1 and 2 Channel PicoGuard™ AC Signal ESD Protector

Features

- Single channel ESD protection for an AC signal up to ±5V for 0.25W transmit power
- Connect two channels in series for signals up to ±10V (1W transmit power)
- ±8kV ESD protection per IEC 61000-4-2 contact discharge
- Sub-1pF loading capacitance
- Minimal variation with voltage and temperature
- Can withstand over 1000 ESD strikes at 8kV
- SOT23-3 or MSOP-8 package options
- Lead-free versions available

Applications

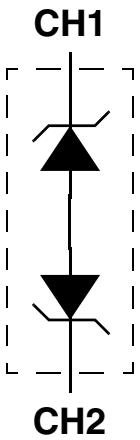
- RF switch and amplifier protection
- RF modules and RF IC protection
- Wireless handsets and WLAN
- High-speed AC signals for Gbit Ethernet, etc.

Product Description

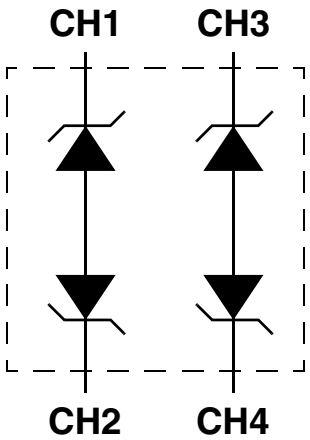
The CM1214 PicoGuard™ ESD protector is used to protect bipolar signal lines against electrostatic discharge (ESD). The CM1214 allows operation in high-speed environments with signals levels up to ±5V. The sub-1pF low loading capacitance makes the CM1214-01ST/SO ideal for protecting high-speed interfaces including RF switch and amplifier protection. The CM1214-02MS/MR is ideal for dual high-speed signal pairs such as with Gigabit Ethernet and ADSL, etc. The CM1214-02MS/MR can also be used for higher transmit power applications by connecting the two pairs of devices together in series.

The CM1214-01ST/SO is a single channel ESD protector and is available in a 3-lead SOT23-3 package. The CM1214-02MS/MR is a dual channel ESD protector and is available in an 8-lead MSOP-8 package. Both devices are available with optional lead-free finishing.

Electrical Schematics

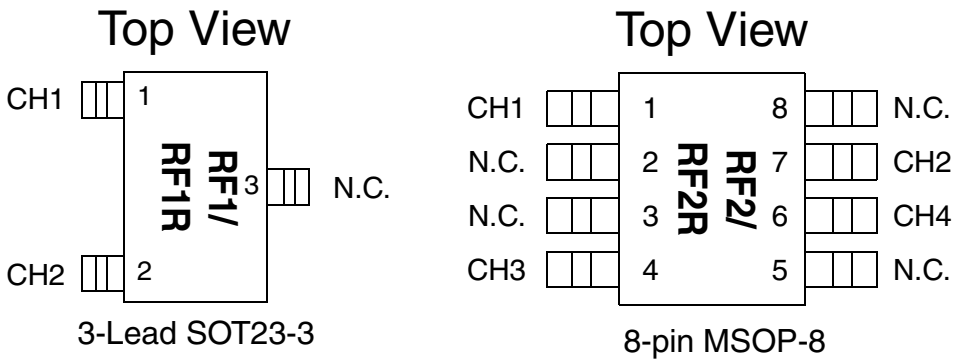


CM1214-01ST/SO



CM1214-02MS/MR

PACKAGE / PINOUT DIAGRAMS



Note: These drawings are not to scale.

SOT23-3 PACKAGE PIN DESCRIPTIONS		
PIN	**NAME**	**DESCRIPTION**
1	CH1	ESD Channel
2	CH2	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**	**Standard Finish**		**Lead-free Finish**	
		Ordering Part Number[1]	**Part Marking**	**Ordering Part Number[1]**	**Part Marking**
3	SOT23	CM1214-01ST	RF1	CM1214-01SO	RF1R
8	MSOP	CM1214-02MS	RF2	CM1214-02MR	RF2R

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
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-65 to +150	°C
Package Power Rating SOT23-3 Package (CM1214-01ST/SO) MSOP8 Package (CM1214-02MS/MR)	 225 400	 mW mW

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

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)						
SYMBOL	**PARAMETER**	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNITS**
V_{ST}	Standoff Voltage	I=10µA		±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	 ±8			 kV
V_F	Diode Forward DC Current	Note 5			8	mA
I_{LEAK}	Channel Leakage Current	T_A=25°C, 5.5V between I/O pins		±0.1	±1.0	µA
V_{CL}	Channel Clamp Voltage Positive Transients Negative Transients	At 8kV ESD HBM; Notes 2, 4 & 6		 9.0 -9.0		 V V
R_{DYN}	Dynamic Resistance	I = 1A, T_A=25°C;		1.5		Ω
C_{IN}	Channel Input Capacitance Voltage between CH pins = 0V Voltage between CH pins = 5V	Measured at 1 MHz between I/O pins; Note 2 applies	 0.5 0.5	 0.8 0.8	 1.2 1.2	 pF pF

Note 1: All parameters specified at T_A = -40°C to +85°C unless otherwise noted.
Note 2: These parameters guaranteed by design and characterization.
Note 3: Standard IEC 61000-4-2 with $C_{Discharge}$ = 150pF, $R_{Discharge}$ = 330Ω.
Note 4: From I/O pin with other I/O pin grounded.
Note 5: Pin 3 unconnected for all tests (CM1214-01ST/SO only).
Note 6: Human Body Model per MIL-STD-883, Method 3015, $C_{Discharge}$ = 100pF, $R_{Discharge}$ = 1.5KΩ

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 CH pins.

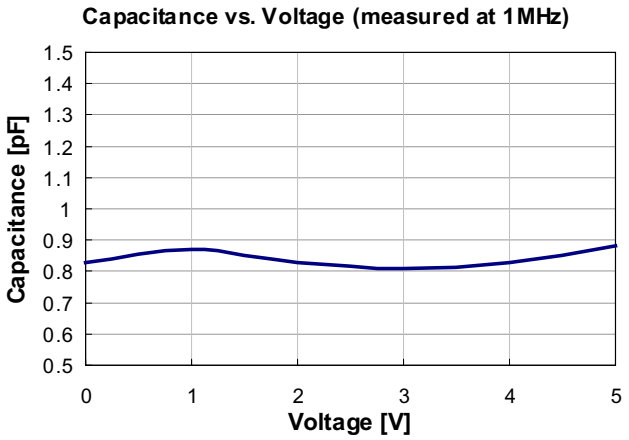


Figure 1. CM1214 Capacitance vs. Voltage

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.

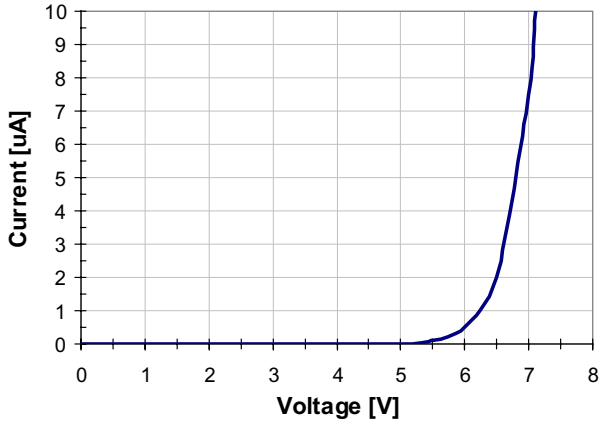


Figure 2. CM1214 VI Characteristics, Low Current

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

Figure 3 shows how the CM1214 experiences a symmetrical I/V curve, without any snapback or trigger voltage. The curve shows only one polarity.

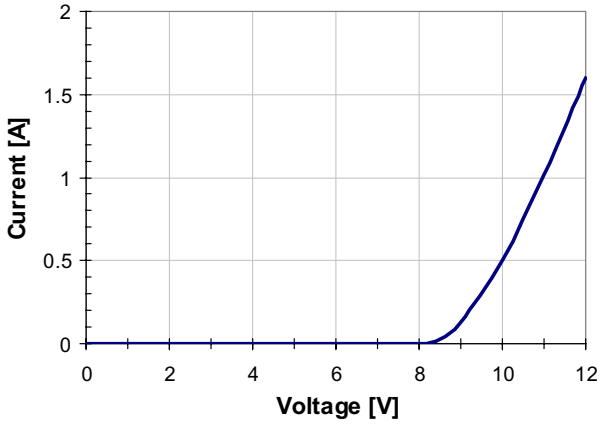


Figure 3. CM1214 VI Characteristics, Low Current, Pulse (clamping) Condition

Performance Information (Cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

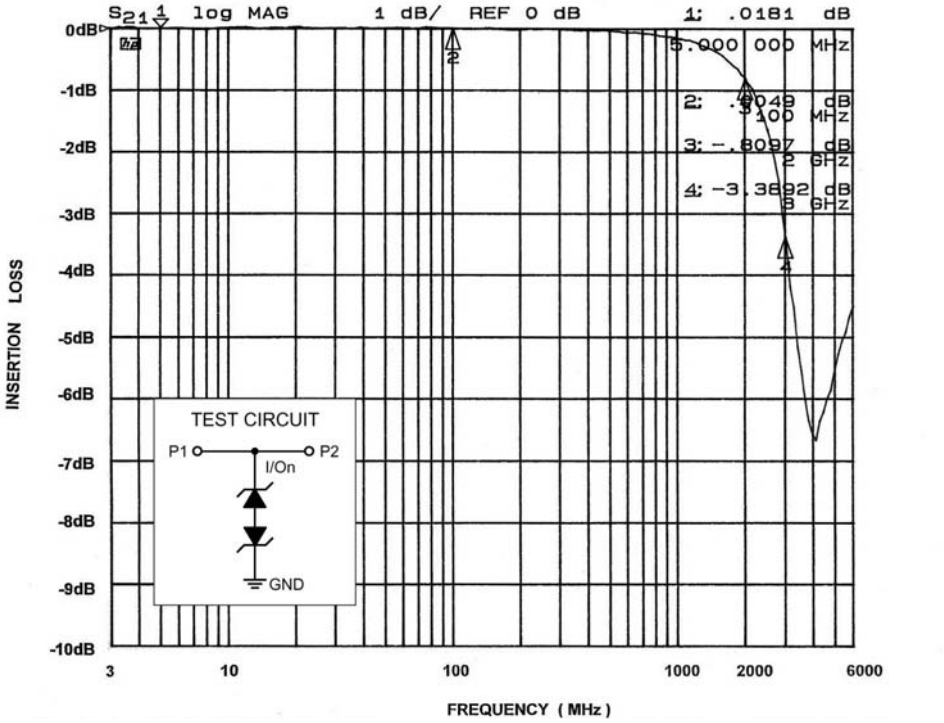


Figure 4. Insertion Loss vs. Frequency (0V DC Bias)

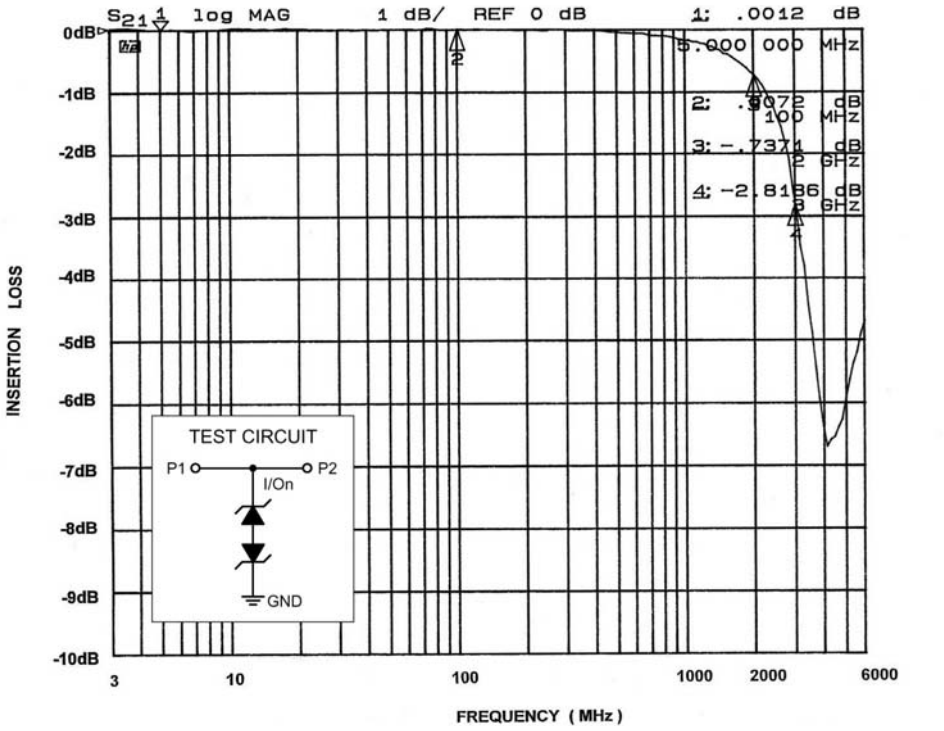


Figure 5. Insertion Loss vs. Frequency (2.5V DC Bias)

Application Information

The CM1214-01ST/SO 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/MR 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.

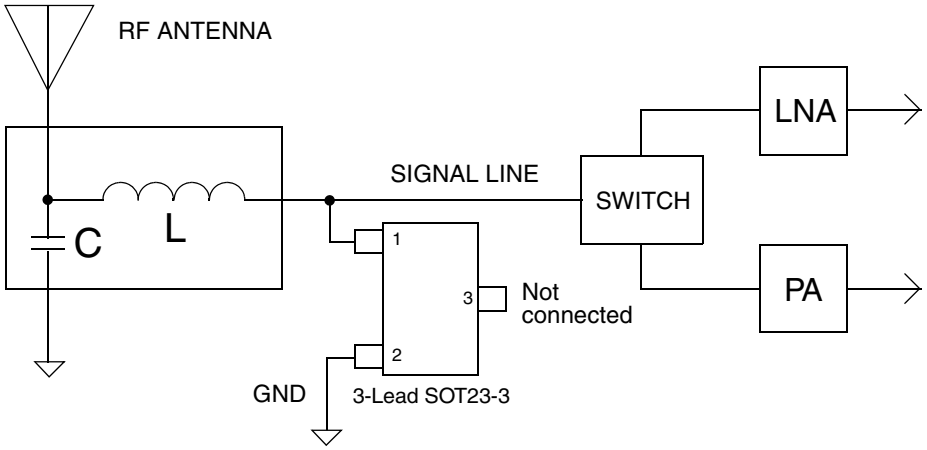


Figure 6. Typical Application - RF Switch and Amplifier Protection, CM1214-01ST/SO in 3-lead SOT23

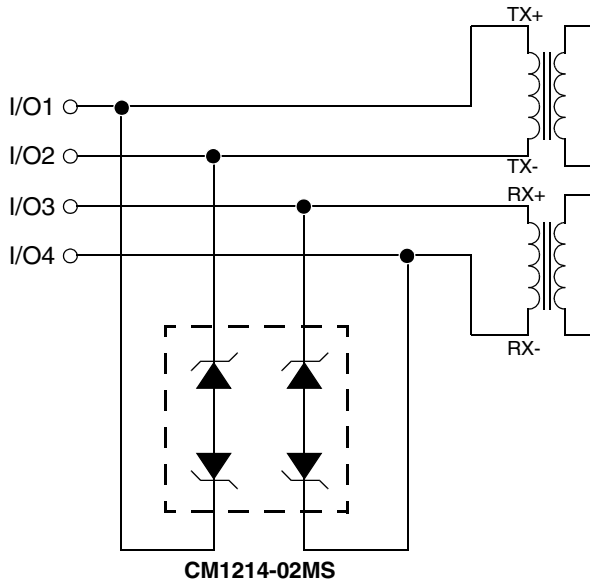


Figure 7. Typical Application - Ethernet Protection, CM1214-02MS/MR in 8-lead MSOP

Mechanical Details

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

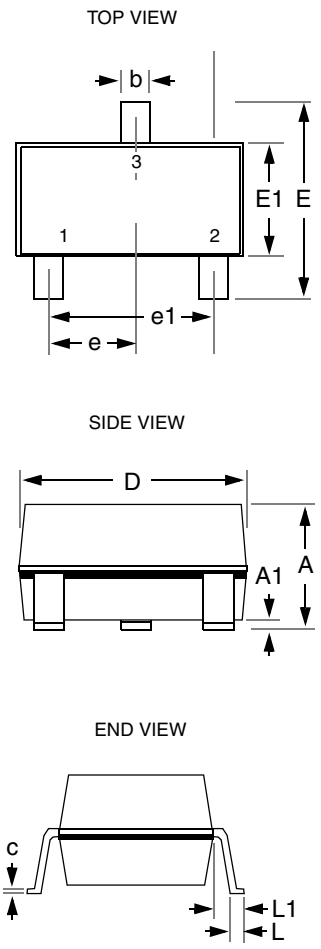
SOT23-3 Mechanical Specifications

Dimensions for CM1214-01ST/SO 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**
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				

Mechanical Package Diagrams



Package Dimensions for SOT23-3.

Mechanical Details (cont'd)

MSOP-8 Mechanical Specifications:

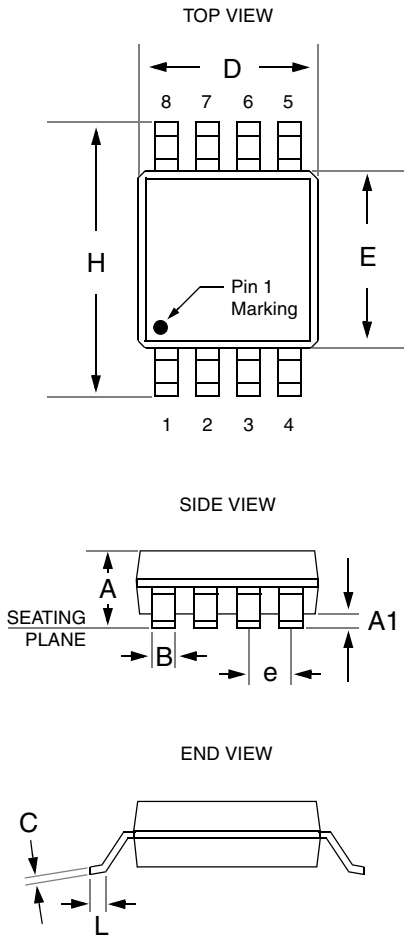
CM1214-02MS/MR devices are packaged in 8-pin MSOP packages. Dimensions are presented below.

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**
A	0.87	1.17	0.034	0.046
A1	0.05	0.25	0.002	0.010
B	0.30 (typ)		0.012 (typ)	
C	0.18		0.007	
D	2.90	3.10	0.114	0.122
E	2.90	3.10	0.114	0.122
e	0.65 BSC		0.025 BSC	
H	4.78	4.98	0.188	0.196
L	0.52	0.54	0.017	0.025
# per tube	80 pieces*			
# per tape and reel	4000 pieces			
Controlling dimension: inches				

* This is an approximate amount which may vary.

Mechanical Package Diagrams



Package Dimensions for MSOP-8