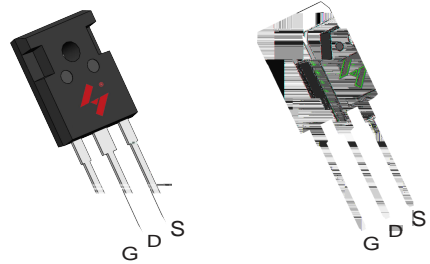


N-Channel Enhancement Mode MOSFET

Features

- 40V/250A
 $R_{DS(ON)} = 2.0\text{ m}\Omega(\text{typ.}) @ V_{GS} = 10\text{V}$
- Avalanche Rated
- Reliable and Rugged
- Halogen Free and Green Devices Available (RoHS Compliant)

Pin Description

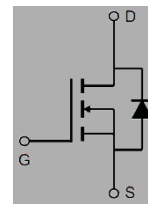


VUEG I TCEEHŠ

VUEHÚEHŠ



Applications

- Power Management for Inverter Systems.



PEÖ@æ } ^|Á T UUØÒV

Ordering and Marking Information

 W HY4504 YYXXXJWW G	 A HY4504 YYXXXJWW G
Package Code W : TO-247 -3L A : TO-3P-3L	Date Code YYXXX WW
Assembly Material G : Halogen Free Device	

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Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings ($T_C=25^\circ\text{C}$ Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		40	V
V_{GSS}	Gate-Source Voltage		± 20	
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	$T_C=25^\circ\text{C}$	250	A
Mounted on Large Heat Sink				
I_{DM}		$T_C=25^\circ\text{C}$	860**	A
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	250	A
		$T_C=100^\circ\text{C}$	172	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	336	W
		$T_C=100^\circ\text{C}$	168	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		0.47	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		40	
Avalanche Ratings				
E_{AS}	Avalanche Energy, Single Pulsed	$L=0.3\text{mH}$	2.2***	J

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

Symbol	Parameter	Test Conditions	HY4504			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_{DS}=250\mu\text{A}$	40	-	-	V
		$V_{DS}=40\text{V}, V_{GS}=0\text{V}$	-	-	1	

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

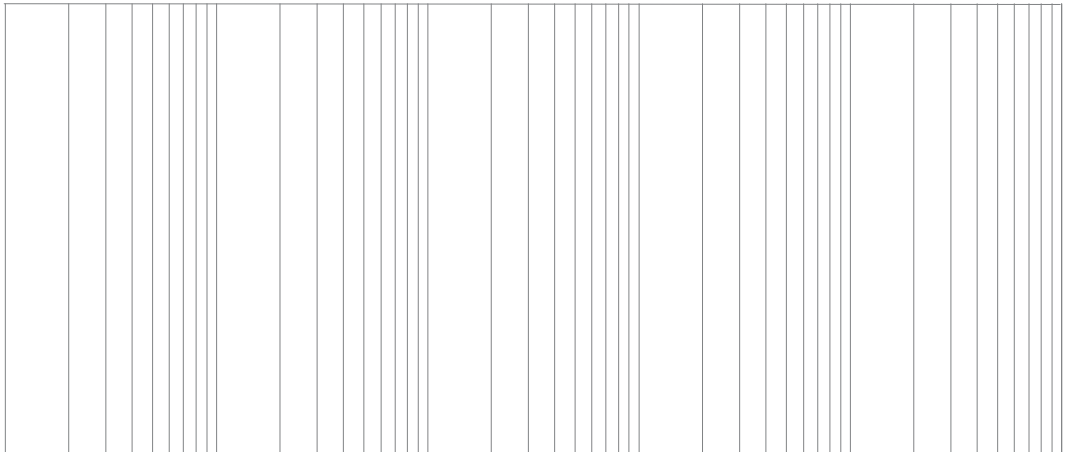
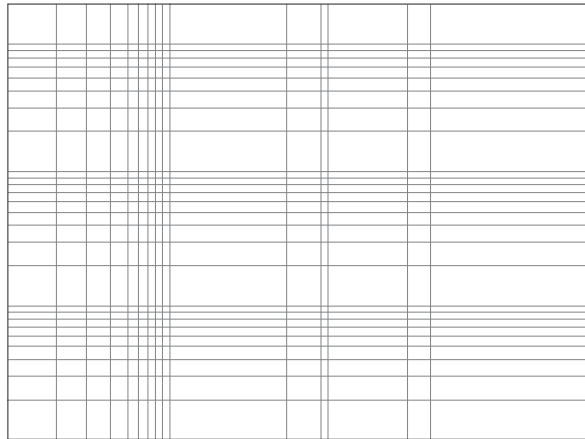
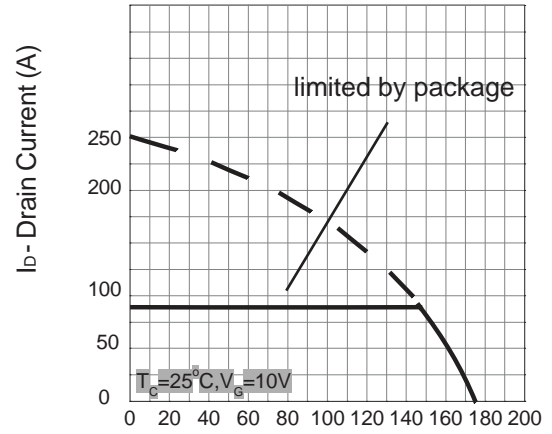
Symbol	Parameter	Test Conditions	HY4504			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	1.0	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, Frequency=1.0MHz	-	7276	-	pF
C _{oss}	Output Capacitance		-	1800	-	
C _{rss}	Reverse Transfer Capacitance		-	614	-	
t _{d(ON)}	Turn-on Delay Time		-	36		
T _r	Turn-on Rise Time		-	20		
t _{d(OFF)}	Turn-off Delay Time		-	45		
T _f	Turn-off Fall Time					

P_{tot} T_c 0.5.99S0 148.298 ISQ q 1 0 e33 3 c21.093 35.906 21.093 -35 006 30.999 -98.51 q 1)tot

Typical Operating Characteristics

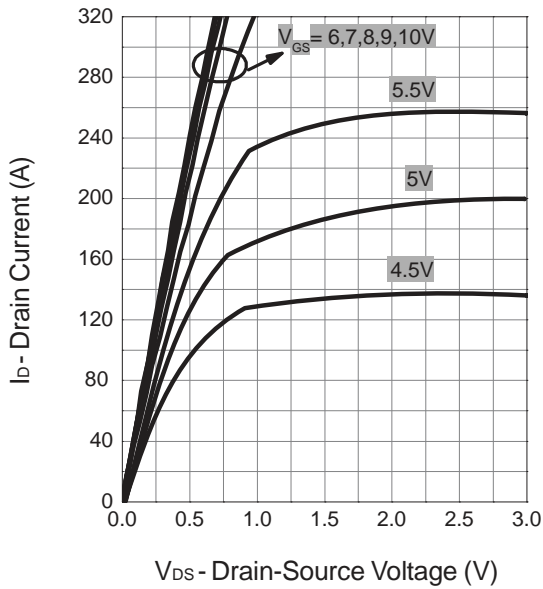
Power Dissipation

Drain Current

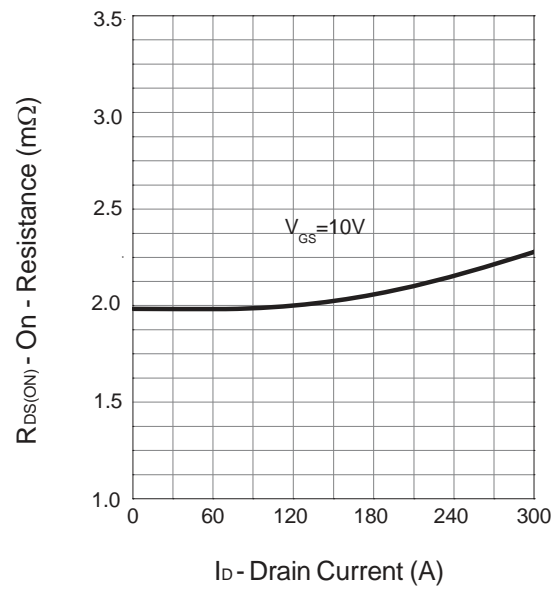


Typical Operating Characteristics (Cont.)

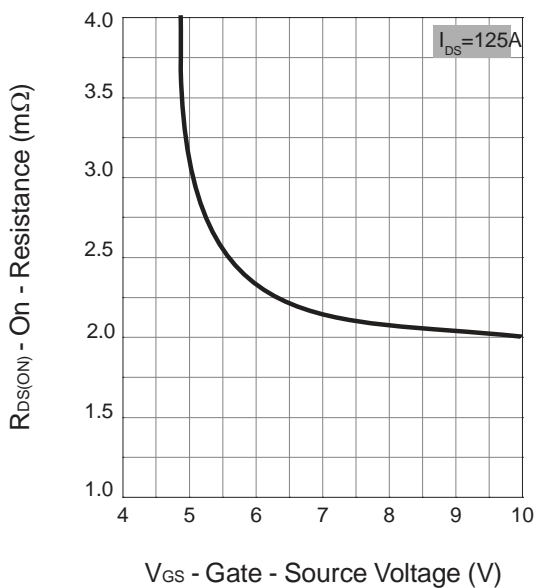
Output Characteristics



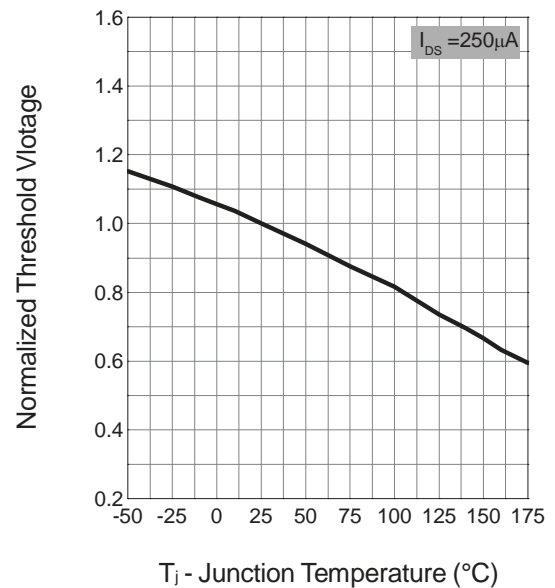
Drain-Source On Resistance



Drain-Source On Resistance

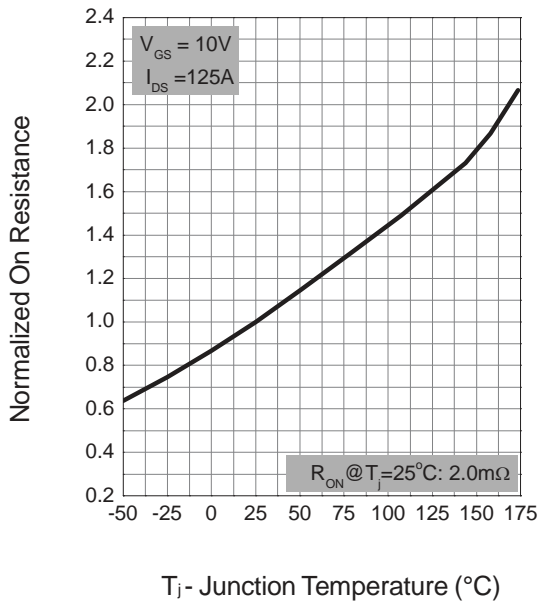


Gate Threshold Voltage

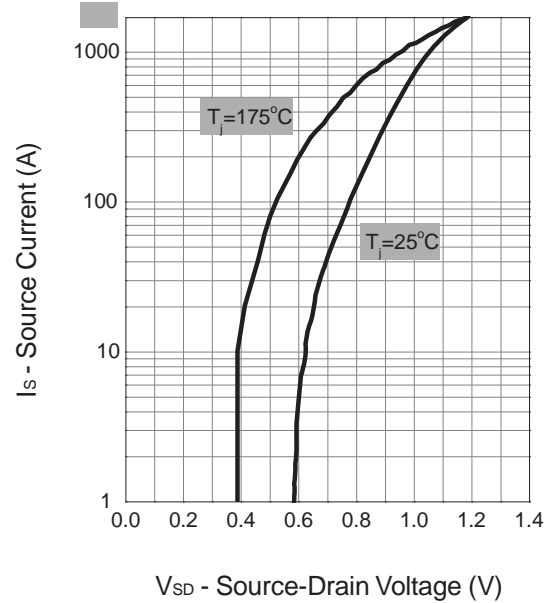


Typical Operating Characteristics (Cont.)

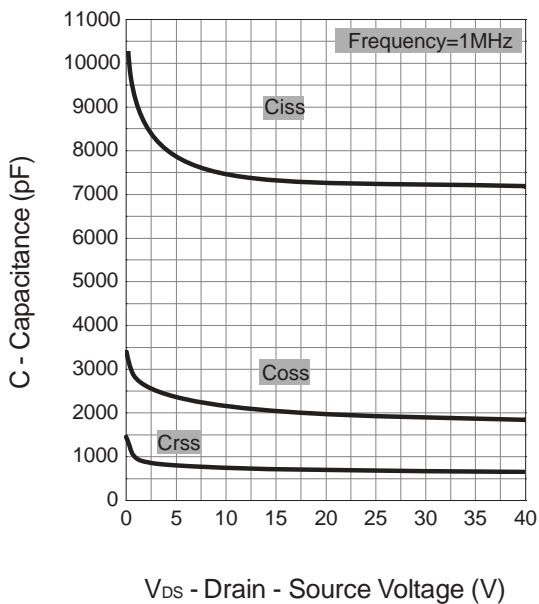
Drain-Source On Resistance



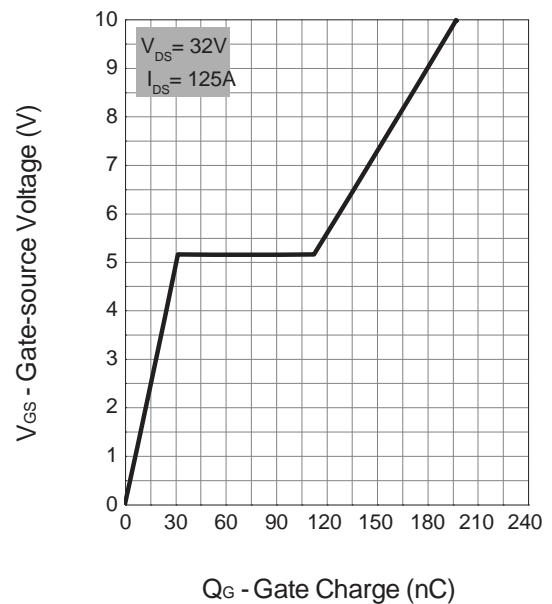
Source-Drain Diode Forward



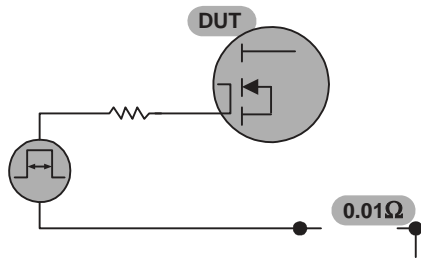
Capacitance



Gate Charge

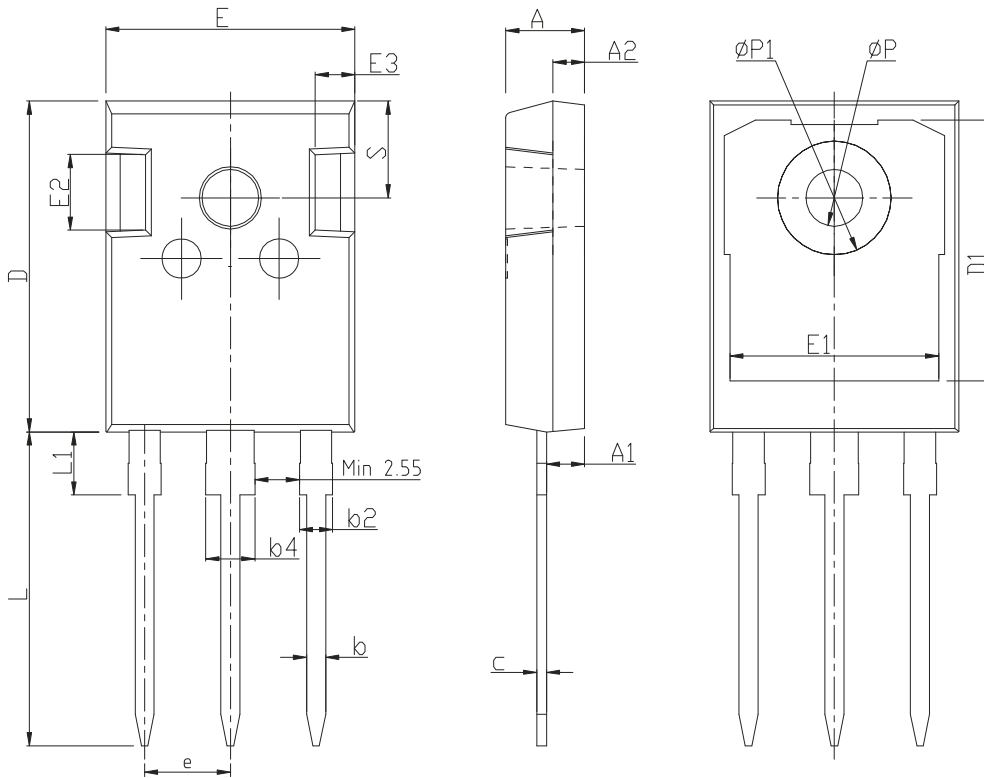


Avalanche Test Circuit



Avalanche Test Circuit

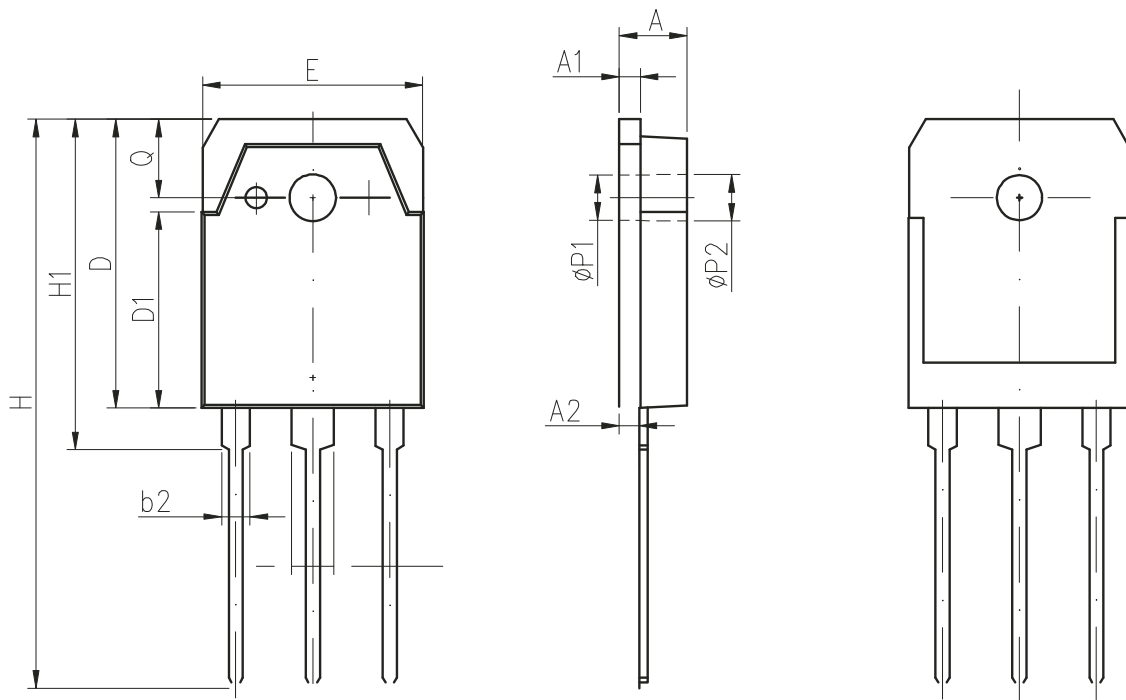
Package Information
TO-247-3L



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
φP	3.40	3.60	3.80
φP1	-	-	7.30
S	6.15BSC		

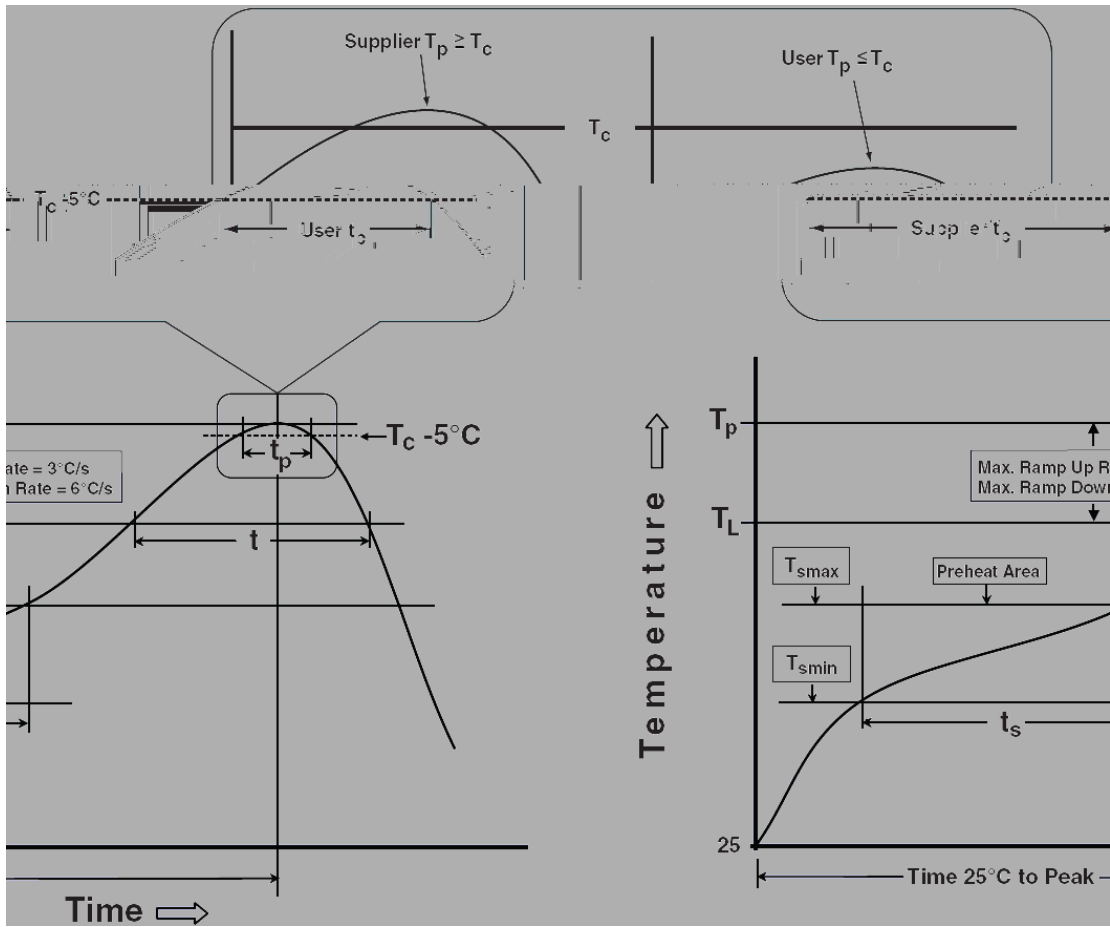
TO-3P-3L



Devices Per Unit

Package Type	Unit	Quantity
TO-247-3L	Tube	30
TO-3P-3L	Tube	30

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