

## ECELCAE5VU

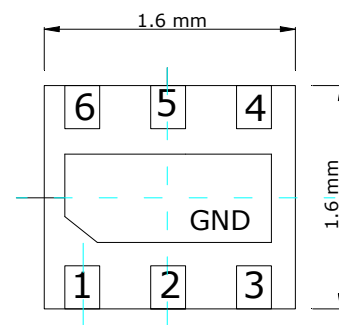
### Ultra Low Capacitance Array for ESD Protection

The ECELCAE5VU provides a typical line to line capacitance of 0.6pF and low insertion loss up to 3GHz providing greater signal integrity making it ideally suited for USB 2.0 applications, such as Digital TVs, DVD players, Computer, set-top boxes and MDDI applications in mobile computing devices.

It 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 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
- ROHS compliant



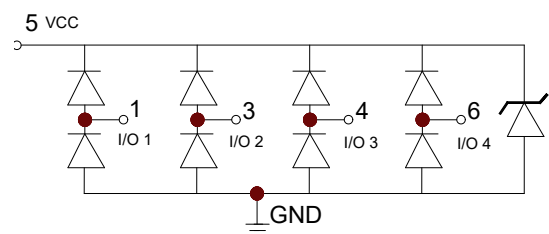
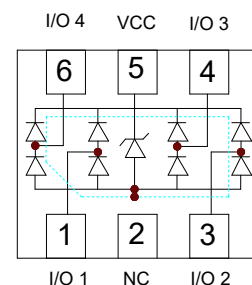
**DFN1616-6L**

### Main 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

### Protection solution to meet

- IEC61000-4-2 (ESD) ±15kV (air), ±8kV (contact)
- IEC61000-4-4 (EFT) 40A (5/50ns)
- IEC61000-4-5 (Lightning) 5A (8/20µs)



### Ordering Information

Device	Qty per Reel	Reel Size
ECELCAE5VU	3000	7 Inch

<b>Maximum ratings (Tamb=25°C Unless Otherwise Specified)</b>			
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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

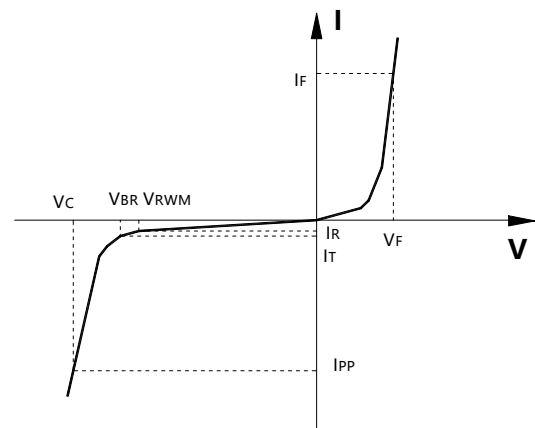
\*Other voltages may be available upon request.

1. Non-repetitive current pulse, per Figure 1.

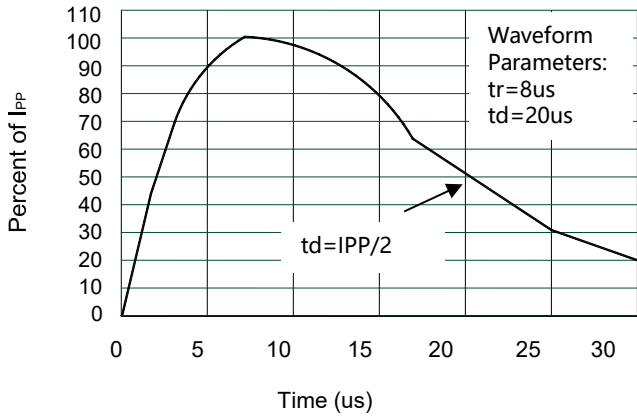
<b>Electrical characteristics (Tamb=25°C Unless Otherwise Specified)</b>						
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V <sub>RWM</sub>	Reverse Working Voltage	Any I/O to Ground			5.0	V
V <sub>BR</sub>	Reverse Breakdown Voltage	I <sub>T</sub> = 1mA, Any I/O to Ground	6.0			V
I <sub>R</sub>	Reverse 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

Junction capacitance is measured in V<sub>R</sub>=0V, F=1MHz

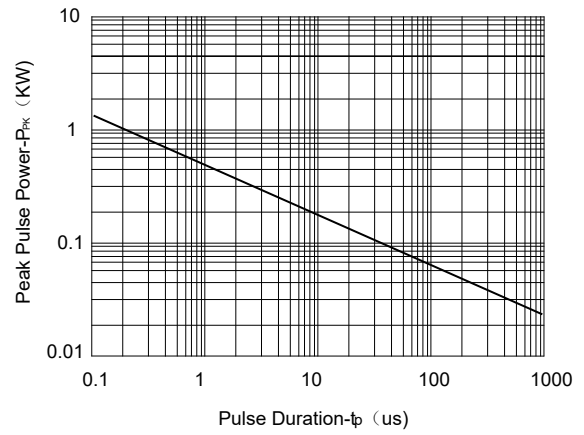
Symbol	Parameter
V <sub>RWM</sub>	Working Peak Reverse Voltage
V <sub>BR</sub>	Breakdown Voltage @ I <sub>T</sub>
V <sub>C</sub>	Clamping Voltage @ I <sub>PP</sub>
I <sub>T</sub>	Test Current
I <sub>RM</sub>	Leakage current at V <sub>RWM</sub>
I <sub>PP</sub>	Peak pulse current
C <sub>O</sub>	Off-state Capacitance
C <sub>J</sub>	Junction Capacitance



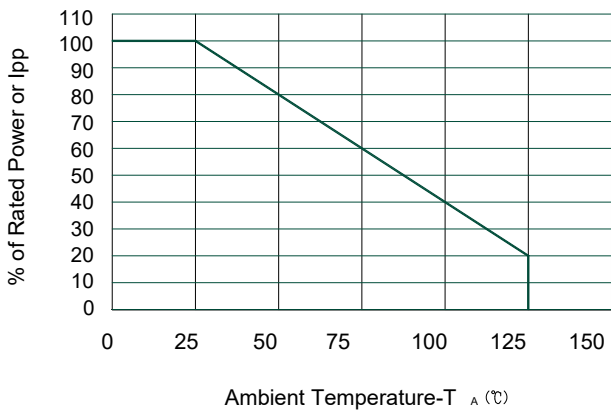
**Typical electrical characterist applications**



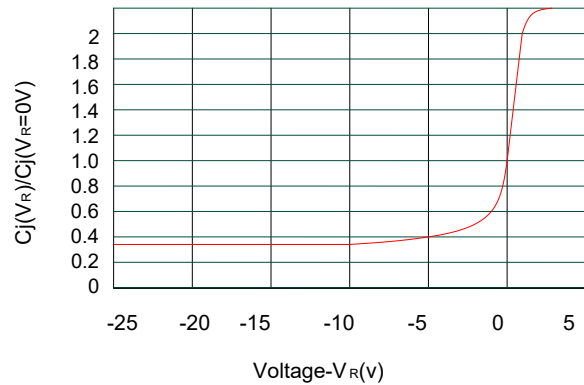
**Pulse Waveform**



**Non-Repetitive Peak Pulse Power vs. Pulse Time**

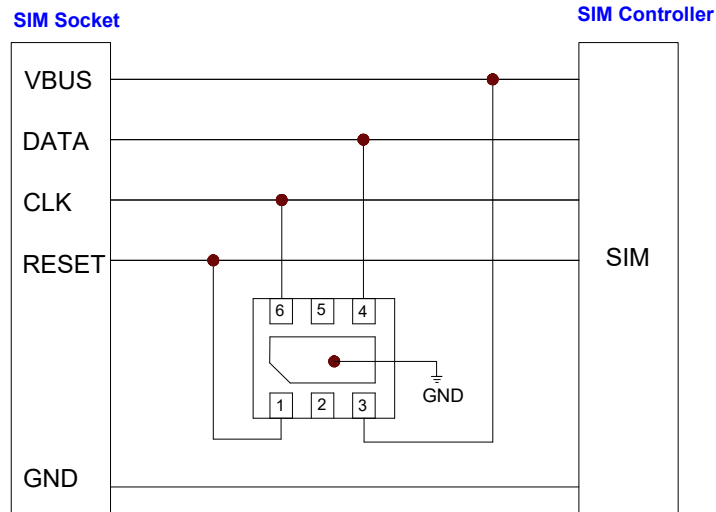


**Power Derating Curve**



**Junction Capacitance vs. Reverse Voltage**

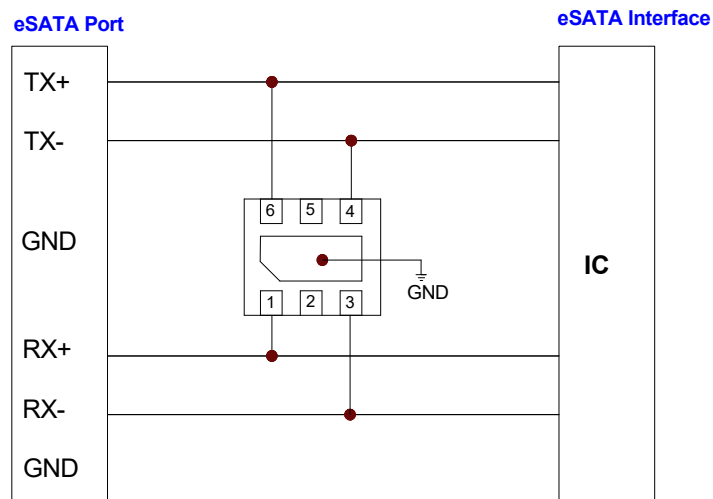
**Typical applications**



**SIM protected solution**

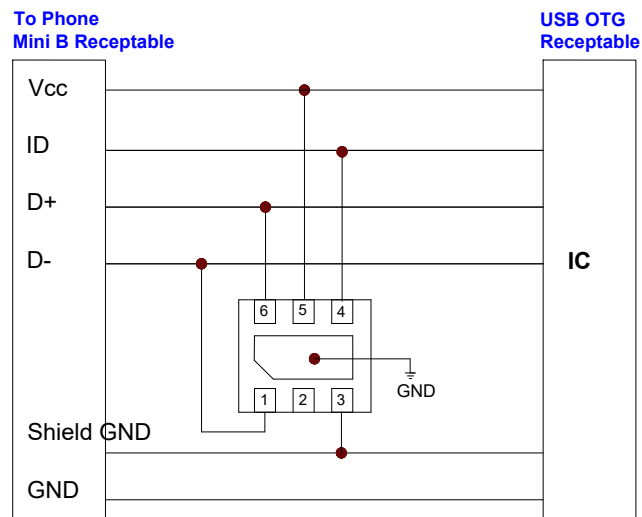
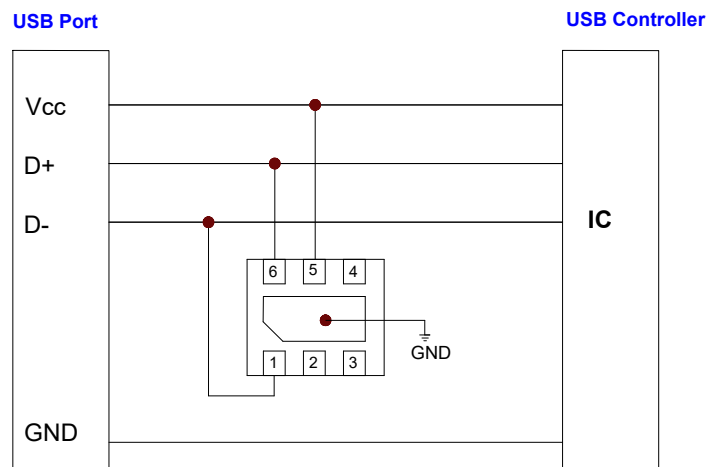
**Considerations:**

- 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±)
  - 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

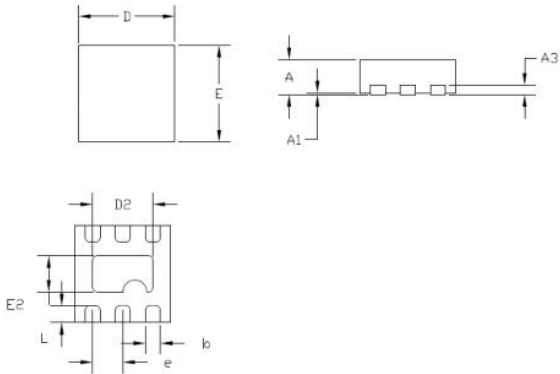
**Package Information**

**DFN1616-6L**

**Mechanical Data**

Case:DFN1616-6L

Case Material: Molded Plastic. UL Flammability



DIM	Millimeters		Inches	
	Min	Max	Min	Max
<b>A</b>	0.5	0.60	0.020	0.024
<b>A1</b>		0.05		0.002
<b>A3</b>	0.15REF		0.006REF	
<b>b</b>	0.20	0.30	0.008	0.012
<b>D</b>	1.55	1.65	0.061	0.065
<b>E</b>	1.55	1.65	0.061	0.065
<b>E2</b>	0.50	0.7	0.020	0.027
<b>D2</b>	0.90	1.10	0.035	0.043
<b>e</b>	0.50BSC		0.020BSC	
<b>L</b>	0.164	0.316	0.006	0.012

**Recommended Pad outline**

