

## P-Channel Enhancement Mode MOSFET

**Feature**

**Pin Description**

## Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
<b>Common Ratings</b> (Tc=25°C Unless Otherwise Noted)				
V <sub>DSS</sub>	Drain-Source Voltage		-30	V
V <sub>GSS</sub>	Gate-Source Voltage		±20	V
T <sub>J</sub>	Junction Temperature Range		-55 to 175	°C
T <sub>STG</sub>	Storage Temperature Range		-55 to 175	°C
I <sub>S</sub>	Source Current-Continuous(Body Diode)	Tc=25°C	-17	A
<b>Mounted on Large Heat Sink</b>				
I <sub>DM</sub>	Pulsed Drain Current *	Tc=25°C	-68	A
I <sub>D</sub>	Continuous Drain Current	Tc=25°C	-17	A
		Tc=100°C	-12	A
P <sub>D</sub>	Maximum Power Dissipation	Tc=25°C	3.75	W
		Tc=100°C	1.88	W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient**		40	°C/W
E <sub>AS</sub>	Single Pulsed-Avalanche Energy***	L=0.3mH	349.8***	mJ

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

\*\* Surface mounted on 1in2 FR-4 board t≤10sec.

\*\*\* Limited by T<sub>Jmax</sub> , starting T<sub>J</sub>=25°C, L = 0.3mH, R<sub>G</sub>= 25Ω, V<sub>GS</sub>=-10V.

## Electrical Characteristics(Tc =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HYG045P03LQ1			Unit
			Min	Typ.	Max	
<b>Static Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>DS</sub> =-250uA	-30	-	-	V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V	-	-	-1	μA
		T <sub>J</sub> =125°C	-	-	-50	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250uA	-1.0	-1.5	-3.0	V
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
R <sub>DS(ON)*</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =-10V, I <sub>DS</sub> =-10A	-	5.9	7.0	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-7A	-	7.9	9.5	
<b>Diode Characteristics</b>						
V <sub>SD*</sub>	Diode Forward Voltage	I <sub>SD</sub> =-10A, V <sub>GS</sub> =0V	-	-0.82	-1	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =-10 A, dI <sub>SD</sub> /dt=100A/us	-	25.1	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	16.1	-	nC

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

Symbol	Parameter	Test Conditions	HYG045P03LQ1			Unit
			Min	Typ.	Max	
<b>Dynamic Characteristics</b>						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, Frequency=1.0MHz	-	5.5	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, Frequency=1.0MHz	-	7328	-	pF
C <sub>oss</sub>	Output Capacitance		-	607	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	553	-	
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>DD</sub> =-15V, R <sub>G</sub> =4Ω, I <sub>DS</sub> =-10A, V <sub>GS</sub> =-10V	-	13.3	-	ns
T <sub>r</sub>	Turn-on Rise Time		-	35.0	-	
t <sub>d(OFF)</sub>	Turn-off Delay Time		-	164.7	-	
T <sub>f</sub>	Turn-off Fall Time		-	60.5	-	
<b>Gate Charge Characteristics</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -24V, V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A	-	139.1	-	nC
Q <sub>g(V<sub>GS</sub>=-4.5V)</sub>	Total Gate Charge(V <sub>GS</sub> =-4.5V)		-	68.0	-	
Q <sub>gs</sub>	Gate-Source Charge		-	25.0	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	23.6	-	

Note: \*Pulse test, pulse width ≤ 300us, duty cycle ≤ 2%

## Typical Operating Characteristics

Figure 1: Power Dissipation

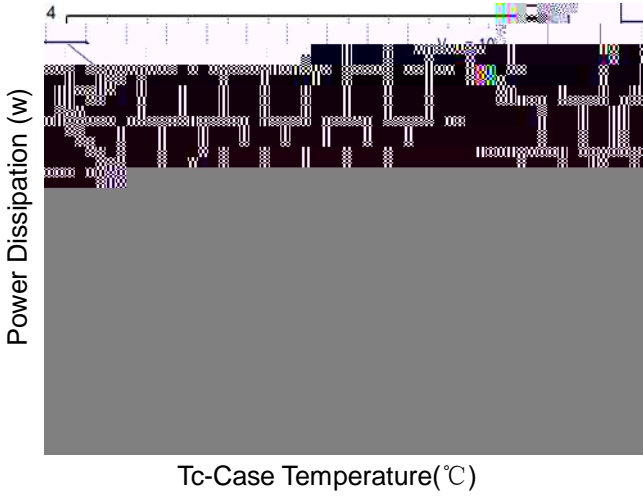


Figure2: Drain Current

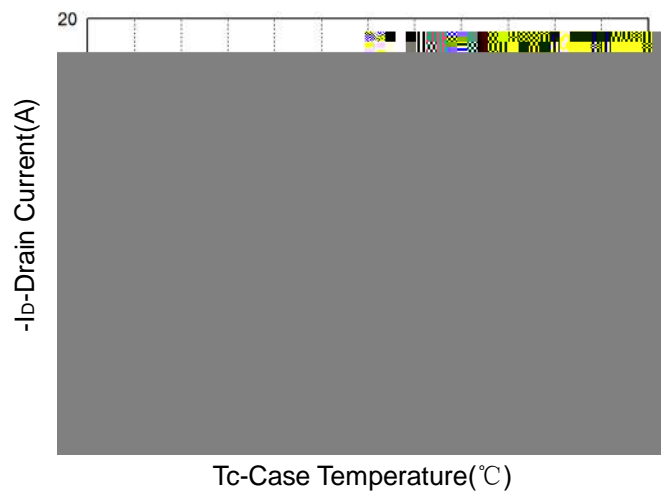


Figure 3: Safe Operation Area

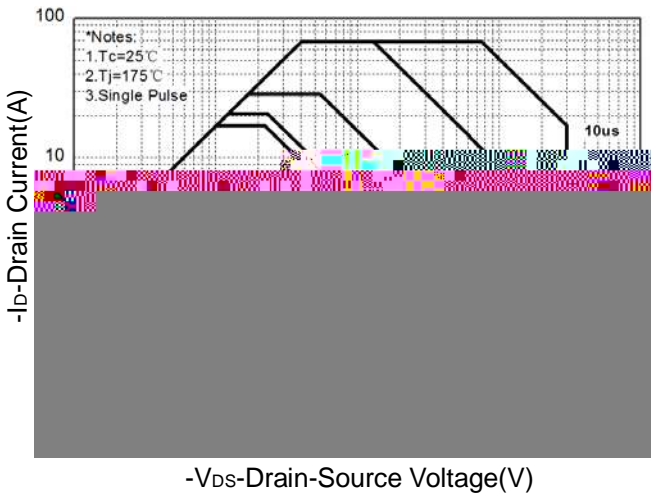


Figure4: Thermal Transient Impedance

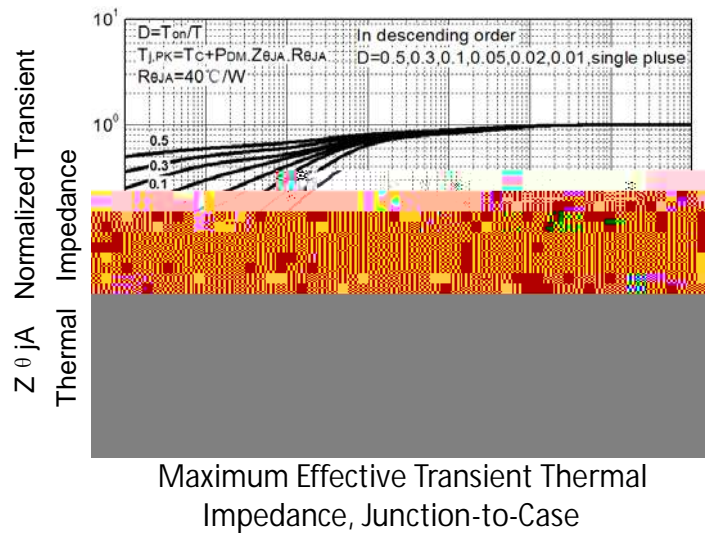


Figure 5: Output Characteristics

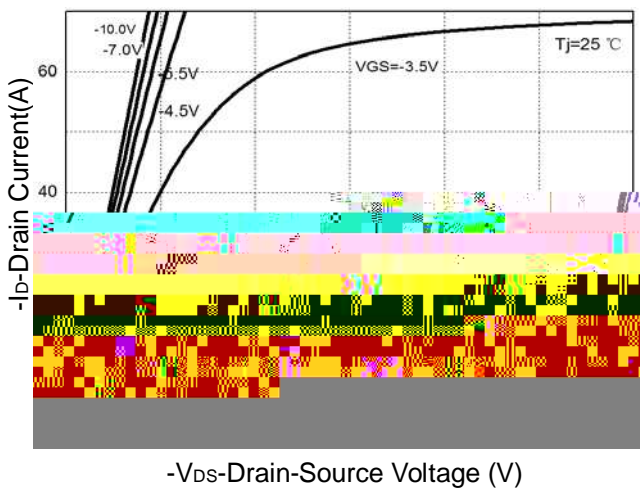
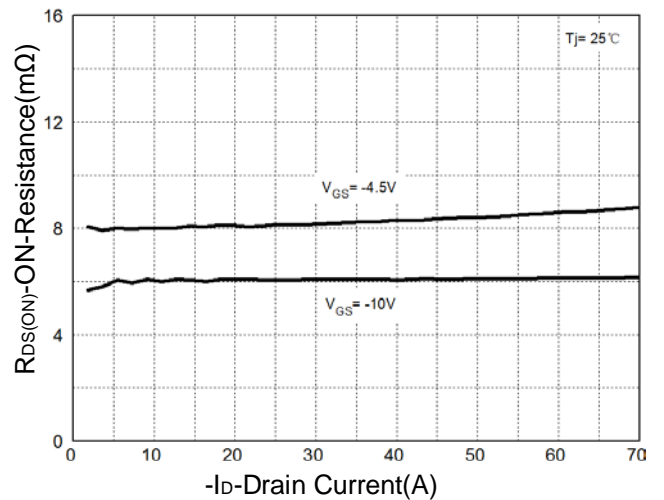
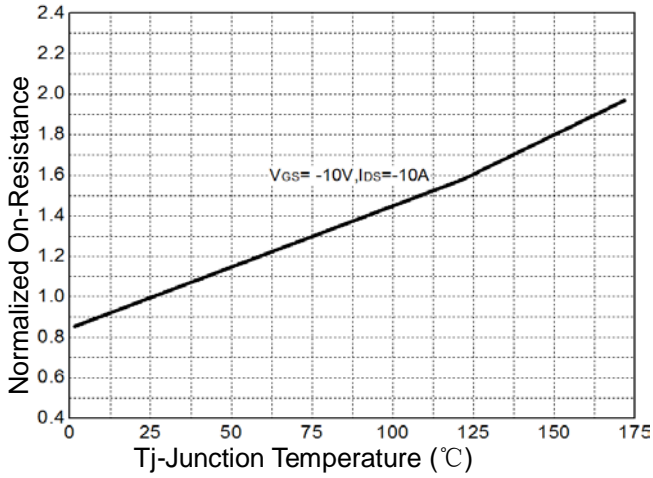


Figure6: Drain-Source On Resistance

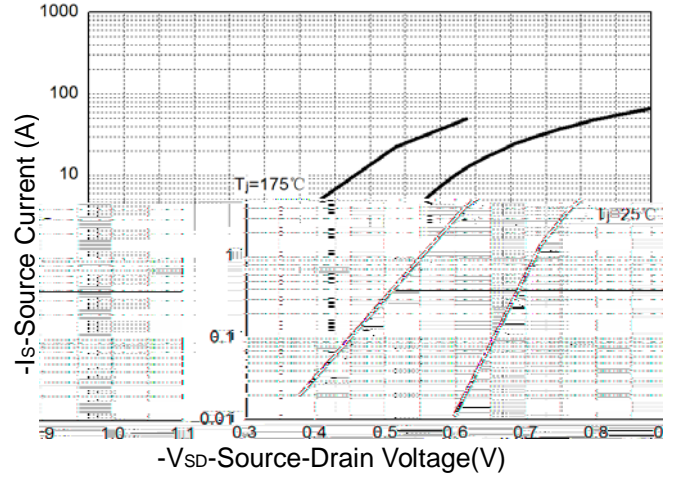


## Typical Operating Characteristics(Cont.)

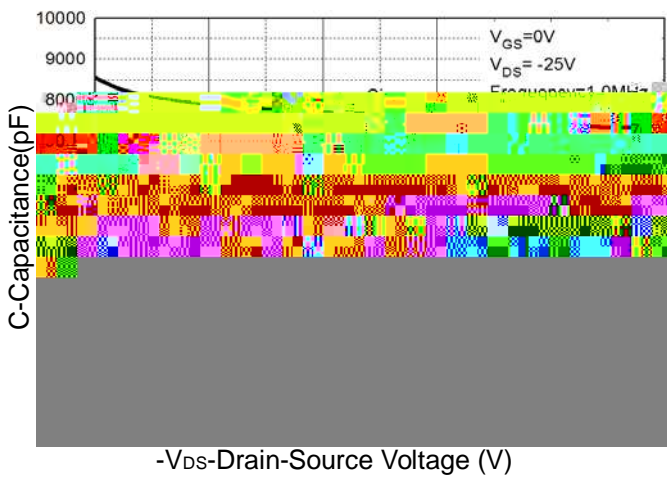
**Figure 7: On-Resistance vs. Temperature**



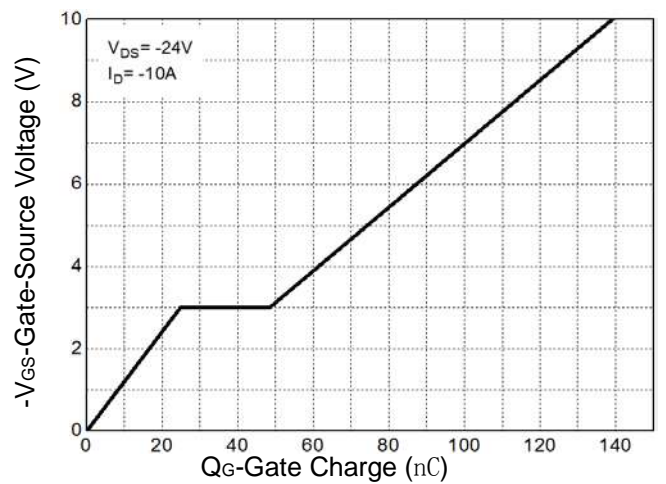
**Figure 8: Source-Drain Diode Forward**



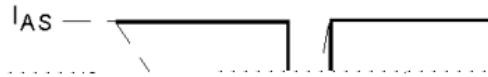
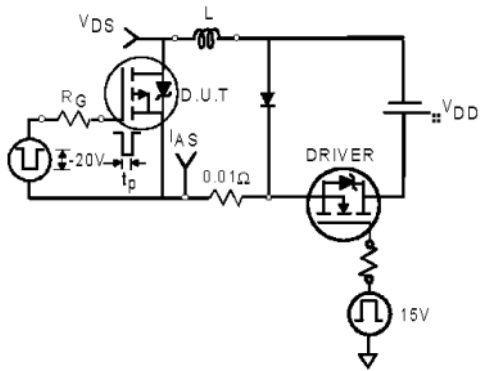
**Figure 9: Capacitance Characteristics**



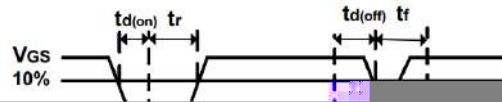
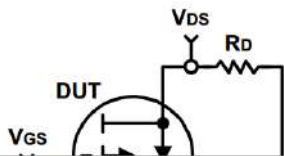
**Figure 10: Gate Charge Characteristics**



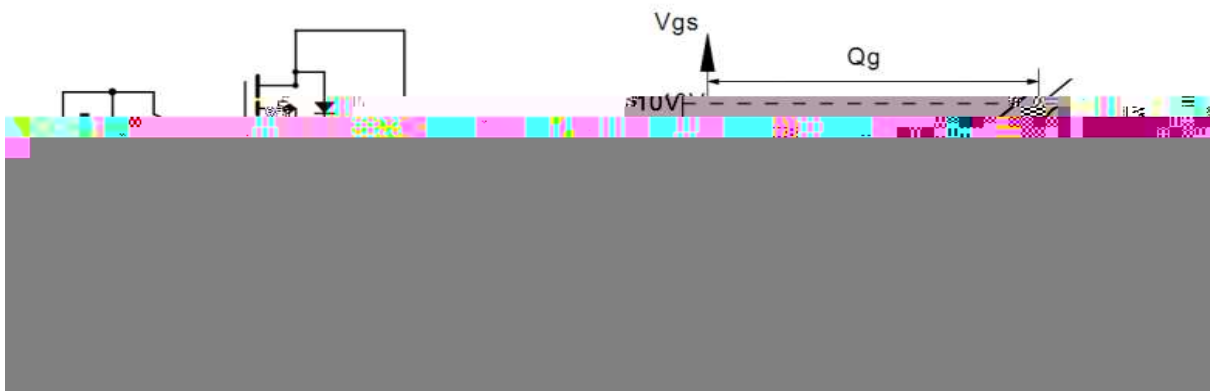
## Avalanche Test Circuit



## Switching Time Test Circuit



## Gate Charge Test Circuit



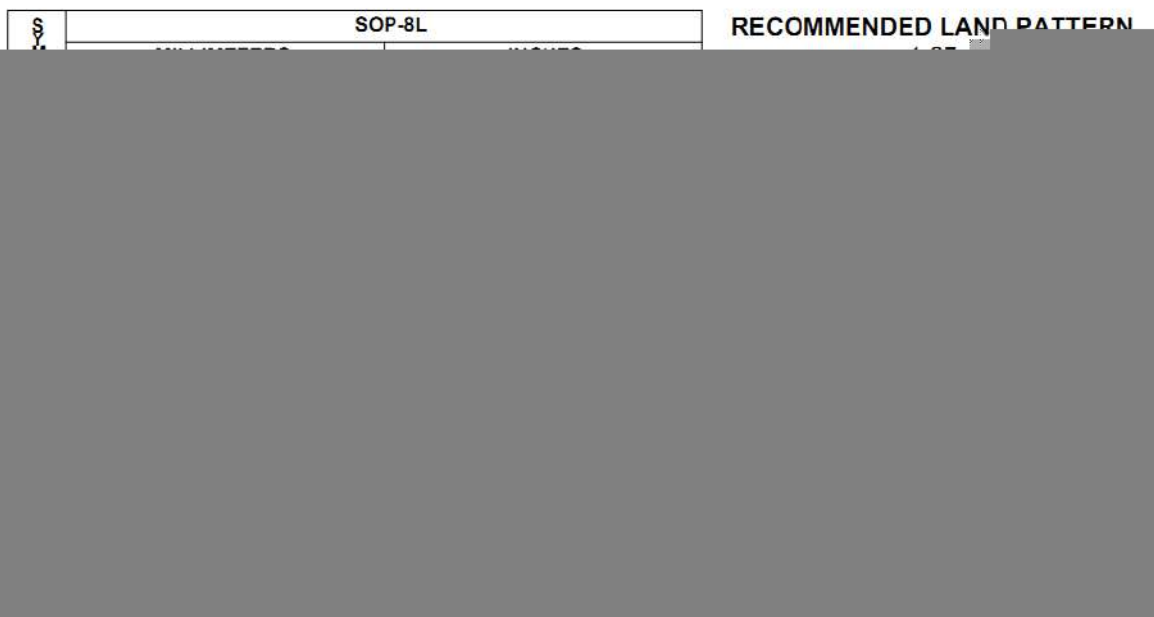
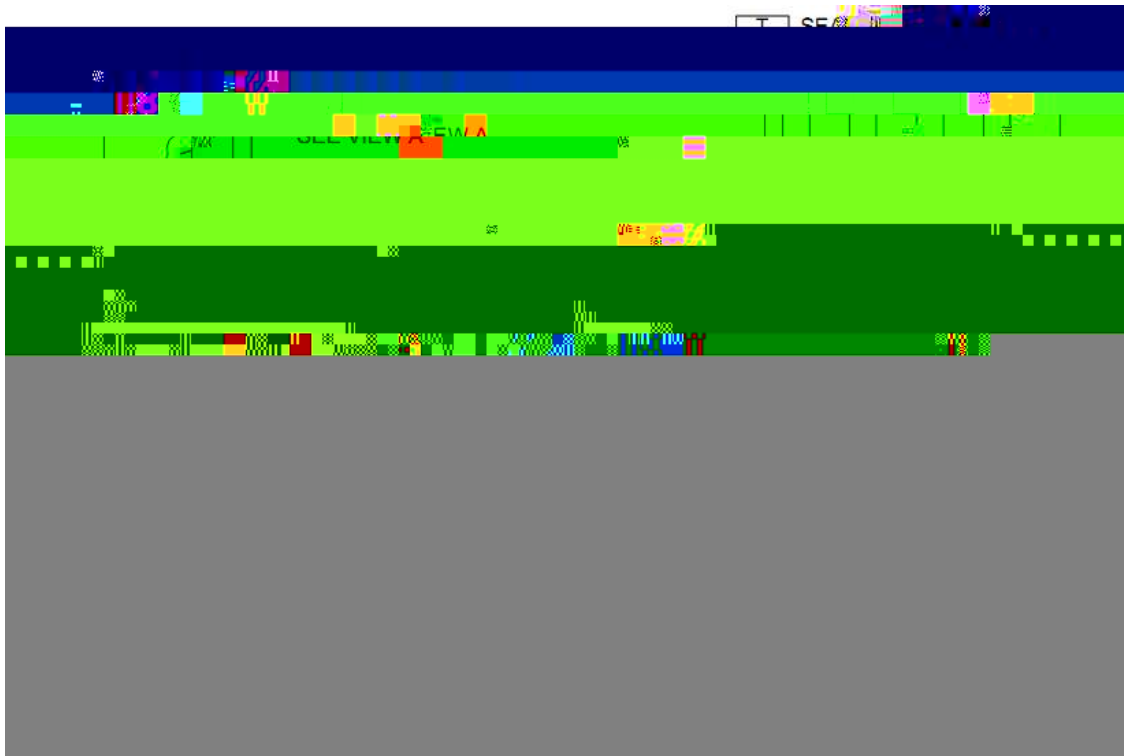
# HYG045P03LQ1S

## Device Per Unit

Package Type	Unit	Quantity
SOP-8L	Reel	2500


## Package Information

SOP-8L



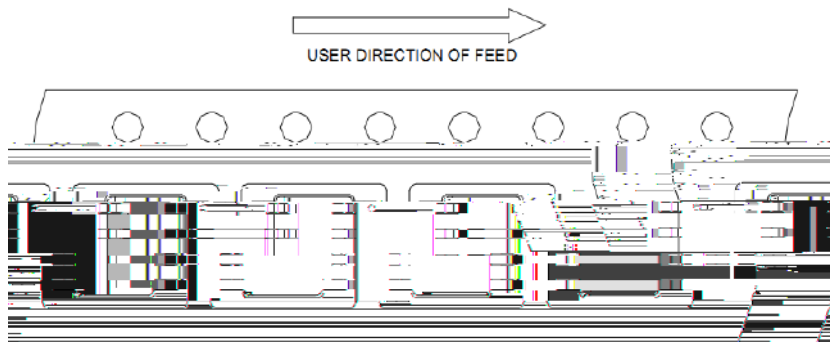
## Carrier Tape & Reel Dimensions



3.5 0.05		330.0 2.00	50 MIN.	12.4 <sup>+2.00</sup> -0.00	13.0 <sup>+0.50</sup> -0.20	1.5 MIN.	20.2 MIN.	12.0 0.30	1.75 0.10	5
<b>K0</b>	<b>SOP-8L</b>	<b>P0</b>	<b>P1</b>	<b>P2</b>	<b>D0</b>	<b>D1</b>	<b>T</b>	<b>A0</b>	<b>B0</b>	5
0.10 0.20		4.0 0.10	8.0 0.10	2.0 0.05	1.5 <sup>+0.10</sup> -0.00	1.5 MIN.	0.6 <sup>+0.00</sup> -0.40	6.40 0.20	5.20 0.20	2

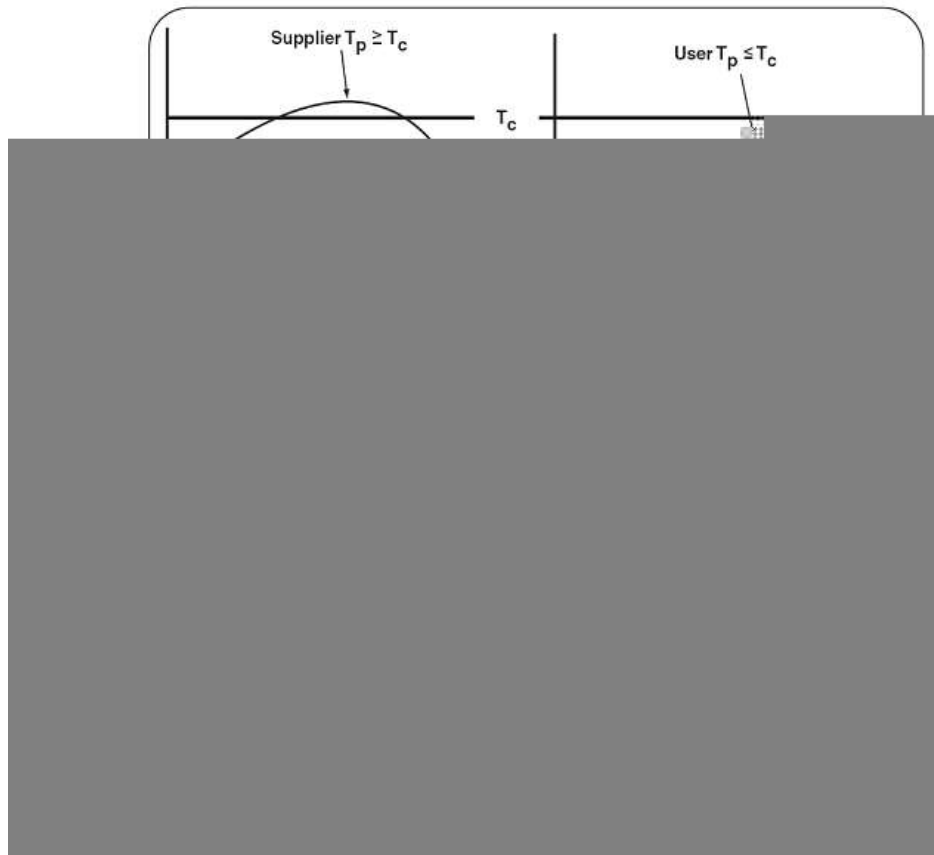
(mm)

## Taping Direction Information





**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 (Tc)

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 (Tc)

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

## Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
PRECON	JESD-22, A113	30°C/60%/192Hrs
HTRB	JESD-22, A108	168Hrs\500Hrs\ 1000 Hrs, Bias @ 125°C
HTGB	JESD-22, A108	168Hrs\500Hrs\ 1000 Hrs, Vgs 100%@150°C
PCT	JESD-22, A102	96Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -55°C~150°C

### Customer Service

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