

## NCE N-Channel and P-Channel Enhancement Mode Power MOSFET

<p><b>Description</b></p> <p>The NCE30NP1812G uses advanced trench technology to provide excellent <math>R_{DS(ON)}</math> and low gate charge. This device is suitable for use in inverter and other applications.</p> <p><b>General Features</b></p> <table style="width: 100%;"> <tr> <td style="width: 50%;"><b>N-channel</b></td> <td style="width: 50%;"><b>P-channel</b></td> </tr> <tr> <td>● <math>V_{DS} = 30V, I_D = 18A</math></td> <td>● <math>V_{DS} = -30V, I_D = -12A</math></td> </tr> <tr> <td><math>R_{DS(ON)} &lt; 24m\Omega @ V_{GS}=10V</math></td> <td><math>R_{DS(ON)} &lt; 35m\Omega @ V_{GS}=-10V</math></td> </tr> <tr> <td><math>R_{DS(ON)} &lt; 37m\Omega @ V_{GS}=4.5V</math></td> <td><math>R_{DS(ON)} &lt; 75m\Omega @ V_{GS}=-4.5V</math></td> </tr> </table> <ul style="list-style-type: none"> <li>● High Power and current handling capability</li> <li>● Lead free product is acquired</li> <li>● Surface mount package</li> </ul>	<b>N-channel</b>	<b>P-channel</b>	● $V_{DS} = 30V, I_D = 18A$	● $V_{DS} = -30V, I_D = -12A$	$R_{DS(ON)} < 24m\Omega @ V_{GS}=10V$	$R_{DS(ON)} < 35m\Omega @ V_{GS}=-10V$	$R_{DS(ON)} < 37m\Omega @ V_{GS}=4.5V$	$R_{DS(ON)} < 75m\Omega @ V_{GS}=-4.5V$	<div style="text-align: center;"> <p><b>Schematic diagram</b></p> <p><b>Pin assignment</b></p> <p><b>DFN5X6-8L Bottom View</b></p> </div>
<b>N-channel</b>	<b>P-channel</b>								
● $V_{DS} = 30V, I_D = 18A$	● $V_{DS} = -30V, I_D = -12A$								
$R_{DS(ON)} < 24m\Omega @ V_{GS}=10V$	$R_{DS(ON)} < 35m\Omega @ V_{GS}=-10V$								
$R_{DS(ON)} < 37m\Omega @ V_{GS}=4.5V$	$R_{DS(ON)} < 75m\Omega @ V_{GS}=-4.5V$								

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
30NP1812G	NCE30NP1812G	DFN5X6-8L	-	-	-

### Absolute Maximum Ratings ( $T_C=25^\circ C$ unless otherwise noted)

Parameter	Symbol	N-channel	P-channel	Unit	
Drain-Source Voltage	$V_{DS}$	30	-30	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V	
Drain Current-Continuous (Note 2)	$I_D$	$T_A=25^\circ C$	18	-12	A
		$T_A=70^\circ C$	13.7	-9.4	A
Drain Current -Pulsed (Note 1)	$I_{DM}$	72	-48	A	
Power Dissipation	$P_D$	$T_A=25^\circ C$	17	15	W
		$T_A=70^\circ C$	11.1	9.6	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	-55 To 150	$^\circ C$	

### Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2) (N-channel)	$R_{\theta JC}$	7.4	$^\circ C/W$
Thermal Resistance, Junction-to-Case (Note 2) (P-channel)	$R_{\theta JC}$	8.3	$^\circ C/W$

### N-channel Electrical Characteristics ( $T_C=25^\circ C$ unless otherwise noted)

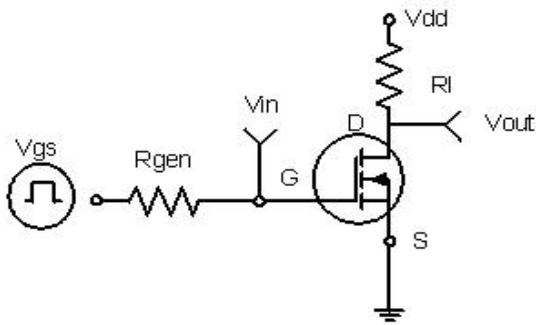
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	30	33	-	V

Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=30V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> (Note 3)						
<b>Parameter</b>	<b>Symbol</b>	<b>Condition</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Unit</b>
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=9A$	-	19	24	m $\Omega$
		$V_{GS}=4.5V, I_D=9A$	-	26	37	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=9A$	15	-	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	547	-	PF
Output Capacitance	$C_{oss}$		-	65.6	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	58.8	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=9A$ $V_{GS}=10V, R_{GEN}=6\Omega$	-	4.5	-	nS
Turn-on Rise Time	$t_r$		-	2.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	14.5	-	nS
Turn-Off Fall Time	$t_f$		-	3.5	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=15V, I_D=9A,$ $V_{GS}=10V$	-	15	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.2	-	nC
Gate-Drain Charge	$Q_{gd}$		-	2.9	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=9A$	-	0.8	1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	18	A

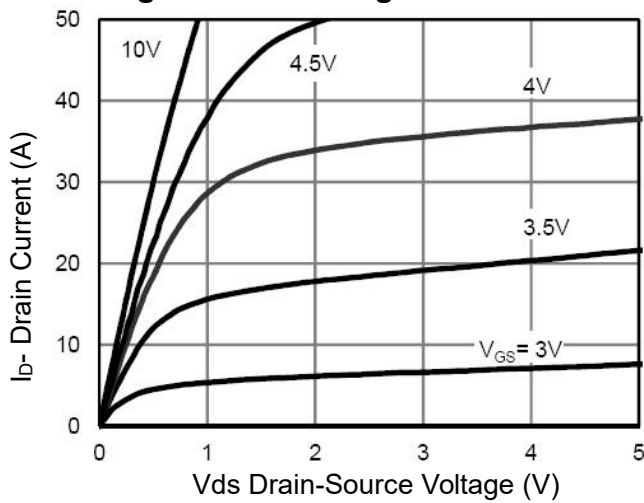
## Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ C$ . The value in any given application depends on the user's specific board design. Surface Mounted on FR4 Board,  $t \leq 10$  sec. The current rating is based on the  $t \leq 10s$  thermal resistance rating.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production .

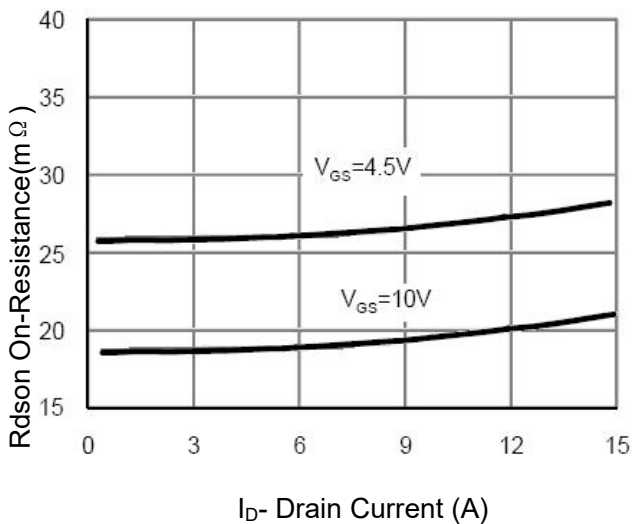
## N-channel Typical Electrical and Thermal Characteristics



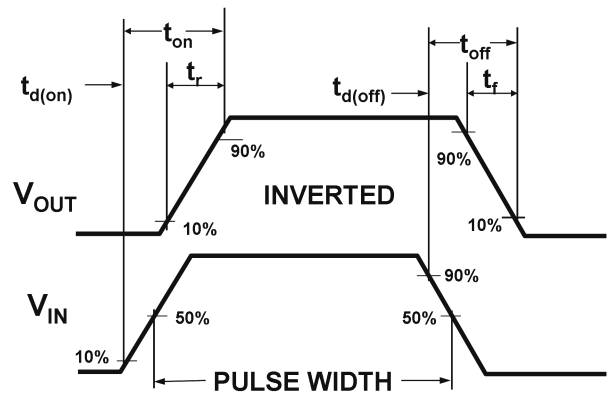
**Figure 1: Switching Test Circuit**



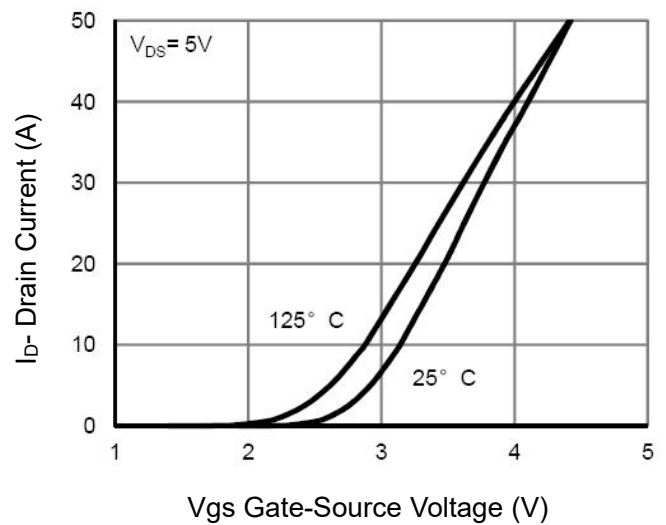
**Figure 3 Output Characteristics**



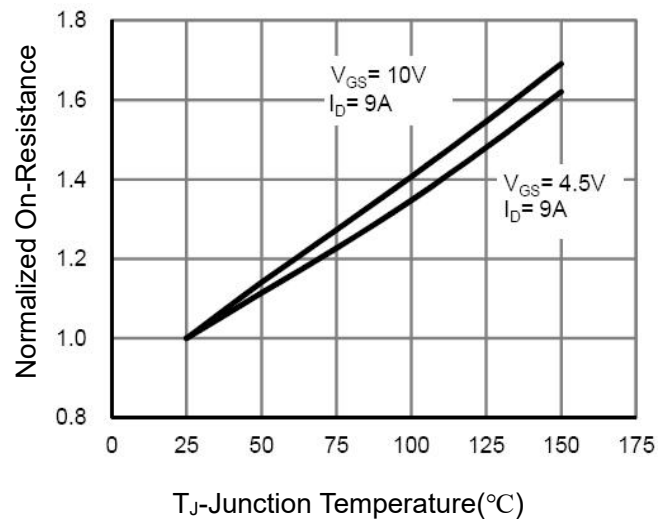
**Figure 5 Drain-Source On-Resistance**



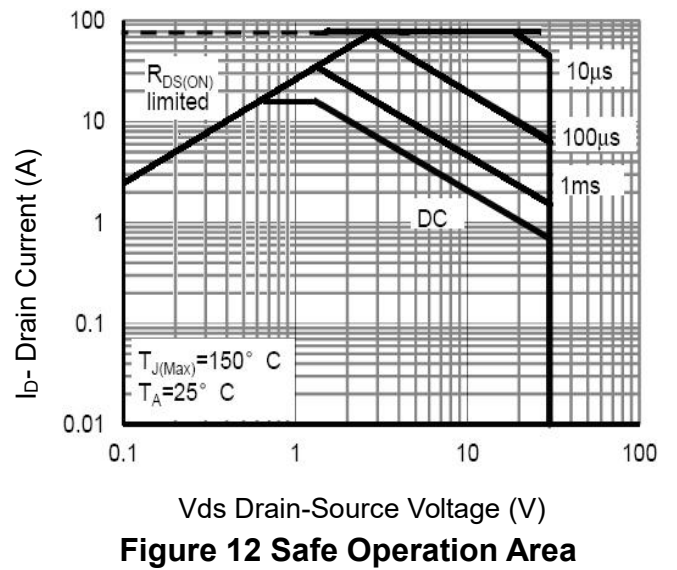
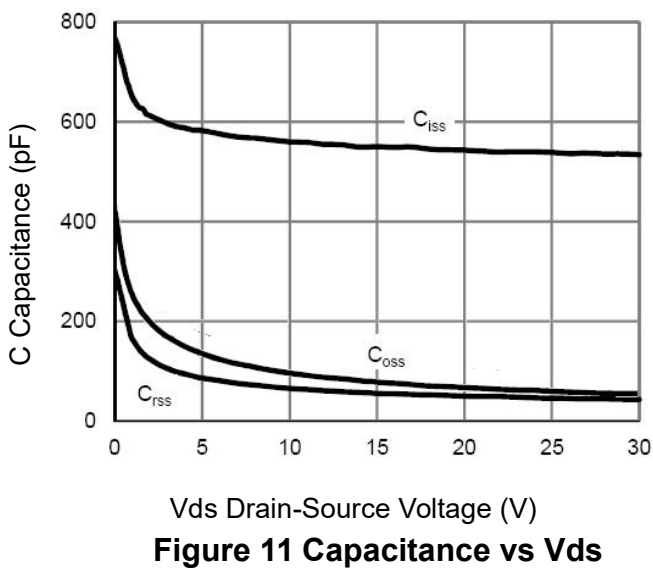
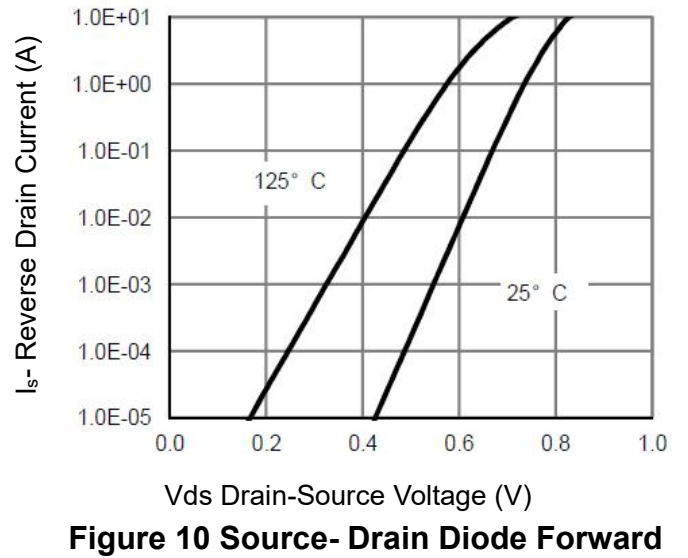
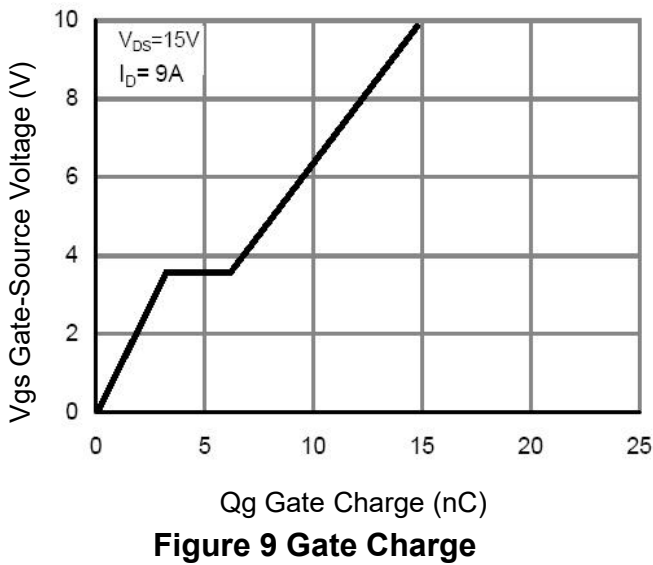
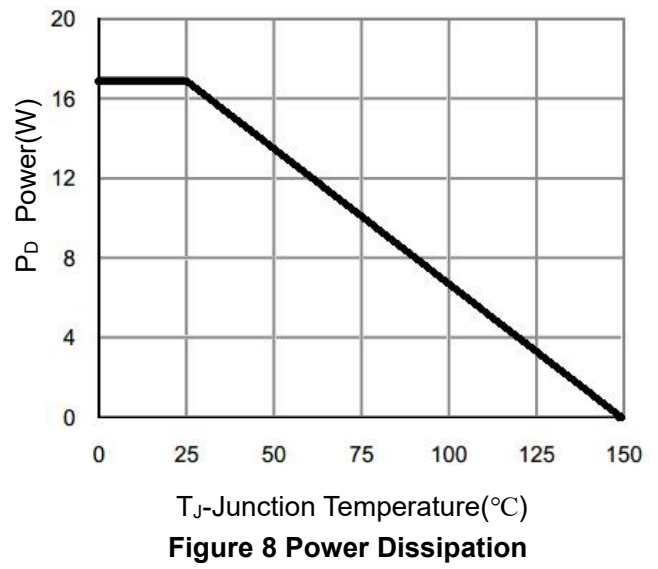
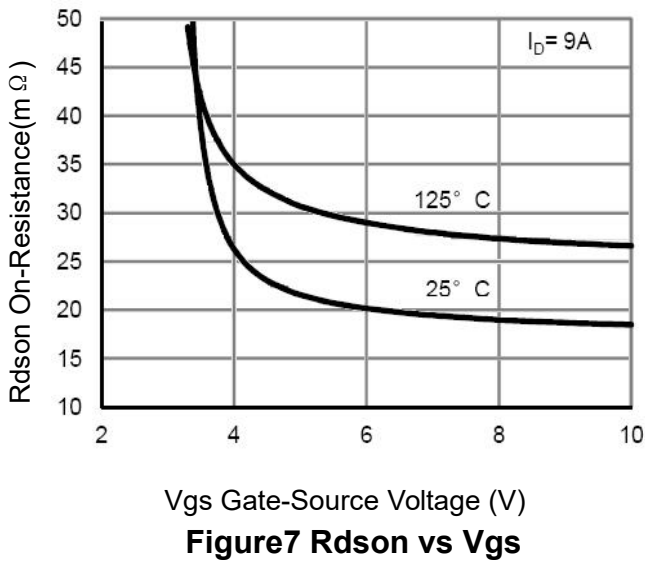
**Figure 2: Switching Waveforms**

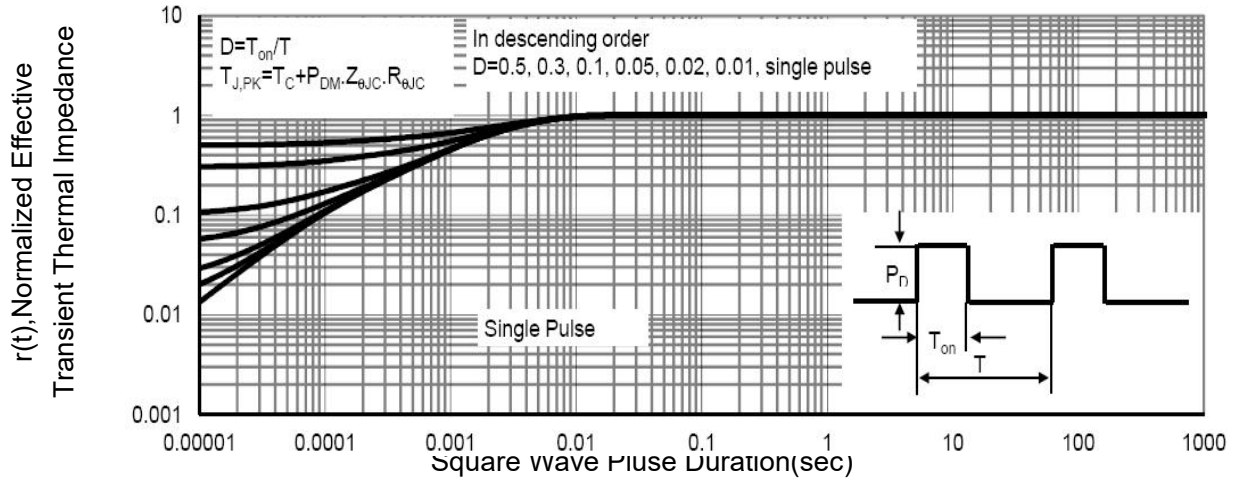


**Figure 4 Transfer Characteristics**



**Figure 6 Drain-Source On-Resistance**





**Figure 13 Normalized Maximum Transient Thermal Impedance**

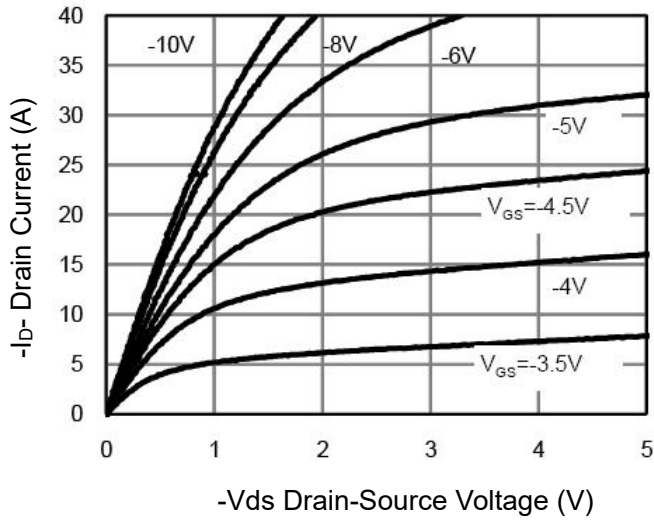
## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-30	-33	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.2	-1.7	-2.5	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-6A	-	29	35	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-6A	-	55	75	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-6A	-	13	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, F=1.0MHz	-	691.9	-	PF
Output Capacitance	C <sub>oss</sub>		-	113.7	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	109.4	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-15V, I <sub>D</sub> =-6A V <sub>GS</sub> =-10V, R <sub>GEN</sub> =3Ω	-	7.5	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	5.5	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	19	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	7	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-15V, I <sub>D</sub> =-6A, V <sub>GS</sub> =-10V	-	12.9	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.5	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	2.7	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-6A	-	-	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-12	A

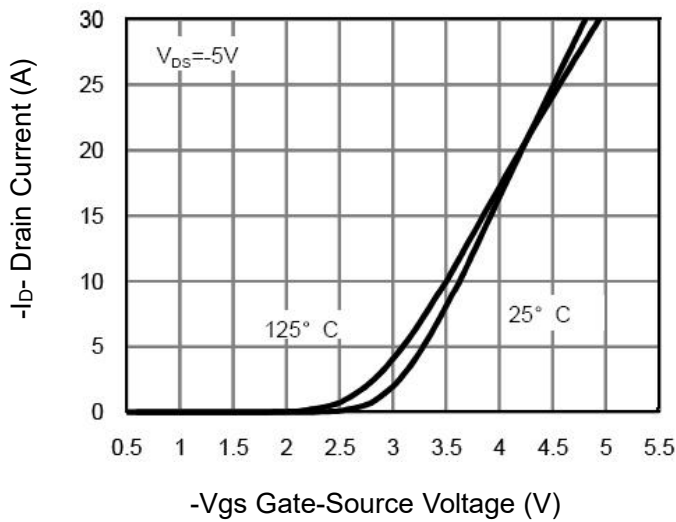
### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
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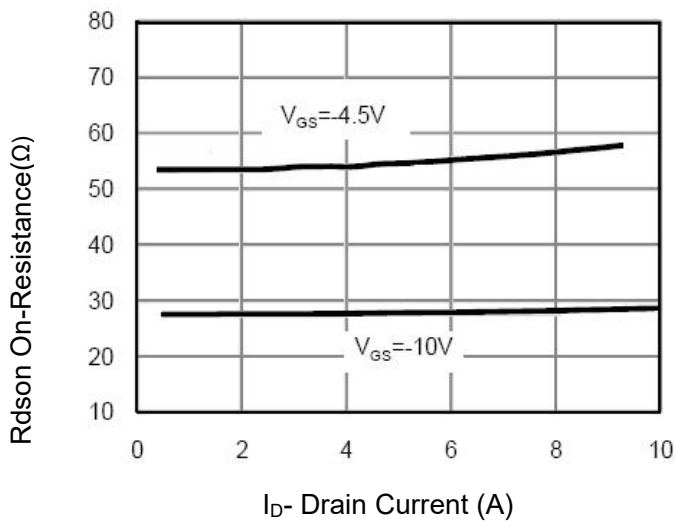
## P- Channel Typical Electrical and Thermal Characteristics (Curves)



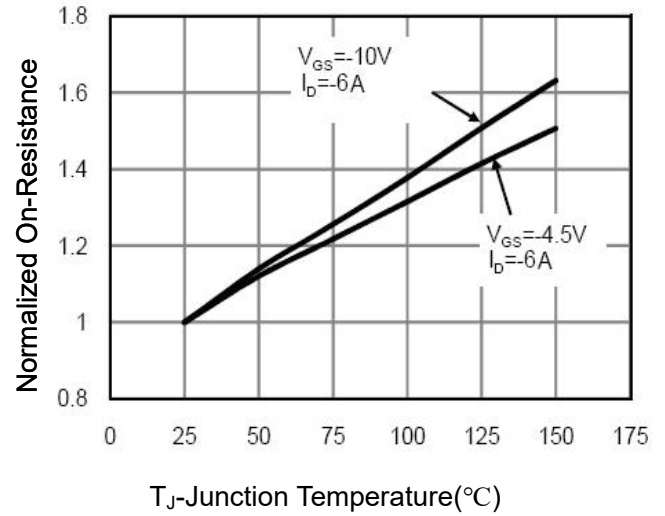
**Figure 1 Output Characteristics**



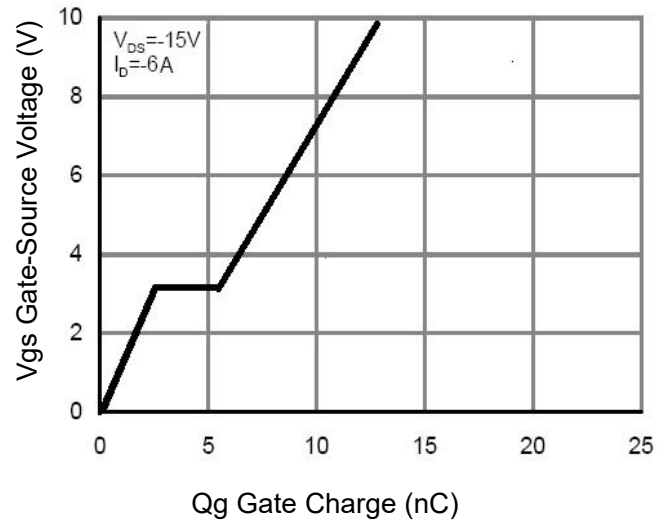
**Figure 2 Transfer Characteristics**



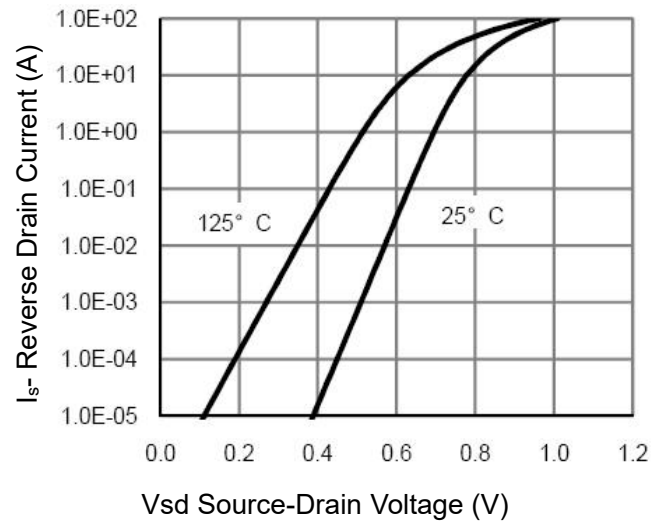
**Figure 3 Rdson- Drain Current**



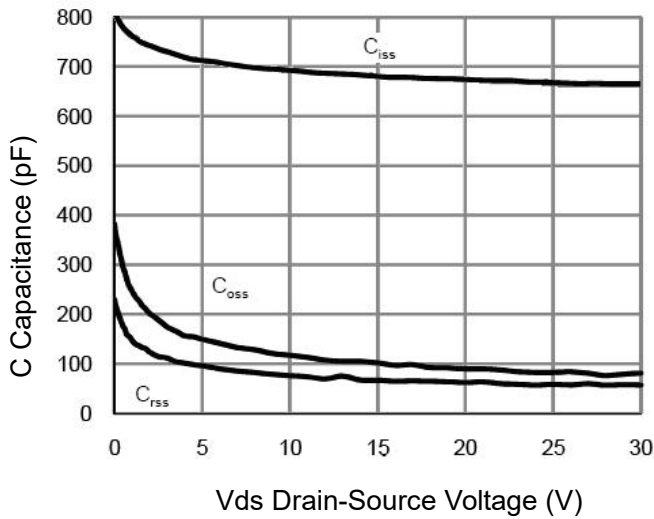
**Figure 4 Rdson-Junction Temperature**



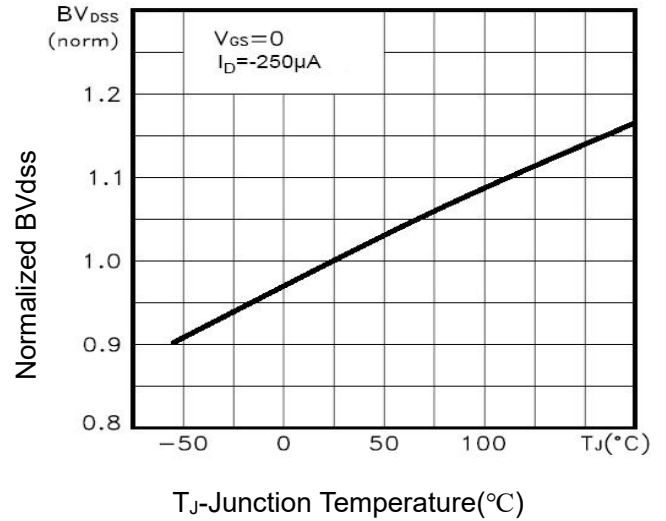
**Figure 5 Gate Charge**



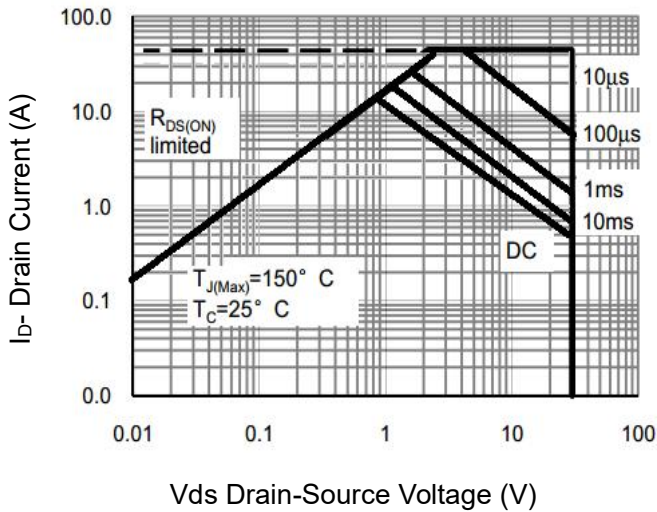
**Figure 6 Source- Drain Diode Forward**



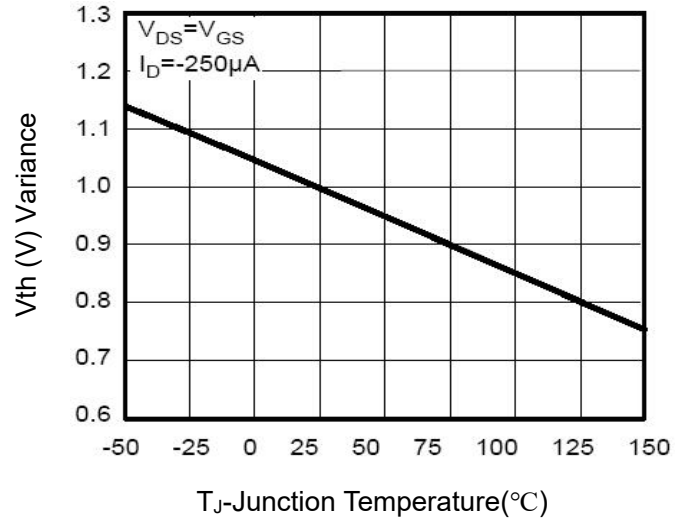
**Figure 7 Capacitance vs Vds**



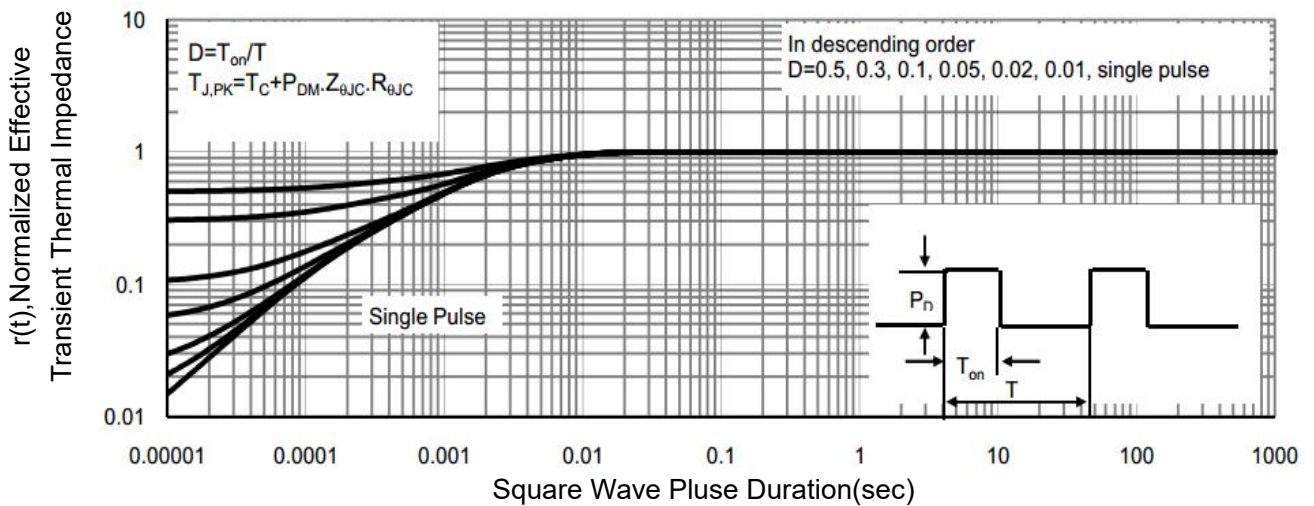
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



**Figure 8 Safe Operation Area**

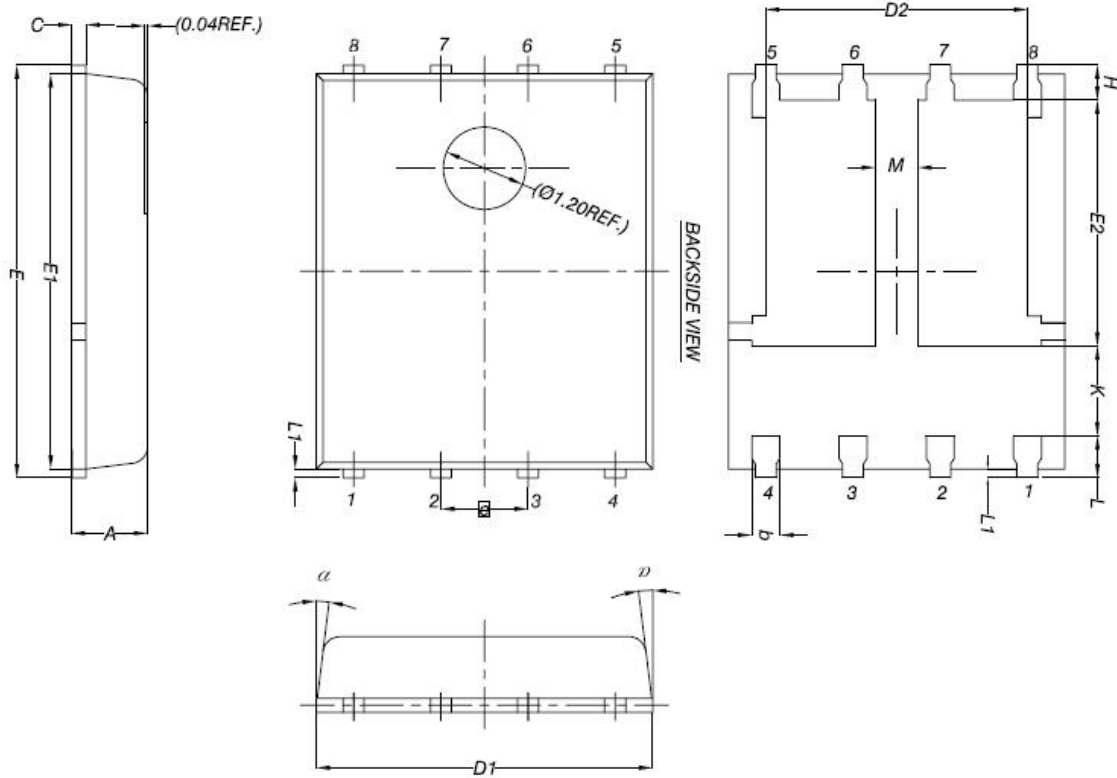


**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
$e$	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
M	0.50	-	-
$\alpha$	0°	-	12°

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