

# CM1431

## LCD and Camera EMI Filter Array with ESD Protection

### Product Description

The CM1431 is a family of pi-style EMI filter arrays with ESD protection, which integrates four, six and eight filters (C-R-C) in small form factor WDFN 0.40 mm pitch packages. The CM1431 has component values of 15 pF – 100  $\Omega$  – 15 pF per channel. The CM1431 has a cut-off frequency of 120 MHz and can be used in applications with data rates up to 48 Mbps. The parts include 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 protection diodes safely dissipate ESD strikes of  $\pm 15$  kV, well beyond 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  $\pm 30$  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 CM1431 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 CM1431 is housed in space-saving, low-profile 8-, 12- and 16-lead WDFN packages with a 0.40 mm pitch and is available with lead-free finishing. This smaller size WDFN package provides up to 42% board space saving vs. the 0.50 mm pitch WDFN packages.

### Features

- Four, Six and Eight Channels of EMI Filtering with Integrated ESD Protection
- Pi-Style EMI Filters in a Capacitor-Resistor-Capacitor (C-R-C) Network
- $\pm 15$  kV ESD Protection on Each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- $\pm 30$  kV ESD Protection on Each Channel (HBM)
- Greater than 35 dB Attenuation (Typical) at 1 GHz
- WDFN Package with 0.40 mm Lead Pitch:
  - ◆ 4-ch. = 8-lead WDFN
  - ◆ 6-ch. = 12-lead WDFN
  - ◆ 8-ch. = 16-lead WDFN
- Tiny WDFN Package Size:
  - ◆ 8-lead: 1.7 mm X 1.35 mm
  - ◆ 12-lead: 2.5 mm X 1.35 mm
  - ◆ 16-lead: 3.3 mm X 1.35 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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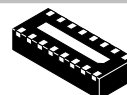
<http://onsemi.com>



WDFN8  
DF/DE SUFFIX  
CASE 511BF

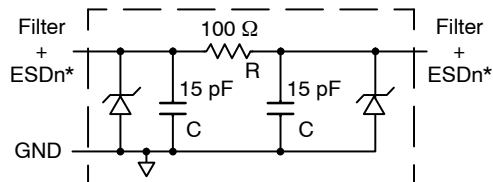


WDFN12  
DF/DE SUFFIX  
CASE 511BC



WDFN16  
DF/DE SUFFIX  
CASE 511AW

### BLOCK DIAGRAM



1 of 4, 6 or 8 EMI/RFI + ESD Channels

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

### MARKING DIAGRAM

|       |           |             |
|-------|-----------|-------------|
| WF/WE | N31F/N31E | N318F/N318E |
|-------|-----------|-------------|

WF/WE = CM1431-04DF/CM1431-04DE  
N31F/N31E = CM1431-06DF/CM1431-06DE  
N318F/N318E = CM1431-08DF/CM1431-08DE

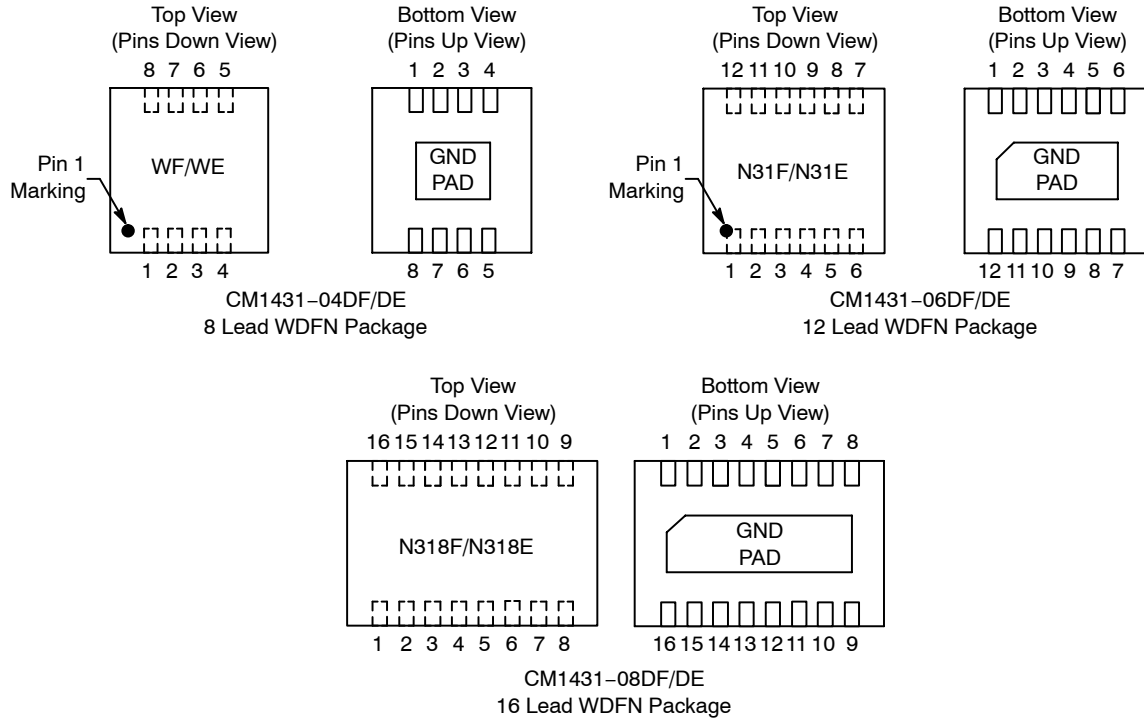
### ORDERING INFORMATION

| Device      | Package           | Shipping†        |
|-------------|-------------------|------------------|
| CM1431-04DF | WDFN-8 (Pb-Free)  | 3000/Tape & Reel |
| CM1431-04DE | WDFN-8 (Pb-Free)  | 3000/Tape & Reel |
| CM1431-06DF | WDFN-12 (Pb-Free) | 3000/Tape & Reel |
| CM1431-06DE | WDFN-12 (Pb-Free) | 3000/Tape & Reel |
| CM1431-08DF | WDFN-16 (Pb-Free) | 3000/Tape & Reel |
| CM1431-08DE | WDFN-16 (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.

# CM1431

## PACKAGE / PINOUT DIAGRAMS



**Table 1. PIN DESCRIPTIONS**

| Device Pin(s) |     |     | Name    | Description            | Device Pin(s) |     |     | Name    | Description            |
|---------------|-----|-----|---------|------------------------|---------------|-----|-----|---------|------------------------|
| -04           | -06 | -08 |         |                        | -04           | -06 | -08 |         |                        |
| 1             | 1   | 1   | FILTER1 | Filter + ESD Channel 1 | 8             | 12  | 16  | FILTER1 | Filter + ESD Channel 1 |
| 2             | 2   | 2   | FILTER2 | Filter + ESD Channel 2 | 7             | 11  | 15  | FILTER2 | Filter + ESD Channel 2 |
| 3             | 3   | 3   | FILTER3 | Filter + ESD Channel 3 | 6             | 10  | 14  | FILTER3 | Filter + ESD Channel 3 |
| 4             | 4   | 4   | FILTER4 | Filter + ESD Channel 4 | 5             | 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          | -             | -   | -   | -       |                        |

## 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 <sub>TOTAL</sub>          | Total Channel Capacitance                                                                                                                | At 2.5 V DC Reverse Bias,<br>1 MHz, 30 mV AC                                           | 24          | 30          | 36          | pF    |
| C                           | Capacitance C                                                                                                                            | At 2.5 V DC Reverse Bias,<br>1 MHz, 30 mV AC                                           | 12          | 15          | 18          | pF    |
| V <sub>DIODE</sub>          | Stand-off 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                                                             |             | 0.1         | 1.0         | μA    |
| V <sub>SIG</sub>            | Signal Clamp Voltage<br>Positive Clamp<br>Negative Clamp                                                                                 | I <sub>LOAD</sub> = 10 mA<br>I <sub>LOAD</sub> = -10 mA                                | 5.6<br>-1.5 | 6.8<br>-0.8 | 9.0<br>-0.4 | V     |
| V <sub>ESD</sub>            | In-system ESD Withstand Voltage<br>a) Human Body Model, MIL-STD-883,<br>Method 3015<br>b) Contact Discharge per<br>IEC 61000-4-2 Level 4 | (Note 2)                                                                               | ±30<br>±15  |             |             | kV    |
| R <sub>DYN</sub>            | Dynamic Resistance<br>Positive<br>Negative                                                                                               |                                                                                        |             | 2.3<br>0.9  |             | Ω     |
| f <sub>C</sub>              | Cut-off Frequency<br>Z <sub>SOURCE</sub> = 50 Ω, Z <sub>LOAD</sub> = 50 Ω                                                                | R = 100 Ω, C = 15 pF                                                                   |             | 110         |             | MHz   |
| A <sub>1GHz</sub>           | Absolute Attenuation @ 1 GHz from 0 dB Level                                                                                             | Z <sub>SOURCE</sub> = 50 Ω, Z <sub>LOAD</sub> = 50 Ω,<br>DC Bias = 0 V (Notes 1 and 3) |             | 35          |             | dB    |
| A <sub>800MHz to 6GHz</sub> | Absolute Attenuation @ 800 MHz to 6 GHz<br>from 0 dB Level                                                                               | Z <sub>SOURCE</sub> = 50 Ω, Z <sub>LOAD</sub> = 50 Ω,<br>DC Bias = 0 V (Notes 1 and 3) |             | 30          |             | dB    |

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

# CM1431

## PERFORMANCE INFORMATION

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

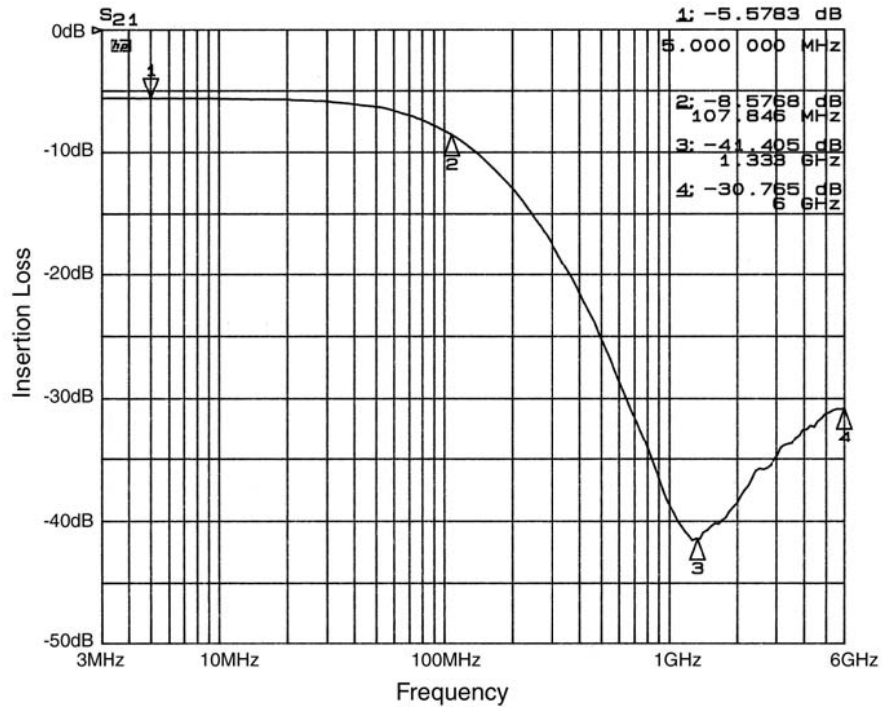


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND)

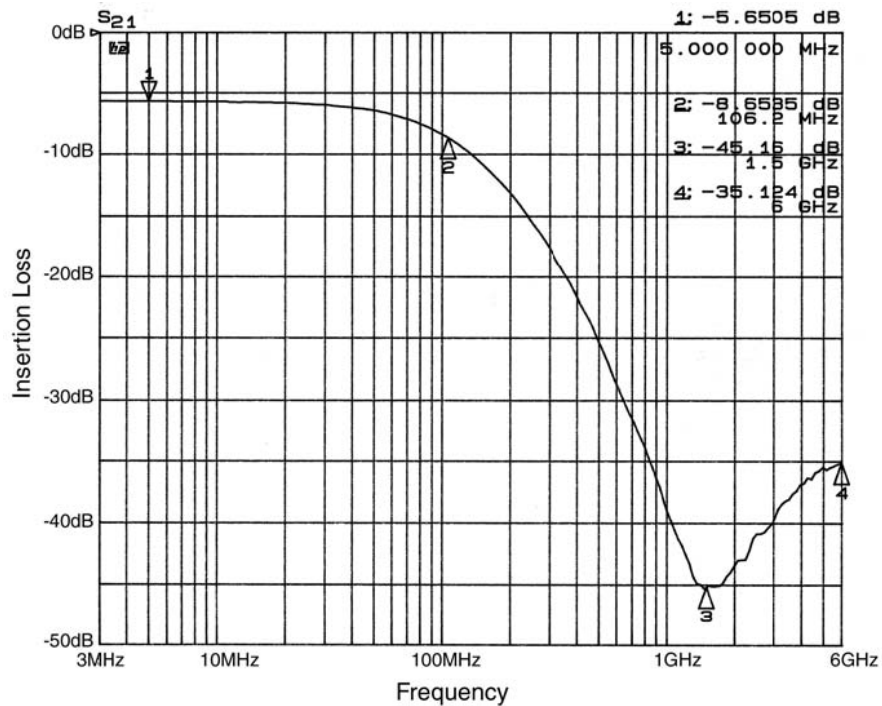


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND)

# CM1431

## PERFORMANCE INFORMATION (Cont'd)

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

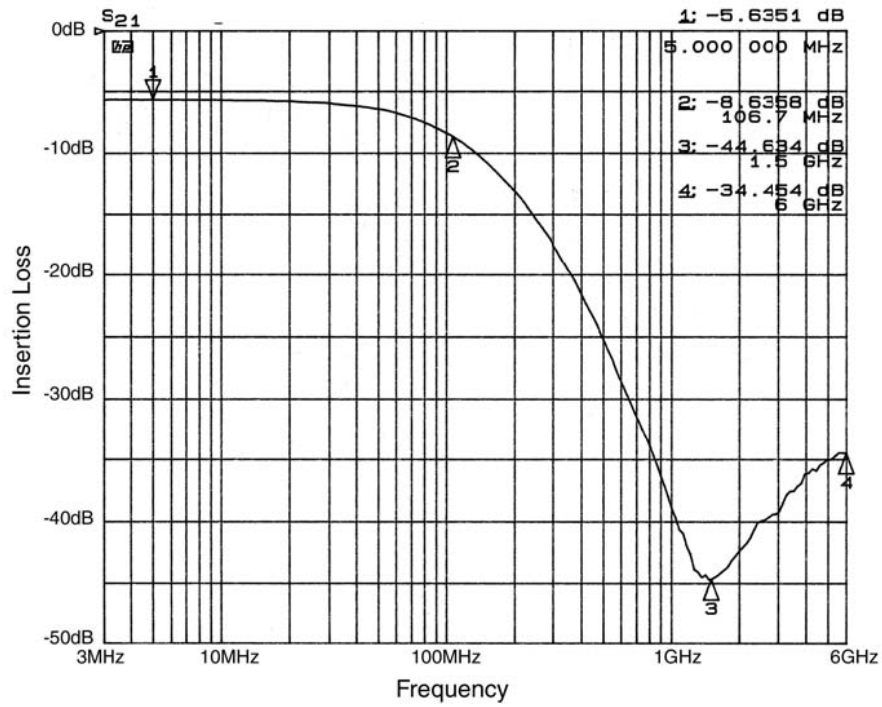


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND)

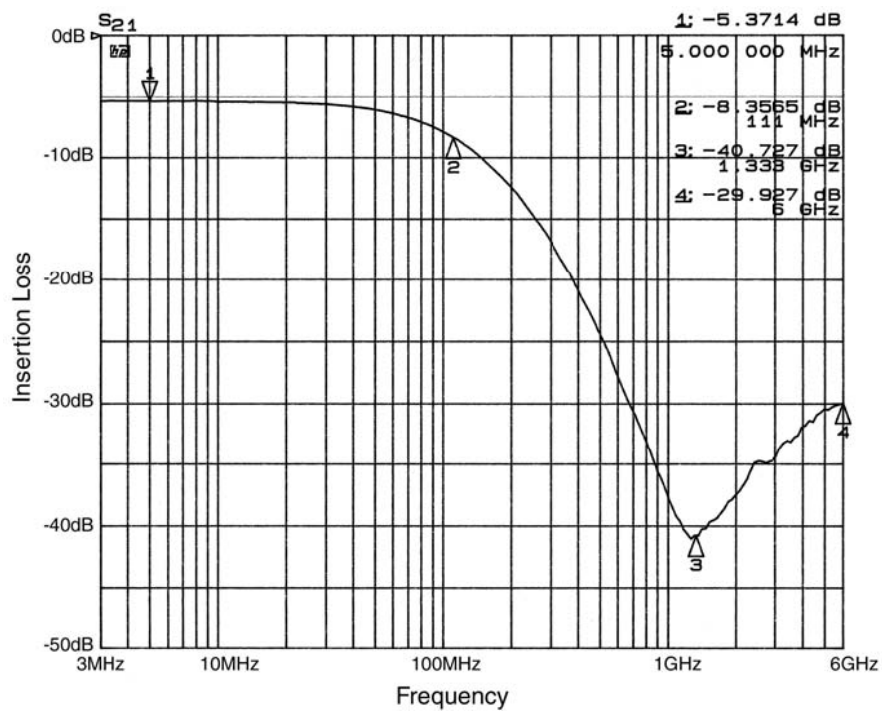
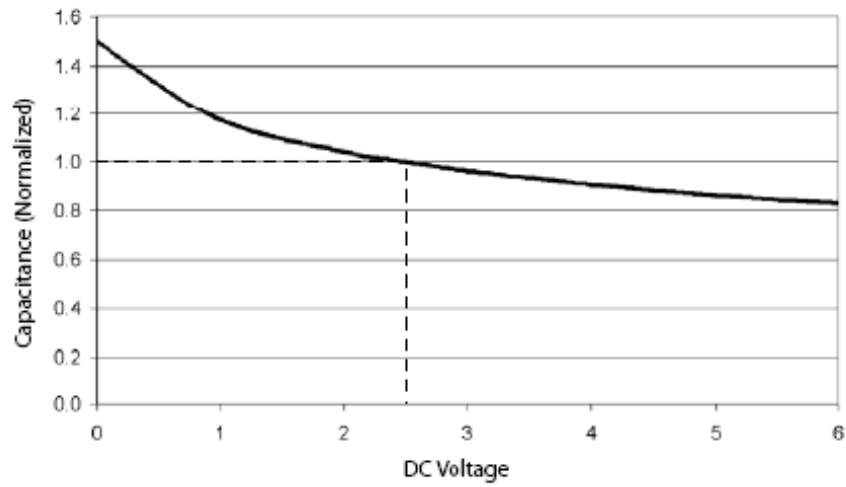


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND)

## PERFORMANCE INFORMATION (Cont'd)

## Typical Diode Capacitance vs. Input Voltage

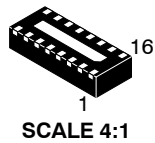


**Figure 5. Filter Capacitance vs. Input Voltage**  
(normalized to capacitance at 2.5 V DC and 25°C)

# MECHANICAL CASE OUTLINE

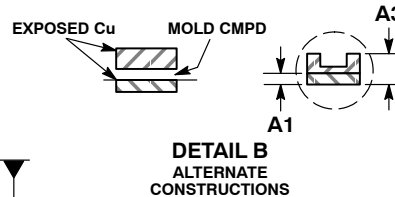
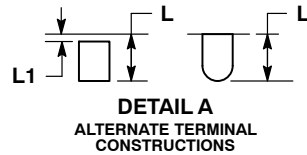
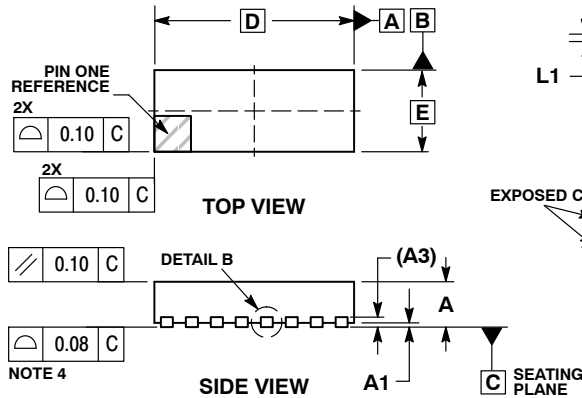
## PACKAGE DIMENSIONS

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WDFN16, 3.3x1.35, 0.4P  
CASE 511AW-01  
ISSUE O

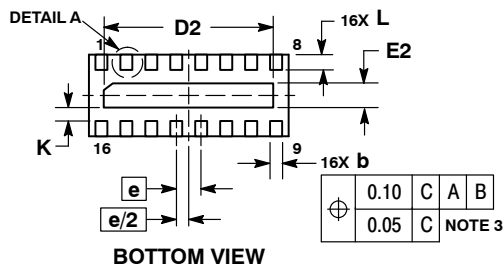
DATE 06 JUL 2010



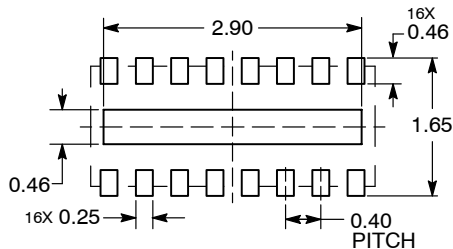
### NOTES:

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.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.70        | 0.80 |
| A1  | 0.00        | 0.05 |
| A3  | 0.20        | REF  |
| b   | 0.15        | 0.25 |
| D   | 3.30        | BSC  |
| D2  | 2.70        | 2.90 |
| E   | 1.35        | BSC  |
| E2  | 0.30        | 0.50 |
| e   | 0.40        | BSC  |
| K   | 0.22        | REF  |
| L   | 0.15        | 0.35 |
| L1  | ---         | 0.15 |



### RECOMMENDED SOLDERING FOOTPRINT\*



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.

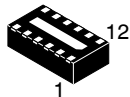
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# MECHANICAL CASE OUTLINE

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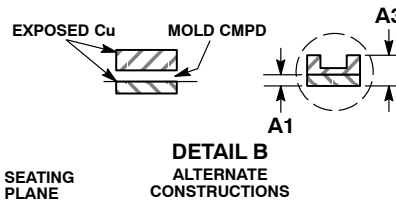
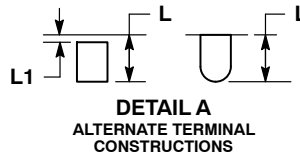
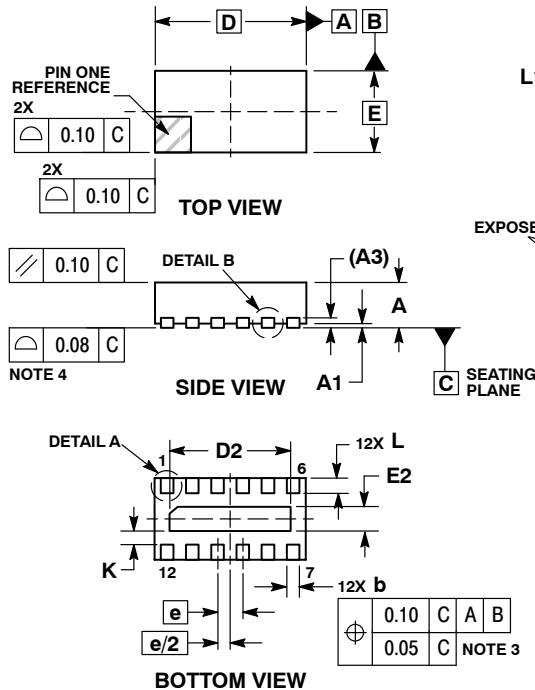
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SCALE 4:1

WDFN12, 2.5x1.35, 0.4P  
CASE 511BC-01  
ISSUE O

DATE 06 JUL 2010

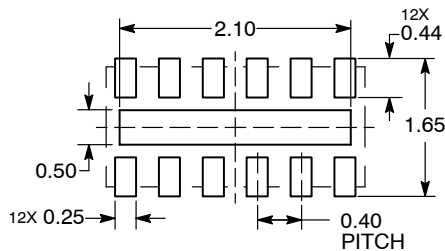


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|-------------|----------|------|
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| A           | 0.70     | 0.80 |
| A1          | 0.00     | 0.05 |
| A3          | 0.20 REF |      |
| b           | 0.15     | 0.25 |
| D           | 2.50 BSC |      |
| D2          | 1.90     | 2.10 |
| E           | 1.35 BSC |      |
| E2          | 0.30     | 0.50 |
| e           | 0.40 BSC |      |
| K           | 0.22 REF |      |
| L           | 0.15     | 0.35 |
| L1          | ---      | 0.15 |

### 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.

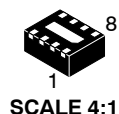
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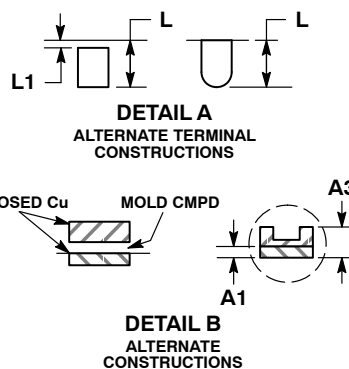
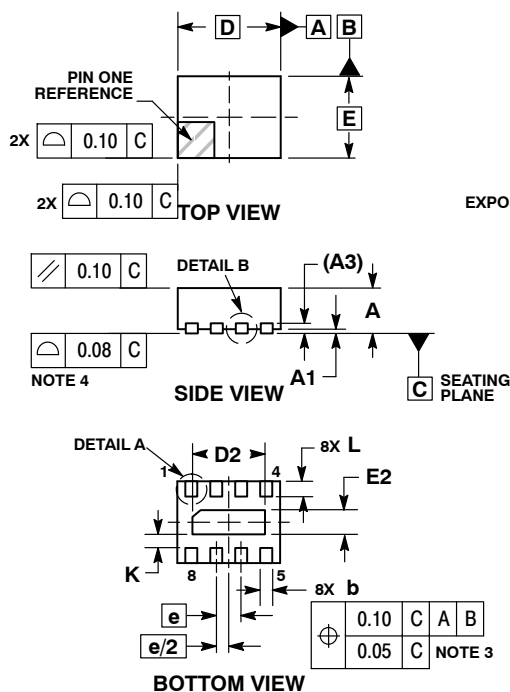
## PACKAGE DIMENSIONS

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CASE 511BF-01  
ISSUE O

DATE 21 JUL 2010

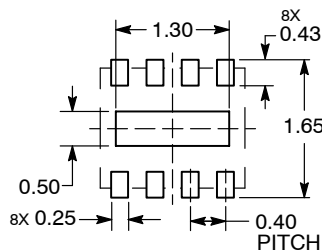


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| A3          | 0.20 | REF  |
| b           | 0.15 | 0.25 |
| D           | 1.7  | BSC  |
| E2          | 1.10 | 1.30 |
| E           | 1.35 | BSC  |
| E2          | 0.30 | 0.50 |
| e           | 0.40 | BSC  |
| K           | 0.22 | REF  |
| L           | 0.15 | 0.35 |
| L1          | ---  | 0.15 |

### RECOMMENDED SOLDERING FOOTPRINT\*



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.

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