TDS3011P
Transient Diverting Suppressor
1-Line, 30V EOS Protection

PROTECTION PRODUCTS

Description

Transient Diverting Suppressors(TDS) are designed to provide high energy EOS protection with superior clamping and temperature characteristics when compared to standard TVS devices. The device uses a surge rated FET as the main protection element. During an EOS event, transient voltage increases beyond the rated breakdown voltage of the device. The FET in turn switches on and conducts transient current to ground. The TDS clamping voltage is nearly constant across the rated peak pulse current range due to the extremely low ON Resistance of the FET. Lower clamping voltage at maximum peak pulse current makes them more suitable for protecting today's sensitive IC's.

TDS3011P is designed to protect voltage bus or data lines with an operating voltage as high as 30V . It is rated for a high-energy transient current up to 35A (t_p = 8/20µs) and may be used to meet the common industrial voltage surge standard of +/-2kV per IEC 61000-4-5 (R_S = 42Ω, C_S= 0.5µF).

TDS3011P is in a small DFN 1.6mm x 1.6mm x 0.55mm 6- Lead package and represents significant board space savings over traditional SMAJ and SMBJ packaged devices.

Features

- High ESD withstand Voltage: +/-30kV (Contact) and +/-30kV (Air) per IEC 61000-4-2
- High peak pulse current capability: 35A (tp = 8/20µs), 2kV (tp = 1.2/50µs, R_S = 42Ω) per IEC 61000-4-5
- High EFT Withstand Voltage: ±4kV (100kHz and 5kHz,
- 5/50ns) IEC 61000-4-4
- Protects one I/O or power line
- Low ESD and clamping voltage
- Working voltage: 30V
- Solid-state technology

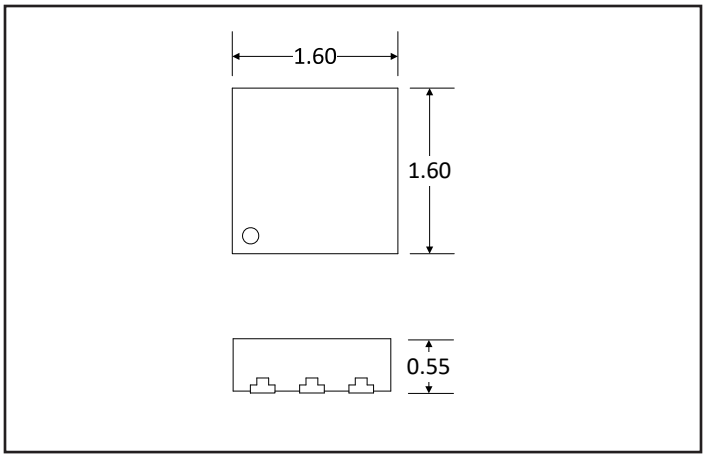
Mechanical Characteristics

- Package: DFN 1.6mm x 1.6mm x 0.55mm 6-Lead
- Pb-free, Halogen Free, RoHS/WEEE Compliant
- Molding compound flammability rating: UL 94V-0
- Lead Finish: Lead-free
- Marking: Marking code and Date Code
- Packaging: Tape and Reel

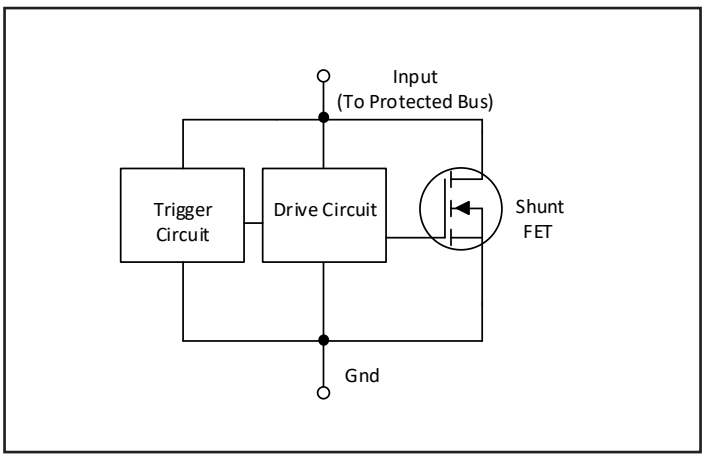
Applications

- IoT Devices
- Notebook and Tablet PC
- USB PD
- Appliances
- VBUS Lines
- Solid-State Switches
- USB Type-C

Package Dimension (mm)



Functional Diagram



Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (t_p = 8/20µs)	P_{PK}	1400	W
Peak Pulse Current (t_p = 8/20µs)	I_{PP}	35	A
ESD per IEC 61000-4-2 (Air)(1) ESD per IEC 61000-4-2 (Contact)(1)	V_{ESD}	±30 ±30	kV
Operating Temperature	T_{OP}	-40 to +125	°C
Junction Temperature and Storage Temperature	T_J and T_{STG}	-55 to +150	°C

Electrical Characteristics (T=25°C unless otherwise specified)

TDS3011P						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
Reverse Stand-Off Voltage	V_{RWM}	Line to GND			30	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA, Line to GND	34		39	V
Forward Voltage	V_F	I_t = 1mA, GND to Line		0.47		V
Reverse Leakage Current	I_R	V_{RWM} = 30V, Line to GND		0.05	1.0	µA
Clamping Voltage (2)	V_C	I_{PP}=35A, tp = 1.2/50µs (Voltage), 8/20µs (Current) Combination Waveform, R_S = 2Ω		38	40	V
Dynamic Resistance (2), (3)	R_{DYN}	tp = 8/20µs		7.4		mΩ
Junction Capacitance	C_J	V_R = 30V, f = 1MHz		170		pF

Notes:

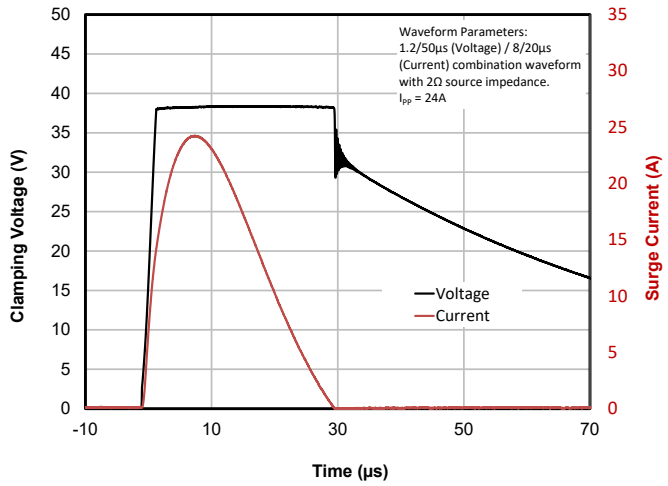
1) ESD gun return path connected to ESD ground plane.

2) Parameter guaranteed by design.

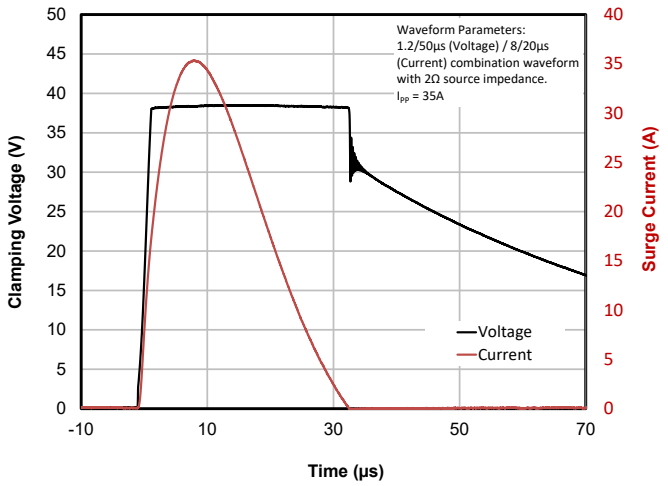
3) Dynamic resistance measured between 1A and 35A.

Typical Characteristics

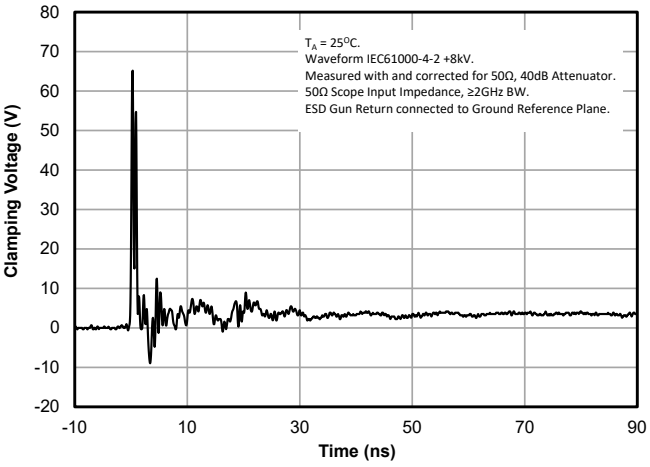
Clamping Voltage (t_p=1.2/50µs, I_{PP}= 24A)



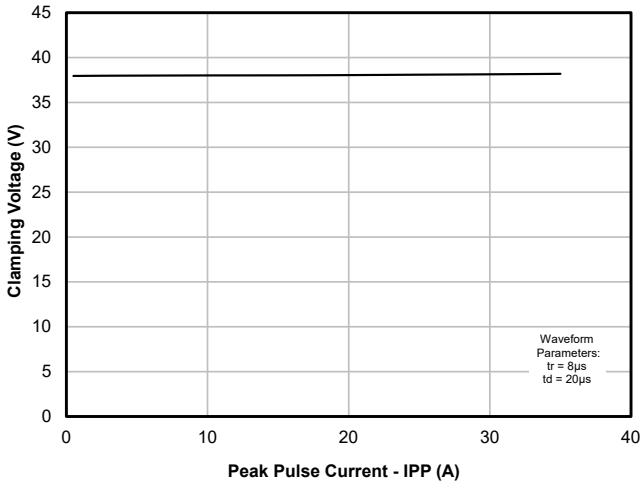
Clamping Voltage (t_p=1.2/50µs, I_{PP}= 35A)



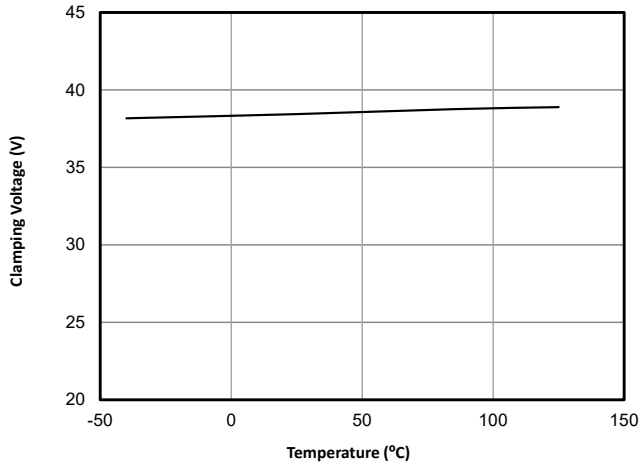
ESD Clamping (+8kV Contact per IEC 61000-4-2)



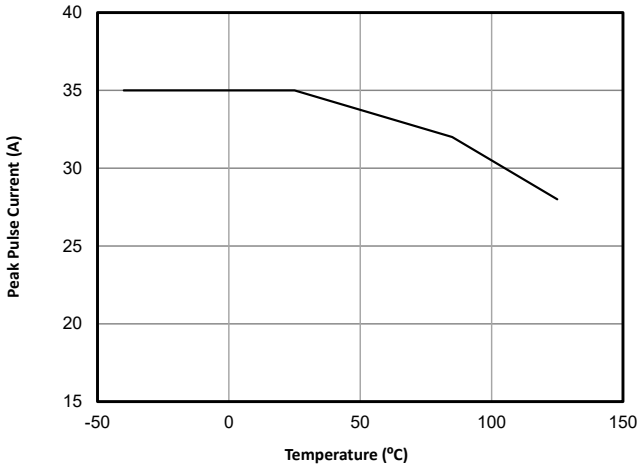
Clamping Voltage vs. Peak Pulse Current (tp=8/20µs)



Clamping Voltage (t_p=1.2/50µs, I_{PP}= 35A) vs Temperature

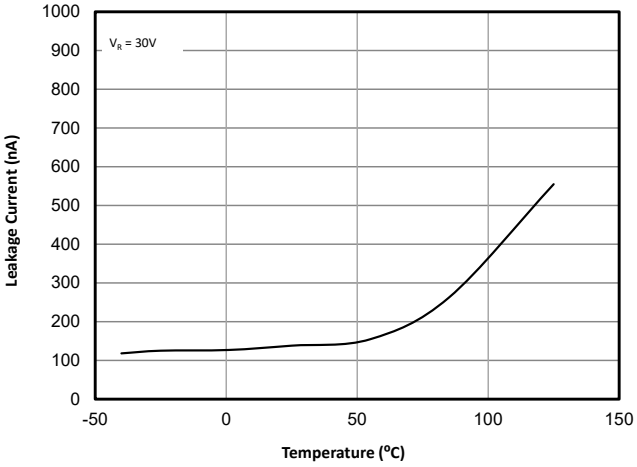


Peak Pulse Current (t_p=8x20µs) vs Temperature

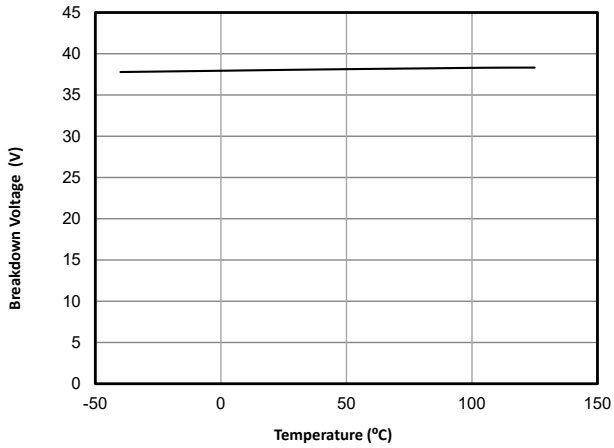


Typical Characteristics

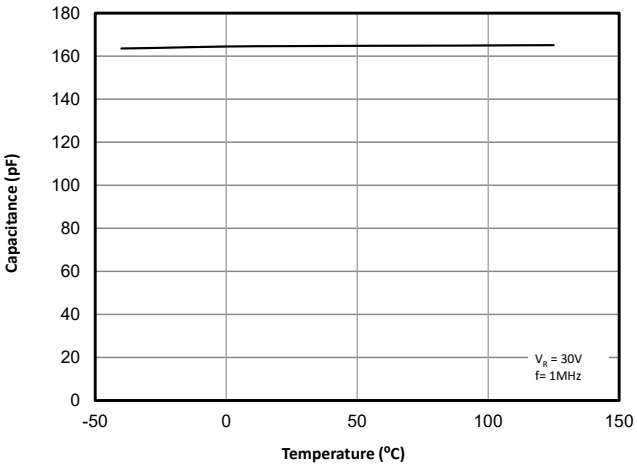
Reverse Leakage vs. Temperature



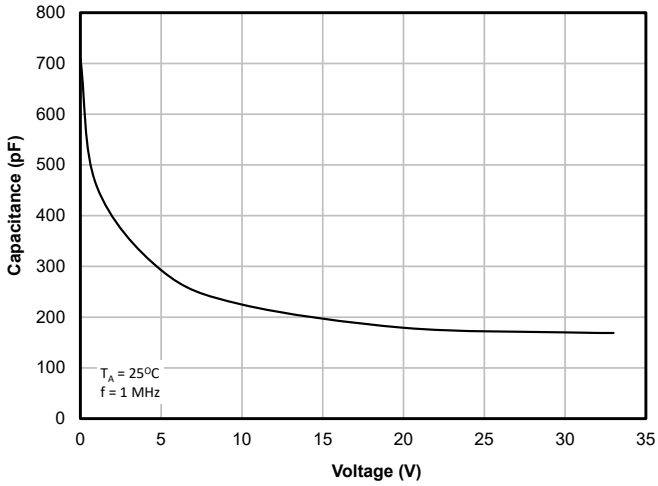
Breakdown Voltage vs. Temperature



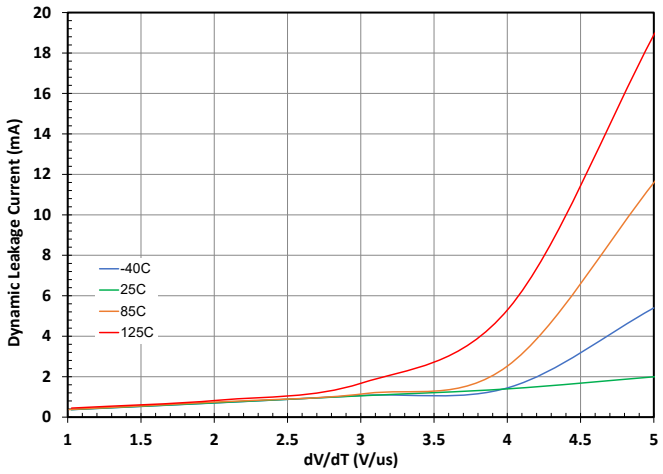
Capacitance vs. Temperature



Capacitance vs. Reverse Voltage



Dynamic Leakage vs. Signal Slew Rate over Temperature



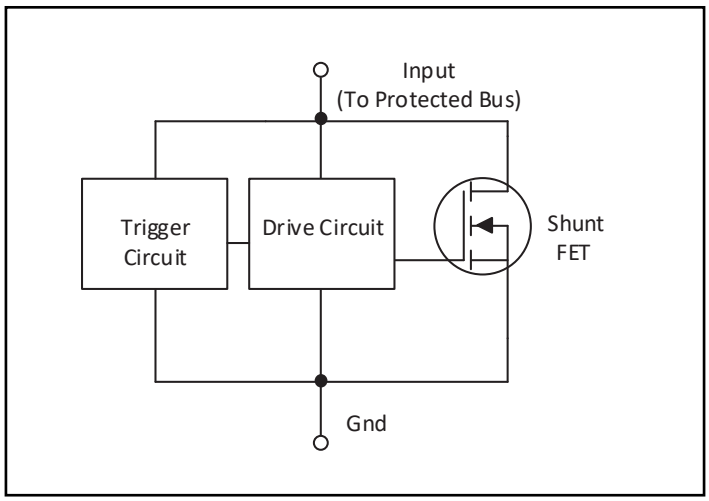
Application Information

Description

Transient Diverting Suppressors(TDS) are designed to provide high energy EOS protection with superior clamping and temperature characteristics when compared to standard TVS devices.

This device uses a surge rated FET as the main protection element. During an EOS event, transient voltage increases beyond the breakdown voltage of the trigger circuit. This in turn activates the drive circuit and turns on the shunt FET which conducts transient current to ground. The TDS has an extremely low dynamic resistance and exhibits a nearly constant clamping voltage across the rated peak pulse current range.

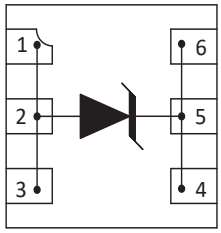
Figure 1- Function Diagram



Pin Configuration

TDS3011P is in a 1.6 x 1.6mm, 6-pin DFN package. The input or connection to the protected bus is made at pins 4, 5, and 6. Ground connection is made at pins 1, 2, and 3. All pins must be connected for maximum peak pulse current handling capability.

Figure 2- Pin Configuration and Description



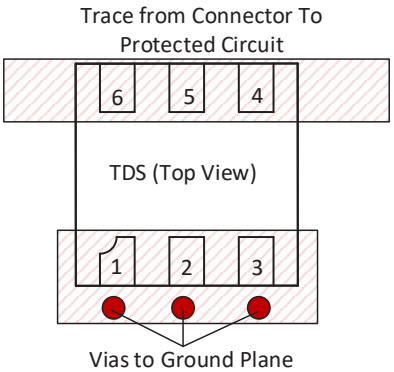
6-Pin DFN Package (Top View)

Pin Number	Pin name	Description
1,2,3	GND	Ground
4,5,6	IN	EOS and ESD Protection Input

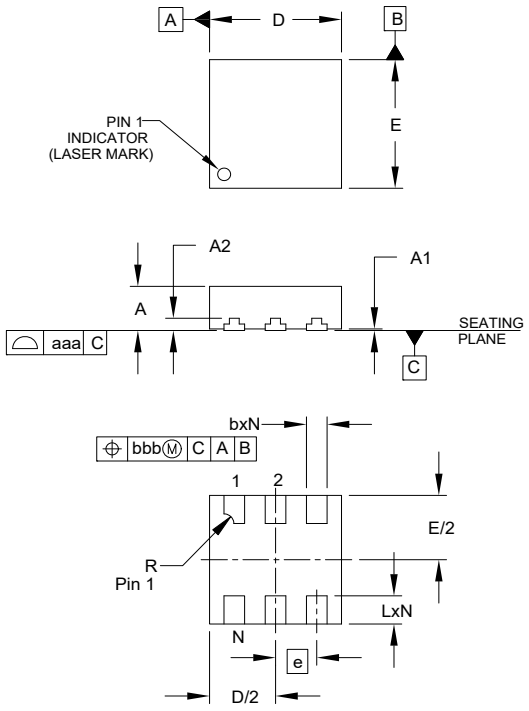
Layout Guidelines

Figure 3 shows a recommended layout for TDS3011P. All the I/O pins (Pin 4, 5 and 6) are connected through a single straight trace. All of the I/O pins must be connected for surge performance. Likewise, all GND pins (Pin 1, 2 and 3) must be connected for maximum surge current capability. Ground connection with multiple vias is recommended.

Figure 3- PCB Layout Recommendation



Outline Drawing - DFN 1.6mm x 1.6mm x 0.55mm 6-Lead

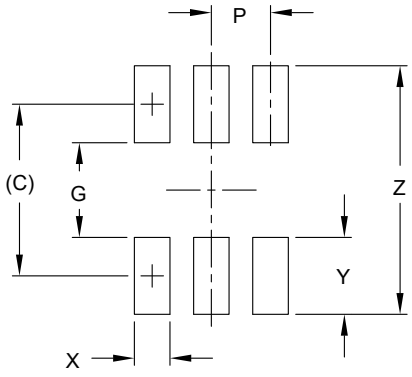


DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A2		(0.152)	
b	0.20	0.25	0.30
D	1.55	1.60	1.65
E	1.55	1.60	1.65
e		0.50 BSC	
L	0.30	0.35	0.40
N		6	
R	0.07	0.12	0.17
aaa		0.08	
bbb		0.10	

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

Land Pattern - DFN 1.6mm x 1.6mm x 0.55mm 6-Lead

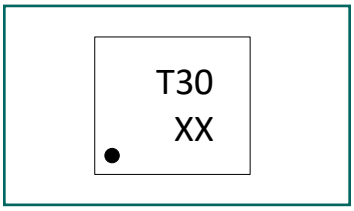


DIMENSIONS	
DIM	MILLIMETERS
C	(1.45)
G	0.80
P	0.50
X	0.30
Y	0.65
Z	2.10

NOTES:

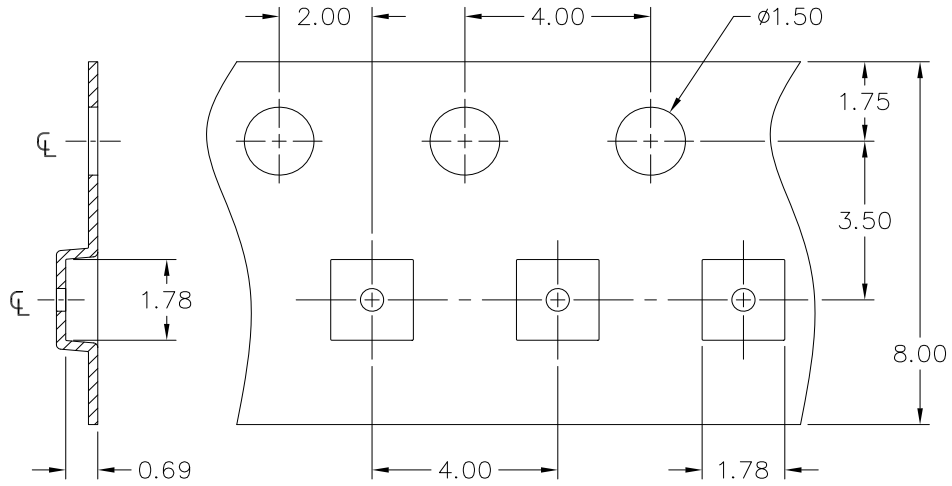
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code

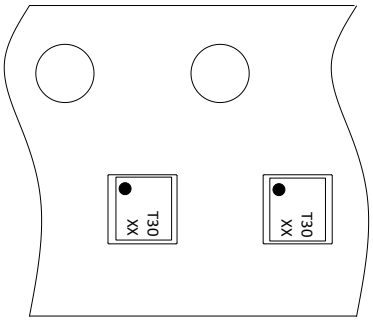


Notes:
1. XX: Date Code.
2. Dot indicates Pin 1 location.

Tape and Reel Specification



Note: All dimensions are nominal dimensions in mm.



Ordering Information

Part Number	V_{RWM}	Qty per Reel	Reel Size
TDS3011P.C	30V	3,000	7”

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