

## NCE N-Channel Super Trench Power MOSFET

### Description

The NCEP6012AS 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

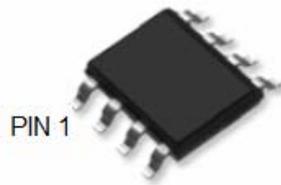
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

### General Features

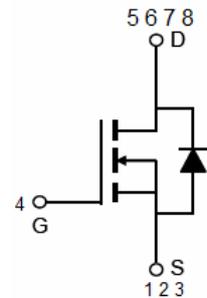
- $V_{DS} = 60V, I_D = 12A$
- $R_{DS(ON)} = 12.7m\Omega$  (typical) @  $V_{GS} = 10V$
- $R_{DS(ON)} = 14.5m\Omega$  (typical) @  $V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

**100% UIS TESTED!**  
**100% ΔVds TESTED!**

SOP-8



Top View



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP6012AS	NCEP6012AS	SOP-8	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	12	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	8.5	A
Pulsed Drain Current	$I_{DM}$	48	A
Maximum Power Dissipation	$P_D$	3.3	W
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	120	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	38	$^\circ C/W$
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## Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> (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	$R_{DS(on)}$	$V_{GS}=10V, I_D=12A$	-	12.7	14.5	m $\Omega$
		$V_{GS}=4.5V, I_D=12A$	-	15.5	18.0	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=12A$		40	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	1010	-	PF
Output Capacitance	$C_{oss}$		-	183.2	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	9.9	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=12A$ $V_{GS}=10V, R_G=1.6\Omega$	-	11	-	nS
Turn-on Rise Time	$t_r$		-	17	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18	-	nS
Turn-Off Fall Time	$t_f$		-	4	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=12A,$ $V_{GS}=10V$	-	21.8	-	nC
Gate-Source Charge	$Q_{gs}$		-	4.6		nC
Gate-Drain Charge	$Q_{gd}$		-	3.5		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=12A$	-		1.2	V
Diode Forward Current	$I_S$		-	-	12	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = I_S$ $di/dt = 100A/\mu s$ (Note 3)	-	30	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	36	-	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 :  $T_J=25^\circ\text{C}, V_{DD}=30V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

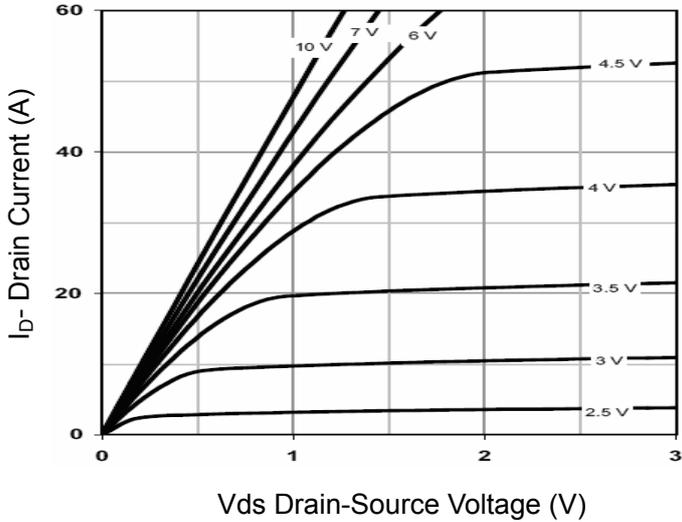


Figure 1 Output Characteristics

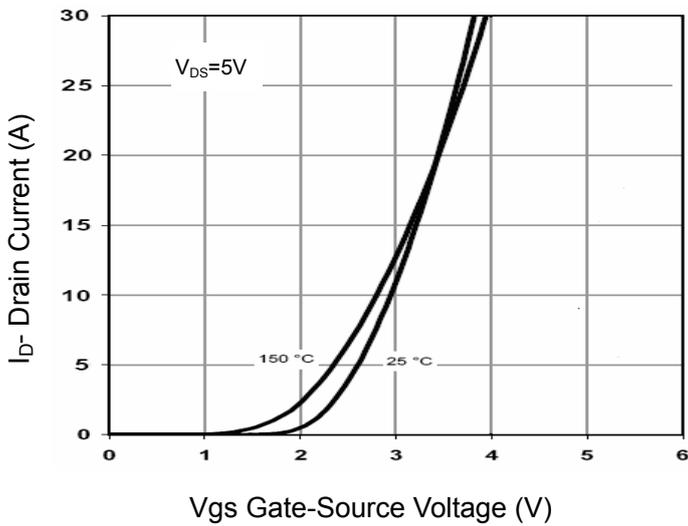


Figure 2 Transfer Characteristics

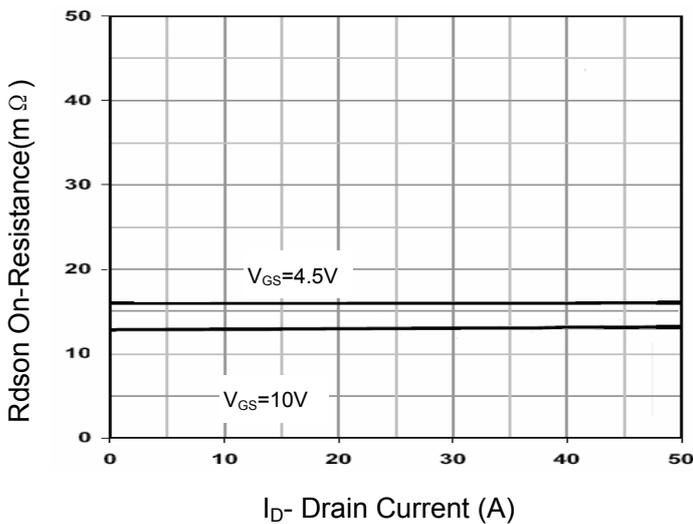


Figure 3 Rdson- Drain Current

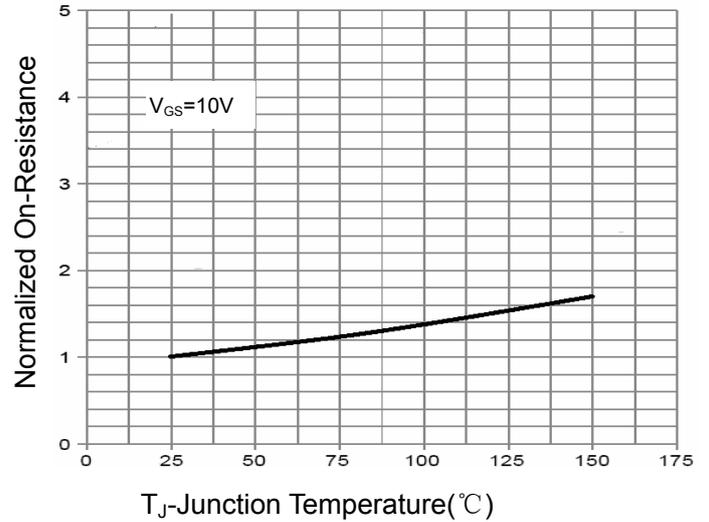


Figure 4 Rdson-Junction Temperature

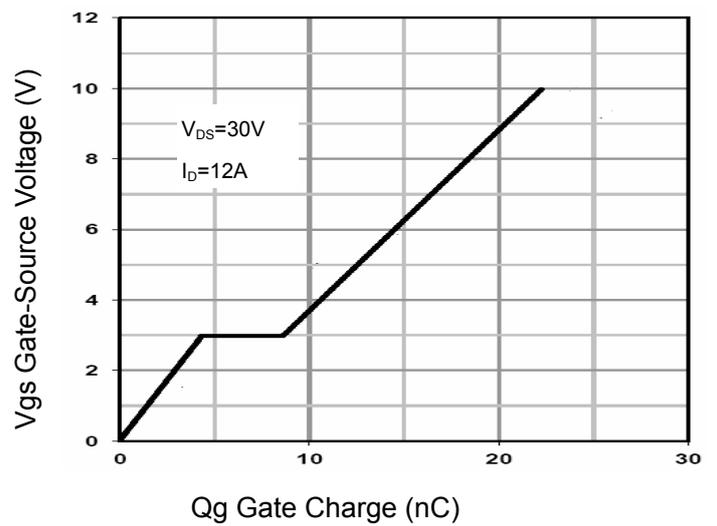


Figure 5 Gate Charge

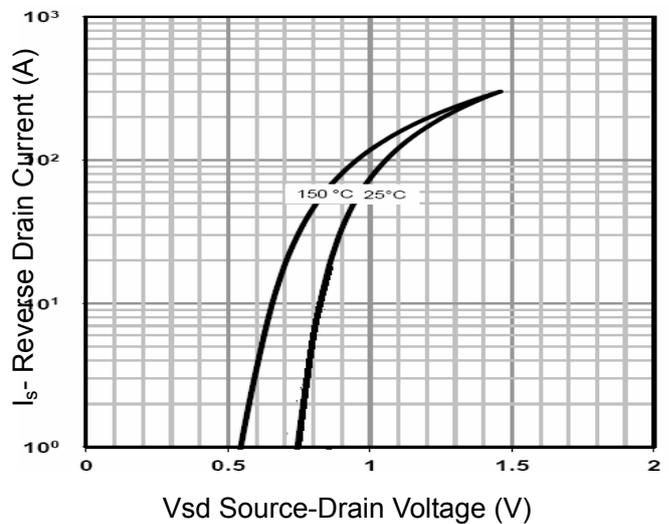
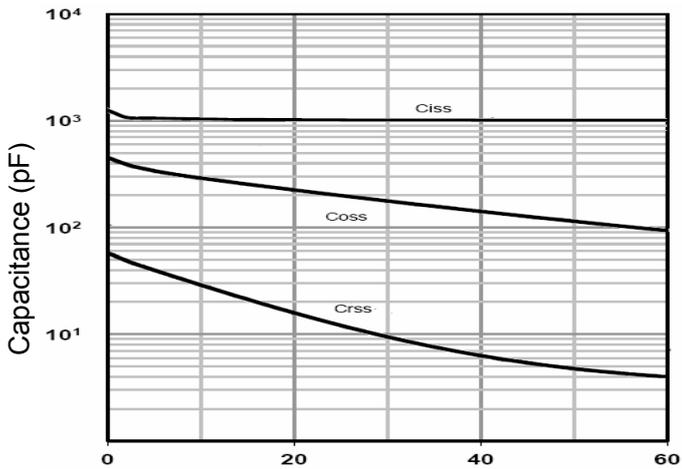
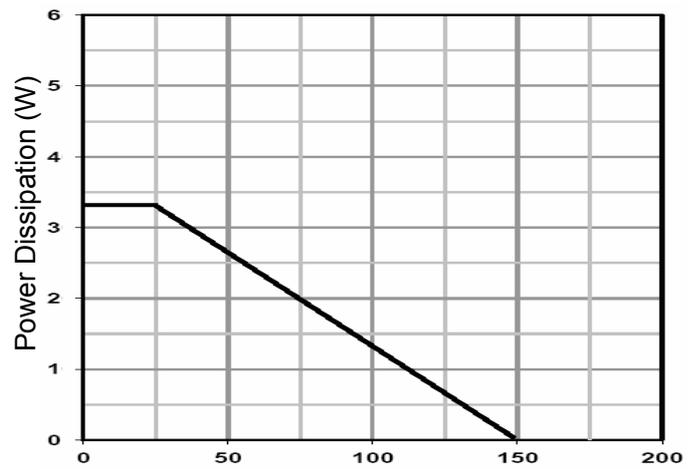


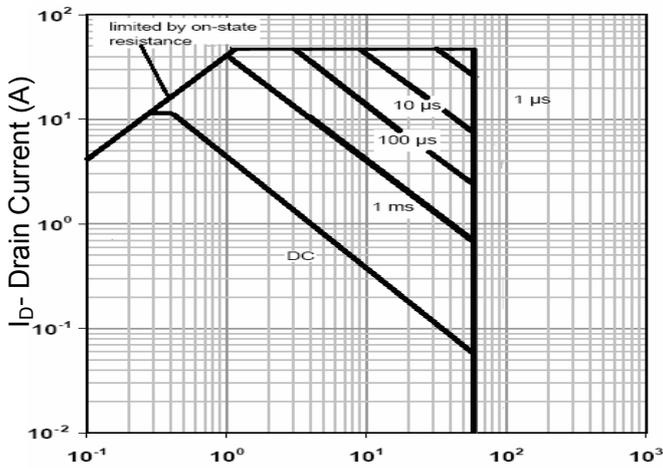
Figure 6 Source- Drain Diode Forward



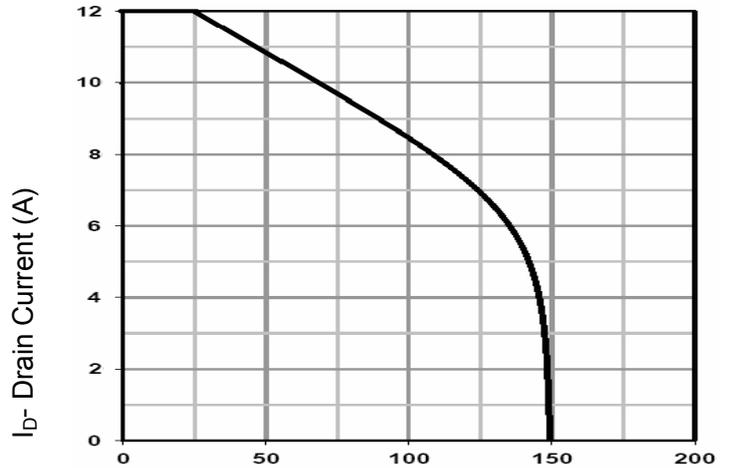
Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



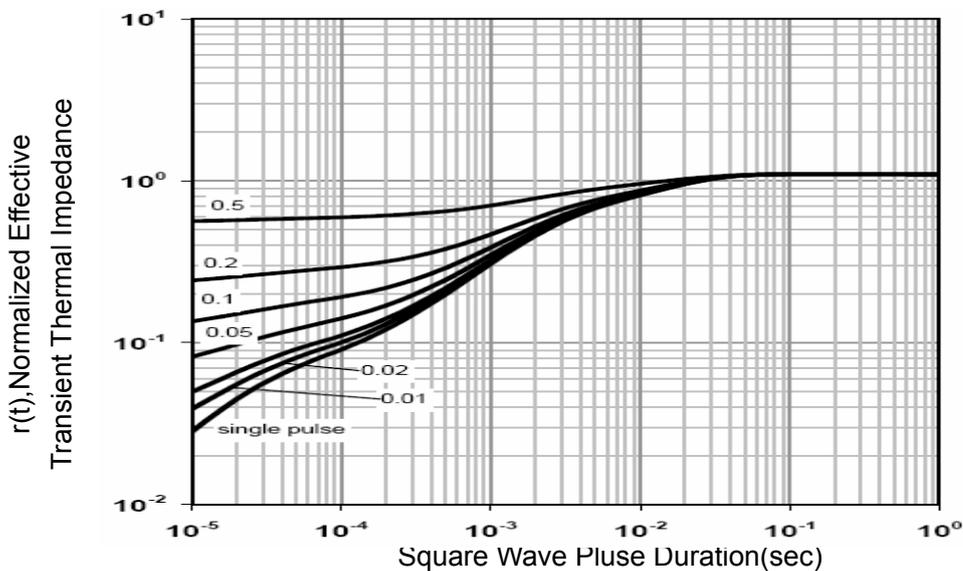
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 9 Power De-rating**



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



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



**Figure 11 Normalized Maximum Transient Thermal Impedance**



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