



## 4 Channel EMI Filter Network

### Features

- 4 EMI filter lines per device
- Filters attenuate to  $-30\text{dB}$  at 3GHz
- CSP package minimizes cross-talk
- 9-bump 2.485mm X 0.985mm Chip Scale Package (CSP), 0.5mm pitch
- 0.30mm Eutectic solder bumps
- Ultra small foot print suitable for portable devices
- Silicon substrate
- Lead-free version available

### Applications

- EMI filtering for RF sections of wireless devices
- Cellular phones
- Cordless phones
- Internet appliances
- PDAs
- Laptop computers

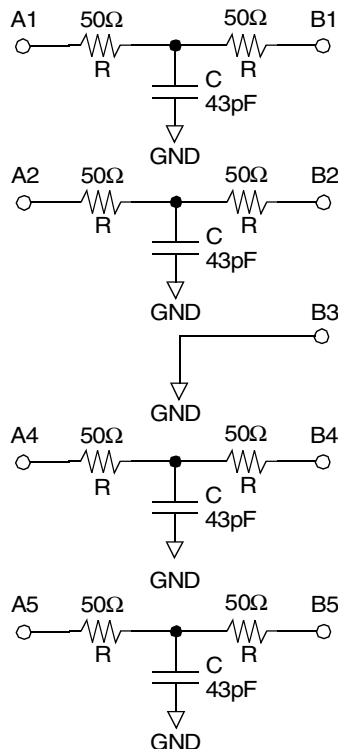
### Product Description

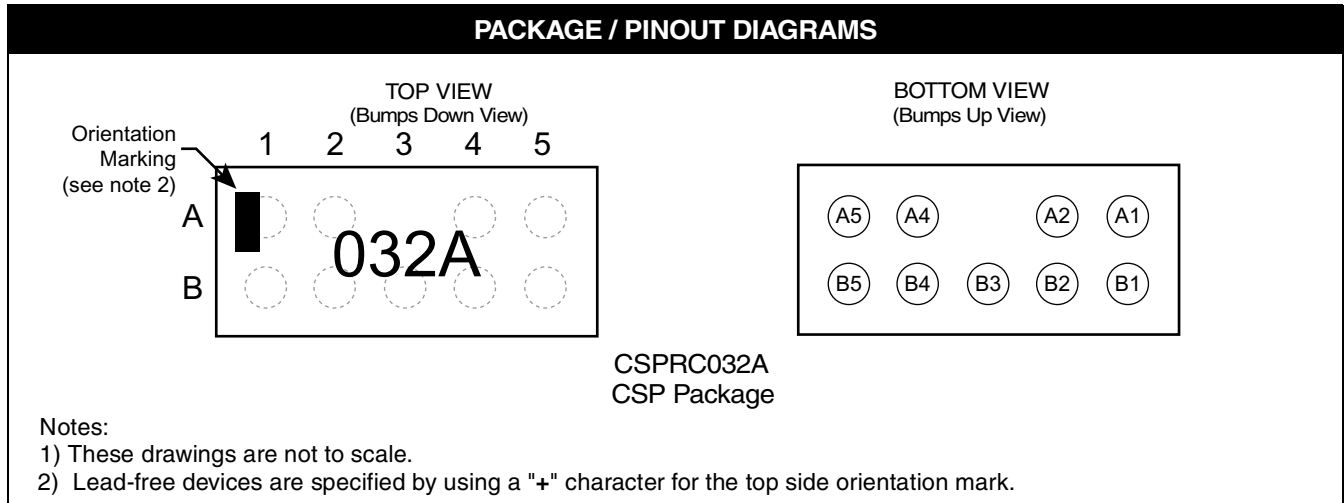
The CSPRC032A is a 4-channel low pass EMI filter (R-C-R configuration) in a Chip Scale Package (CSP). Many portable applications require the attenuation of signals in the 800-3000 MHz band. California Micro Devices' unique thin film technology provides a minimum of  $-25\text{dB}$  of attenuation over this frequency band.

The bump size and pitch of these filters are selected such that the device can be placed directly on a FR4 printed circuit board using conventional assembly techniques. The pin-out for the device features a signal 'flow through' design, allowing optimal signal routing. The solder bump contacts are a 63/37 Sn/Pb alloy (Sn/Ag/Cu for lead-free finish) and are 0.30 mm in diameter.

The CSPRC032A is available in a space-saving, low-profile Chip Scale Package with optional lead-free finishing.

### Electrical Schematic





## 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 |
| 9                          | CSP     | CSPRC032A                         | 032A         | CSPRC032AG                        | 032A         |

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 | -55 to +150 | °C    |
| Power Rating per Resistor | 25          | mW    |

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



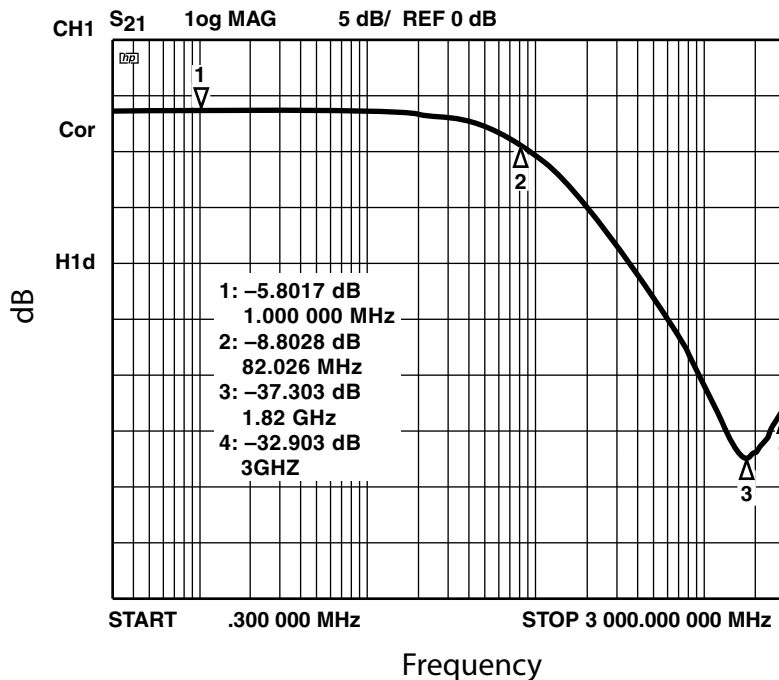
| ELECTRICAL OPERATING CHARACTERISTICS <sup>1</sup> |  |                         |     |          |           |                  |
|---|--|-------------------------|-----|----------|-----------|------------------|
| SYMBOL  | PARAMETER  | CONDITIONS              | MIN | TYP      | MAX       | UNITS            |
| $I_{LEAK}$  | Leakage Current, An or Bn to GND   | $V_{IN}=6.0V$           |     |          | 1         | $\mu A$          |
| R   | Resistance   |                         | 45  | 50       | 55        | $\Omega$         |
| C   | Capacitance  |                         | 34  | 43       | 52        | pF               |
| $TOL_R$   | Resistor Absolute Tolerance  | $R = 50\Omega$          |     |          | $\pm 10$  | %                |
| $TOL_C$   | Capacitor Absolute Tolerance   | $C=43pF$                |     |          | $\pm 20$  | %                |
| TCR   | Temperature Coefficient of Resistance  |                         |     |          | $\pm 150$ | ppm/ $^{\circ}C$ |
| TCC   | Temperature Coefficient of Capacitance   |                         |     |          | $\pm 500$ | ppm/ $^{\circ}C$ |
| $F_C$   | Filter Cutoff Frequency<br>$Z_{SOURCE}=0\Omega$ $Z_{LOAD}=\infty$<br>$Z_{SOURCE}=50\Omega$ $Z_{LOAD}=50\Omega$ | $R=50\Omega$ $C=43pF$ ; |     | 74<br>82 |           | MHz<br>MHz       |

Note 1: Electrical Operating Characteristics are guaranteed over the Operating Temperature Range unless otherwise specified.

## Filter Performance

### CSPRC032 Filter Typical Measured Frequency Response (S21) Measurement

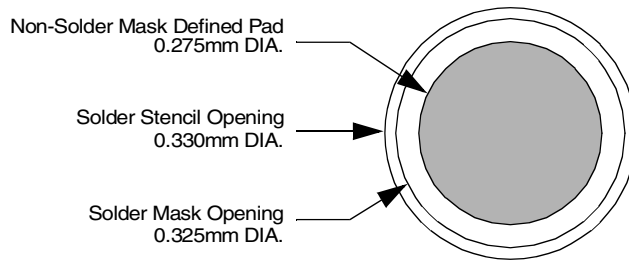
The measurement is done with 50 $\Omega$ -source and 50 $\Omega$ -load impedance using a HP8753C Network Analyzer with a HP85047A S-parameter Test Set.



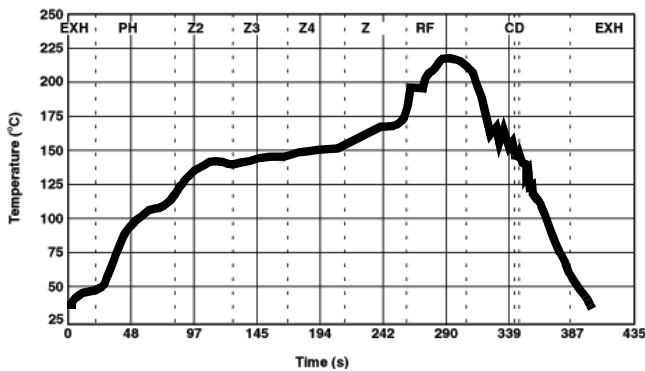
**Application Information**

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

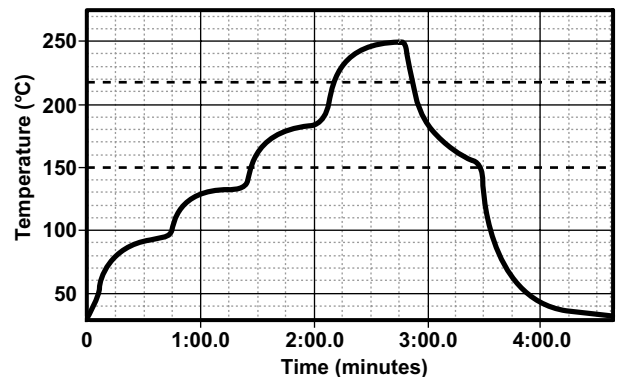
| <b>PRINTED CIRCUIT BOARD RECOMMENDATIONS</b>                  |                              |
|---|------------------------------|
| <b>PARAMETER</b>  | <b>VALUE</b>                 |
| Pad Size on PCB   | 0.275mm                      |
| Pad Shape   | Round                        |
| Pad Definition  | Non-Solder Mask defined pads |
| Solder Mask Opening   | 0.325mm Round                |
| Solder Stencil Thickness                                      | 0.125 - 0.150mm              |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls) | 0.330mm 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**

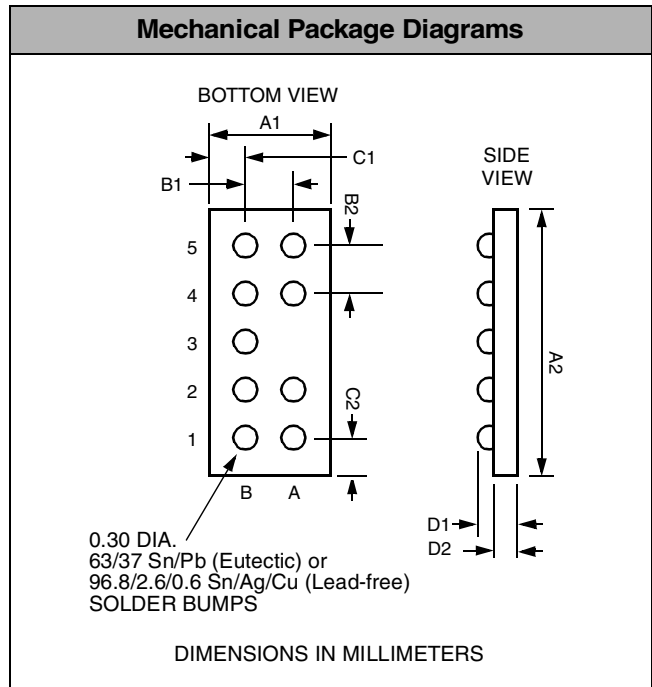
**Mechanical Details**

The CSPRC032A devices are packaged in custom Chip Scale Packages (CSP).

**CSPRC032A 9-bump CSP Mechanical Specifications**

The CSPRC032A devices are packaged in a 9-bump custom Chip Scale Package (CSP). Dimensions are presented below.

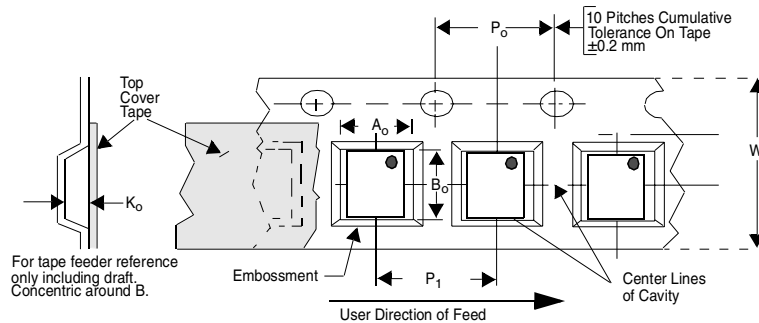
| PACKAGE DIMENSIONS                 |             |        |        |        |        |        |
|------------------------------------|-------------|--------|--------|--------|--------|--------|
| Package                            | Custom CSP  |        |        |        |        |        |
| Bumps                              | 9           |        |        |        |        |        |
| Dim                                | Millimeters |        |        | Inches |        |        |
|                                    | Min         | Nom    | Max    | Min    | Nom    | Max    |
| A1                                 | 0.940       | 0.985  | 1.030  | 0.0370 | 0.0388 | 0.0406 |
| A2                                 | 2.440       | 2.485  | 2.530  | 0.0961 | 0.0978 | 0.0996 |
| B1                                 | 0.495       | 0.500  | 0.505  | 0.0195 | 0.0197 | 0.0199 |
| B2                                 | 0.495       | 0.500  | 0.505  | 0.0195 | 0.0197 | 0.0199 |
| C1                                 | 0.1925      | 0.2425 | 0.2925 | 0.0076 | 0.0095 | 0.0115 |
| C2                                 | 0.1925      | 0.2425 | 0.2925 | 0.0076 | 0.0095 | 0.0115 |
| D1                                 | 0.562       | 0.606  | 0.650  | 0.0221 | 0.0239 | 0.0256 |
| D2                                 | 0.356       | 0.381  | 0.406  | 0.0140 | 0.0150 | 0.0160 |
| # per tape and reel                | 3500 pieces |        |        |        |        |        |
| Controlling dimension: millimeters |             |        |        |        |        |        |



**Package Dimensions for CSPRC032A 9-bump Chip Scale Package**

**CSP Tape and Reel Specifications**

| PART NUMBER | PKG. SIZE (mm)        | POCKET SIZE (mm)<br>$B_0 \times A_0 \times K_0$ | TAPE WIDTH<br>W | REEL DIA.  | QTY PER REEL | $P_0$ | $P_1$ |
|-------------|-----------------------|---|-----------------|------------|--------------|-------|-------|
| CSPRC032A   | 2.485 X 0.985 X 0.606 | 2.62 X 1.12 X 0.762                             | 8mm             | 178mm (7") | 3500         | 4mm   | 4mm   |



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