

NCE N-Channel Enhancement Mode Power MOSFET

Description

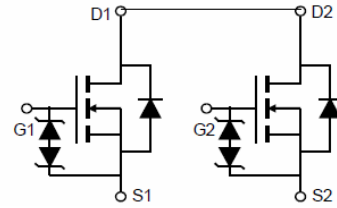
The NCE8651Q uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

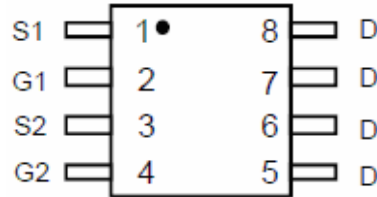
- $V_{DS} = 20V, I_D = 10A$
 $R_{DS(ON)} < 11m\Omega @ V_{GS}=4.5V$
 $R_{DS(ON)} < 11.5m\Omega @ V_{GS}=4V$
 $R_{DS(ON)} < 12.5m\Omega @ V_{GS}=3.1V$
 $R_{DS(ON)} < 15.5m\Omega @ V_{GS}=2.5V$
- High density cell design for ultra low $R_{ds(on)}$
- Fully characterized avalanche voltage and current
- 2.5V Drive
- Common-drain type

Application

- Battery protection switch
- Mobile device battery charging and discharging



Schematic diagram



Pin Assignment



DFN 3x3 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE8651Q	NCE8651Q	DFN 3x3	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	10	A
Pulsed Drain Current	I_{DM}	32	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 ^(Note 2)	$R_{\theta JA}$	83	$^\circ C/W$
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Electrical Characteristics (TC=25°C unless otherwise noted)

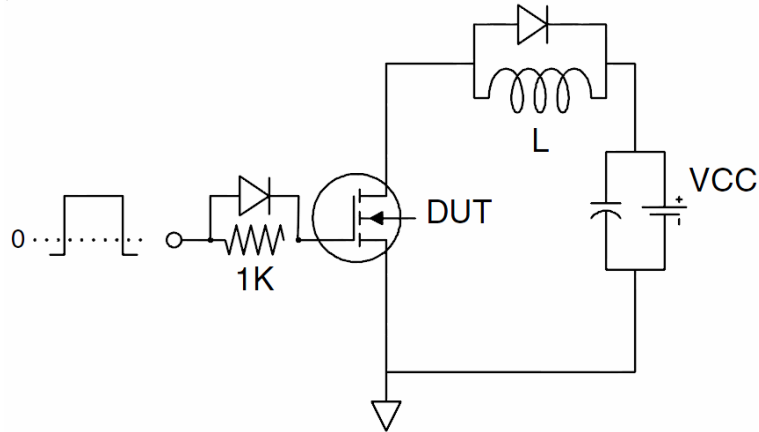
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	20		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=20V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	± 10	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.7	1	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=10A$	-	7.2	11	m Ω
		$V_{GS}=4V, I_D=5A$	-	7.4	11.5	
		$V_{GS}=3.1V, I_D=5A$		7.8	12.5	
		$V_{GS}=2.5V, I_D=2.5A$		8.6	15.5	
Forward Transconductance	g_{FS}	$V_{DS}=10V, I_D=5A$	5	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0MHz$	-	1255	-	PF
Output Capacitance	C_{oss}		-	220	-	PF
Reverse Transfer Capacitance	C_{rss}		-	168	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=10V, I_D=5A$ $V_{GS}=10V, R_{GEN}=50\Omega$	-	300	-	nS
Turn-on Rise Time	t_r		-	1000	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	4000	-	nS
Turn-Off Fall Time	t_f		-	2500	-	nS
Total Gate Charge	Q_g	$V_{DS}=10V, I_D=10A,$ $V_{GS}=10V$	-	29	-	nC
Gate-Source Charge	Q_{gs}		-	5.2	-	nC
Gate-Drain Charge	Q_{gd}		-	6.3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=10A$	-	0.85	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	10	A

Notes:

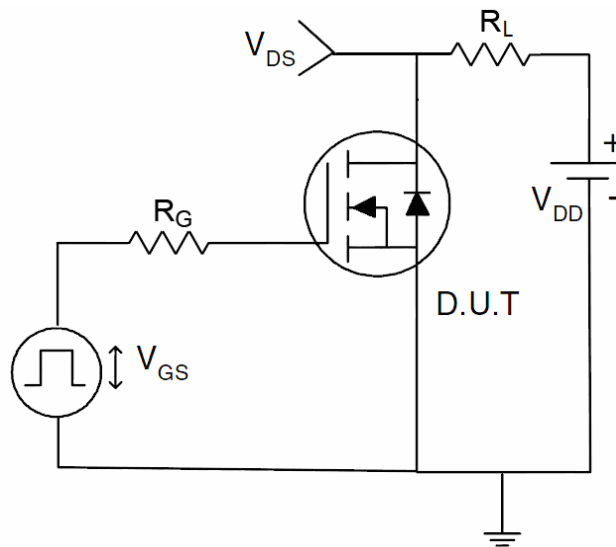
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Test Circuit

1) Gate Charge Test Circuit



2) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

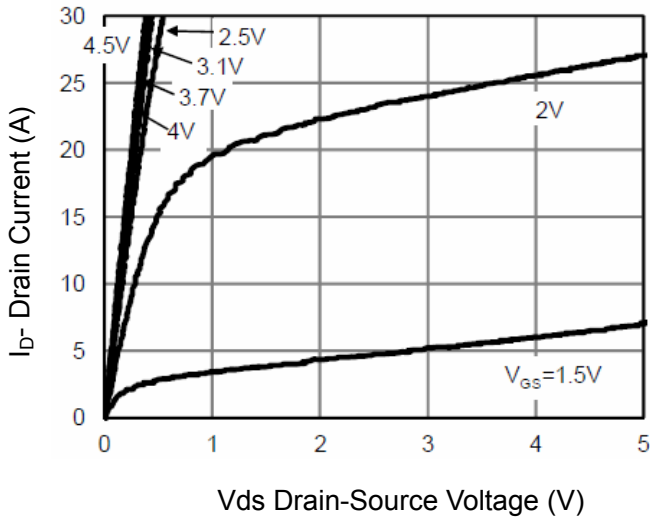


Figure 1 Output Characteristics

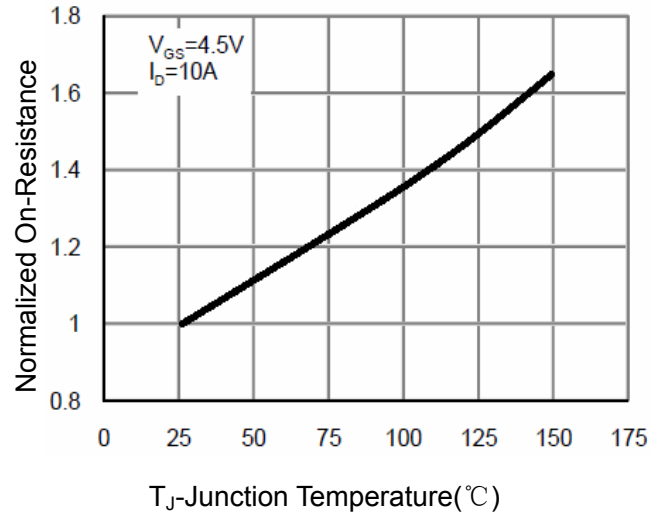


Figure 4 R_{dson} -Junction Temperature

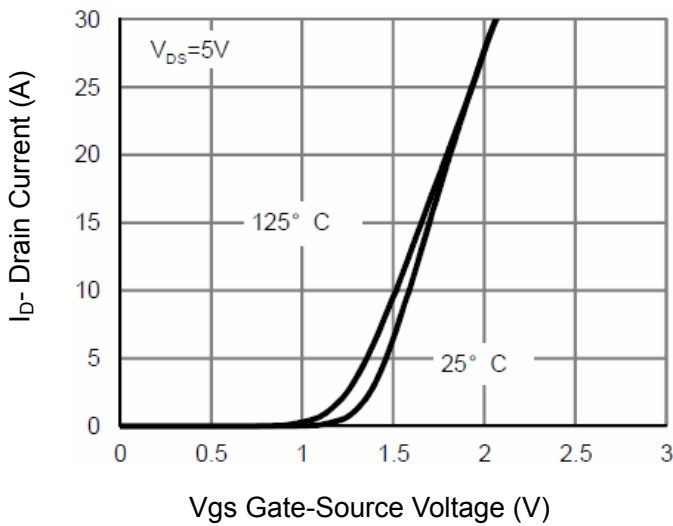


Figure 2 Transfer Characteristics

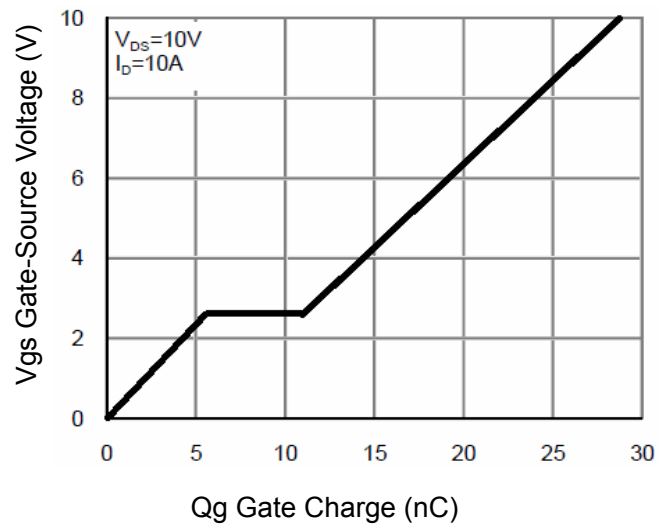


Figure 5 Gate Charge

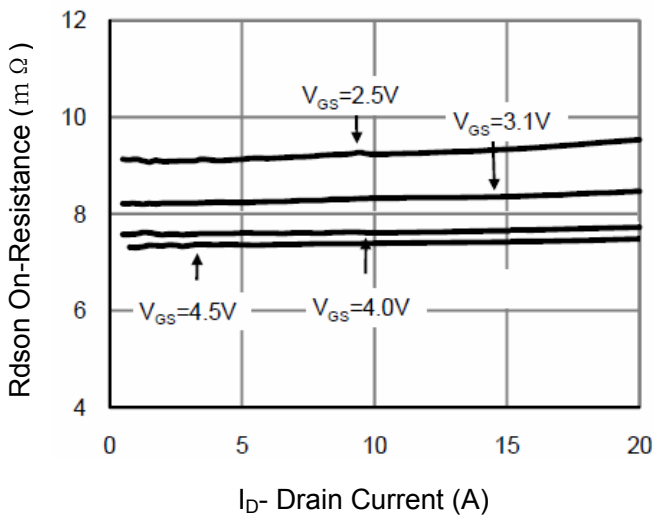


Figure 3 R_{dson} - Drain Current

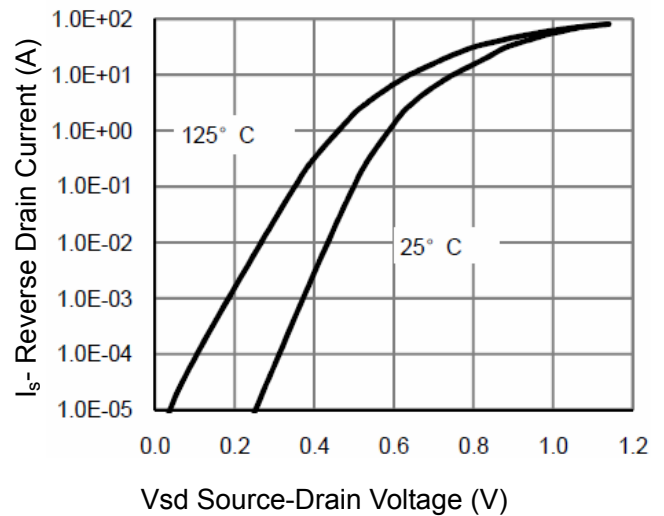
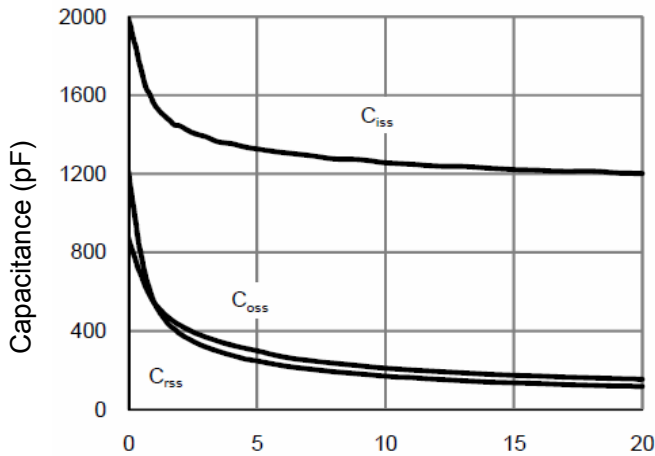
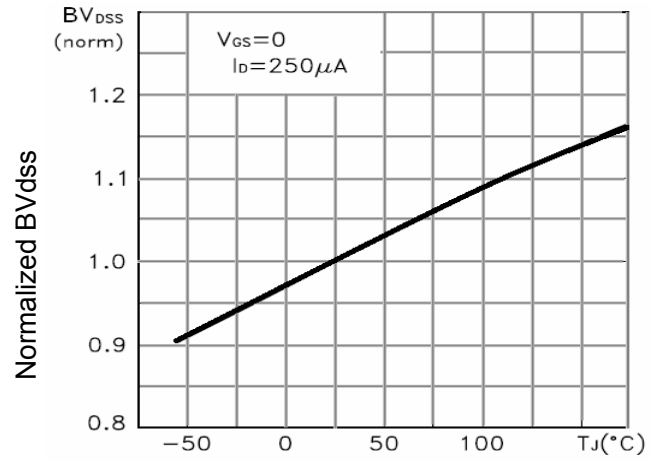


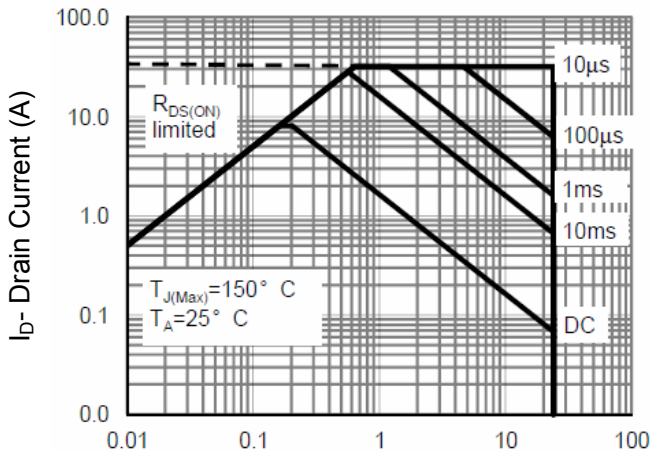
Figure 6 Source- Drain Diode Forward



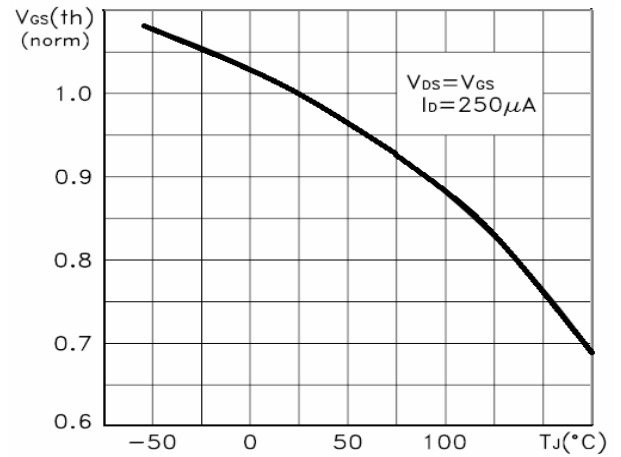
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



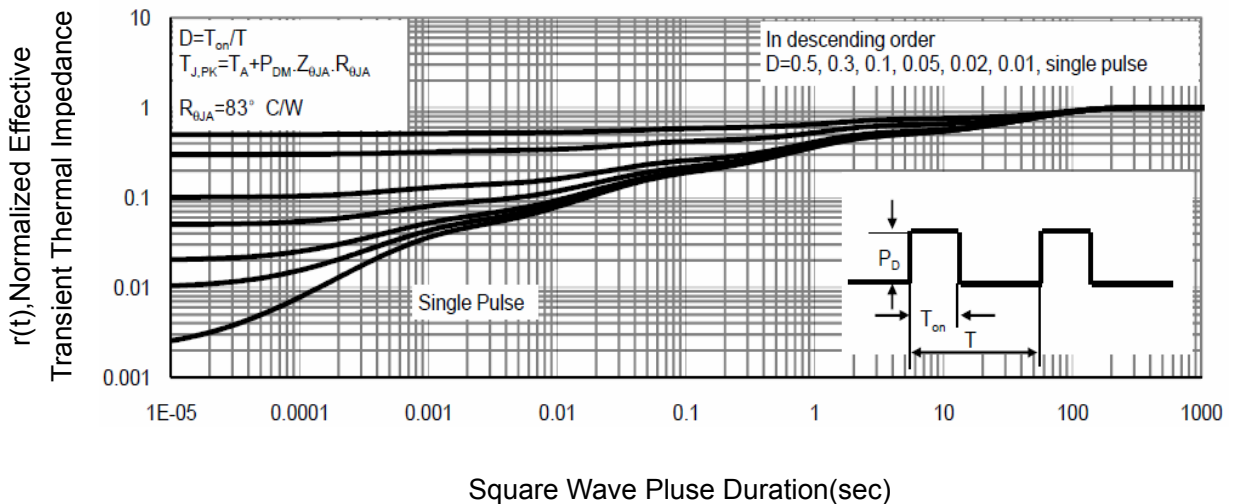
T_J-Junction Temperature(°C)
Figure 9 BV_{DSS} vs Junction Temperature



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area

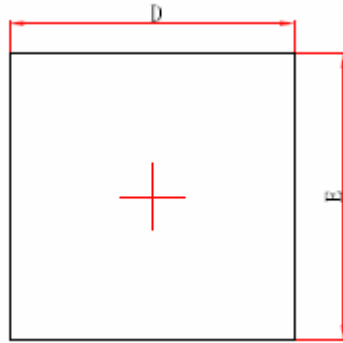


T_J-Junction Temperature(°C)
Figure 10 V_{GS(th)} vs Junction Temperature

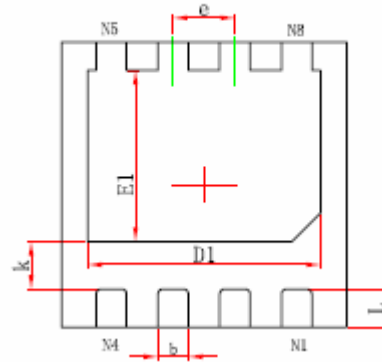


Square Wave Pulse Duration(sec)
Figure 11 Normalized Maximum Transient Thermal Impedance

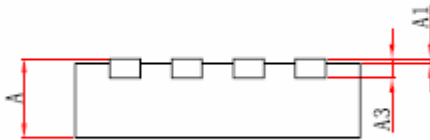
DFN3X3 EP Package Information



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.924	3.076	0.115	0.121
E	2.924	3.076	0.115	0.121
D1	2.350	2.550	0.093	0.100
E1	1.700	1.900	0.067	0.075
k	0.450	0.550	0.018	0.022
b	0.270	0.370	0.011	0.015
e	0.650TYP.		0.026TYP.	
L	0.324	0.476	0.013	0.019

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