



**THE DATASHEET OF
CM1416-03CP**





Headset/Speaker EMI Filter with ESD Protection

CM1416

Features

- Functionally and pin compatible with the CSPEMI201A and CM1411
- *OptiGuard*[™] coated for improved reliability at assembly
- Two channels of EMI filtering for 8Ω speakers
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-C) network
- Greater than 30dB attenuation at 1GHz
- ±30kV ESD protection on each channel per IEC 61000-4-2 Level 4, contact discharge
- Extremely low lead inductance for optimum filter and ESD performance
- 5-bump, 0.96mm X 1.33mm footprint Chip Scale Package (CSP)
- RoHS-compliant, lead-free finishing

Applications

- Headset Speaker port 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.

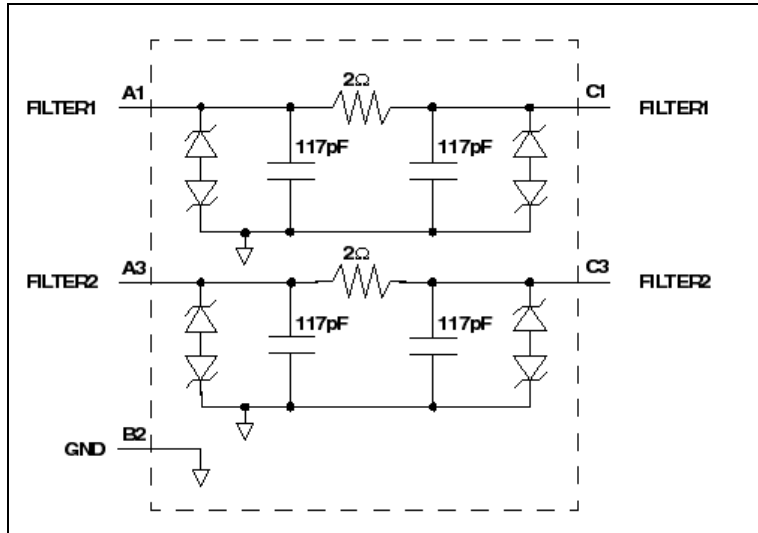
Product Description

The CM1416 is an EMI filter array with ESD protection, which integrates two Pi-filters (C-R-C). The CM1416 has component values of 117pF-2Ω-117pF. 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 safely dissipate ESD strikes of ±30kV, 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, these devices protect for contact discharges at greater than ±30kV.

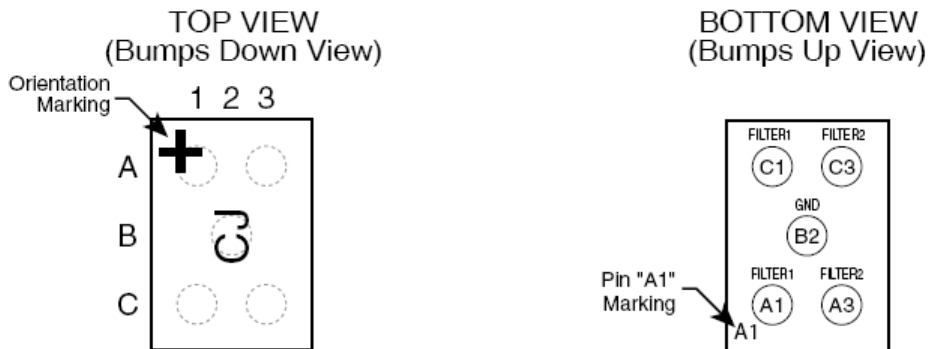
This device is well suited for portable electronics (e.g. mobile handsets, PDAs, notebook computers) because of its small package and easy-to-use pin assignments. In particular, the CM1416 is ideal for filtering unwanted EMI-induced noise and providing ESD protection for headset speaker port applications in wireless handsets with 8Ω speakers.

The CM1416 incorporates *OptiGuard*[™] coating which results in improved reliability at assembly. The CM1416 is available in a space saving, low profile Chip Scale Package with RoHS-compliant, lead-free finishing.

Block Diagram



PACKAGE / PINOUT DIAGRAMS



CM1416
5 Bump CSP Package

Notes:
1) These drawings are not to scale.

CM1416

PIN DESCRIPTIONS

| PIN | NAME | DESCRIPTION |
|-----|---------|---------------|
| A1 | FILTER1 | EMI Filter 1 |
| A3 | FILTER2 | EMI Filter 2 |
| B2 | GND | Device Ground |
| C1 | FILTER1 | EMI Filter 1 |
| C3 | FILTER2 | EMI Filter 2 |

Ordering Information

PART NUMBERING INFORMATION

| Pins | Package | Lead-free Finish | |
|------|---------|-----------------------------------|--------------|
| | | Ordering Part Number ¹ | Part Marking |
| 5 | CSP | CM1416-03CP | CJ |

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

Specifications

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | RATING | UNITS |
|----------------------------------|-------------|-------|
| Storage Temperature Range | -65 to +150 | °C |
| DC Power per Resistor (note 5) | 100 | mW |
| DC Package Power Rating (note 5) | 500 | mW |

STANDARD OPERATING CONDITIONS

| PARAMETER | RATING | UNITS |
|-----------------------------|------------|-------|
| Operating Temperature Range | -40 to +85 | °C |

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------|--|---|----------------------|--------------|-------------|----------------------|
| R | R1 Resistance | | | 2 | | Ω |
| C _{TOT} | Total Channel Capacitance | At 2.5VDC, 1MHz, 30mVAC | 187 | 234 | 281 | pF |
| C ₁ | C1 Capacitance | At 2.5VDC, 1MHz, 30mVAC | 93 | 117 | 140 | pF |
| V _{DIODE} | Diode Standoff Voltage | I _{DIODE} = 10 μ A | | 6.0 | | V |
| I _{LEAK} | Diode Leakage Current | V _{IN} = 3.3V (reverse bias voltage) | | 0.1 | 2 | μ A |
| V _{SIG} | Signal Clamp Voltage Positive Clamp Negative Clamp | I _{LOAD} = 10mA I _{LOAD} = -10mA | 6.4 -9.8 | 7.6 -7.6 | 9.8 -6.4 | V 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 | \pm 30 \pm 30 | | | kV kV |
| R _{DYN} | Dynamic Resistance Positive Negative | | | 0.95 0.90 | | Ω Ω |
| f _c | Cut-off frequency Z _{SOURCE} = 50 Ω , Z _{LOAD} = 50 Ω | R = 2 Ω , C = 117pF | | 21 | | MHz |

Note 1: T_A=25°C unless otherwise specified.

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

Performance Information

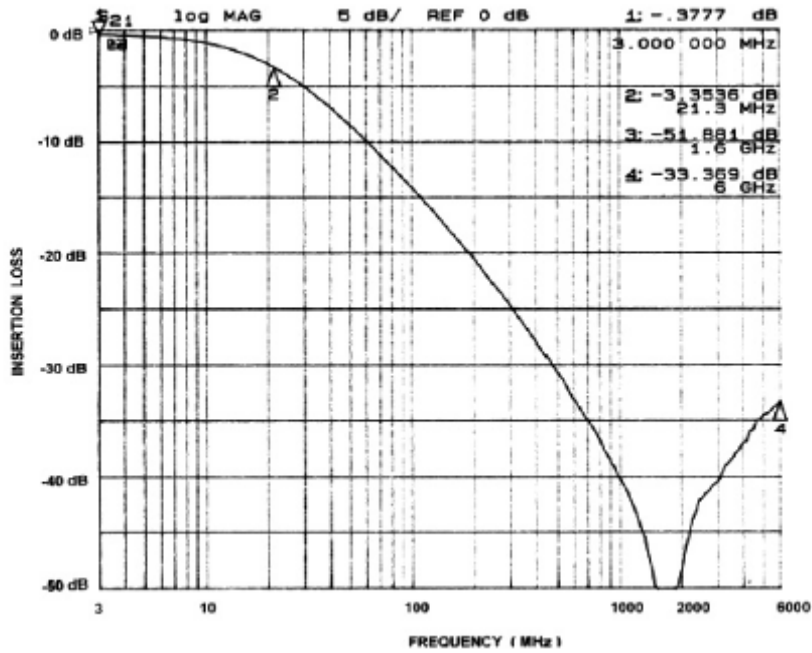


Figure 1. Typical EMI Filter Performance (0VDC, 50 Ohm Environment)

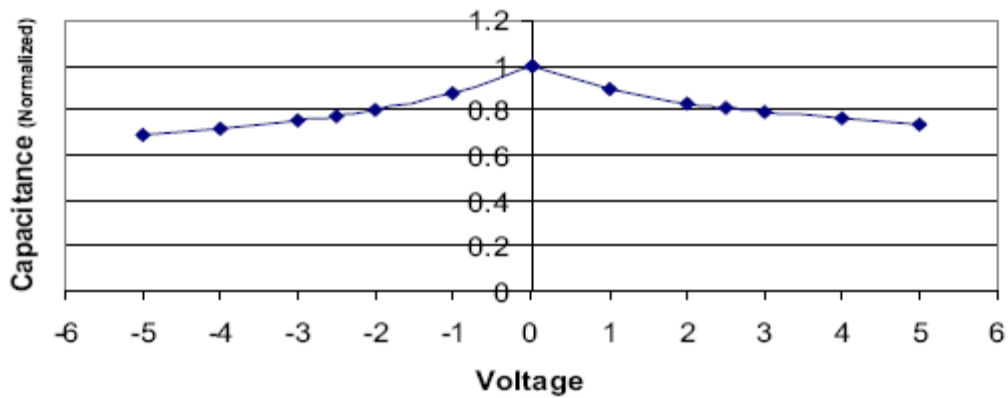


Figure 2. Typical Diode Capacitance VS. Input Voltage (normalized to 2.5VDC)

Application Information

| PARAMETER | VALUE |
|--|------------------------------|
| Pad Size on PCB | 0.240mm |
| Pad Shape | Round |
| Pad Definition | Non-Solder Mask defined pads |
| Solder Mask Opening | 0.290mm Round |
| Solder Stencil Thickness | 0.125mm - 0.150mm |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls) | 0.300mm 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 | $\pm 50\mu\text{m}$ |
| Solder Ball Side Coplanarity | $\pm 20\mu\text{m}$ |
| Maximum Dwell Time Above Liquidous | 60 seconds |
| Maximum Soldering Temperature for Lead-free Devices using a Lead-free Solder Paste | 260°C |

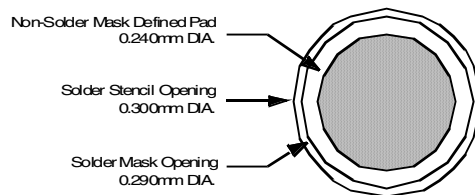


Figure 5. Recommended Non-Solder Mask Defined Pad Illustration

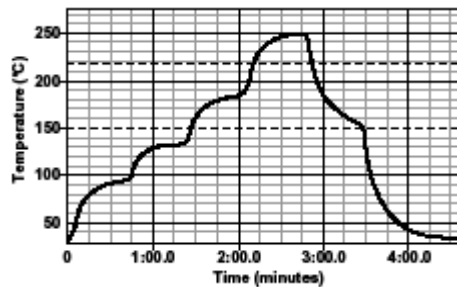


Figure 6. Lead-free (SnAgCu) Solder Ball Reflow Profile

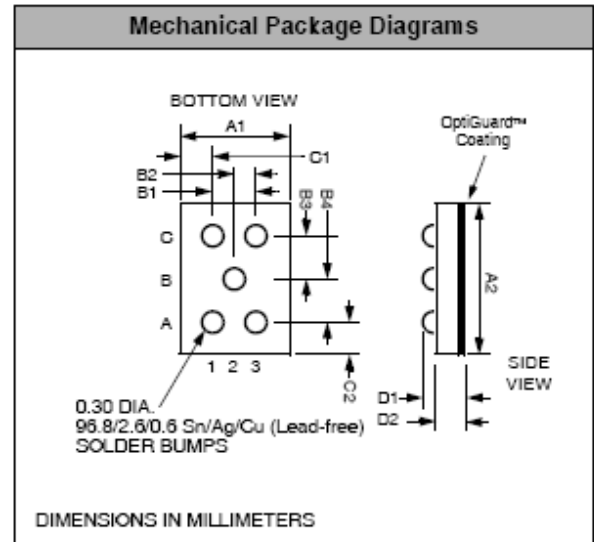
CM1416

Mechanical Details

CSP Mechanical Specifications

The CM1416 is supplied in a custom Chip Scale Package (CSP). Dimensions are presented below.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 5 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 0.955 | 1.000 | 1.045 | 0.0376 | 0.0394 | 0.0411 |
| A2 | 1.325 | 1.370 | 1.415 | 0.0522 | 0.0539 | 0.0557 |
| B1 | 0.495 | 0.500 | 0.505 | 0.0195 | 0.0197 | 0.0199 |
| B2 | 0.245 | 0.250 | 0.255 | 0.0096 | 0.0098 | 0.0100 |
| B3 | 0.430 | 0.435 | 0.440 | 0.0169 | 0.0171 | 0.0173 |
| B4 | 0.430 | 0.435 | 0.440 | 0.0169 | 0.0171 | 0.0173 |
| C1 | 0.200 | 0.250 | 0.300 | 0.0079 | 0.0098 | 0.0118 |
| C2 | 0.200 | 0.250 | 0.300 | 0.0079 | 0.0098 | 0.0118 |
| D1 | 0.575 | 0.644 | 0.714 | 0.0226 | 0.0254 | 0.0281 |
| D2 | 0.368 | 0.419 | 0.470 | 0.0145 | 0.0165 | 0.0185 |
| # per tape and reel | 3500 pieces | | | | | |
| Controlling dimension: millimeters | | | | | | |



**Package Dimensions for
CM1416 Chip Scale Package**

CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm) | POCKET SIZE (mm) $B_0 \times A_0 \times K_0$ | TAPE WIDTH W | REEL DIAMETER | QTY PER REEL | P_0 | P_1 |
|-------------|---------------------|---|-------------------|---------------|--------------|-------|-------|
| CM1416 | 1.33 x 0.96 x 0.644 | 1.42 x 1.07 x 0.74 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |

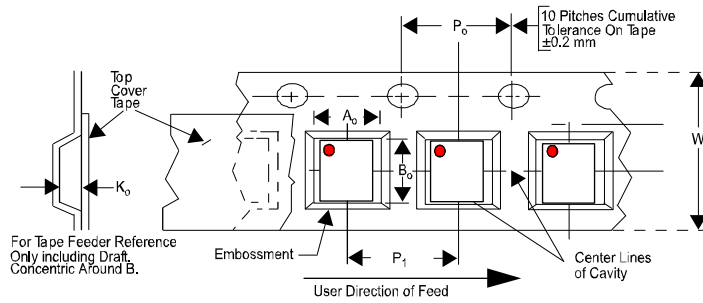



Figure 5. Tape and Reel Mechanical Data

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