

# CM1204

## 4-Channel ESD Array in CSP

### Product Description

The CM1204 is a quad ESD transient voltage suppression diode array. Each diode provides a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). These diodes safely dissipate ESD strikes of  $\pm 15$  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  $\pm 30$  kV.

The CM1204 is particularly well suited for portable electronics (e.g., cellular telephones, PDAs, notebook computers) because of its small package format and low weight.

The CM1204 features *Optiguard*<sup>™</sup> coating which results in improved reliability at assembly. It is available in a space-saving, low-profile chip scale package with RoHS-compliant lead-free finishing.

### Features

- Functionally and Pin Compatible with ON Semiconductor's CSPESD304
- Optiguard<sup>™</sup> Coated for Improved Reliability
- Four Channels of ESD Protection
- $\pm 15$  kV ESD Protection on Each Channel (IEC 61000-4-2 Level 4, Contact Discharge)
- $\pm 30$  kV ESD Protection on Each Channel (HBM)
- Chip Scale Package Features Extremely Low Lead Inductance for Optimum ESD Protection
- 5-bump, 0.960 mm X 1.330 mm Footprint
- Chip Scale Package (CSP)
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- ESD Protection for Sensitive Electronic Equipment
- I/O Port and Keypad and Button Circuitry Protection for Portable Devices
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Digital Camcorders
- Notebooks
- Desktop PCs



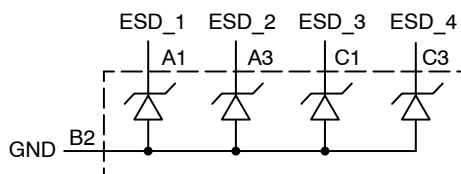
ON Semiconductor®

<http://onsemi.com>

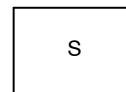


CSP-5  
CP SUFFIX  
CASE 567AY

### BLOCK DIAGRAM



### MARKING DIAGRAM



S = Specific Device Code

### ORDERING INFORMATION

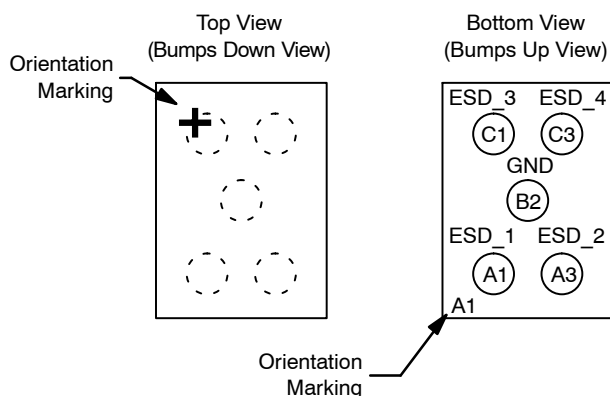
| Device      | Package          | Shipping <sup>†</sup> |
|-------------|------------------|-----------------------|
| CM1204-03CP | CSP<br>(Pb-Free) | 3500/Tape & Reel      |

<sup>†</sup>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.

Table 1. PIN DESCRIPTIONS

| Pin | Name  | Description   |
|-----|-------|---------------|
| A1  | ESD_1 | ESD Channel 1 |
| A3  | ESD_2 | ESD Channel 2 |
| B2  | GND   | Device Ground |
| C1  | ESD_3 | ESD Channel 3 |
| C3  | ESD_4 | ESD Channel 4 |

PACKAGE / PINOUT DIAGRAMS

CM1204  
CSP Package with OptiGuard™

## SPECIFICATIONS

Table 2. ABSOLUTE MAXIMUM RATINGS

| Parameter                 | Rating      | Units |
|---------------------------|-------------|-------|
| Storage Temperature Range | -65 to +150 | °C    |
| DC Package Power Rating   | 200         | 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 |
|-------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|-------------|-------------|-------|
| $V_{DIODE}$ | Diode Reverse Breakdown Voltage                                                                                            | $I_{DIODE} = 10 \mu A$                     |                      | 6.0         |             | V     |
| $I_{LEAK}$  | Diode Leakage Current                                                                                                      | $V_{IN} = 3.3 V, T_A = 25^\circ C$         |                      |             | 100         | nA    |
| $V_{SIG}$   | Signal Voltage<br>Positive Clamp<br>Negative Clamp                                                                         | $I_{DIODE} = 10 mA$                        | 5.6<br>-1.5          | 6.8<br>-0.8 | 9.0<br>-0.4 | V     |
| $V_{ESD}$   | In-system ESD Withstand Voltage<br>a) Human Body Model, MIL-STD-883, Method 3015<br>b) Contact Discharge per IEC 61000-4-2 | (Note 2)                                   | $\pm 30$<br>$\pm 15$ |             |             | kV    |
| $V_{CL}$    | Clamping Voltage during ESD Discharge<br>MIL-STD-883 (Method 3015), 8 kV<br>Positive Transients<br>Negative Transients     | (Note 2)                                   |                      | +15<br>-8   |             | V     |
| $C_{DIODE}$ | Diode Capacitance                                                                                                          | At 2.5 VDC Reverse Bias,<br>1 MHz, 30 mVAC | 22                   | 27          | 32          | pF    |

1.  $T_A = -40$  to  $+85^\circ C$  unless otherwise specified.

2. ESD applied to input and output pins with respect to GND, one at a time.

## PERFORMANCE INFORMATION

Diode Characteristics (nominal conditions unless specified otherwise)

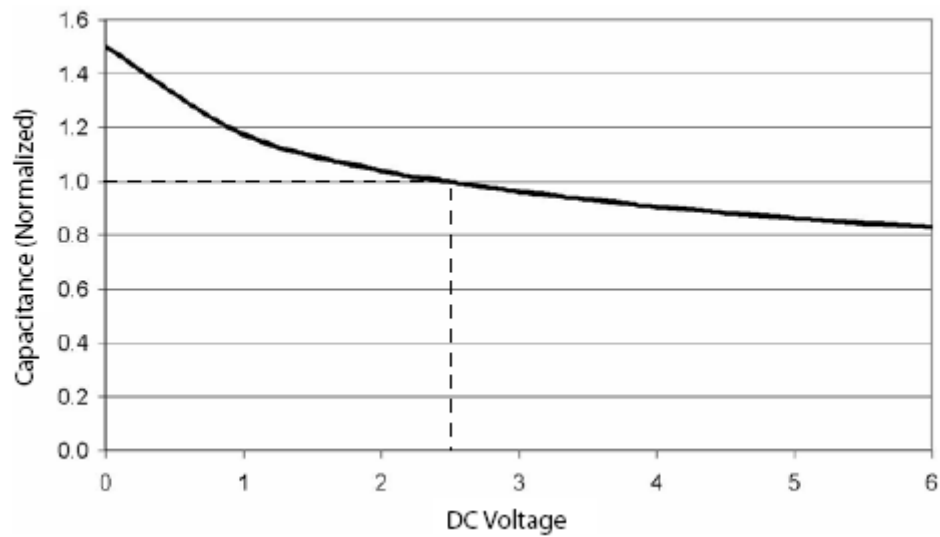


Figure 1. Typical Diode Capacitance vs. Input Voltage (Normalized to 2.5 VDC)

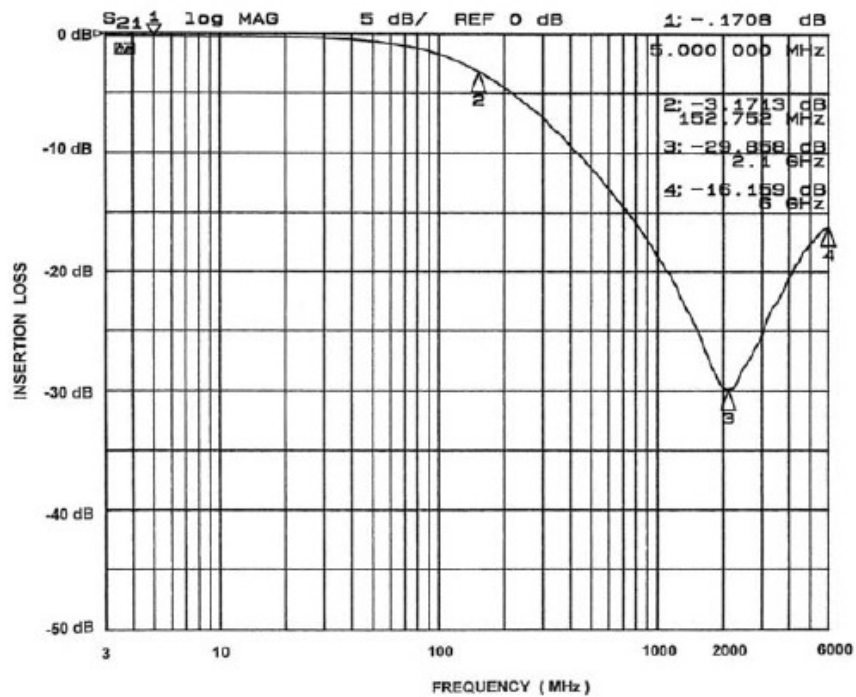


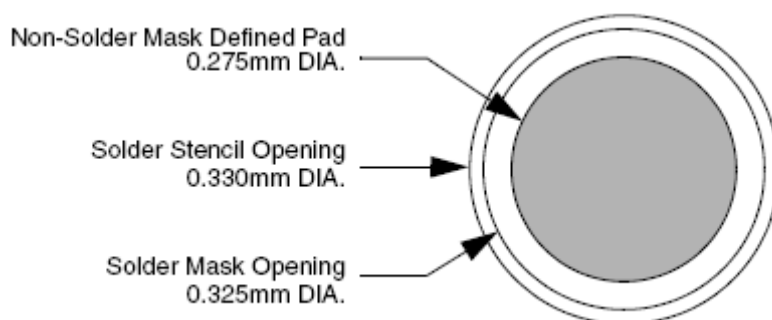
Figure 2. Frequency Response (Single Channel vs. GND, in 50  $\Omega$  System)

## APPLICATION INFORMATION

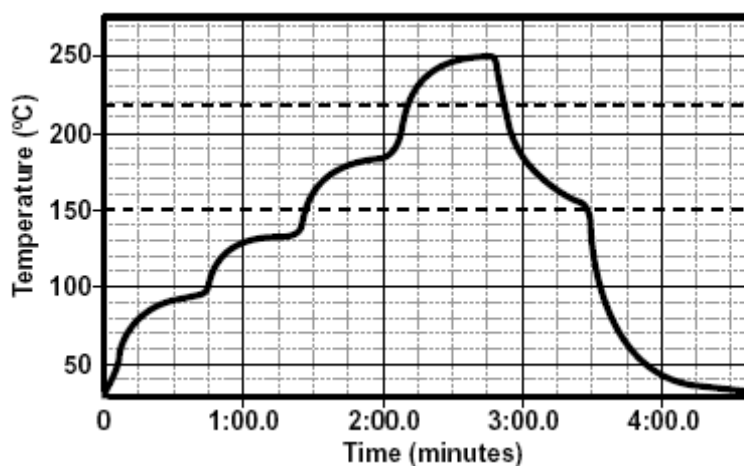
Refer to Application Note “The Chip Scale Package”, for a detailed description of Chip Scale Packages offered by ON Semiconductor.

**Table 5. PRINTED CIRCUIT BOARD RECOMMENDATIONS**

| Parameter                                                     | Value                        |
|---------------------------------------------------------------|------------------------------|
| Pad Size on PCB                                               | 0.275 mm                     |
| Pad Shape                                                     | Round                        |
| Pad Definition                                                | Non-Solder Mask defined pads |
| Solder Mask Opening                                           | 0.325 mm Round               |
| Solder Stencil Thickness                                      | 0.125 mm – 0.150 mm          |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls) | 0.330 mm Round               |
| Solder Flux Ratio                                             | 50/50 by volume              |
| Solder Paste Type                                             | No Clean                     |
| Pad Protective Finish                                         | OSP (Entek Cu Plus 106 A)    |
| Tolerance — Edge To Corner Ball                               | $\pm 50\text{ }\mu\text{m}$  |
| Solder Ball Side Coplanarity                                  | $\pm 20\text{ }\mu\text{m}$  |
| Maximum Dwell Time Above Liquidous                            | 60 seconds                   |
| Maximum Soldering Temperature                                 | 260°C                        |



**Figure 3. Recommended Non-Solder Mask Defined Pad Illustration**



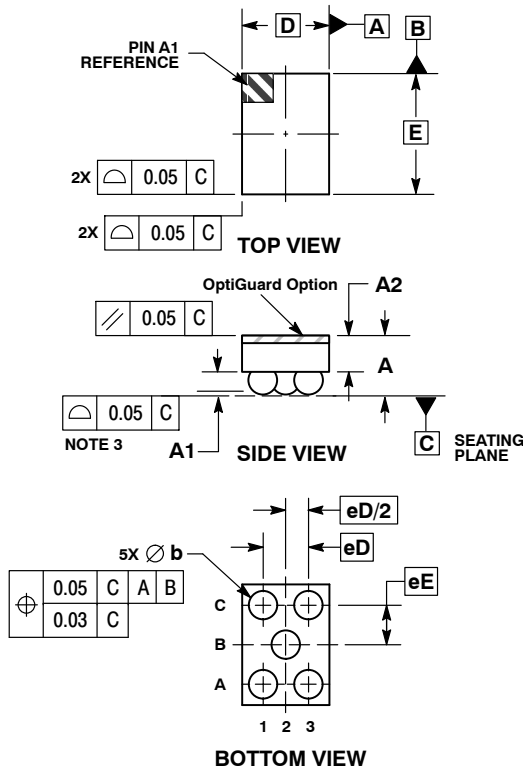
**Figure 4. Lead-free (SnAgCu) Solder Ball Reflow Profile**



SCALE 4:1

**WLCSP5, 0.96x1.33**  
**CASE 567AY**  
**ISSUE O**

DATE 26 JUL 2010

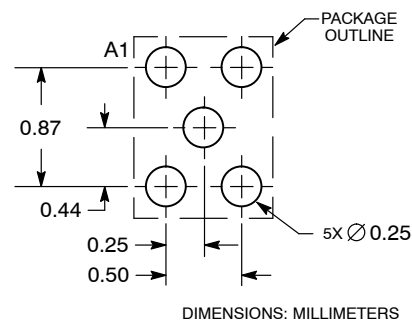


**NOTES:**

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

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.56        | 0.72 |
| A1  | 0.21        | 0.27 |
| A2  | 0.40        | REF  |
| b   | 0.29        | 0.35 |
| D   | 0.96        | BSC  |
| E   | 1.33        | BSC  |
| eD  | 0.50        | BSC  |
| eE  | 0.435       | BSC  |

**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.

|                         |                          |                                                                                                                                                                                  |
|-------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON49808E</b>       | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>WLCSP5, 0.96X1.33</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

onsemi and Onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at  
[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)