

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	0.59mΩ@10V	450A
	0.80mΩ@4.5V	



合肥矽普半导体

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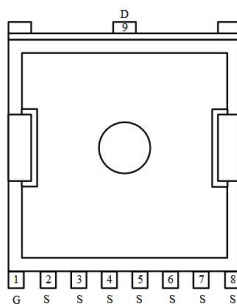
Feature

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

Applications

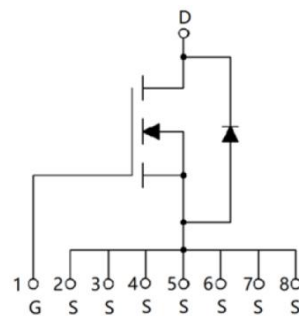
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

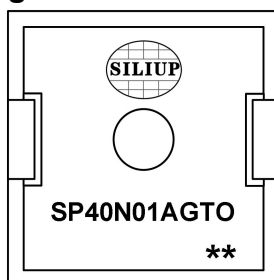


TOLL-8L

Circuit diagram



Marking



SP40N01AGTO : Device Code
** : Week Code

Order Information

Device	Package	Unit/Tape
SP40N01AGTO	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	450	A
Continuous Drain Current(Tc=100°C)	I_D	300	A
Pulsed Drain Current	I_{DM}	1800	A
Single Pulse Avalanche Energy ¹	E_{AS}	2500	mJ
Power Dissipation(Tc=25°C)	P_D	194	W
Power Dissipation (Tc=100°C)	P_D	78	W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	0.64	°C/W
Storage Temperature Range	T_{STG}	-55 to 150	°C
Operating Junction Temperature Range	T_J	-55 to 150	°C

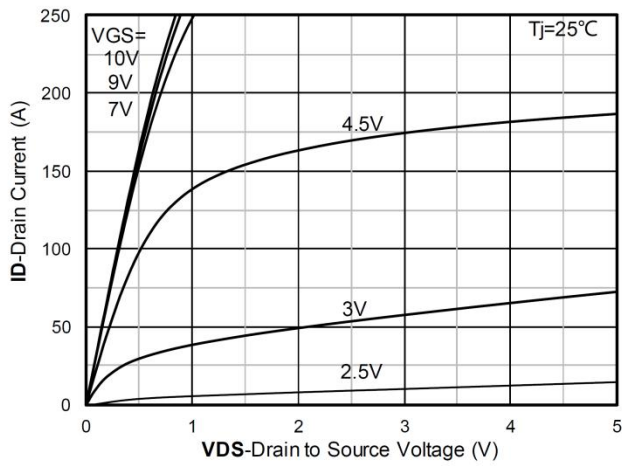
Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	40	48	-	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	1.1	1.5	2.1	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=50A	-	0.59	0.75	mΩ
		VGS=4.5V , ID=35A	-	0.80	1.05	
Gate Resistance	RG	f=1MHz	-	2.05	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=20V , VGS=0V , f=1MHz	-	9507	-	pF
Output Capacitance	Coss		-	3743	-	
Reverse Transfer Capacitance	Crss		-	290	-	
Total Gate Charge	Qg	VDS=20V , VGS=10V , ID=20A	-	142	-	nC
Gate-Source Charge	Qgs		-	31	-	
Gate-Drain Charge	Qgd		-	26	-	
Gate Plateau Voltage	Vplateau		-	3.3	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=20V , VGS=10V , RG=1.6Ω, ID=20A	-	13.8	-	nS
Rise Time	Tr		-	28	-	
Turn-Off Delay Time	Td(off)		-	14.3	-	
Fall Time	Tf		-	72	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	Is		-	-	450	A
Reverse Recovery Time	Trr	IS=50A, di/dt=100A/us, TJ=25℃	-	42	-	nS
Reverse Recovery Charge	Qrr		-	86	-	nC

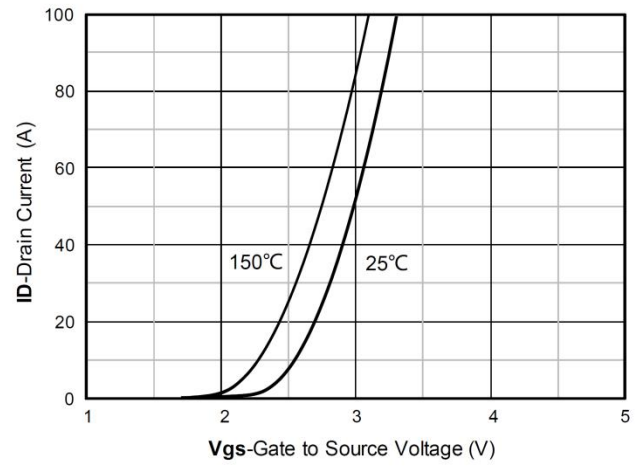
Note :

1. The test condition is $V_{DD}=20V$, $V_{GS}=10V$, $L=0.5mH$, $R_G=25\Omega$;

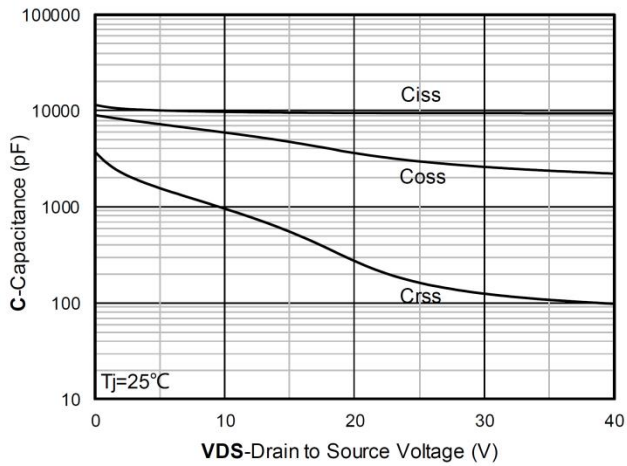
Typical Characteristics



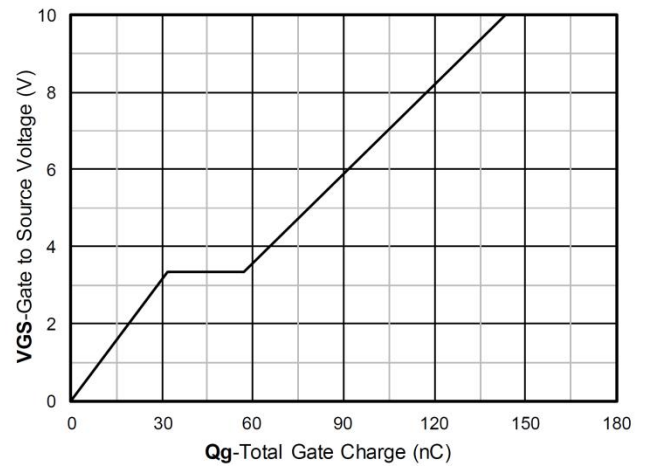
Output Characteristics



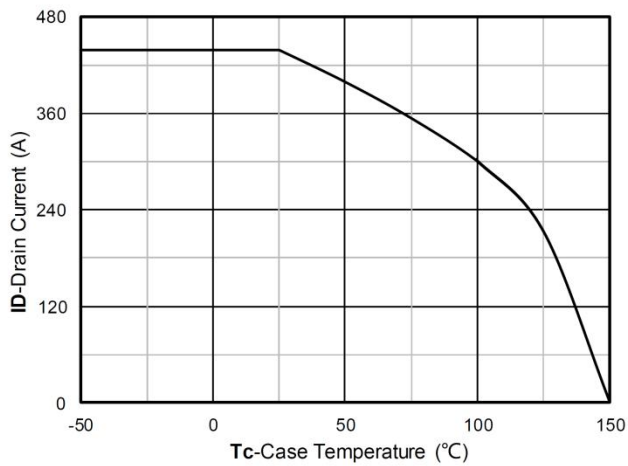
Transfer Characteristics



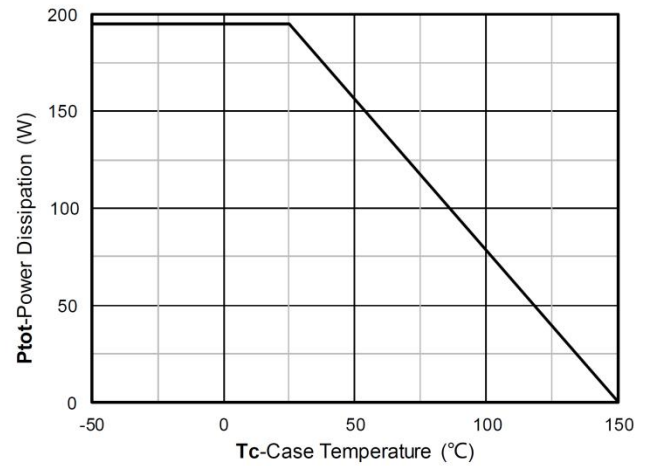
Capacitance Characteristics



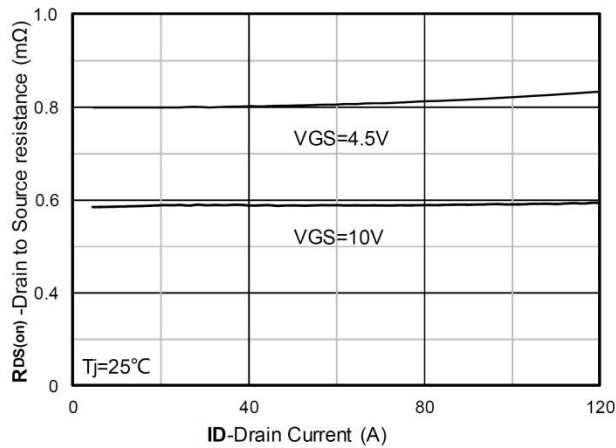
Gate Charge



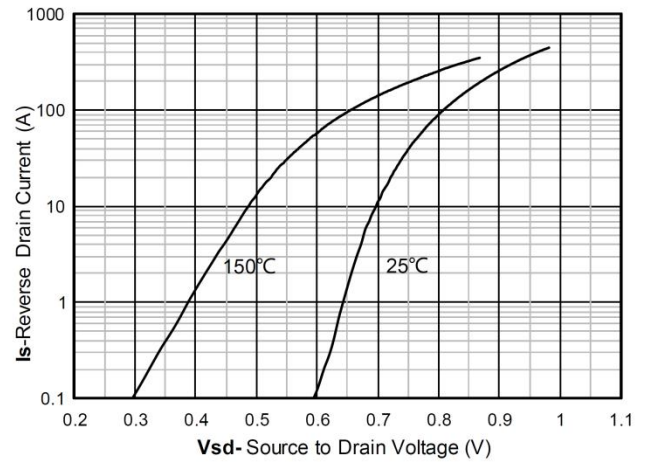
Current dissipation



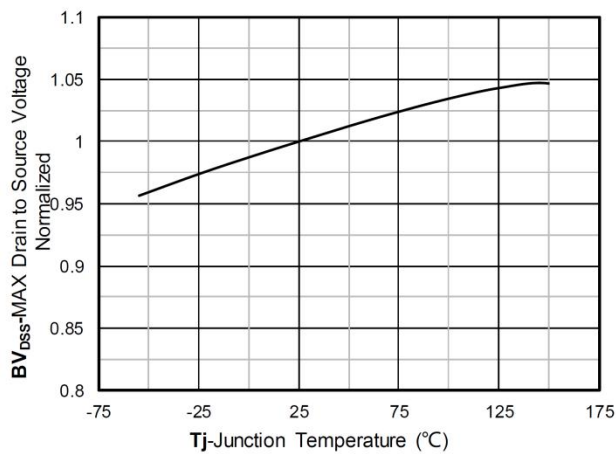
Power dissipation



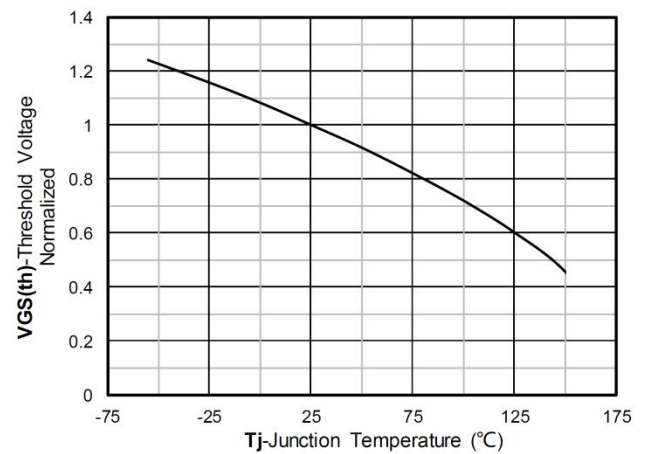
$R_{DS(on)}$ VS Drain Current



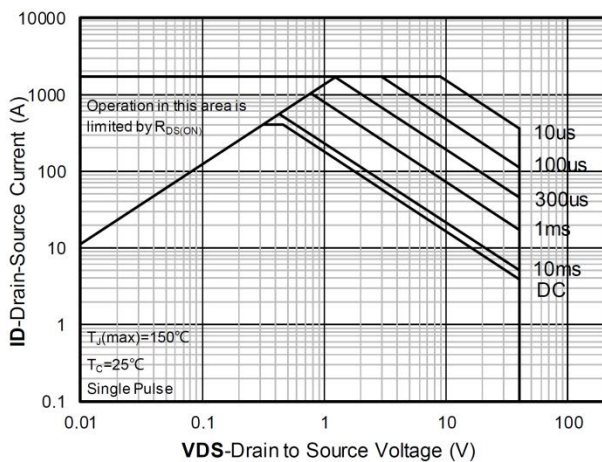
Forward characteristics of reverse diode



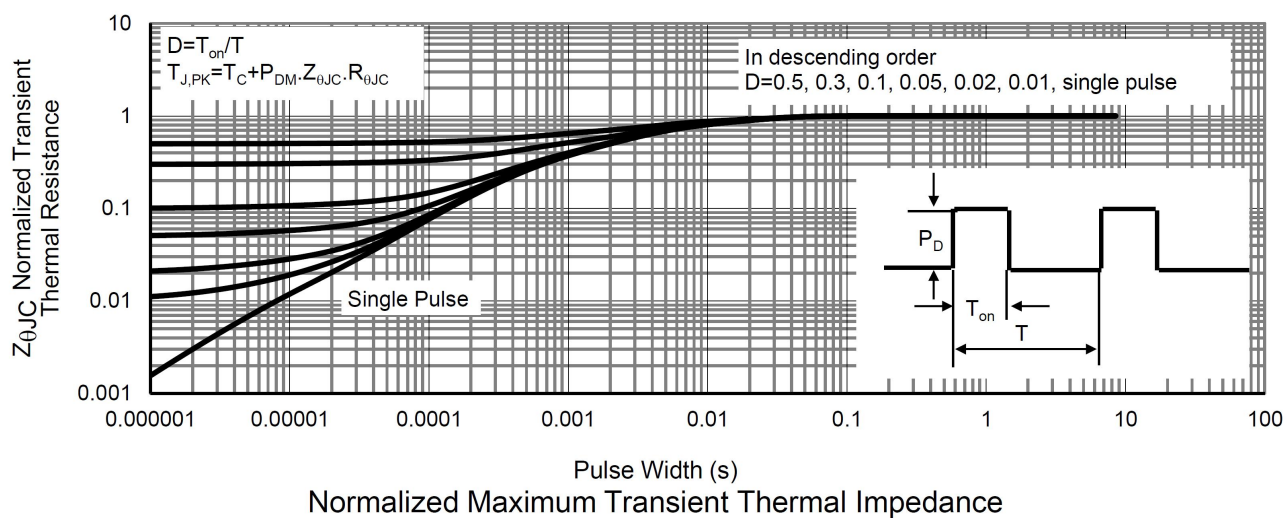
Normalized breakdown voltage



Normalized Threshold voltage

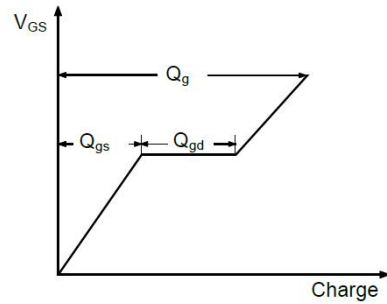
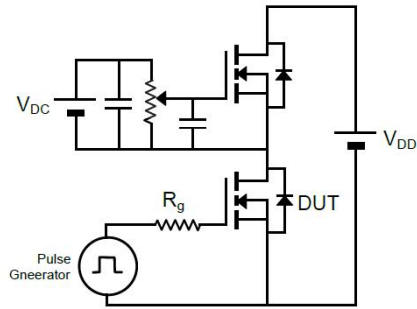


Safe Operation Area

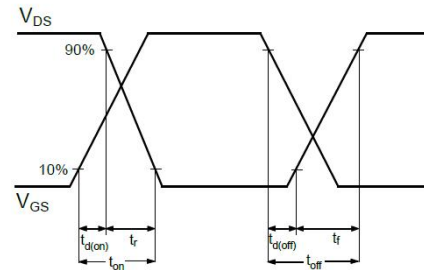
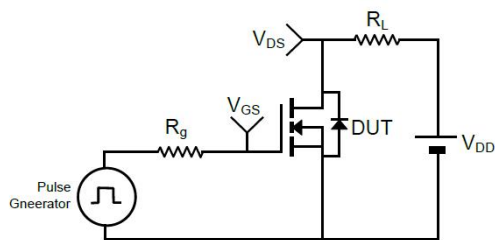


Test Circuit

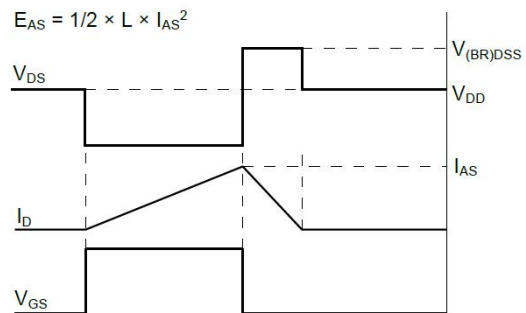
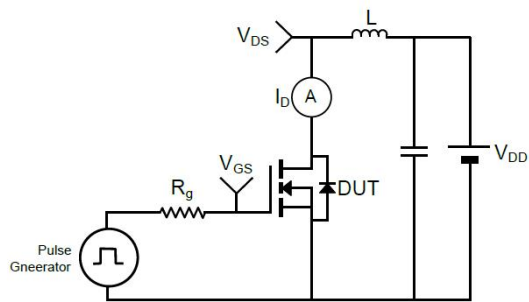
Gate Charge



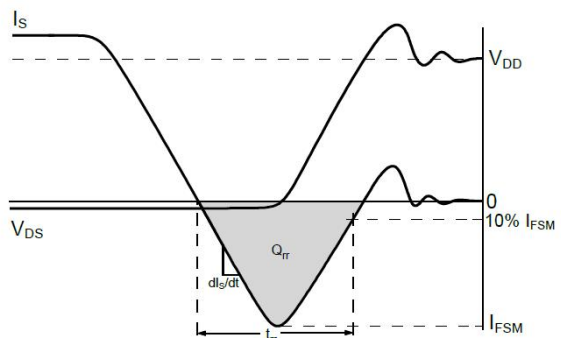
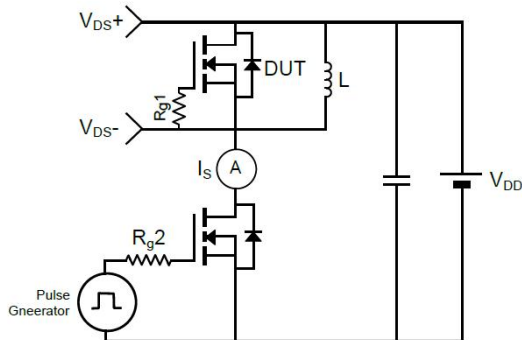
Resistive Load Switching Time



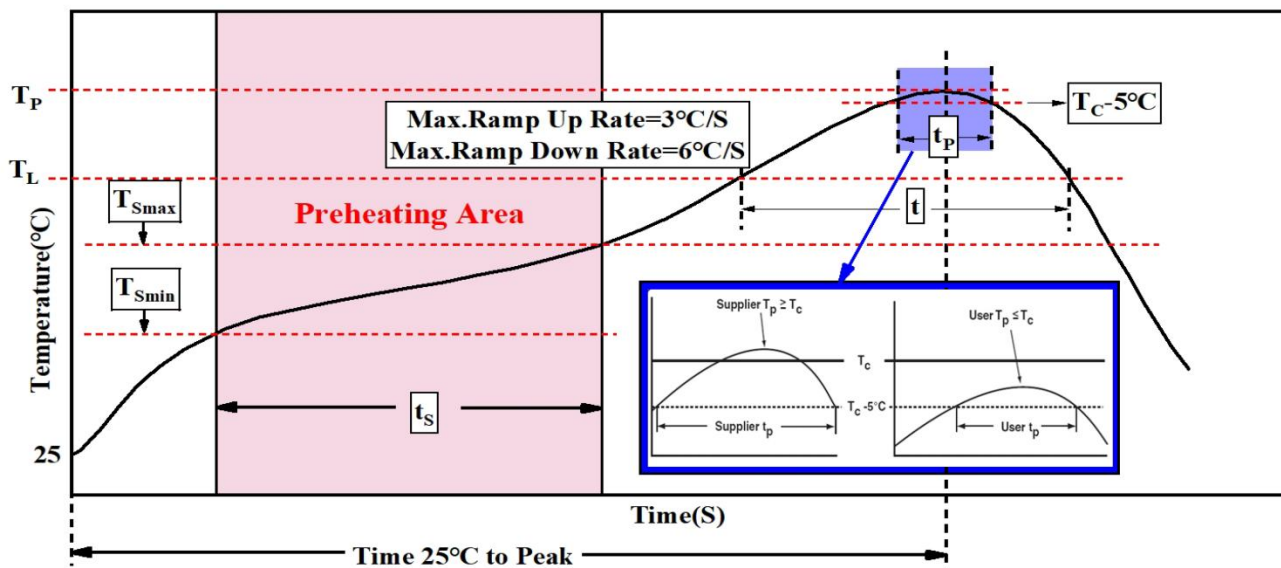
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



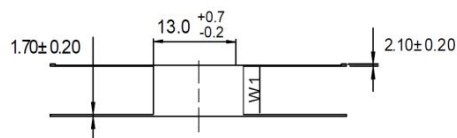
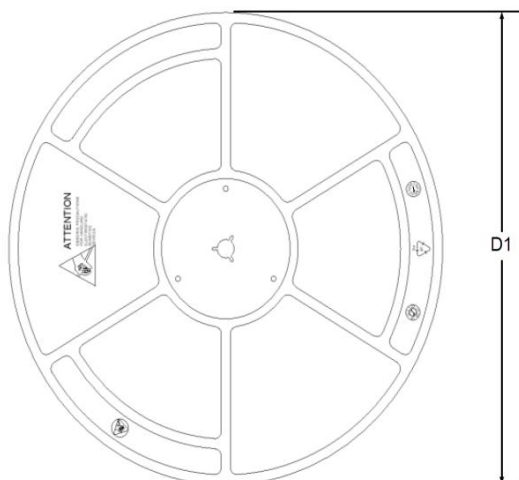
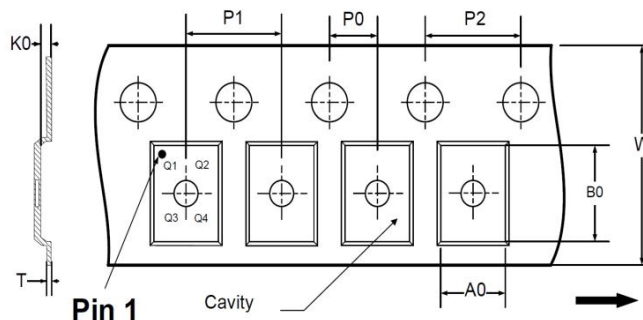
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{Smin})	100°C	150°C
Temperature max (T_{Smax})	150°C	200°C
Time (T_{Smin} to T_{Smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{Smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (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)

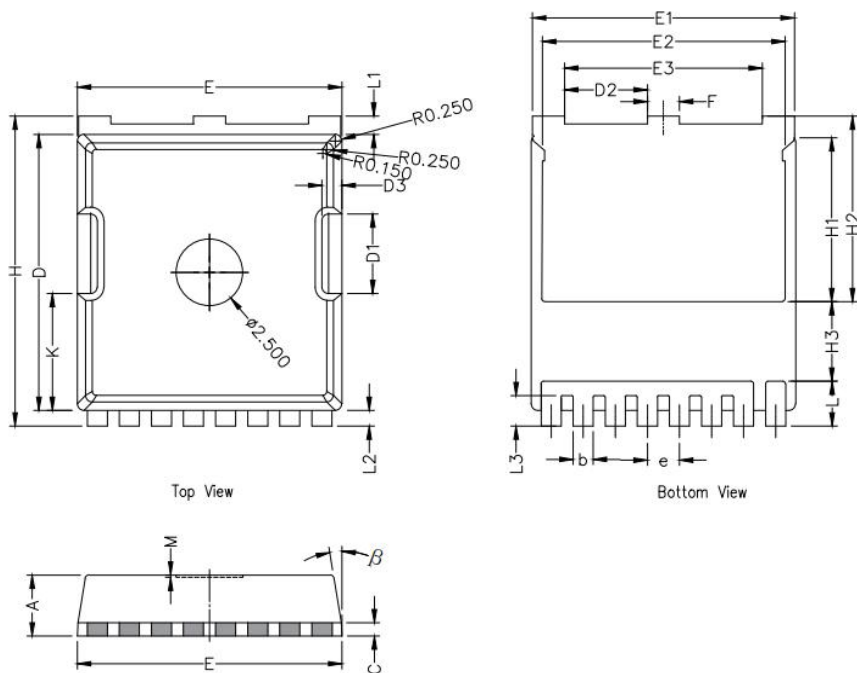
Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥ 2.5 mm	250 °C	245 °C	245 °C

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°