

## NCE N-Channel Super Trench II Power MOSFET

<p><b>Description</b></p> <p>The series of devices uses <b>Super Trench II</b> 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 <math>R_{DS(ON)}</math> and <math>Q_g</math>. This device is ideal for high-frequency switching and synchronous rectification.</p> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>● DC/DC Converter</li> <li>● Ideal for high-frequency switching and synchronous rectification</li> </ul>	<p><b>General Features</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS} = 30V, I_D = 55A</math></li> <li>● <math>R_{DS(ON)} = 4.2m\Omega</math> (typical) @ <math>V_{GS} = 10V</math></li> <li>● <math>R_{DS(ON)} = 7.4m\Omega</math> (typical) @ <math>V_{GS} = 4.5V</math></li> <li>● Excellent gate charge x <math>R_{DS(on)}</math> product(FOM)</li> <li>● Very low on-resistance <math>R_{DS(on)}</math></li> <li>● 150 °C operating temperature</li> <li>● Pb-free lead plating</li> </ul> <p style="color: red; text-align: center;"><b>100% UIS TESTED!</b> <b>100% ΔVs TESTED!</b></p>
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**DFN 5X6**

**Top View**

**Bottom View**

**Schematic Diagram**

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P055N30GU	NCEP055N30GU	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	55	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	42	A
Pulsed Drain Current	$I_{DM}$	220	A
Maximum Power Dissipation	$P_D$	30	W
Derating factor		0.24	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	115	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

**Thermal Characteristic**

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	4.17	$^{\circ}C/W$
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**Electrical Characteristics ( $T_C=25^{\circ}C$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	30		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=30V, V_{GS}=0V$	-	-	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	1.6	2.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=27.5A$	-	4.2	5.5	m $\Omega$
		$V_{GS}=4.5V, I_D=27.5A$	-	7.4	9.0	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=27.5A$		30	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	980	-	PF
Output Capacitance	$C_{oss}$		-	600	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	40	-	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=27.5A$ $V_{GS}=10V, R_G=1.6\Omega$	-	4	-	nS
Turn-on Rise Time	$t_r$		-	5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	nS
Turn-Off Fall Time	$t_f$		-	4	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=15V, I_D=27.5A,$ $V_{GS}=10V$	-	9.5	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.2		nC
Gate-Drain Charge	$Q_{gd}$		-	3.0		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=27.5A$	-		1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	55	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}C, I_F = I_S$ $di/dt = 100A/\mu s$ <sup>(Note 3)</sup>	-	11	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	19	-	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 :  $T_J=25^{\circ}C, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

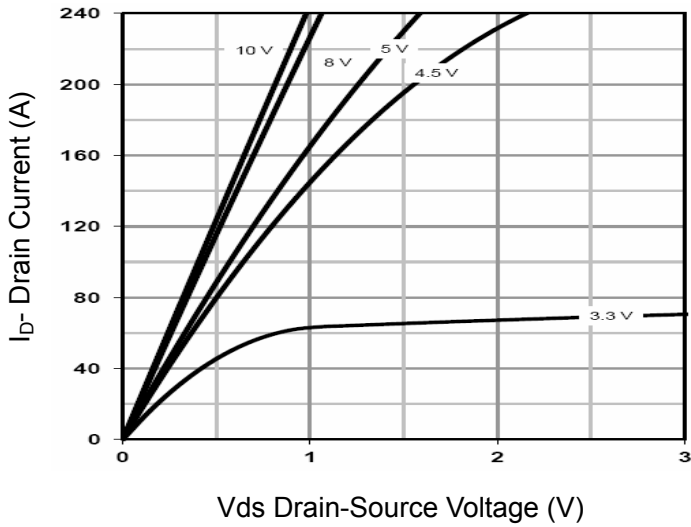


Figure 1 Output Characteristics

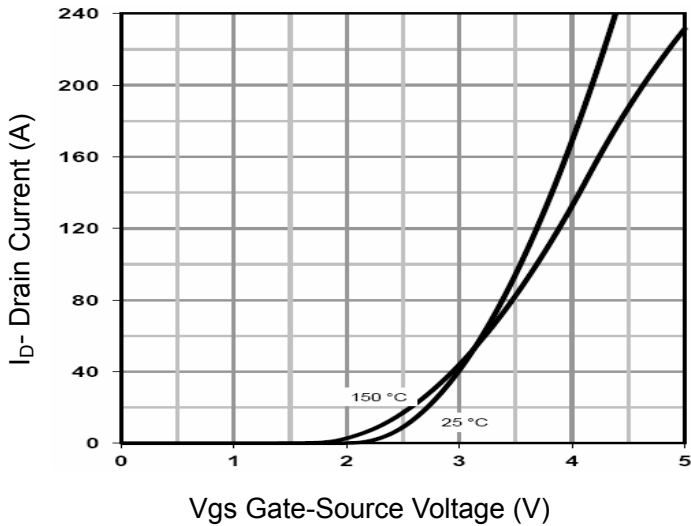


Figure 2 Transfer Characteristics

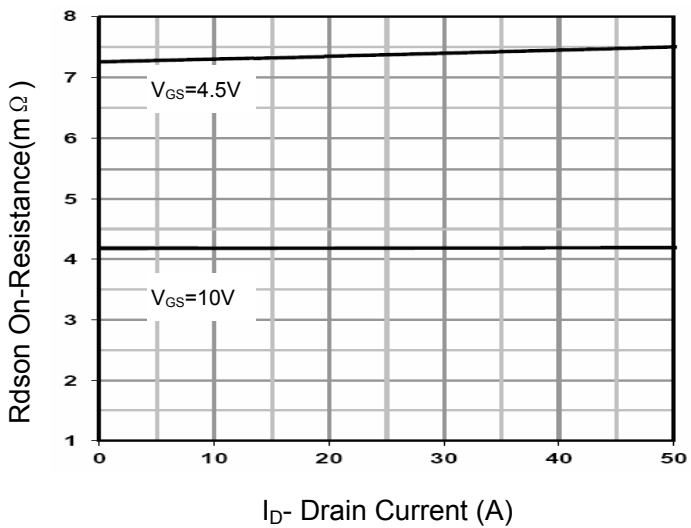


Figure 3  $R_{DS(on)}$ - Drain Current

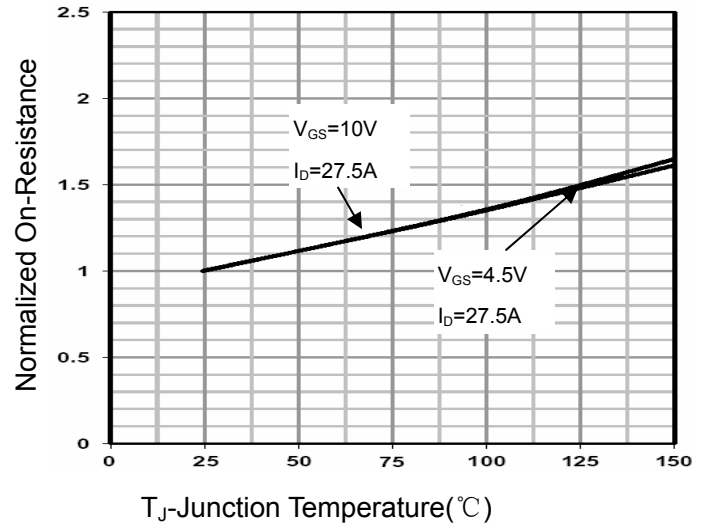


Figure 4  $R_{DS(on)}$ -Junction Temperature

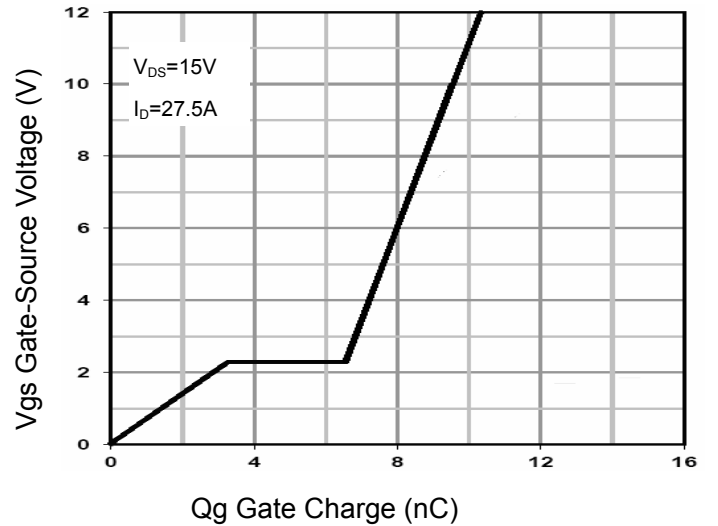


Figure 5 Gate Charge

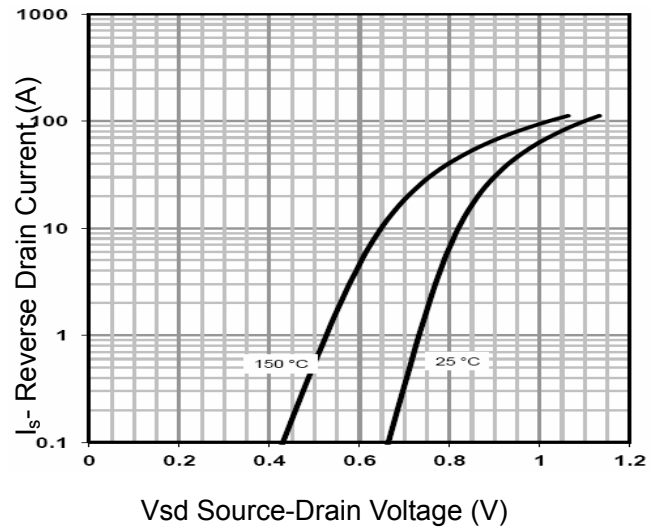
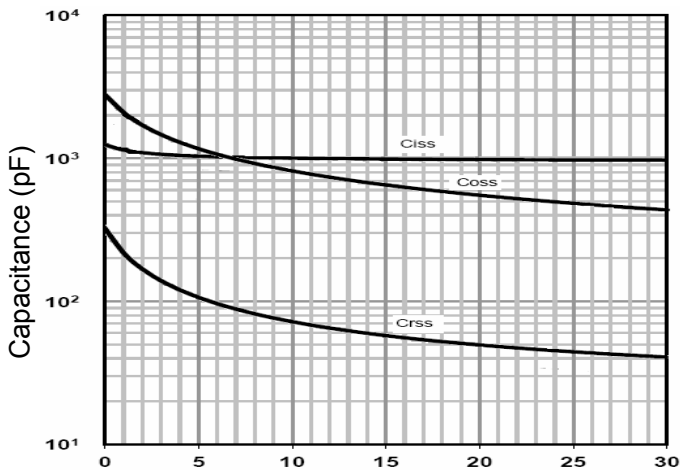
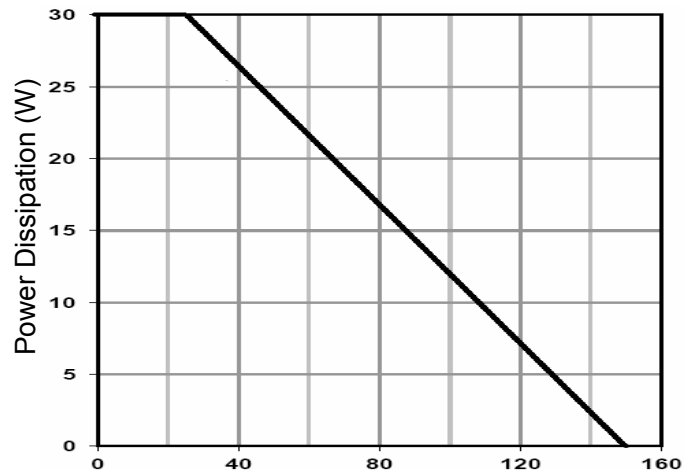


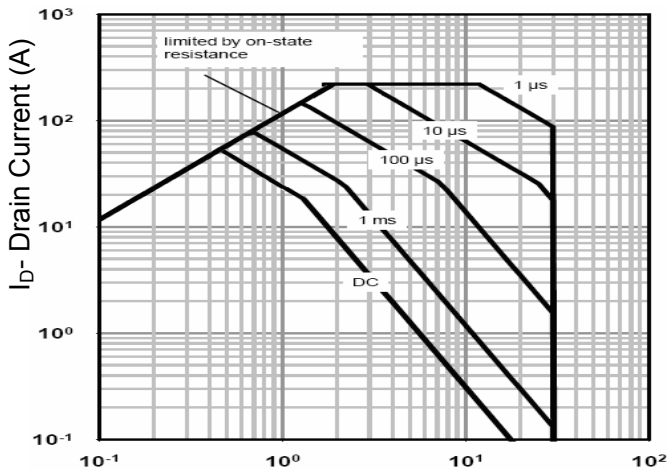
Figure 6 Source- Drain Diode Forward



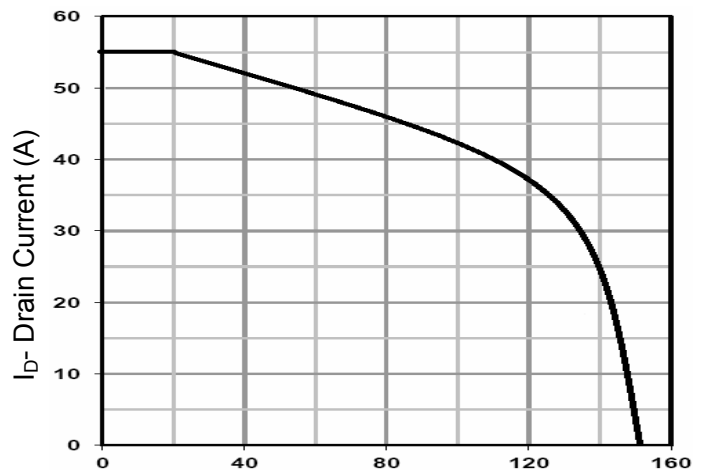
Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



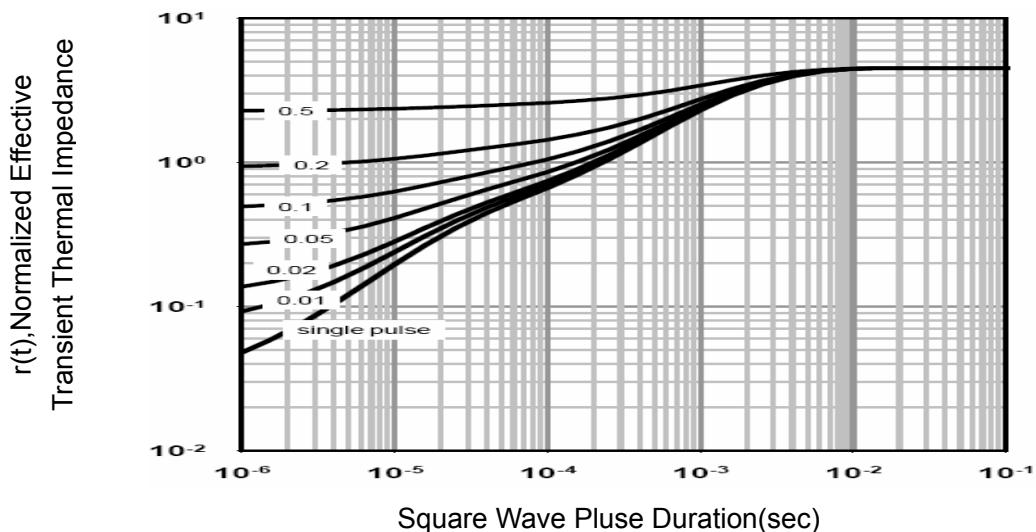
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 9 Power De-rating**



Vds Drain-Source Voltage (V)  
**Figure 8 Safe Operation Area**

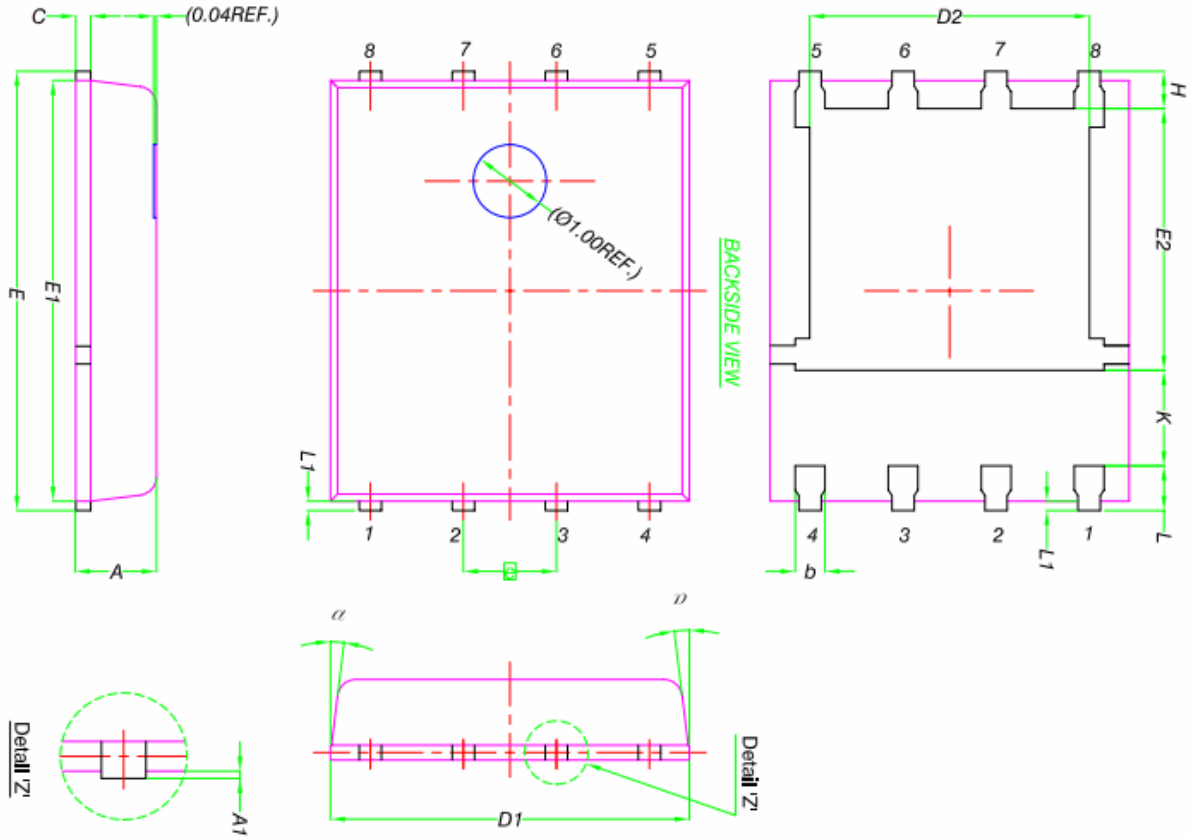


T<sub>J</sub>-Junction Temperature (°C)  
**Figure 10 Current De-rating**

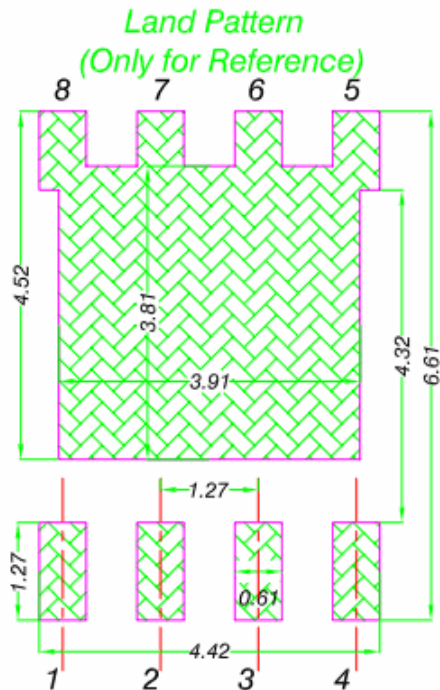


Square Wave Pulse Duration(sec)  
**Figure 11 Normalized Maximum Transient Thermal Impedance**

DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°



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