

## 1 and 2 Channel PicoGuard™ AC Signal ESD Protector

### Features

- Single channel ESD protector for AC signals up to  $\pm 5V$  signals
- $\pm 8kV$  ESD protection per IEC 61000-4-2 contact discharge
- Sub-1pF loading capacitance
- Matching I/O to Ground capacitance 0.02pF
- Minimal variation with voltage and temperature
- Each I/O pin can withstand over 1000 ESD strikes
- SOT23-3 or MSOP-8 package

### Applications

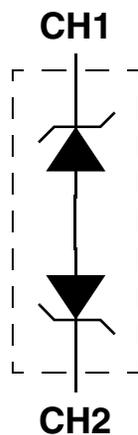
- RF switch and amplifier protection
- RF modules and RF IC protection
- Wireless handsets and WLAN
- High-speed AC signals for Gbit Ethernet, etc.

### Product Description

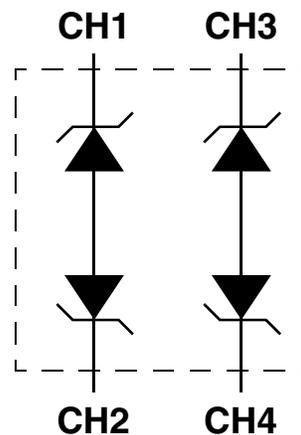
The CM1214 PicoGuard™ ESD protector is used to protect bipolar signal lines against electrostatic discharge (ESD). The CM1214 allows operation in high-speed environments with signals levels up to  $\pm 5V$ . The sub-1pF low loading capacitance makes the CM1214-01ST ideal for protecting high-speed interfaces including RF switch and amplifier protection. The CM1214-02MS is ideal for dual high-speed signal pairs such as with Gigabit Ethernet and ADSL, etc.

The CM1214-01ST is a single channel ESD protector and is available in a 3-lead SOT23-3 package. The CM1214-02MS is a dual channel ESD protector and is available in a 8-lead MSOP-8 package.

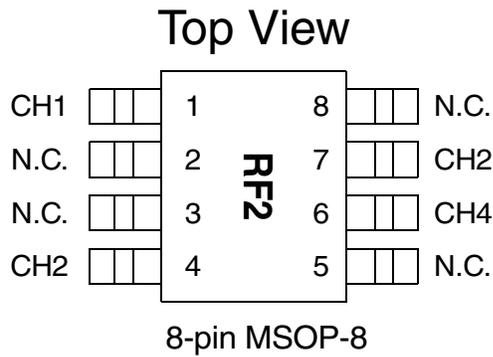
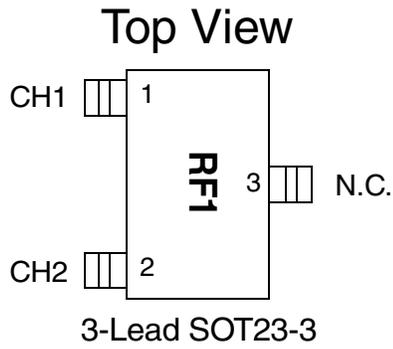
### Electrical Schematics



**CM1214-01ST**



**CM1214-02MS**

**PACKAGE / PINOUT DIAGRAMS**


Note: This drawing is not to scale.

**SOT23-3 PACKAGE PIN DESCRIPTIONS**

PIN	NAME	DESCRIPTION
1	CH1	ESD Channel
2	CH1	ESD Channel
3	N.C.	No connect

**MSOP-8 PACKAGE PIN DESCRIPTIONS**

PIN	NAME	DESCRIPTION
1	CH1	ESD Channel
2	N.C.	No connect
3	N.C.	No connect
4	CH3	ESD Channel
5	N.C.	No connect
6	CH4	ESD Channel
7	CH2	ESD Channel
8	N.C.	No connect

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

Pins	Package	Ordering Part Number <sup>1</sup>	Part Marking
3	SOT23	CM1214-01ST	RF1
8	MSOP	CM1214-02MS	RF2

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

## Specifications

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNITS
DC Voltage between I/O pins	7	V
Diode Forward DC Current (Note 1)	8	mA
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-65 to +150	°C
Package Power Rating		
SOT23-3 Package (CM1214-01ST)	225	mW
MSOP8 Package (CM1214-02MS)	400	mW

Note 1: Pin 3 unconnected for all tests (CM1214-01ST only).

### STANDARD OPERATING CONDITIONS

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

### ELECTRICAL OPERATING CHARACTERISTICS (NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$V_{ST}$	Standoff Voltage	$I = 10\mu A$		$\pm 7$		V
$V_{ESD}$	ESD Voltage Protection Peak discharge voltage between I/O pins a) Contact discharge per IEC 61000-4-2 standard	Notes 2, 3 and 4	$\geq 8$			kV
$I_{LEAK}$	Channel Leakage Current	$T_A = 25^\circ C$ , 5.5V between I/O pins		$\pm 0.1$	$\pm 1.0$	$\mu A$
$V_{CL}$	Channel Clamp Voltage Positive Transients Negative Transients	At 8kV ESD HBM; Notes 2, 4 & 5		9.0 -9.0		V V
$R_{DYN}$	Dynamic Resistance	$I = 1A$ , $T_A = 25^\circ C$ ; Note 6 applies		1.5		$\Omega$
$\Delta C_{IN}$	Matching I/O to GND Capacitance			0.02		pF
$C_{IN}$	Channel Input Capacitance	Measured at 1 MHz between I/O pins; Note 2 applies				
	Voltage between I/O pins = 0V		0.5	0.8	1.2	pF
	Voltage between I/O pins = 5V		0.5	0.8	1.2	pF

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

Note 2: These parameters guaranteed by design and characterization.

Note 3: Standard IEC 61000-4-2 with  $C_{Discharge} = 150pF$ ,  $R_{Discharge} = 330\Omega$ .

Note 4: From I/O pin with other I/O pin grounded.

Note 5: Human Body Model per MIL-STD-883, Method 3015,  $C_{Discharge} = 100pF$ ,  $R_{Discharge} = 1.5K\Omega$



### Performance Information

#### Typical Capacitance Characteristics VS. Voltage

Figure 1 illustrates how the loading capacitance remains mainly flat across the voltage range from 0V to 5V, which is the voltage between I/O pins.

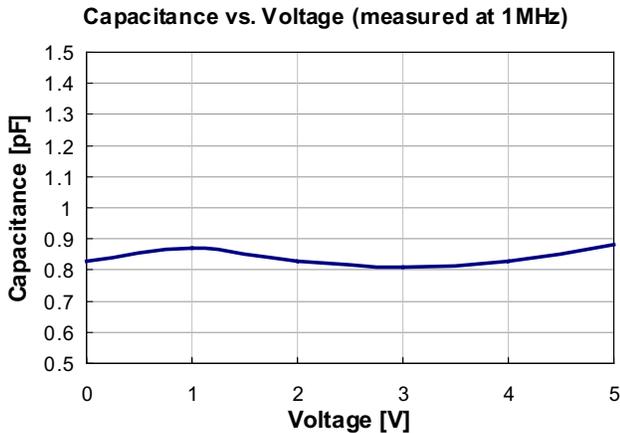


Figure 1. CM1214 Capacitance VS. Voltage

#### Typical Voltage Current (VI) Characteristics (high current, pulse condition)

Figure 2 shows how the CM1214 experiences a symmetrical I/V curve, without any snapback or trigger voltage. The curve shows only one polarity.

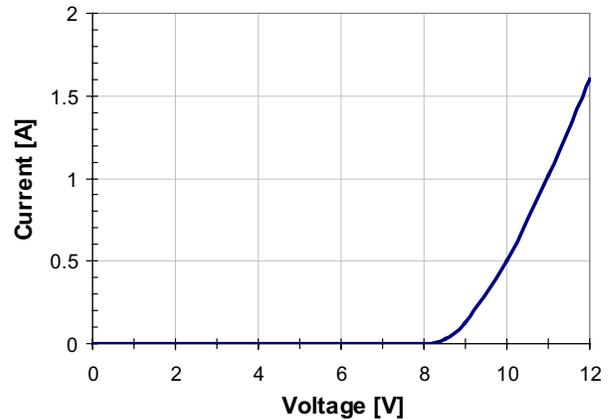


Figure 3. CM1214 VI Characteristics, Low Current, Pulse (clamping) Condition

#### Typical Voltage Current (VI) Characteristics (low current)

Figure 2 shows how the CM1214 experiences a symmetrical I/V curve, without any snapback or trigger voltage. It gradually starts to leak at about 6V and clamps above 7V.

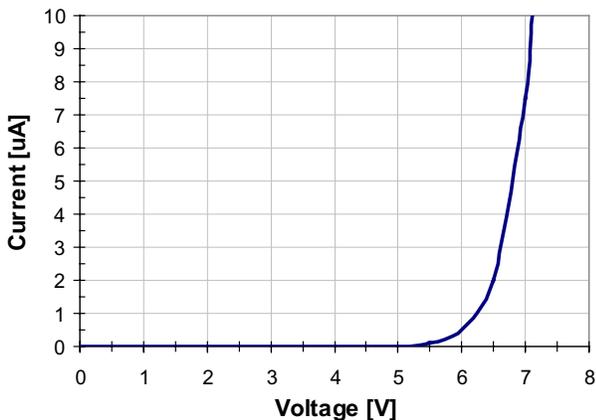


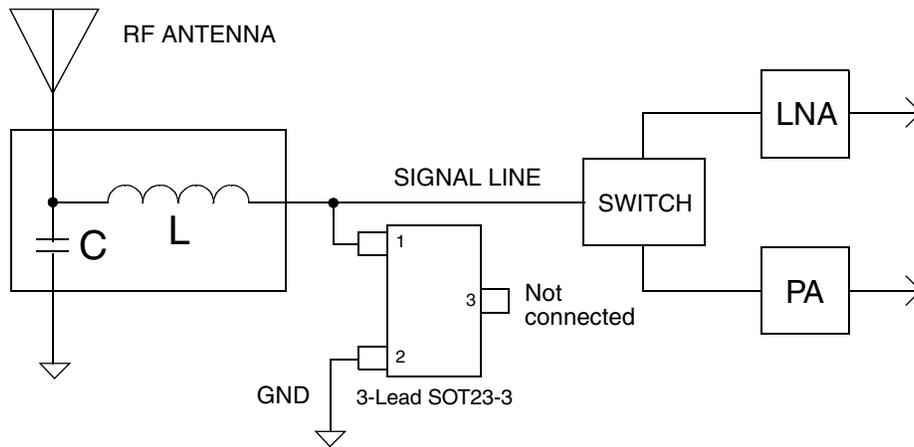
Figure 2. CM1214 VI Characteristics, Low Current

**Application Information**

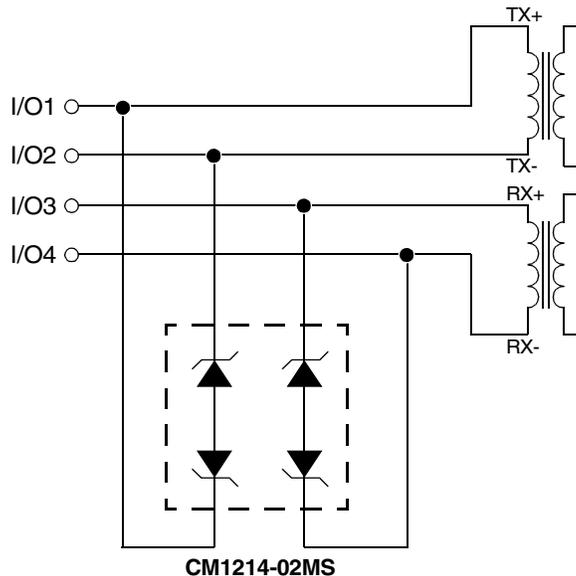
The CM1214-01ST protects a single bipolar signal line, such as is found in RF circuits. One I/O pin (pin 1 for example) is connected to the signal line to be protected, and the other I/O pin is tied to GND. It is important to have a solid ground connection in order to reduce the clamping voltage. Pin 3 of the 3-lead SOT23 must be left open (not connected on the PCB).

The CM1214-02MS protects two bipolar lines, such as for Gbit Ethernet. The PCB traces connect across underneath the package to the corresponding pins, i.e., pin 1 to pin 8 etc.

Any disturbance on the line above or below the stand-off voltage is clamped.



**Figure 4. Typical Application - RF Switch and Amplifier Protection, CM1214-01ST in 3-lead SOT23**



**Figure 5. Typical Application - Ethernet Protection, CM1214-02MS in 8-lead MSOP**

## Mechanical Details

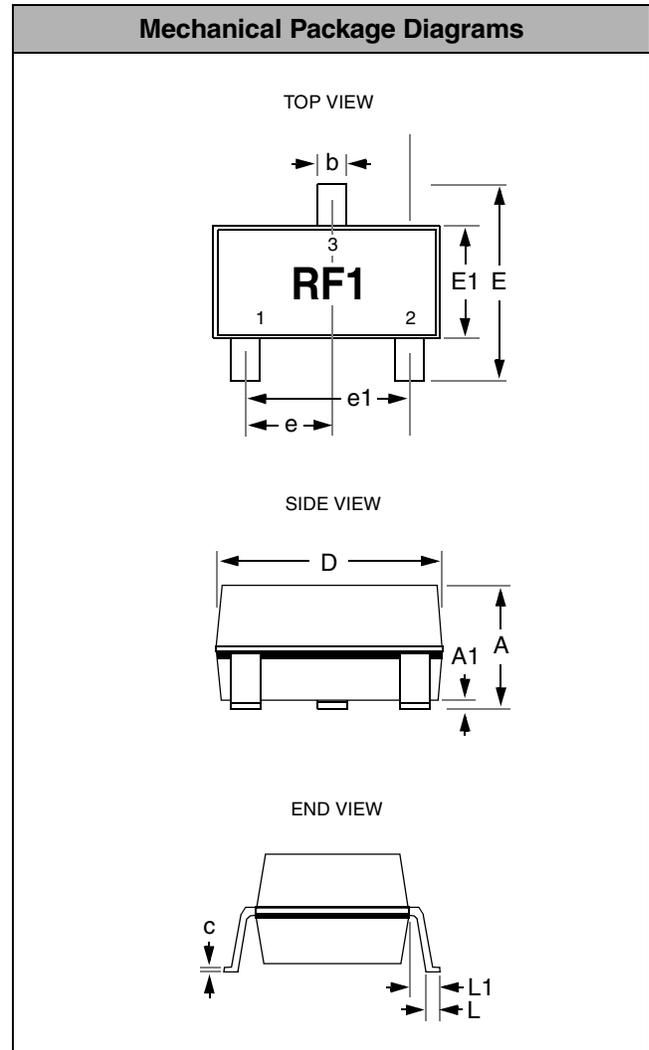
The CM1214 is available in SOT23-3 and MSOP-8 packages. The various package drawings are presented below.

### SOT23-3 Mechanical Specifications

Dimensions for CM1214-01ST devices packaged in 3-pin SOT23 packages are presented below.

For complete information on the SOT23-3 package, 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
<b>A</b>	0.89	1.12	0.0350	0.0441
<b>A1</b>	0.01	0.10	0.0004	0.0039
<b>b</b>	0.30	0.50	0.0118	0.0197
<b>c</b>	0.08	0.20	0.0031	0.0079
<b>D</b>	2.80	3.04	0.1102	0.1197
<b>E</b>	2.10	2.64	0.0827	0.1039
<b>E1</b>	1.20	1.40	0.0472	0.0551
<b>e</b>	0.95 BSC		0.0374 BSC	
<b>e1</b>	1.90 BSC		0.0748 BSC	
<b>L</b>	0.40	0.60	0.0157	0.0236
<b>L1</b>	0.54 REF		0.0213 REF	
<b># per tape and reel</b>	3000 pieces			
Controlling dimension: millimeters				



**Package Dimensions for SOT23-3.**

## Mechanical Details

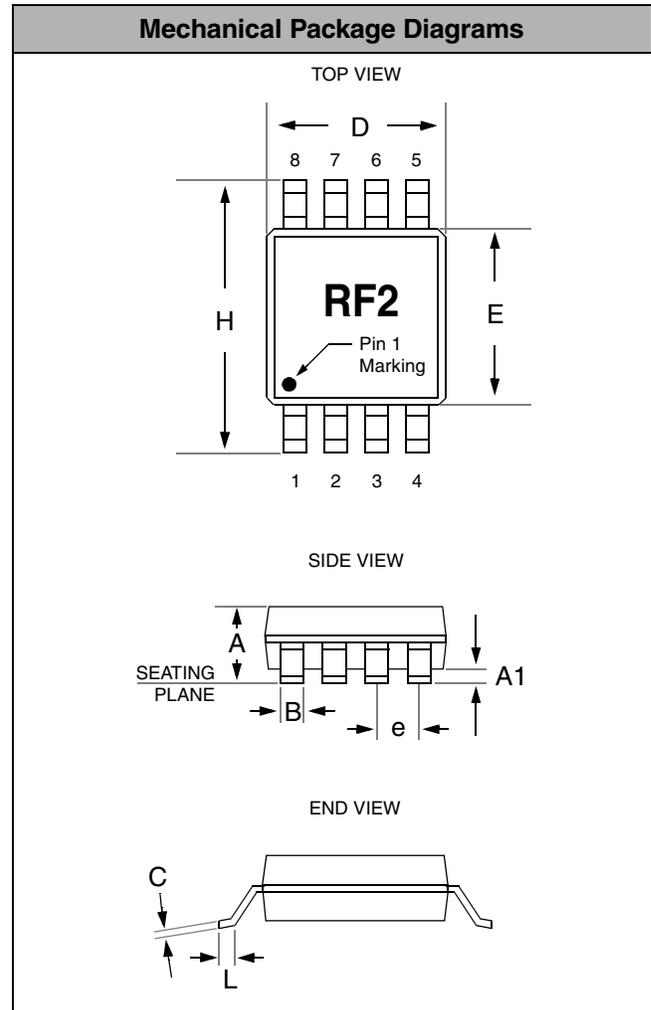
### MSOP-8 Mechanical Specifications:

CM1214-02MS devices are packaged in 8-pin MSOP packages. Dimensions are presented below.

For complete information on the MSOP-8 package, see the California Micro Devices MSOP Package Information document.

PACKAGE DIMENSIONS				
Package	MSOP			
Pins	8			
Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.87	1.17	0.034	0.046
<b>A1</b>	0.05	0.25	0.002	0.010
<b>B</b>	0.30 (typ)		0.012 (typ)	
<b>C</b>	0.18		0.007	
<b>D</b>	2.90	3.10	0.114	0.122
<b>E</b>	2.90	3.10	0.114	0.122
<b>e</b>	0.65 BSC		0.025 BSC	
<b>H</b>	4.78	4.98	0.188	0.196
<b>L</b>	0.52	0.54	0.017	0.025
<b># per tube</b>	80 pieces*			
<b># per tape and reel</b>	4000 pieces			
Controlling dimension: inches				

\* This is an approximate amount which may vary.



**Package Dimensions for MSOP-8**