30V Half Bridge Dual N-Channel Enhancement Mode Power MOSFET

Description

The NCEB301Q is designed to provide a high efficiency synchronous buck power stage with optimal layout and board space utilization. It includes two specialized MOSFETs in a dual Power DFN3X3 package. The Q1 "High Side" MOSFET is desgined to minimze switching losses. The Q2"Low Side" MOSFET uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge.

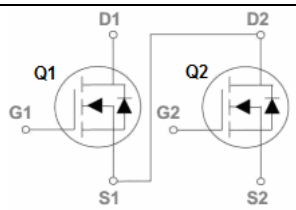
General Features

Q1 "High Side" MOSFET **Q2 "Low Side" MOSFET**

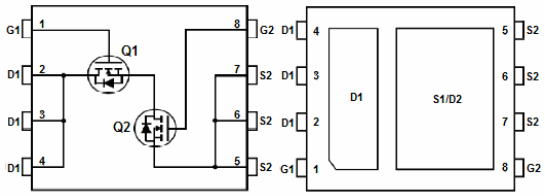
- V_{DS} =30V,I_D =15A V_{DS} =30V,I_D =20A
  $R_{DS(ON)}$ <9mΩ @ V_{GS}=10V $R_{DS(ON)}$ <8.5mΩ @ V_{GS}=10V
  $R_{DS(ON)}$<14mΩ @ V_{GS}=4.5V $R_{DS(ON)}$ <22mΩ @ V_{GS}=4.5V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

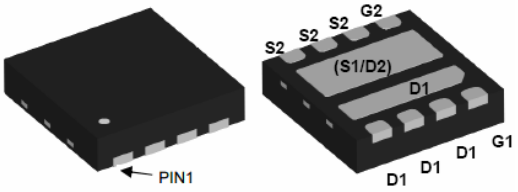
- Compact DC/DC converter applications



Schematic Diagram



pin assignment



Top View **Bottom View**

100% UIS TESTED!

100% ΔVds TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEB301Q	NCEB301Q	DFN3X3-8L	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter		Symbol	Q1	Q2	Unit
Drain-Source Voltage		V_{DS}	30	30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Drain Current-Continuous (Note 2)	T_C=25°C	I_D	15	20	A
	T_C=100°C		10.6	14.1	A
Drain Current -Pulsed (Note 1)		I_{DM}	60	80	
Power Dissipation	T_C=25°C	P_D	18	20	W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	-55 To 150	℃

Thermal Characteristic

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance,Junction-to-Case (Note 2) **(Q1)**	$R_{\theta JC}$	6.5	7	℃/W
Thermal Resistance,Junction-to-Case (Note 2) **(Q2)**	$R_{\theta JC}$	6	6.3	℃/W

Q1 Electrical Characteristics (T_C=25℃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	-	-	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	1.0	1.5	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A	-	7.5	9	mΩ
		V_{GS}=4.5V, I_D=10A	-	10.2	14	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=10A	-	20	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=15V,V_{GS}=0V, F=1.0MHz	-	690	-	PF
Output Capacitance	C_{oss}		-	105	-	PF
Reverse Transfer Capacitance	C_{rss}		-	80	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V, R_L=0.75Ω V_{GS}=10V,R_G=3Ω	-	5	-	nS
Turn-on Rise Time	t_r		-	3.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	nS
Turn-Off Fall Time	t_f		-	3.5	-	nS
Total Gate Charge	Q_g	V_{DS}=15V,I_D=10A, V_{GS}=10V	-	15		nC
Gate-Source Charge	Q_{gs}		-	2.5		nC
Gate-Drain Charge	Q_{gd}		-	3		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=10A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	15	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =10A di/dt = 100A/μs (Note3)	-	19	-	nS
Reverse Recovery Charge	Qrr		-	10	-	nC

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
5. EAS condition : Tj=25℃,V_{DD}=15V,V_G=10V,L=0.5mH,Rg=25Ω

Q1Typical Electrical and Thermal Characteristics (Curves)

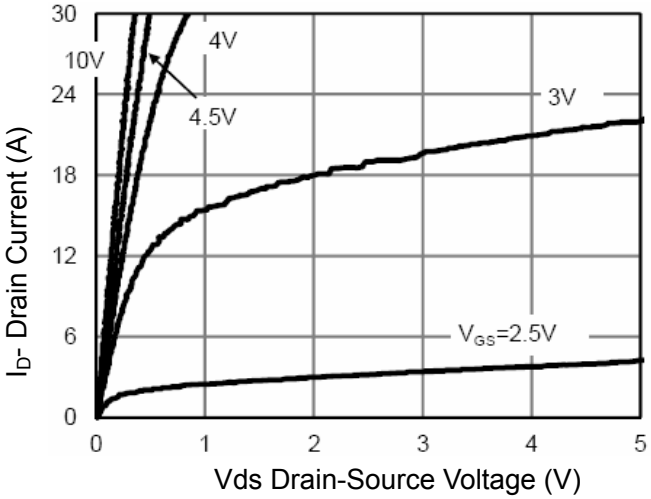


Figure 1 Output Characteristics

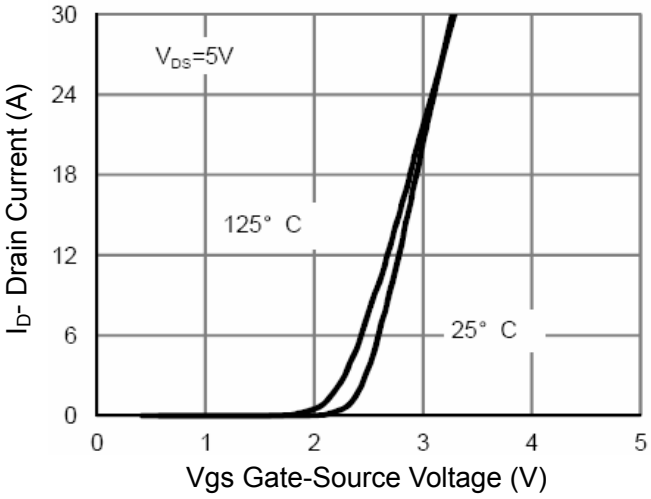


Figure 2 Transfer Characteristics

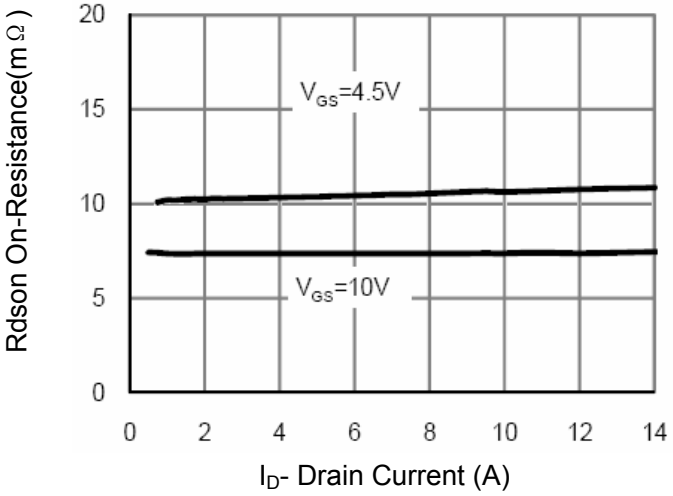


Figure 3 Rdson- Drain Current

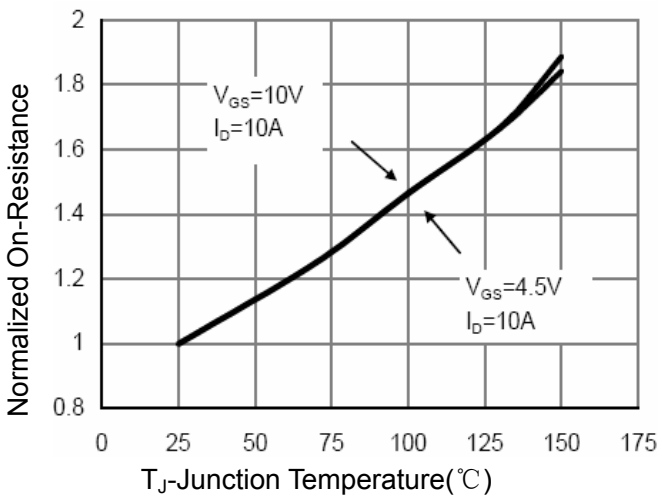


Figure 4 Rdson-Junction Temperature

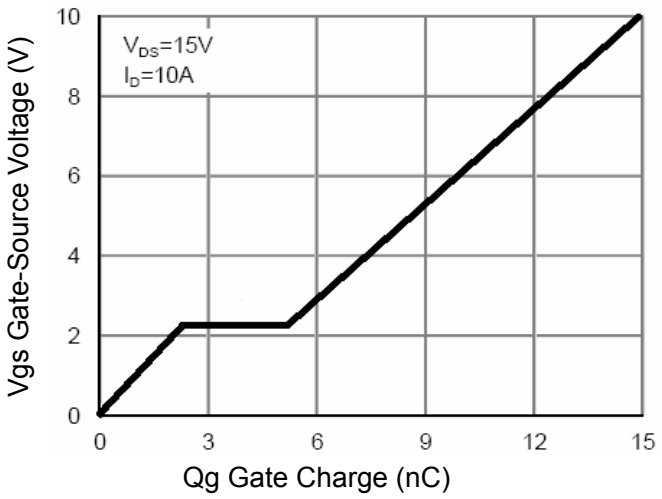


Figure 5 Gate Charge

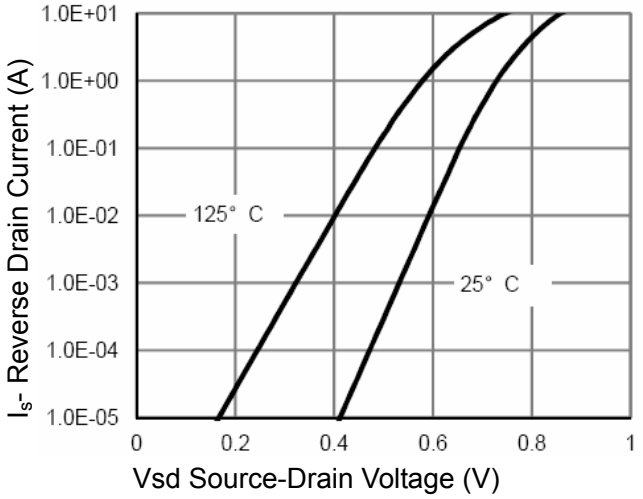


Figure 6 Source- Drain Diode Forward

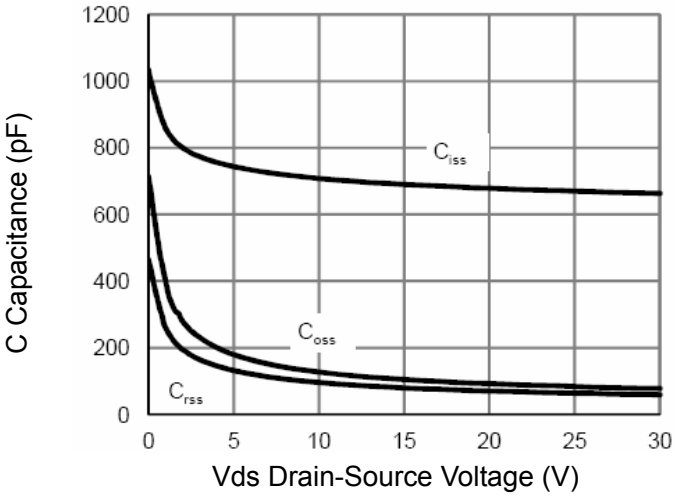


Figure 7 Capacitance vs Vds

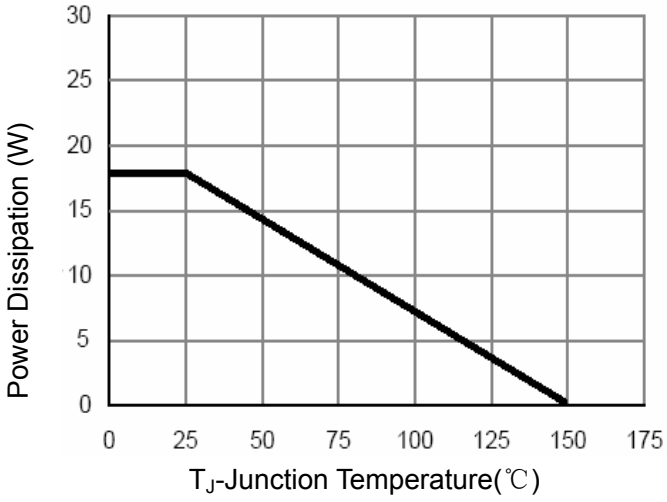


Figure 9 Power De-rating

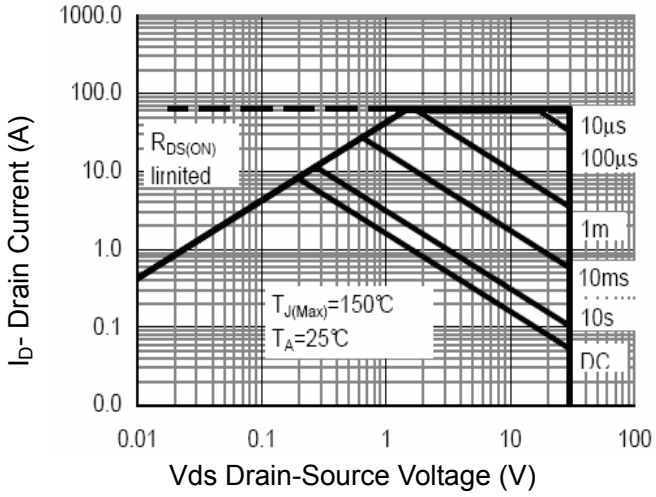


Figure 8 Safe Operation Area

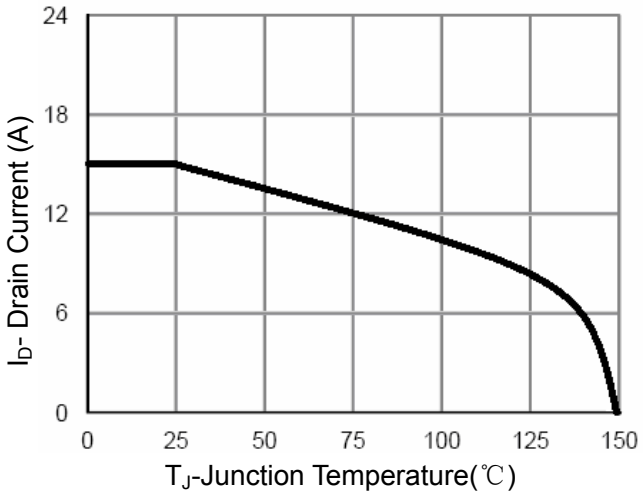


Figure 10 I_D Current De-rating

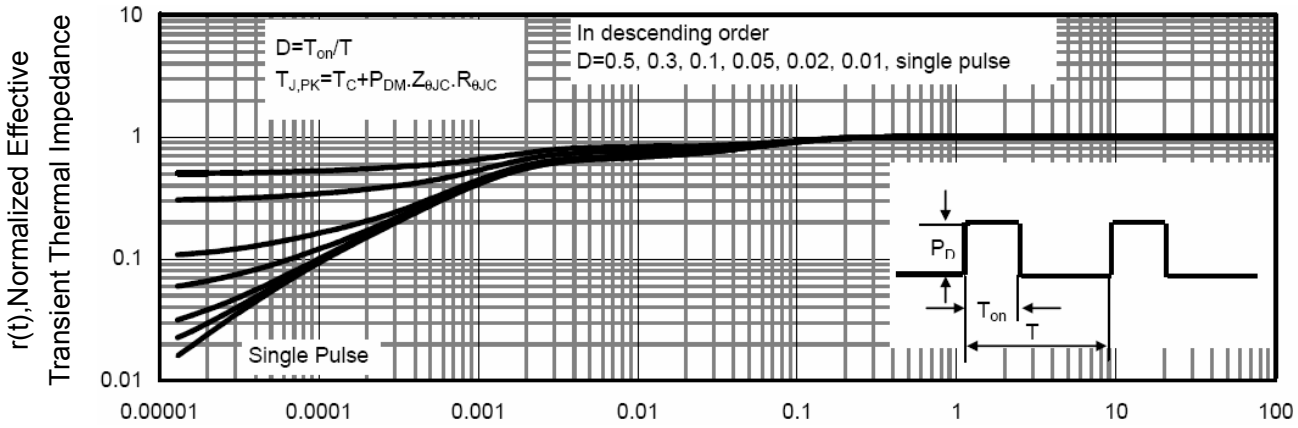


Figure 11 Normalized Maximum Transient Thermal Impedance

Q2 Electrical Characteristics (TC=25℃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	-	-	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	1.0	1.5	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A	-	6.4	8.5	mΩ
		V_{GS}=4.5V, I_D=10A	-	17	22	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=10A	-	26	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=15V,V_{GS}=0V, F=1.0MHz	-	1210	-	PF
Output Capacitance	C_{oss}		-	160	-	PF
Reverse Transfer Capacitance	C_{rss}		-	105	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V, R_L=0.75Ω V_{GS}=10V,R_G=3Ω	-	5	-	nS
Turn-on Rise Time	t_r		-	12	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	nS
Turn-Off Fall Time	t_f		-	6	-	nS
Total Gate Charge	Q_g	V_{DS}=15V,I_D=10A, V_{GS}=10V	-	17.5		nC
Gate-Source Charge	Q_{gs}		-	3		nC
Gate-Drain Charge	Q_{gd}		-	4.1		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=10A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	20	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =10A di/dt = 100A/μs (Note3)	-	19	-	nS
Reverse Recovery Charge	Qrr		-	10	-	nC

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
5. EAS condition : Tj=25℃,V_{DD}=15V,V_G=10V,L=0.5mH,Rg=25Ω

Q2Typical Electrical and Thermal Characteristics (Curves)

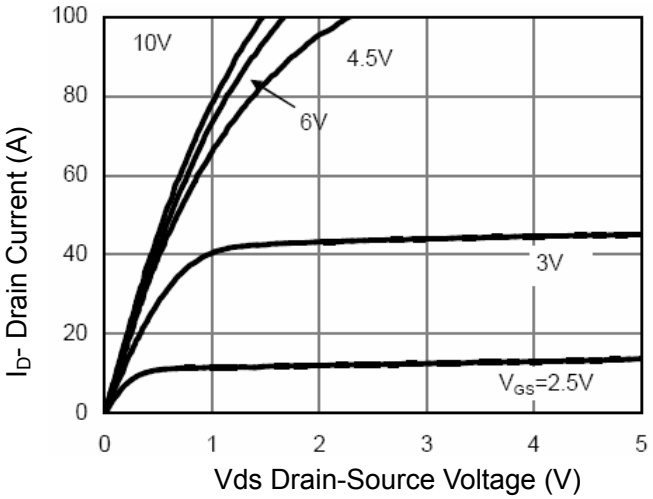


Figure 1 Output Characteristics

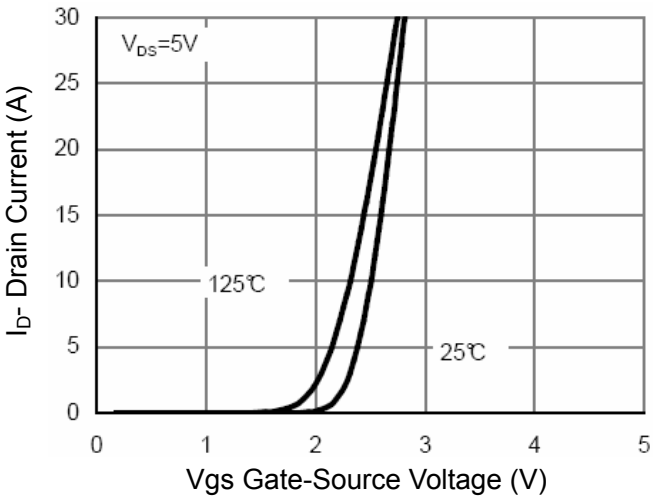


Figure 2 Transfer Characteristics

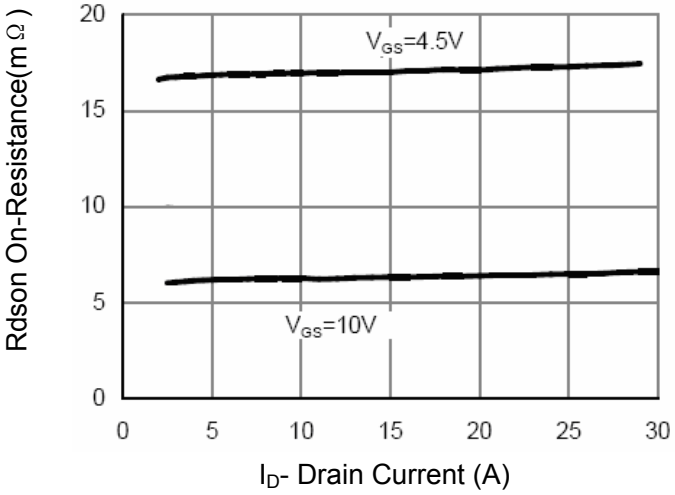


Figure 3 Rdson- Drain Current

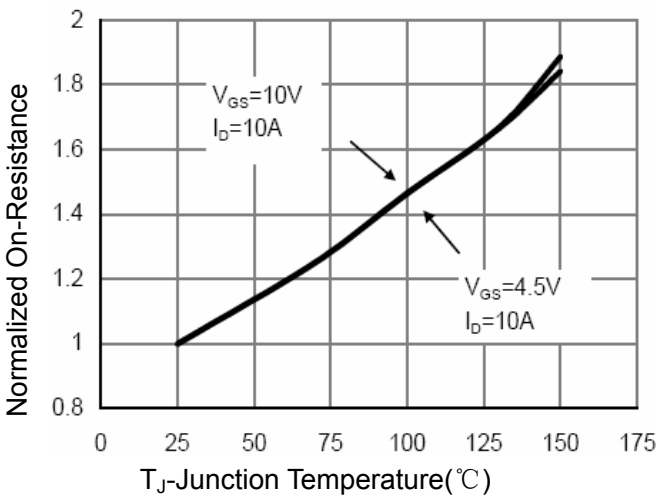


Figure 4 Rdson-Junction Temperature

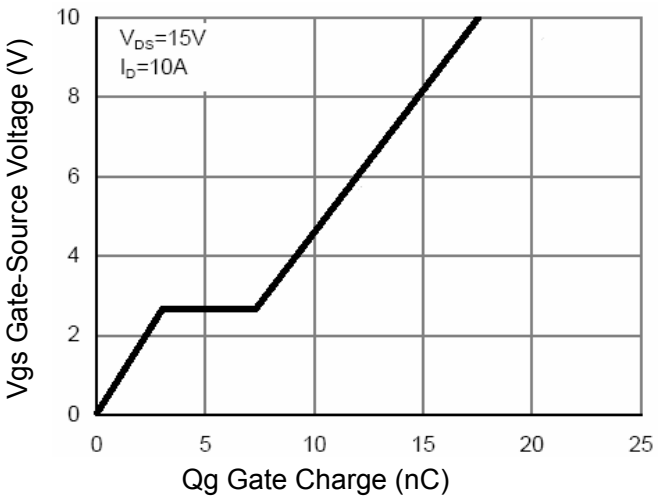


Figure 5 Gate Charge

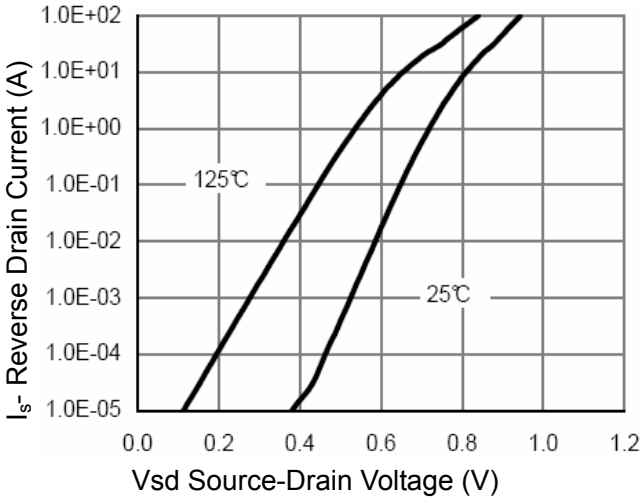


Figure 6 Source- Drain Diode Forward

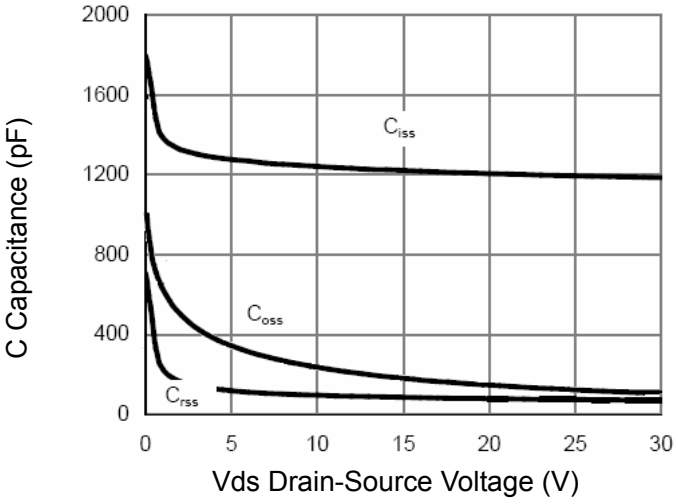


Figure 7 Capacitance vs Vds

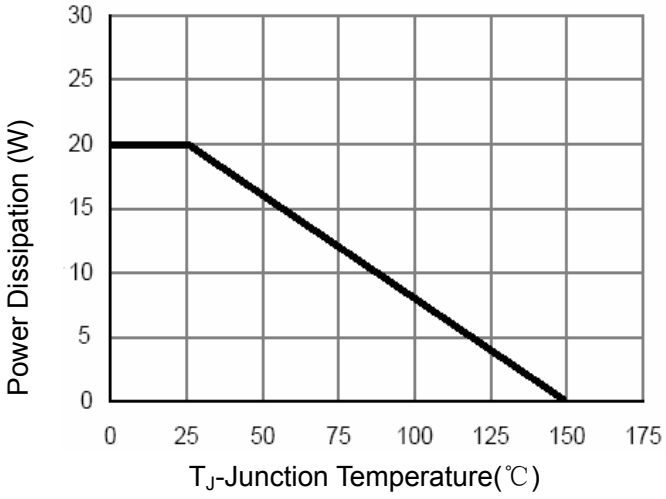


Figure 9 Power De-rating

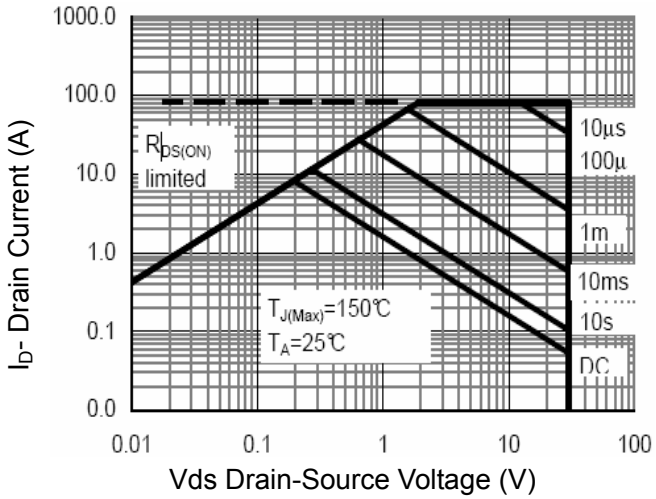


Figure 8 Safe Operation Area

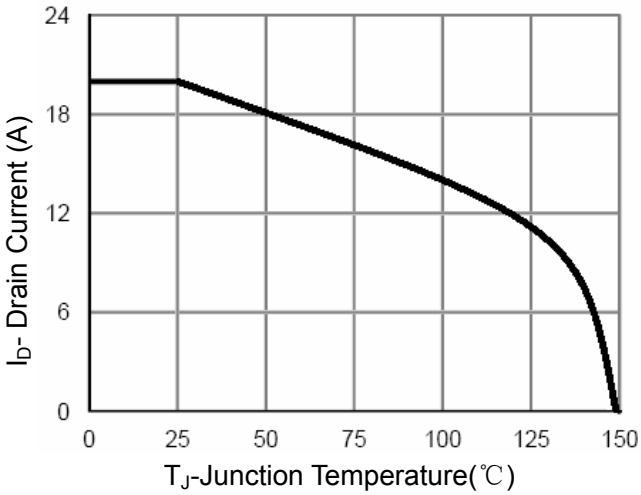


Figure 10 I_D Current De-rating

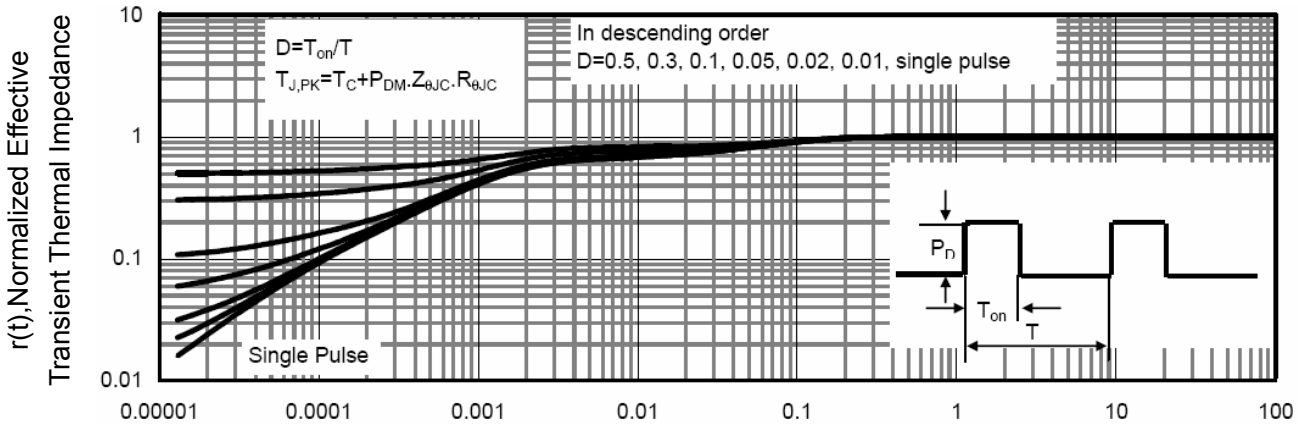
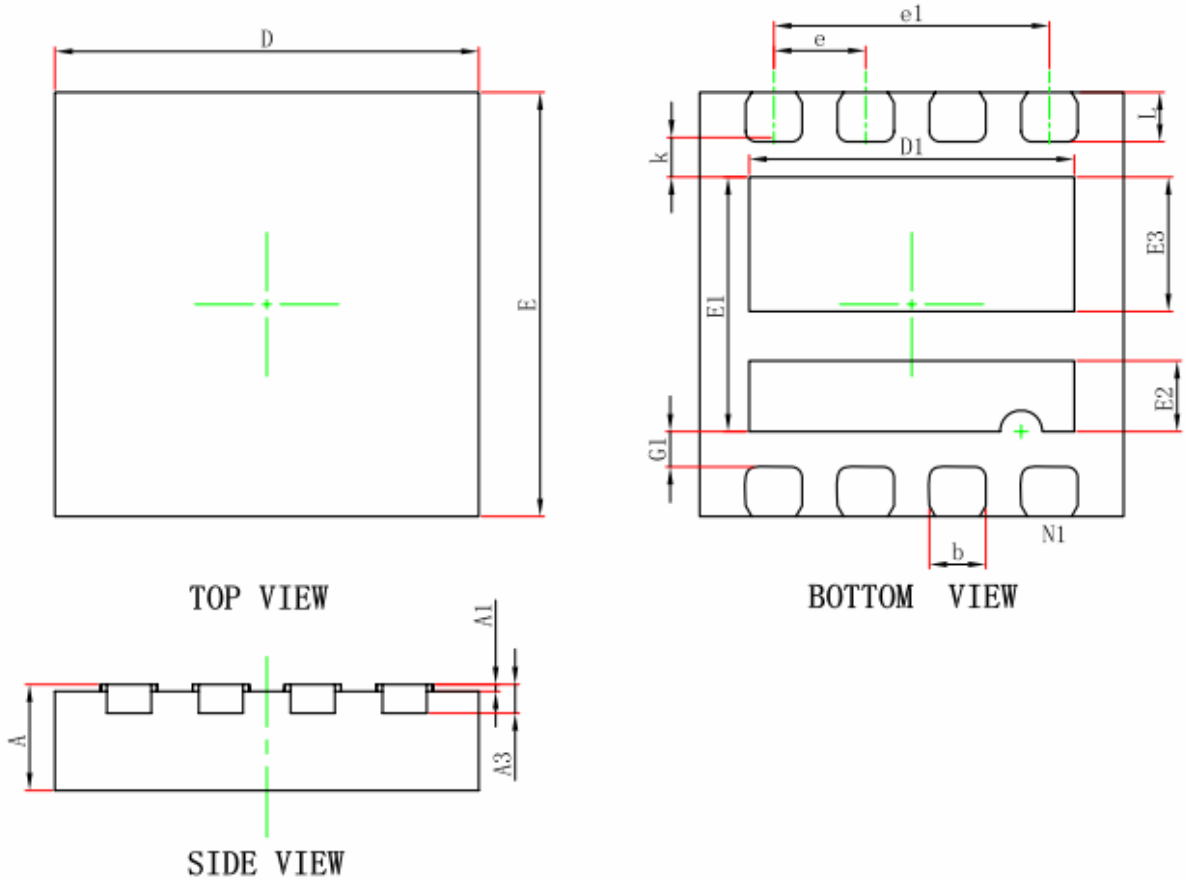


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3X3-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.950	3.050	0.116	0.120
E	2.950	3.050	0.116	0.120
D1	2.250	2.350	0.089	0.093
E1	1.700	1.900	0.067	0.075
E2	0.450	0.550	0.018	0.022
E3	0.900	1.000	0.035	0.039
k	0.200	0.300	0.008	0.012
G1	0.200	0.300	0.008	0.012
b	0.350	0.450	0.014	0.018
e	0.650BSC		0.026BSC	
e1	1.95BSC		0.077BSC	
L	0.300	0.400	0.012	0.016

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