

N-Channel Enhancement Mode MOSFET

Features

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

Pin Description



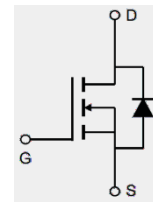
TO-220FB-3L



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			

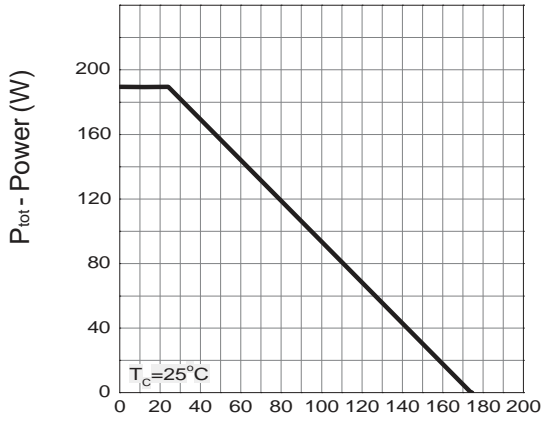
Electrical Characteristics (Cont.) (T_C = 25 C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HY1906			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics^b						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	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 Ω, 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	-	

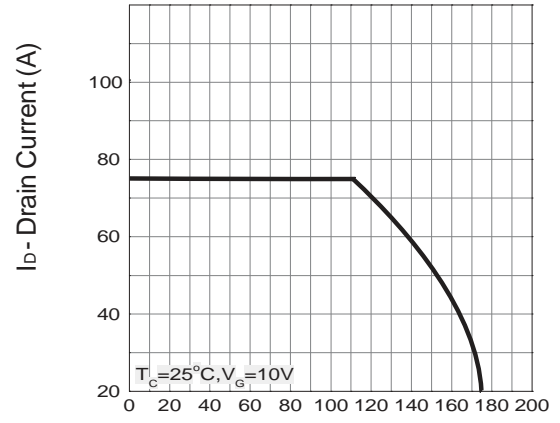
Note * : Pulse test ; pulse width 300 μs, duty cycle 2%.

Typical Operating Characteristics

Power Dissipation



Drain Current



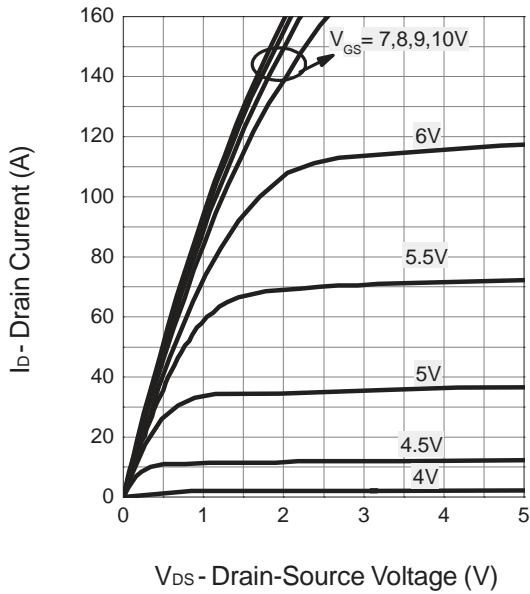
Safe Operation Area

I_D - Drain Current (A)

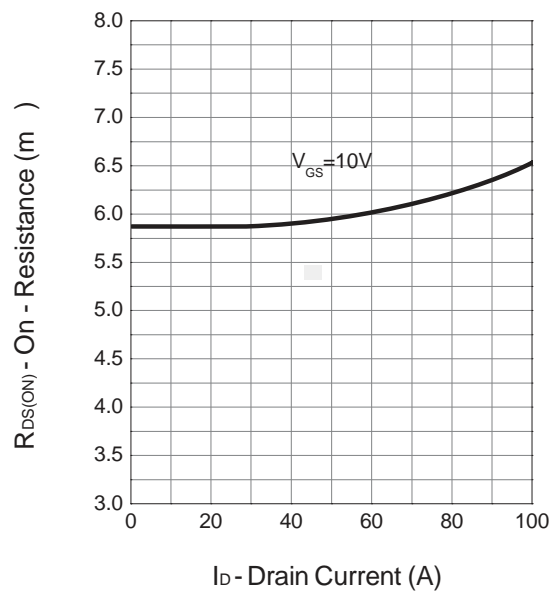
V_{DS} - Drain - Source Voltage (V)

Typical Operating Characteristics (Cont.)

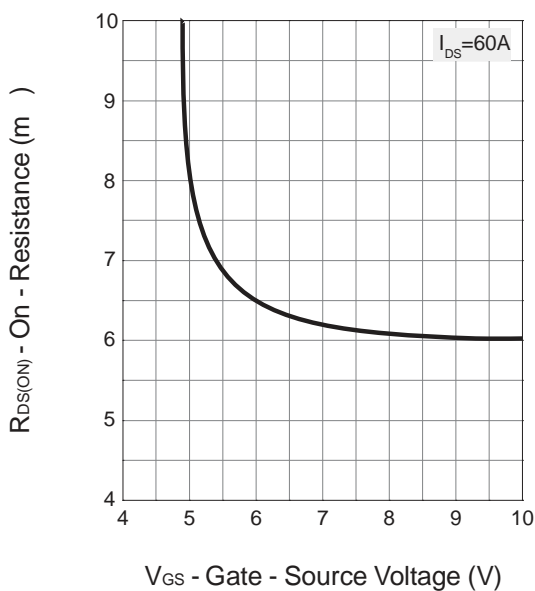
Output Characteristics



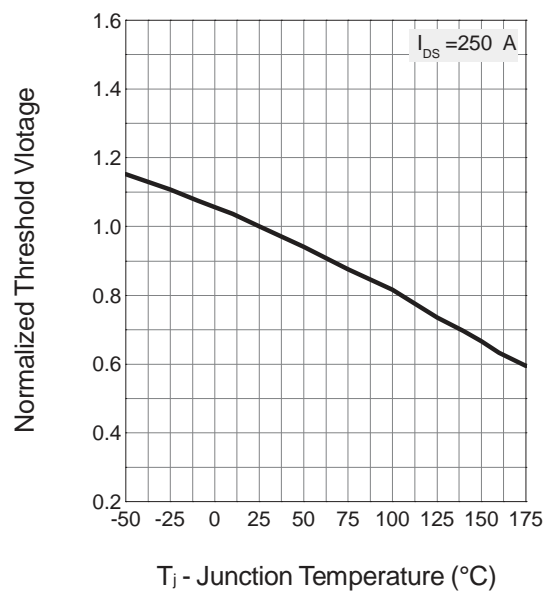
Drain-Source On Resistance



Drain-Source On Resistance

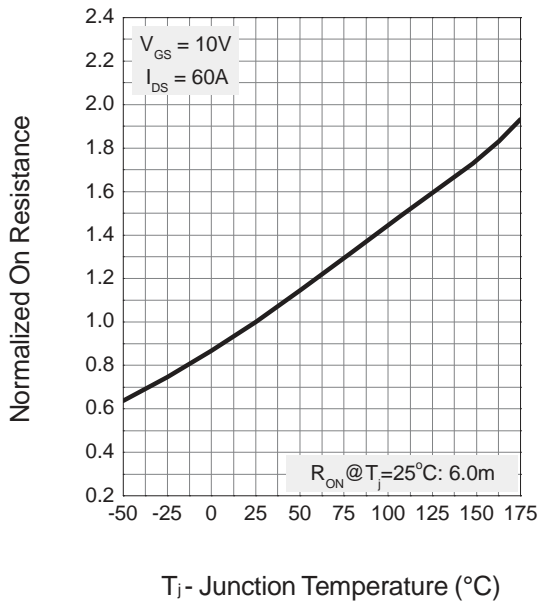


Gate Threshold Voltage

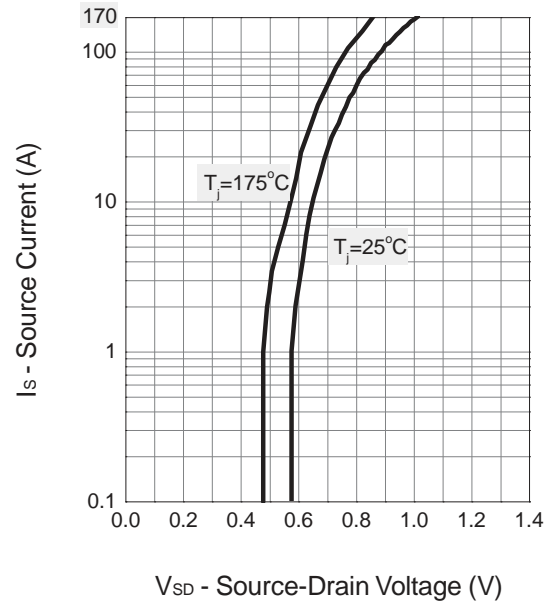


Typical Operating Characteristics (Cont.)

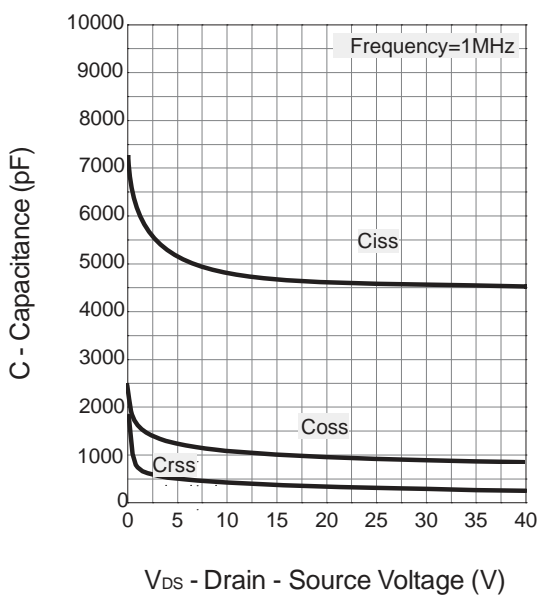
Drain-Source On Resistance



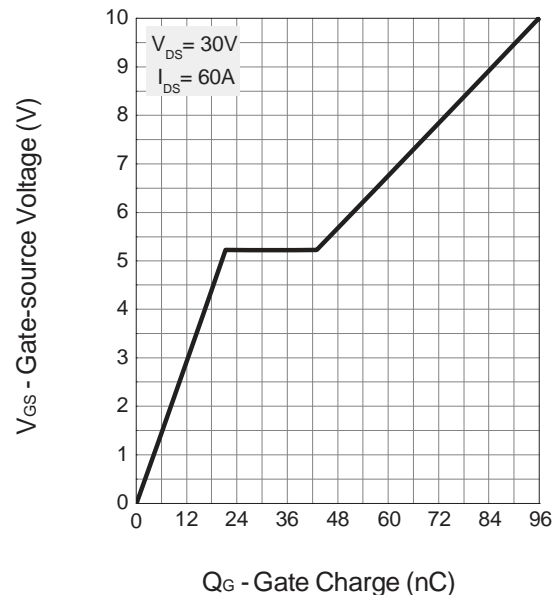
Source-Drain Diode Forward



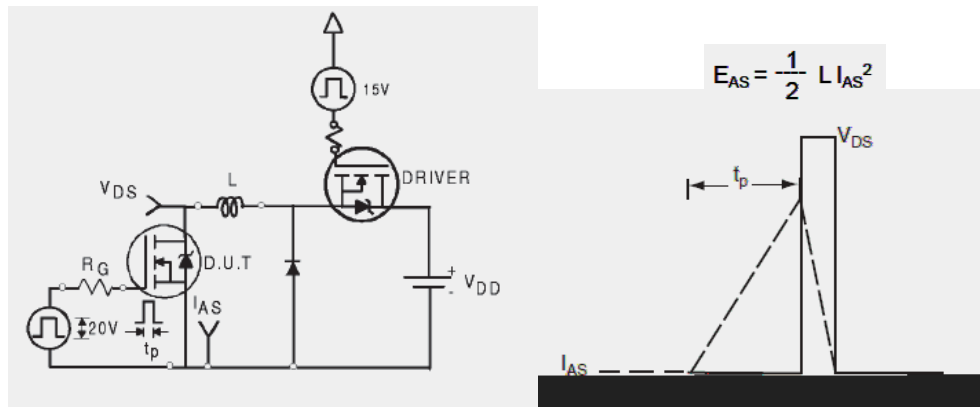
Capacitance



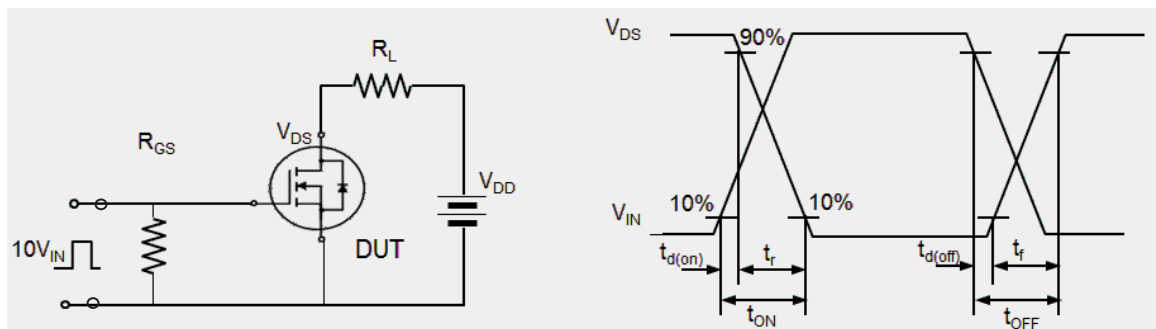
Gate Charge



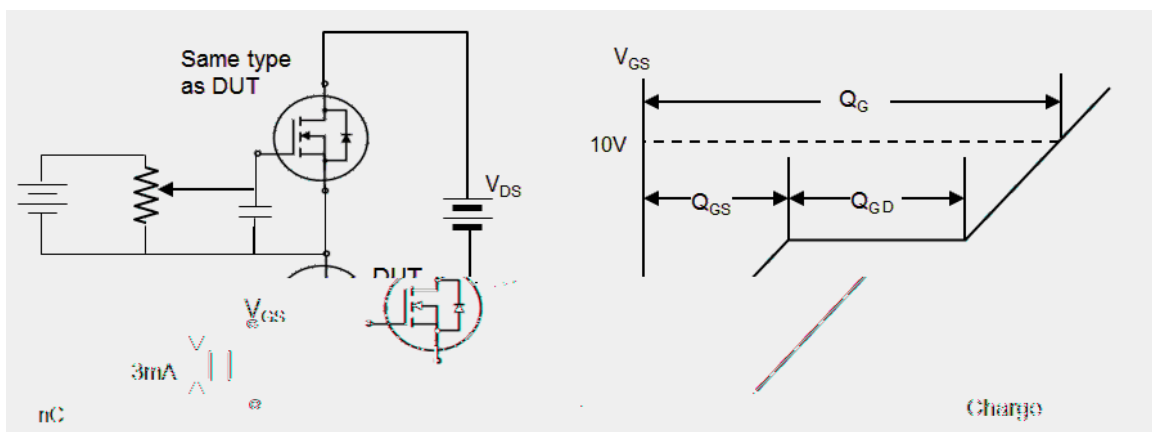
Avalanche Test Circuit



Switching Time Test Circuit



Gate Charge Test Circuit

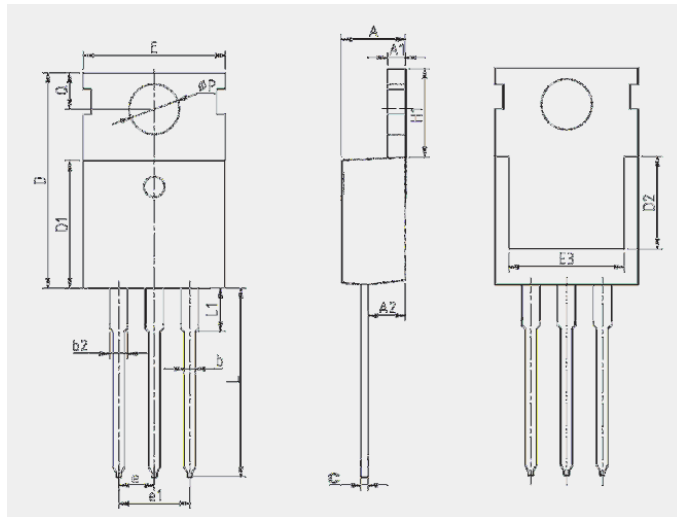


Device Per Unit

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

Package Information

TO-220FB-3L



COMMON DIMENSIONS

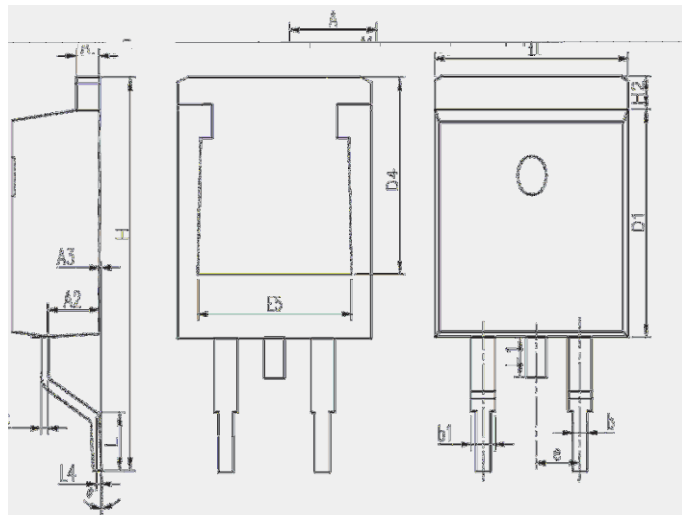
SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.25	1.30	1.45
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
P	3.40	3.60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

Device Per Unit

Package Type	Unit	Quantity
VUĒĠĪHĒĠSĀ	V~à^A	ÍĒ

Package Information

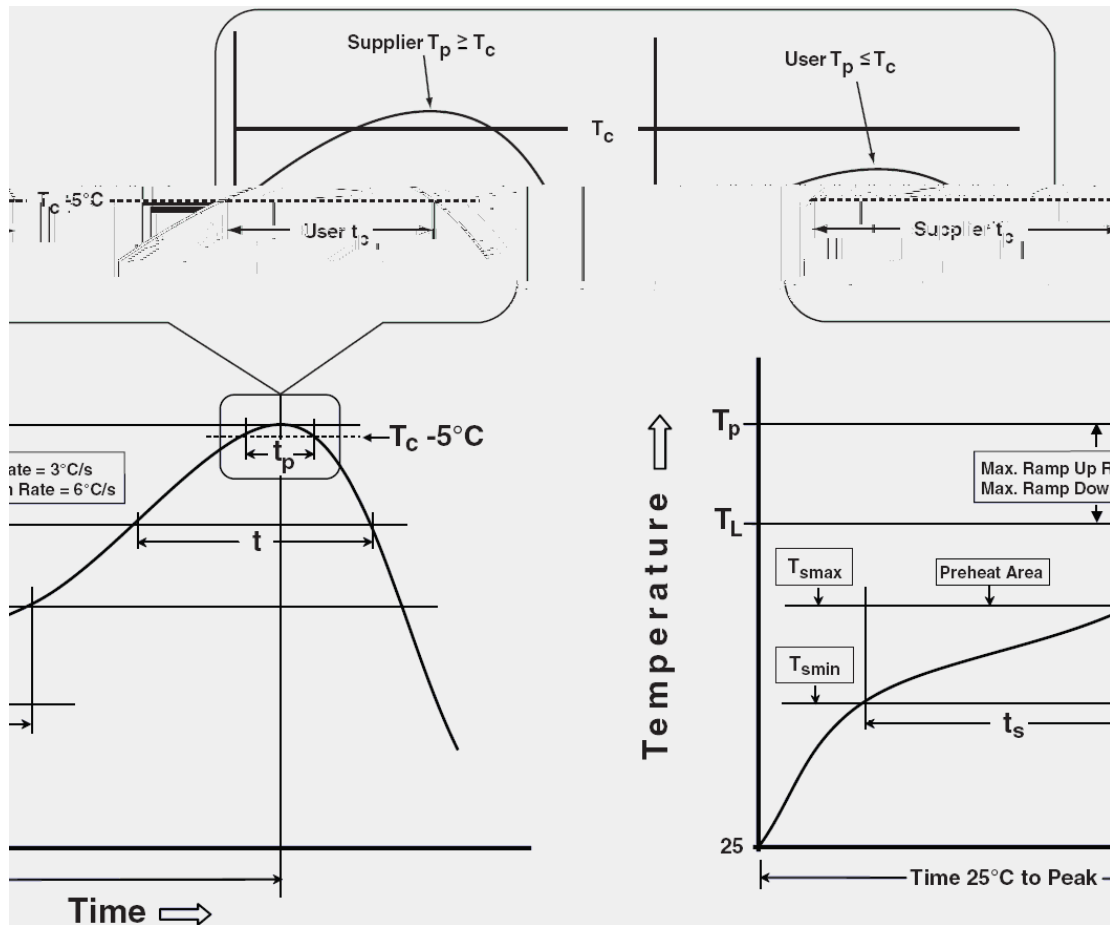
TO-263-2L



ÔUTTURĀŌQTŌRÛQURÛĀ

ÛŸTŌUSĀ	{ { Ā		
	TQPĀ	PUPĀ	TŌĒYĀ
ĀĀ	ĪĒĪĀ	ĪĒĪĀ	ĪĒĪĀ
ĀFĀ	FĒGGĀ	FĒGĪĀ	FĒIGĀ
ĀGĀ	GĒIJĀ	GĒĪJĀ	GĒĪJĀ
ĀHĀ	ĒĀ	ĒĒFHĀ	ĒĒGĪĀ
āĀ	ĒĒĪĀ	ĒĒĪFĀ	ĒĒĪĪĀ
āFĀ	FĒFĪĀ	FĒGĪĀ	FĒĪĪĀ
ĀĀ	ĒĒHĀ	ĒĒĪĪĀ	ĒĒĪHĀ
ŌFĀ	ĪĒĪĀ	ĪĒĪĀ	ĪĒĪĀ
ŌĪĀ	ĪĒĪĀ	ĒĀ	ĒĀ
ŌĀ	JĒĪĪĀ	FĒĒFĪĀ	FĒĒHĪĀ
ŌĪĀ	ĪĒĒĪĀ	ĒĀ	ĒĀ
^Ā	GĒĪĪĀŌÛŌĀ		
PĀ	FĪĒĪĀ	FĪĒFĀ	FĪĒĪĀ
PGĀ	FĒĒĪĀ	FĒGĪĀ	FĒĪĪĀ
ŠĀ	GĀ	GĒHĀ	GĒĪĀ
ŠFĀ	FĒĪĀ	FĒĪĪĀ	FĒĪĀ
ŠĪĀ	ĒĒGĪĪĀŌÛŌĀ		
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

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