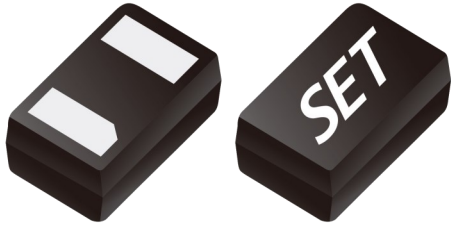


# ESD Protection Diodes

Ultra-Low Capacitance ESD and Transient Voltage Protection

SD0504F06U

DFN0603



## Description

SD0504F06U is a low-capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.25 pF, SD0504F06U is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 ( $\pm 15$  kV air,  $\pm 8$  kV contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40 A, 5 / 50 ns), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

## Pinout and Functional Block Diagram



SD0504F06U uses ultra-small DFN0603 package. Each SD0504F06U device can protect one high-speed data line. It offers system designers flexibility to protect single data line where space is a premium concern. The combined features of low capacitance, ultra-small size and high ESD robustness make SD0504F06U ideal for high-speed data port and high-frequency line applications, such as cellular phones and HD visual devices.

## Applications

- Serial and Parallel Ports
- Notebooks, Desktops, Servers
- MDDI Ports
- Cellular handsets and accessories
- USB Data Line Protection
- Display Ports
- Digital Visual Interfaces (DVI)

## Features

- IEC61000-4-2 (ESD)  $\pm 15$  kV (Air),  $\pm 8$  kV (Contact)
- IEC61000-4-4 (EFT) 40 A (5 / 50 ns)
- Cable Discharge Event (CDE)
- Package Optimized for High-speed Lines
- Ultra-small Package (0.6 mm × 0.3 mm × 0.3 mm)
- Protects One Data, Control Line
- Low Capacitance: 0.25 pF (Typical)
- Low Leakage Current
- Low Clamping Voltage
- Flammability Rating: UL 94 V-0
- Halogen Free and RoHS Compliant

## Order Information

Type	Package	Marking	Size (mm)	Delivery Form	Delivery Quantity
SD0504F06U	DFN 0603	5BU	0.6 × 0.3 × 0.3	7" T&R	15000 PCS

## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{ESD}$	Electrostatic Discharge Voltage	IEC 61000-4-2; Contact Discharge	-	20	kV
		IEC 61000-4-2; Air Discharge	-	20	kV
$P_{PP}$	Peak Pulse Power (8 / 20 $\mu\text{s}$ )	-	-	100	W
$T_A$	Operating Temperature Range	-	-55	125	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-	-55	150	$^\circ\text{C}$

## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
$V_{RWM}$	Max. Reverse Working Voltage	$T_A = 25\text{ }^\circ\text{C}$	-	-	5.5	V
$V_{BR}$	Breakdown Voltage	$I_R = 1\text{ mA}$ ; $T_A = 25\text{ }^\circ\text{C}$	6	-	-	V
$I_R$	Reverse Leakage Current	$V_{RWM} = 5\text{ V}$ ; $T_A = 25\text{ }^\circ\text{C}$	-	-	0.1	$\mu\text{A}$
$V_C$	Clamping Voltage	$I_{PP}=1\text{ A}$ , $t_p=8 / 20\text{ }\mu\text{s}$	-	-	13	V
		$I_{PP}=4.0\text{ A}$ , $t_p=8 / 20\text{ }\mu\text{s}$	-	-	25	V
$C_J$	Junction Capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	-	0.25	-	pF

## Performance Curve for Reference

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

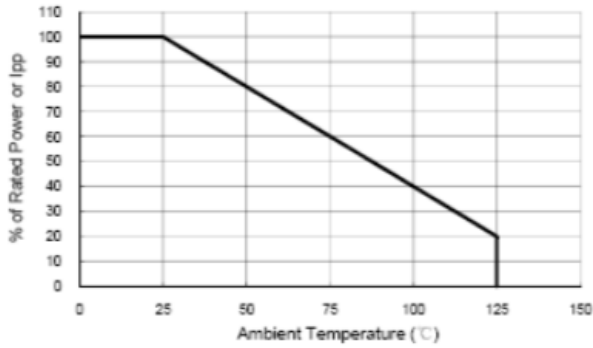


FIGURE 1  
Power Derating Curve

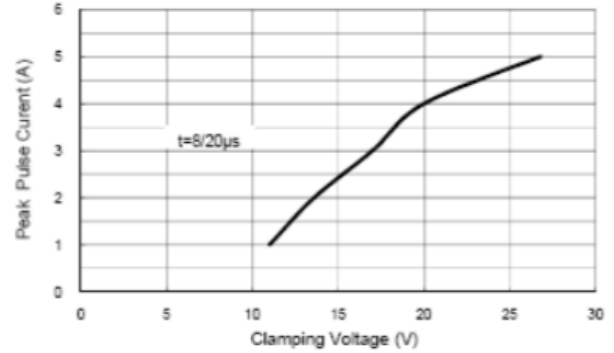


FIGURE 2  
Clamping Voltage VS. Peak Pulse Current

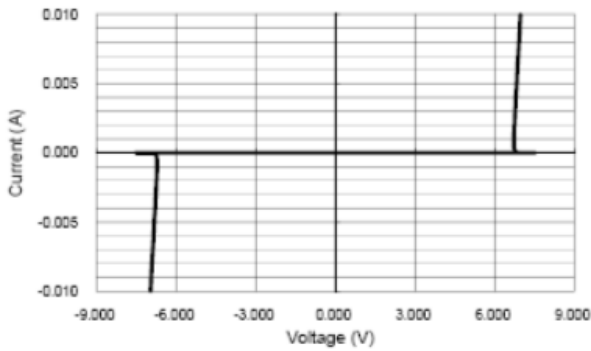


FIGURE 3  
Voltage Sweeping

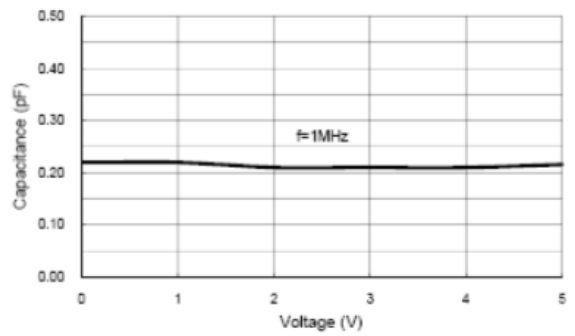


FIGURE 4  
Voltage VS. Capacitance

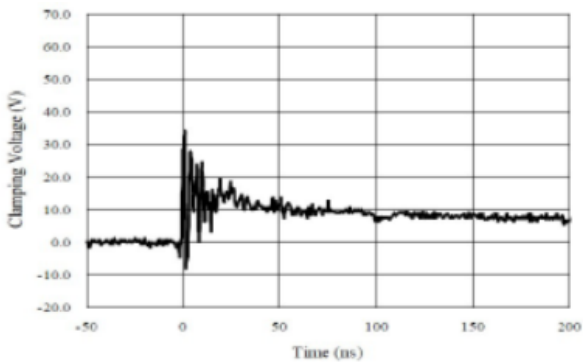


FIGURE 5  
ESD Clamping  
(+8 kV Contact Per IEC 61000-4-2)

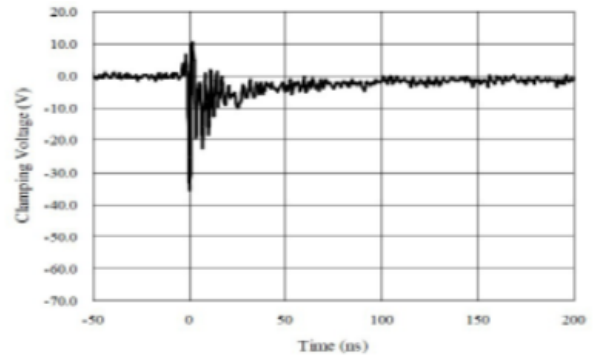


FIGURE 6  
ESD Clamping  
(-8 kV Contact Per IEC 61000-4-2)

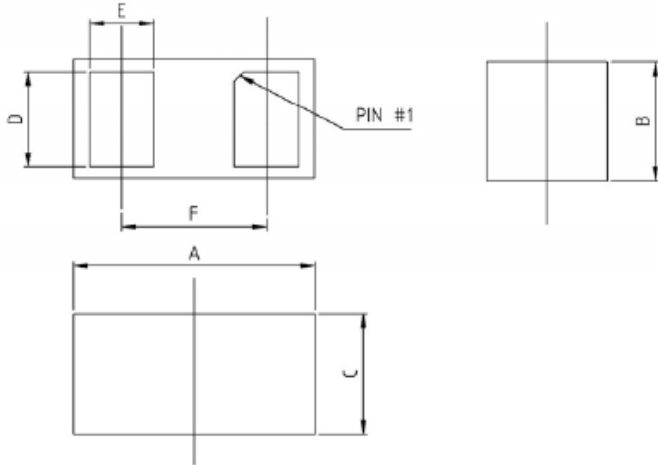
# ESD Protection Diodes

Ultra-Low Capacitance ESD and Transient Voltage Protection

SD0504F06U

DFN0603

## Package Dimensions –DFN0603

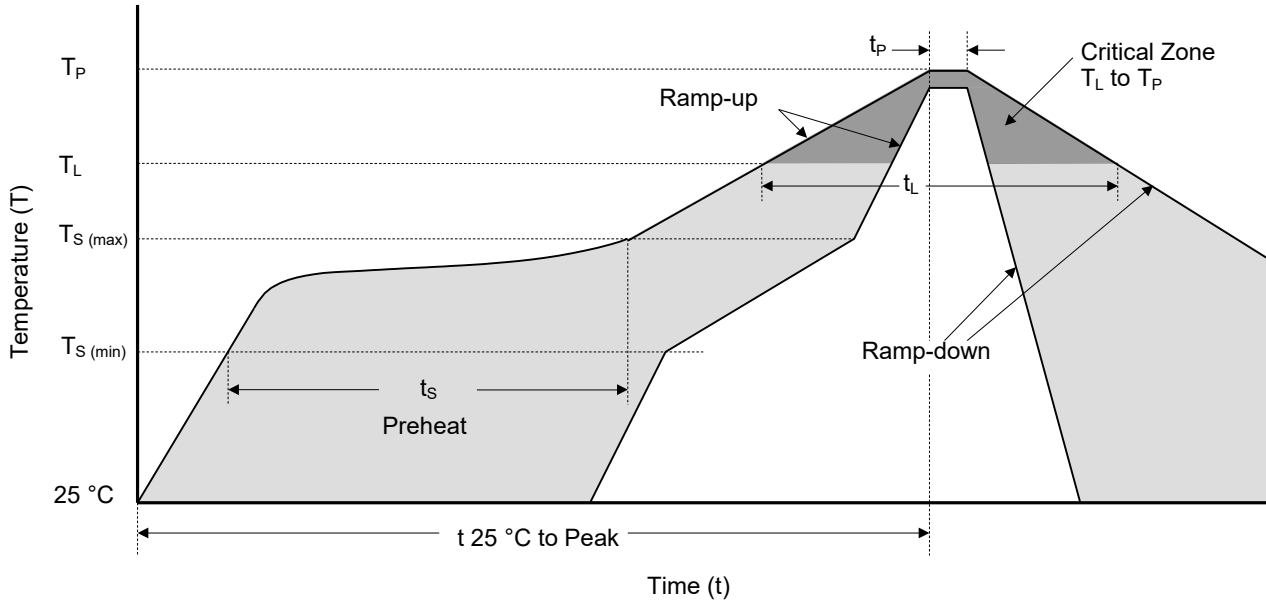


Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.58	0.65	0.023	0.026
B	0.28	0.35	0.011	0.014
C	0.28	0.34	0.011	0.013
D	0.20	0.26	0.008	0.010
E	0.13	0.19	0.005	0.007
F	-	0.36	-	0.014

ESD TVS

ESD TVS

## 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.