



DT1446-04S

4 CHANNEL LOW CAPACITANCE TVS DIODE ARRAY

Product Summary

| V _{BR (min)} | I _{PP (max)} | C _{T (typ)} | |
|-----------------------|-----------------------|----------------------|--|
| 6V | 4.7A | 0.55pF | |

Description

The DT1446-04S is a high performance device suitable for protecting four high speed I/Os and one V_{CC} . These devices are assembled in SOT363 package. They have high ESD surge capability and low capacitance.

Applications

Typically Used for High Speed Ports such as:

- USB 2.0
- IEEE1394
- HDMI
- Laptop and Personal Computers
- Flat Panel Displays
- Video Graphics Displays
- SIM Ports

SOT363



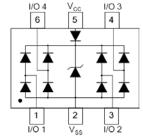
Top View

Features

- IEC 61000-4-2 (ESD): Air ±19kV, Contact ±16kV
- Low Channel Input Capacitance of 0.55pF Max
- ESD Protection for four I/Os and one V_{CC}
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic, "Green" Molding Compound.
 UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020 (Lead Free Plating).
 Solderable per MIL-STD-202, Method 208³
- Weight: 0.006 grams (approximate)



Device Schematic

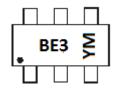
Ordering Information (Note 4)

| Product | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|--------------|------------|---------|--------------------|-----------------|-------------------|
| DT1446-04S-7 | Standard | BE3 | 7 | 8 | 3,000/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/quality/lead_free.html 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/products/packages.html.

Marking Information



BE3 = Product Type Marking Code YM = Date Code Marking Y = Year (ex: A = 2013) M = Month (ex: 9 = September)

Date Code Key

| Date Code Rey | | | | | | |
|---------------|------|------|------|------|------|------|
| Year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
| Code | Α | В | С | D | E | F |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | N | D |



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

| Characteristic | Symbol | Value | Unit | Conditions |
|---|----------------------|-------|------|--|
| Peak Pulse Current ,per IEC 61000-4-5 | I _{PP_I/O} | 4.7 | Α | I/O to V _{SS} , 8/20µs |
| Operating Voltage (DC) | V_{DC} | 6 | V | V _{CC} to V _{SS} |
| ESD Protection – Contact Discharge | V _{ESD_I/O} | ±16 | kV | I/O to V _{SS} , per IEC 61000-4-2 |
| LSD Flotection - Contact Discharge | $V_{ESD}V_{CC}$ | ±30 | kV | V _{CC} to V _{SS} , per IEC 61000-4-2 |
| ESD Protection – Air Discharge, per IEC 61000-4-2 | V _{ESD_I/O} | ±19 | kV | I/O to V _{SS} , per IEC 61000-4-2 |
| L3D Flotection – All Discharge, per IEC 61000-4-2 | $V_{ESD}V_{CC}$ | ±30 | kV | V _{CC} to V _{SS} , per IEC 61000-4-2 |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|------------|------|
| Power Dissipation Typical (Note 5) | P _D | 200 | mW |
| Thermal Resistance, Junction to Ambient Typical (Note 5) | R _{θJA} | 625 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to 150 | °C |

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

| Characteristic | Symbol | Min | Тур | Max | Unit | Test Conditions |
|---|---|-----|------|------|------|--|
| Reverse Working Voltage | VRWM | _ | _ | 5.0 | V | V _{CC} to V _{SS} |
| Reverse Current (Note 6) | I _{R(} V _{CC to} V _{SS)} | _ | _ | 5.0 | μA | $V_R = V_{RWM} = 5V$, V_{CC} to V_{SS} |
| Reverse Current (Note 6) | I _{R(IO to} V _{SS)} | _ | _ | 1.0 | μA | $V_R = V_{RWM} = 5V$, any I/O to V_{SS} |
| Reverse Breakdown Voltage | V _{BR} | 6.0 | _ | 9.0 | V | I _R = 1mA, V _{CC} to V _{SS} |
| Forward Clamping Voltage | V _F | | 0.8 | 1.0 | V | I _F = 15mA, V _{SS} to V _{CC} |
| Reverse Clamping Voltage (Note 7) | V _{C_I/O} | _ | 8.5 | _ | V | I _{PP} =4.7A, I/O to V _{SS} , 8/20μs |
| ESD Clamping Valtage | Vesd_Vcc | _ | 10 | _ | V | TLP, 20A, tp = 100ns, V _{CC} to V _{SS} |
| ESD Clamping Voltage | Vesd_i/o | _ | 12 | _ | V | TLP, 20A, tp = 100ns, I/O to V _{SS} |
| Dynamia Resistance | R _{DIF_} V _{CC} | _ | 0.14 | _ | Ω | TLP, 20A, tp = 100ns, V _{CC} to V _{SS} |
| Dynamic Resistance | R _{DIF_I/O} | _ | 0.3 | _ | Ω | TLP, 20A, tp = 100ns, I/O to V_{SS} |
| Channel Input Capacitance | C _{I/O to} V _{SS} | _ | 0.55 | 0.65 | pF | $V_R = 2.5V, V_{CC} = 5V, f = 1MHz$ |
| Channel Input Capacitance | C _{I/O to} V _{SS} | _ | 0.65 | _ | pF | V _R = 2.5V, V _{CC} = floating, f = 1MHz |
| Variation of Channel Input Capacitance | C _{I/OMAX} -C _{I/OMIN} | _ | 0.03 | _ | pF | $V_{CC} = 5V$, $V_{SS} = 0V$, $I/O = 2.5V$, $f = 1MHz$, $T = +25^{\circ}C$, $C_{I/OMAX} - C_{I/OMIN}$ |
| Variation of Channel Input Capacitance | C _{I/OMAX} -C _{I/OMIN} | _ | 0.05 | _ | pF | V_{CC} = floating , V_{SS} = 0V, I/O = 2.5V, f = 1MHz, T = +25°C , $C_{I/OMAX}$ - $C_{I/OMIN}$ |

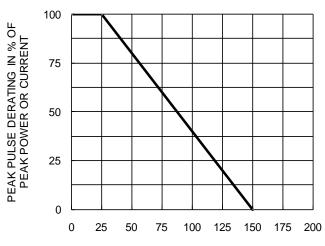
Notes:

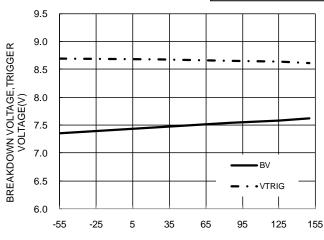
- 5. Device mounted on FR-4 PCB pad layout (2oz copper) as shown on Diodes, Inc. suggested pad layout AP02001, which can be found on our website at http://www.diodes.com.

 6. Short duration pulse test used to minimize self-heating effect.
- 7. Clamping voltage value is based on an $8x20\mu s$ peak pulse current (I_{pp}) waveform.



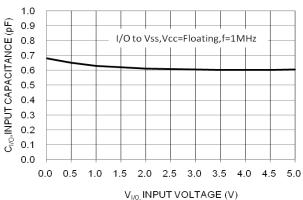
DT1446-04S

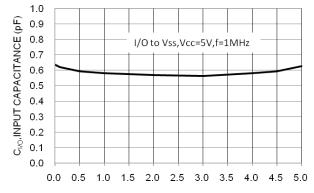




T_A, AMBIENT TEMPERATURE (°C) Figure 1. Pulse Derating Curve

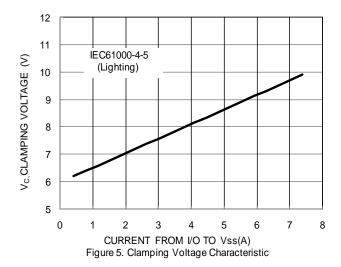
T_A, AMBIENT TEMPERATURE (°C) Figure 2. BV, Trigger Voltage vs. Ambient Temperature





V_{I/0,} INPUT VOLTAGE (V) Figure 3. Input Capacitance vs. Input Voltage

V_{I/O,} INPUT VOLTAGE (V) Figure 4. Input Capacitance vs. Input Voltage



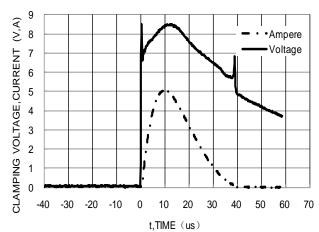


Figure 6. Waveform of Clamping Voltage, Current vs. Time(8/20us,I/O to Vss)



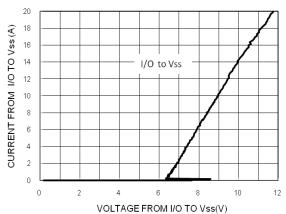
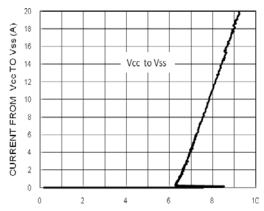


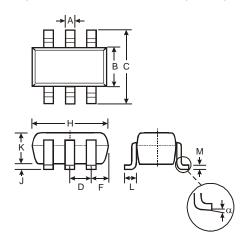
Figure 7. Transmission Line Pulsing (TLP) Measurement
Current vs. Voltage



VOLTAGE FROM Vcc TO Vss(V)
Figure 8. Transmission Line Pulsing (TLP) Measurement
Current vs. Voltage

Package Outline Dimensions

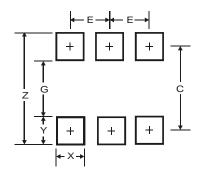
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



| SOT363 | | | | | | | |
|--------|----------------------|------|-------|--|--|--|--|
| Dim | Min | Max | Тур | | | | |
| Α | 0.10 | 0.30 | 0.25 | | | | |
| В | 1.15 | 1.35 | 1.30 | | | | |
| ပ | 2.00 | 2.20 | 2.10 | | | | |
| D | 0.65 Typ | | | | | | |
| F | 0.40 | 0.45 | 0.425 | | | | |
| H | 1.80 | 2.20 | 2.15 | | | | |
| J | 0 | 0.10 | 0.05 | | | | |
| K | 0.90 | 1.00 | 1.00 | | | | |
| L | 0.25 | 0.40 | 0.30 | | | | |
| M | 0.10 | 0.22 | 0.11 | | | | |
| α | 0° | 8° | - | | | | |
| All | 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 | 2.5 |
| G | 1.3 |
| Х | 0.42 |
| Y | 0.6 |
| С | 1.9 |
| E | 0.65 |



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