

NCE Automotive N-Channel Super Trench III Power MOSFET

Description

The NCEAP008NH40AGU 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

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

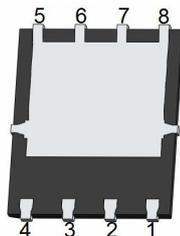
General Features

- $V_{DS} = 40V, I_D = 373A$
 $R_{DS(ON)} = 0.72m\Omega$ (typical) @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested
- 100% ΔV_{ds} tested
- **AEC-Q101 qualified**

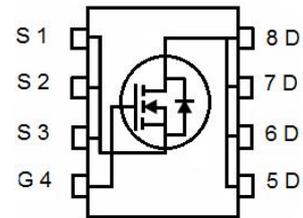
PDFN 5X6-8L



Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP008NH40AGU	NCEAP008NH40AGU	PDFN5X6-8L	Ø330mm	12mm	5000units

Absolute Maximum Ratings ($T_c = 25^\circ C$ 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	373	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D(100^\circ C)$	257	A
Pulsed Drain Current	I_{DM}	1492	A
Maximum Power Dissipation	P_D	238	W
Derating factor		1.6	W/ $^\circ C$
Single pulse avalanche energy (Note 1)	E_{AS}	1797	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	0.63	$^{\circ}C/W$
Thermal Resistance,Junction-to-Ambient (Note 4)	$R_{\theta JA}$	50	$^{\circ}C/W$

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.0	4.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	0.72	0.95	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=10V, I_D=20A$	-	50	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$	-	7150	-	pF
Output Capacitance	C_{oss}		-	2000	-	pF
Reverse Transfer Capacitance	C_{rss}		-	140	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, I_D=20A$ $V_{GS}=10V, R_G=1.6\Omega$	-	25	-	nS
Turn-on Rise Time	t_r		-	48	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	75	-	nS
Turn-Off Fall Time	t_f		-	30	-	nS
Total Gate Charge	Q_g	$V_{DS}=20V, I_D=20A,$ $V_{GS}=10V$	-	130	-	nC
Gate-Source Charge	Q_{gs}		-	27	-	nC
Gate-Drain Charge	Q_{gd}		-	30	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	1.2	V
Diode Forward Current	I_S		-	-	373	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = 20A$ $di/dt = 100A/\mu s$	-	98	-	nS
Reverse Recovery Charge	Q_{rr}		-	64	-	nC

Notes:

- EAS condition : $T_J=25^{\circ}C, V_{DD}=20V, V_G=10V, L=0.5mH, R_G=25\Omega$
- Guaranteed by design, not subject to production
- 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 $T_{J(MAX)}=175^{\circ}C$. The SOA curve provides a single pulse rating.
- 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 $T_A = 25^{\circ}C$. The maximum allowed junction temperature of $175^{\circ}C$. The value in any given application depends on the user's specific board design.

Typical Electrical and Thermal Characteristics

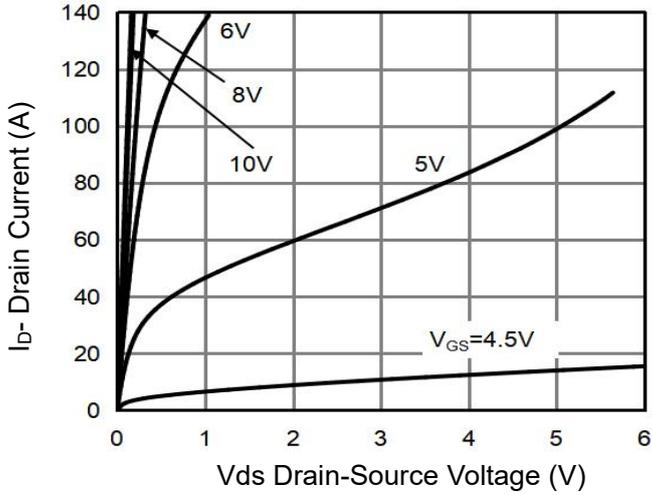


Figure 1 Output Characteristics

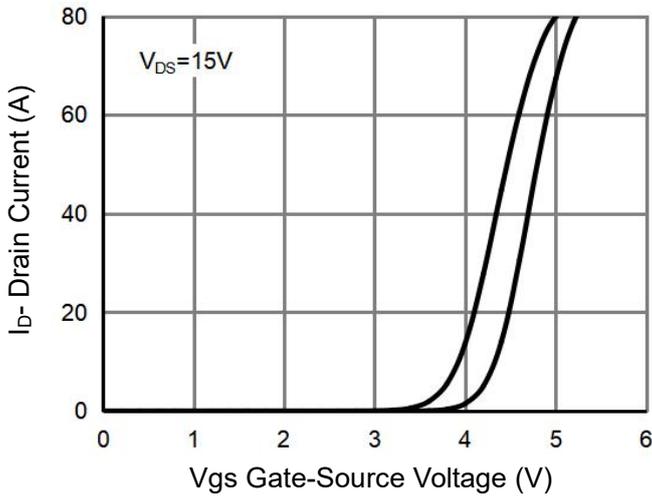


Figure 2 Transfer Characteristics

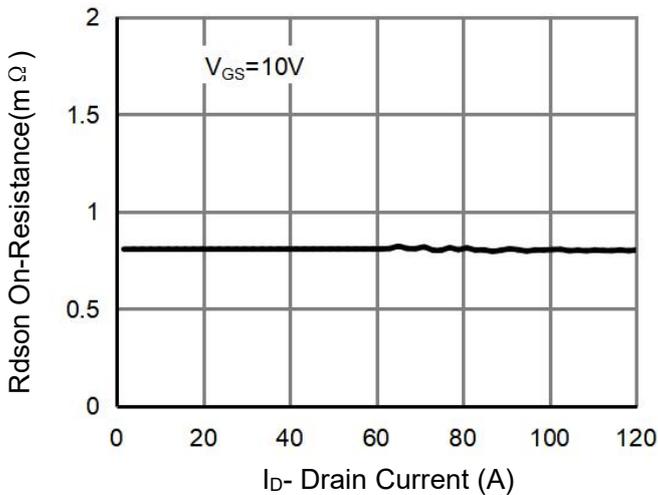


Figure 3 Rdson- Drain Current

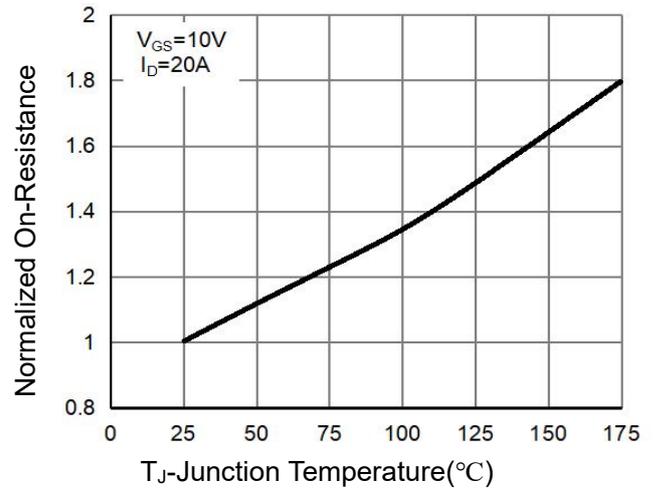


Figure 4 Rdson-Junction Temperature

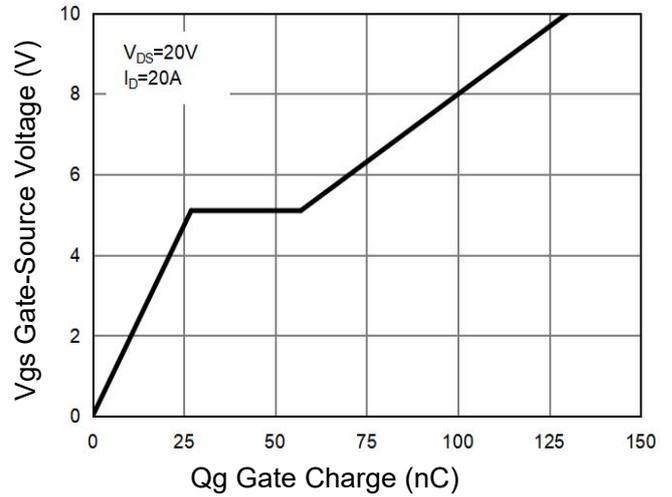


Figure 5 Gate Charge

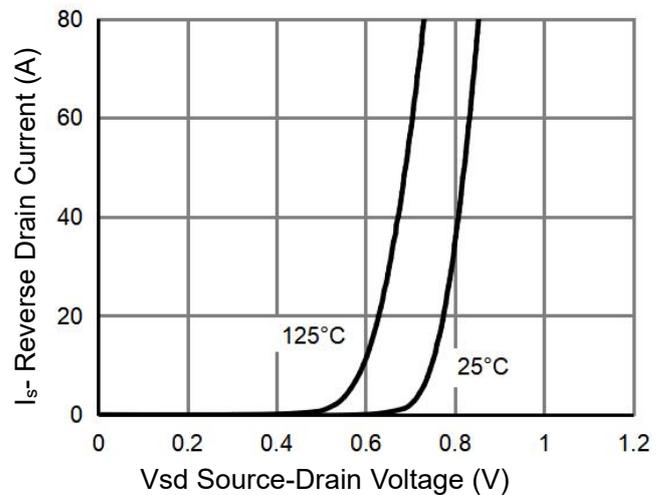


Figure 6 Source- Drain Diode Forward

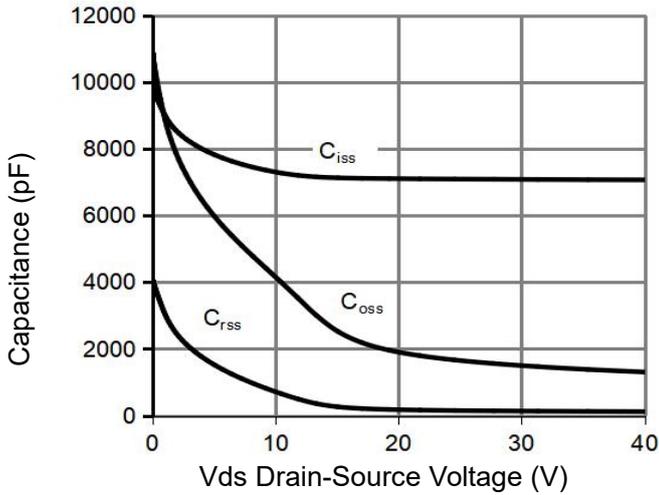


Figure 7 Capacitance vs Vds

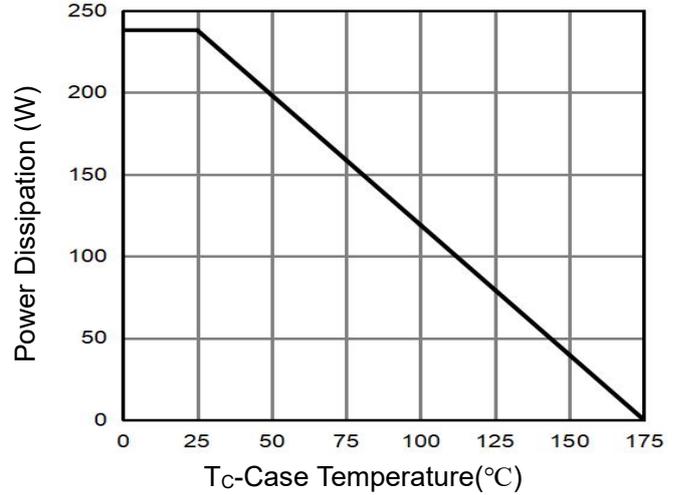


Figure 9 Power De-rating

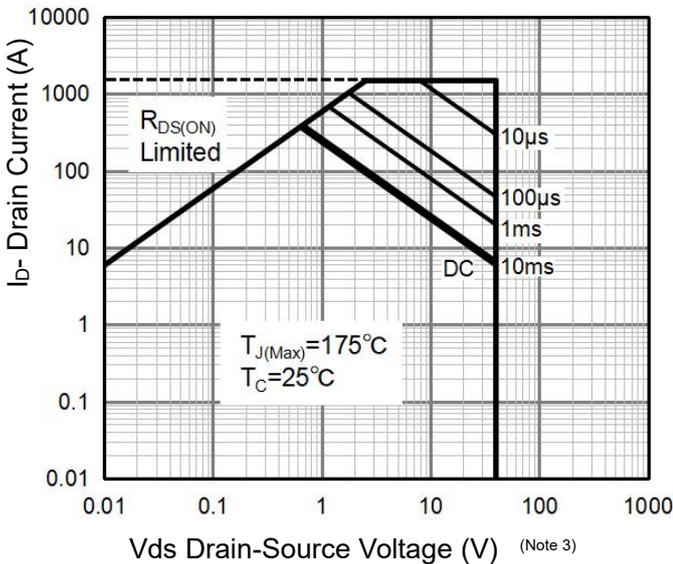


Figure 8 Safe Operation Area

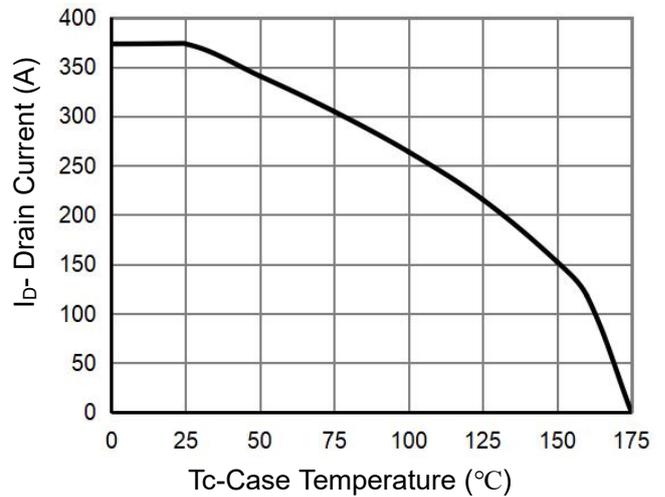


Figure 10 Current De-rating

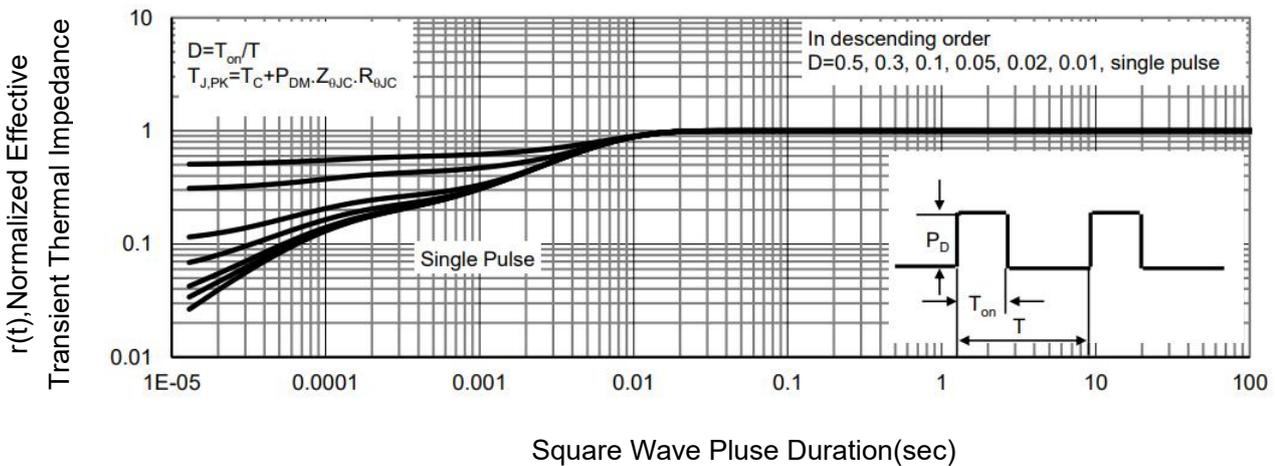
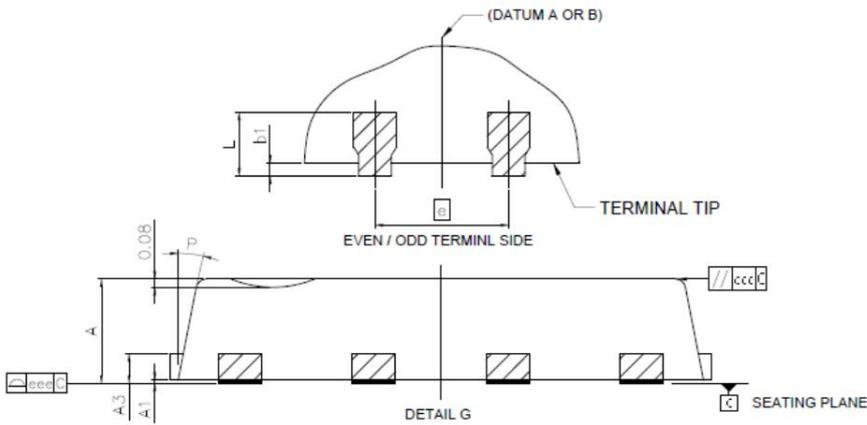
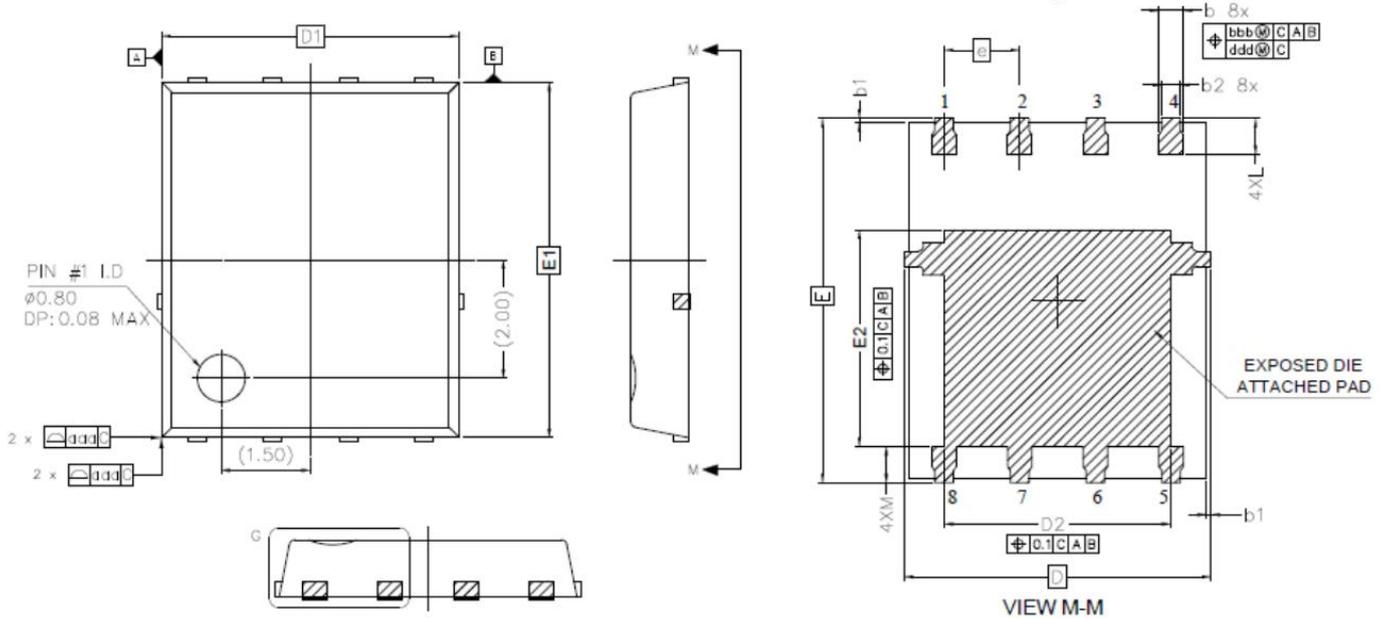


Figure 11 Normalized Maximum Transient Thermal Impedance

PDFN5X6-8L Package Information



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	0.95	1.05	aaa	0.10	
A1	0.00	0.05	bbb	0.10	
A3	0.25 REF		ccc	0.10	
b	0.31	0.51	ddd	0.05	
b1	0.03	0.13	eee	0.08	
b2	0.21	0.41			
D	5.15 BSC				
D1	5.00 BSC				
D2	3.70	3.90			
E	6.15 BSC				
E1	6.00 BSC				
E2	3.56	3.76			
e	1.27 BSC				
L	0.51	0.71			
M	0.51	0.71			
P	10°	12°			

Revision History

Revision	Date	Subjects
V1.0	2024.01.03	Product data sheet
V2.0	2024.03.05	Update $R_{DS(ON)}$ SOA I_D

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