CM1451

LCD and Camera EMI Filter Array with ESD Protection

ON Semiconductor®

http://onsemi.com

WLCSP15
CP SUFFIX
CASE 567BT

WLCSP20
CP SUFFIX
CASE 567CL

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Description

The CM1451 is an inductor−capacitor (L−C) based EMI filter array with integrated ESD protection in CSP. The CM1451−06 and CM1451−08 are configured in 6 and 8 channel formats respectively. Each channel is implemented as a 5−pole L−C filter with the component values 9.5 pF − 17 nH − 9.5 pF − 17 nF − 9.5 pF. The CM1451's roll−off frequency at −10 dB attenuation is 500 MHz. It can be used in applications where the data rates are as high as 200 Mbps while providing greater than 35 dB attenuation over the 800 MHz to 2.7 GHz frequency range. The device has ESD protection diodes on every pin that provide a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The ESD protection diodes connected to the filter ports safely dissipate ESD strikes of ±15 kV, exceeding the Level 4 requirement of the IEC61000−4−2 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.

This device is particularly well−suited for portable electronics (e.g. wireless handsets, PDAs) because of its small package format and easy−to−use pin assignments. In particular, the CM1451 is ideal for EMI filtering and protecting data and control lines for the LCD display and camera interface in wireless handsets while maintaining the integrity of signals that have rise/fall times as fast as 2 ns.

The CM1451 incorporates OptiGuard, a coating that results in improved reliability at assembly. The CM1451 is available in a space−saving, low−profile Chip Scale Package with RoHS compliant lead−free finishing.

MARKING DIAGRAM

CM1451−06
15−Bump CSP Package

CM1451−08
20−Bump CSP Package

N516 = CM1451−06CP
N518 = CM1451−08CP

ORDERING INFORMATION

Device	Package	Shipping†
CM1451−06CP	CSP−15 (Pb−Free)	3500/Tape & Reel
CM1451−08CP	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.

Features

- High Bandwidth, High RF Rejection Filter Array
- Six and Eight Channels of EMI Filtering
- Utilizes Inductor−Based Design Technology for True L−C Filter Implementation
- OptiGuard Coating for Improved Reliability
- Chip Scale Package (CSP) Features Extremely Low Lead Inductance for Optimum Filter and ESD Performance
- 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 40 dB of Attenuation at 1 GHz
- Maintains Signal Integrity for Signals that Have a Risetime and Falltime as Fast as 2 ns
- 15−Bump, 3.006 mm x 1.376 mm Footprint Chip Scale Package (CM1451−06CP)
- 20−Bump, 4.006 mm x 1.376 mm Footprint Chip Scale Package (CM1451−08CP)
- These Devices are Pb−Free and are RoHS Compliant

Applications

- LCD and Camera Data Lines in Mobile Handsets
- I/O Port Protection for Mobile Handsets, Notebook Computers, PDAs, etc.
- Wireless Handsets / Cell Phones
- EMI Filtering for Data Ports in Cell Phones, PDAs or Notebook Computers
- Handheld PCs / PDAs
- LCD and Camera Modules

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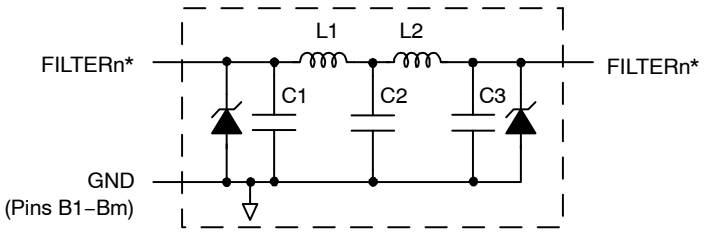
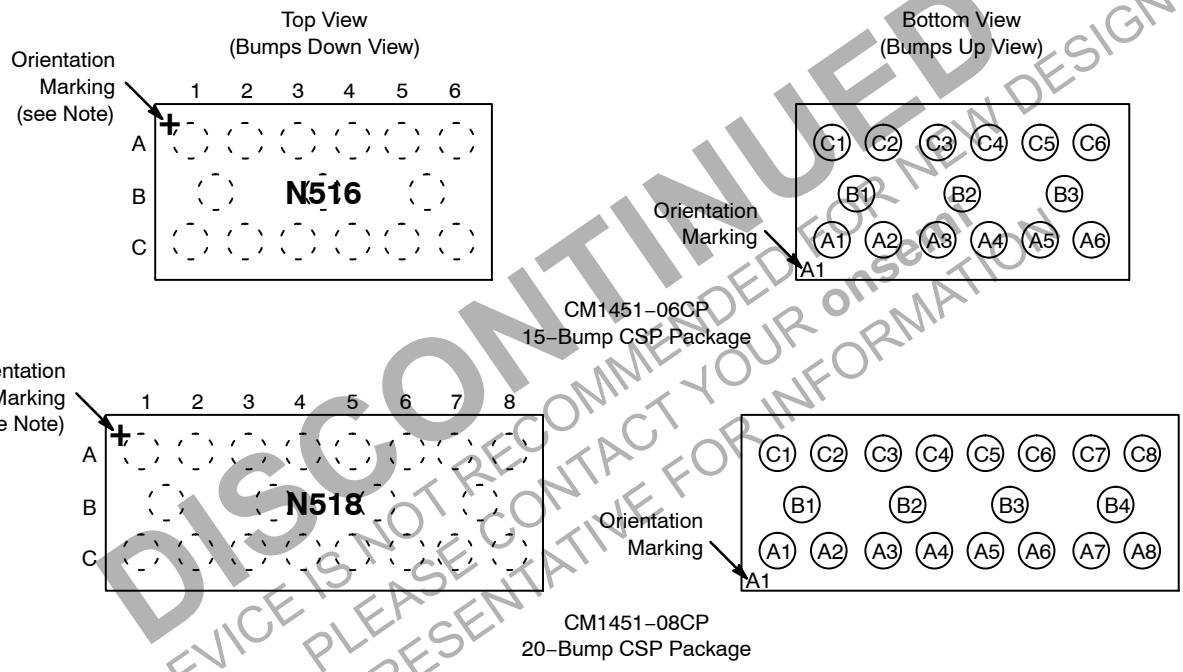
BLOCK DIAGRAM



1 of n EMI Filtering + ESD Channels
(n = 6 for CM1451−06, 8 for CM1451−08, m=n/2)

*See Package/Pinout Diagrams for expanded pin information.

PACKAGE / PINOUT DIAGRAMS



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Note: Lead−free devices are specified by using a “+” character for the top side orientation mark.

Table 1. PIN DESCRIPTIONS

CM1451−06	CM1451−08				CM1451−06	CM1451−08		
Pin(s)	Pin(s)	Name	Description		Pin(s)	Pin(s)	Name	Description
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					

SPECIFICATIONS

Table 2. ABSOLUTE MAXIMUM RATINGS

Parameter	Rating	Units
Storage Temperature Range	−65 to +150	°C
Current per Inductor	30	mA
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
L_{TOT}	Total Channel Inductance ($L_1 + L_2$)			34		nH
L_1, L_2	Inductance			17		nH
$R_{DC\ IN-OUT}$	DC Channel Resistance			18		Ω
C_{TOT}	Total Channel Capacitance ($C_1 + C_2 + C_3$)	At 2.5 V DC, 1 MHz, 30 mV AC	22.8	28.5	34.2	pF
C_1, C_2, C_3	Capacitance	At 2.5 V DC, 1 MHz, 30 mV AC	7.6	9.5	11.4	pF
f_C	Cut−off Frequency Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω			260		MHz
f_{RO}	Roll−off Frequency at −10 dB Attenuation Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω			500		MHz
V_{DIODE}	Diode Standoff Voltage	I_{DIODE} = 10 μA		6.0		V
I_{LEAK}	Diode Leakage Current	V_{DIODE} = +3.3 V		0.1	1.0	μA
V_{SIG}	Signal Clamp 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
R_{DYN}	Dynamic Resistance Positive Negative			 2.30 0.90		Ω

1. T_A = 25°C unless otherwise specified.
2. ESD applied to input and output pins with respect to GND, one at a time.

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PERFORMANCE INFORMATION

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

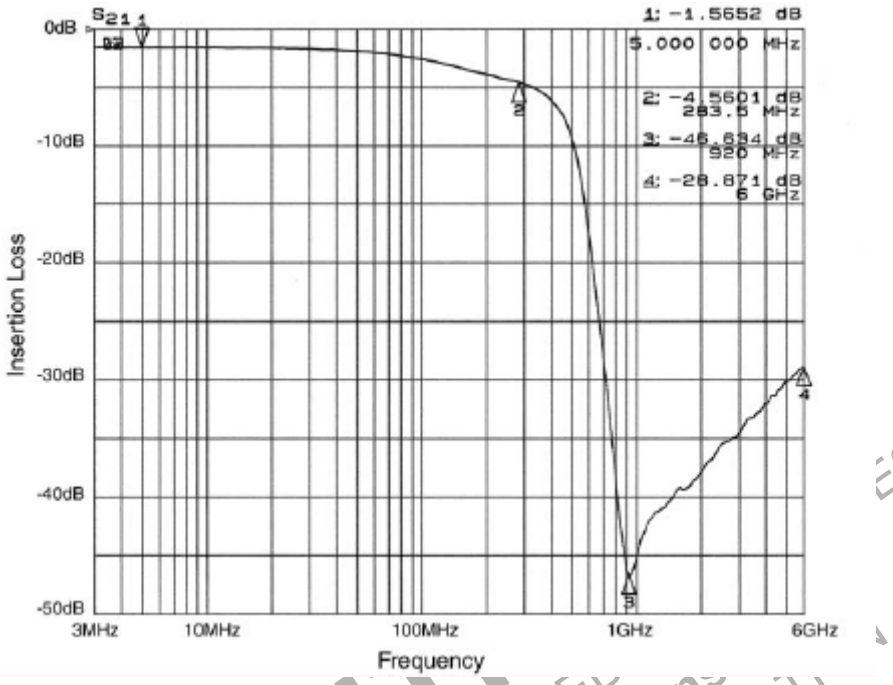

Figure 1. Insertion Loss vs. Frequency (A1−C1 to GND B1)

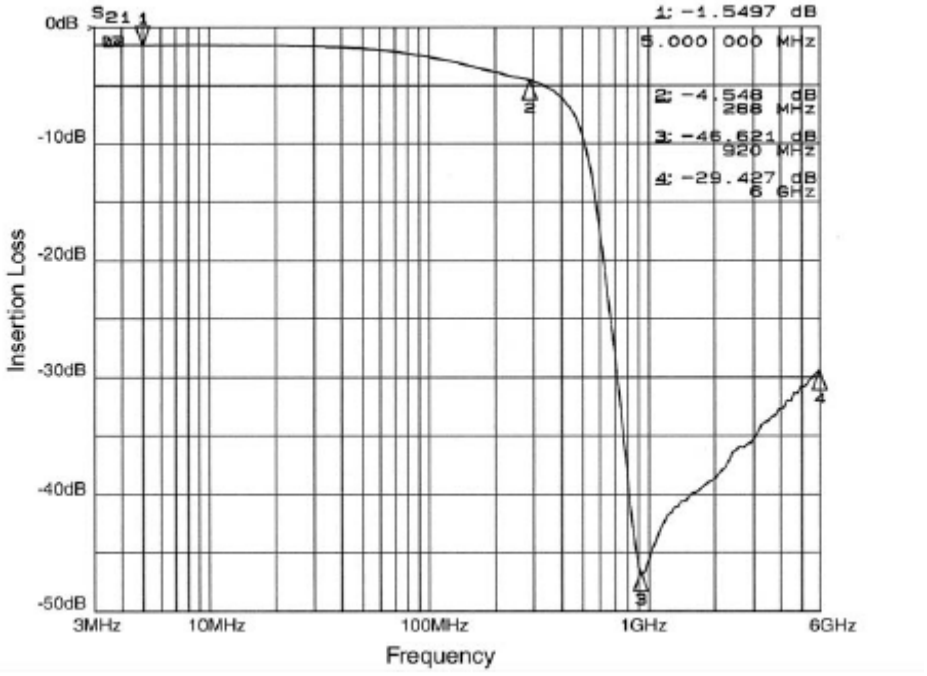

Figure 2. Insertion Loss vs. Frequency (A2−C2 to GND B1)

PERFORMANCE INFORMATION (Cont'd)

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

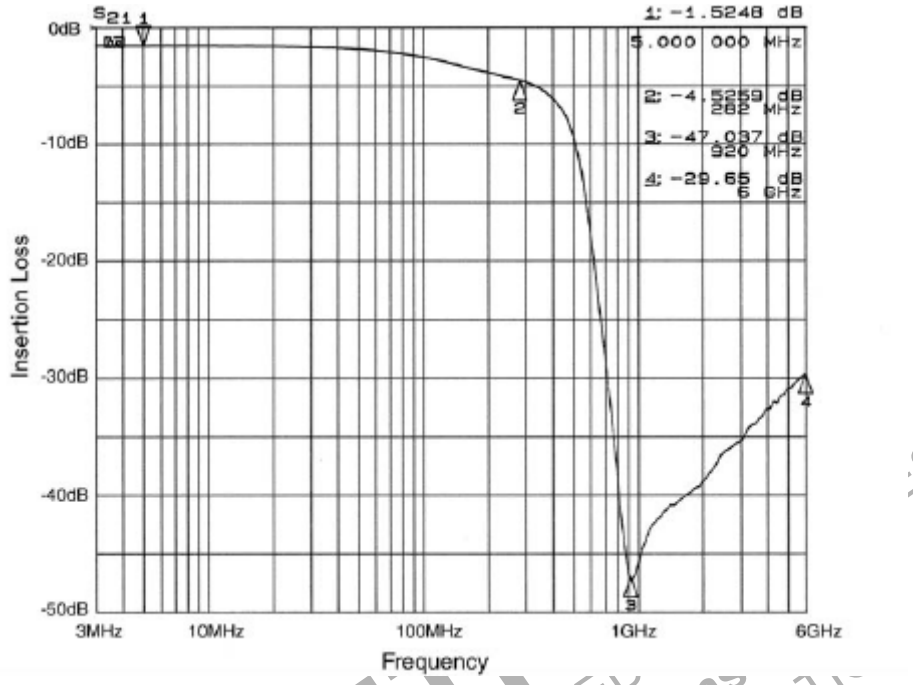

Figure 3. Insertion Loss vs. Frequency (A3−C3 to GND B2)

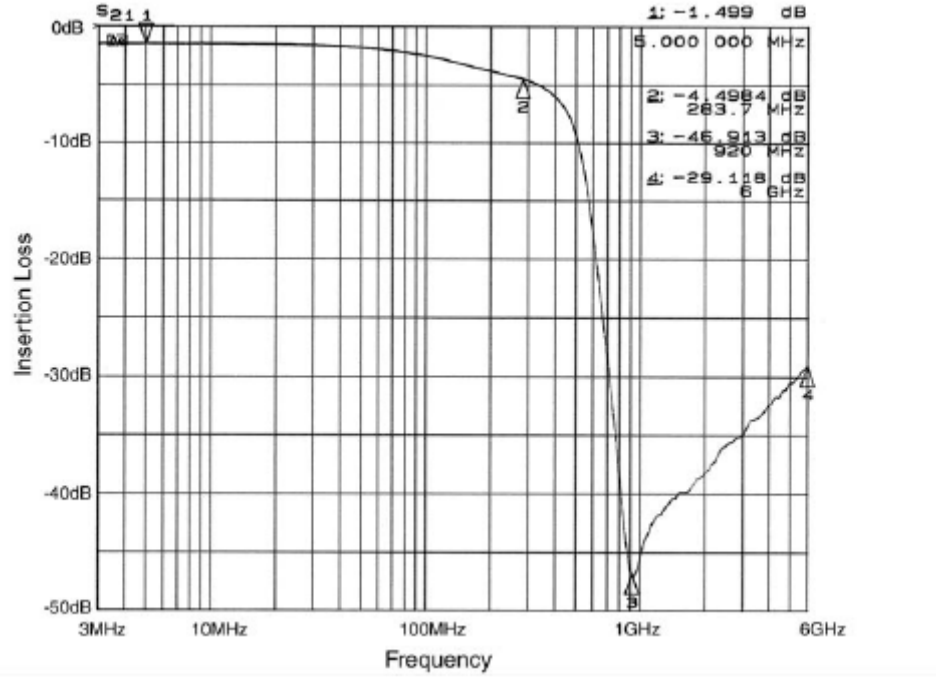

Figure 4. Insertion Loss vs. Frequency (A4−C4 to GND B2)

PERFORMANCE INFORMATION (Cont'd)

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

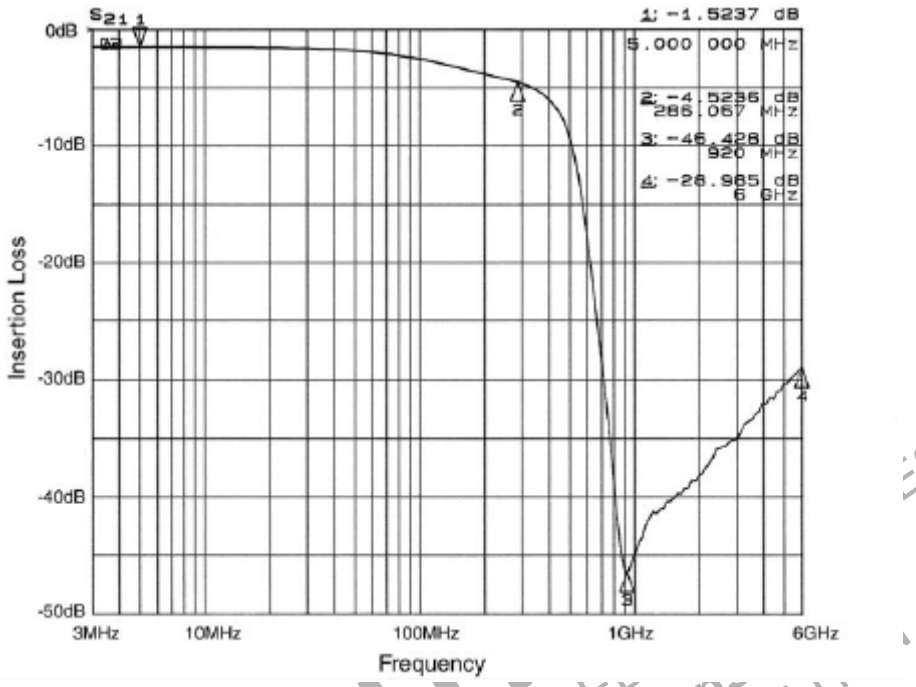

Figure 5. Insertion Loss vs. Frequency (A5−C5 to GND B3)

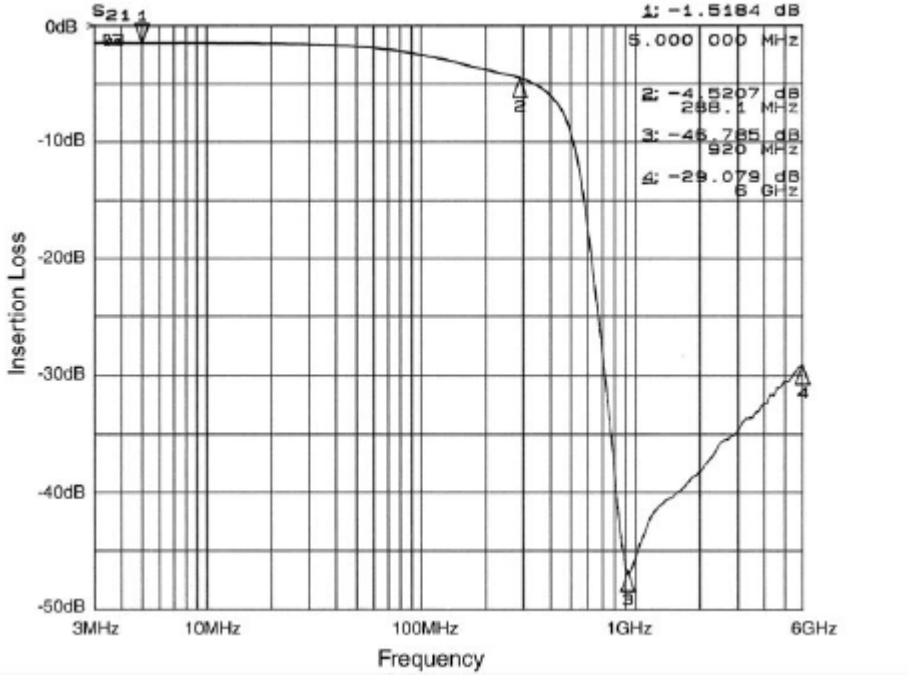

Figure 6. Insertion Loss vs. Frequency (A6−C6 to GND B3)

PERFORMANCE INFORMATION (Cont'd)

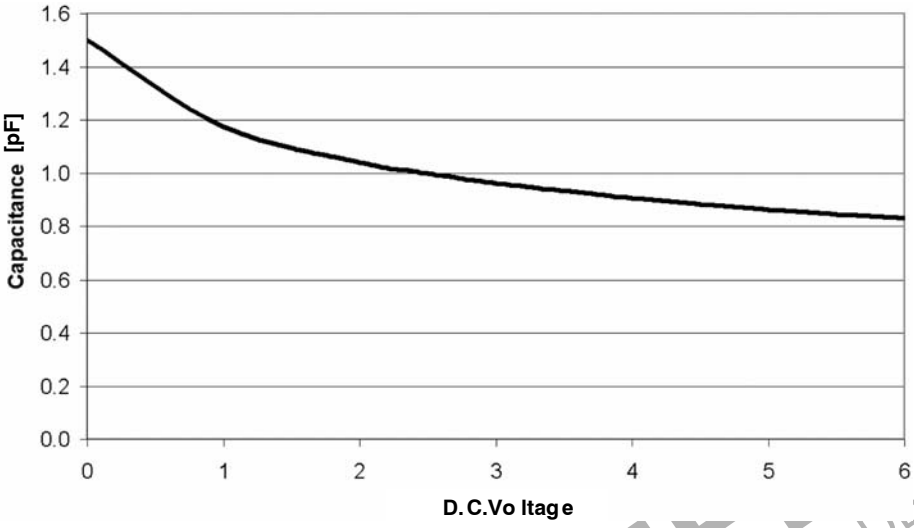

Figure 7. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5 VDC and 25°C)

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Transient Response Characteristics

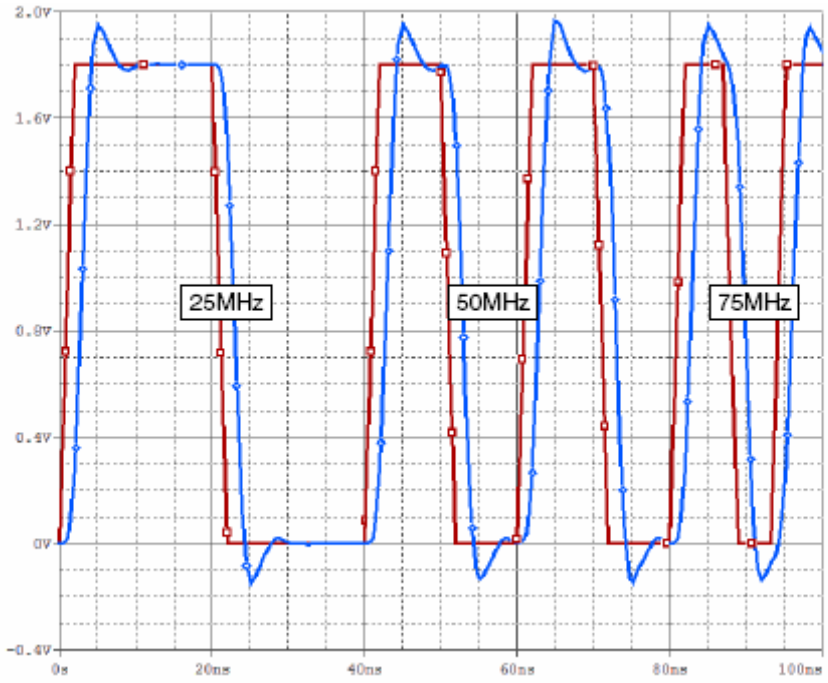

Figure 8. Simulated Transient Response (input signal risetime and falltime = 2 ns, clocked at 25, 50 and 75 MHz, 15 Ω Source Resistance, 5 pF Load)

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

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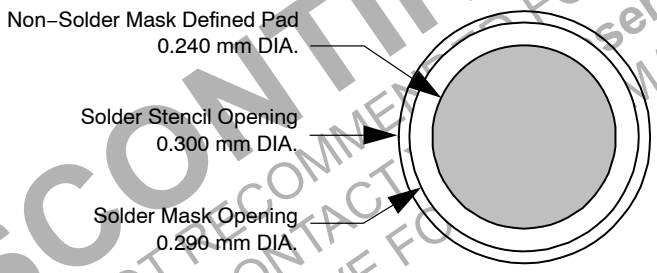

Figure 9. Recommended Non−Solder Mask Defined Pad Illustration

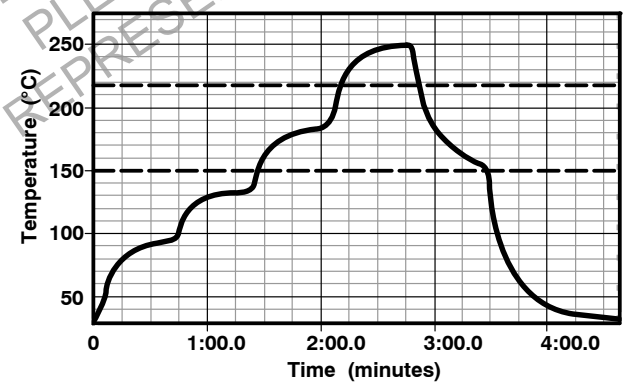

Figure 10. Lead−free (SnAgCu) Solder Ball Reflow Profile

SCALE 4:1

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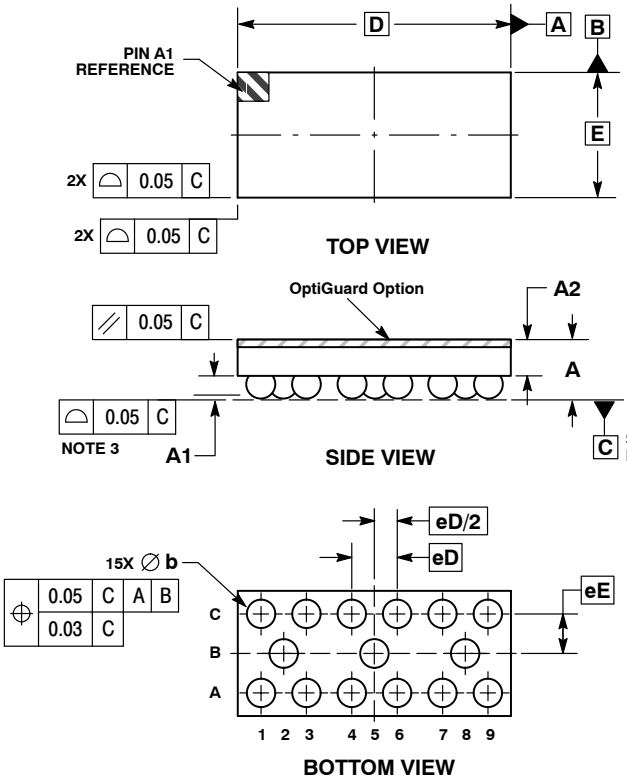
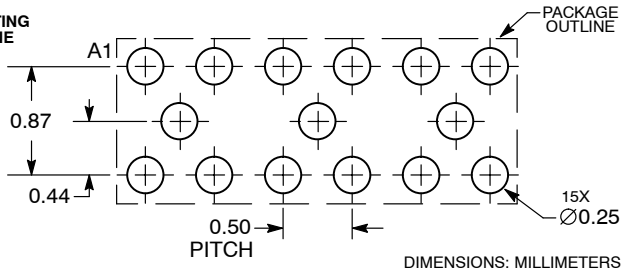


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. COPLANARITY APPLIES TO SPHERICAL CROWNS OF SOLDER BALLS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.56	0.72
A1	0.21	0.27
A2	0.42 REF	
b	0.29	0.35
D	3.01 BSC	
E	1.38 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 **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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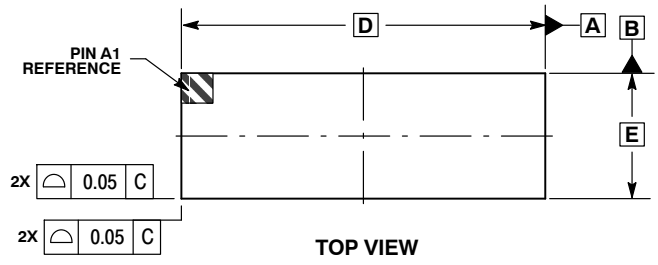
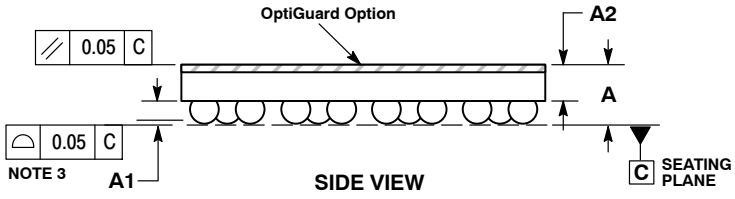
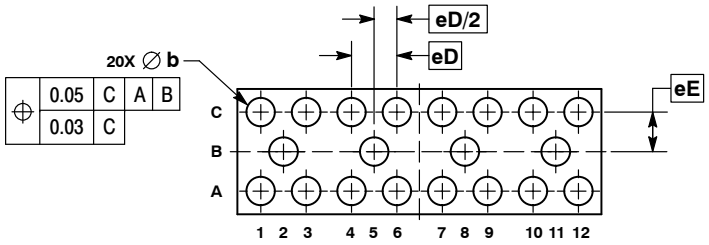


TOP VIEW



SIDE VIEW



BOTTOM VIEW

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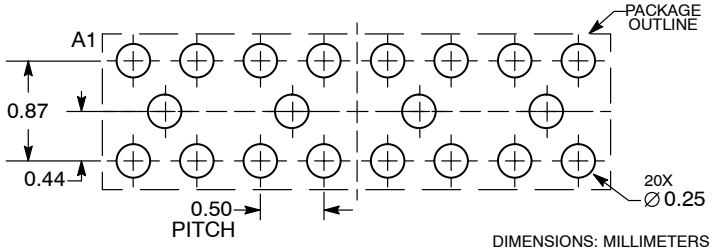

DIMENSIONS: MILLIMETERS

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