

NCE N-Channel Super Trench Power MOSFET

Description

The NCEAP40ND60AG 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

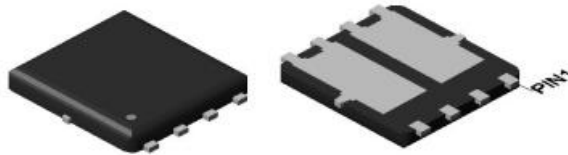
Application

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

General Features

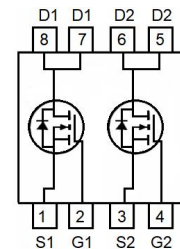
- $V_{DS} = 40V, I_D = 65A$
 $R_{DS(ON)} = 8.3m\Omega$ (typical) @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175°C operating temperature
- Pb-free lead plating;RoHScompliant
- Halogen-free according to IEC61249-2-21
- 100% UIS tested
- 100% ΔV_{ds} tested
- **AEC-Q101 qualified**

DFN5X6-8L



Top View

Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP40ND60AG	NCEAP40ND60AG	DFN5X6-8L	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	65	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D(100^\circ C)$	46.2	A
Pulsed Drain Current	I_{DM}	260	A
Maximum Power Dissipation	P_D	72	W
Derating factor		0.48	W/°C
Single pulse avalanche energy ^(Note 1)	E_{AS}	144	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.08	°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						
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	-	8.3	9.6	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =20A	-	35	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	1040	-	pF
Output Capacitance	C _{oss}		-	520	-	pF
Reverse Transfer Capacitance	C _{rss}		-	32	-	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	-	7	-	nS
Turn-on Rise Time	t _r		-	5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	25	-	nS
Turn-Off Fall Time	t _f		-	5	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	17	-	nC
Gate-Source Charge	Q _{gs}		-	6.3	-	nC
Gate-Drain Charge	Q _{gd}		-	3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current	I _S		-	-	65	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S di/dt = 100A/μs	-	16	-	nS
Reverse Recovery Charge	Q _{rr}		-	26	-	nC

Notes:

1. EAS condition : T_j=25°C, V_{DD}=20V, V_G=10V, L=0.5mH, R_G=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)}=175°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

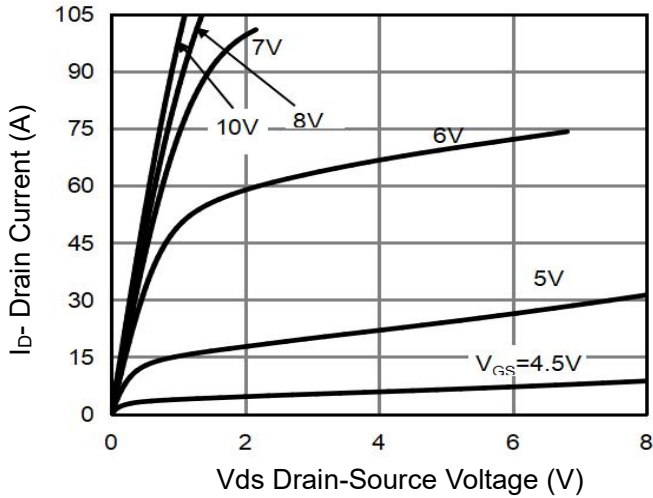


Figure 1 Output Characteristics

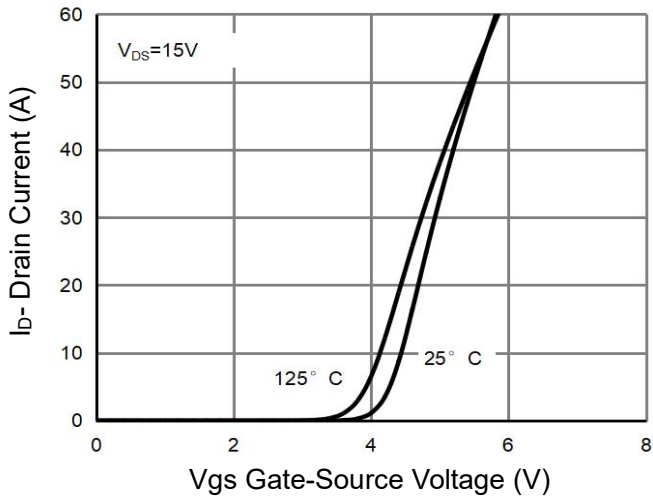


Figure 2 Transfer Characteristics

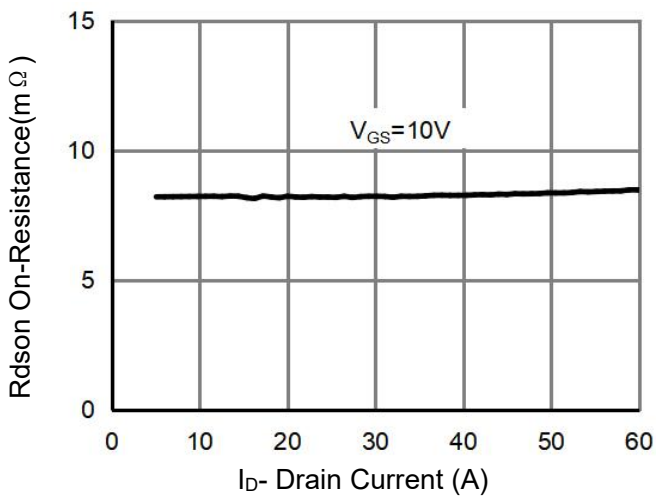


Figure 3 Rdson- Drain Current

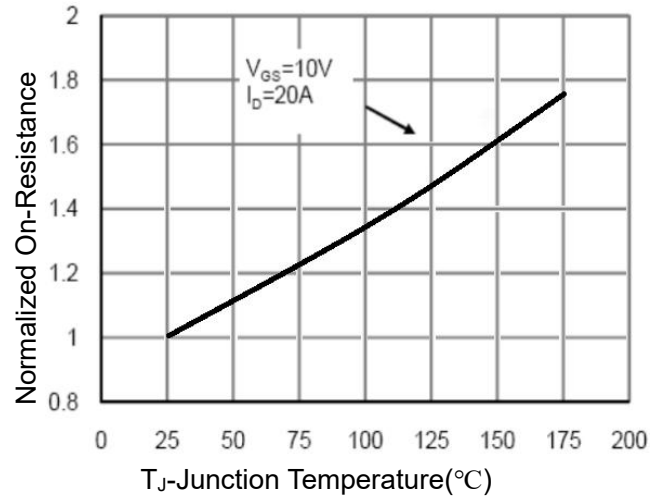


Figure 4 Rdson-Junction Temperature

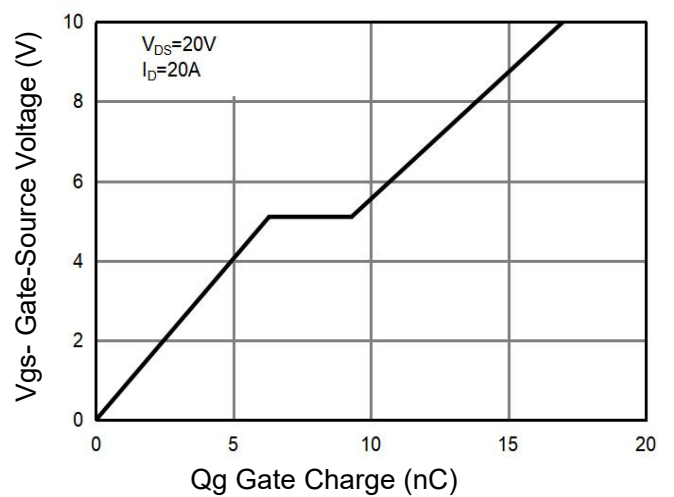


Figure 5 Gate Charge

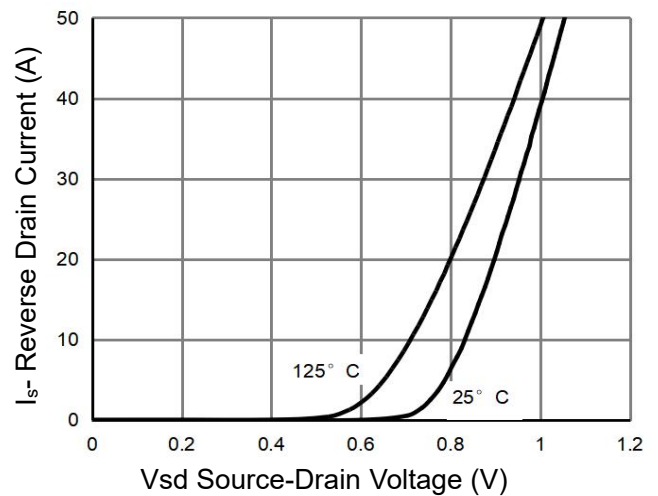


Figure 6 Source- Drain Diode Forward

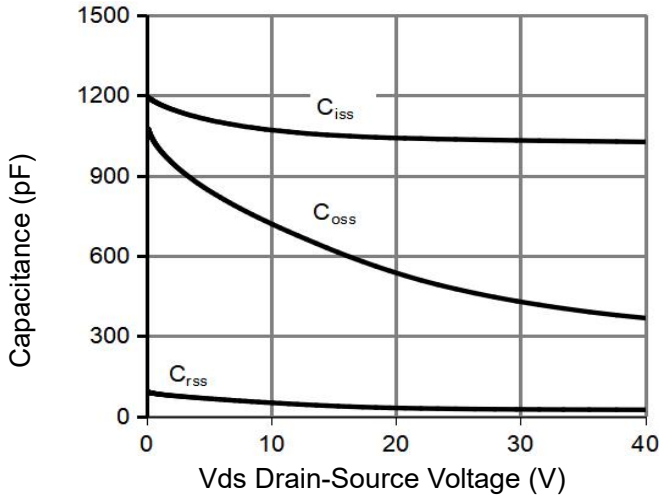


Figure 7 Capacitance vs Vds

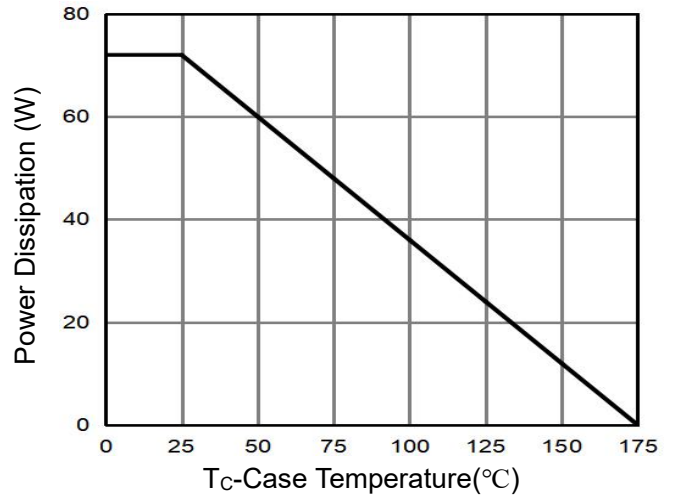


Figure 9 Power De-rating

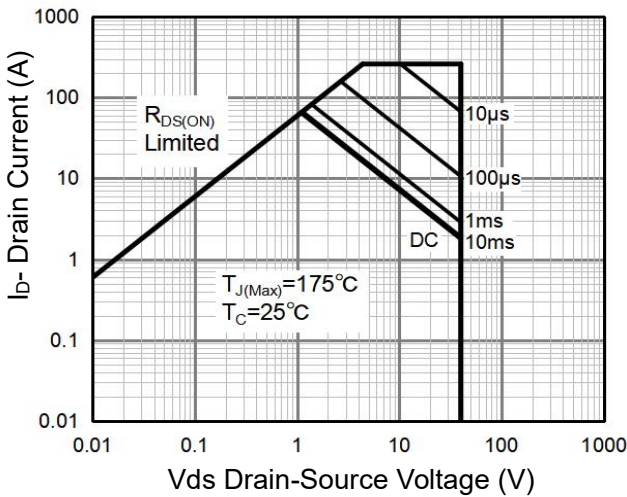


Figure 8 Safe Operation Area^(Note3)

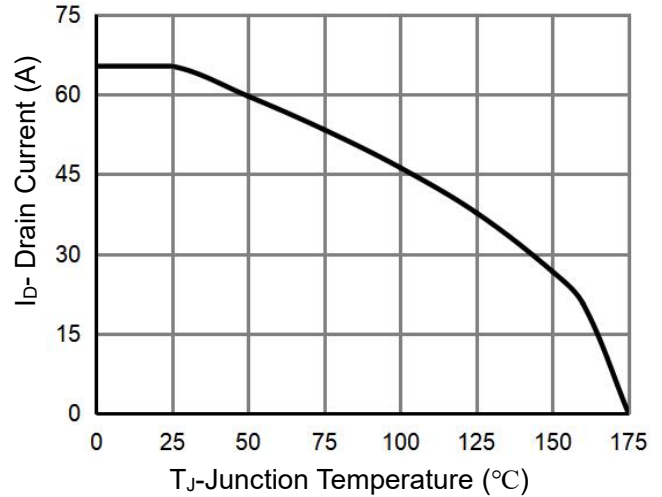


Figure 10 Current De-rating

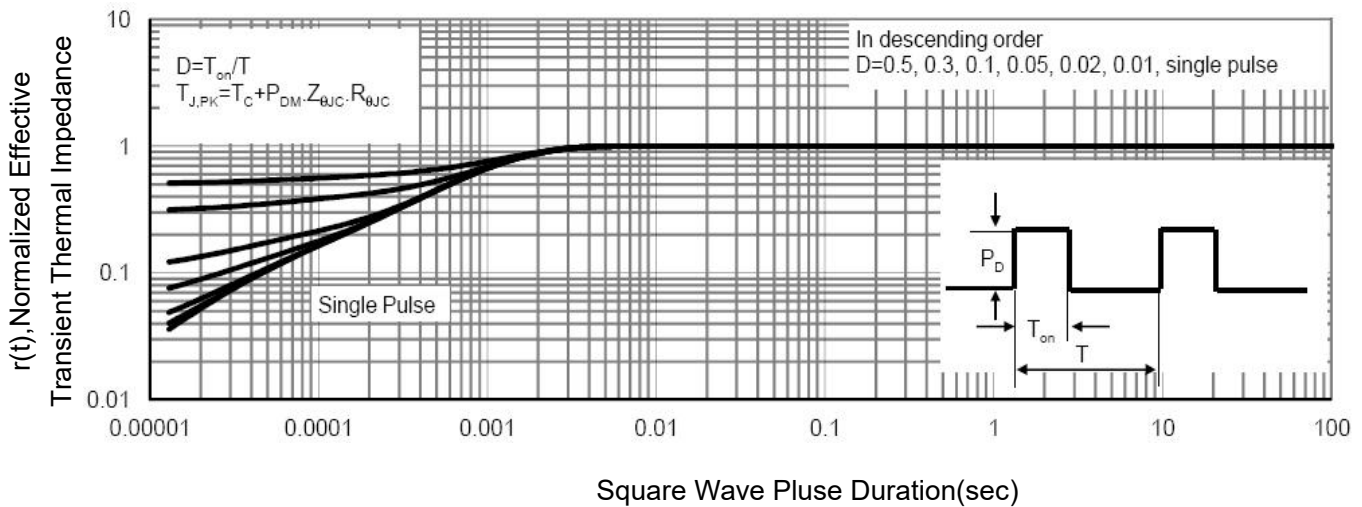
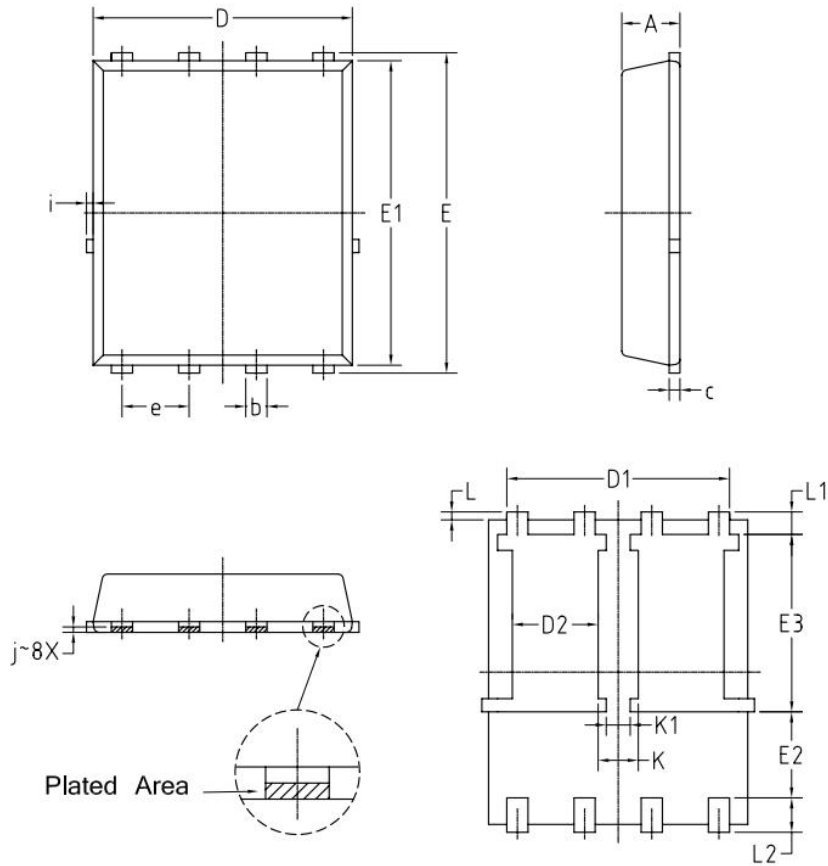


Figure 11 Normalized Maximum Transient Thermal Impedance

PDFN5X6-8L Package Information



SYMBOL	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	1.00	1.20	0.039	0.047
b	0.30	0.50	0.012	0.020
c	0.203 BSC		0.008 BSC	
D	4.80	5.00	0.189	0.197
D1	4.06	4.36	0.160	0.172
D2	1.47	1.77	0.058	0.070
E	5.90	6.20	0.232	0.244
E1	5.65	5.85	0.222	0.230
E2	1.45	—	0.057	—
E3	3.20	3.50	0.126	0.138
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.002	0.010
L1	0.325	0.525	0.013	0.021
L2	0.500	0.800	0.020	0.031
i	—	0.20	—	0.008
K	0.61	0.91	0.024	0.036
K1	0.31	0.60	0.012	0.024
j	0.1015 BSC		0.004 BSC	

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