

## **NCE N-Channel Super Trench Power MOSFET**

## **Description**

The NCEP40ND80G 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.

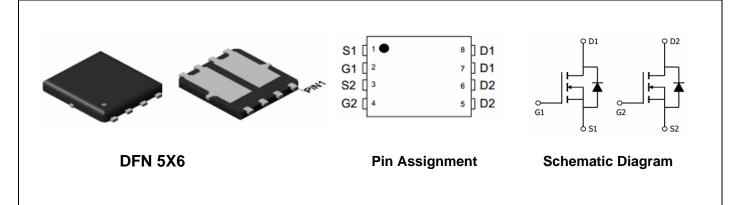
## **Application**

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

#### **General Features**

- $V_{DS}$  =40V, $I_D$  =80A  $R_{DS(ON)}$ =4.3m $\Omega$  (typical) @  $V_{GS}$ =10V  $R_{DS(ON)}$ =5.5m $\Omega$  (typical) @  $V_{GS}$ =4.5V
- Excellent gate charge x R<sub>DS(on)</sub> product(FOM)
- Very low on-resistance R<sub>DS(on)</sub>
- 150 °C operating temperature
- Pb-free lead plating

100% UIS TESTED! 100% ΔVds TESTED!



## **Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P40ND80G	NCEP40ND80G	DFN5x6-8L	-	-	-

## Absolute Maximum Ratings (T<sub>C</sub>=25 ℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	40	V
Gate-Source Voltage	V <sub>G</sub> s	±20	V
Drain Current-Continuous	I <sub>D</sub>	80	А
Drain Current-Continuous(T <sub>C</sub> =100 °C)	I <sub>D</sub> (100℃)	56.6	Α
Pulsed Drain Current	I <sub>DM</sub>	320	Α
Maximum Power Dissipation	P <sub>D</sub>	70	W
Derating factor		0.56	W/℃
Single pulse avalanche energy (Note 5)	E <sub>AS</sub>	500	mJ
Operating Junction and Storage Temperature Range	$T_{J}, T_{STG}$	-55 To 150	$^{\circ}\mathbb{C}$

#### **Thermal Characteristic**

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	Rejc	1.8	°C/W

# NCEP40ND80G

## Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)

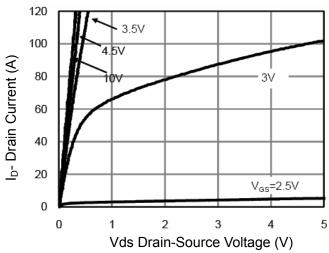
Parameter	Symbol	Condition	Min	Тур	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	40		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =40V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)			•			
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS}=V_{GS}$ , $I_{D}=250\mu A$	1.0	-	2.2	V
Drain-Source On-State Resistance	В	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	4.3	5.0	mΩ
Dialii-Source Oii-State Resistance	R <sub>DS(ON)</sub>	$V_{GS}$ =4.5V, $I_D$ =20A	-	5.5	6.5	mΩ
Forward Transconductance	<b>g</b> FS	V <sub>DS</sub> =5V,I <sub>D</sub> =20A		60	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>lss</sub>	)/ 00\/\/ 0\/	-	2300	-	PF
Output Capacitance	Coss	$V_{DS}$ =20V, $V_{GS}$ =0V, F=1.0MHz	-	740	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>	F=1.UIVITIZ	-	38	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>		-	7.5	-	nS
Turn-on Rise Time	t <sub>r</sub>	$V_{DD}$ =20 $V$ , $I_{D}$ =20 $A$	-	4.0	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>	$V_{GS}$ =10 $V$ , $R_{G}$ =1.6 $\Omega$	-	37	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	7.5	-	nS
Total Gate Charge	$Q_g$	\/ -20\/ L -20A	-	34.8	-	nC
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS}=20V,I_{D}=20A,$	-	6.2		nC
Gate-Drain Charge	$Q_{gd}$	V <sub>GS</sub> =10V	-	5.1		nC
Drain-Source Diode Characteristics			•		•	
Diode Forward Voltage (Note 3)	$V_{SD}$	V <sub>GS</sub> =0V,I <sub>S</sub> =20A	-		1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	80	Α
Reverse Recovery Time	t <sub>rr</sub>	$T_J = 25^{\circ}C, I_F = I_S$	-	14	-	nS
Reverse Recovery Charge	Qrr	$di/dt = 100A/\mu s^{(Note3)}$	-	21	-	nC

## Notes:

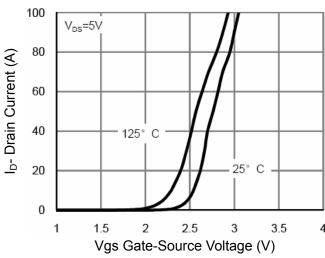
- ${\bf 1.}\ {\bf Repetitive}\ {\bf Rating:}\ {\bf Pulse}\ {\bf width}\ {\bf limited}\ {\bf by}\ {\bf maximum}\ {\bf junction}\ {\bf temperature}.$
- 2. Surface Mounted on FR4 Board, t  $\leq$  10 sec.
- 3. Pulse Test: Pulse Width  $\leq$  300µs, Duty Cycle  $\leq$  2%.
- 4. Guaranteed by design, not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



## **Typical Electrical and Thermal Characteristics**



**Figure 1 Output Characteristics** 



**Figure 2 Transfer Characteristics** 

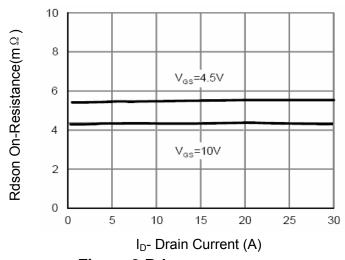
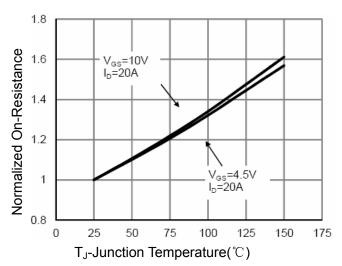
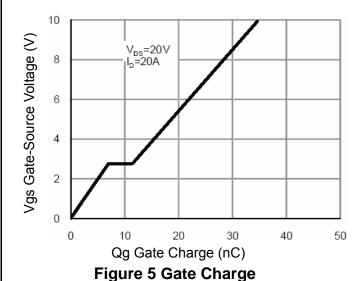


Figure 3 Rdson- Drain Current



**Figure 4 Rdson-Junction Temperature** 



1.0E+01 Reverse Drain Current (A) 1.0E+00 125° C 1.0E-01 1.0E-02 25° C 1.0E-03 1.0E-04 1.0E-05 0.0 0.2 0.4 0.8 1.0 Vsd Source-Drain Voltage (V)

Figure 6 Source- Drain Diode Forward



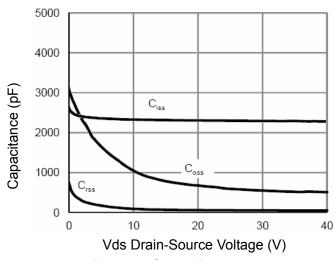


Figure 7 Capacitance vs Vds

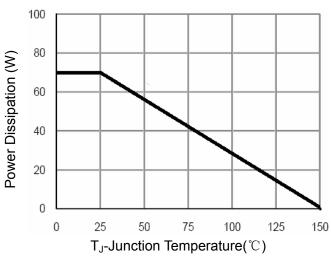
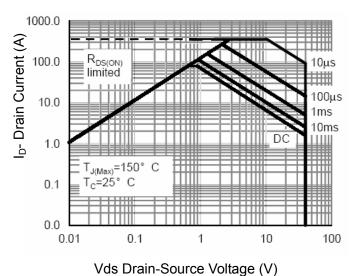


Figure 9 Power De-rating



- vao Brain Godreo Voltago (V)

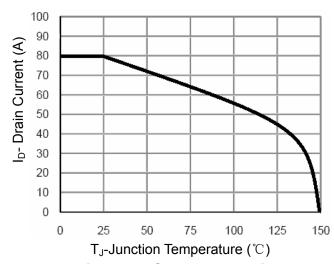


Figure 10 Current De-rating

## **Figure 8 Safe Operation Area**

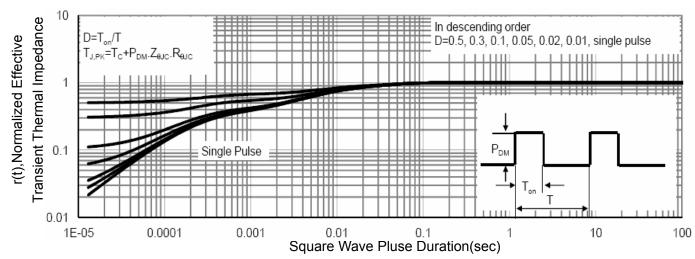
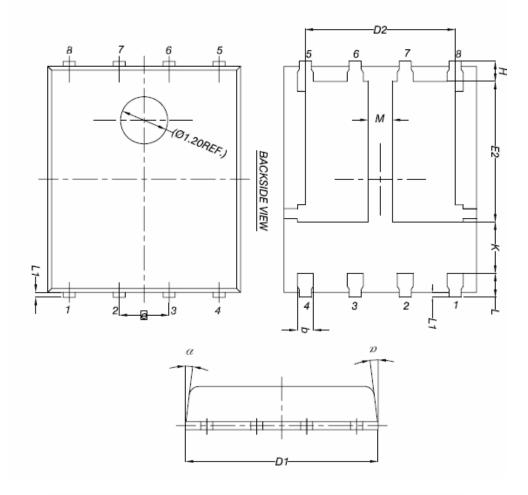


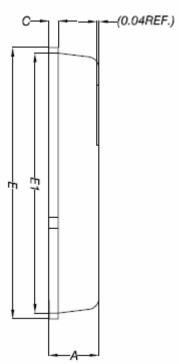
Figure 11 Normalized Maximum Transient Thermal Impedance



# **DFN5X6-8L Package Information**



544	MILLIMETERS				
DIM.	MIN.	NOM.	MAX.		
Α	0.90	1.00	1.10		
b	0.33	0.41	0.51		
С	0.20	0.25	0.30		
D1	4.80	4.90	5.00		
D2	3.61	3.81	3.96		
Ε	5.90	6.00	6.10		
E1	5.70	5.75	5.80		
E2	3.38	3.58	3.78		
е					
Н	0.41	0.51	0.61		
K	1.10	-	-		
L	0.51	0.61	0.71		
L1	0.06	0.13	0.20		
М	0.50	-	-		
α	0°	-	12°		



## http://www.ncepower.com

# NCEP40ND80G

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