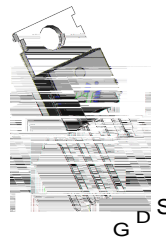


N-Channel Enhancement Mode MOSFET

Features

- 60V / 120 A,
 $R_{DS(ON)} = 6.0\ m\ (\text{typ.}) @ V_{GS} = 10V$
- Avalanche Rated
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

Pin Description



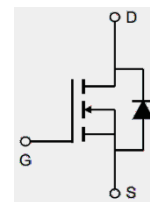
TO-220FB-3L



TO-263-2L



Applications

Power Management for Inverter Systems.



N-Channel MOSFET

Ordering and Marking Information

 P HY1906 YYXXXJWW G	 B HY1906 YYXXXJWW G	Package Code P : TO-220FB-3L B: TO-263-2L	Date Code YYXXX WW Assembly Material G : Lead Free Device
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Note: HUAYI lead-free products contain molding compounds/die attach materials and 100% matte tin plate Termination finish; which are fully compliant with RoHS. HUAYI lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020 for MSL classification at lead-free peak reflow temperature. HUAYI 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).

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 ($T_C=25^\circ\text{C}$ Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage	60	V	
V_{GSS}	Gate-Source Voltage	± 25		
T_J	Maximum Junction Temperature	175	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$	
I_S	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$	120	A
Mounted on Large Heat Sink				
I_{DM}		$T_C=25^\circ\text{C}$	380**	A
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	120	A
		$T_C=100^\circ\text{C}$	80	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	188	W
		$T_C=100^\circ\text{C}$	94	
R_{JC}	Thermal Resistance-Junction to Case		0.8	$^\circ\text{C/W}$
R_{JA}	Thermal Resistance-Junction to Ambient		62.5	
Avalanche Ratings				
E_{AS}	Avalanche Energy, Single Pulsed	$L=0.5\text{mH}$	600***	mJ

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

Symbol	Parameter	Test Conditions	HY1906			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_{DS}=250\text{ A}$	60			

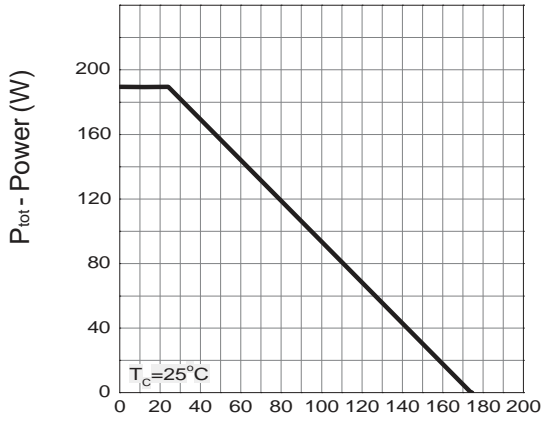
Electrical Characteristics (Cont.) ($T_C = 25\text{ }^\circ\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HY1906			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	1.0	-	
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=25V,$ Frequency=1.0MHz	-	4577	-	pF
C_{oss}	Output Capacitance		-	876	-	
C_{rss}	Reverse Transfer Capacitance		-	276	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=30V, R_G=6\ \Omega,$ $I_{DS}=60A, V_{GS}=10V,$	-	13	26	ns
T_r	Turn-on Rise Time		-	11	20	
$t_{d(OFF)}$	Turn-off Delay Time		-	40	66	
T_f	Turn-off Fall Time		-	60	95	
Gate Charge Characteristics^b						
Q_g	Total Gate Charge	$V_{DS}=30V, V_{GS}=10V,$ $I_{DS}=60A$	-	96	-	nC
Q_{gs}	Gate-Source Charge		-	21	-	
Q_{gd}	Gate-Drain Charge		-	23	-	

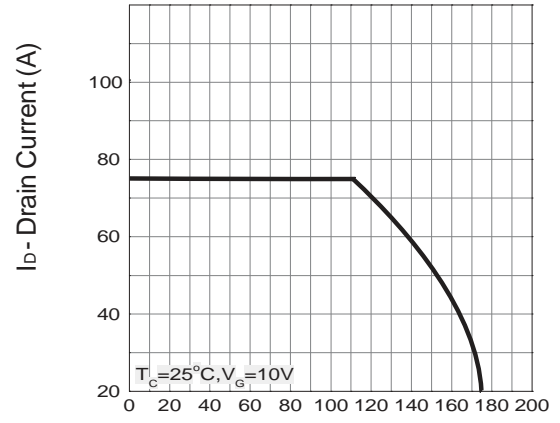
Note * : Pulse test ; pulse width 300 μs , duty cycle 2%.

Typical Operating Characteristics

Power Dissipation



Drain Current



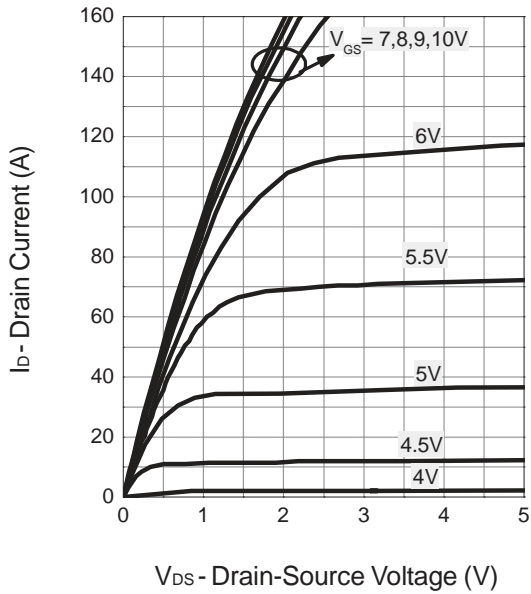
Safe Operation Area

I_D - Drain Current (A)

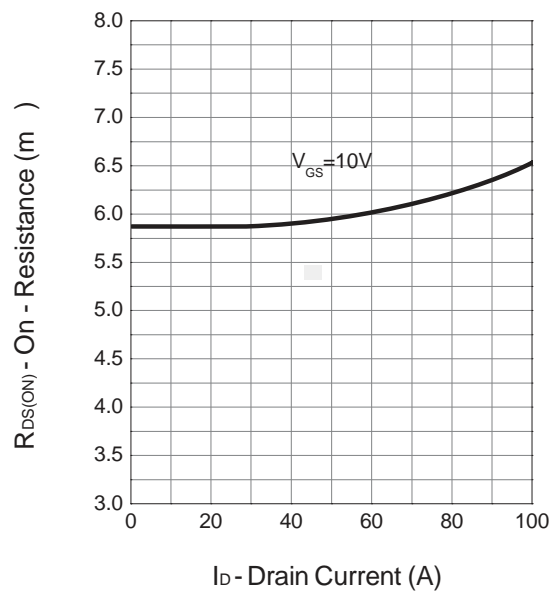
V_{DS} - Drain - Source Voltage (V)

Typical Operating Characteristics (Cont.)

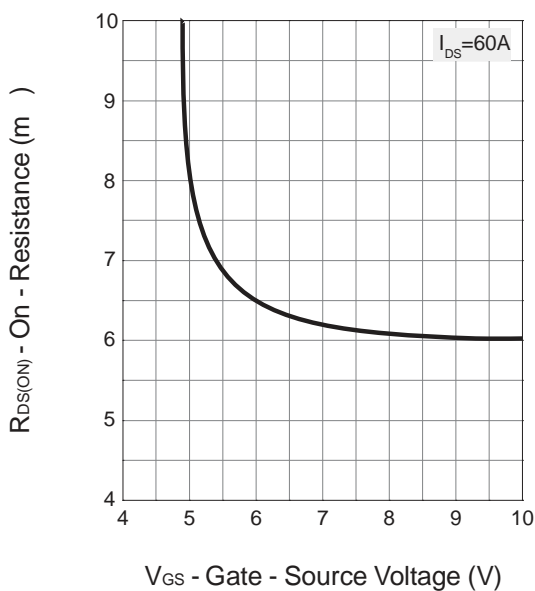
Output Characteristics



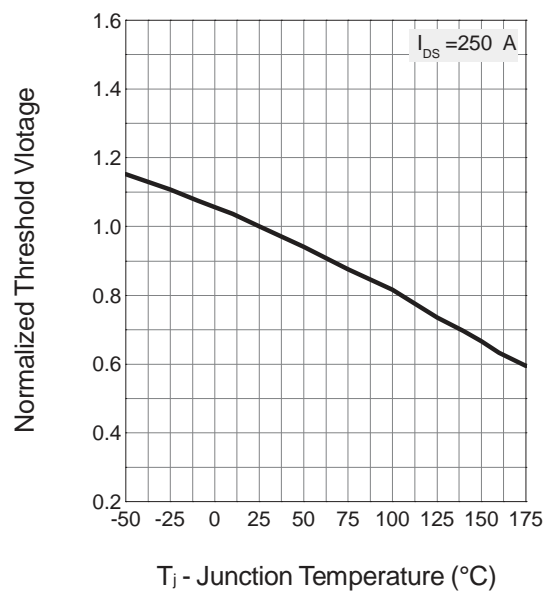
Drain-Source On Resistance



Drain-Source On Resistance

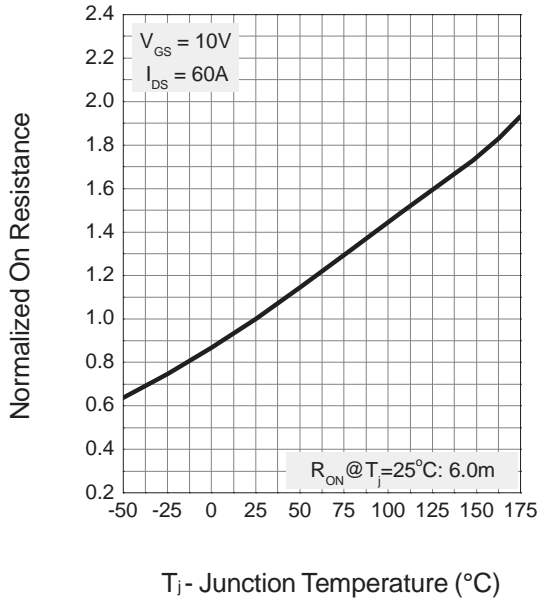


Gate Threshold Voltage

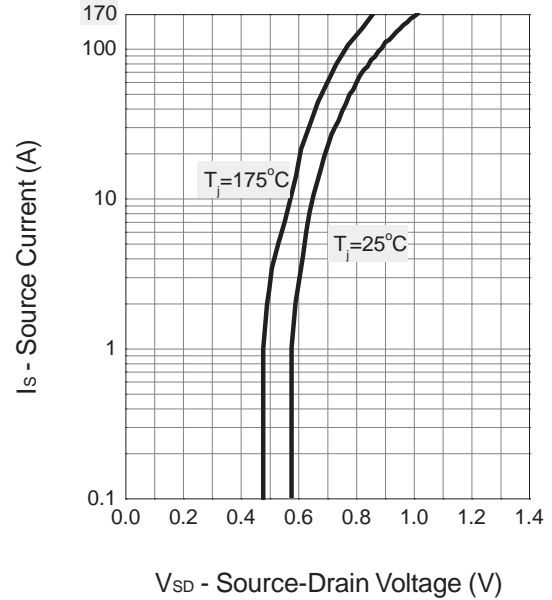


Typical Operating Characteristics (Cont.)

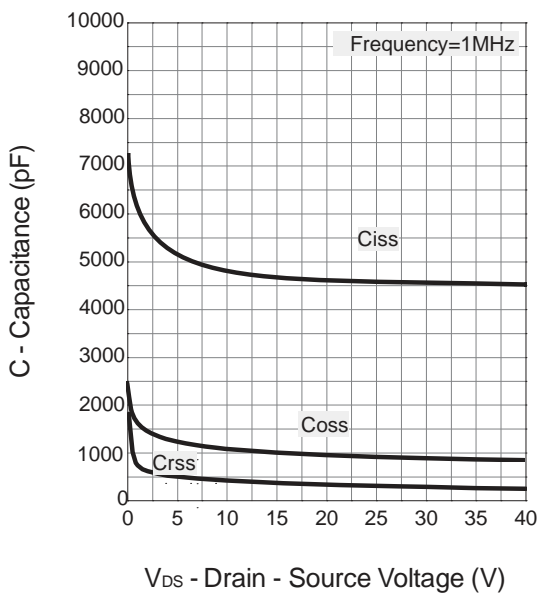
Drain-Source On Resistance



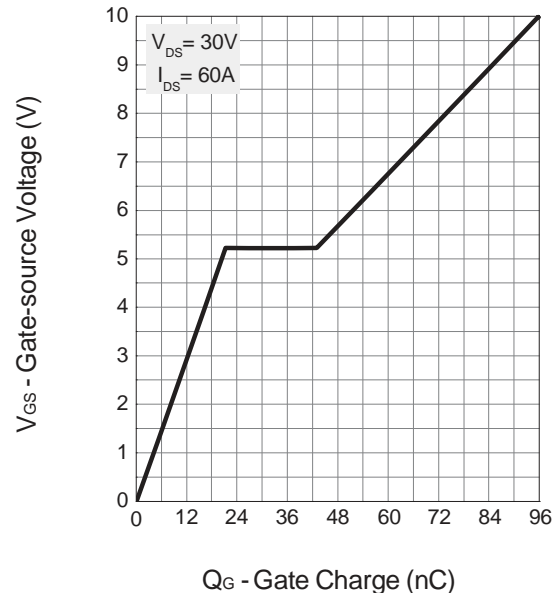
Source-Drain Diode Forward



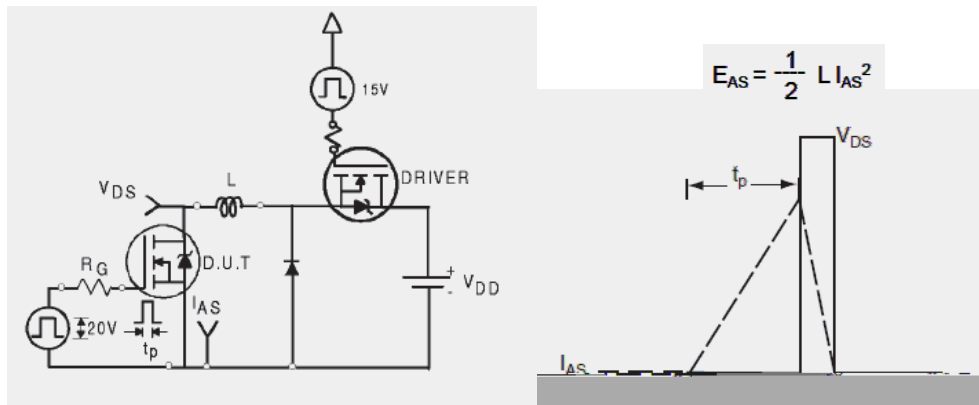
Capacitance



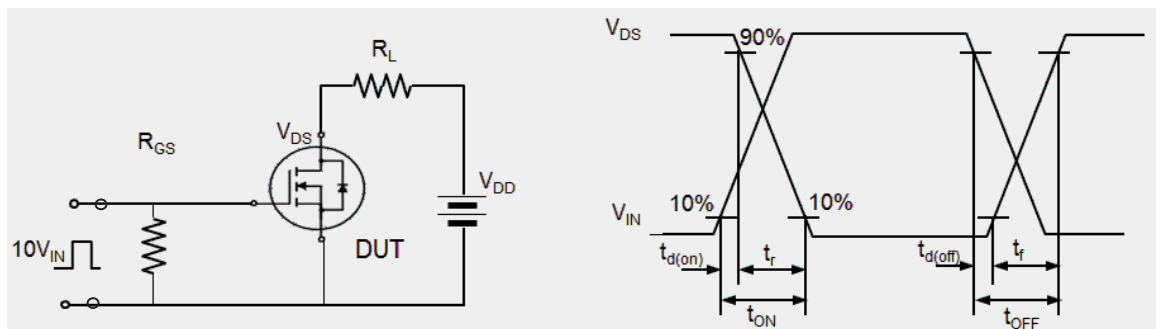
Gate Charge



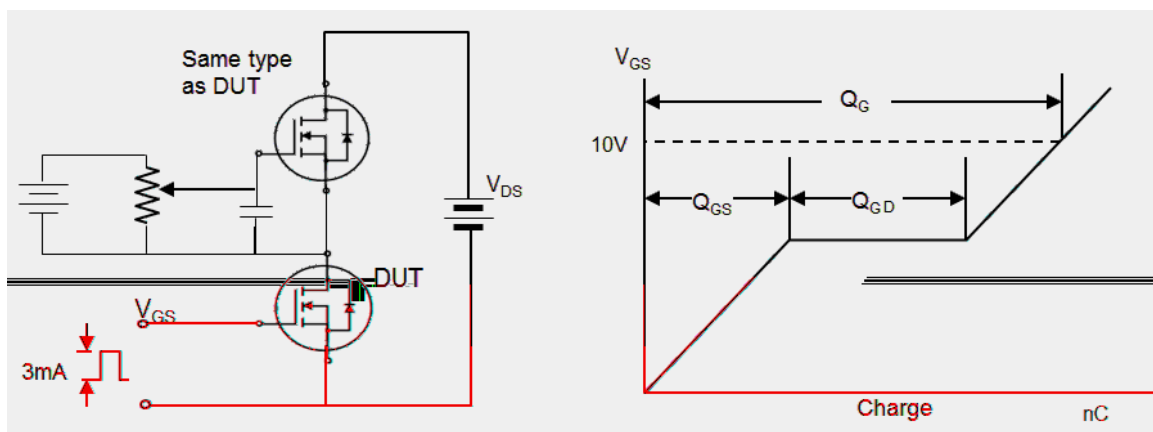
Avalanche Test Circuit



Switching Time Test Circuit



Gate Charge Test Circuit

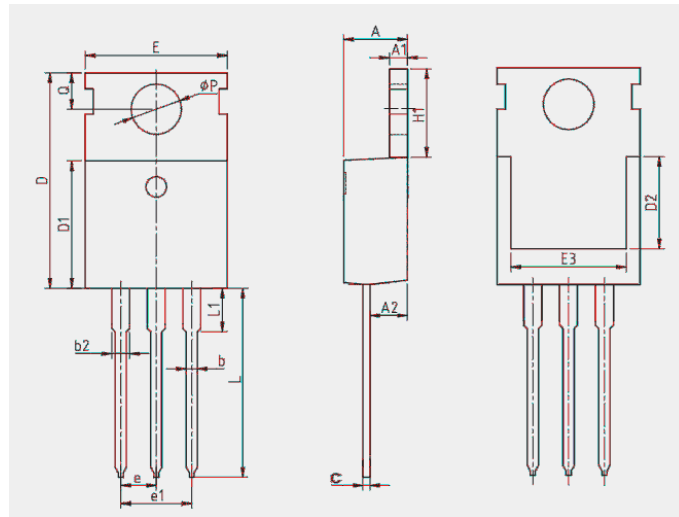


Device Per Unit

Package Type	Unit	Quantity
TO-220FB-3L	Tube	50

Package Information

TO-220FB-3L



COMMON DIMENSIONS

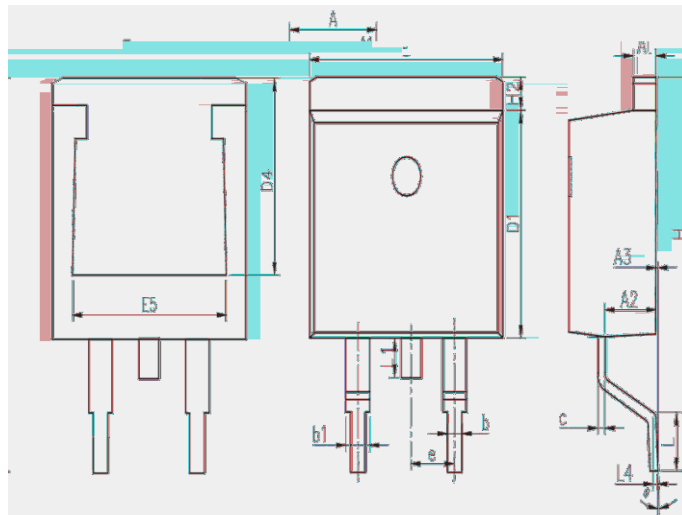
SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.25	1.30	1.45
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
P	3.40	3.60	3.80
Q	2.60	2.80	3.00

Device Per Unit

Package Type	Unit	Quantity
VUĒĠĪHĒĠSĀ	V~ā^Ā	ÍĒĀ

Package Information

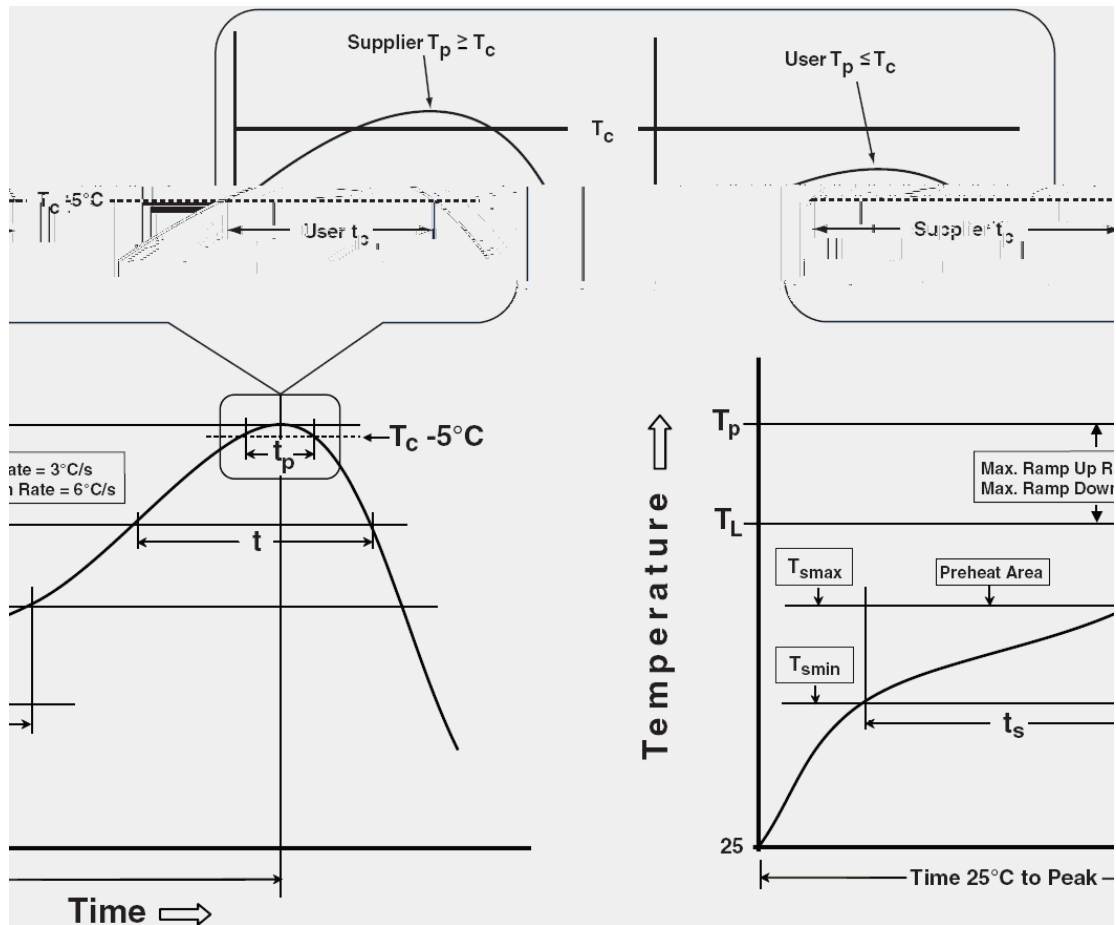
TO-263-2L



ÔUTTURĀÔQTÔRÛQURÛĀ

ÛŸTÓUSĀ	{ { Ā		
	TQPA	PUTA	TCEYĀ
ĀĀ	ĪĒĪĀ	ĪĒĪĀ	ĪĒĪĀ
ĀFĀ	FĒGGĀ	FĒĠĪĀ	FĒĠĠĀ
ĀGĀ	GĒĪĠĀ	GĒĪĠĀ	GĒĪĠĀ
ĀHĀ	ĒĀ	ĒĒFHĀ	ĒĒĠĪĀ
āĀ	ĒĒĪĀ	ĒĒĪFĀ	ĒĒĠĪĀ
āFĀ	FĒFĪĀ	FĒĠĪĀ	FĒĪĪĀ
ĀĀ	ĒĒHĀ	ĒĒĪĪĀ	ĒĒĪĪĀ
ÖFĀ	ĪĒĪĀ	ĪĒĪĀ	ĪĒĠĀ
ÖĪĀ	ĪĒĪĀ	ĒĀ	ĒĀ
ÒĀ	JĒĪĪĀ	FĒĒFĪĀ	FĒĒĪĪĀ
ÒĪĀ	ĪĒĒĪĀ	ĒĀ	ĒĀ
^Ā	GĒĪĪĀÓŪŌĀ		
PĀ	FĪĒĪĀ	FĪĒFĀ	FĪĒĪĀ
PGĀ	FĒĒĪĀ	FĒĠĪĀ	FĒĪĪĀ
ŠĀ	GĀ	GĒHĀ	GĒĪĀ
ŠFĀ	FĒĪĀ	FĒĪĪĀ	FĒĪĀ
ŠĪĀ	ĒĒĠĪĀÓŪŌĀ		
Ā	ĒĀ	ĪĀ	JĀ

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 (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

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245 C
HTRB	JESD-22, A108	168Hrs/500Hrs/1000Hrs, Bias@125 C
PCT	JESD-22, A102	96 Hrs, 100 RH, 2atm, 121 C
TCT	JESD-22, A104	500 Cycles, -55 C~150 C

Customer Service

Worldwide Sales and Service: sales@hymexa.com

Technical Support: Technology@hymexa.com

Xi'an Huayi Microelectronics Co., Ltd.

No.8928, Shangji Road, Economic and Technological Development Zone, Xi'an, China

TEL: (86-029) 86685706

FAX: (86-029) 86685705

E-mail: sales@hymexa.com

Web net: www.hymexa.com