Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	1.0mΩ@10V	250A
	1.5mΩ@4.5V	

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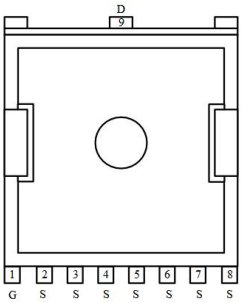
Feature

- Fast Switching
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- ***100% UIS TESTED***
- ***100% ΔVds TESTED***

Applications

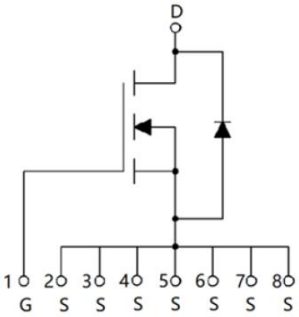
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

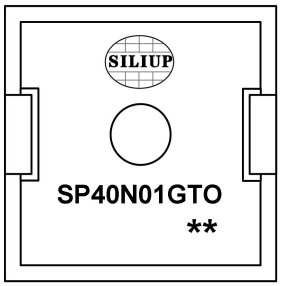


TOLL-8L

Circuit diagram



Marking



SP40N01GTO :Device Code
** :Week Code

Order Information

Device	Package	Unit/Tape
SP40N01GTO	TOLL-8L	2000

Absolute maximum ratings (Ta=25℃, unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current (Tc=25℃)	I_D	250	A
Continuous Drain Current (Tc=100℃)	I_D	167	A
Pulsed Drain Current	I_{DM}	1000	A
Single Pulse Avalanche Energy[1]	E_{AS}	1089	mJ
Total Power Dissipation (Tc=25℃)	P_D	128	W
Total Power Dissipation (Tc=100℃)	P_D	51.2	W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	0.98	℃/W
Storage Temperature Range	T_{STG}	-55 to 150	℃
Operating Junction Temperature Range	T_J	-55 to 150	℃

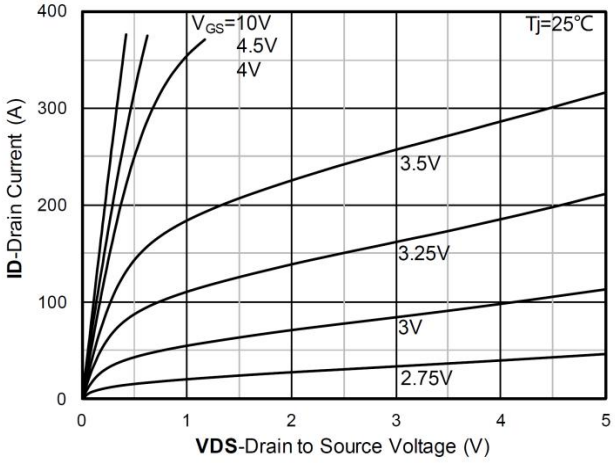
Electrical characteristics (Ta=25℃, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	VGS=0V , ID=250uA	40	48	-	V
Drain-Source Leakage Current	I_{DSS}	VDS=32V , VGS=0V , TJ=25℃	-	-	1	uA
Gate-Source Leakage Current	I_{GSS}	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	VGS=VDS , ID=250uA	1.1	1.5	2.1	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	VGS=10V , ID=50A	-	1.0	1.25	mΩ
		VGS=4.5V , ID=50A	-	1.5	2.0	
Gate Resistance	R_G	f=1MHz	-	3.92	-	Ω
Dynamic characteristics						
Input Capacitance	C_{iss}	VDS=20V , VGS=0V , f=1MHz	-	4830	-	pF
Output Capacitance	C_{oss}		-	1988	-	
Reverse Transfer Capacitance	C_{rss}		-	119	-	
Total Gate Charge	Q_g	VDS=20V , VGS=10V , ID=85A	-	72	-	nC
Gate-Source Charge	Q_{gs}		-	19	-	
Gate-Drain Charge	Q_{gd}		-	12	-	
Gate Plateau Voltage	$V_{plateau}$		-	3.2	-	V
Switching Characteristics						
Turn-On Delay Time	$T_{d(on)}$	VDD=20V , VGS=10V , RG=1.6Ω , ID=85A	-	18	-	nS
Rise Time	T_r		-	25	-	
Turn-Off Delay Time	$T_{d(off)}$		-	76	-	
Fall Time	T_f		-	25	-	
Diode Characteristics						
Diode Forward Voltage	V_{SD}	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	I_S		-	-	250	A
Reverse Recovery Time	T_{rr}	IS=50A , di/dt=100A/us , TJ=25℃	-	52	-	nS
Reverse Recovery Charge	Q_{rr}		-	45	-	nC

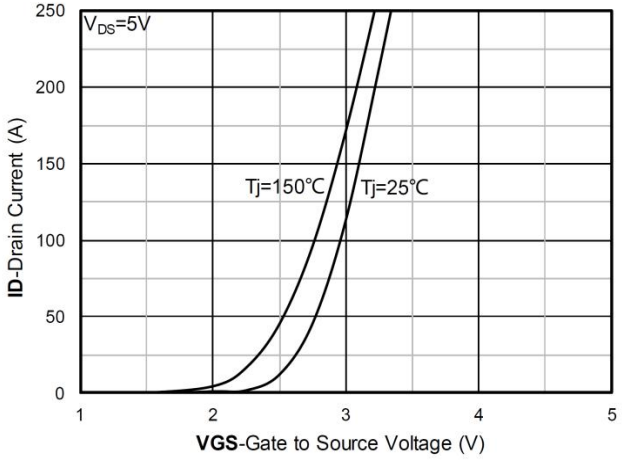
Note :

1. The test condition is VDD=20V, VGS=10V, L=0.5mH, RG=25Ω;

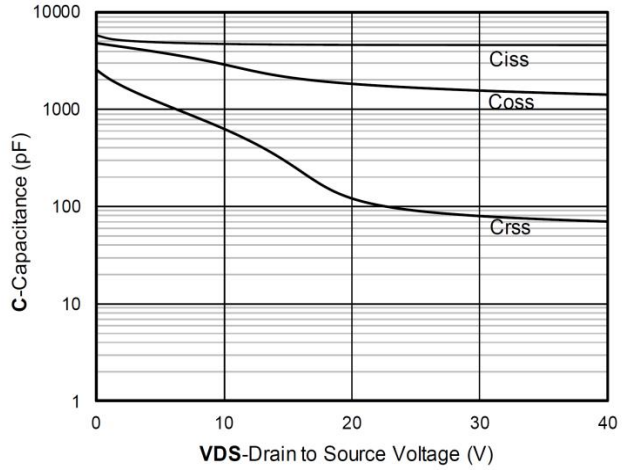
Typical Characteristics



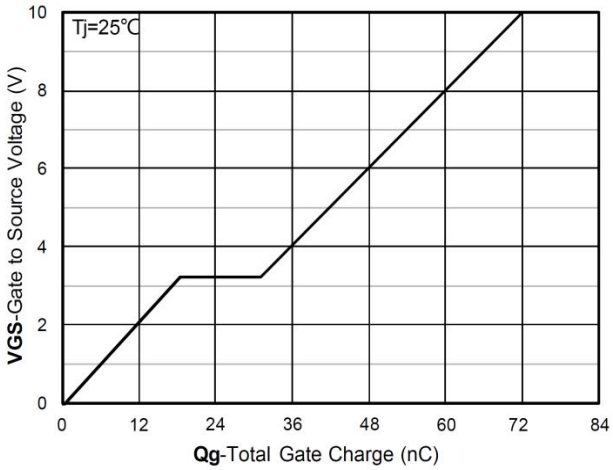
Output Characteristics



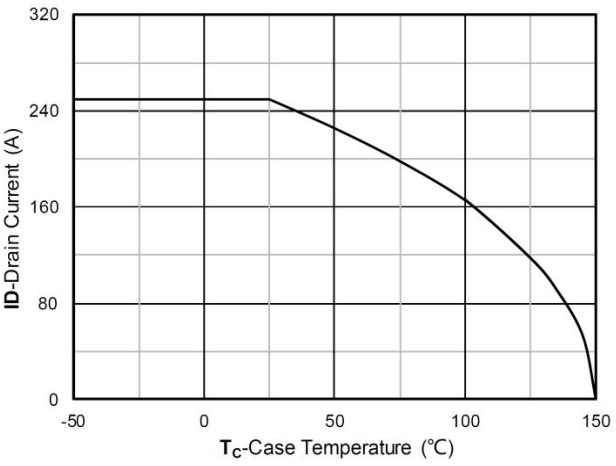
Transfer Characteristics



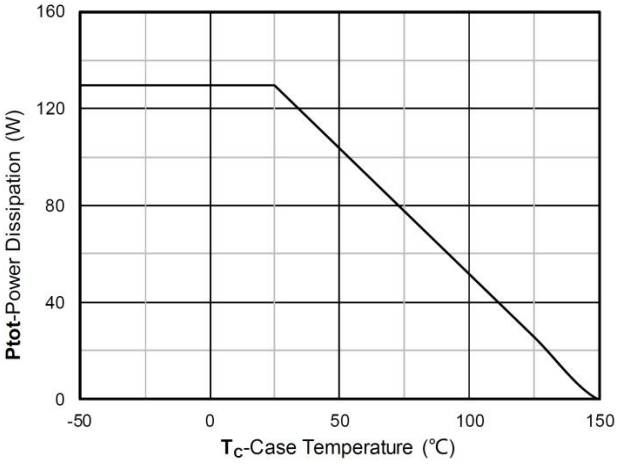
Capacitance Characteristics



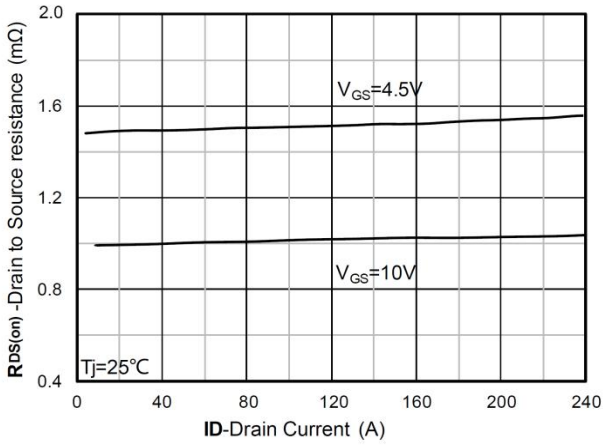
Gate Charge



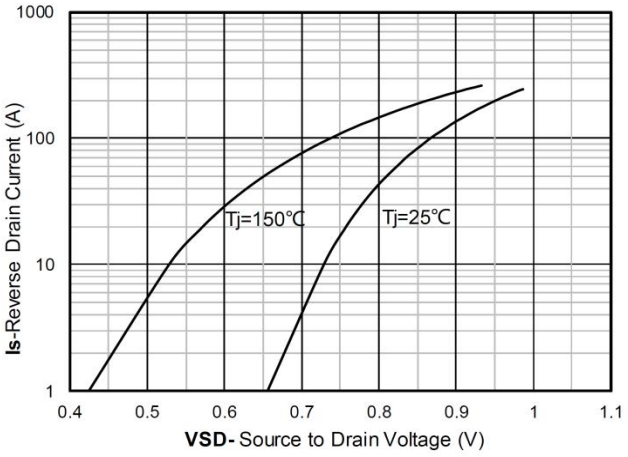
Current dissipation



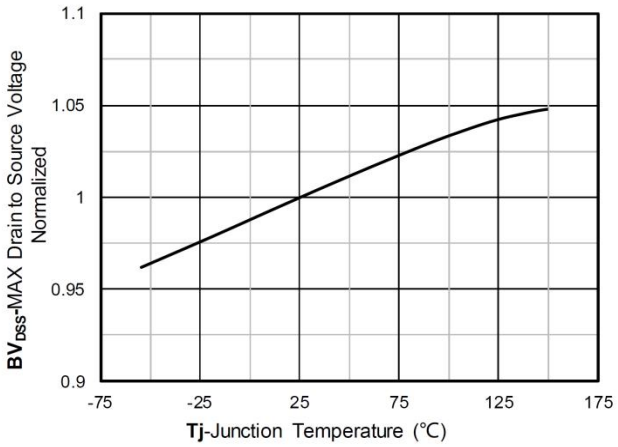
Power dissipation



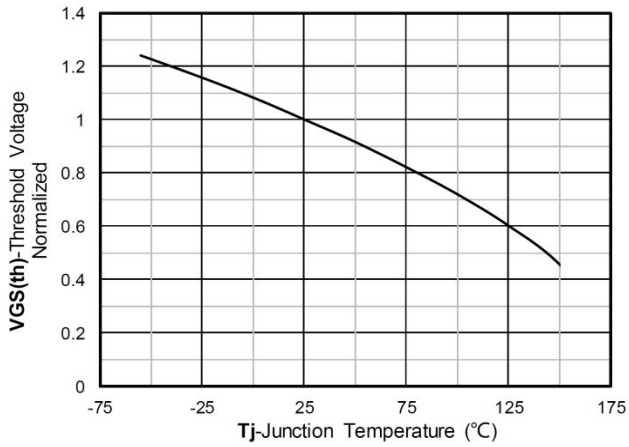
RDS(on) vs. Drain Current;



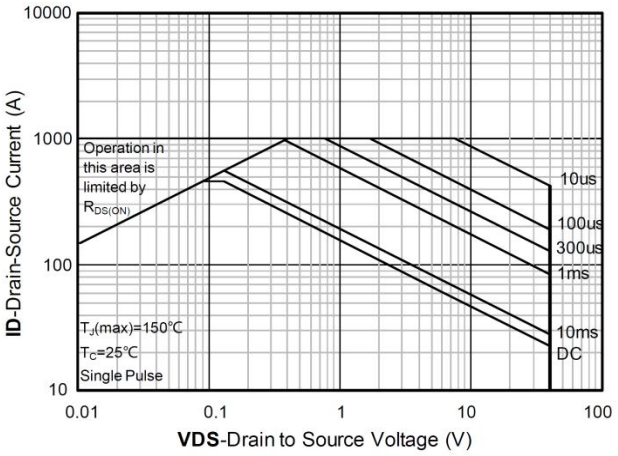
Forward characteristics of reverse diode



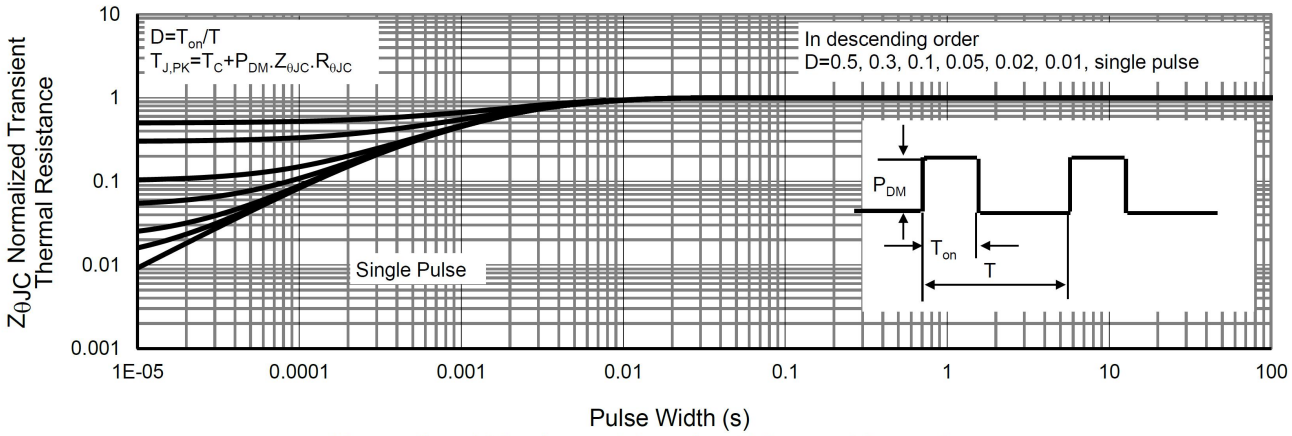
Normalized breakdown voltage



Normalized Threshold voltage



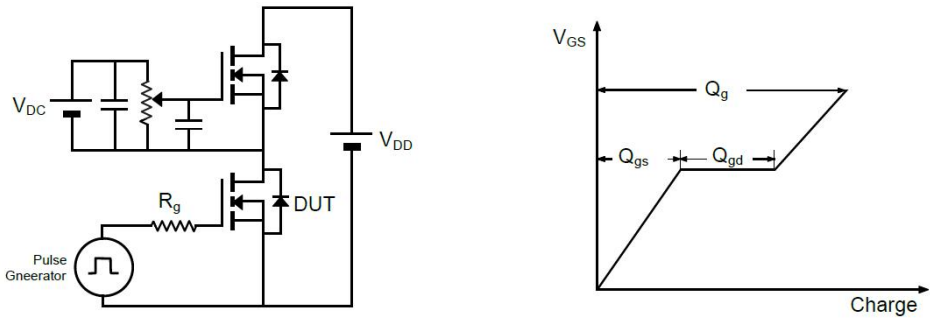
Safe Operation Area



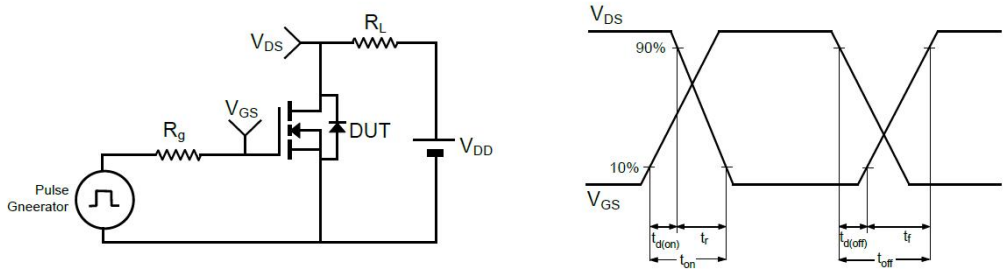
Normalized Maximum Transient Thermal Impedance

Test Circuit

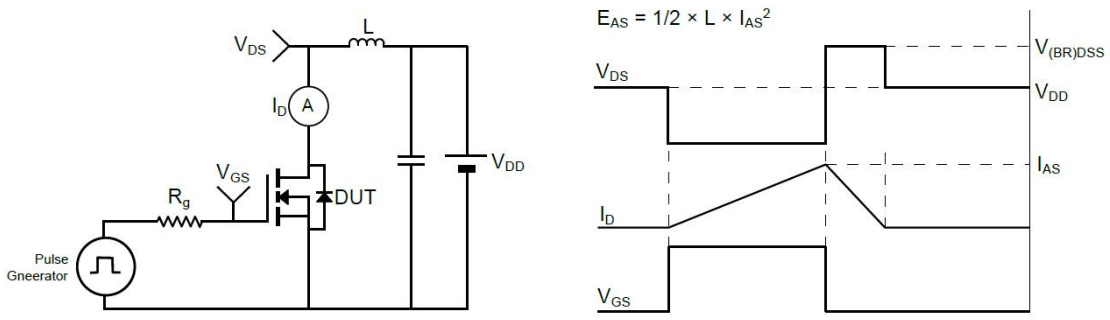
Gate Charge



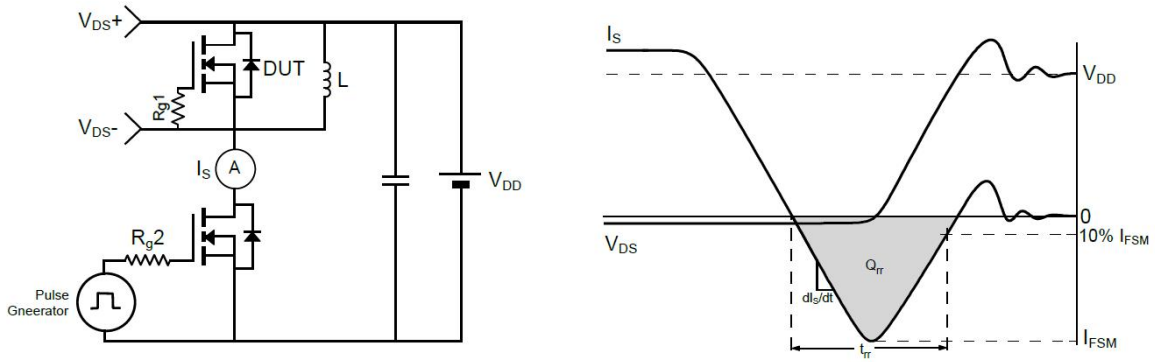
Resistive Load Switching Time



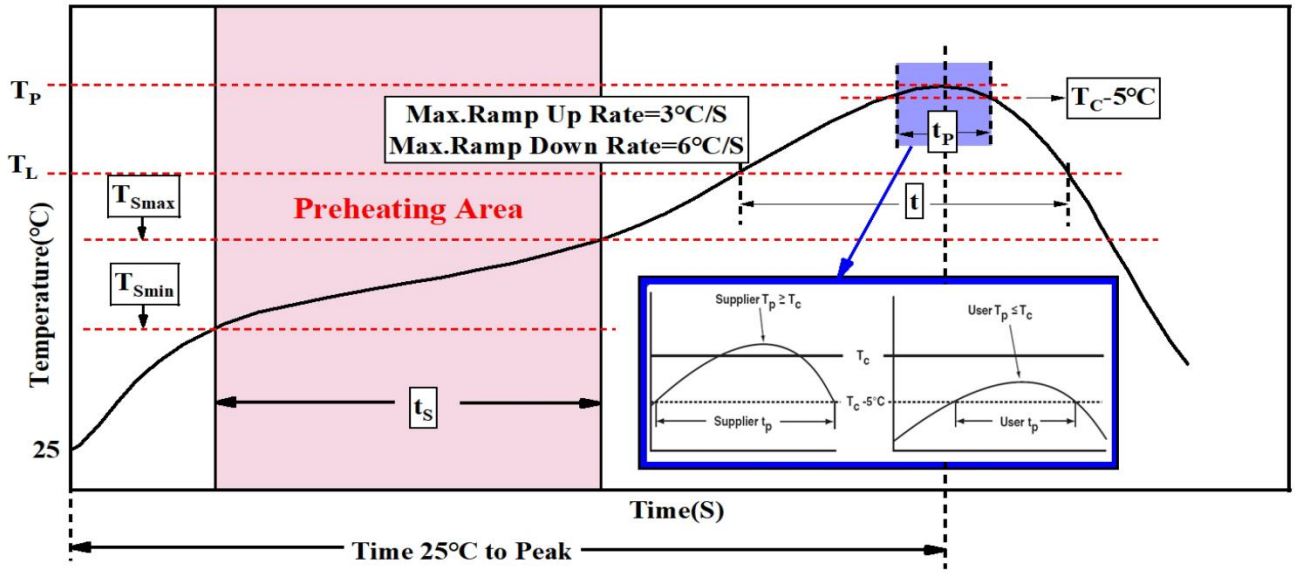
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3 °C/second max.	3°C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	183 °C 60-150 seconds	217°C 60-150 seconds
Peak package body Temperature e (Tp)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (tp)** within 5°C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (Tp) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum		

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

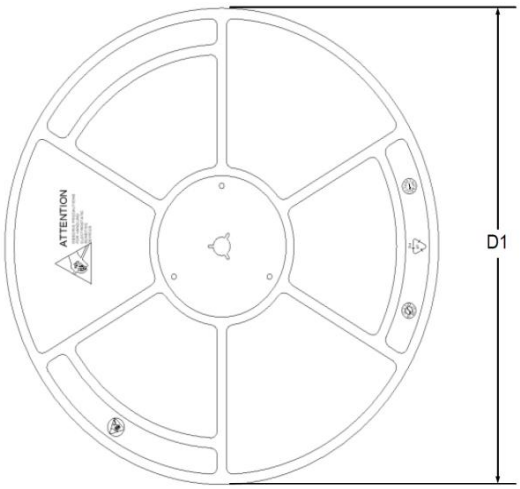
Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

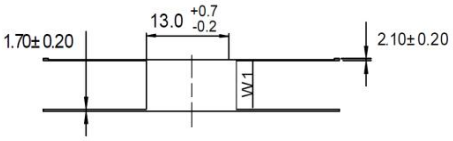
Table 2. Pb-free Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

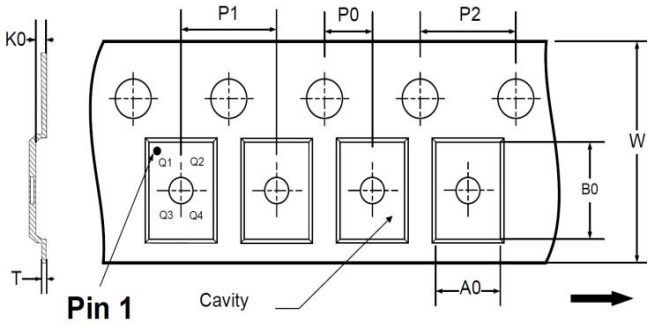
TOLL-8L Reel Information

REEL DIMENSIONS





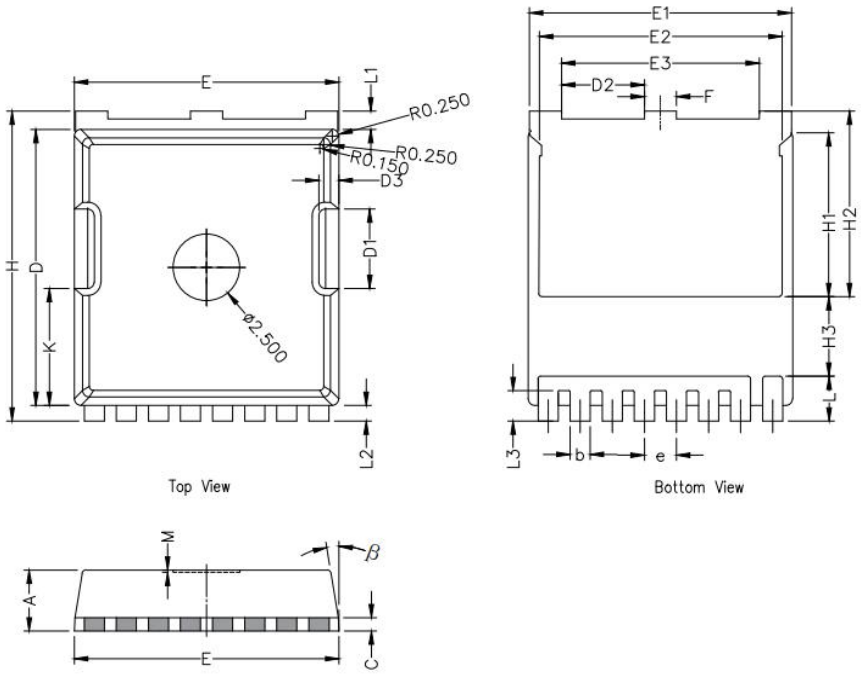
TAPE DIMENSIONS



A0：Dimension designed to accommodate the component width
B0：Dimension designed to accommodate the component length
K0：Dimension designed to accommodate the component thickness
W：Overall width of the carrier tape
P0：Pitch between successive cavity centers and sprocket hole
P1：Pitch between successive cavity centers
P2：Pitch between sprocket hole
T：Tape material thickness
D1：Reel Diameter
W1：Reel Width

DIMENSIONS										(Unit: mm)
	D1	W1								Material
Reel	330	24.4								Hips
	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material
Tape	2	4	12	24	10.3	12.1	2.6	0.35	Q1	PC
All dimensions are nominal										

TOLL-8L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	2.15	2.30	2.45
b	0.60	0.75	0.90
C	0.40	0.50	0.60
D	10.18	10.38	10.58
D1	3.15	3.3	3.45
E	9.70	9.90	10.10
E1	9.65	9.80	9.95
E2	7.90	--	9.15
E3	7.20	--	8.40
e	1.20 BSC		
F	1.05	1.20	1.35
H	11.45	11.70	11.95
H2	6.75	7.00	7.3
H3	3.00 BSC		
L	1.20	--	2.10
L1	0.50	0.75	0.90
L2	0.45	0.6	0.75
M	0.08 REF.		
β	8°	10°	12°