



**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Channel 1	Channel 2	Unit	
<b>Common Ratings</b> ( $T_A=25^\circ\text{C}$ Unless Otherwise Noted)					
$V_{DSS}$	Drain-Source Voltage	30	30	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$		
$T_J$	Maximum Junction Temperature	150		$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 150			
$I_S$	Diode Continuous Forward Current	$T_A=25^\circ\text{C}$	1.5	2	A
$I_{SM}$	Pulsed Diode Forward Current	$T_A=25^\circ\text{C}$	22	25	
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$	6.8	10.3	
$I_{DM}^a$	Pulsed Drain Current	$T_A=25^\circ\text{C}$	17	25	
$P_D$	Power Dissipation	$T_A=25^\circ\text{C}$	1.5	1.7	W
		$T_A=70^\circ\text{C}$	1	1.1	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	50	40	$^\circ\text{C/W}$
		Steady State	80	70	
$R_{\theta JL}$	Thermal Resistance-Junction to Lead	Steady State	20	16	
$I_{AS}^b$	Avalanche Current, Single pulse ( $L=0.1\text{mH}$ )		10	20	A
$E_{AS}^b$	Avalanche Energy, Single pulse ( $L=0.1\text{mH}$ )		5	20	mJ

Note a : Pulse width limited by max. junction temperature.

Note b : UIS tested and pulse width limited by maximum junction temperature  $150^\circ\text{C}$  (initial temperature  $T_j=25^\circ\text{C}$ ).

## Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise noted)

### Channel 1

Symbol	Parameter	Test Conditions	Channel 1			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> =250μA	30	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =85°C	-	-	1	μA
			-	-	30	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	1.5	1.8	2.5	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
R <sub>DS(ON)</sub> <sup>a</sup>	Drain-Source On-state Resistance	V <sub>GS</sub> =10V, I <sub>DS</sub> =8A	-	18	21.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =5A	-	23	30	
<b>Diode Characteristics</b>						
V <sub>SD</sub> <sup>a</sup>	Diode Forward Voltage	I <sub>SD</sub> =1A, V <sub>GS</sub> =0V	-	0.75	1.1	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>DS</sub> =8A, di <sub>SD</sub> /dt=100A/μs	-	9	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	3.6	-	nC
<b>Dynamic Characteristics<sup>b</sup></b>						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	-	1.6	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, Frequency=1.0MHz	-	400	-	pF
C <sub>oss</sub>	Output Capacitance		-	77	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	40	-	
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>DD</sub> =15V, R <sub>L</sub> =15Ω, I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V, R <sub>G</sub> =6Ω	-	5.4	8	ns
t <sub>r</sub>	Turn-on Rise Time		-	9	13	
t <sub>d(OFF)</sub>	Turn-off Delay Time		-	13.2	20	
t <sub>f</sub>	Turn-off Fall Time		-	3.2	4.8	
<b>Gate Charge Characteristics<sup>b</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>DS</sub> =8A	-	8.2	12	nC
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>DS</sub> =8A	-	3.9	-	
Q <sub>gs</sub>	Gate-Source Charge		-	0.78	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	2.2	-	
Q <sub>gth</sub>	Threshold Gate Charge		-	0.47	-	

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

Note b : Guaranteed by design, not subject to production testing.

**Electrical Characteristics (Cont.)** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

## Channel 2

Symbol	Parameter	Test Conditions	Channel 2			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	30	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0V$	-	-	50	$\mu A$
		$T_J=85^\circ C$	-	-	5	mA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.3	1.7	2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
$R_{DS(on)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=13A$	-	8.7	10.5	m $\Omega$
		$V_{GS}=4.5V, I_{DS}=10A$	-	13	17	
<b>Diode Characteristics</b>						
$V_{SD}^a$	Diode Forward Voltage	$I_{SD}=1A, V_{GS}=0V$	-	0.4	0.55	V
		$I_{SD}=10A, V_{GS}=0V$	-	0.77	1.1	
$t_{rr}$	Reverse Recovery Time	$I_{sd}=5A, di_{SD}/dt=100A/\mu s$	-	14	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	5.3	-	nC
<b>Dynamic Characteristics<sup>b</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	1.9	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz	-	900	-	pF
$C_{oss}$	Output Capacitance		-	200	-	
$C_{riss}$	Reverse Transfer Capacitance		-	90	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=1\Omega$	-	8.6	13	ns
$t_r$	Turn-on Rise Time		-	10	15	
$t_{d(OFF)}$	Turn-off Delay Time		-	20.4	30	
$t_f$	Turn-off Fall Time		-	6	9	
<b>Gate Charge Characteristics<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=15V, V_{GS}=10V,$ $I_{DS}=13A$	-	17.3	25	nC
$Q_g$	Total Gate Charge	$V_{DS}=15V, V_{GS}=4.5V,$ $I_{DS}=13A$	-	8.5	-	
$Q_{gs}$	Gate-Source Charge		-	1.5	-	
$Q_{gd}$	Gate-Drain Charge		-	5.5	-	
$Q_{gth}$	Threshold Gate Charge		-	0.75	-	

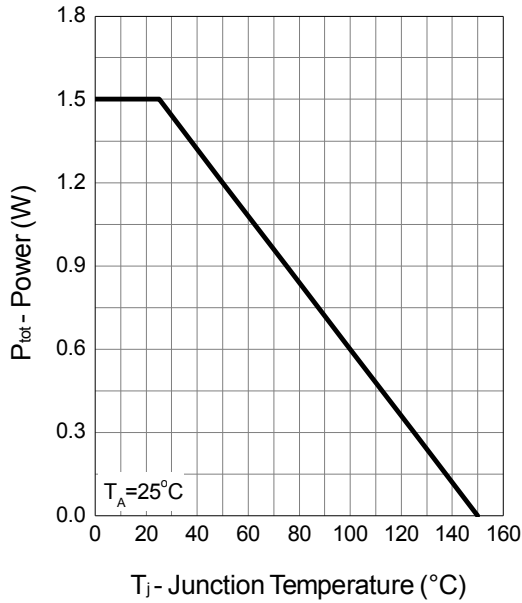
Note a : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

Note b : Guaranteed by design, not subject to production testing.

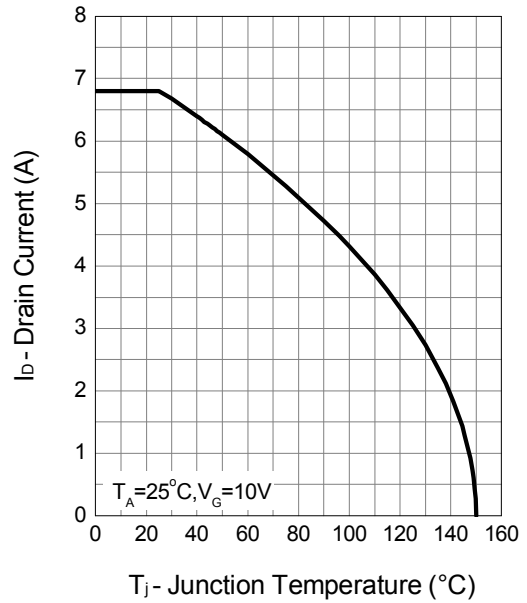
## Typical Characteristics

Channel 1

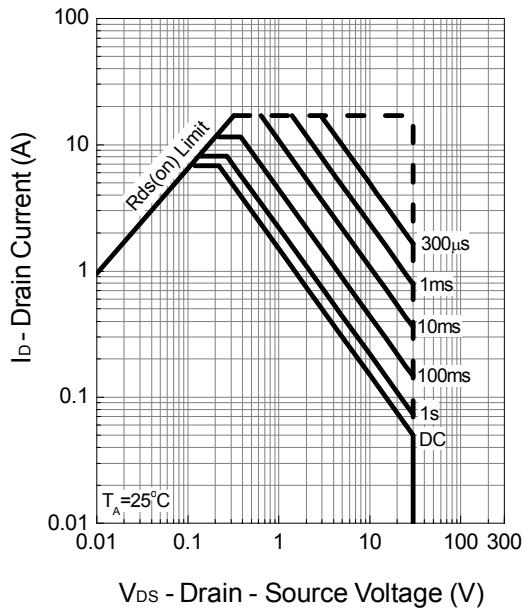
Power Dissipation



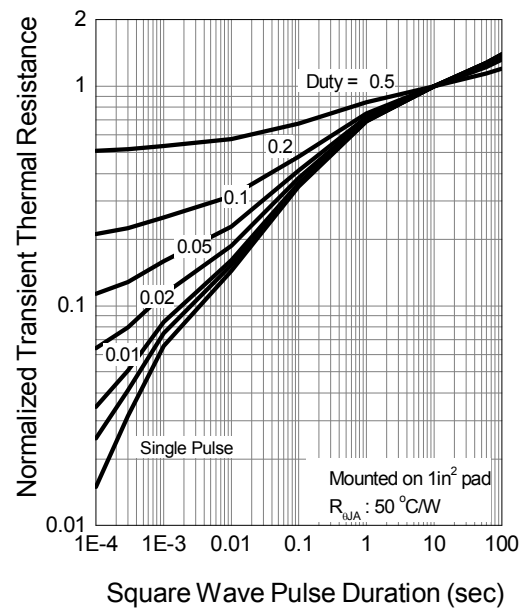
Drain Current



Safe Operation Area



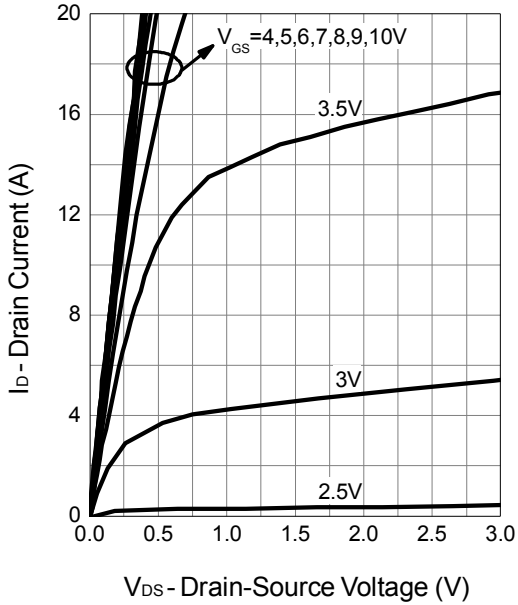
Thermal Transient Impedance



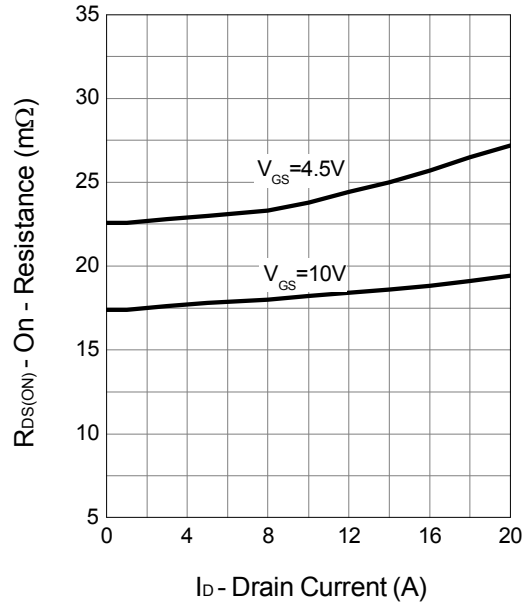
## Typical Characteristics (Cont.)

Channel 1

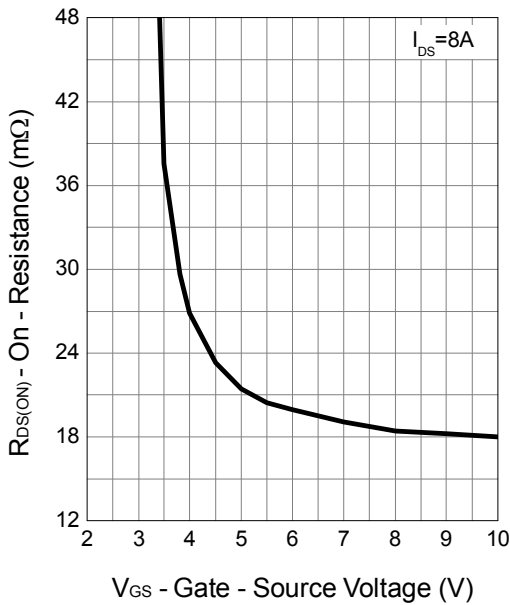
Output Characteristics



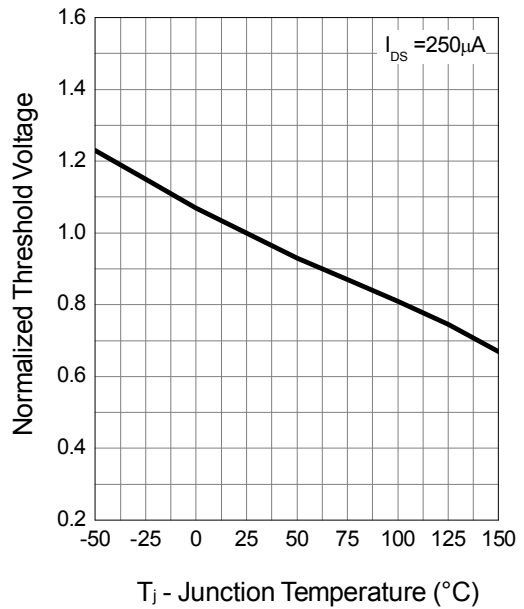
Drain-Source On Resistance



Gate-Source On Resistance



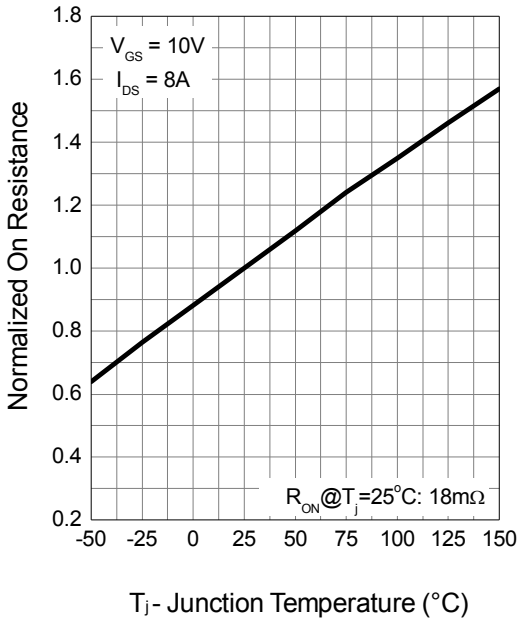
Gate Threshold Voltage



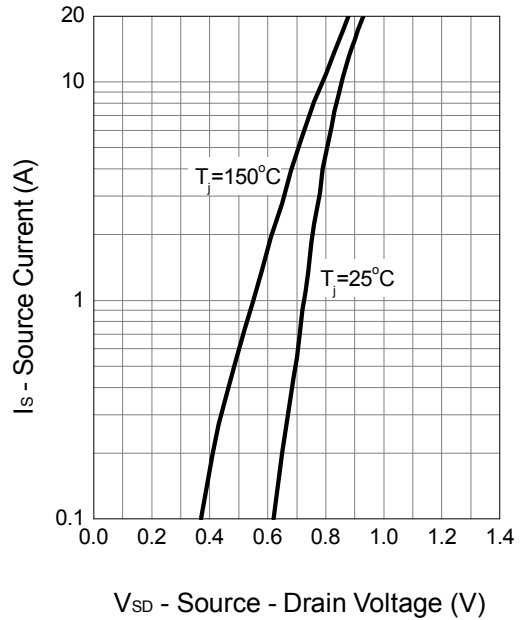
## Typical Characteristics (Cont.)

Channel 1

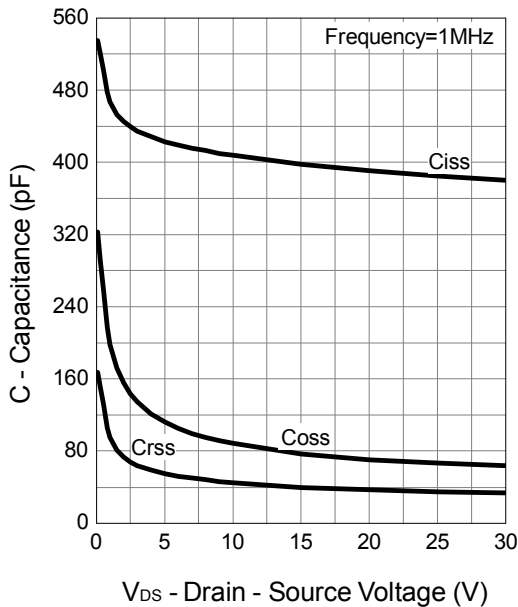
**Drain-Source On Resistance**



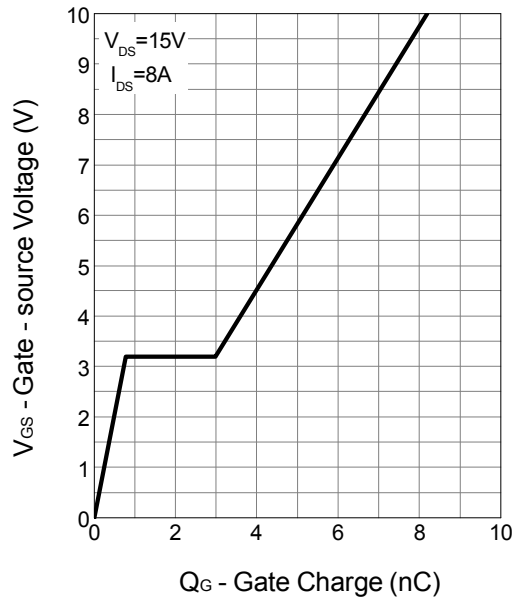
**Source-Drain Diode Forward**



**Capacitance**

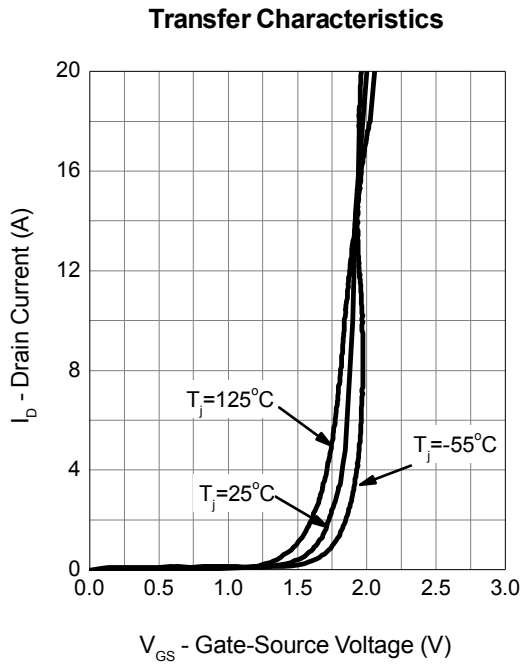


**Gate Charge**



## Typical Characteristics (Cont.)

Channel 1

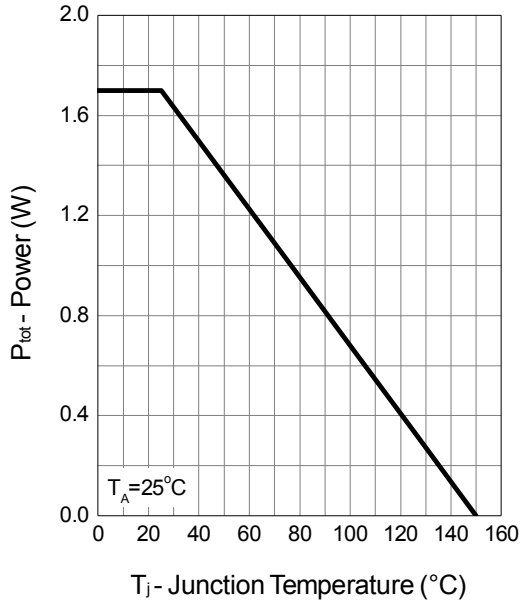




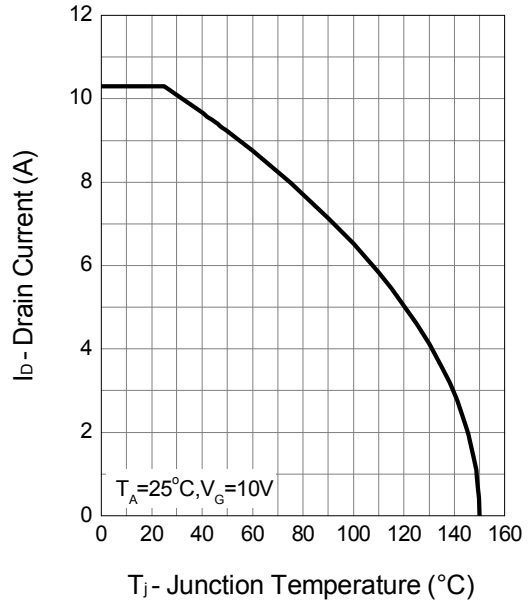
Typical Characteristics (Cont.)

Channel 2

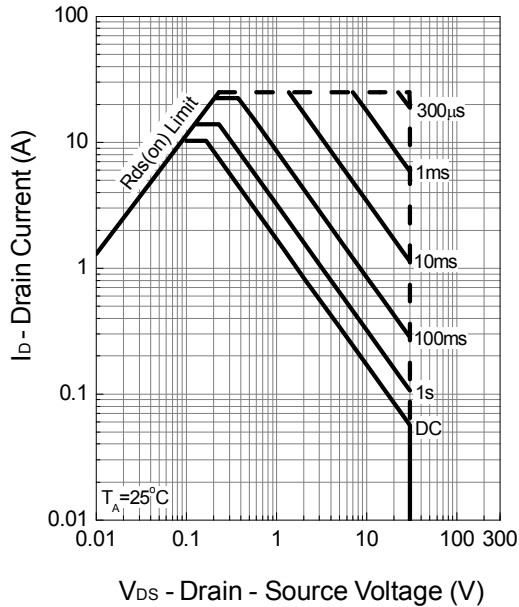
Power Dissipation



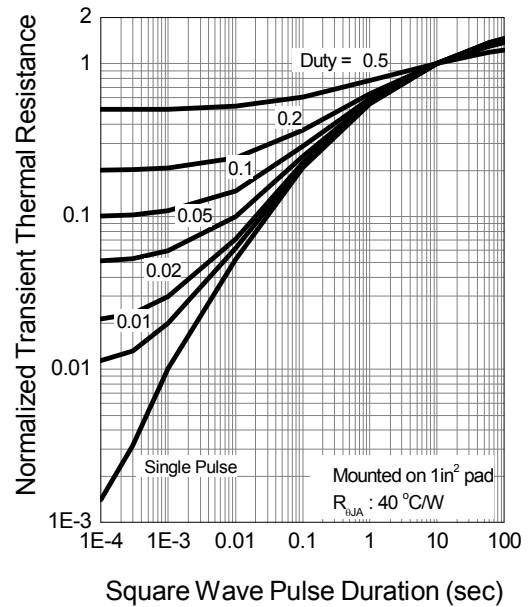
Drain Current



Safe Operation Area



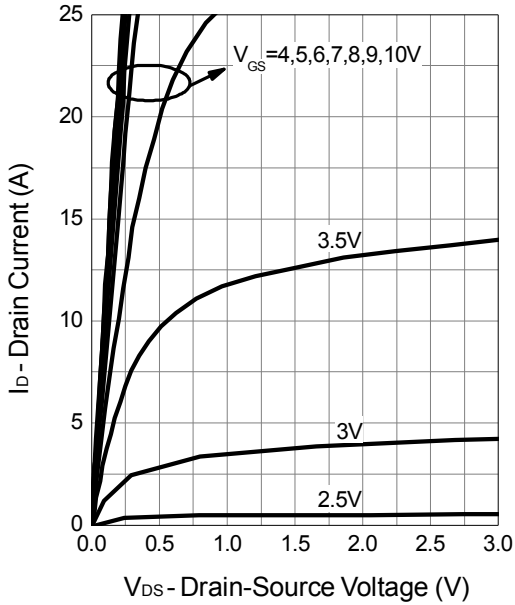
Thermal Transient Impedance



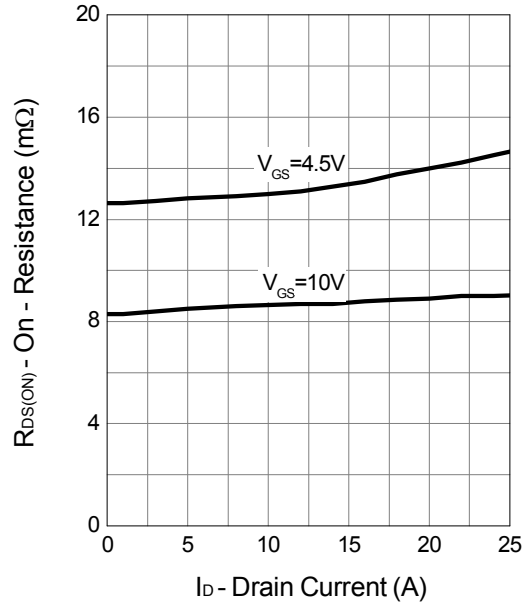
## Typical Characteristics (Cont.)

Channel 2

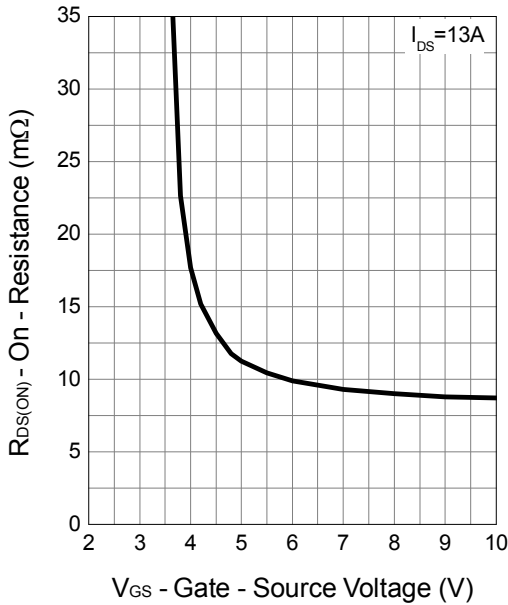
Output Characteristics



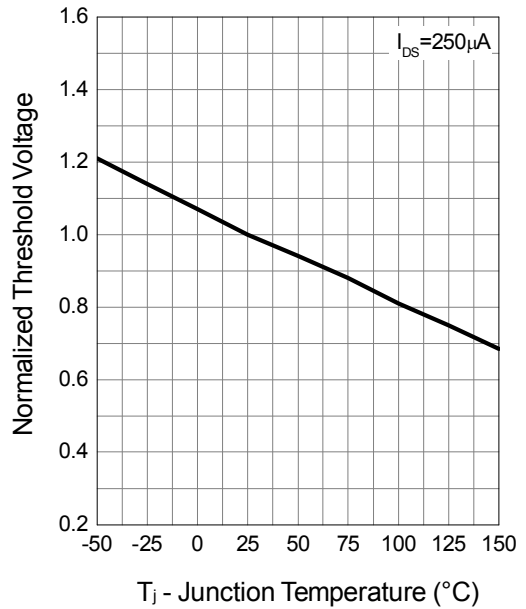
Drain-Source On Resistance



Gate-Source On Resistance



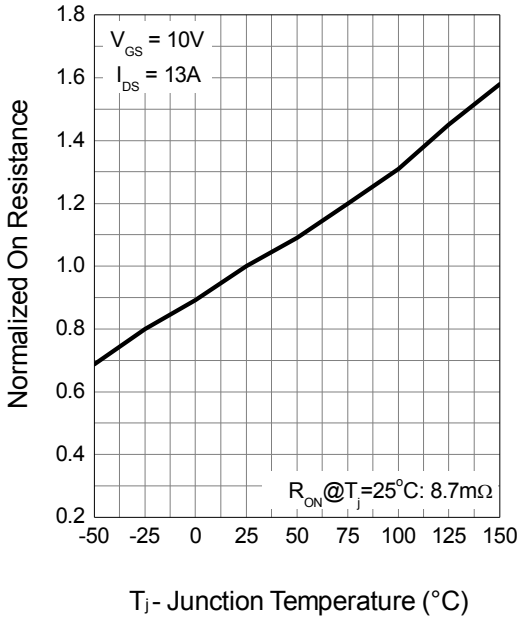
Gate Threshold Voltage



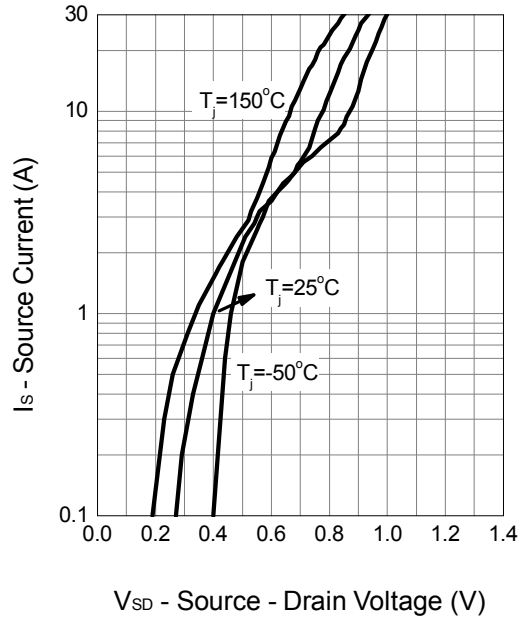
Typical Characteristics (Cont.)

Channel 2

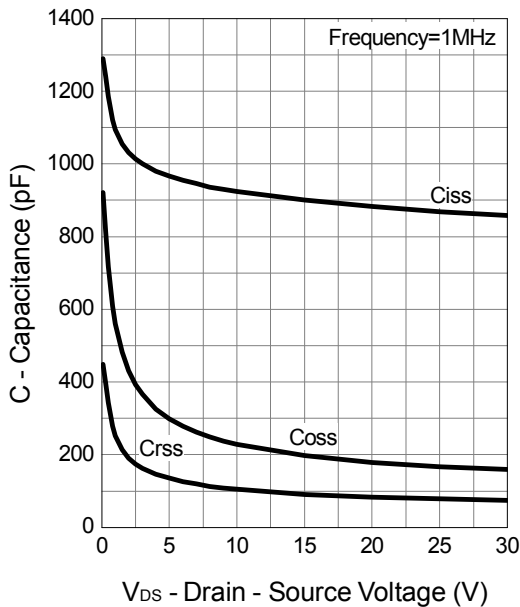
Drain-Source On Resistance



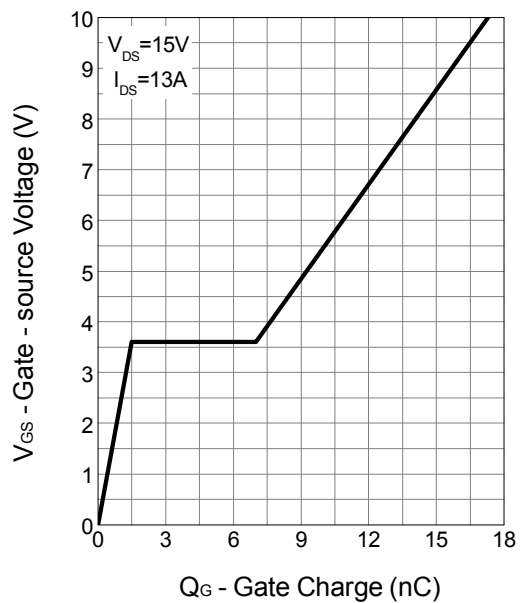
Source-Drain Diode Forward



Capacitance

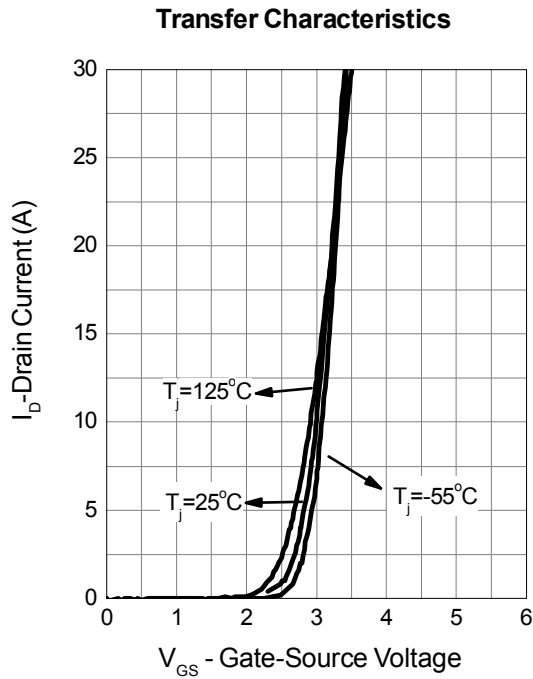


Gate Charge



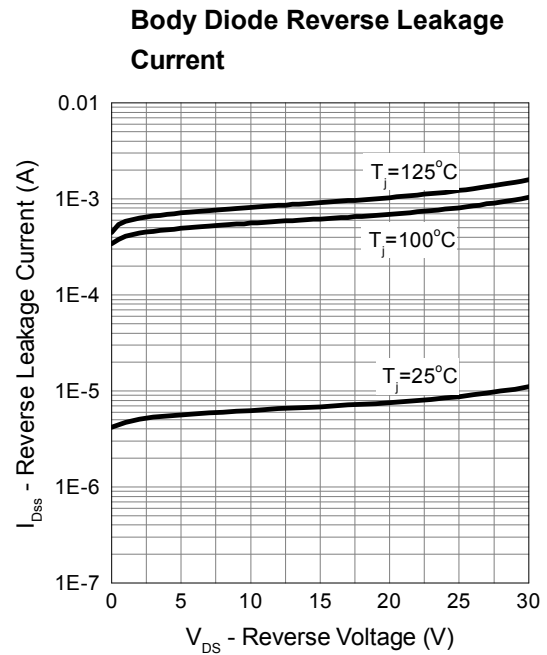
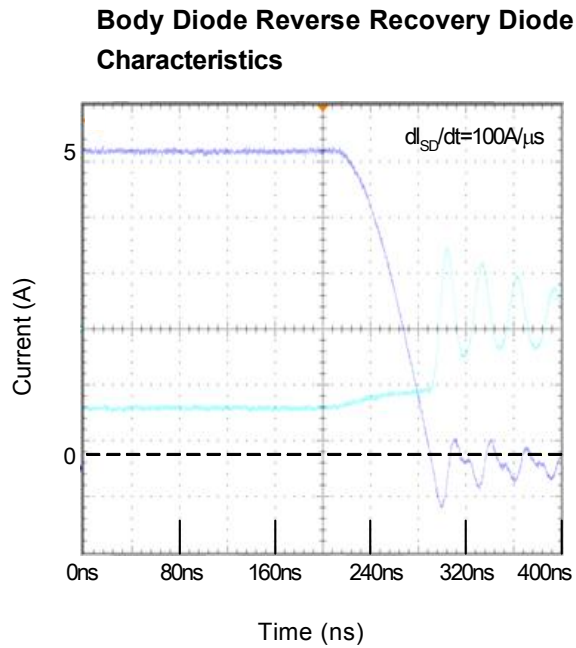
## Typical Characteristics (Cont.)

Channel 2

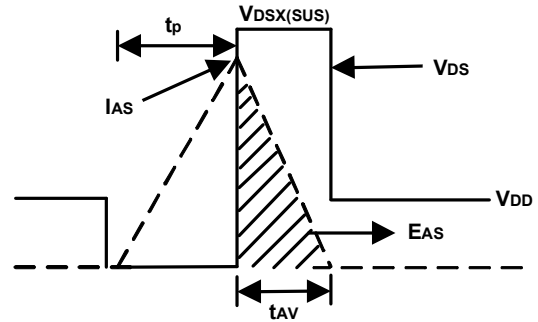
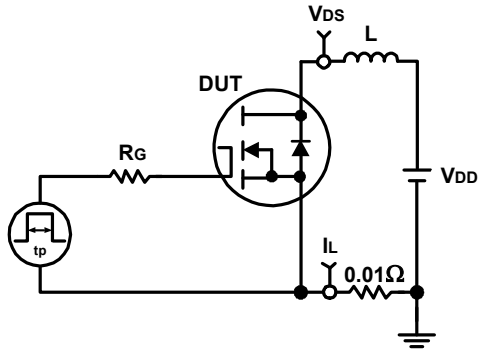


## Schottky Body Diode Characteristics

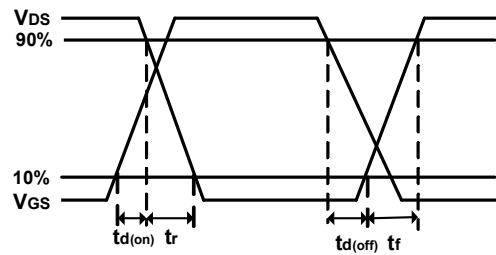
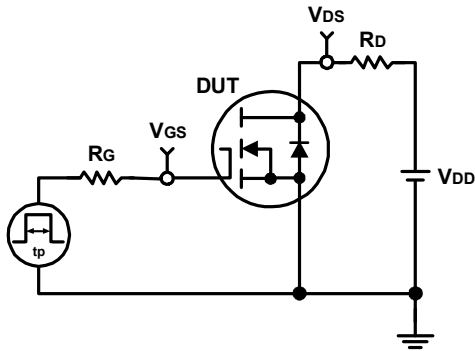
Channel 2



### Avalanche Test Circuit and Waveforms

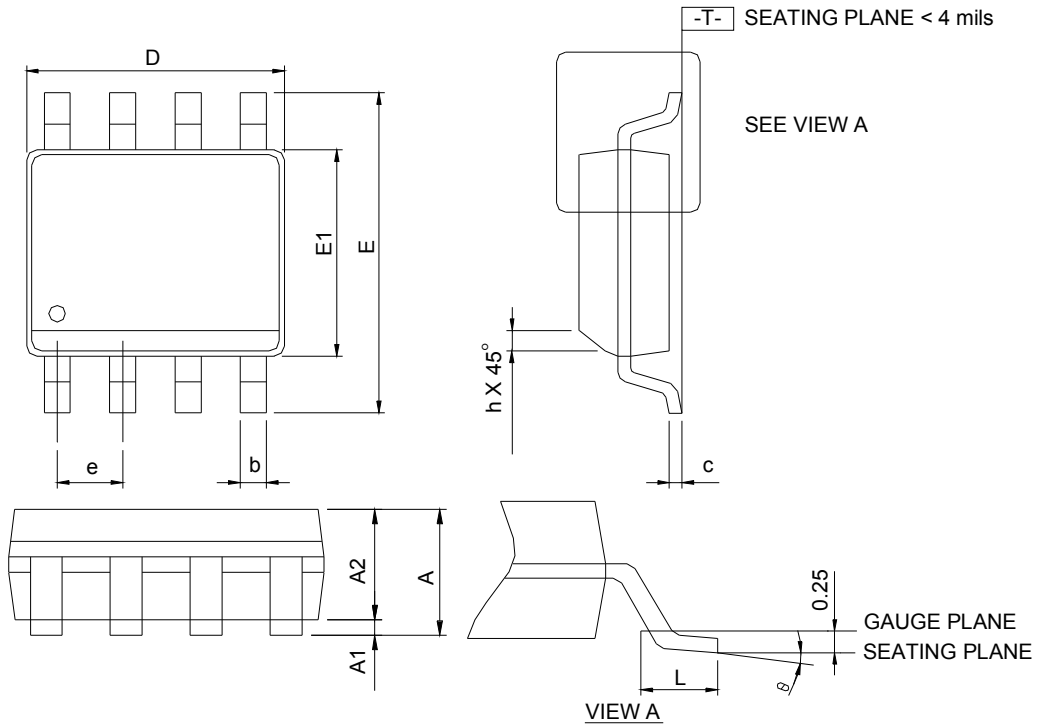


### Switching Time Test Circuit and Waveforms



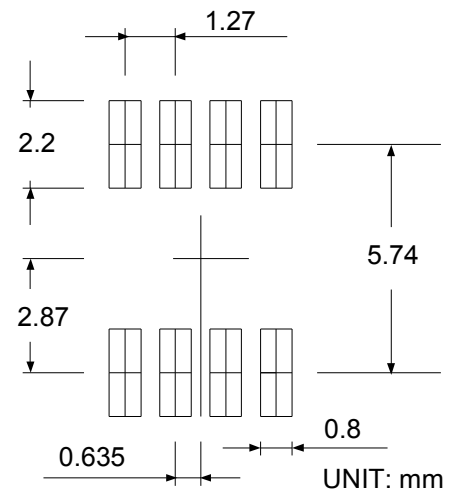
## Package Information

SOP-8



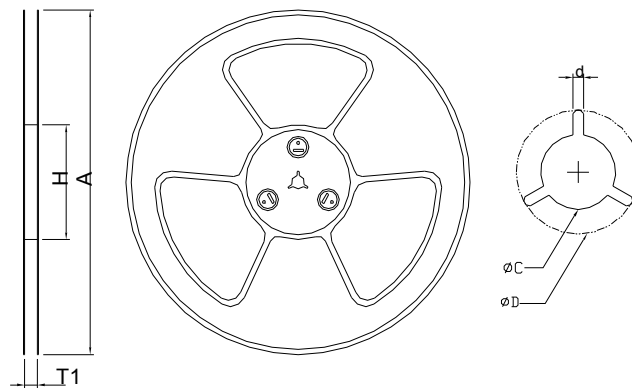
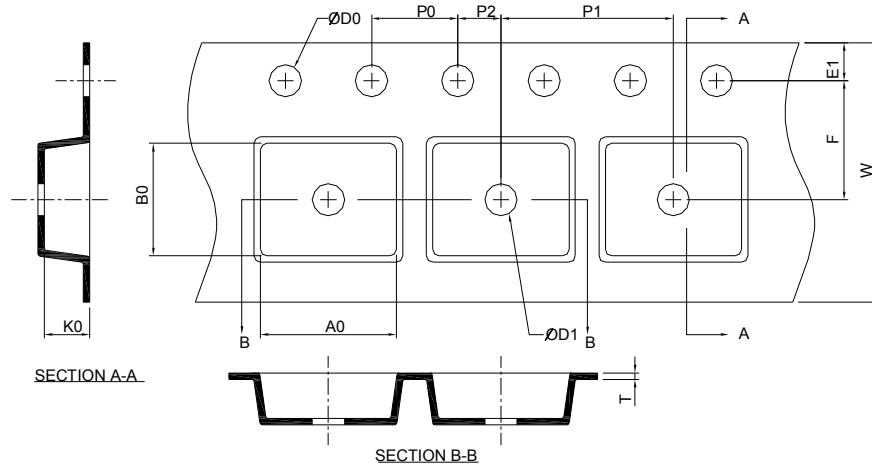
DIMENSIONS	SOP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	-	1.75	-	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	-	0.049	-
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

### RECOMMENDED LAND PATTERN



- Note: 1. Follow JEDEC MS-012 AA.  
 2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.  
 3. Dimension "E" does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 10 mil per side.

### Carrier Tape & Reel Dimensions

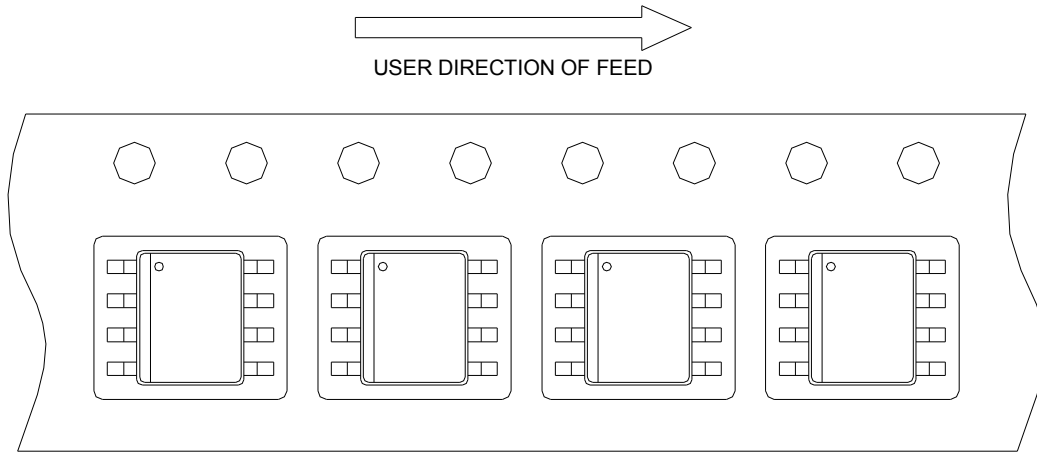


Application	A	H	T1	C	d	D	W	E1	F
SOP-8	330.0±2.00	50 MIN.	12.4+2.00-0.00	13.0+0.50-0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10-0.00	1.5 MIN.	0.6+0.00-0.40	6.40±0.20	5.20±0.20	2.10±0.20

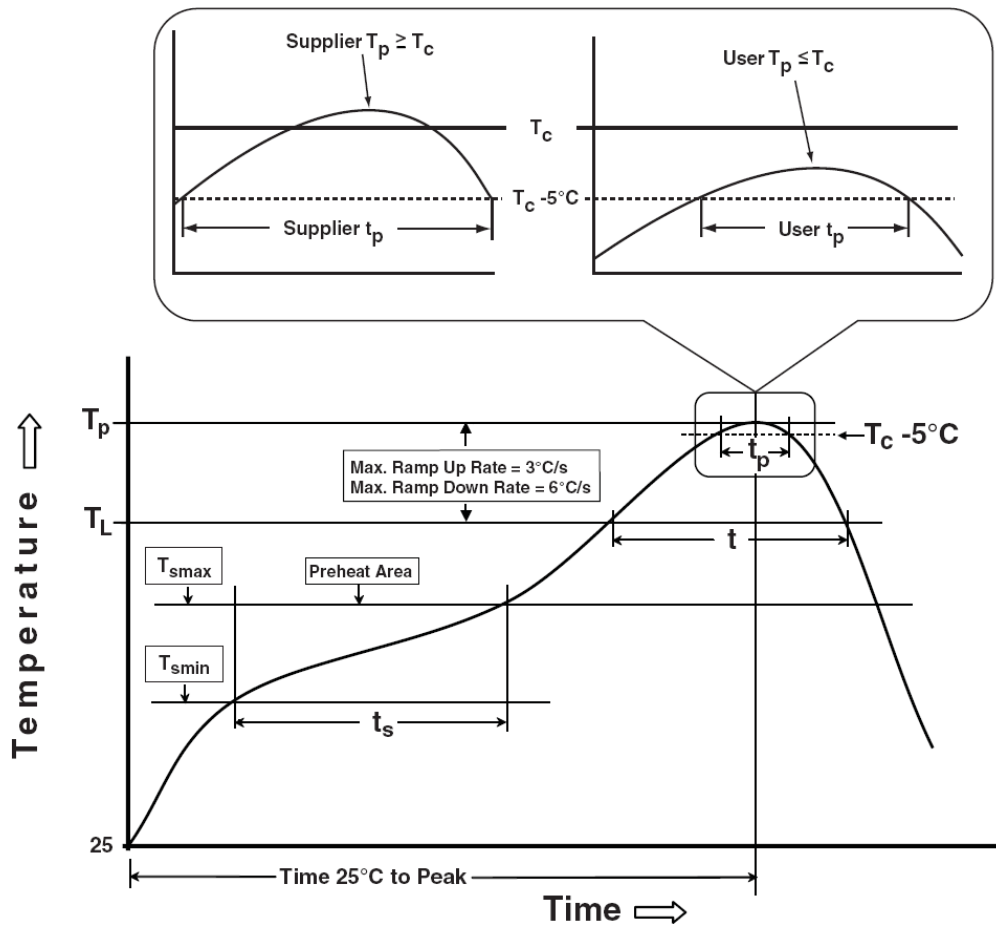
(mm)

## Taping Direction Information

SOP-8



## 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

## Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HOLT	JESD-22, A108	1000 Hrs, Bias @ 125°C
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

## Customer Service

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