XPX3013FD

N and P-Channel Enhancement Mode Power MOSFET

RoHS COMPLIANT

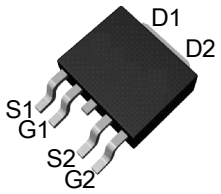
Features

- **N Channel**
  30V/20A,
  $R_{DS(ON)}$ = 14mΩ (typ.) @ V_{GS} = 10V
  $R_{DS(ON)}$ = 17mΩ (typ.) @ V_{GS} = 4.5V
- **P Channel**
  -30V/-20A,
  $R_{DS(ON)}$ = 24mΩ (typ.) @ V_{GS} =-10V
  $R_{DS(ON)}$ = 32mΩ (typ.) @ V_{GS} =-4.5V
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

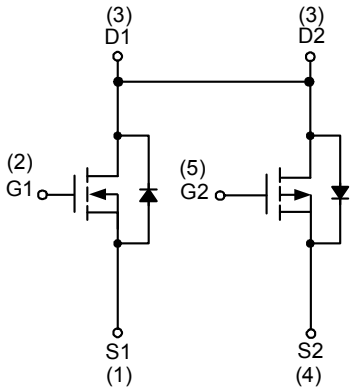
Applications

- Synchronous Rectification.
- Motor Fan Control.
- High Current, High Speed Switchin.
- H-bridge and Inverter.

Pin Description



Top View of TO-252-4



N-Channel MOSFET P-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
XPX3013	TO-252-4	XPX3013 XXX YYYY	2500

Absolute Maximum Ratings (T_A = 25°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	V
T_J	Maximum Junction Temperature		175		°C
T_{STG}	Storage Temperature Range		-55 to 175		°C
I_S	Diode Continuous Forward Current	T_C=25°C	20*	-20	A
I_{DP} [a]	Pulse Drain Current Tested	V_{GS}=10V(N),V_{GS}=-10V(P)	48*	-48*	A
I_D	Continuous Drain Current	T_C=25°C	20*	-20*	A
		T_C=70°C	20*	-20*	
P_D	Maximum Power Dissipation	T_C=25°C	24	24	W
		T_C=70°C	16	16	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	6.25	6.25	°C/W
I_D	Continuous Drain Current	T_A=25°C	20*	-20	A
		T_A=70°C	12*	-9.6	
P_D	Maximum Power Dissipation	T_A=25°C	7.5	7.5	W
		T_A=70°C	5.25	5.25	
$R_{\theta JA}$ [b]	Thermal Resistance-Junction to Ambient	t ≤ 10s	20	20	°C/W
		Steady State	60	60	
I_{AS} [c]	Avalanche Current, Single pulse	L=0.5mH	9	-9	A
E_{AS} [c]	Avalanche Energy, Single pulse	L=0.5mH	20	20	mJ

Note * : Max. current is limited by bonding wire.
Note a : Pulse width limited by max. junction temperature.
Note b : $R_{\theta JA}$ steady state t=999s. $R_{\theta JA}$ is measured with the device mounted on 1in^2, FR-4 board with 2oz. Copper.
Note c : UIS tested and pulse width limited by maximum junction temperature 175°C (initial temperature T_j=25°C).

N Channel Electrical Characteristics (T_A = 25°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}=250μA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=24V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.3	1.8	2.3	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$ [d]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=8A	-	14	18.4	mΩ
		V_{GS}=4.5V, I_{DS}=5A	-	17	25	
Diode Characteristics						
V_{SD} [d]	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/μs	-	10	-	ns
Q_{rr}	Reverse Recovery Charge		-	3.5	-	nC
Dynamic Characteristics [e]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	1.7	3.4	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz	-	545	708	pF
C_{oss}	Output Capacitance		-	95	-	
C_{rss}	Reverse Transfer Capacitance		-	55	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	6	-	ns
t_r	Turn-on Rise Time		-	8.6	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	16	-	
t_f	Turn-off Fall Time		-	3.6	-	
Gate Charge Characteristics [e]						
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=10V, I_{DS}=8A	-	10.8	16	nC
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=4.5V, I_{DS}=8A	-	5.2	7.8	
Q_{gth}	Threshold Gate Charge		-	0.6	-	
Q_{gs}	Gate-Source Charge		-	1	-	
Q_{gd}	Gate-Drain Charge		-	2.8	-	

Note d：Pulse test ; pulse width≤300μs, duty cycle≤2%.
Note e：Guaranteed by design, not subject to production testing.

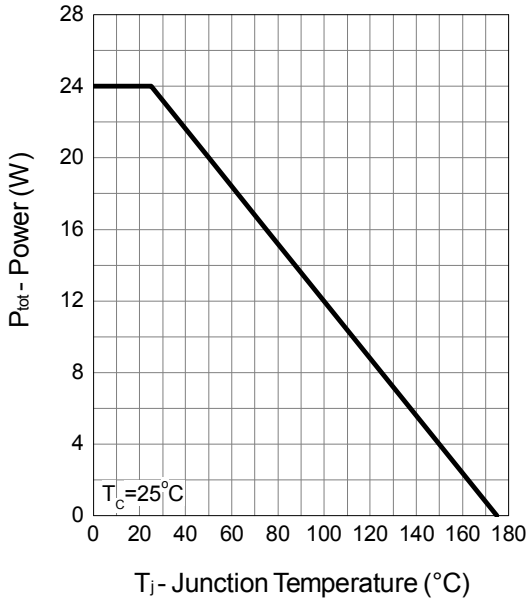
P Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=-250μA	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-24V, V_{GS}=0V	-	-	-1	μA
		T_J=85°C	-	-	-30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=-250μA	-1.3	-1.8	-2.3	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$ [d]	Drain-Source On-state Resistance	V_{GS}=-10V, I_{DS}=-12A	-	24	33.5	mΩ
		V_{GS}=-4.5V, I_{DS}=-5A	-	32	44	
Diode Characteristics						
V_{SD} [d]	Diode Forward Voltage	I_{SD}=-1A, V_{GS}=0V	-	-0.75	-1	V
t_{rr}	Reverse Recovery Time	I_{DS}=-12A, dI_{SD}/dt=100A/μs	-	11	-	ns
Q_{rr}	Reverse Recovery Charge		-	4	-	nC
Dynamic Characteristics [e]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	3.3	6.6	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, Frequency=1.0MHz	-	580	754	pF
C_{oss}	Output Capacitance		-	105	-	
C_{rss}	Reverse Transfer Capacitance		-	72	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-15V, R_L=15Ω, I_{DS}=-1A, V_{GEN}=-10V, R_G=6Ω	-	8.7	-	ns
t_r	Turn-on Rise Time		-	10	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	22	-	
t_f	Turn-off Fall Time		-	9	-	
Gate Charge Characteristics [e]						
Q_g	Total Gate Charge	V_{DS}=-15V, V_{GS}=-10V, I_{DS}=-12A	-	13	-	nC
Q_{gs}	Gate-Source Charge		-	1	-	
Q_{gd}	Gate-Drain Charge		-	4	-	

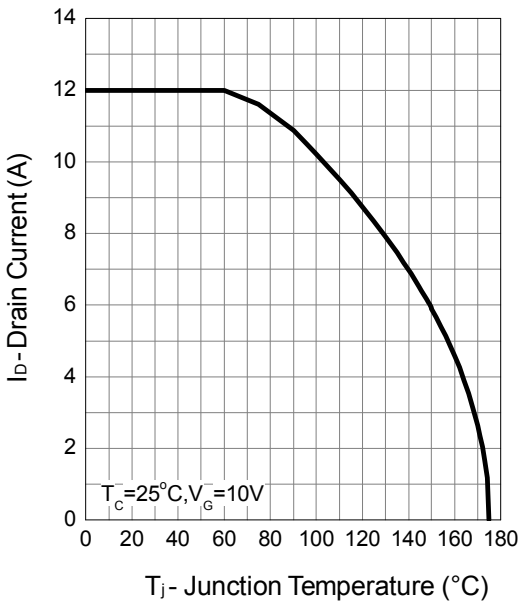
Note d：Pulse test; pulse width≤300μs, duty cycle≤2%.
Note e：Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

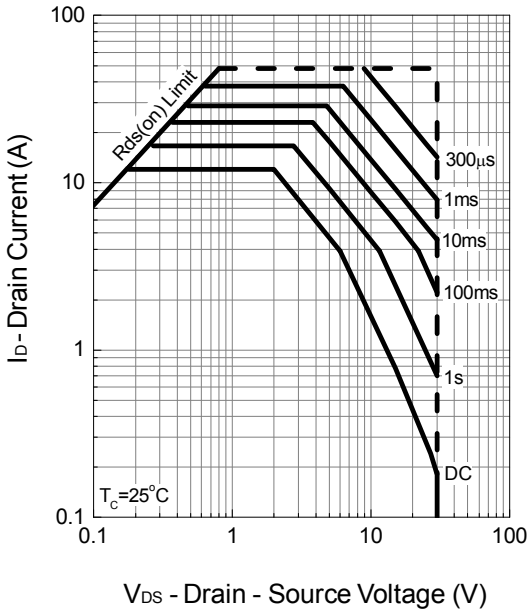
Power Dissipation



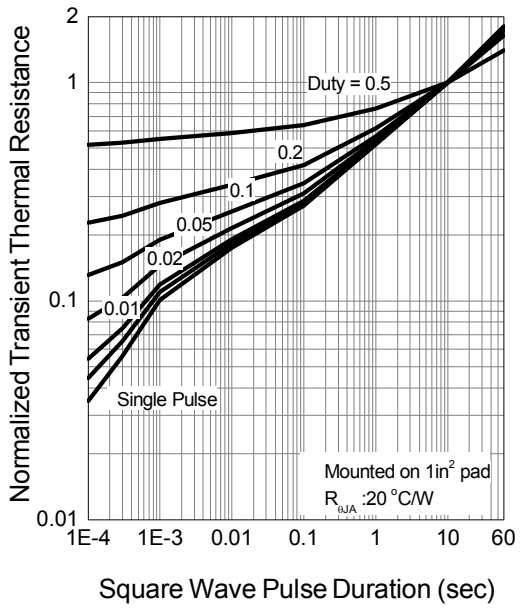
Drain Current



Safe Operation Area

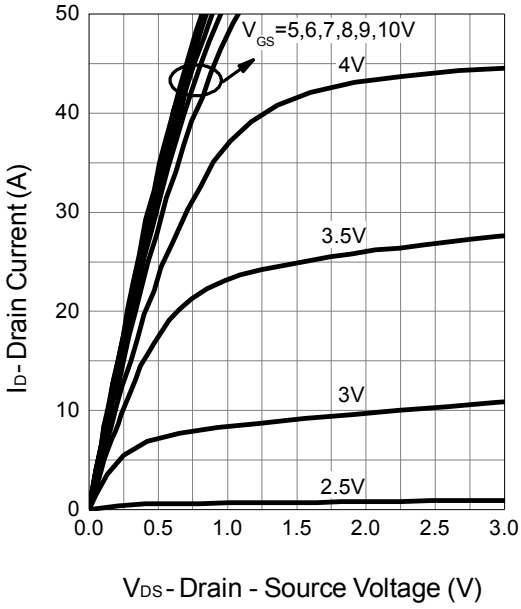


Thermal Transient Impedance

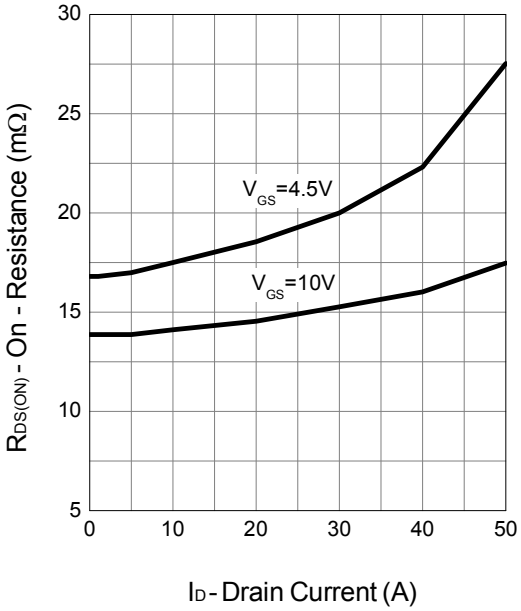


N Channel Typical Operating Characteristics (Cont.)

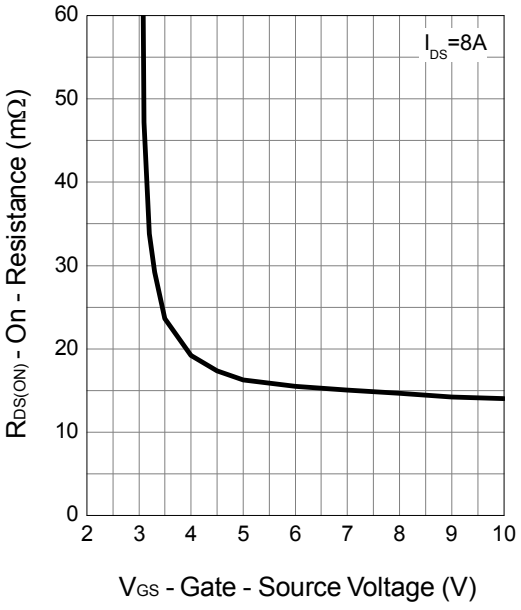
Output Characteristics



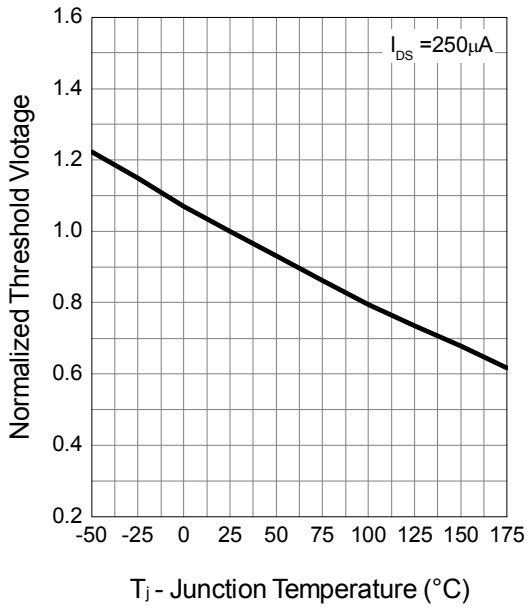
Drain-Source On Resistance



Gate-Source On Resistance

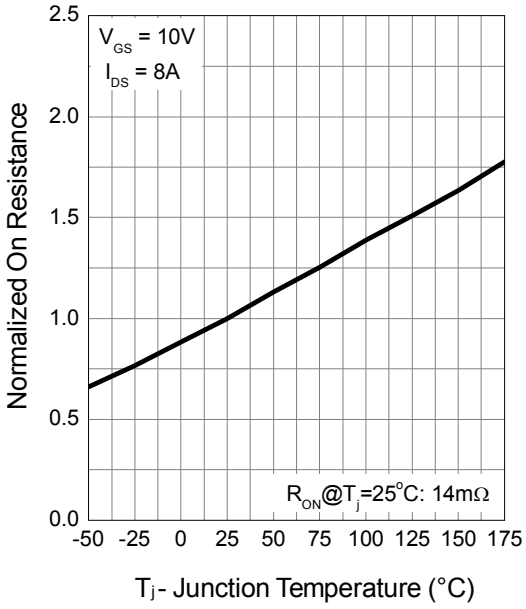


Gate Threshold Voltage

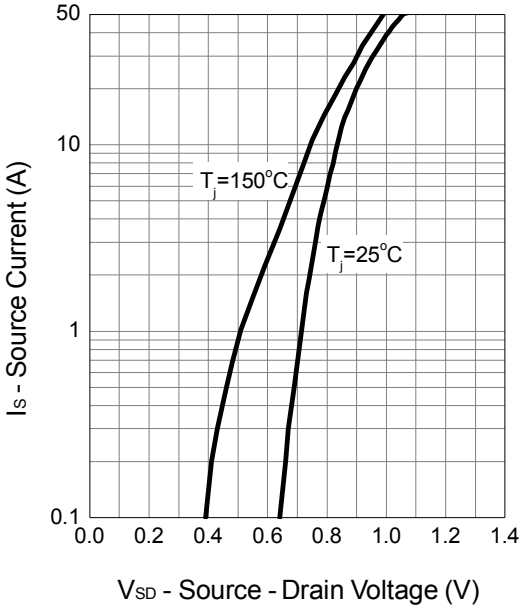


N Channel Typical Operating Characteristics (Cont.)

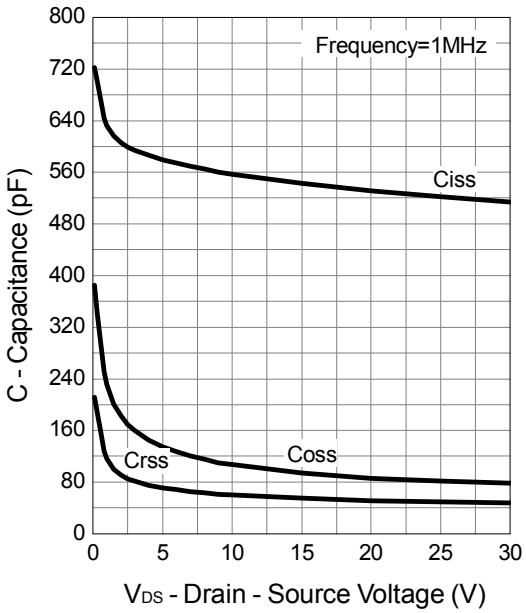
Drain-Source On Resistance



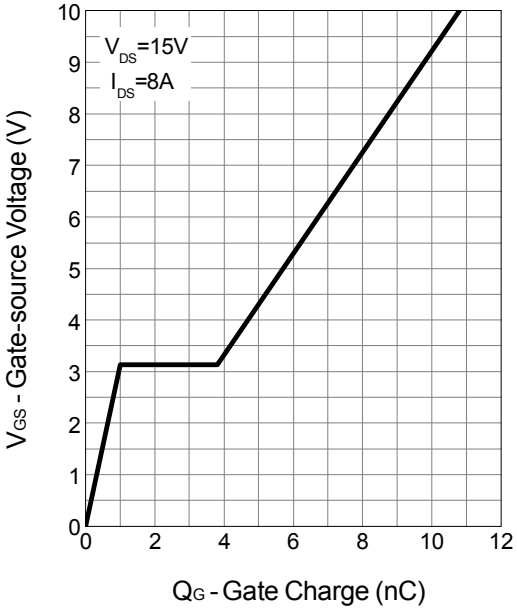
Source-Drain Diode Forward



Capacitance

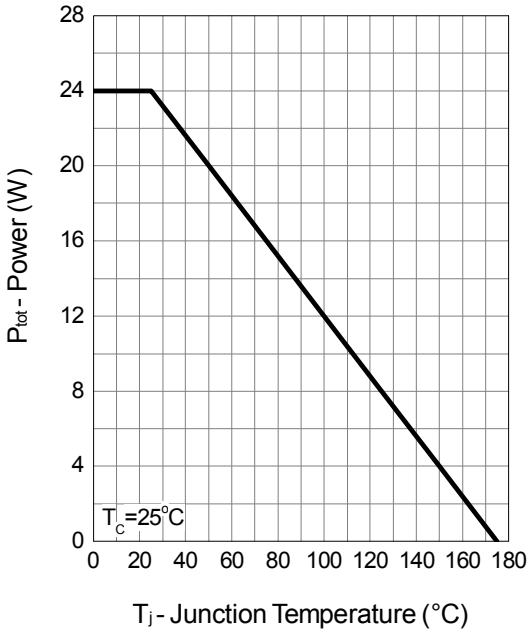


Gate Charge

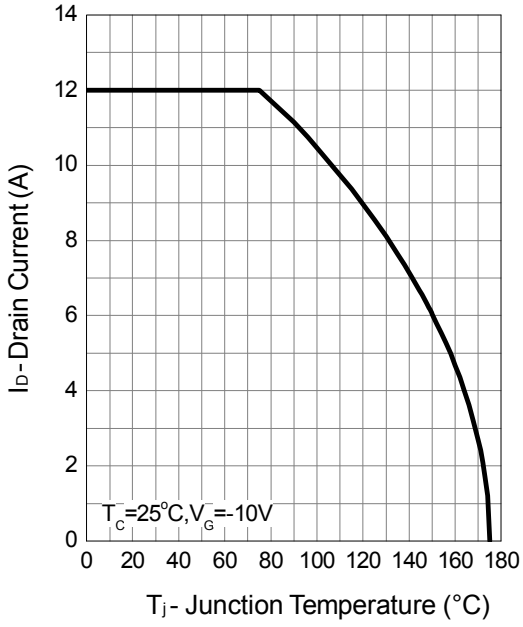


P Channel Typical Operating Characteristics

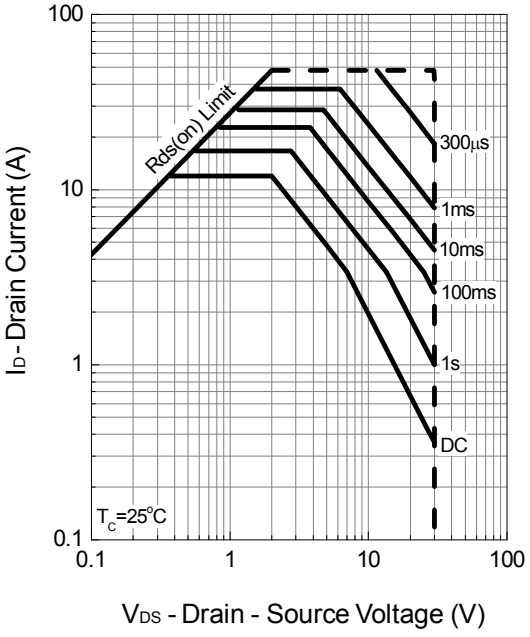
Power Dissipation



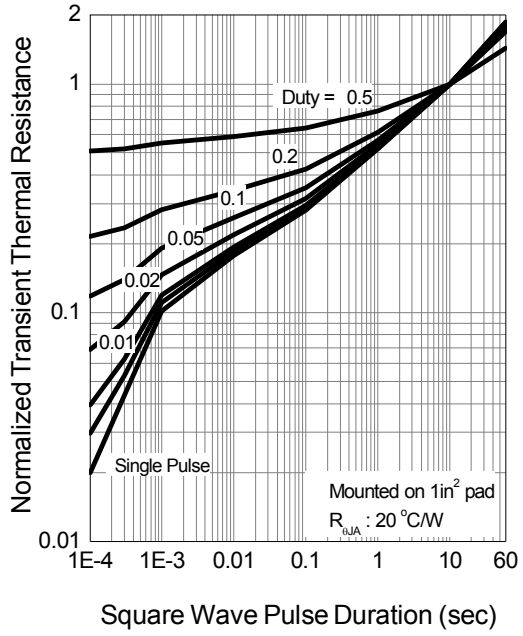
Drain Current



Safe Operation Area

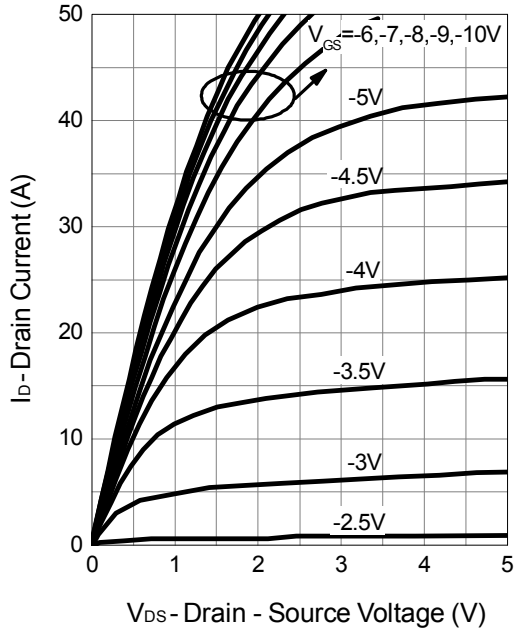


Thermal Transient Impedance

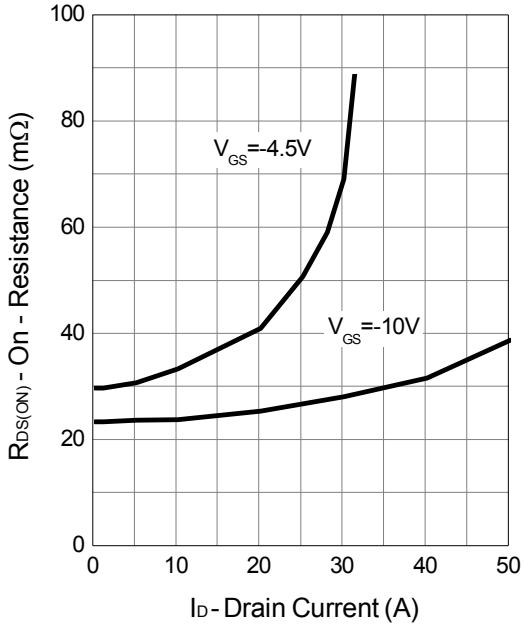


P Channel Typical Operating Characteristics (Cont.)

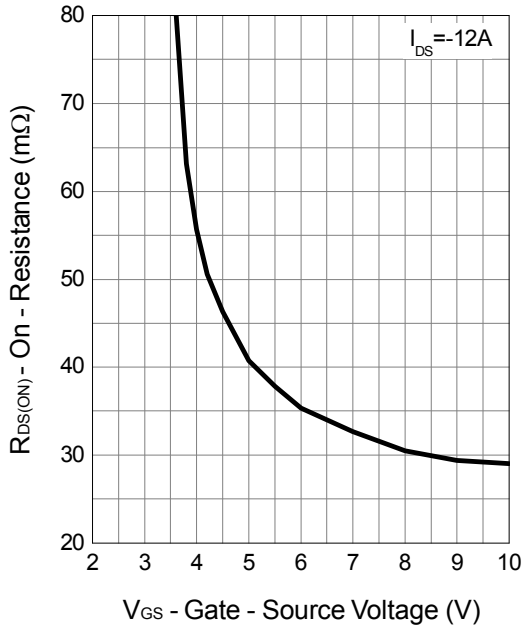
Output Characteristics



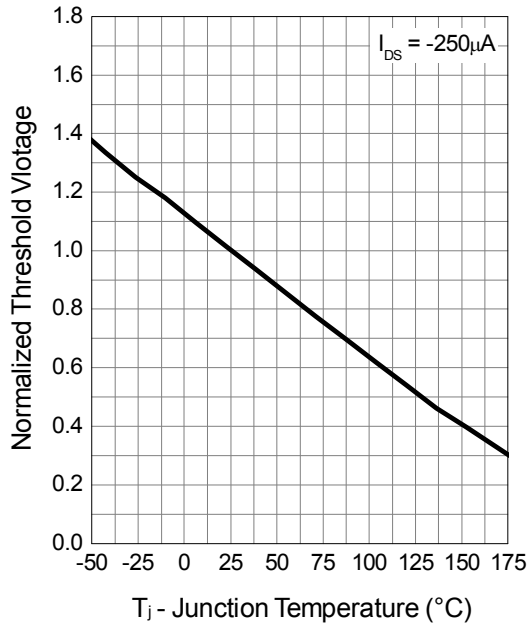
Drain-Source On Resistance



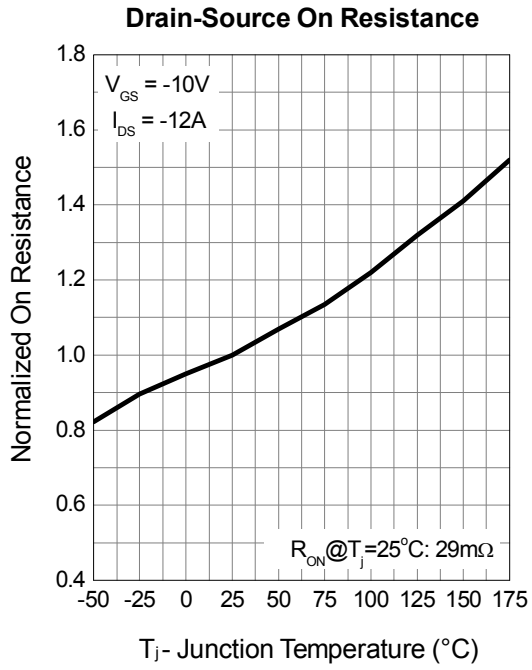
Gate-Source On Resistance

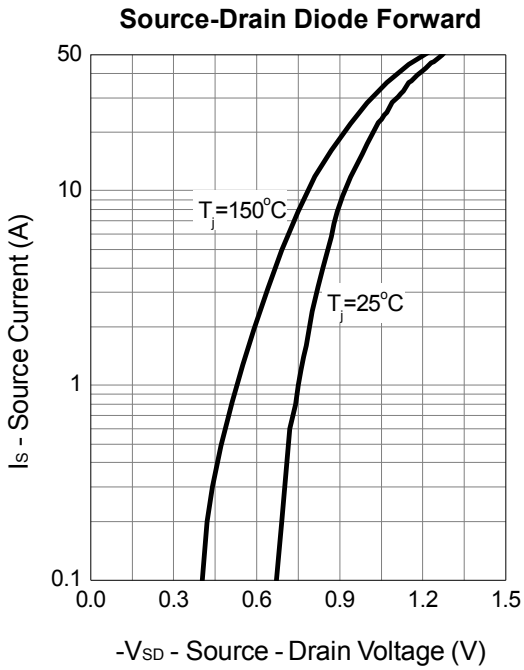


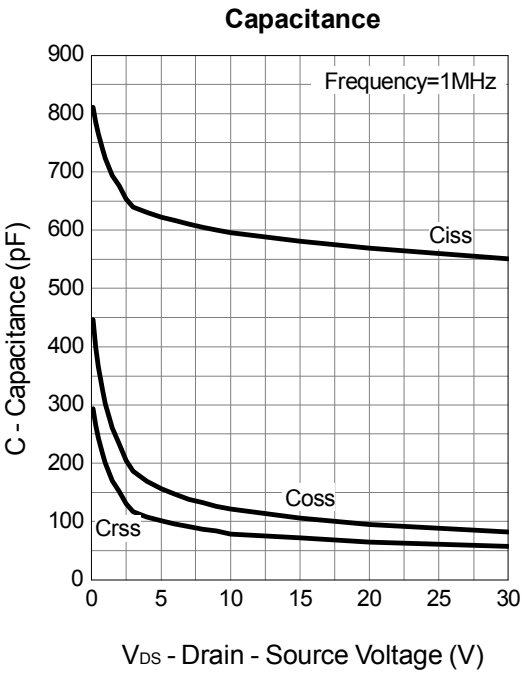
Gate Threshold Voltage

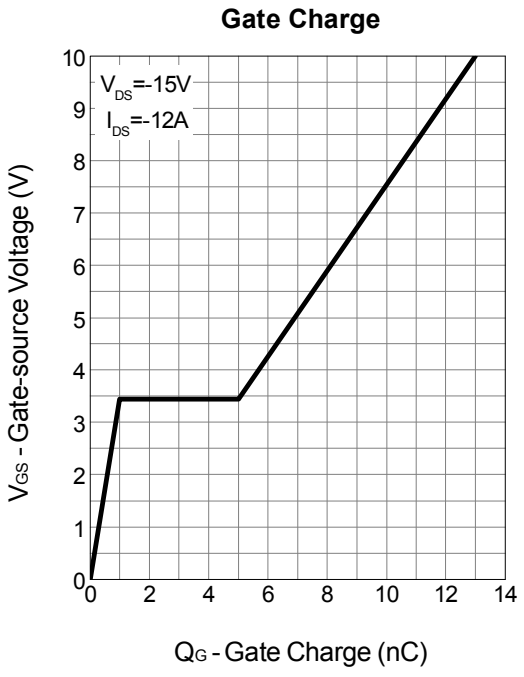


P Channel Typical Operating Characteristics (Cont.)



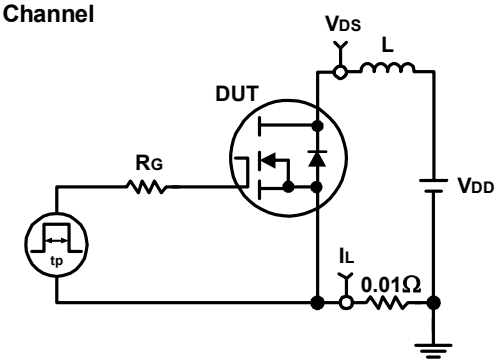


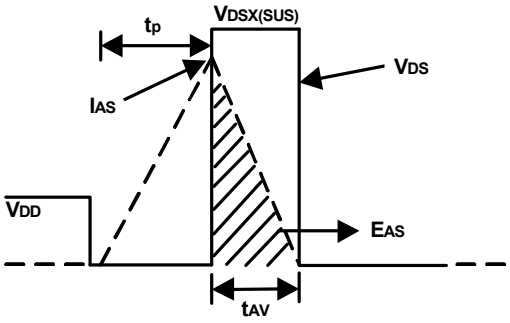




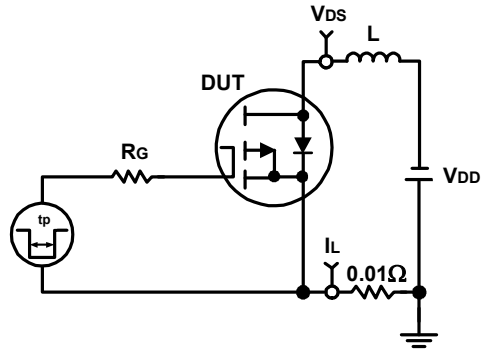
Avalanche Test Circuit and Waveforms

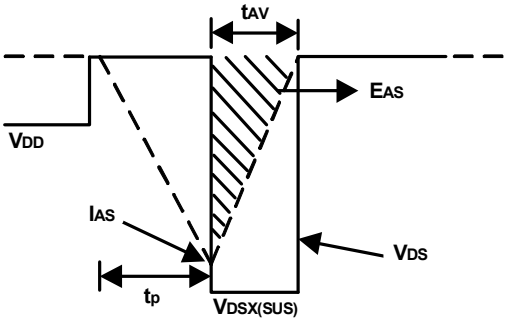
N Channel





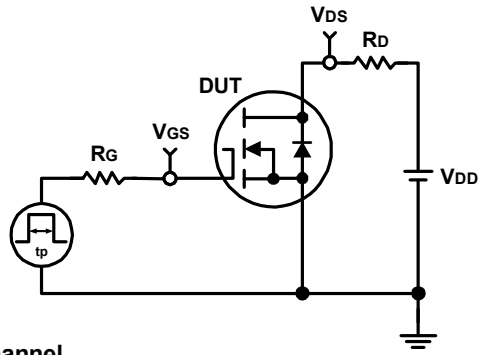
P Channel

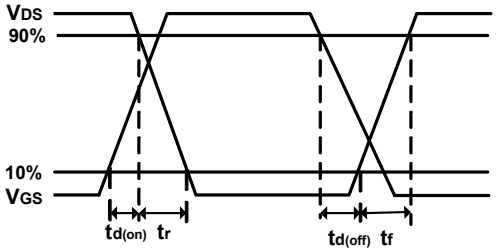




Switching Time Test Circuit and Waveforms

N Channel





P Channel