

## Low Capacitance Transient Voltage Suppressors / ESD Protectors

### Features

- Low I/O capacitance at 7pF typical
- In-system ESD protection to  $\pm 15\text{kV}$  contact discharge, per the IEC 61000-4-2 international standard
- Two, three, four or five channels of ESD protection
- Compact SMT package saves board space and facilitates layout in space-critical applications
- Each I/O pin can withstand over 1000 ESD strikes
- Lead-free versions available

### Applications

- High-speed consumer electronic ports
- ESD protection of PC ports, including USB ports, serial ports, parallel ports, IEEE1394 ports, docking ports, proprietary ports, etc.
- Protection of interface ports or IC pins which are exposed to high ESD levels

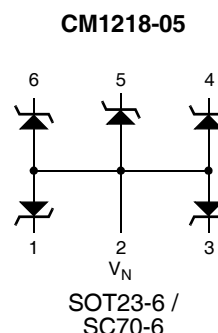
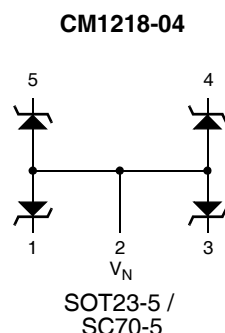
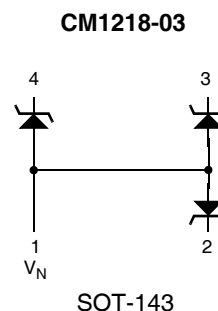
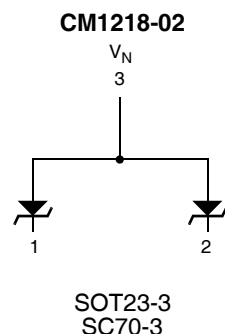
### Product Description

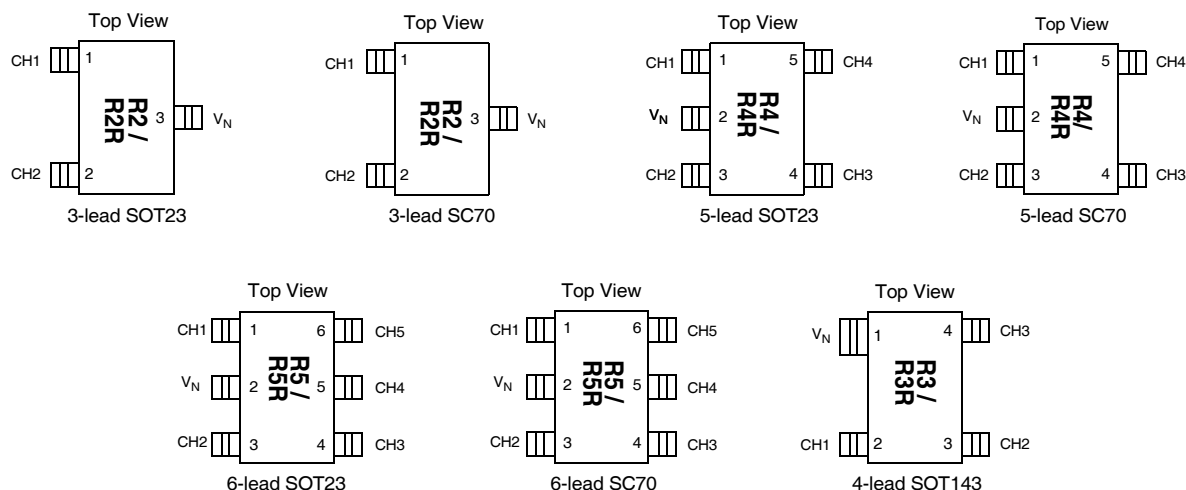
The CM1218 family of devices features transient voltage suppressor arrays that provide a very high level of protection for sensitive electronic components which may be subjected to electrostatic discharge (ESD).

All pins of the CM1218 are rated to withstand  $\pm 15\text{kV}$  ESD pulses 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 from contact discharges of greater than  $\pm 30\text{kV}$ .

The CM1218 is supplied in a number of compact, surface mount packages depending on the channel configuration desired. All versions of this device are available with optional lead-free finishing.

### Electrical Schematics



**PACKAGE / PINOUT DIAGRAMS**


Note: SOT23, SC70 and SOT143 and packages may differ in size. These drawings are not to scale.

**PIN DESCRIPTIONS**

LEADS	NAME	DESCRIPTION
(Refer to package / pinout diagrams)	CHx	The cathode of the respective TVS diode, which should be connected to the node requiring transient voltage protection.
(Refer to package / pinout diagrams)	V <sub>N</sub>	The anode of the TVS diodes.

**Ordering Information**
**PART NUMBERING INFORMATION**

Leads	Package	Standard Finish		Lead-free Finish	
		Ordering Part Number <sup>1</sup>	Part Marking	Ordering Part Number <sup>1</sup>	Part Marking
3	SOT23-3	CM1218-02ST	R2	CM1218-02SO	R2R
3	SC70-3	CM1218-02SC	R2	CM1218-02S7	R2R
4	SOT143	CM1218-03SS	R3	CM1218-03SR	R3R
5	SOT23-5	CM1218-04ST	R4	CM1218-04SO	R4R
5	SC70-5	CM1218-04SC	R4	CM1218-04S7	R4R
6	SOT23-6	CM1218-05ST	R5	CM1218-05SO	R5R
6	SC70-6	CM1218-05SC	R5	CM1218-05S7	R5R

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
Package Power Dissipation SC70 SOT23-3, SOT23-5, SOT23-6, SOT143	0.2 0.225	W W

### STANDARD OPERATING CONDITIONS

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

### ELECTRICAL OPERATING CHARACTERISTICS (NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$C_{IN}$	Channel Input Capacitance	$T_A = 25^{\circ}\text{C}$ , 2.5VDC, 1MHz; Note 2		7		pF
$\Delta C_{IN}$	Differential Channel I/O to GND Capacitance	$T_A = 25^{\circ}\text{C}$ , 2.5VDC, 1MHz; Note 2		0.19		pF
$V_{RSO}$	Reverse Stand-off Voltage	$I_R = 10\mu\text{A}$ , $T_A = 25^{\circ}\text{C}$	5.5			V
		$I_R = 1\text{mA}$ , $T_A = 25^{\circ}\text{C}$	6.1			V
$I_{LEAK}$	Leakage Current	$V_{IN} = 5.0\text{VDC}$ , $T_A = 25^{\circ}\text{C}$			1	$\mu\text{A}$
$V_{SIG}$	Small Signal Clamp Voltage Positive Clamp Negative Clamp	$I = 10\text{mA}$ , $T_A = 25^{\circ}\text{C}$		6.8		V
		$I = -10\text{mA}$ , $T_A = 25^{\circ}\text{C}$		-0.8		V
$V_{ESD}$	ESD Withstand Voltage Contact Discharge per IEC 61000-4-2 standard Human Body Model, MIL-STD-883, Method 3015	Notes 2, 4 & 5; $T_A = 25^{\circ}\text{C}$	$\pm 15$			kV
		Notes 2, 3 & 5; $T_A = 25^{\circ}\text{C}$	$\pm 30$			kV
$R_D$	Diode Dynamic Resistance Forward Conduction Reverse Conduction	$T_A = 25^{\circ}\text{C}$ ; Notes 2 & 3		1.1		$\Omega$
				2.7		$\Omega$

Note 1: All parameters specified at  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  unless otherwise noted.

Note 2: These parameters guaranteed by design and characterization.

Note 3: Human Body Model per MIL-STD-883, Method 3015,  $C_{\text{Discharge}} = 100\text{pF}$ ,  $R_{\text{Discharge}} = 1.5\text{K}\Omega$ ,  $V_N$  grounded.

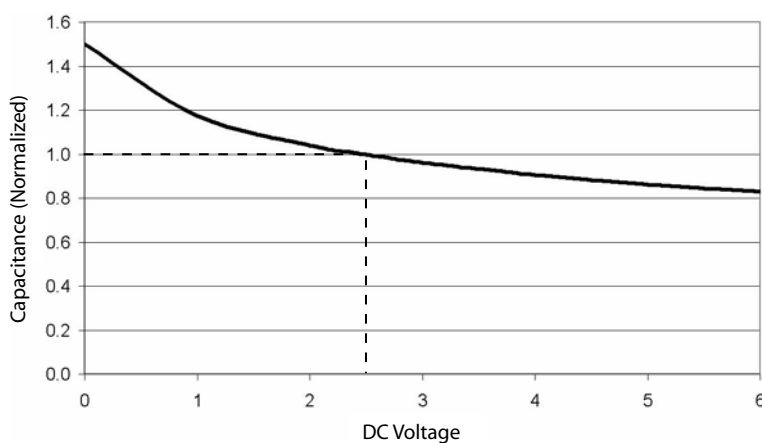
Note 4: Standard IEC 61000-4-2 with  $C_{\text{Discharge}} = 150\text{pF}$ ,  $R_{\text{Discharge}} = 330\Omega$ ,  $V_N$  grounded.

Note 5: These measurements performed with no external capacitor on  $\text{CH}_X$ .

## Performance Information

### Diode Capacitance

Typical diode capacitance with respect to positive TVS cathode voltage (reverse voltage across the diode) is given in Figure 1.



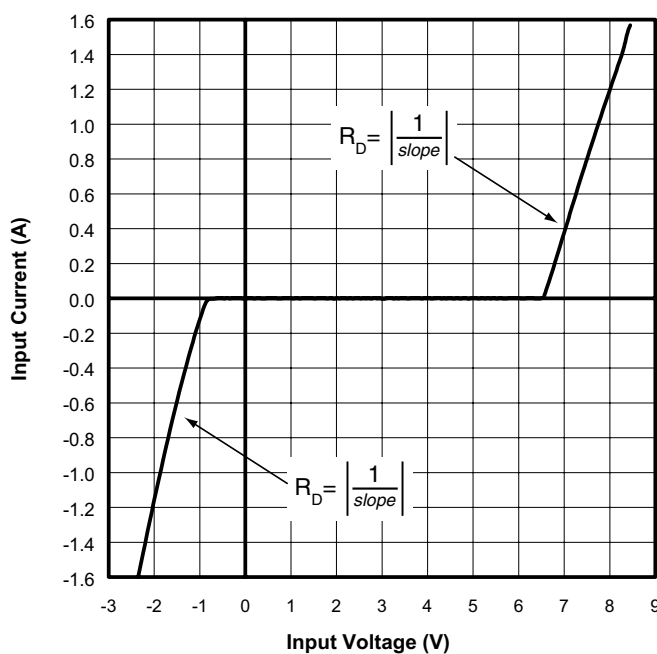
**Figure 1. Diode Capacitance vs. Reverse Voltage**

### Typical High Current Diode Characteristics

Measurements are made in pulsed mode with a nominal pulse width of 0.7ms.

#### Typical Input VI Characteristics

(Pulse-mode measurements, pulse width = 0.7ms nominal)



## Mechanical Details

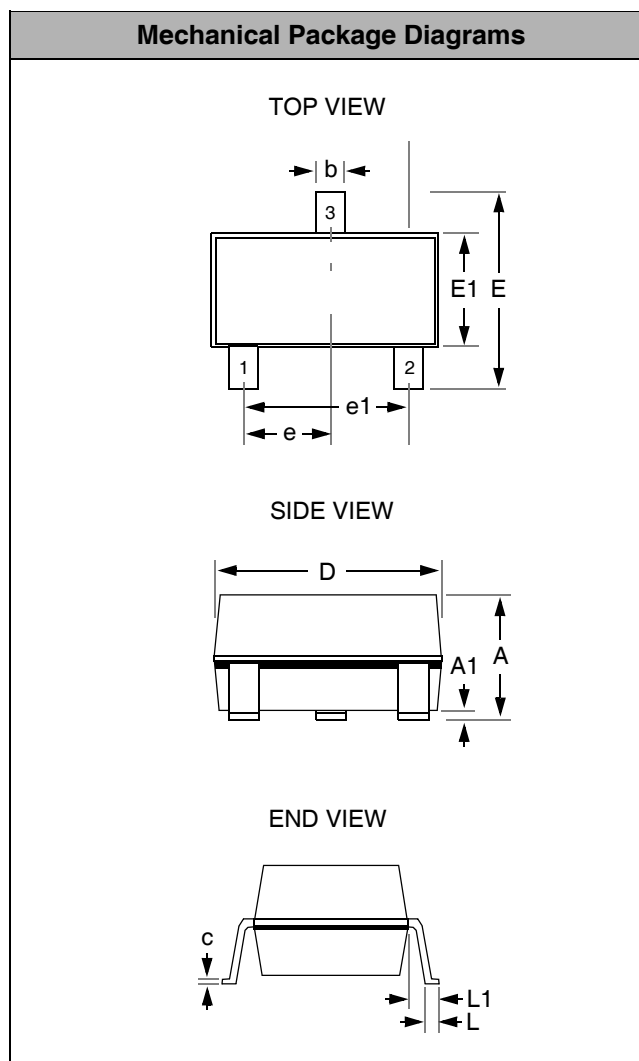
CM1218 devices are supplied in the following packages: SOT23-3, SOT143, SOT23-5, SOT23-6, SC70-3, SC70-5, and SC70-6.

### SOT23-3 Mechanical Specifications

Dimensions for CM1218-02ST/SO devices supplied in 3-pin SOT23 packages are presented below.

For complete information on the SOT23-3, see the California Micro Devices SOT23 Package Information document.

PACKAGE DIMENSIONS				
Package	SOT23-3 (JEDEC name is TO-236)			
Pins	3			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	0.89	1.12	0.0350	0.0441
A1	0.01	0.10	0.0004	0.0039
b	0.30	0.50	0.0118	0.0197
c	0.08	0.20	0.0031	0.0079
D	2.80	3.04	0.1102	0.1197
E	2.10	2.64	0.0827	0.1039
E1	1.20	1.40	0.0472	0.0551
e	0.95 BSC		0.0374 BSC	
e1	1.90 BSC		0.0748 BSC	
L	0.40	0.60	0.0157	0.0236
L1	0.54 REF		0.0213 REF	
# per tape and reel	3000 pieces			
Controlling dimension: millimeters				



**Package Dimensions for SOT23-3.**

## Mechanical Details (continued)

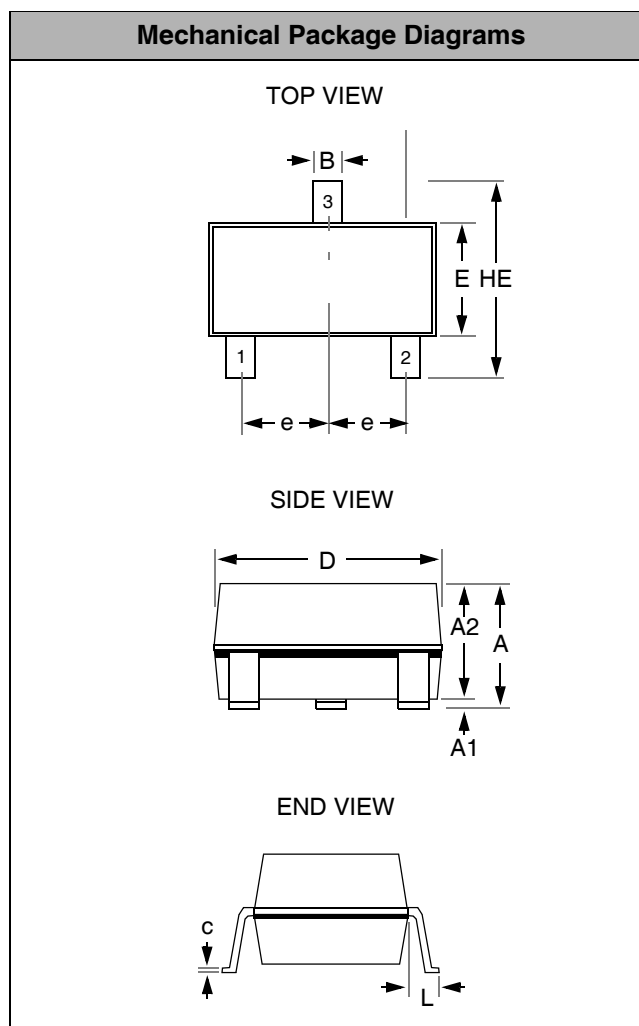
### SC70-3 Mechanical Specifications:

Dimensions for CM1218-02SC/S7 device supplied in 3-pin SC70 packages are presented below.

For complete information on the SC70-3, see the California Micro Devices SC70 Package Information document.

PACKAGE DIMENSIONS		
Package	SC70 (JEDEC name is MO-203 Issue A)	
Pins	3	
Dimensions	Millimeters	
	Min	Max
A	0.80	1.10
A1	0.00	0.10
A2	0.70	1.00
B	0.15	0.30
c	0.08	0.25
D	1.85	2.25
E	1.15	1.35
e	0.65 BSC	
HE	2.00	2.40
L	0.26	0.46
# / tube	1000 pieces*	
# per tape and reel	3000 pieces*	

\* This is an approximate amount which may vary.



**Package Dimensions for SC70-3.**

## Mechanical Details (continued)

### SOT143 Mechanical Specifications

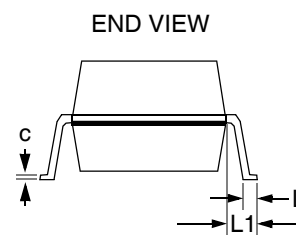
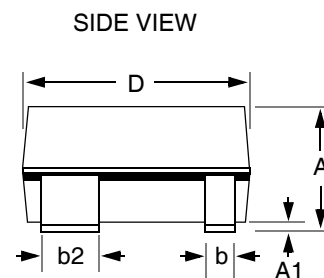
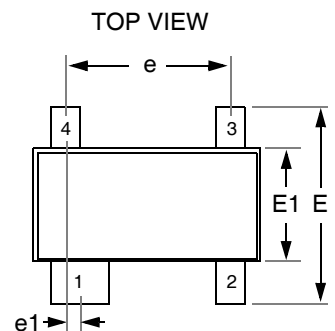
Dimensions for CM1218-03SS/SR devices supplied in 4-pin SOT143 packages are presented below.

For complete information on the SOT143, see the California Micro Devices SOT143 Package Information document.

PACKAGE DIMENSIONS				
Package	SOT143			
Pins	4			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	0.80	1.22	0.031	0.048
A1	0.05	0.15	0.002	0.006
b	0.30	0.50	0.012	0.019
b2	0.76	0.89	0.030	0.035
c	0.08	0.20	0.003	0.008
D	2.80	3.04	0.110	0.119
E	2.10	2.64	0.082	0.103
E1	1.20	1.40	0.047	0.055
e	1.92 BSC		0.075 BSC	
e1	0.20 BSC		0.008 BSC	
L	0.4	0.6	0.016	0.024
L1	0.54 REF		0.021 REF	
# per tape and reel	3000 pieces*			
Controlling dimension: millimeters				

\* This is an approximate amount which may vary.

### Mechanical Package Diagrams



**Package Dimensions for SOT143.**

## Mechanical Details (continued)

### SOT23-5 Mechanical Specifications

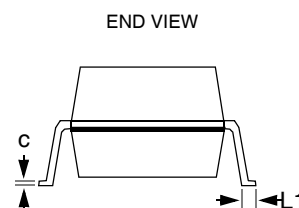
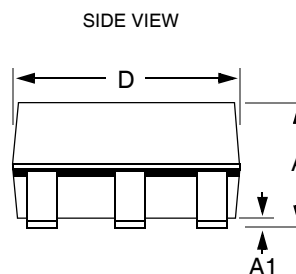
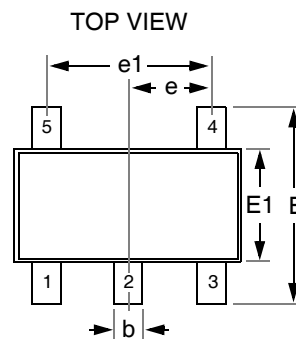
Dimensions for CM1218-04ST/SO devices supplied in 5-pin SOT23 packages are presented below.

For complete information on the SOT23-5, see the California Micro Devices SOT23 Package Information document.

PACKAGE DIMENSIONS				
Package	SOT23-5 (JEDEC name is MO-178)			
Pins	5			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	--	1.45	--	0.057
A1	0.00	0.15	0.000	0.006
b	0.30	0.50	0.012	0.020
c	0.08	0.22	0.003	0.009
D	2.75	3.05	0.108	0.120
E	2.60	3.00	0.102	0.118
E1	1.45	1.75	0.057	0.069
e	0.95 BSC		0.0374 BSC	
e1	1.90 BSC		0.0748 BSC	
L	0.60 REF		0.0236 REF	
# per tape and reel	3000 pieces*			
Controlling dimension: inches				

\* This is an approximate amount which may vary.

### Mechanical Package Diagrams



**Package Dimensions for SOT23-5.**



## Mechanical Details (continued)

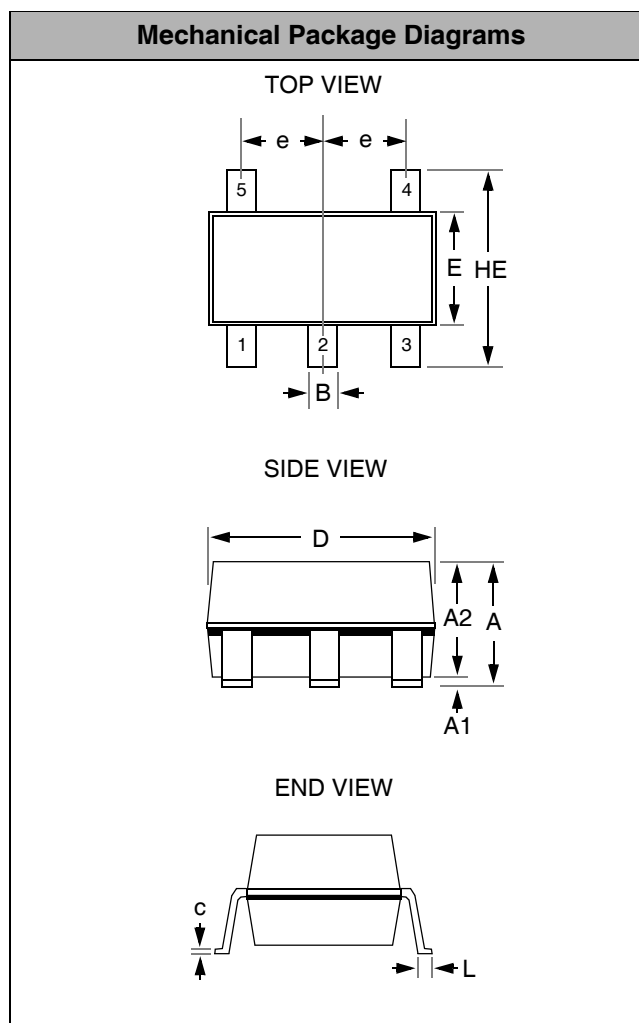
### SC70-5 Mechanical Specifications:

Dimensions for CM1218-04SC/S7 devices supplied in 5-pin SC70 packages are presented below.

For complete information on the SC70-5, see the California Micro Devices SC70 Package Information document.

PACKAGE DIMENSIONS		
Package	SC70-5 (JEDEC name is MO-203 Issue A)	
Pins	5	
Dimensions	Millimeters	
	Min	Max
A	0.80	1.10
A1	0.00	0.10
A2	0.70	1.00
B	0.15	0.30
c	0.08	0.25
D	1.85	2.25
E	1.15	1.35
e	0.65 BSC	
HE	2.00	2.40
L	0.26	0.46
# / tube	1000 pieces*	
# / tape and reel	3000 pieces*	

\* This is an approximate amount which may vary.



**Package Dimensions for SC70-5**

## Mechanical Details (continued)

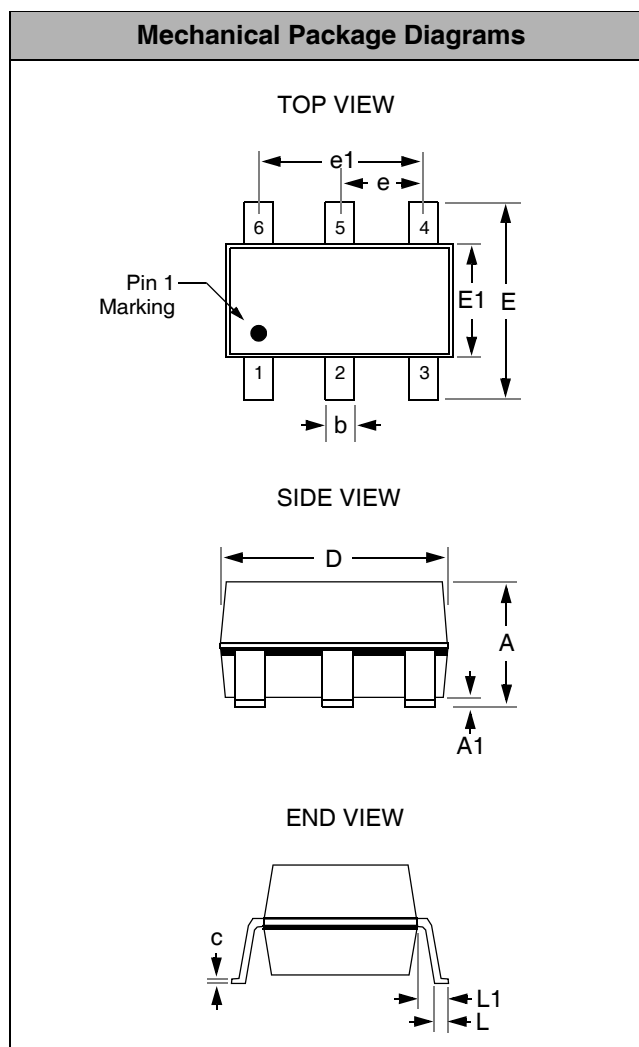
### SOT23-6 Mechanical Specifications:

Dimensions for CM1218-05ST/SO devices supplied in 6-pin SOT23 packages are presented below.

For complete information on the SOT23-6, see the California Micro Devices SOT23 Package Information document.

PACKAGE DIMENSIONS				
Package	SOT23 (JEDEC name is MO-178)			
Pins	6			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	--	1.45	--	0.057
A1	0.00	0.15	0.000	0.006
b	0.30	0.50	0.012	0.020
c	0.08	0.22	0.003	0.009
D	2.75	3.05	0.108	0.120
E	2.60	3.00	0.102	0.118
E1	1.45	1.75	0.057	0.069
e	0.95 BSC		0.0374 BSC	
e1	1.90 BSC		0.0748 BSC	
L	0.60 REF		0.0236 REF	
# per tape and reel	3000 pieces*			
Controlling dimension: inches				

\* This is an approximate amount which may vary.



## Mechanical Details (continued)

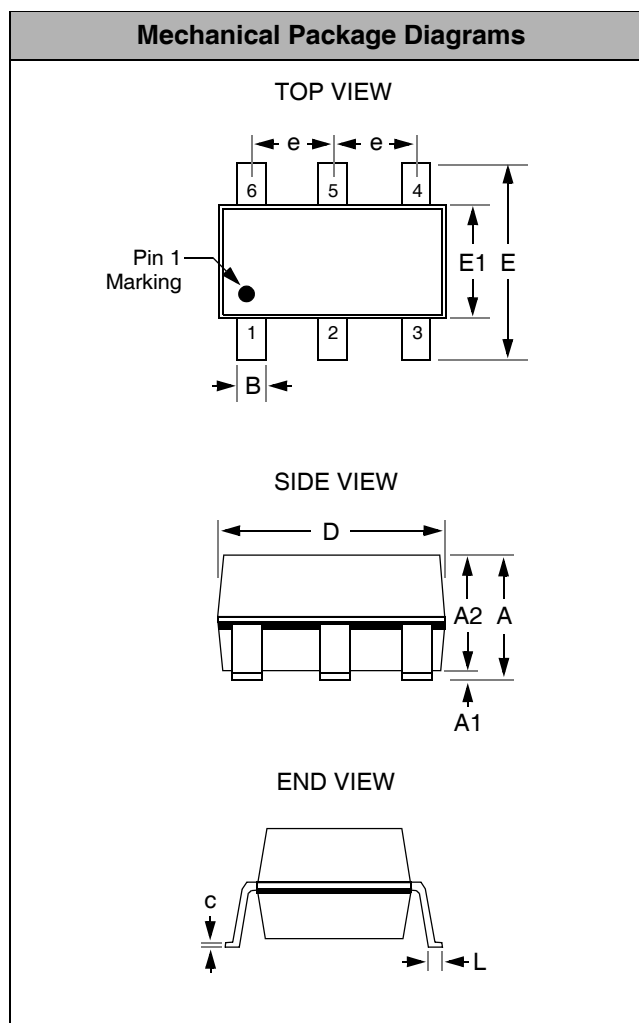
### SC70-6 Mechanical Specifications:

Dimensions for CM1218-05SC/S7 devices supplied in 6-pin SC70 packages are presented below.

For complete information on the SC70-6, see the California Micro Devices SC70 Package Information document.

PACKAGE DIMENSIONS		
Package	SC70-6 (JEDEC name is MO-203 Issue A)	
Pins	6	
Dimensions	Millimeters	
	Min	Max
A	0.80	1.10
A1	0.00	0.10
A2	0.70	1.00
B	0.15	0.30
c	0.08	0.25
D	1.85	2.25
E	1.15	1.35
e	0.65 BSC	
HE	2.00	2.40
L	0.26	0.46
# / tube	1000 pieces*	
# / tape and reel	3000 pieces*	

\* This is an approximate amount which may vary.



**Package Dimensions for SC70-6.**