

NCE N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** 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

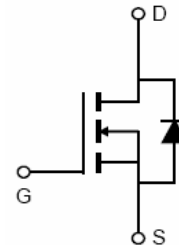
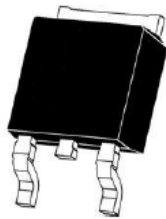
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 100V, I_D = 75A$
 $R_{DS(ON)} = 7.2m\Omega$, typical@ $V_{GS} = 10V$
 $R_{DS(ON)} = 9.4m\Omega$, 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% ΔVds TESTED!

TO-252



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP078N10AK	NCEP078N10AK	TO-252	-	-	-

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	75	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	58	A
Pulsed Drain Current	I_{DM}	300	A
Maximum Power Dissipation	P_D	100	W
Derating factor		0.67	W/ $^\circ C$
Single pulse avalanche energy ^(Note 4)	E_{AS}	420	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	$^\circ C/W$
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Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	100		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.7	2.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=37.5A$	-	7.2	7.8	m Ω
		$V_{GS}=4.5V, I_D=37.5A$	-	9.4	11.5	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=37.5A$		60	-	S
Dynamic Characteristics (Note 3)						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$	-	3650	-	pF
Output Capacitance	C_{oss}		-	315	-	pF
Reverse Transfer Capacitance	C_{rss}		-	22	-	pF
Switching Characteristics (Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=50V, I_D=37.5A$ $V_{GS}=10V, R_G=1.6\Omega$	-	16	-	nS
Turn-on Rise Time	t_r		-	11	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	35	-	nS
Turn-Off Fall Time	t_f		-	9	-	nS
Total Gate Charge	Q_g	$V_{DS}=50V, I_D=37.5A,$ $V_{GS}=10V$	-	70	-	nC
Gate-Source Charge	Q_{gs}		-	14.5	-	nC
Gate-Drain Charge	Q_{gd}		-	16.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 2)	V_{SD}	$V_{GS}=0V, I_S=37.5A$	-	-	1.2	V
Diode Forward Current	I_S		-	-	75	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}, I_F = 37.5A$ $di/dt = 100A/\mu s$ (Note 3)	-	60	-	nS
Reverse Recovery Charge	Q_{rr}		-	106	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
3. Guaranteed by design, not subject to production
4. EAS condition : $T_J=25^\circ\text{C}, V_{DD}=50V, V_G=10V, L=0.25mH, R_G=25\Omega$

Typical Electrical and Thermal Characteristics

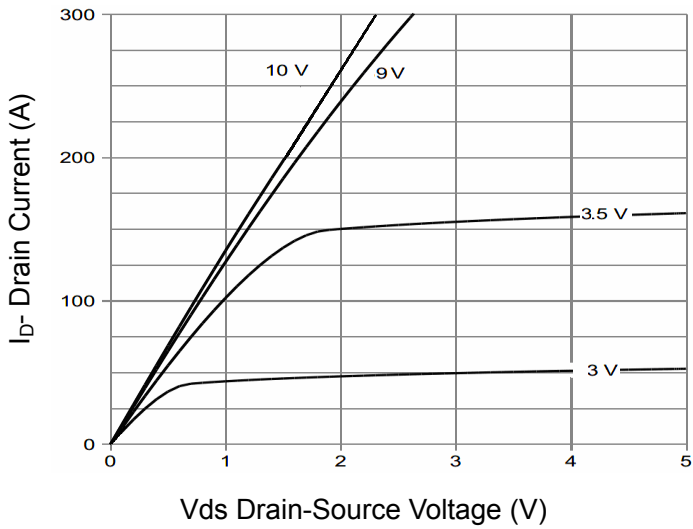


Figure 1 Output Characteristics

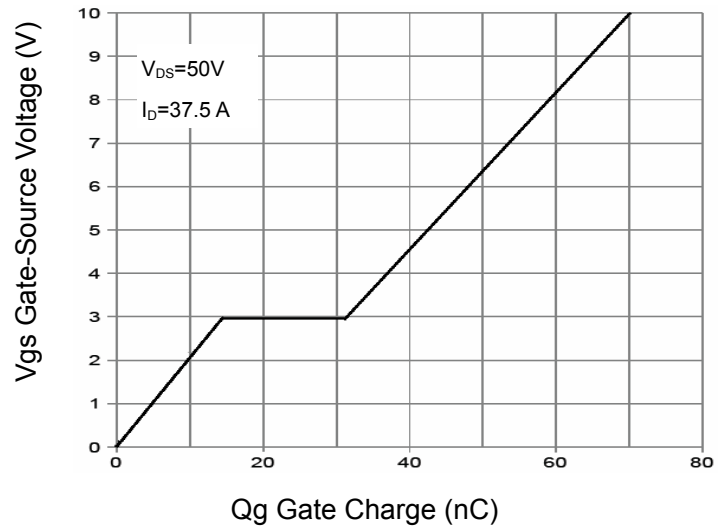


Figure 4 Gate Charge

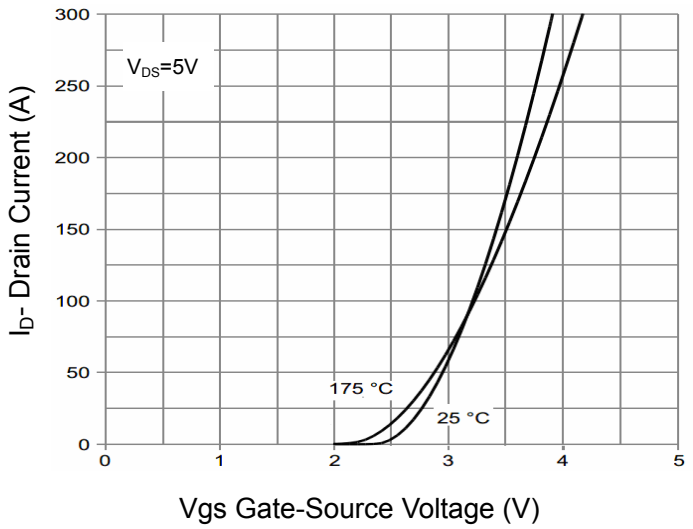


Figure 2 Transfer Characteristics

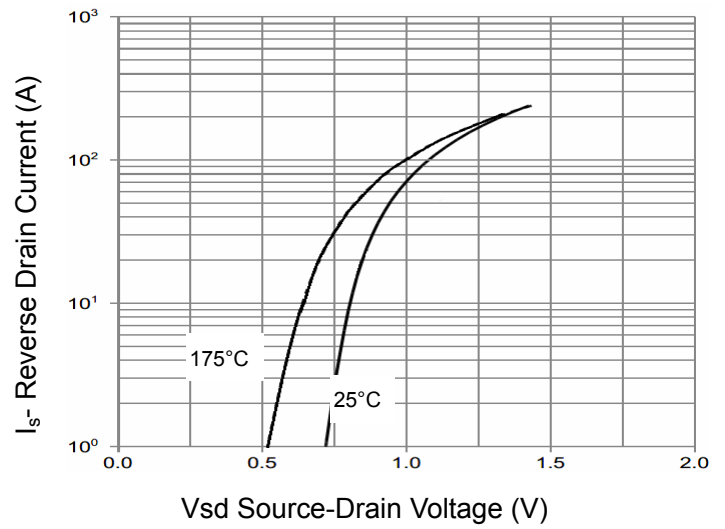


Figure 5 Source- Drain Diode Forward

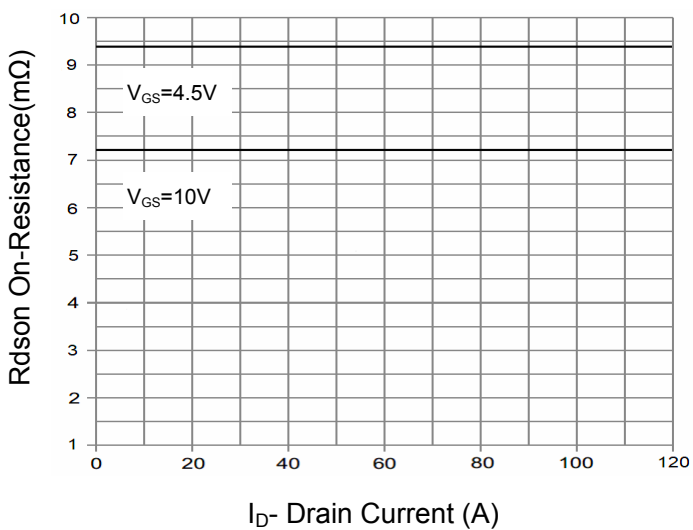


Figure 3 Rdson- Drain Current

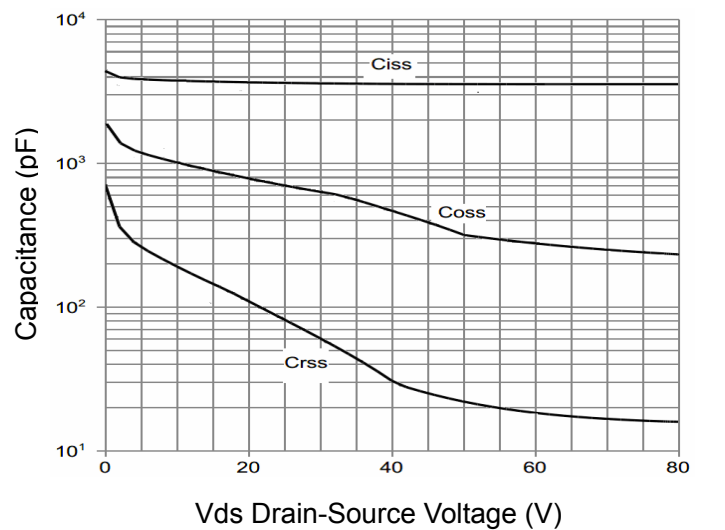
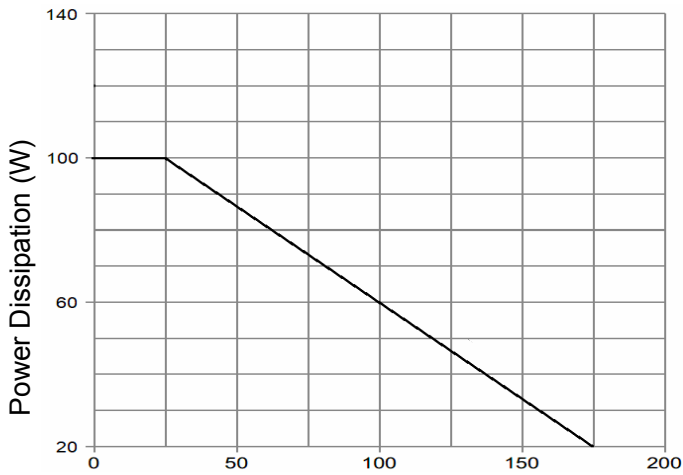
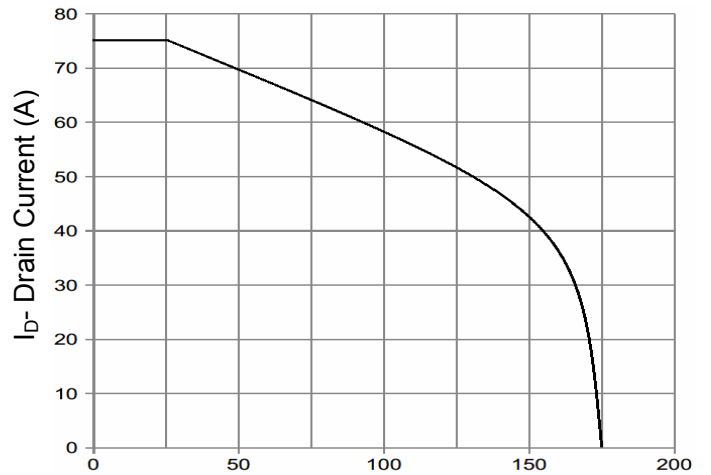


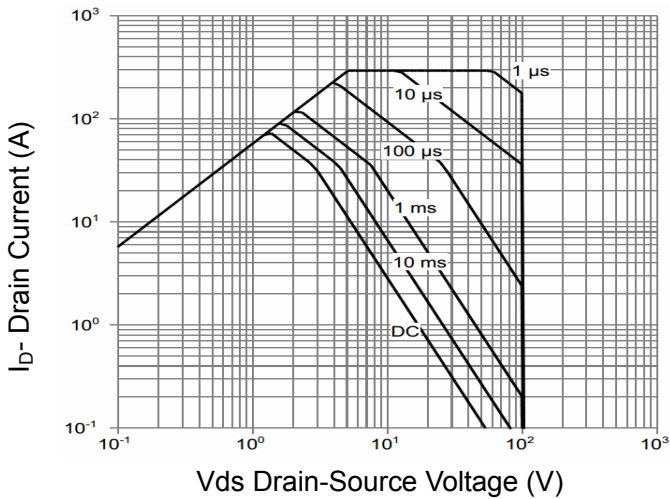
Figure 6 Capacitance vs Vds



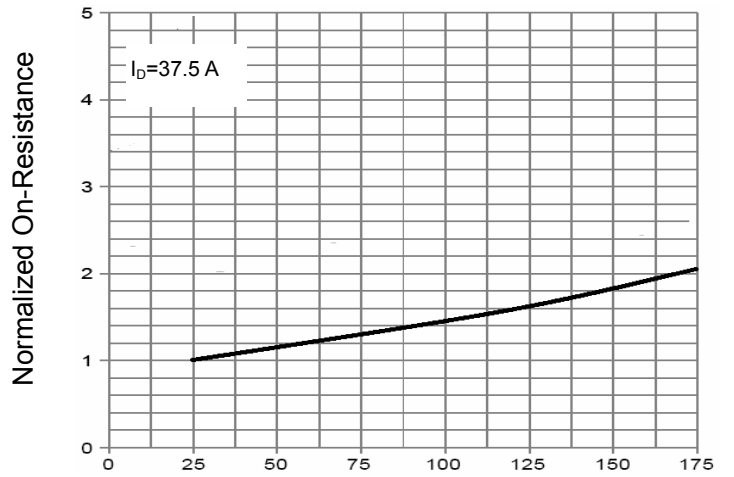
T_J-Junction Temperature(°C)
Figure 7 Power De-rating



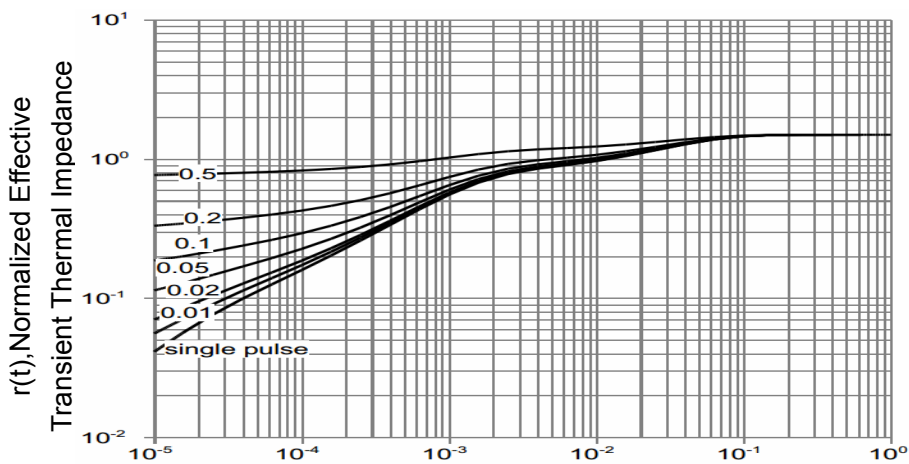
T_J-Junction Temperature (°C)
Figure 9 Current De-rating



V_{ds} Drain-Source Voltage (V)
Figure 8 Safe Operation Area



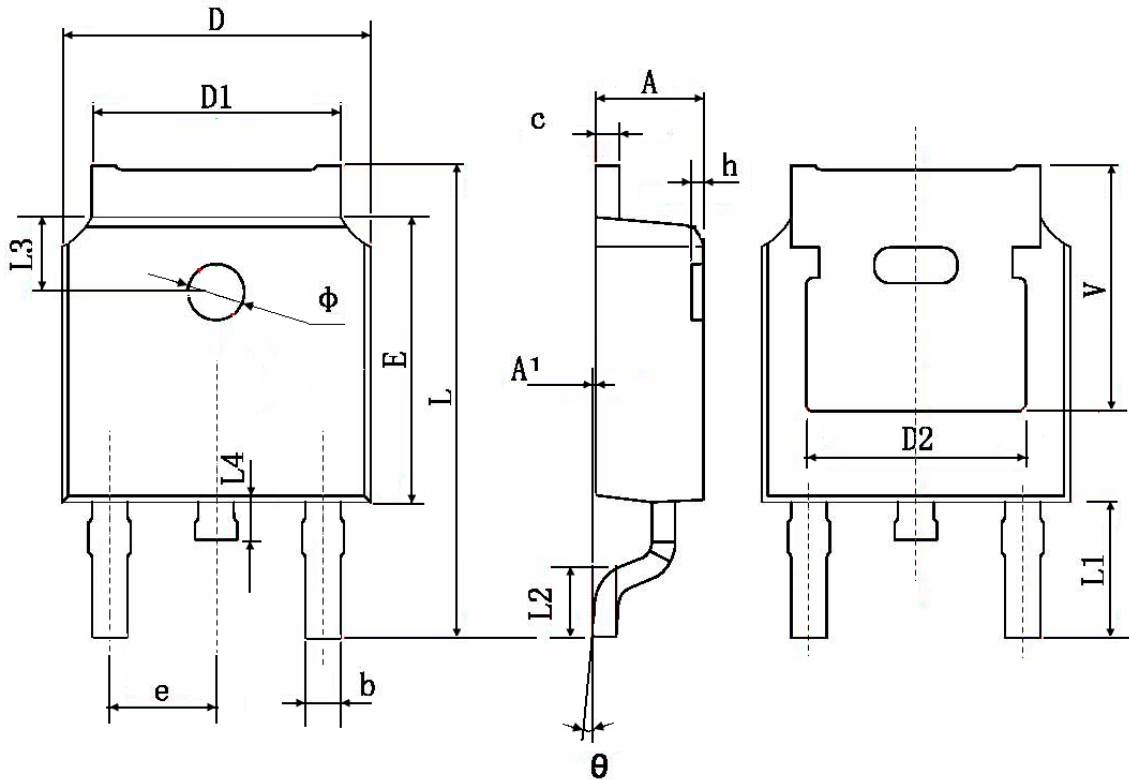
T_J-Junction Temperature(°C)
Figure 10 Rdson-Junction Temperature



Square Wave Pulse Duration(sec)

Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-2L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.83 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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