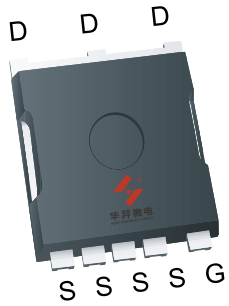
N-Channel Enhancement Mode MOSFET

Feature

- 100V/192A
  $R_{DS(ON)}$ = 2.6 mΩ(typ.) @V_{GS} = 10V
- 100% Avalanche Tested
- 100% DVDS
- Reliable and Rugged
- Halogen Free and Green Devices Available
  (RoHS Compliant)

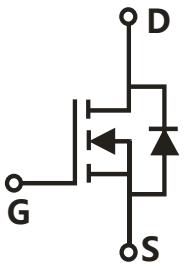
Pin Description



sTOLL

Applications

- Motor control
- DC-DC
- Li-battery protection
- Load switch



Single N-Channel MOSFET

Ordering and Marking Information

HYG 029N10NS XYMXXXXX	Package Code TS: sTOLL Date Code XYMXXXXX

Note: HUAYI halogen free products contain molding compounds and 100% matte tin plate Termi-Nation finish; which are fully compliant with RoHS. HUAYI halogen free products meet or exceed the halogen free requirements of IPC/JEDEC J-STD-020 for MSL classification at halogen free peak reflow temperature. HUAYI defines “Green” to mean halogen free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

HUAYI reserves the right to make changes, corrections, enhancements, modifications, and improvements to this product and/or to this document at any time without notice.

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_C=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		100	V
V_{GSS}	Gate-Source Voltage		±20	V
T_J	Junction Temperature Range		-55 to 175	°C
T_{STG}	Storage Temperature Range			°C
I_S	Source Current-Continuous(Body Diode)	T_C=25°C	192	A
Mounted on Large Heat Sink				
I_{DM}	Pulsed Drain Current *	T_C=25°C	650	A
I_D	Continuous Drain Current	T_C=25°C	192	A
		T_C=100°C	135	A
P_D	Maximum Power Dissipation	T_C=25°C	250	W
		T_C=100°C	125	W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case		0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient **		50	°C/W
E_{AS}	Single Pulsed-Avalanche Energy ***	L=0.3mH	666	mJ

Note: * Repetitive rating; pulse width limited by max.junction temperature.
** Surface mounted on 1in2 FR-4 board.
*** Limited by TJmax, starting T_J=25°C, L=0.3mH, R_G=25Ω, V_{GS}=10V.

Electrical Characteristics (T_C =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HYG029N10NS1			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	100	-	-	V
I_{DSS}	Drain-to-Source Leakage Current	V_{DS}=100V, V_{GS}=0V	-	-	1	μA
		T_J=125°C	-	-	50	μA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	2.0	3.0	4.0	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=10V, I_{DS}=50A	-	2.6	3.2	mΩ
Diode Characteristics						
V_{SD}	Diode Forward Voltage	I_{SD}=50A, V_{GS}=0V	-	0.84	1.3	V
t_{rr}	Reverse Recovery Time	I_{SD}=50A, dI_{SD}/dt=100A/μs	-	60	-	ns
Q_{rr}	Reverse Recovery Charge		-	92	-	nC

Electrical Characteristics (Cont.) (T_C =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HYG029N10NS1			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,f=500KHz	-	1.3	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=500KHz	-	5575	-	pF
C_{oss}	Output Capacitance		-	2130	-	
C_{rss}	Reverse Transfer Capacitance		-	179	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=50V, R_G=2.5Ω, I_{DS}=50A, V_{GS}=10V	-	23	-	ns
t_r	Turn-on Rise Time		-	89	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	48	-	
t_f	Turn-off Fall Time		-	81	-	
Gate Charge Characteristics						
Q_g	Total Gate Charge(V_{GS}=10V)	V_{DS}=80V, I_{DS}=50A	-	90	-	nC
Q_{gs}	Gate-Source Charge		-	30	-	
Q_{gd}	Gate-Drain Charge		-	20	-	
$V_{plateau}$	Gate plateau voltage		-	5.0	-	V

Note: *Pulse test，pulse width ⩽ 300us，duty cycle ⩽ 2%

Typical Operating Characteristics

Figure 1: Power Dissipation

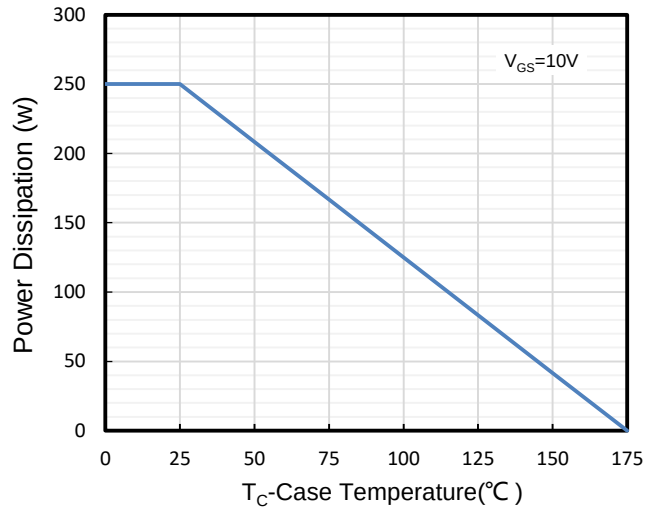


Figure 2: Drain Current

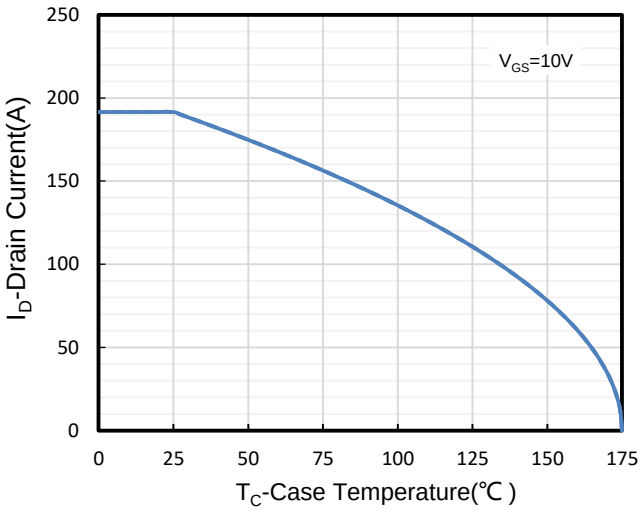


Figure 3: Safe Operation Area

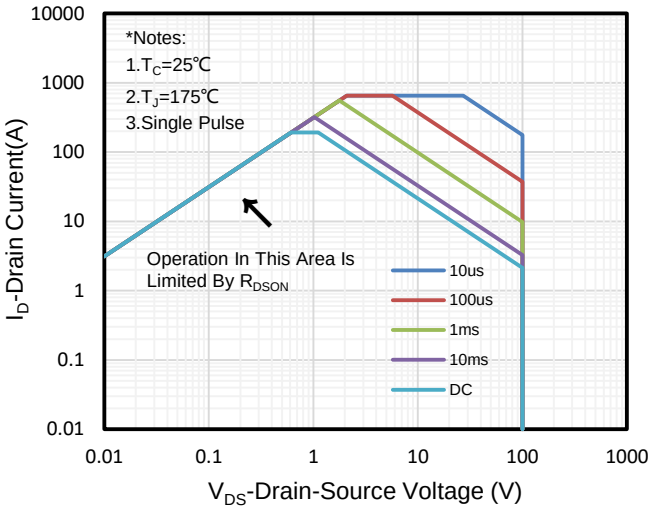


Figure 4: Thermal Transient Impedance

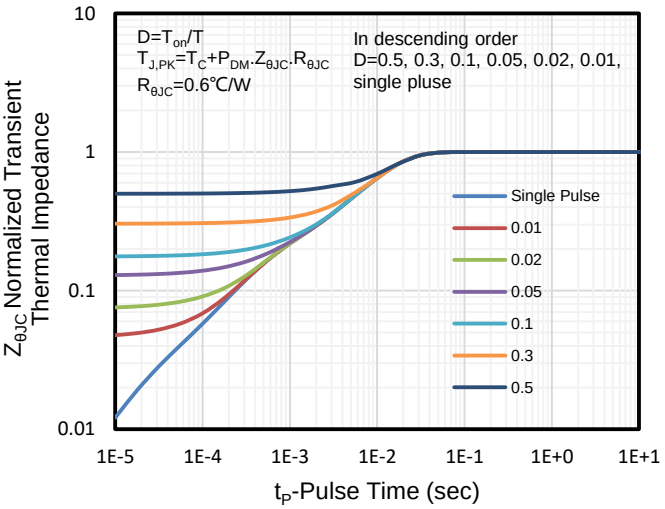


Figure 5: Output Characteristics

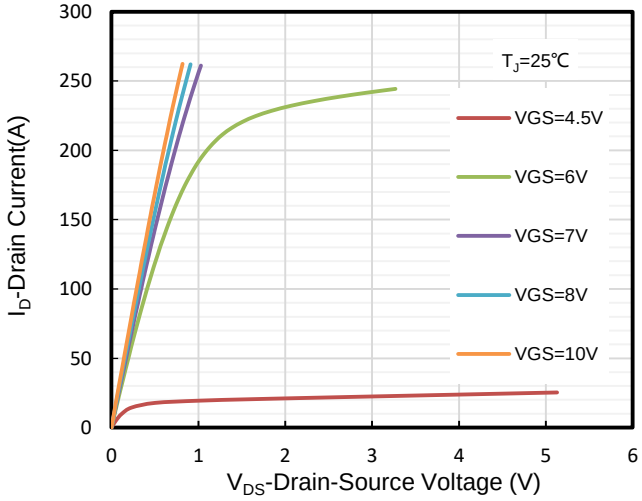
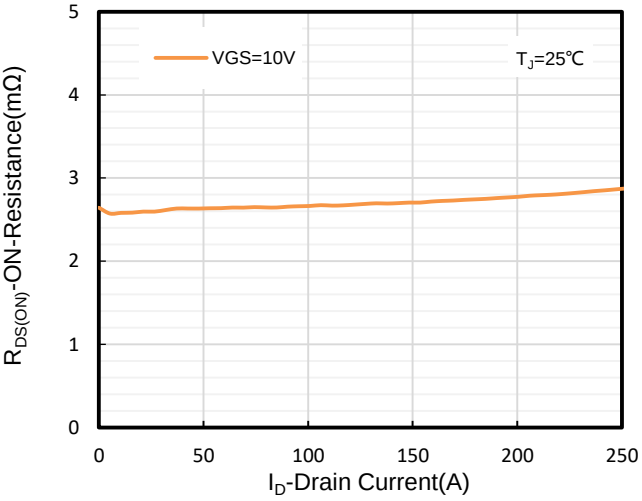


Figure 6: Drain-Source On Resistance



Typical Operating Characteristics(Cont.)

Figure 7: On-Resistance vs. Temperature

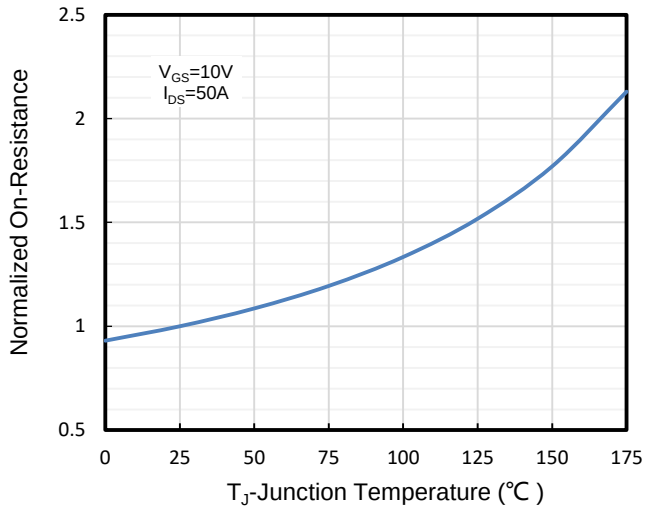


Figure 8: Source-Drain Diode Forward

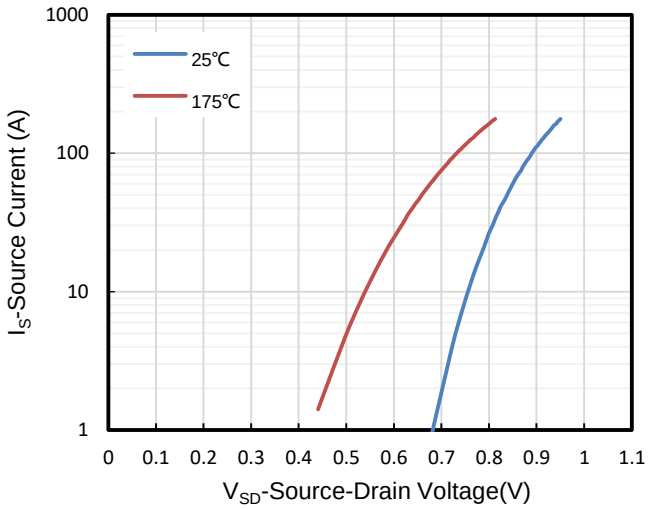


Figure 9: Capacitance Characteristics

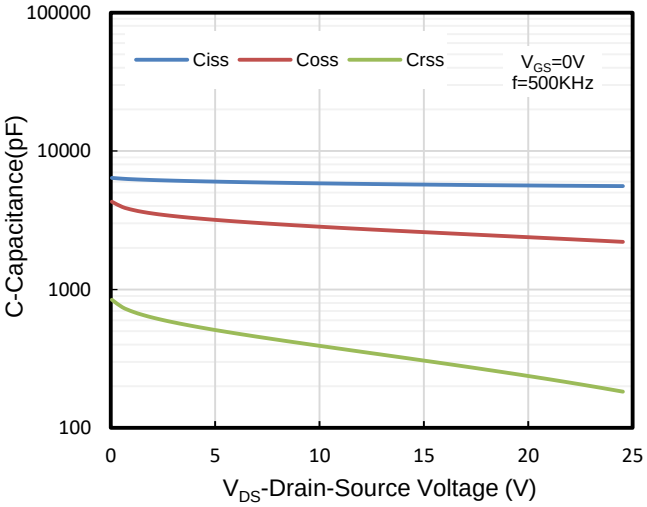
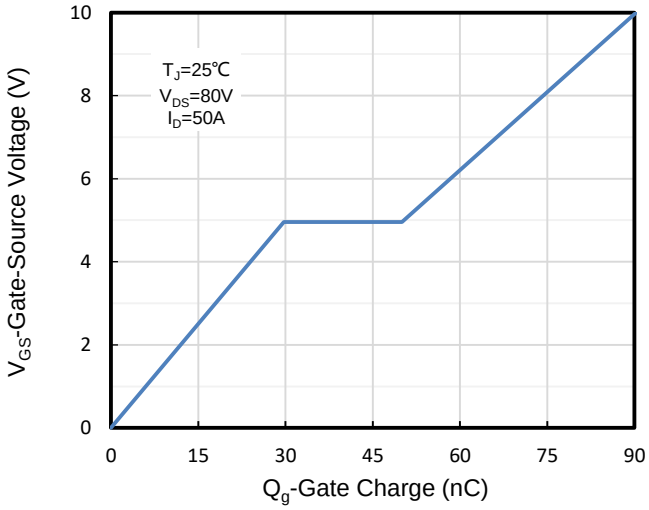
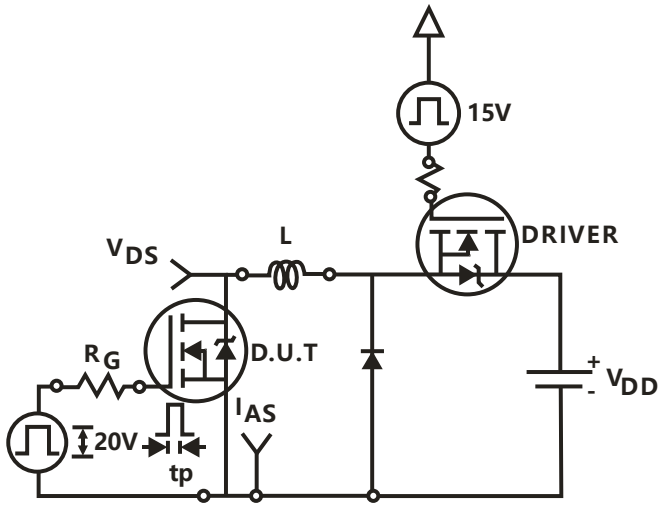


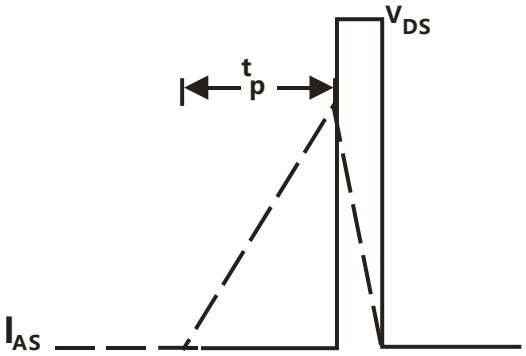
Figure 10: Gate Charge Characteristics



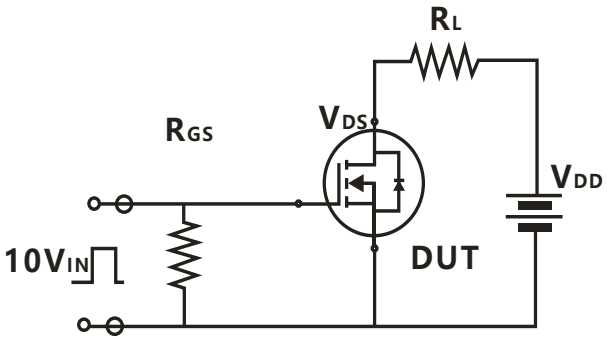
Avalanche Test Circuit

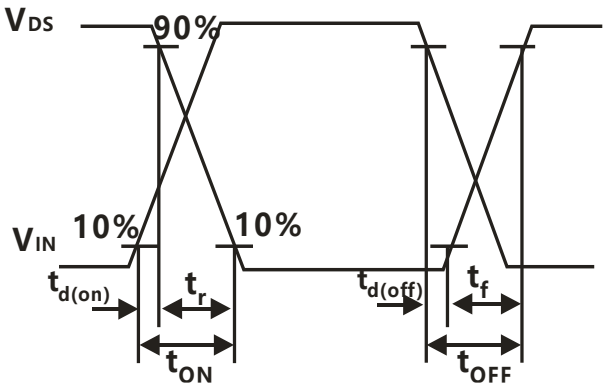


$$E_{AS} = \frac{1}{2} L I_{AS}^2$$

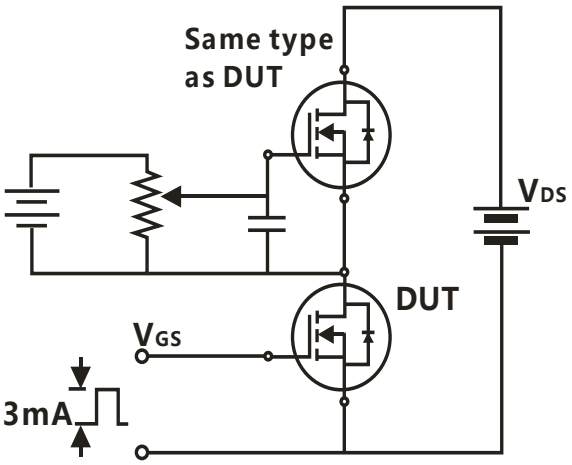


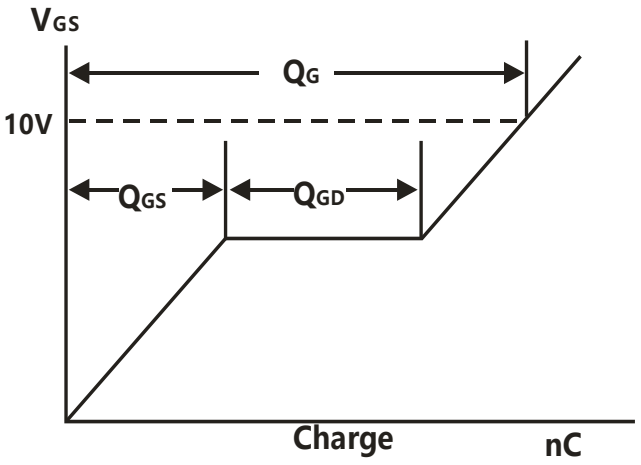
Switching Time Test Circuit





Gate Charge Test Circuit



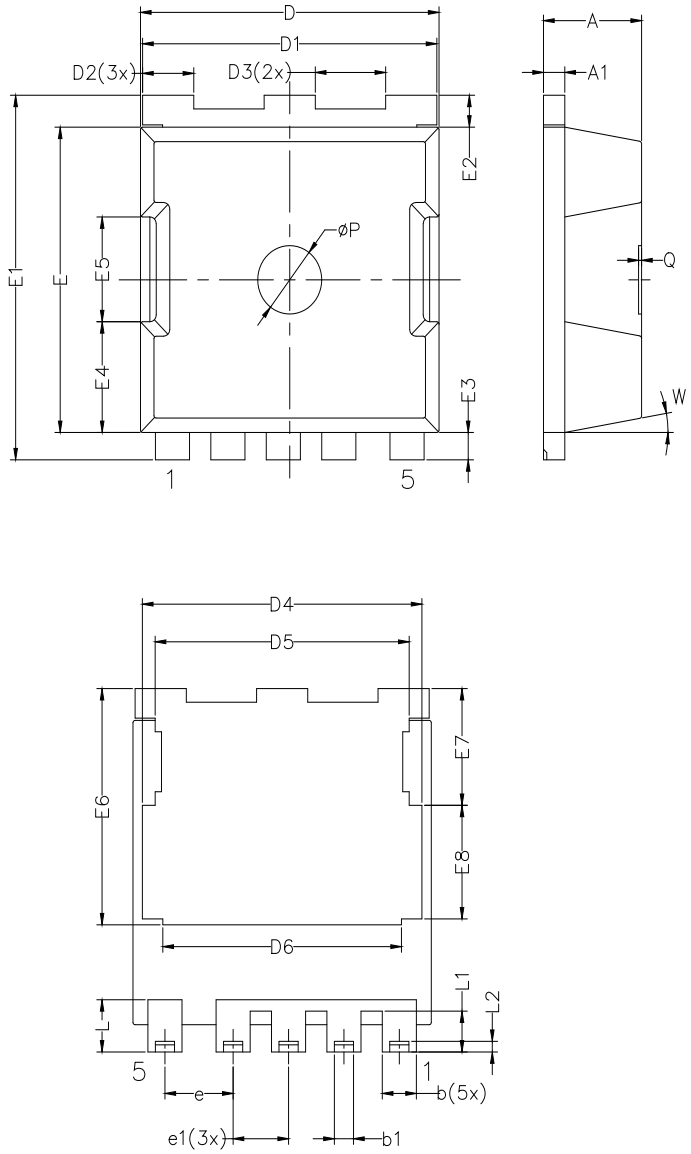


Device Per Unit

Package Type	Unit	Quantity
sTOLL	Reel	2000

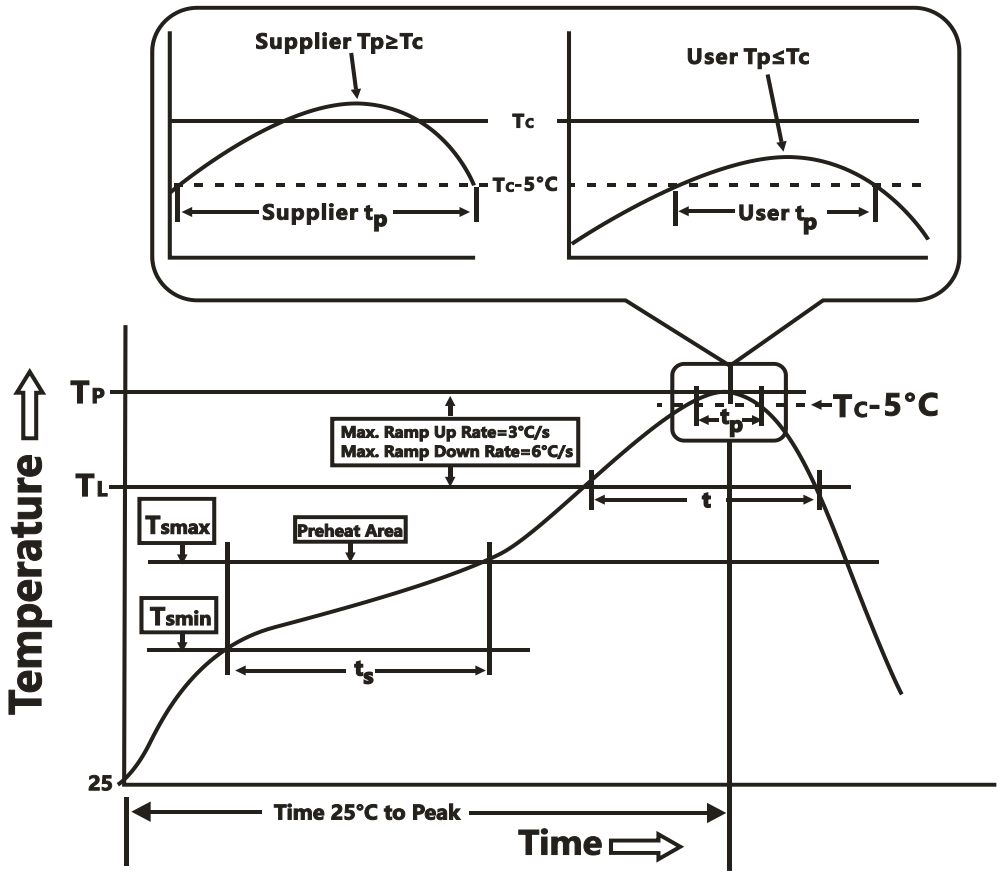
Package Information

sTOLL



COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.2	2.3	2.4
A1	0.4	0.5	0.6
b	0.7	0.8	0.9
b1	0.42	0.45	0.5
D	6.8	7	7.2
D1	6.8	6.9	7
D2	1.1	1.2	1.3
D3	1.55	1.65	1.75
D4	6.56(REF)		
D5	5.96(REF)		
D6	5.60(REF)		
E	6.5	6.7	6.9
E1	7.8	8	8.2
E2	0.6	0.7	0.8
E3	0.5	0.6	0.7
E4	2.43(REF)		
E5	2.30(REF)		
E6	5.20(REF)		
E7	2.57(REF)		
E8	2.50(REF)		
e	1.60(BSC)		
e1	1.30(BSC)		
L	1.05	1.15	1.25
L1	0.8	0.9	1
L2	0.13	0.235	0.33
P	1.4	1.5	1.6
W	8.50°	-	11.50°

Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_S)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_P)*	See Classification Temp in table1	See Classification Tempin table2
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	Volume mm³	Volume mm³
Thickness	**<350**	**⩾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	Volume mm³	Volume mm³	Volume mm³
Thickness	**<350**	**350-2000**	**⩾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

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	168/500/1000 Hrs, Bias @ 150°C
HTGB	JESD-22, A108	168/500/1000 Hrs, V_{GS}100% @ 150°C
PCT	JESD-22, A102	96 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	250/500/1000 Cycles, -55°C~150°C

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