#### NCE N-Channel Enhancement Mode Power MOSFET

#### **Description**

The NCE80H16 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

#### **General Features**

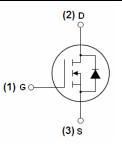
- $V_{DS}$  =80V, $I_{D}$  =160A  $R_{DS(ON)}$  <4.7m $\Omega$  @  $V_{GS}$ =10V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E<sub>AS</sub>
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

#### **Application**

- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

100% ΔVds TESTED!



#### Schematic diagram



#### Marking and pin assignment



#### **Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE80H16	NCE80H16	TO-220-3L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	80	V
Gate-Source Voltage	V <sub>G</sub> S	±20	V
Drain Current-Continuous	I <sub>D</sub>	160	А
Drain Current-Continuous(T <sub>C</sub> =100℃)	I <sub>D</sub> (100℃)	113	А
Pulsed Drain Current	I <sub>DM</sub>	500	А
Maximum Power Dissipation	P <sub>D</sub>	285	W
Derating factor		1.9	W/℃
Single pulse avalanche energy (Note 5)	E <sub>AS</sub>	1936	mJ



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# **NCE80H16**

Operating Junction and Storage Temperature Range	$T_{J}, T_{STG}$	-55 To 175	$^{\circ}\! \mathbb{C}$	

### **Thermal Characteristic**

Thermal Resistance, Junction-to-Case (Note 2)	R <sub>θJC</sub>	0.53	°C/W
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# 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	80	88	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =80V,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	$V_{GS(th)}$	$V_{DS}=V_{GS}$ , $I_{D}=250\mu A$	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	3.7	4.7	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>	\/ -05\/\/ -0\/	-	6500	-	PF
Output Capacitance	Coss	$V_{DS}$ =25V, $V_{GS}$ =0V, F=1.0MHz	-	810	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>	F=1.UIVIΠZ	-	310	-	PF
Switching Characteristics (Note 4)			•			
Turn-on Delay Time	t <sub>d(on)</sub>		-	31.5	-	nS
Turn-on Rise Time	t <sub>r</sub>	$V_{DD}$ =40V, $I_D$ =2A, $R_L$ =15 $\Omega$	-	33	-	nS
Turn-Off Delay Time	$t_{d(off)}$	$V_{GS}$ =10V, $R_{G}$ =2.5 $\Omega$	-	46	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	17.5	-	nS
Total Gate Charge	$Q_g$	1/ 40\/   00 4	-	130		nC
Gate-Source Charge	$V_{DS}$ =40V, $I_D$ =20A,		-	36		nC
Gate-Drain Charge	$Q_{gd}$	V <sub>GS</sub> =10V	-	46		nC
Drain-Source Diode Characteristics	1					
Diode Forward Voltage (Note 3)	$V_{SD}$	V <sub>GS</sub> =0V,I <sub>S</sub> =40A	-		1.2	V
Diode Forward Current (Note 2)	Is		-	-	160	Α
Reverse Recovery Time	t <sub>rr</sub>	TJ = 25°C, IF = 20A	-	51	-	nS
Reverse Recovery Charge	Qrr	di/dt = 500A/µs <sup>(Note3)</sup>	-	61	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

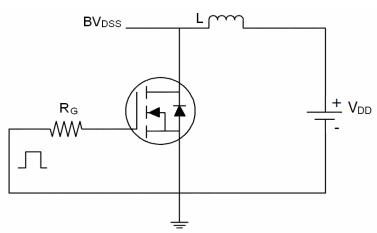
#### Notes:

- 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
- 5. EAS condition: Tj=25  $^{\circ}\text{C}\,\text{,V}_\text{DD}\text{=}40\text{V}\text{,V}_\text{G}\text{=}10\text{V}\text{,L=}0.5\text{mH}\text{,Rg=}25\Omega$

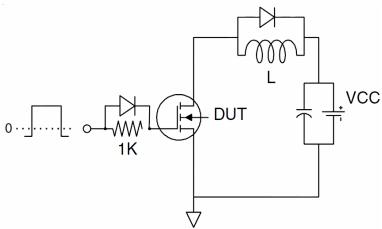


### **Test circuit**

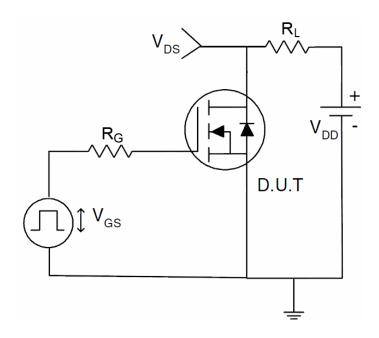
# 1) E<sub>AS</sub> test Circuit



# 2) Gate charge test Circuit

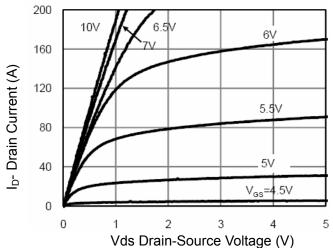


### 3) Switch Time Test Circuit

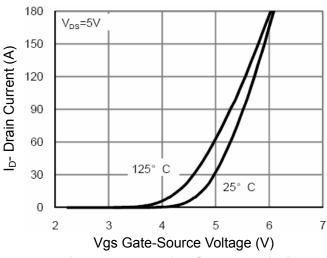




## Typical Electrical and Thermal Characteristics (Curves)



**Figure 1 Output Characteristics** 



**Figure 2 Transfer Characteristics** 

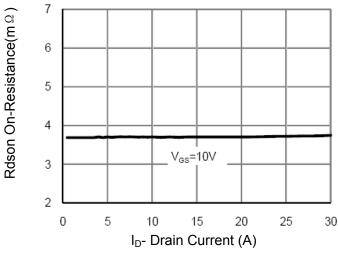


Figure 3 Rdson- Drain Current

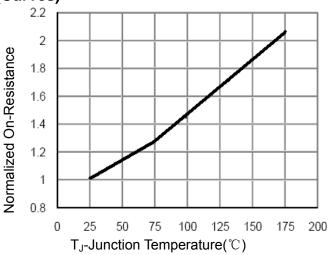


Figure 4 Rdson-JunctionTemperature

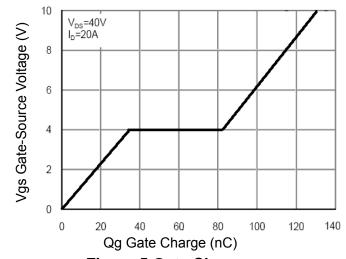


Figure 5 Gate Charge

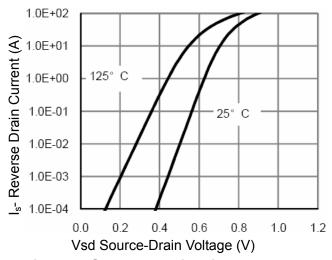


Figure 6 Source- Drain Diode Forward



# **NCE80H16**

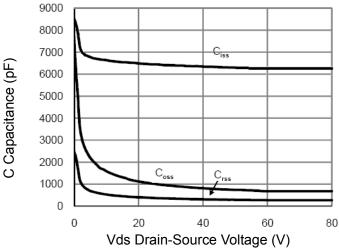


Figure 7 Capacitance vs Vds

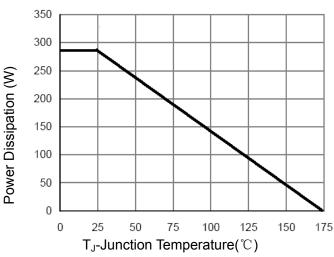
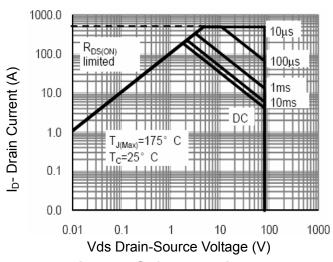


Figure 9 Power De-rating



**Figure 8 Safe Operation Area** 

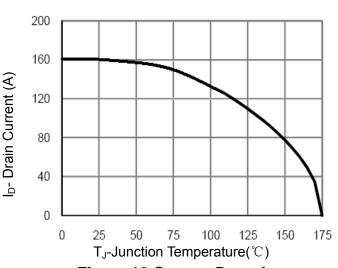


Figure 10 Current De-rating

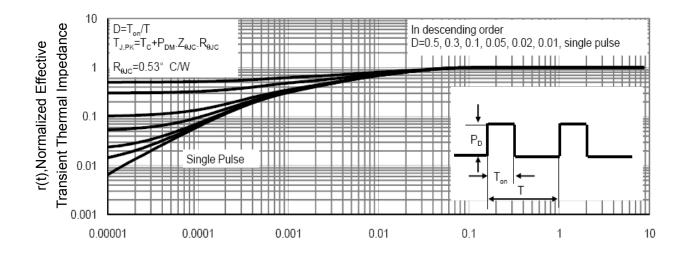
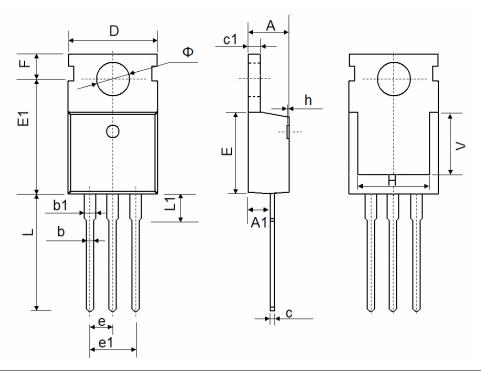


Figure 11 Normalized Maximum Transient Thermal Impedance

Square Wave Pluse Duration(sec)



# **TO-220-3L Package Information**



Symbol	Dimensions	In Millimeters	Dimensions In Inches			
Symbol	Min.	Max.	Min.	Max.		
Α	4.400	4.600	0.173	0.181		
A1	2.250	2.550	0.089	0.100		
b	0.710	0.910	0.028	0.036		
b1	1.170	1.370	0.046	0.054		
С	0.330	0.650	0.013	0.026		
c1	1.200	1.400	0.047	0.055		
D	9.910	10.250	0.390	0.404		
E	8.9500	9.750	0.352	0.384		
E1	12.650	12.950	0.498	0.510		
е	2.54	0 TYP.	0.100 TYP.			
e1	4.980	5.180	0.196	0.204		
F	2.650	2.950	0.104	0.116		
Н	7.900	8.100	0.311	0.319		
h	0.000	0.300	0.000	0.012		
L	12.900	13.400	0.508	0.528		
L1	2.850	3.250	0.112	0.128		
V	V 7.500 REF.		0.295 REF.			
Ф	3.400	3.800	0.134	0.150		



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