

NCE N-Channel Super Trench Power MOSFET

Description

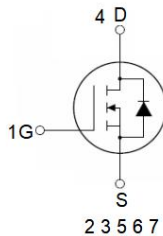
The NCEAP40T35AVD uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

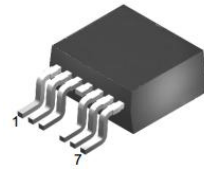
- Automotive application
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 40V, I_D = 480A$ (Silicon Limited)
 $R_{DS(ON)} = 0.68m\Omega$ (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**



Schematic diagram



TO-263-7L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP40T35AVD	NCEAP40T35AVD	TO-263-7L	-	-	-

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(Silicon Limited) ^(Note 1)	I_D	480	A
Drain Current-Continuous(Silicon Limited) ^(Note 1)	$I_D(100^\circ C)$	343	A
Drain Current-Continuous(Package Limited)	I_D	350	A
Pulsed Drain Current	I_{DM}	1400	A
Maximum Power Dissipation	P_D	380	W
Derating factor		2.53	W/ $^\circ C$
Single pulse avalanche energy ^(Note 2)	E_{AS}	3000	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.39	$^\circ C/W$
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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	43	-	-	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	-	0.68	0.88	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	-	100	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	12850	-	pF
Output Capacitance	C _{oss}		-	4641	-	pF
Reverse Transfer Capacitance	C _{rss}		-	205	-	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	-	26	-	nS
Turn-on Rise Time	t _r		-	14	-	nS
Turn-Off Delay Time	t _{d(off)}		-	110	-	nS
Turn-Off Fall Time	t _f		-	17	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	156.5	210	nC
Gate-Source Charge	Q _{gs}		-	59	78	nC
Gate-Drain Charge	Q _{gd}		-	23.5	38	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current	I _S		-	-	350	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S di/dt = 100A/μs	-	66	-	nS
Reverse Recovery Charge	Q _{rr}		-	240	-	nC

Notes:

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

Typical Electrical and Thermal Characteristics

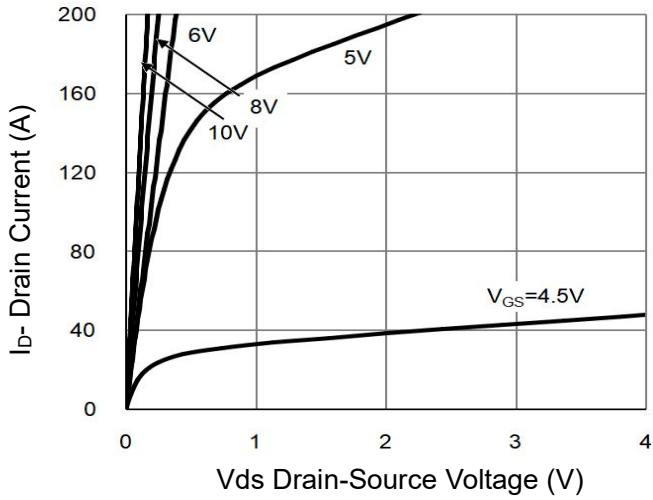


Figure 1 Output Characteristics

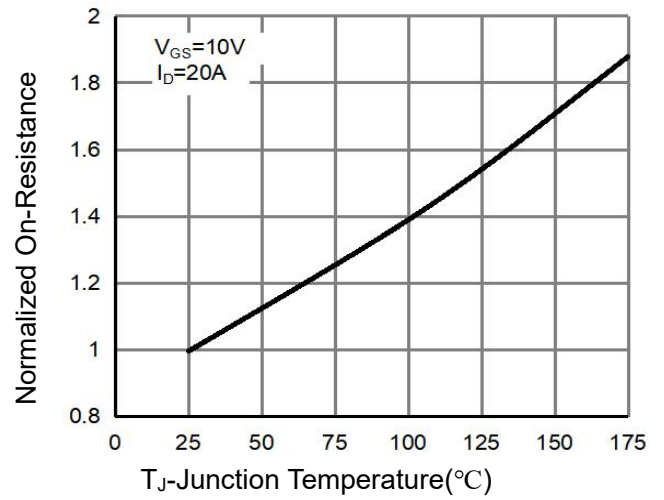


Figure 4 Rdson-Junction Temperature

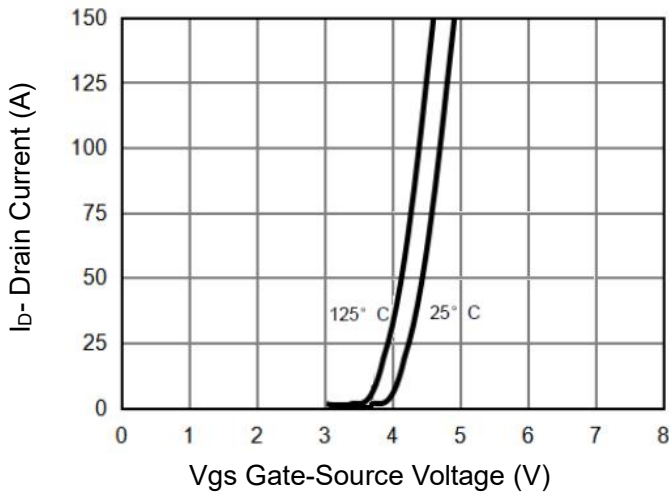


Figure 2 Transfer Characteristics

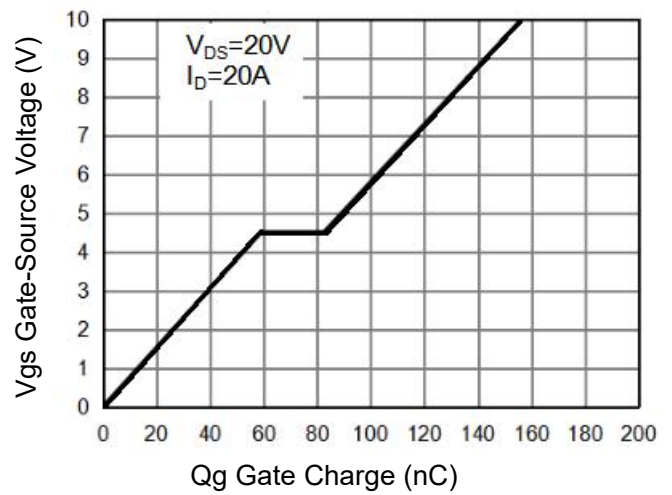


Figure 5 Gate Charge

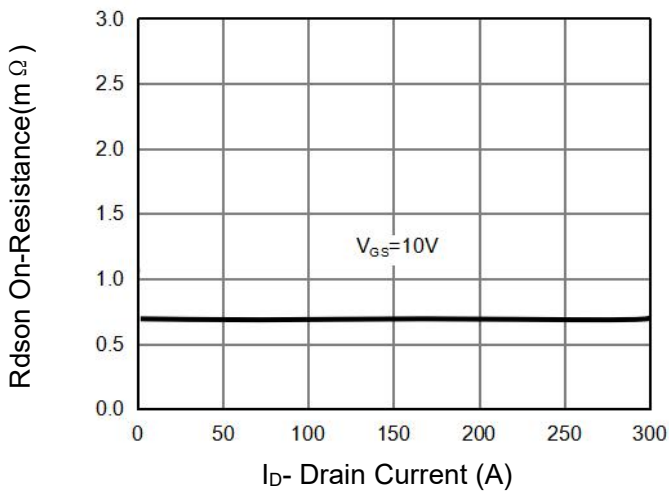


Figure 3 Rdson- Drain Current

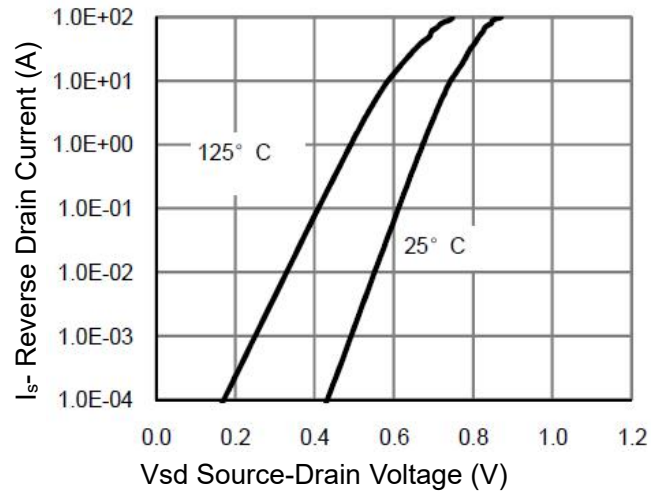


Figure 6 Source- Drain Diode Forward

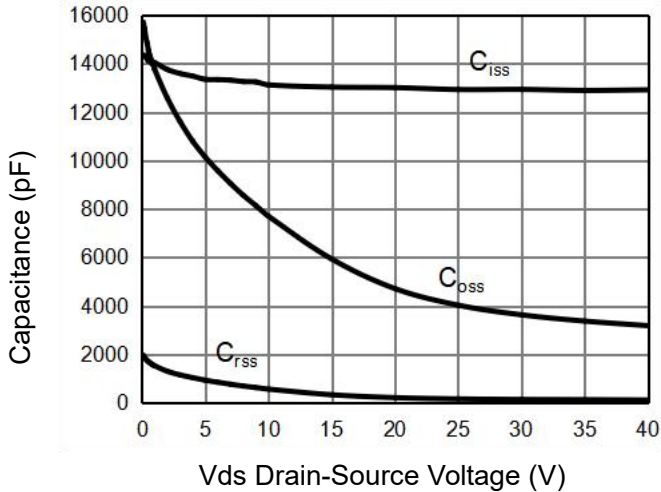


Figure 7 Capacitance vs Vds

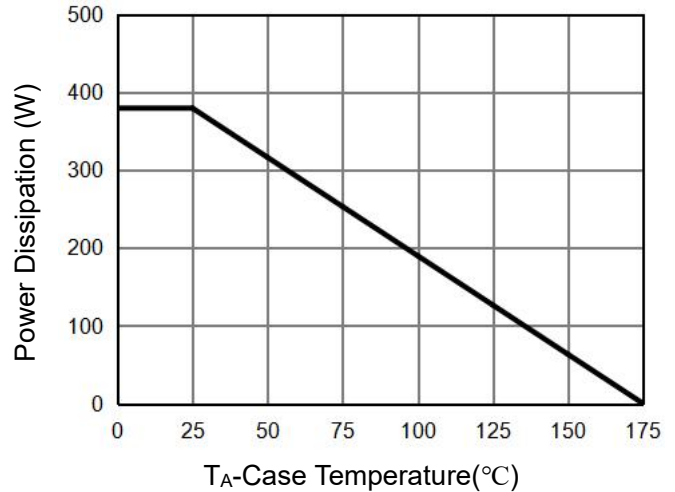


Figure 9 Power De-rating

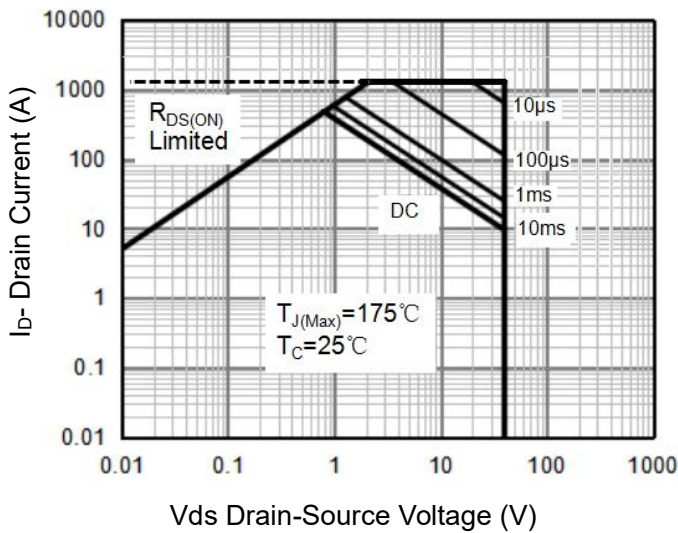


Figure 8 Safe Operation Area (Note 3)

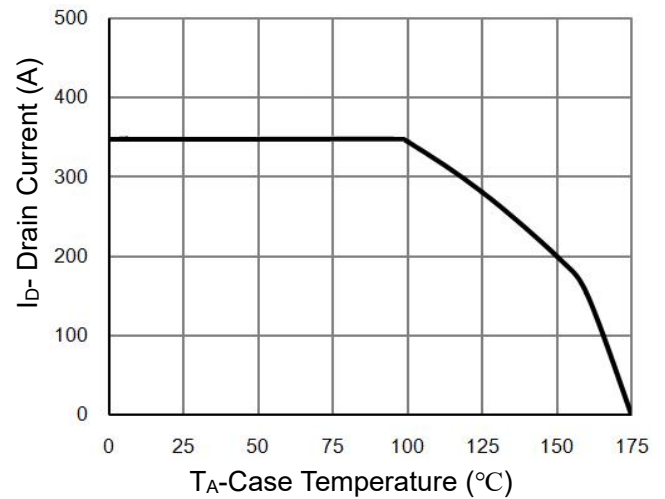


Figure 10 Current De-rating

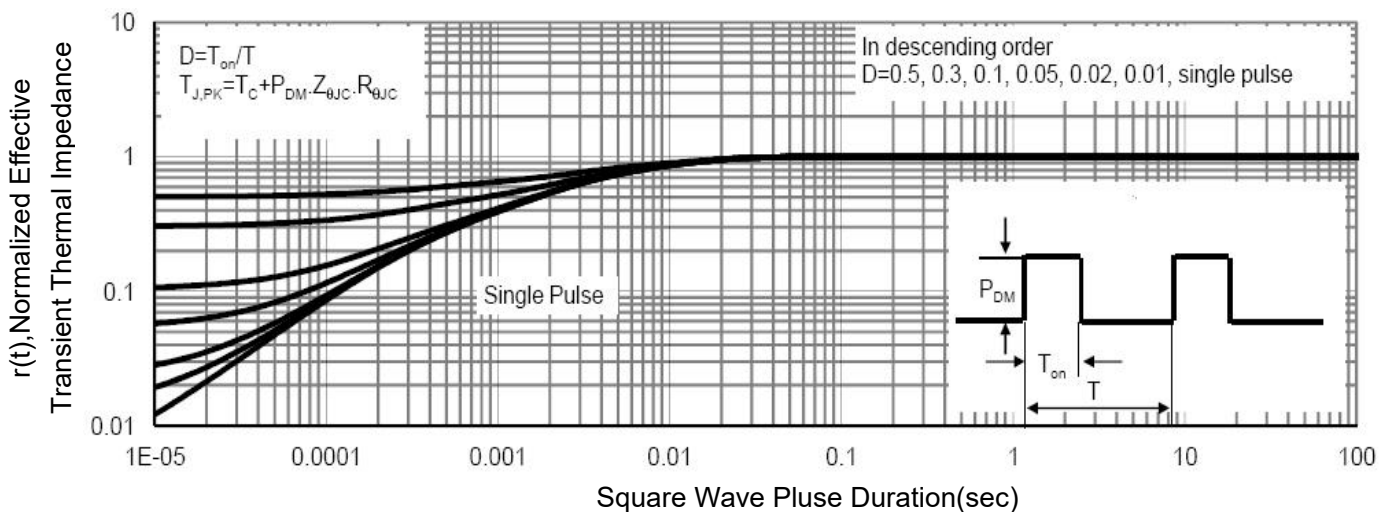
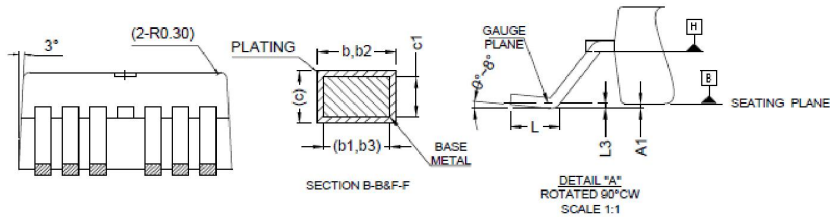
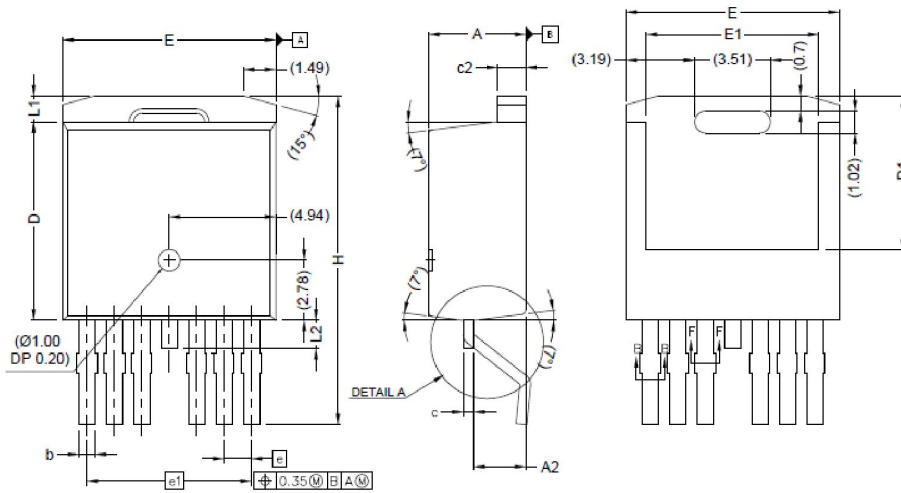


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-263-7L Package Information



SYMBOL	MIN	MAX
A	4.30	4.70
A1	-	0.25
A2	2.20	2.60
b	0.65	0.85
b1	0.65	0.80
b2	0.80	1.00
b3	0.80	0.95
c	0.45	0.60
c1	0.45	0.55
c2	1.25	1.40
D	9.00	9.40
D1	6.86	7.42
E	9.68	10.08
E1	7.70	8.30
e	1.27 BSC	
e1	7.62 BSC	
L	1.78	2.79
L1	-	1.60
L2	-	1.78
L3	0.25BSC	
H	14.61	15.88

Revision History

Revision	Date	Subjects
V1.0	2022.06.20	Preliminary data sheet
V2.0	2022.08.08	Product data sheet
V2.1	2023.10.11	Qg Qgs Qgd Max Value
V3.0	2023.12.04	Diode Forward Current IS max350A

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