TDS3061P
1-Line, 30V EOS Protection

Description

SurgeSwitch™ 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, when compared to standard TVS diodes.

TDS3061P 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 40A (tp = 8/20µs) and may be used to meet the common industrial voltage surge standard of +/-2kV per IEC 61000-4-5 (RS =42Ω, CS= 0.5µF).

TDS3061P is in a small 2.0 x 2.0mm, 6-pin DFN 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: 40A (tp = 8/20µs), 2kV (tp = 1.2/50µs, RS = 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

Applications

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

Mechanical Characteristics

- Package: DFN 2.0 x 2.0 x 0.75mm 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

Dimensions

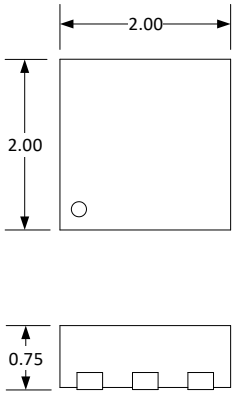


Figure (1) Nominal Dimensions Drawing

Functional Diagram

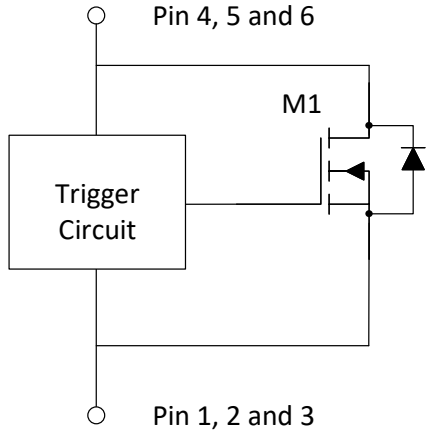


Figure (2) Functional diagram

Absolute Maximum ESD Rating

RATING	SYMBOL	VALUE	UNITS
Peak Pulse Power (t_p = 8/20µs)	P_{PK}	1600	W
Peak Pulse Current (t_p = 8/20µs)	I_{PP}	40	A
Peak Pulse Current (t_p = 10/1000µs)	I_{PP}	3	A
ESD per IEC 61000-4-2 (Air)(1) ESD per IEC 61000-4-2 (Contact)(1)	V_{ESD}	±30 ±30	kV kV
Junction and Operating Temperature	T_{OP}	-40 to +125	°C
Storage Temperature	T_J and T_{STG}	-55 to +150	°C

Exceeding the above specifications may result in permanent damage to the device or device malfunction. Operation outside of the parameters specified in the Electrical Characteristics section is not recommended.

Electrical Characteristics

T_A = 25°C unless otherwise specified. All data taken from Pin 4, 5, 6 to Pin 1, 2, 3 unless otherwise specified.

PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}					30	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA		34	38	39	V
Forward Voltage	V_F	I_t = 1mA, Pin 1, 2, 3 to Pin 4, 5, 6			0.46		V
Reverse Leakage Current	I_R	V_{RWM} = 30V	T_A = 25°C		112	500	nA
			T_A = 85°C		193	750	nA
Clamping Voltage(2)	V_C	I_{PP}=24A, t_p = 8/20µs, Line to GND			37.9	39.8	V
		I_{PP}=40A, t_p = 8/20µs, Line to GND			38.1	40	V
Dynamic Resistance(2),(3)	R_{DYN}	t_p = 8/20µs			14.9		mΩ
Junction Capacitance	C_J	V_R = 30V, f = 1MHz			93		pF

Notes:

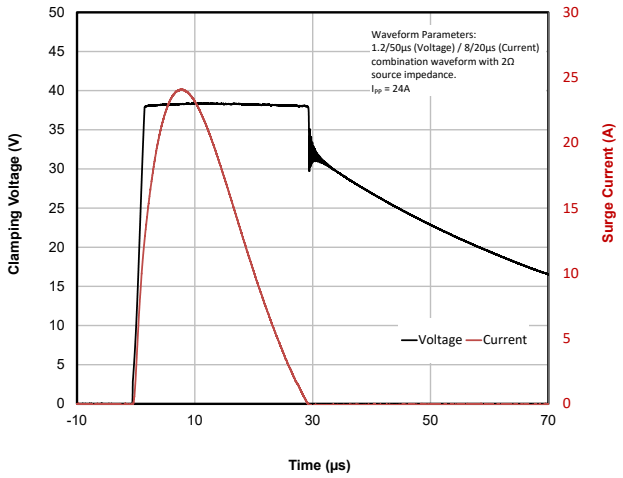
1) ESD gun return path connected to ESD ground plane.

2) Parameter guaranteed by design.

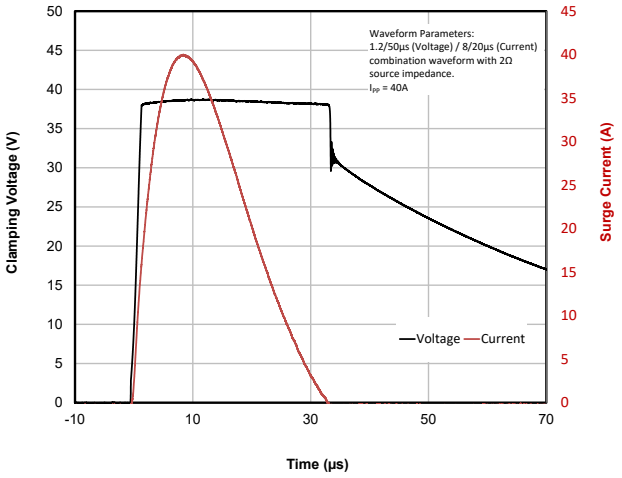
3) Dynamic resistance measured between 1A and I_{PP} (tp = 8/20µs)

Typical Characteristics

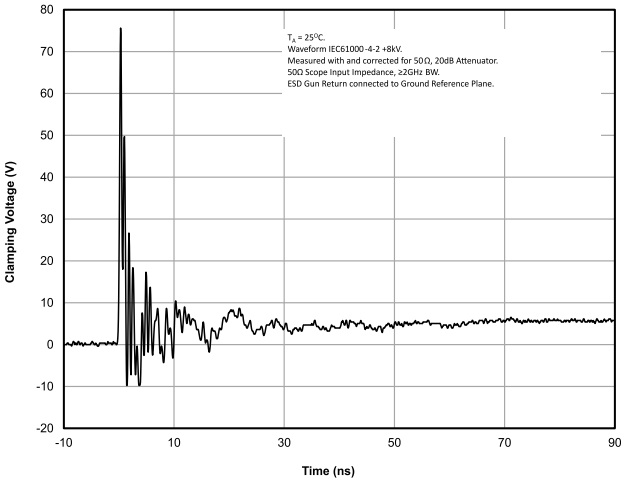
Clamping Voltage (t_p=1.2/50µs, I_{PP}= 24A)



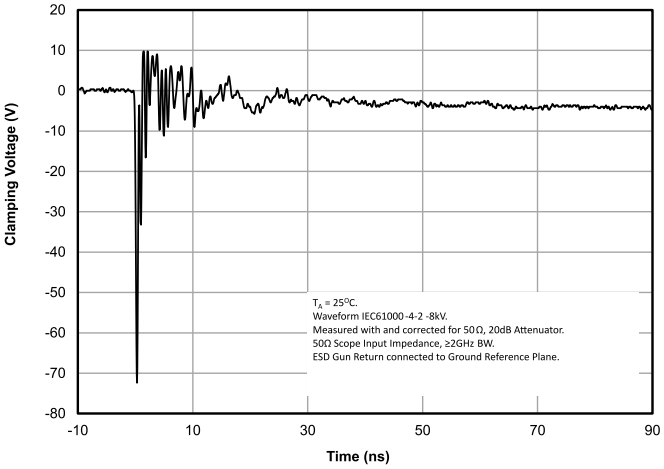
Clamping Voltage (t_p=1.2/50µs, I_{PP}= 40A)



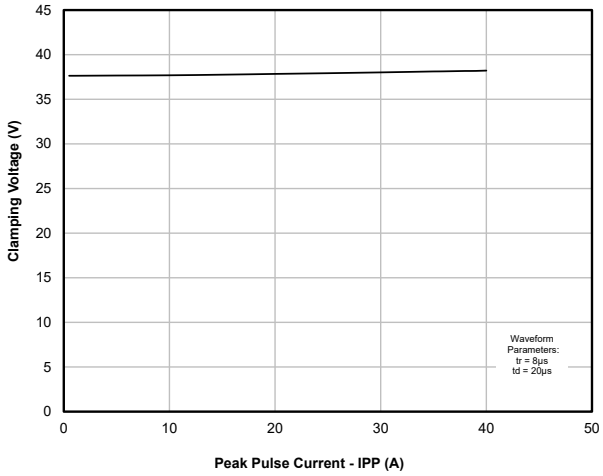
ESD Clamping (+8kV Contact per IEC 61000-4-2)



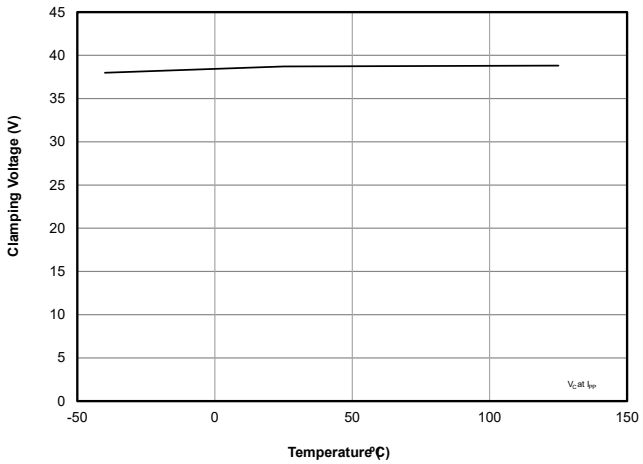
ESD Clamping (-8kV Contact per IEC 61000-4-2)



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

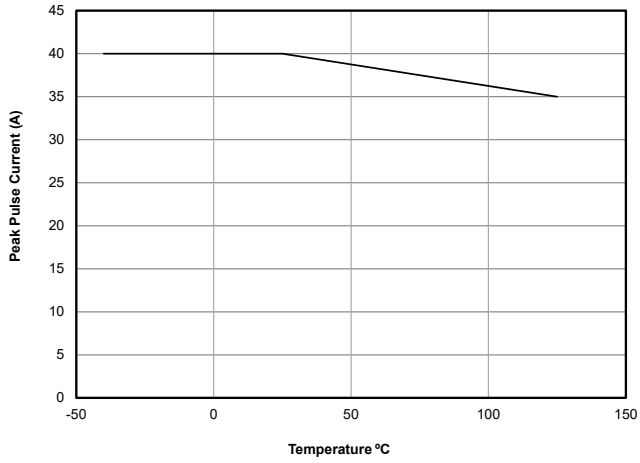


Clamping Voltage (t_p=1.2/50µs, I_{pp}=40A) vs. Temperature

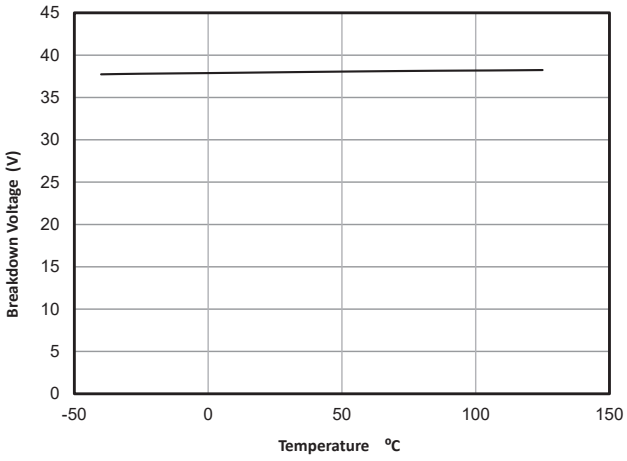


Typical Characteristics

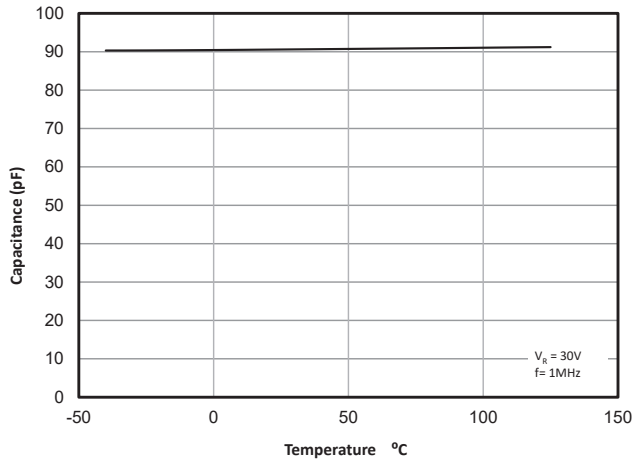
Peak Pulse Current (t_p=8/20μs) vs. Temperature



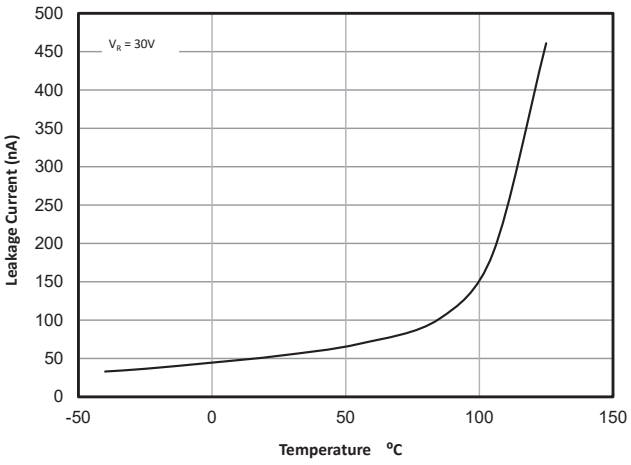
Breakdown Voltage vs. Temperature



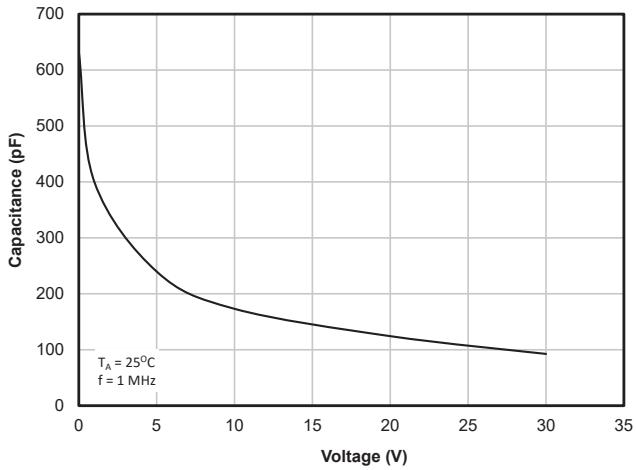
Capacitance vs. Temperature



Reverse Leakage vs. Temperature



Capacitance vs. Reverse Voltage



Application Information

DESCRIPTION

SurgeSwiitch$_{TM}$ devices 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.

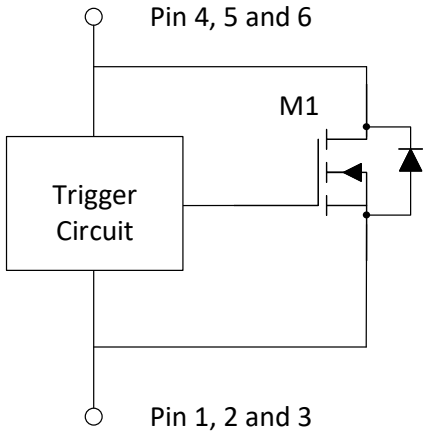
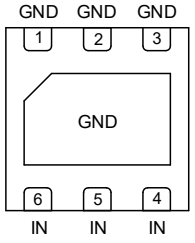


Figure (3) Function Diagram

PIN CONFIGURATION

TDS3061P is in a 2 x 2mm, 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. The exposed center pad may optionally be connected to GND.



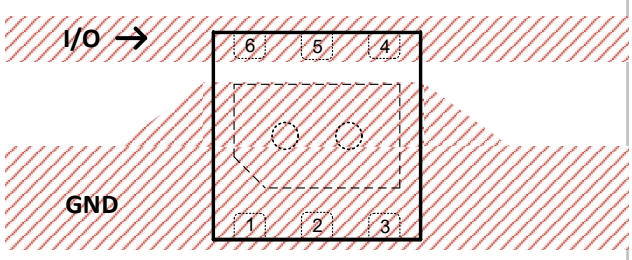
(Bottom View)

Figure (4) Pin Configuration

PIN NUMBER	PIN NAME	DESCRIPTION
1, 2, 3	GND	Ground Connection
4, 5, 6	IN	EOS and ESD Protection Input
Center Pad	GND	Optional GND Connection

LAYOUT GUIDELINES

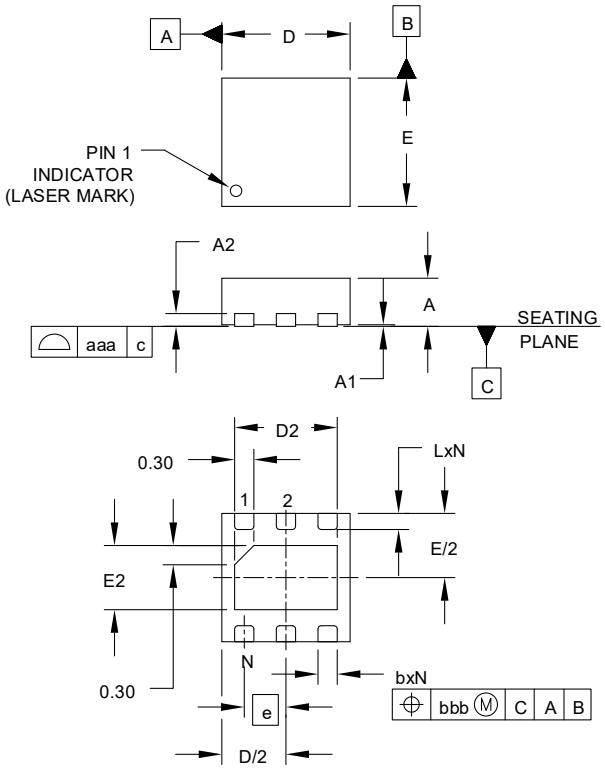
Figure 5 shows a recommended layout for TDS3061P. All the I/O pins (Pin 4, 5 and 6) are connected through a single straight trace. All of the I/O pins must be connected for surge performance. Likewise, all GND pins (Pin 1, 2 and 3) must be connected for maximum surge current capability. The center pad may also be connected to ground. In this case, one large trace may be used as shown. Note that pins 1, 2, and 3 must always be connected to ground, even if the center tab is connected.



(Top View)

Figure (5) Pin Configuration

Outline Drawing - DFN 2.0 x 2.0 x 0.75 mm, 6 Lead

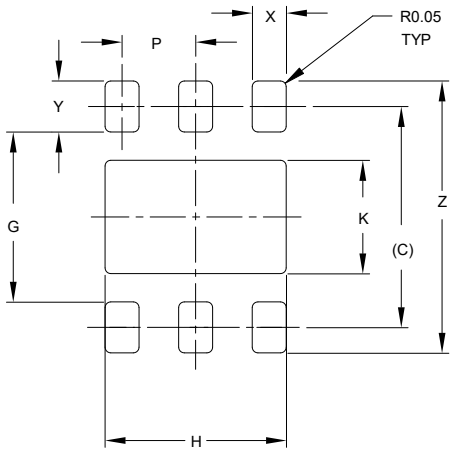


DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.18	0.20	0.25
b	0.25	0.30	0.35
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	1.55	1.60	1.65
E2	0.95	1.00	1.05
e	0.65 BSC		
L	0.20	0.25	0.30
N	6		
aaa	0.08		
bbb	0.08		

NOTES:

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

Landing Pattern - DFN 2.0 x 2.0 x 0.75 mm, 6 Lead

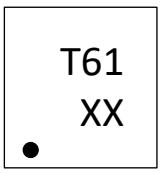


DIMENSIONS	
DIM	MILLIMETERS
C	(1.95)
G	1.50
H	1.60
K	1.00
P	0.65
X	0.30
Y	0.45
Z	2.40

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.

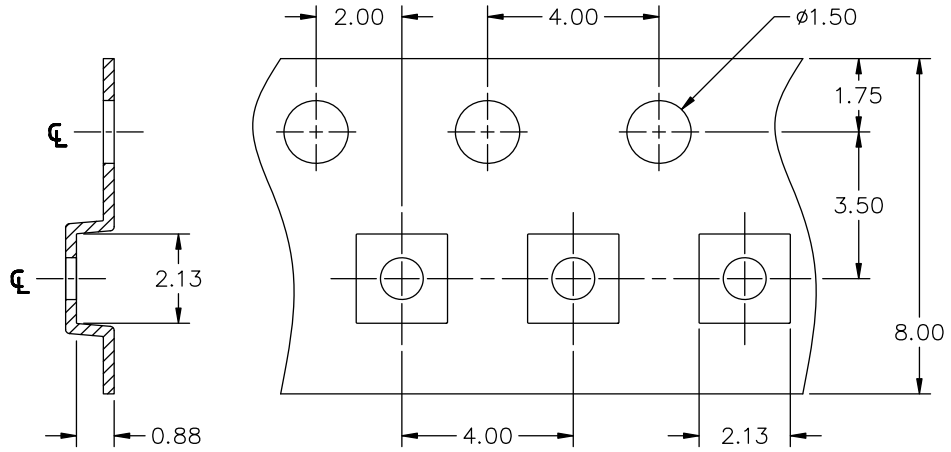
Marking Code



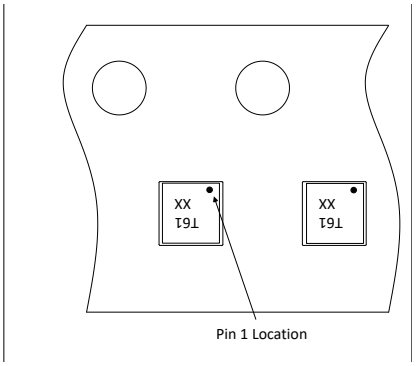
Notes:

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

Tape and Reel Specification



Note: All dimensions are nominal dimensions in mm.



Order Information

PART NUMBER	QTY PER REEL	DESCRIPTION
TDS3061P.C	3,000	7" Reel

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