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.

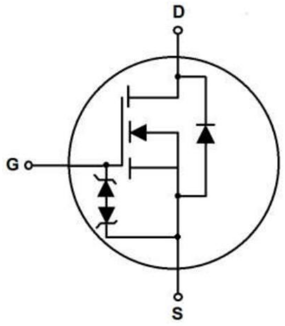
$V_{DS\ min@Tjmax}$	750	V
$R_{DS(ON)TYP.}$	260	mΩ
I_D	13	A
Qg	16.5	nC

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

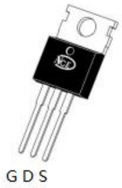
- Power factor correction（PFC）
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply（UPS）
- LLC Half-bridge



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE70N290	TO-220	NCE70N290



TO-220

Table 1. Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V_{GS}=0V）	V_{DS}	700	V
Gate-Source Voltage (V_{DS}=0V) ,AC (f>1 Hz)	V_{GS}	±30	V
Gate-Source Voltage (V_{DS}=0V) ,DC	V_{GS}	±20	V
Continuous Drain Current at Tc=25°C	$I_{D\ (DC)}$	13	A
Continuous Drain Current at Tc=100°C	$I_{D\ (DC)}$	9.1	A
Pulsed drain current (Note 1)	$I_{DM\ (pluse)}$	39	A
Maximum Power Dissipation(Tc=25℃)	P_D	124	W
Derate above 25°C		0.82	W/°C
Single pulse avalanche current (Note 2)	I_{AS}	1.5	A
Reverse diode dv/dt，V_{DS} ≤480 V,I_{SD}<I_D	dv/dt	15	V/ns
Drain Source voltage slope，V_{DS} ≤480 V	dv/dt	50	V/ns
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55...+175	°C

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance，Junction-to-Case（Maximum）	R_{thJC}	1.20	°C /W
Thermal Resistance，Junction-to-Ambient （Maximum）	R_{thJA}	62	°C /W

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250uA	700			V
Zero Gate Voltage Drain Current(Tc=25℃)	I_{DSS}	V_{DS}=700V,V_{GS}=0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I_{DSS}	V_{DS}=700V,V_{GS}=0V			50	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V			±200	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	3		4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=6.5A		260	295	mΩ
Dynamic Characteristics						
Gate Resistance	Rg	F=1MHZ, D-S short		17		Ω
Input Capacitance	C_{iss}	V_{DS}=50V,V_{GS}=0V, F=1MHz		1082		pF
Output Capacitance	C_{oss}			35		pF
Reverse Transfer Capacitance	C_{rss}			9		pF
Total Gate Charge	Q_g	V_{DS}=520V,I_D=6.5A, V_{GS}=10V		16.5		nC
Gate-Source Charge	Q_{gs}			3.9		nC
Gate-Drain Charge	Q_{gd}			3.5		nC
Gate plateau voltage	Vgp			4.6		V
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=520V,I_D=6.5A, R_G=4Ω,V_{GS}=10V		13		nS
Turn-on Rise Time	t_r			8		nS
Turn-Off Delay Time	$t_{d(off)}$			50		nS
Turn-Off Fall Time	t_f			8		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	T_C=25°C			13	A
Pulsed-Source-drain current(Body Diode)	I_{SDM}				39	A
Forward on voltage	V_{SD}	Tj=25°C,I_{SD}=13A,V_{GS}=0V		0.9	1.1	V
Reverse Recovery Time	t_{rr}	Tj=25°C,I_F6.5A, di/dt=100A/μs		220		nS
Reverse Recovery Charge	Q_{rr}			1.1		uC
Peak reverse recovery current	I_{rrm}			10		A

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

2. Tj=25℃,VDD=50V,VG=10V, R_G=25Ω

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

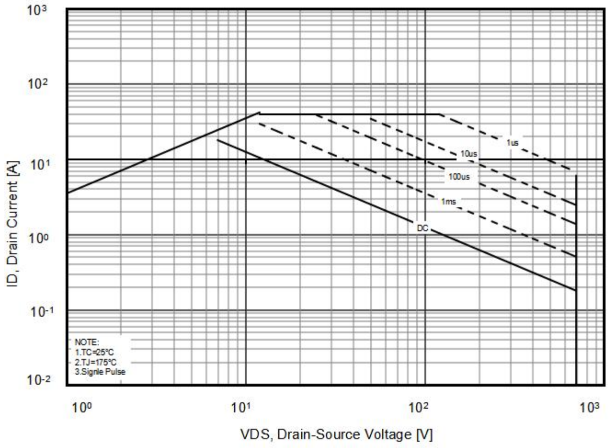


Figure2. Source-Drain Diode Forward Voltage

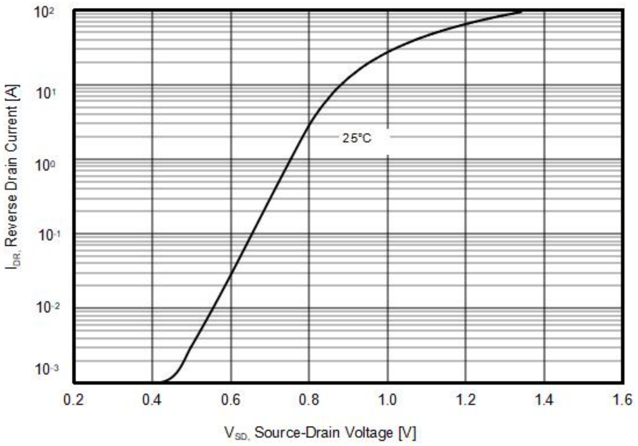


Figure3. Output characteristics

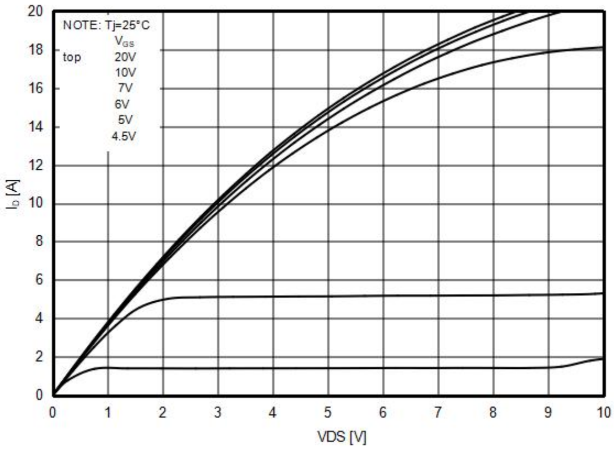


Figure4. Transfer characteristics

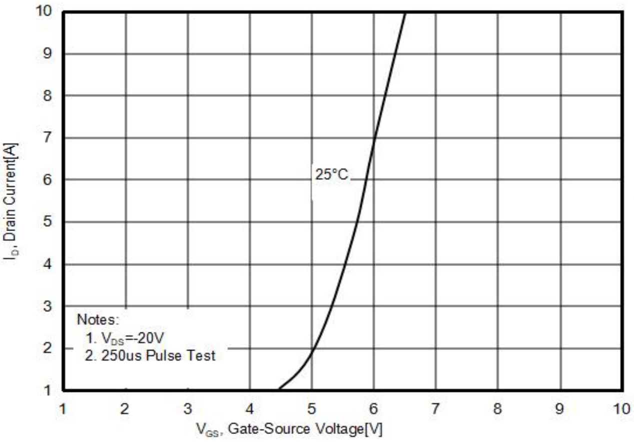


Figure5. Static drain-source on resistance

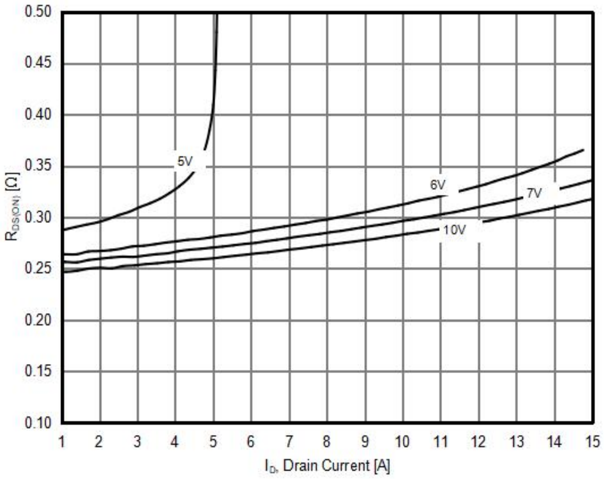


Figure6. $R_{DS(ON)}$ vs Junction Temperature

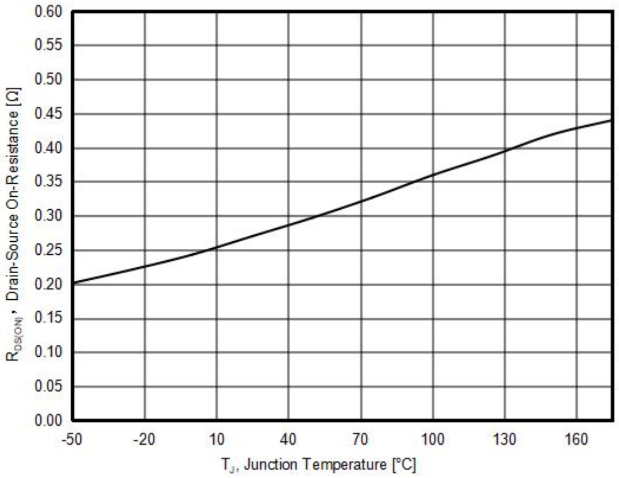


Figure7. BV_{DSS} vs Junction Temperature

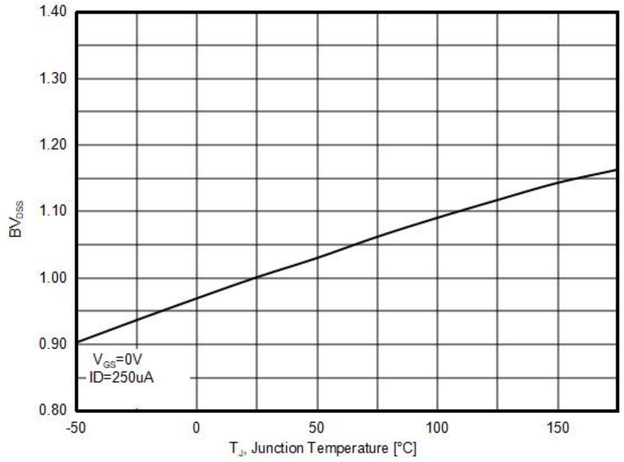


Figure8. Maximum I_D vs Junction Temperature

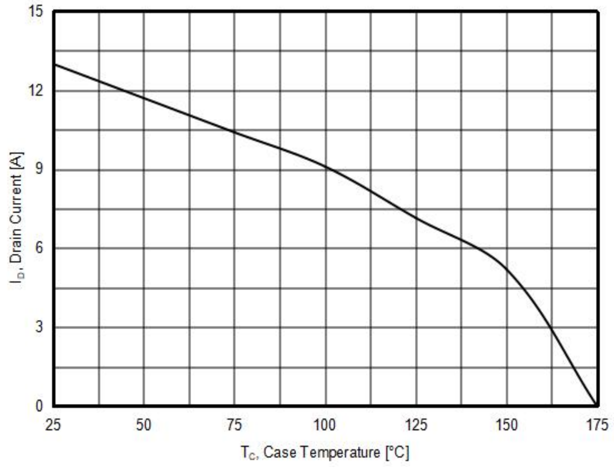


Figure9. Gate charge waveforms

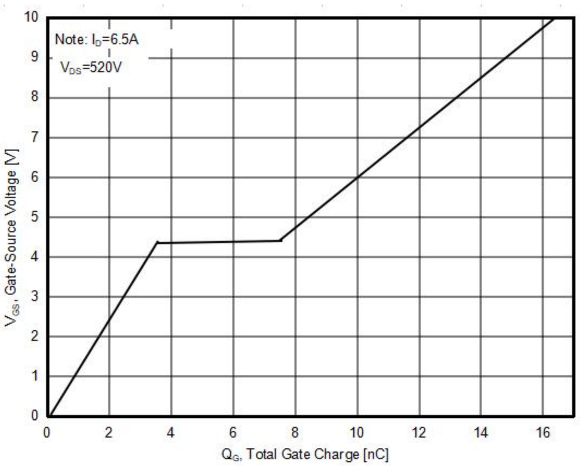
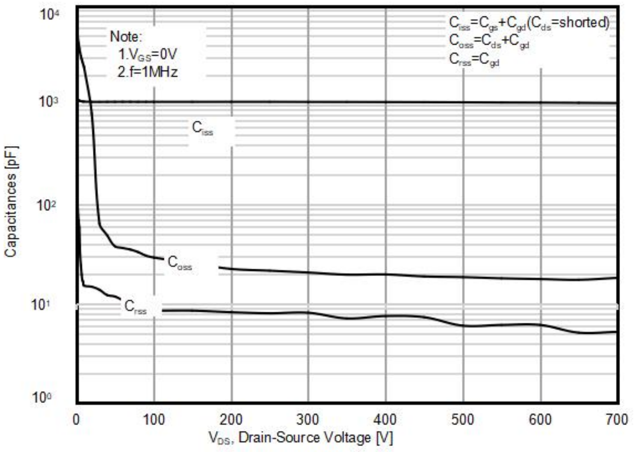
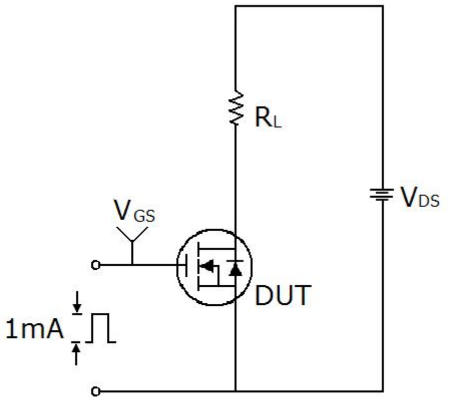


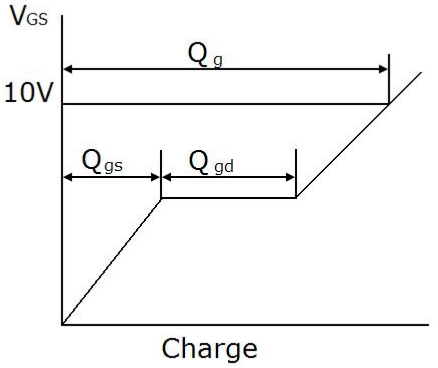
Figure10. Capacitance



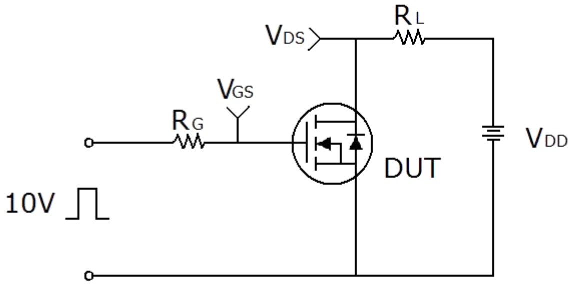
Test circuit

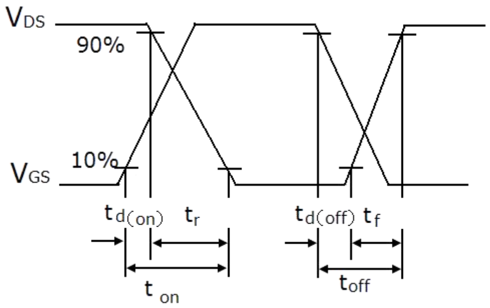
1）Gate charge test circuit & Waveform



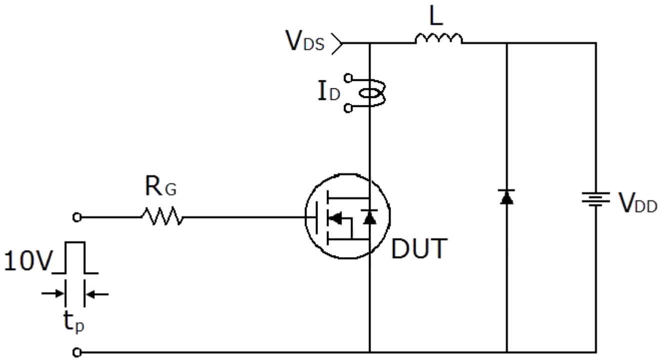


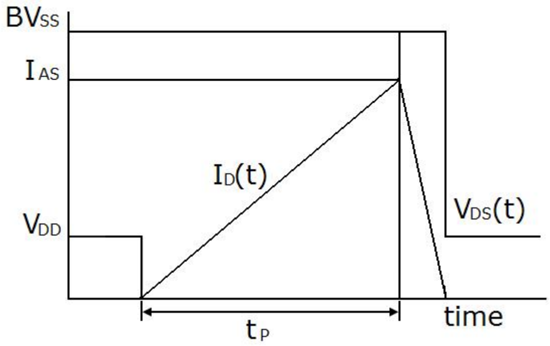
2）Switch Time Test Circuit:



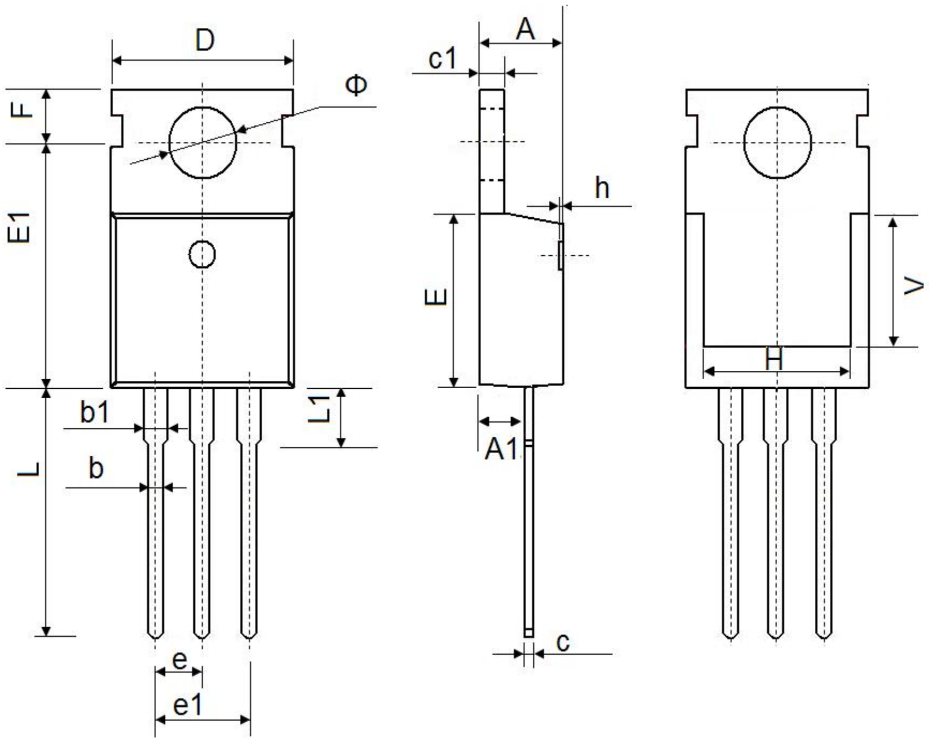


3）Unclamped Inductive Switching Test Circuit & Waveforms





TO-220-E Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	**Max.**	**Min.**	**Max.**
A	4.20	4.60	0.165	0.181
A1	2.25	2.55	0.089	0.100
b	0.70	0.90	0.028	0.035
b1	1.17	1.37	0.046	0.054
c	0.33	0.65	0.013	0.026
c1	1.20	1.40	0.047	0.055
D	9.91	10.25	0.390	0.404
E	8.95	9.75	0.352	0.384
E1	12.80	12.90	0.504	0.508
e	2.54BSC		0.100BSC	
e1	5.08BSC		0.200BSC	
F	2.65	2.95	0.104	0.116
H	7.90	8.10	0.311	0.319
L	12.90	13.40	0.508	0.528
L1	2.85	3.25	0.112	0.128
Φ	3.40	3.80	0.134	0.150

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