

NCE N-Channel Super Trench Power MOSFET

Description

The NCEP12T12 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.

General Features

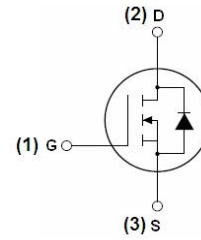
- $V_{DS} = 120V, I_D = 129A$
 $R_{DS(ON)} < 6.0m\Omega @ V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

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

100% UIS TESTED!

100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-220-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP12T12	NCEP12T12	TO-220-3L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	120	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	129	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	92	A
Pulsed Drain Current	I_{DM}	480	A
Maximum Power Dissipation	P_D	185	W
Derating factor		1.3	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	1000	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.8	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

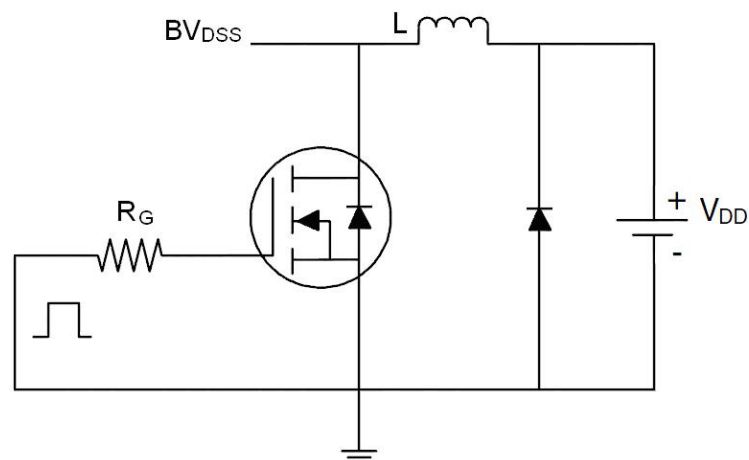
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	120		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =120V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.5	3.3	4.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =60A	-	5.0	6.0	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =60A	60	-	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz	-	5600	-	PF
Output Capacitance	C _{oss}		-	641	-	PF
Reverse Transfer Capacitance	C _{rss}		-	28	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =60V, I _D =60A V _{GS} =10V, R _G =4.7Ω	-	16	-	nS
Turn-on Rise Time	t _r		-	67	-	nS
Turn-Off Delay Time	t _{d(off)}		-	45	-	nS
Turn-Off Fall Time	t _f		-	14	-	nS
Total Gate Charge	Q _g	V _{DS} =60V, I _D =60A, V _{GS} =10V	-	84.7		nC
Gate-Source Charge	Q _{gs}		-	30.6		nC
Gate-Drain Charge	Q _{gd}		-	18.3		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =129A	-		1.2	V
Diode Forward Current	I _S		-	-	129	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-	60		nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	140		nC

Notes:

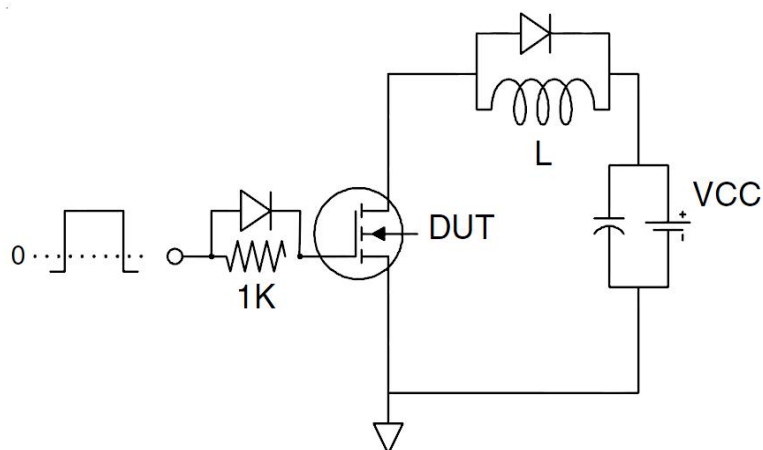
1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_J(\text{MAX})=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Test Circuit

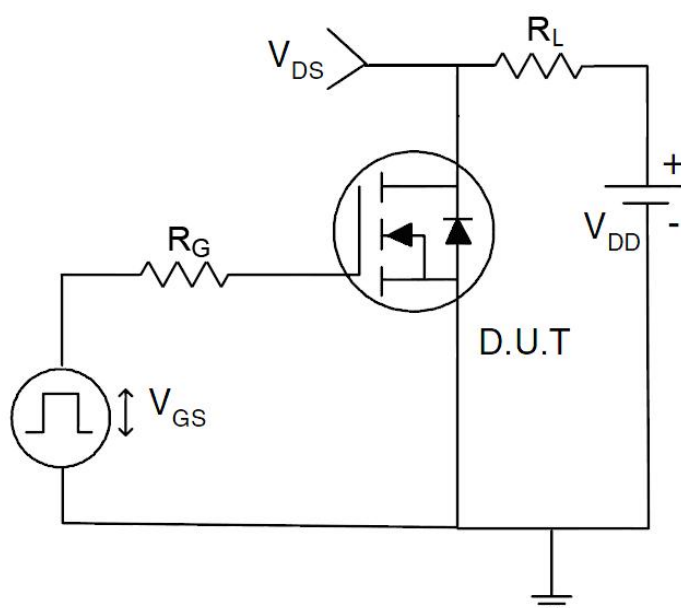
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

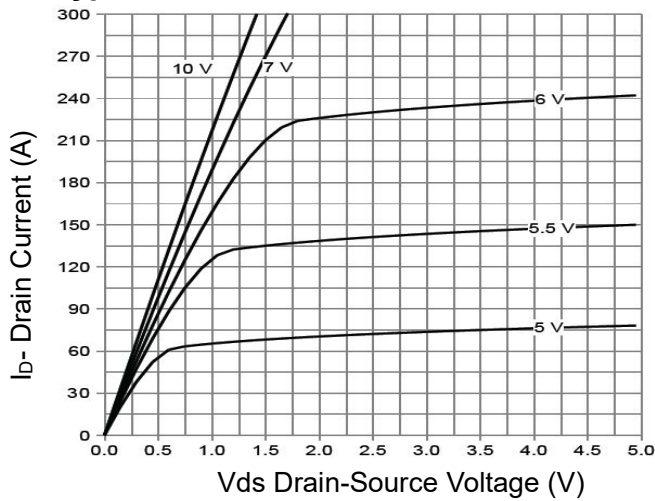


Figure 1 Output Characteristics

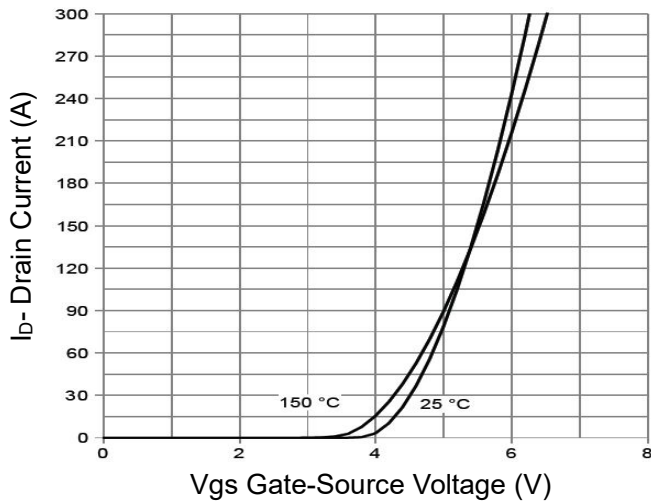


Figure 2 Transfer Characteristics

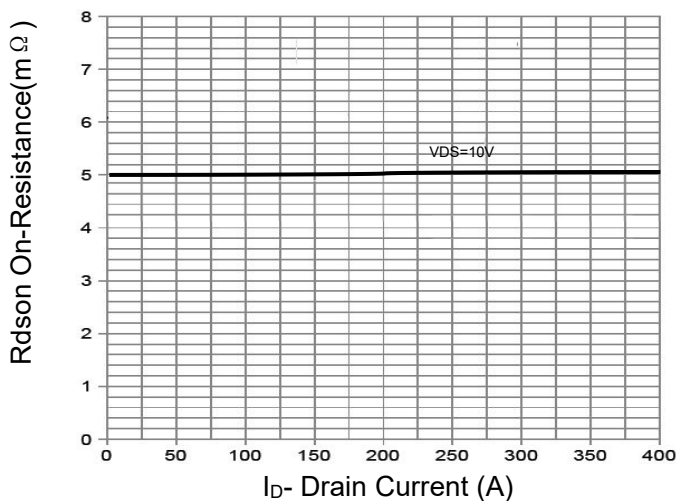


Figure 3 Rdson- Drain Current

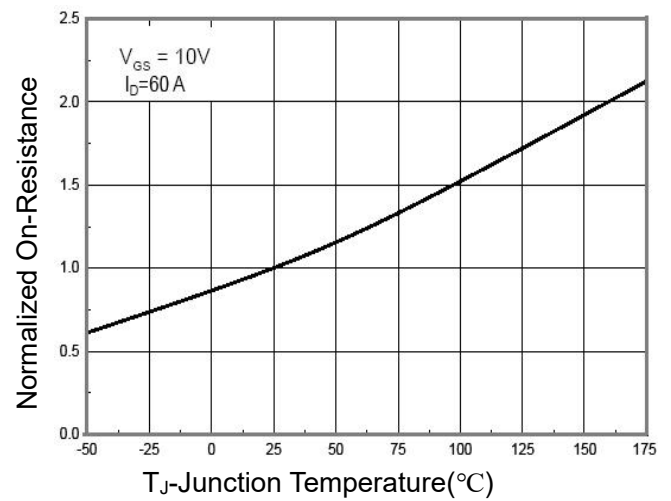


Figure 4 Rdson-Junction Temperature

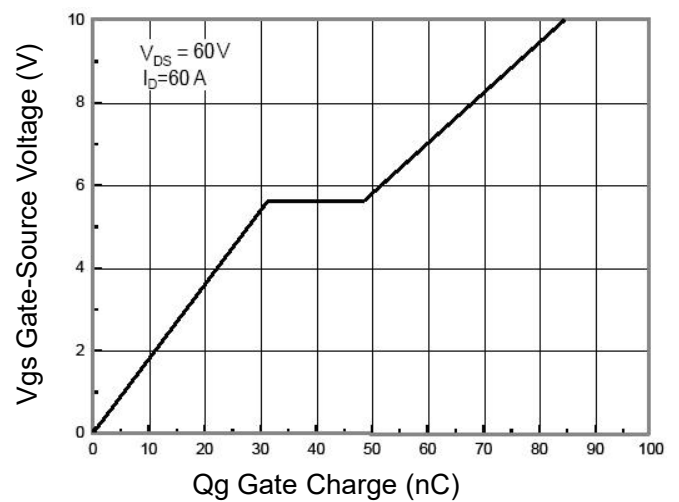


Figure 5 Gate Charge

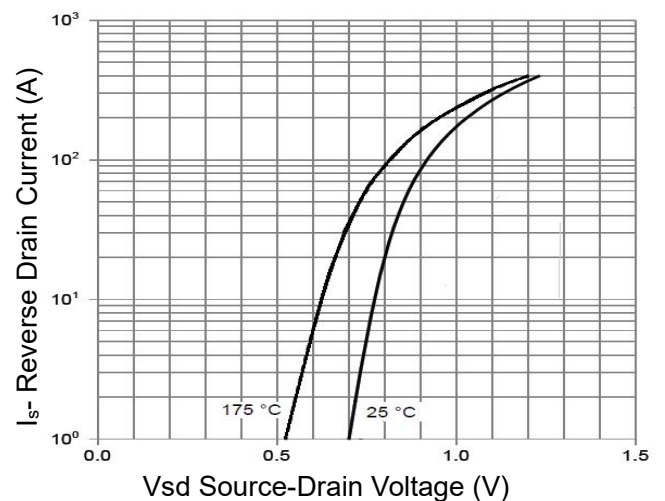


Figure 6 Source- Drain Diode Forward

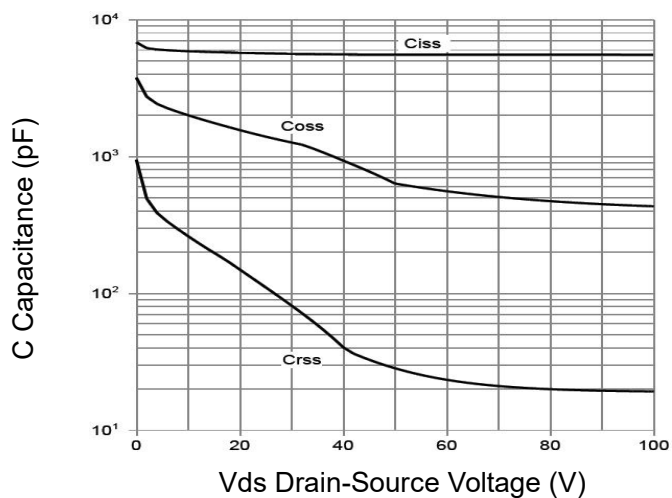


Figure 7 Capacitance vs Vds

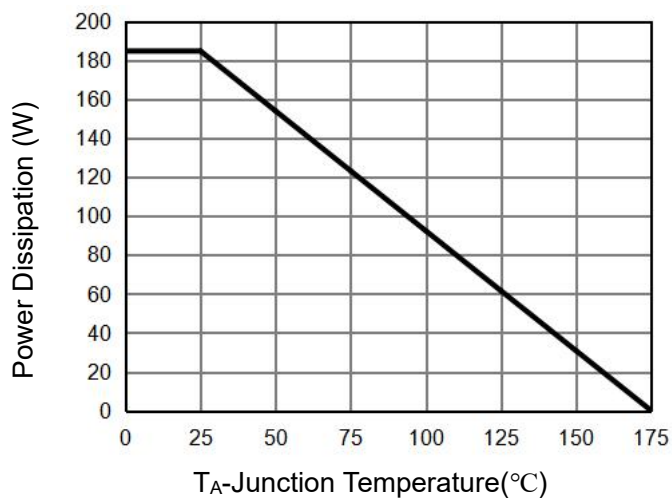


Figure 9 Power De-rating

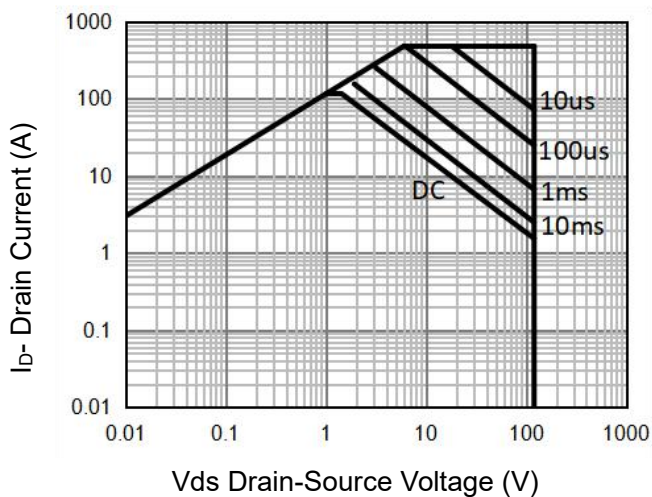


Figure 8 Safe Operation Area (Note3)

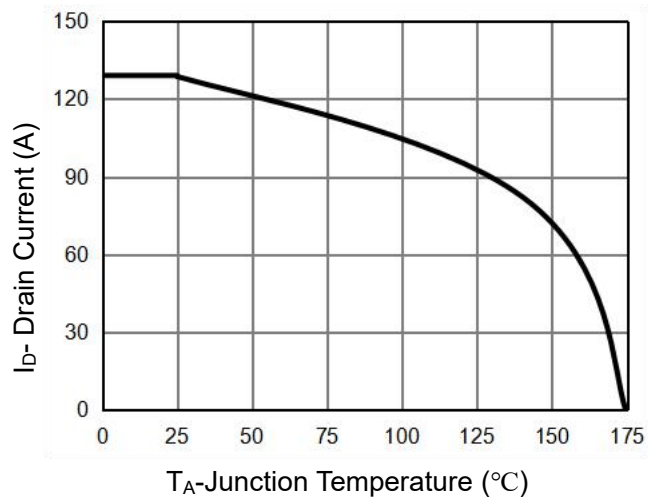


Figure 10 Current De-rating

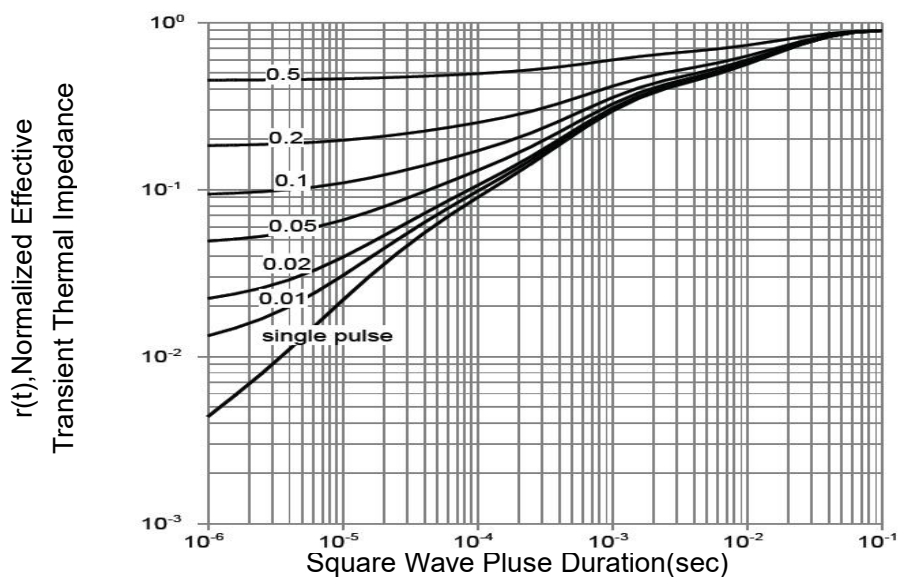
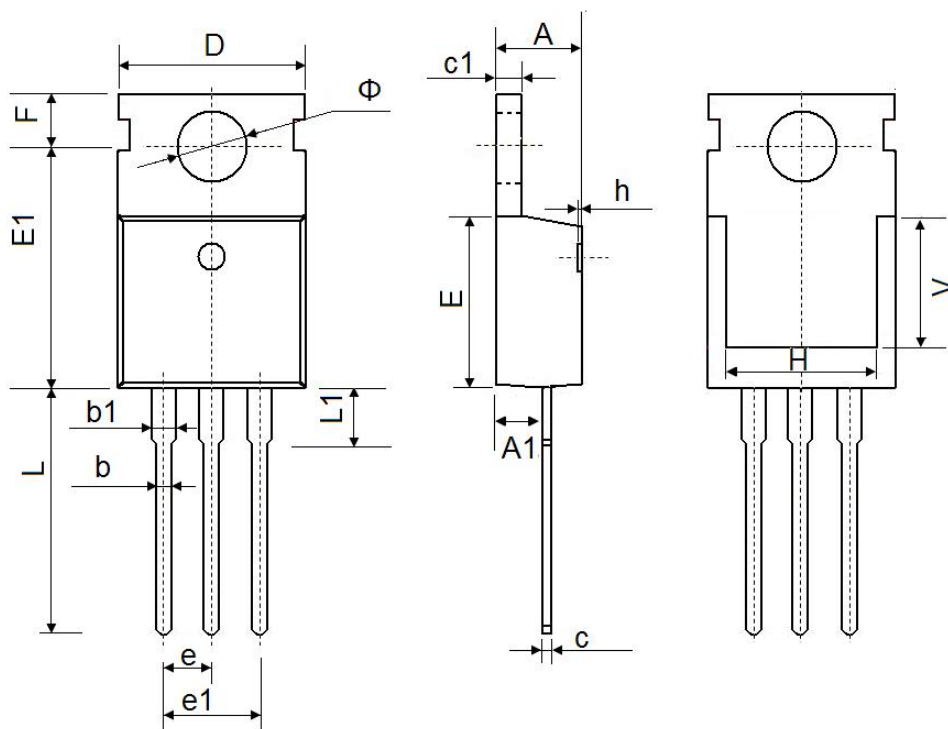


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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