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

$V_{DS\ min@Tjmax}$	710	V
$R_{DS(ON)TYP.}$	790	mΩ
I_D	5.1	A
Qg	9	nC
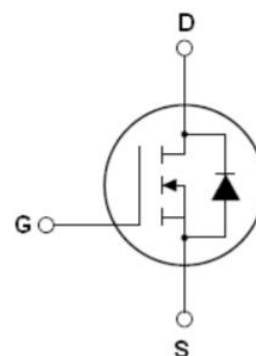
Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65N900R	SOT-223-2L	NCE65N900R

SOT-223-2L

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V_{GS}=0V）	V_{DS}	650	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	$I_{D(DC)}$	5.1	A
Continuous Drain Current at Tc=100°C	$I_{D(DC)}$	3.57	A
Pulsed drain current [Note 1]	$I_{DM(pluse)}$	15.3	A
Maximum Power Dissipation(Tc=25℃)	P_D	5.5	W
Derate above 25°C		0.04	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}	27.27	°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	650			V
Zero Gate Voltage Drain Current(Tc=25℃)	I_{DSS}	V_{DS}=650V,V_{GS}=0V			1	µA
Zero Gate Voltage Drain Current(Tc=125℃)	I_{DSS}	V_{DS}=650V,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=2.5A		790	900	mΩ
Dynamic Characteristics						
Gate Resistance	Rg	F=1MHZ, D-S short		36		Ω
Input Capacitance	C_{Iss}	V_{DS}=50V,V_{GS}=0V, F=1MHz		296		pF
Output Capacitance	C_{oss}			12		pF
Reverse Transfer Capacitance	C_{rss}			4		pF
Total Gate Charge	Q_g	V_{DS}=480V,I_D=2.5A, V_{GS}=10V		9		nC
Gate-Source Charge	Q_{gs}			2.3		nC
Gate-Drain Charge	Q_{gd}			3.2		nC
Gate plateau voltage	Vgp			5.7		V
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=480V,I_D=2.5A, R_G=4Ω,V_{GS}=10V		7		nS
Turn-on Rise Time	t_r			3		nS
Turn-Off Delay Time	$t_{d(off)}$			50		nS
Turn-Off Fall Time	t_f			9		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	T_C=25°C			5.1	A
Pulsed-Source-drain current(Body Diode)	I_{SDM}				15.3	A
Forward on voltage	V_{SD}	Tj=25°C,I_{SD}=5.1A,V_{GS}=0V		0.9	1.1	V
Reverse Recovery Time	t_{rr}	Tj=25°C,I_F2.5A, di/dt=100A/µs		190		nS
Reverse Recovery Charge	Q_{rr}			0.57		uC
Peak reverse recovery current	I_{rrm}			6		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)
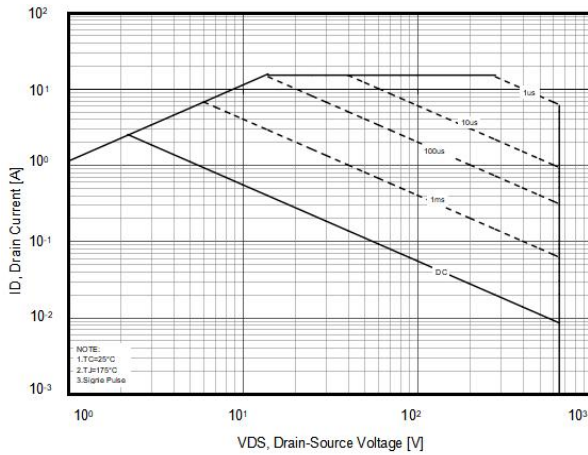
Figure1. Safe operating area

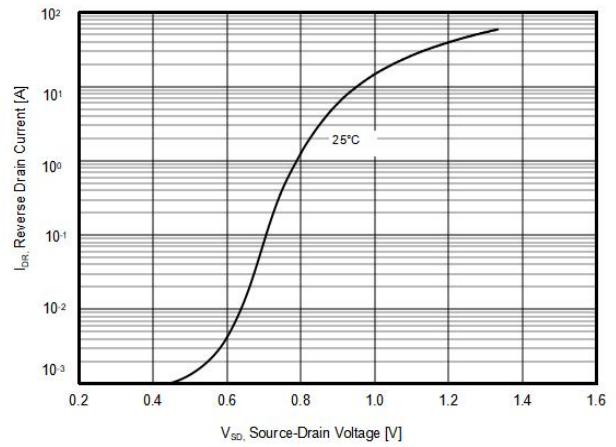### Figure2. Source-Drain Diode Forward Voltage
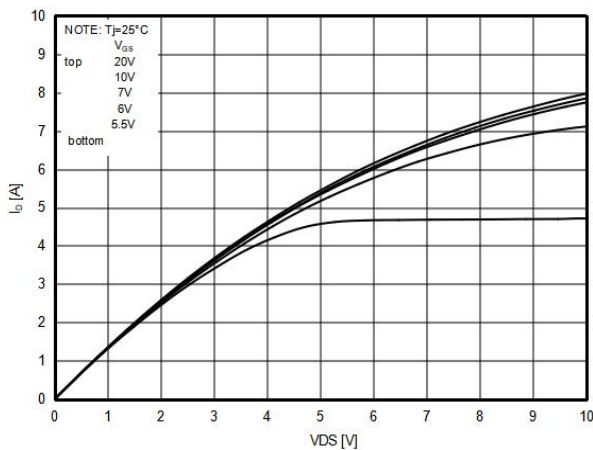

Figure3. Output characteristics

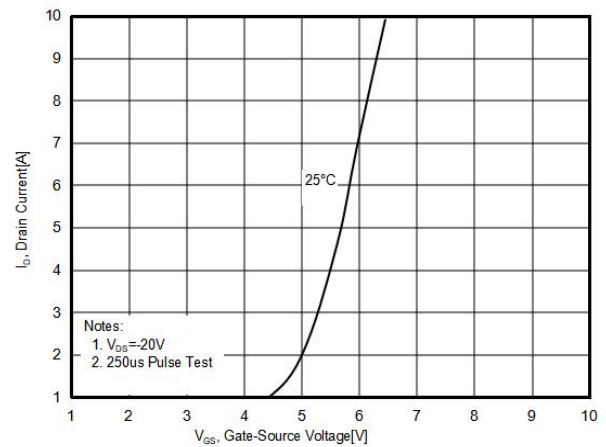### Figure4. Transfer characteristics
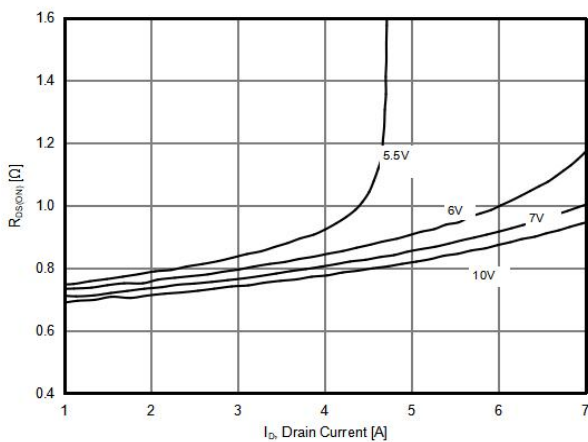

Figure5. Static drain-source on resistance

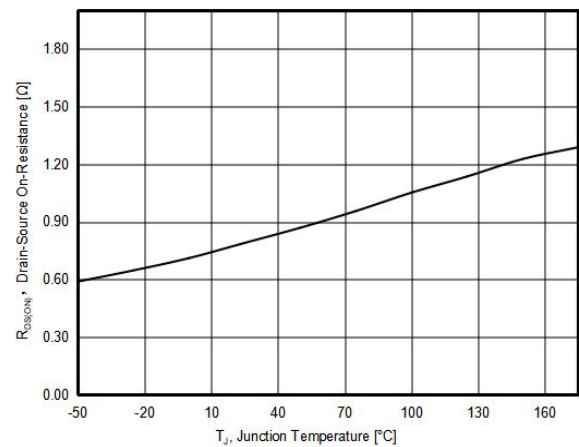### Figure6. $R_{DS(ON)}$ vs Junction Temperature
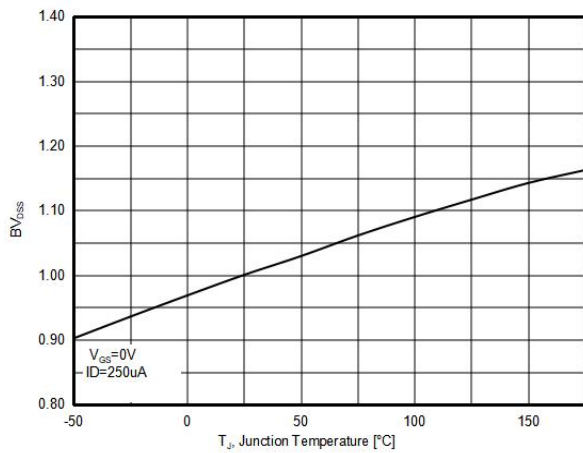
Figure7. BV$_{DSS}$ vs Junction Temperature

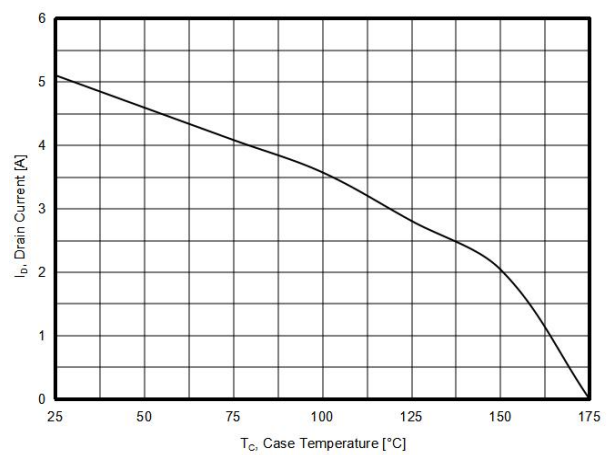### Figure8. Maximum I$_D$ vs Junction Temperature

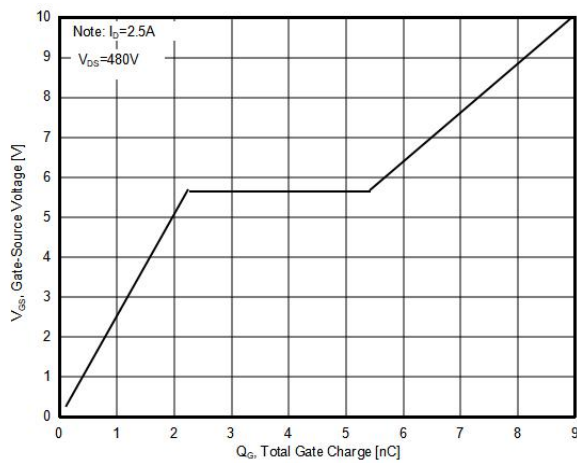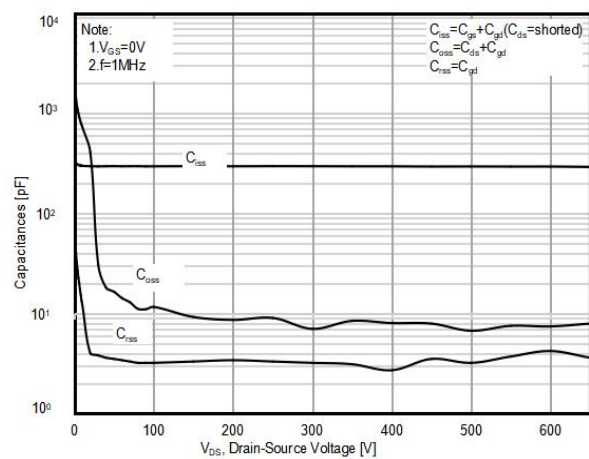### Figure9. Gate charge waveforms

Figure10. Capacitance

Test circuit

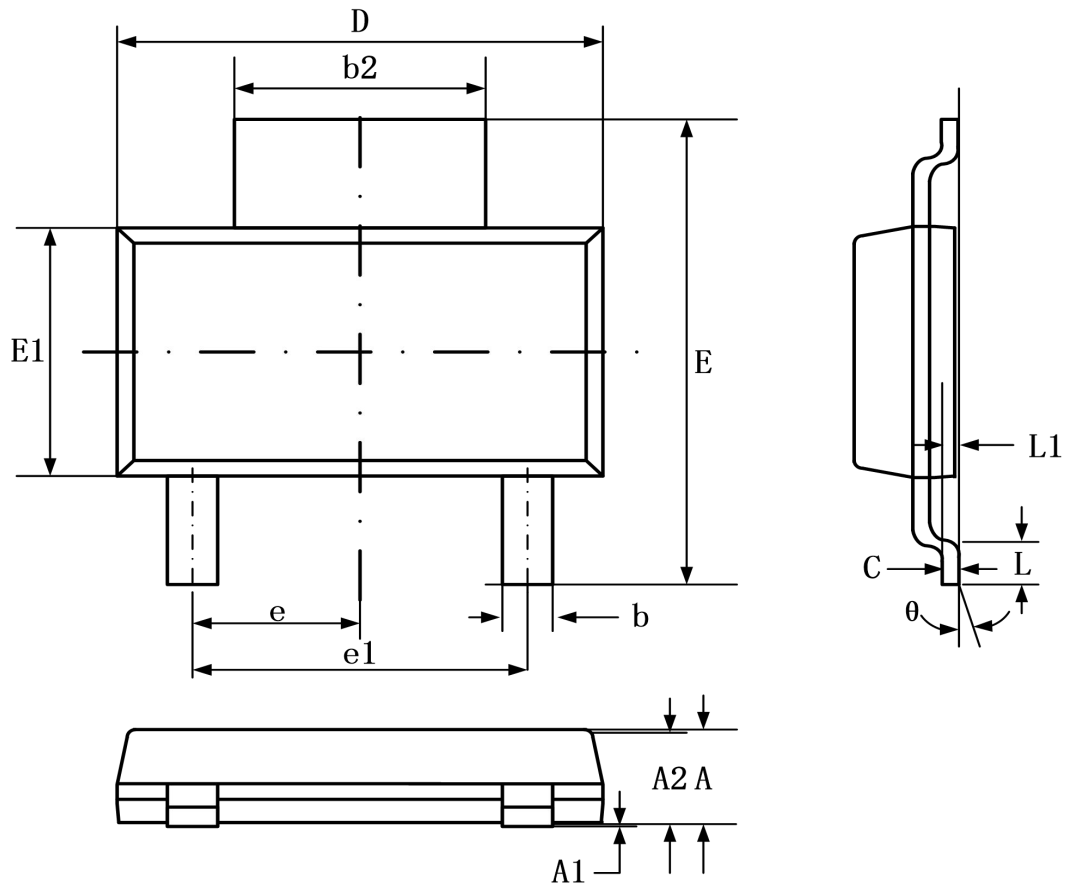## 1）Gate charge test circuit & Waveform

2）Switch Time Test Circuit：

3）Unclamped Inductive Switching Test Circuit & Waveforms

SOT-223-2L   Package Information

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	**Max.**	**Min.**	**Max.**
A	——	1.8	——	0.071
A1	0.02	0.1	0.001	0.004
A2	1.5	1.7	0.059	0.067
b	0.66	0.84	0.026	0.033
b2	2.9	3.1	0.114	0.122
c	0.23	0.35	0.009	0.014
D	6.3	6.7	0.248	0.264
E	6.7	7.3	0.264	0.287
E1	3.3	3.7	0.13	0.146
e	2.30 BSC.		0.091 BSC.	
e1	4.60 BSC.		0.182 BSC.	
L	0.81	——	0.032	——
L1	0.25 BSC.		0.032 BSC.	
θ	0°	10°	0°	10°

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