



## ESD Protection Arrays, Chip Scale Package

### Features

- 4, 8, or 16 transient voltage suppressors in a single package
- In-system Electrostatic Discharge (ESD) protection to  $\pm 18\text{kV}$  contact discharge per IEC 61000-4-2 international standard
- Supports AC signal applications
- 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

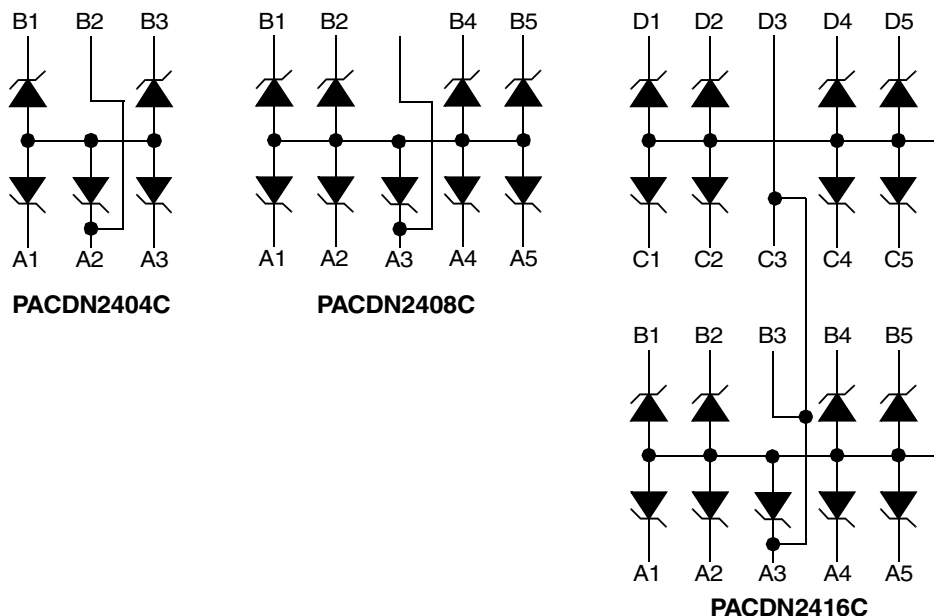
### Product Description

The PACDN2404C, PACDN2408C and PACDN2416C are transient voltage suppressor arrays that provide a very high level of protection for sensitive electronic components that may be subjected to ESD. The back-to-back Zener connections provide ESD protection in cases where nodes with AC signals are present.

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  $\pm 18\text{kV}$  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  $\pm 30\text{kV}$ .

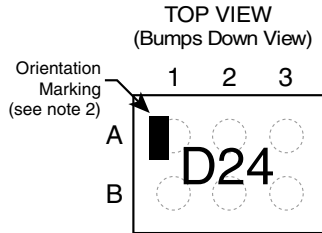
The Chip Scale Package format of these devices enable extremely small footprints that are necessary in portable electronics such as cellular phones, PDAs, internet appliances and PCs. The large solder bumps allow for standard attachment to laminate boards without the use of underfill. The PACDN2404C, PACDN2408C and PACDN2416C are available with optional lead-free finishing.

### Electrical Schematic

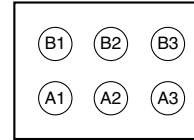




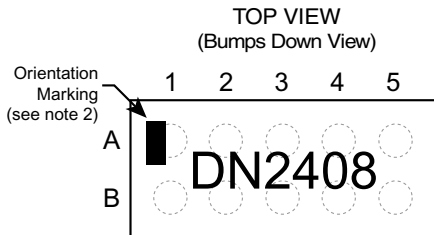
**PACKAGE / PINOUT DIAGRAMS**



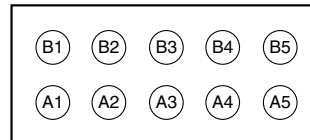
BOTTOM VIEW  
(Bumps Up View)



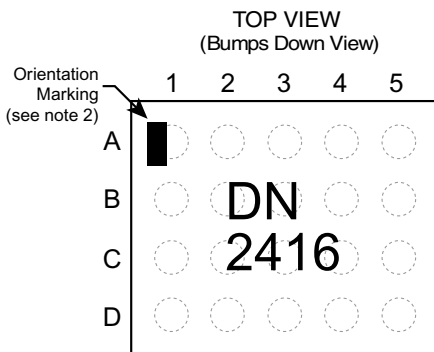
PACDN2404C  
CSP Package



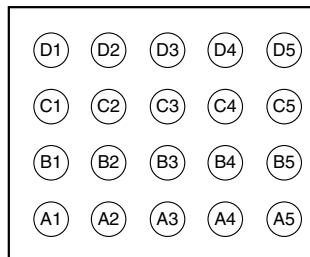
BOTTOM VIEW  
(Bumps Up View)



PACDN2408C  
CSP Package



BOTTOM VIEW  
(Bumps Up View)



PACDN2416C  
CSP Package

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	PACDN2404C	D24	PACDN2404CG	D24
10	CSP	PACDN2408C	DN2408	PACDN2408CG	DN2408
20	CSP	PACDN2416C	DN2416	PACDN2416CG	DN2416

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	5.9			V
I <sub>LEAK</sub>	Leakage Current	V <sub>IN</sub> =3.3V DC			100	nA
V <sub>SIG</sub>	Signal Clamp Voltage Positive Clamp Negative Clamp	I <sub>LOAD</sub> = 10mA	6.0 -9.2	7.6 -7.6	9.2 -6.0	V V
V <sub>ESD</sub>	In-system ESD Withstand Voltage a) Human Body Model, MIL-STD-883, Method 3015 b) Contact Discharge per IEC 61000-4-2 Level 4	Notes 2 & 3	±30 ±18			kV kV
V <sub>CL</sub>	Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8kV Positive Transients Negative Transients	Notes 2 & 3		+14 -14		V 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

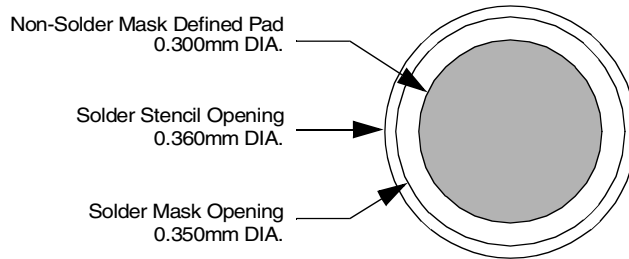


Figure 1. Recommended Non-Solder Mask Defined Pad Illustration

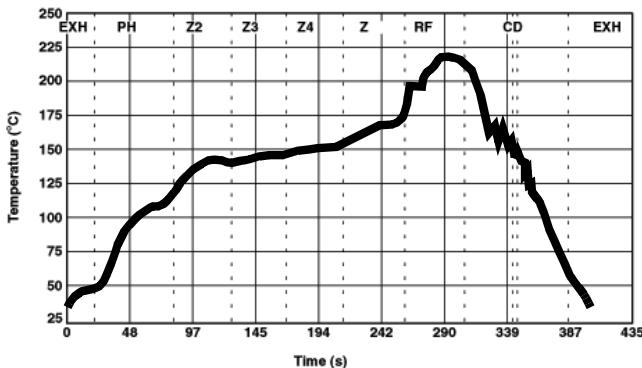


Figure 2. Eutectic (SnPb) Solder Ball Reflow Profile

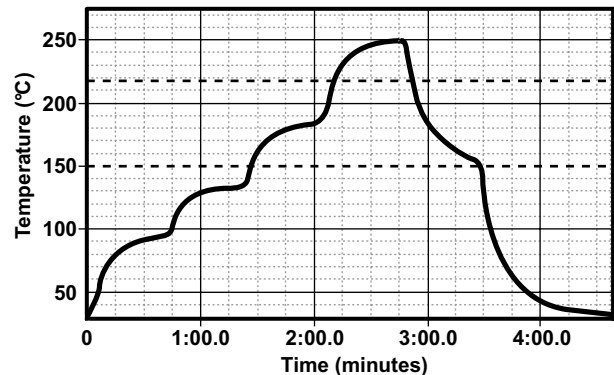


Figure 3. Lead-free (SnAgCu) Solder Ball Reflow Profile



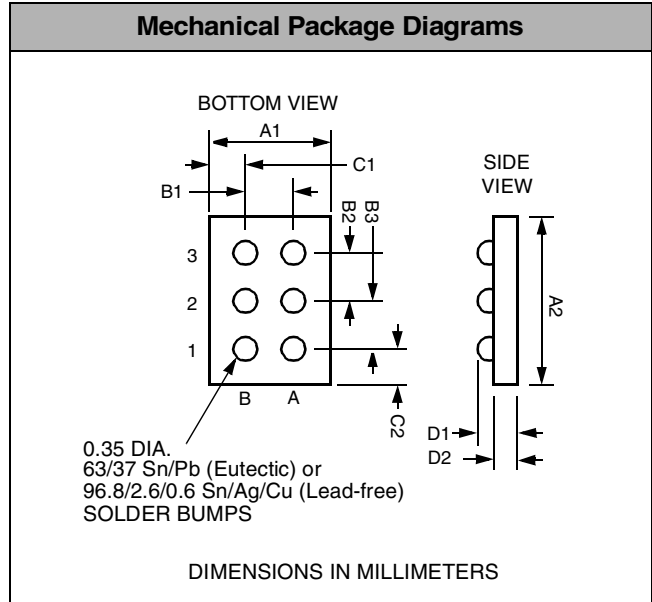
### Mechanical Details

The PACDN2404C/2408C/2416C devices are packaged in custom Chip Scale Packages (CSP).

#### PACDN2404C 6-bump CSP Mechanical Specifications

The PACDN2404C 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	0.600	0.644	0.687	0.0236	0.0253	0.0271
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 PACDN2404C 6-bump Chip Scale Package

### CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B <sub>0</sub> X A <sub>0</sub> X K <sub>0</sub>	TAPE WIDTH W	REEL DIA.	QTY PER REEL	P <sub>0</sub>	P <sub>1</sub>
PACDN2404C	1.804 X 1.154 X 0.644	1.98 X 1.32 X 0.91	8mm	178mm (7")	3500	4mm	4mm

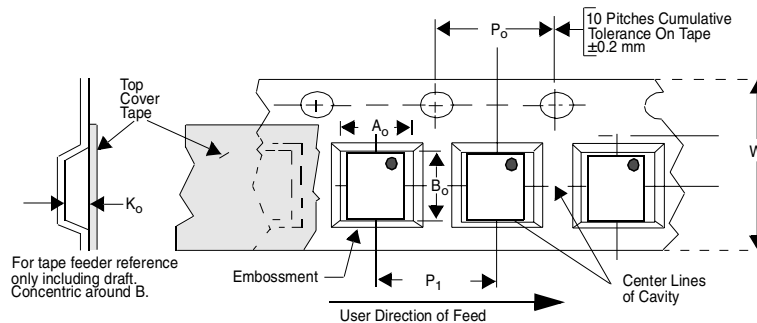


Figure 4. Tape and Reel Mechanical Data

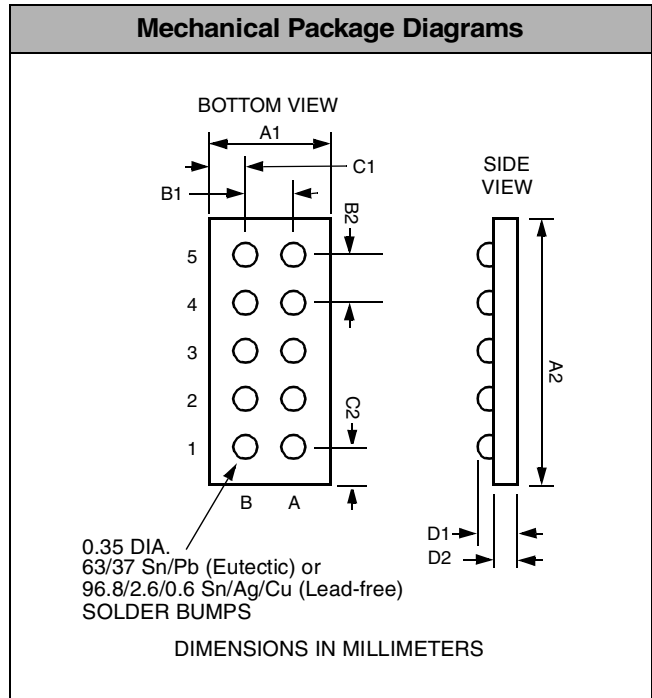


Mechanical Details (cont'd)

PACDN2408C 10-bump CSP Mechanical Specifications

The PACDN2408C devices are packaged in a 6-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	0.600	0.644	0.687	0.0236	0.0253	0.0271
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 PACDN2408C 10-bump Chip Scale Package

CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B <sub>0</sub> X A <sub>0</sub> X K <sub>0</sub>	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P <sub>0</sub>	P <sub>1</sub>
PACDN2408C	3.104 X 1.154 X 0.644	3.28 X 1.32 X 0.81	8mm	178mm (7")	3500	4mm	4mm

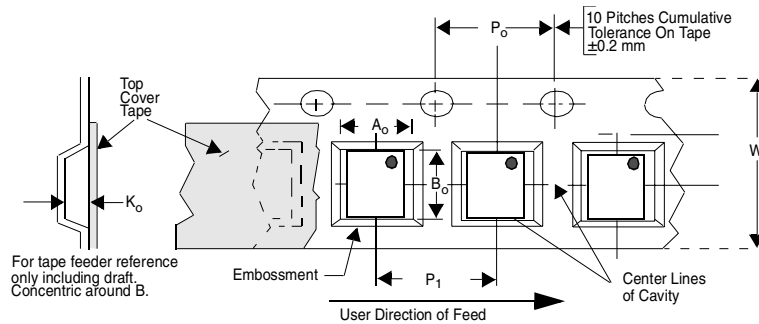


Figure 5. Tape and Reel Mechanical Data

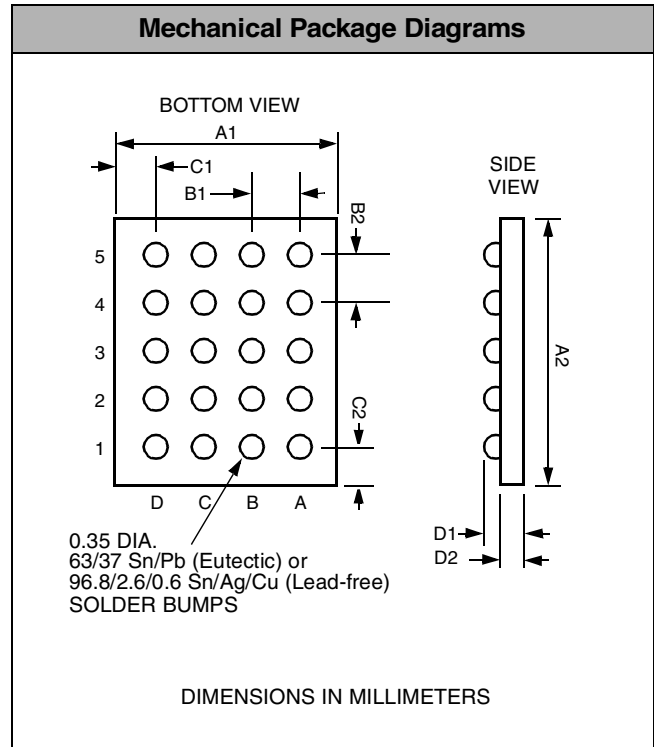


Mechanical Details (cont'd)

PACDN2416C 20-bump CSP Mechanical Specifications

The PACDN2416C 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	0.600	0.644	0.687	0.0236	0.0253	0.0271
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 PACDN2416C 20-bump Chip Scale Package

CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B <sub>0</sub> X A <sub>0</sub> X K <sub>0</sub>	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P <sub>0</sub>	P <sub>1</sub>
PACDN2416C	3.104 X 2.454 X 0.644	3.28 X 2.64 X 0.86	8mm	178mm (7")	3500	4mm	4mm

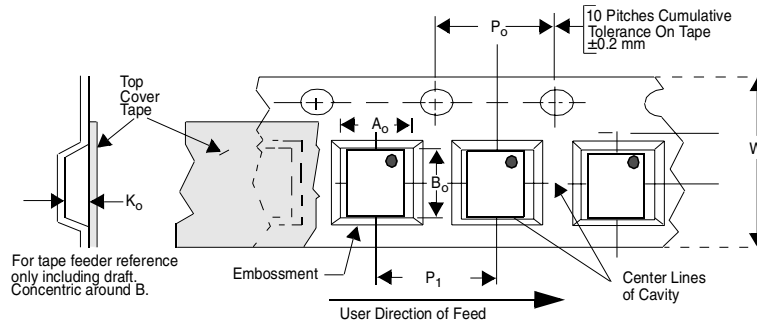


Figure 6. Tape and Reel Mechanical Data