

## NCE N-Channel Super Trench Power MOSFET

### Description

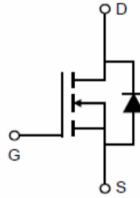
The NCEP40T15GU uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

### General Features

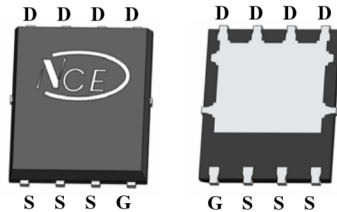
- $V_{DS} = 40V, I_D = 150A$   
 $R_{DS(ON)} = 1.09m\Omega$  (typical) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 1.5m\Omega$  (typical) @  $V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(ON)}$  product(FOM)
- Very low on-resistance  $R_{DS(ON)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

### Application

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



Schematic Diagram



Top View

Bottom View

**100% UIS TESTED!**

**100% ΔVs TESTED!**

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP40T15GU	NCEP40T15GU	DFN5X6-8L	-	-	-

### 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 ( <b>Silicon Limited</b> )	$I_D$	150	A
Drain Current-Continuous ( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	106	A
Pulsed Drain Current ( <b>Package Limited</b> )	$I_{DM}$	400	A
Maximum Power Dissipation	$P_D$	88	W
Derating factor		0.7	W/°C
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	1250	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

**Thermal Characteristic**

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	1.42	$^{\circ}\text{C/W}$
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**Electrical Characteristics ( $T_c=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	1.09	1.35	m $\Omega$
		$V_{GS}=4.5V, I_D=20A$	-	1.5	1.85	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=20A$		80	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	5200	-	PF
Output Capacitance	$C_{oss}$		-	1700	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	85	-	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, I_D=20A$ $V_{GS}=10V, R_G=1.6\Omega$	-	12	-	nS
Turn-on Rise Time	$t_r$		-	6.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	49	-	nS
Turn-Off Fall Time	$t_f$		-	8	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=20V, I_D=20A,$ $V_{GS}=10V$	-	91	-	nC
Gate-Source Charge	$Q_{gs}$		-	13	-	nC
Gate-Drain Charge	$Q_{gd}$		-	16	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=75A$	-		1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	150	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}\text{C}, I_F = I_S$	-		30	nS
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100A/\mu s$ <sup>(Note 3)</sup>	-		110	nC

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=0.5mH, R_G=25\Omega$

Typical Electrical and Thermal Characteristics

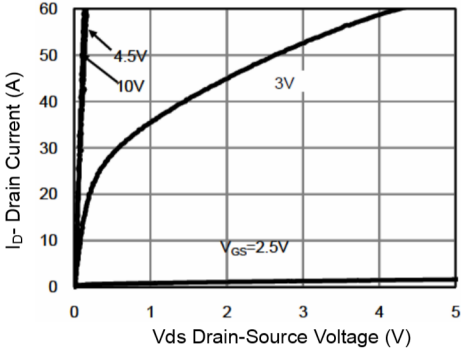


Figure 1 Output Characteristics

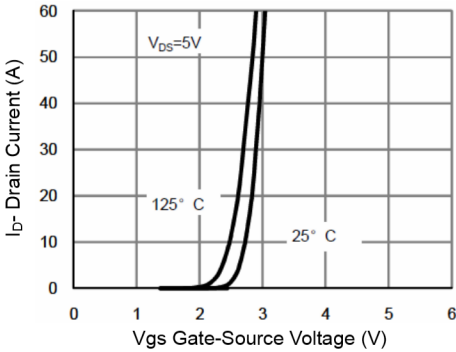


Figure 2 Transfer Characteristics

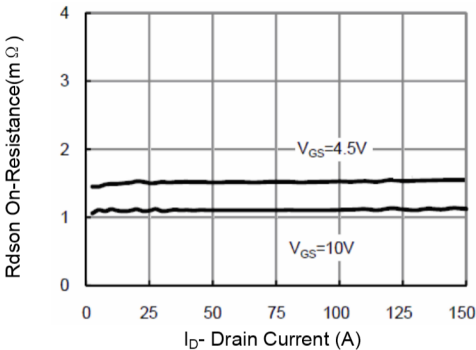


Figure 3  $R_{DS(on)}$  - Drain Current

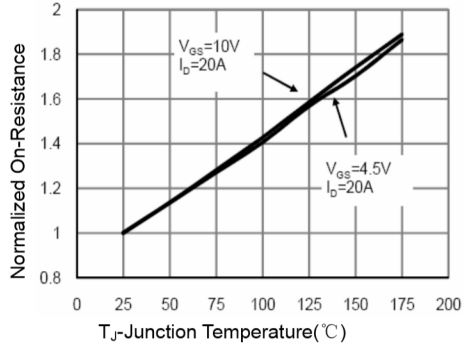


Figure 4  $R_{DS(on)}$ -Junction Temperature

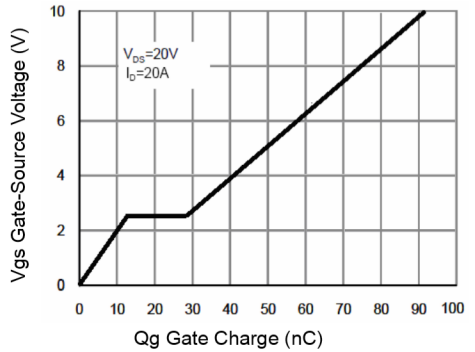


Figure 5 Gate Charge

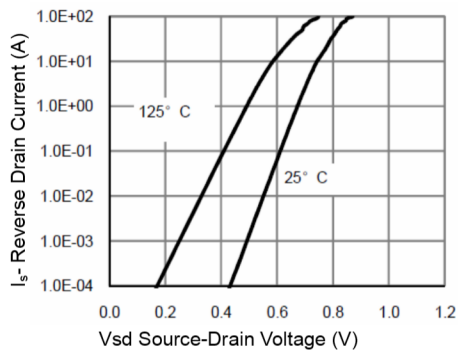


Figure 6 Source- Drain Diode Forward

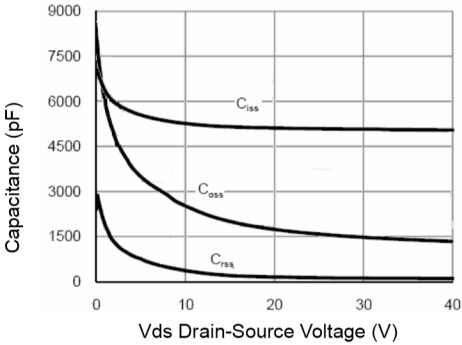


Figure 7 Capacitance vs Vds

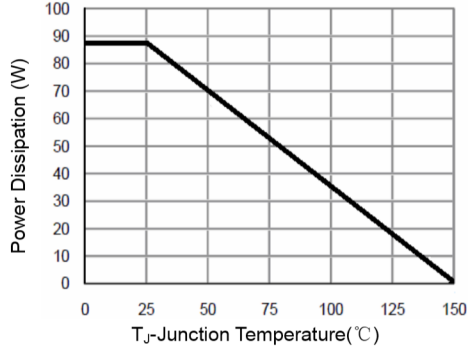


Figure 9 Power De-rating

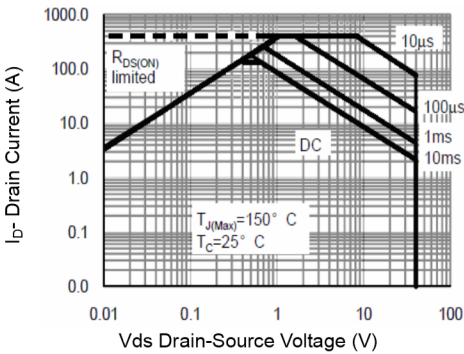


Figure 8 Safe Operation Area

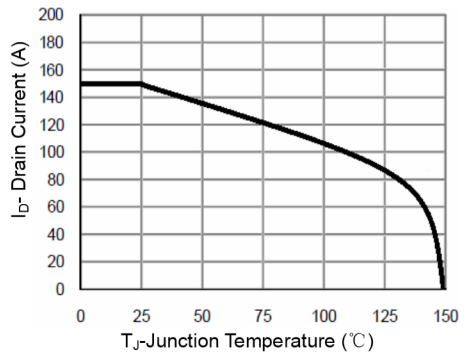


Figure 10 Current De-rating

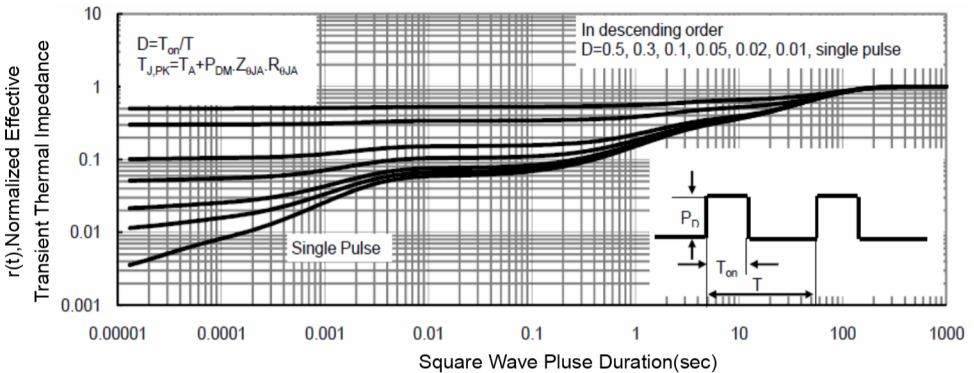
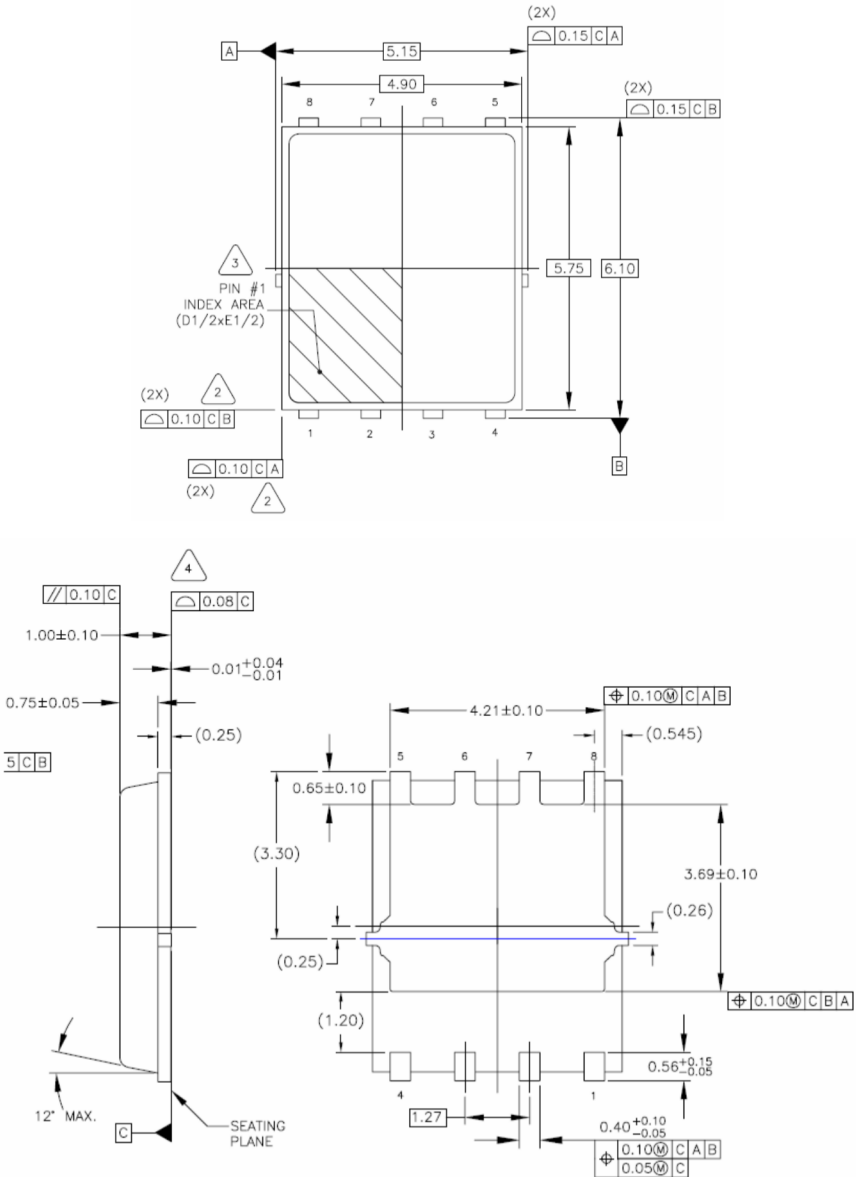


Figure 11 Normalized Maximum Transient Thermal Impedance

## DFN5X6-8L Package Information



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