CM1405

LCD EMI Filter Array with ESD Protection

ON Semiconductor®

http://onsemi.com

WLCSP20
CP SUFFIX
CASE 567BZ

Description

ON Semiconductor's CM1405 is an EMI filter array with ESD protection, which integrates eight Pi− filters (C−R−C). The CM1405 has component values of 25 pF − 100 Ω − 25 pF. The parts include avalanche−type ESD 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 safely dissipate ESD strikes of ±30 kV, exceeding the maximum 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. mobile handsets, PDAs, notebook computers) because of its small package and easy−to−use pin assignments. In particular, the CM1405 is ideal for EMI filtering and protecting data lines from ESD for the LCD display in mobile handsets.

The CM1405−03 incorporates *OptiGuard™* coating which results in improved reliability at assembly and is available in a space−saving, low−profile Chip Scale Package with RoHS compliant lead−free finishing.

Features

- Eight Channels of EMI Filtering
- ±30 kV ESD Protection on Each Channel (IEC 61000−4−2 Level 4, Contact Discharge)
- ±30 kV ESD Protection on Each Channel (HBM)
- Better than 35 dB of Attenuation at 800−2700 MHz
- Chip Scale Package Features Extremely Low Lead Inductance for Optimum Filter and ESD Performance
- 20−Bump, 4.000 mm x 1.458 mm Footprint Chip Scale Package
- *OptiGuard™* Coated Version Available for Improved Reliability at Assembly
- These Devices are Pb−Free and are RoHS Compliant

Applications

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

MARKING DIAGRAM

N051	N053
CM1405−01 20−Bump CSP Package	CM1405−03 20−Bump CSP Package

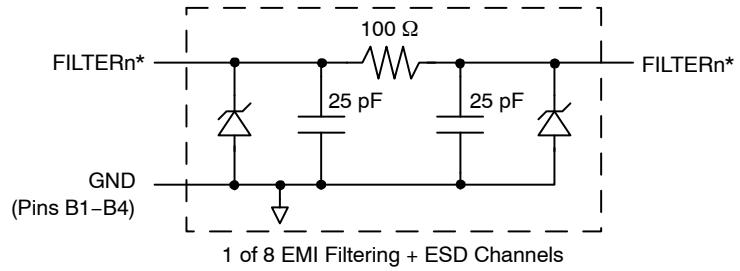
N051 = CM1405−01CP
N053 = CM1405−03CP

ORDERING INFORMATION

Device	Package	Shipping†
CM1405−01CP	CSP−20 (Pb−Free)	3500/Tape & Reel
CM1405−03CP	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.

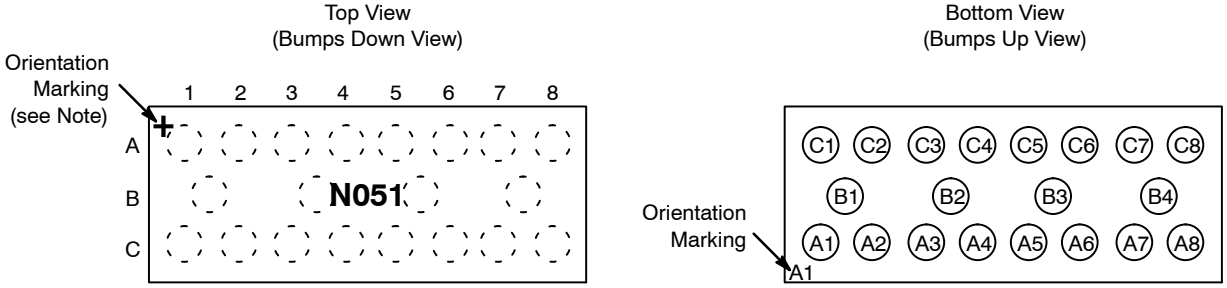
BLOCK DIAGRAM



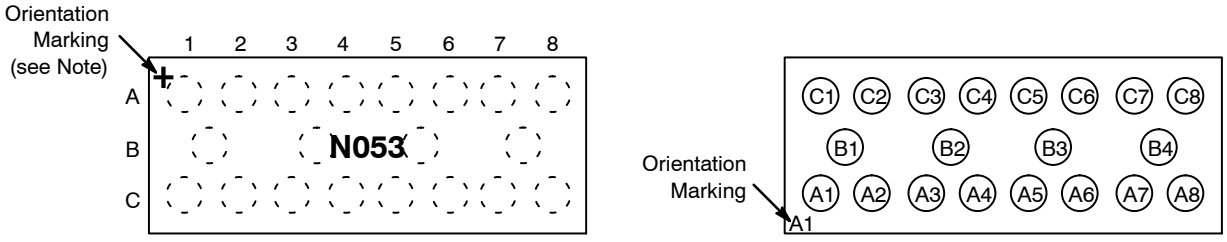
1 of 8 EMI Filtering + ESD Channels

*See Package/Pinout Diagrams for expanded pin information.

PACKAGE / PINOUT DIAGRAMS



CM1405−01
Chip Scale Package



CM1405−03
Chip Scale Package

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

Table 1. PIN DESCRIPTIONS

Pins	Name	Description		Pins	Name	Description
A1	FILTER1	Filter Channel 1		C1	FILTER1	Filter Channel 1
A2	FILTER2	Filter Channel 2		C2	FILTER2	Filter Channel 2
A3	FILTER3	Filter Channel 3		C3	FILTER3	Filter Channel 3
A4	FILTER4	Filter Channel 4		C4	FILTER4	Filter Channel 4
A5	FILTER5	Filter Channel 5		C5	FILTER5	Filter Channel 5
A6	FILTER6	Filter Channel 6		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−B4	GND	Device Ground				

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	20	25	30	pF
V_{DIODE}	Diode Standoff Voltage	I_{DIODE} = 10 μA		6.0		V
I_{LEAK}	Diode Leakage Current (reverse bias)	V_{DIODE} = +3.3 V		0.1	1	μA
V_{SIG}	Signal Clamp Voltage Positive Clamp Negative Clamp	 I_{LOAD} = 10 mA 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 30			kV
R_{DYN}	Dynamic Resistance Positive Negative			 1.5 0.9		Ω
f_C	Cut−off Frequency Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω	R = 100 Ω, C = 25 pF		 70		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.

PERFORMANCE INFORMATION

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ω Environment)

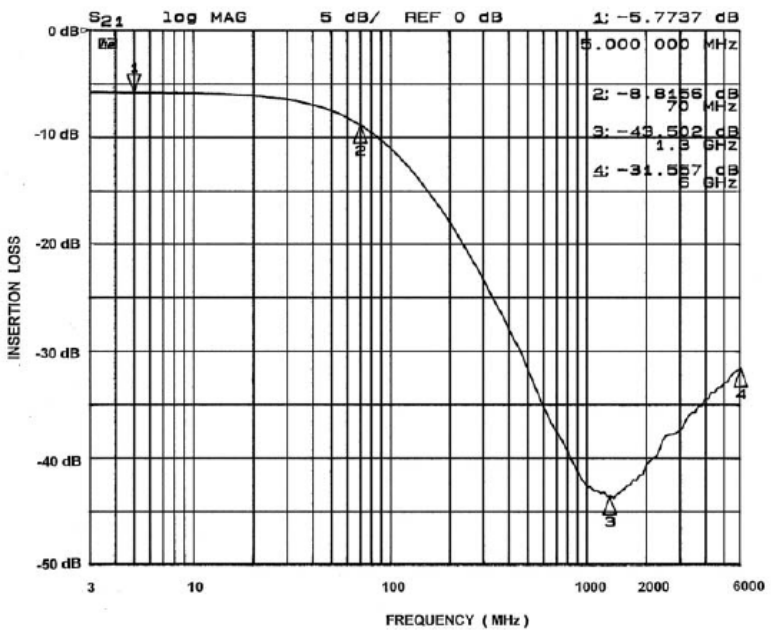


Figure 1. A1−C1 EMI Filter Performance

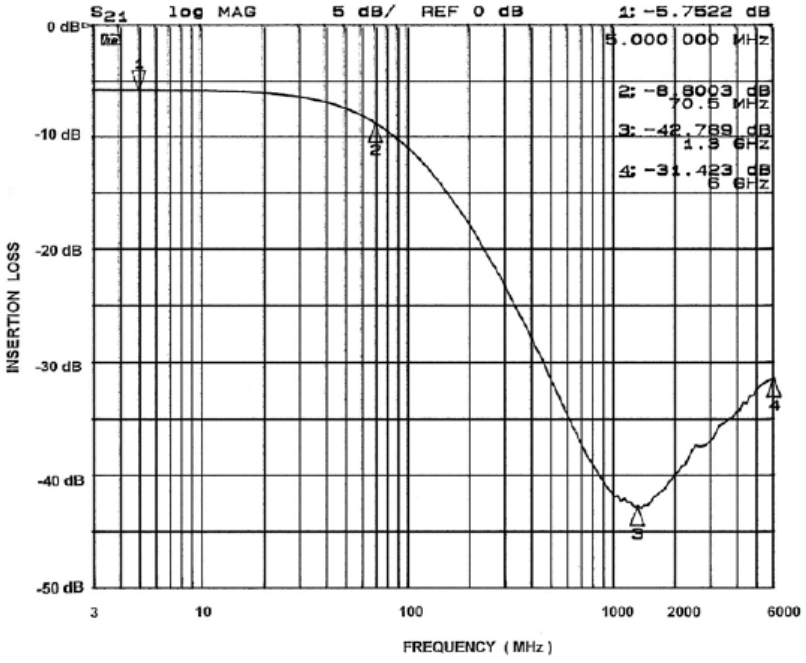


Figure 2. A2−C2 EMI Filter Performance

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ω Environment)

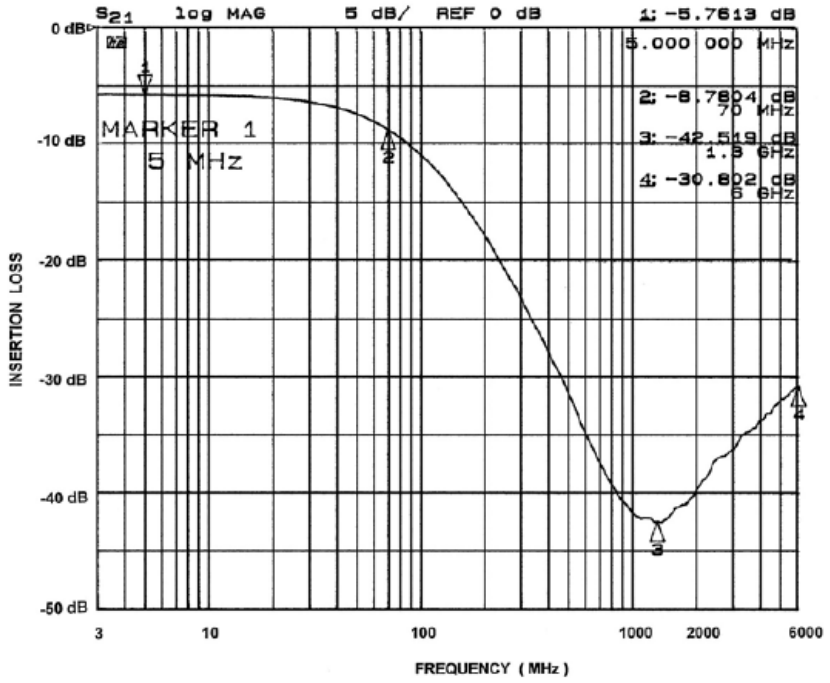


Figure 3. A3−C3 EMI Filter Performance

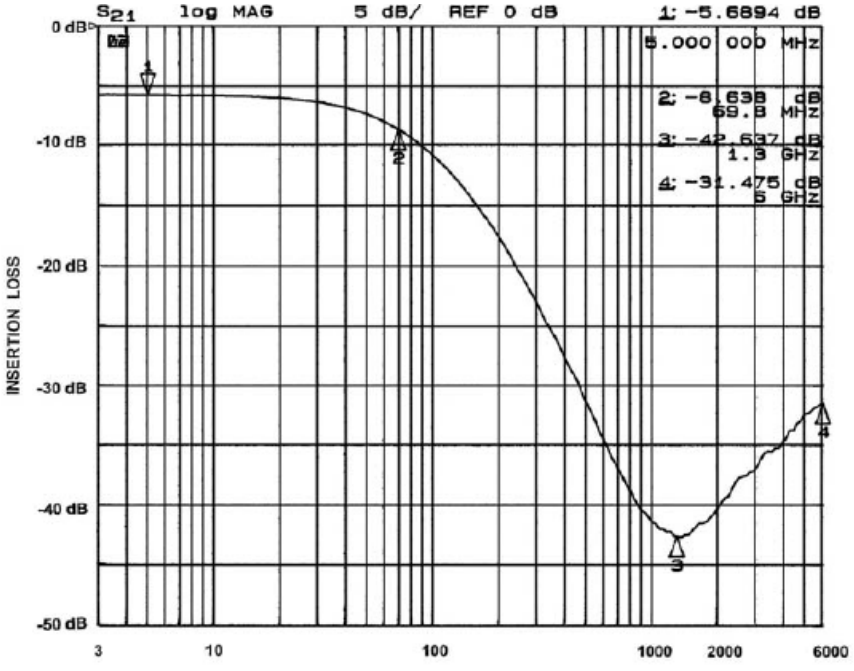


Figure 4. A4−C4 EMI Filter Performance

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ω Environment)

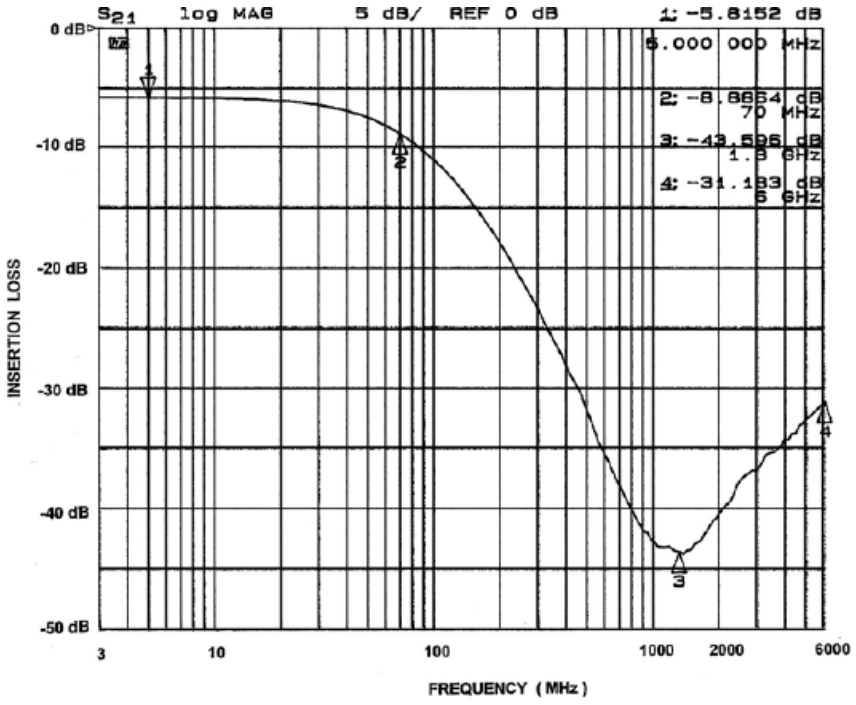


Figure 5. A5−C5 EMI Filter Performance

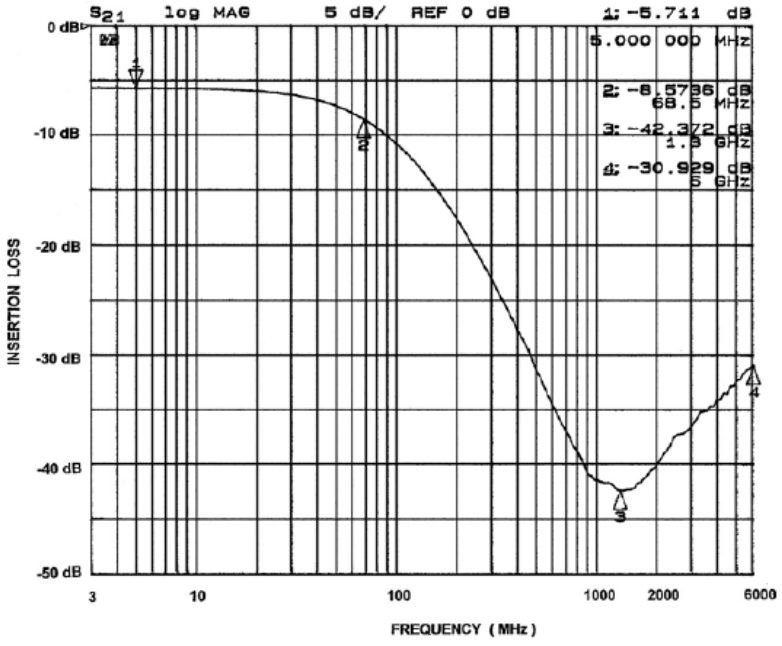


Figure 6. A6−C6 EMI Filter Performance

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ω Environment)

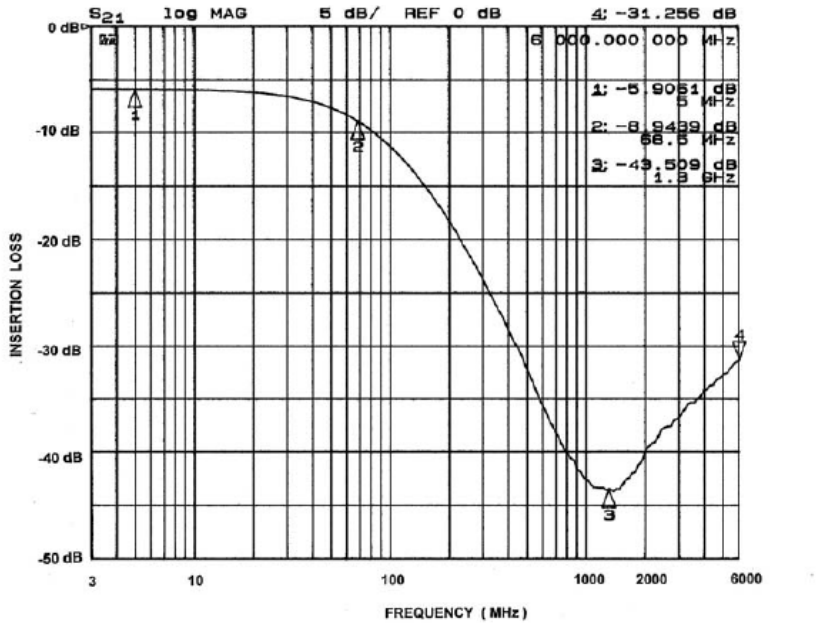


Figure 7. A7−C7 EMI Filter Performance

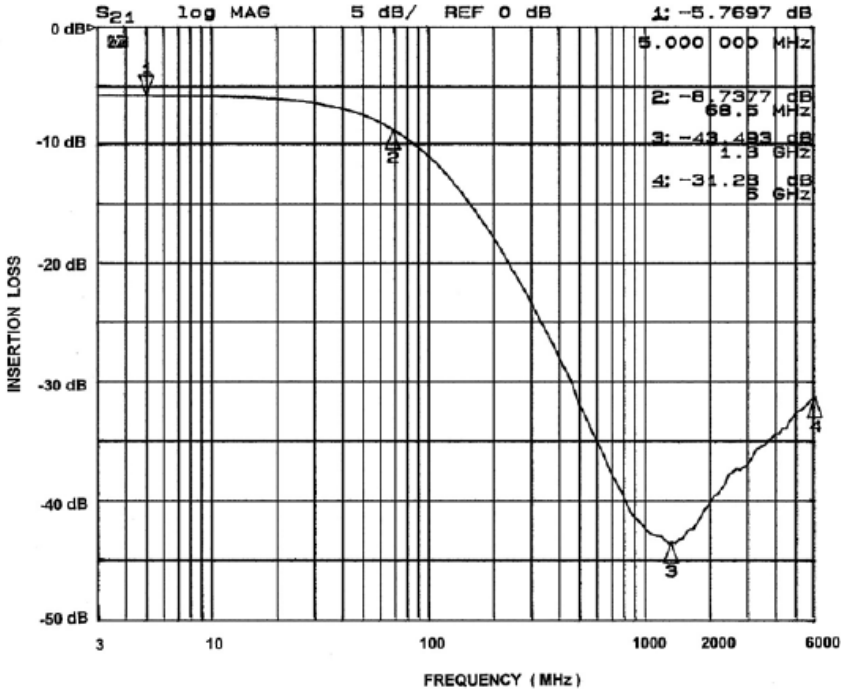


Figure 8. A8−C8 EMI Filter Performance

PERFORMANCE INFORMATION (Cont'd)

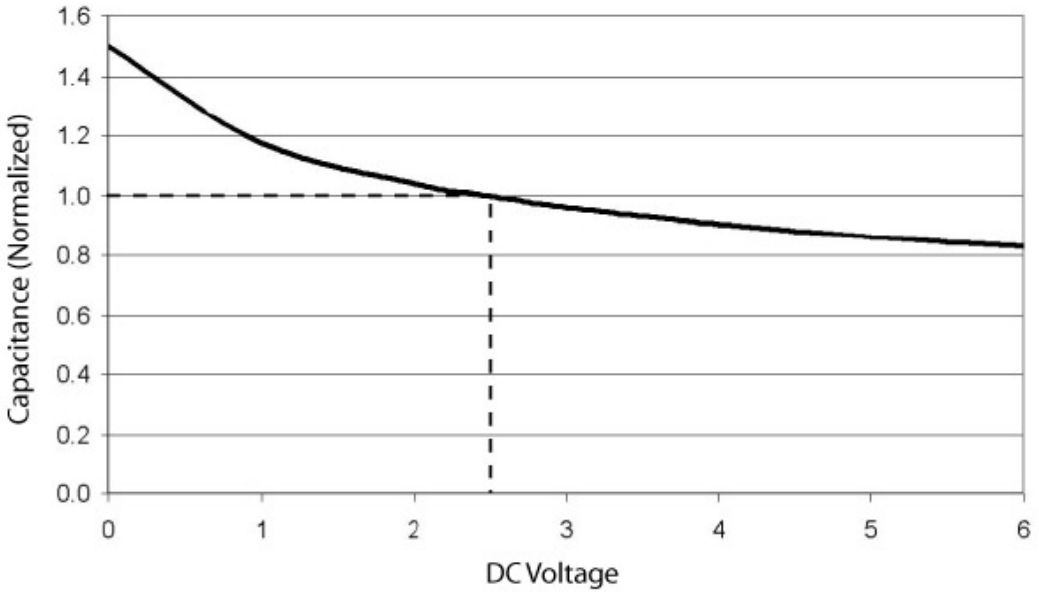


Figure 9. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5 VDC and 25°C)

APPLICATION INFORMATION

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

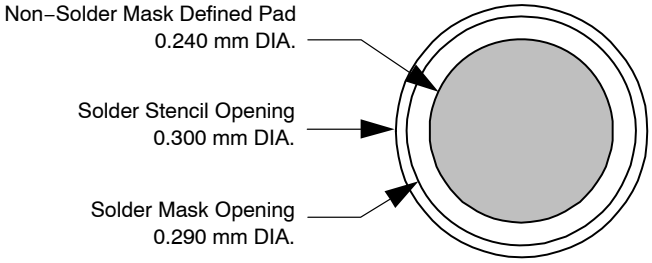


Figure 10. Recommended Non−Solder Mask Defined Pad Illustration

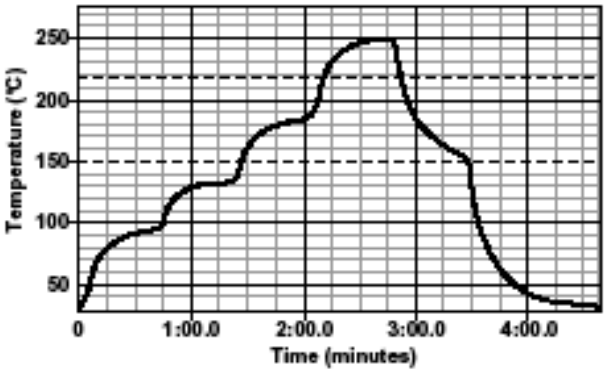
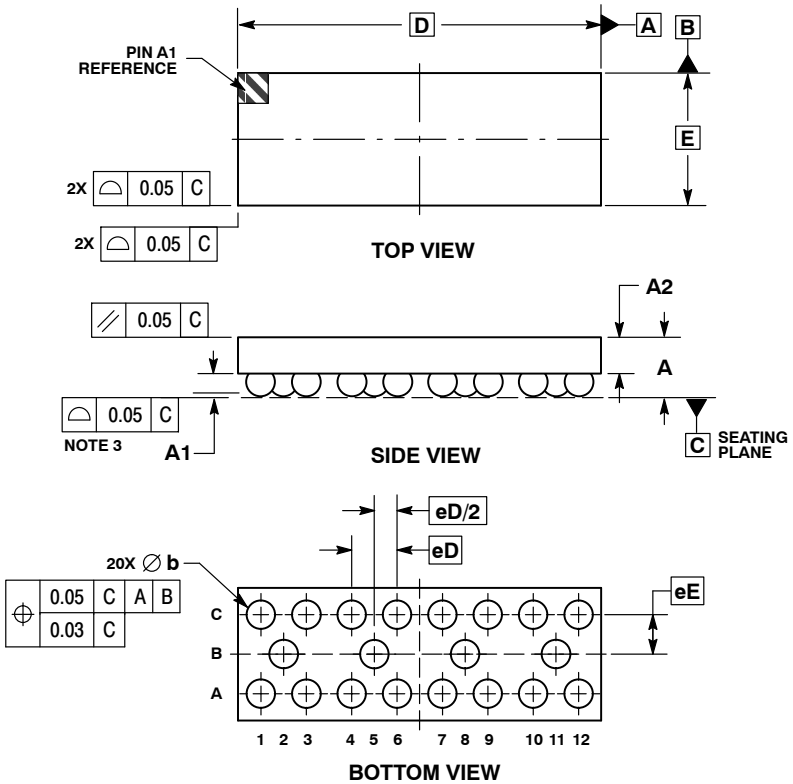


Figure 11. Lead−free (SnAgCu) Solder Ball Reflow Profile

PACKAGE DIMENSIONS

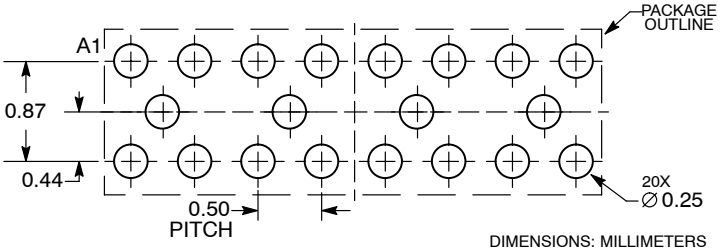
WLCSP20, 4.00x1.46
CASE 567BZ−01
ISSUE O



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	4.00 BSC	
E	1.46 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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PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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