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

Description

The NCEB301G 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 DFN5x6 package. The Q1 "High Side" MOSFET is designed to minimize switching losses. The Q2 "Low Side" MOSFET uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge.

Application

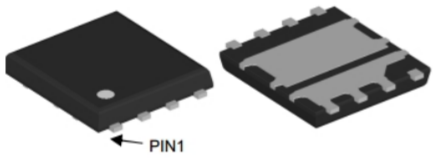
- Compact DC/DC converter applications
- Synchronous buck converters

Q1 "High Side" MOSFET

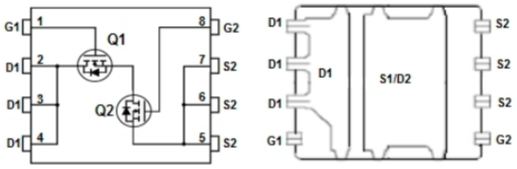
- V_{DS} = 30 V,I_D = 20 A
  $R_{DS(ON)}$< 7.2 mΩ @V_{GS}=10V (typical: 6.1 mΩ)
  $R_{DS(ON)}$< 12.5 mΩ @V_{GS}=4.5V (typical: 9.6 mΩ)

Q2 "Low Side" MOSFET

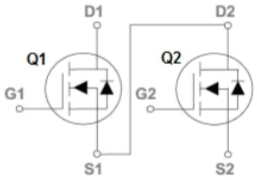
- V_{DS} = 30 V,I_D = 35 A
  $R_{DS(ON)}$< 4.1 mΩ @V_{GS}=10V (typical: 3.5 mΩ)
  $R_{DS(ON)}$< 7.8 mΩ @V_{GS}=4.5V (typical: 5.9 mΩ)
- Excellent gate charge x $R_{DS(on)}$ (FOM)
- Very low on-resistance $R_{DS(on)}$
- 150°C operating temperature
- Pb-free lead plating
- 100% UIS tested



Top View Bottom View
Dual PDFN5×6-8L



Pin Assignment



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
B301G	NCEB301G	PDFN5×6-8L	Ø330mm	12mm	5000units

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
Continuous Drain Current	I_D	20	35	A
Continuous Drain Current(T_C=100℃)	I_D(100℃)	20	35	A
Pulsed Drain Current	I_{DM}	80	140	A
Maximum Power Dissipation	P_D	20	40	W
Single pulse avalanche energy (Note 1)	E_{AS}	100	207	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150		℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case**(Q1)**	$R_{\theta JC}$	6.3	℃/W
Thermal Resistance,Junction-to-Case**(Q2)**	$R_{\theta JC}$	3.1	℃/W
Thermal Resistance,Junction-to-Ambient (Note 2)**(Q1)**	$R_{\theta JA}$	50	℃/W
Thermal Resistance,Junction-to-Ambient (Note 2)**(Q2)**	$R_{\theta JA}$	50	℃/W

Q1 N-Channel 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						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.0	1.6	2.3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A	-	6.1	7.2	mΩ
		V_{GS}=4.5V, I_D=10A	-	9.6	12.5	mΩ
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=13A	-	32	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=15V,V_{GS}=0V F=1.0MHz	-	960	-	pF
Output Capacitance	C_{oss}		-	157	-	pF
Reverse Transfer Capacitance	C_{rss}		-	140	-	pF
Switching Characteristics (Note 3)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V ,R_L=0.75Ω V_{GS}=10V,R_G=3Ω	-	7	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-off Delay Time	$t_{d(off)}$		-	26	-	nS
Turn-off Fall Time	t_f		-	7	-	nS
Total Gate Charge	Q_g	V_{DS}=15V,I_D=15A, V_{GS}=10V	-	24	-	nC
Gate-Source Charge	Q_{gs}		-	3	-	nC
Gate-Drain Charge	Q_{gd}		-	6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=10A	-	-	1.2	V
Diode Forward Current	I_S		-	-	20	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =20A di/dt = 100A/μs	-	11	-	nS
Reverse Recovery Charge	Qrr		-	15	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Q2 N-Channel 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

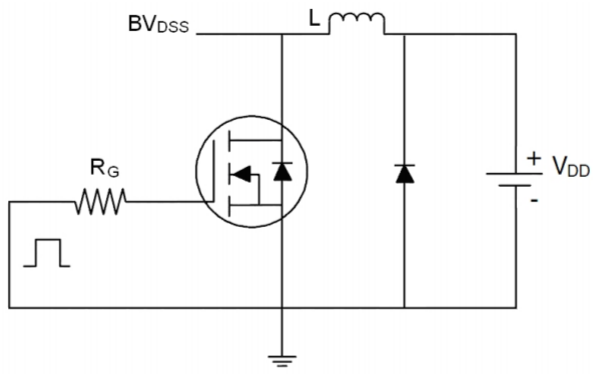
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1	1.6	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=12A	-	3.5	4.1	mΩ
		V_{GS}=4.5V, I_D=10A	-	5.9	7.8	mΩ
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=20A	-	30	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=15V,V_{GS}=0V F=1.0MHz	-	1784	-	pF
Output Capacitance	C_{oss}		-	266	-	pF
Reverse Transfer Capacitance	C_{rss}		-	212	-	pF
Switching Characteristics (Note 3)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V ,R_L=1.5Ω V_{GS}=10V,R_G=6Ω	-	7	-	nS
Turn-on Rise Time	t_r		-	6	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	8	-	nS
Total Gate Charge	Q_g	V_{DS}=15V,I_D=20A V_{GS}=10V	-	38.4	-	nC
Gate-Source Charge	Q_{gs}		-	5.8	-	nC
Gate-Drain Charge	Q_{gd}		-	7.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=12A	-	-	1.2	V
Diode Forward Current	I_S		-	-	35	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = 20A di/dt = 100A/μs	-	47	-	nS
Reverse Recovery Charge	Qrr		-	47	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

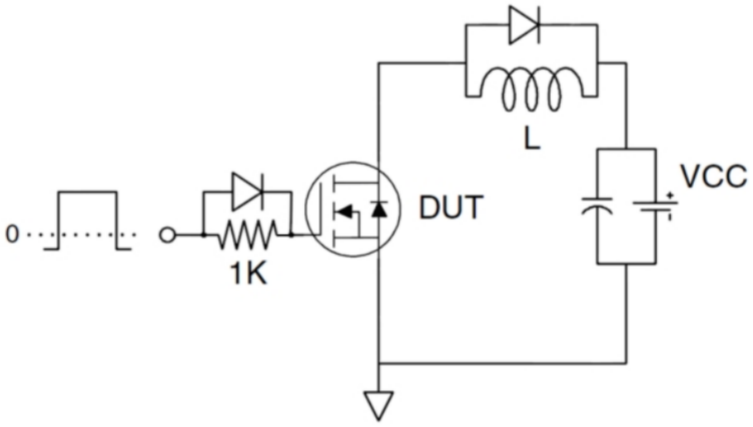
1. EAS condition : Tj=25℃,V_{DD}=25V,,V_G=10V,L=0.5mH,Rg=25Ω.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C. The maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.
3. Guaranteed by design, not subject to production.
4. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

Test Circuit

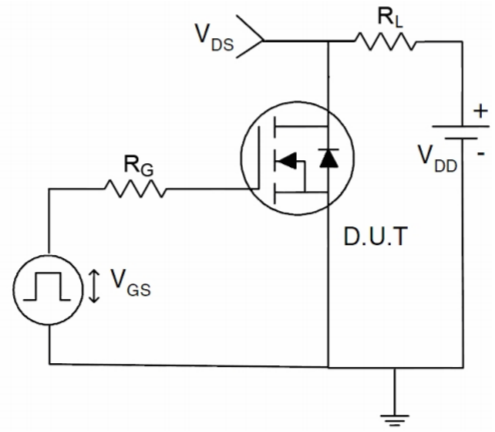
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Q1 N-Channel Typical Electrical and Thermal Characteristics (Curves)

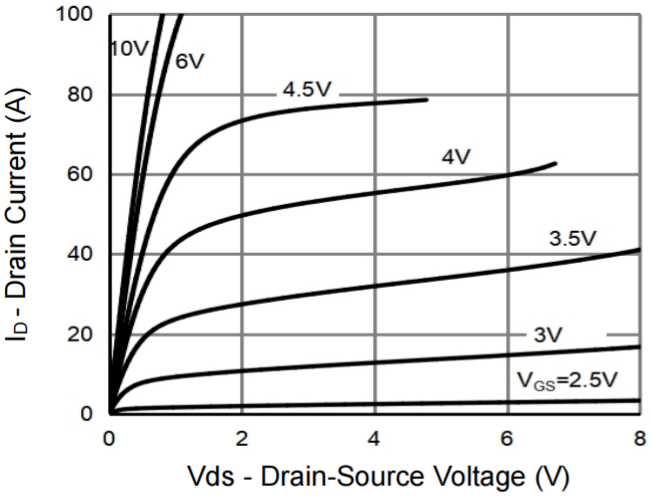


Figure 1 Output Characteristics

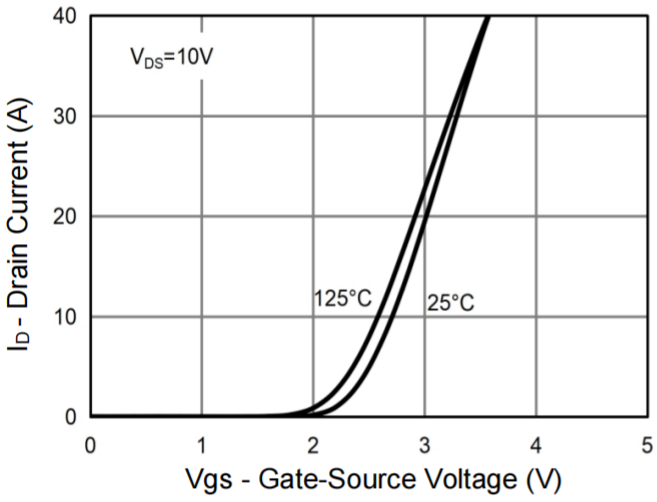


Figure 2 Transfer Characteristics

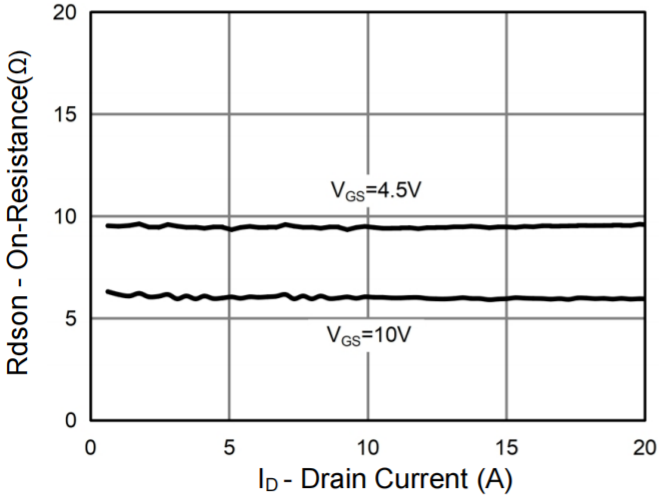


Figure 3 Rdson vs Drain Current

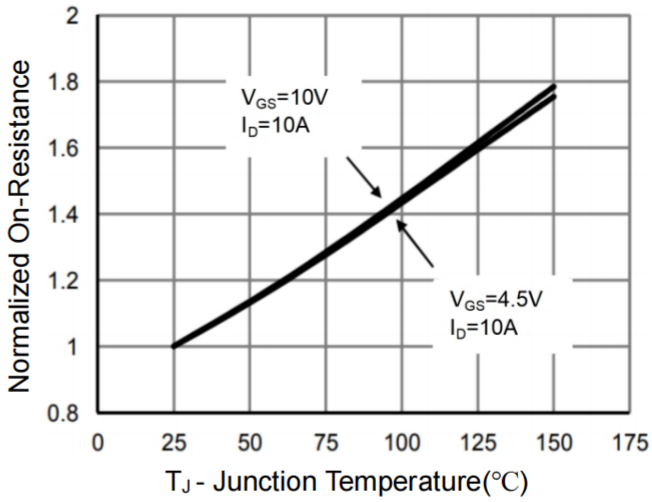


Figure 4 Rdson vs Junction Temperature

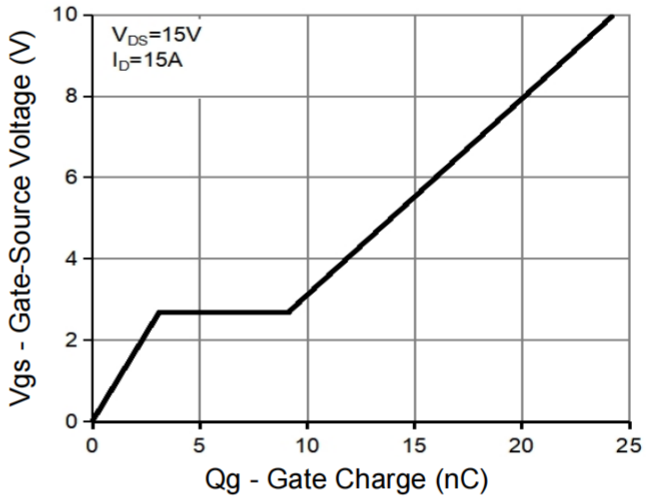


Figure 5 Gate Charge

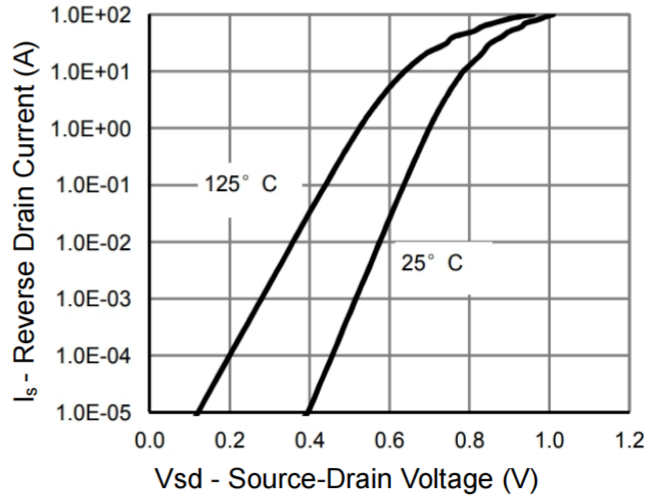


Figure 6 Source-Drain Diode Forward

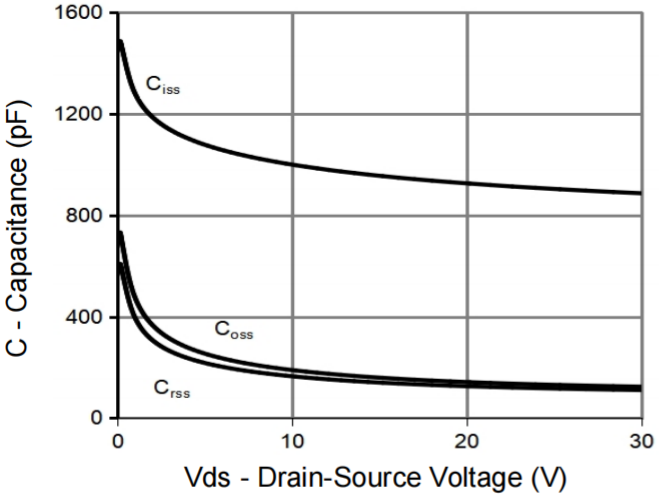


Figure 7 Capacitance vs Vds

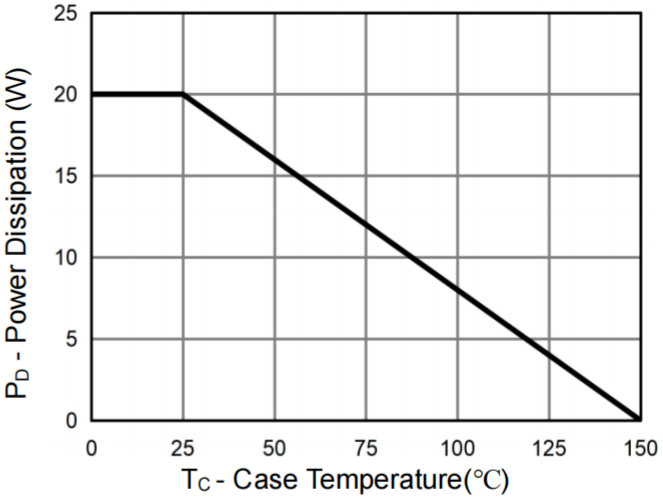


Figure 9 Power De-rating

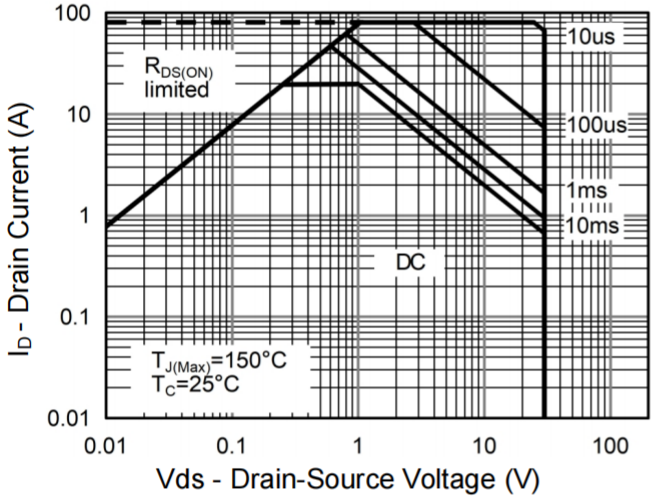


Figure 8 Safe Operation Area (Note 4)

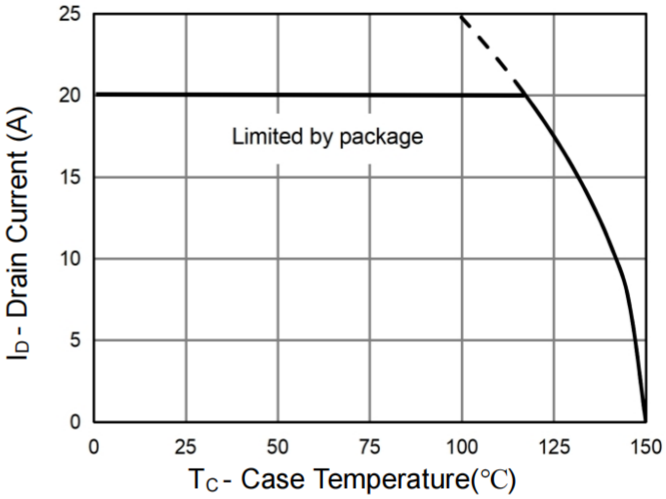


Figure 10 Drain Current De-rati

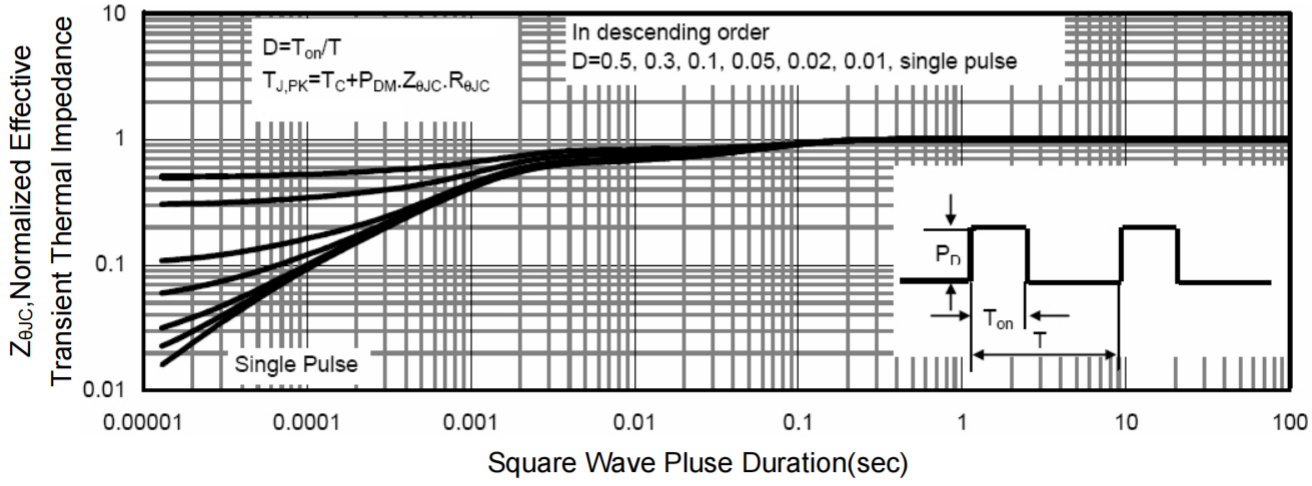


Figure 11 Normalized Maximum Transient Thermal Impedance

Q2 N-Channel Typical Electrical and Thermal Characteristics (Curves)

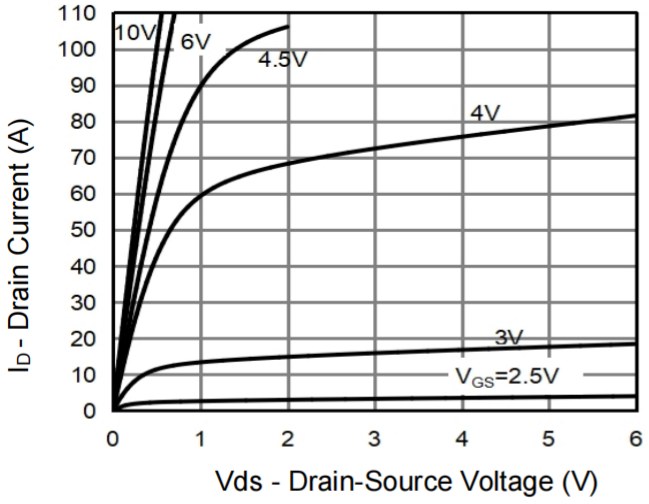


Figure 1 Output Characteristics

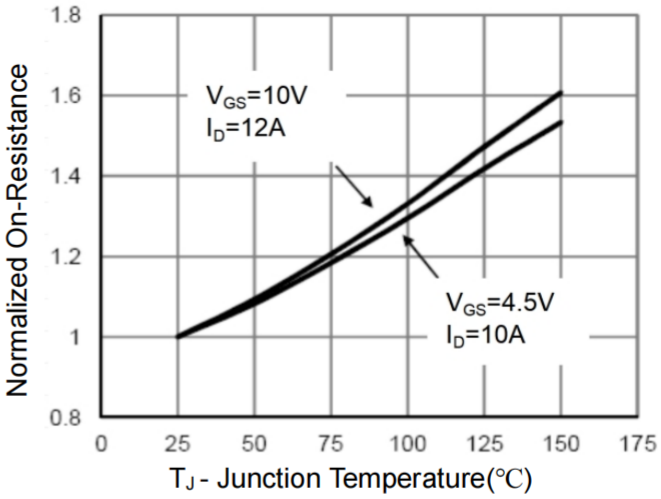


Figure 4 Rdson vs Junction Temperature

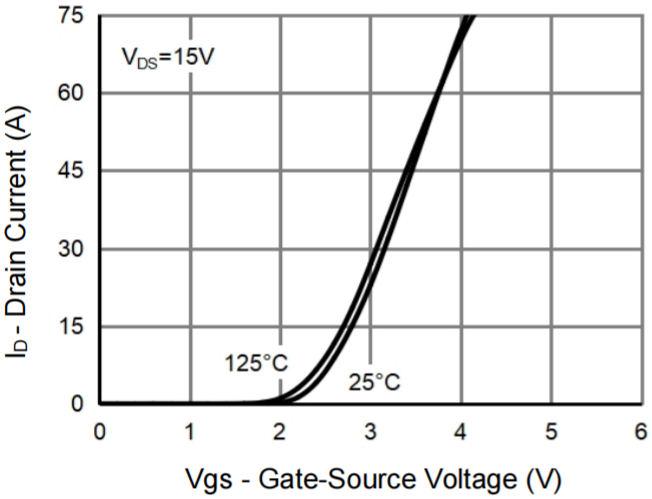


Figure 2 Transfer Characteristics

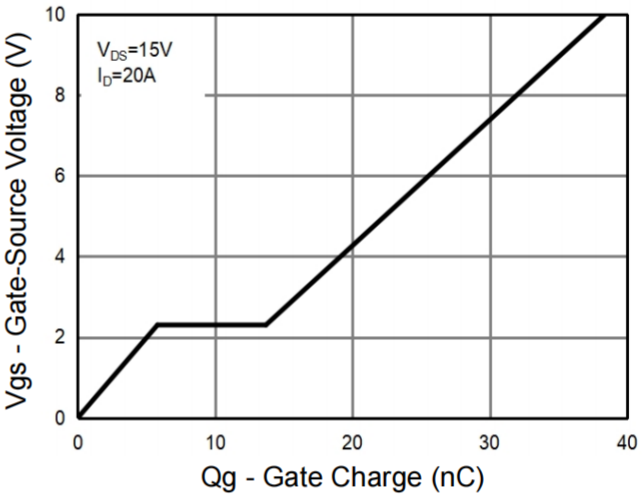


Figure 5 Gate Charge

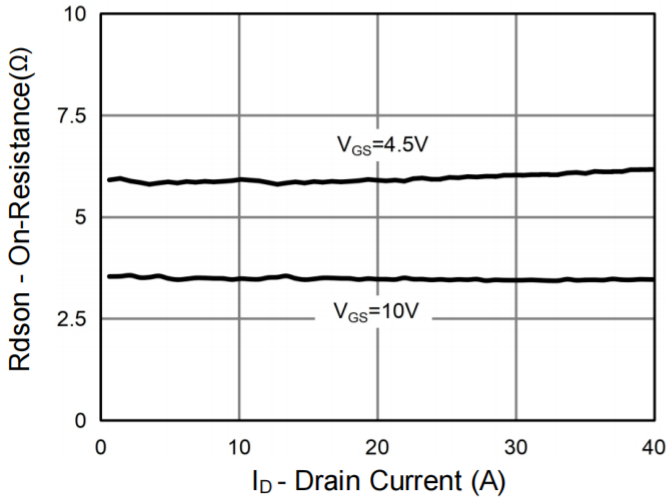


Figure 3 Rdson vs Drain Current

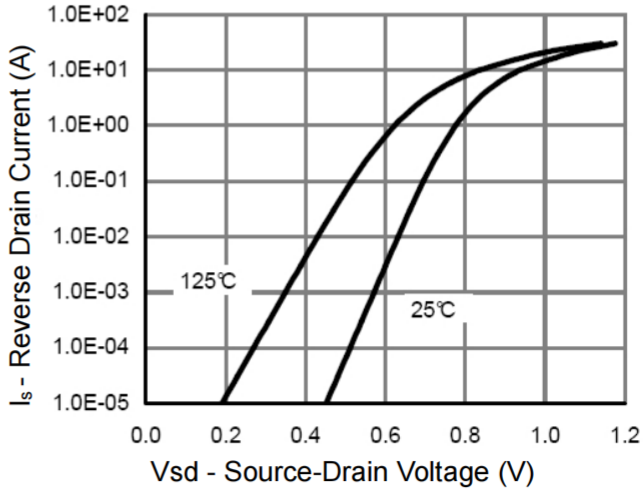


Figure 6 Source-Drain Diode Forward

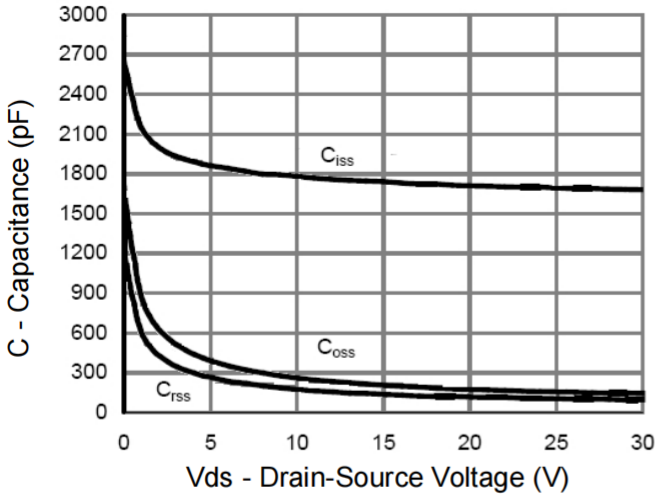


Figure 7 Capacitance vs Vds

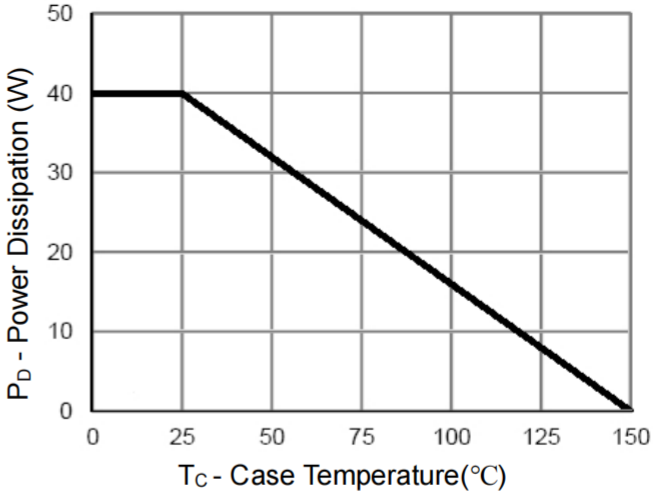


Figure 9 Power De-rating

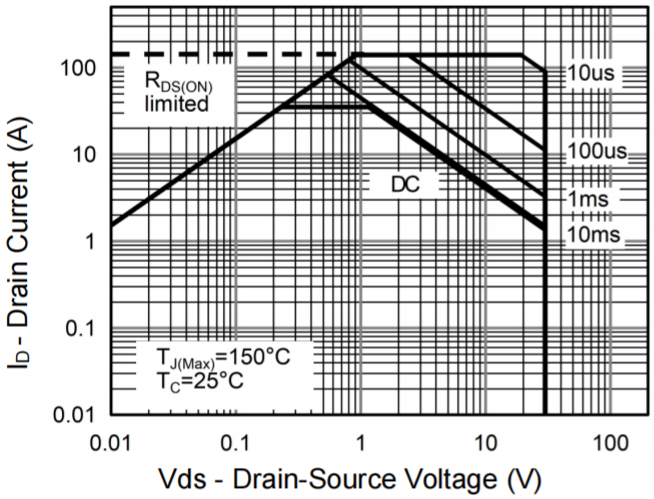


Figure 8 Safe Operation Area (Note 4)

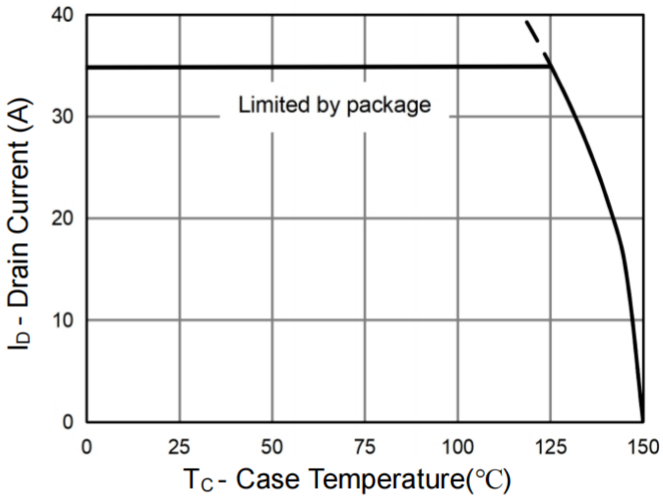


Figure 10 Drain Current De-rating

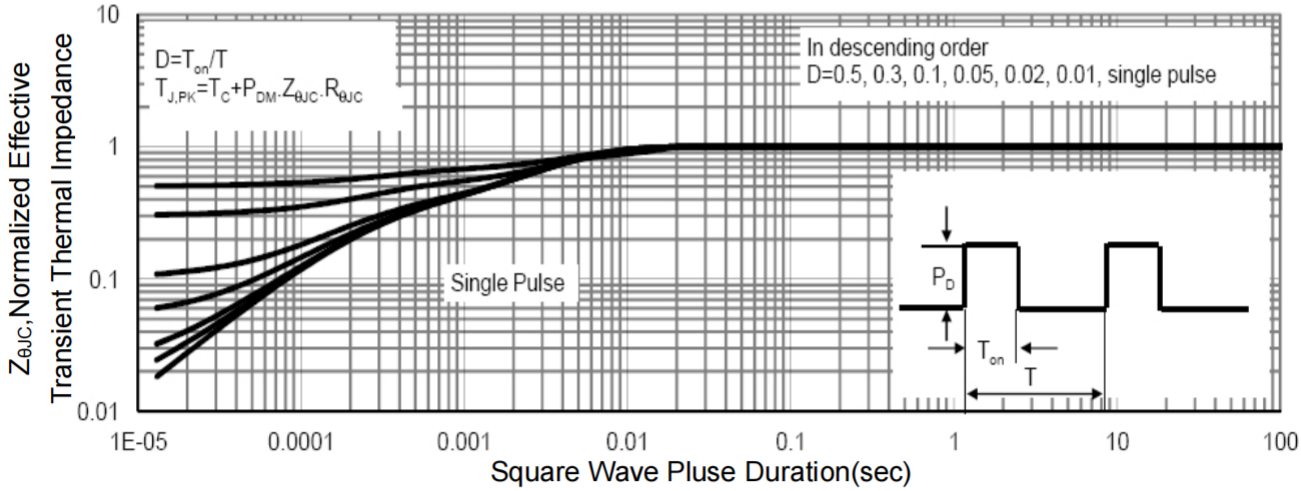
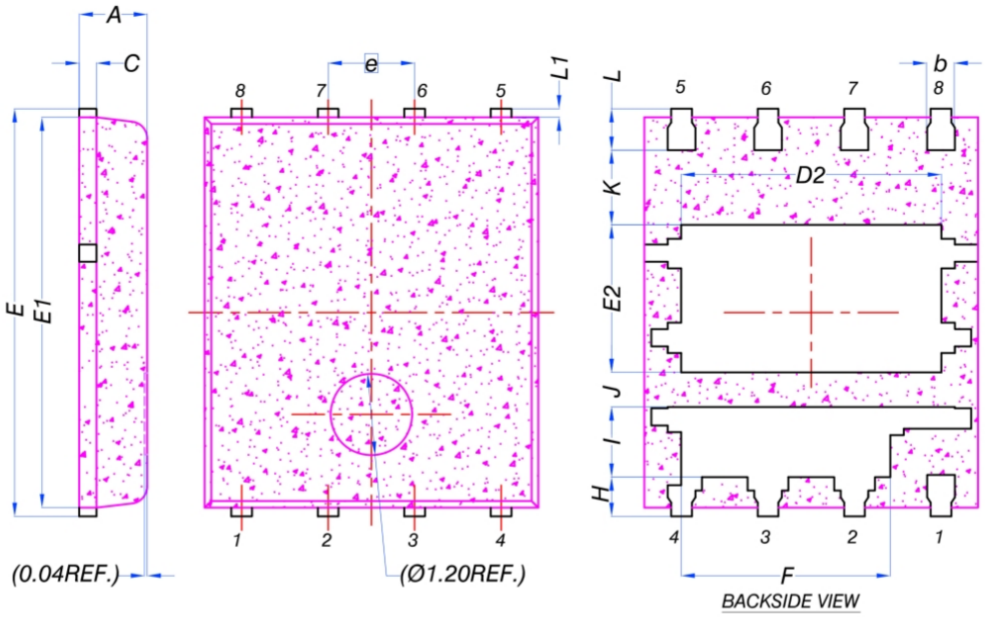


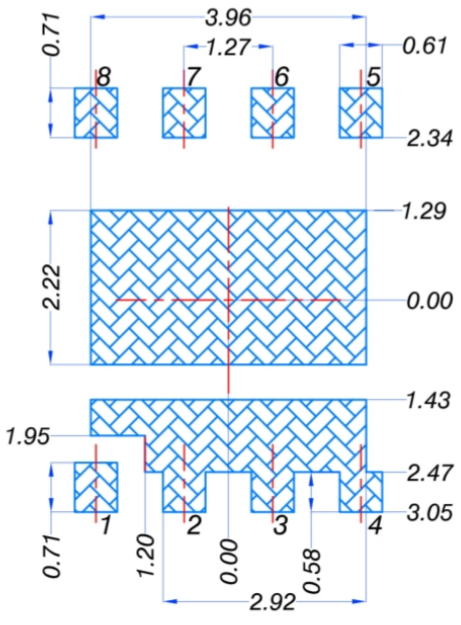
Figure 11 Normalized Maximum Transient Thermal Impedance

PDFN5×6-8L(G) Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	---	0.05
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	2.02	2.17	2.32
e	1.27 BSC		
F	2.87	3.07	3.22
H	0.48	0.58	0.68
I	0.94	1.04	1.14
J	0.40	0.50	0.60
K	0.50	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°

Land Pattern
(Only for Reference)



Revision History

Revision	Date	Subjects
V2.0	2026.3	Update the parameters and curves.

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