

N-Channel Super Junction Power MOSFET IV

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.

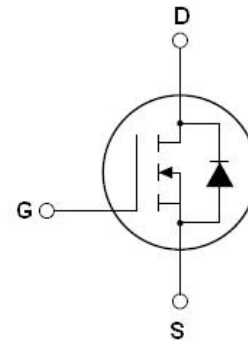
Features

- Optimized body diode reverse recovery performance
- 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)
- LLC Half-bridge

$V_{DS\ min@T_{jmax}}$	710	V
$R_{DS(ON)TYP}$	165	mΩ
ID	18	A
Qg	30	nC

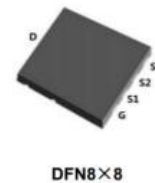


Schematic diagram

✧ Intrinsic fast-recovery body diode

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65NF190V	DFN8*8	NCE65NF190V



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
Gate-Source Voltage ($V_{DS}=0V$) DC	V_{GS}	± 20	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	18	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	12.6	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	54	A
Maximum Power Dissipation($T_c=25^\circ\text{C}$)	P_D	194	W
Derate above 25°C		1.29	W/ $^\circ\text{C}$
Avalanche current(Note 1)	I_{AS}	4	A
Drain Source voltage slope, $V_{DS} \leq 480\text{ V}$,	dv/dt	50	V/ns
Reverse diode dv/dt , $V_{DS} \leq 480\text{ V}, I_{SD} < I_D$	dv/dt	50	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+175	$^\circ\text{C}$

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	0.77	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	$^{\circ}\text{C}/\text{W}$

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(Tc=25°C)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			10	μA
Zero Gate Voltage Drain Current(Tc=125°C)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			300	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.5	4.2	5.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=9A$		165	190	m Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$		1550	1950	pF
Output Capacitance	C_{oss}			60		pF
Reverse Transfer Capacitance	C_{rss}			5		pF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=9A,$ $V_{GS}=10V$		30		nC
Gate-Source Charge	Q_{gs}			12.5		nC
Gate-Drain Charge	Q_{gd}			11		nC
Gate plateau voltage	V_{gp}			7.5		V
Intrinsic gate resistance	R_G	$f = 1 \text{ MHz open drain}$		1.5		Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=9A,$ $R_G=1.7\Omega, V_{GS}=10V$		43		nS
Turn-on Rise Time	t_r			17		nS
Turn-Off Delay Time	$t_{d(off)}$			94		nS
Turn-Off Fall Time	t_f			26		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_C=25^{\circ}\text{C}$			18	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				54	A
Forward On Voltage	V_{SD}	$T_j=25^{\circ}\text{C}, I_{SD}=18A, V_{GS}=0V$		0.9	1.2	V
Reverse Recovery Time	t_{rr}	$T_j=25^{\circ}\text{C}, I_F=9A,$ $di/dt=100A/\mu s$		125		nS
Reverse Recovery Charge	Q_{rr}			0.51		μC
Peak Reverse Recovery Current	I_{rrm}			8.2		A

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

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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

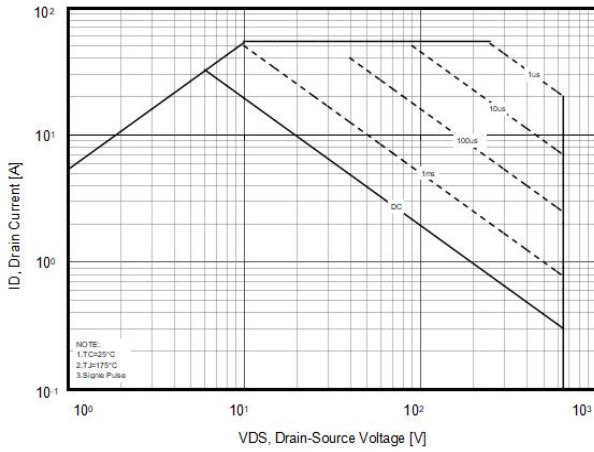


Figure2. Capacitance

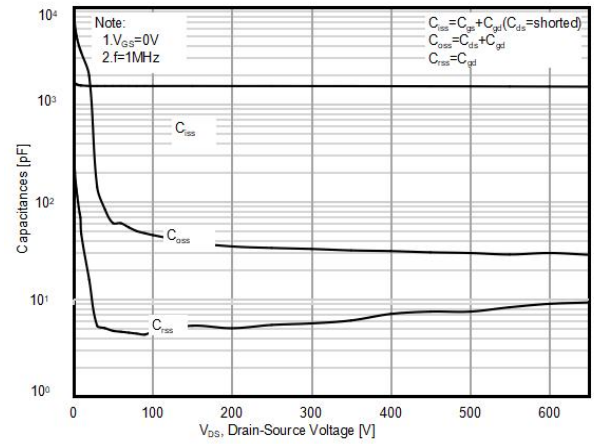


Figure3. Transfer characteristics

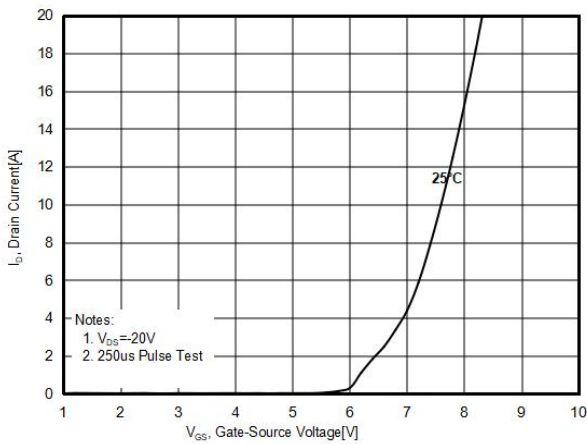


Figure4. Output characteristics

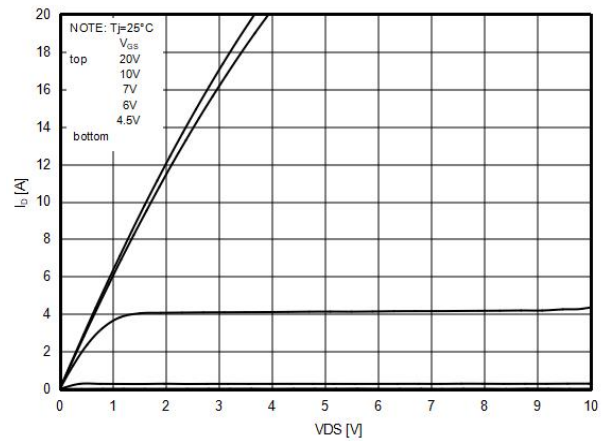


Figure5. $R_{DS(ON)}$ vs Junction Temperature

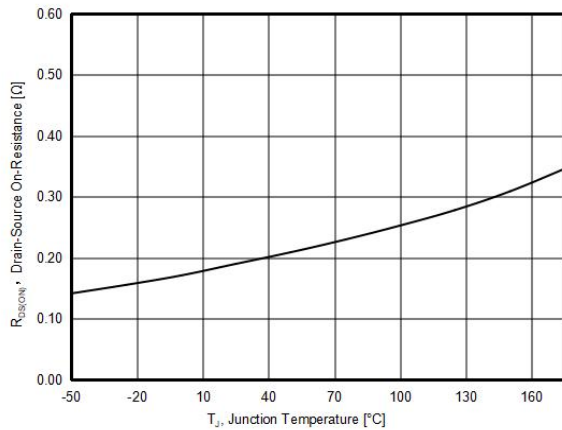


Figure6. BV_{DSS} vs Junction Temperature

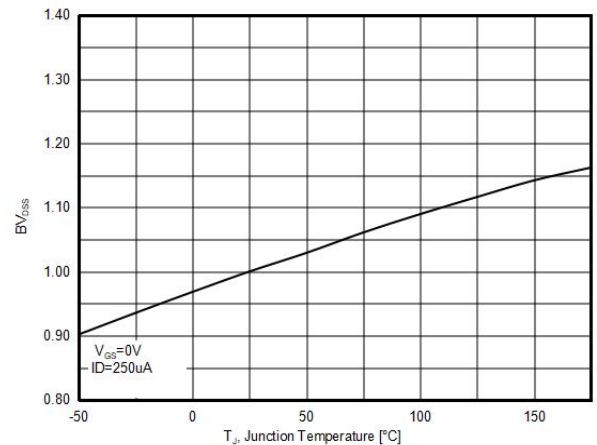


Figure7. Maximum I_D vs Junction Temperature

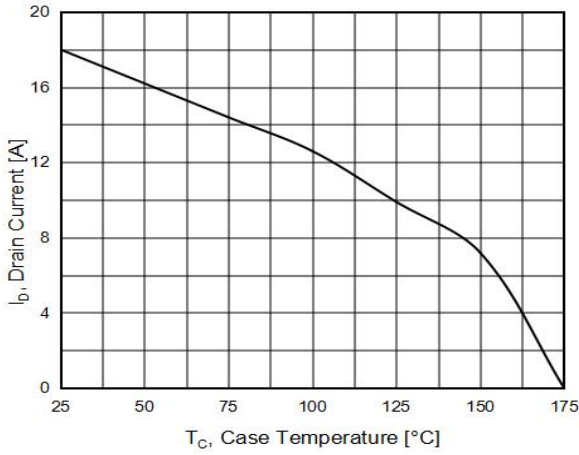


Figure8. Gate charge waveforms

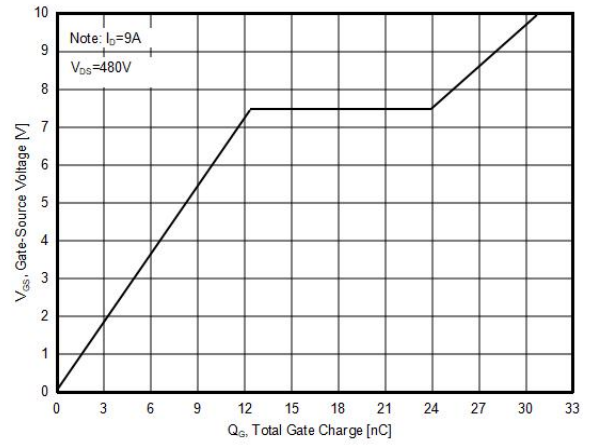


Figure9. Static drain-source on resistance

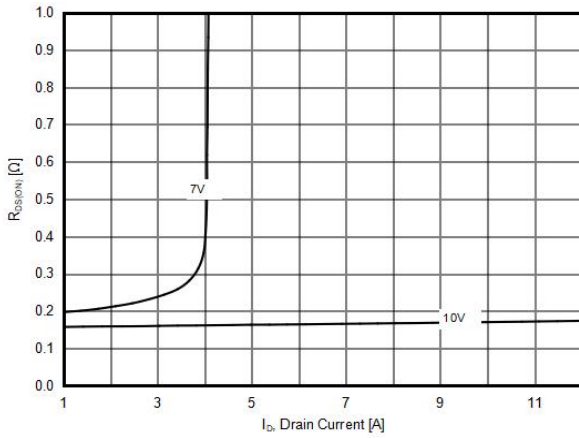
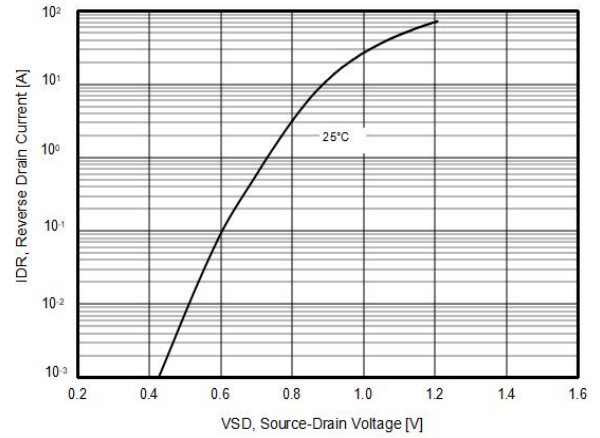


Figure10. Source-Drain Diode Forward Voltage

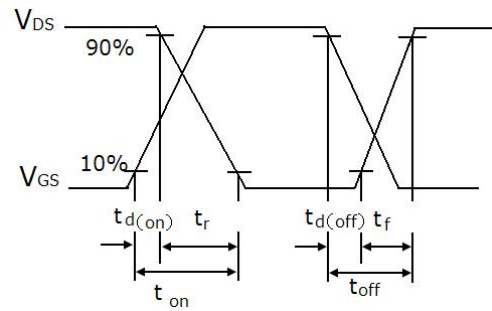


Test circuit

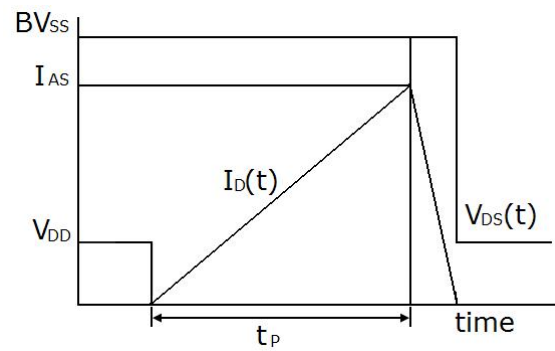
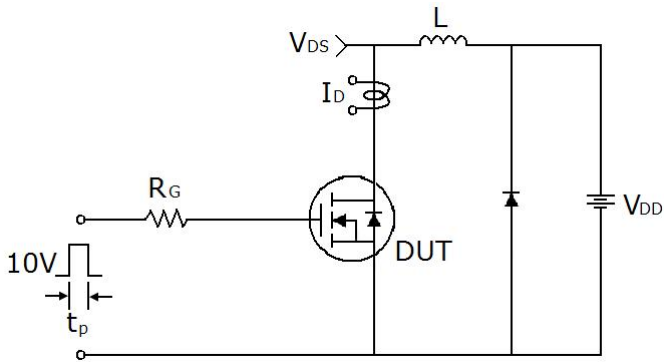
1) Gate charge test circuit & Waveform



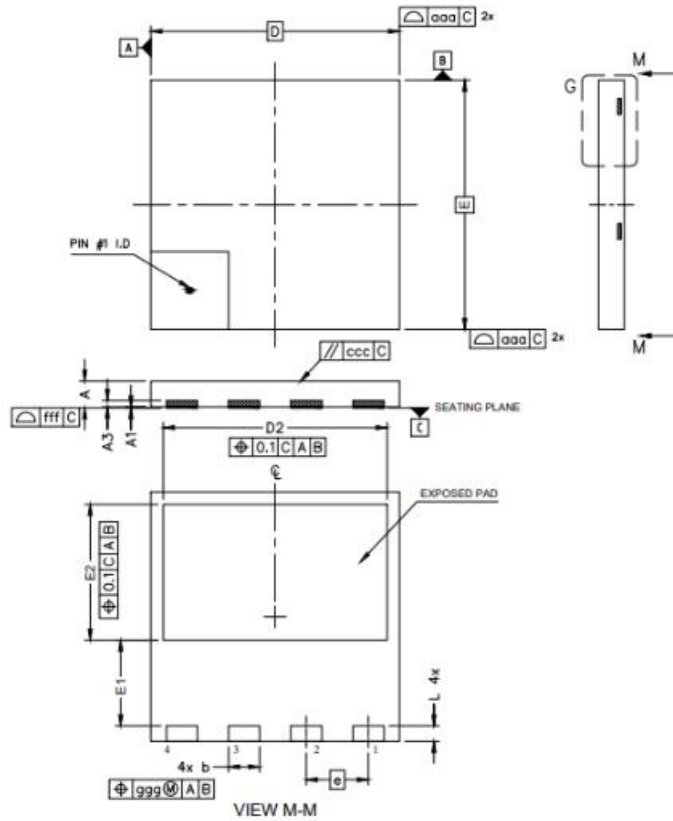
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



DFN8*8-B Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.75	0.95	0.030	0.037
A1	0.00	0.05	0.000	0.002
b	0.90	1.10	0.035	0.043
A3	0.10	0.30	0.004	0.012
D	7.90	8.10	0.311	0.319
E	7.90	8.10	0.311	0.319
D2	7.10	7.30	0.280	0.287
E1	2.65	2.85	0.104	0.112
E2	4.25	4.45	0.167	0.175
e	2.00 BSC		0.079 BSC	
L	0.40	0.60	0.016	0.024

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