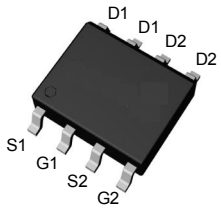
60V N+P-Channel Enhancement Mode MOSFET

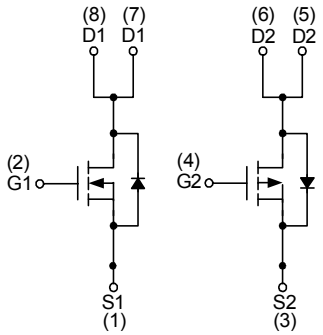
Features

- N-Channel
  60V/5.1A,
  $R_{DS(ON)}$ =33mΩ(typ.) @ V_{GS} = 10V
  $R_{DS(ON)}$ =37mΩ(typ.) @ V_{GS} = 4.5V
- P-Channel
  -60V/-3.7A,
  $R_{DS(ON)}$ =75mΩ(typ.) @ V_{GS} =-10V
  $R_{DS(ON)}$ =95mΩ(typ.) @ V_{GS} =-4.5V
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

Pin Description



Top View of SOP–8



N-Channel MOSFET P-Channel MOSFET

Applications

- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems.

Symbol	Parameter		N Channel	P Channel	Unit
Common Ratings					
V_{DSS}	Drain-Source Voltage		60	-60	V
V_{GSS}	Gate-Source Voltage		±20	±20	
T_J	Maximum Junction Temperature		150		°C
T_{STG}	Storage Temperature Range		-55 to 150		
I_S	Diode Continuous Forward Current	T_A=25°C	2.5	-1	A
I_D	Continuous Drain Current	T_A=25°C	5.1	-3.7	
I_{DM}[a]	Pulsed Drain Current	T_A=25°C	20	-14	
P_D	Power Dissipation	T_A=25°C	2	2	W
		T_A=70°C	1.3	1.3	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	t ≤ 10s	62.5	62.5	°C/W
		Steady State	90	90	
$R_{\theta JL}$	Thermal Resistance-Junction to Lead	Steady State	50	50	
I_{AS}[b]	Avalanche Current, Single pulse (L=0.1mH)		16	-18	A
E_{AS}[b]	Avalanche Energy, Single pulse (L=0.1mH)		12	16	mJ

Note a：Pulse width limited by max. junction temperature.
Note b：UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature Tj=25°C).

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	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=48V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1	2	3	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=5A	-	33	40	mΩ
		V_{GS}=4.5V, I_{DS}=4A	-	37	48	
Diode Characteristics						
V_{SD}	Diode Forward Voltage	I_{SD}=2.5A, V_{GS}=0V	-	0.8	1.3	V
t_{rr}	Reverse Recovery Time	I_{DS}=5A, dI_{SD}/dt=100A/μs	-	20	-	ns
Q_{rr}	Reverse Recovery Charge		-	20	-	nC
Dynamic Characteristics						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	3	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=30V, Frequency=1.0MHz	-	670	940	pF
C_{oss}	Output Capacitance		-	70	-	
C_{rss}	Reverse Transfer Capacitance		-	35	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=30V, R_L=30Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	8	15	ns
t_r	Turn-on Rise Time		-	6	11	
$t_{d(OFF)}$	Turn-off Delay Time		-	23	42	
t_f	Turn-off Fall Time		-	6	11	
Gate Charge Characteristics						
Q_g	Total Gate Charge	V_{DS}=30V, V_{GS}=4.5V, I_{DS}=5A	-	7	-	nC
Q_g	Total Gate Charge	V_{DS}=30V, V_{GS}=10V, I_{DS}=5A	-	14	20	
Q_{gs}	Gate-Source Charge		-	2.6	-	
Q_{gd}	Gate-Drain Charge		-	2.6	-	
Q_{gth}	Threshold Gate Charge		-	2.2	-	

Package Marking and Ordering Information

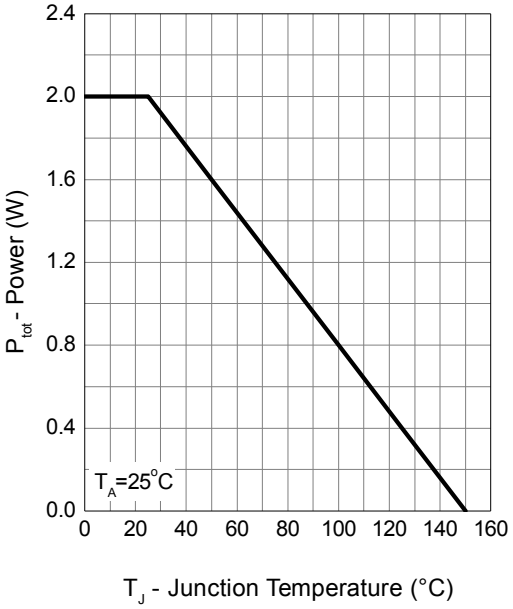
Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
XPX4612XS	4612	SOP-8	-	-	-

Electrical Characteristics (Cont.) (T_A = 25°C unless otherwise noted)

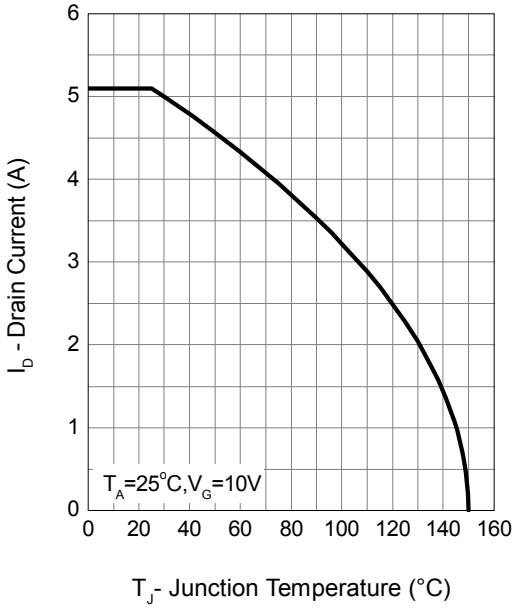
Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=-250μA	-60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-48V, V_{GS}=0V	-	-	-1	μA
		T_J=85°C	-	-	-30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_{DS}=-250μA	-1.5	-2	-2.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=-10V, I_{DS}=-3.7A	-	75	95	mΩ
		V_{GS}=-4.5V, I_{DS}=-2A	-	95	130	
Diode Characteristics						
V_{SD}	Diode Forward Voltage	I_{SD}=-1A, V_{GS}=0V	-	-0.7	-1	V
t_{rr}	Reverse Recovery Time	I_{sd}=-3.7A, dI_{SD}/dt=100A/μs	-	20	-	ns
Q_{rr}	Reverse Recovery Charge		-	15	-	nC
Dynamic Characteristics						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	10	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-30V, Frequency=1.0MHz	-	500	-	pF
C_{oss}	Output Capacitance		-	66	-	
C_{rss}	Reverse Transfer Capacitance		-	32	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-30V, R_L=30Ω, I_{DS}=-1A, V_{GEN}=-10V, R_G=6Ω	-	7.5	-	ns
t_r	Turn-on Rise Time		-	4.5	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	38	-	
t_f	Turn-off Fall Time		-	28	-	
Gate Charge Characteristics						
Q_g	Total Gate Charge	V_{DS}=-30V, V_{GS}=-4.5V, I_{DS}=-3.7A	-	6	-	nC
Q_g	Total Gate Charge	V_{DS}=-30V, V_{GS}=-10V, I_{DS}=-3.7A	-	12	-	
Q_{gs}	Gate-Source Charge		-	1.3	-	
Q_{gd}	Gate-Drain Charge		-	1.5	-	
Q_{gth}	Threshold Gate Charge		-	3	-	

N Channel Typical Operating Characteristics

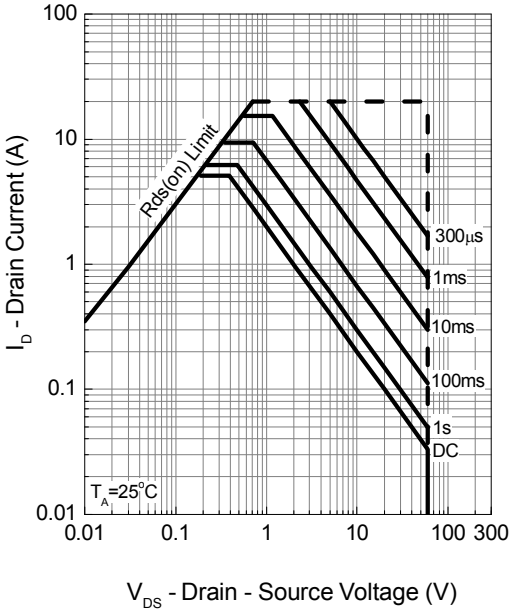
Power Dissipation



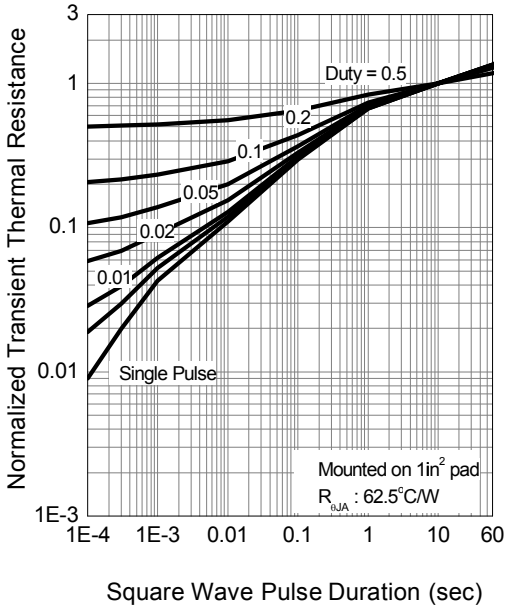
Drain Current



Safe Operation Area

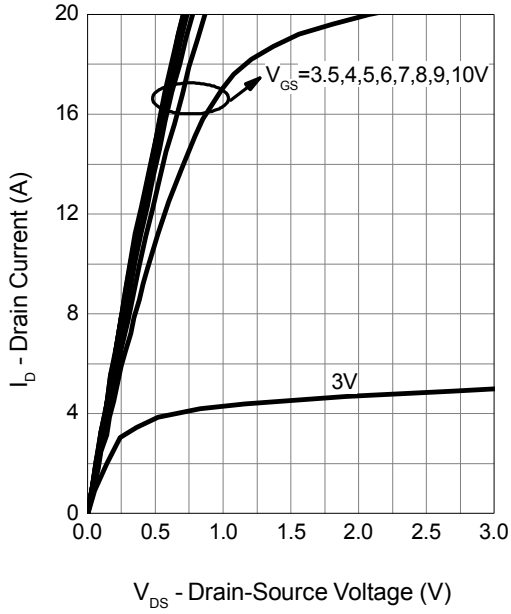


Thermal Transient Impedance

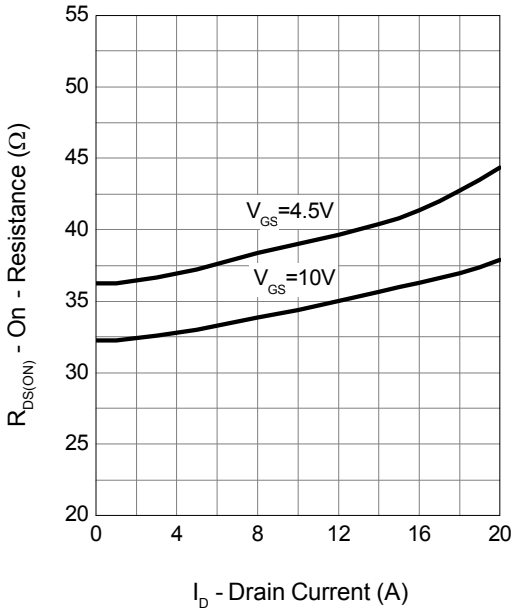


N Channel Typical Operating Characteristics (Cont.)

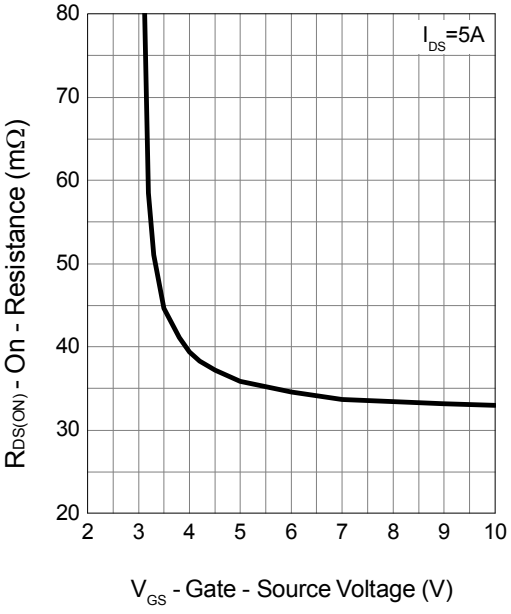
Output Characteristics



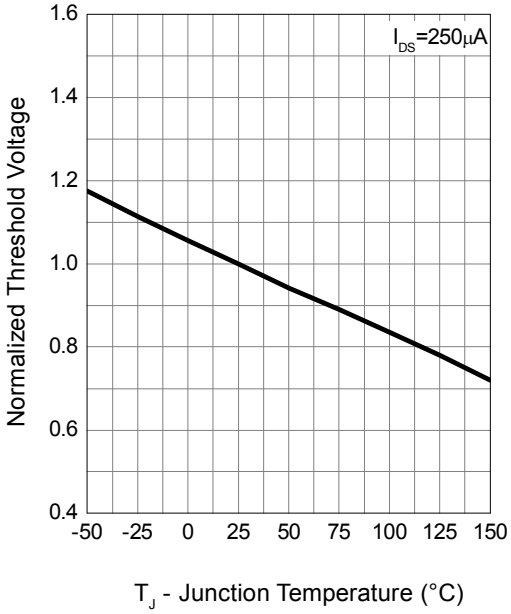
Drain-Source On Resistance



Transfer Characteristics

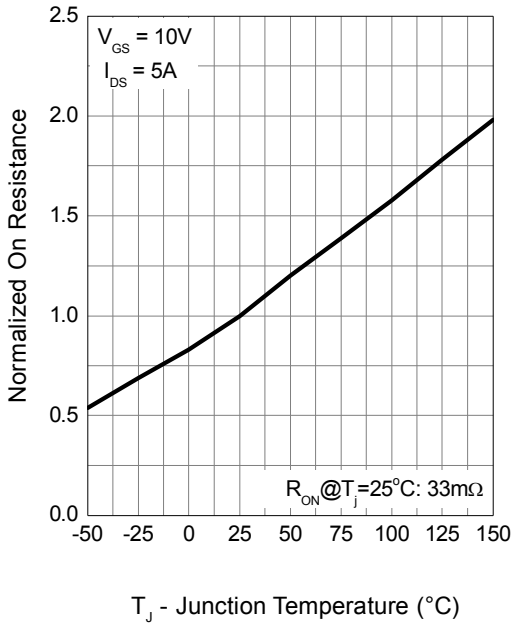


Gate Threshold Voltage



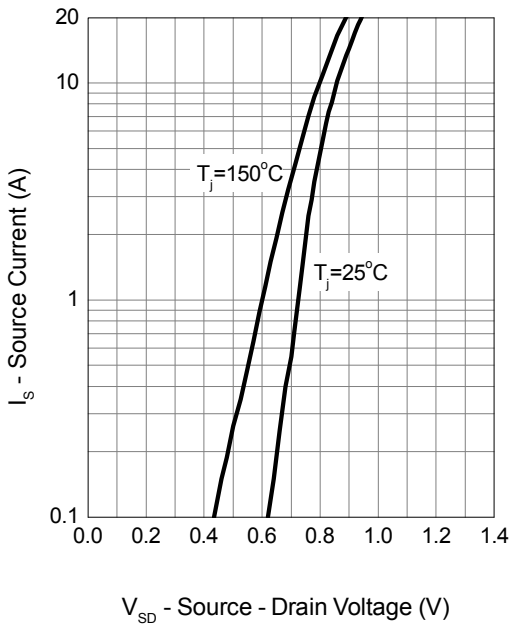
N Channel Typical Operating Characteristics (Cont.)

Drain-Source On Resistance



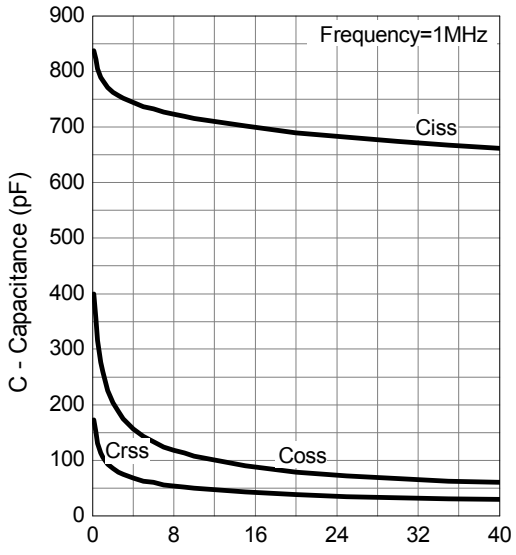
T_J - Junction Temperature (°C)

Source-Drain Diode Forward



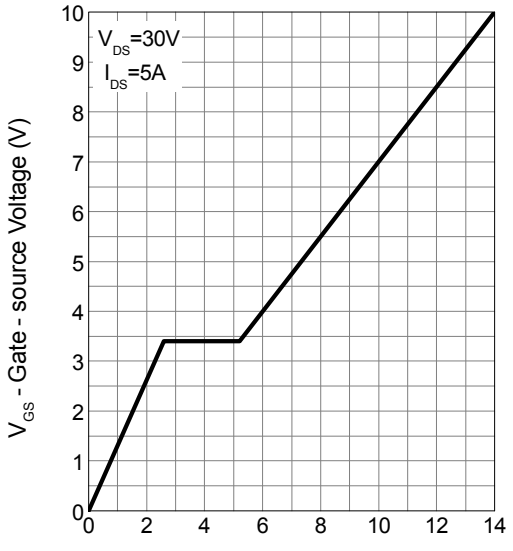
V_{SD} - Source - Drain Voltage (V)

Capacitance



V_{DS} - Drain - Source Voltage (V)

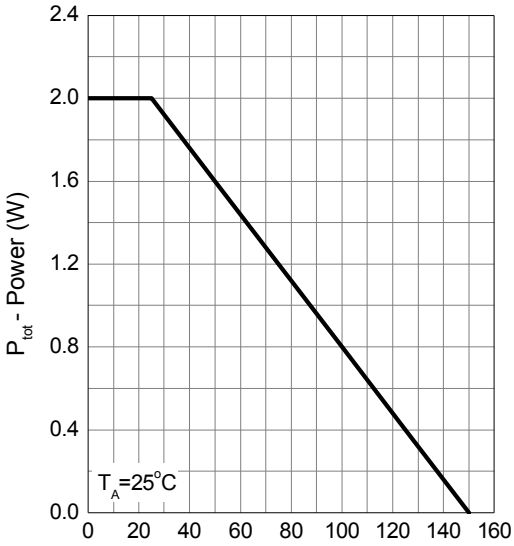
Gate Charge



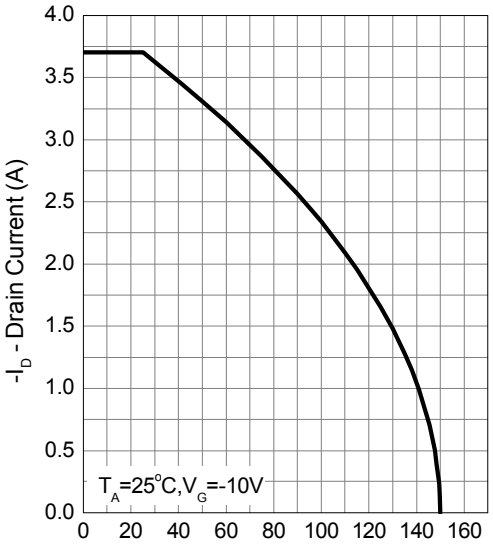
Q_G - Gate Charge (nC)

P Channel Typical Operating Characteristics

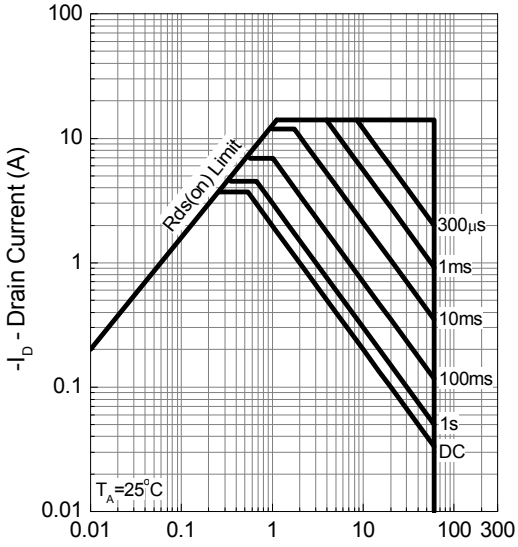
Power Dissipation



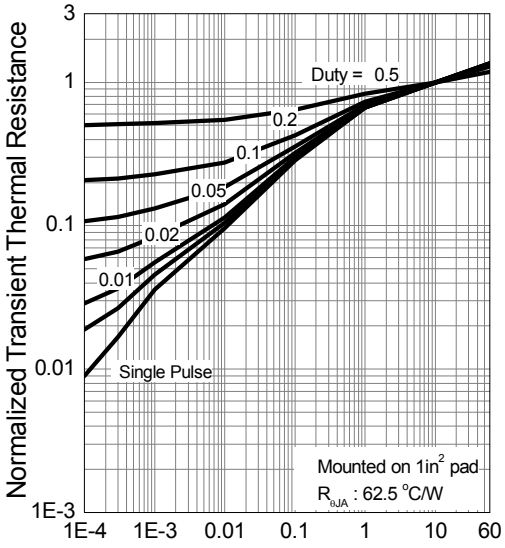
Drain Current



Safe Operation Area

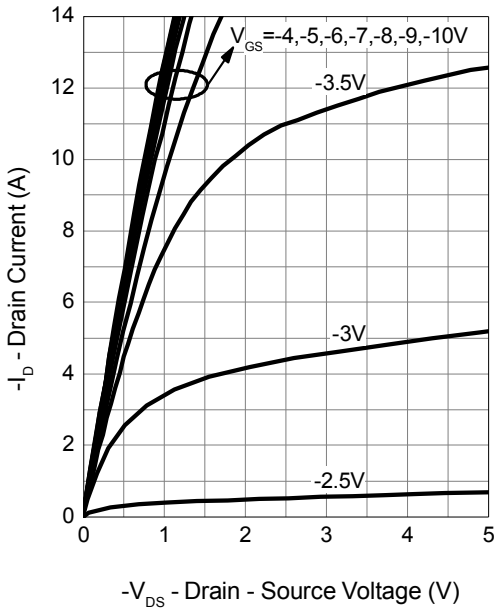


Thermal Transient Impedance

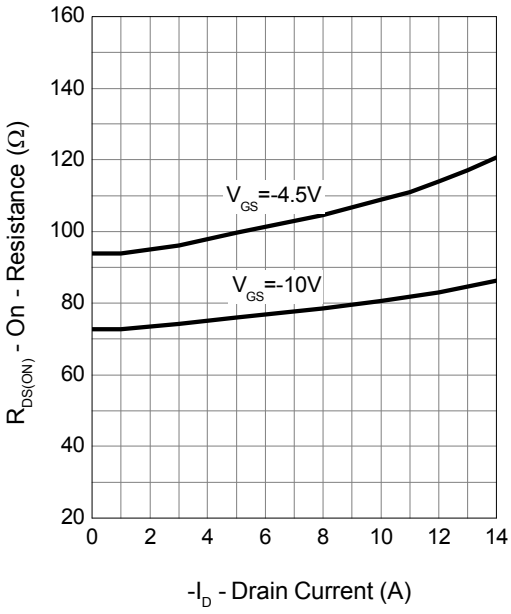


P Channel Typical Operating Characteristics (Cont.)

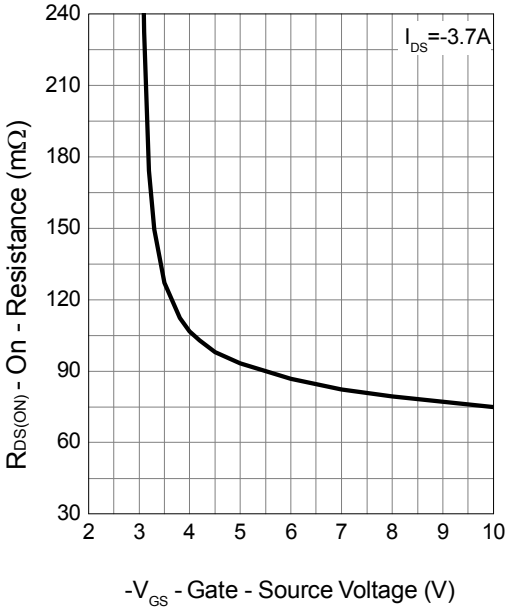
Output Characteristics



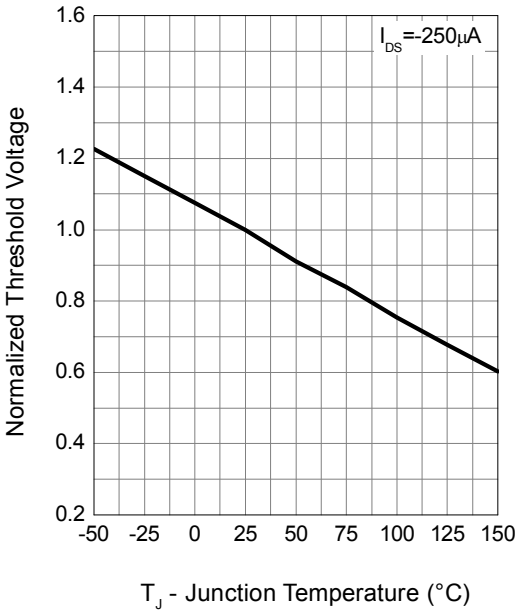
Drain-Source On Resistance



Transfer Characteristics

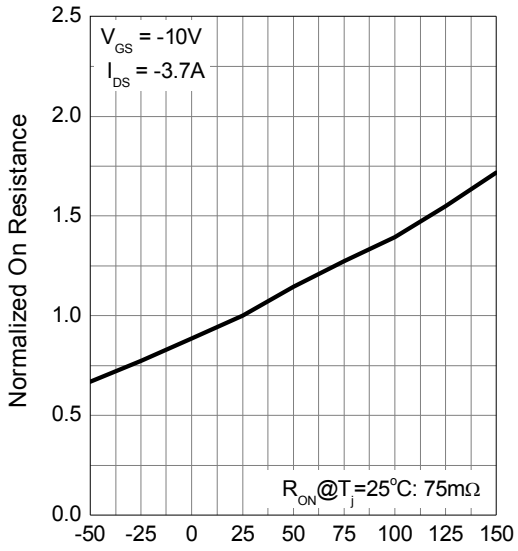


Gate Threshold Voltage



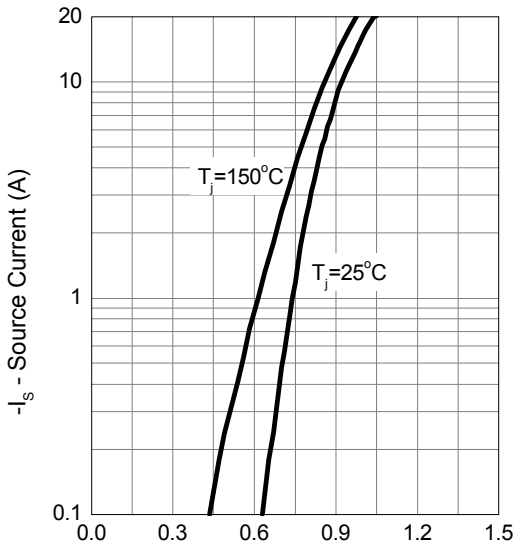
P Channel Typical Operating Characteristics (Cont.)

Drain-Source On Resistance



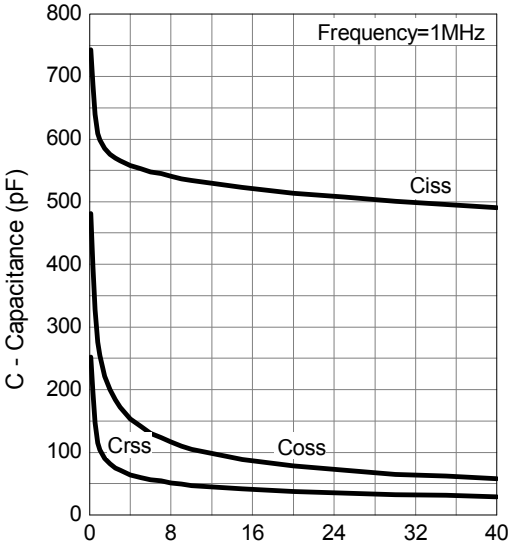
T_J- Junction Temperature (°C)

Source-Drain Diode Forward



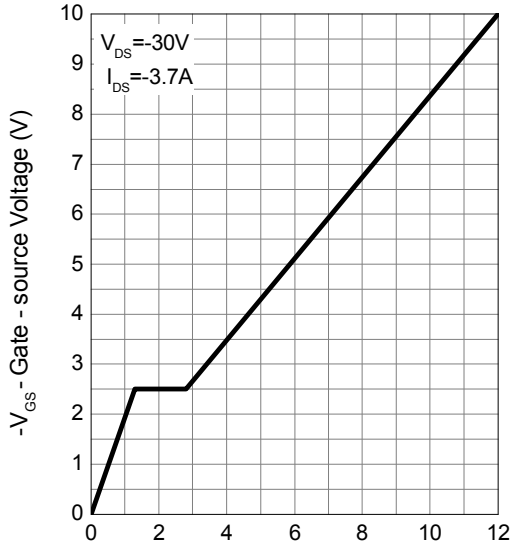
$-V_{SD}$ - Source - Drain Voltage (V)

Capacitance



$-V_{DS}$ - Drain - Source Voltage (V)

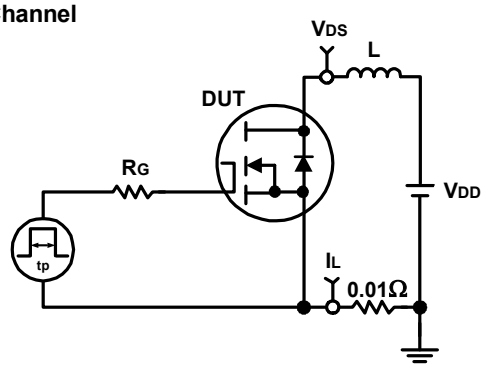
Gate Charge

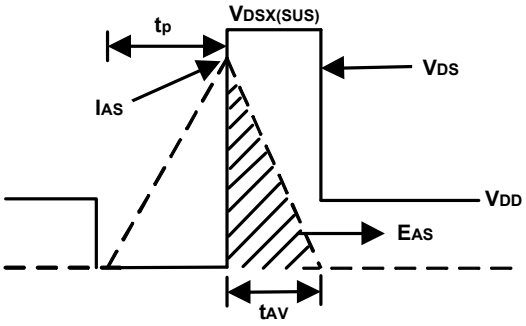


Q_G - Gate Charge (nC)

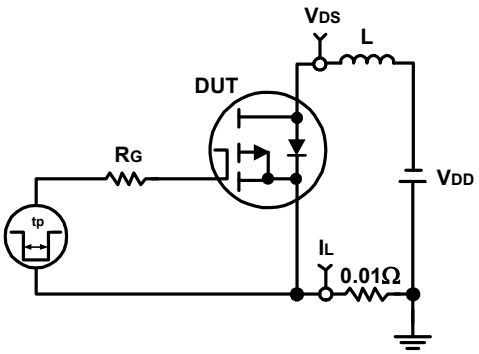
Avalanche Test Circuit and Waveforms

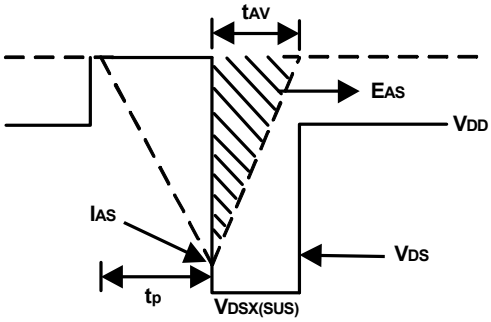
N Channel





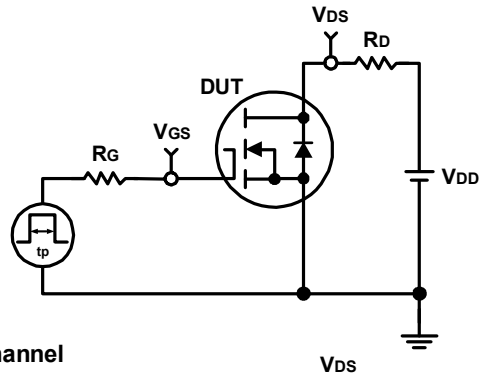
P Channel

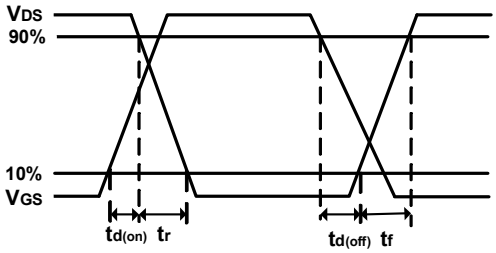




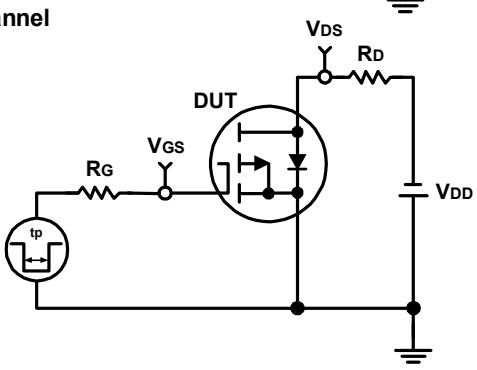
Switching Time Test Circuit and Waveforms

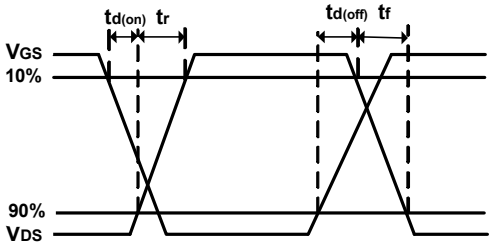
N Channel





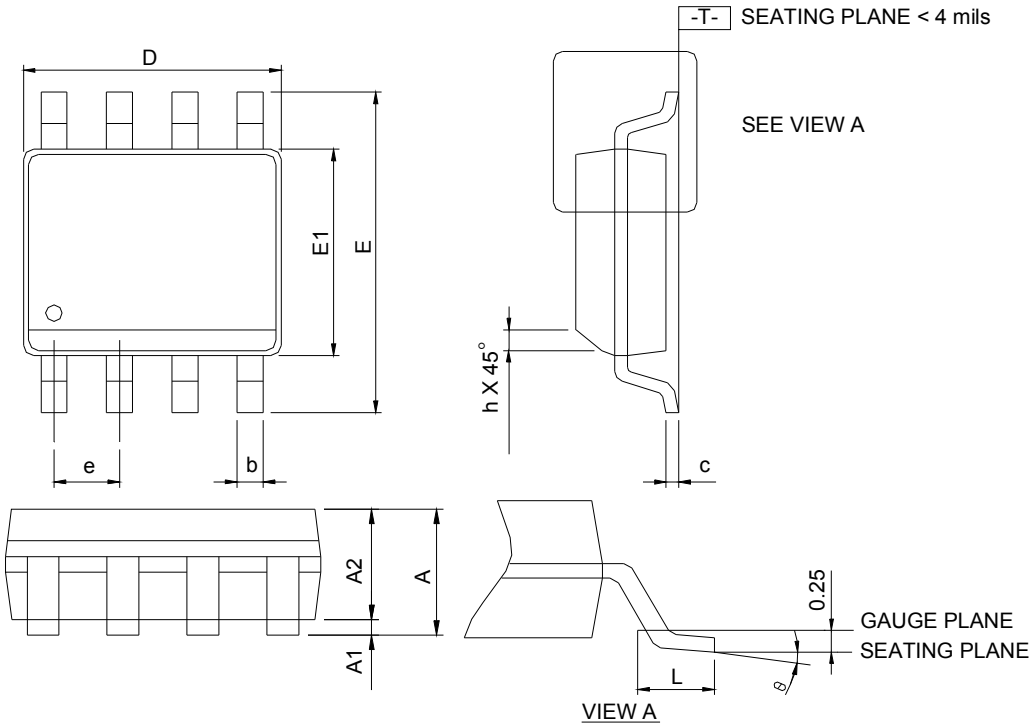
P Channel





Package Information

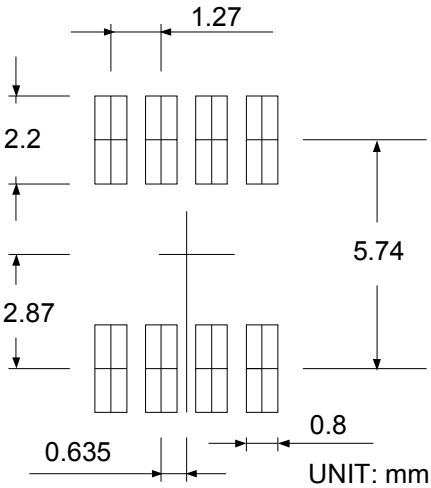
SOP-8



SYMBOL	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°

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.

RECOMMENDED LAND PATTERN



Flow (wave) soldering (solder dipping)

Product	Peak Temperature	Dipping Time
Pb device	245℃±5℃	5sec±1sec
Pb-Free device	260℃+0/-5℃	5sec±1sec

This integrated circuit can be damaged by ESD UniverChip Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedure can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Attention:

- Any and all XPX power products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your XPX power representative nearest you before using any XPX power products described or contained herein in such applications.

- XPX power assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all XPX power products described or contained herein.

- Specifications of any and all XPX power products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

- XPX power Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

- In the event that any or all XPX power products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of XPX power Semiconductor CO.,LTD.

- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. XPX power believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

- Any and all information described or contained herein are subject to change without notice due to product/ technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the XPX power product that you intend to use.

- This catalog provides information as of Sep.2019. Specifications and information herein are subject to change without notice.