

### Features

- Protects four I/O lines and one Vcc line
- Low capacitance
- Working voltages : 5V
- Low leakage current
- Response Time is < 1 ns
- Low capacitance (<1.2pF) for high-speed interfaces
- No insertion loss to 3.0GHz
- Solid-state silicon avalanche technology
- Meets MSL 1 Requirements
- IEC61000-4-2 (ESD) ±15kV (air), ±8kV (contact)
- IEC61000-4-4 (EFT) 40A (5/50ns)
- IEC61000-4-5 (Lightning) 5A (8/20µs)

### Mechanical Characteristics

- Package: DFN1616-6
- Lead Finish: Lead Free
- UL Flammability Classification Rating 94V-0



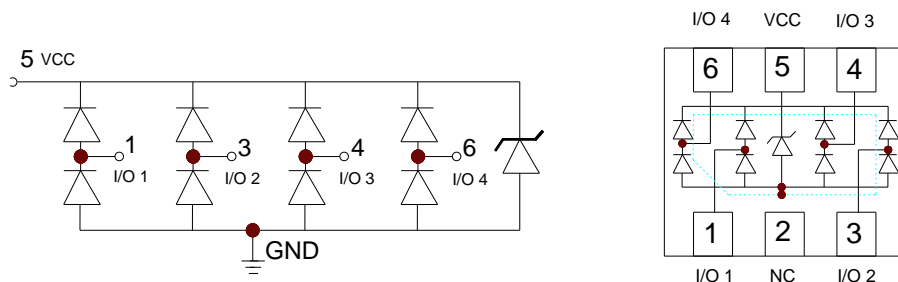
### Applications

- Digital Visual Interface (DVI)
- 10/100/1000 Ethernet
- USB 1.1/2.0/OTG
- IEEE 1394 Firewire Ports
- Projection TV Monitors and Flat Panel Displays
- Notebook Computers
- Set Top Box
- Projection TV

### Ordering Information

Part Number	Qty per Reel	Reel Size
TPESD0504P	3000	7"

### Dimensions and Pin Configuration



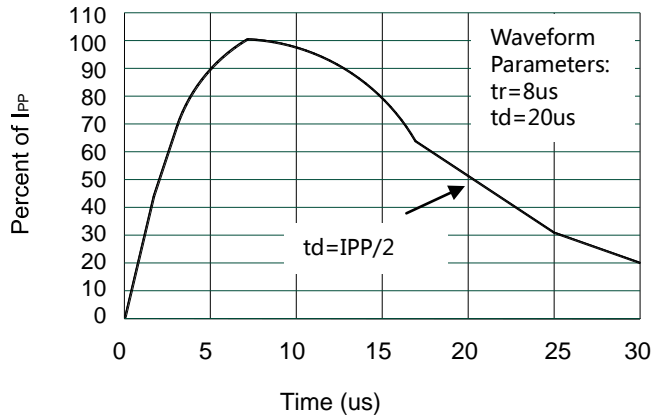
### Absolute Maximum Ratings (Tamb=25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Peak Pulse Power (tp=8/20μs waveform)	P <sub>PPP</sub>	150	Watts
Peak Pulse Current(tp=8/20μs waveform)	I <sub>PP</sub>	5	A
ESD Rating per IEC61000-4-2:	Contact	8	KV
	Air	15	
Lead Soldering Temperature	T <sub>L</sub>	260 (10 sec.)	°C
Operating Temperature Range	T <sub>J</sub>	-55 ~ 150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 ~ 150	°C

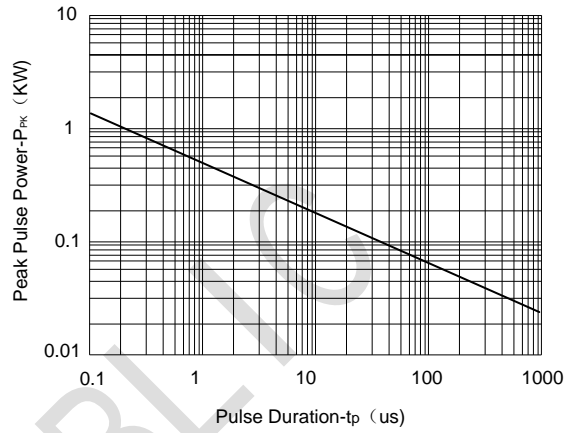
### Electrical Characteristics (TA=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V <sub>RWM</sub>	Reverse Working Voltage	Any I/O to Ground			5.0	V
V <sub>BR</sub>	Reverse Breakdown Voltage	I <sub>T</sub> = 1mA, Any I/O to Ground	6.0			V
I <sub>R</sub>	Reverse Leakage Current	V <sub>RWM</sub> = 5V, Any I/O to Ground			1	μA
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 15mA		0.85	1.2	V
V <sub>C</sub>	Clamping Voltage	I <sub>PP</sub> = 1A, tp = 8/20μs, any I/O pin to Ground			15.5	V
		I <sub>PP</sub> = 5A, tp = 8/20μs, any I/O pin to Ground			30	V
I <sub>PP</sub>	Peak Pulse Current	tp = 8/20μs			5	A
C <sub>J</sub>	Junction Capacitance	V <sub>R</sub> = 0V, f = 1MHz, between I/O pins		0.6	0.8	pF
		V <sub>R</sub> = 0V, f = 1MHz, any I/O pin to Ground		1.0	1.2	pF

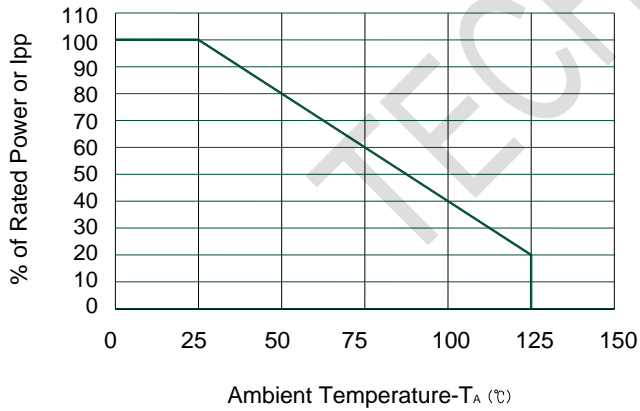
### Typical Performance Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise Specified)



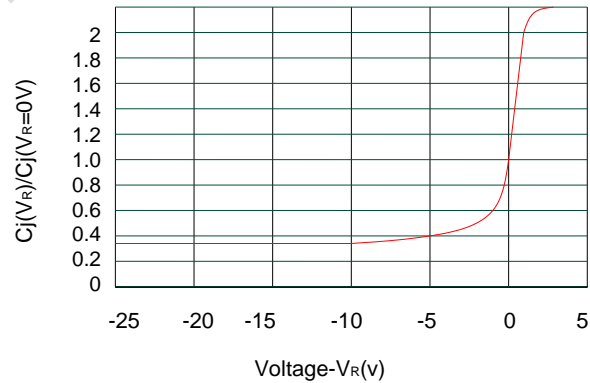
Pulse Waveform



Non-Repetitive Peak Pulse Power vs. Pulse Time

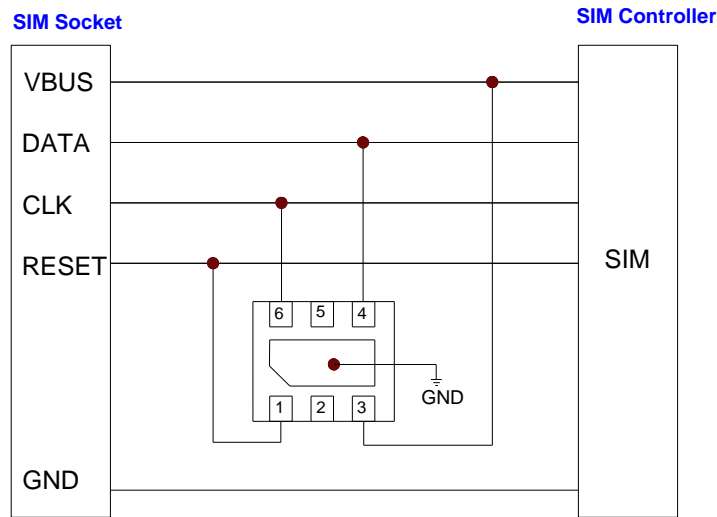


Power Derating Curve



Junction Capacitance vs. Reverse Voltage

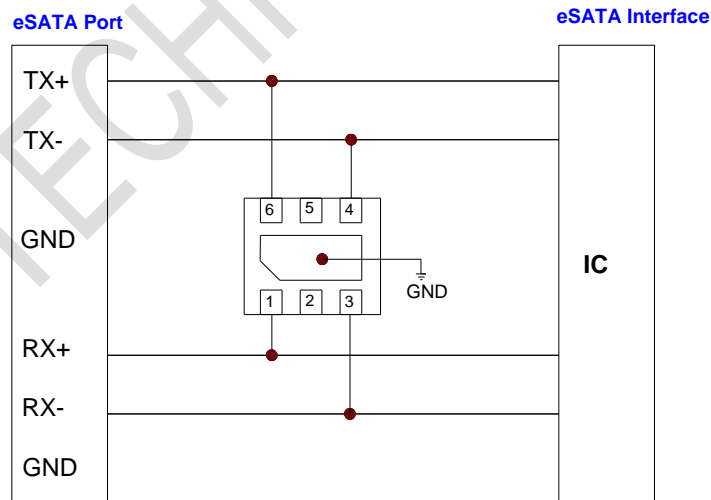
## Typical applications



**SIM protected solution**

### Considerations:

- The SIM (Subscriber Identification Module) card has 3 data lines that are low-speed and low-voltage
  - Given the low speed of the signals, the capacitance will not be a concern
- The low-voltage signal lines are best protected by a device which has a low standoff voltage or  $V_{RWM}$
- Protection of the 3 data lines is shown below (i.e. CLK, DATA, and RESET)

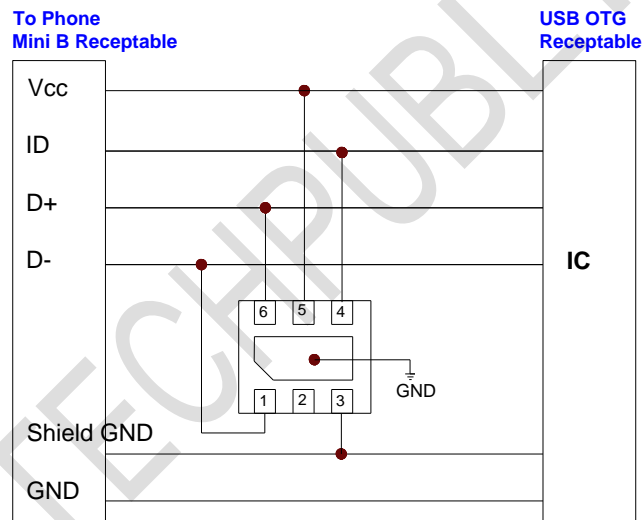
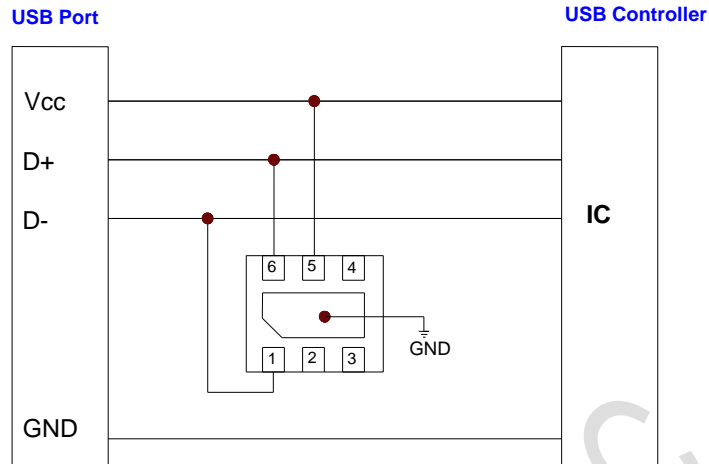


### Considerations:

- eSATA is a subset of the SATA protocol that uses 2 differential pairs for communication
  - Four lines need to be protected per port (i.e.  $TX_{\pm}$  and  $RX_{\pm}$ )
  - Currently eSATA is capable of running raw data rates of 1.5Gbps (Gen 1) and 3.0Gbps (Gen 2)
- These high bus speeds require very low capacitance devices to prevent signal degradation
- To maintain the line impedance the designer should avoid using 90° angles and vias

## Typical applications

### USB2.0 Protection



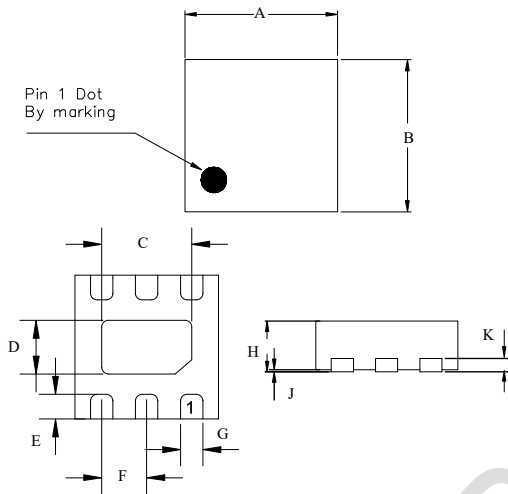
### USB OTG CarKit Protection

#### Considerations:

- Each port can operate up to 480Mbps
  - The high data rate requires a low capacitance device to preserve signal integrity
- Requires 2 channels of data line protection per port (i.e. D $\pm$ )
  - A 4 channel device can be useful if protecting a USB stack of 2 ports to make the ESD footprint as small as possible
  - VBUS can be protected by connecting it to the VCC pin on the diode array or by using a separate single channel device as previously shown

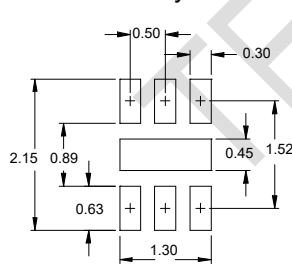
**Outline Drawing - DFN1616-6**

**DFN1616-6**



DIM	DIMENSIONS				NOTE
	INCHES		MM		
A	0.061	0.065	1.55	1.65	
B	0.061	0.065	1.55	1.65	
C	0.035	0.041	0.90	1.05	
D	0.020	0.026	0.50	0.65	
E	0.008	0.012	0.20	0.30	
F	0.020 REF.		0.50 REF.		
G	0.008	0.026	0.20	0.30	
H	0.020	0.024	0.50	0.60	
J	0.000	0.002	0.00	0.05	
K	0.006 REF.		0.15 REF.		

**Suggested Solder Pad Layout**



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