

NCE Automotive N-Channel Super Trench Power MOSFET

Description

The NCEAP40ND80G 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

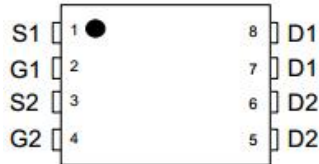
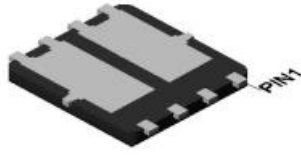
- Automotive application
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

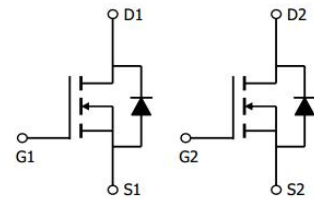
- $V_{DS} = 40V, I_D = 90A$
 - $R_{DS(ON)} = 4.3m\Omega$ (typical) @ $V_{GS} = 10V$
 - $R_{DS(ON)} = 5.5m\Omega$ (typical) @ $V_{GS} = 4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested
- 100% ΔV_{ds} tested
- **AEC-Q101 qualified**



DFN 5X6



Pin Assignment



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP40ND80G	NCEAP40ND80G	DFN5x6-8L	-	-	-

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	90	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	65	A
Pulsed Drain Current	I_{DM}	360	A
Maximum Power Dissipation	P_D	83	W
Derating factor		0.56	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	500	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	1.8	$^\circ C/W$
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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	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 (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.0	1.6	2.2	V
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A	-	4.3	5.0	mΩ
		V _{GS} =4.5V, I _D =20A	-	5.5	6.5	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	-	60	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	2300	-	pF
Output Capacitance	C _{oss}		-	740	-	pF
Reverse Transfer Capacitance	C _{rss}		-	38	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, I _D =20A V _{GS} =10V, R _G =1.6Ω	-	7.5	-	nS
Turn-on Rise Time	t _r		-	4.0	-	nS
Turn-Off Delay Time	t _{d(off)}		-	37	-	nS
Turn-Off Fall Time	t _f		-	7.5	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	34.8	-	nC
Gate-Source Charge	Q _{gs}		-	6.2	-	nC
Gate-Drain Charge	Q _{gd}		-	5.1	-	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		-	-	90	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-	14	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs (Note3)	-	21	-	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}=20V, V_G=10V, L=0.5mH, R_G=25Ω

Typical Electrical and Thermal Characteristics

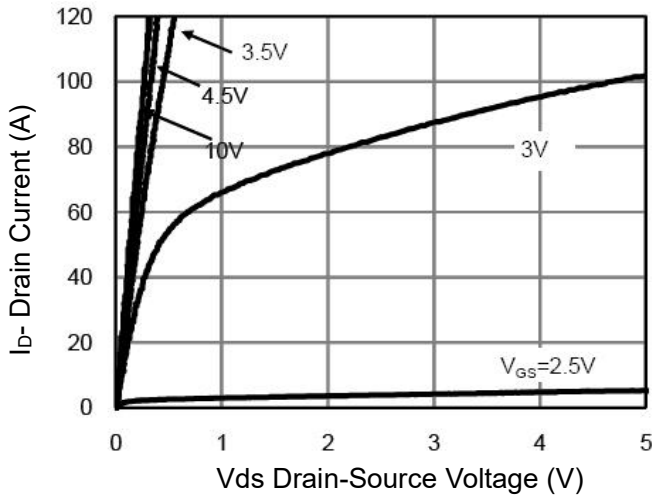


Figure 1 Output Characteristics

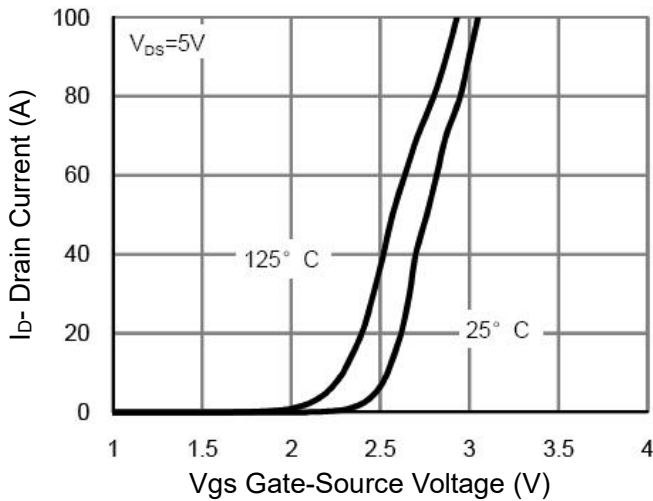


Figure 2 Transfer Characteristics

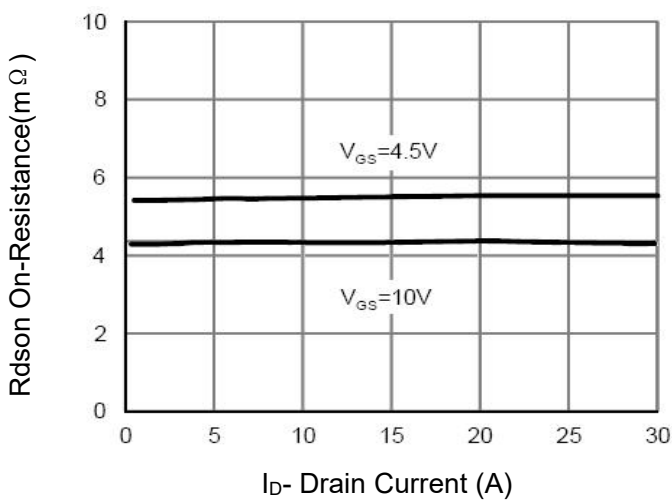


Figure 3 Rdson- Drain Current

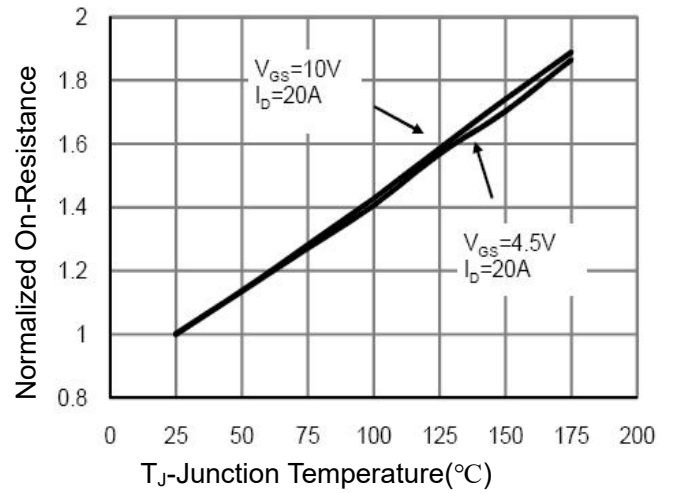


Figure 4 Rdson-Junction Temperature

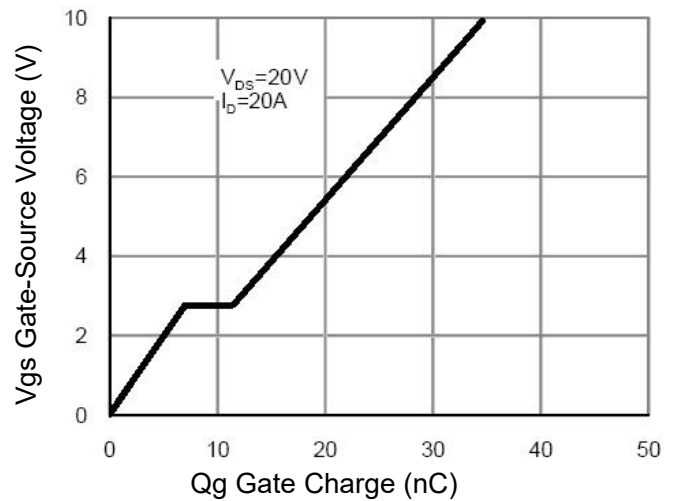


Figure 5 Gate Charge

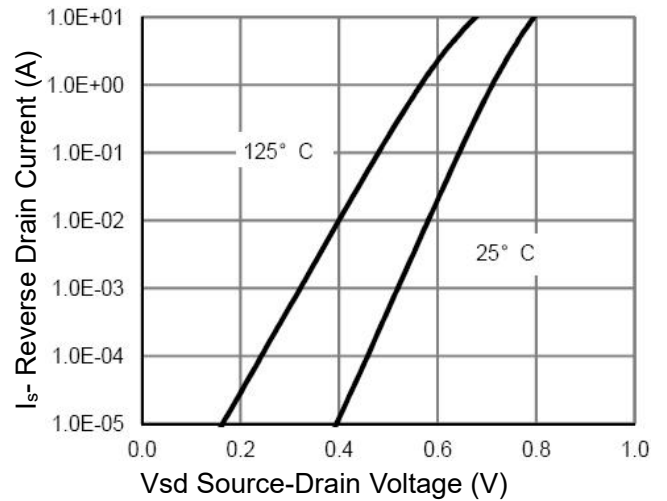


Figure 6 Source- Drain Diode Forward

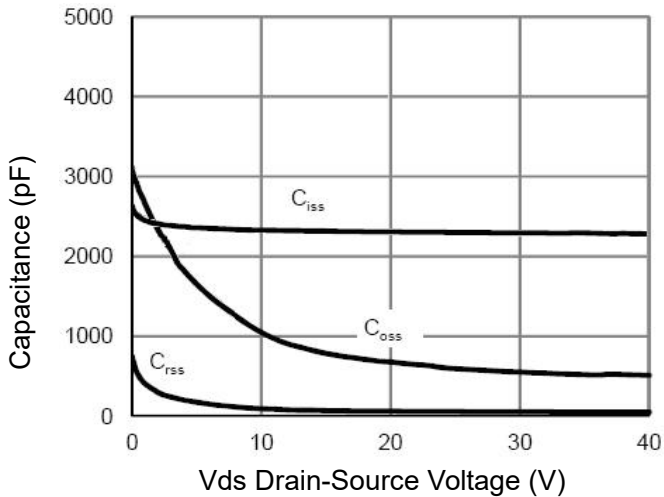


Figure 7 Capacitance vs Vds

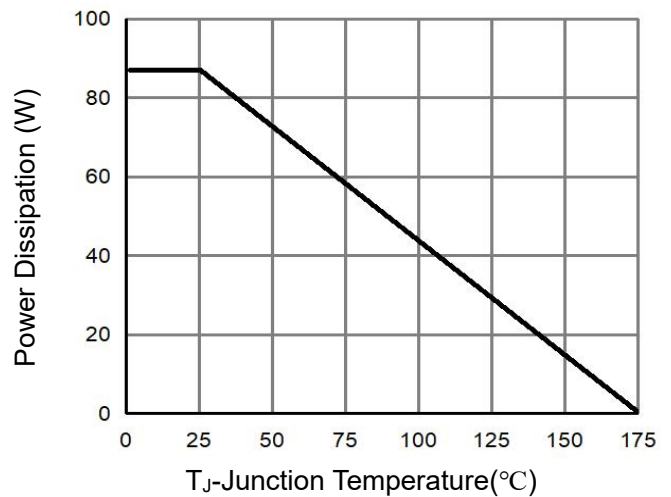


Figure 9 Power De-rating

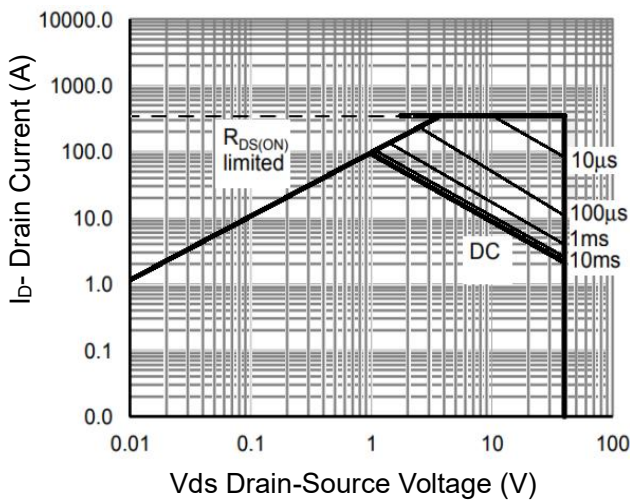


Figure 8 Safe Operation Area

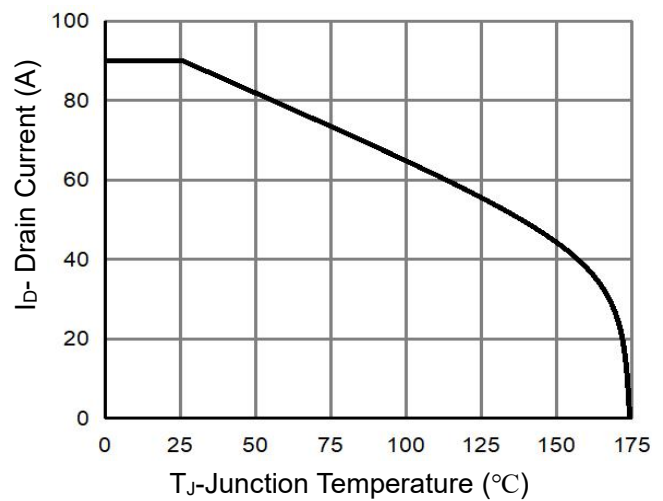


Figure 10 Current De-rating

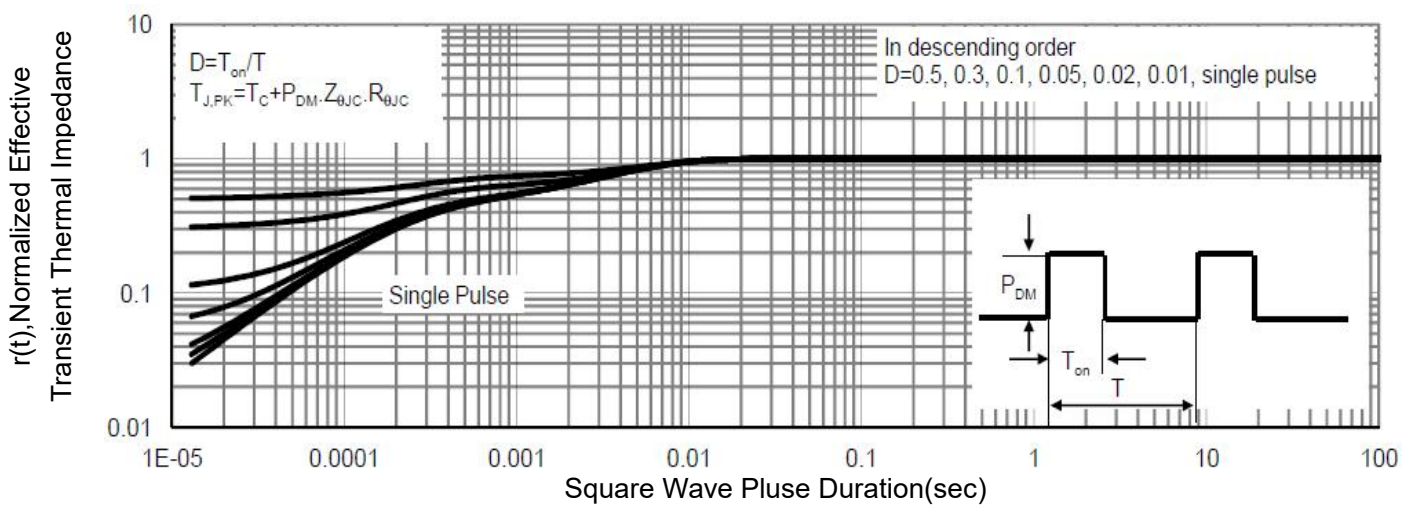
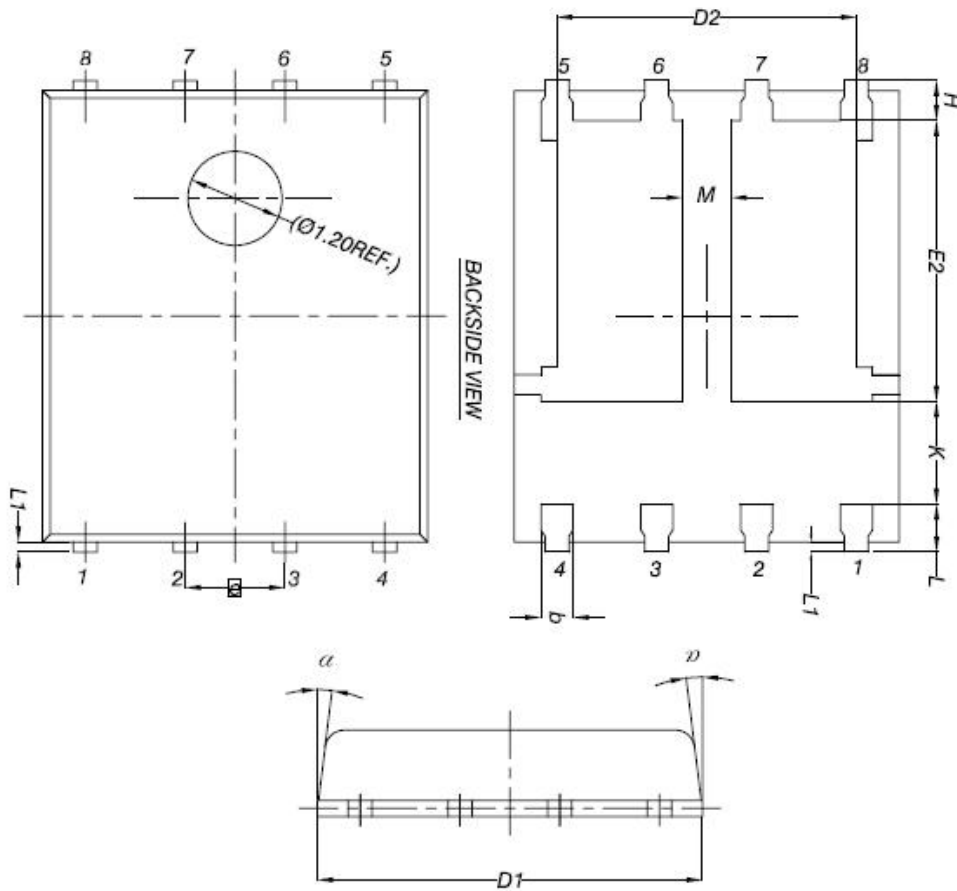
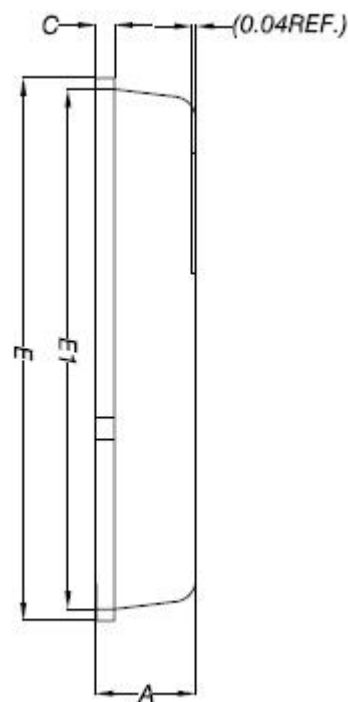


Figure 11 Normalized Maximum Transient Thermal Impedance

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	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
M	0.50	-	-
α	0°	-	12°



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