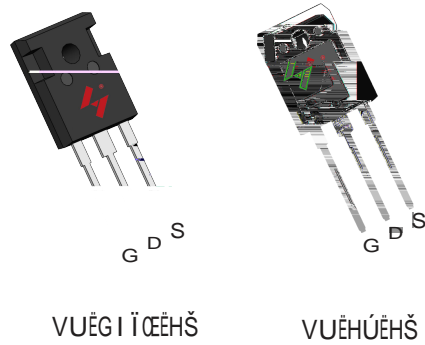


**N-Channel Enhancement Mode MOSFET**

**Features**

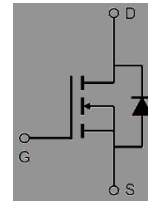
- 40V/250A  
 $R_{DS(ON)} = 2.0\text{ m}\Omega(\text{typ.}) @ V_{GS} = 10\text{V}$
- Avalanche Rated
- Reliable and Rugged
- Halogen Free and Green Devices Available (RoHS Compliant)

**Pin Description**



**Applications**

- Power Management for Inverter Systems.



Power MOSFET

**Ordering and Marking Information**

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

The HY4504W/A is a N-channel enhancement mode MOSFET. It is designed for high current and voltage applications. The device is available in TO-247-3L and TO-3P-3L packages. The typical on-resistance is 2.0 mΩ at V<sub>GS</sub> = 10V. The device is avalanche rated and is RoHS compliant.

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## Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
<b>Common Ratings</b> ( $T_C=25^\circ\text{C}$ Unless Otherwise Noted)				
$V_{DSS}$	Drain-Source Voltage		40	V
$V_{GSS}$	Gate-Source Voltage		$\pm 20$	
$T_J$	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
<b>Mounted on Large Heat Sink</b>				
$I_{DM}$		$T_C=25^\circ\text{C}$	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	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		40	
<b>Avalanche Ratings</b>				
$E_{AS}$	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.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_{DS}=250\mu\text{A}$	40	-	-	V
		$V_{DS}=40\text{V}, V_{GS}=0\text{V}$	-	-	1V	

## Electrical Characteristics (Cont.) (T<sub>c</sub> = 25°C Unless Otherwise Noted)

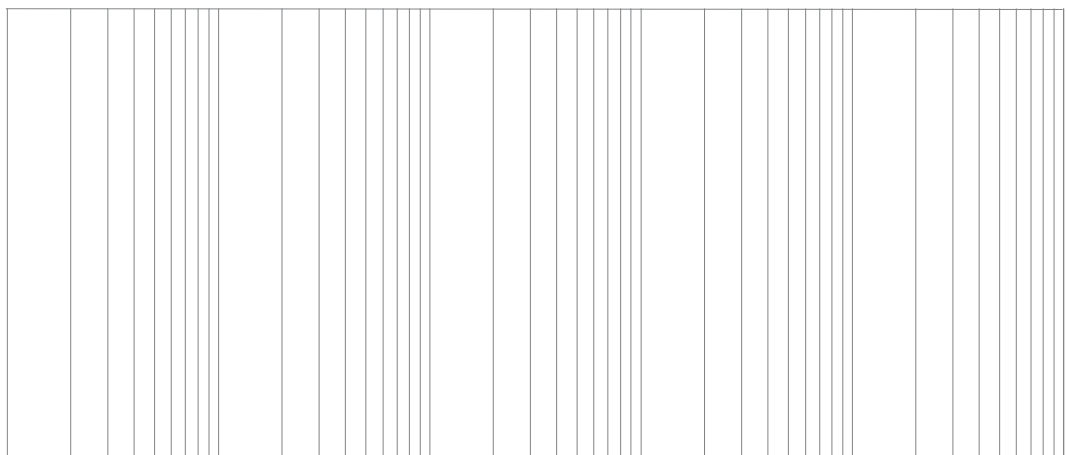
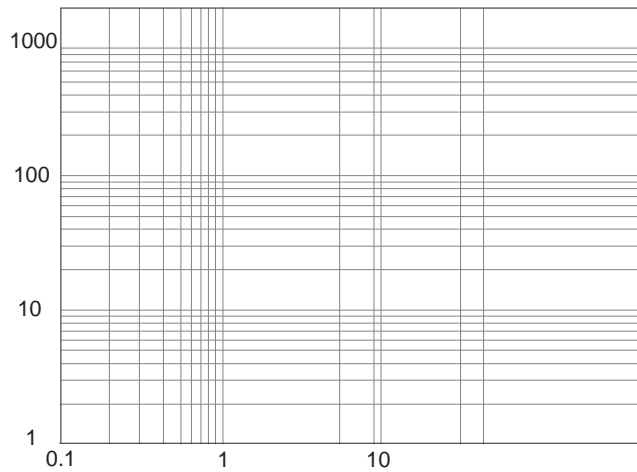
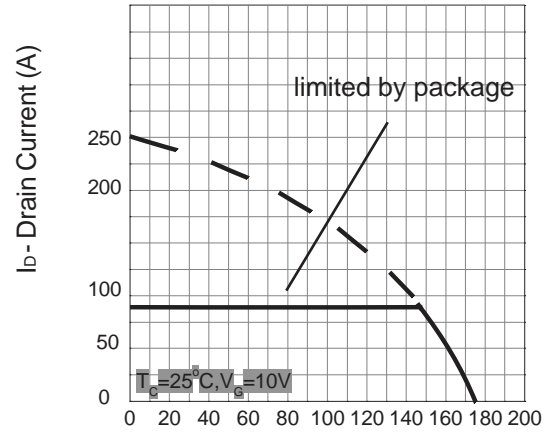
Symbol	Parameter	Test Conditions	HY4504			Unit
			Min.	Typ.	Max.	
<b>Dynamic Characteristics</b>						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	-	1.0	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, Frequency=1.0MHz	-	7276	-	pF
C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

## Typical Operating Characteristics

Power Dissipation

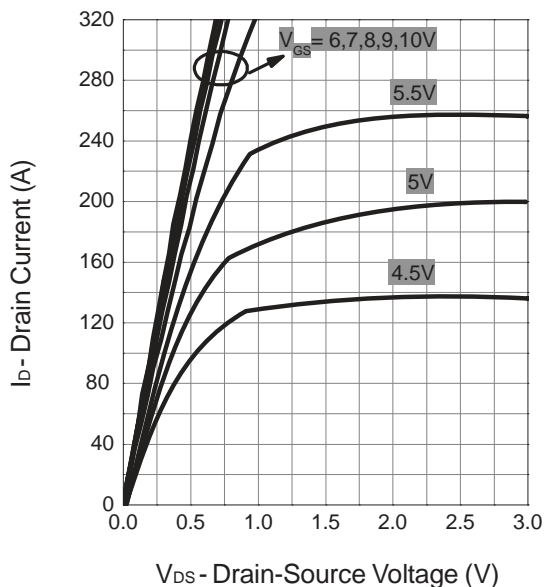
P

Drain Current

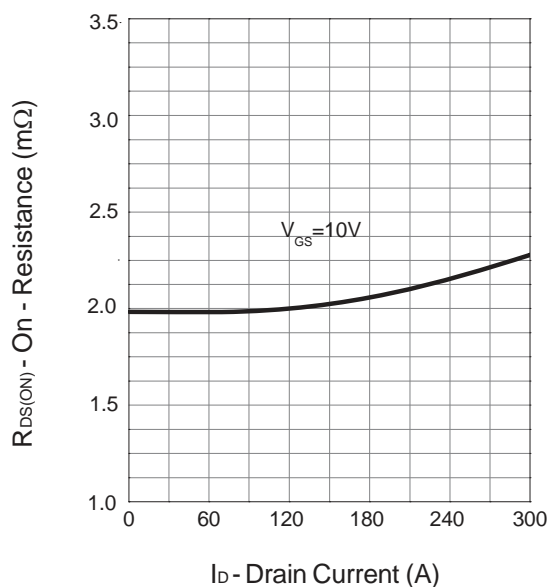


### Typical Operating Characteristics (Cont.)

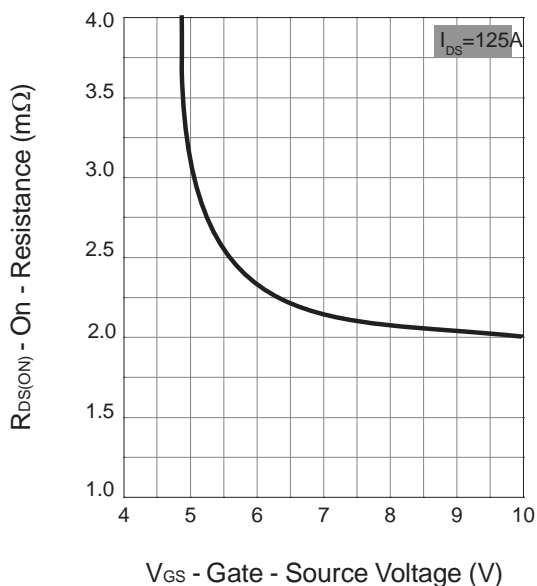
Output Characteristics



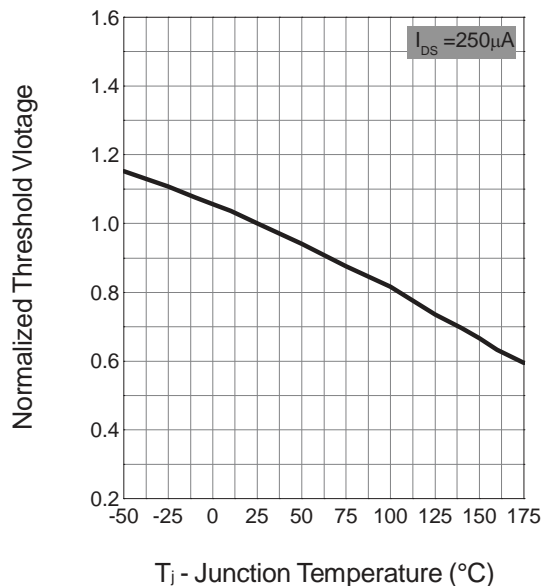
Drain-Source On Resistance



Drain-Source On Resistance

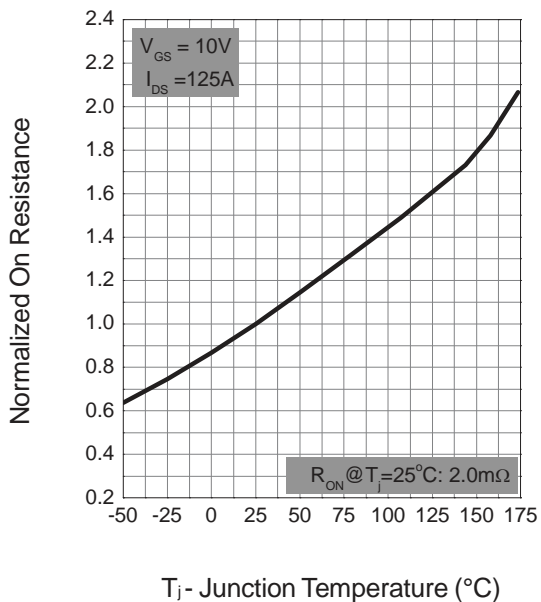


Gate Threshold Voltage

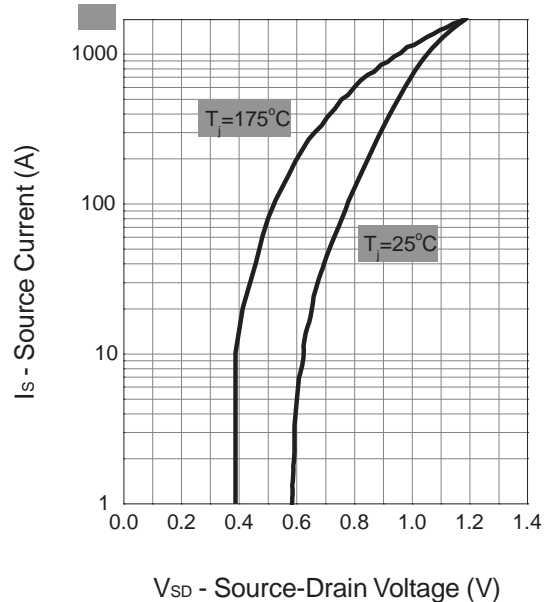


### Typical Operating Characteristics (Cont.)

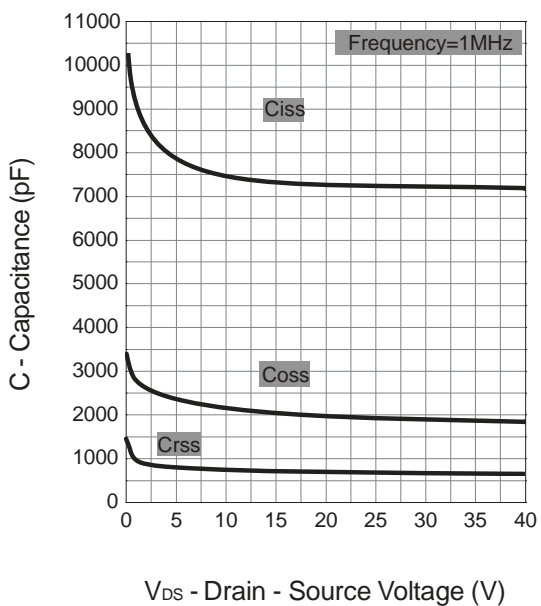
**Drain-Source On Resistance**



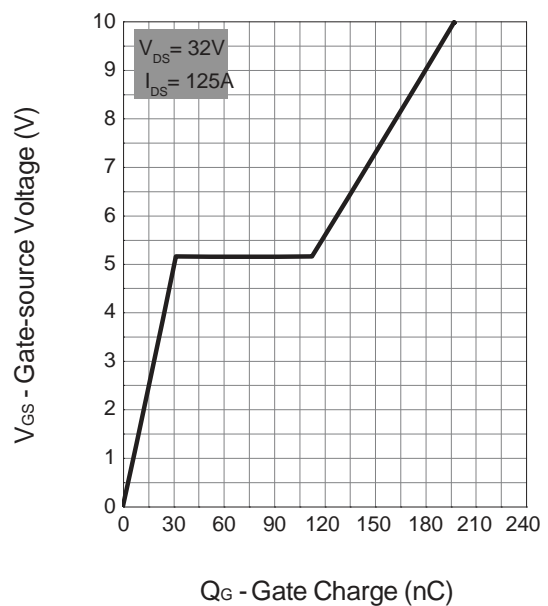
**Source-Drain Diode Forward**



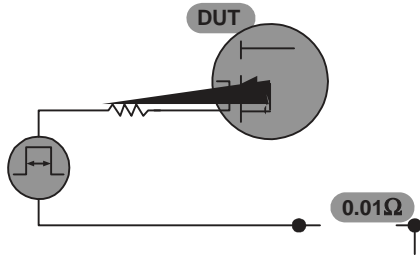
**Capacitance**



**Gate Charge**



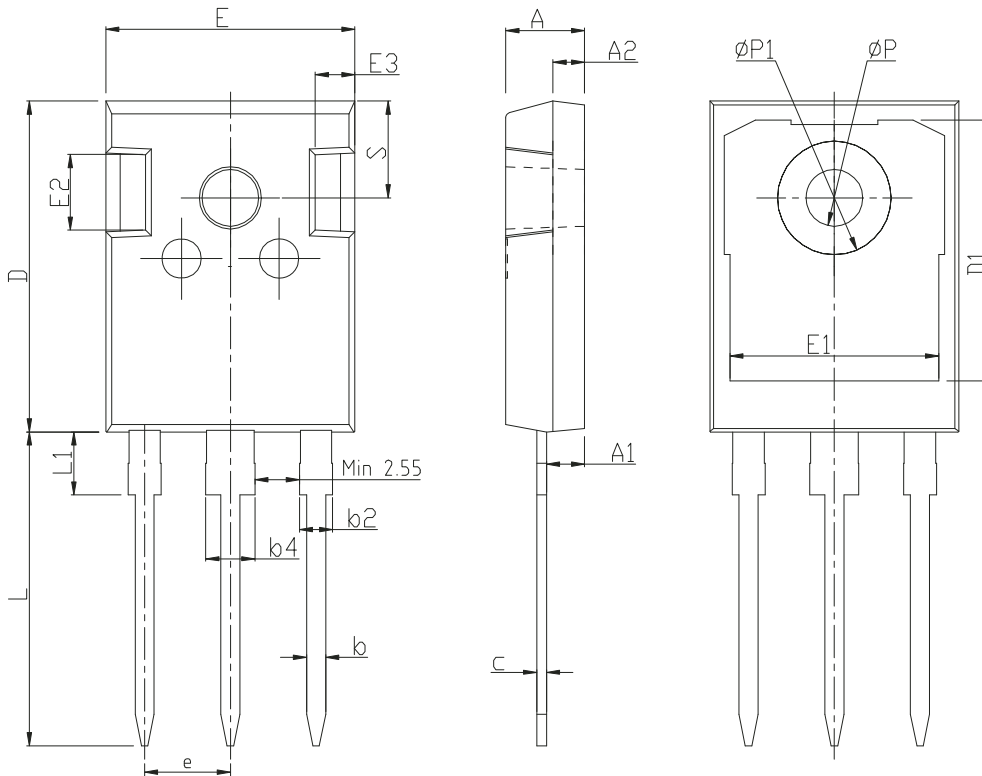
## Avalanche Test Circuit



## Avalanche Test Circuit

Package Information

TO-247-3L

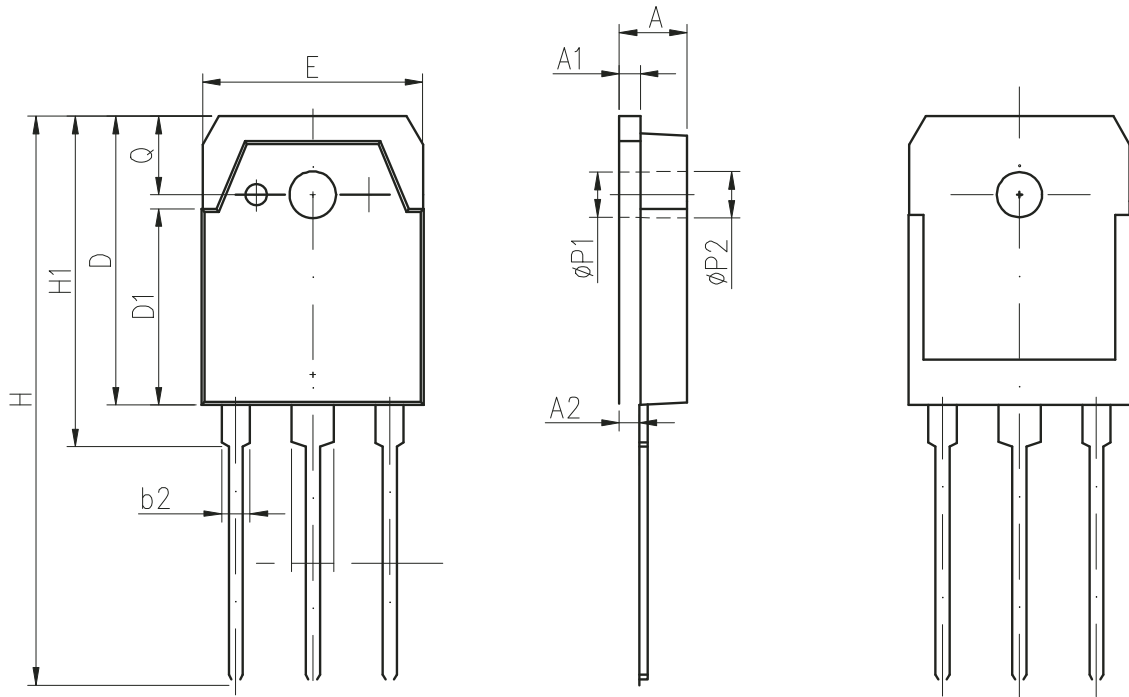


COMMON DIMENSIONS

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		



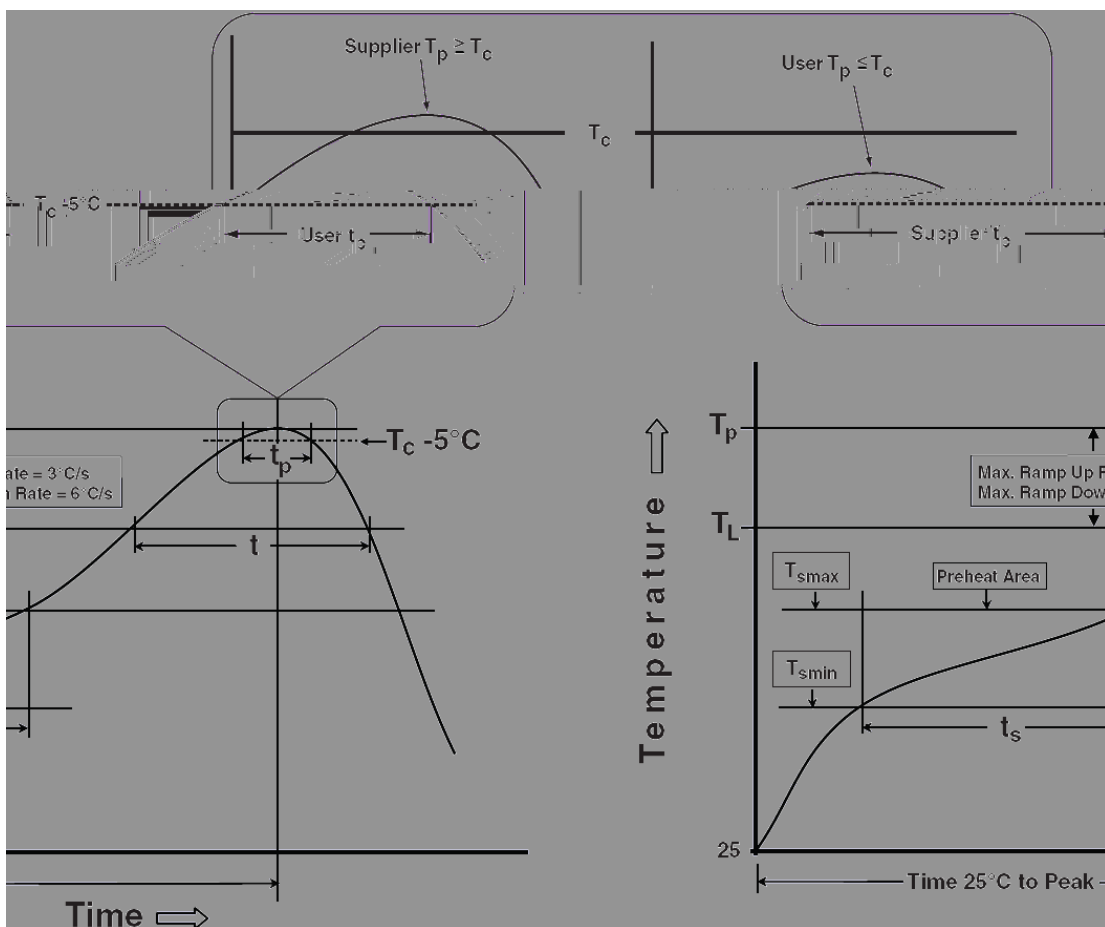
## TO-3P-3L



### 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
<b>Preheat &amp; Soak</b>		
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 <sup>3</sup> <350	Volume mm <sup>3</sup> ≥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 <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >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