NCE N-Channel Super Trench III Power MOSFET

Description

The NCEP020NH40AGU uses **Super Trench III** 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

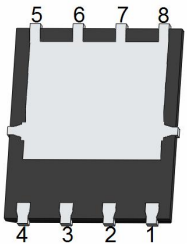
- V_{DS} =40V,I_D =170A
  $R_{DS(ON)}$=1.85mΩ (typical) @ V_{GS}=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔVds TESTED!

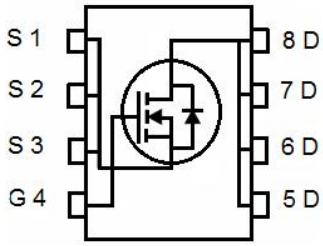
PDFN 5X6-8L



Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P020NH40AGU	NCEP020NH40AGU	PDFN5X6-8L	Ø330mm	12mm	5000units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	170	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	106	A
Pulsed Drain Current	I_{DM}	680	A
Maximum Power Dissipation	P_D	115	W
Derating factor		0.92	W/℃
Single pulse avalanche energy (Note 1)	E_{AS}	466	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	1.09	℃/W
Thermal Resistance,Junction-to-Ambient (Note 4)	$R_{\theta JA}$	50	℃/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	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,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	2.0	3.0	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	1.85	2.5	mΩ
Gate resistance	R_G	F=1.0MHz	-	1.8	-	Ω
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=20A	-	50	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	2550	-	pF
Output Capacitance	C_{oss}		-	645	-	pF
Reverse Transfer Capacitance	C_{rss}		-	38	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V,I_D=20A V_{GS}=10V,R_G=1.6Ω	-	10	-	nS
Turn-on Rise Time	t_r		-	60	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	26	-	nS
Turn-Off Fall Time	t_f		-	13	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A, V_{GS}=10V	-	42	-	nC
Gate-Source Charge	Q_{gs}		-	11	-	nC
Gate-Drain Charge	Q_{gd}		-	11	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=20A	-	-	1.2	V
Diode Forward Current	I_S		-	-	170	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =20A di/dt = 100A/μs	-	45	-	nS
Reverse Recovery Charge	Qrr		-	50	-	nC

Notes:

1. EAS condition : Tj=25℃,V_{DD}=20V,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 heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.
4. 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.

Typical Electrical and Thermal Characteristics

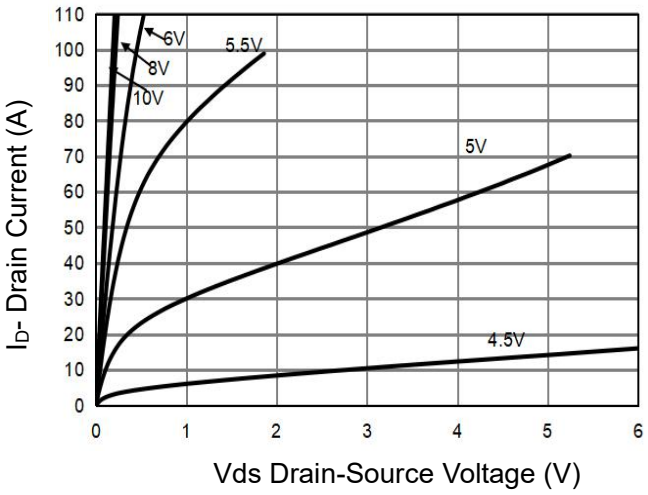


Figure 1 Output Characteristics

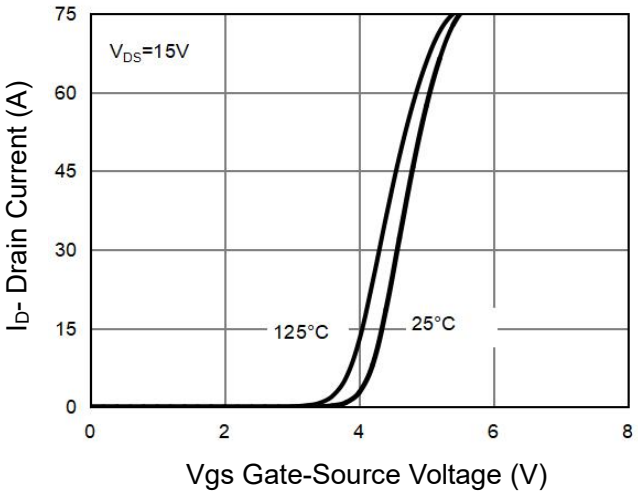


Figure 2 Transfer Characteristics

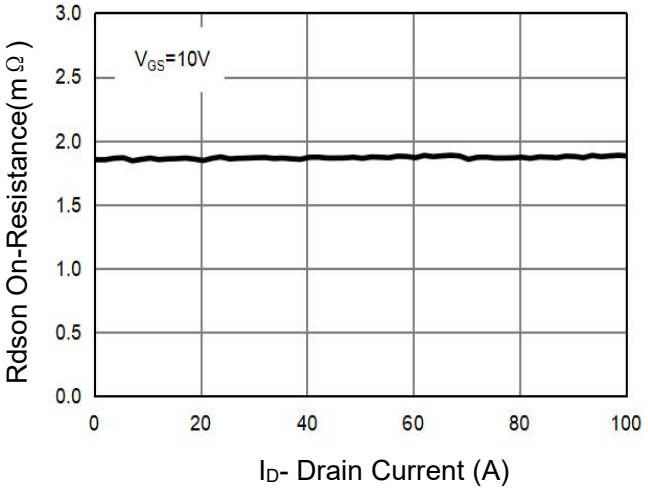


Figure 3 Rdson- Drain Current

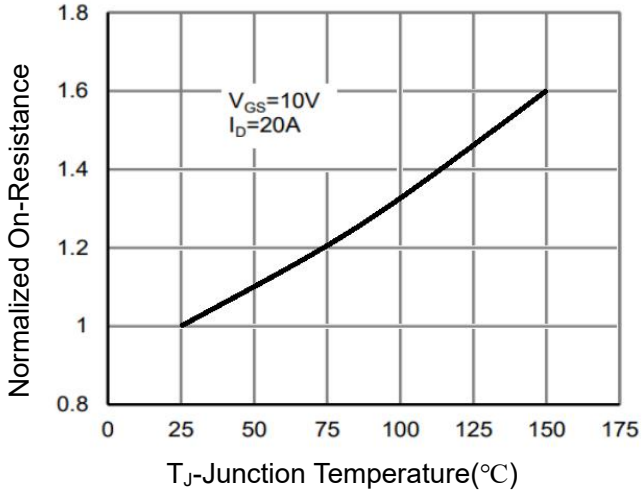


Figure 4 Rdson-Junction Temperature

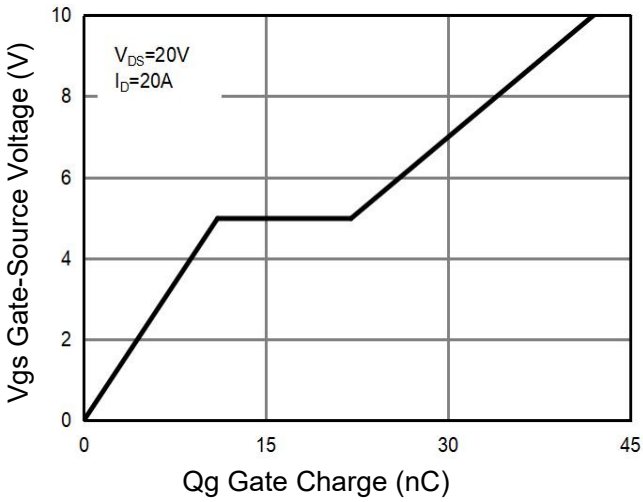


Figure 5 Gate Charge

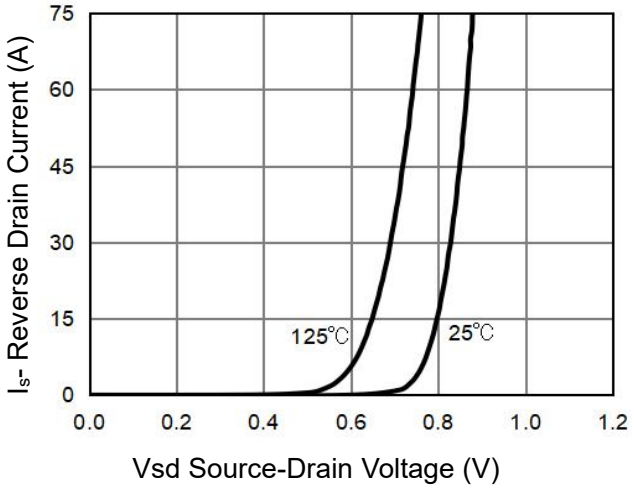


Figure 6 Source- Drain Diode Forward

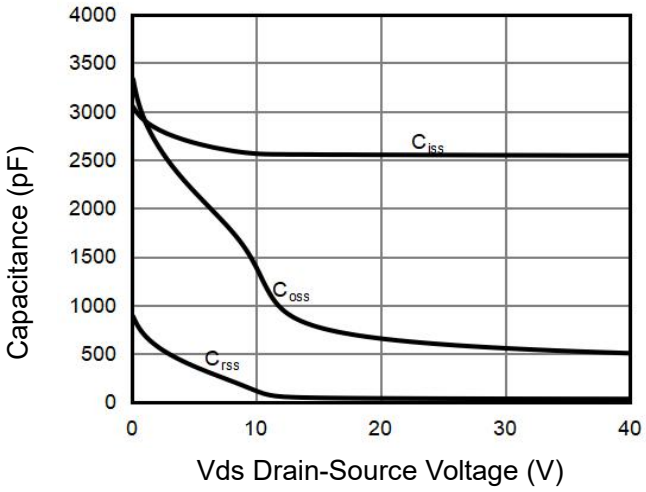


Figure 7 Capacitance vs Vds

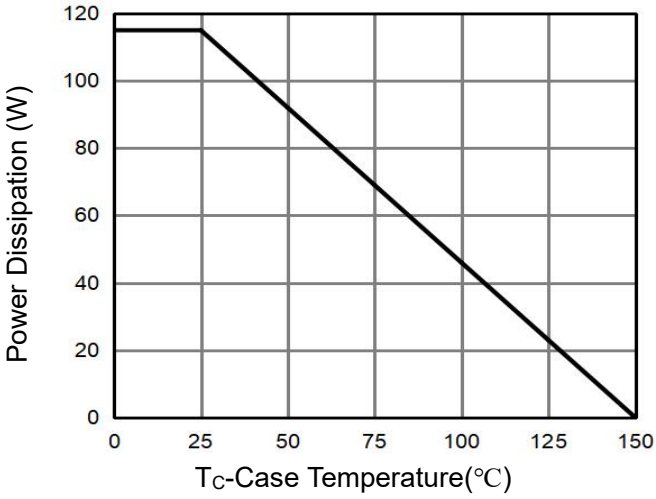


Figure 9 Power De-rating

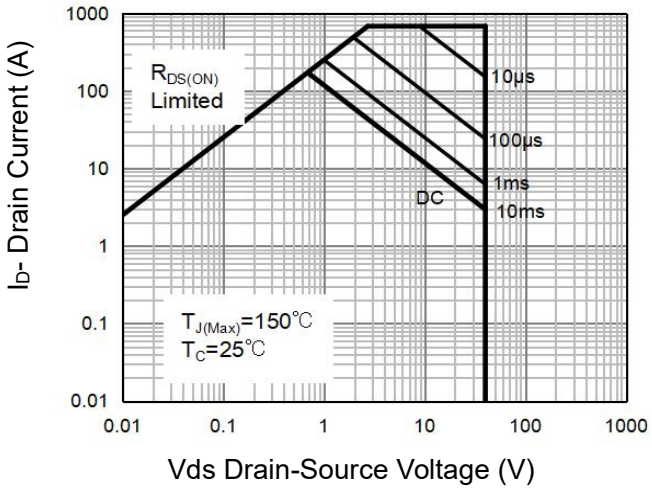


Figure 8 Safe Operation Area (Note 3)

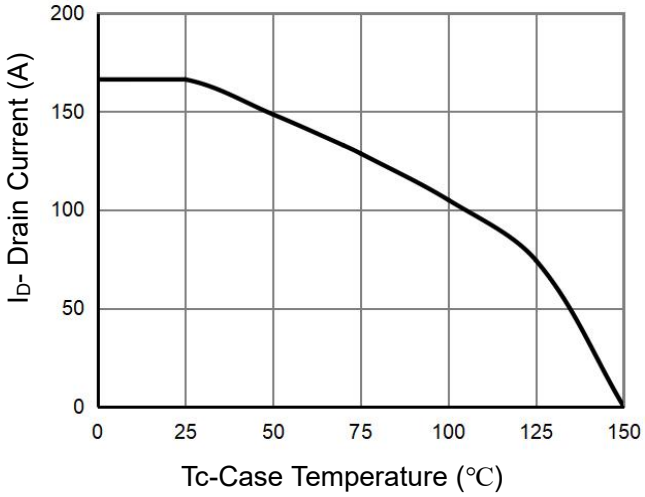


Figure 10 Current De-rating

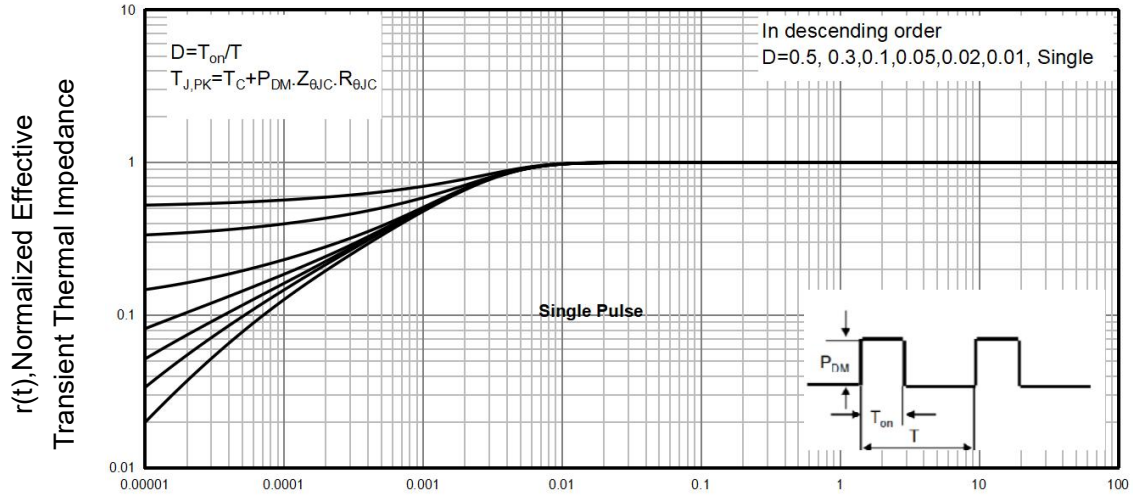
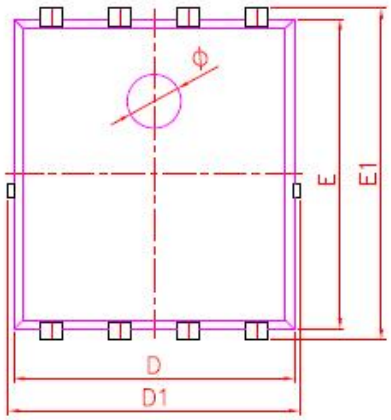
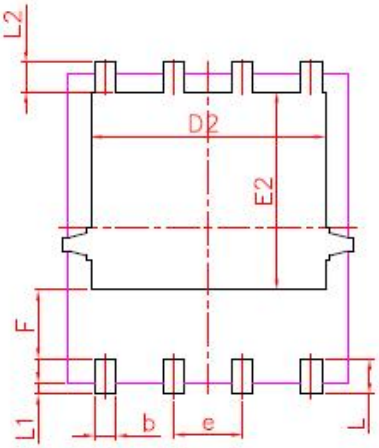


Figure 11 Normalized Maximum Transient Thermal Impedance

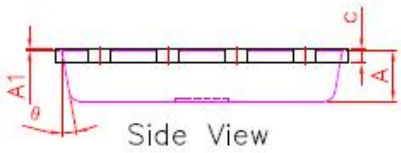
PDFN5X6-8L Package Information



Top View



Bottom View



Side View

PDFN5X6—8L			
DIM.	MIN.	NOM.	MAX.
A	0.90	0.95	1.00
A1	0.00	0.02	0.05
b	0.35	0.40	0.50
c	0.20	0.25	0.30
D	5.10	5.20	5.30
D1	5.10	5.40	5.50
D2	4.25	4.35	4.45
e	1.27 BSC		
E	5.70	5.75	5.80
E1	6.00	6.15	6.30
E2	3.57	3.67	3.77
F	1.18	1.28	1.38
L	0.55	0.65	0.75
L1	0.15	0.20	0.25
L2	0.45	0.55	0.65
ø	0.90	1.00	1.10
Θ	8°	10°	12°
All dimensions in millimeters			

Revision History

Revision	Date	Subjects
V1.0	2024.09.20	Product data sheet
V2.0	2025.06.03	Update Ron、ID
V3.0	2025.07.07	Update datasheet Typical Electrical and Thermal Characteristics

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