

## Features

- IEC 61000-4-2 (ESD): Air –  $\pm 15\text{kV}$ , Contact –  $\pm 8\text{kV}$
- 4 Channels of ESD protection
- Low Channel Input Capacitance of  $0.85\text{pF}$  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**

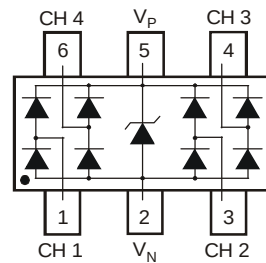
## Mechanical Data

- Case: SOT26
- 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 
- Weight: 0.016 grams (approximate)

SOT26



Top View



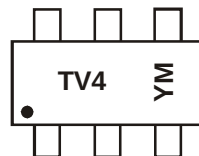
Device Schematic

## Ordering Information (Note 4)

| Part Number   | Case  | Packaging        |
|---------------|-------|------------------|
| D1213A-04SO-7 | SOT26 | 3000/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



TV4 = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: Z = 2012)  
M = Month (ex: 9 = September)

### Date Code Key

| Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|
| Code | Z    | A    | B    | C    | D    | E    |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                     | Symbol                          | Value                                            | Unit | Conditions             |
|------------------------------------|---------------------------------|--------------------------------------------------|------|------------------------|
| Operating Supply Voltage           | V <sub>P</sub> - V <sub>N</sub> | 6.0                                              | V    | -                      |
| DC Voltage at any Channel Input    | -                               | (V <sub>N</sub> - 0.5) to (V <sub>P</sub> + 0.5) | V    | -                      |
| Peak Pulse Current                 | I <sub>PP</sub>                 | 5                                                | A    | 8/20 μs, Per Figure 3  |
| ESD Protection – Contact Discharge | V <sub>ESD Contact</sub>        | ±8                                               | kV   | Standard IEC 61000-4-2 |
| ESD Protection – Air Discharge     | V <sub>ESD Air</sub>            | ±15                                              | kV   | Standard IEC 61000-4-2 |

## Thermal Characteristics

| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 5)                       | P <sub>D</sub>                    | 300         | mW   |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 417         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 | °C   |

## Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                        | Symbol           | Min  | Typ  | Max  | Unit | Test Conditions                                                               |
|---------------------------------------|------------------|------|------|------|------|-------------------------------------------------------------------------------|
| Operating Supply Voltage              | V <sub>P</sub>   | —    | 3.3  | 5.5  | V    | —                                                                             |
| Operating Supply Current (Note 6)     | I <sub>P</sub>   | —    | —    | 8.0  | μA   | (V <sub>P</sub> - V <sub>N</sub> ) = 3.3V                                     |
| Channel Leakage Current (Note 6)      | I <sub>R</sub>   | —    | 0.1  | 1.0  | μA   | V <sub>P</sub> = 5V, V <sub>N</sub> = 0V                                      |
| Reverse breakdown voltage             | V <sub>BR</sub>  | 6.0  | —    | —    | V    | I <sub>R</sub> = 1mA                                                          |
| Clamping Voltage, Positive Transients | V <sub>CL1</sub> | —    | 10.0 | —    | V    | I <sub>PP</sub> = 1A (Note 7)                                                 |
| Clamping Voltage, Negative Transients | V <sub>CL2</sub> | —    | -1.7 | —    | V    | I <sub>PP</sub> = -1A (Note 7)                                                |
| Forward Voltage for Top Diode         | V <sub>FD1</sub> | 0.60 | 0.80 | 0.95 | V    | I <sub>F</sub> = 8mA, any channel to V <sub>P</sub>                           |
| Forward Voltage for Bottom Diode      | V <sub>FD2</sub> | 0.60 | 0.80 | 0.95 | V    | I <sub>F</sub> = 8mA, V <sub>N</sub> to and channel                           |
| Dynamic Resistance                    | R <sub>DYN</sub> | —    | 0.9  | —    | Ω    | I <sub>PP</sub> = 1A (Note 7)                                                 |
| Channel Input Capacitance             | C <sub>T</sub>   | —    | 0.85 | 1.2  | pF   | V <sub>IN</sub> = 1.65V, V <sub>P</sub> = 3.3V, V <sub>N</sub> = 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<sub>PP</sub>) waveform.
  - Measured from any channel to V<sub>N</sub>
  - Measured from V<sub>P</sub> to V<sub>N</sub>.
  - 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/destools/appnote\\_dnote.html](http://www.diodes.com/destools/appnote_dnote.html).

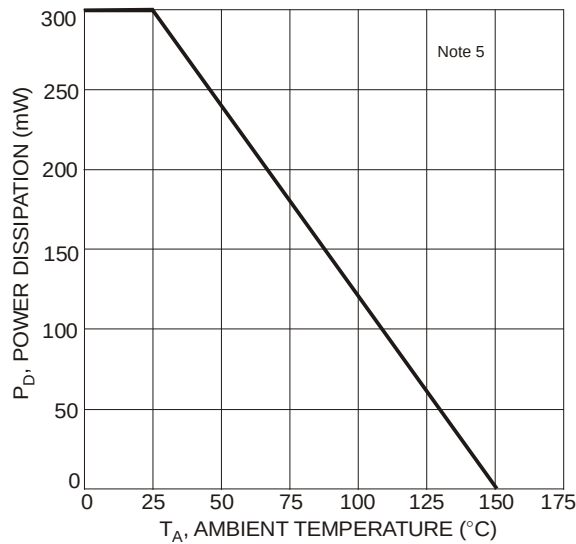


Figure 1 Power Derating Curve

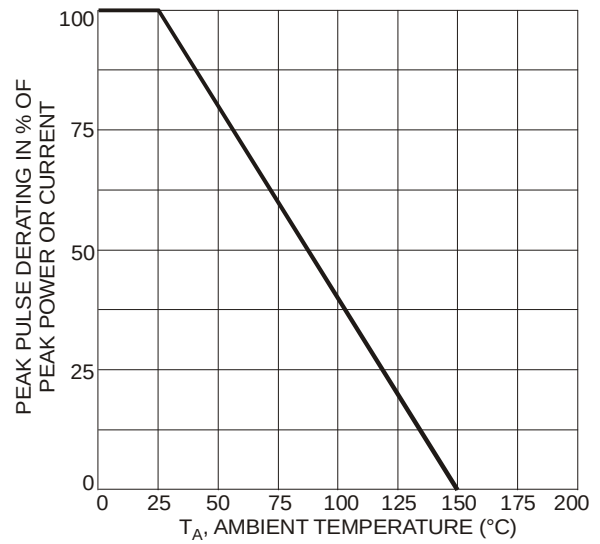


Figure 2 Pulse Derating Curve

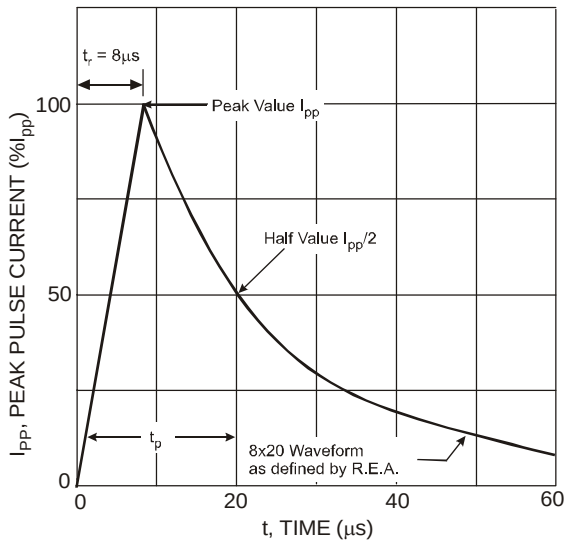


Figure 3 Pulse Waveform

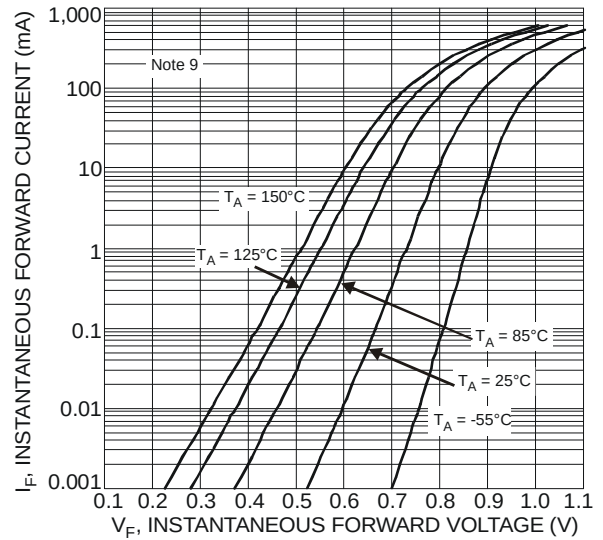


Figure 4 Typical Forward Characteristics

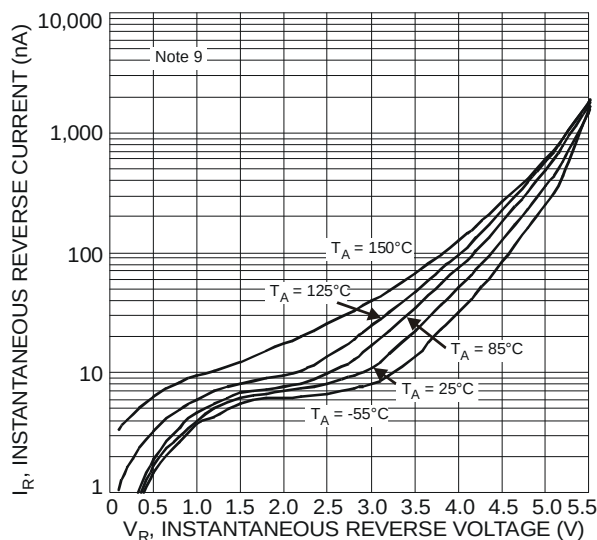


Figure 5 Typical Reverse Characteristics

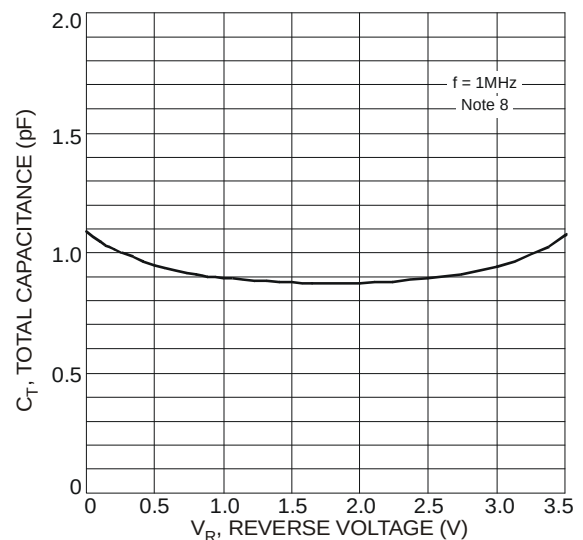
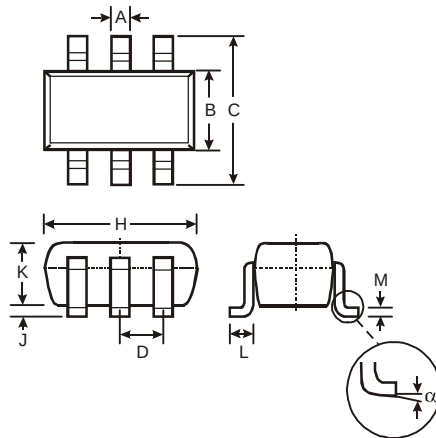


Figure 6 Typical Total Capacitance vs. Reverse Voltage

## Package Outline Dimensions

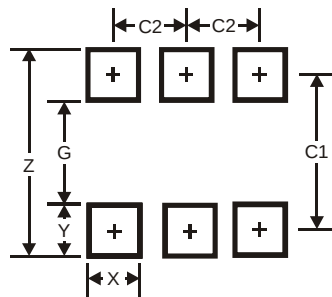
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT26                |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 0.35  | 0.50 | 0.38 |
| B                    | 1.50  | 1.70 | 1.60 |
| C                    | 2.70  | 3.00 | 2.80 |
| D                    | —     | —    | 0.95 |
| H                    | 2.90  | 3.10 | 3.00 |
| J                    | 0.013 | 0.10 | 0.05 |
| K                    | 1.00  | 1.30 | 1.10 |
| L                    | 0.35  | 0.55 | 0.40 |
| M                    | 0.10  | 0.20 | 0.15 |
| α                    | 0°    | 8°   | —    |
| All Dimensions in mm |       |      |      |

## Suggested Pad Layout

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



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 3.20          |
| G          | 1.60          |
| X          | 0.55          |
| Y          | 0.80          |
| C1         | 2.40          |
| C2         | 0.95          |

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.