CM1400-03

6 Channel EMI Filter Array with ESD Protection

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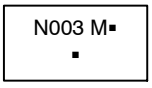
WLCSP15
CP SUFFIX
CASE 567BS

MARKING DIAGRAM



N003 = CM1400−03CP
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
CM1400−03CP	CSP−15 (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.

Product Description

The CM1400−03 is a six channel low−pass filter array that reduces EMI/RFI emissions while at the same time providing ESD protection. It is used on data ports on mobile devices. To reduce EMI/RFI emissions, the CM1400−03 integrates a pi−style filter (C−R−C) for each of the 6 channels. Each high quality filter provides greater than 30 dB attenuation in the 800−2700 MHz range relative to the pass band attenuation. These pi−style filters also support bidirectional filtering, controlling EMI both to and from a data port connector.

In addition, the CM1400−03 provides a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The input pins are designed and characterized to safely dissipate ESD strikes of ±15 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 device provides protection for contact discharges to greater than ±30 kV.

The CM1400−03 is particularly well suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package footprint and low weight.

The CM1400−03 incorporates *OptiGuard*™ coating which results in improved reliability at assembly. The CM1400−03 is available in a space−saving, low−profile chip scale package with RoHS−compliant lead−free finishing.

Features

- Functionally and Pin Compatible with CSPEMI306A Device
- *OptiGuard*™ Coated for Improved Reliability at Assembly
- Six Channels of EMI Filtering for Data Ports
- Pi−Style EMI Filters in a Capacitor−Resistor−Capacitor (C−R−C) Network
- 40 dB Absolute Attenuation (Typical) at 1 GHz
- 35 dB Attenuation (Typical) at 1 GHz Relative to Pass Band
- ±15 kV ESD Protection on Each Channel (IEC 61000−4−2 Level 4, Contact Discharge)
- ±30 kV ESD Protection on Each Channel (HBM)
- 15−Bump, 2.960 mm X 1.330 mm Footprint Chip Scale Package (CSP)
- Chip Scale Package Features Extremely Low Lead Inductance for Optimum Filter and ESD Performance
- These Devices are Pb−Free and are RoHS Compliant

Applications

- EMI Filtering and ESD Protection for Both Data and I/O Ports
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Notebooks
- Desktop PCs

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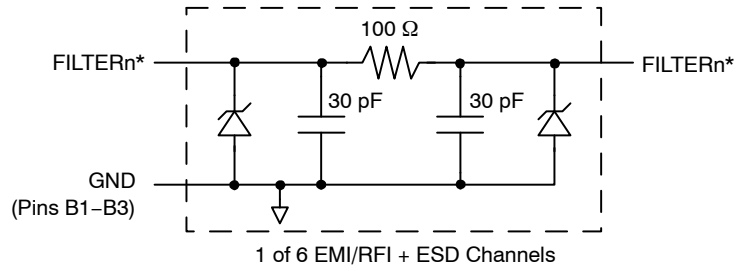
BLOCK DIAGRAM

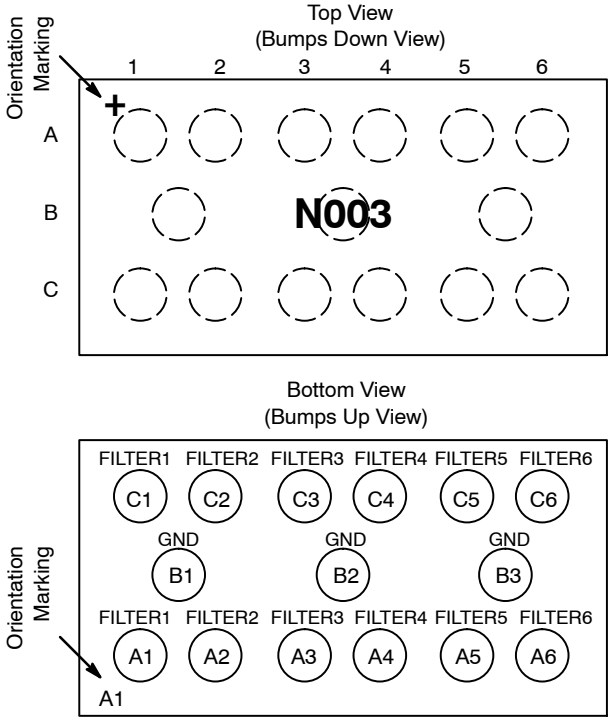


*See Package/Pinout Diagram for expanded pin information.

Table 1. PIN DESCRIPTIONS

15−bump CSP Package		
Pin	**Name**	**Description**
A1	FILTER1	Filter Channel 1
A2	FILTER2	Filter Channel 2
A3	FILTER3	Filter Channel 3
A4	FILTER4	Filter Channel 4
A5	FILTER5	Filter Channel 5
A6	FILTER6	Filter Channel 6
B1−B3	GND	Device Ground
C1	FILTER1	Filter Channel 1
C2	FILTER2	Filter Channel 2
C3	FILTER3	Filter Channel 3
C4	FILTER4	Filter Channel 4
C5	FILTER5	Filter Channel 5
C6	FILTER6	Filter Channel 6

PACKAGE / PINOUT DIAGRAMS



CM1400−03CP
CSP Package

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	600	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	24	30	36	pF
TCR	Temperature Coefficient of Resistance			1200		ppm/°C
TCC	Temperature Coefficient of Capacitance	At 2.5 V DC		−300		ppm/°C
V_{DIODE}	Diode Voltage (reverse bias)	I_{DIODE} = 10 μA		6.0		V
I_{LEAK}	Diode Leakage Current (reverse bias)	V_{DIODE} = 3.3 V			100	nA
V_{SIG}	Signal Voltage Positive Clamp Negative Clamp	I_{LOAD} = 10 mA	 5.6 −1.5	 6.8 −0.8	 9.0 −0.4	V
V_{ESD}	In−system ESD Withstand Voltage a) Human Body Model, MIL−STD−883, Method 3015 b) Contact Discharge per IEC 61000−4−2 Level 4	(Note 2)	 ±30 ±15			kV
V_{CL}	Clamping Voltage during ESD Discharge MIL−STD−883 (Method 3015), 8 kV Positive Transients Negative Transients	(Notes 2 and 3)		 +10 −5		V
f_C	Cut−off Frequency Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω	R = 100 Ω, C = 30 pF		 58		MHz

1. T_A = 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.

PERFORMANCE INFORMATION

Typical Filter Performance (T_A = 25°C, DC Bias = 0 V, 50 Ω Environment)

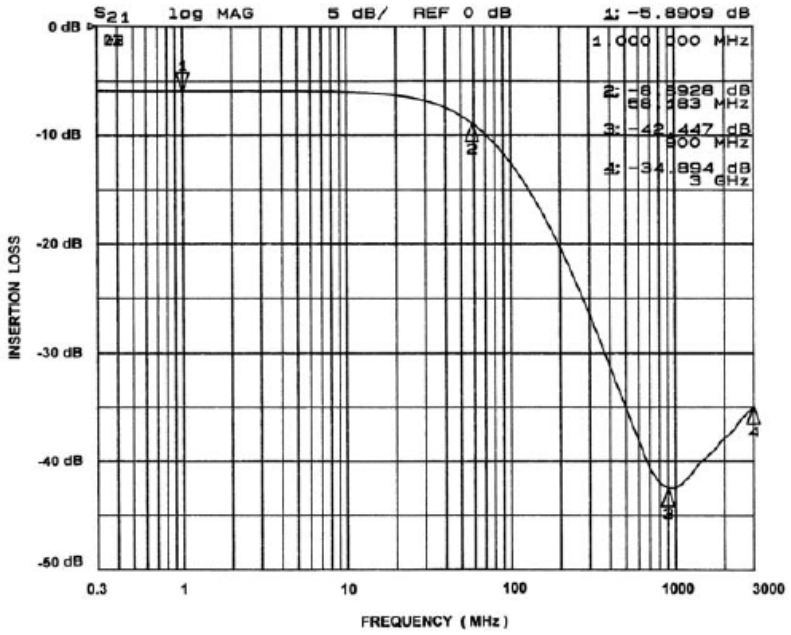


Figure 1. Insertion Loss vs. Frequency (A1−C1 to GND B2)

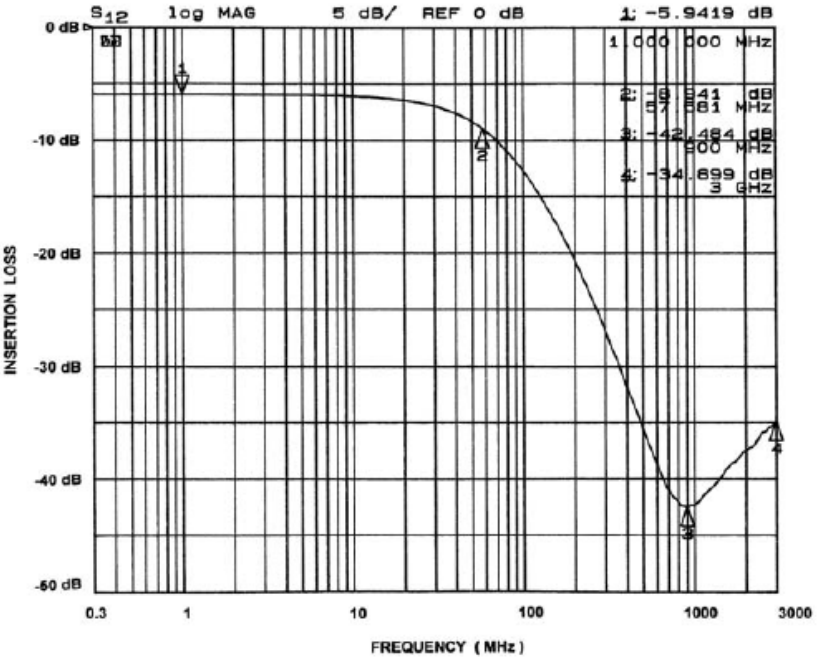


Figure 2. Insertion Loss vs. Frequency (A2−C2 to GND B2)

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (T_A = 25°C, DC Bias = 0 V, 50 Ω Environment)

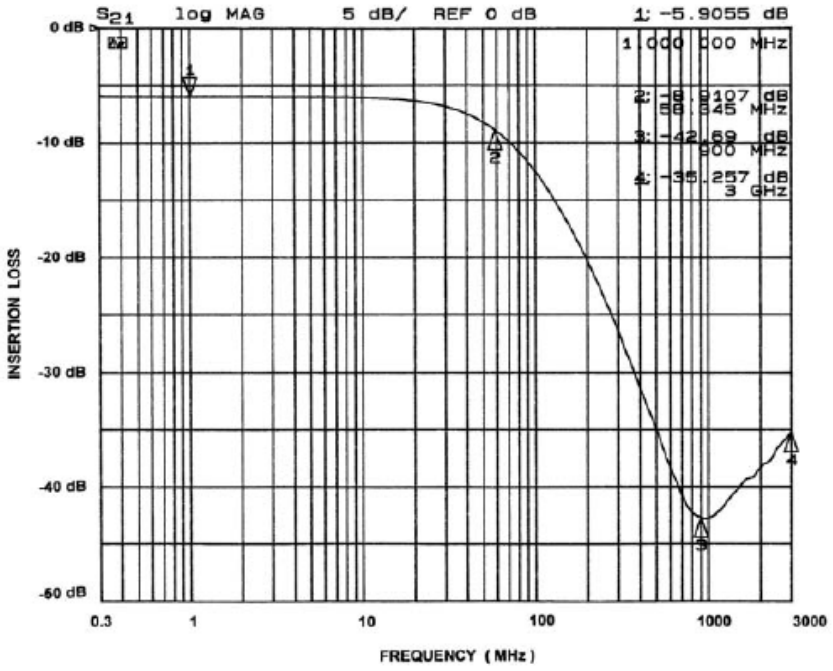


Figure 3. Insertion Loss vs. Frequency (A3−C3 to GND B2)

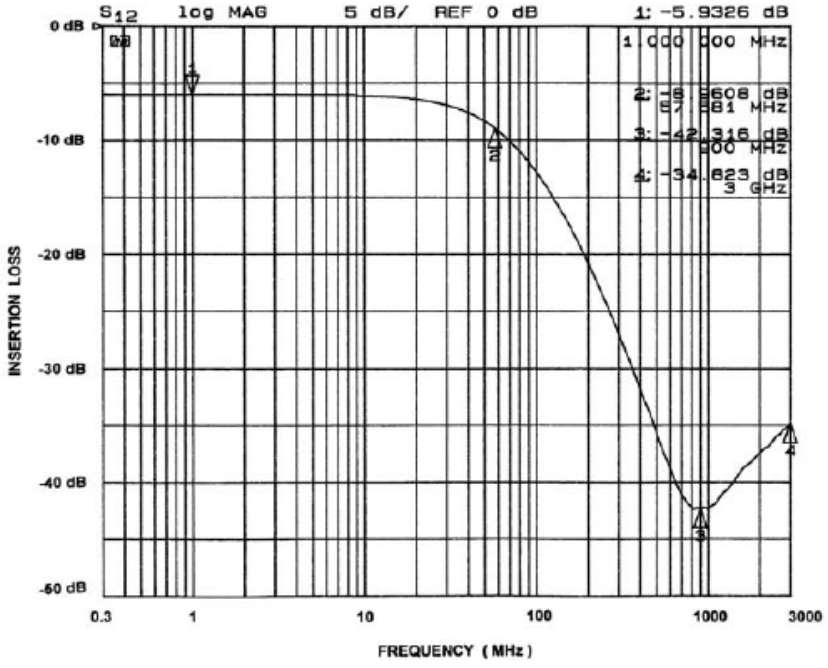


Figure 4. Insertion Loss vs. Frequency (A4−C4 to GND B2)

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (T_A = 25°C, DC Bias = 0 V, 50 Ω Environment)

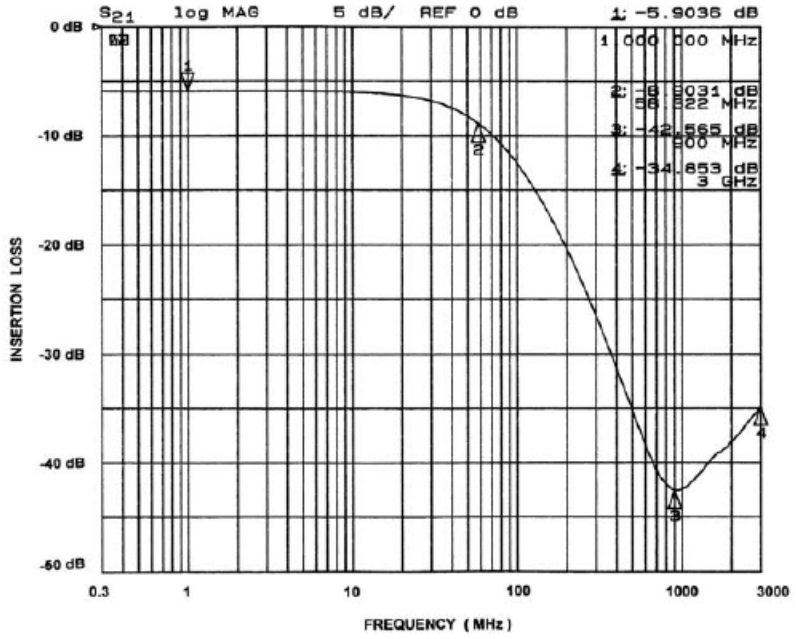


Figure 5. Insertion Loss vs. Frequency (A5−C5 to GND B2)

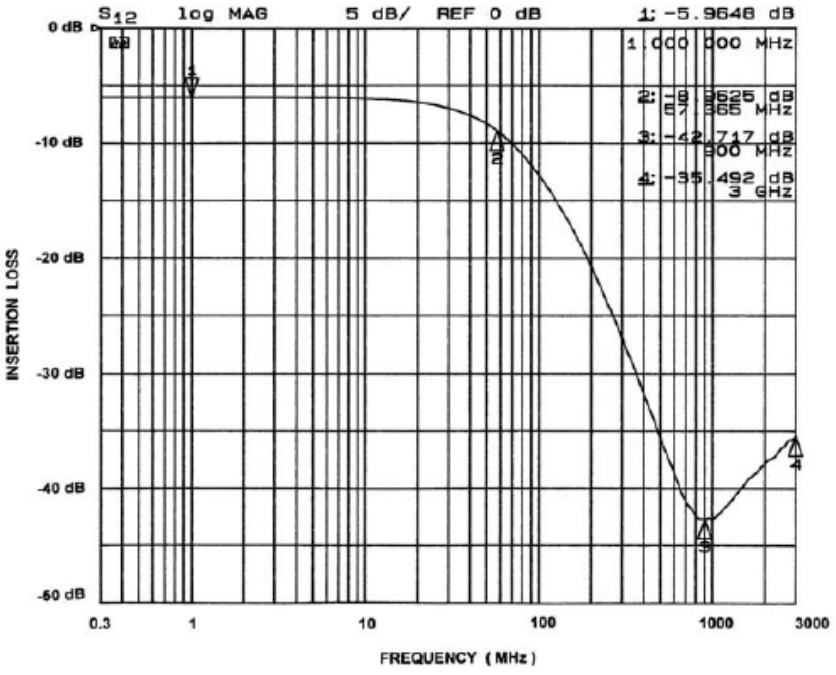


Figure 6. Insertion Loss vs. Frequency (A6−C6 to GND B2)

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (T_A = 25°C, 50 Ω Environment)

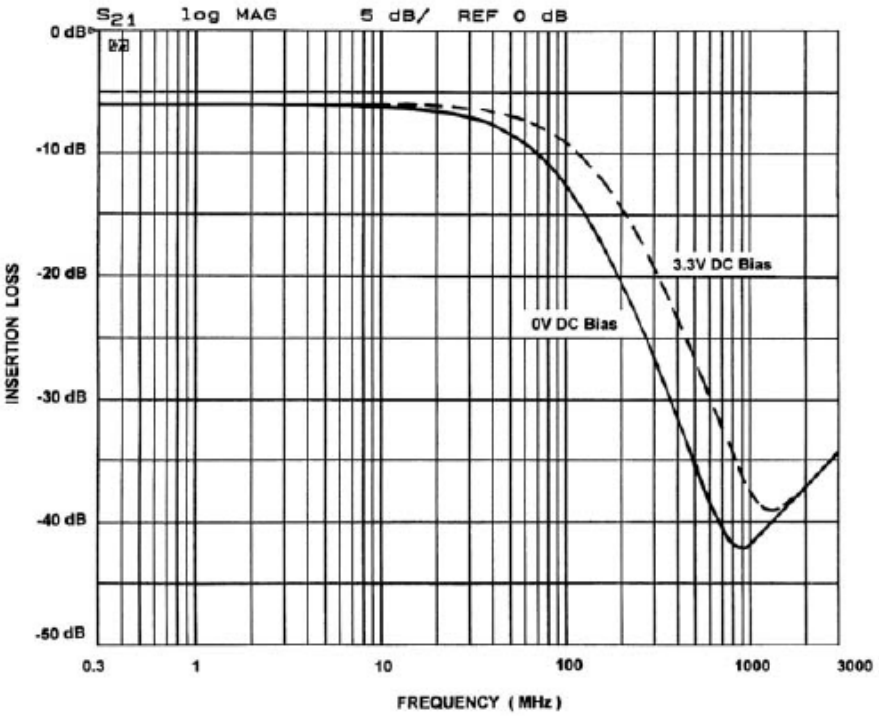


Figure 7. Comparison of Filter Response Curves for CM1400−03 with DC Bias

PERFORMANCE INFORMATION (Cont'd)

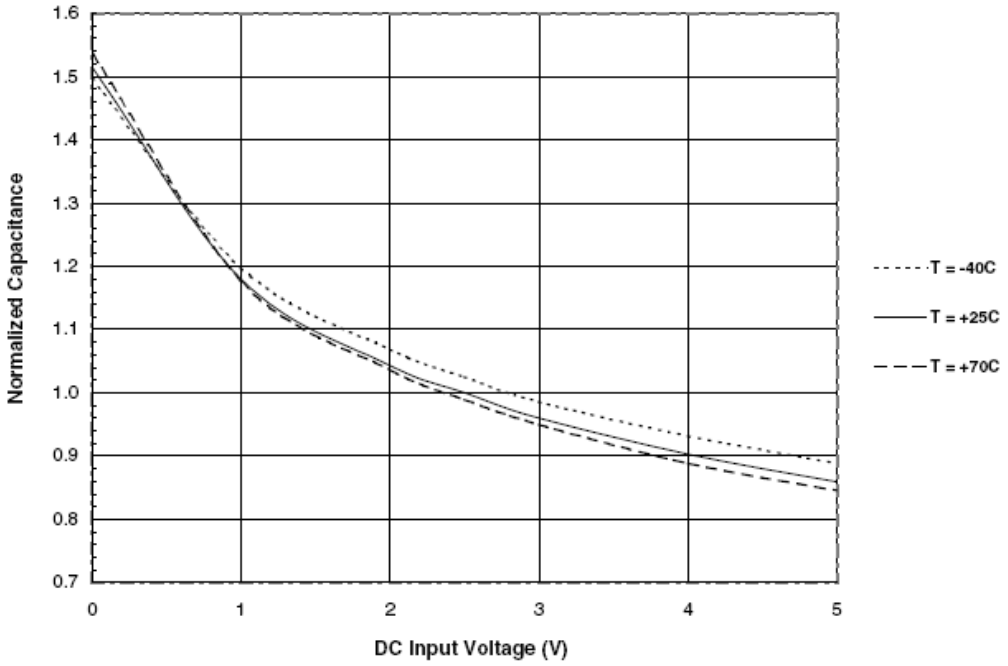


Figure 8. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5 VDC and 25°C)

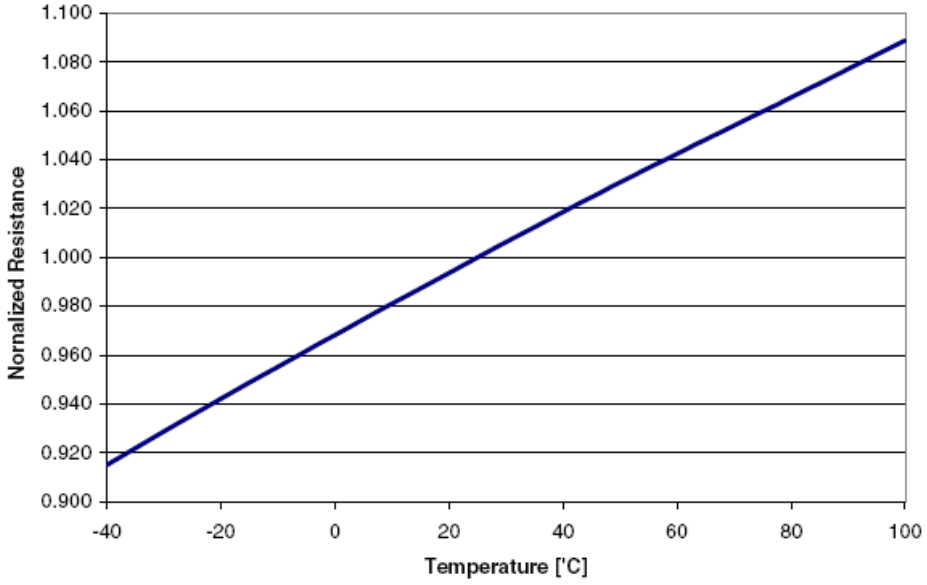


Figure 9. Resistance vs. Temperature (normalized to resistance at 25°C)

APPLICATION INFORMATION

Table 5. PRINTED CIRCUIT BOARD RECOMMENDATIONS

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 − 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 (183°C)	60 seconds
Maximum Soldering Temperature for Lead−free Devices using a Lead−free Solder Paste	260°C

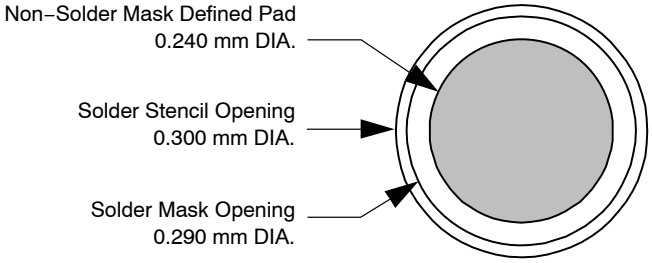


Figure 10. Recommended Non−Solder Mask Defined Pad Illustration

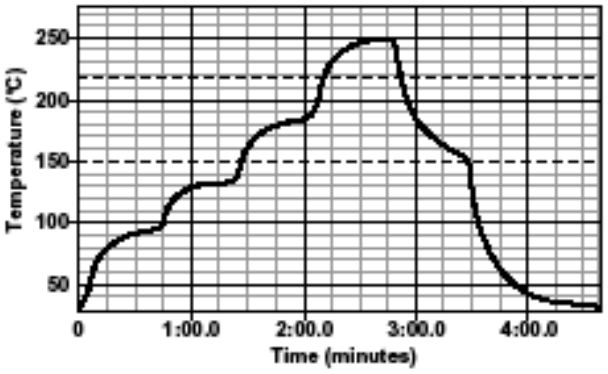


Figure 11. Lead−free (SnAgCu) Solder Ball Reflow Profile

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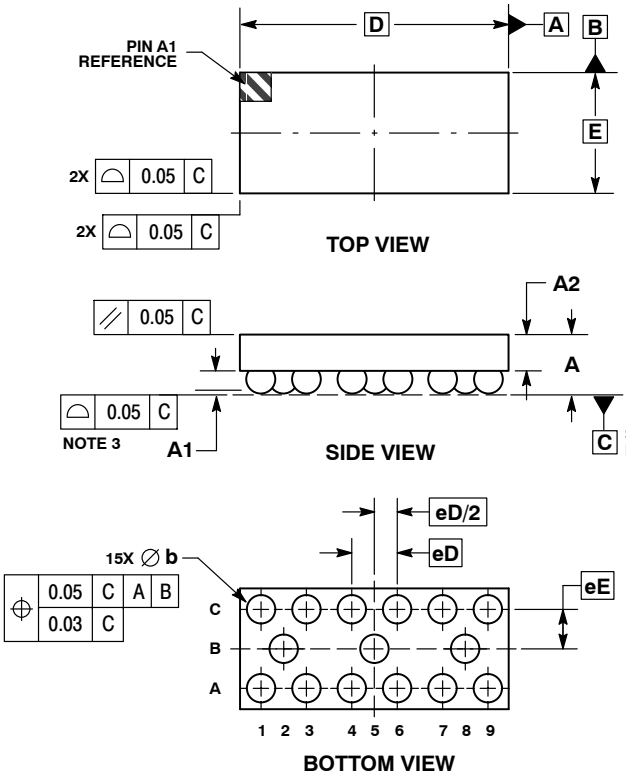
SCALE 4:1

WLCSP15, 2.96x1.33
CASE 567BS
ISSUE O

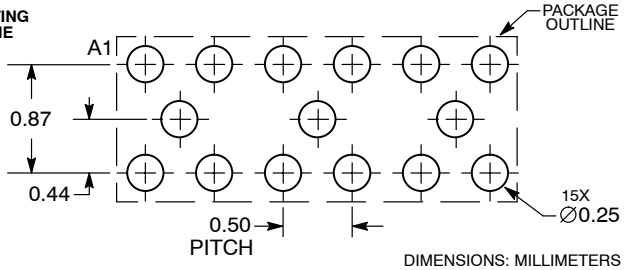
DATE 26 JUL 2010



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

	MILLIMETERS	
DIM	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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