

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE20ND07U uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It is ESD protected. This device is suitable for use as a uni-directional or bi-directional load switch, facilitated by its common-drain configuration.

### Application

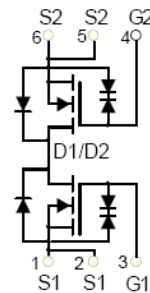
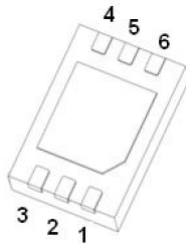
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**

### General Features

- $V_{DS} = 20V, I_D = 7A$
- $R_{DS(ON)} < 16m\Omega @ V_{GS}=4.5V$
- $R_{DS(ON)} < 20m\Omega @ V_{GS}=2.5V$
- $R_{DS(ON)} < 35m\Omega @ V_{GS}=1.8V$
- Special process technology for high ESD capability
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- ESD Rating: 2000V HBM

DFN 2X3-6L



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
20ND07	NCE20ND07U	DFN2X3-6L	Ø180mm		3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	7	A
Drain Current-Pulsed <sup>(Note 1)</sup>	$I_{DM}$	30	A
Maximum Power Dissipation	$P_D$	1.5	W
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>	$R_{\theta JA}$	125	$^\circ C/W$
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## Electrical Characteristics (T<sub>A</sub>=25 °C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	-	-	±10	μA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.5	0.7	0.9	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A	-	11.5	16	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =6.5A	-	14.5	20	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =6A	-	19.5	35	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =7A	-	20	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1.0MHz	-	811.1	-	PF
Output Capacitance	C <sub>oss</sub>		-	183.6	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	131.2	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, R <sub>L</sub> =1.4Ω V <sub>GS</sub> =5V, R <sub>GEN</sub> =3Ω	-	6		nS
Turn-on Rise Time	t <sub>r</sub>		-	13		nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	52		nS
Turn-Off Fall Time	t <sub>f</sub>		-	16		nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =7A, V <sub>GS</sub> =10V	-	14.2		nC
Gate-Source Charge	Q <sub>gs</sub>		-	1.4	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	4.5	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =7A	-	-	1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	7	A

### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

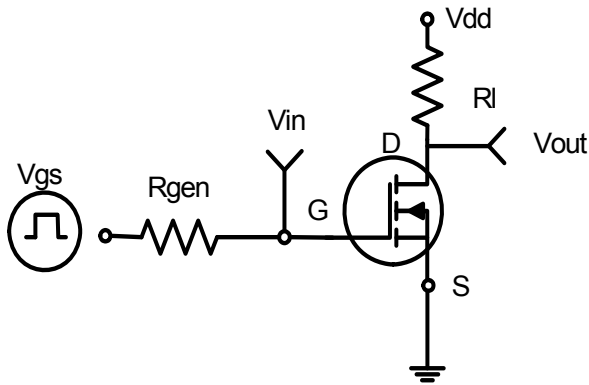


Figure 1: Switching Test Circuit

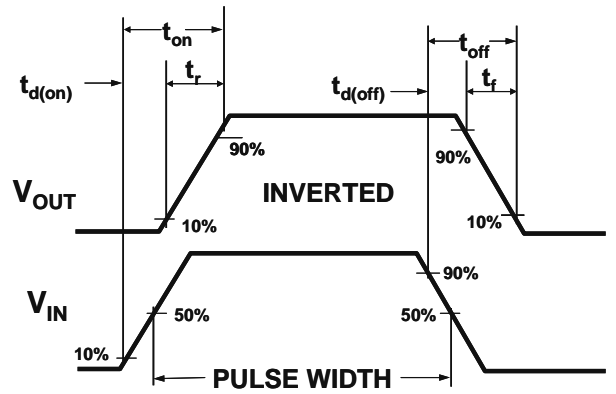


Figure 2: Switching Waveforms

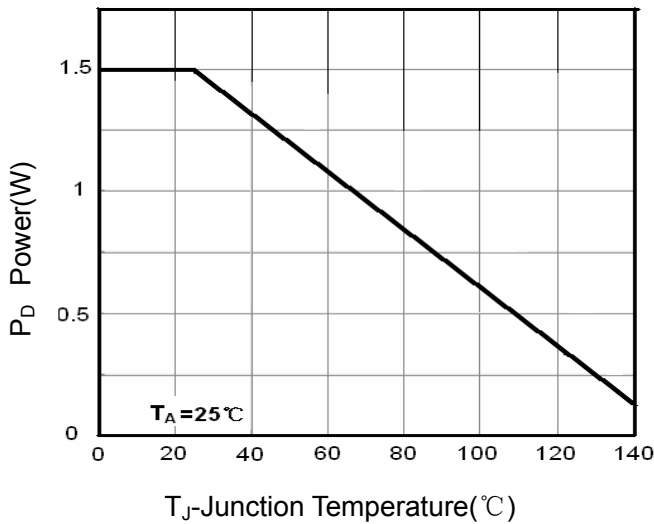


Figure 3 Power Dissipation

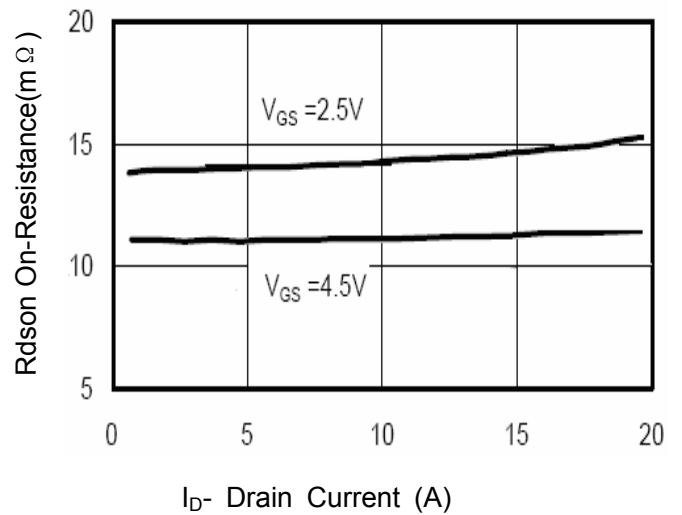


Figure 6 Drain-Source On-Resistance

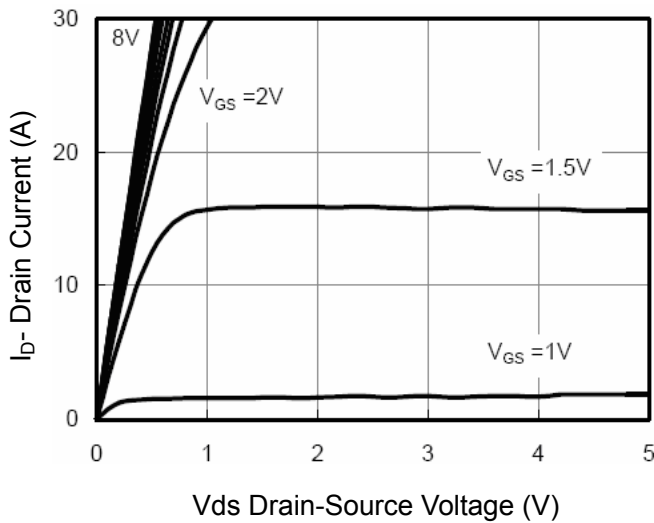


Figure 5 Output Characteristics

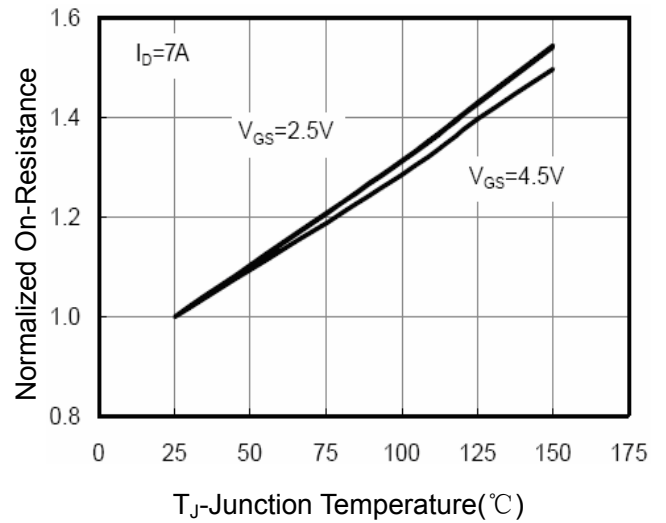
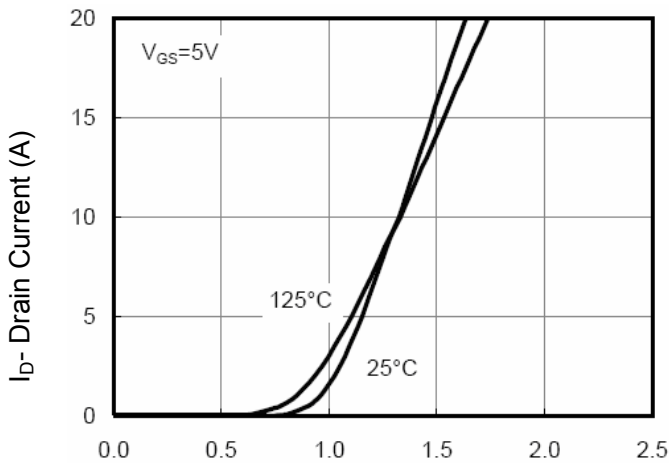
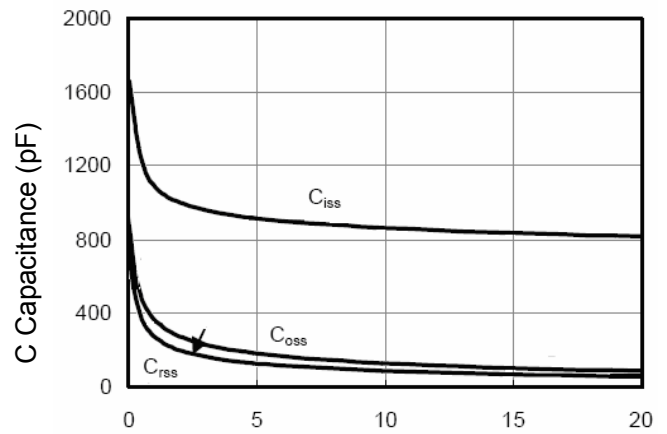


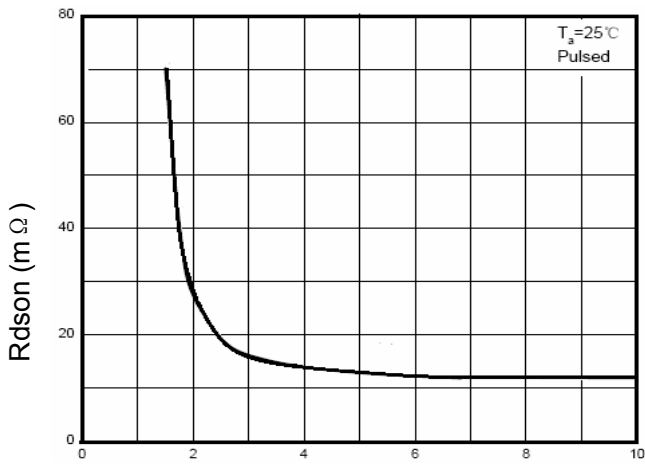
Figure 8 Drain-Source On-Resistance



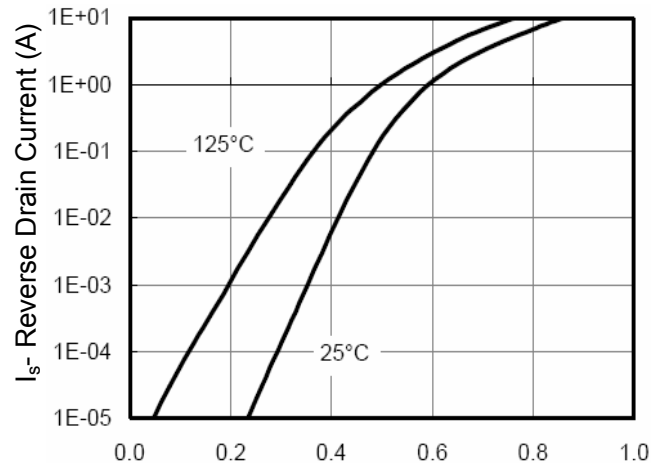
Vgs Gate-Source Voltage (V)  
**Figure 7 Transfer Characteristics**



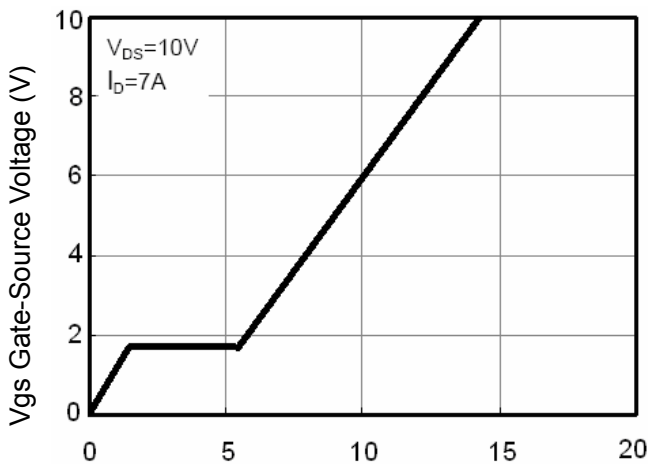
Vds Drain-Source Voltage (V)  
**Figure 8 Capacitance vs Vds**



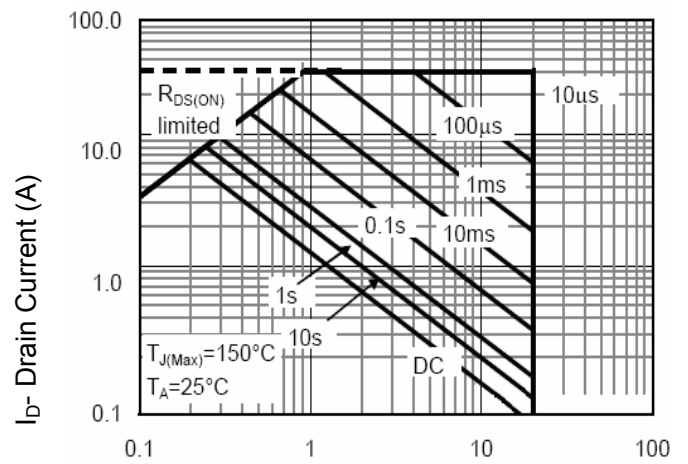
Vgs Gate-Source Voltage (V)  
**Figure 9 Rdson vs Vgs**



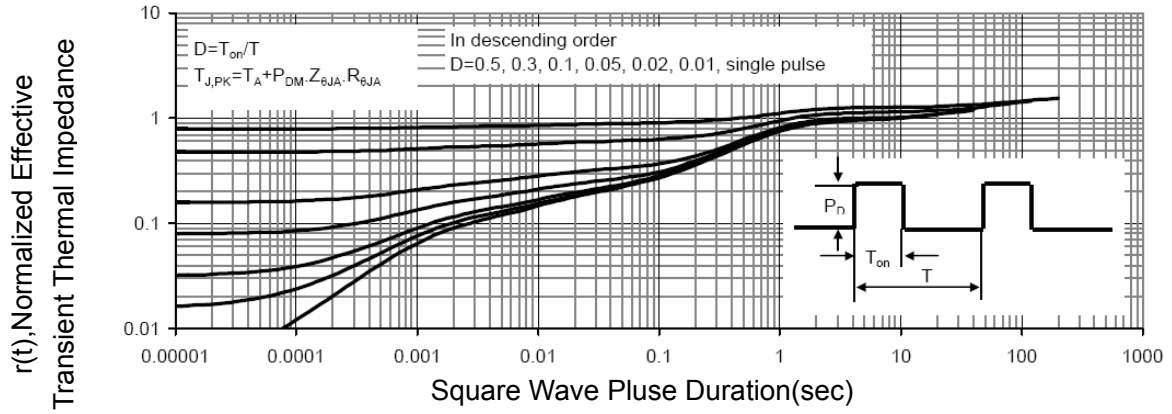
Vds Drain-Source Voltage (V)  
**Figure 10 Capacitance vs Vds**



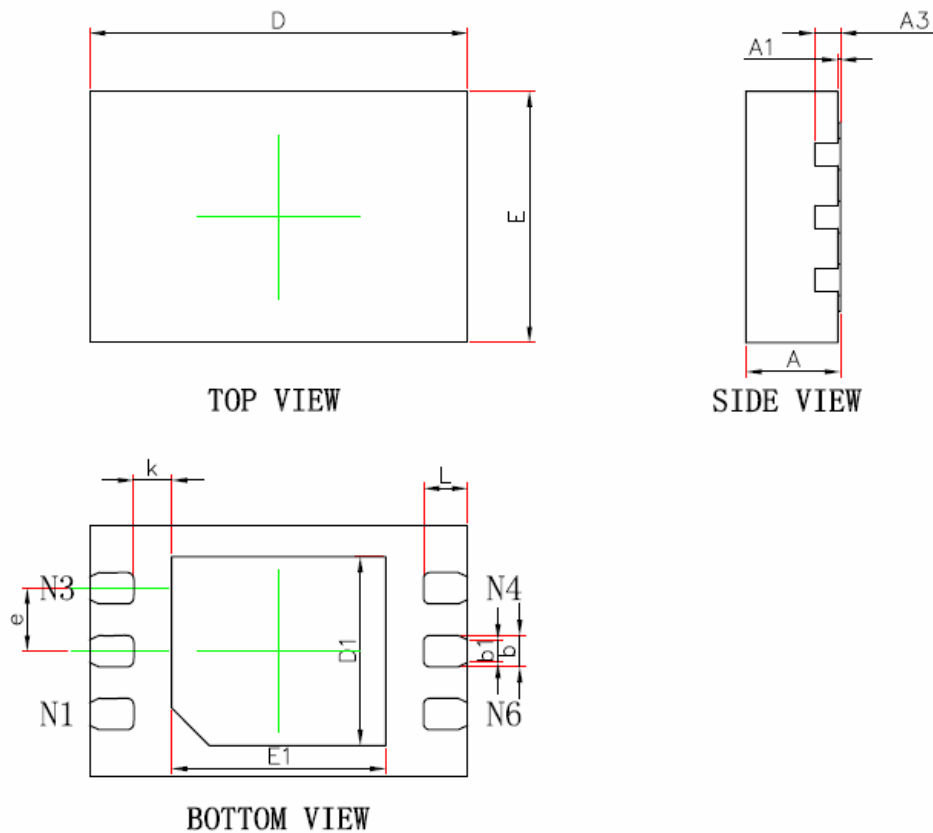
Qg Gate Charge (nC)  
**Figure 11 Gate Charge**



Vds Drain-Source Voltage (V)  
**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

**DFN2X3-6L Package Information**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN.	MAX.	MIN.	MAX.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.950	3.050	0.116	0.120
E	1.950	2.050	0.077	0.081
D1	1.400	1.600	0.055	0.063
E1	1.600	1.800	0.063	0.071
b	0.200	0.300	0.008	0.012
b1	0.180REF.		0.007REF.	
e	0.500TYP.		0.020TYP.	
k	0.200MIN.		0.008MIN.	
L	0.300	0.400	0.012	0.016

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