

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE40H21 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.

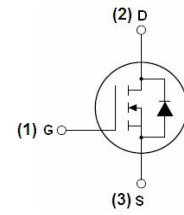
General Features

- $V_{DS} = 40V$, $I_D = 210A$
 $R_{DS(ON)} < 2.3m\Omega$ @ $V_{GS} = 10V$
 $R_{DS(ON)} < 3.2m\Omega$ @ $V_{GS} = 4.5V$
- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

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

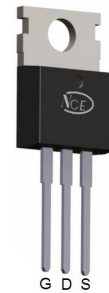
100% UIS TESTED!
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-220-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE40H21	NCE40H21	TO-220-3L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	210	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	190	A
Pulsed Drain Current	I_{DM}	840	A
Maximum Power Dissipation	P_D	310	W
Derating factor		2.07	W/ $^\circ C$
Single pulse avalanche energy (Note 1)	E_{AS}	2500	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.48	$^\circ C/W$
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Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

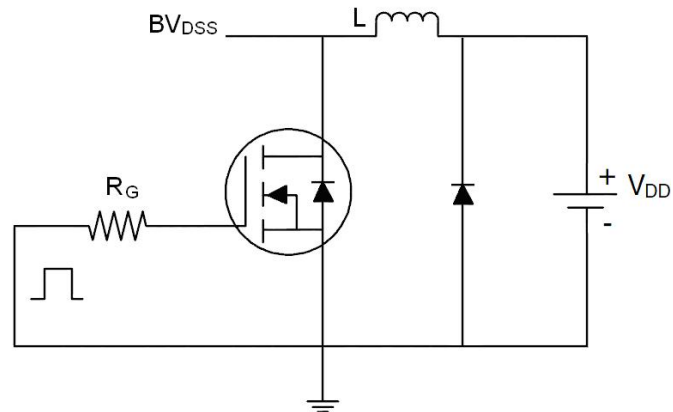
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics <small>(Note 3)</small>						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.3	1.8	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	1.9	2.3	mΩ
	R _{DS(ON)}	V _{GS} =4.5V, I _D =20A	-	2.45	3.2	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =40A	-	50	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	8300	-	pF
Output Capacitance	C _{oss}		-	1145	-	pF
Reverse Transfer Capacitance	C _{rss}		-	998	-	pF
Switching Characteristics <small>(Note 2)</small>						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, R _L =15Ω, R _G =2.5Ω, V _{GS} =10V	-	15	-	nS
Turn-on Rise Time	t _r		-	40	-	nS
Turn-Off Delay Time	t _{d(off)}		-	100	-	nS
Turn-Off Fall Time	t _f		-	32	-	nS
Total Gate Charge	Q _g	I _D =20A, V _{DD} =20V, V _{GS} =10V	-	179.5	-	nC
Gate-Source Charge	Q _{gs}		-	27.6	-	nC
Gate-Drain Charge	Q _{gd}		-	40.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	0.85	1.2	V
Diode Forward Current	I _S		-	-	210	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 20A di/dt = 100A/μs	-	54	-	nS
Reverse Recovery Charge	Q _{rr}		-	86	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

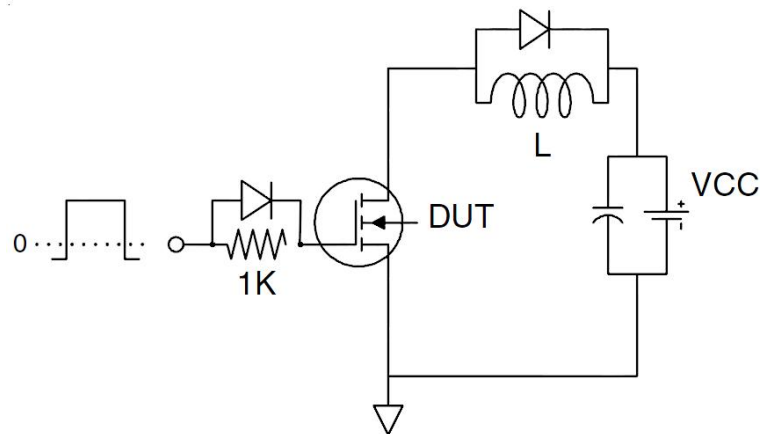
1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=0.5mH, R_G=25\Omega$
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Test circuit

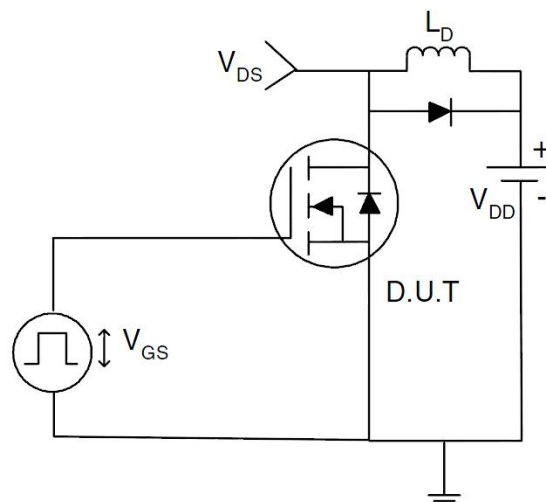
1) E_{AS} test Circuits



2) Gate charge test Circuit:



3) Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

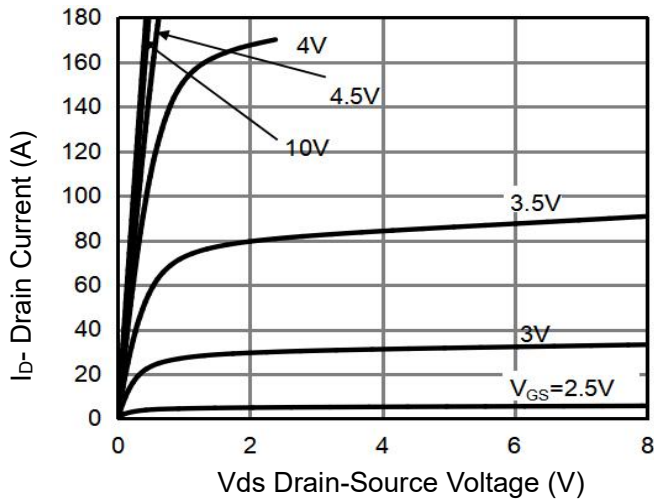


Figure 1 Output Characteristics

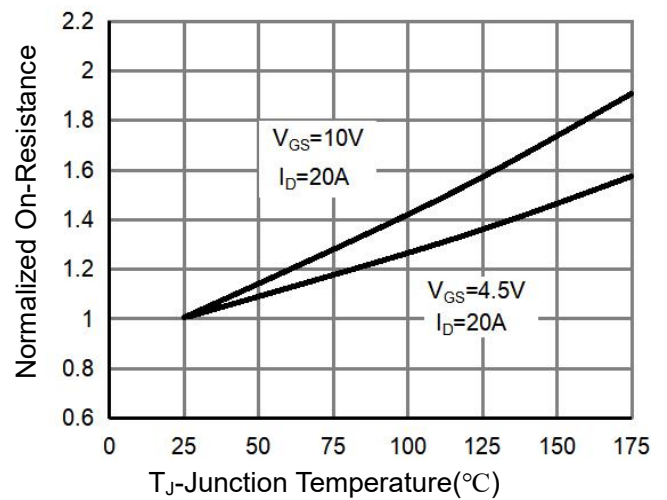


Figure 4 $R_{DS(on)}$ -Junction Temperature

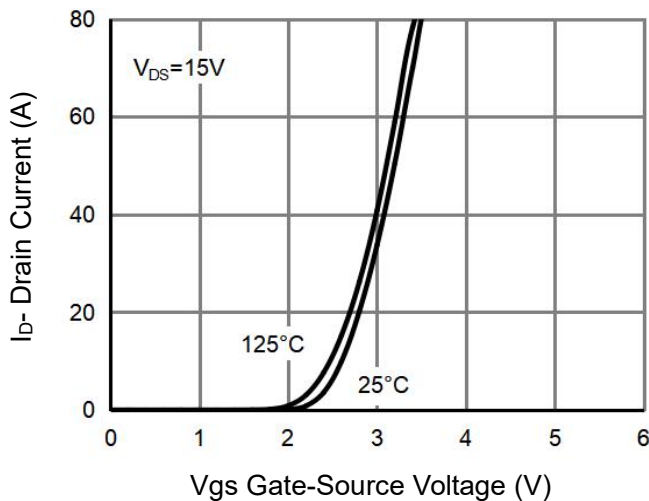


Figure 2 Transfer Characteristics

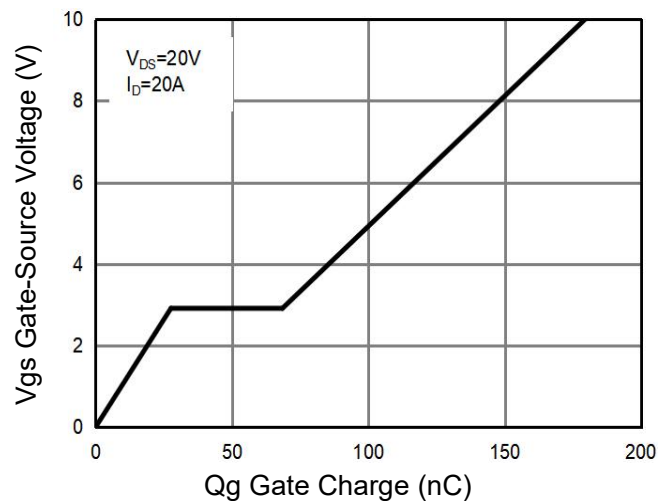


Figure 5 Gate Charge

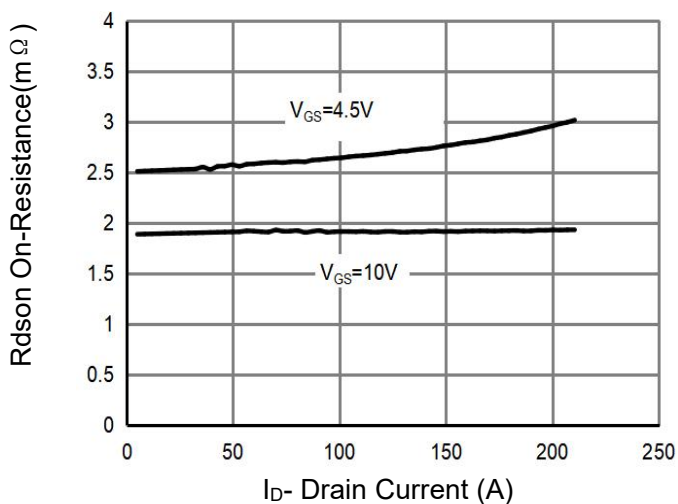


Figure 3 $R_{DS(on)}$ - Drain Current

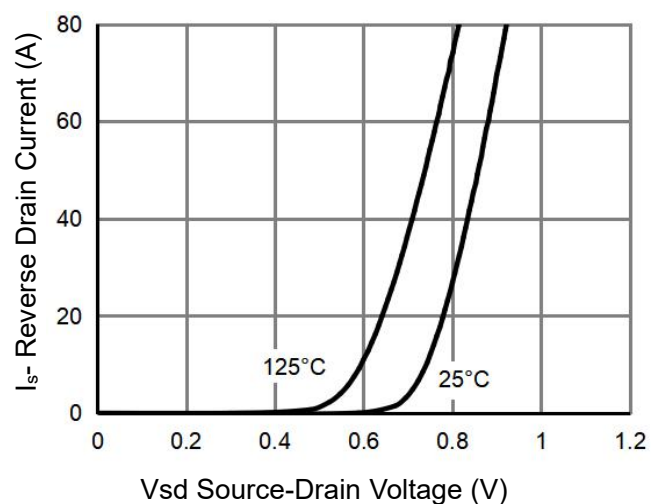


Figure 6 Source- Drain Diode Forward

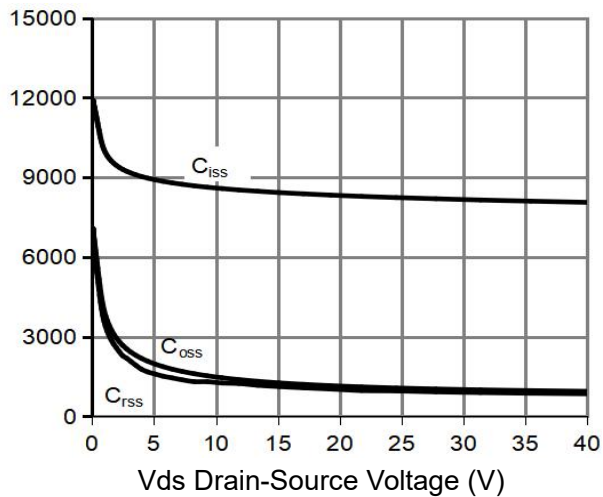


Figure 7 Capacitance vs Vds

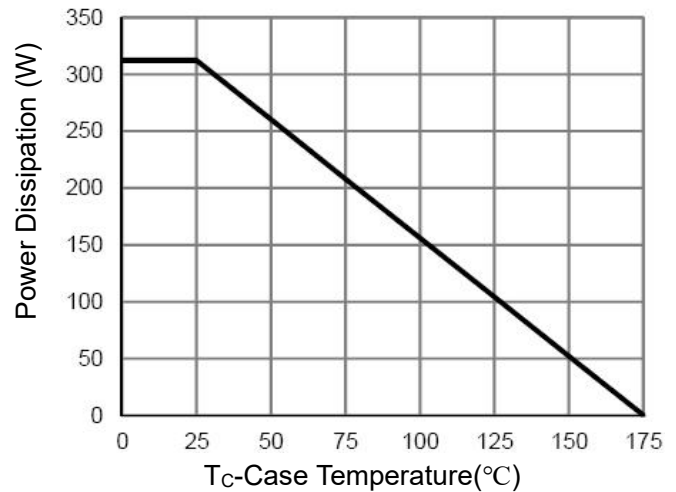


Figure 9 Power De-rating

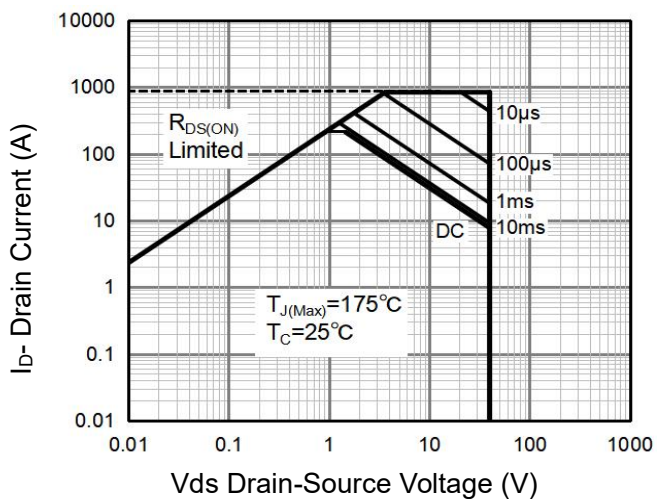


Figure 8 Safe Operation Area (Note3)

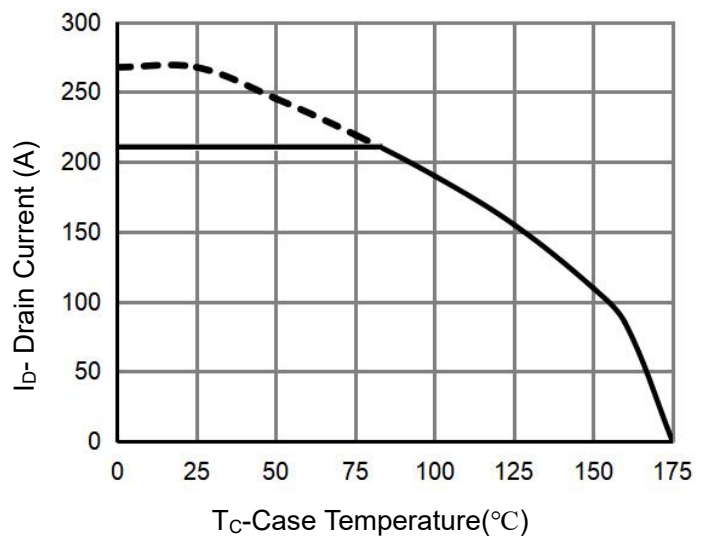


Figure 10 Current De-rating

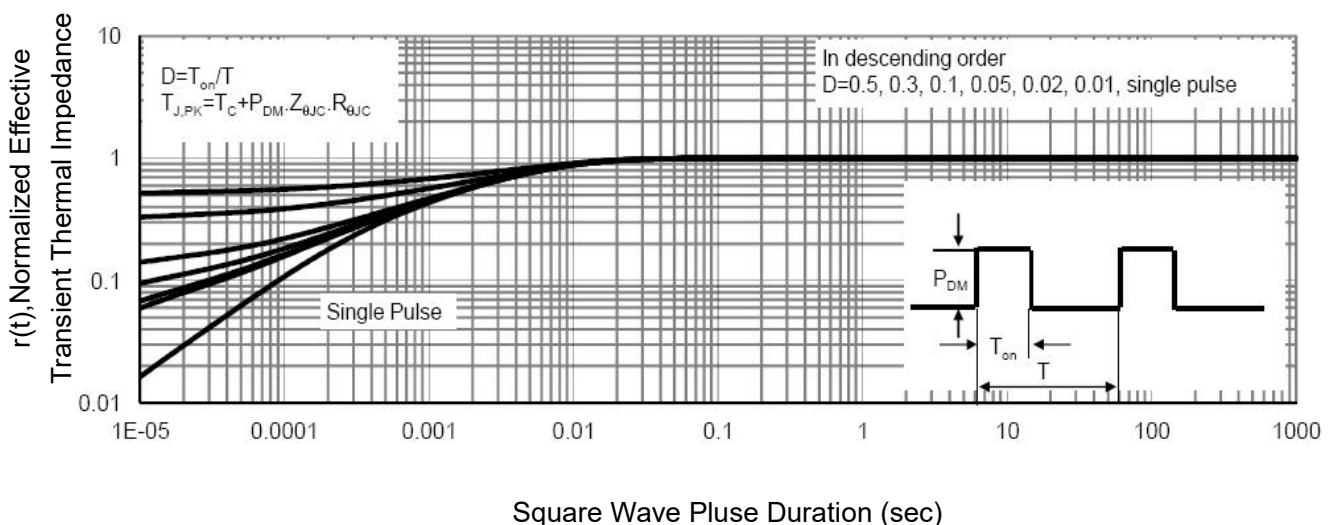
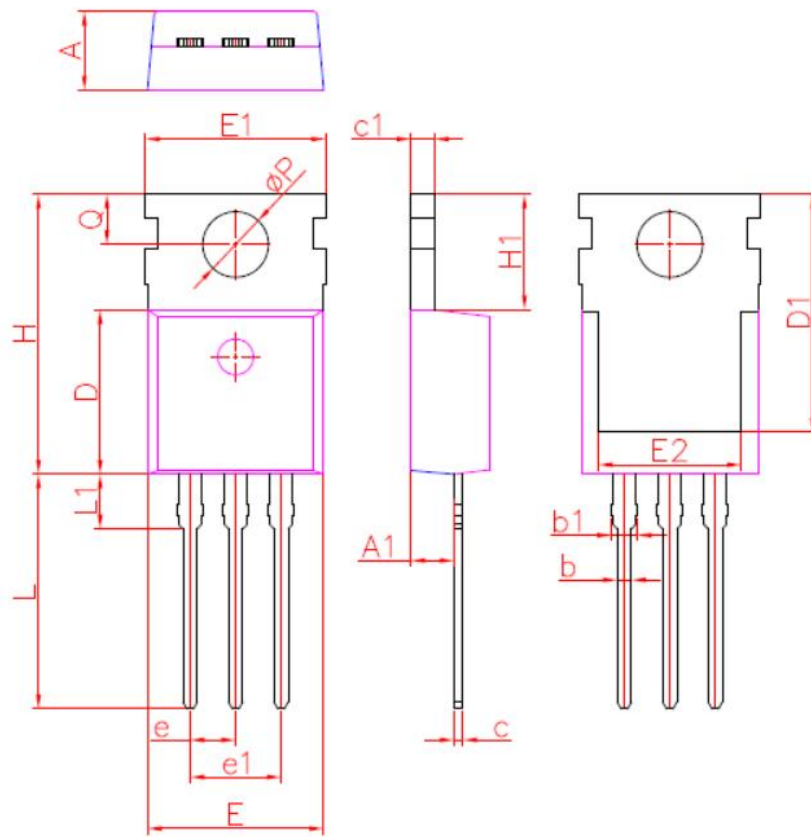


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



TO220			
DIM.	MIN.	NOM.	MAX.
A	4.20	4.40	4.60
A1	2.25	2.40	2.55
b	0.70	0.80	0.90
b1	1.17	1.27	1.37
c	0.33	0.50	0.65
c1	1.20	1.30	1.40
D	8.95	9.20	9.75
D1	13.10	13.30	13.50
E	9.74	9.84	10.04
E1	9.91	10.08	10.25
E2	7.90	8.00	8.10
e	2.54BSC		
e1	5.08BSC		
H	15.45	15.65	15.85
H1	6.30	6.45	6.60
L	12.90	13.13	13.40
L1	2.85	3.05	3.25
Q	2.65	2.80	2.95
ϕP	3.40	3.68	3.80
All dimensions in millimeters			

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