

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE5020Q 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

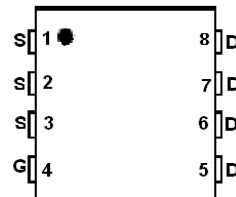
- $V_{DS} = 50V, I_D = 20A$
 $R_{DS(ON)} < 15m\Omega @ V_{GS} = 10V$ (Typ: 11.5m Ω)
 $R_{DS(ON)} < 20m\Omega @ V_{GS} = 10V$ (Typ: 15.5m Ω)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current

Application

- Industrial power supplies
- LED backlighting



Schematic diagram



Pin assignment



DFN3.3X3.3-8L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE5020Q	NCE5020Q	DFN3.3X3.3-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	50	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	20	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	14	A
Pulsed Drain Current	I_{DM}	60	A
Maximum Power Dissipation	P_D	35	W
Derating factor		0.23	W/ $^\circ C$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	3.6	$^\circ C/W$
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Electrical Characteristics (T_C=25°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	50		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =50V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1	1.5	2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A	-	11.5	15	mΩ
		V _{GS} =4.5V, I _D =10A	-	15.5	20	mΩ
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz	-	1543	-	PF
Output Capacitance	C _{oss}		-	165	-	PF
Reverse Transfer Capacitance	C _{rss}		-	120	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =25V, I _D =10A, R _L =3Ω, R _G =3Ω	-	6	-	nS
Turn-on Rise Time	t _r		-	2.5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	22	-	nS
Turn-Off Fall Time	t _f		-	2.5	-	nS
Total Gate Charge	Q _g	V _{DS} =25V, I _D =10A, V _{GS} =10V	-	22	-	nC
Gate-Source Charge	Q _{gs}		-	6	-	nC
Gate-Drain Charge	Q _{gd}		-	3.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	20	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =10A	-	18		nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs (Note3)	-	42		nC

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. E_{AS} condition: T_J=25°C, V_{DD}=25V, V_G=10V, L=0.5mH, R_G=25Ω

Test circuit

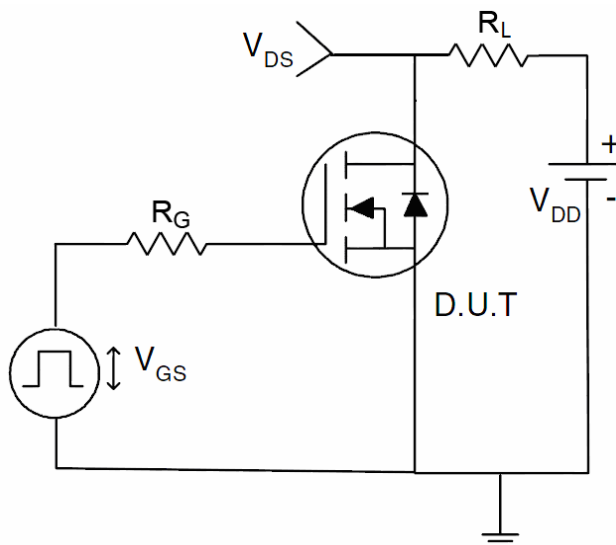
1) E_{AS} test Circuits



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

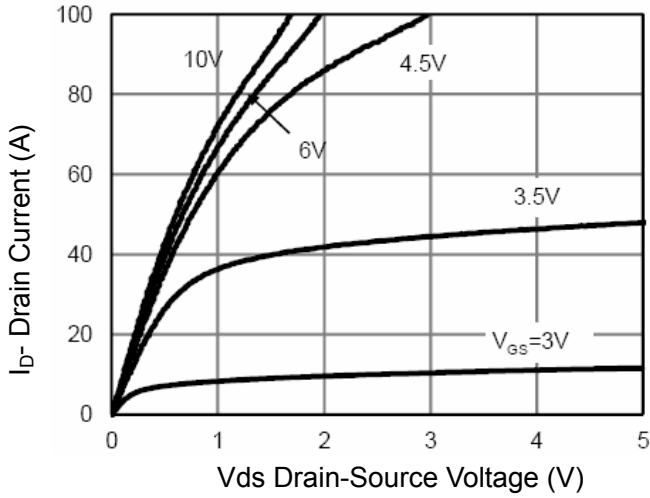


Figure 1 Output Characteristics

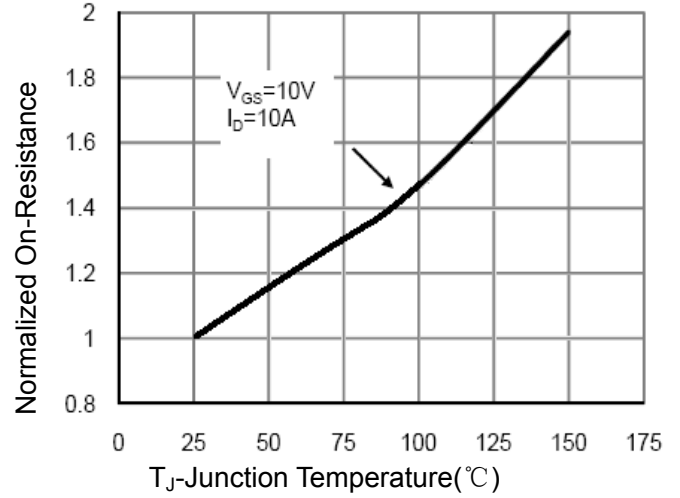


Figure 4 R_{dson} -Junction Temperature

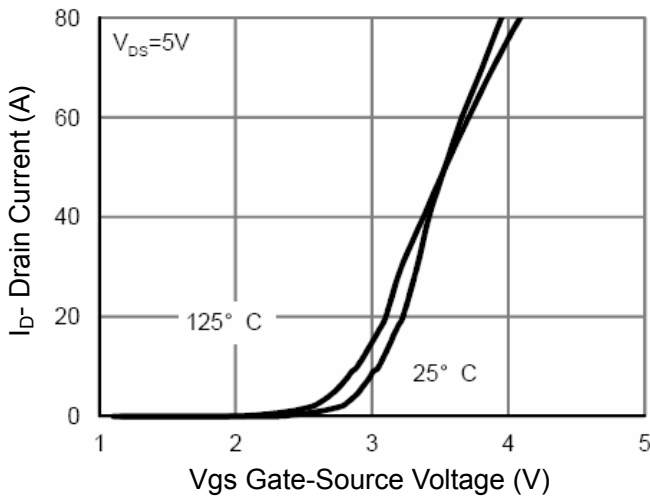


Figure 2 Transfer Characteristics

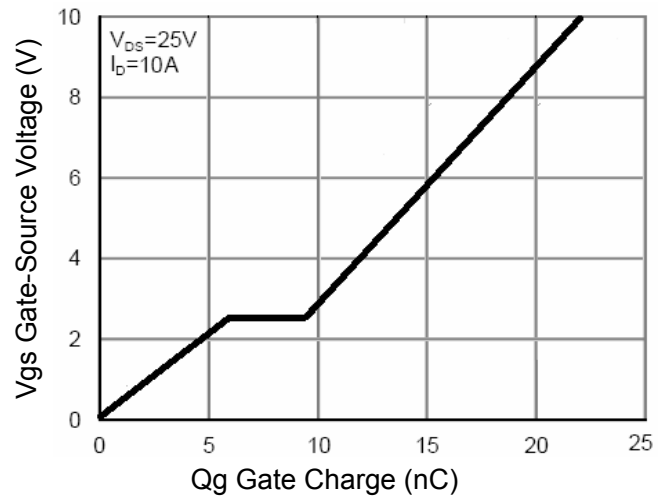


Figure 5 Gate Charge

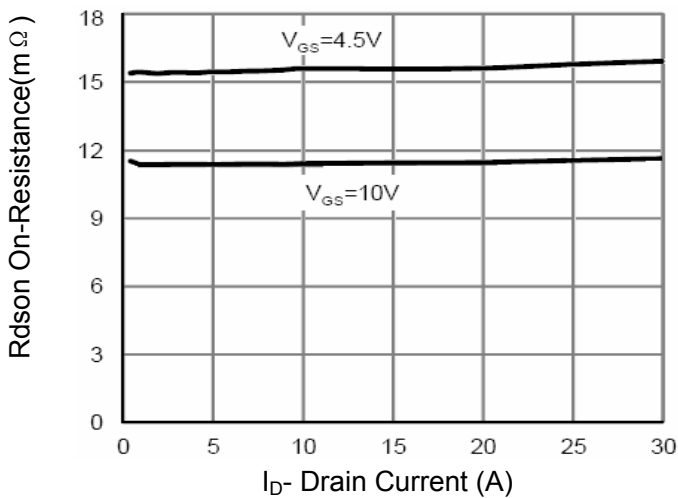


Figure 3 R_{dson} - Drain Current

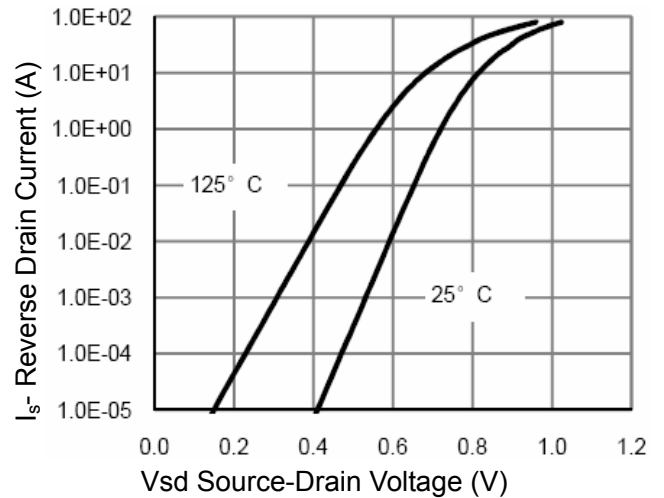


Figure 6 Source- Drain Diode Forward

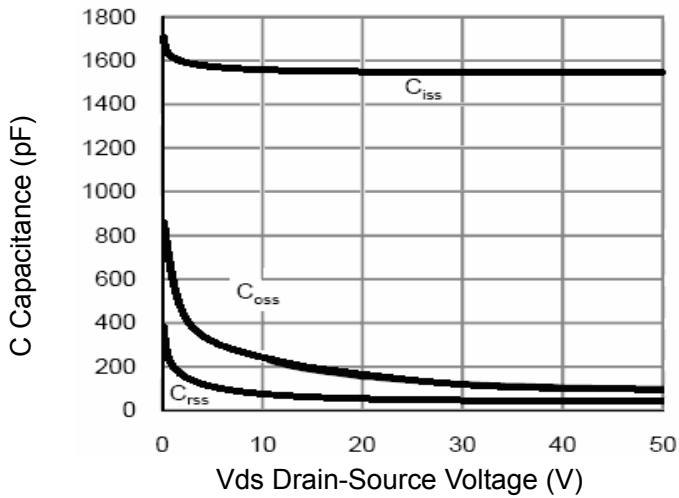


Figure 7 Capacitance vs Vds

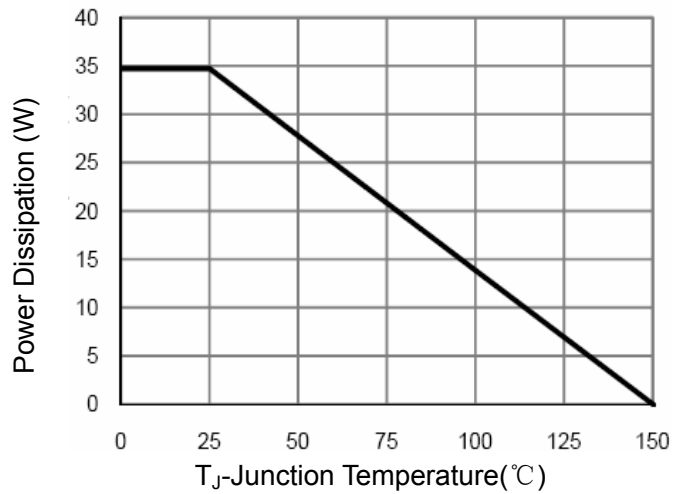


Figure 9 Power De-rating

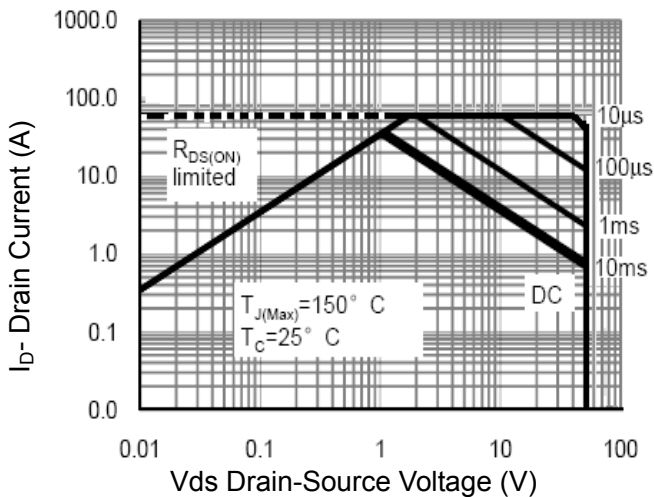


Figure 8 Safe Operation Area

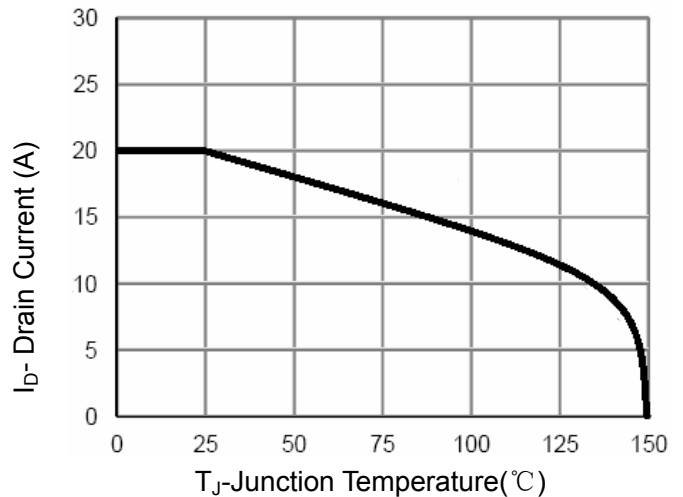


Figure 10 ID Current De-rating

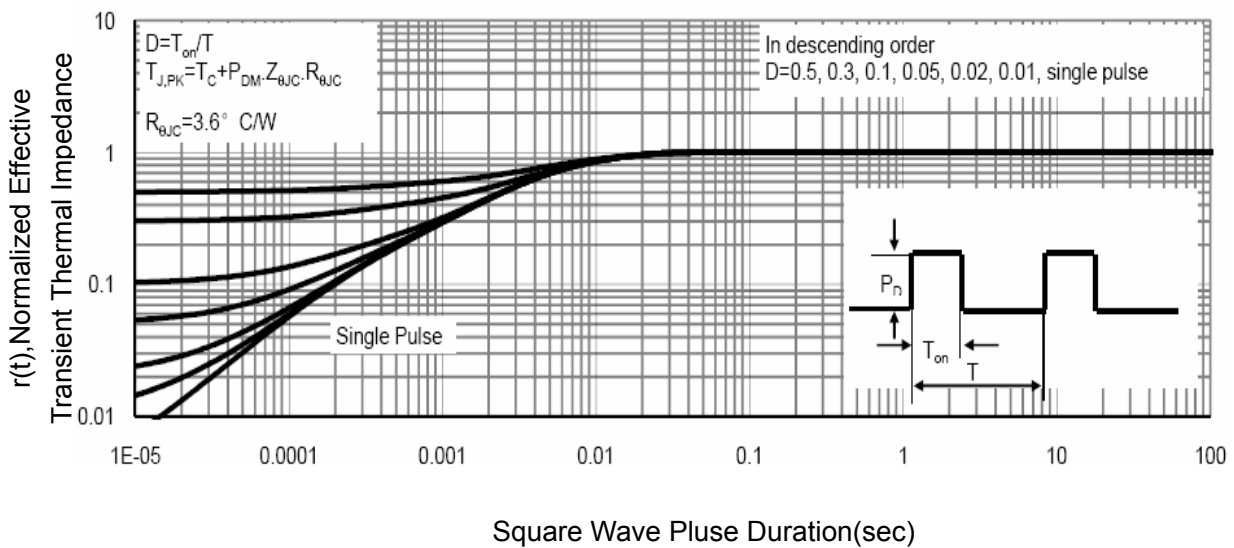
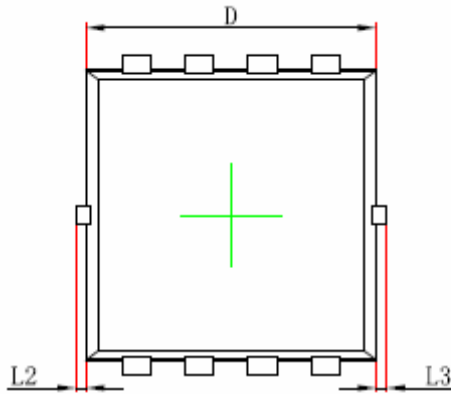
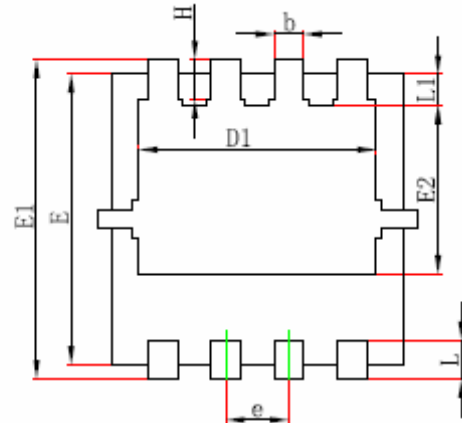


Figure 11 Normalized Maximum Transient Thermal Impedance

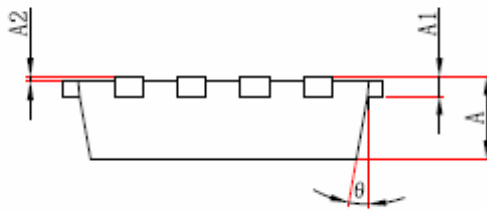
DFN3.3X3.3-8L Package Information



Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.650	0.850	0.026	0.033
A1	0.152 REF.		0.006 REF.	
A2	0~0.05		0~0.002	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.102
E	2.900	3.100	0.114	0.122
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0~0.100		0~0.004	
L3	0~0.100		0~0.004	
H	0.315	0.515	0.012	0.020
θ	9°	13°	9°	13°

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