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[D1213A-04MR-13](#)

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D1213A-04MR

4 CHANNEL LOW CAPACITANCE TVS DIODE ARRAY

Features

- IEC 61000-4-2 (ESD): Air ±15kV, Contact ±8kV
- 4 Channels of ESD Protection
- Low Channel Input Capacitance of 0.85pF Typical
- Typically Used at High Speed Ports such as USB 2.0, IEEE1394, Serial ATA, DVI, HDMI, PCI
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

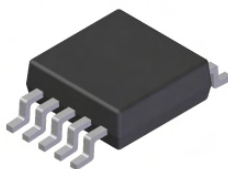
Mechanical Data

- Case: MSOP-10
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Copper leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.026 grams (approximate)

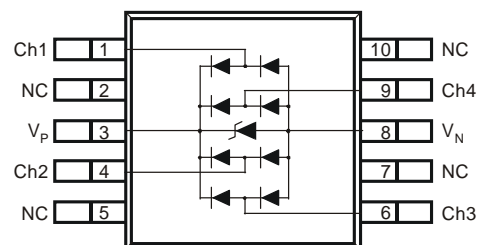
Pin#	Description
1, 4, 6, 9	Inputs
2, 5, 7, 10	No Connection
8	V _N , Ground
3	V _P , Power

Pin Description

MSOP-10



Top View



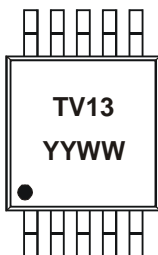
Device Schematic

Ordering Information (Note 4)

Part Number	Case	Packaging
D1213A-04MR-13	MSOP-10	2500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com>.

Marking Information



TV13 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Two Digits of Year (ex: 12 = 2012)
 WW = Week Code (01 ~ 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit	Conditions
Operating Supply Voltage	V _P - V _N	6.0	V	-
DC Voltage at any Channel Input	-	(V _N - 0.5) to (V _P + 0.5)	V	-
Peak Pulse Current	I _{PP}	5	A	8/20 μs, Per Fig. 3
ESD Protection – Contact Discharge	V _{ESD_Contact}	±8	kV	Standard IEC 61000-4-2
ESD Protection – Air Discharge	V _{ESD_Air}	±15	kV	Standard IEC 61000-4-2

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	500	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	250	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-65 to +150	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
Operating Supply Voltage	V _P	-	3.3	5.5	V	-
Operating Supply Current (Note 6)	I _P	-	-	8.0	μA	(V _P - V _N) = 3.3V
Channel Leakage Current (Note 6)	I _R	-	0.1	1.0	μA	V _P = 5V, V _N = 0V
Reverse breakdown voltage	V _{BR}	6.0	-	-	V	I _R = 1mA
Clamping Voltage, Positive Transients	V _{CL1}	-	10.0	-	V	I _{PP} = 1A (Note 7)
Clamping Voltage, Negative Transients	V _{CL2}	-	-1.7	-	V	I _{PP} = -1A (Note 7)
Forward Voltage for Top Diode	V _{FD1}	0.60	0.80	0.95	V	I _F = 8mA, any channel to V _P
Forward Voltage for Bottom Diode	V _{FD2}	0.60	0.80	0.95	V	I _F = 8mA, V _N to and channel
Dynamic Resistance	R _{DYN}	-	0.9	-	Ω	I _{PP} = 1A (Note 7)
Channel Input Capacitance	C _T	-	0.85	1.2	pF	V _{IN} = 1.65V, V _P = 3.3V, V _N = 0V, f = 1MHz

- Notes:
- Device mounted on FR-4 PCB pad layout (2oz copper) as shown on Diodes, Inc. suggested pad layout AP02001, which can be found on our website at <http://www.diodes.com>.
 - Short duration pulse test used to minimize self-heating effect.
 - Clamping voltage value is based on an 8x20μs peak pulse current (I_{pp}) waveform.
 - Measured from any channel to V_N
 - Measured from V_P to V_N.
 - For information on the impact of Diodes' USB 2.0 compatible ESD protectors on signal integrity including eye diagram plots, please refer to AN77 at the following URL: http://www.diodes.com/destdtools/appnote_dnote.html.



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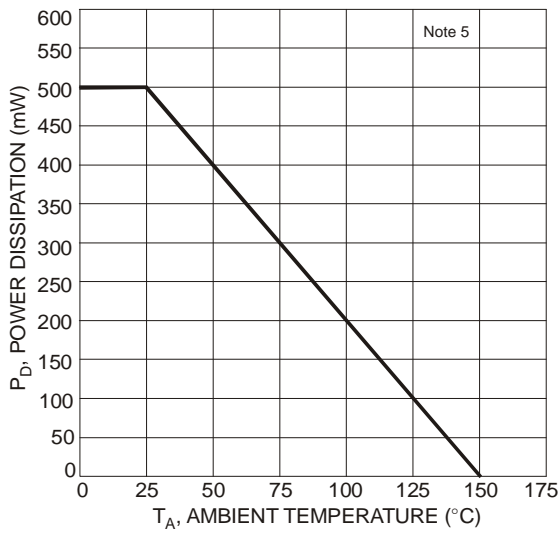


Figure 1 Power Derating Curve

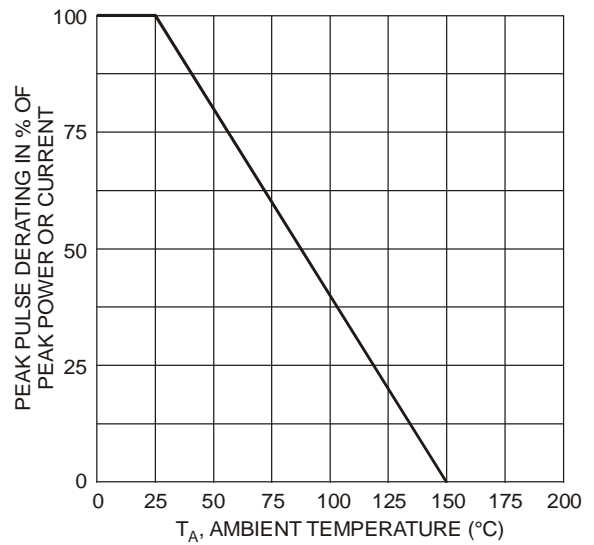


Figure 2 Pulse Derating Curve

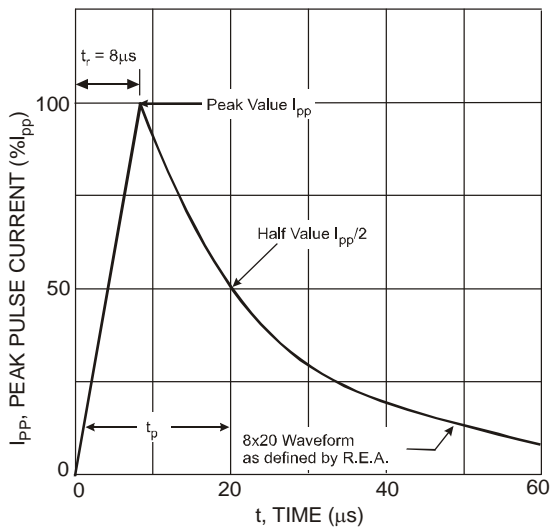


Figure 3 Pulse Waveform

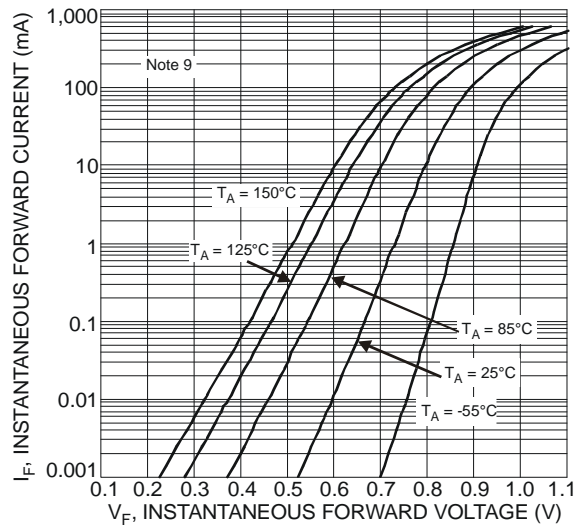


Figure 4 Typical Forward Characteristics

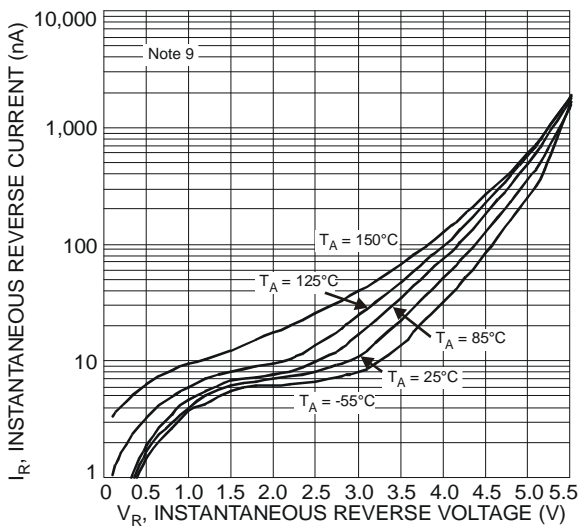


Figure 5 Typical Reverse Characteristics

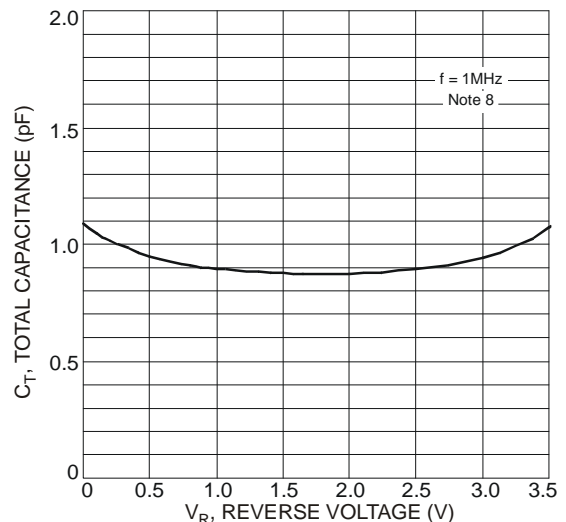
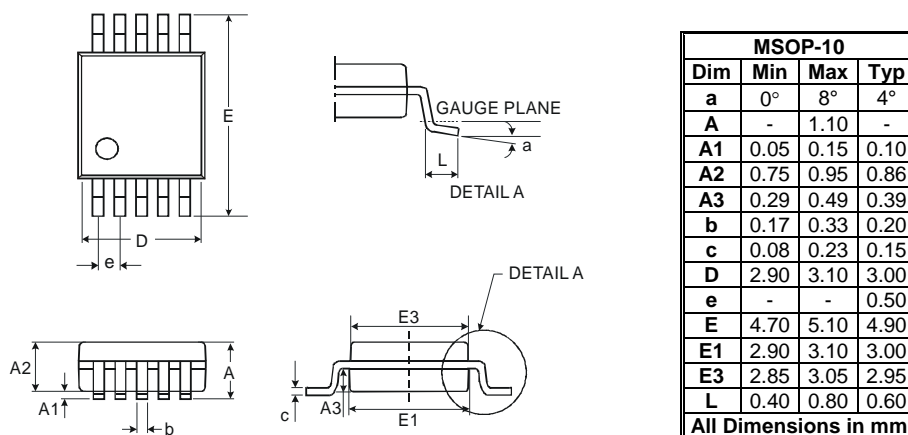


Figure 6 Typical Total Capacitance vs. Reverse Voltage

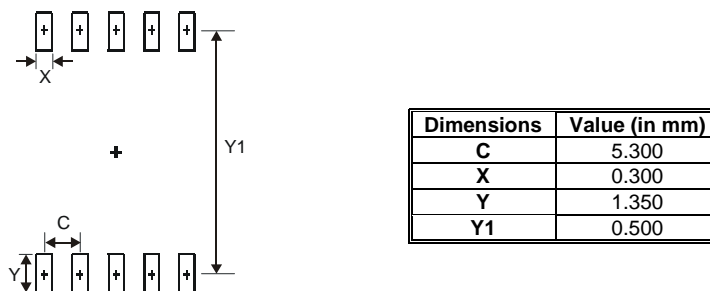
Package Outline Dimensions

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



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