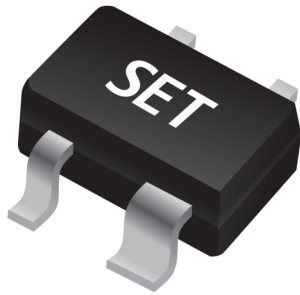


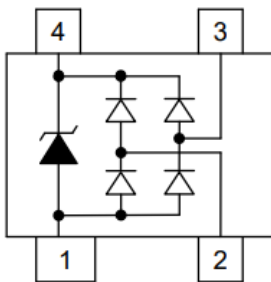
# ESD Protection Diodes

Ultra-Low Capacitance ESD and Transient Voltage Protection Diodes Array

SD0505T43U SOT143



## Pinout and Functional Block Diagram



PIN1– GND  
 PIN2– I/O  
 PIN3– I/O  
 PIN4– V<sub>BUS</sub>

## Description

SD0505T43U provides a typical line to line capacitance of 0.6 pF and low insertion loss up to 3 GHz providing greater signal integrity making it ideally suited for USB 2.0 applications, such as Digital TVs, DVD players, Computing, set-top boxes and MDDI applications in mobile computing devices.

This device has been specifically designed to protect sensitive components which are connected to high-speed data and transmission lines from overvoltage caused by ESD (electrostatic discharge), CDE (Cable Discharge Events), and EFT (electrical fast transients).

## Features

- Protects Two I/O Lines and One Vcc Line
- IEC61000-4-2 (ESD) ± 15 kV (Air), ± 8 kV (Contact)
- No Insertion to 3.0 GHz
- Peak Power Dissipation: 125 W@8 / 20 μs
- Low Clamping Voltage
- Low Leakage Current
- Response Time < 1 ns
- High Temperature to Reflow Soldering Guaranteed: 260 °C / 10 sec
- Device Meets MSL 1 Requirements
- Flammability Rating: UL 94 V-0
- Halogen Free and RoHS Compliant

## Applications

- xDSL
- USB 1.1/2.0/OTG
- IEEE 1394 Firewire Ports
- Notebooks & Handhelds
- Projection TV & Monitors
- Set-top box
- Flat Panel Displays

## Order Information

| Type       | Package | Marking Code | Delivery Form | Delivery Quantity |
|------------|---------|--------------|---------------|-------------------|
| SD0505T43U | SOT-143 | SL3 or R05   | 7" T&R        | 3000 PCS          |

## Limiting Values

(T<sub>A</sub> = 25 °C, unless otherwise specified)

| Symbol           | Parameter                       | Conditions                       | Min | Max | Unit |
|------------------|---------------------------------|----------------------------------|-----|-----|------|
| V <sub>ESD</sub> | Electrostatic Discharge Voltage | IEC 61000-4-2; Contact Discharge | -   | 8   | kV   |
|                  |                                 | IEC 61000-4-2; Air Discharge     | -   | 15  | kV   |
| P <sub>PP</sub>  | Peak Pulse Power (8 / 20 μs)    | -                                | -   | 125 | W    |
| T <sub>A</sub>   | Operating Temperature Range     | -                                | -55 | 150 | °C   |
| T <sub>stg</sub> | Storage Temperature Range       | -                                | -55 | 150 | °C   |

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## Electrical Characteristics

( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

| Symbol    | Parameter                 | Conditions  | Min | Typ  | Max  | Unit          |
|-----------|---------------------------|---|-----|------|------|---------------|
| $V_{RWM}$ | Reverse Working Voltage   | Any I/O pin to GND  | -   | -    | 5.0  | V             |
| $V_{BR}$  | Reverse Breakdown Voltage | $I_T = 1\text{ mA}$<br>Any I/O pin to GND                                       | 6.0 | -    | -    | V             |
| $I_R$     | Reverse Leakage Current   | $V_{RWM} = 5\text{ V}$<br>Any I/O pin to GND                                    | -   | -    | 1.0  | $\mu\text{A}$ |
| $V_F$     | Diode Forward Voltage     | $I_F = 15\text{ mA}$  | -   | 0.85 | 1.2  | V             |
| $V_{C1}$  | Clamping Voltage1         | $I_{PP} = 1\text{ A}$ , $t_p = 8 / 20\text{ }\mu\text{s}$<br>Any I/O pin to GND | -   | -    | 15.5 | V             |
| $V_{C2}$  | Clamping Voltage2         | $I_{PP} = 5\text{ A}$ , $t_p = 8 / 20\text{ }\mu\text{s}$<br>Any I/O pin to GND | -   | -    | 25   | V             |
| $I_{PP}$  | Peak Pulse Current        | $t_p = 8 / 20\text{ }\mu\text{s}$<br>Any I/O pin to GND                         | -   | -    | 5    | A             |
| $C_{J1}$  | Junction Capacitance1     | $V_R = 0\text{ V}$ , Measured at 1 MHz<br>Between I/O pins                      | -   | 0.45 | 0.6  | pF            |
| $C_{J2}$  | Junction Capacitance2     | $V_R = 0\text{ V}$ , Measured at 1 MHz<br>Any I/O pin to GND                    | -   | 0.9  | 1.2  | pF            |

Note: I/O pins are pin2,3.

## Performance Curve for Reference

( $T_A=25\text{ }^\circ\text{C}$  unless otherwise noted)

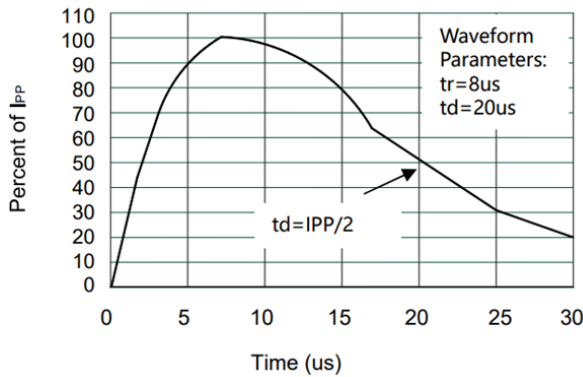


FIGURE 1  
Pulse Waveform

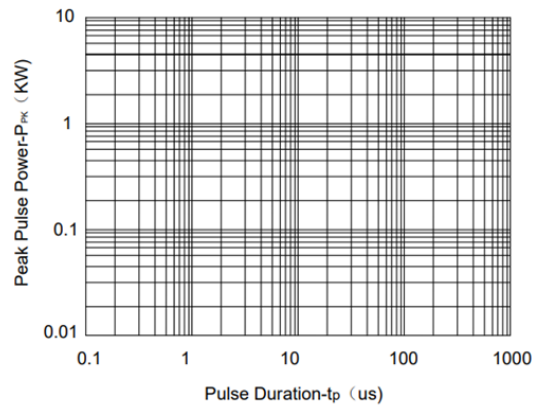


FIGURE 2  
Non-Repetitive Peak Pulse Power VS. Pulse Time

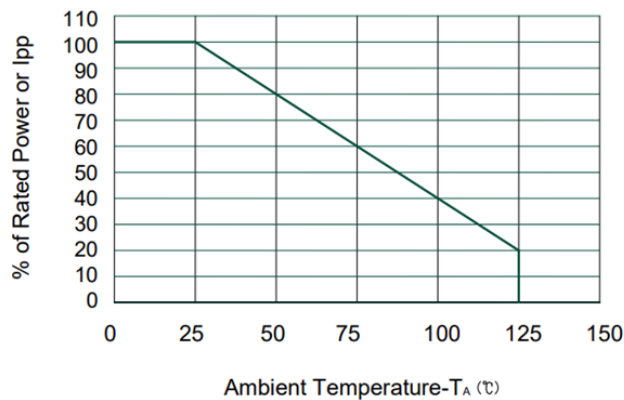


FIGURE 3  
Power Derating Curve

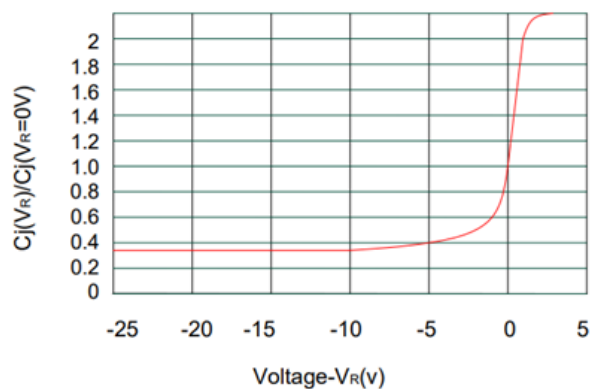


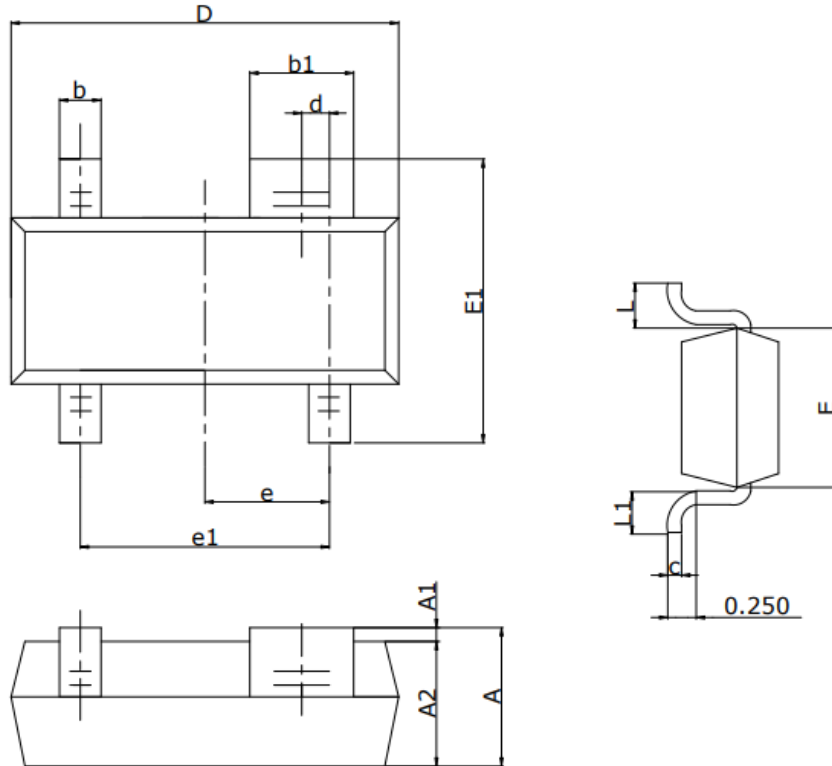
FIGURE 4  
Junction Capacitance VS. Reverse Voltage

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SD0505T43U SOT143

## Package Dimensions - SOT-143



SOT-143

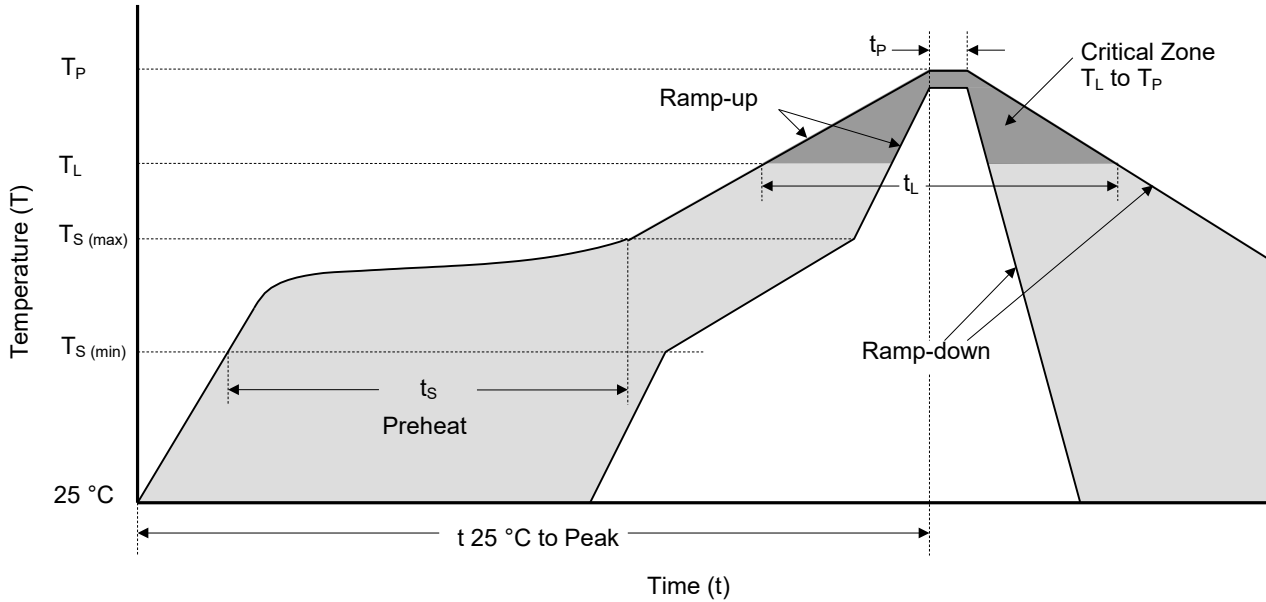
| Symbol | Millimeters |      | Inches    |       |
|--------|-------------|------|-----------|-------|
|        | Min.        | Max. | Min.      | Max.  |
| A      | 0.90        | 1.15 | 0.035     | 0.045 |
| A1     | 0.00        | 0.10 | 0.000     | 0.004 |
| A2     | 0.90        | 1.05 | 0.035     | 0.041 |
| b      | 0.30        | 0.50 | 0.012     | 0.020 |
| b1     | 0.75        | 0.90 | 0.030     | 0.035 |
| c      | 0.08        | 0.15 | 0.003     | 0.006 |
| D      | 2.80        | 3.00 | 0.110     | 0.118 |
| d      | 0.20 TYP    |      | 0.008 TYP |       |
| E      | 1.20        | 1.40 | 0.047     | 0.055 |
| E1     | 2.25        | 2.55 | 0.089     | 0.100 |
| e      | 0.95 TYP    |      | 0.037 TYP |       |
| e1     | 1.80        | 2.00 | 0.071     | 0.079 |
| L      | 0.55 REF    |      | 0.022 REF |       |
| L1     | 0.30        | 0.50 | 0.012     | 0.020 |

# ESD Protection Diodes

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## Soldering Parameters



Reflowing Condition

| Reflow Soldering Parameters                              |                                   | Lead-Free Assembly      |
|--|-----------------------------------|-------------------------|
| Pre-heat   | Temperature Min ( $T_{S (min)}$ ) | 150 °C                  |
|  | Temperature Max ( $T_{S (max)}$ ) | 200 °C                  |
|  | Time (min to max) ( $t_s$ )       | 60 ~ 120 seconds        |
| Average Ramp Up Rate (Liquidus Temp ( $T_L$ ) to Peak)   |                                   | 3 °C / second max.      |
| $T_S (max)$ to $T_L$ Ramp-up Rate                        |                                   | 3 °C / second max.      |
| Reflow   | Temperature ( $T_L$ ) (Liquidus)  | 217 °C                  |
|  | Time (min to max) ( $t_L$ )       | 60 ~ 150 seconds        |
| Peak Temperature ( $T_P$ )                               |                                   | 260 <sup>+0/-5</sup> °C |
| Time of within 5 °C of Actual Peak Temperature ( $t_p$ ) |                                   | 20 ~ 40 seconds         |
| Ramp-down Rate   |                                   | 6 °C / second max.      |
| Time from 25 °C to Peak Temperature                      |                                   | 8 Minutes max.          |
| Do Not Exceed  |                                   | 260 °C                  |



# ATTENTION

## Usage

1. TVS must be operated in the specified ambient temp.
2. Do not clean the TVS with strong polar solvent such as ketone, esters, benzene and halogenated hydrocarbon, to avoid damaging the encapsulating layer.
3. Please do not apply severe vibration, shock or pressure to TVS, to avoid element cracking.

## Replacement

1. If TVS is visually damaged, please replace it.
2. TVS is a non-repairable product. For safety sake, please use equivalent TVS for replacement.

## Storage

1. Storage Temp. Range: (-55 to 150) °C.
2. Do not store the TVS at the high temp., high humidity or corrosive gas environment, to avoid influencing the solder- ability of the lead wires. The product shall be used up within 1 year after receiving the goods.

## Environmental Conditions

1. TVS should not be exposed to the open air, nor direct sunshine.
2. TVS should avoid rain, water vapor or other condition of high temp. and high humidity.
3. TVS should avoid sand dust, salt mist, or other harmful gases.

## Max. Typical Capacitance of TVS

1. The typical capacitance of TVS is listed in the specifications. Designers may refer to it when designing TVS in High frequency circuit.

## Installation Mechanical Stress

1. Do not knock TVS when installing, to avoid mechanical damage.
2. Please do not apply severe vibration, shock or pressure to TVS, to avoid surface resin or element cracking.