

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

Description
The NCE30NP1812Q uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use in inverter and other applications.

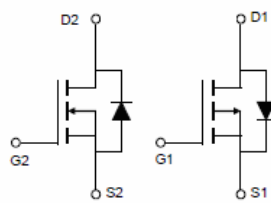
General Features

N-channel

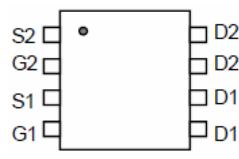
- $V_{DS} = 30V, I_D = 18A$
- $R_{DS(ON)} < 24m\Omega @ V_{GS}=10V$
- $R_{DS(ON)} < 37m\Omega @ V_{GS}=4.5V$
- High Power and current handing capability
- Lead free product is acquired
- Surface mount package

P-channel

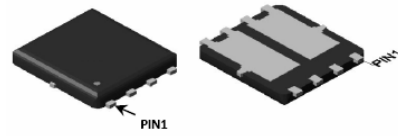
- $V_{DS} = -30V, I_D = -12A$
- $R_{DS(ON)} < 35m\Omega @ V_{GS}=-10V$
- $R_{DS(ON)} < 75m\Omega @ V_{GS}=-4.5V$



Schematic diagram



Pin assignment



DFN3.3X3.-8L Bottom View

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE30NP1812Q	NCE30NP1812Q	DFN3X3-8L	-	-	-

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}	± 20	± 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
Off Characteristics						
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	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						

Parameter	Symbol	Condition	Min	Typ	Max	Unit
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 Ω
		$V_{GS}=4.5V, I_D=9A$	-	26	37	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=9A$	15	-	-	S
Dynamic Characteristics (Note4)						
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
Switching Characteristics (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
Drain-Source Diode Characteristics						
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 1 in 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

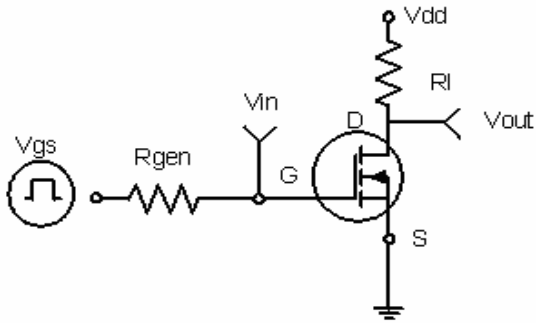


Figure 1: Switching Test Circuit

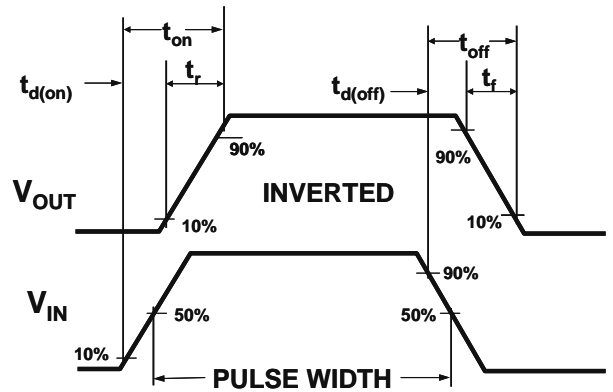


Figure 2: Switching Waveforms

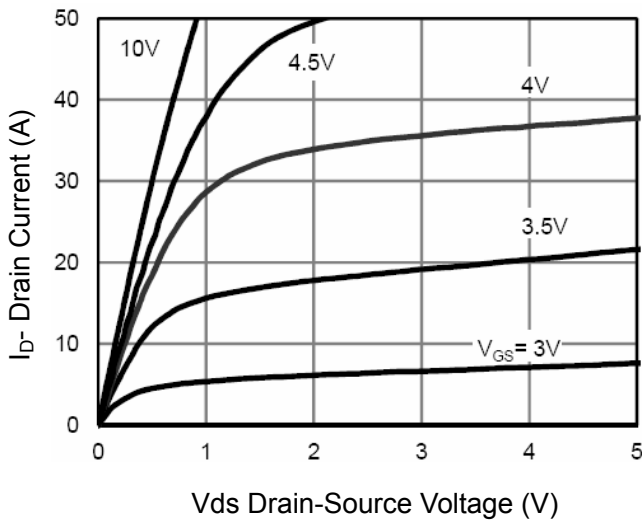


Figure 3 Output Characteristics

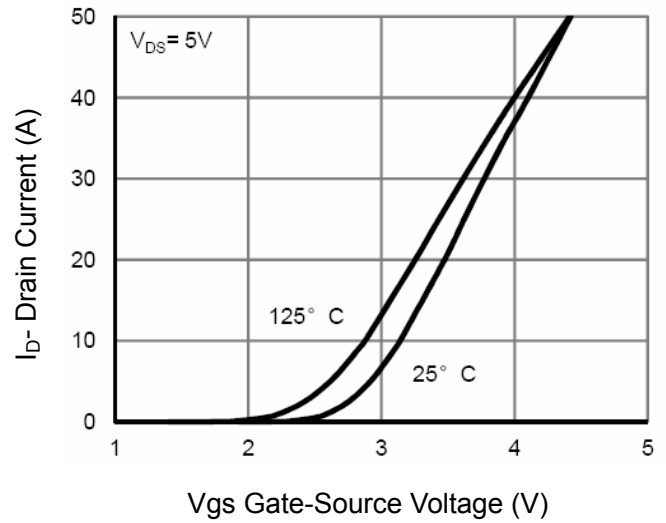


Figure 4 Transfer Characteristics

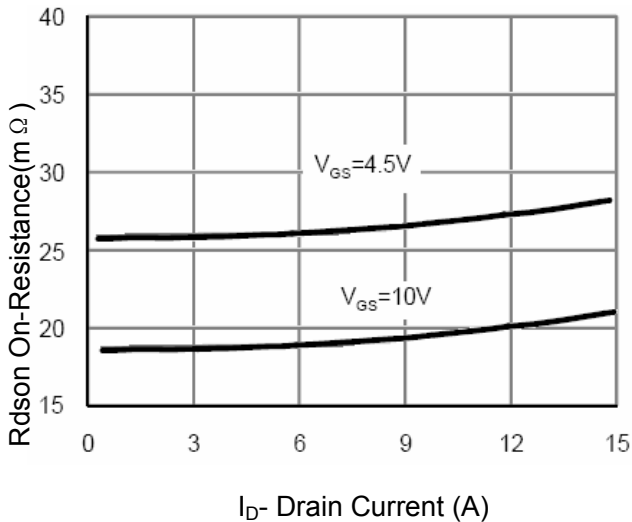


Figure 5 Drain-Source On-Resistance

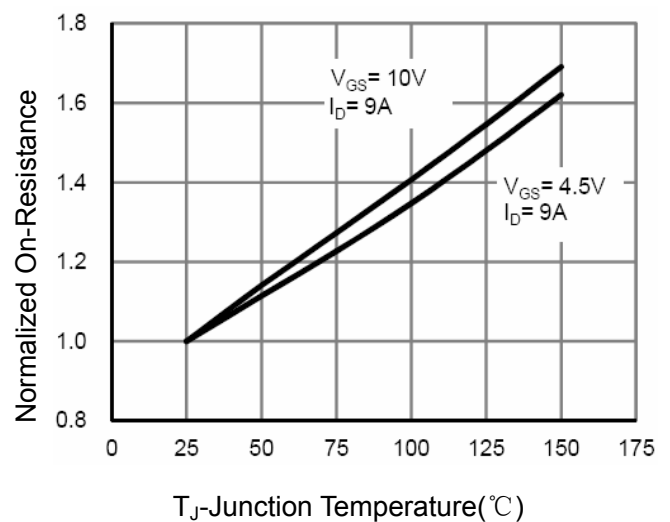
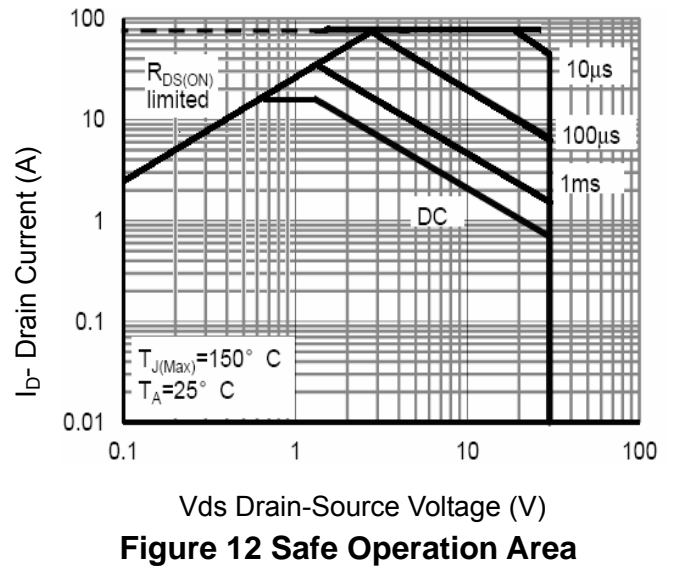
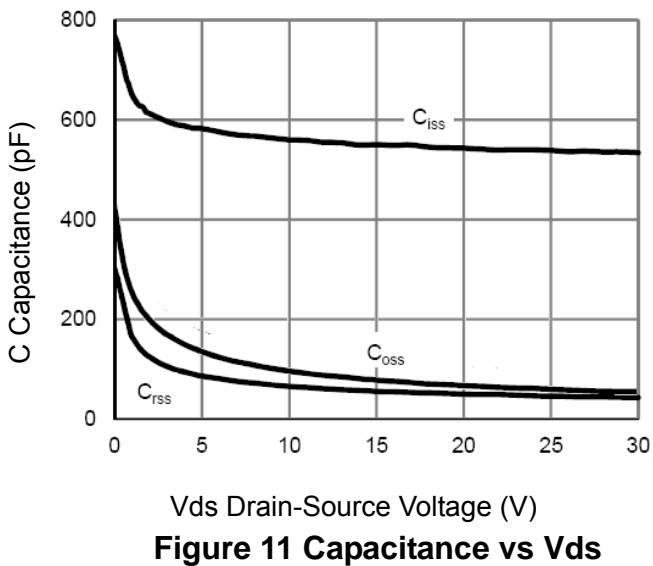
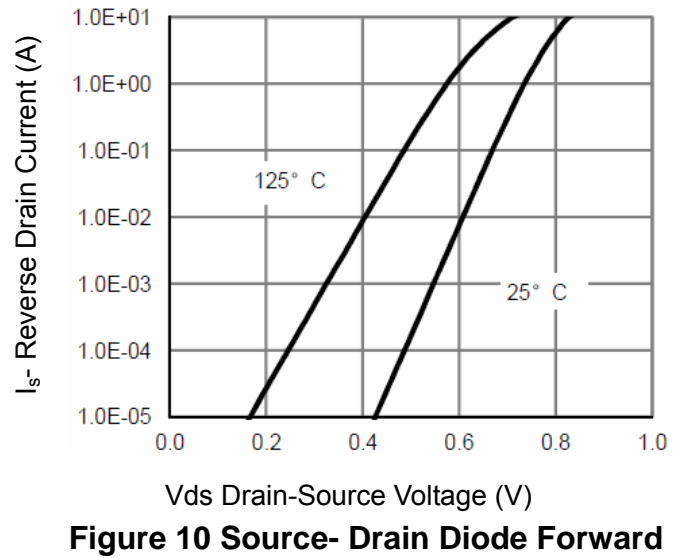
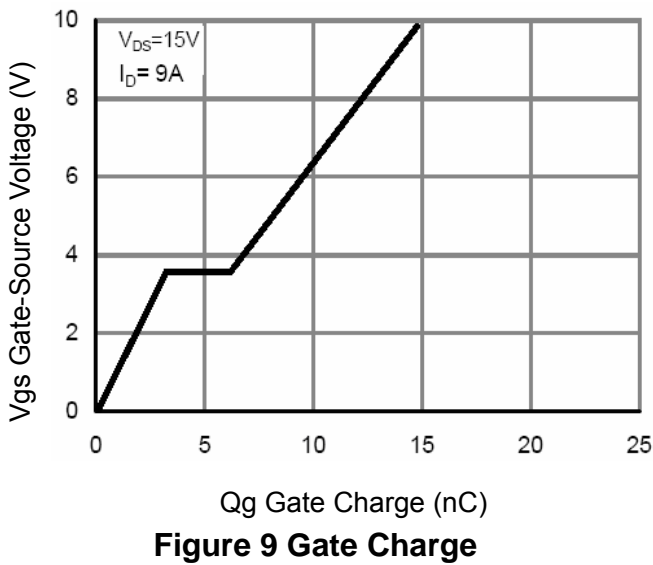
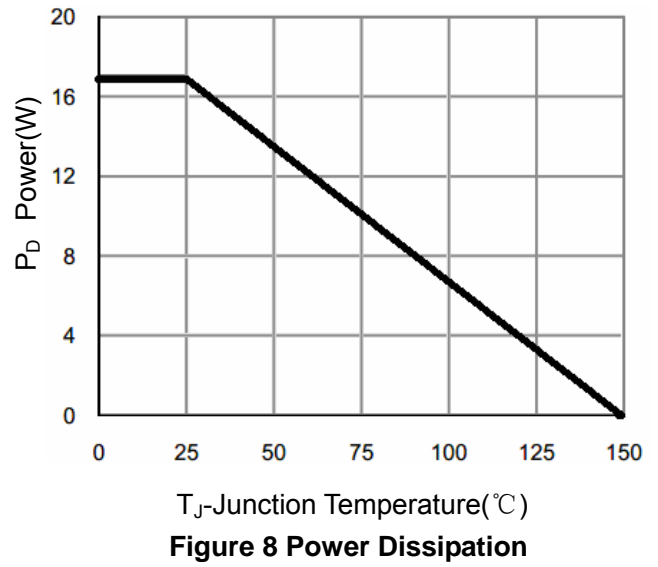
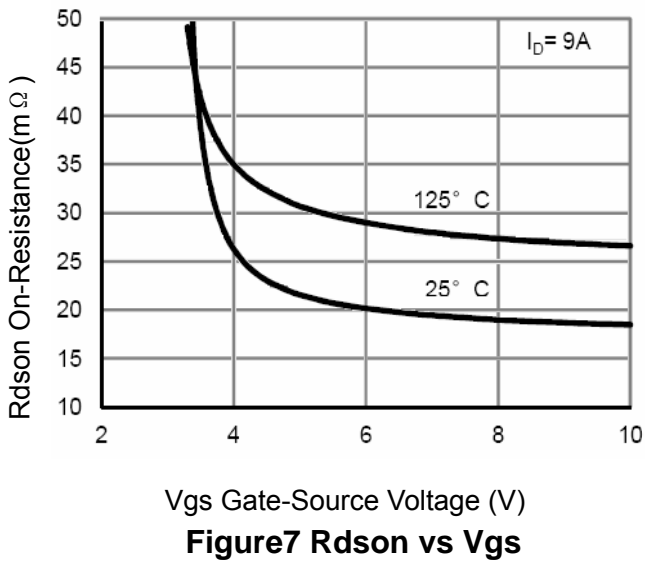


Figure 6 Drain-Source On-Resistance



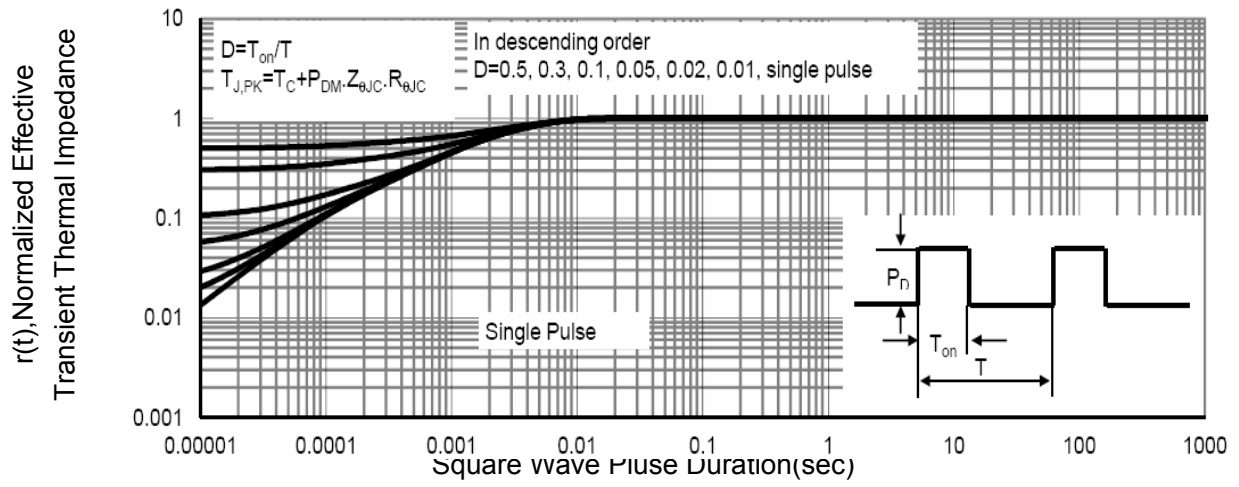


Figure 13 Normalized Maximum Transient Thermal Impedance

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

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

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

P- Channel Typical Electrical and Thermal Characteristics (Curves)

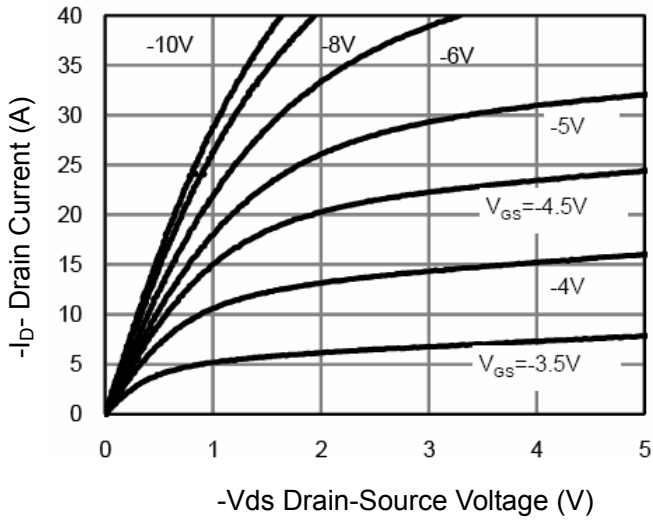


Figure 1 Output Characteristics

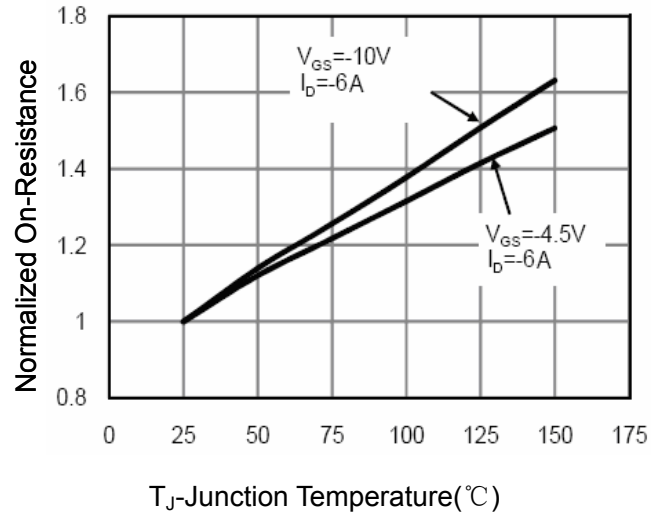


Figure 4 Rdson-Junction Temperature

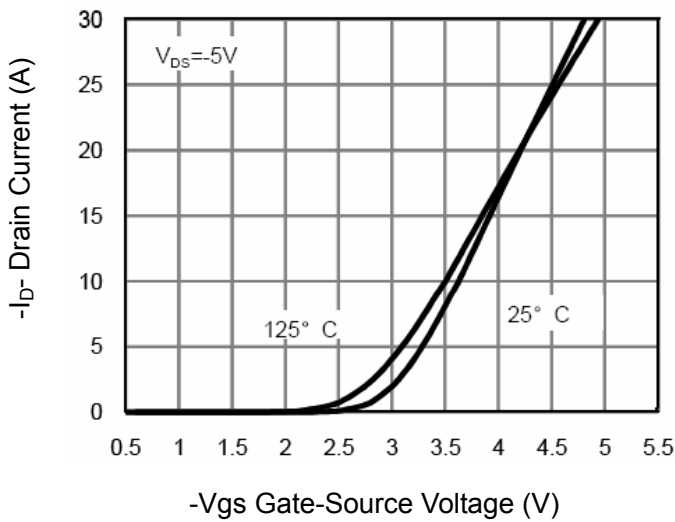


Figure 2 Transfer Characteristics

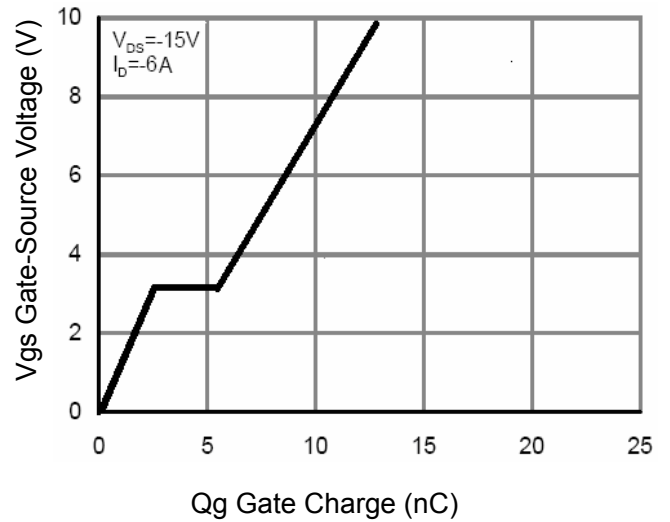


Figure 5 Gate Charge

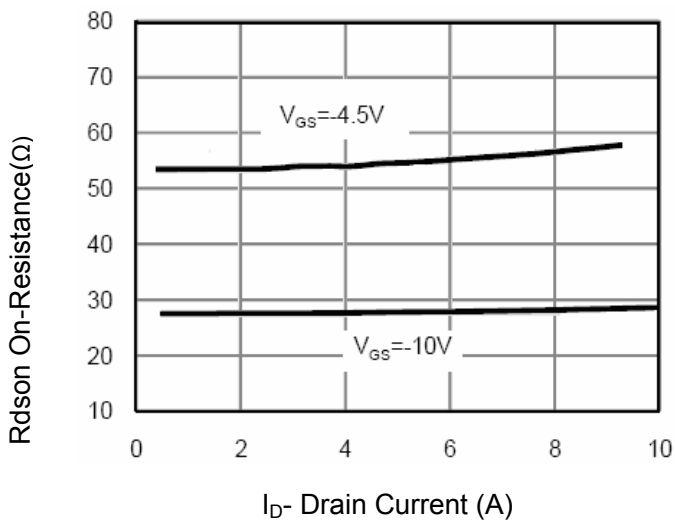


Figure 3 Rdson- Drain Current

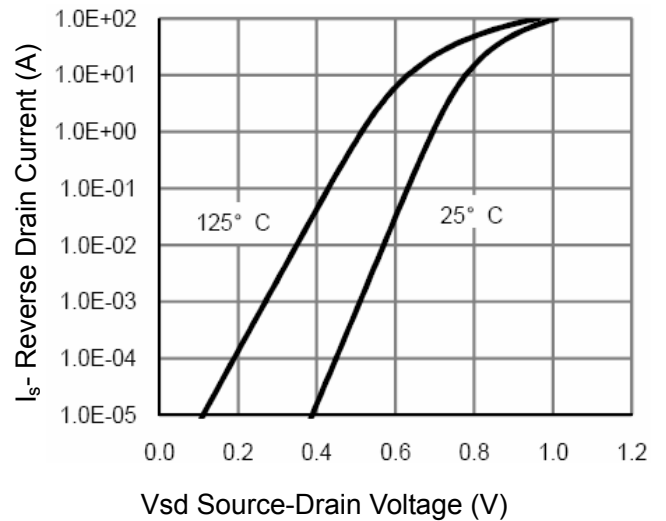


Figure 6 Source- Drain Diode Forward

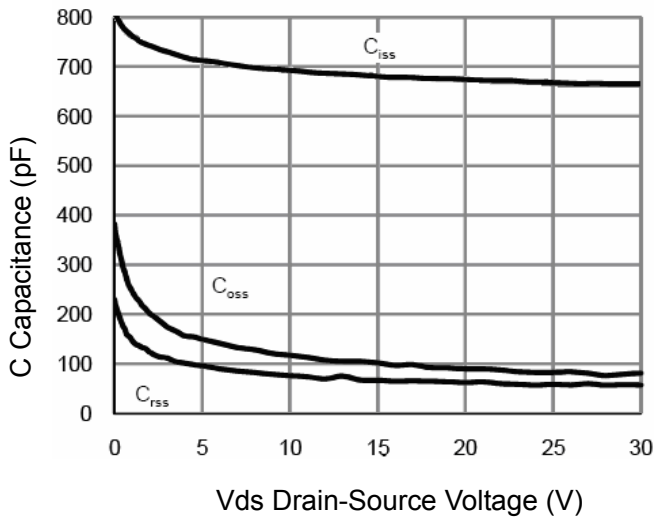


Figure 7 Capacitance vs Vds

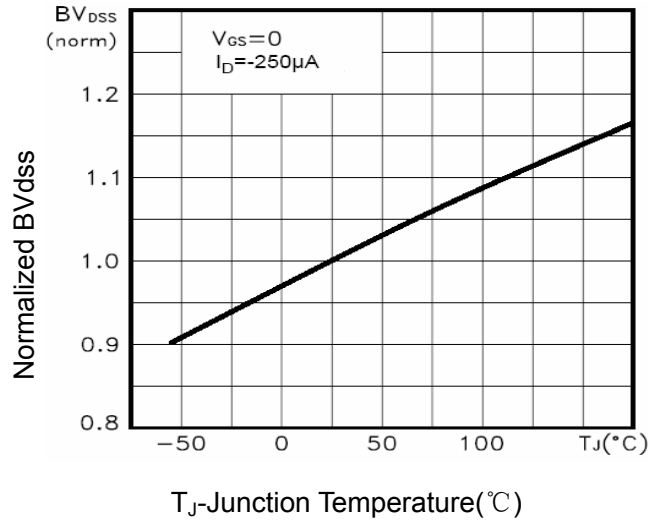


Figure 9 BV_{DSS} vs Junction Temperature

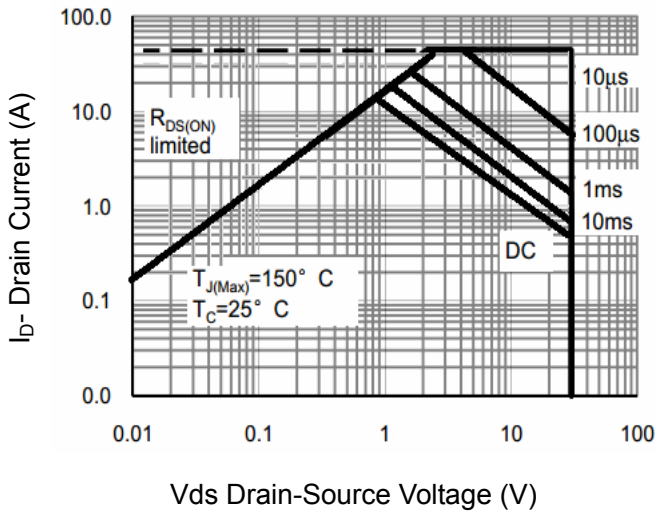


Figure 8 Safe Operation Area

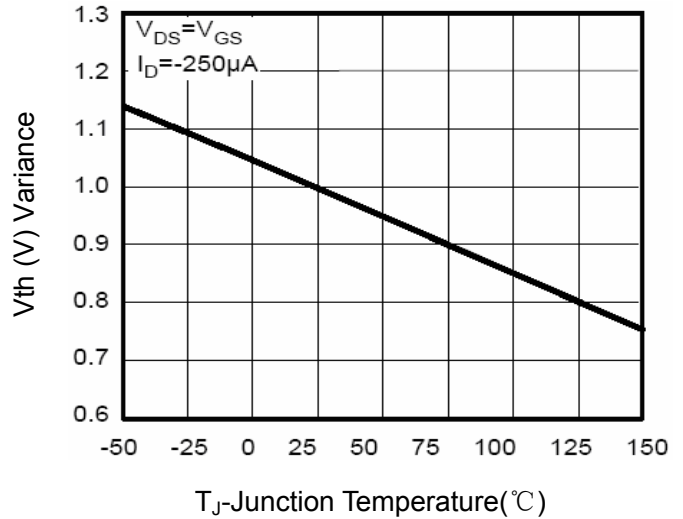


Figure 10 V_{GS(th)} vs Junction Temperature

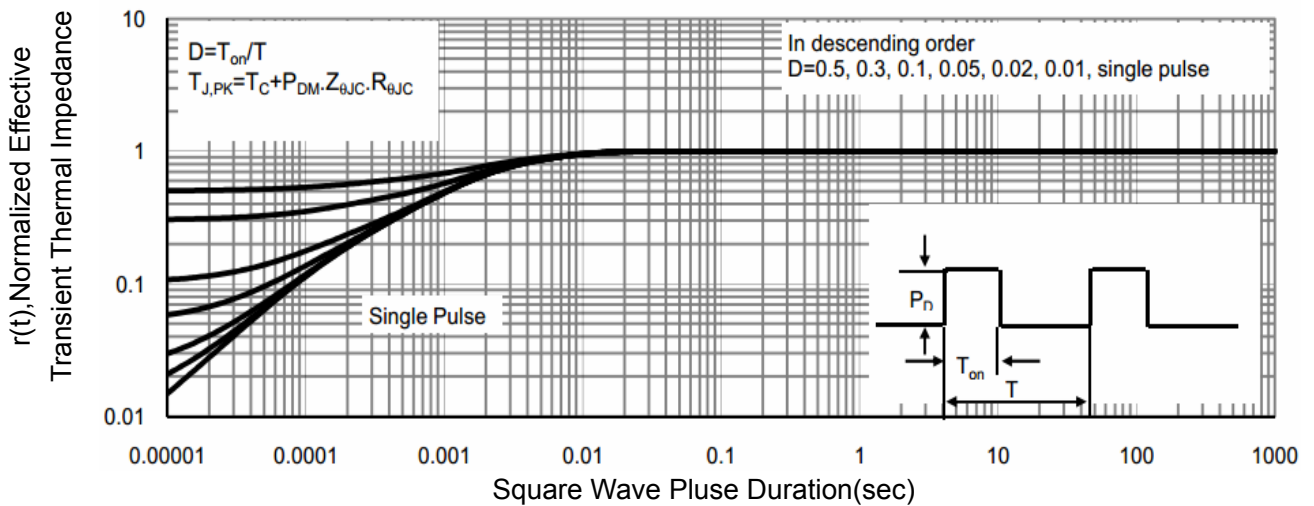
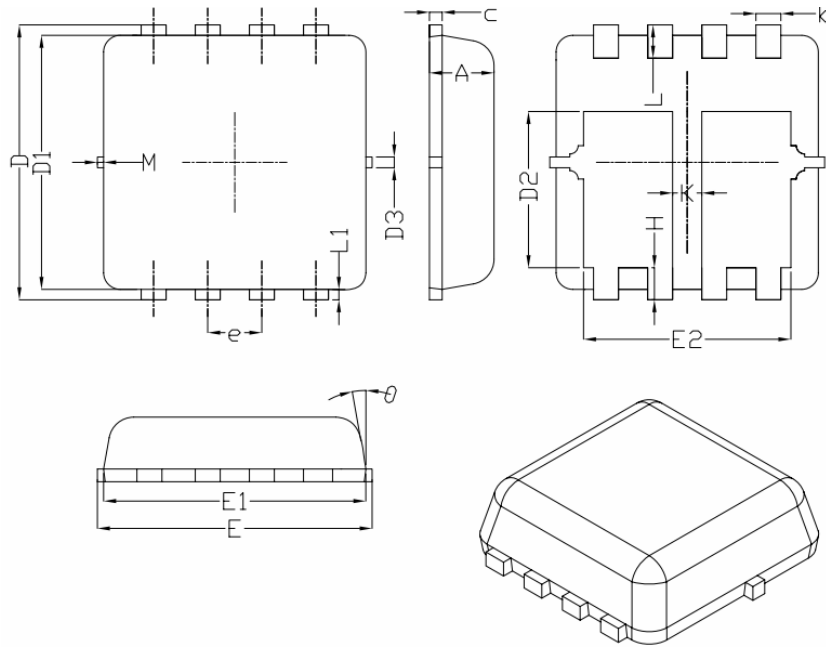
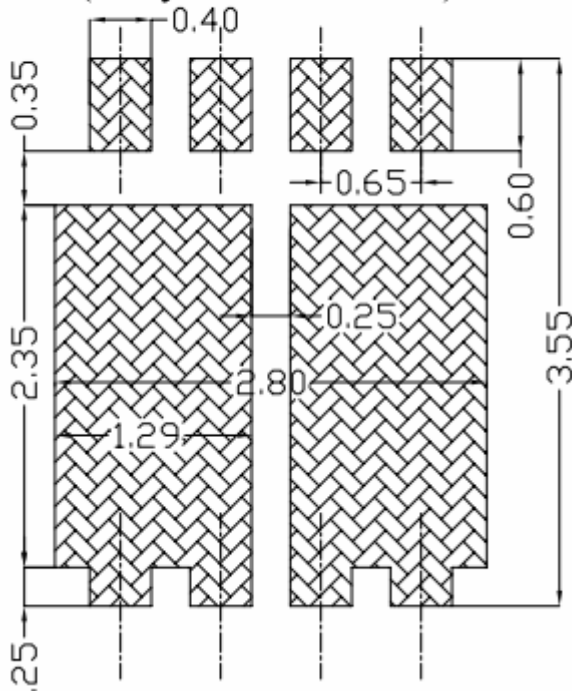


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3.3X3.3-8L Package Information



Land Pattern (Only for Reference)



SYMBOL	DIMENSIONAL REOMTS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	---	0.13	---
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	---	0.13	---
K	0.30	---	---
θ	---	10°	12°
M	*	*	0.15

* Not specified

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