Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P_{pk}	50	Watts
Peak Pulse Current (tp = 8/20μs)	I_{PP}	3	A
ESD per IEC 61000-4-2 (Air) [1] ESD per IEC 61000-4-2 (Contact)	V_{ESD}	±20 ±15	kV
Operating Temperature	T_J	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

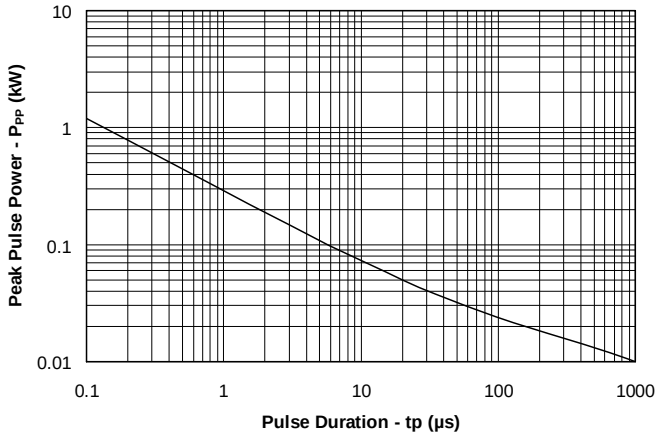
Note 1: Between any I/O and GND

Electrical Characteristics (T=25°C)

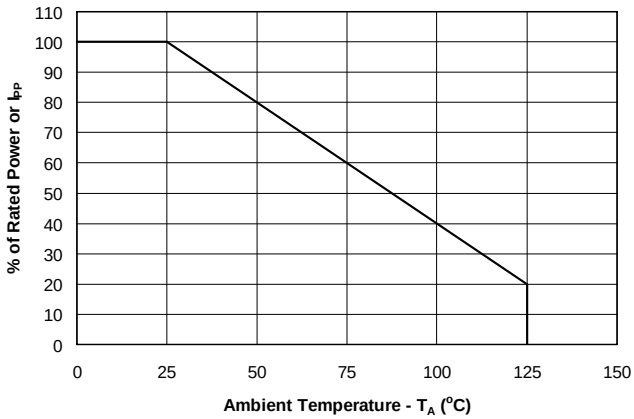
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}	Between I/O lines to Gnd or I/O to I/O			5	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA Between I/O lines to Gnd	6			V
Reverse Leakage Current	I_R	V_{RWM} = 5V, T=25°C Between I/O lines to Gnd or I/O to I/O			1	μA
Clamping Voltage	V_C	I_{PP} = 1A, tp = 8/20μs Between I/O lines to Gnd			14	V
Clamping Voltage	V_C	I_{PP} = 3A, tp = 8/20μs Between I/O to Gnd			16	V
Clamping Voltage	V_C	I_{PP} = 3A, tp = 8/20μs Between I/O to I/O			18	V
Junction Capacitance	C_j	V_R = 0V, f = 1MHz Between I/O to Gnd			0.9	pF
Junction Capacitance	C_j	V_R = 0V, f = 1MHz Between I/O to I/O		0.3	0.7	pF

Typical Characteristics

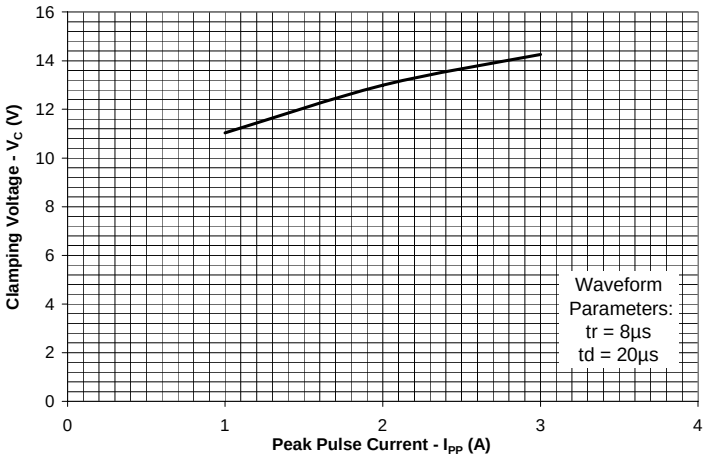
Non-Repetitive Peak Pulse Power vs. Pulse Time



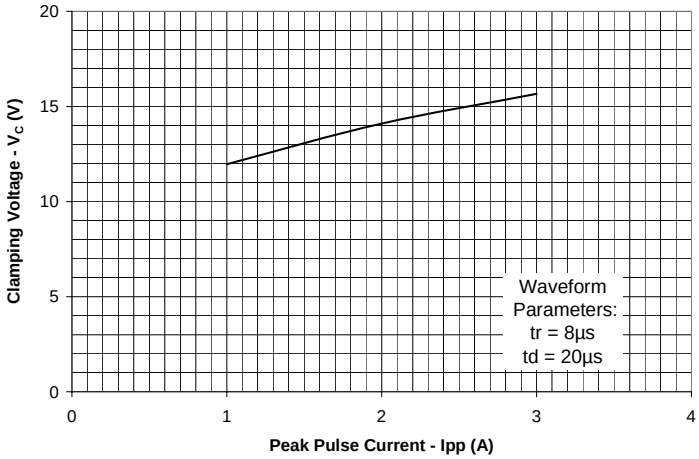
Power Derating Curve



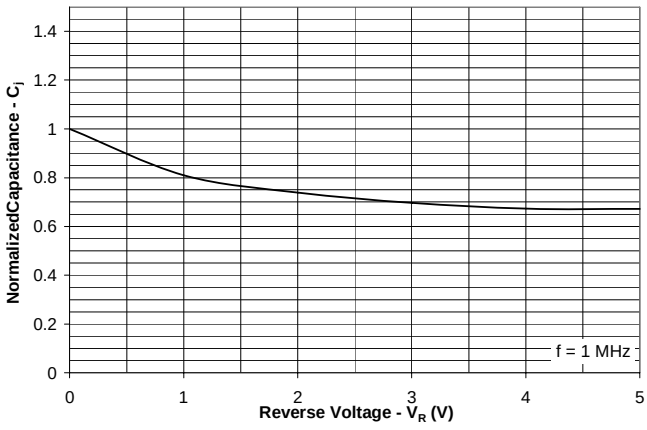
Clamping Voltage vs. Peak Pulse Current I/O to Gnd - Pin 1, 3, 4, 6 to Pin 2



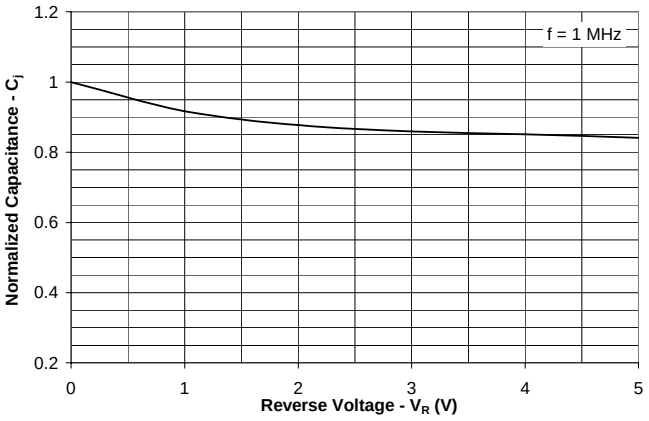
Clamping Voltage vs. Peak Pulse Current I/O to I/O



Normalized Capacitance vs. Reverse Voltage I/O to Gnd - Pin 1, 3, 4, or 6 to Pin 2

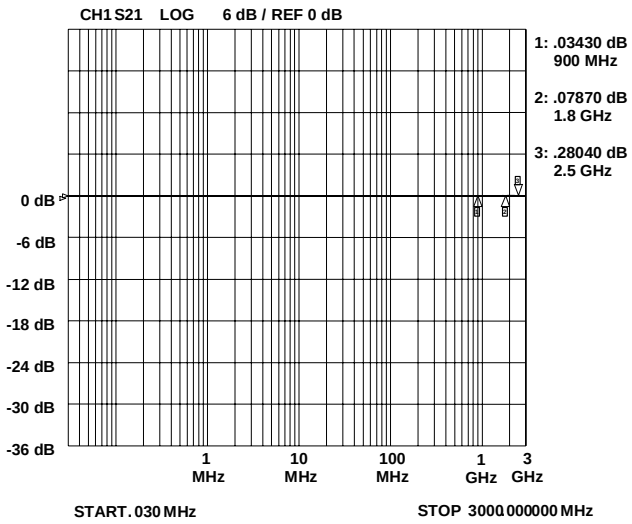


Normalized Capacitance vs. Reverse Voltage I/O to I/O

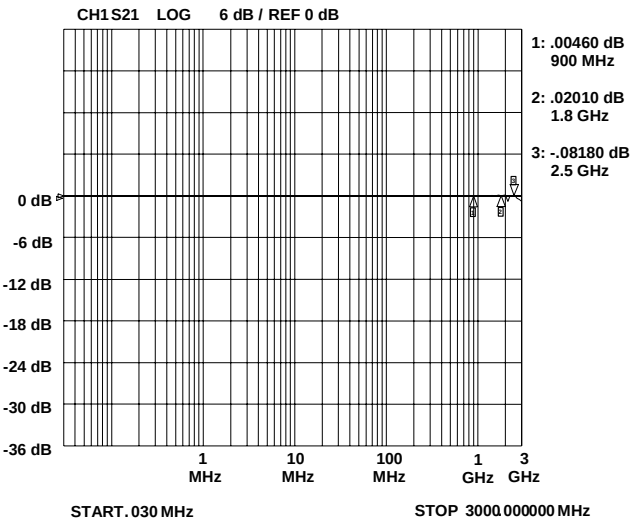


Typical Characteristics

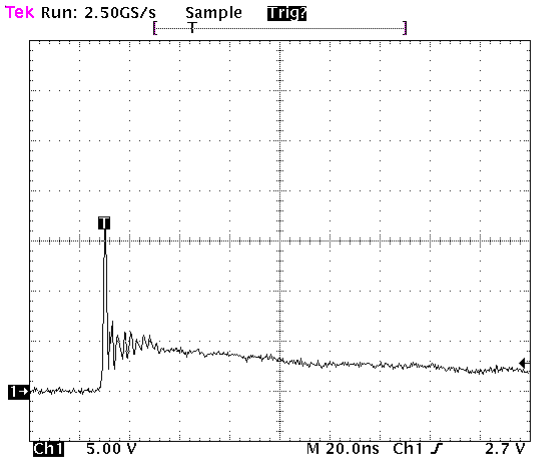
Insertion Loss S21 (I/O to I/O)



Insertion Loss S21 (I/O to Gnd)

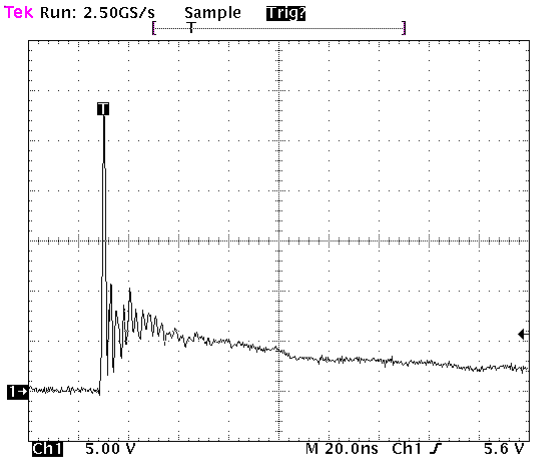


ESD Response (4kV Contact per IEC 61000-4-2)



Note: Data is taken with a 10x attenuator

ESD Response (8kV Contact per IEC 61000-4-2)



Note: Data is taken with a 10x attenuator

Applications Information

Device Connection Options for Protection of Two High-Speed Data Lines

This device is designed to protect data lines by clamping them to a fixed reference. When the voltage on the protected line exceeds the reference voltage the steering diodes are forward biased, conducting the transient current away from the sensitive circuitry. Data lines are connected at pins 1 & 6 and pins 3 & 4. Pins 5 and 2 can be connected to ground or Vcc based on application and location of those connections. The connection to ground should be made directly to a ground plane. The path length should also be kept as short as possible to minimize parasitic inductance. Figure 1 shows the layout configuration to send data input at pins 6 and 4 and output at pins 1 and 3.

This device is designed for ease of PCB layout by allowing the traces run straight through the device. Figure 2 shows the proper way to design the PCB board trace in order to use the flow through layout for two line pairs. The solid line represents the PCB trace. Note the PCB traces are used to connect the pin pairs for each I/O (pin 1 to pin 6 and pin 3 to pin 4). For example, I/O 1 enters at pin 6 and exits at pin 1 and the PCB trace connects pins 6 and 1 together. This is also true for I/O 2. The negative reference (Gnd) is connected at pin 2. The positive reference is connected at pin 5.

Universal Serial Bus ESD Protection

The RClamp0502A may also be used to protect both upstream and downstream USB ports on monitors, computers, peripherals or portable systems. Each device will protect up to one USB port (Figure 3). When the voltage on the data lines exceed the bus voltage (plus one diode drop), the internal rectifiers are forward biased conducting the transient current away from the protected controller chip. The TVS diode directs the surge to ground. The TVS diode also acts to suppress ESD strikes directly on the voltage bus. Thus, both power and data pins are protected with a single device.

Figure 1. Protection of Two Data Lines and One Power Supply Line

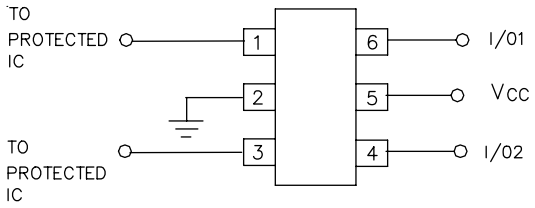


Figure 2. Flow Through Layout for Two Data Lines and one Power Line

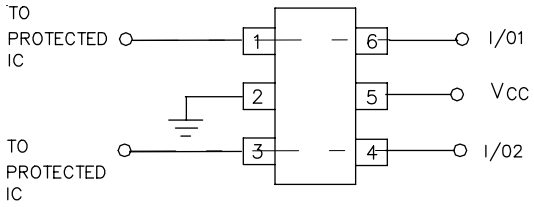
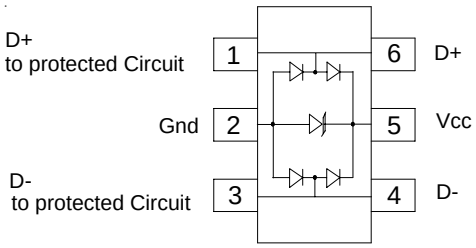
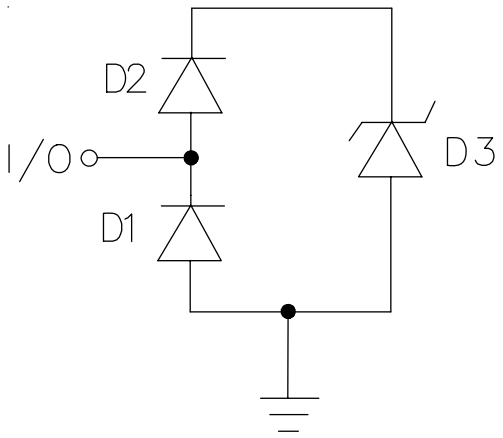


Figure 3. USB 2.0 (up to 480Mbps) Upstream or Downstream Port Protection



Applications Information - Spice Model

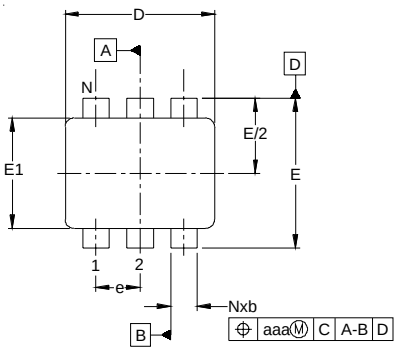


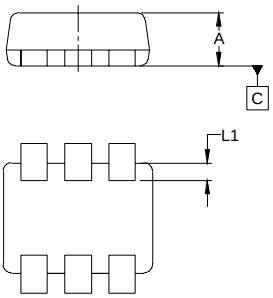
RClamp0502A Spice Model

Table 1 - RClamp0502A Spice Parameters

Parameter	Unit	D1 (LCRD)	D2 (LCRD)	D3 (TVS)
IS	Amp	1E-20	1E-20	2.43E-13
BV	Volt	110	20	8
VJ	Volt	0.67	0.67	0.64
RS	Ohm	0.339	0.568	1.24
IBV	Amp	1E-3	1E-3	1E-3
CJO	Farad	0.7E-12	0.7E-12	83E-12
TT	sec	2.541E-9	2.541E-9	2.541E-9
M	--	0.01	0.01	0.222
N	--	1.1	1.1	1.1
EG	eV	1.11	1.11	1.11

Outline Drawing - SC-89 (SOT-666)



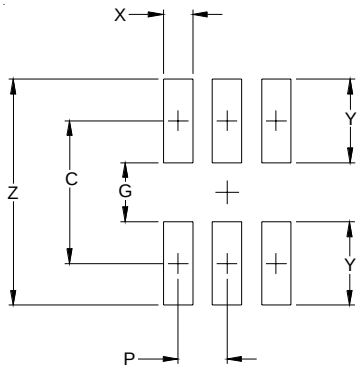


DIMENSIONS						
DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.019	-	.024	0.50	-	0.60
b	.005	-	.012	0.15	-	0.30
c	.003	-	.007	0.10	-	0.18
D	.059	.063	.067	1.50	1.60	1.70
E	.061	.063	.067	1.55	1.60	1.70
E1	.043	.047	.049	1.10	1.20	1.25
e	.020 BSC			0.50 BSC		
L	.003	.008	.012	0.10	0.20	0.30
L1	.003	.006	.008	0.10	0.15	0.20
N	6			6		
aaa	.004			0.10		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

Land Pattern - SC-89 (SOT-666)

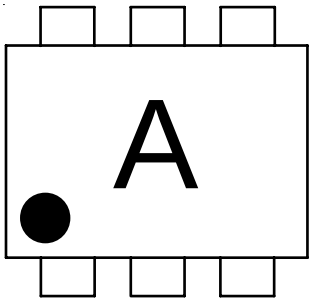


DIMENSIONS		
DIM	INCHES	MILLIMETERS
C	(.057)	(1.45)
P	.020	0.50
G	.024	0.60
X	.012	0.30
Y	.033	0.85
Z	.090	2.30

NOTES:

1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking

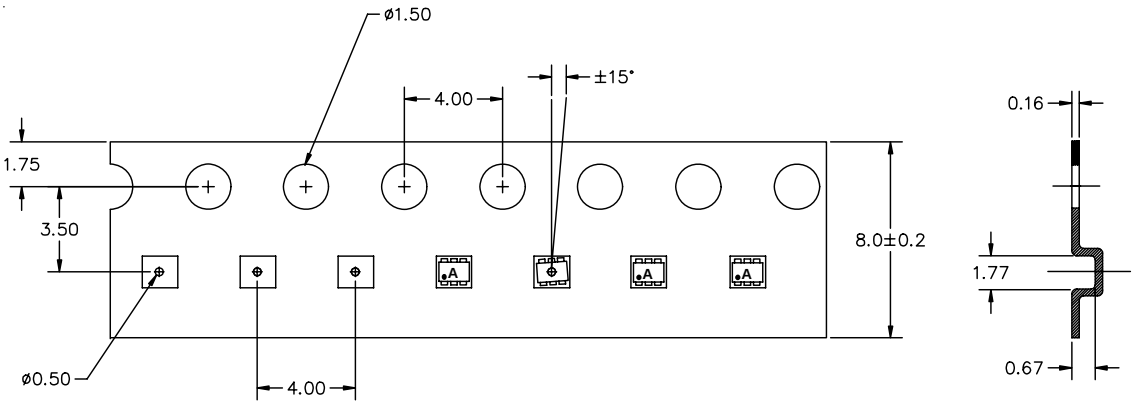


Ordering Information

Part Number	Lead Finish	Qty per Reel	Reel Size
RClamp0502A.TCT	Pb Free	3,000	7 Inch

RailClamp and RClamp are registered marks of Semtech Corporation

Tape and Reel Specification



[2] DIMENSIONS ARE IN MILLIMETERS.

[1] SAME AS 3M US046041.

Tape Specification and Device Orientation

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