

MT3013N3

30V Complementary Power MOSFET



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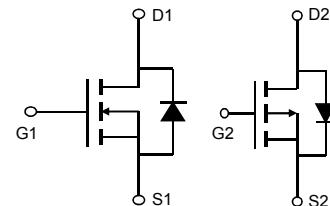
Features

- N-Channel
30V/20A
 $R_{DS(ON)} = 7m\Omega$ (typ) @ $VGS = 10V$
 $R_{DS(ON)} = 11m\Omega$ (typ) @ $VGS = 4.5V$
- P-Channel
-30V/-19A
 $R_{DS(ON)} = 13m\Omega$ (typ) @ $VGS = -10V$
 $R_{DS(ON)} = 19m\Omega$ (typ) @ $VGS = -4.5V$
- RoHS Compliant

General Description

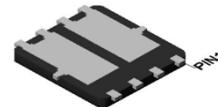
This complementary MOSFET device is produced using Mos-tech's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

Simplified Schematic

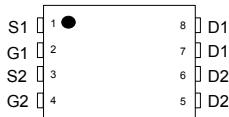


MARKING DIAGRAM & PIN ASSIGNMENT

DFN3X3-8L



Top View



Applications

- DC-DC converter
- Power management
- LCD backlight inverter

Absolute Maximum Ratings

Symbol	Parameter	N-CH	P-CH	Units
V_{DSS}	Drain-Source Voltage	30	-30	V
V_{GSS}	Gate-Source Voltage	± 20	± 20	V
I_D	Drain Current - Continuous - Pulsed	20	-19	A
		51	-47	
P_D	Power Dissipation for Dual Operation	18		W
	Power Dissipation for Single Operation (Note 1a)	3.6		
	(Note 1b)	2.2		
	(Note 1c)	3.1		
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	75	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	45	°C/W

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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$ $V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	N-CH P-CH	30 -30	-	-	V
ΔBV_{DSS} ΔT_J	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C $I_D = -250 \mu\text{A}$, Referenced to 25°C	N-CH P-CH	-	21 -13	-	$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$	N-CH P-CH	-	-	1 -1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	N-CH P-CH	-	-	± 100 ± 100	nA

On Characteristics (Note 2)

$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$ $V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	N-CH P-CH	1 -1	1.6 -1.5	2.8 -2.8	V
$\Delta V_{GS(\text{th})}$ ΔT_J	Gate Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C $I_D = -250 \mu\text{A}$, Referenced to 25°C	N-CH P-CH	-	-3.6 -3.6	-	$\text{mV}/^\circ\text{C}$
$R_{DS(\text{on})}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 3.0 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 2.0 \text{ A}$	N-CH	-	7 11	10 16	$\text{m}\Omega$
		$V_{GS} = -10 \text{ V}, I_D = -3.0 \text{ A}$ $V_{GS} = -4.5 \text{ V}, I_D = -2.0 \text{ A}$	P-CH	-	13 19	19 29	
$I_{D(\text{on})}$	On-State Drain Current	$V_{GS} = 10 \text{ V}, V_{DS} = 5 \text{ V}$ $V_{GS} = -10 \text{ V}, V_{DS} = -5 \text{ V}$	N-CH P-CH	20 -19	-	-	A
g_{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 4.5 \text{ A}$ $V_{DS} = -5 \text{ V}, I_D = -3.5 \text{ A}$	N-CH P-CH	-	19 15	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	N-CH $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$	N-CH P-CH	-	652 81	-	pF
C_{oss}	Output Capacitance	P-CH	N-CH P-CH	-	46 23	-	pF
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$	N-CH P-CH	-	73 36	-	pF

Switching Characteristics (Note 2)

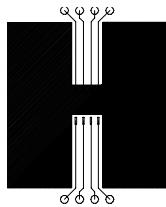
$t_{d(\text{on})}$	Turn-On Delay Time	N-CH $V_{DD} = 10 \text{ V}, I_D = 1 \text{ A},$ $V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 1 \Omega$	N-CH P-CH	-	4 6	-	ns
t_r	Turn-On Rise Time	P-CH $V_{DD} = -10 \text{ V}, I_D = -1 \text{ A},$ $V_{GS} = -10 \text{ V}, R_{\text{GEN}} = 1 \Omega$	N-CH P-CH	-	7.8 14	-	ns
$t_{d(\text{off})}$	Turn-Off Delay Time	N-CH P-CH	-	23 28	-	-	ns
t_f	Turn-Off Fall Time	N-CH P-CH	-	8 13	-	-	ns
Q_g	Total Gate Charge	N-CH $V_{DS} = 10 \text{ V}, I_D = 4.5 \text{ A}, V_{GS} = 10 \text{ V}$	N-CH P-CH	-	22 25	-	nC
Q_{gs}	Gate-Source Charge	P-CH $V_{DS} = -10 \text{ V}, I_D = -3.5 \text{ A}, V_{GS} = -10 \text{ V}$	N-CH P-CH	-	1.2 0.9	-	nC
Q_{gd}	Gate-Drain Charge	N-CH P-CH	-	2.5 1.9	-	-	nC

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

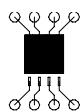
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-CH P-CH	-	-	1.4 -1.4	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}$, $I_S = 1 \text{ A}$ (Note 2) $V_{GS} = 0 \text{ V}$, $I_S = -3.5 \text{ A}$ (Note 2)	N-CH P-CH	-	0.8 -0.9	-	V

Notes:

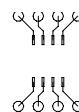
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper



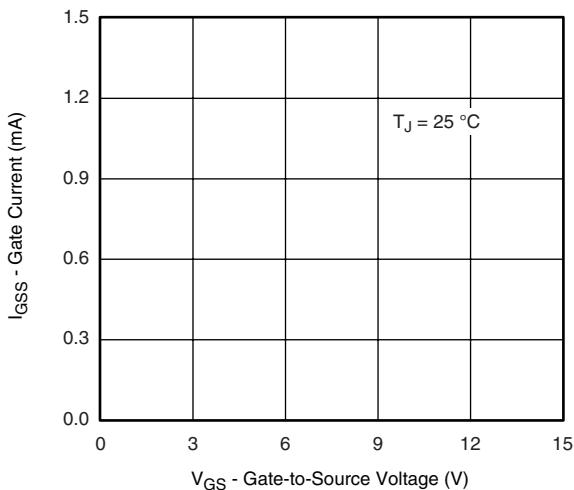
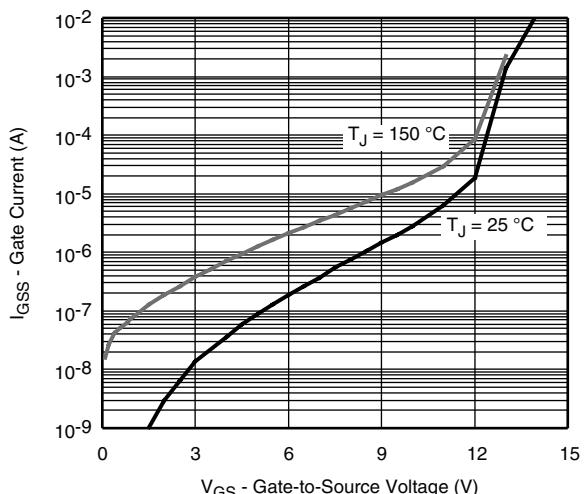
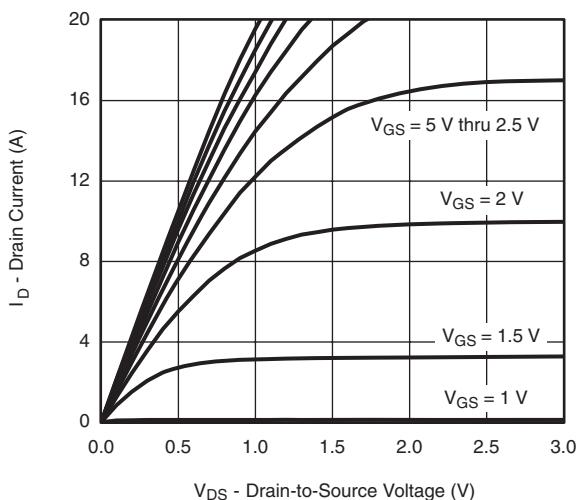
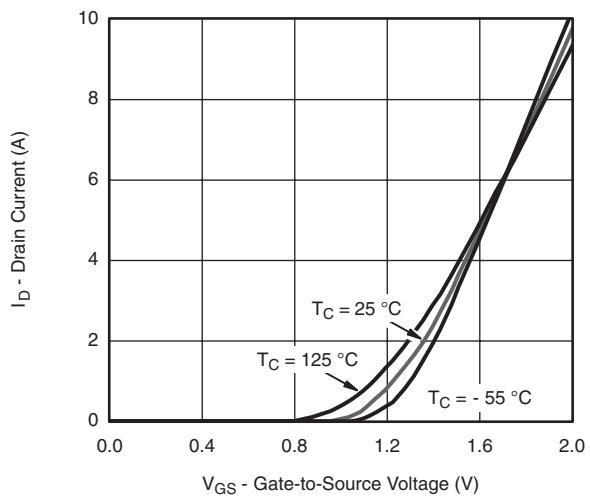
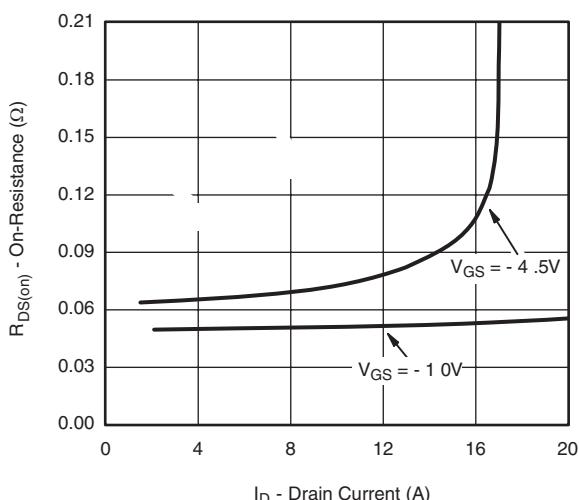
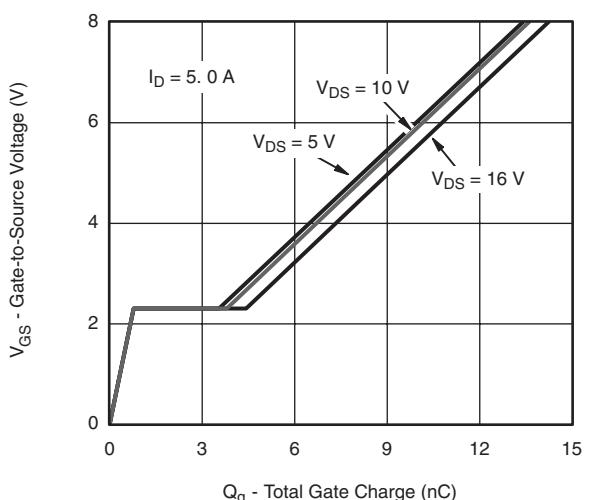
b) 125°C/W when mounted on a $.02 \text{ in}^2$ pad of 2 oz copper



c) 135°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%

TYPICAL CHARACTERISTICS P-CH**Figure 1 Gate Current vs. Gate-Source Voltage****Figure 2 Gate Current vs. Gate-Source Voltage****Figure 3 Output Characteristics****Figure 4 Transfer Characteristics****Figure 5 On-Resistance vs. Drain Current****Figure 6 Gate Charge**

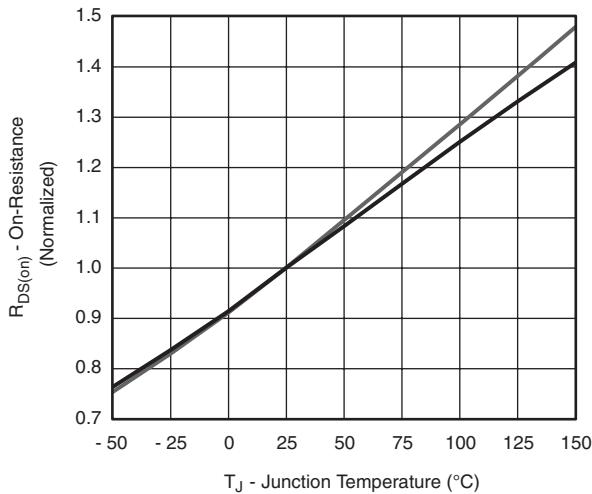


Figure 7 On-Resistance vs. Junction Temperature

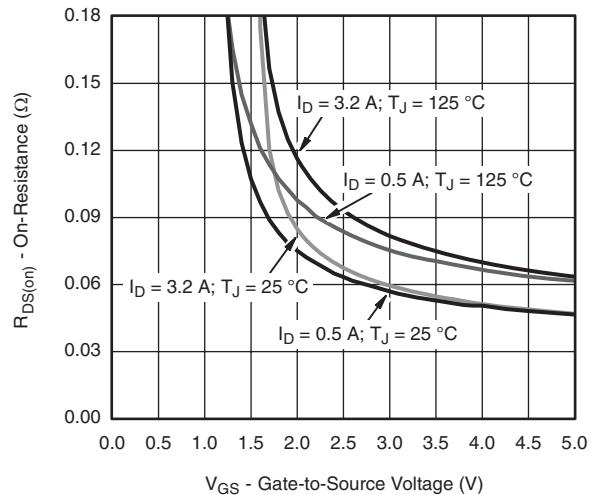


Figure 9 On Resistance VS. Gate-to-Source Voltage

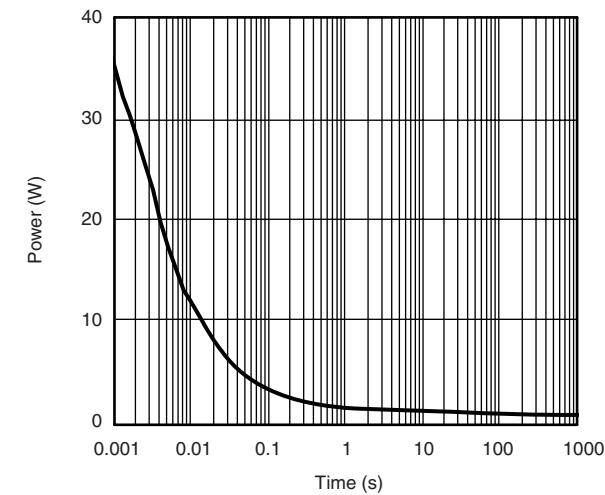


Figure 11 Single Pulse Power, Junction-to-Ambient

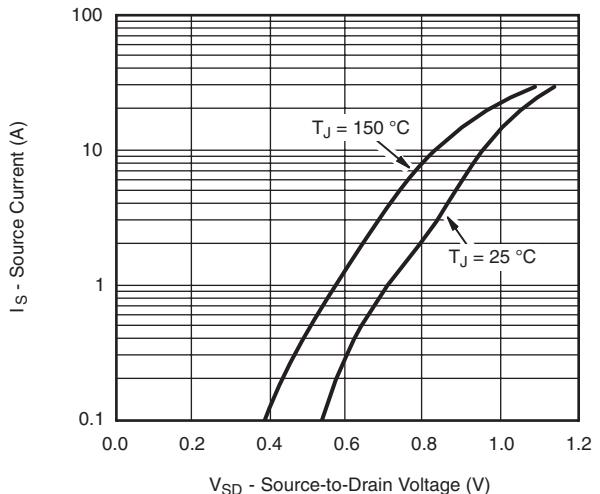


Figure 8 Source-Drain Diode Forward Voltage

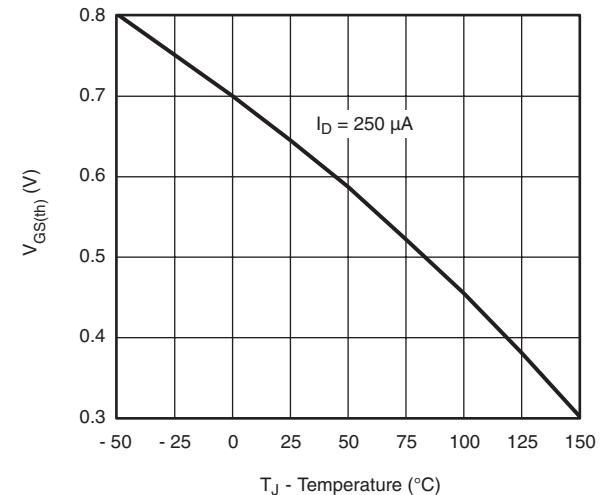


Figure 10 Threshold Voltage

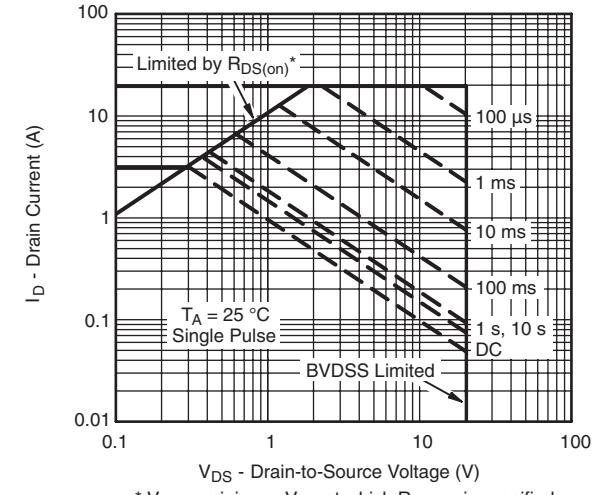
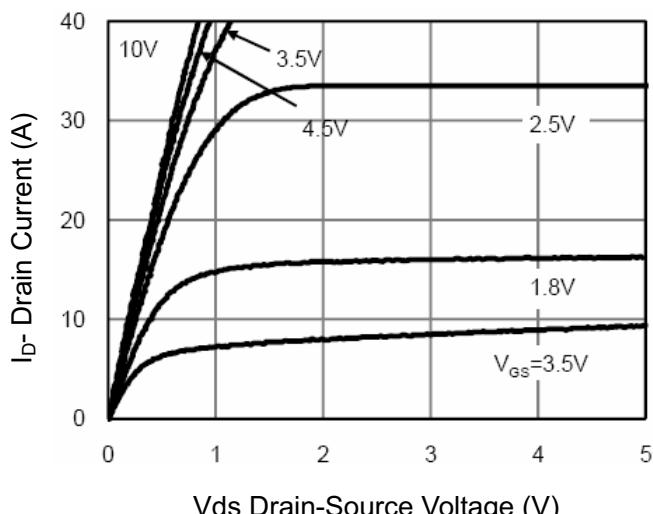
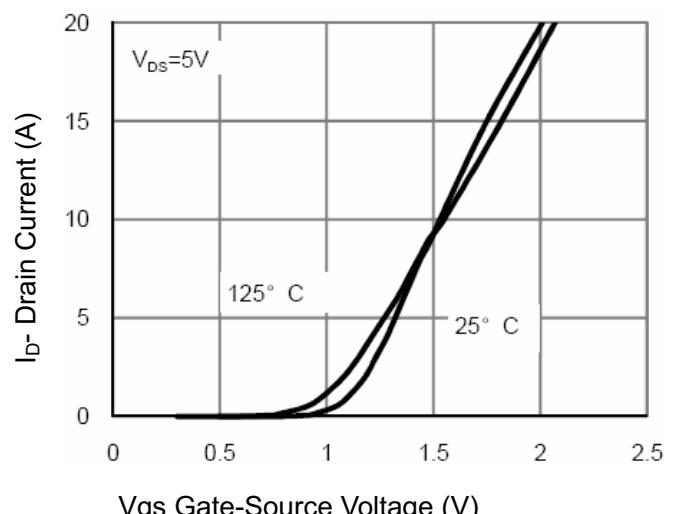
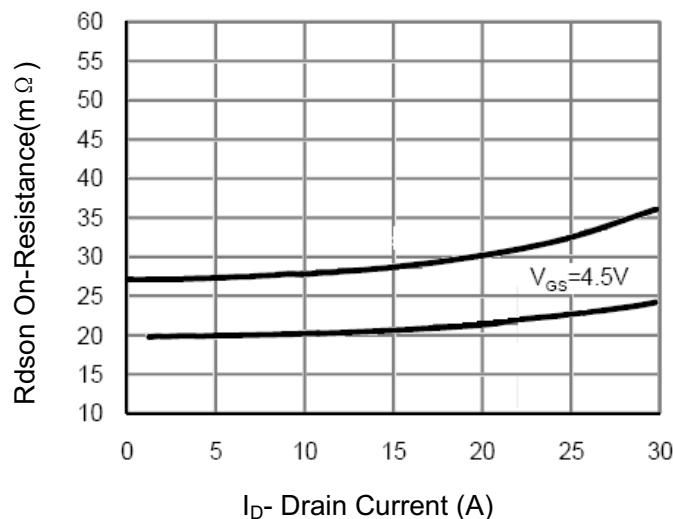
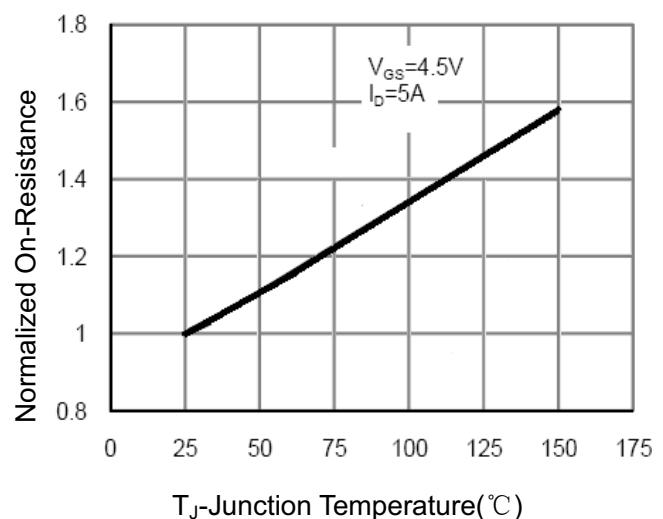
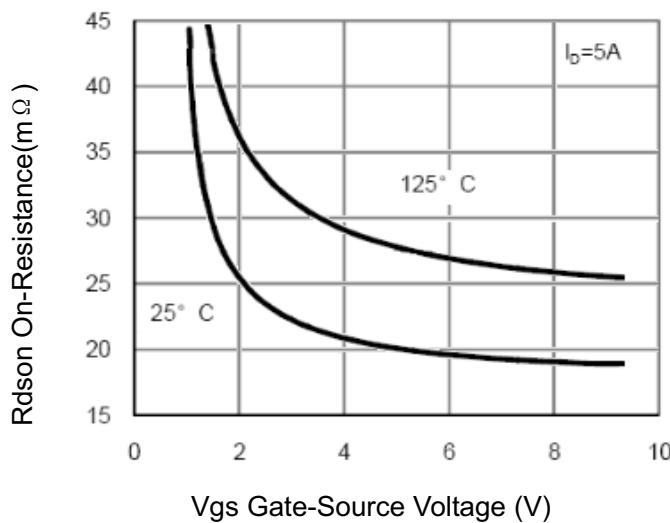
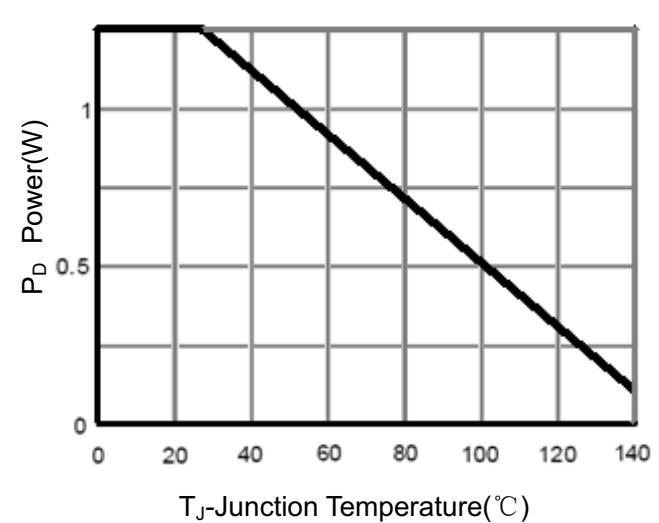
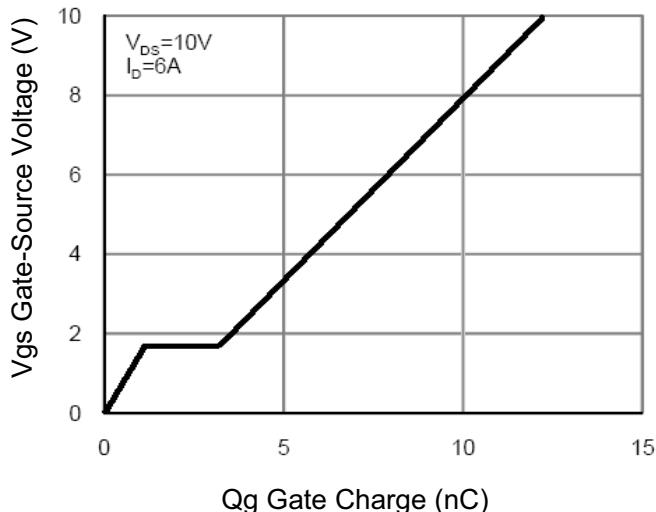
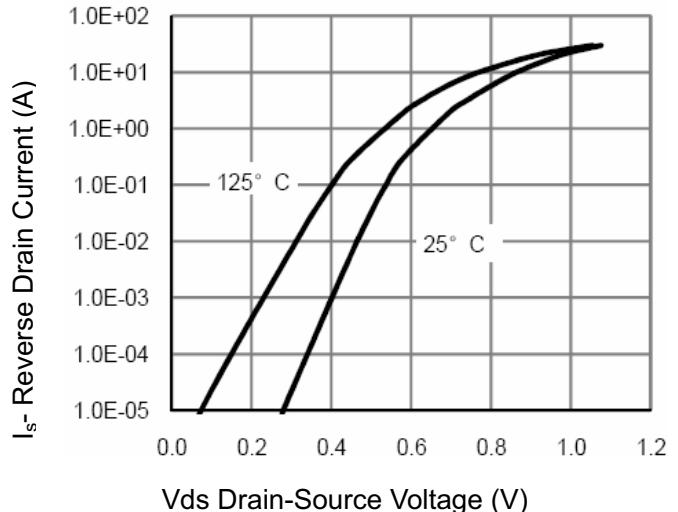
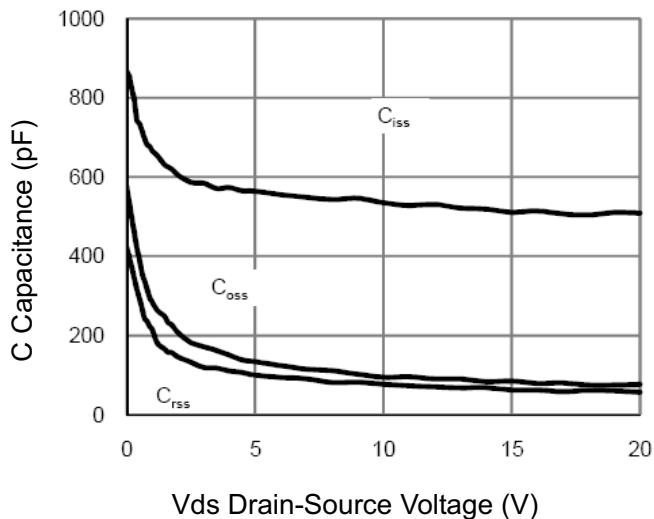
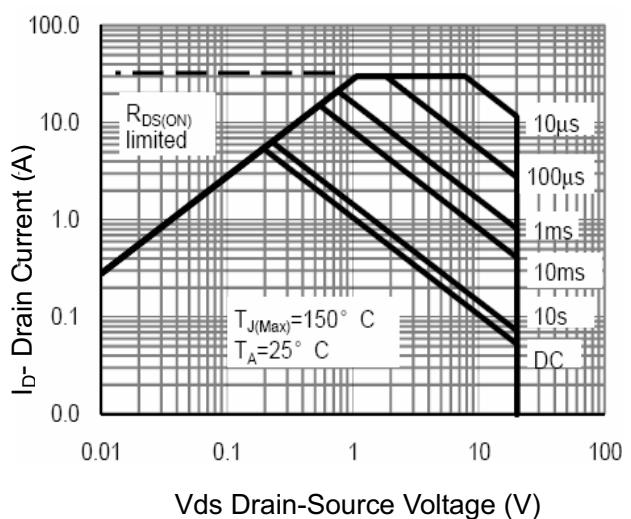
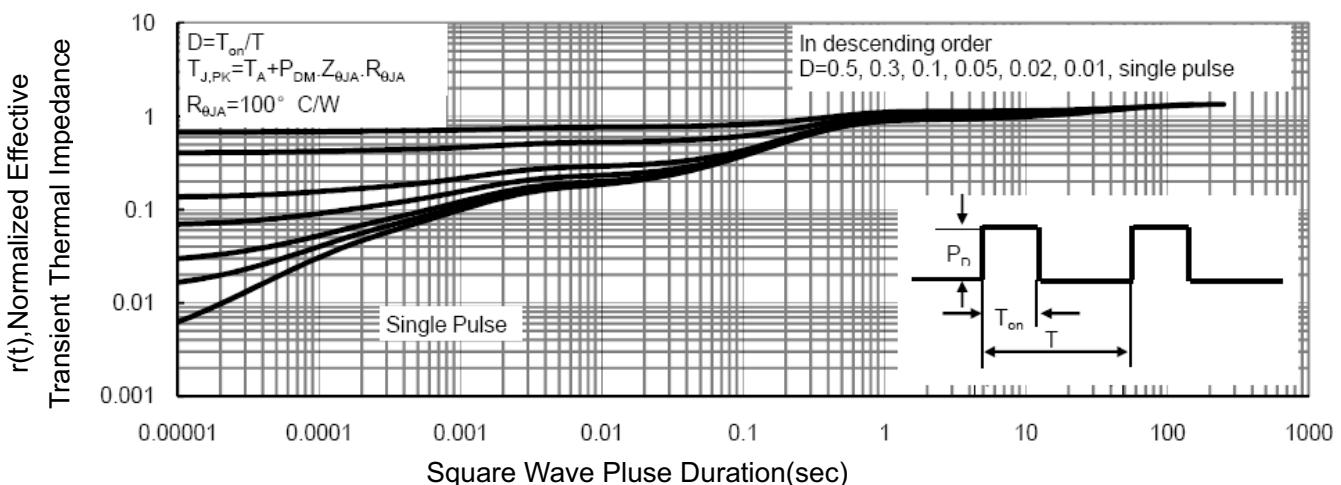
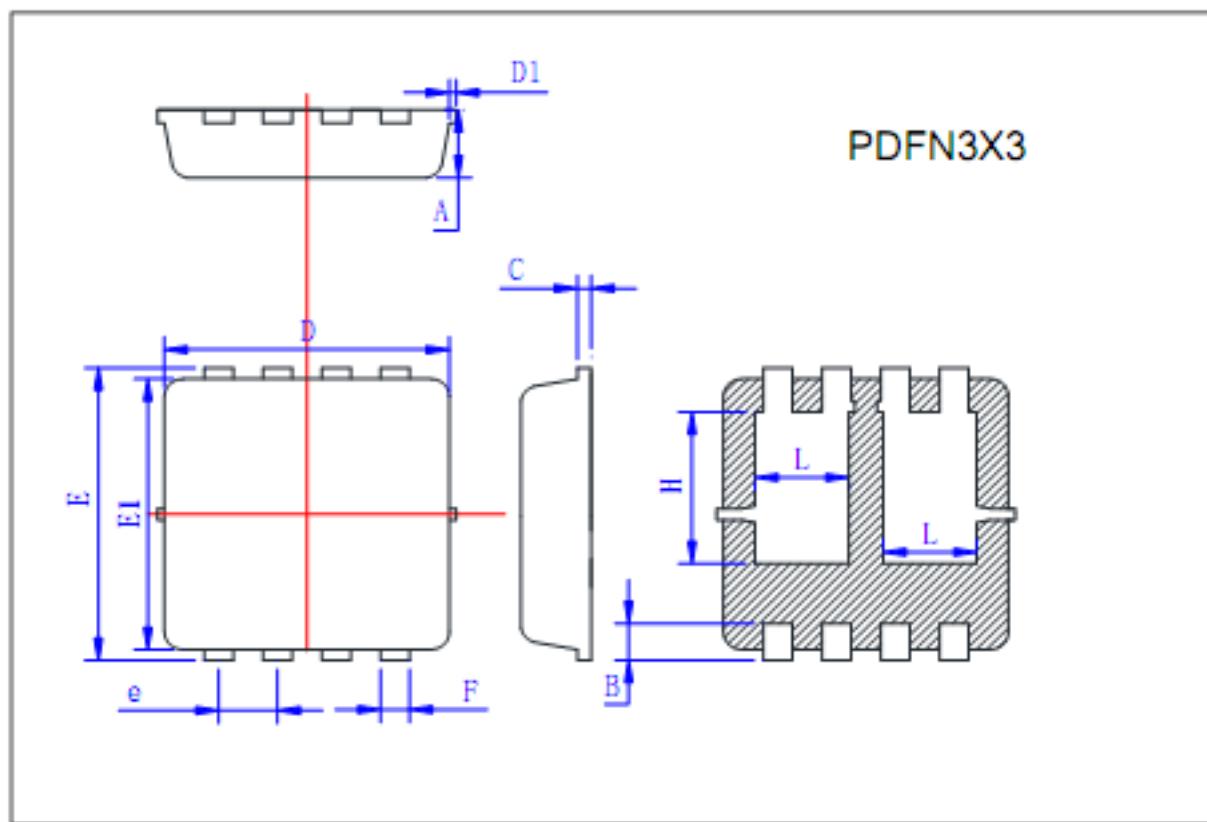


Figure 12 Safe Operating Area, Junction-to-Ambient

Typical Characteristics: N-CH**Figure 1 Output Characteristics****Figure 2 Transfer Characteristics****Figure 3 Drain-Source On-Resistance****Figure 4 Drain-Source On-Resistance****Figure 5 Rdson vs Vgs**

Typical Characteristics: N-CH**Figure 7 Gate Charge****Figure 8 Source- Drain Diode Forward****Figure 9 Capacitance vs Vds****Figure 10 Safe Operation Area****Figure 11 Normalized Maximum Transient Thermal Impedance**



Symbol	Min	Typ	Max
A	0.725	0.775	0.825
B	0.28	0.38	0.48
C	0.13	0.15	0.20
D	3.05	3.15	3.25
D1			0.10
E	3.25	3.35	3.45
E1	3.0	3.1	3.2
e	0.60	0.65	0.70
F	0.27	0.32	0.37
H	1.63	1.73	1.83
L	0.93	1.03	1.13

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Keep safety first in your circuit designs!

1. MOS-TECH Semiconductor Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.