

30V Half Bridge Dual N-Channel Super Trench Power MOSFET

Description

The NCEPB303GU uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . It includes two specialized MOSFETs in a dual Power DFN5x6 package.

General Features

Q1 "High Side" MOSFET

• $V_{DS} = 30V, I_D = 30A$

$R_{DS(ON)} < 5.8m\Omega @ V_{GS} = 10V$

$R_{DS(ON)} < 8.9m\Omega @ V_{GS} = 4.5V$

• Excellent gate charge x $R_{DS(on)}$ product(FOM)

• Very low on-resistance $R_{DS(on)}$

• 150 °C operating temperature

• **Pb free terminal plating**

• **RoHS compliant**

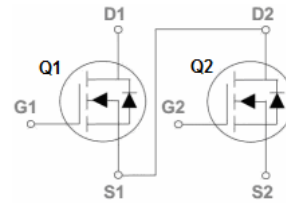
• **Halogen free**

Application

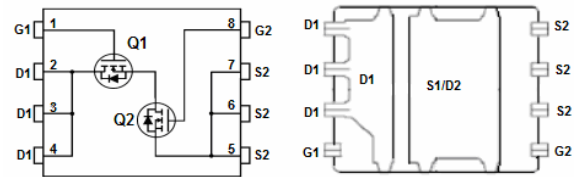
• Compact DC/DC converter applications

100% UIS TESTED!

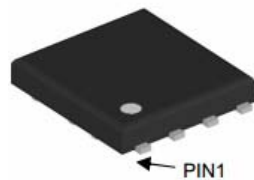
100% ΔVds TESTED!



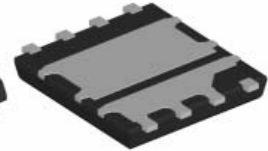
Schematic Diagram



pin assignment



Top View



Bottom View

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
PB303GU	NCEPB303GU	DFN5X6-8L	330mm	12mm	5000 units

Absolute Maximum Ratings ($T_C = 25^\circ C$ 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)	I_D	$T_C = 25^\circ C$	30	100
		$T_C = 100^\circ C$	21	70
Drain Current -Pulsed (Note 1)	I_{DM}	120	400	A
Power Dissipation	P_D	30	80	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	-55 To 150	$^\circ C$

Thermal Characteristic

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction-to-Case (Note 2) (Q1)	$R_{\theta JC}$	3.3	4.2	$^\circ C/W$
Thermal Resistance, Junction-to-Case (Note 2) (Q2)	$R_{\theta JC}$	1.2	1.6	$^\circ C/W$

Q1 Electrical Characteristics (T_C=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		-	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	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =15A	-	5.2	5.8	mΩ
		V _{GS} =4.5V, I _D =15A	-	7.7	8.9	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =15A		30	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, F=1.0MHz	-	822	-	PF
Output Capacitance	C _{oss}		-	344	-	PF
Reverse Transfer Capacitance	C _{rss}		-	15.3	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =15V, I _D =15A V _{GS} =10V, R _G =1.6Ω	-	6.5	-	nS
Turn-on Rise Time	t _r		-	2.5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	17	-	nS
Turn-Off Fall Time	t _f		-	2.5	-	nS
Total Gate Charge	Q _g	V _{DS} =15V, I _D =15A, V _{GS} =10V	-	15	-	nC
Gate-Source Charge	Q _{gs}		-	2.9		nC
Gate-Drain Charge	Q _{gd}		-	2.1		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =20A	-		1.2	V
Diode Forward Current (Note 2)	I _S		-	-	30	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S di/dt = 100A/μs (Note 3)	-	11	-	nS
Reverse Recovery Charge	Q _{rr}		-	19	-	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 : T_J=25°C, V_{DD}=15V, V_G=10V, L=0.5mH, R_G=25Ω

Q1 Typical Electrical and Thermal Characteristics

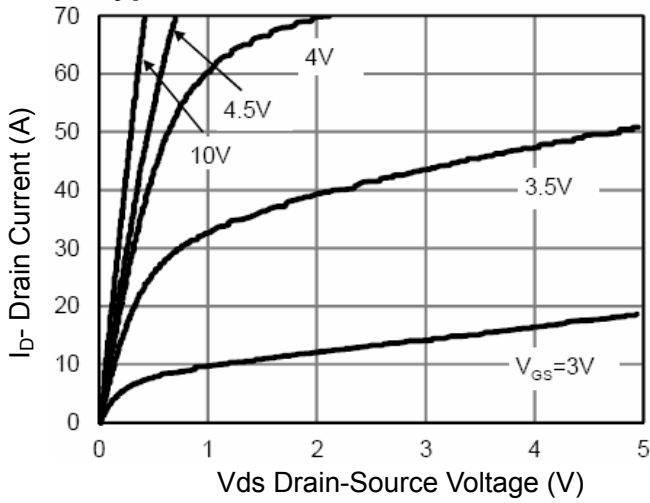


Figure 1 Output Characteristics

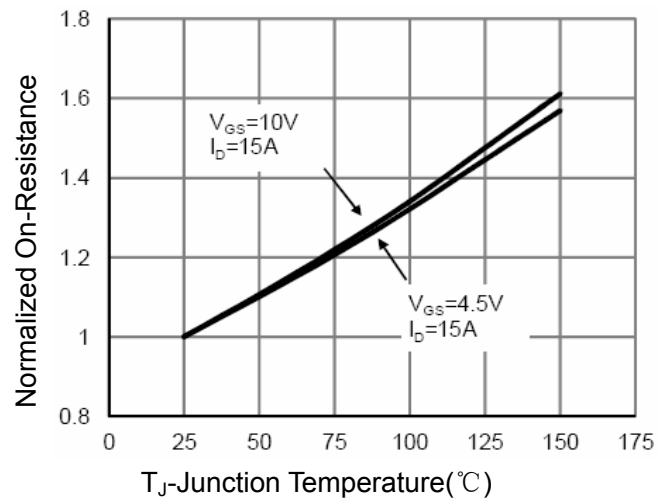


Figure 4 R_{dson} -Junction Temperature

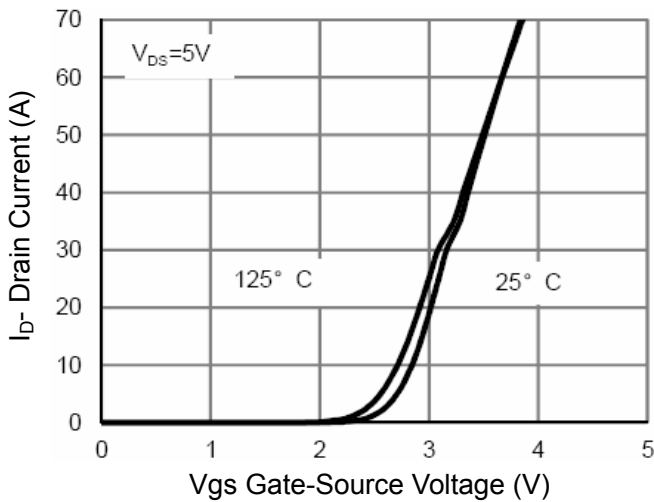


Figure 2 Transfer Characteristics

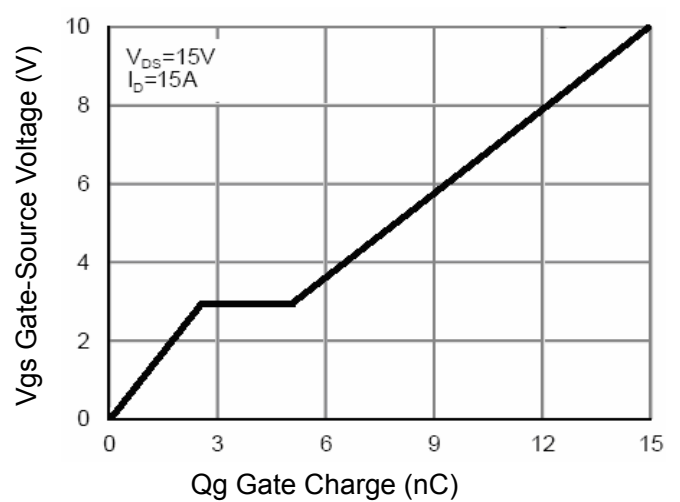


Figure 5 Gate Charge

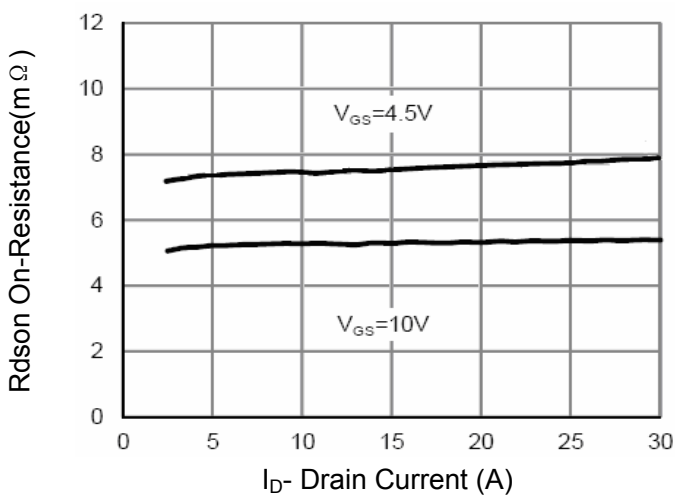


Figure 3 R_{dson} - Drain Current

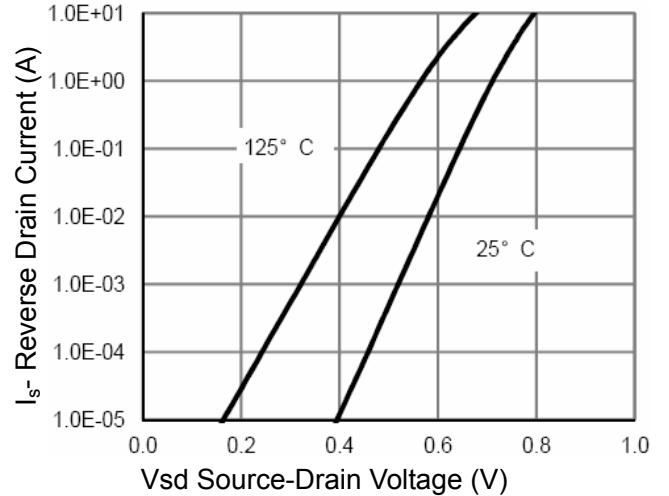


Figure 6 Source- Drain Diode Forward

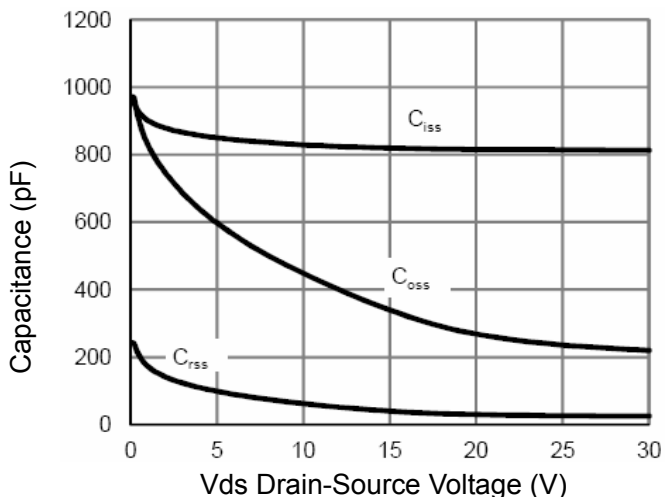


Figure 7 Capacitance vs Vds

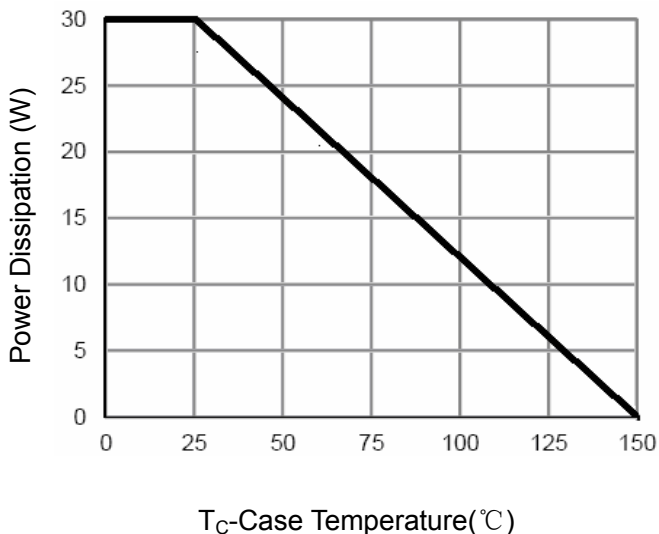


Figure 9 Power De-rating

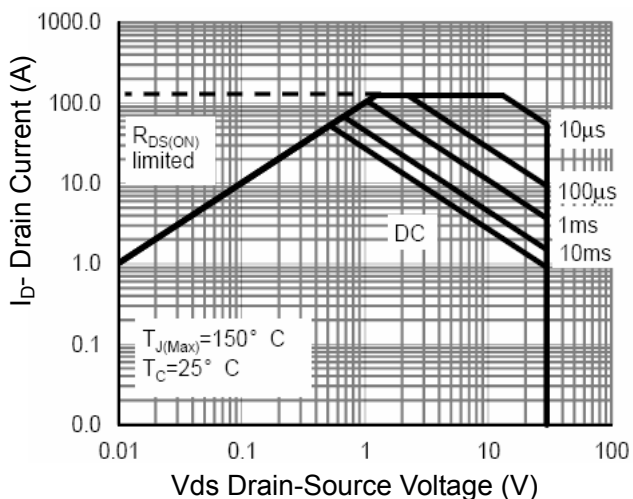


Figure 8 Safe Operation Area

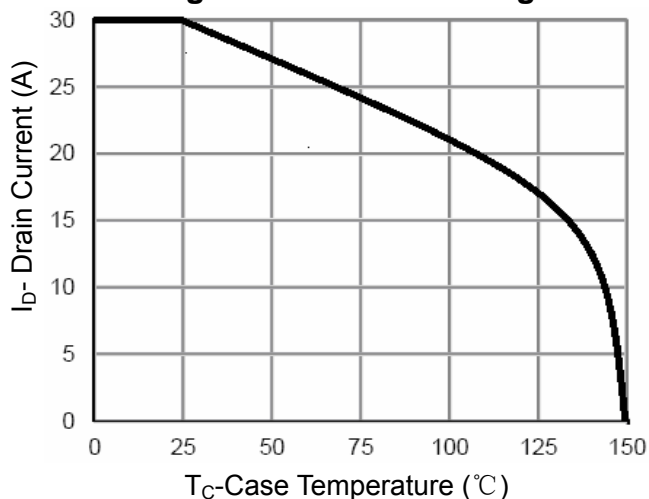


Figure 10 Current De-rating

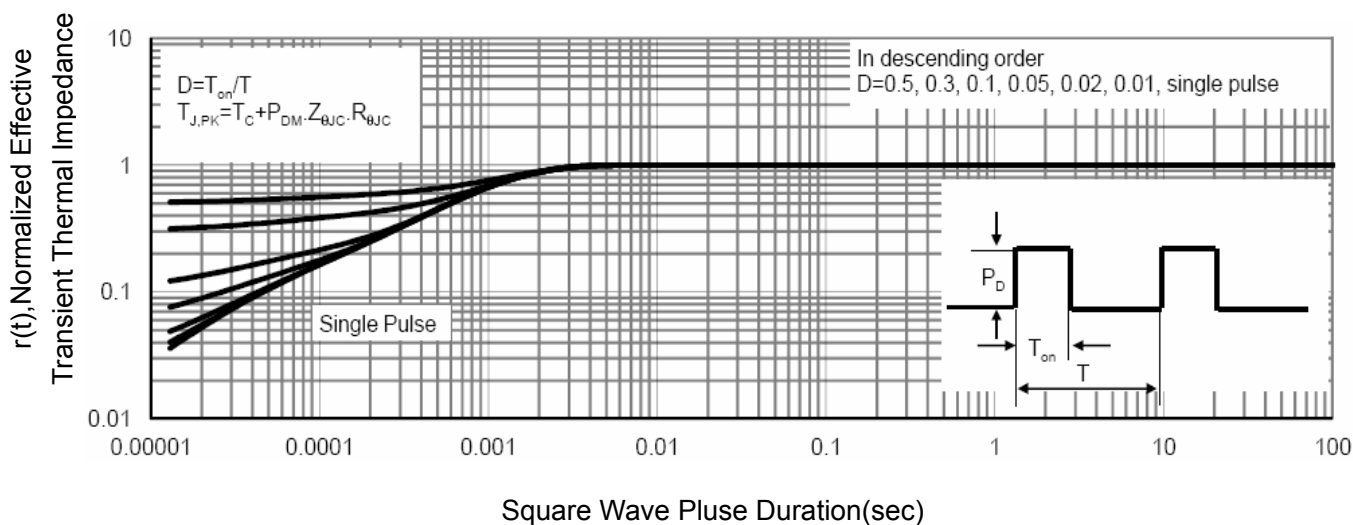


Figure 11 Normalized Maximum Transient Thermal Impedance

Q2 Electrical Characteristics (TC=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 10	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.7	2.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=50A$	-	1.7	1.9	m Ω
		$V_{GS}=4.5V, I_D=50A$	-	2.4	2.8	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=50A$		65	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	3370	-	PF
Output Capacitance	C_{oss}		-	902	-	PF
Reverse Transfer Capacitance	C_{rss}		-	60	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=50A$ $V_{GS}=10V, R_G=1.6\Omega$	-	7	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	32	-	nS
Turn-Off Fall Time	t_f		-	9	-	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=50A,$ $V_{GS}=10V$	-	55	-	nC
Gate-Source Charge	Q_{gs}		-	9		nC
Gate-Drain Charge	Q_{gd}		-	8.5		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=50A$	-		1.2	V
Diode Forward Current	I_S		-	-	100	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ C, I_F = I_S$ $di/dt = 500A/\mu s$ (Note 3)	-	20	-	nS
Reverse Recovery Charge	Q_{rr}		-	50	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25\Omega$

Q2 Typical Electrical and Thermal Characteristics

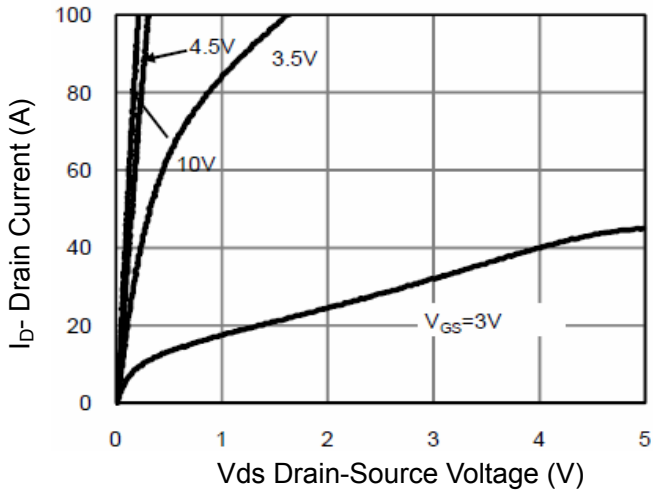


Figure 1 Output Characteristics

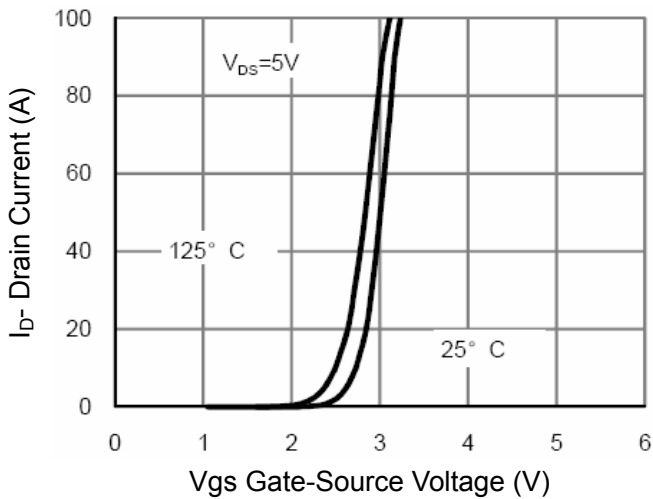


Figure 2 Transfer Characteristics

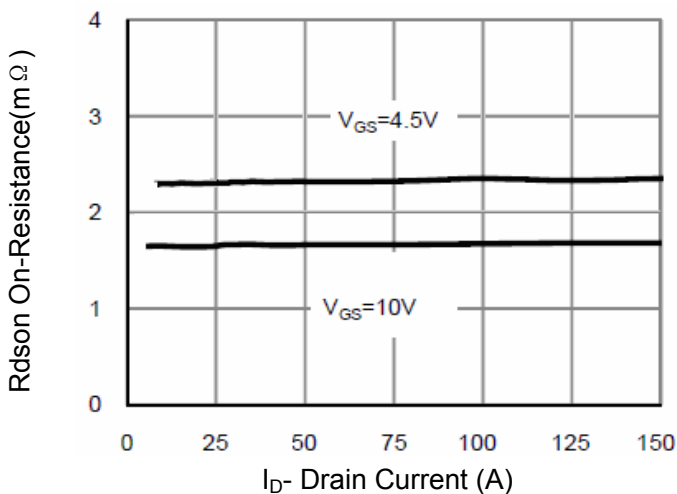


Figure 3 $R_{DS(on)}$ - Drain Current

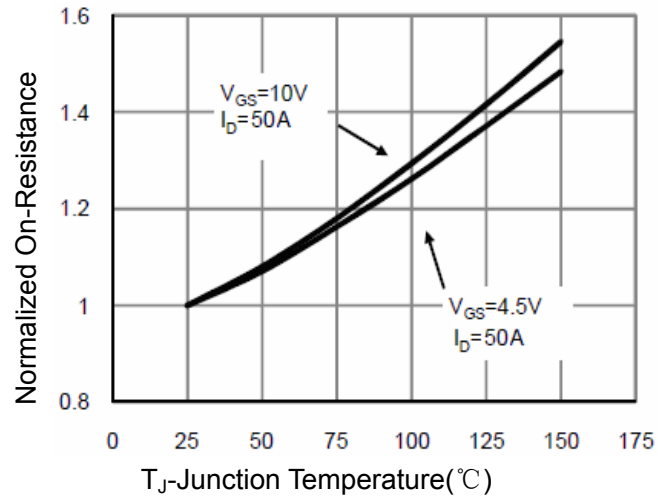


Figure 4 $R_{DS(on)}$ -Junction Temperature

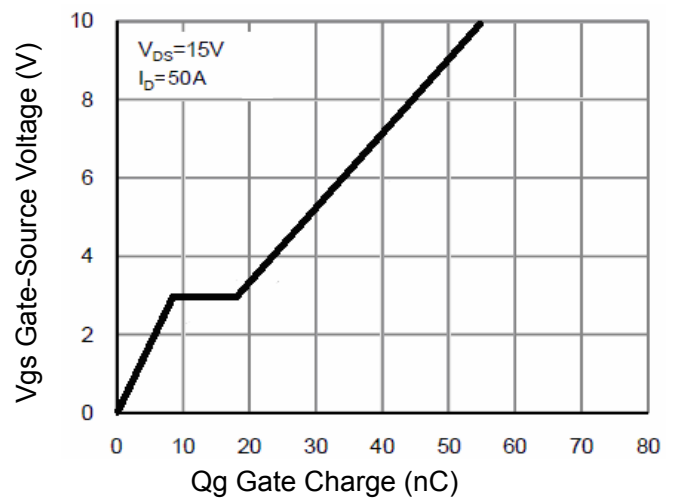


Figure 5 Gate Charge

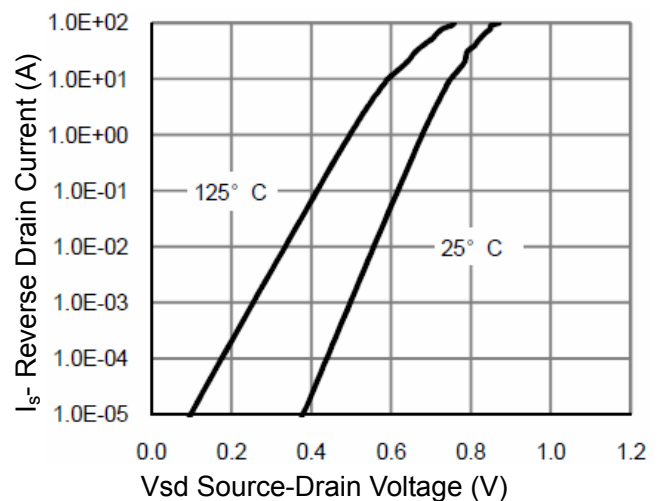


Figure 6 Source- Drain Diode Forward

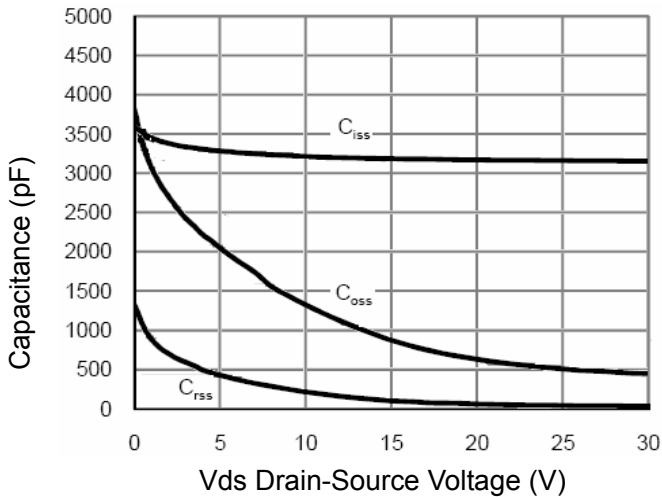


Figure 7 Capacitance vs Vds

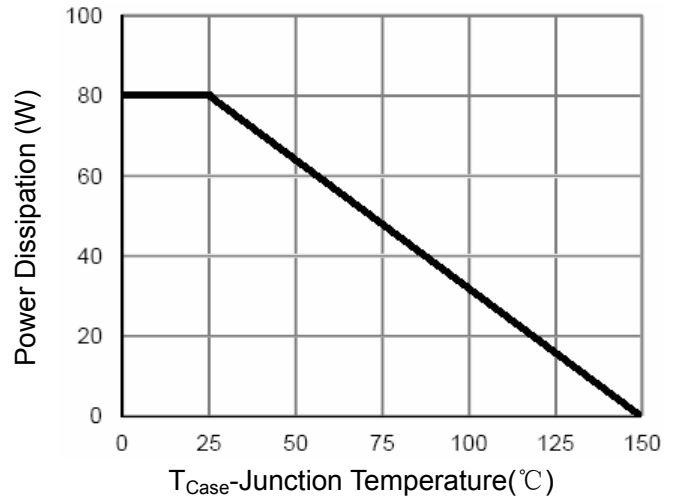


Figure 9 Power De-rating

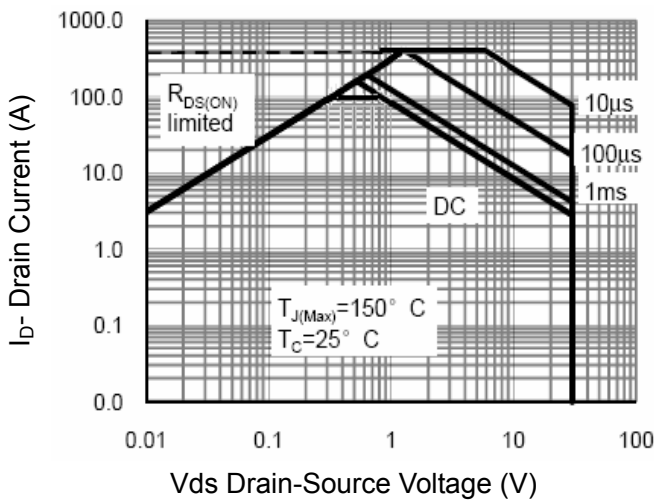


Figure 8 Safe Operation Area

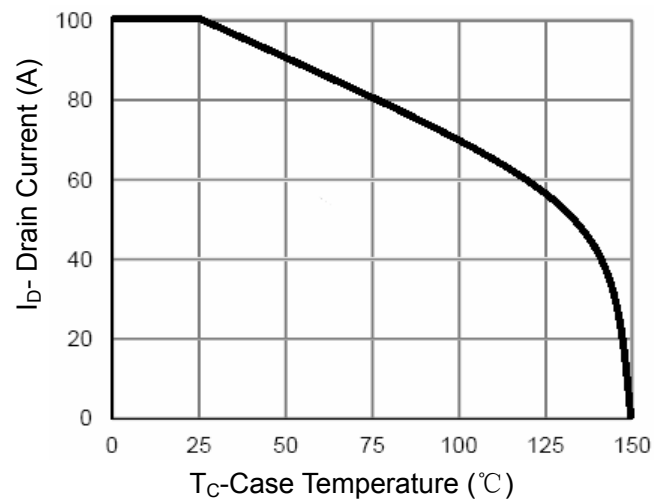


Figure 10 Current De-rating

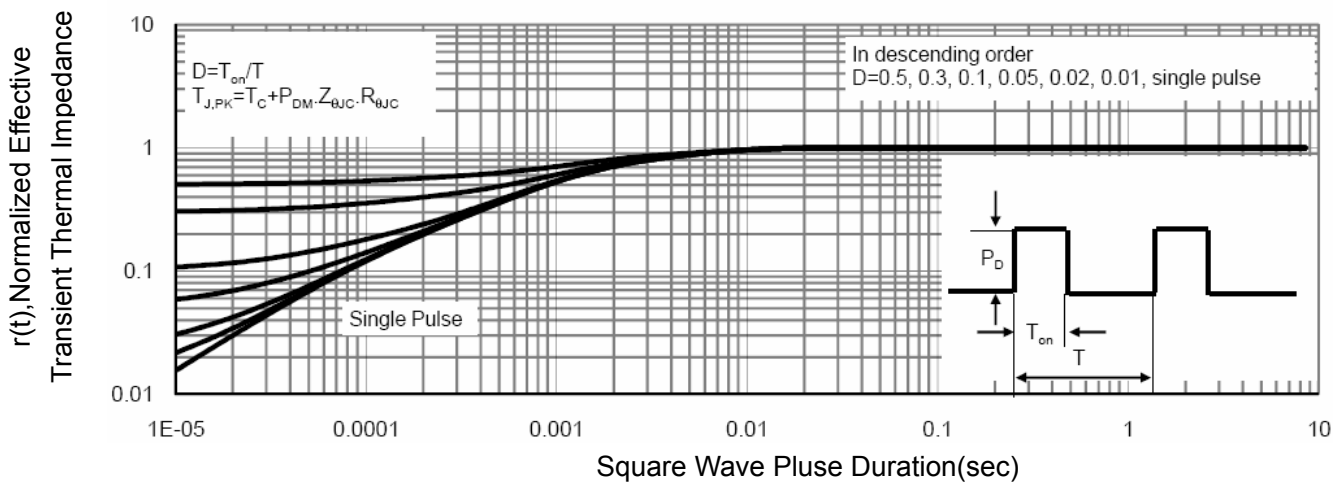
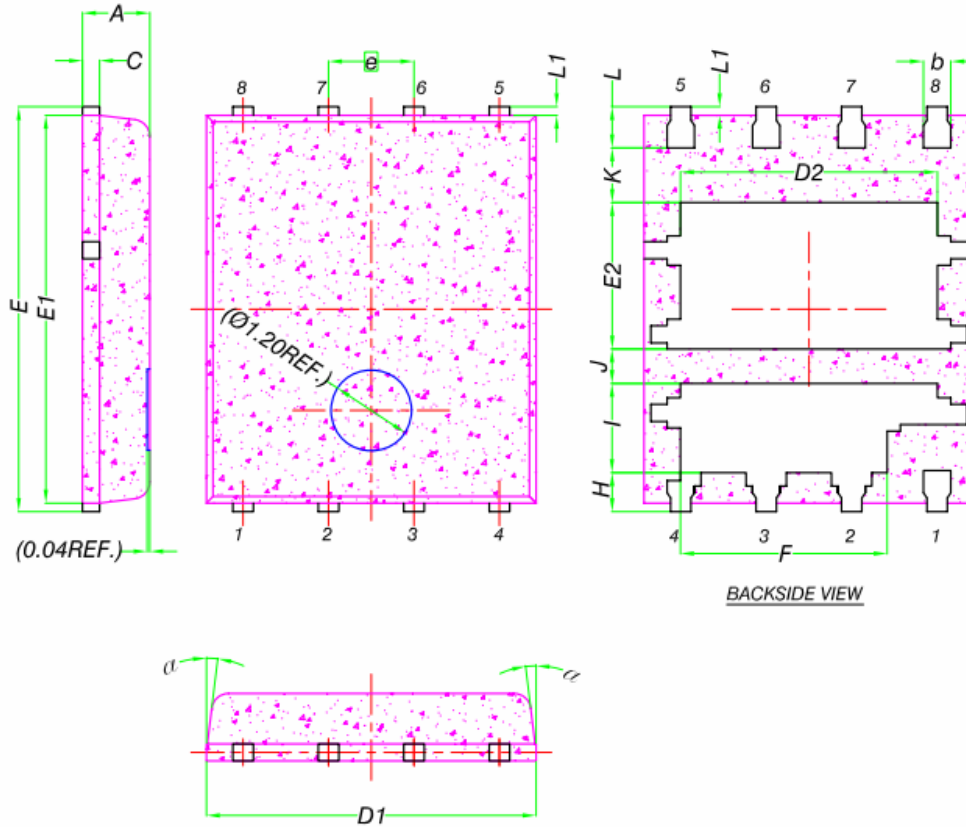
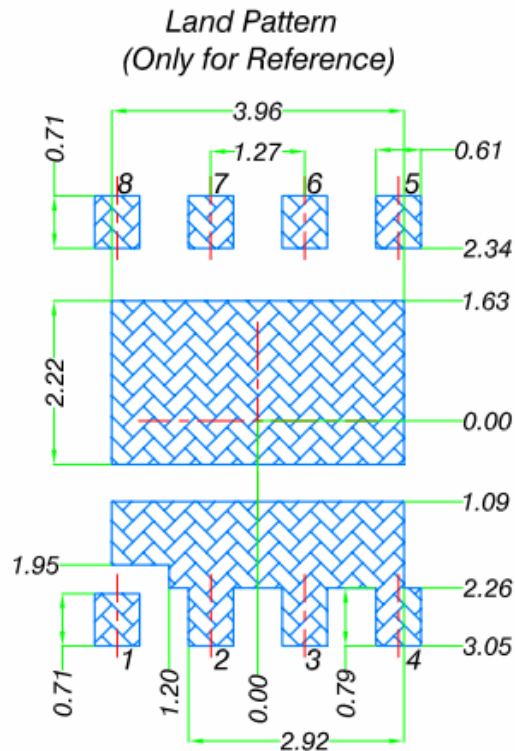


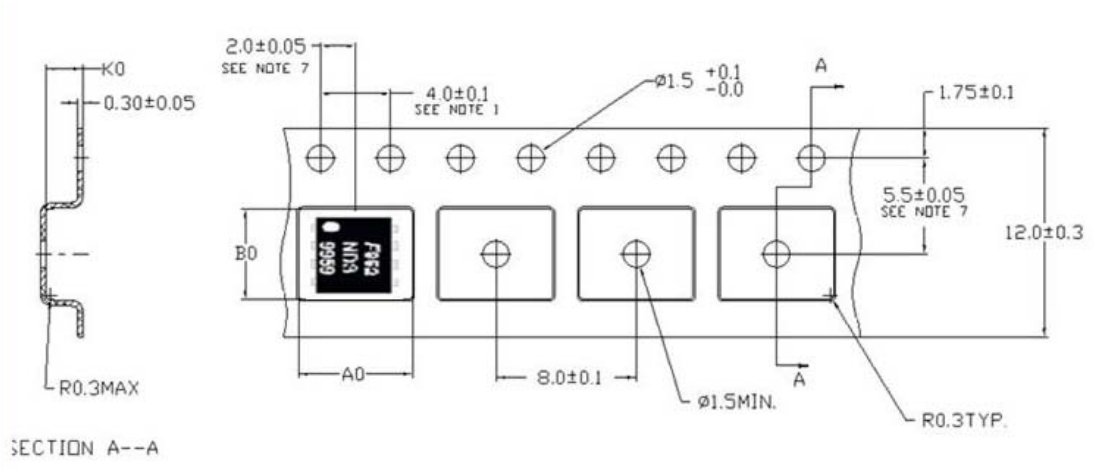
Figure 11 Normalized Maximum Transient Thermal Impedance

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	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	1.22	1.32	1.42
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°





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