

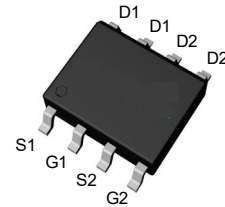
## Features

- N Channel**  
 40V/7.5A,  
 $R_{DS(ON)} = 16m\Omega$  (typ.) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 18m\Omega$  (typ.) @  $V_{GS} = 4.5V$
- P Channel**  
 -40V/-5.5A,  
 $R_{DS(ON)} = 30m\Omega$  (typ.) @  $V_{GS} = -10V$   
 $R_{DS(ON)} = 46m\Omega$  (typ.) @  $V_{GS} = -4.5V$
- 100% UIS +  $R_g$  Tested
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

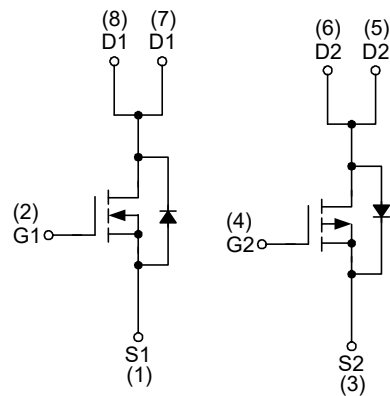
## Applications

- Synchronous Rectification
- Motor Control
- Fan Pre-driver H-bridge

## Pin Description



Top View of SOP-8



N-Channel MOSFET

P-Channel MOSFET

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
4614B	XPX4614BXS	SOP-8	-	-	-

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

Symbol	Parameter	N Channel	P Channel	Unit	
<b>Common Ratings</b>					
$V_{DSS}$	Drain-Source Voltage	40	-40	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V	
$T_J$	Maximum Junction Temperature	150		$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 150		$^\circ\text{C}$	
$I_S$	Diode Continuous Forward Current	2	-2	A	
$I_{DP}$	Pulse Drain Current Tested	$V_{GS}=10\text{V(N)}, V_{GS}=-10\text{V(P)}$		A	
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$	7.5	-5.5	A
		$T_A=70^\circ\text{C}$	6	-4.5	
$P_D$	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	$^\circ\text{C/W}$
		Steady State <sup>b</sup>	110	110	
$I_{AS}^a$	Avalanche Current, Single pulse	$L=0.5\text{mH}$	10	10	A
$E_{AS}^a$	Avalanche Energy, Single pulse	$L=0.5\text{mH}$	25	25	mJ

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

Note b : Surface Mounted on  $1\text{in}^2$  pad area,  $t=999\text{sec}$ .

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

Symbol	Parameter	Test Conditions	N Channel			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=32V, V_{GS}=0V$	-	-	1	$\mu A$
		$T_J=85^\circ C$	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.5	2	2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
$R_{DS(ON)}^c$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=6A$	-	16	21	m $\Omega$
		$V_{GS}=4.5V, I_{DS}=5A$	-	18	25	
<b>Diode Characteristics</b>						
$V_{SD}^c$	Diode Forward Voltage	$I_{SD}=1A, V_{GS}=0V$	-	0.75	1.1	V
$t_{rr}$	Reverse Recovery Time	$I_{DS}=6A, dI_{SD}/dt=100A/\mu s$	-	13	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	8.7	-	nC
<b>Dynamic Characteristics<sup>d</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	2.5	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=20V, Frequency=1.0MHz$	-	815	-	pF
$C_{oss}$	Output Capacitance		-	95	-	
$C_{rss}$	Reverse Transfer Capacitance		-	60	-	
$t_{d(ON)}$	Turn-on Delay Time		$V_{DD}=20V, R_L=20\Omega, I_{DS}=1A, V_{GEN}=10V, R_G=6\Omega$	-	7.8	-
$t_r$	Turn-on Rise Time	-		6.9	-	
$t_{d(OFF)}$	Turn-off Delay Time	-		22.4	-	
$t_f$	Turn-off Fall Time	-		4.8	-	
<b>Gate Charge Characteristics<sup>d</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=20V, V_{GS}=10V, I_{DS}=6A$	-	15.7	22	nC
$Q_g$	Total Gate Charge	$V_{DS}=20V, V_{GS}=4.5V, I_{DS}=6A$	-	7.5	10.5	
$Q_{gth}$	Threshold Gate Charge		-	1.85	-	
$Q_{gs}$	Gate-Source Charge		-	3.24	-	
$Q_{gd}$	Gate-Drain Charge		-	2.75	-	

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

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

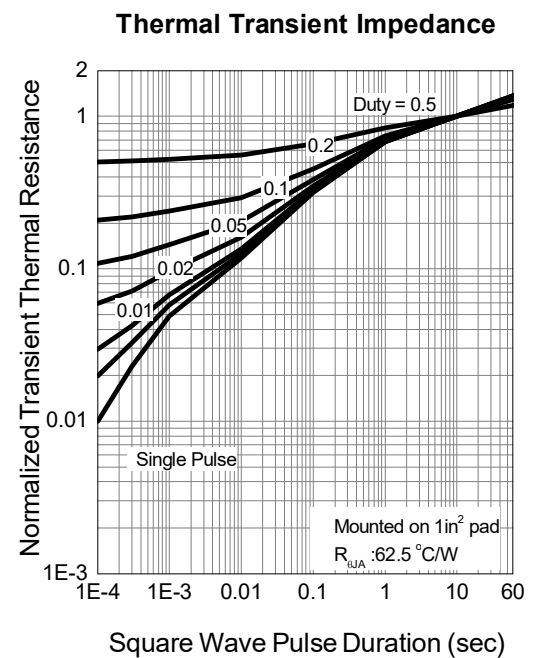
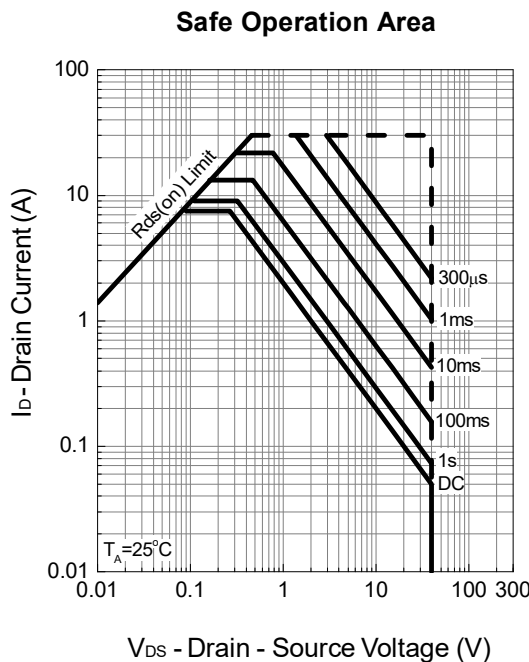
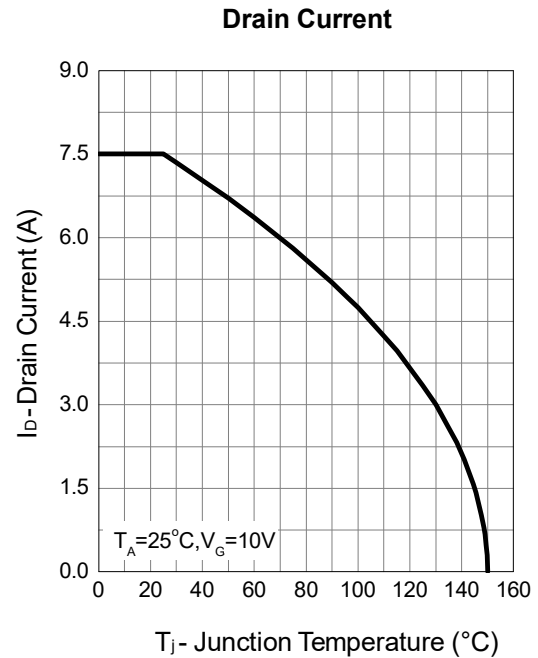
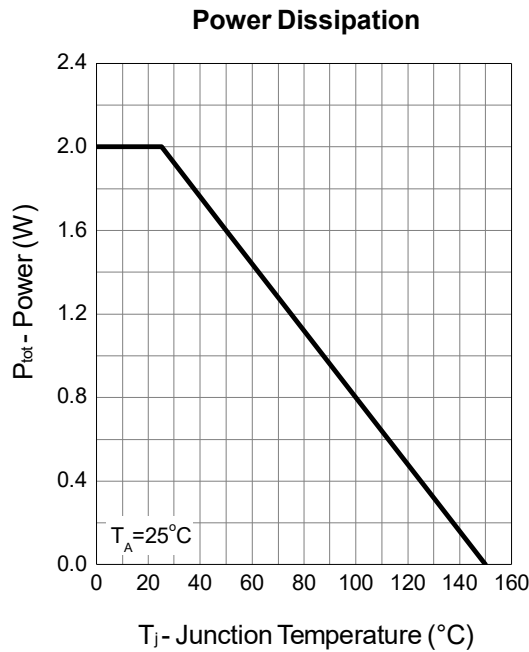
**P Channel Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=-250\mu A$	-40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-32V, V_{GS}=0V$	-	-	-1	$\mu A$
		$T_J=85^\circ C$	-	-	-30	mA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.5	-2	-2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
$R_{DS(ON)}^c$	Drain-Source On-state Resistance	$V_{GS}=-10V, I_{DS}=-5.5A$	-	30	38	m $\Omega$
		$V_{GS}=-4.5V, I_{DS}=-3.5A$	-	46	62	
<b>Diode Characteristics</b>						
$V_{SD}^c$	Diode Forward Voltage	$I_{SD}=-1A, V_{GS}=0V$	-	-0.75	-1	V
$t_{rr}$	Reverse Recovery Time	$I_{DS}=-5.5A,$ $di_{SD}/dt=100A/\mu s$	-	15	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	8	-	nC
<b>Dynamic Characteristics<sup>d</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	8	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=-20V,$ Frequency=1.0MHz	-	668	-	pF
$C_{oss}$	Output Capacitance		-	98	-	
$C_{rss}$	Reverse Transfer Capacitance		-	72	-	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-20V, R_L=20\Omega,$ $I_{DS}=-1A, V_{GEN}=-10V,$ $R_G=6\Omega$	-	8.7	-	ns
$t_r$	Turn-on Rise Time		-	7	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	31	-	
$t_f$	Turn-off Fall Time		-	17	-	
<b>Gate Charge Characteristics<sup>d</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=-20V, V_{GS}=-10V,$ $I_{DS}=-5.5A$	-	15	-	nC
$Q_g$	Total Gate Charge		-	7.5	-	
$Q_{gth}$	Threshold Gate Charge	$V_{DS}=-20V, V_{GS}=-4.5V,$ $I_{DS}=-5.5A$	-	1.4	-	
$Q_{gs}$	Gate-Source Charge		-	2.4	-	
$Q_{gd}$	Gate-Drain Charge		-	3.5	-	

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

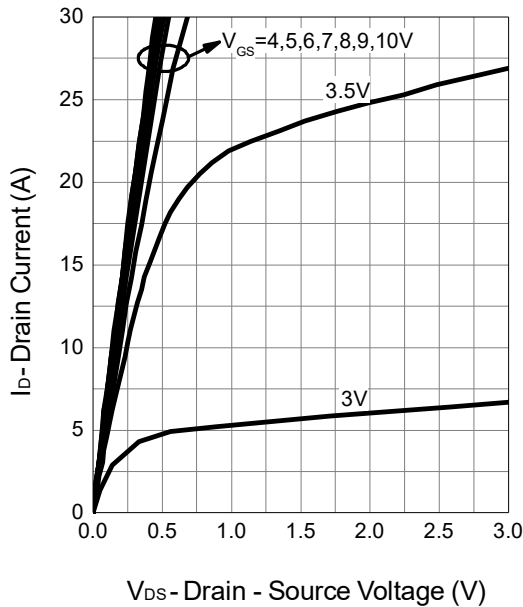
Note d : Guaranteed by design, not subject to production testing.

## N Channel Typical Operating Characteristics

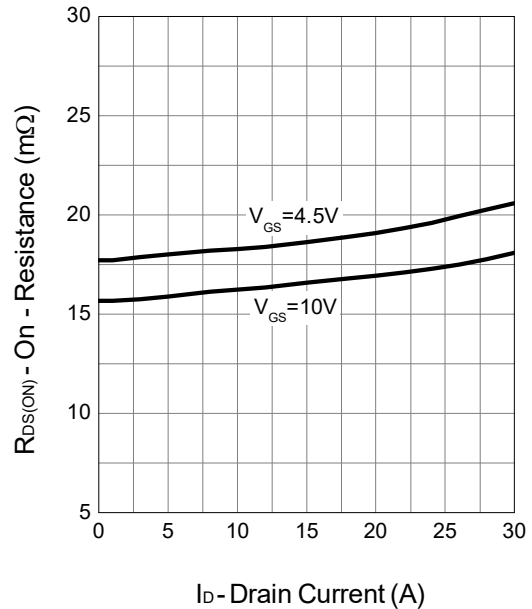


### N Channel Typical Operating Characteristics (Cont.)

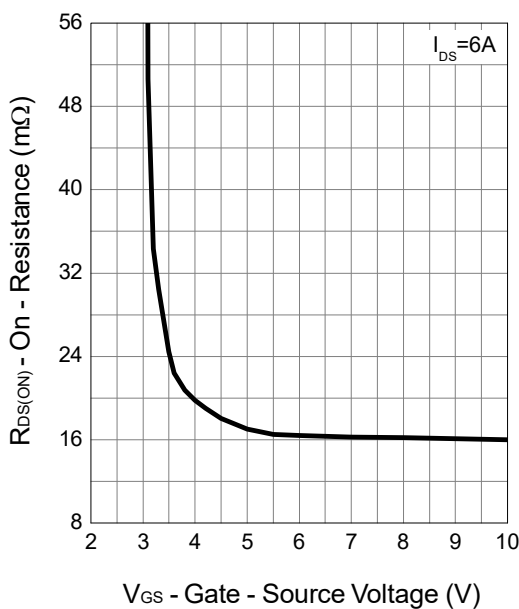
Output Characteristics



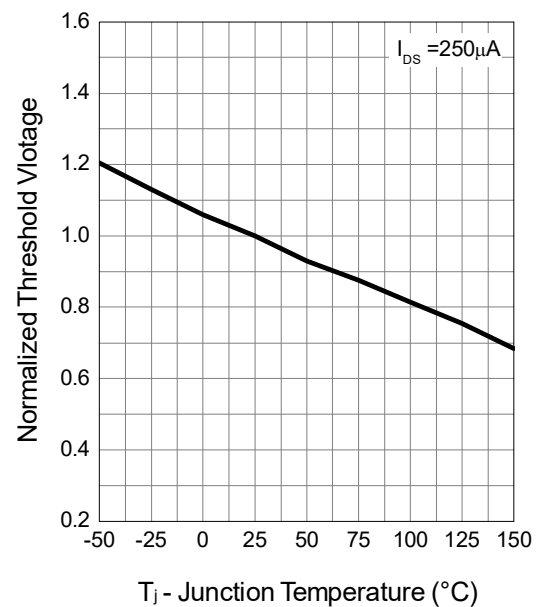
Drain-Source On Resistance



Gate-Source On Resistance

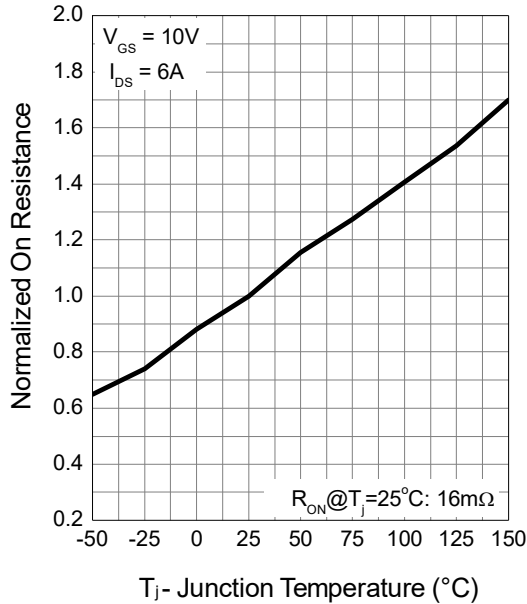


Gate Threshold Voltage

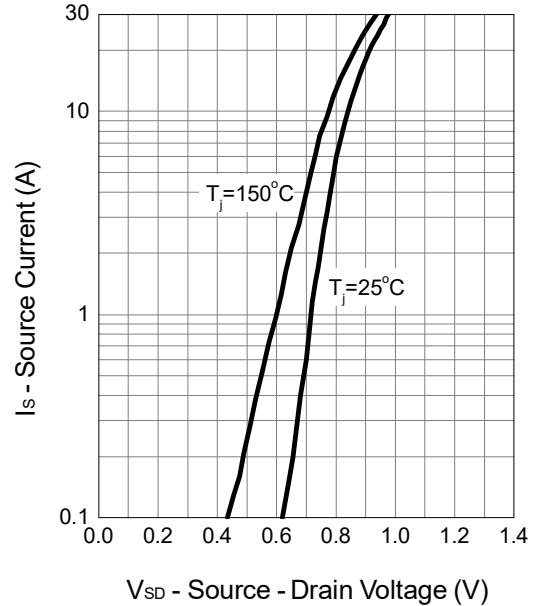


### N Channel Typical Operating Characteristics (Cont.)

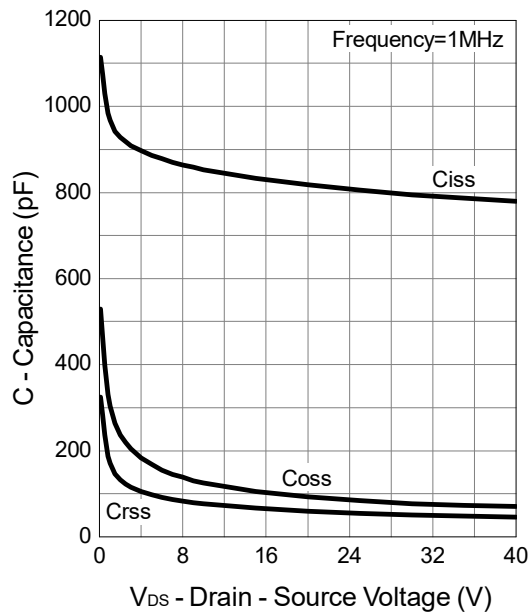
**Drain-Source On Resistance**



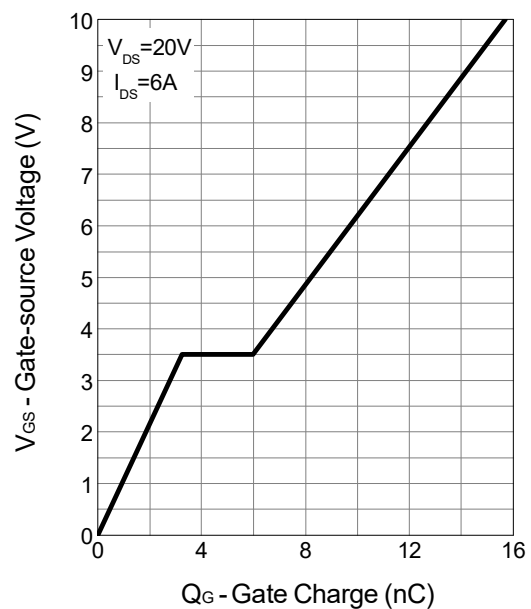
**Source-Drain Diode Forward**



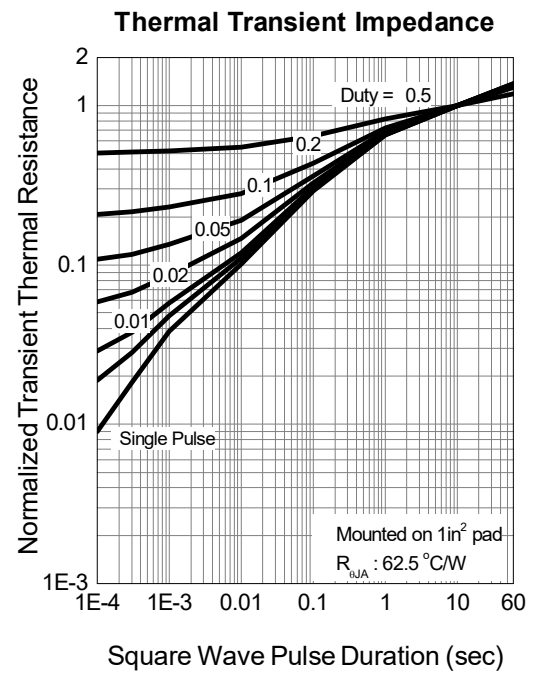
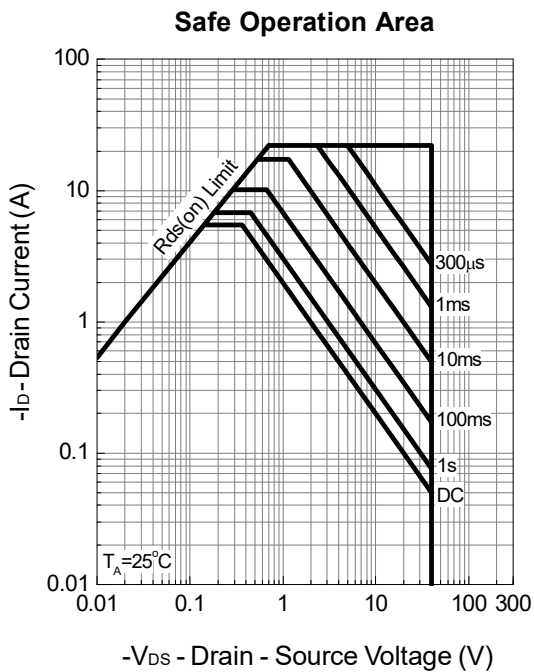
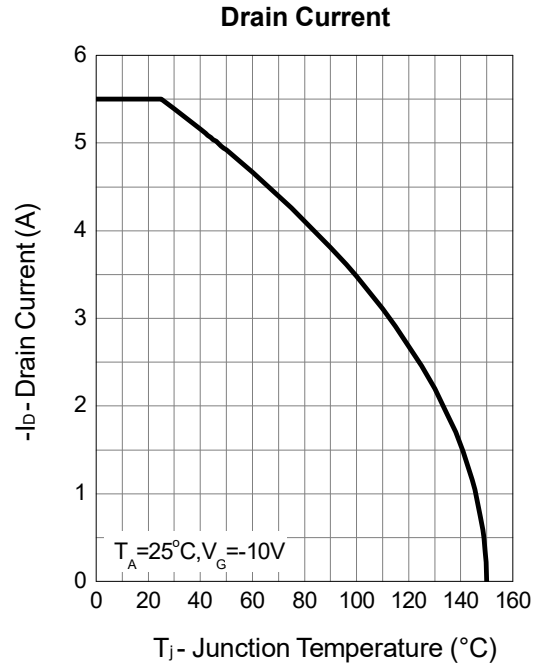
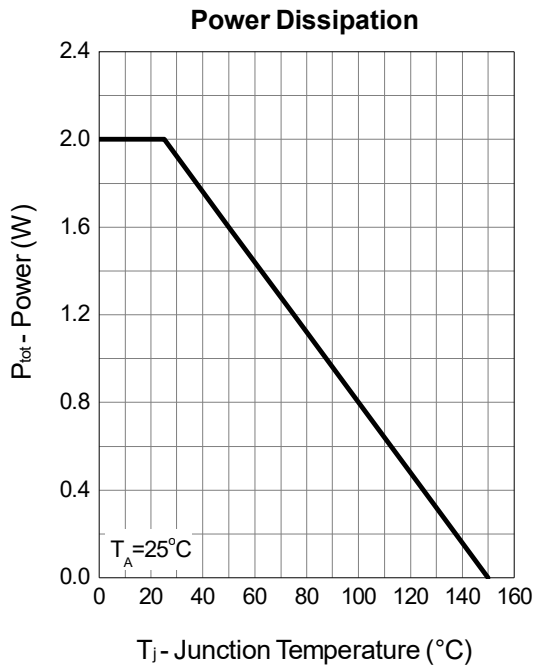
**Capacitance**



**Gate Charge**

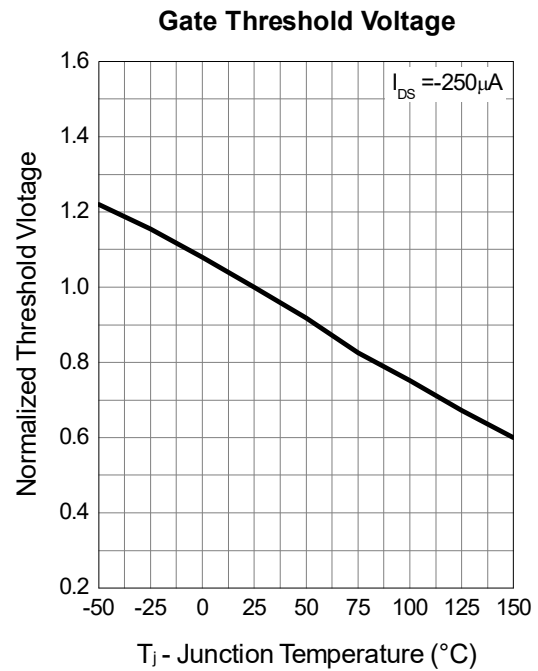
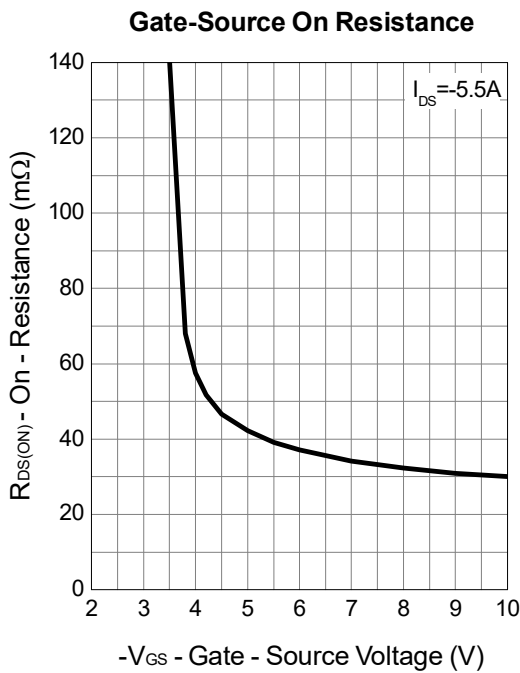
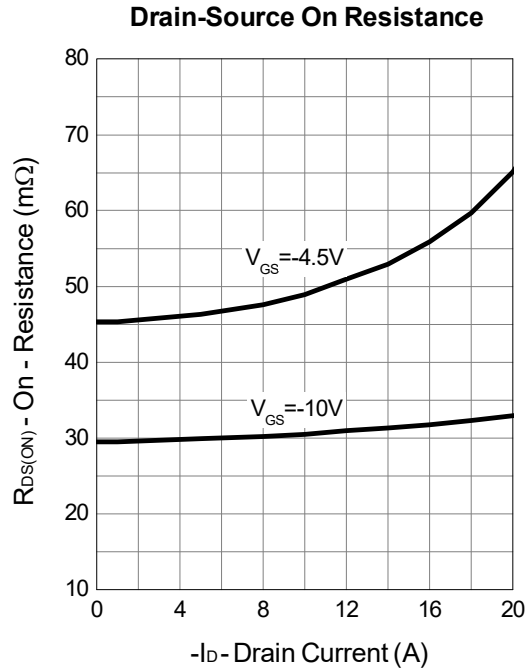
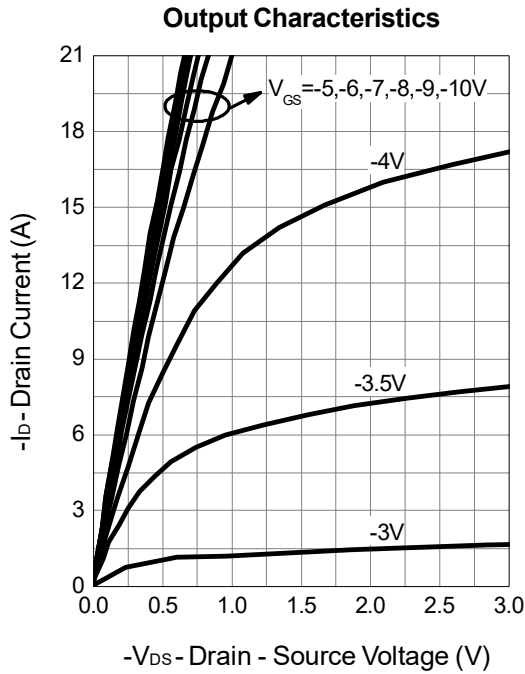


## P Channel Typical Operating Characteristics

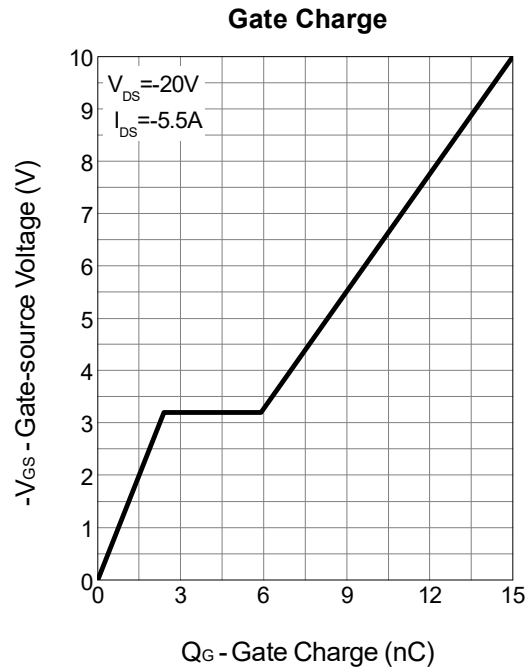
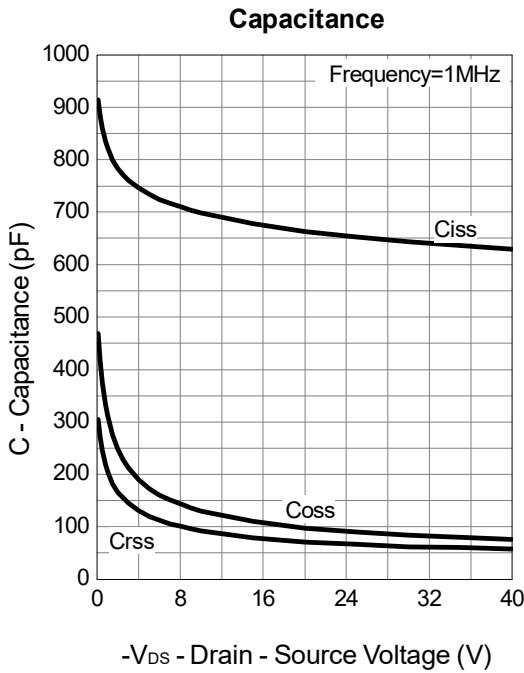
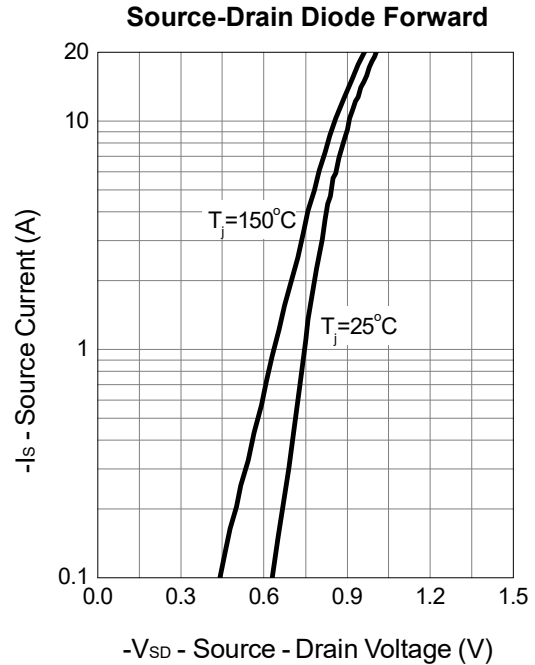
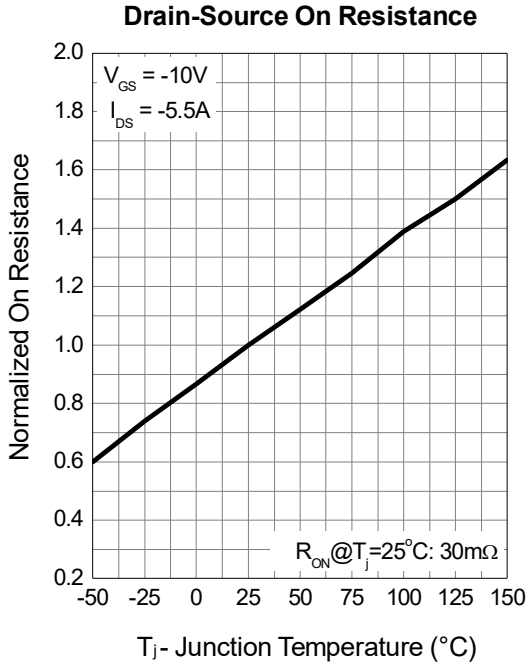




### P Channel Typical Operating Characteristics (Cont.)

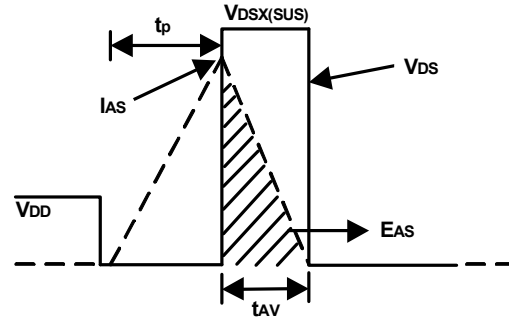
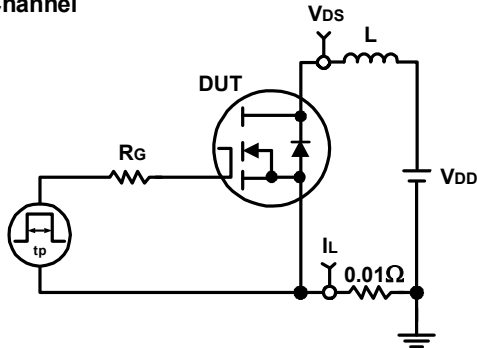


**P Channel Typical Operating Characteristics (Cont.)**

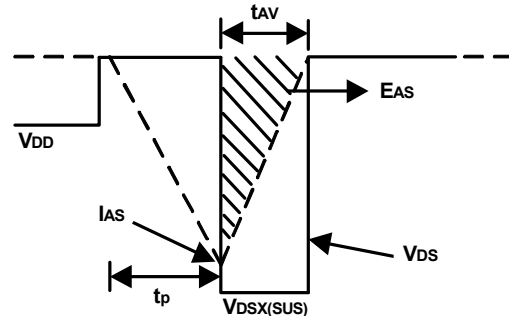
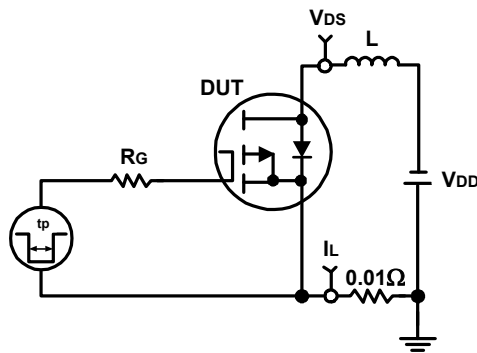


### Avalanche Test Circuit and Waveforms

N Channel

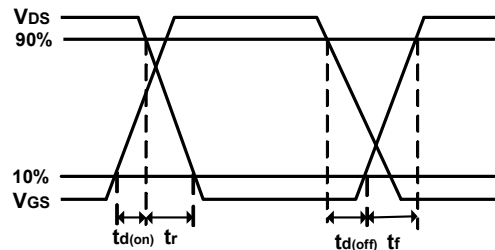
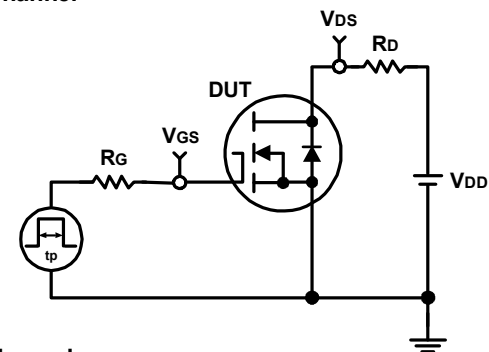


P Channel



### Switching Time Test Circuit and Waveforms

N Channel



P Channel

