

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

### Description

The NCEPB302G 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

●  $V_{DS} = 30V, I_D = 25A$

$R_{DS(ON)} < 8.1m\Omega @ V_{GS} = 10V$

$R_{DS(ON)} < 11m\Omega @ V_{GS} = 4.5V$

#### Q2 "Low Side" MOSFET

$V_{DS} = 30V, I_D = 75A$

$R_{DS(ON)} < 4.4m\Omega @ V_{GS} = 10V$

$R_{DS(ON)} < 5.6m\Omega @ V_{GS} = 4.5V$

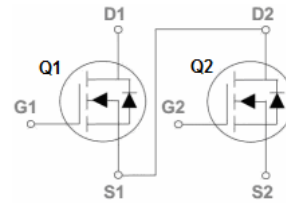
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- [Pb free terminal plating](#)
- [RoHS compliant](#)
- [Halogen free](#)

### Application

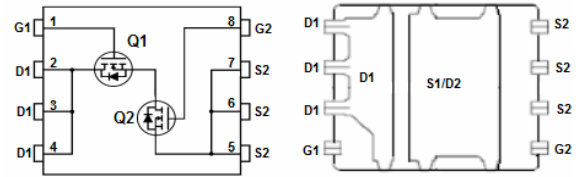
- Compact DC/DC converter applications

**100% UIS TESTED!**

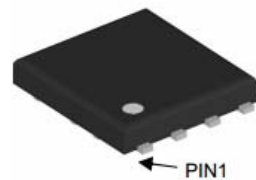
**100% ΔVds TESTED!**



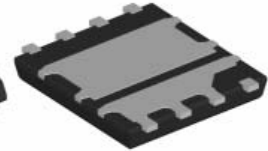
Schematic Diagram



pin assignment



Top View



Bottom View

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
PB302G	NCEPB302G	DFN5X6-8L	-	-	-

### 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	$V_{GS}$	$\pm 20$	$\pm 20$	V	
Drain Current-Continuous (Note 2)	$I_D$	$T_C=25^\circ C$	25	75	A
		$T_C=100^\circ C$	18	52	A
Drain Current -Pulsed (Note 1)	$I_{DM}$	80	320	A	
Power Dissipation	$P_D$	28	65	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)	$R_{\theta JC}$	4.2	4.5	$^\circ C/W$
Thermal Resistance, Junction-to-Case (Note 2) (Q2)	$R_{\theta JC}$	1.7	1.9	$^\circ C/W$

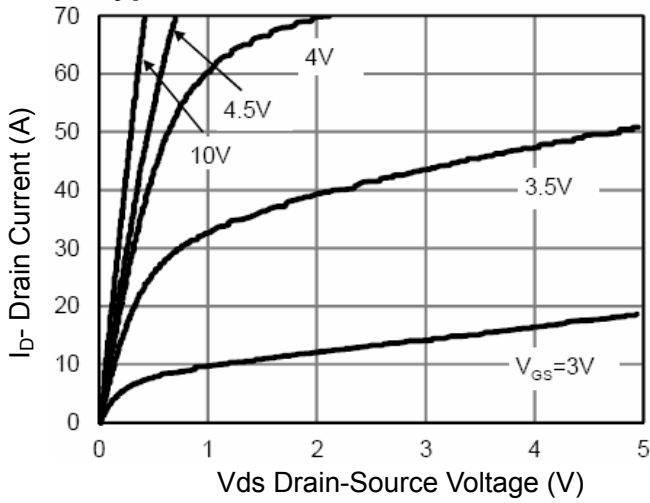
## Q1 Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

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		-	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)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$	-	7.6	8.1	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$	-	10	11	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=10A$		30	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	822	-	PF
Output Capacitance	$C_{oss}$		-	344	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	15.3	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=10A$ $V_{GS}=10V, R_G=1.6\Omega$	-	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	$Q_g$	$V_{DS}=15V, I_D=10A,$ $V_{GS}=10V$	-	15	-	nC
Gate-Source Charge	$Q_{gs}$		-	2.9		nC
Gate-Drain Charge	$Q_{gd}$		-	2.1		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=10A$	-		1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	25	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = I_S$ $di/dt = 100A/\mu s$ (Note 3)	-	11	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	19	-	nC

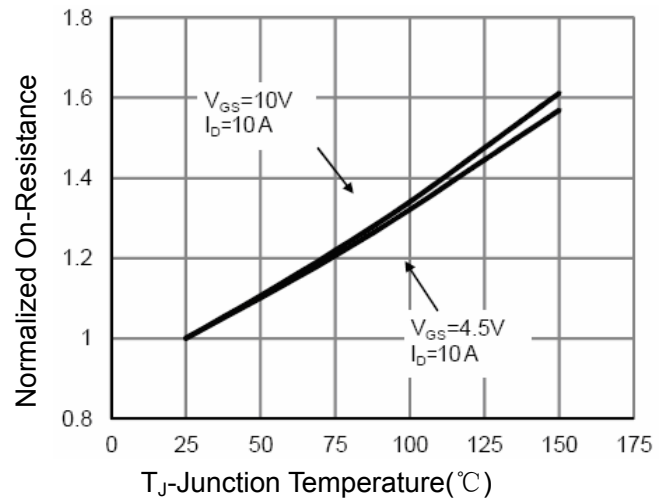
### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  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 :  $T_J=25^\circ\text{C}, V_{DD}=15V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

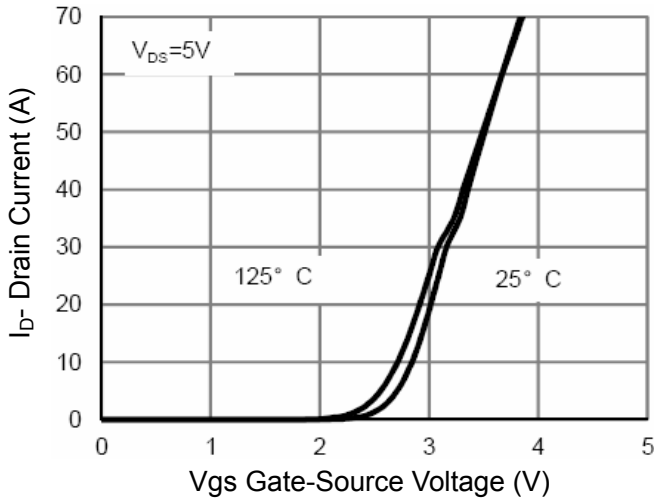
**Q1 Typical Electrical and Thermal Characteristics**



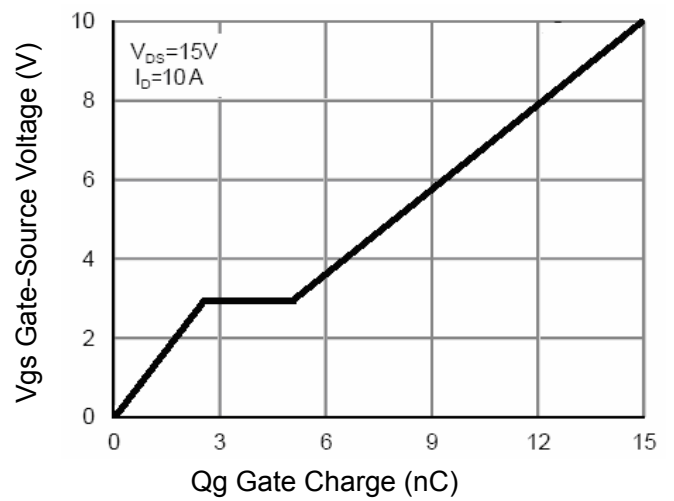
**Figure 1 Output Characteristics**



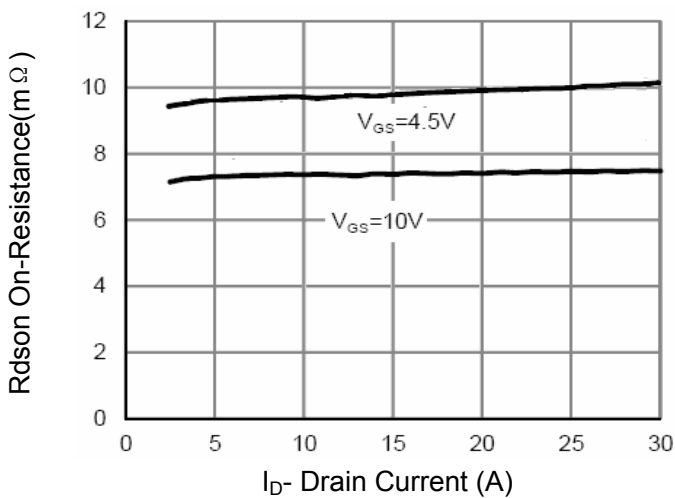
**Figure 4 Rds(on)-Junction Temperature**



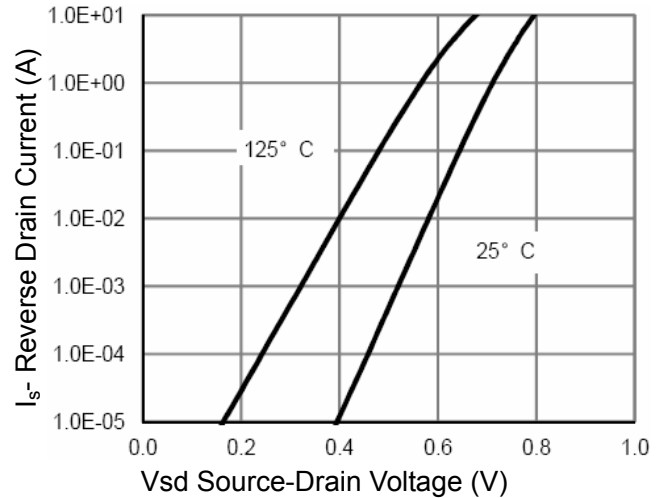
**Figure 2 Transfer Characteristics**



**Figure 5 Gate Charge**



**Figure 3 Rds(on)- Drain Current**



**Figure 6 Source- Drain Diode Forward**

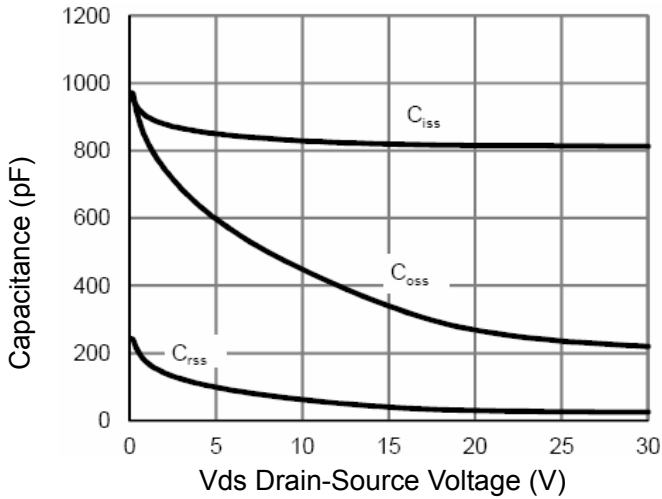
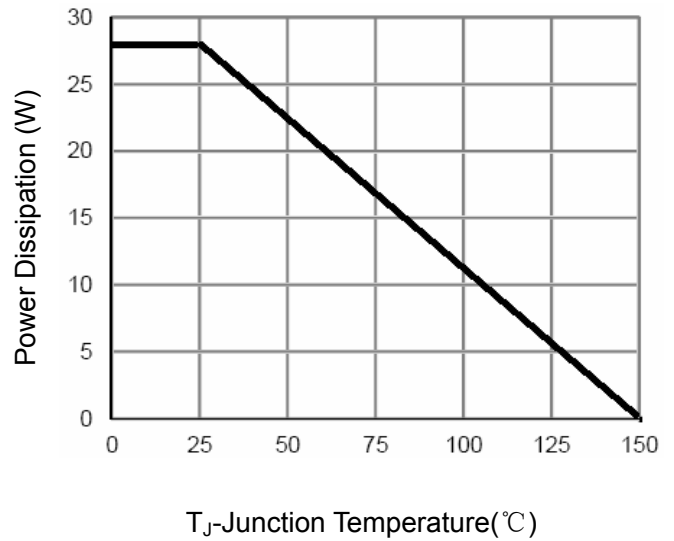


Figure 7 Capacitance vs Vds



T<sub>J</sub>-Junction Temperature(°C)  
Figure 9 Power De-rating

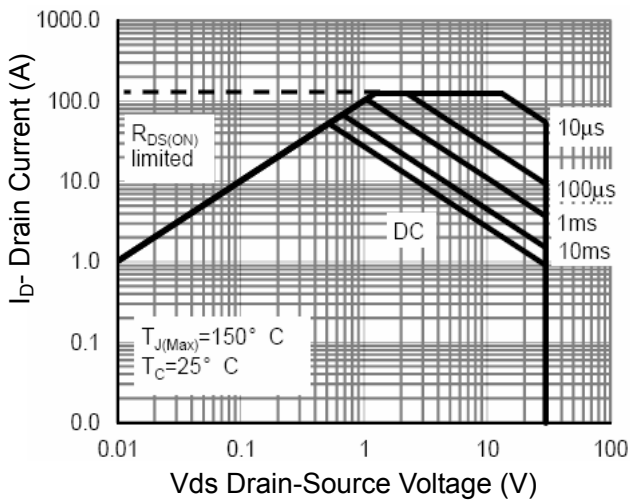


Figure 8 Safe Operation Area

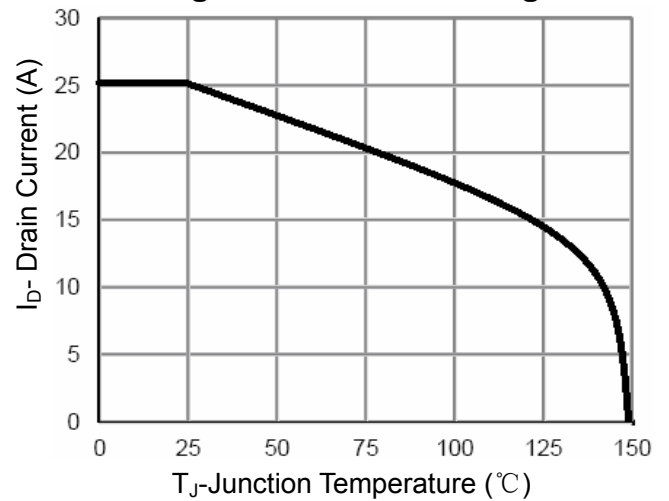


Figure 10 Current De-rating

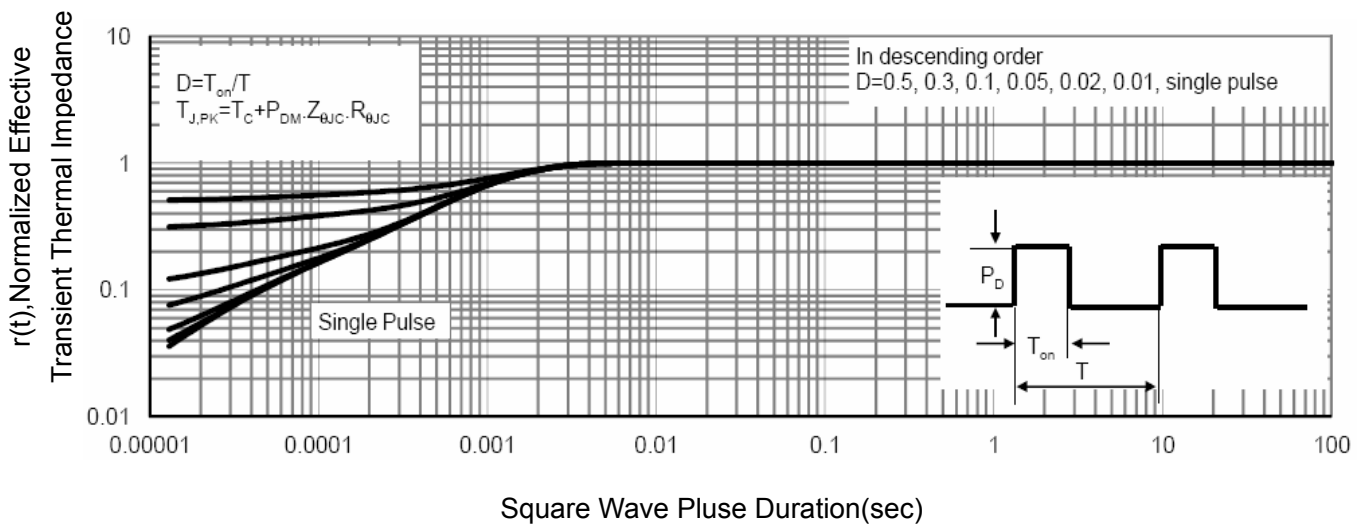


Figure 11 Normalized Maximum Transient Thermal Impedance

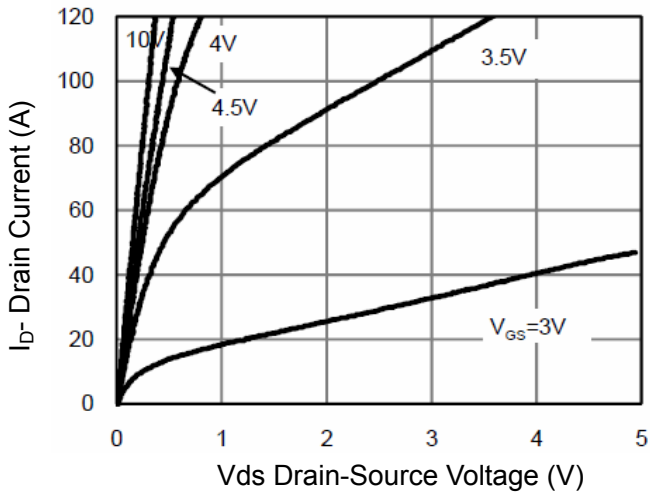
**Q2 Electrical Characteristics (TC=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
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	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 10$	$\mu A$
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2		2.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=40A$	-	3.9	4.4	m $\Omega$
		$V_{GS}=4.5V, I_D=40A$	-	5.1	5.6	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=40A$		30	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	2200	2640	PF
Output Capacitance	$C_{oss}$		-	807	906	PF
Reverse Transfer Capacitance	$C_{rss}$		-	22.7	27	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=40A$ $V_{GS}=10V, R_G=1.6\Omega$	-	8	-	nS
Turn-on Rise Time	$t_r$		-	4.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	29	-	nS
Turn-Off Fall Time	$t_f$		-	8.5	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=15V, I_D=40A,$ $V_{GS}=10V$	-	34.6	38	nC
Gate-Source Charge	$Q_{gs}$		-	7.8		nC
Gate-Drain Charge	$Q_{gd}$		-	3.5		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=40A$	-		1.2	V
Diode Forward Current	$I_S$		-	-	75	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ C, I_F = I_S$ $di/dt = 500A/\mu s$ (Note 3)	-	16	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	35	-	nC

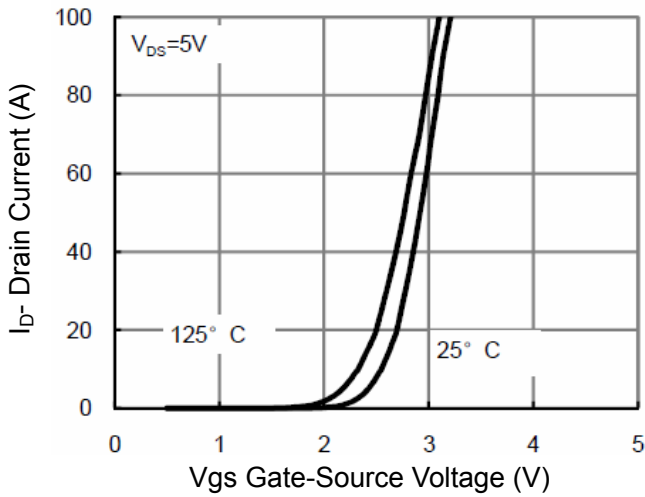
**Notes:**

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 :  $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25\Omega$

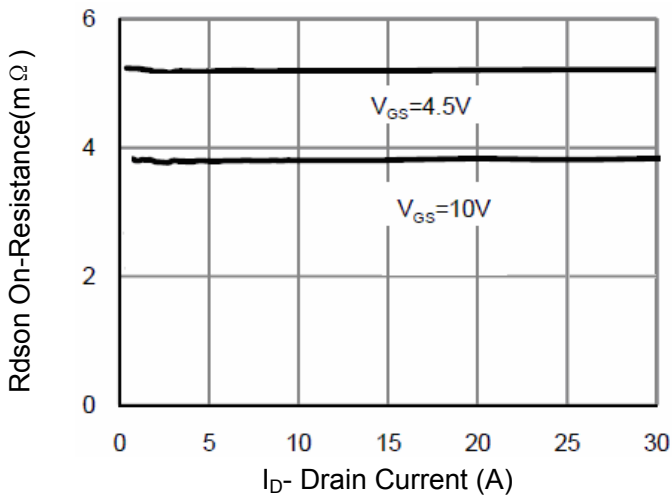
**Q2 Typical Electrical and Thermal Characteristics**



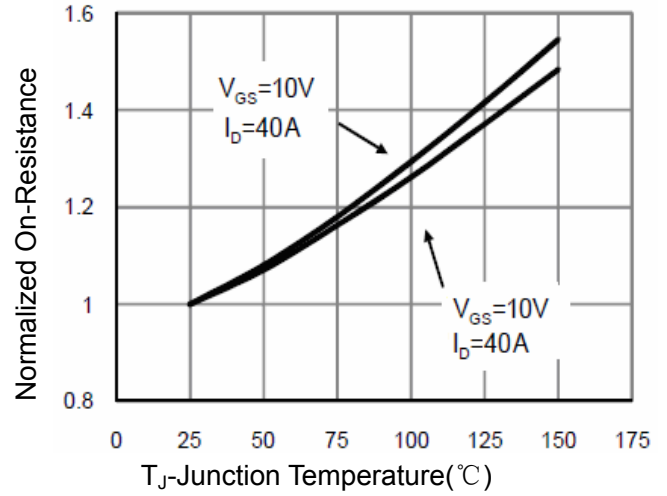
**Figure 1 Output Characteristics**



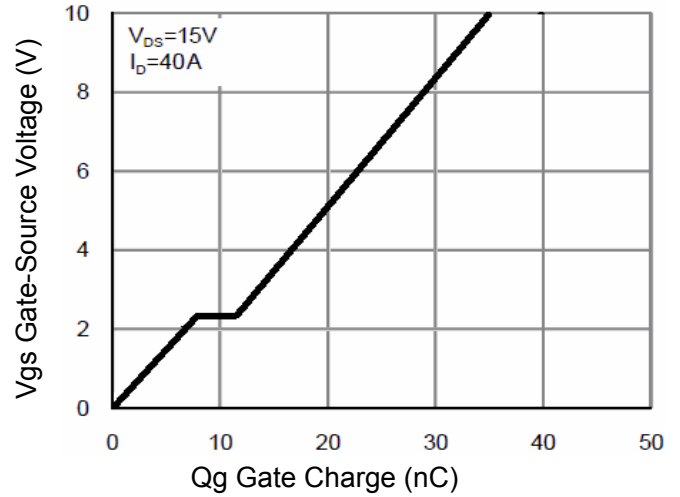
**Figure 2 Transfer Characteristics**



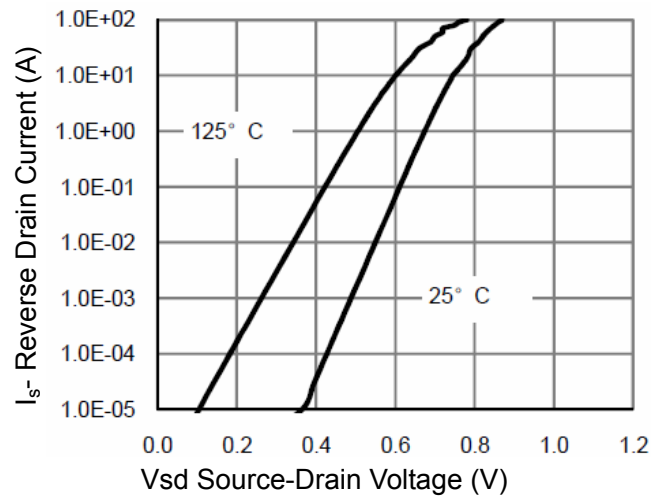
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

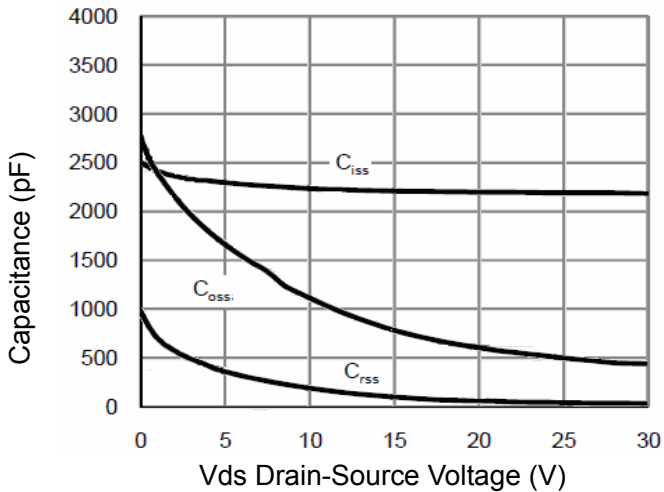


Figure 7 Capacitance vs Vds

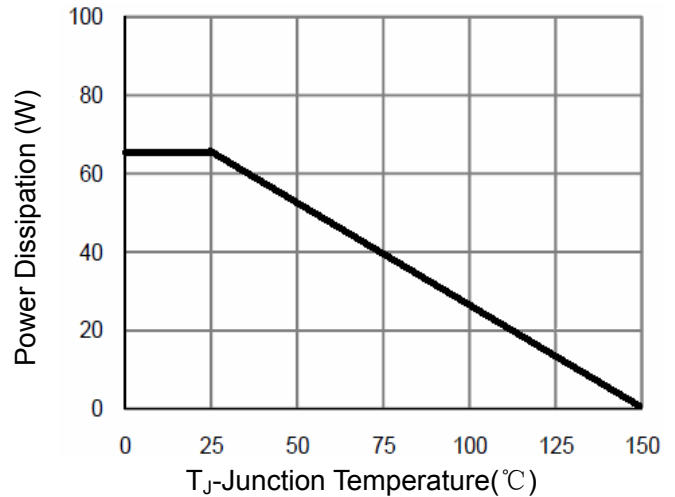


Figure 9 Power De-rating

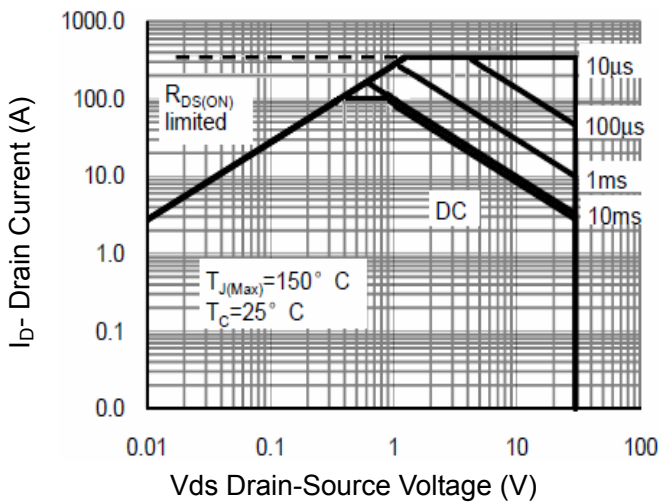


Figure 8 Safe Operation Area

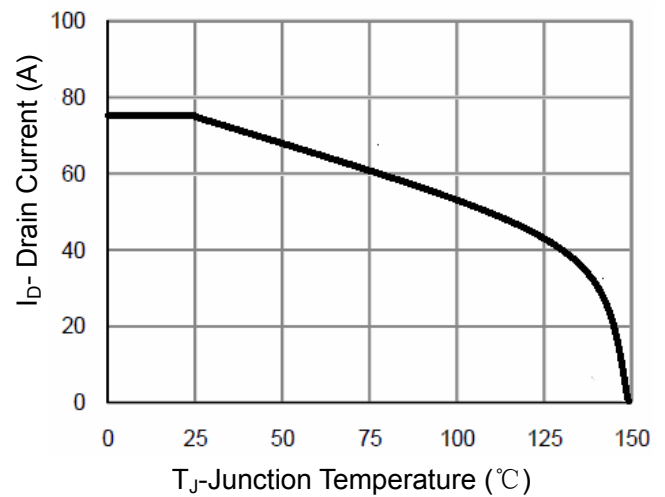


Figure 10 Current De-rating

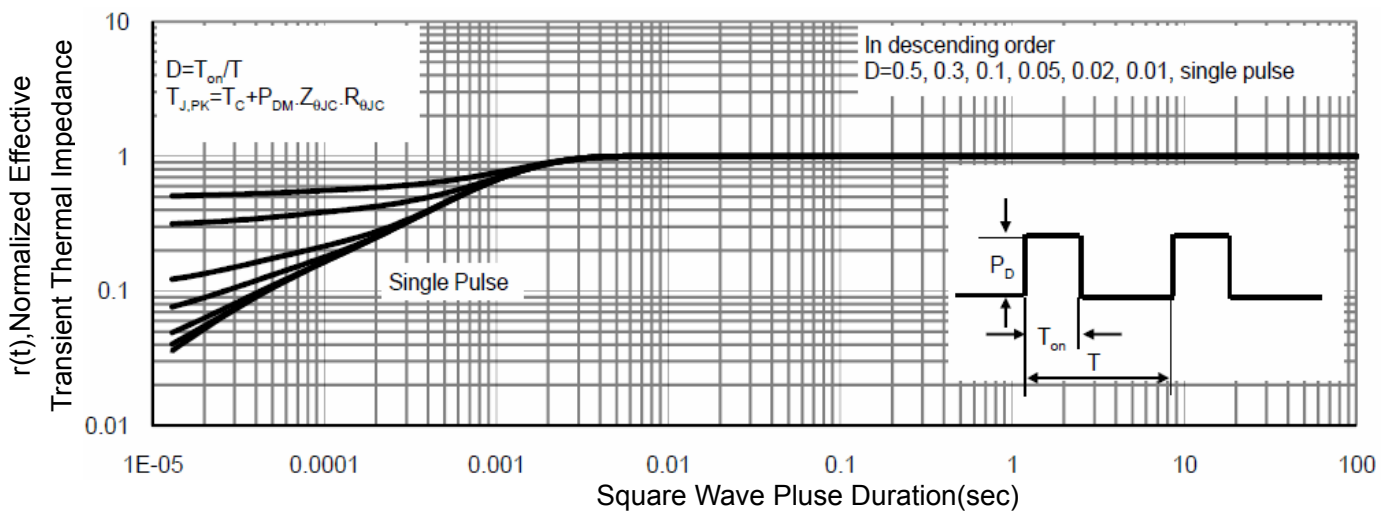
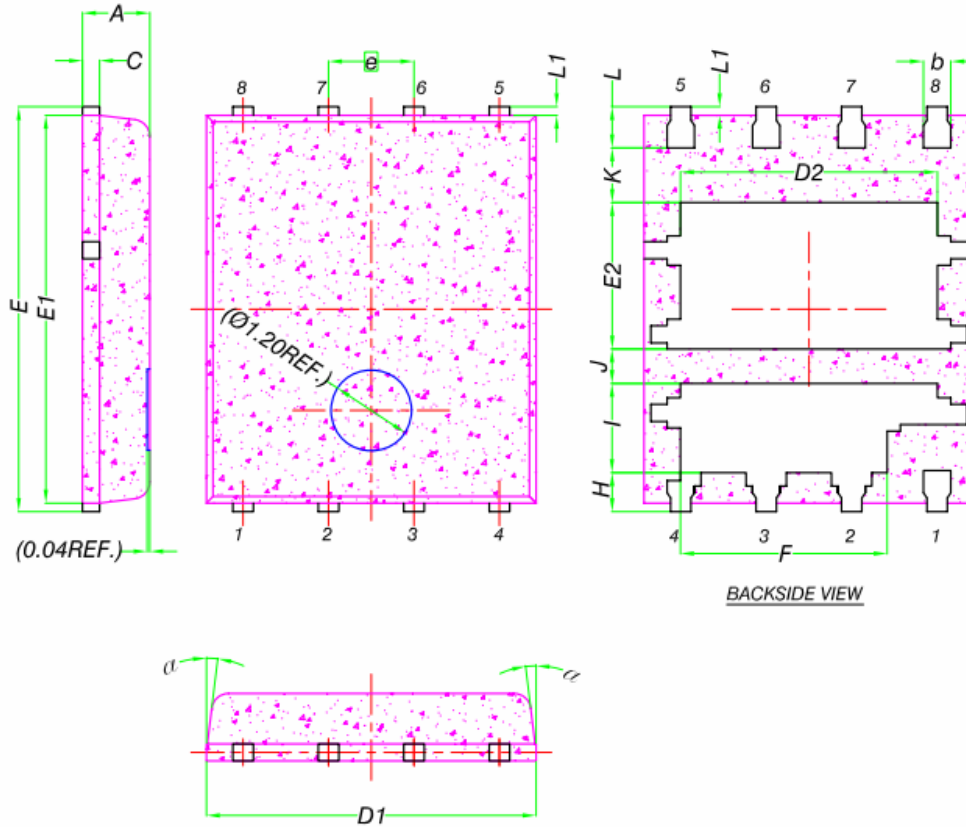
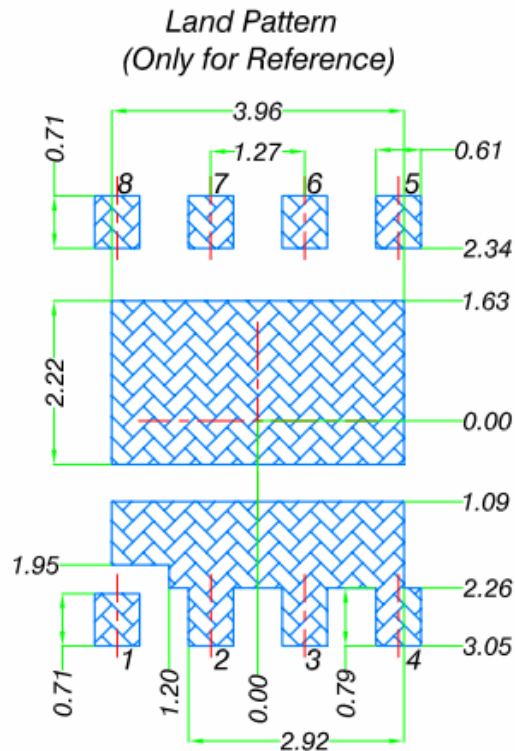


Figure 11 Normalized Maximum Transient Thermal Impedance

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
$\alpha$	0°	-	12°





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