

## ESD Protection Arrays, Chip Scale Package

### Features

- Functionally and pin compatible with CAMD's PACDN1404C, PACDN1408C and PACDN1416C family of ESD protection devices
- 4, 8, or 16 transient voltage suppressors in a single package
- Optiguard™ coated for improved reliability at assembly
- In-system Electrostatic Discharge (ESD) protection to  $\pm 25\text{kV}$  contact discharge per IEC 61000-4-2 international standard
- Compact Chip Scale Package (0.65mm pitch) format saves board space and eases layout in space critical applications compared to discrete solutions and traditional wire bonded packages
- Lead-free versions available

### Applications

- ESD protection for sensitive electronic equipment
- I/O port, keypad and button circuitry protection for portable devices
- Wireless Handsets
- Handheld PCs / PDAs
- MP3 Players
- Digital Cameras and Camcorders
- Notebooks
- Desktop PCs

### Product Description

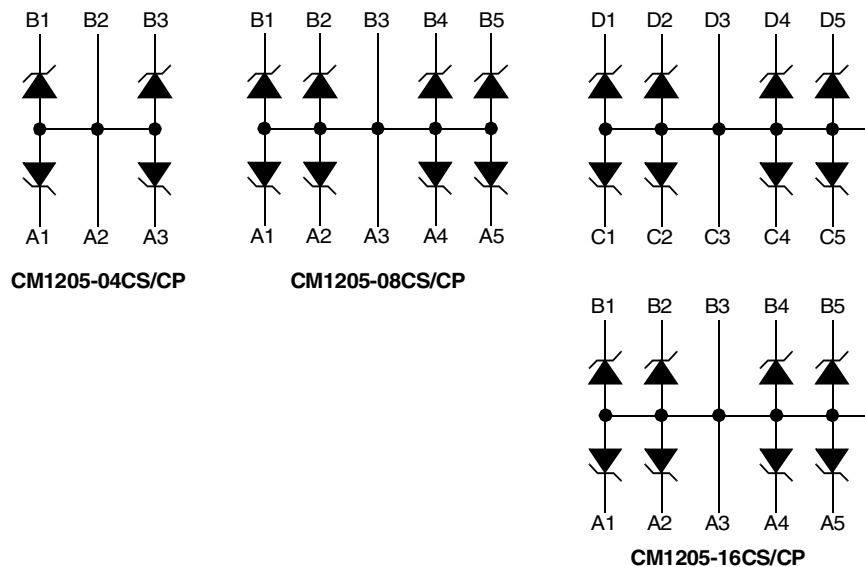
The CM1205 family of transient voltage suppressor arrays provides a very high level of protection for sensitive electronic components that may be subjected to ESD.

These devices are designed and characterized to safely dissipate ESD strikes at levels well beyond the maximum requirements set forth in the IEC 61000-4-2 international standard (Level 4,  $\pm 8\text{kV}$  contact discharge). All I/Os are rated at  $\pm 25\text{kV}$  using the IEC 61000-4-2 contact discharge method. Using the MIL-STD-883D (Method 3015) specification for Human Body Model (HBM) ESD, all pins are protected for contact discharges to greater than  $\pm 30\text{kV}$ .

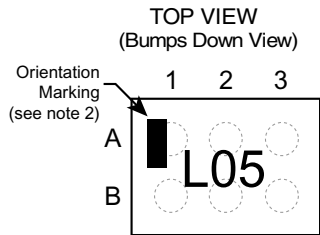
The Chip Scale Package format of these devices enable extremely small footprints that are necessary in portable electronics such as cellular phones, PDAs, internet appliances and PCs. The large solder bumps allow for standard attachment to laminate boards without the use of underfill.

The CM1205 features OptiGuard™ coating for improved reliability at assembly and is available with optional lead-free finishing.

### Electrical Schematic

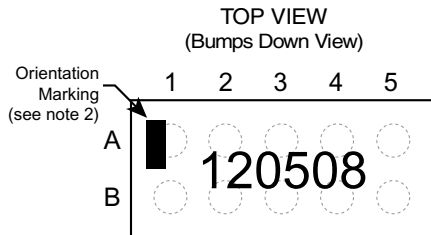
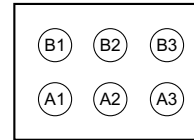


**PACKAGE / PINOUT DIAGRAMS**



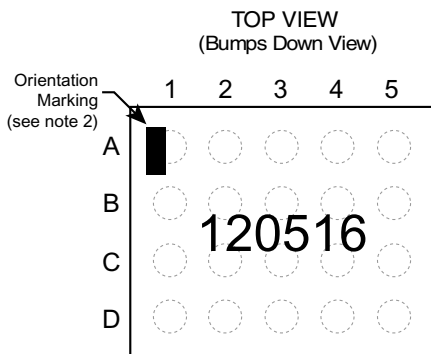
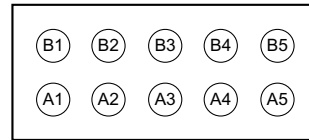
CM1405-04  
CSP Package

BOTTOM VIEW  
(Bumps Up View)



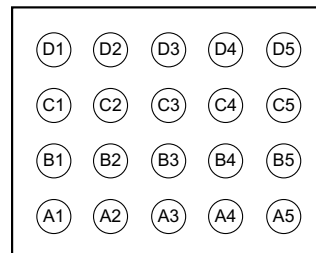
CM1405-08  
CSP Package

BOTTOM VIEW  
(Bumps Up View)



CM1405-16  
CSP Package

BOTTOM VIEW  
(Bumps Up View)



- Notes:  
 1) These drawings are not to scale.  
 2) Lead-free devices are specified by using a "+" character for the top side orientation mark.

**Ordering Information**

**PART NUMBERING INFORMATION**

| Bumps | Package | Standard Finish                   |              | Lead-free Finish <sup>2</sup>     |              |
|-------|---------|-----------------------------------|--------------|-----------------------------------|--------------|
|       |         | Ordering Part Number <sup>1</sup> | Part Marking | Ordering Part Number <sup>1</sup> | Part Marking |
| 6     | CSP     | CM1205-04CS                       | L05          | CM1205-04CP                       | L05          |
| 10    | CSP     | CM1205-08CS                       | 120508       | CM1205-08CP                       | 120508       |
| 20    | CSP     | CM1205-16CS                       | 120516       | CM1205-16CP                       | 120516       |

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

Note 2: Lead-free devices are specified by using a "+" character for the top side orientation mark.



## Specifications

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                 | RATING      | UNITS |
|---------------------------|-------------|-------|
| Storage Temperature Range | -65 to +150 | °C    |

### STANDARD OPERATING CONDITIONS

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

### ELECTRICAL OPERATING CHARACTERISTICS<sup>1</sup>

| SYMBOL            | PARAMETER  | CONDITIONS               | MIN         | TYP         | MAX         | UNITS    |
|-------------------|--|--------------------------|-------------|-------------|-------------|----------|
| V <sub>REV</sub>  | Reverse Standoff Voltage   | I <sub>DIODE</sub> =10μA | 5.5         |             |             | V        |
| I <sub>LEAK</sub> | Leakage Current  | V <sub>IN</sub> =3.3V DC |             |             | 100         | nA       |
| V <sub>SIG</sub>  | Signal Clamp Voltage<br>Positive Clamp<br>Negative Clamp   | I <sub>LOAD</sub> = 10mA | 5.6<br>-1.2 | 6.8<br>-0.8 | 8.0<br>-0.4 | V<br>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 IEC 61000-4-2<br>Level 4 | Notes 2 & 3              | ±30<br>±25  |             |             | kV<br>kV |
| V <sub>CL</sub>   | Clamping Voltage during ESD Discharge<br>MIL-STD-883 (Method 3015), 8kV<br>Positive Transients<br>Negative Transients                    | Notes 2 & 3              |             | +12<br>-8   |             | V<br>V   |
| C                 | Channel Capacitance  | At 2.5V DC, f = 1MHz     |             | 39          | 47          | pF       |

Note 1: T<sub>A</sub>=25°C unless otherwise specified. GND in this document refers to the lower supply voltage.

Note 2: ESD applied to channel pins with respect to GND, one at a time. All other channels are open. All GND pins tied to ground.

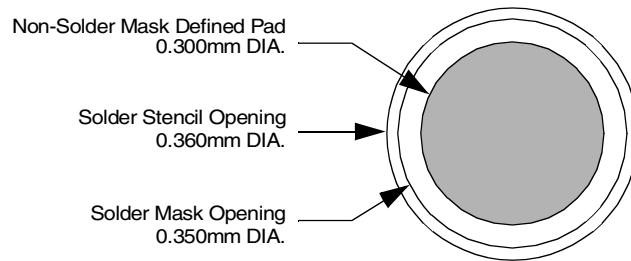
Note 3: These parameters are guaranteed by design and characterization.

## Application Information

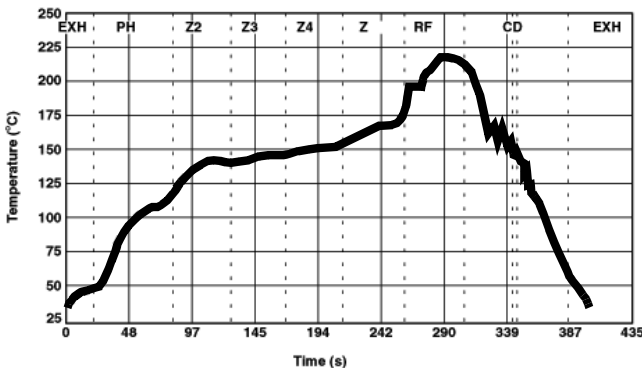
Refer to Application Note AP-217, "The Chip Scale Package", for a detailed description of Chip Scale Packages offered by California Micro Devices.

### PRINTED CIRCUIT BOARD RECOMMENDATIONS

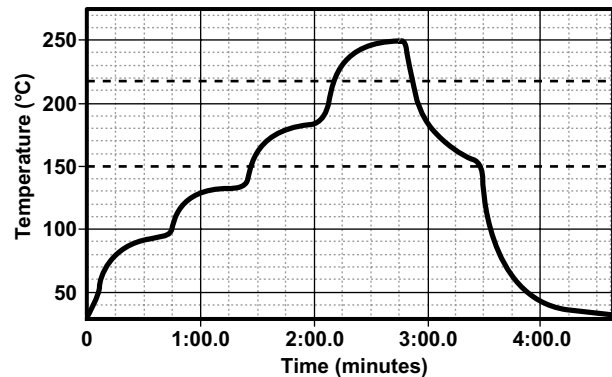
| PARAMETER   | VALUE                        |
|---|------------------------------|
| Pad Size on PCB   | 0.300mm                      |
| Pad Shape   | Round                        |
| Pad Definition  | Non-Solder Mask defined pads |
| Solder Mask Opening   | 0.350mm Round                |
| Solder Stencil Thickness                                      | 0.125 - 0.150mm              |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls) | 0.360mm 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                               | ±50µm                        |
| Solder Ball Side Coplanarity                                  | ±20µm                        |
| Maximum Dwell Time Above Liquidous                            | 60 seconds                   |
| Soldering Maximum Temperature                                 | 260°C                        |



**Figure 1. Recommended Non-Solder Mask Defined Pad Illustration**



**Figure 2. Eutectic (SnPb) Solder Ball Reflow Profile**



**Figure 3. Lead-free (SnAgCu) Solder Ball Reflow Profile**

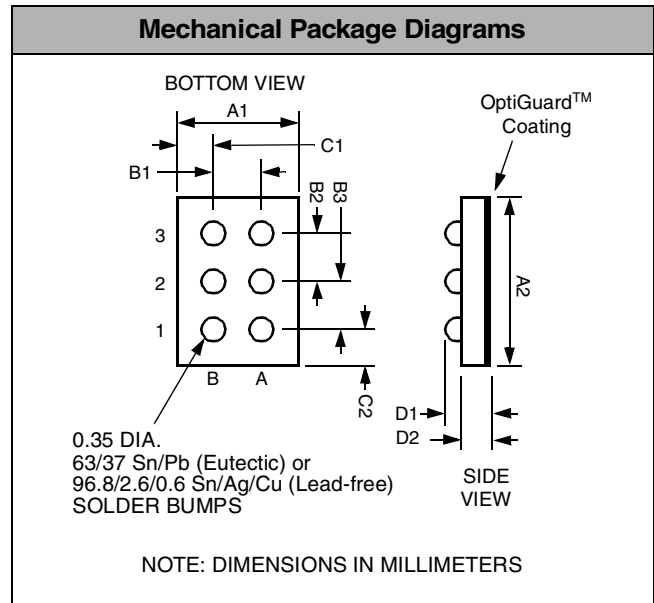
## Mechanical Details

The CM1205 devices are packaged in custom Chip Scale Packages (CSP).

### CM1205-04CS/CP 6-bump CSP Mechanical Specifications

The CM1205-04CS/CP devices are packaged in a 6-bump custom Chip Scale Package (CSP). Dimensions are presented below.

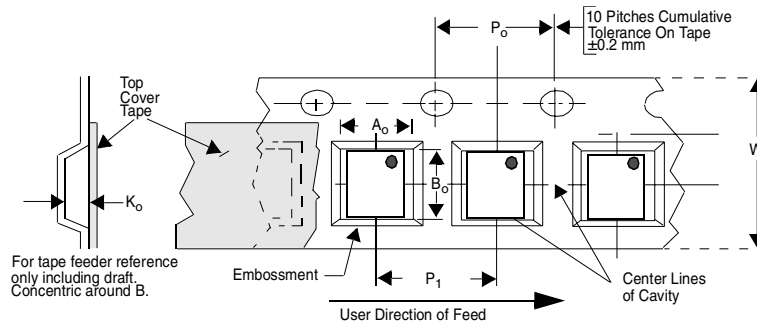
| PACKAGE DIMENSIONS                 |             |       |       |        |        |        |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package                            | Custom CSP  |       |       |        |        |        |
| Bumps                              | 6           |       |       |        |        |        |
| Dim                                | Millimeters |       |       | Inches |        |        |
|                                    | Min         | Nom   | Max   | Min    | Nom    | Max    |
| A1                                 | 1.109       | 1.154 | 1.199 | 0.0437 | 0.0454 | 0.0472 |
| A2                                 | 1.759       | 1.804 | 1.849 | 0.0693 | 0.0710 | 0.0728 |
| B1                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B2                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B3                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| C1                                 | 0.202       | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| C2                                 | 0.202       | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| D1                                 | 0.638       | 0.707 | 0.776 | 0.0251 | 0.0278 | 0.0306 |
| D2                                 | 0.394       | 0.445 | 0.495 | 0.0155 | 0.0175 | 0.0195 |
| # per tape and reel                | 3500 pieces |       |       |        |        |        |
| Controlling dimension: millimeters |             |       |       |        |        |        |



**Package Dimensions for CM1205-04CS/CP  
6-bump Chip Scale Package**

### CSP Tape and Reel Specifications

| PART NUMBER    | CHIP SIZE (mm)        | POCKET SIZE (mm)<br>$B_0 \times A_0 \times K_0$ | TAPE WIDTH<br>W | REEL DIA.  | QTY PER REEL | $P_0$ | $P_1$ |
|----------------|-----------------------|---|-----------------|------------|--------------|-------|-------|
| CM1205-04CS/CP | 1.804 X 1.154 X 0.644 | 1.98 X 1.32 X 0.91                              | 8mm             | 178mm (7") | 3500         | 4mm   | 4mm   |



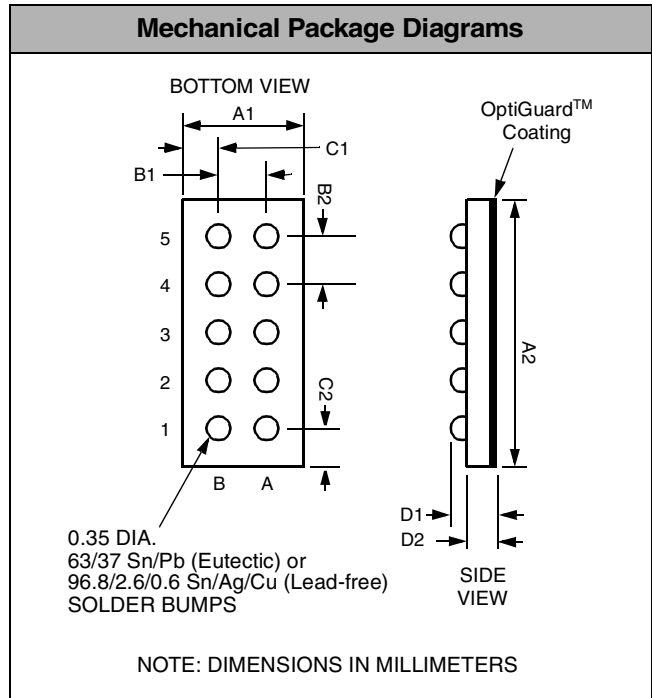
**Figure 4. Tape and Reel Mechanical Data**

**Mechanical Details (cont'd)**

**CM1205-08CS/CP 10-bump CSP Mechanical Specifications**

The CM1205-08CS/CP devices are packaged in a 10-bump custom Chip Scale Package (CSP). Dimensions are presented below.

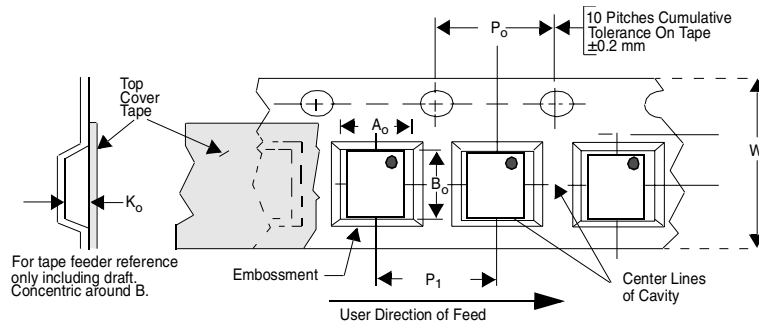
| PACKAGE DIMENSIONS                 |             |       |       |        |        |        |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package                            | Custom CSP  |       |       |        |        |        |
| Bumps                              | 10          |       |       |        |        |        |
| Dim                                | Millimeters |       |       | Inches |        |        |
|                                    | Min         | Nom   | Max   | Min    | Nom    | Max    |
| A1                                 | 1.109       | 1.154 | 1.199 | 0.0437 | 0.0454 | 0.0472 |
| A2                                 | 3.059       | 3.104 | 3.149 | 0.1204 | 0.1222 | 0.1240 |
| B1                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B2                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| C1                                 | 0.202       | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| C2                                 | 0.202       | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| D1                                 | 0.638       | 0.707 | 0.776 | 0.0251 | 0.0278 | 0.0306 |
| D2                                 | 0.394       | 0.445 | 0.495 | 0.0155 | 0.0175 | 0.0195 |
| # per tape and reel                | 3500 pieces |       |       |        |        |        |
| Controlling dimension: millimeters |             |       |       |        |        |        |



**Package Dimensions for CM1205-08CS/CP 10-bump Chip Scale Package**

**CSP Tape and Reel Specifications**

| PART NUMBER    | CHIP SIZE (mm)        | POCKET SIZE (mm)<br>B <sub>0</sub> X A <sub>0</sub> X K <sub>0</sub> | TAPE WIDTH<br>W | REEL<br>DIAMETER | QTY<br>PER<br>REEL | P <sub>0</sub> | P <sub>1</sub> |
|----------------|-----------------------|--|-----------------|------------------|--------------------|----------------|----------------|
| CM1205-08CS/CP | 3.104 X 1.154 X 0.644 | 3.28 X 1.32 X 0.81   | 8mm             | 178mm (7")       | 3500               | 4mm            | 4mm            |



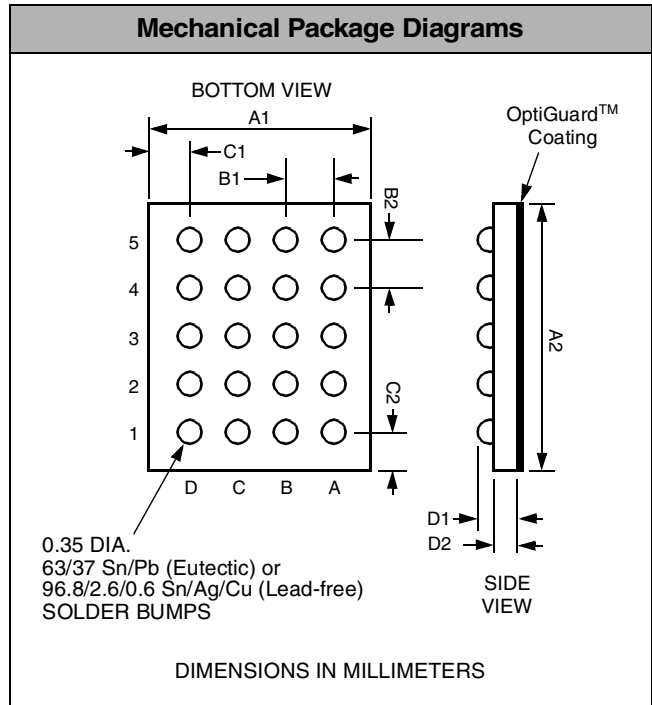
**Figure 5. Tape and Reel Mechanical Data**

## Mechanical Details (cont'd)

### CM1205-16CS/CP 20-bump CSP Mechanical Specifications

The CM1205-16CS/CP devices are packaged in a 20-bump custom Chip Scale Package (CSP). Dimensions are presented below.

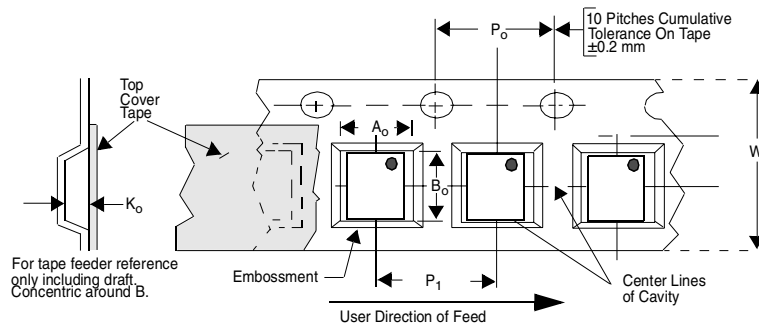
| PACKAGE DIMENSIONS                 |             |       |       |        |        |        |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package                            | Custom CSP  |       |       |        |        |        |
| Bumps                              | 20          |       |       |        |        |        |
| Dim                                | Millimeters |       |       | Inches |        |        |
|                                    | Min         | Nom   | Max   | Min    | Nom    | Max    |
| A1                                 | 2.409       | 2.454 | 2.499 | 0.0948 | 0.0966 | 0.0984 |
| A2                                 | 3.059       | 3.104 | 3.149 | 0.1204 | 0.1222 | 0.1240 |
| B1                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B2                                 | 0.645       | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| C1                                 | 0.202       | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| C2                                 | 0.202       | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| D1                                 | 0.638       | 0.707 | 0.776 | 0.0251 | 0.0278 | 0.0306 |
| D2                                 | 0.394       | 0.445 | 0.495 | 0.0155 | 0.0175 | 0.0195 |
| # per tape and reel                | 3500 pieces |       |       |        |        |        |
| Controlling dimension: millimeters |             |       |       |        |        |        |



**Package Dimensions for CM1205-16CS/CP  
20-bump Chip Scale Package**

### CSP Tape and Reel Specifications

| PART NUMBER    | CHIP SIZE (mm)        | POCKET SIZE (mm)<br>$B_0 \times A_0 \times K_0$ | TAPE WIDTH<br>W | REEL<br>DIAMETER | QTY<br>PER<br>REEL | $P_0$ | $P_1$ |
|----------------|-----------------------|---|-----------------|------------------|--------------------|-------|-------|
| CM1205-16CS/CP | 3.104 X 2.454 X 0.644 | 3.28 X 2.64 X 0.86                              | 8mm             | 178mm (7")       | 3500               | 4mm   | 4mm   |



**Figure 6. Tape and Reel Mechanical Data**