NCE Automotive N-Channel Super Trench Power MOSFET

Description

The NCEAP40T11AG 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

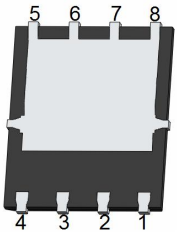
- Automotive application
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

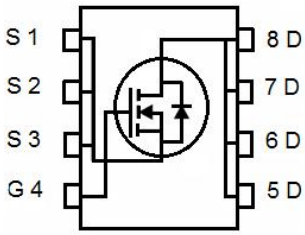
- V_{DS} =40V,I_D =150A (Silicon Limited)
  $R_{DS(ON)}$=2.5mΩ (typical) @ V_{GS}=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested
- 100% ΔVds tested
- **AEC-Q101 qualified**

PDFN 5X6-8L

Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP40T11AG	NCEAP40T11AG	PDFN5X6-8L	-	-	-

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 (Silicon Limited)(Note1)	I_D	150	A
Drain Current-Continuous (Silicon Limited)(Note1)	I_D (100℃)	110	A
Drain Current-Continuous (Package Limited)	I_D	120	A
Pulsed Drain Current	I_{DM}	480	A
Maximum Power Dissipation	P_D	120	W
Derating factor		0.8	W/℃
Single pulse avalanche energy (Note 2)	E_{AS}	380	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	-	1.25	1.5	℃/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	-	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	2.5	2.9	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	-	60	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	2750	3575	pF
Output Capacitance	C_{oss}		-	850	1105	pF
Reverse Transfer Capacitance	C_{rss}		-	54	81	pF
Switching Characteristics (Note 1)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V,I_D=20A V_{GS}=10V,R_G=1.6Ω	-	9	-	nS
Turn-on Rise Time	t_r		-	3.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	31	-	nS
Turn-Off Fall Time	t_f		-	4	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=20A, V_{GS}=10V	-	38.5	50.0	nC
Gate-Source Charge	Q_{gs}		-	13.5	19.0	nC
Gate-Drain Charge	Q_{gd}		-	7	10.5	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=20A	-	-	1.2	V
Diode Forward Current	I_S		-	-	120	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = I_S di/dt = 100A/μs	-	-	22	nS
Reverse Recovery Charge	Qrr		-	-	62	nC

Notes:

1. Defined by design.Not Subject to production test
2. EAS condition : Tj=25℃,V_{DD}=20V,V_G=10V,L=0.5mH,Rg=25Ω
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 TJ(MAX)=175°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

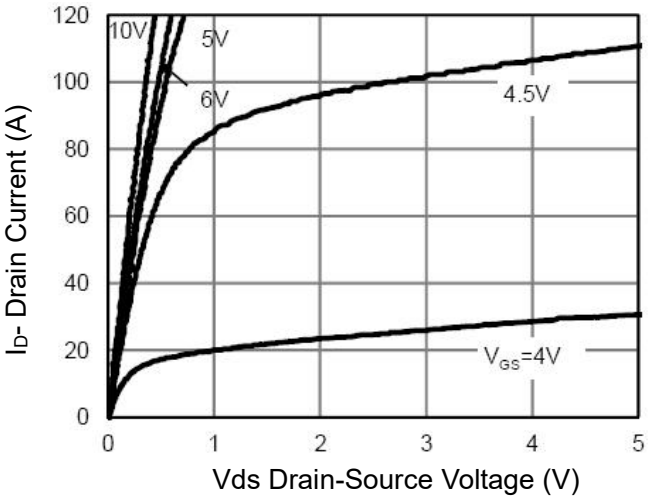


Figure 1 Output Characteristics

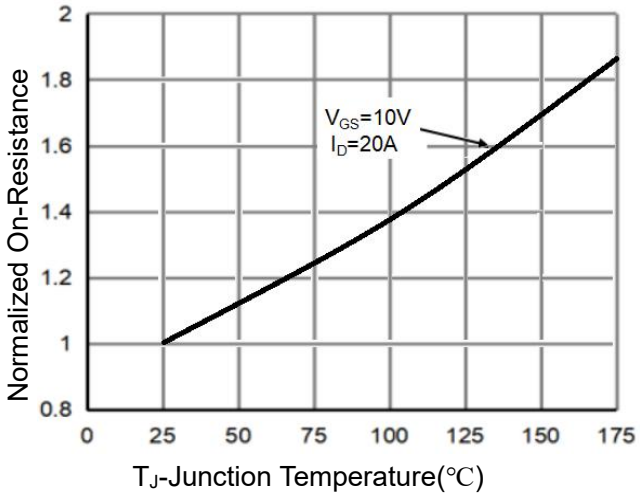


Figure 4 Rdson-JunctionTemperature

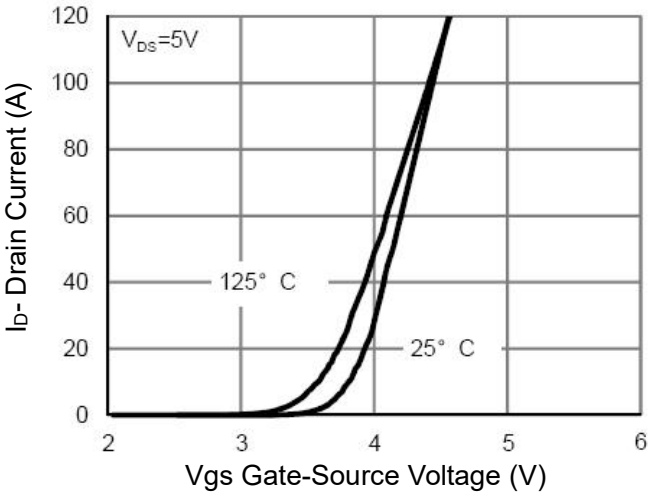


Figure 2 Transfer Characteristics

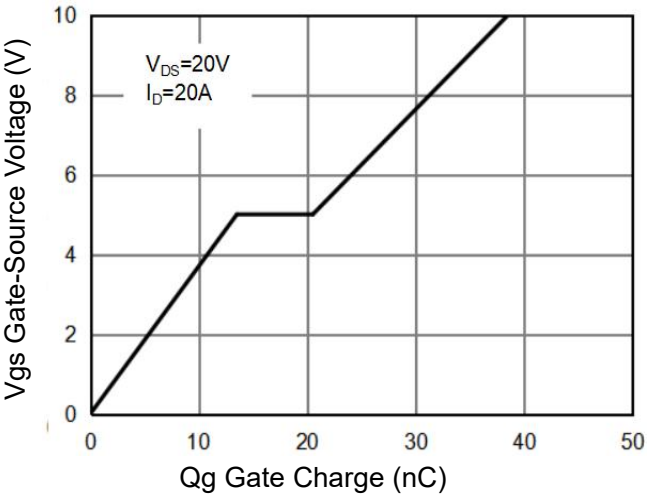


Figure 5 Gate Charge

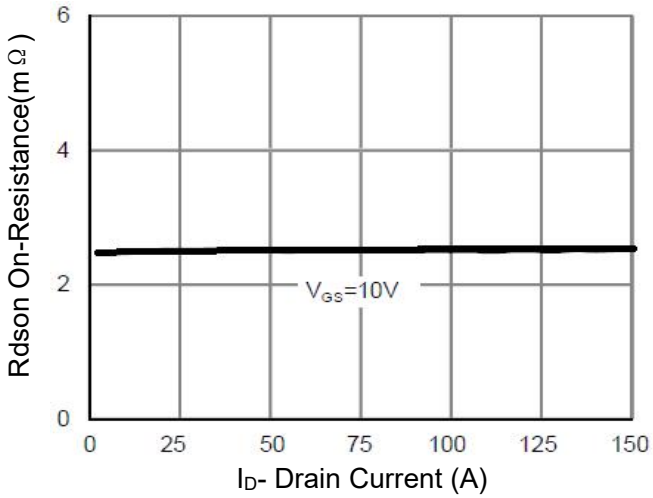


Figure 3 Rdson- Drain Current

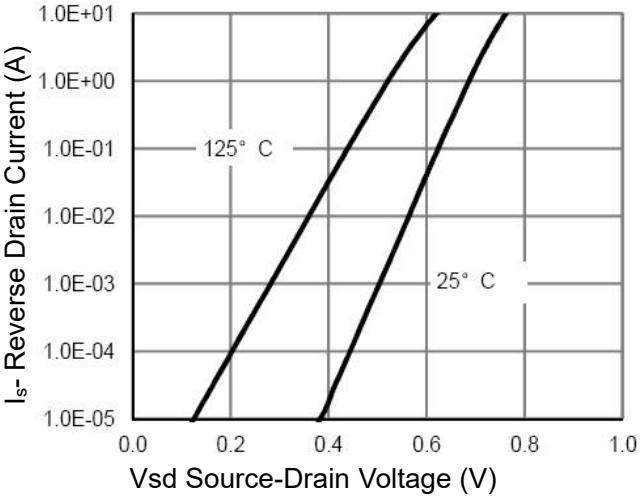


Figure 6 Source- Drain Diode Forward

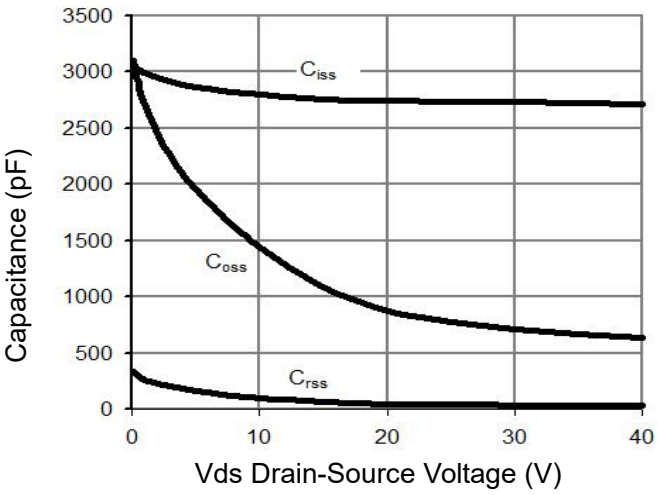


Figure 7 Capacitance vs Vds

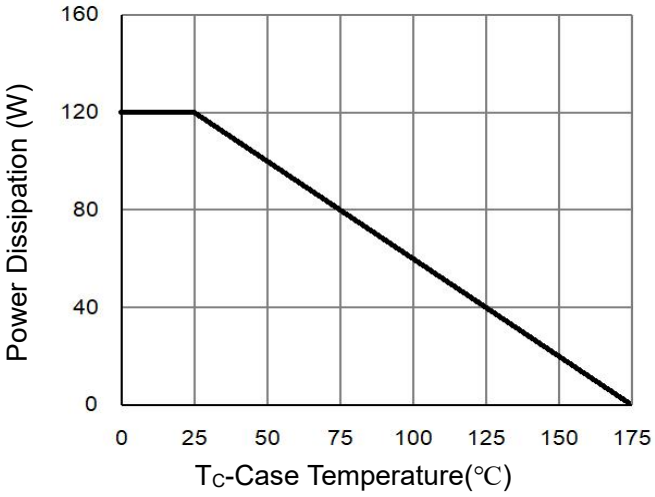


Figure 9 Power De-rating

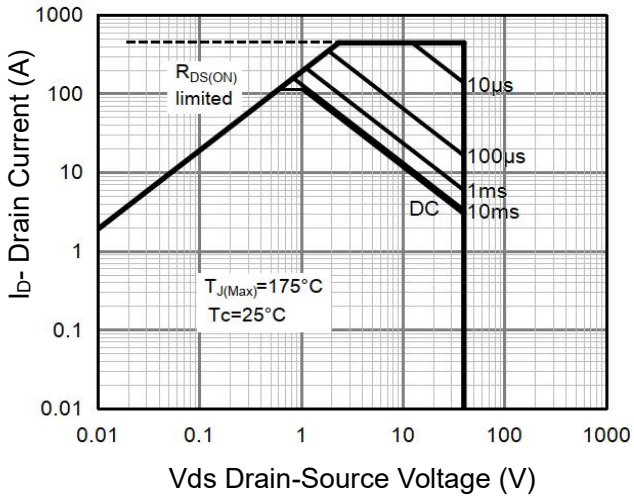


Figure 8 Safe Operation Area(Note 3)

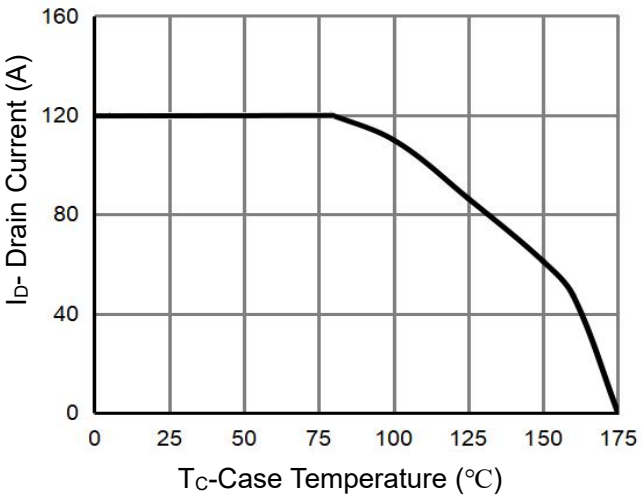


Figure 10 Current De-ratin

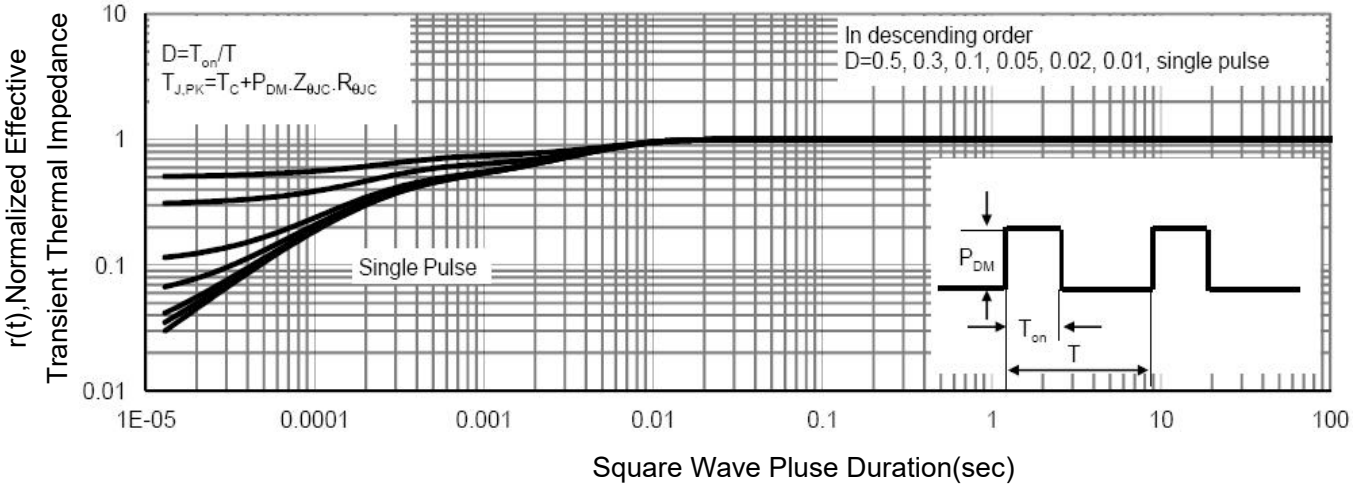
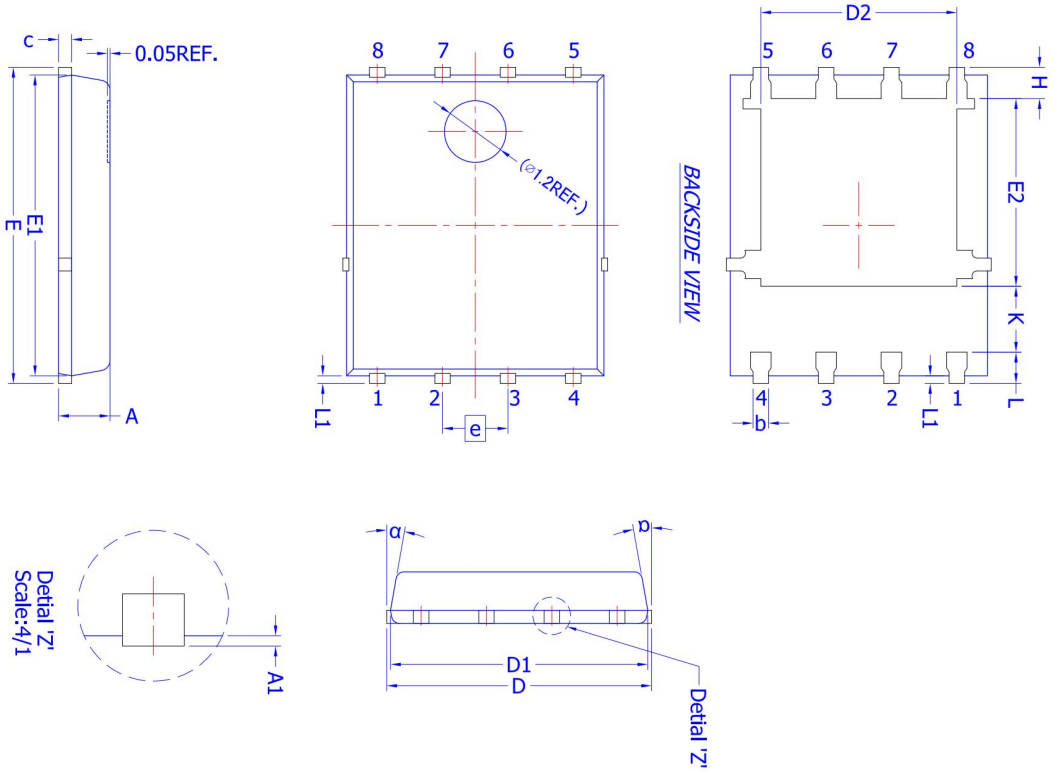


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.30	0.40	0.50
c	0.20	0.25	0.30
D	5.15 BSC		
D1	5.00 BSC		
D2	3.76	3.81	3.86
E	6.15 BSC		
E1	5.80	5.85	5.90
E2	3.45	3.65	3.85
e	1.27 BSC		
H	0.51	0.61	0.71
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.08	0.15	0.23
α	10°	11°	12°

Note:
1. All Dimension Are In mm;
2. Package Body Sizes Exclude Mold Flash,Protrusion Or Gate Burrs.
   Mold Flash,Protrusion Or Gate Burrs Shall Not Exceed 0.10mm Per Side.
3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic.
   Body Exclusive Of Mold Flash,Tie Bar, Tie Bar Burrs Gate Burrs And Interlead Flash,
   But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.
4. The Package Top May Be Smaller Than The Package Bottom.

Revision	Date	Subjects
V1.0	2022.09.12	Product data sheet
V2.0	2023.06.27	$R_{\theta JC}$ Typ Max value
V3.0	2023.11.16	Ciss C_{oss} C_{rss} Q_g Q_{gs} Q_{gd} Max value

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