

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
-40V	1.2m Ω @-10V	-330A
	1.8m Ω @-4.5V	



合肥矽普半导体

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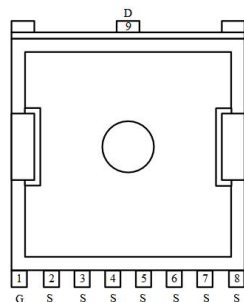
Feature

- Fast Switching
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- **100% UIS TESTED**
- **100% ΔV_{ds} TESTED**

Applications

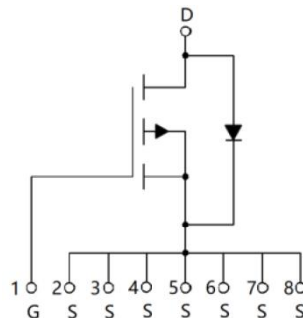
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

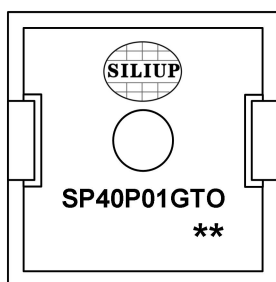


TOLL-8L

Circuit diagram



Marking



SP40P01GTO
**

:Device Code
:Week Code

Order Information

Device	Package	Unit/Tape
SP40P01GTO	TOLL-8L	2000

Absolute maximum ratings (Ta=25°C, 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°C)	I _D	-330	A
Continuous Drain Current(Tc=100°C)	I _D	-220	A
Pulsed Drain Current	I _{DM}	-1320	A
Single Pulse Avalanche Energy ¹	E _{AS}	2350	mJ
Power Dissipation(Tc=25°C)	P _D	400	W
Power Dissipation(Tc=100°C)	P _D	160	W
Thermal Resistance Junction-to-Case	R _{θJC}	0.31	°C/W
Storage Temperature Range	T _{STG}	-55 to 150	°C
Operating Junction Temperature Range	T _J	-55 to 150	°C

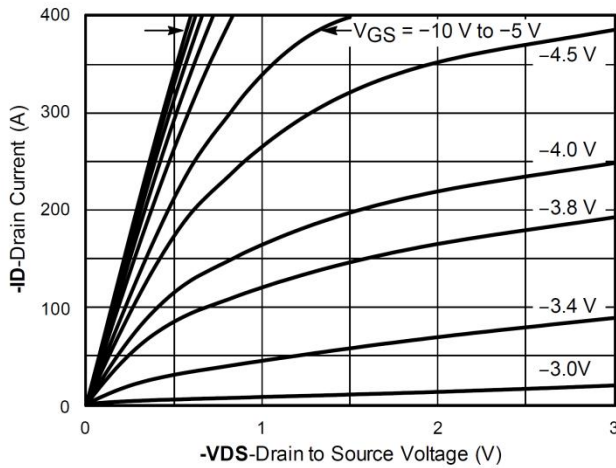
Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=-250uA	-40	-47	-	V
Drain-Source Leakage Current	IDSS	VDS=-32V , VGS=0V , TJ=25℃	-	-	-1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=-250uA	-1.3	-1.7	-2.3	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=-10V , ID=-20A	-	1.2	1.5	mΩ
		VGS=-4.5V , ID=-20A	-	1.8	2.3	
Gate Resistance	RG	f=1MHz	-	7.5	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=-20V , VGS=0V , f=1MHz	-	13820	-	pF
Output Capacitance	Coss		-	4774	-	
Reverse Transfer Capacitance	Crss		-	318	-	
Total Gate Charge	Qg	VDS=-20V , VGS=-10V , ID=-75A	-	205	-	nC
Gate-Source Charge	Qgs		-	44	-	
Gate-Drain Charge	Qgd		-	31	-	
Gate Plateau Voltage	Vplateau		-	-3.4	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=-20V , VGS=-10V , RG=1.6Ω , ID=-75A	-	35	-	nS
Rise Time	Tr		-	52	-	
Turn-Off Delay Time	Td(off)		-	136	-	
Fall Time	Tf		-	41	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=-1A , TJ=25℃	-	-	-1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	-330	A
Reverse Recovery Time	Trr	IS=-20A , di/dt=100A/us , TJ=25℃	-	68	-	nS
Reverse Recovery Charge	Qrr		-	186	-	nC

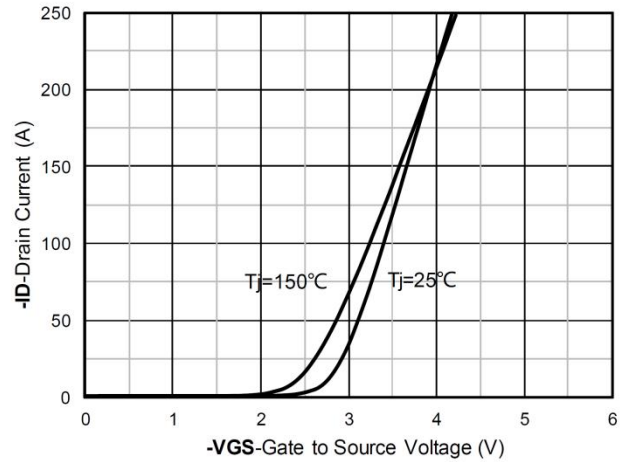
Note :

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

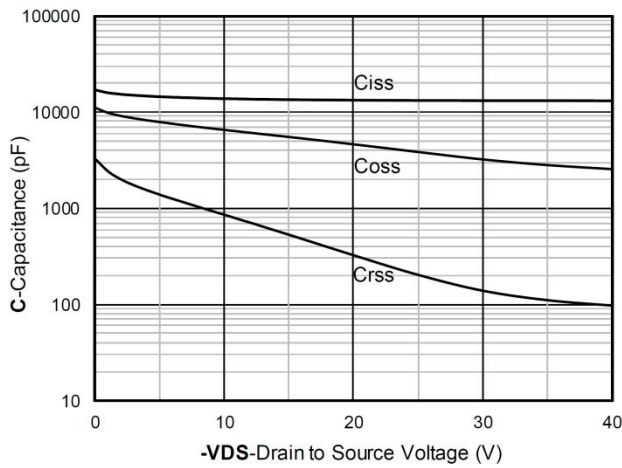
Typical Characteristics



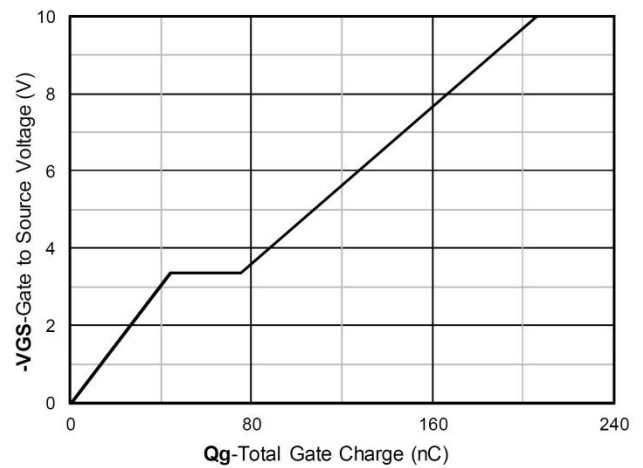
Output Characteristics



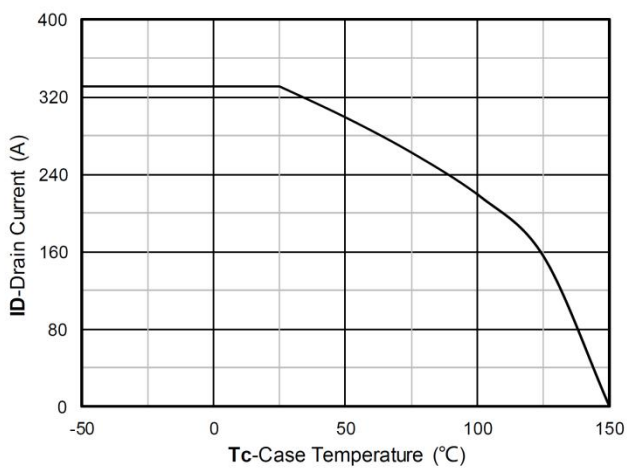
Transfer Characteristics



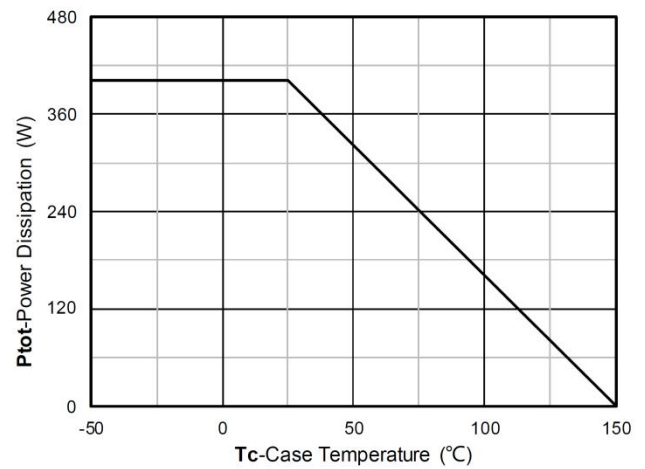
Capacitance Characteristics



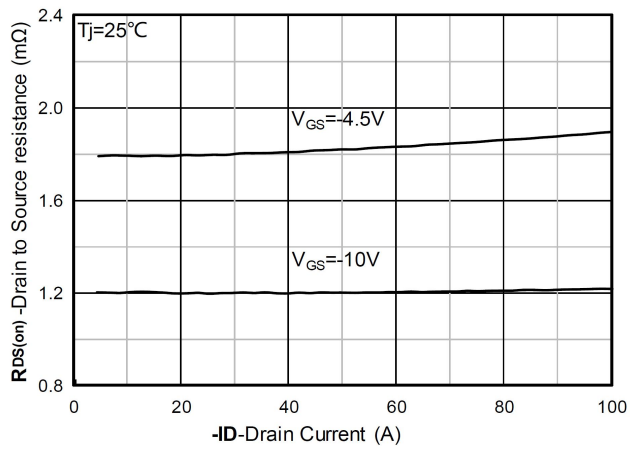
Gate Charge



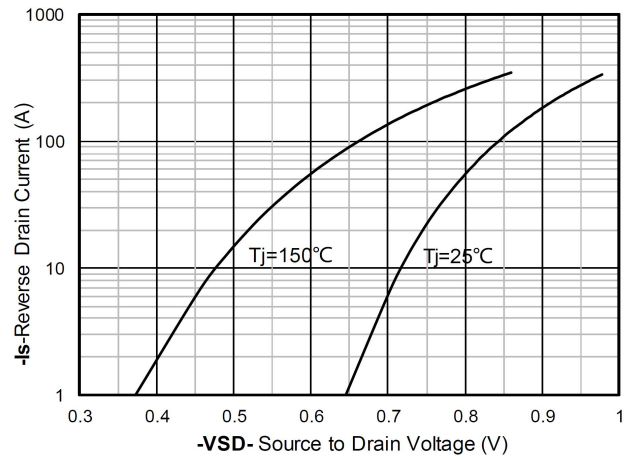
Current dissipation



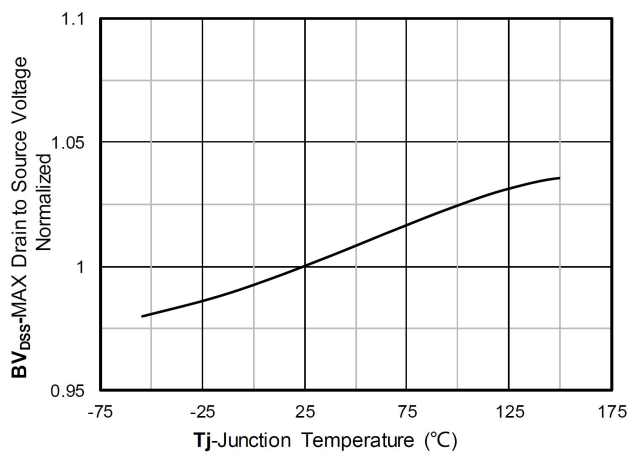
Power dissipation



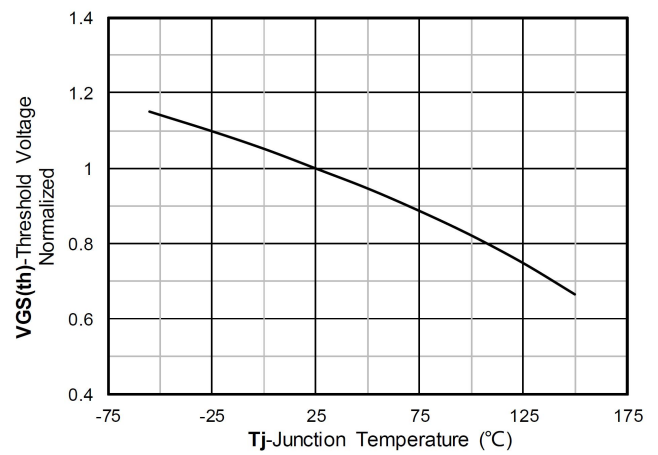
RDS(on) vs. Drain Current



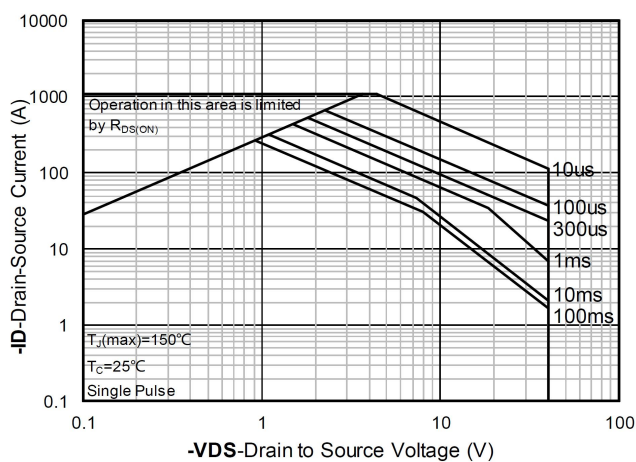
Forward characteristics of reverse diode



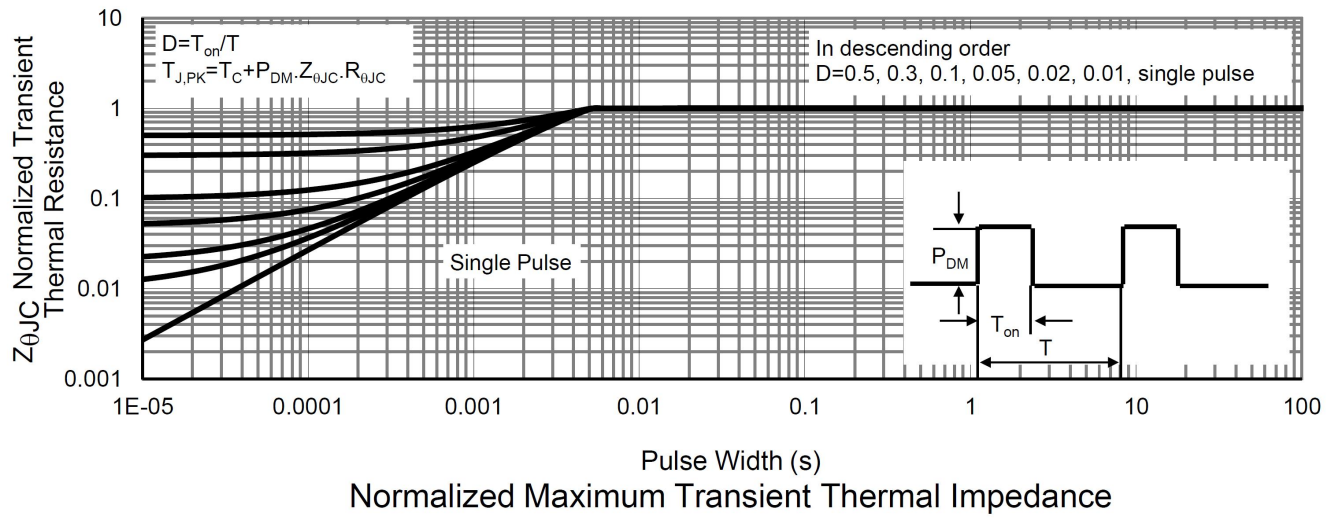
Normalized breakdown voltage



Normalized Threshold voltage

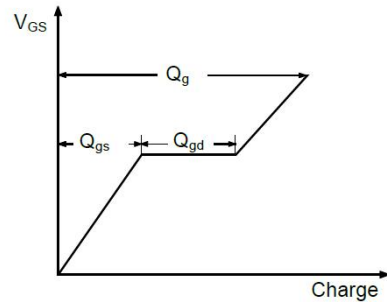
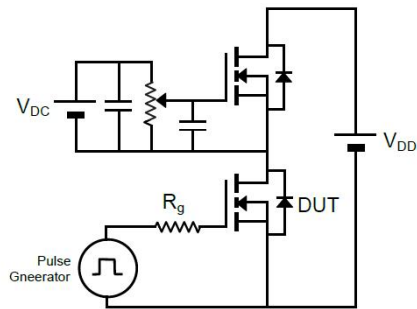


Safe Operation Area

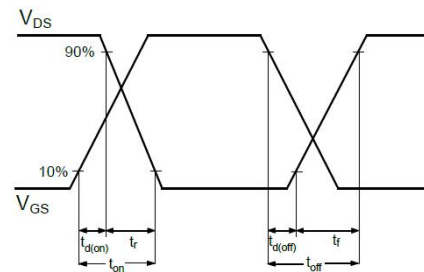
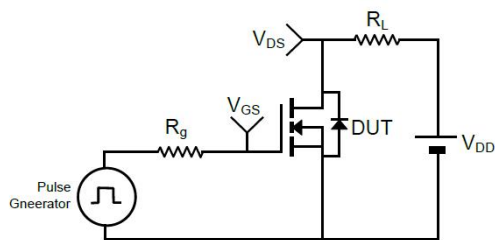


Test Circuit

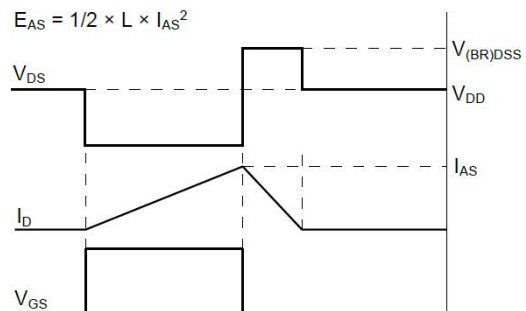
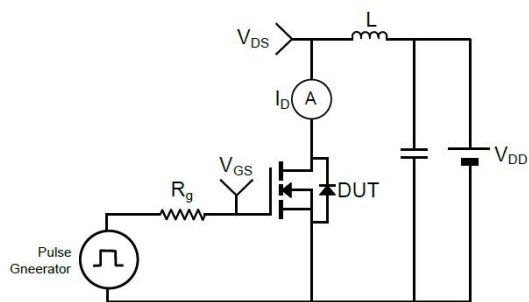
Gate Charge



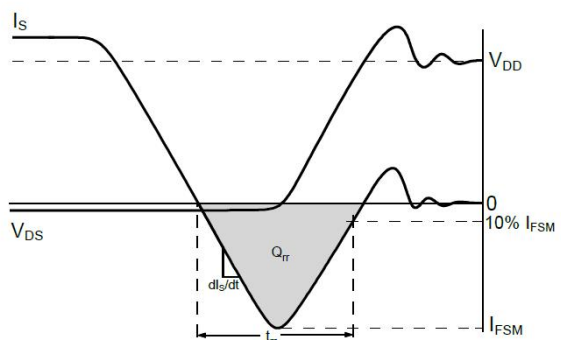
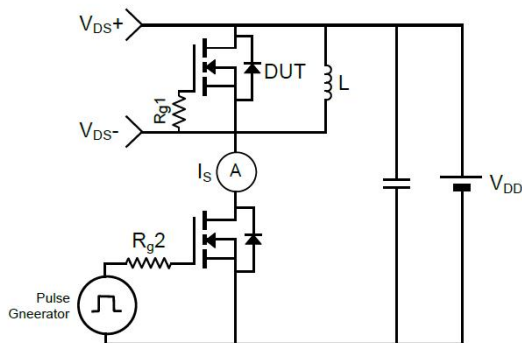
Resistive Load Switching Time



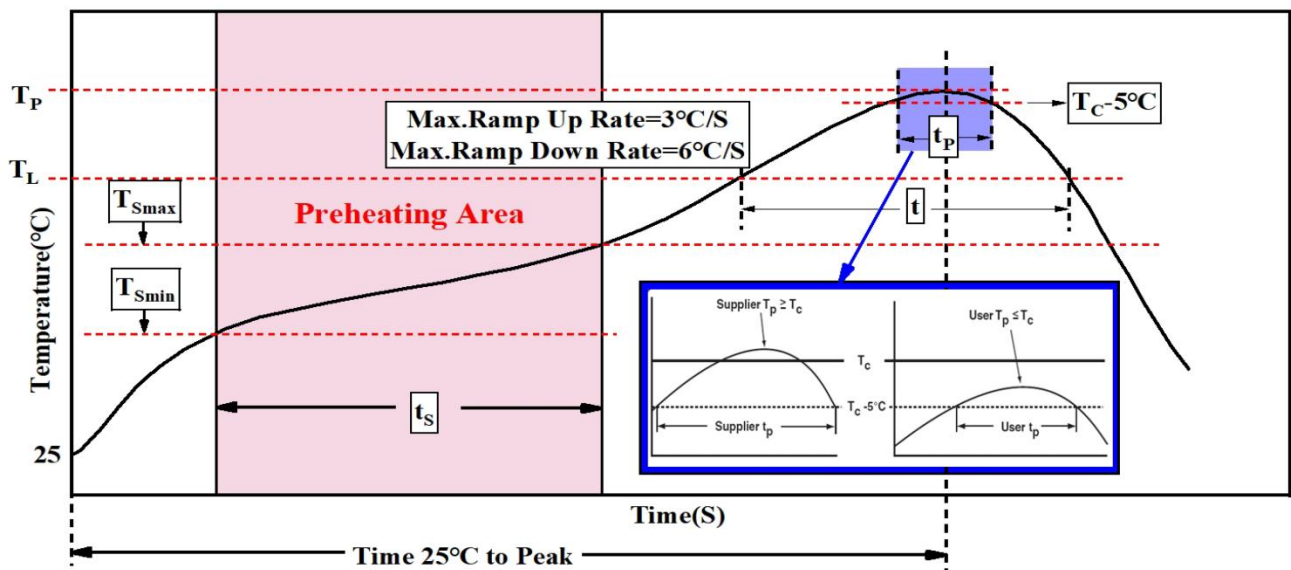
Un-clamped Inductive Load Switching



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 (T_{Smin})	100°C	150°C
Temperature max (T_{Smax})	150°C	200°C
Time (T_{Smin} to T_{Smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{Smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217°C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature e (T_P)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_C)	20** seconds	30** seconds
Average ramp-down rate (T_P to T_{Smax})	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 (T_P) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_P) is defined as a supplier minimum and a user maximum		

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

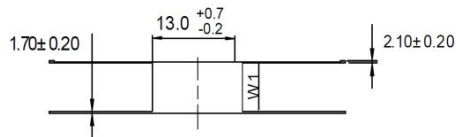
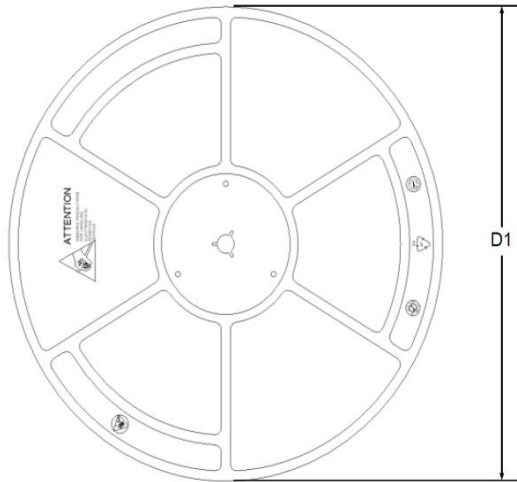
Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

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

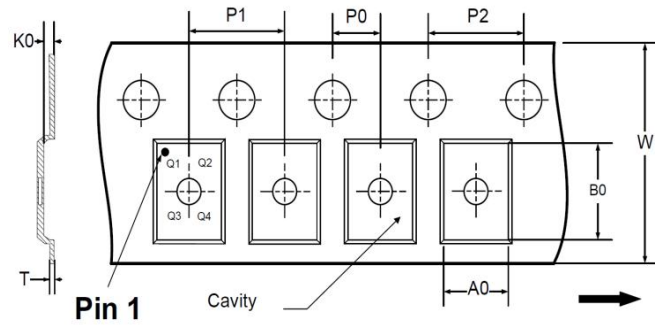
Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

TOLL-8L Reel Information

REEL DIMENSIONS



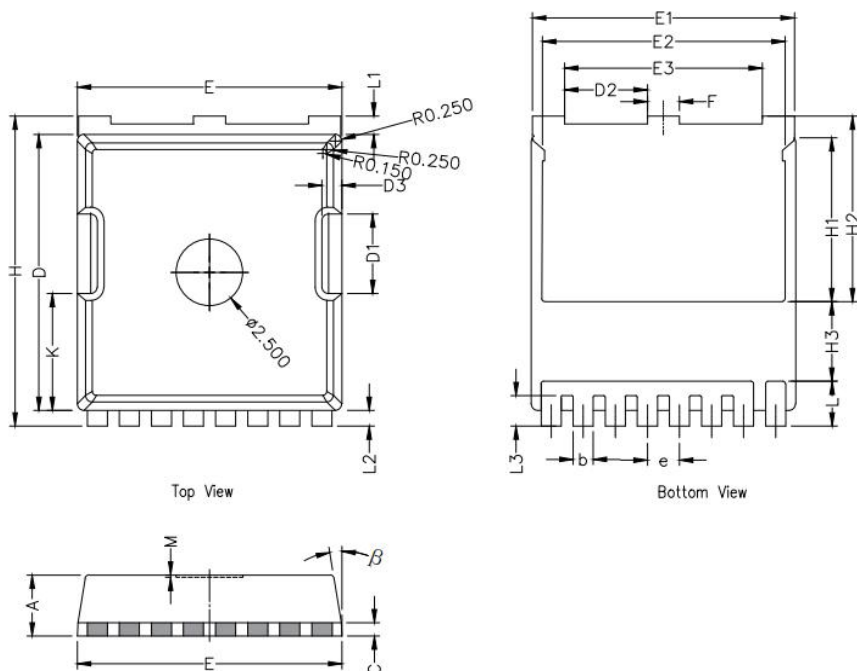
TAPE DIMENSIONS



- 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)
Reel	D1	W1								Material
	330	24.4								Hips
Tape	P0	P1	P2	W	A0	B0	K0	T	Pin 1 Quadrant	Material
	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°