NCE N-Channel Super Trench Power MOSFET

Description

The NCEP12N60AQ 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. This device is ideal for high-frequency switching and synchronous rectification.

Application

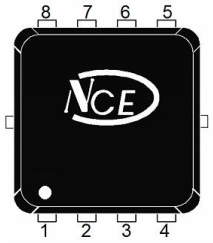
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

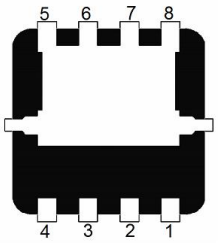
- V_{DS} =60V,I_D =39A
  $R_{DS(ON)}$=9.6mΩ (typical) @ V_{GS}=10V
  $R_{DS(ON)}$=12.0mΩ (typical) @ V_{GS}=4.5V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔVds TESTED!

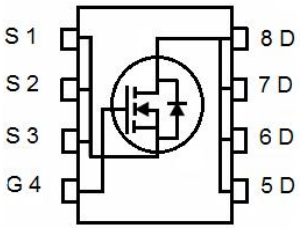
DFN 3.3X3.3



Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP12N60AQ	NCEP12N60AQ	DFN3.3X3.3-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	39	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	25	A
Pulsed Drain Current	I_{DM}	156	A
Maximum Power Dissipation	P_D	33	W
Derating factor		0.26	W/℃
Single pulse avalanche energy (Note 1)	E_{AS}	108	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	3.8	℃/W

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	60		-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,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	1.2	1.7	2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	9.6	12.0	mΩ
		V_{GS}=4.5V, I_D=20A	-	12.0	14.0	
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A		45	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=30V,V_{GS}=0V, F=1.0MHz	-	940	-	PF
Output Capacitance	C_{oss}		-	169	-	PF
Reverse Transfer Capacitance	C_{rss}		-	18	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V,I_D=20A V_{GS}=10V,R_G=1.6Ω	-	11	-	nS
Turn-on Rise Time	t_r		-	17	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18	-	nS
Turn-Off Fall Time	t_f		-	4	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=20A, V_{GS}=10V	-	19.8	-	nC
Gate-Source Charge	Q_{gs}		-	3.8		nC
Gate-Drain Charge	Q_{gd}		-	3.2		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=20A	-		1.2	V
Diode Forward Current	I_S		-	-	39	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =20A di/dt = 100A/μs	-	30	-	nS
Reverse Recovery Charge	Qrr		-	36	-	nC

Notes:

1. EAS condition : Tj=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsin k, assuming a maximum junction temperature of TJ(MAX)=150° C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

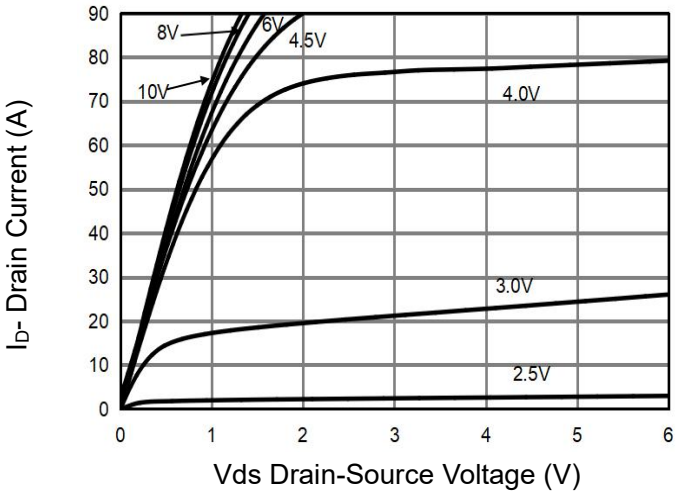


Figure 1 Output Characteristics

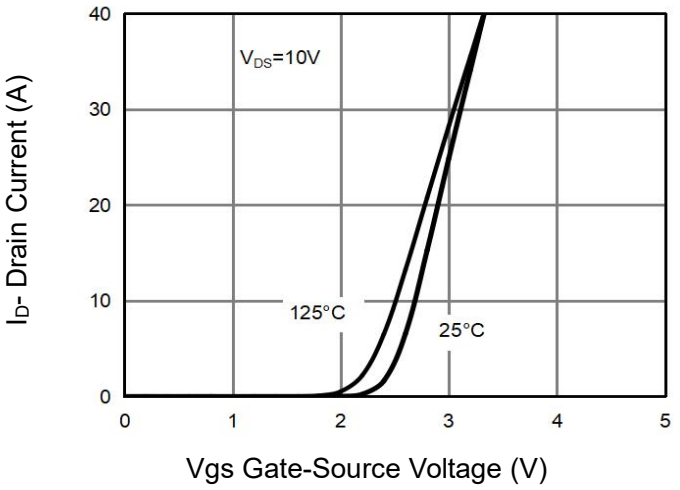


Figure 2 Transfer Characteristics

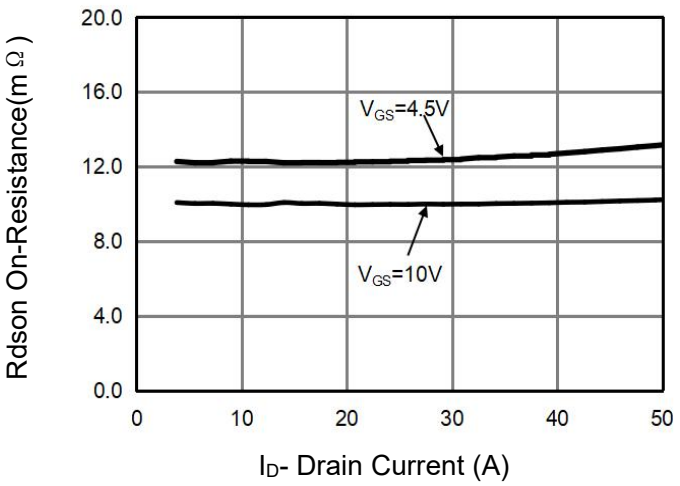


Figure 3 Rdson- Drain Current

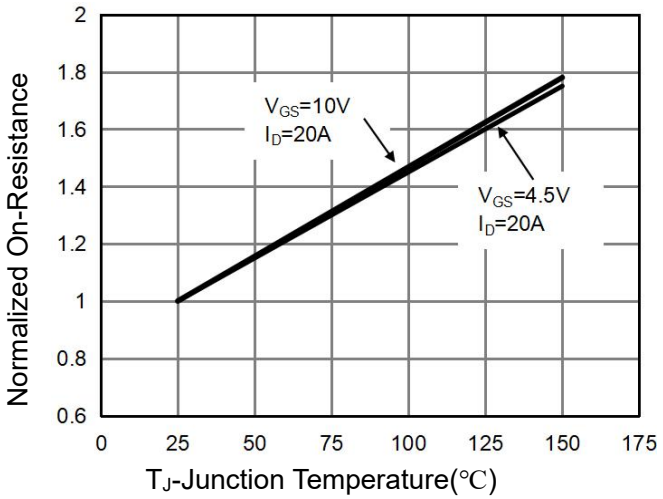


Figure 4 Rdson-Junction Temperature

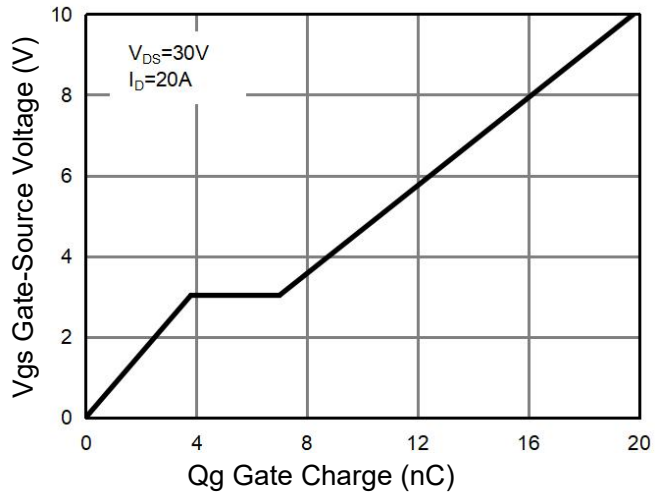


Figure 5 Gate Charge

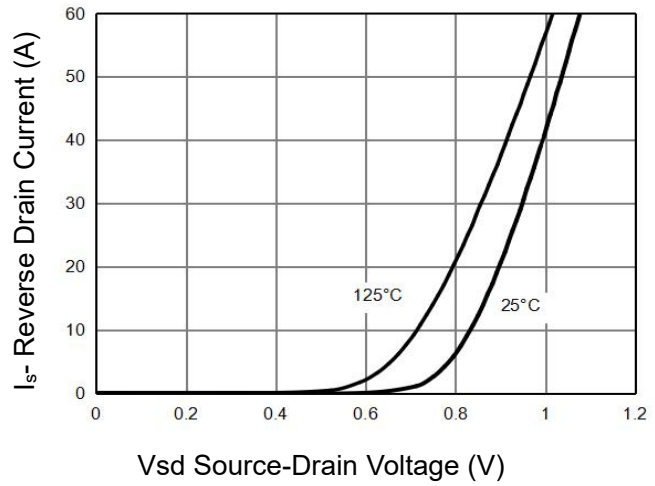


Figure 6 Source- Drain Diode Forward

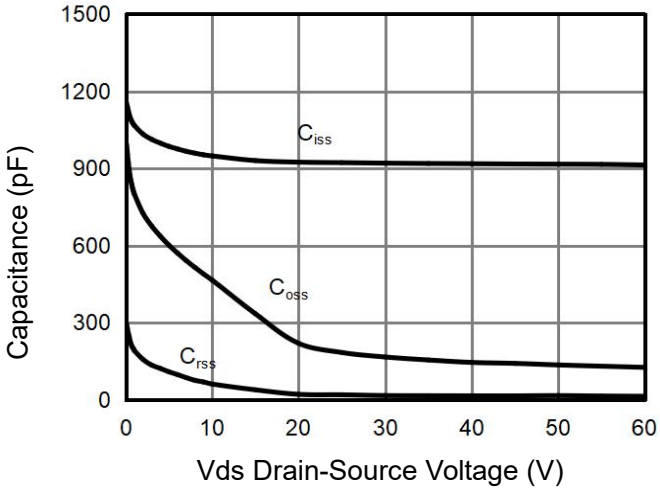


Figure 7 Capacitance vs Vds

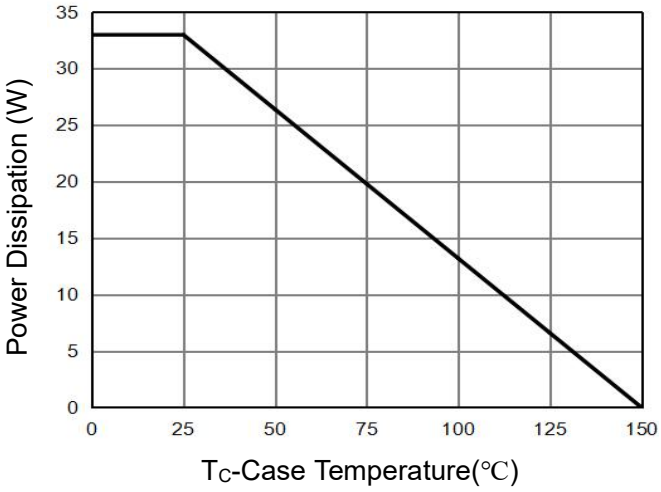


Figure 9 Power De-rating

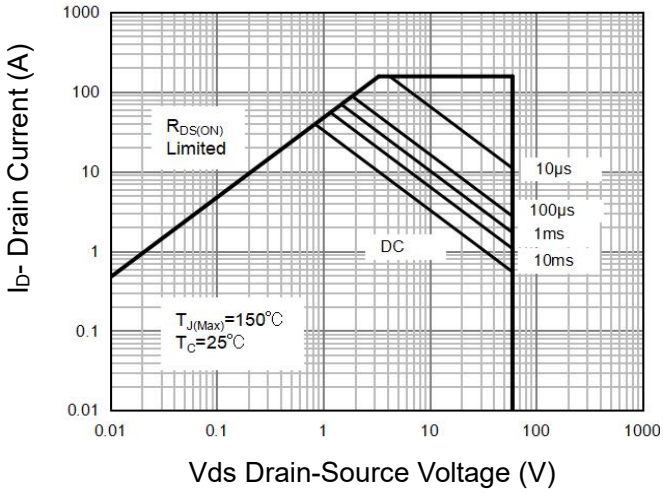


Figure 8 Safe Operation Area (Note 3)

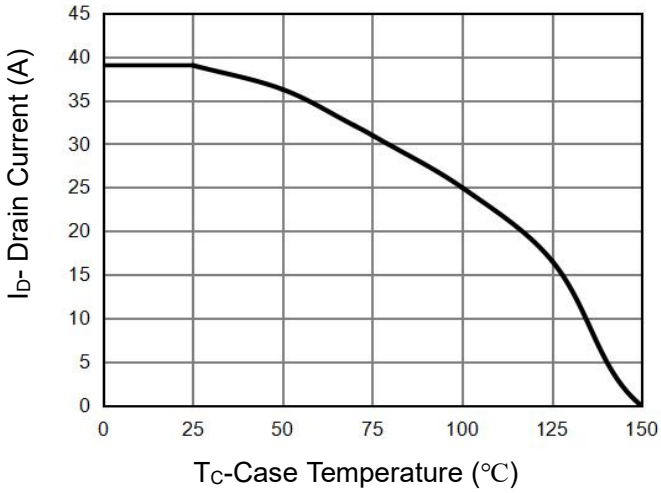


Figure 10 Current De-rating

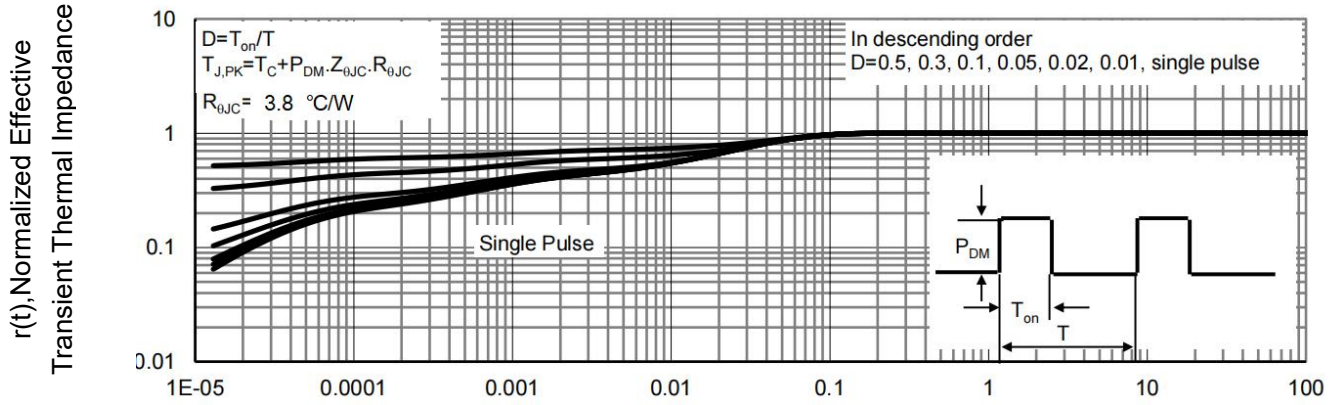
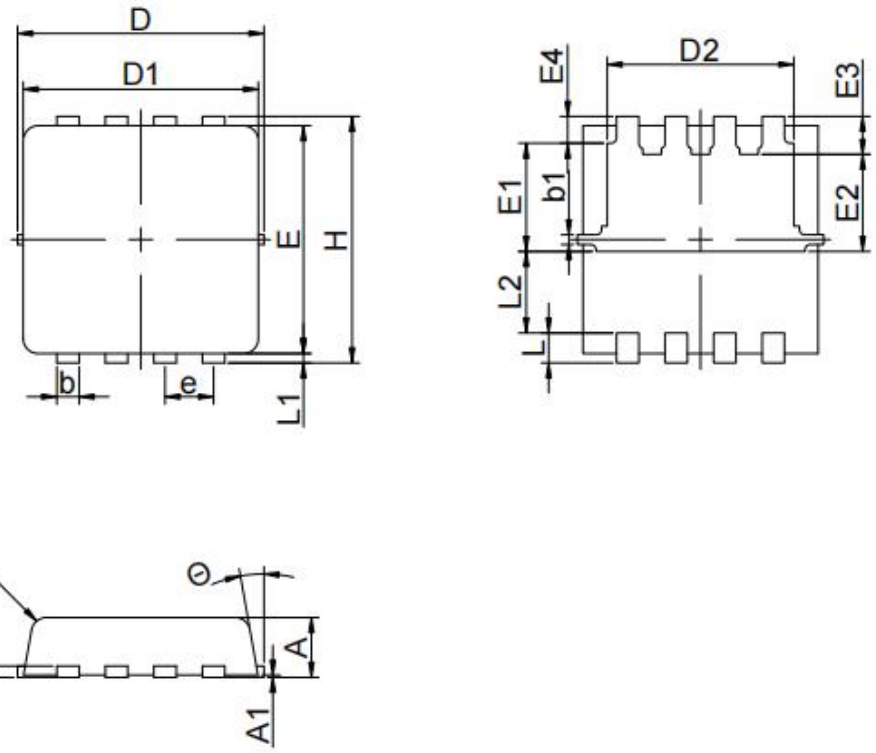


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3.3X3.3-8L Package Information



SYMBOL	MIN	NOM	MAX
A	0.70	0.80	0.90
A_1	0.00	0.03	0.05
b	0.24	0.30	0.35
b1	0.08	0.13	0.18
c		0.152REF	
D	3.25	3.32	3.40
D1	3.05	3.15	3.25
D2	2.40	2.50	2.60
E	3.00	3.10	3.20
E1	1.35	1.45	1.55
E2	1.20	1.30	1.40
E3	0.37	0.45	0.53
E4	0.20	0.28	0.36
e		0.65 BSC	
H	3.20	3.30	3.40
L	0.30	0.40	0.50
L1	0.10	0.15	0.20
L2	0.83	-	1.33
R		0.20 REF	
Θ	6°	10°	14°

Revision History

Revision	Date	Subjects
V1.0	2025.05.08	Product data sheet

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