

### PROTECTION PRODUCTS - EMIClamp®

#### Description

The EClamp®2485T is combination EMI filter and line termination device with integrated TVS diodes for use on SIM Card interfaces that utilize the Single Wire Protocol (SWP) line. This device utilizes solid-state silicon-avalanche technology for superior clamping performance and DC electrical characteristics. They have been optimized for **protection of SIM interfaces** in cellular phones with NFC capability.

The device consists of three circuits that include series impedance matching resistors for proper termination of the SIM card interface. Termination resistor value of 100 Ohms is included on the Reset and Data lines and 47 Ohms on the CLK line. TVS diodes are included on each line for ESD protection in excess of IEC 61000-4-2, level 4 requirements. A TVS diode is also included for protection of the voltage (Vcc) bus. The SWP line features a low capacitance (<0.9pF) TVS diode for maximum signal integrity. This line also features an extremely low leakage current of less than 25nA (VR=3.3V).

The EClamp2485T is in an 8-pin SLP1713P8T package. It measures 1.7 x 1.3 mm with a nominal height of only 0.4mm. The leads are spaced at a pitch of 0.4mm and are finished with lead-free NiPdAu. The small package makes it ideal for use in portable electronics such as cell phones and digital still cameras.

#### Features

- ◆ Integrated TVS diodes and line termination resistors
- ◆ ESD protection to **IEC 61000-4-2 (ESD) Level 4, ±18kV (air), ±12kV (contact)**
- ◆ TVS working voltage: 5V
- ◆ Termination Resistors: 100 Ohms & 47 Ohms
- ◆ Low SWP Line Capacitance: 0.9pF max (VR = 0V)
- ◆ Protection for five lines
- ◆ Low ESD clamping voltage
- ◆ Solid-state silicon-avalanche technology

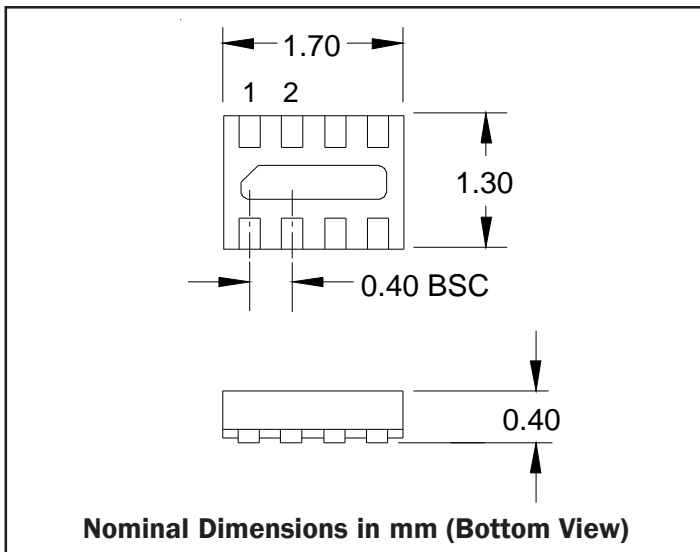
#### Mechanical Characteristics

- ◆ SLP1713P8T 8-pin package (1.7 x 1.3 x 0.40 mm)
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Lead Pitch: 0.4mm
- ◆ Lead finish: NiPdAu
- ◆ Marking: Marking Code + Date Code
- ◆ Packaging: Tape and Reel

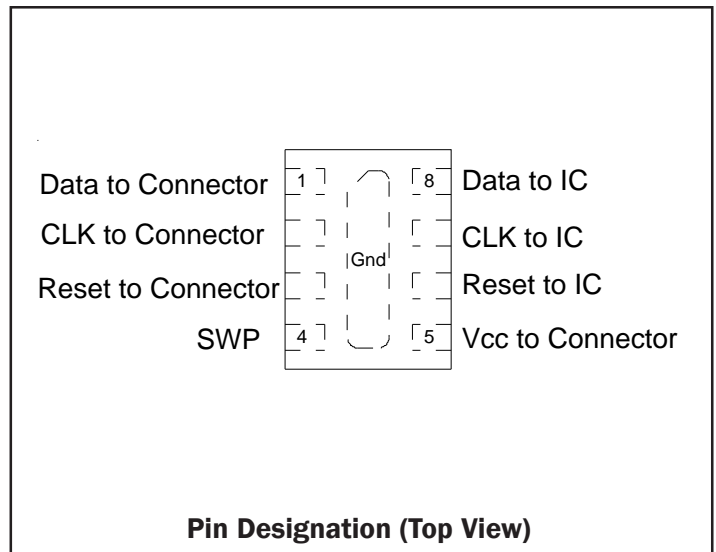
#### Applications

- ◆ SIM Card Interface with SWP
- ◆ Cell Phones with NFC Capability
- ◆ Smartphones

#### Package Dimensions

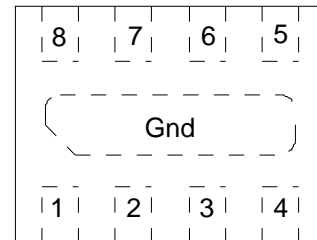
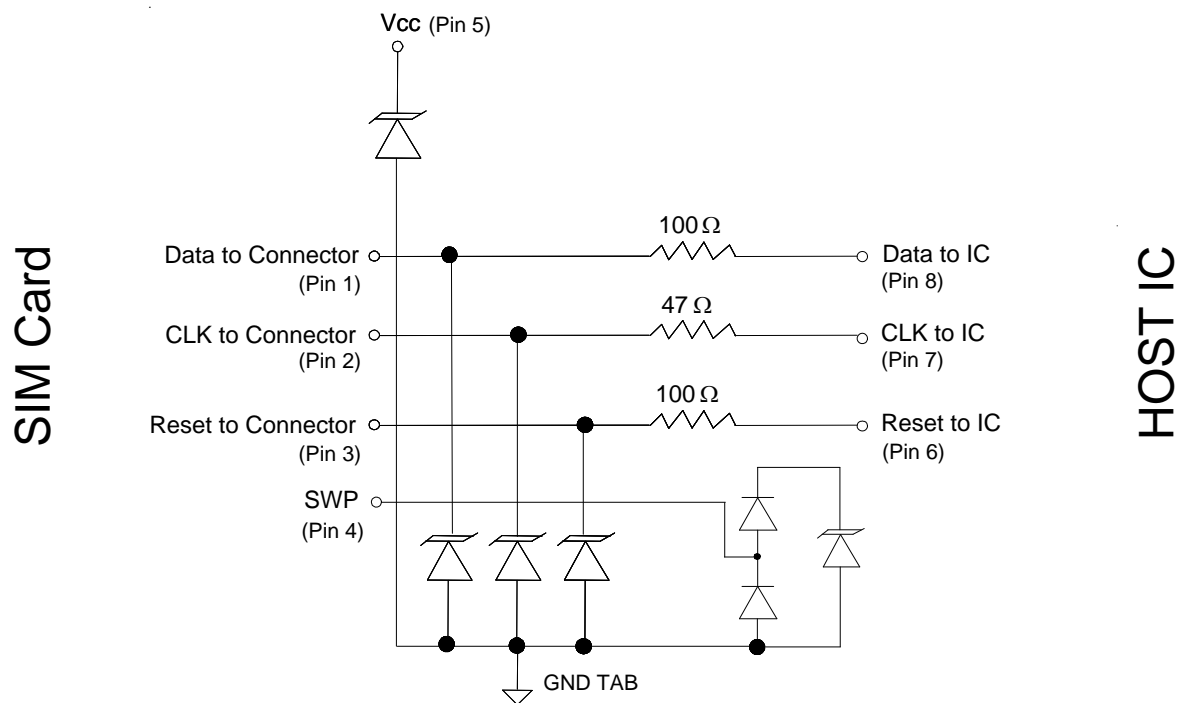


#### Pin Configuration



**PROTECTION PRODUCTS**
**Pin Identification and Configuration**

Pin	Symbol	Identification
1	Data	Data Input (SIM Connector Side)
2	CLK	Clock Input (SIM Connector Side)
3	Reset	Reset Input (SIM Connector Side)
4	SWP	Single Wire Protocol
5	Vcc	Power Supply ESD Protection (SIM Connector Side)
6	Reset	Reset Output (IC Side)
7	CLK	Clock Output (IC Side)
8	Data	Data Output (IC Side)
Center tab	GND	Ground connection


**Pin Configuration (Top View)**
**Schematics & Component Values**


**PROTECTION PRODUCTS**
**Absolute Maximum Rating**

Parameter	Symbol	Value	Units
<b>ESD Withstand Voltage per IEC 61000-4-2</b>			
Input (SWP) Pin 4 (Contact) Input (SWP) Pin 4 (Air)	$V_{ESD}$	+/- 20 +/- 22	kV
Input (Data, CLK, Reset, VCC) Pins 1, 2, 3, 5 (Contact) Input (Data, CLK, Reset, VCC) Pins 1, 2, 3, 5 (Air)	$V_{ESD}$	+/- 12 +/- 17	kV
Junction Temperature	$T_J$	125	°C
Operating Temperature	$T_{op}$	-40 to +85	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

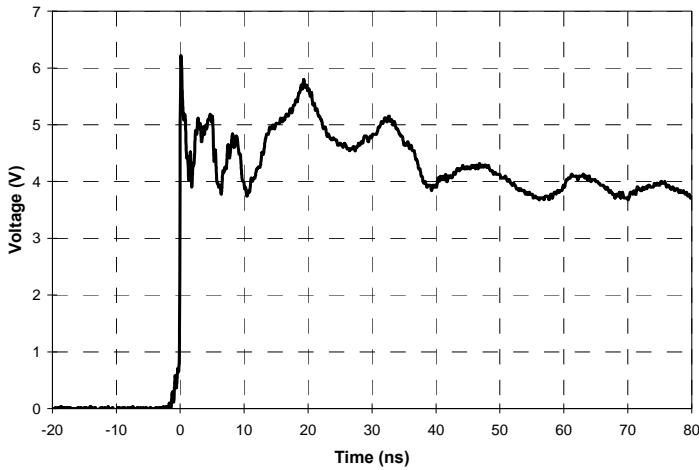
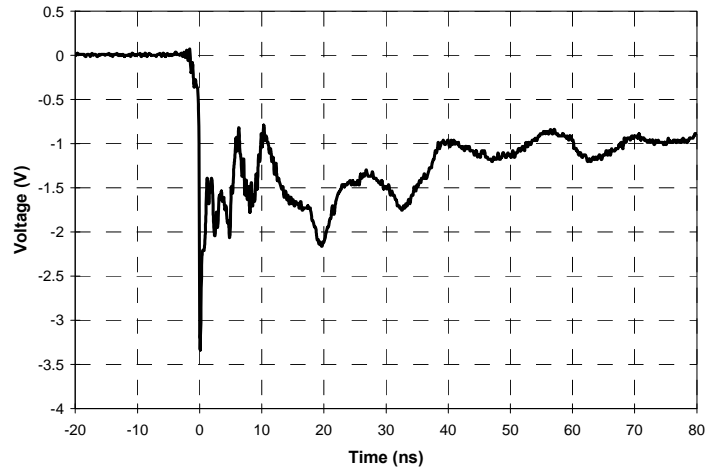
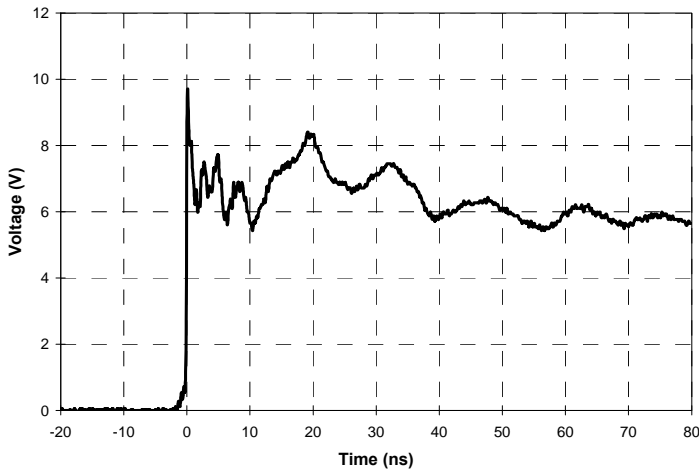
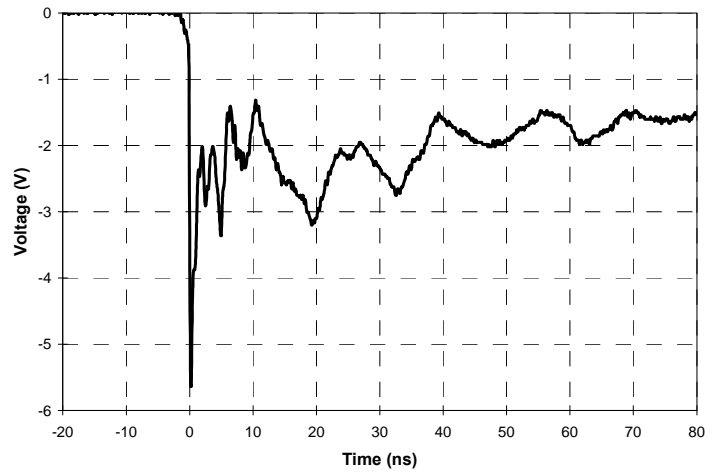
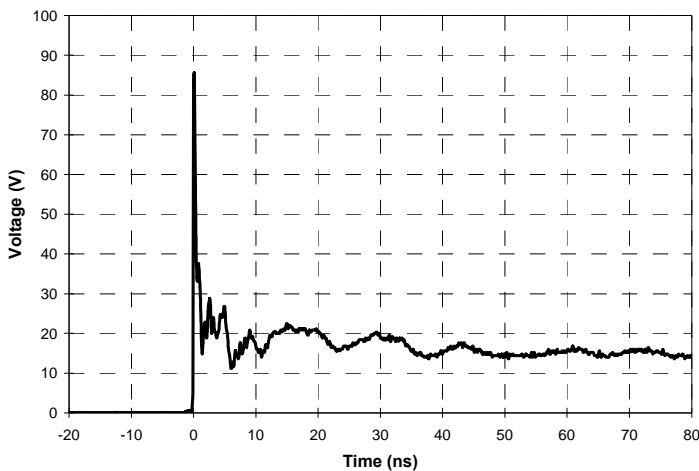
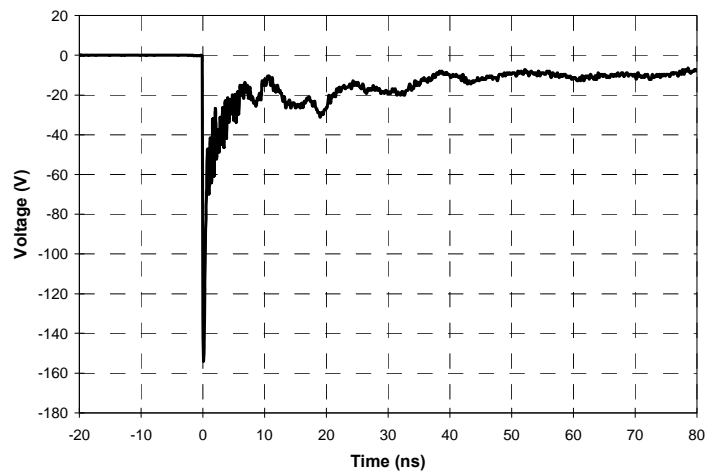
Note: 1) ESD input at Pins 1, 2, 3, 4, 5

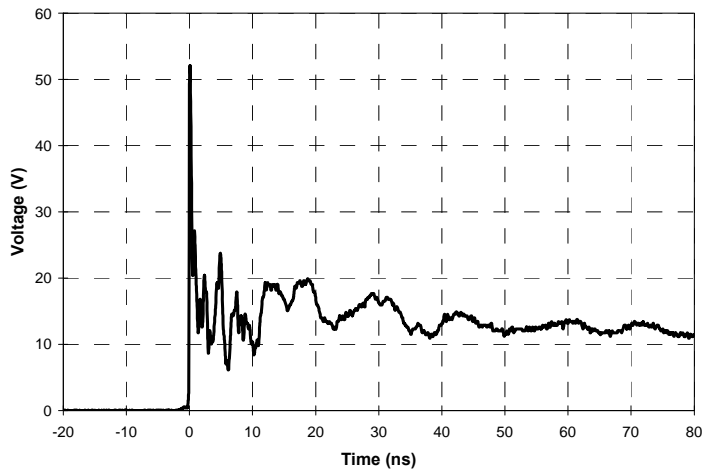
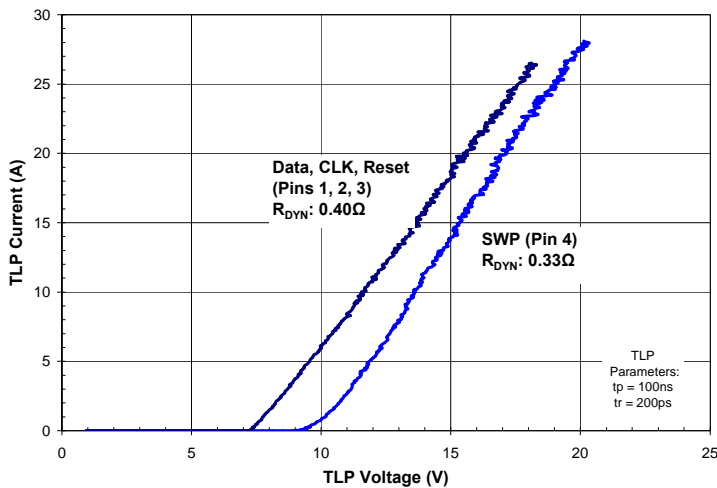
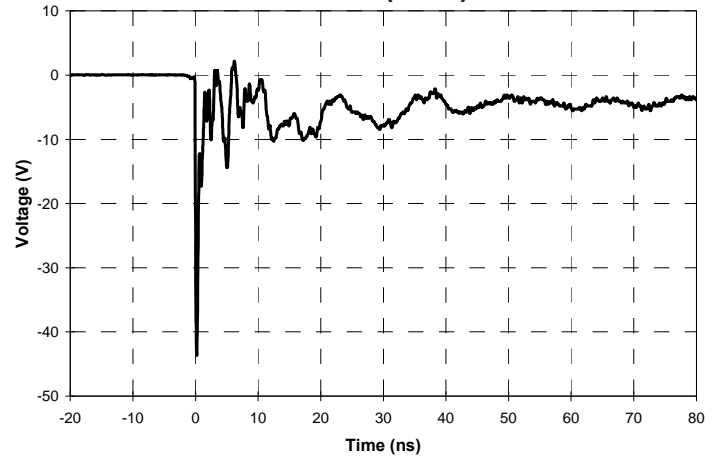
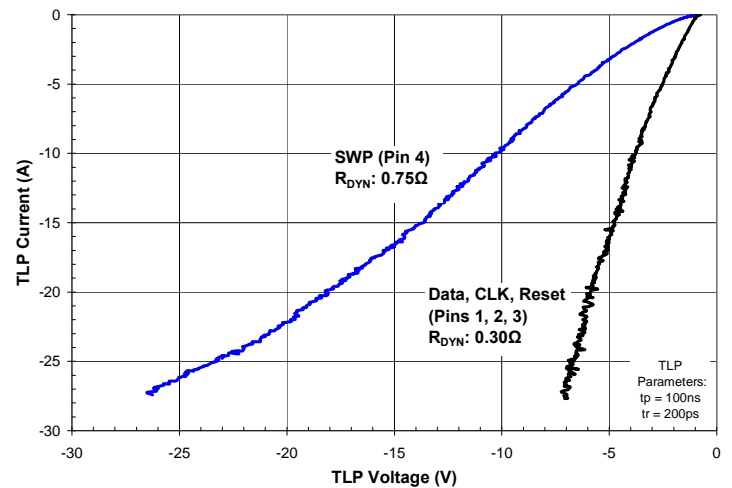
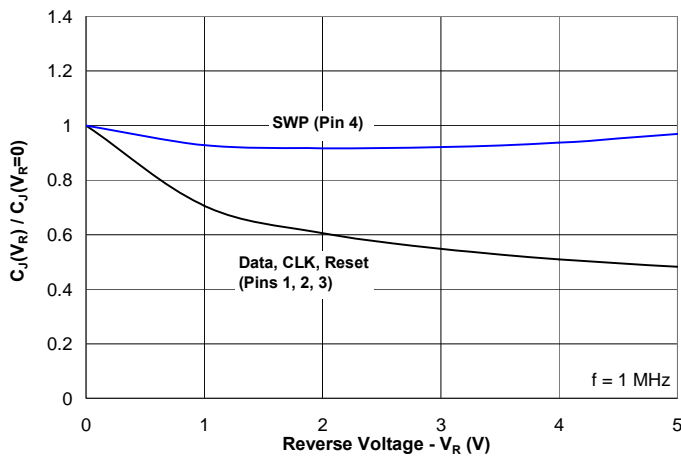
**Electrical Characteristics (T=25°C)**

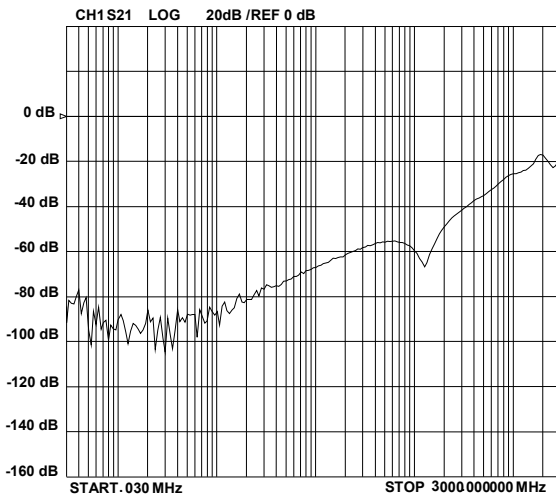
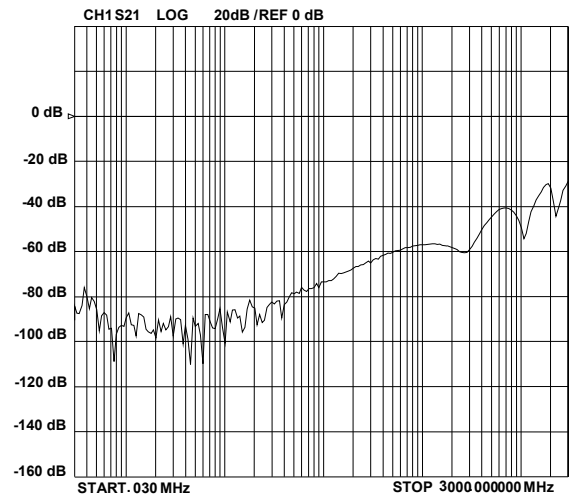
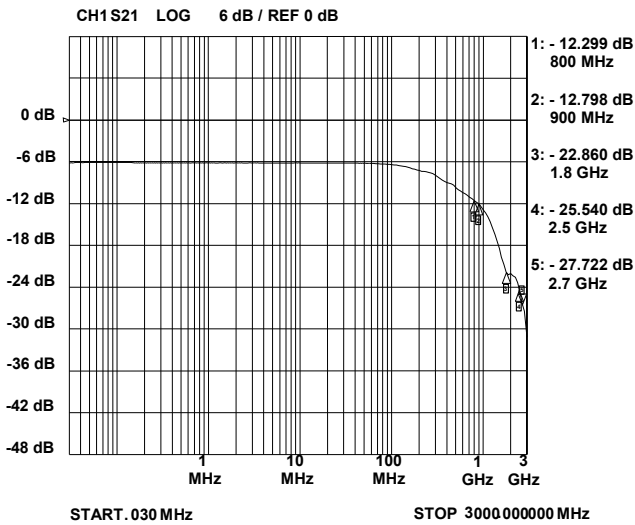
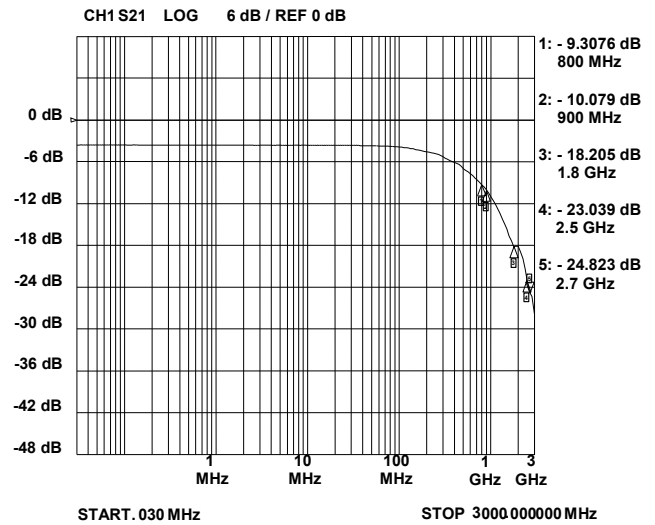
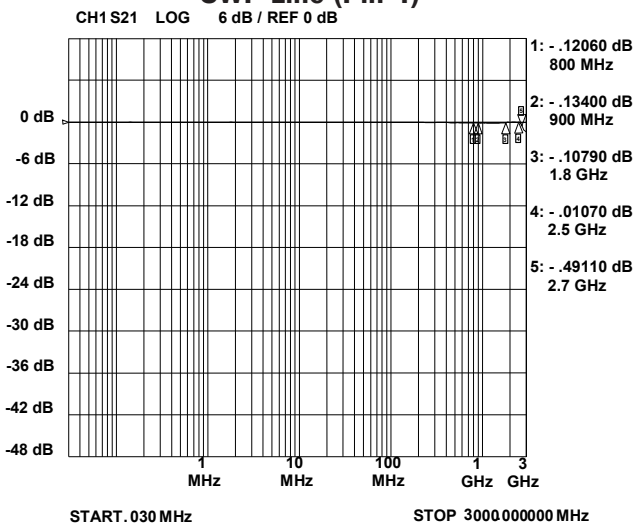
<b>Data, Clock, Reset, VBus Lines (Pins 1, 2, 3, 5)</b>						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$	Pin 1, 2, 3, 5 to GND			5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$ , Pin 1, 2, 3, 5 to GND	6	8	10	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 5.0V$ , Pin 1, 2, 3, 5 to GND		0.005	0.100	μA
Reset Series Resistor	$R_{RST}$	Pin 3 to Pin 6	85	100	115	Ohms
Clk Series Resistor	$R_{CLK}$	Pin 2 to Pin 7	40	47	55	Ohms
Data Series Resistor	$R_{DATA}$	Pin 1 to Pin 8	85	100	115	Ohms
Dynamic Resistance	$R_{DYN}$	$t_p = 100ns$ , Measured from 4A to 16A		0.40		Ohms
Junction Capacitance	$C_J$	$V_R = 0V$ , $f = 1MHz$ , Pin 1, 2, 3, 5 to GND	8		12	pF

**PROTECTION PRODUCTS**
**Electrical Characteristics (T=25°C)**

<b>SWP Line (Pin 4)</b>						
Reverse Stand-Off Voltage	$V_{RWM}$	Pin 4 to GND			5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$ , Pin 4 to GND	6.5	9	11	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 3.3V$ , Pin 4 to GND		0.001	0.025	$\mu A$
Clamping Voltage	$V_C$	$I_{pp} = 1A$ , $t_p = 8/20\mu s$ Pin 4 to GND			12	V
Clamping Voltage	$V_C$	$I_{pp} = 5A$ , $t_p = 8/20\mu s$ Pin 4 to GND			15	V
Dynamic Resistance	$R_{DYN}$	$t_p = 100ns$ , Measured from 4A to 16A		0.33		Ohms
Junction Capacitance	$C_j$	$V_R = 0V$ , $f = 1MHz$ , Pin 4 to GND		0.6	0.9	pF

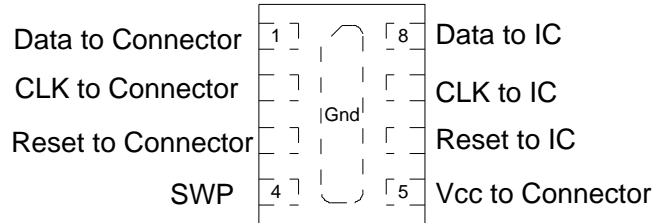
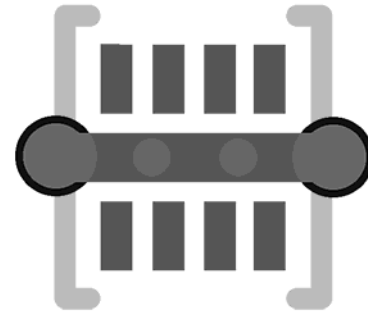
**PROTECTION PRODUCTS**
**Typical Characteristics**
**ESD Clamping (+8kV Contact per IEC 61000-4-2)  
Data, Reset Lines (Pins 1, 3)**

**ESD Clamping (-8kV Contact per IEC 61000-4-2)  
Data, Reset Lines (Pins 1, 3)**

**ESD Clamping (+8kV Contact per IEC 61000-4-2)  
CLK Line (Pin 2)**

**ESD Clamping (-8kV Contact per IEC 61000-4-2)  
CLK Line (Pin 2)**

**ESD Clamping +8kV Contact per IEC 61000-4-2)  
SWP Line (Pin 4)**

**ESD Clamping -8kV Contact per IEC 61000-4-2)  
SWP Line (Pin 4)**


**PROTECTION PRODUCTS**
**Typical Characteristics**
**ESD Clamping +8kV Contact per IEC 61000-4-2  
VCC Line (Pin 5)**

**TLP Characteristic (Positive)**

**ESD Clamping -8kV Contact per IEC 61000-4-2  
VCC Line (Pin 5)**

**TLP Characteristic (Negative)**

**Capacitance vs. Reverse Voltage  
Data, CLK, Reset, SWP Lines (Pins 1, 2, 3, 4)**


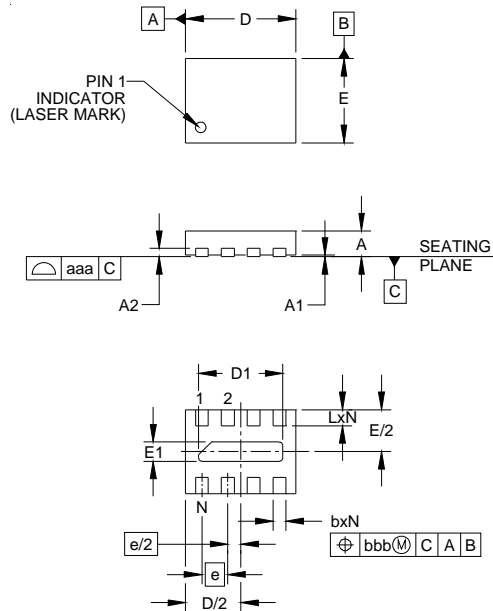
**PROTECTION PRODUCTS**
**Typical Characteristics**
**Analog Crosstalk (Pin 1 to Pin 2)**

**Analog Crosstalk (Pin 3 to Pin 4)**

**Typical Insertion Loss S21  
Data, Reset Lines (Pin 1, 3)**

**Typical Insertion Loss S21  
CLK Line (Pin 2)**

**Typical Insertion Loss S21  
SWP Line (Pin 4)**


**PROTECTION PRODUCTS**
**Applications Information**
**Device Connection**

The EClamp2485T designed with ease of layout in mind. The package has flow through design which allows the designer to route the signals straight in and out between the SIM port connector and the SIM controller. The device is in a 8-pin SLP package. Electrical connection is made to the 8 pins located at the bottom of the device. A center tab serves as the ground connection. Pin connections are noted in Figure 1. Note that the ESD protection diodes are located at pins 1 - 3 for the data and clock lines. Therefore, Pins 1 - 3 must be routed to the SIM connector while pins 6 - 8 are routed to the protected IC. Pin 5 is routed to the Vcc pin of the SIM connector. Pin 4 should be connected to the SWP line. All path lengths should be kept as short as possible to minimize the effects of parasitic inductance in the board traces. The center tab should be connected directly to the ground plane. Multiple micro-vias are recommended in the device ground pad as shown in Figure 2. Multiple vias in the device ground pad will result in a lower inductive ground loop, increasing the ESD effectiveness of the device.

**Figure 1 - Pin Identification and Configuration (Top Side View)**

**Figure 2 - Recommended Layout Using Ground Vias**


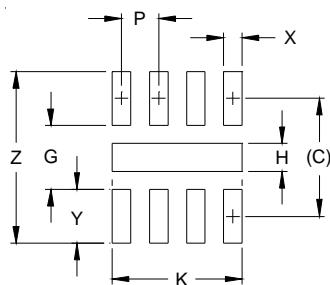


**PROTECTION PRODUCTS**
**Outline Drawing - SLP1713P8T**


DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.015	.016	.017	0.37	0.40	0.43
A1	.000	.001	.002	0.00	0.02	0.05
A2	(.005)			(0.13)		
b	.006	.008	.010	0.15	0.20	0.25
D	.065	.067	.070	1.65	1.70	1.78
D1	.047	.051	.055	1.20	1.30	1.40
E	.049	.051	.054	1.25	1.30	1.38
E1	.008	.012	.016	0.20	0.30	0.40
e	.016 BSC			0.40 BSC		
L	.008	.010	.012	0.20	0.25	0.30
N	8			8		
aaa	.003			0.08		
bbb	.004			0.10		

**NOTES:**

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

**Land Pattern - SLP1713P8T**


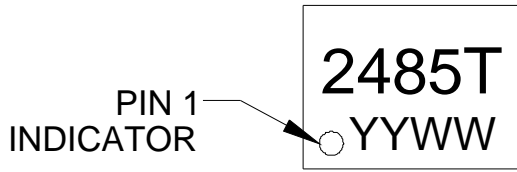
DIM	DIMENSIONS	
	INCHES	MILLIMETERS
C	(.050)	(1.27)
G	.027	0.69
H	.012	0.30
K	.055	1.40
P	.016	0.40
X	.008	0.20
Y	.023	0.58
Z	.073	1.85

**NOTES:**

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.
3. THERMAL VIAS IN THE LAND PATTERN OF THE EXPOSED PAD SHALL BE CONNECTED TO A SYSTEM GROUND PLANE. FAILURE TO DO SO MAY COMPROMISE THE THERMAL AND/OR FUNCTIONAL PERFORMANCE OF THE DEVICE.

## PROTECTION PRODUCTS

### Marking Codes



### Ordering Information

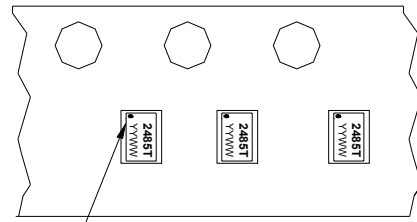
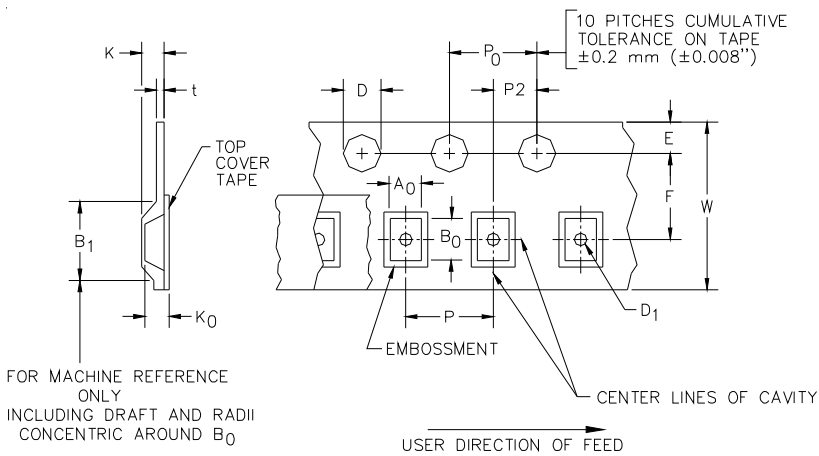
Part Number	Qty per Reel	Reel Size
EClamp2485T.TCT	3000	7 Inch

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**Notes:**

YYWW = date code

### Carrier Tape Specification



Pin 1 Location (Towards Sprocket Holes)

User Direction of feed

### Device Orientation in Tape

A0	B0	K0
1.51 +/-0.10 mm	1.91 +/-0.10 mm	0.66 +/-0.10 mm

Tape Width	B, (Max)	D	D1	E	F	K (MAX)	P	P0	P2	T(MAX)	W
8 mm	4.2 mm (.165)	1.5 + 0.1 mm - 0.0 mm (0.59 +.005 - .000)	0.8 mm ±0.05 (.031)	1.750±.10 mm (.069±.004)	3.5±0.05 mm (.138±.002)	2.4 mm (.094)	4.0±0.1 mm (.157±.00-4)	4.0±0.1 mm (.157±.00-4)	2.0±0.05mm (.079±.002)	0.4 mm (.016)	8.0 mm + 0.3 mm - 0.1 mm (.312±.012)

### Contact Information

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