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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

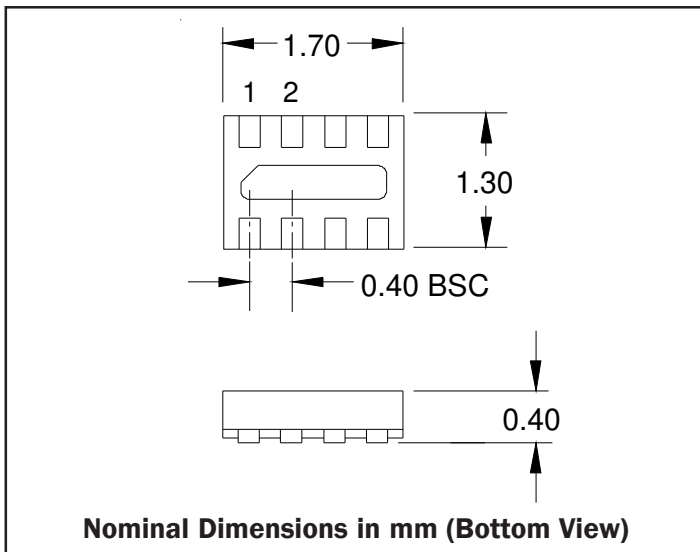
Mechanical Characteristics

- ◆ 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

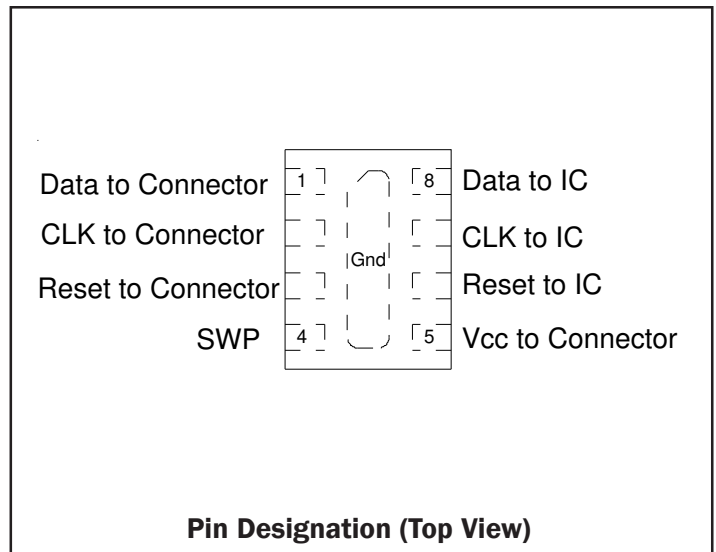
Applications

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

Package Dimensions



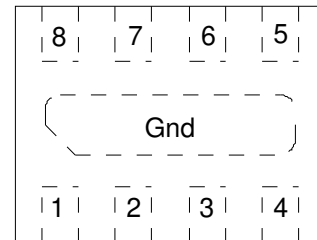
Pin Configuration



PROTECTION PRODUCTS

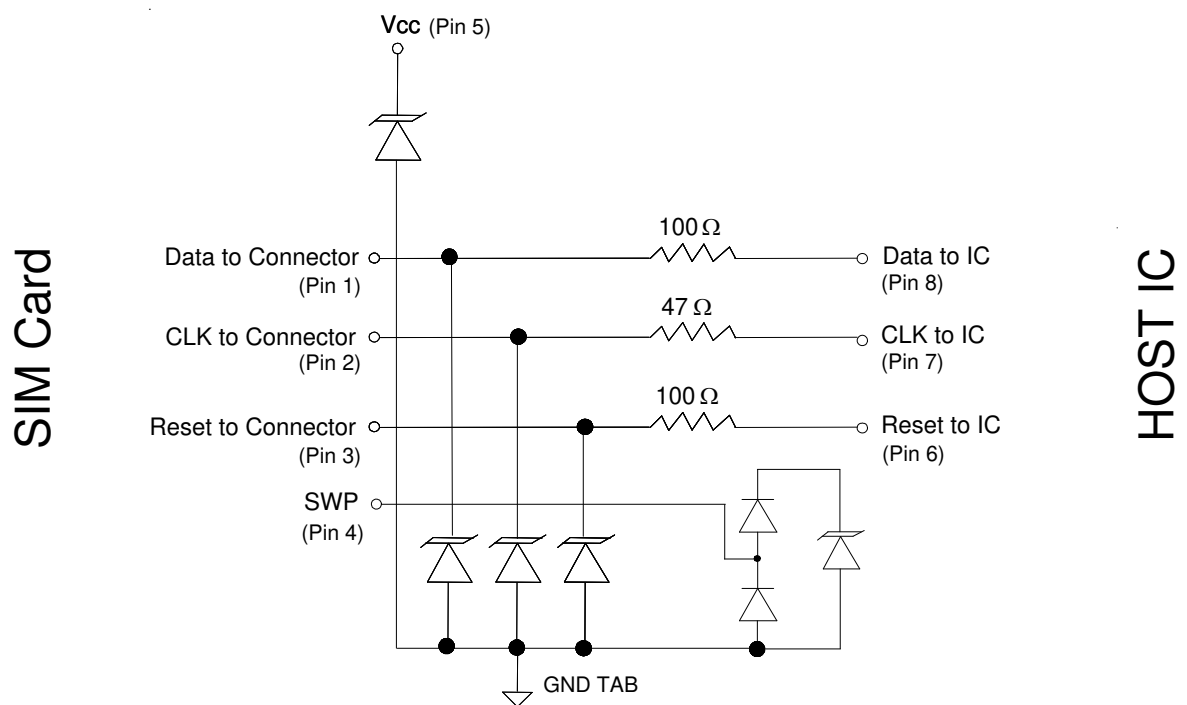
Pin Identification and Configuration

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
ESD Withstand Voltage per IEC 61000-4-2			
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

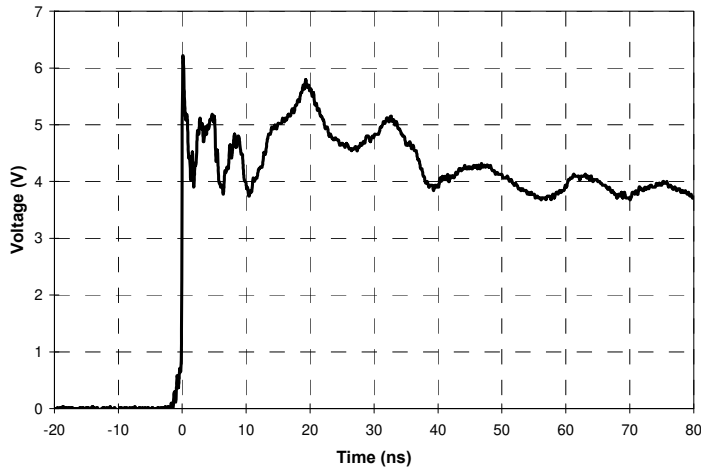
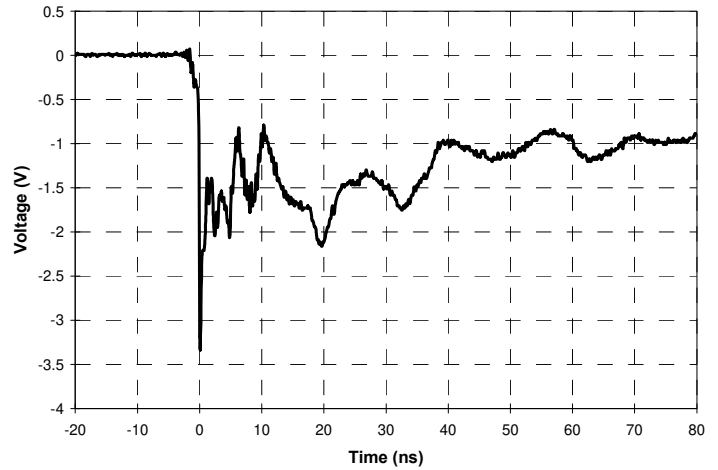
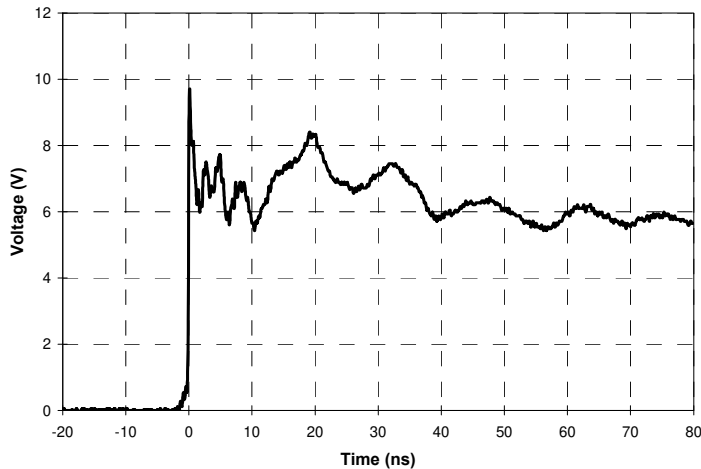
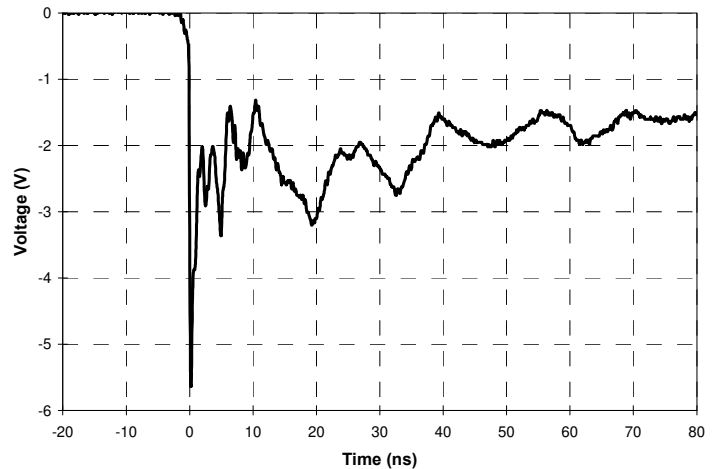
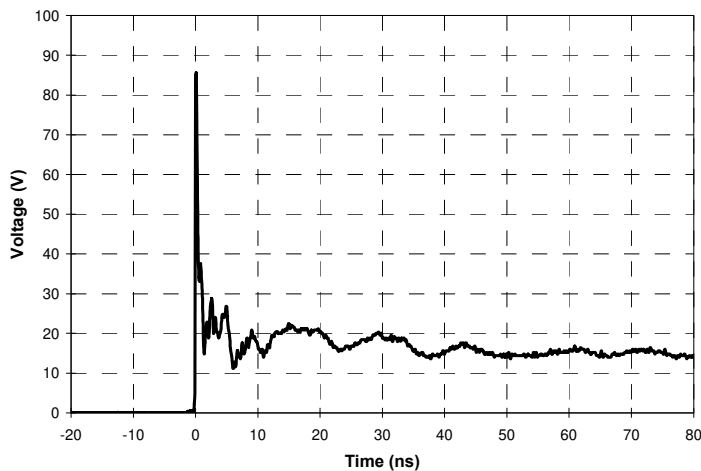
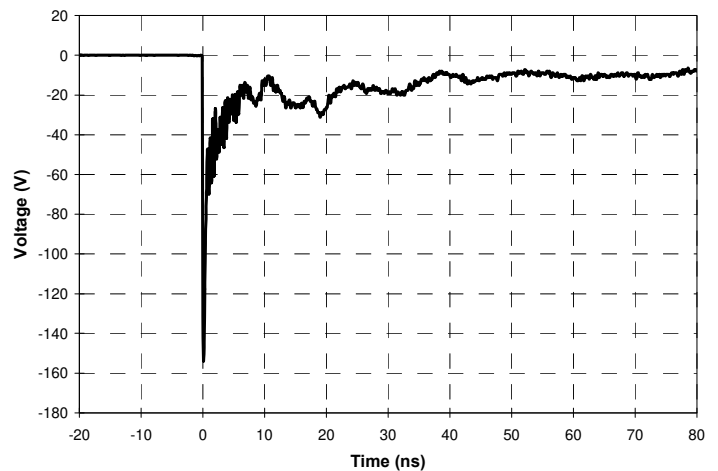
Note: 1) ESD input at Pins 1, 2, 3, 4, 5

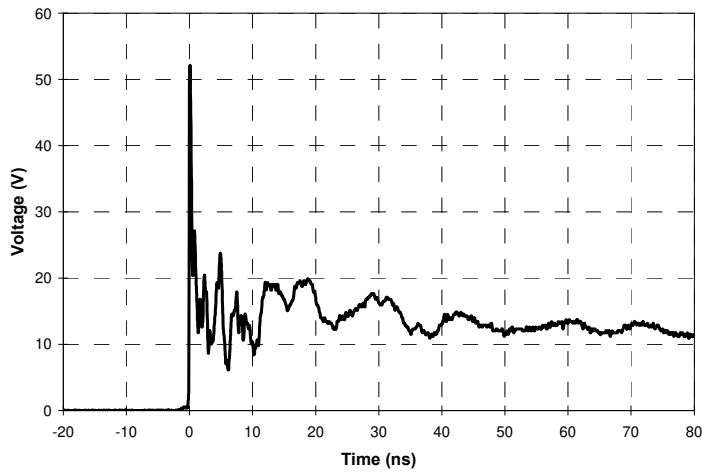
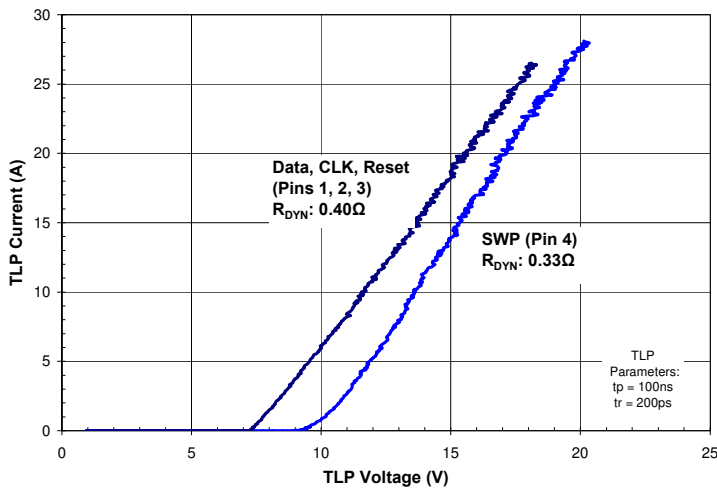
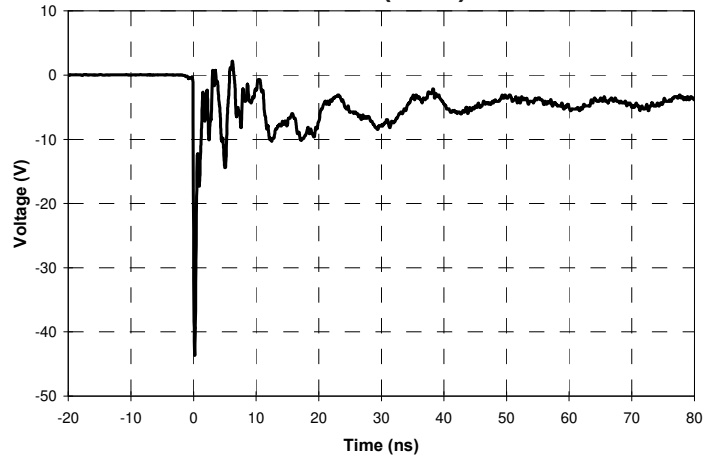
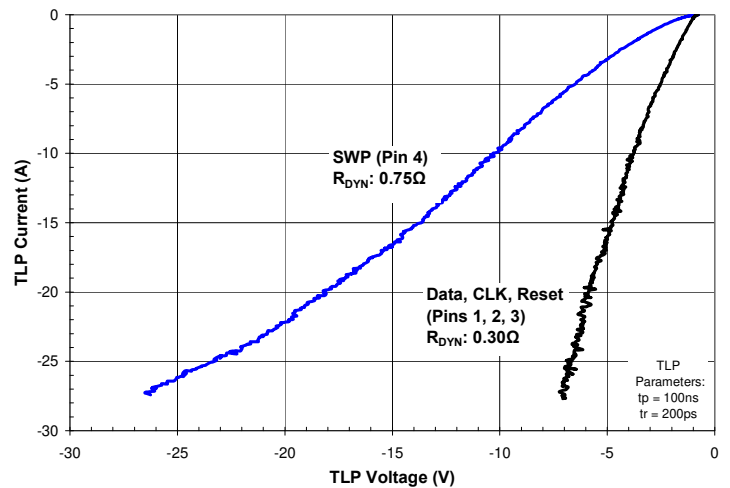
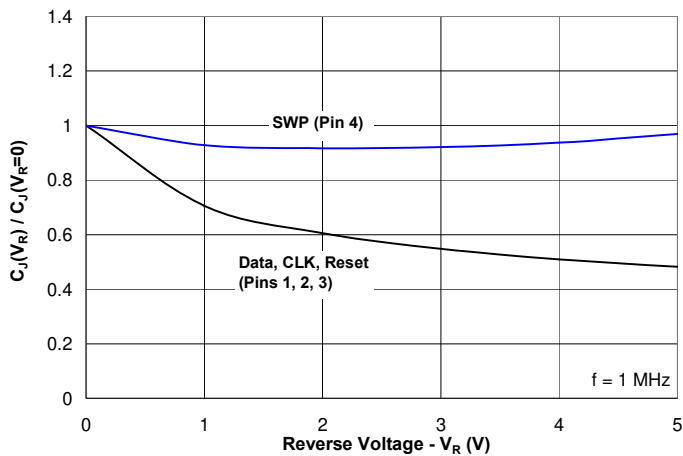
Electrical Characteristics (T=25°C)

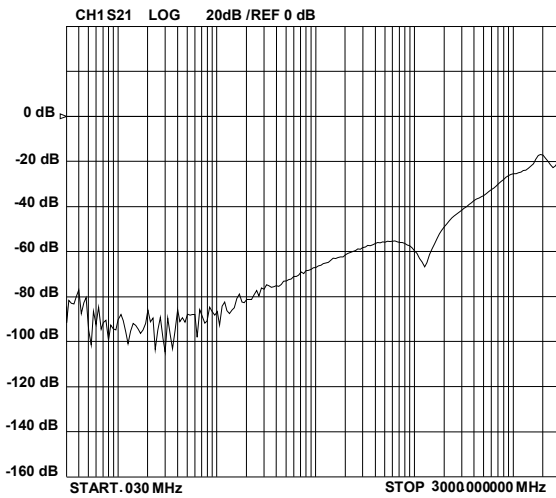
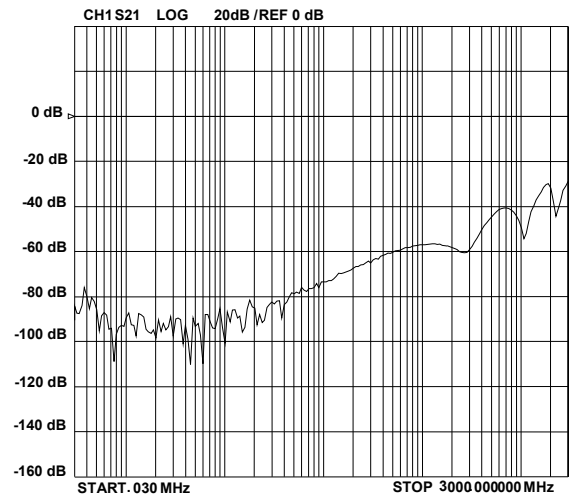
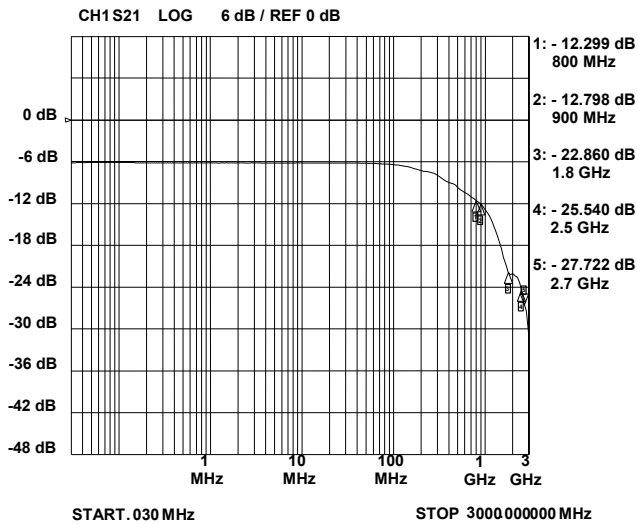
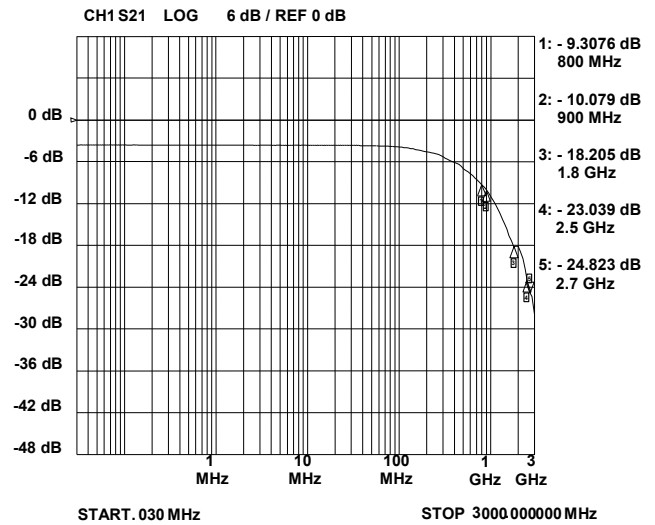
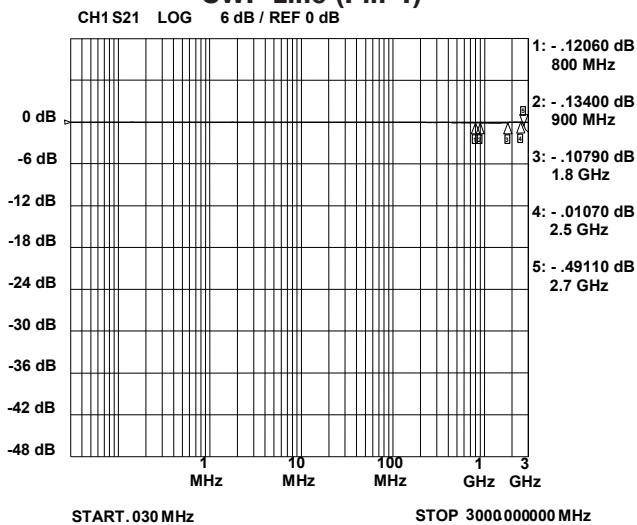
Data, Clock, Reset, VBus Lines (Pins 1, 2, 3, 5)						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 1, 2, 3, 5 to GND			5	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1mA$, Pin 1, 2, 3, 5 to GND	6	8	10	V
Reverse Leakage Current	I_R	$V_{RWM} = 5.0V$, Pin 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)

SWP Line (Pin 4)						
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	μA
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

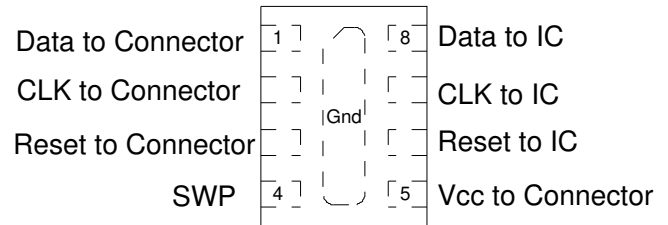
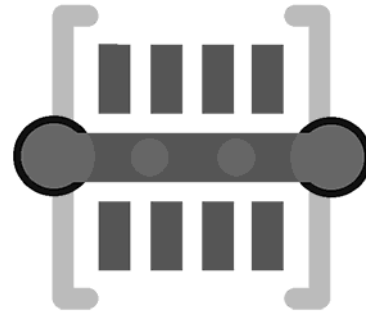
PROTECTION PRODUCTS
Typical Characteristics
**ESD Clamping (+8kV Contact per IEC 61000-4-2)
Data, Reset Lines (Pins 1, 3)**

**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)**


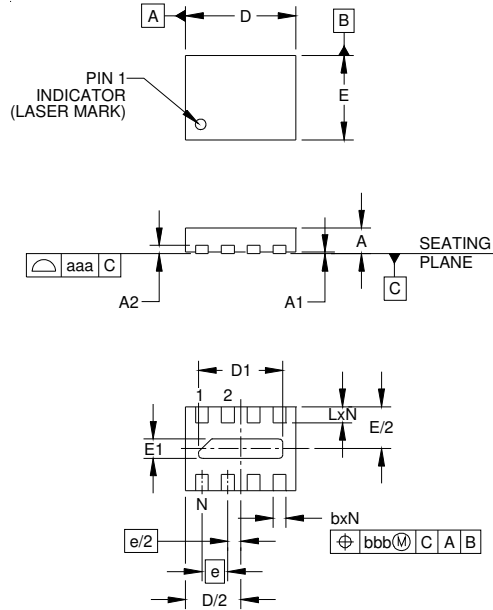
PROTECTION PRODUCTS
Typical Characteristics
**ESD Clamping +8kV Contact per IEC 61000-4-2
VCC Line (Pin 5)**

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)**


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.

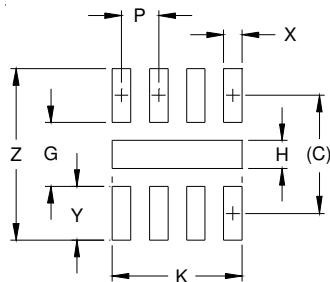
Figure 1 - Pin Identification and Configuration (Top Side View)

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


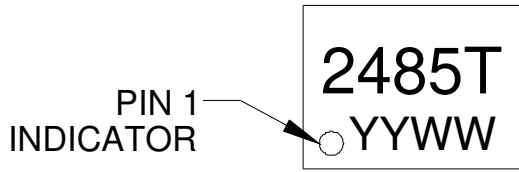
DIM	DIMENSIONS	
	INCHES	MILLIMETERS
C	(.050)	(1.27)
G	.027	0.69
H	.012	0.30
K	.055	1.40
P	.016	0.40
X	.008	0.20
Y	.023	0.58
Z	.073	1.85

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

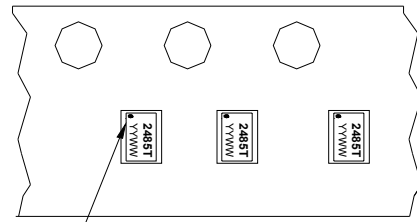
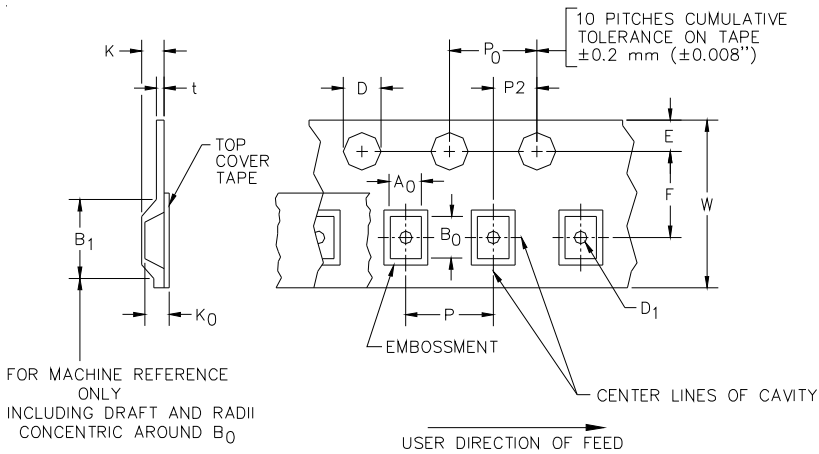
Part Number	Qty per Reel	Reel Size
EClamp2485T.TCT	3000	7 Inch

EMIClamp and EClamp are trademarks of Semtech Corporation.

Notes:

YYWW = date code

Carrier Tape Specification



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)

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