

NCE P-Channel Enhancement Mode Power MOSFET

Description

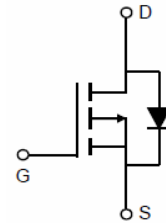
The NCE20P45Q uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

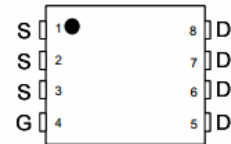
- $V_{DS} = -20V, I_D = -45A$
 $R_{DS(ON)} < 7m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 9m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 12m\Omega @ V_{GS} = -1.8V$
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

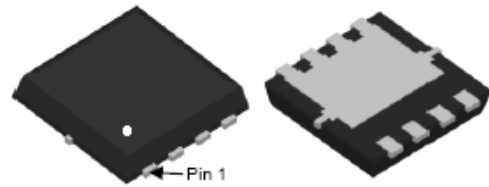
- Load switch
- Battery protection



Schematic diagram



Pin Assignment



DFN 3.3x3.3 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE20P45Q	NCE20P45Q	DFN 3.3x3.3-8L	-	-	-

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}	± 10	V
Drain Current-Continuous	I_D	-45	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	-35	A
Pulsed Drain Current	I_{DM}	-200	A
Maximum Power Dissipation	P_D	80	W
Single pulse avalanche energy ^(Note 5)	E_{AS}	180	mJ
Derating factor		0.64	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)	$R_{\theta JC}$	1.6	$^\circ C/W$
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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	-20	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-16V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±10V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.4	-0.6	-1.0	V
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} =-4.5V, I _D =-20A	-	5.8	7	mΩ
		V _{GS} =-2.5V, I _D =-20A	-	7.2	9	
		V _{GS} =-1.8V, I _D =-20A		9	12	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-20A	80	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =-10V, V _{GS} =0V, F=1.0MHz	-	3500	-	PF
Output Capacitance	C _{oss}		-	577	-	PF
Reverse Transfer Capacitance	C _{rss}		-	445	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-10V, R _{GEN} =3Ω V _{GS} =-4.5V, R _L =0.5Ω	-	18	-	nS
Turn-on Rise Time	t _r		-	42	-	nS
Turn-Off Delay Time	t _{d(off)}		-	85	-	nS
Turn-Off Fall Time	t _f		-	23	-	nS
Total Gate Charge	Q _g	V _{DS} =-10V, I _D =-20A, V _{GS} =-4.5V	-	55	-	nC
Gate-Source Charge	Q _{gs}		-	10	-	nC
Gate-Drain Charge	Q _{gd}		-	15	-	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		-	-	-45	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = -10A di/dt = 100A/μs (Note 3)	-	47	-	nS
Reverse Recovery Charge	Q _{rr}		-	53	-	nC
Forward Turn-On Time	t _{on}	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. 5. E_{AS} condition: T_J=25°C, V_{DD}=-10V, V_G=-10V, L=0.5mH, R_g=25Ω

Typical Electrical and Thermal Characteristics (Curves)

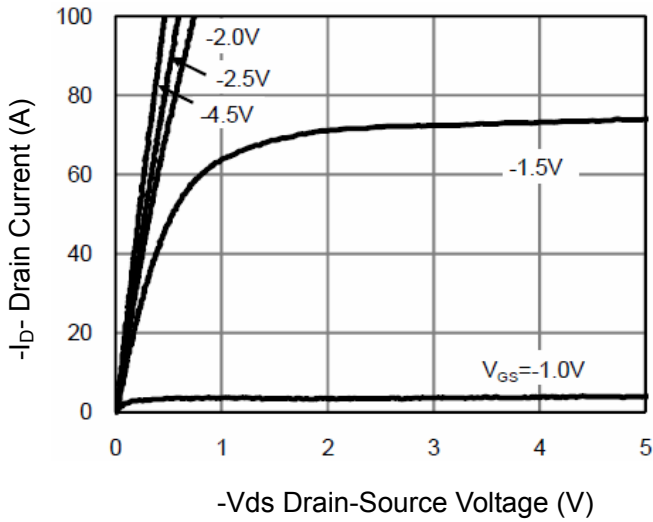


Figure 1 Output Characteristics

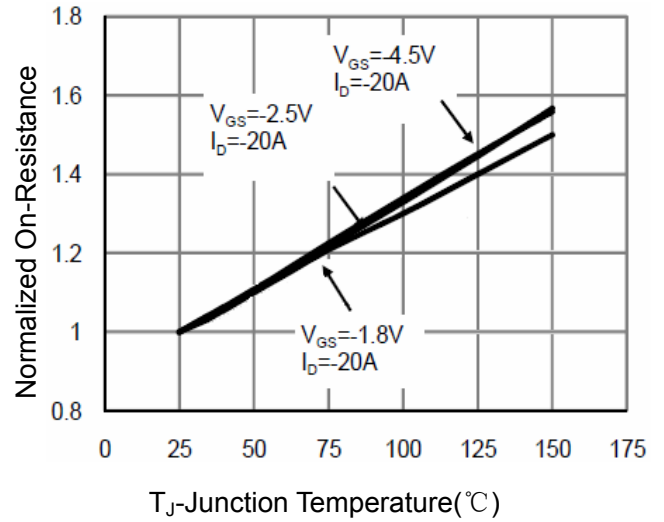


Figure 4 Rds(on)-Junction Temperature

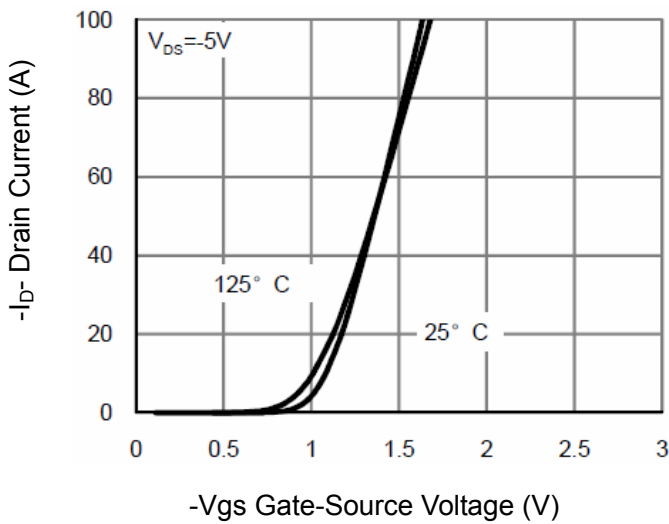


Figure 2 Transfer Characteristics

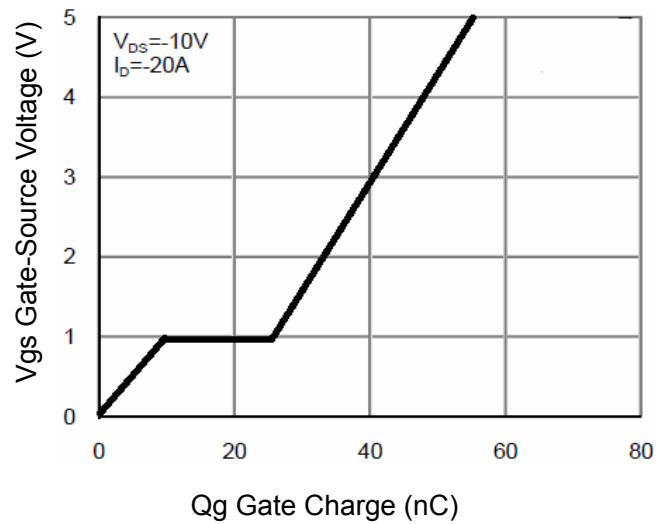


Figure 5 Gate Charge

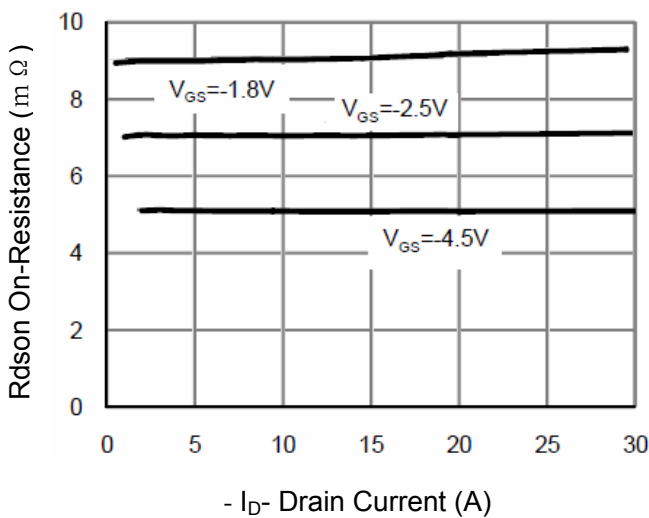


Figure 3 Rds(on)- Drain Current

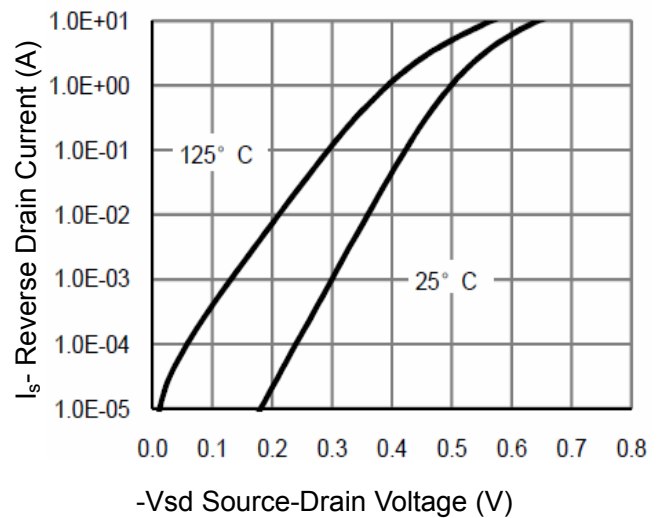
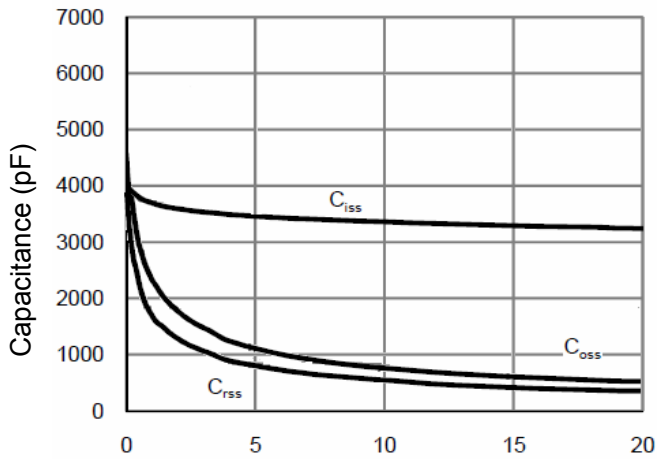
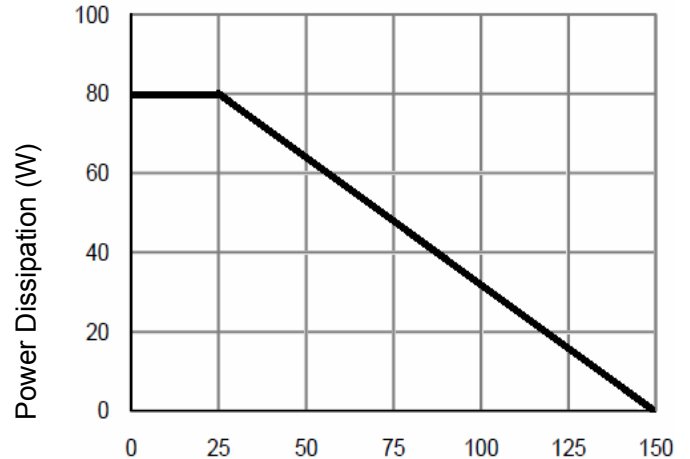


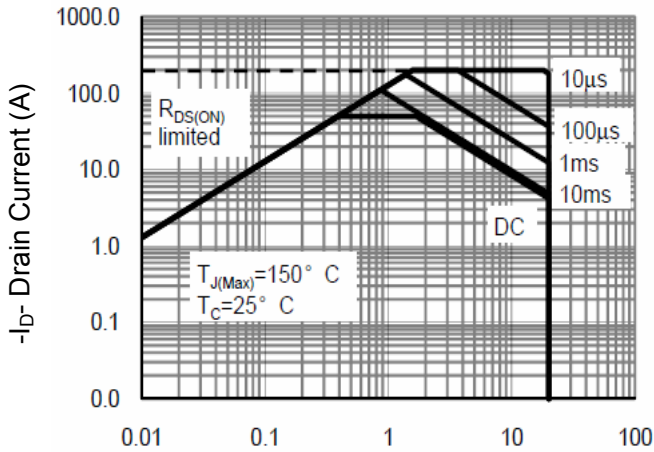
Figure 6 Source- Drain Diode Forward



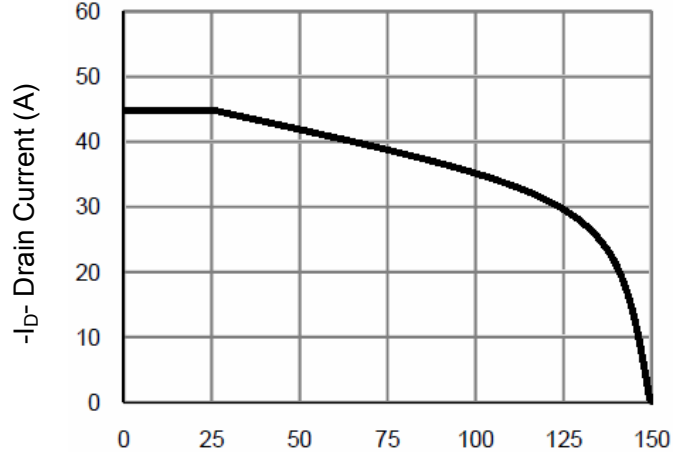
-Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



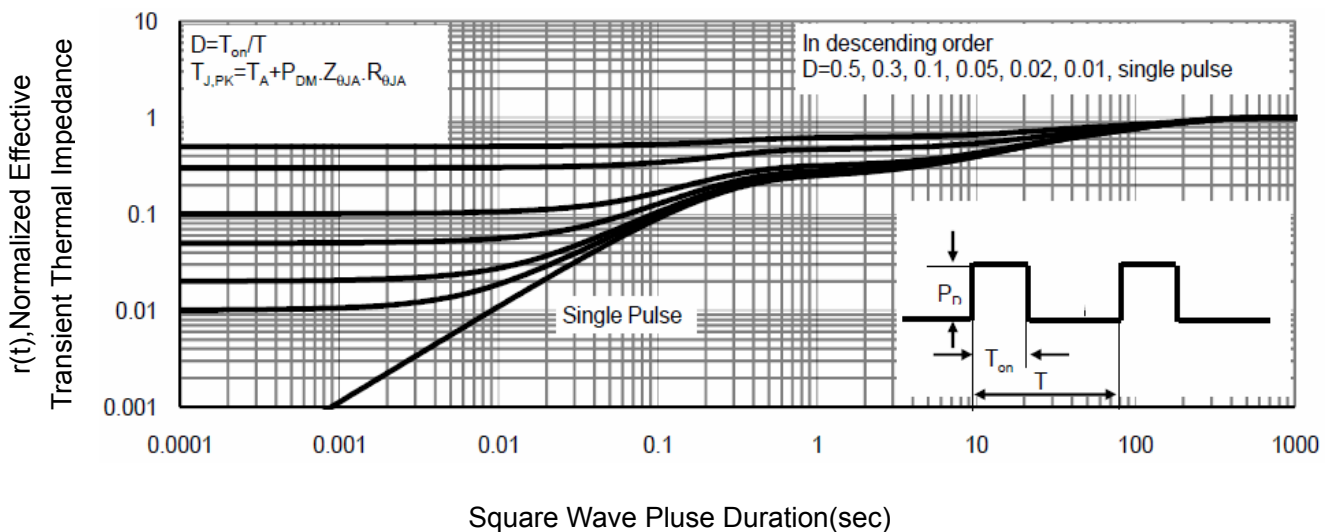
T_J -Junction Temperature(°C)
Figure 9 Power De-rating



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

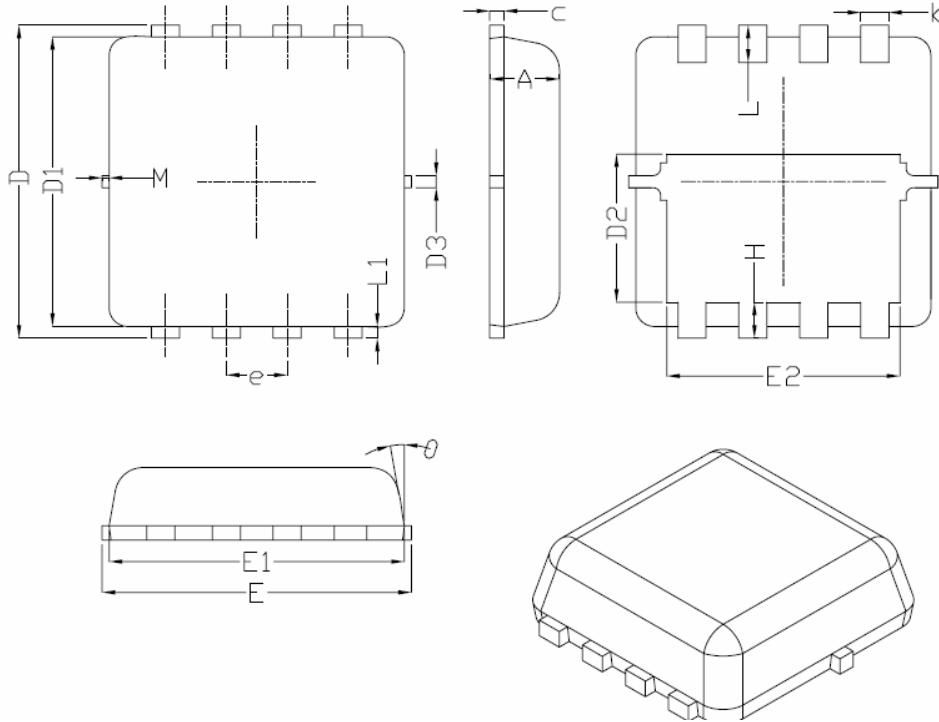


T_J -Junction Temperature(°C)
Figure 10 -Current De-rating



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

DFN3.3X3.3 EP Package Information



SYMBOL	DIMENSIONAL REQMTS		
	MIN	NOM	MAX
<i>A</i>	0.70	0.75	0.80
<i>b</i>	0.25	0.30	0.35
<i>c</i>	0.10	0.15	0.25
<i>D</i>	3.25	3.35	3.45
<i>D1</i>	3.00	3.10	3.20
<i>D2</i>	1.48	1.58	1.68
<i>D3</i>	---	0.13	---
<i>E</i>	3.20	3.30	3.40
<i>E1</i>	3.00	3.15	3.20
<i>E2</i>	2.39	2.49	2.59
<i>e</i>	0.65BSC		
<i>H</i>	0.30	0.39	0.50
<i>L</i>	0.30	0.40	0.50
<i>L1</i>	---	0.13	---
θ	---	10°	12°
<i>M</i>	*	*	0.15
* Not specified			

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