

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

Symbol	Parameter	N Channel	P Channel	Unit	
Common Ratings					
V_{DSS}	Drain-Source Voltage	30	-30	V	
V_{GSS}	Gate-Source Voltage	± 20	± 20		
T_J	Maximum Junction Temperature	150		$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150			
I_S	Diode Continuous Forward Current	2	-2	A	
I_{DP}	Pulse Drain Current Tested	$V_{GS}=10\text{V(N)}, V_{GS}=-10\text{V(P)}$			
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$	8		-5
		$T_A=70^\circ\text{C}$	6.4	-4	
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2	2	W
		$T_A=70^\circ\text{C}$	1.3	1.3	
$R_{\theta JL}$	Thermal Resistance-Junction to Lead	Steady State	50	50	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	62.5	62.5	
		Steady State	110	110	
I_{AS}	Avalanche Current, Single pulse	L=0.1mH	9	16	A
		L=0.5mH	7.2	7.8	
E_{AS}	Avalanche Energy, Single pulse	L=0.1mH	4	12	mJ
		L=0.5mH	12	15	

N Channel Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	N Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0V$ $T_J=85^\circ\text{C}$	-	-	1	μA
			-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.5	1.8	2.3	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=8A$	-	17	21	m Ω
		$V_{GS}=4.5V, I_{DS}=5A$	-	23	30	
Diode Characteristics						
V_{SD}^a	Diode Forward Voltage	$I_{SD}=1A, V_{GS}=0V$	-	0.75	1.1	V
t_{rr}	Reverse Recovery Time	$I_{DS}=8A, dI_{SD}/dt=100A/\mu s$	-	12	-	ns
Q_{rr}	Reverse Recovery Charge		-	3.5	-	nC
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	1.5	-	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz	-	410	-	pF
C_{oss}	Output Capacitance		-	70	-	
C_{riss}	Reverse Transfer Capacitance		-	40	-	
$t_{d(ON)}$	Turn-on Delay Time		$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=6\Omega$	-	5.2	-
t_r	Turn-on Rise Time	-		8.6	-	
$t_{d(OFF)}$	Turn-off Delay Time	-		13.5	-	
t_f	Turn-off Fall Time	-		3.4	-	
Gate Charge Characteristics^b						
Q_g	Total Gate Charge	$V_{DS}=15V, V_{GS}=10V,$ $I_{DS}=8A$	-	8.1	13	nC
Q_g	Total Gate Charge		-	3.9	5.5	
Q_{gth}	Threshold Gate Charge	$V_{DS}=15V, V_{GS}=4.5V,$ $I_{DS}=8A$	-	0.73	-	
Q_{gs}	Gate-Source Charge		-	1.5	-	
Q_{gd}	Gate-Drain Charge		-	1.6	-	

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

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

P Channel Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

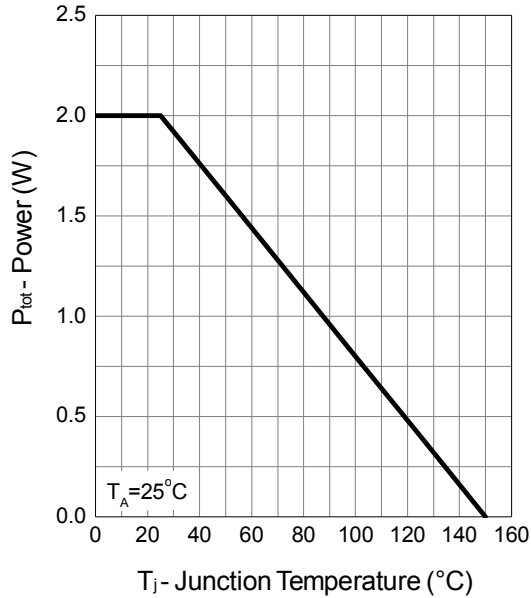
Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=-250\mu A$	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-24V, V_{GS}=0V$	-	-	-1	μA
		$T_J=85^\circ C$	-	-	-30	mA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.3	-1.8	-2.3	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=-10V, I_{DS}=-5A$	-	42	53	m Ω
		$V_{GS}=-4.5V, I_{DS}=-3A$	-	62	83	
Diode Characteristics						
V_{SD}^a	Diode Forward Voltage	$I_{SD}=-1A, V_{GS}=0V$	-	-0.75	-1	V
t_{rr}	Reverse Recovery Time	$I_{DS}=-5A, di_{SD}/dt=100A/\mu s$	-	16	-	ns
Q_{rr}	Reverse Recovery Charge		-	10	-	nC
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	3.8	-	Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=-15V,$ Frequency=1.0MHz	-	420	-	pF
C_{oss}	Output Capacitance		-	77	-	
C_{riss}	Reverse Transfer Capacitance		-	55	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-15V, R_L=15\Omega,$ $I_{DS}=-1A, V_{GEN}=-10V,$ $R_G=6\Omega$	-	8	-	ns
t_r	Turn-on Rise Time		-	10	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	18	-	
t_f	Turn-off Fall Time		-	8	-	
Gate Charge Characteristics^b						
Q_g	Total Gate Charge	$V_{DS}=-15V, V_{GS}=-10V,$ $I_{DS}=-5A$	-	9.5	-	nC
Q_{gs}	Gate-Source Charge		-	1.7	-	
Q_{gd}	Gate-Drain Charge		-	2	-	

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

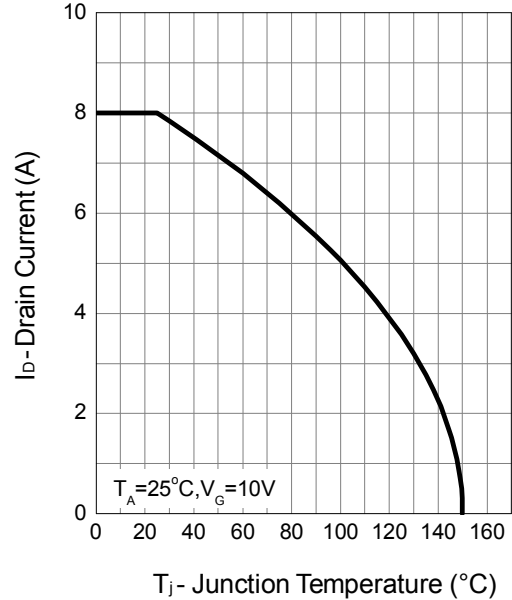
Note b : Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

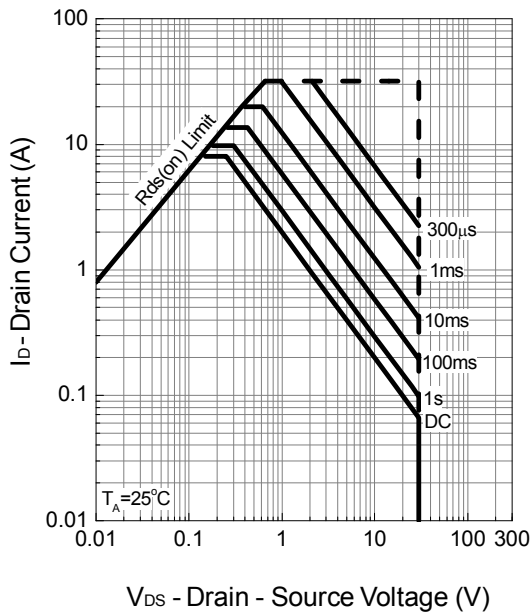
Power Dissipation



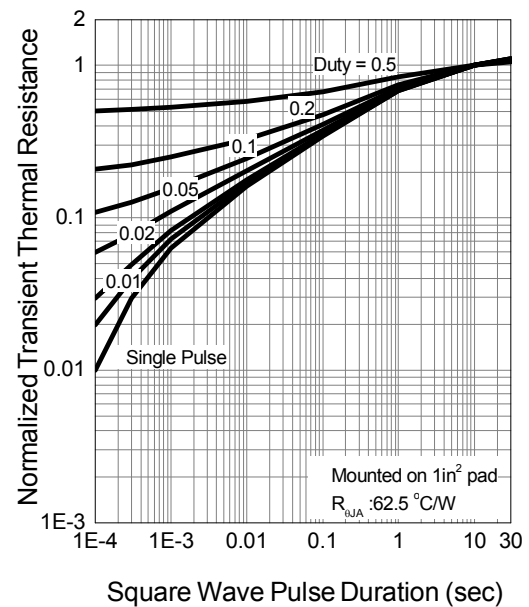
Drain Current



Safe Operation Area

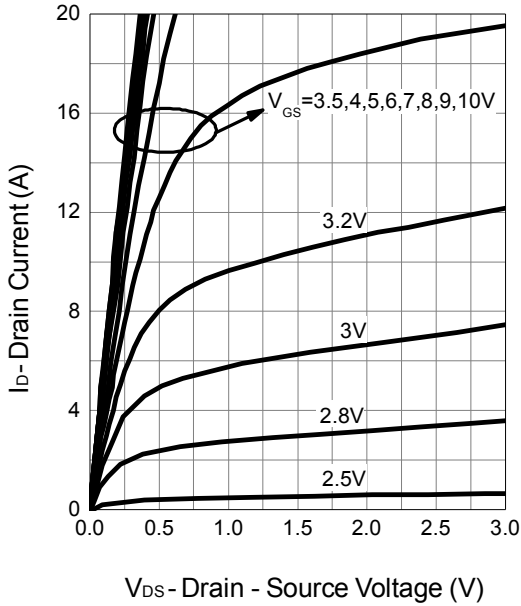


Thermal Transient Impedance

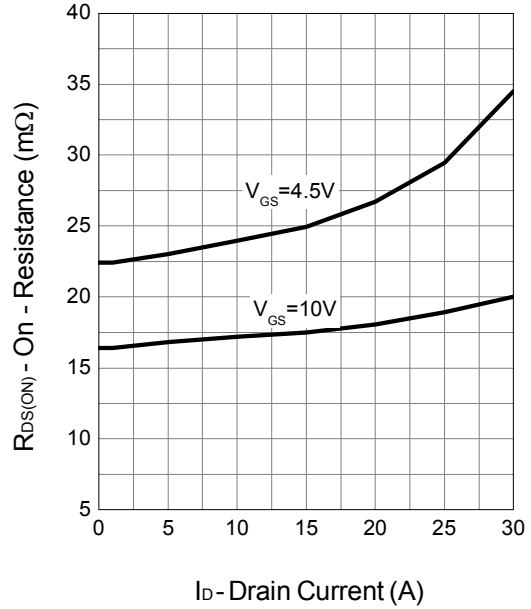


N Channel Typical Operating Characteristics (Cont.)

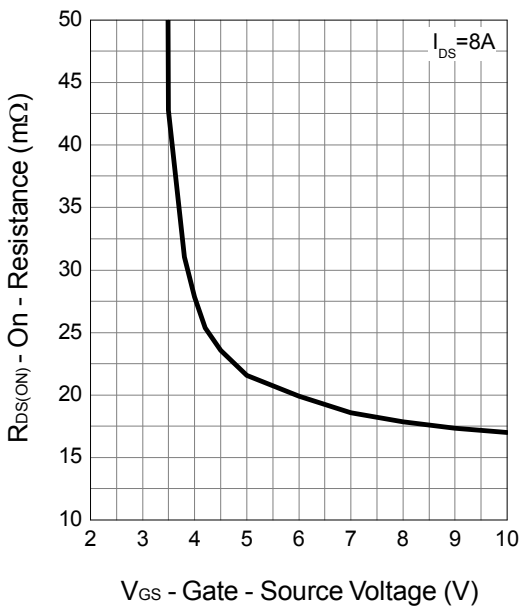
Output Characteristics



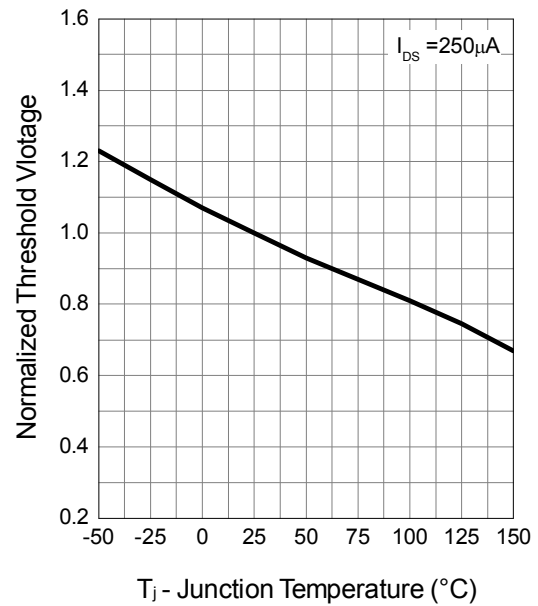
Drain-Source On Resistance



Gate-Source On Resistance

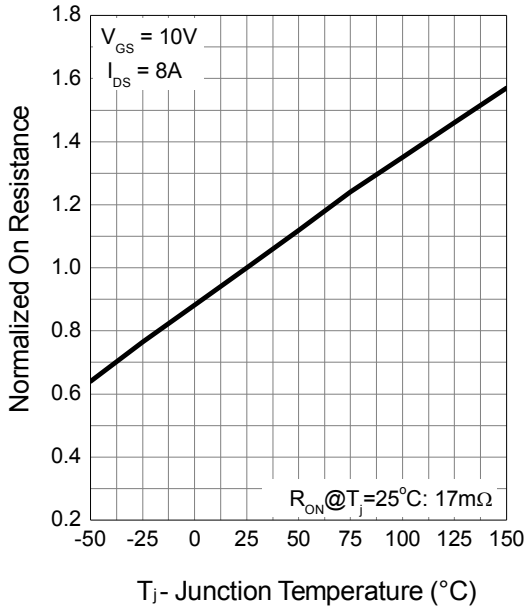


Gate Threshold Voltage

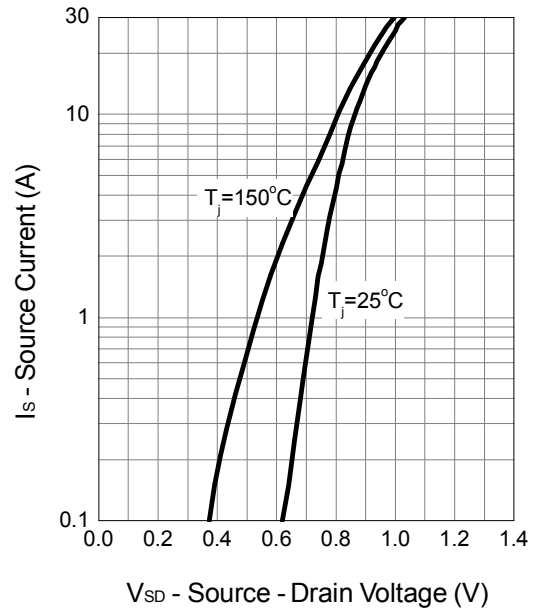


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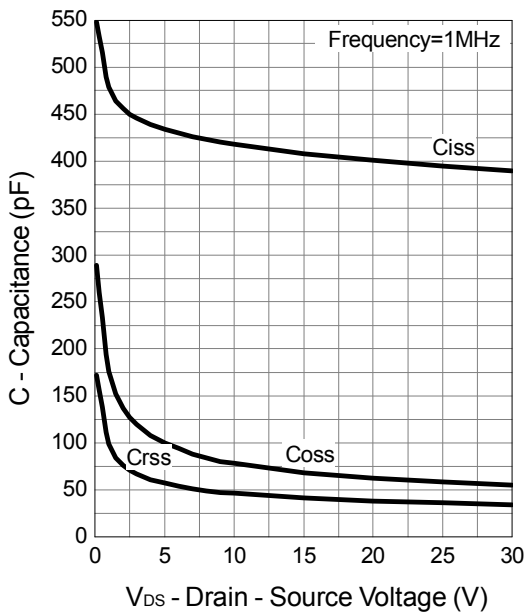
Drain-Source On Resistance



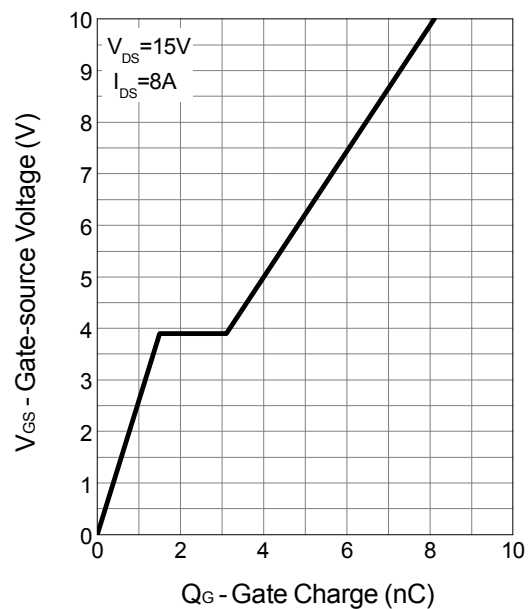
Source-Drain Diode Forward



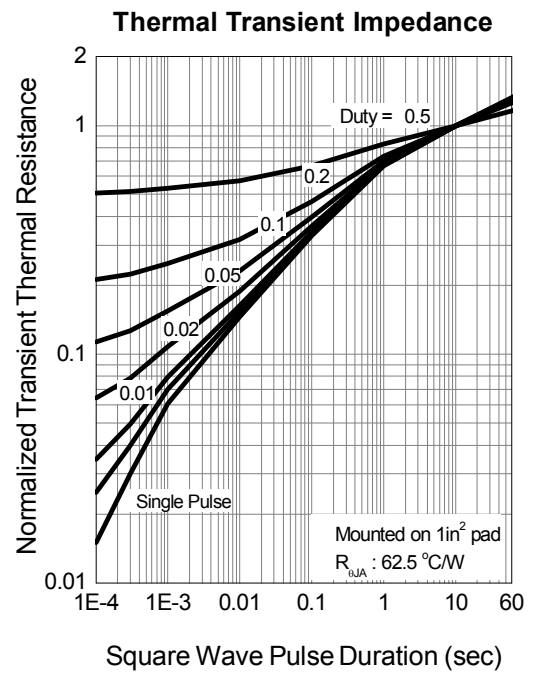
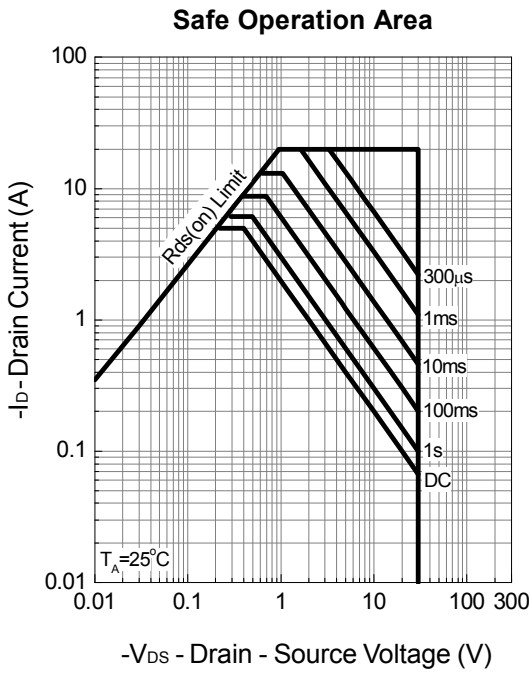
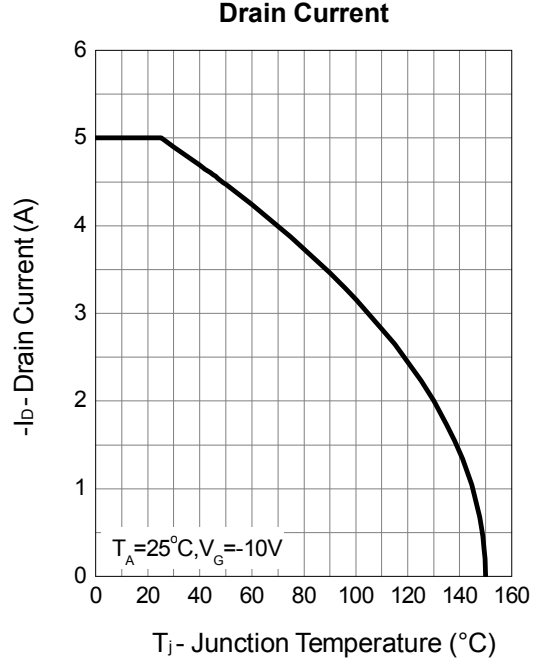
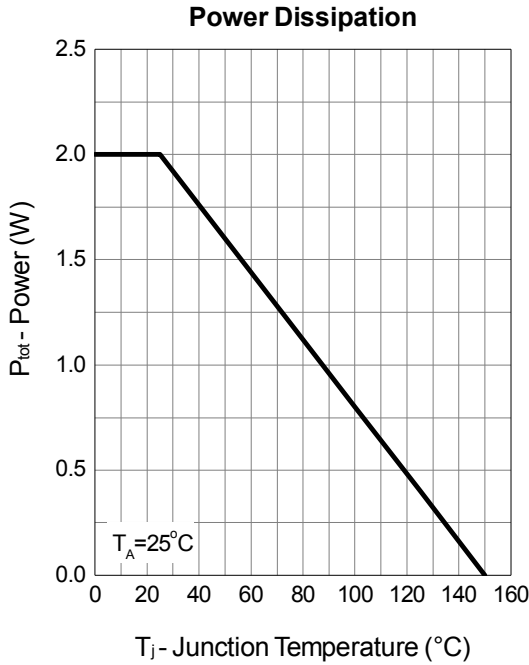
Capacitance



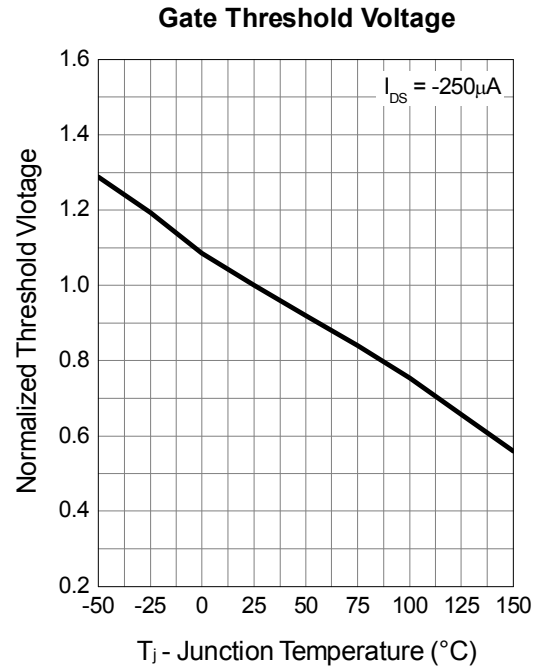
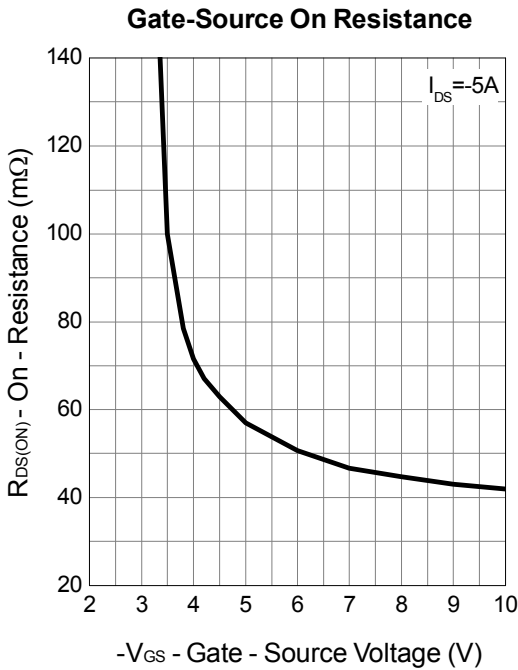
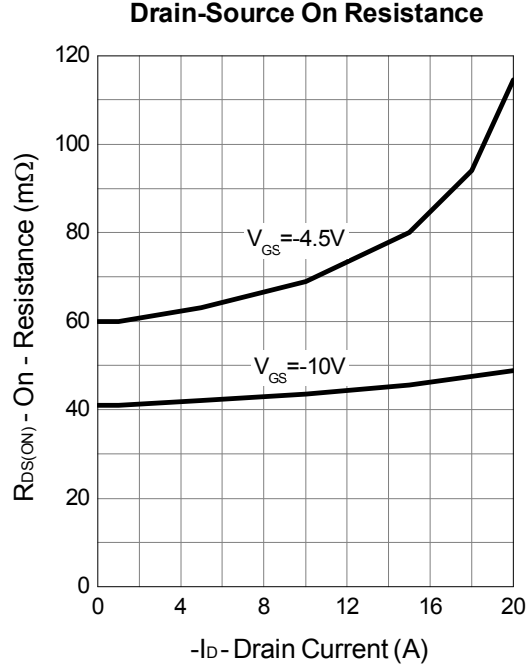
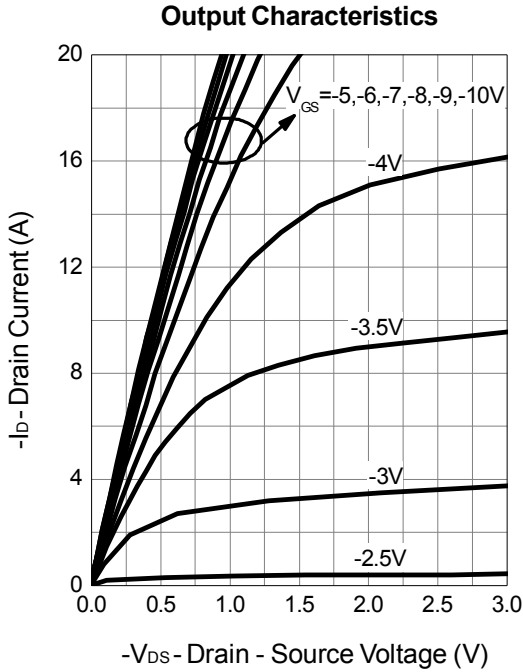
Gate Charge



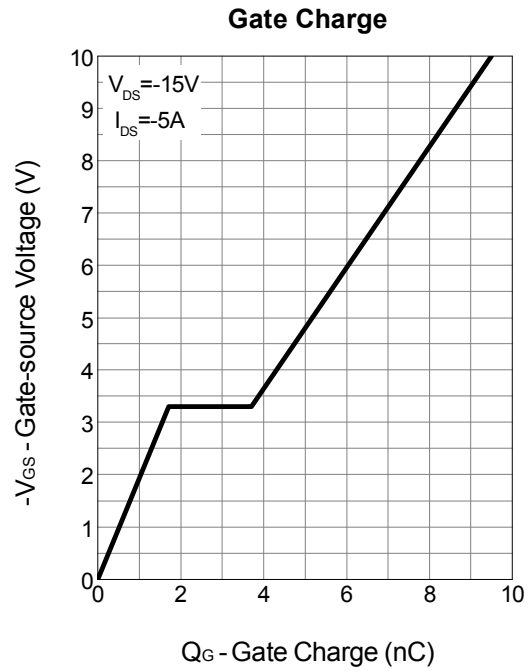
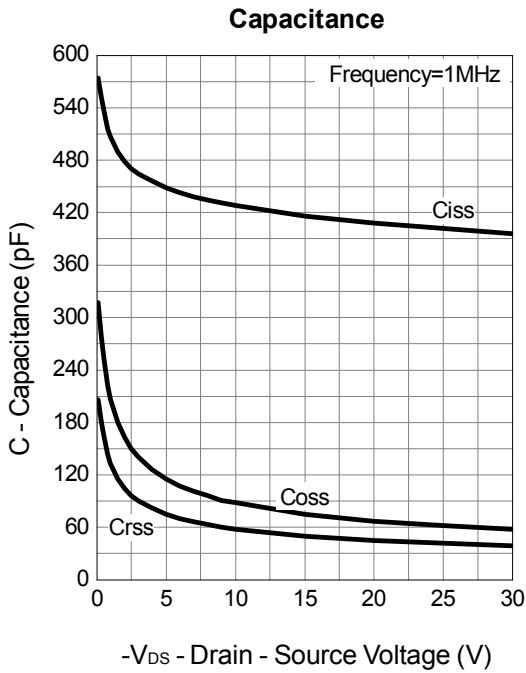
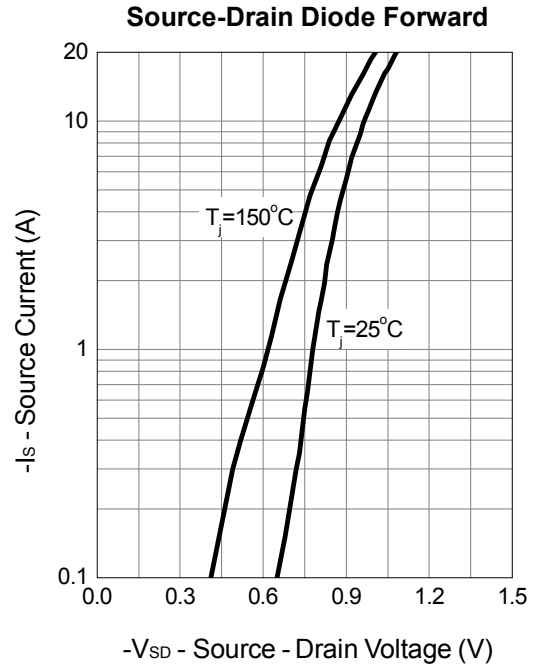
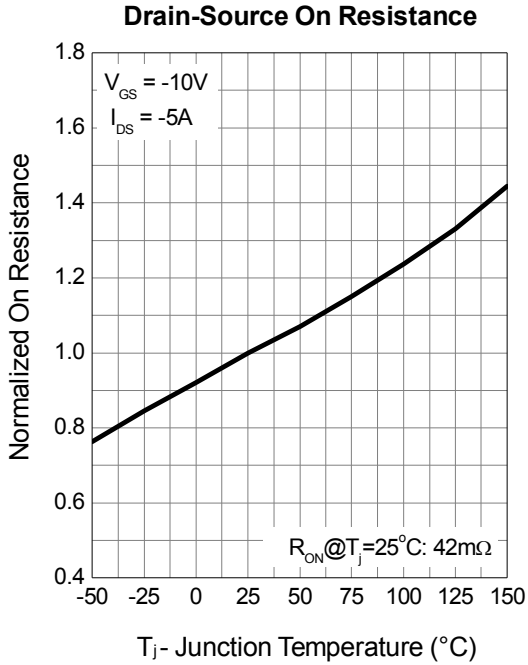
P Channel Typical Operating Characteristics



P Channel Typical Operating Characteristics (Cont.)

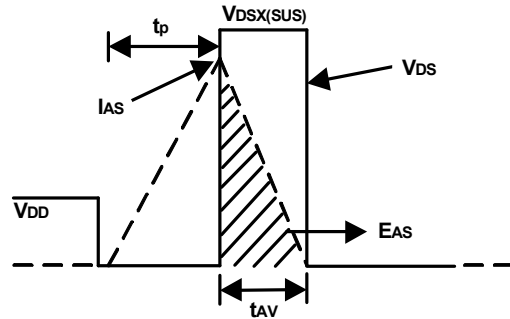
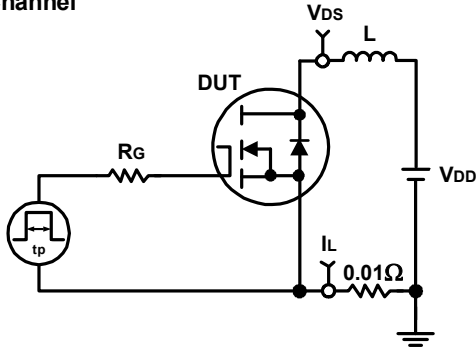


P Channel Typical Operating Characteristics (Cont.)

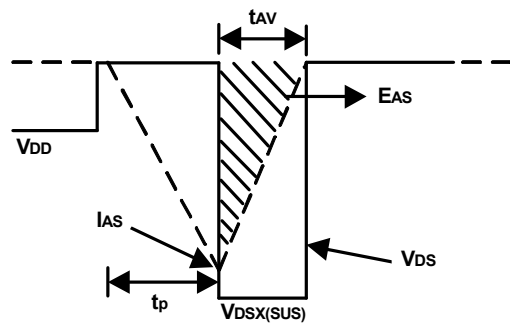
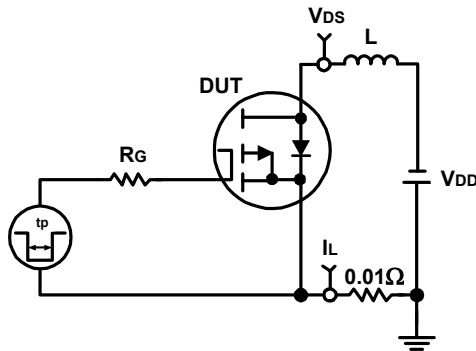


Avalanche Test Circuit and Waveforms

N Channel

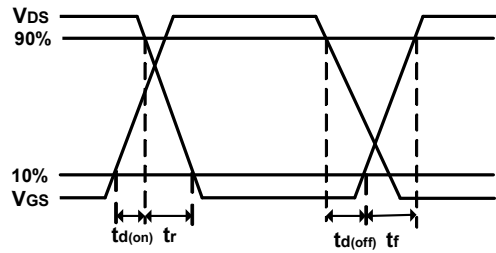
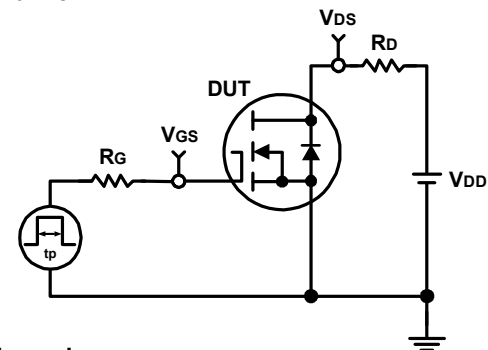


P Channel

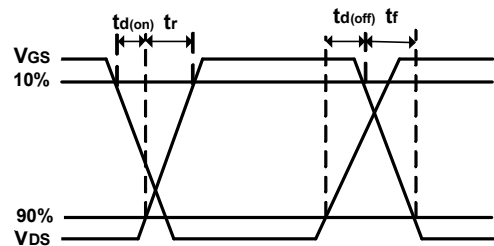
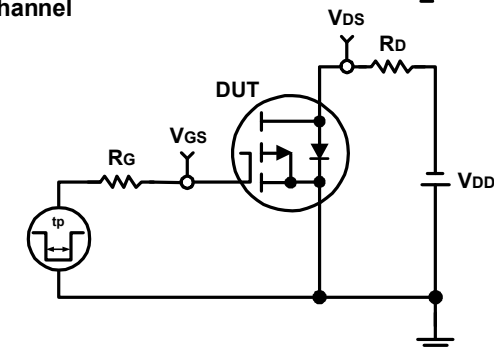


Switching Time Test Circuit and Waveforms

N Channel



P Channel



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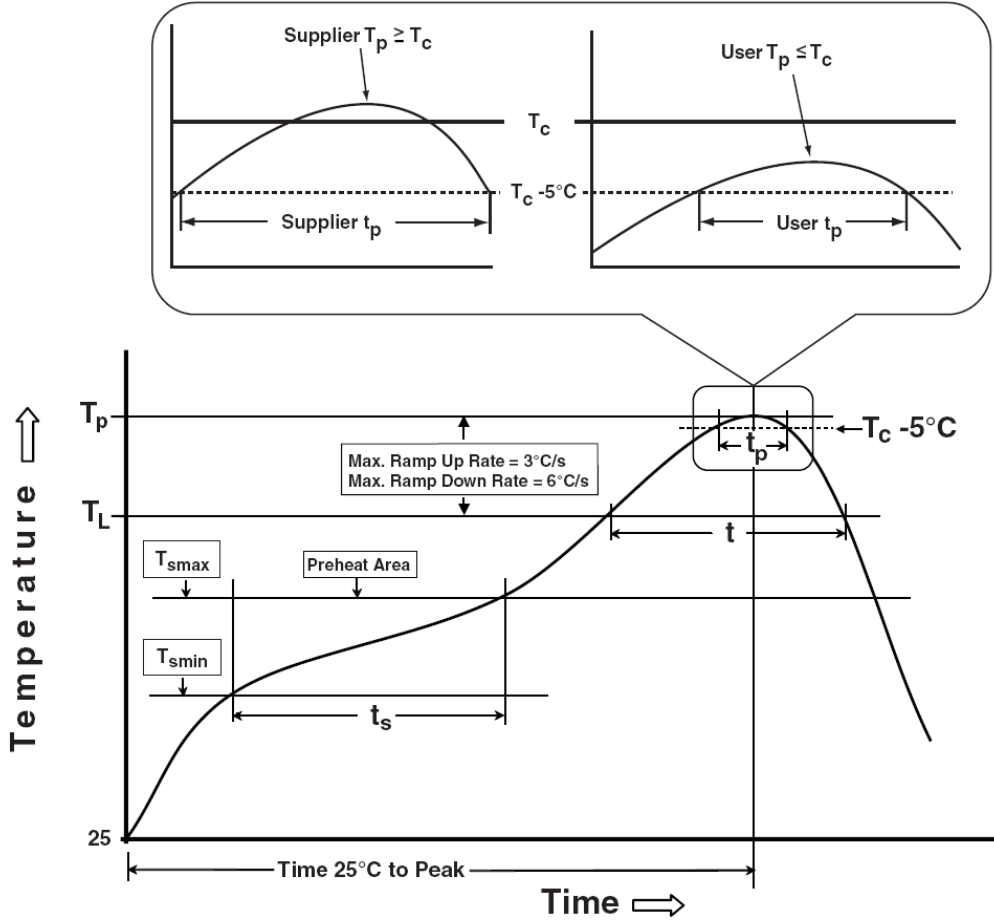
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Classification Profile



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

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ T_{jmax}
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ T_{jmax}
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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