

N-Channel Enhancement Mode MOSFET

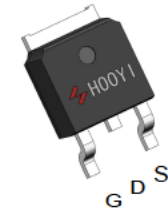
Features

- 150V/10A,
 $R_{DS(ON)} = 75\text{ m}\Omega$ (typ.) @ $V_{GS} = 10\text{V}$
- 100% EAS Guaranteed
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology
- Halogen - Free Device Available

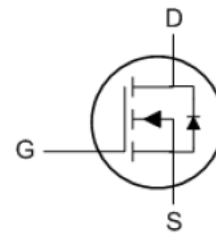
Applications

- High Frequency Synchronous Buck Converters for Computer Processor Power
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use

Pin Description




TO-252-2L



N-Channel MOSFET

Ordering and Marking Information

 D HY1115 YYXXJWW G	Package Code D : TO-252-2L Date Code YYXX WW Assembly Material G : Lead Free Device
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Note: HOOYI lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. HOOYI lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. HOOYI defines "Green" to mean lead-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).

HOOYI reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
Common Ratings ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage	150	V	
V_{GSS}	Gate-Source Voltage	± 20		
T_{J}	Maximum Junction Temperature	150	$^{\circ}\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}\text{C}$	
I_{S}	Diode Continuous Forward Current	$T_{\text{C}}=25^{\circ}\text{C}$	10	A
Mounted on Large Heat Sink				
I_{DM}	Pulsed Drain Current *	$T_{\text{C}}=25^{\circ}\text{C}$	40**	A
I_{D}	Continuous Drain Current	$T_{\text{C}}=25^{\circ}\text{C}$	10	A
		$T_{\text{C}}=100^{\circ}\text{C}$	7	
P_{D}	Maximum Power Dissipation	$T_{\text{C}}=25^{\circ}\text{C}$	50	W
		$T_{\text{C}}=100^{\circ}\text{C}$	20	
$R_{\theta\text{JC}}$	Thermal Resistance-Junction to Case		2.5	$^{\circ}\text{C}/\text{W}$
$R_{\theta\text{JA}}$	Thermal Resistance-Junction to Ambient		110	$^{\circ}\text{C}/\text{W}$
E_{AS}	Drain-Source Avalanche Energy	$L=0.5\text{mH}$	33***	mJ

Note : * Repetitive rating ; pulse width limited by junction temperature

** Drain current is limited by junction temperature

*** $V_{\text{D}}=100\text{V}$

Electrical Characteristics ($T_A = 25^{\circ}\text{C}$ Unless Otherwise Noted)

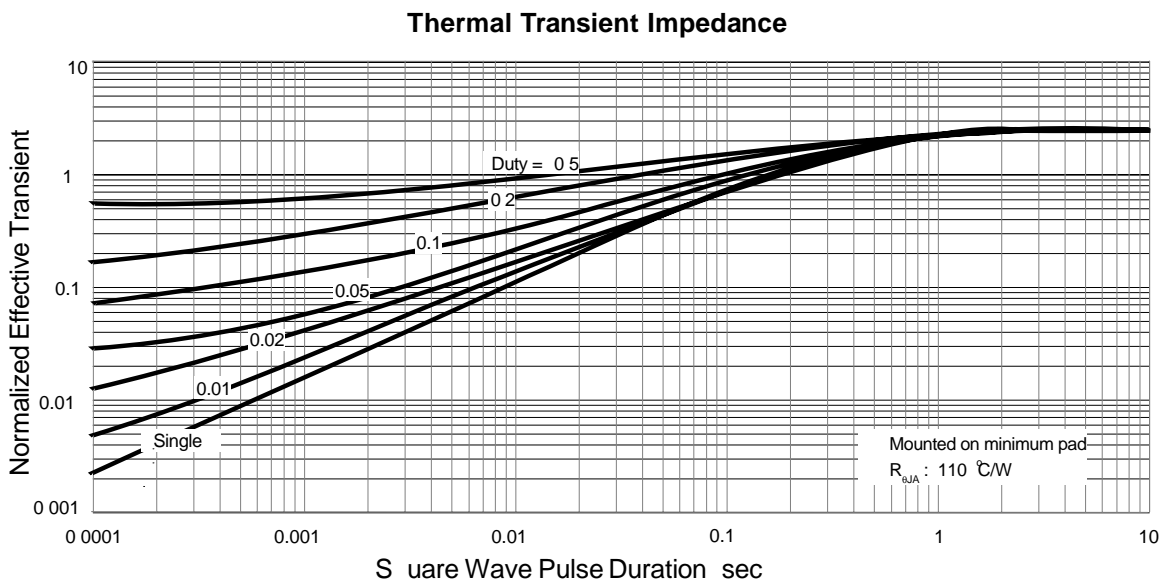
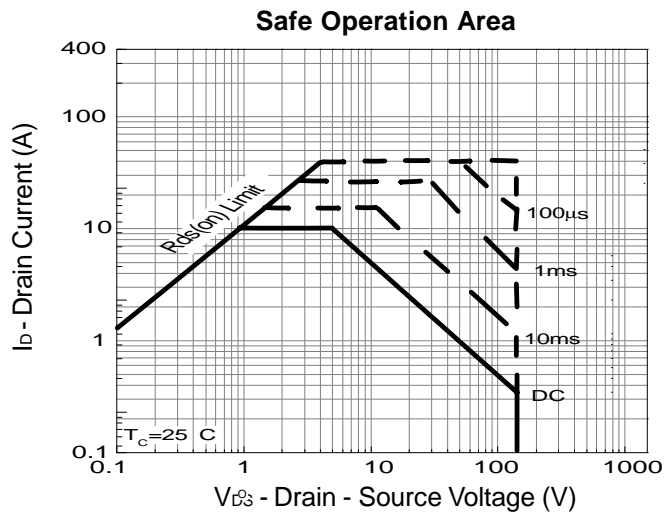
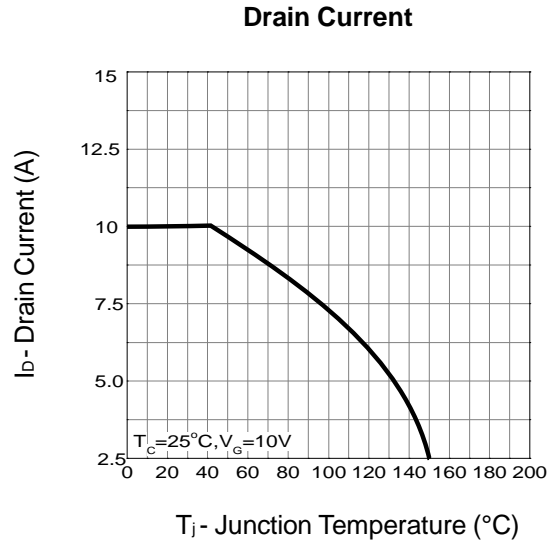
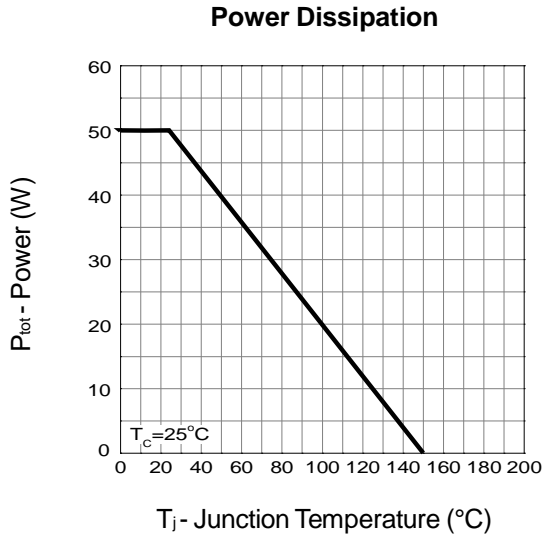
Symbol	Parameter	Test Conditions	HY1115			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}, I_{\text{DS}}=250\mu\text{A}$	150	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}}=150\text{V}, V_{\text{GS}}=0\text{V}$ $T_{\text{J}}=85^{\circ}\text{C}$	-	-	1	μA
			-	-	30	
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{DS}}=250\mu\text{A}$	2	3	4	V
I_{GSS}	Gate Leakage Current	$V_{\text{GS}}=\pm 20\text{V}, V_{\text{DS}}=0\text{V}$	-	-	± 100	nA
$R_{\text{DS(ON)}}^*$	Drain-Source On-state Resistance	$V_{\text{GS}}=10\text{V}, I_{\text{DS}}=5\text{A}$	-	75	130	$\text{m}\Omega$
Diode Characteristics						
V_{SD}^*	Diode Forward Voltage	$I_{\text{SD}}=5\text{A}, V_{\text{GS}}=0\text{V}$	-	0.8	1.1	V
t_{rr}	Reverse Recovery Time	$I_{\text{DS}}=5\text{A}, \text{d}I_{\text{SD}}/\text{d}t=100\text{A}/\mu\text{s}$	-	21	-	ns
Q_{rr}	Reverse Recovery Charge		-	13	-	nC

Electrical Characteristics (Cont.) ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HY1115			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	2.0	-	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=25V,$ Frequency=1.0MHz	-	945	-	pF
C_{oss}	Output Capacitance		-	265	-	
C_{rss}	Reverse Transfer Capacitance		-	165	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=75V, R_G=3\Omega,$ $I_{DS}=5A, V_{GS}=10V,$	-	15	28	ns
T_r	Turn-on Rise Time		-	13	24	
$t_{d(OFF)}$	Turn-off Delay Time		-	20	35	
T_f	Turn-off Fall Time		-	10	19	
Gate Charge Characteristics						
Q_g	Total Gate Charge	$V_{DS}=100V, V_{GS}=10V,$ $I_{DS}=5A$	-	28.5	-	nC
Q_{gs}	Gate-Source Charge		-	3.7	-	
Q_{gd}	Gate-Drain Charge		-	8	-	

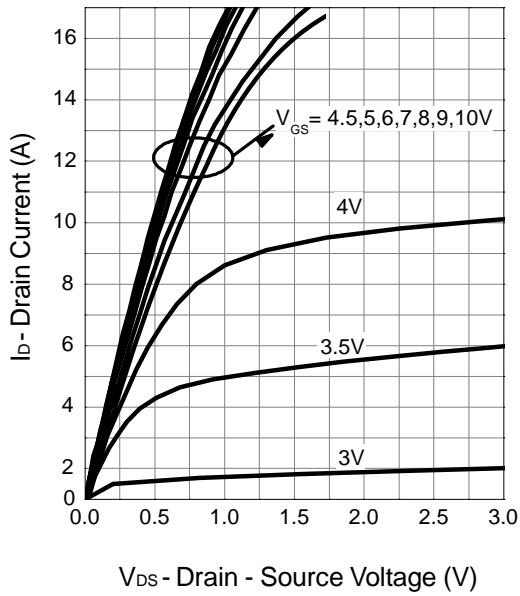
Note * : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

Typical Operating Characteristics

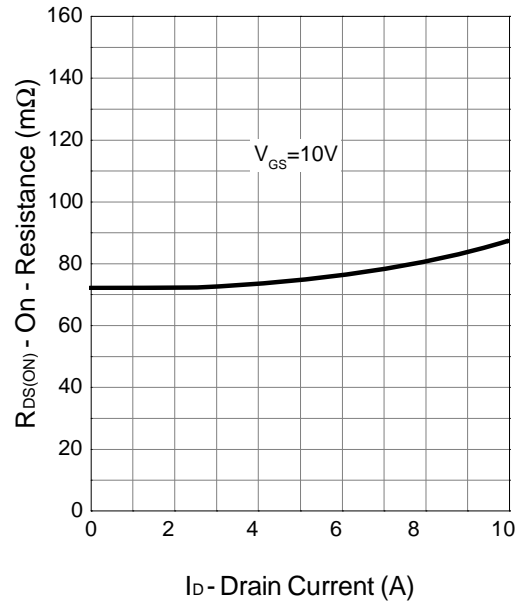


Typical Operating Characteristics (Cont.)

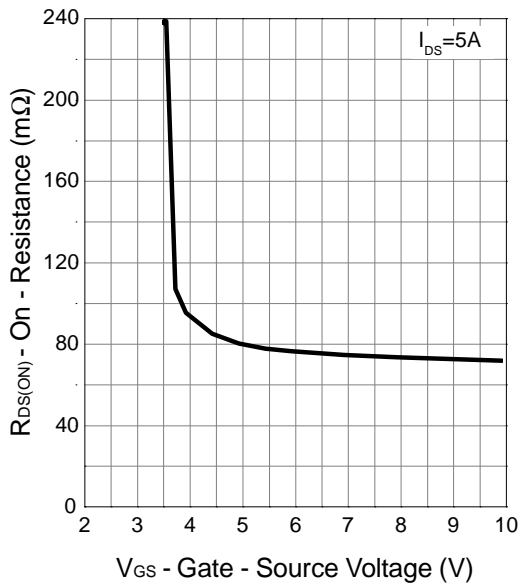
Output Characteristics



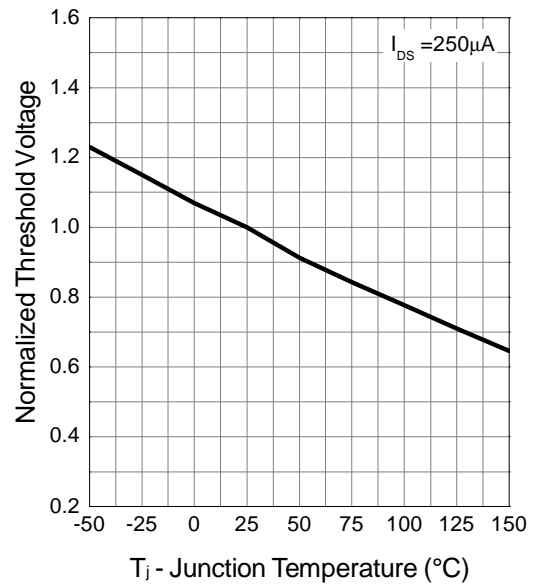
Drain-Source On Resistance



Gate-Source On Resistance

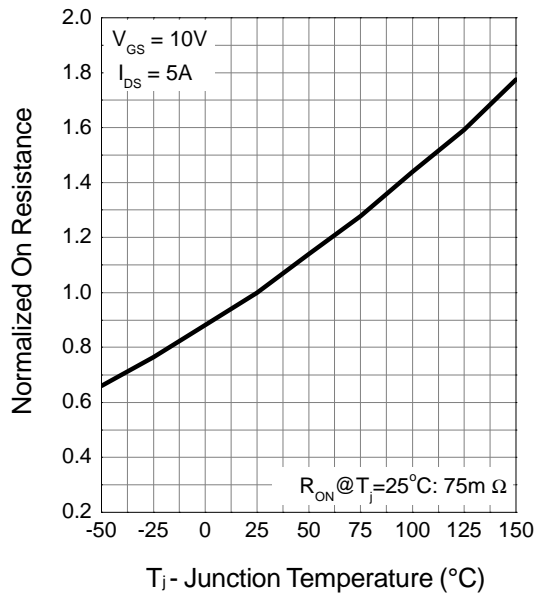


Gate Threshold Voltage

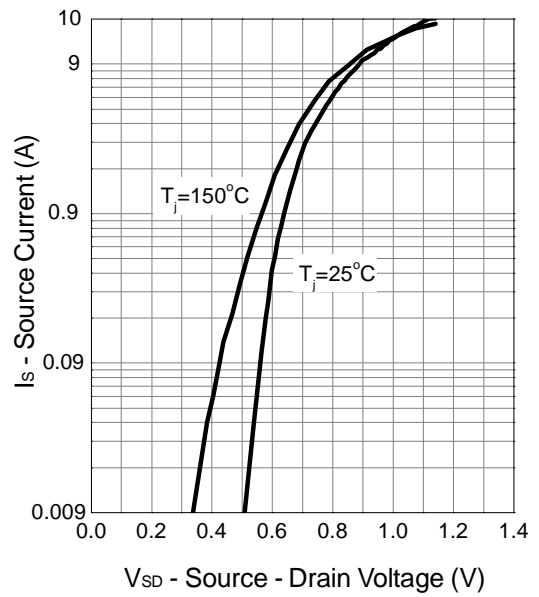


Typical Operating Characteristics (Cont.)

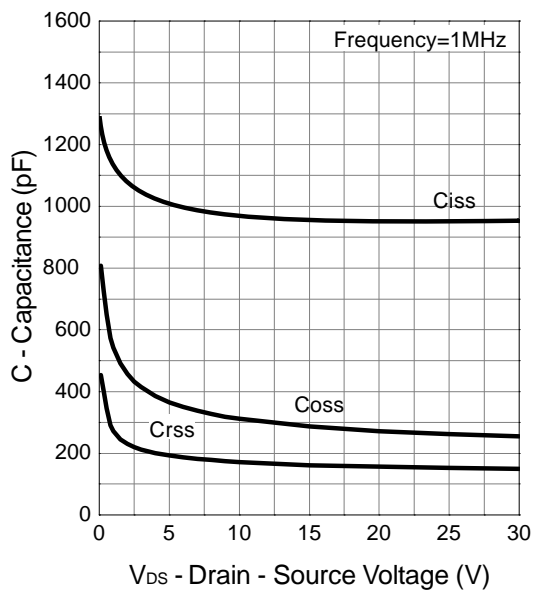
Drain-Source On Resistance



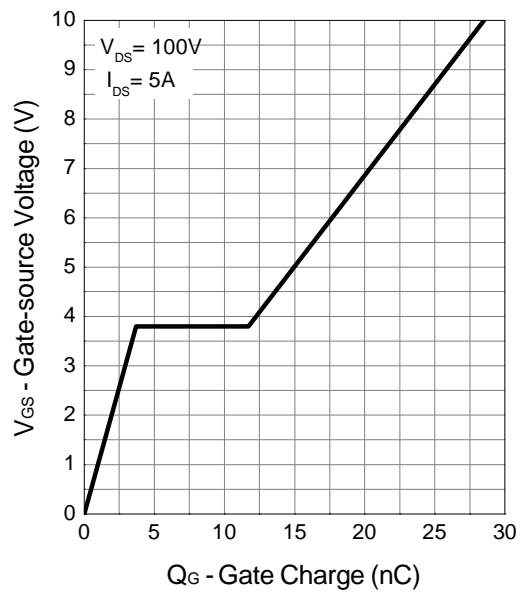
Source-Drain Diode Forward



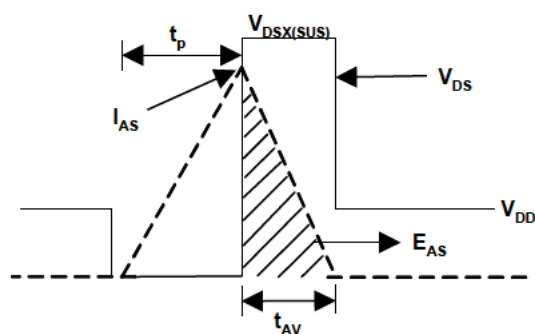
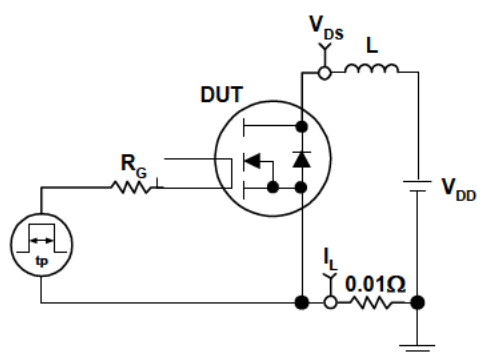
Capacitance



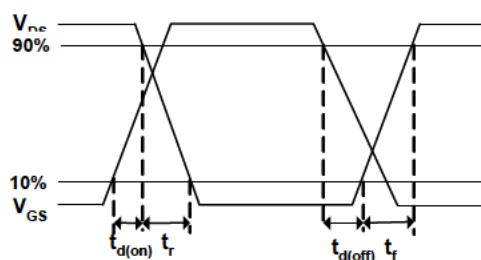
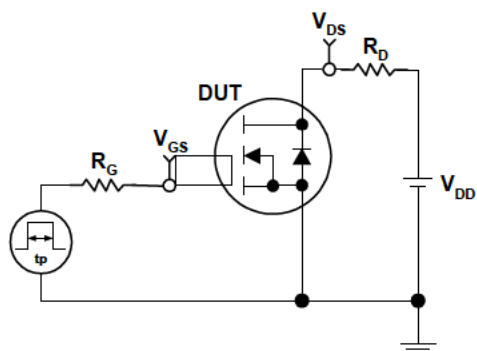
Gate Charge



Avalanche Test Circuit and Waveforms

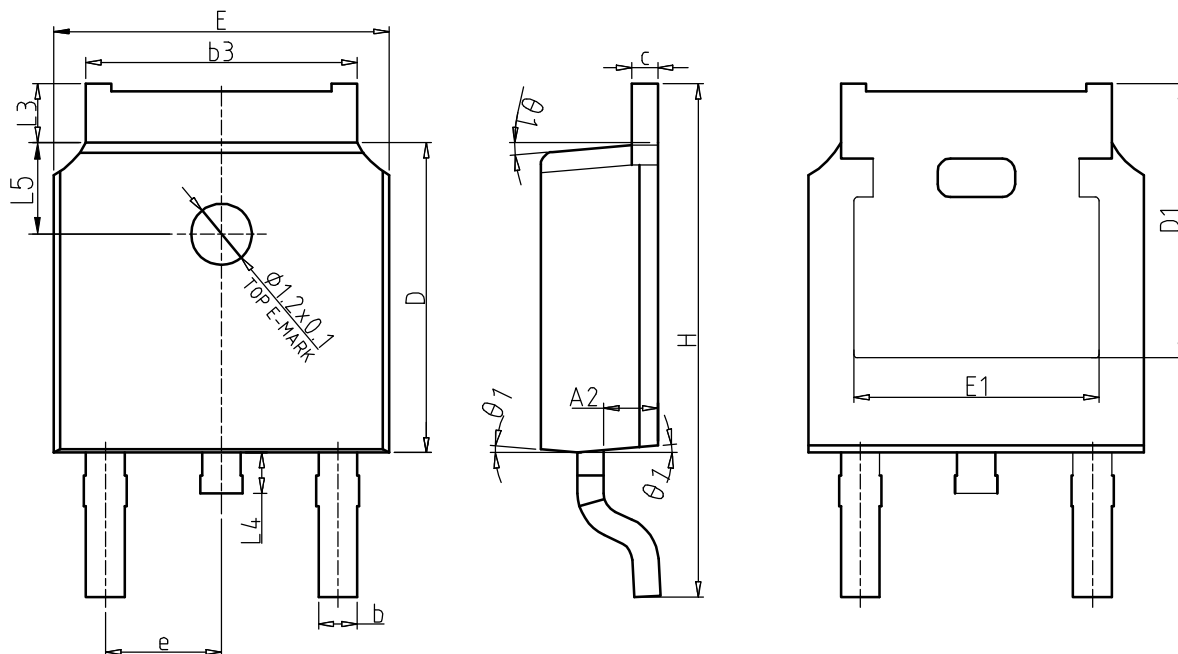


Switching Time Test Circuit and Waveforms



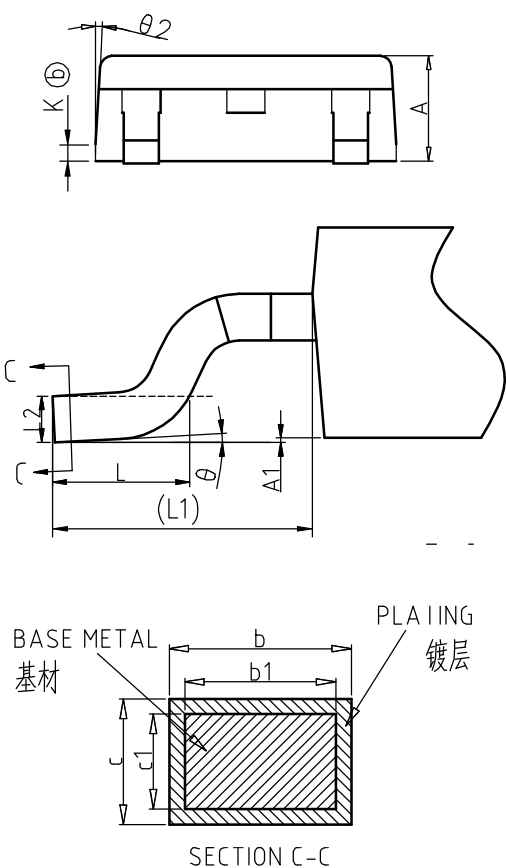
Package Information

TO-252-2L



COMMON DIMENSIONS

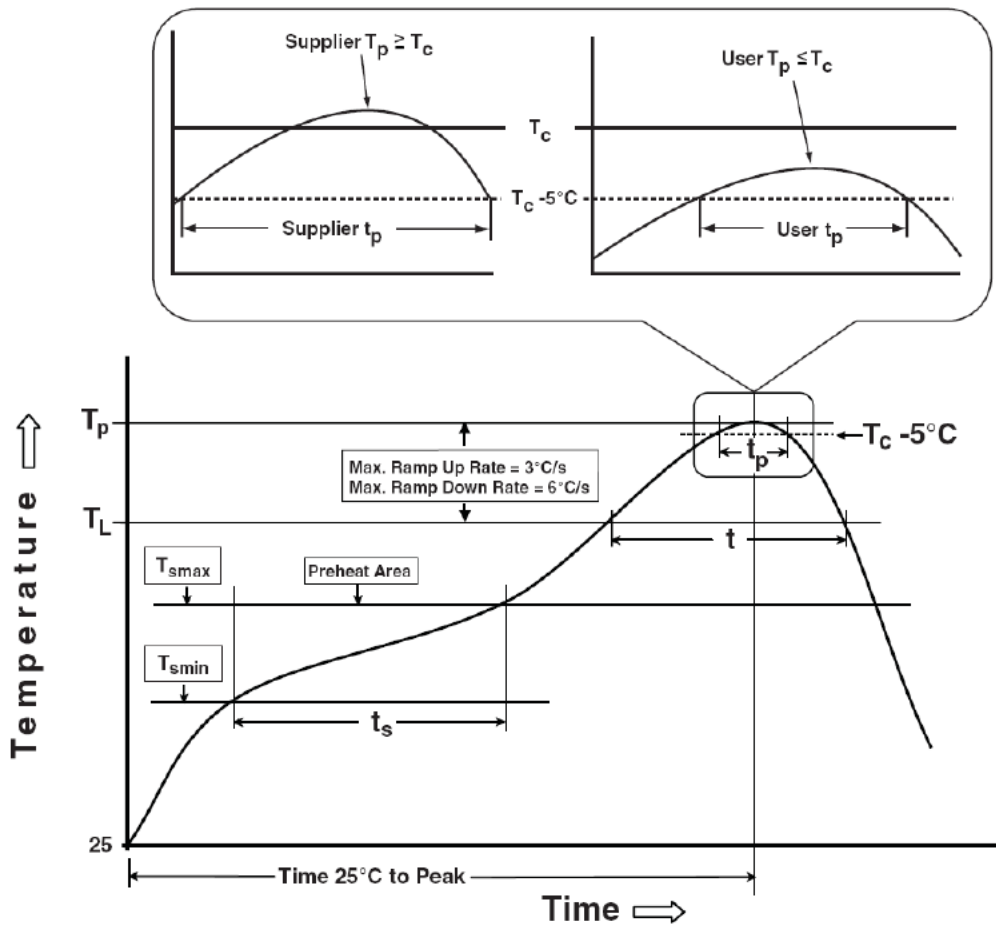
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.97	1.07	1.17
b	0.72	0.78	0.85
b1	0.71	0.76	0.81
b3	5.23	5.33	5.46
c	0.47	0.53	0.58
c1	0.46	0.51	0.56
D	6.00	6.10	6.20
D1	5.30REF		
E	6.50	6.60	6.70
E1	4.70	4.83	4.92
e	2.286BSC		
H	9.90	10.10	10.30
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
	0°	-	8°
1	5°	7°	9°
2	5°	7°	9°
K	0.40REF		



Devices Per Unit

Package Type	Unit	Quantity
TO-252-2L	Tube	72

Classification Profile



Classification Reflow Profiles

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 (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

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HOLT	JESD-22, A108	1000 Hrs, Bias @ 125°C
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C