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CM1409

LCD and Camera EMI Filter Array with ESD Protection

Product Description

The CM1409 is a family of pi-style EMI filter arrays with ESD protection, which integrates either six or eight filters (C-R-C) in a small form factor, WDFN 0.50 mm pitch package. The CM1409 has component values of 15 pF – 100 Ω – 15 pF per channel. The CM1409 has a cut-off frequency of 110 MHz and can be used in applications with data rates up to 44 Mbps. The parts include ESD diodes on every pin, which provide a very high level of protection for sensitive electronic components against electrostatic discharge (ESD). The ESD protected diodes safely dissipate ESD strikes of ±15 kV, which even exceeds 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.

These devices are particularly well-suited for portable electronics (e.g. wireless handsets, PDAs, notebook computers) because of their small package and easy-to-use pin assignments. In particular, the CM1409 is ideal for EMI filtering and protecting data and control lines for the I/O data ports, LCD display and camera interface in mobile handsets.

The CM1409 is housed in space-saving, low-profile 12- and 16-lead WDFN packages with a 0.50 mm pitch, RoHS-compliant, lead-free finishing.

Features

- Six or Eight Channels of EMI Filtering with Integrated ESD Protection
- Pi-Style EMI Filters in a Capacitor-Resistor-Capacitor (C-R-C) Network
- ±15 kV ESD Protection on Each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- ±30 kV ESD Protection on Each Channel (HBM)
- Greater than -35 dB Attenuation (Typical) at 1 GHz
- WDFN Package with 0.50 mm Lead Pitch:
 - 6-ch. = 12-lead WDFN
 - 8-ch. = 16-lead WDFN
- Tiny WDFN Package Size:
 - 12-lead: 3.0 mm x 1.35 mm
 - 16-lead: 4.0 mm x 1.60 mm
- Increased Robustness against Vertical Impacts During Manufacturing Process
- These Devices are Pb-Free and are RoHS Compliant

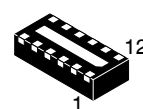
Applications

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

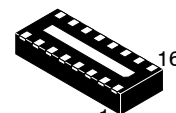


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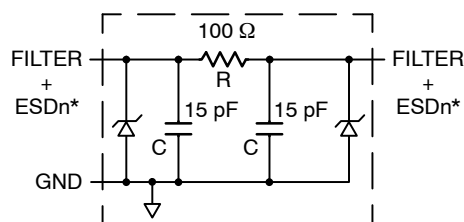


WDFN12
DE SUFFIX
CASE 511AZ



WDFN16
DE SUFFIX
CASE 511AV

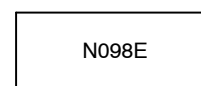
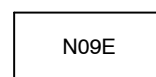
BLOCK DIAGRAM



1 of 6 or 8 EMI/RFI + ESD Channels

*See Package/Pinout Diagrams for Expanded Pin Information.

MARKING DIAGRAM



N09E = CM1409-06DE
N098E = CM1409-08DE

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|---------------------|------------------|
| CM1409-06DE | WDFN12 (Pb-Free) | 3000/Tape & Reel |
| CM1409-08DE | WDFN16 (Pb-Free) | 3000/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.

CM1409

PACKAGE / PINOUT DIAGRAMS

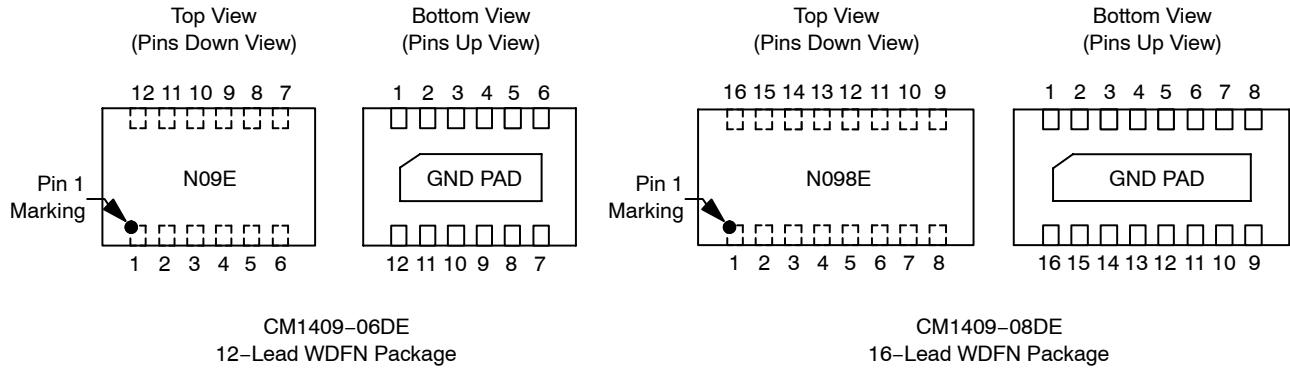


Table 1. PIN DESCRIPTIONS

| Device Pin(s) | | Name | Description | Device Pin(s) | | Name | Description |
|---------------|-----|---------|------------------------|---------------|-----|---------|------------------------|
| -06 | -08 | | | -06 | -08 | | |
| 1 | 1 | FILTER1 | Filter + ESD Channel 1 | 12 | 16 | FILTER1 | Filter + ESD Channel 1 |
| 2 | 2 | FILTER2 | Filter + ESD Channel 2 | 11 | 15 | FILTER2 | Filter + ESD Channel 2 |
| 3 | 3 | FILTER3 | Filter + ESD Channel 3 | 10 | 14 | FILTER3 | Filter + ESD Channel 3 |
| 4 | 4 | FILTER4 | Filter + ESD Channel 4 | 9 | 13 | FILTER4 | Filter + ESD Channel 4 |
| 5 | 5 | FILTER5 | Filter + ESD Channel 5 | 8 | 12 | FILTER5 | Filter + ESD Channel 5 |
| 6 | 6 | FILTER6 | Filter + ESD Channel 6 | 7 | 11 | FILTER6 | Filter + ESD Channel 6 |
| | 7 | FILTER7 | Filter + ESD Channel 7 | | 10 | FILTER7 | Filter + ESD Channel 7 |
| | 8 | FILTER8 | Filter + ESD Channel 8 | | 9 | FILTER8 | Filter + ESD Channel 8 |
| GND PAD | | GND | Device Ground | | | | |

CM1409

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 _{TOTAL} | Total Channel Capacitance | At 2.5 VDC Reverse Bias, 1 MHz, 30 mVAC | 24 | 30 | 36 | pF |
| C | Capacitance C ₁ | At 2.5 VDC Reverse Bias, 1 MHz, 30 mVAC | | 15 | | pF |
| V _{DIODE} | Standoff Voltage | I _{DIODE} = 10 μA | | 6.0 | | V |
| I _{LEAK} | Diode Leakage Current (Reverse Bias) | V _{DIODE} = 3.3 V | | 0.1 | 1.0 | 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 ±15 | | | kV |
| R _{DYN} | Dynamic Resistance Positive Negative | | | 2.3 0.9 | | Ω |
| f _C | Cut-off Frequency Z _{SOURCE} = 50 Ω, Z _{LOAD} = 50 Ω | Channel R = 100 Ω, Channel C = 15 pF | | 110 | | MHz |
| A _{1GHz} | Absolute Attenuation @ 1GHz from 0 dB Level | Z _{SOURCE} = 50 Ω, Z _{LOAD} = 50 Ω, DC Bias = 0 V (Notes 1 and 3) | | 35 | | dB |
| A _{800MHz-6GHz} | Absolute Attenuation @ 800 MHz to 6 GHz from 0 dB Level | Z _{SOURCE} = 50 Ω, Z _{LOAD} = 50 Ω, DC Bias = 0 V (Notes 1 and 3) | | 30 | | dB |

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. Attenuation / RF curves characterized by a network analyzer using microprobes.

CM1409

PERFORMANCE INFORMATION

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

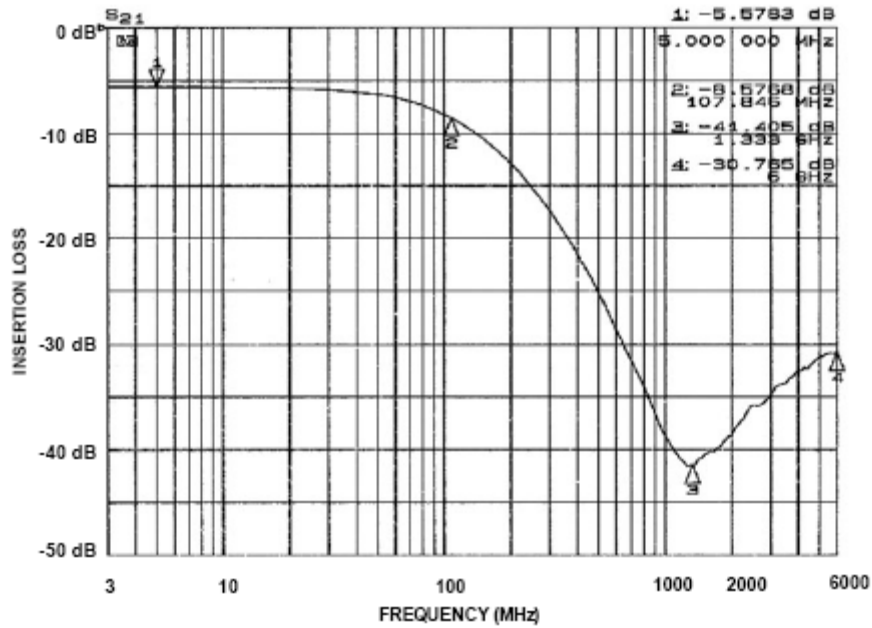


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND)

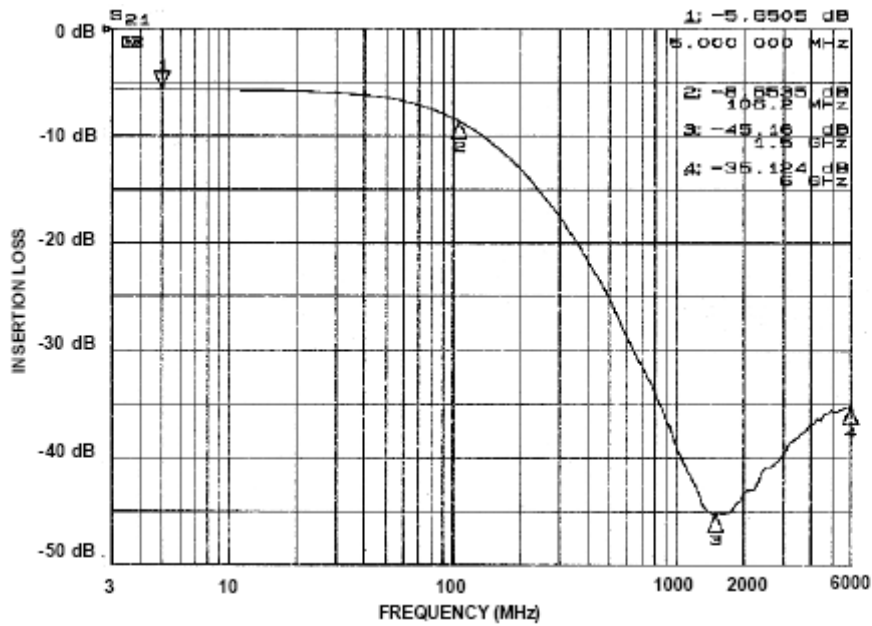


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND)

PERFORMANCE INFORMATION (Cont'd)

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

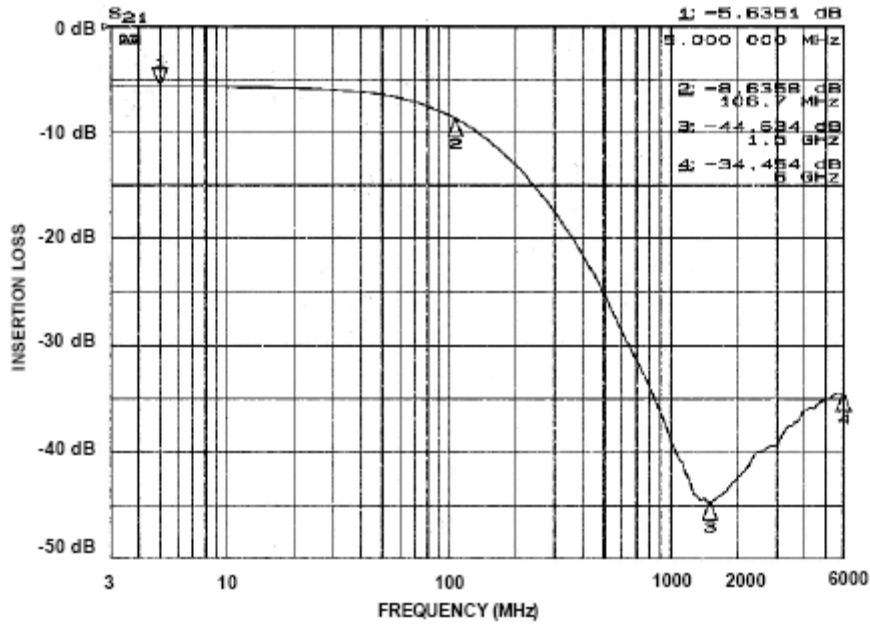


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND)

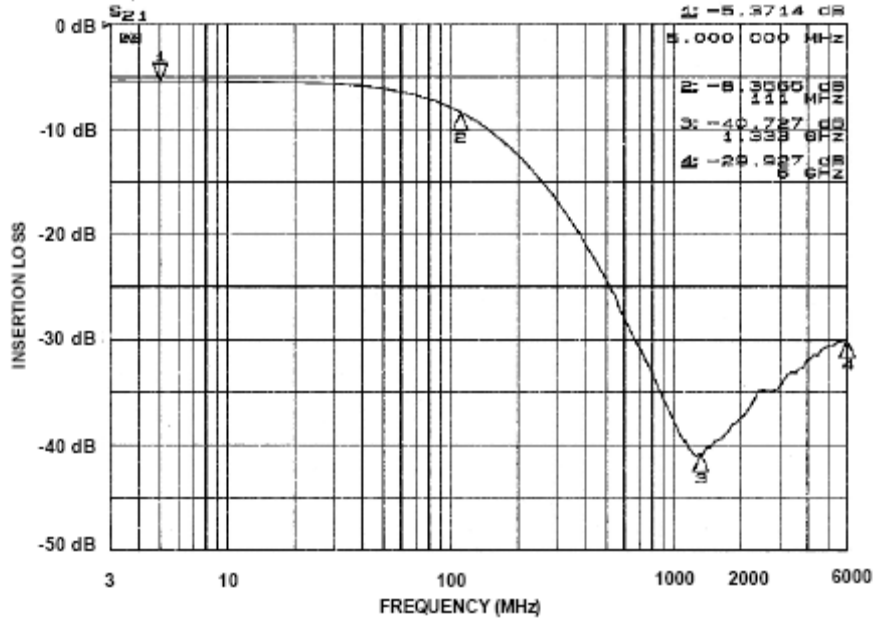


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND)

PERFORMANCE INFORMATION (Cont'd)

Typical Diode Capacitance vs. Input Voltage

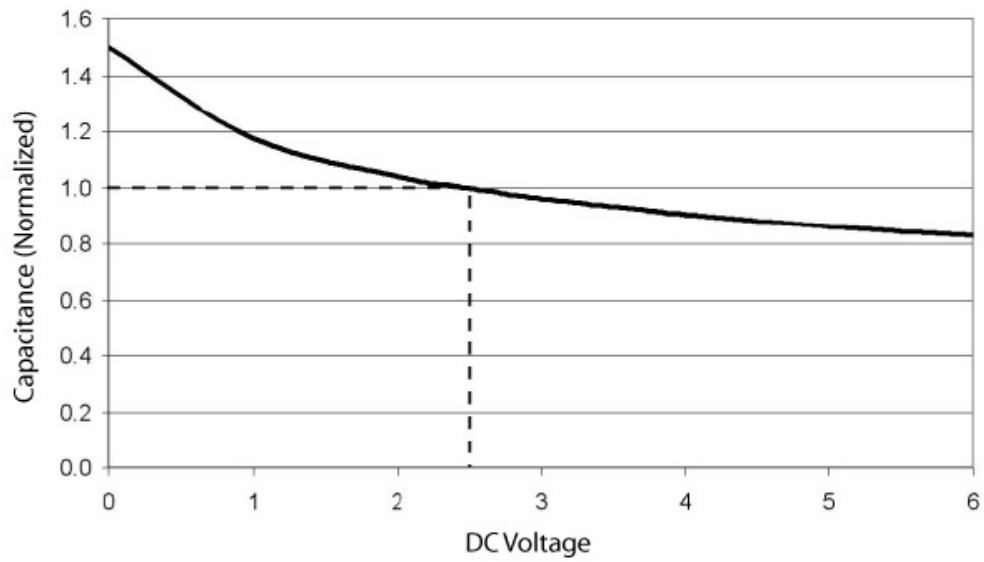
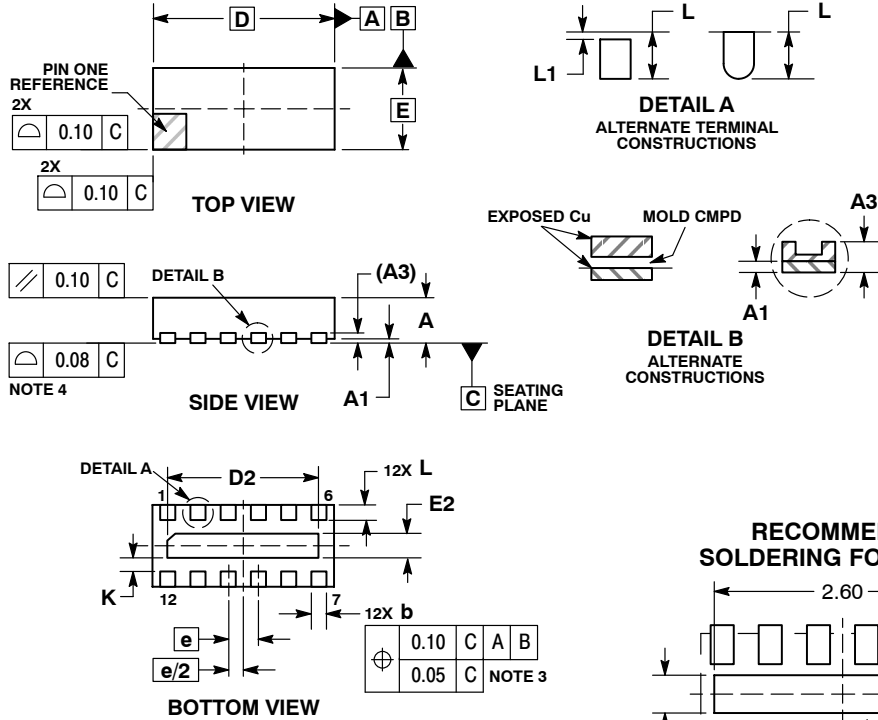


Figure 5. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5 VDC and 25°C)

CM1409

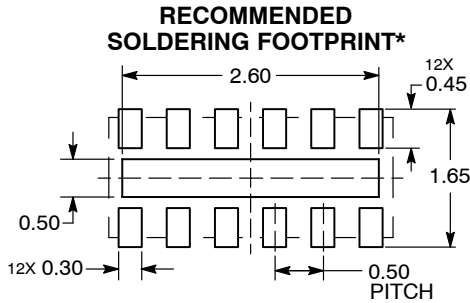
PACKAGE DIMENSIONS

WDFN12, 3x1.35, 0.5P
CASE 511AZ-01
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL TIP.
 4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| MILLIMETERS | | |
|-------------|------|------|
| DIM | MIN | MAX |
| A | 0.70 | 0.80 |
| A1 | 0.00 | 0.05 |
| A3 | 0.20 | REF |
| b | 0.20 | 0.30 |
| D | 3.00 | BSC |
| D2 | 2.40 | 2.60 |
| E | 1.35 | BSC |
| E2 | 0.30 | 0.50 |
| e | 0.50 | BSC |
| K | 0.22 | REF |
| L | 0.20 | 0.30 |
| L1 | --- | 0.15 |



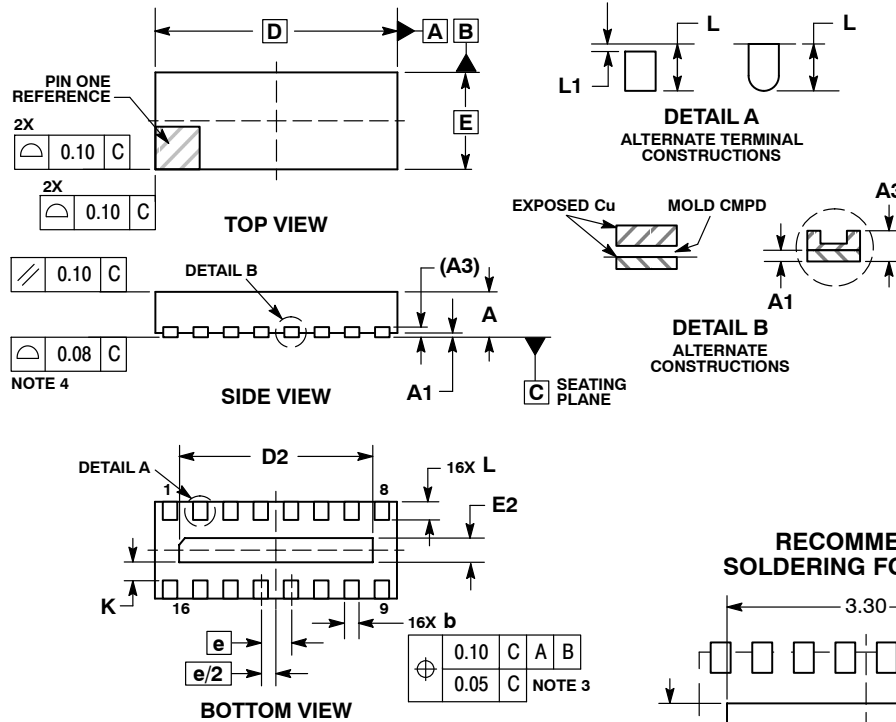
DIMENSION: MILLIMETERS

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

CM1409

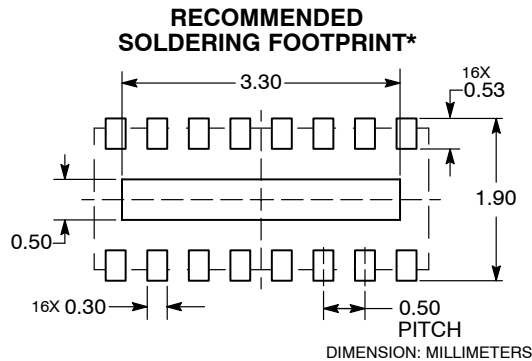
PACKAGE DIMENSIONS

WDFN16, 4x1.6, 0.5P
CASE 511AV-01
ISSUE 0



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL TIP.
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| MILLIMETERS | | |
|-------------|------|------|
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| A | 0.70 | 0.80 |
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| b | 0.20 | 0.30 |
| D | 4.00 | BSC |
| D2 | 3.10 | 3.30 |
| E | 1.60 | BSC |
| E2 | 0.30 | 0.50 |
| e | 0.50 | BSC |
| K | 0.30 | REF |
| L | 0.20 | 0.40 |
| L1 | --- | 0.15 |



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