Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

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SEMTECH

PROTECTION PRODUCTS - EMIClamp®

Description

The EClamp®2515K is combination EMI filter and line termination device with integrated TVS diodes for use on Multimedia Card interfaces. This device utilizes solid-state silicon-avalanche technology for superior clamping performance and DC electrical characteristics. They have been optimized for **protection of T-Flash/MicroSD interfaces** in cellular phones and other portable electronics.

The device consists of six circuits that include series impedance matching resistors and pull up resistors as required by the SD specification. TVS diodes are included on each line for ESD protection. Each data line has a typical capacitance of 22pF while the clock line has a typical capacitance of only 12pF. An additional TVS diode connection is included for protection of the voltage (Vdd) bus. A 45 Ohm termination resistor is included on the DAT0, DAT1, DAT2, DAT3, CMD, and CLK lines. Pull up resistors of 15k Ohms are included on DAT0, DAT1, DAT2, DAT3, and CMD lines. The TVS diodes provide effective suppression of ESD voltages in excess of ±15kV (air discharge) and ±12kV (contact discharge) per IEC 61000-4-2.

The EClamp2515K is in a 16-pin SLP3313P16 package. It measures 3.3 x 1.3 x 0.50mm. The leads are spaced at a pitch of 0.4mm and are finished with lead-free NiPdAu.

Features

◆ EMI/RFI filtering and line termination with integrated ESD protection
◆ ESD protection to **IEC 61000-4-2 (ESD), ±15kV (air), ±12kV (contact)** on input lines
◆ TVS working voltage: 5V
◆ Termination Resistors: 45Ω
◆ Pull Up Resistors: 15kΩ (4 each)
◆ Typical capacitance on DAT and CMD lines: 22pF (VR = 0V)
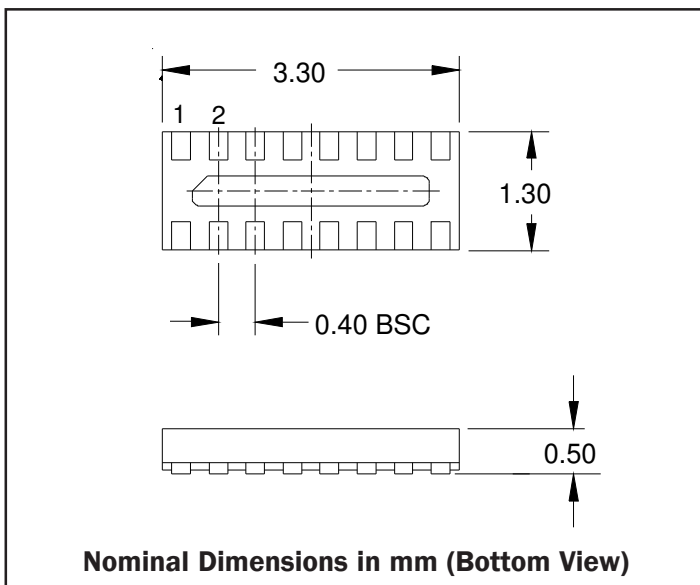◆ Typical capacitance on CLK line: 12pF (VR=0V)
◆ Solid-state technology

Mechanical Characteristics

◆ SLP3313P16 16-pin package
◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
◆ Nominal Dimensions: 3.3 x 1.3 x 0.50 mm
◆ Lead Pitch: 0.4mm
◆ Lead finish: NiPdAu
◆ Marking: Marking Code
◆ Packaging: Tape and Reel

Applications
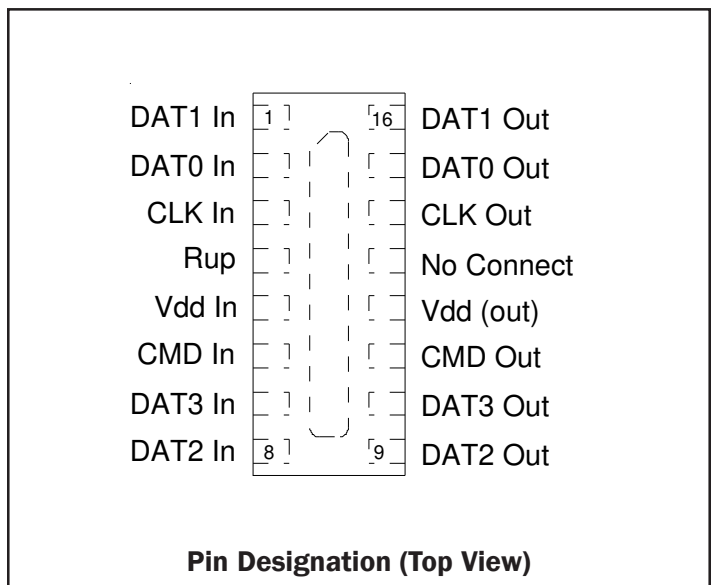
◆ T-Flash / MicroSD Interfaces
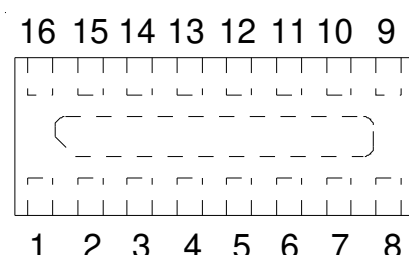◆ MMC Interfaces
◆ CDMA, GSM, 3G Cell Phones

Package Dimensions

3.30

1 2

1.30

0.40 BSC

0.50

Nominal Dimensions in mm (Bottom View)

Pin Configuration

DAT1 In	1 — 16	DAT1 Out
DAT0 In		DAT0 Out
CLK In		CLK Out
Rup		No Connect
Vdd In		Vdd (out)
CMD In		CMD Out
DAT3 In		DAT3 Out
DAT2 In	8 — 9	DAT2 Out

Pin Designation (Top View)

Pin Identification and Configuration

Pin	Symbol	Identification
1, 16	DAT1	Data line #1 input/output
2, 15	DAT0	Data line #0 Input/Output
3, 14	Clock	Clock line Input/Output
4	Rup	15K Pull-up resistors
5, 12	Vdd	Power Supply ESD Protection in/output
6, 11	CMD	Command Line Input/Output
7, 10	DAT3	Data line #3 input/output
8, 9	DAT2	Data line #2 input/output
13	NC	Not connected
Center tab	GND	Ground connection

16 15 14 13 12 11 10 9

1 2 3 4 5 6 7 8

Pin Configuration (Top View)

Schematics & Component Values

Notes:
In = Connector (uSD Card) Side
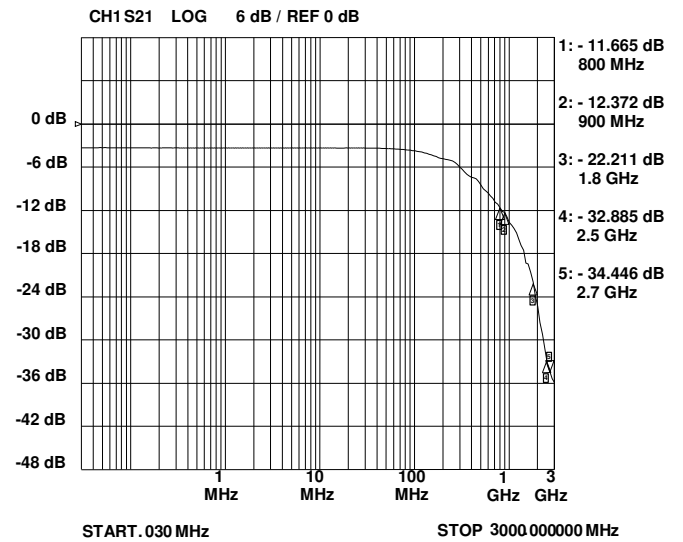Out = Protected (Host) IC Side
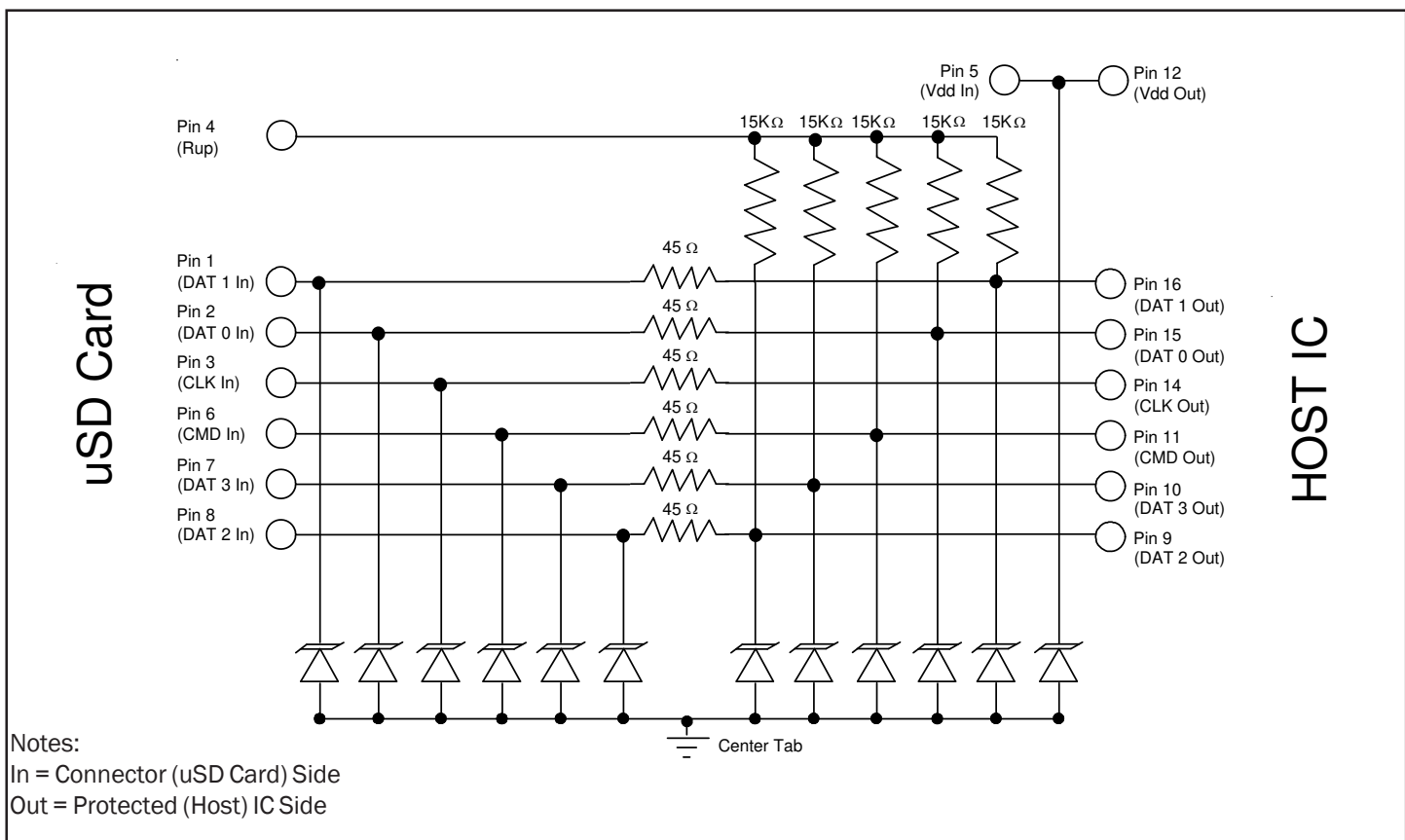
Absolute Maximum Rating

Parameter	Symbol	Value	Units
Junction Temperature	T_J	125	°C
Operating Temperature	T_{op}	-40 to +85	°C
Storage Temperature	T_{STG}	-55 to +150	°C
ESD per IEC 61000-4-2			
Input Pins 1, 2, 3, 5, 6, 7, 8, 12 (Contact) Input Pins 1, 2, 3, 5, 6, 7, 8, 12 (Air)	V_{ESD}	+/- 12 +/- 15	kV
Output Pins 4, 9, 10, 11, 14, 15, 16 (Contact) Output Pins 4, 9, 10, 11, 14, 15, 16 (Air)	V_{ESD}	+/- 10 +/- 10	kV

Electrical Characteristics (T = 25°C)

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
TVS Reverse Stand-Off Voltage	V_{RWM}				5	V
TVS Reverse Breakdown Voltage	V_{BR}	$I_t = 1mA$	6	8	10	V
TVS Reverse Leakage Current	I_R	$V_{RWM} = 3.0V$			0.1	µA
Series Resistors	R	Each Line	38	45	52	Ohms
DAT Pull Up Resistor	R_{up}		12	15	18	k Ohms
Dynamic Resistance	R_{DYN}	tp = 100ns, Measured from 4A to 16A		0.40		Ohms
Total Capacitance	C_{in}	Input to Gnd, Pins 1, 2, 6, 7, 8 $V_R = 0V$, f = 1MHz	10	22	25	pF
Total Capacitance	C_{in}	Input to Gnd, Pin 3, 5, 12 $V_R = 0V$, f = 1MHz	6	12	15	pF

PROTECTION PRODUCTS

Typical Characteristics (Con't)

Capacitance vs. Reverse Voltage (CLK & VDD)

f = 1 MHz

DD149202
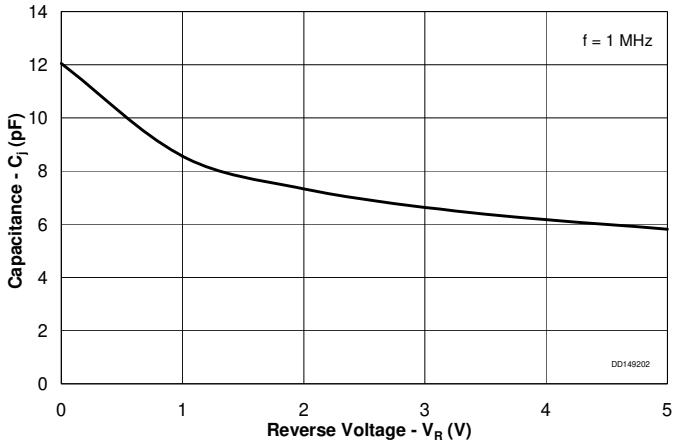
Capacitance vs. Reverse Voltage (DAT & CMD Lines)

f = 1 MHz

DD149202
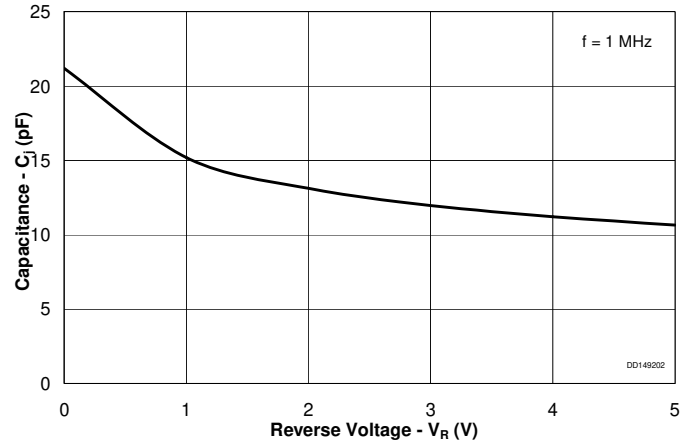
Typical Insertion Loss S21 (CLK Line)

CH1 S21   LOG   6 dB / REF 0 dB

1: - 7.5642 dB
800 MHz

2: - 8.1753 dB
900 MHz

3: - 14.004 dB
1.8 GHz

4: - 18.668 dB
2.5 GHz

5: - 19.850 dB
2.7 GHz

START .030 MHz   STOP 3000.000000 MHz
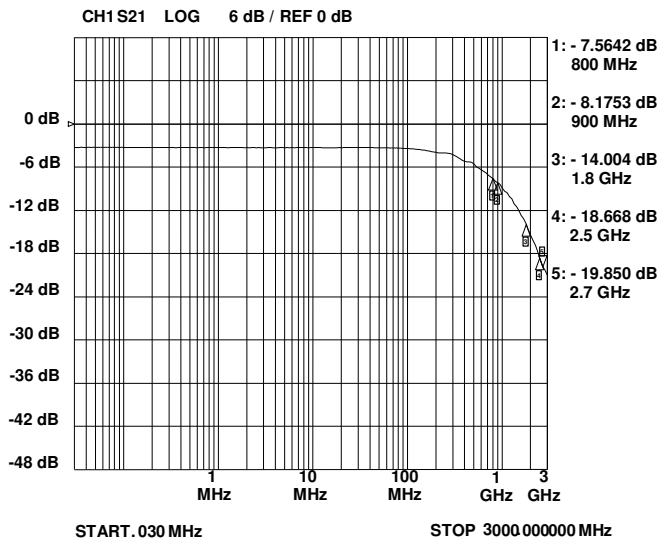
Typical Insertion Loss S21 (Each DAT Line)

CH1 S21   LOG   6 dB / REF 0 dB

1: - 11.665 dB
800 MHz

2: - 12.372 dB
900 MHz

3: - 22.211 dB
1.8 GHz

4: - 32.885 dB
2.5 GHz

5: - 34.446 dB
2.7 GHz

START .030 MHz   STOP 3000.000000 MHz

Analog Crosstalk

CH1 S21   LOG   20dB / REF 0 dB

START .030 MHz   STOP 3000.000000 MHz
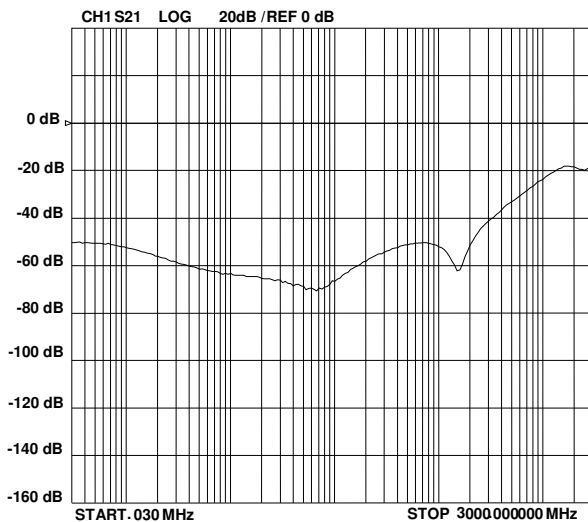
TLP Characteristic

$R_{DYN} = 0.40$

TLP Parameters:
tp = 100ns
tr = 200ps

ESD Clamping (+8kV Contact per IEC 61000-4-2)
DAT Lines

ESD Clamping (-8kV Contact per IEC 61000-4-2)
DAT Lines

ESD Clamping +8kV Contact per IEC 61000-4-2
CLK Line

ESD Clamping -8kV Contact per IEC 61000-4-2
CLK Line

ESD Clamping +8kV Contact per IEC 61000-4-2
VDD Line
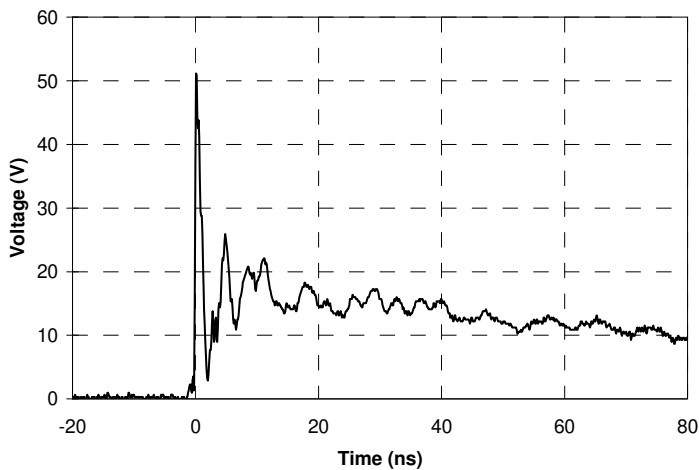
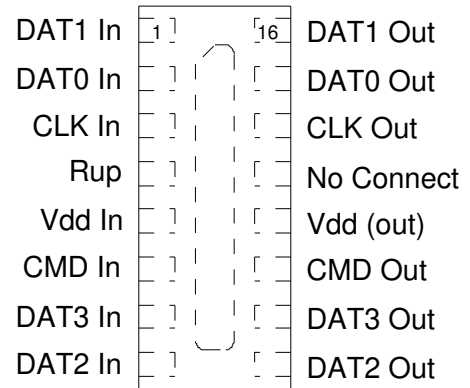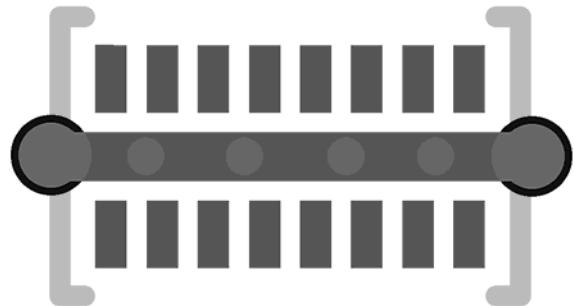**ESD Clamping -8kV Contact per IEC 61000-4-2**
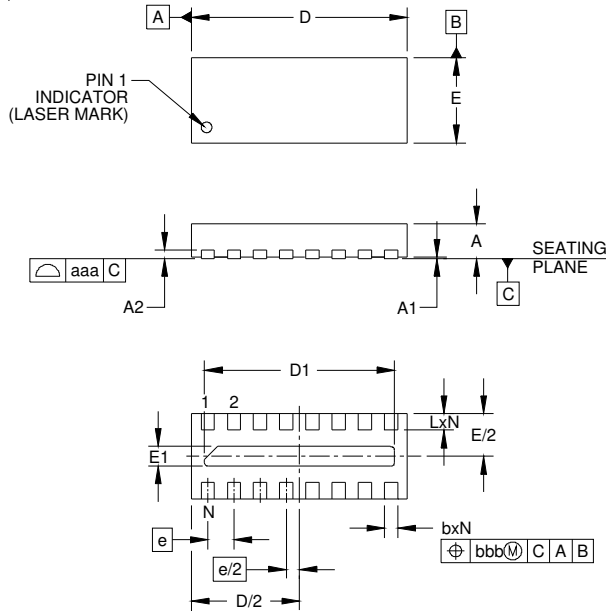**VDD Line**
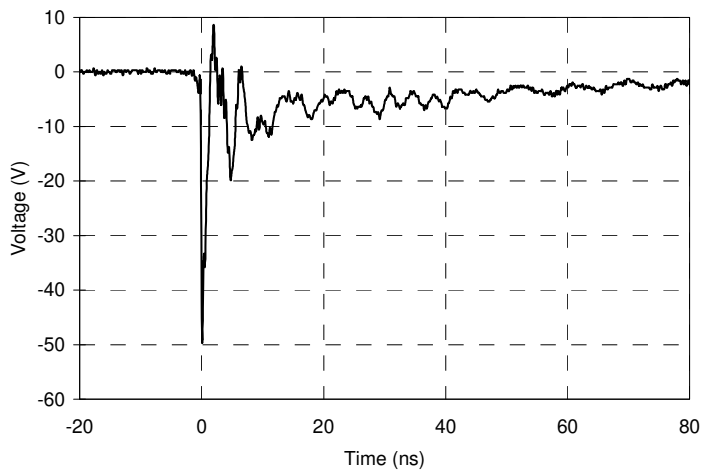
Device Connection

The EClamp2515K is a microSD/T-Flash interface device designed for use in cell phones and other portable electronic devices. The EClamp2515K is comprised of series and pull up resistors required on the microSD interface. Each line also includes TVS diodes for ESD protection.

The EClamp2515K is in a 16-pin SLP package. Electrical connection is made to the 16 pins located at the bottom of the device. The device has a flow through design for easy layout. Pin connections are noted in Figure 1. A center tab serves as the ground connection. Recommendations for the ground connection are given below.

Ground Connection Recommendation

Parasitic inductance present in the board layout will affect the filtering and ESD performance of the device. Ground loop inductance can be reduced by using multiple vias to make the connection to the ground plane. Figure 2 shows the recommended device layout. The ground pad vias have a diameter of 0.008 inches (0.20 mm) while the two external vias have a diameter of 0.010 inches (0.250mm). The internal vias are spaced approximately evenly from the center of the pad. The designer may choose to use more vias with a smaller diameter (such as 0.005 inches or 0.125mm) since changing the diameter of the via will result in little change in inductance.

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

DAT1 In	DAT1 Out
DAT0 In	DAT0 Out
CLK In	CLK Out
Rup	No Connect
Vdd In	Vdd (out)
CMD In	CMD Out
DAT3 In	DAT3 Out
DAT2 In	DAT2 Out

Figure 2 - Recommended Layout using Ground Vias

Outline Drawing - SLP3313P16T

DIMENSIONS						
DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.018	.020	.022	0.45	0.50	0.55
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	.128	.130	.133	3.25	3.30	3.375
D1	.110	.114	.118	2.80	2.90	3.00
E	.049	.051	.054	1.25	1.30	1.375
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		16			16	
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 - SLP3313P16T
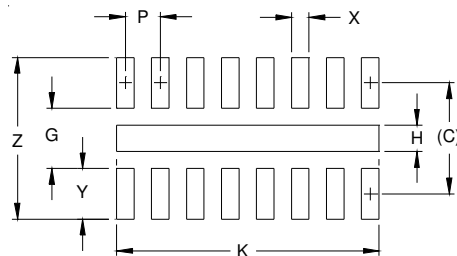
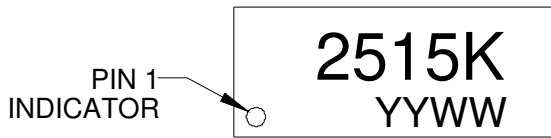| DIMENSIONS		
DIM	INCHES	MILLIMETERS
C	(.050)	(1.27)
G	.027	0.69
H	.012	0.30
K	.118	3.00
P	.016	0.40
X	.008	0.20
Y	.023	0.58
Z	.073	1.85

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
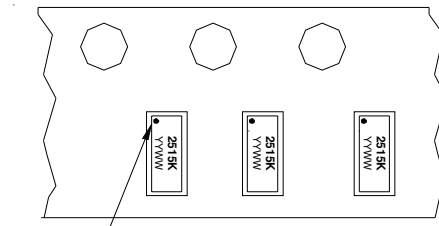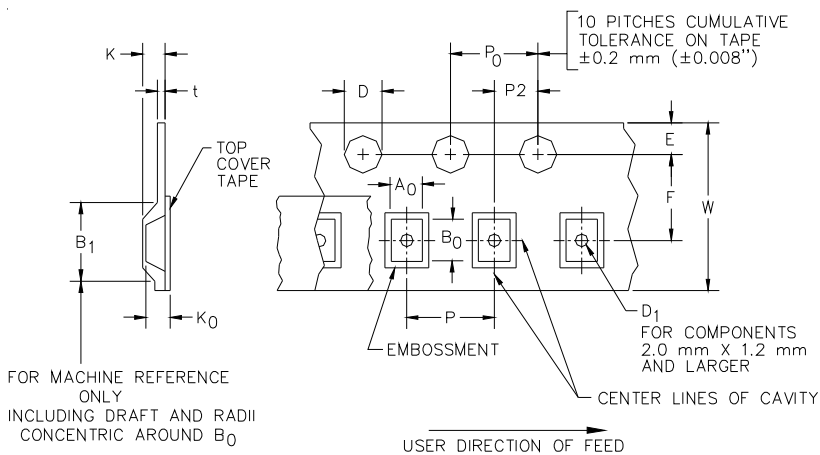   COMPANY'S MANUFACTURING GUIDELINES ARE MET.

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Marking Code

PIN 1
INDICATOR

2515K
YYWW

YYWW = Date Code

Ordering Information

Part Number	Qty per Reel	Reel Size
EClamp2515K.TCT	3000	7 Inch

EMIClamp and EClamp are trademarks of Semtech Corporation

Tape and Reel Specification

K

t

TOP
COVER
TAPE

B₁

K₀

FOR MACHINE REFERENCE
ONLY
INCLUDING DRAFT AND RADII
CONCENTRIC AROUND B₀

10 PITCHES CUMULATIVE
TOLERANCE ON TAPE
±0.2 mm (±0.008")

P₀

P2

D

E

F

W

A₀

B₀

P

EMBOSSMENT

D₁
FOR COMPONENTS
2.0 mm X 1.2 mm
AND LARGER

CENTER LINES OF CAVITY

USER DIRECTION OF FEED

Pin 1 Location (Towards Sprocket Holes)

User Direction of feed

Device Orientation in Tape

A0	B0	K0
1.51 +/-0.10 mm	3.51 +/-0.10 mm	0.66 +/-0.10 mm

Tape Width	B, (Max)	D	D1	E	F	K (MAX)	P	P0	P2	T(MAX)	W
12 mm	8.2 mm (.476)	1.5 + 0.1 mm - 0.0 mm (0.59 +.005 - .000)	1.0 mm ±0.05 (.039)	1.750±.10 mm (.069±.004)	5.5±0.05 mm (.217±.002)	4.5 mm (.177)	4.0±0.1 mm (.157±.00-4)	4.0±0.1 mm (.157±.00-4)	2.0±0.05m-m (.079±.002)	0.4 mm (.016)	12.0 mm + 0.3 mm - 0.1 mm (.472±.012)

Contact Information