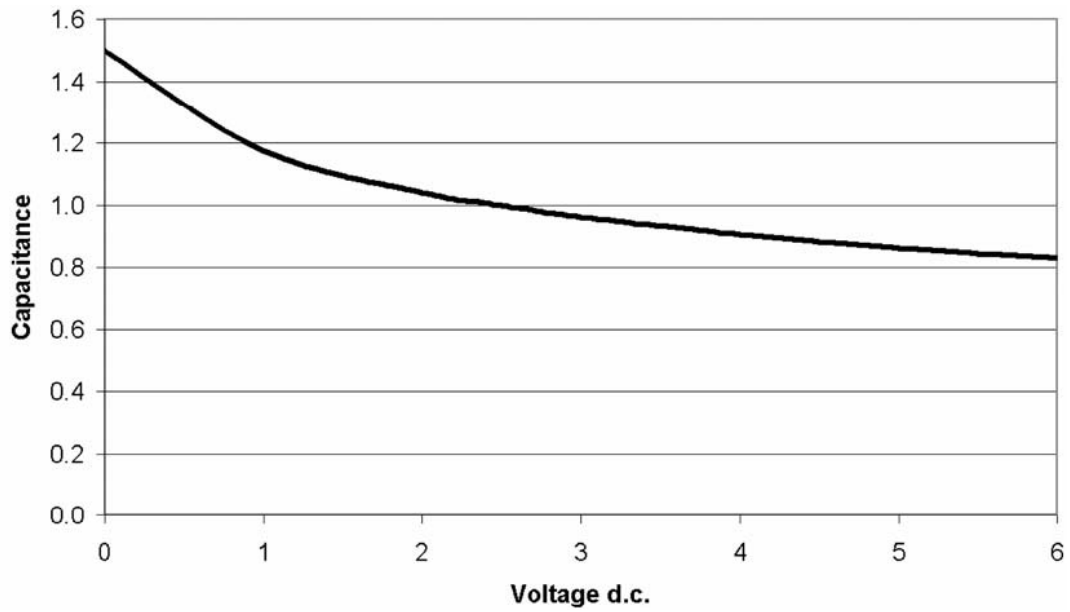


Figure 9. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5 VDC and 25°C)



APPLICATION INFORMATION

Parameter	Value
Pad Size on PCB	0.240 mm
Pad Shape	Round
Pad Definition	Non-Solder Mask defined pads
Solder Mask Opening	0.290 mm Round
Solder Stencil Thickness	0.125 mm – 0.150 mm
Solder Stencil Aperture Opening (laser cut, 5% tapered walls)	0.300 mm 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	±50 µm
Solder Ball Side Coplanarity	±20 µm
Maximum Dwell Time Above Liquidous	60 seconds
Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste	260°C

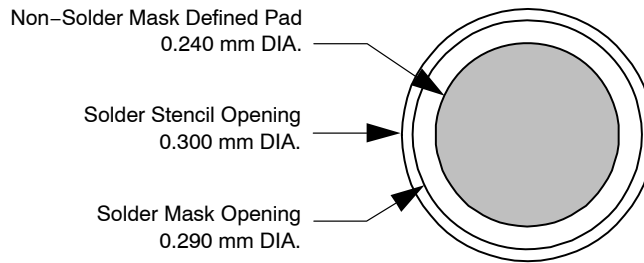


Figure 10. Recommended Non-Solder Mask Defined Pad Illustration

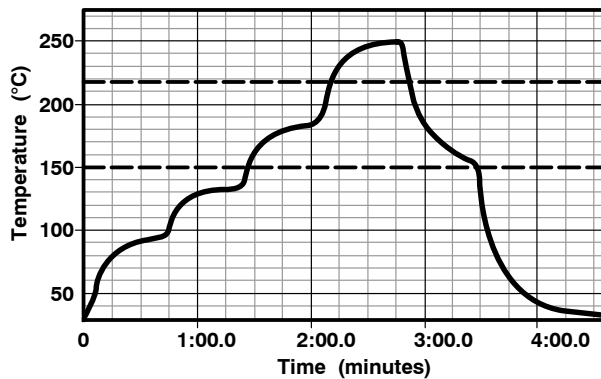


Figure 11. Lead-free (SnAgCu) Solder Ball Reflow Profile

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

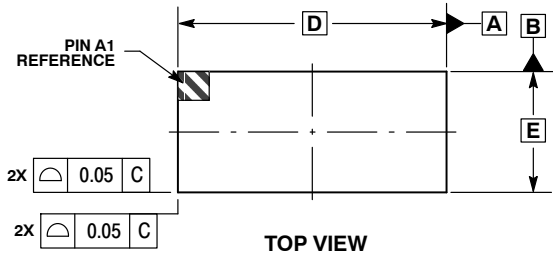
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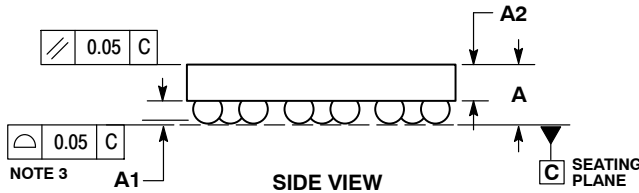
SCALE 4:1

**WLCSP15, 2.96x1.33**  
CASE 567BS-01  
ISSUE O

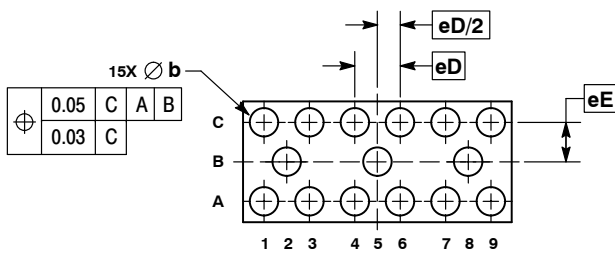
DATE 26 JUL 2010



TOP VIEW



SIDE VIEW

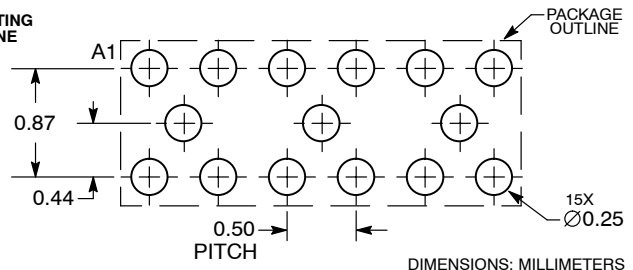


BOTTOM VIEW

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. COPLANARITY APPLIES TO SPHERICAL CROWNS OF SOLDER BALLS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.56	0.65
A1	0.21	0.27
A2	0.40 REF	
b	0.29	0.35
D	2.96 BSC	
E	1.33 BSC	
eD	0.50 BSC	
eE	0.435 BSC	

### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

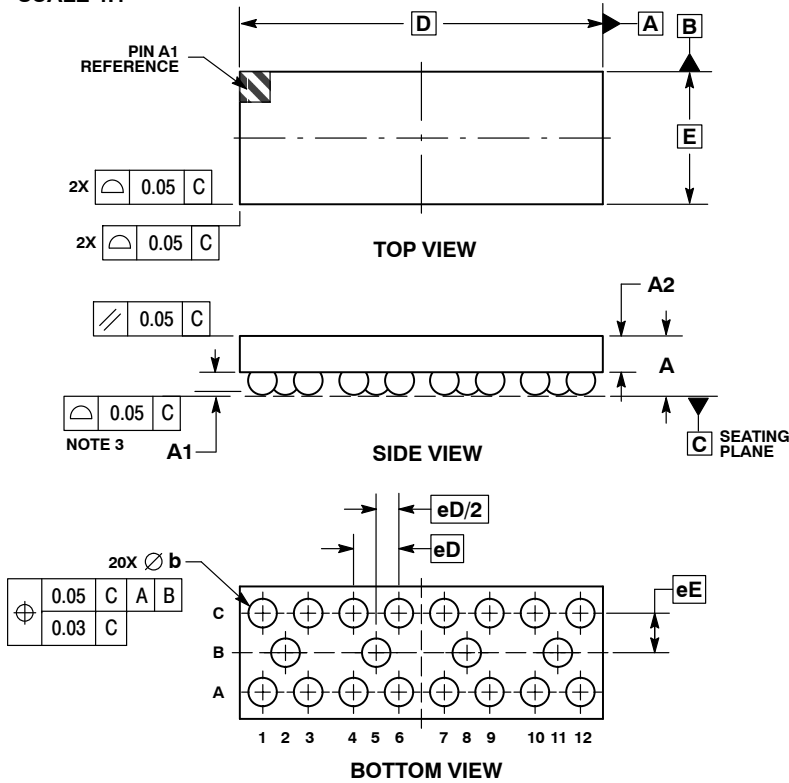
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**WLCSP20, 4.00x1.46**  
CASE 567BZ-01  
ISSUE O

DATE 26 JUL 2010

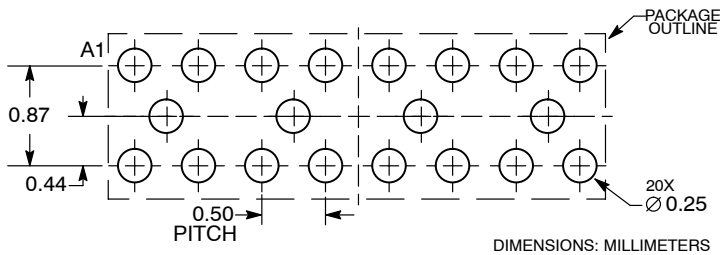
SCALE 4:1



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	MIN	MAX
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A1	0.21	0.27
A2	0.40 REF	
b	0.29	0.35
D	4.00 BSC	
E	1.46 BSC	
eD	0.50 BSC	
eE	0.435 BSC	

### RECOMMENDED SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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