

N-Channel Super Junction Power MOSFET III

General Description

The series of devices use advanced trench gate super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

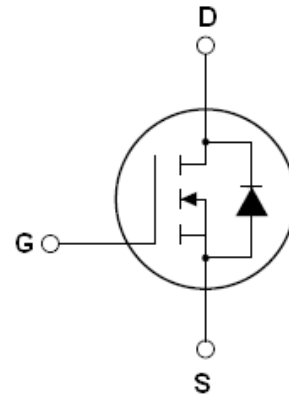
Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

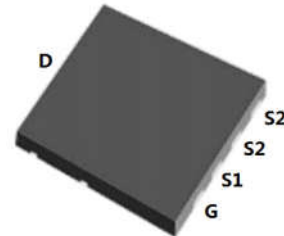
V_{DS}	650	V
$R_{DS(ON) MAX}$	199	mΩ
I_D	21	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65T180V	DFN8×8	NCE65T180V



DFN8×8

Table 1. Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	650	V
Gate-Source Voltage ($V_{DS}=0V$), AC ($f>1\text{ Hz}$)	V_{GS}	± 30	V
Continuous Drain Current at $T_C=25^\circ\text{C}$	$I_{D(DC)}$	21	A
Continuous Drain Current at $T_C=100^\circ\text{C}$	$I_{D(DC)}$	13.2	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	84	A
Maximum Power Dissipation($T_C=25^\circ\text{C}$)	P_D	188	W
Derate above 25°C		1.5	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	441	mJ
Avalanche current (Note 1)	I_{AR}	10.5	A
Repetitive Avalanche energy , t_{AR} limited by T_{Jmax} (Note 1)	E_{AR}	0.7	mJ

Parameter	Symbol	Value	Unit
Drain Source voltage slope, $V_{DS} \leq 480V$,	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS} \leq 480V, I_{SD} < I_D$	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+150	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	0.66	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62.5	°C/W

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650			V
Zero Gate Voltage Drain Current($T_C=25^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$		0.05	1	μA
Zero Gate Voltage Drain Current($T_C=125^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	3.5	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10.5A$		170	199	m Ω
Dynamic Characteristics						
Forward Transconductance	g_{FS}	$V_{DS} = 20V, I_D = 10.5A$		16		S
Input Capacitance	C_{ISS}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		2250		PF
Output Capacitance	C_{OSS}			83		PF
Reverse Transfer Capacitance	C_{RSS}			1.6		PF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=21A,$ $V_{GS}=10V$		36		nC
Gate-Source Charge	Q_{gs}			14		nC
Gate-Drain Charge	Q_{gd}			8.5		nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=11A,$ $R_G=4\Omega, V_{GS}=10V$		11		nS
Turn-on Rise Time	t_r			6		nS
Turn-Off Delay Time	$t_{d(off)}$			61		nS
Turn-Off Fall Time	t_f			4.5		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_C=25^\circ C$			21	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				84	A
Forward on voltage	V_{SD}	$T_J=25^\circ C, I_{SD}=21A, V_{GS}=0V$		0.9	1.3	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ C, I_F=21A, di/dt=100A/\mu s$		310		nS
Reverse Recovery Charge	Q_{rr}			5		μC
Peak Reverse Recovery Current	I_{rrm}			28		A

Notes 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

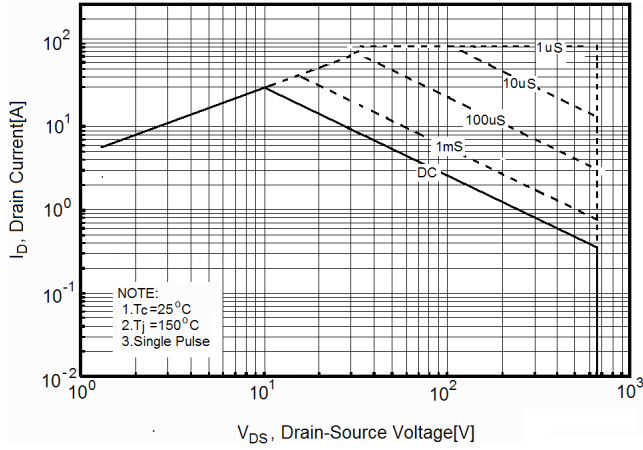


Figure2. Transient Thermal Impedance

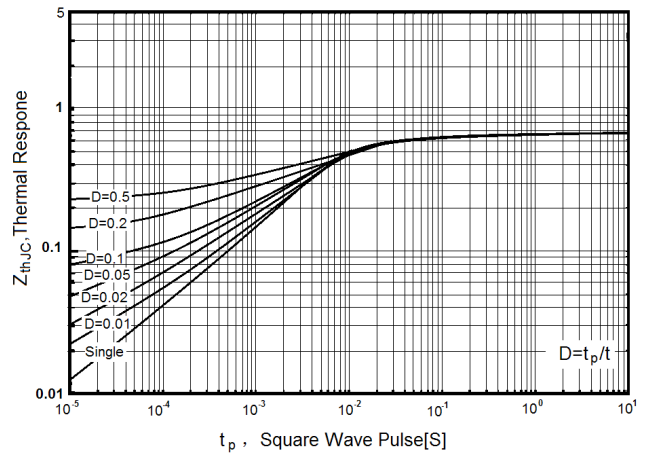


Figure3. Source-Drain Diode Forward Voltage

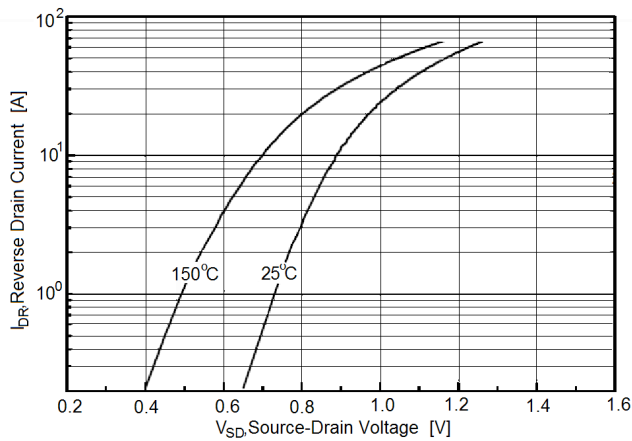


Figure4. Output characteristics

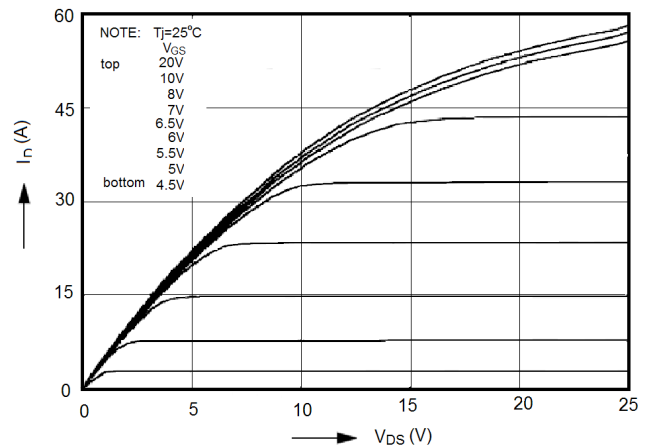


Figure5. Transfer characteristics

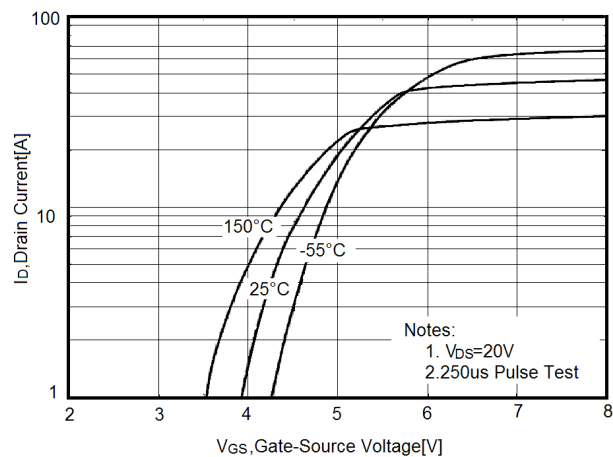


Figure6. Static drain-source on resistance

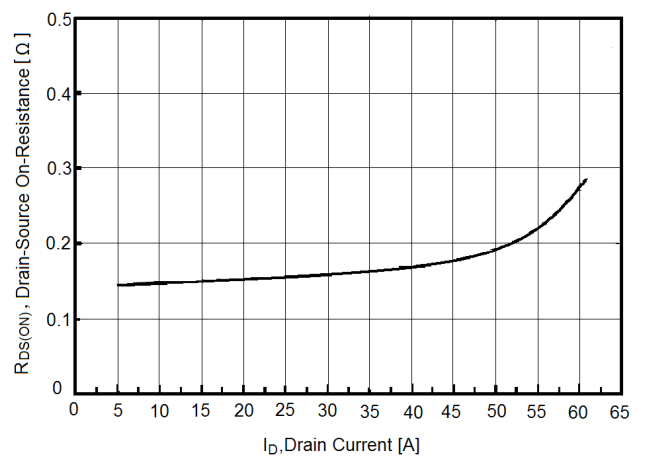


Figure7. $R_{DS(ON)}$ vs Junction Temperature

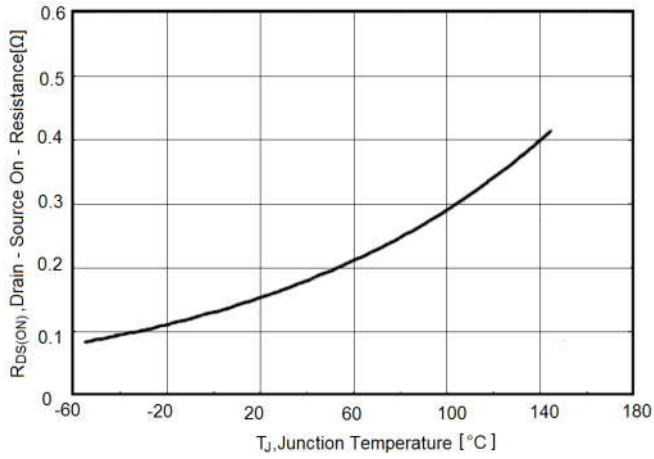


Figure8. BV_{DSS} vs Junction Temperature

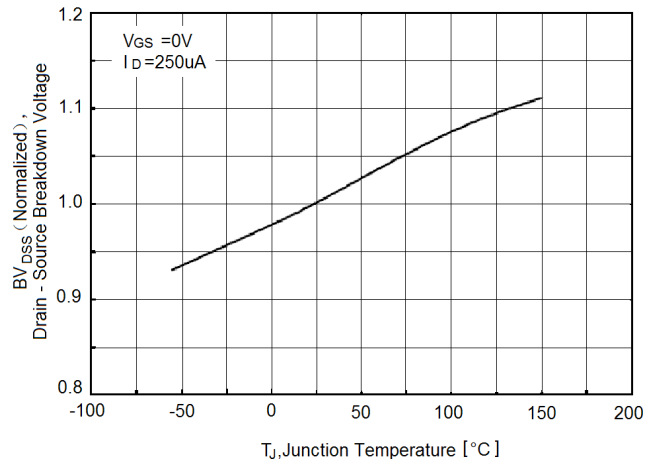


Figure9. Maximum I_D vs Junction Temperature

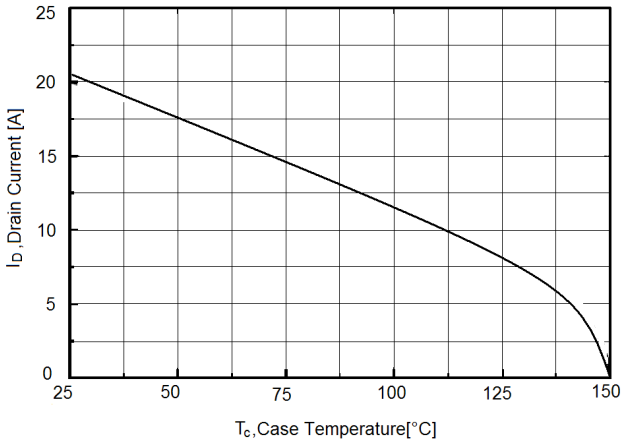


Figure10. Gate charge waveforms

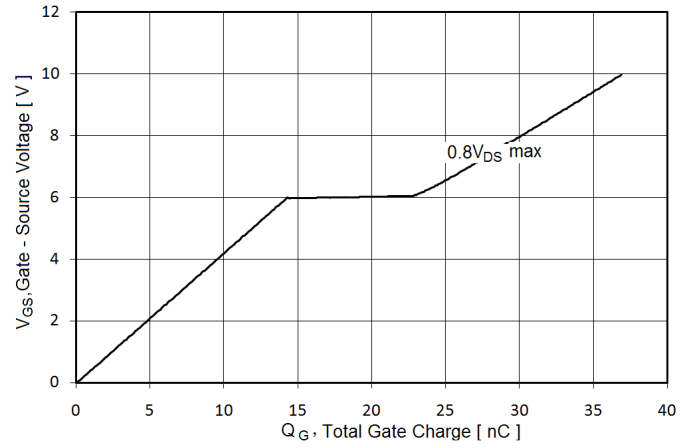
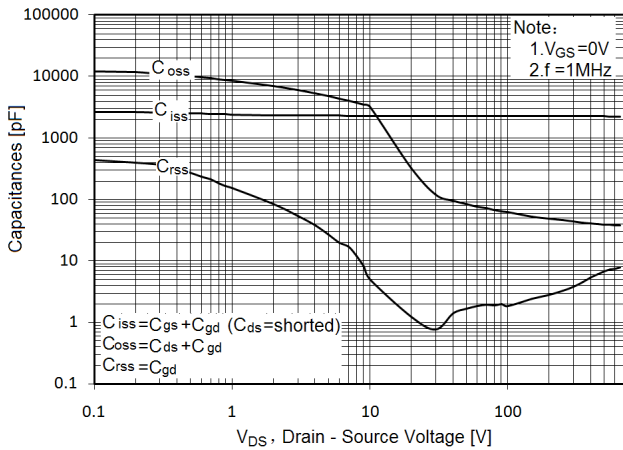
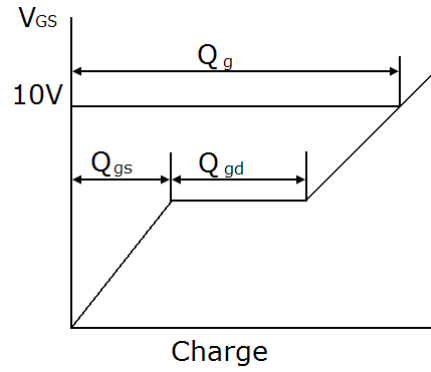
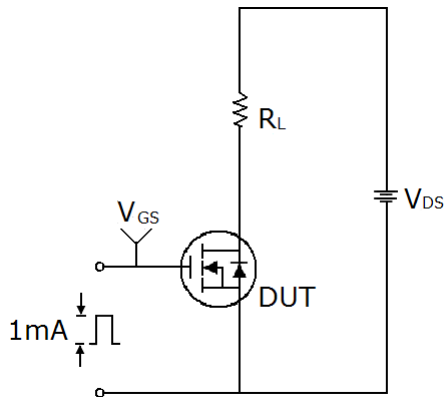


Figure11. Capacitance

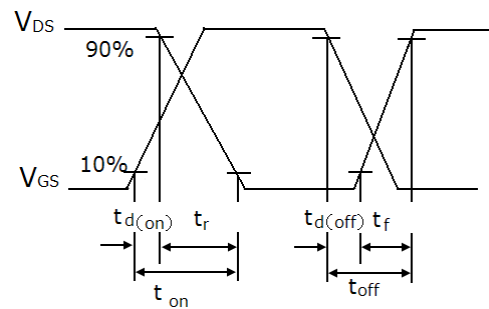
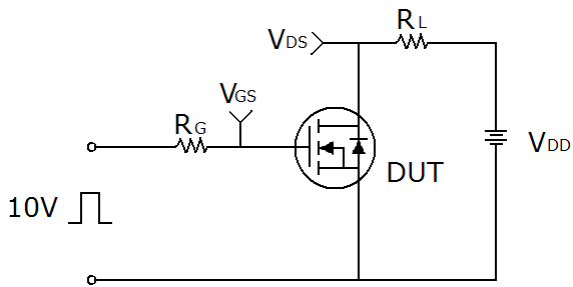


Test circuit

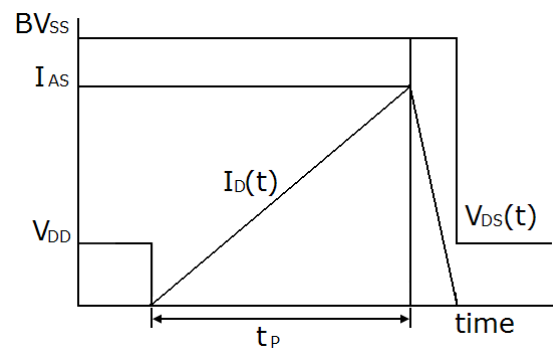
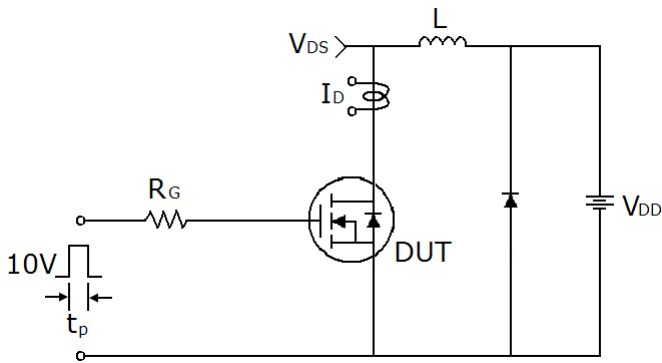
1) Gate charge test circuit & Waveform



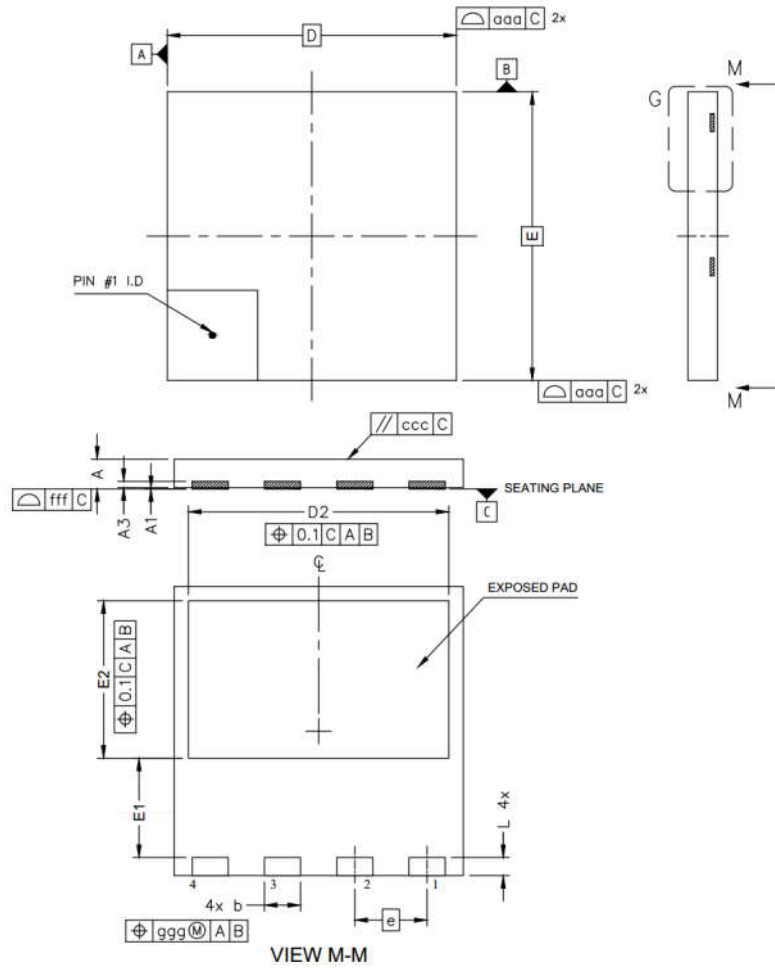
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



DFN 8×8 Package Information



DIM	MIN	NOM	MAX	NOTES
A	0.75	0.85	0.95	1.0 DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994. 2.0 ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES. 3.0 DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.90mm AND 1.10mm FROM TERMINAL TIP. 4.0 DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. 5.0 COPLANARITY APPLIES TO THE EXPOSED HEAT SLUG AS WELL AS THE TERMINAL. 6.0 RADIUS ON TERMINAL IS OPTIONAL.
A1	0.00		0.05	
A3	0.10	0.20	0.30	
b	0.90	1.00	1.10	
D	7.90	8.00	8.10	
E	7.90	8.00	8.10	
D2	7.10	7.20	7.30	
E1	2.65	2.75	2.85	
E2	4.25	4.35	4.45	
e		2.00 BSC		
L	0.40	0.50	0.60	
aaa		0.10		
ggg		0.05		
ccc		0.05		
fff		0.05		

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