

## N-Channel Super Junction Power MOSFET II

#### **General Description**

The series of devices use advanced super junction technology and design to provide excellent R<sub>DS(ON)</sub> 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.

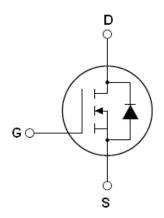
#### **Features**

- 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)

$V_{DS}$	700	V
R <sub>DS(ON)TYP</sub> .	840	mΩ
$I_D$	5	A



Schematic diagram

#### **Package Marking And Ordering Information**

Device	Device Package	Marking
NCE70R900I	TO-251	NCE70R900I
NCE70R900K	TO-252	NCE70R900K





TO-251

**TO-252** 

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V <sub>GS</sub> =0V)	V <sub>DS</sub>	700	V
Gate-Source Voltage (VDS=0V)	V <sub>G</sub> s	±30	V
Continuous Drain Current at Tc=25°C	I <sub>D (DC)</sub>	5	Α
Continuous Drain Current at Tc=100°C	I <sub>D (DC)</sub>	3	Α
Pulsed drain current (Note 1)	I <sub>DM (pluse)</sub>	15	Α
Drain Source voltage slope, VDS = 480 V, ID = 5 A, Tj = 125 °C	dv/dt	48	V/ns
Maximum Power Dissipation(Tc=25℃)	P <sub>D</sub>	49	W
Derate above 25°C		0.39	w/°C
Single pulse avalanche energy (Note2)	Eas	135	mJ
Avalanche current <sup>(Note 1)</sup>	I <sub>AR</sub>	2.5	Α



## NCE70R900I, NCE70R900K

Parameter	Symbol	Value	Unit
Repetitive Avalanche energy , $t_{\text{AR}}$ limited by $T_{\text{jmax}}$ (Note 1)	E <sub>AR</sub>	0.4	mJ
Operating Junction and Storage Temperature Range	$T_{J}, T_{STG}$	-55+150	°C

#### Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	2.55	°C /W
Thermal Resistance, Junction-to-Ambient (Maximum)	R <sub>thJA</sub>	75	°C /W

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

Parameter	Symbol	Condition	Min	Тур	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	700			V
Zero Gate Voltage Drain Current(Tc=25℃)	I <sub>DSS</sub>	V <sub>DS</sub> =700V,V <sub>GS</sub> =0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I <sub>DSS</sub>	V <sub>DS</sub> =700V,V <sub>GS</sub> =0V			50	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V,V <sub>DS</sub> =0V			±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	2.5	3	3.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =2.5A		840	950	mΩ
Dynamic Characteristics			•			•
Forward Transconductance	<b>g</b> FS	V <sub>DS</sub> = 20V, I <sub>D</sub> = 3A		4.8		S
Input Capacitance	C <sub>lss</sub>	\/ -50\/\/ -0\/		460		pF
Output Capacitance	Coss	$V_{DS}$ =50V, $V_{GS}$ =0V, F=1.0MHz		45		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	F=1.UIVITZ		3.5		pF
Total Gate Charge	Qg	\/ -400\/  -54		10	20	nC
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS}$ =480V, $I_{D}$ =5A, $V_{GS}$ =10V		1.6		nC
Gate-Drain Charge	$Q_{gd}$	V <sub>GS</sub> =10V		4		nC
Intrinsic gate resistance	R <sub>G</sub>	f = 1 MHz open drain		2.5		Ω
Switching times						
Turn-on Delay Time	t <sub>d(on)</sub>			6		nS
Turn-on Rise Time	t <sub>r</sub>	$V_{DD}$ =380V, $I_{D}$ =3A,		3		nS
Turn-Off Delay Time	t <sub>d(off)</sub>	$R_G$ =18 $\Omega$ , $V_{GS}$ =10 $V$		50	60	nS
Turn-Off Fall Time	t <sub>f</sub>			9	15	nS
Source- Drain Diode Characteristics			•			•
Source-drain current(Body Diode)	I <sub>SD</sub>	T -05°C			5	Α
Pulsed Source-drain current(Body Diode)	I <sub>SDM</sub>	T <sub>C</sub> =25°C			15	Α
Forward on voltage	V <sub>SD</sub>	Tj=25°C,I <sub>SD</sub> =5A,V <sub>GS</sub> =0V		1	1.3	V
Reverse Recovery Time	t <sub>rr</sub>			250		nS
Reverse Recovery Charge	Qrr	Tj=25°C,I <sub>F</sub> =5A,di/dt=100A/µs		2.2		uC
Peak reverse recovery current	I <sub>rrm</sub>			15		Α

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

<sup>2.</sup> Tj=25°C,VDD=50V,VG=10V, R\_G=25 $\Omega$ 





#### TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure 1. Safe operating area

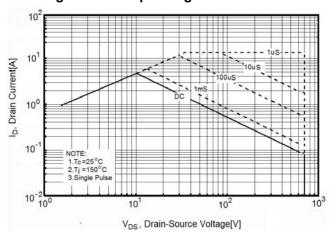


Figure 2. Source-Drain Diode Forward Voltage

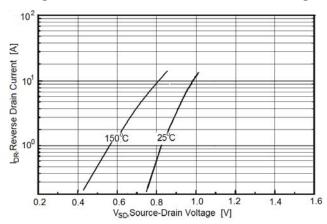


Figure3. Output characteristics

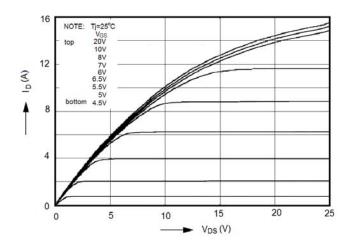


Figure 4. Transfer characteristics

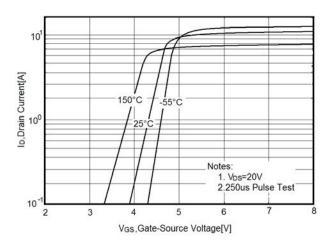


Figure 5. Static drain-source on resistance

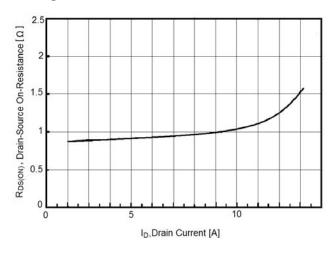
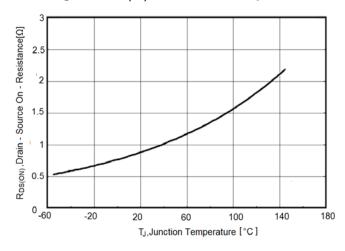


Figure 6. R<sub>DS(ON)</sub> vs Junction Temperature



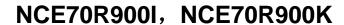




Figure 7. BV<sub>DSS</sub> vs Junction Temperature

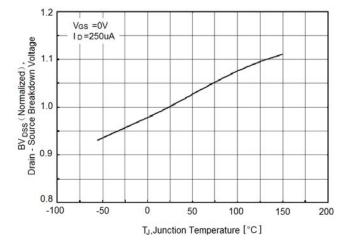


Figure 9. Gate charge waveforms

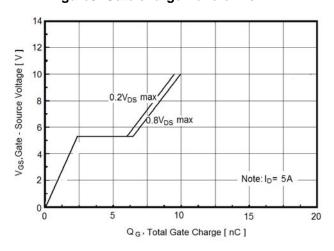


Figure 11. Transient Thermal Impedance

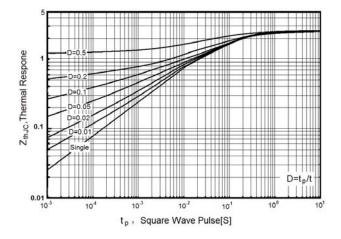


Figure 8. Maximum I<sub>D</sub> vs Junction Temperature

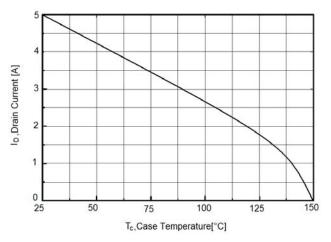
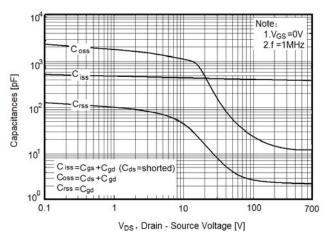


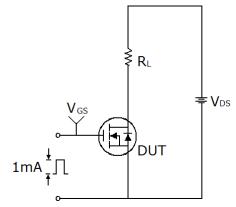
Figure 10. Capacitance

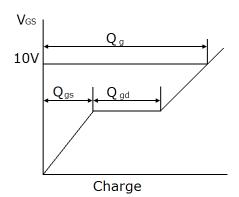




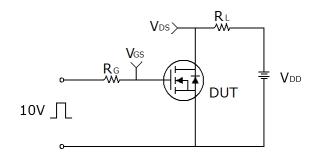
## **Test circuit**

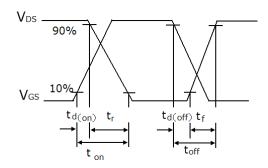
#### 1) Gate charge test circuit & Waveform



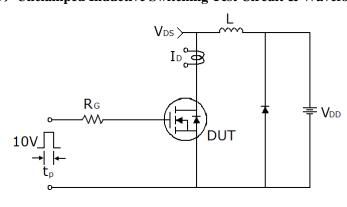


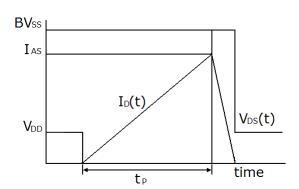
#### 2) Switch Time Test Circuit:





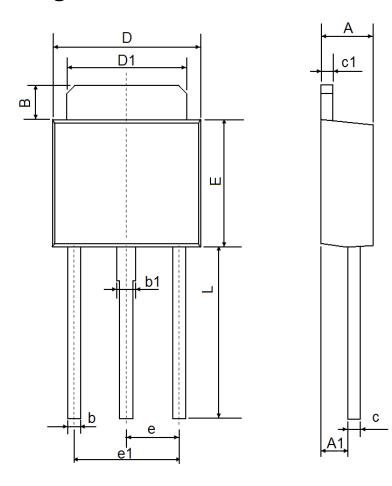
#### 3) Unclamped Inductive Switching Test Circuit & Waveforms







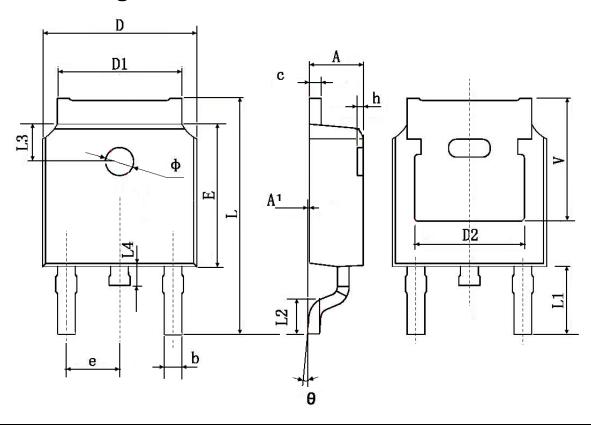
# **TO-251 Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
А	2.200	2.400	0.087	0.094
A1	1.050	1.350	0.042	0.054
В	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
С	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
Е	5.400	5.700	0.213	0.224
е	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311



# **TO-252 Package Information**



Symbol	Dimensions	In Millimeters	Dimensions In Inches		
Symbol	Min.	Max.	Min.	Max.	
Α	2.200	2.400	0.087	0.094	
A1	0.000	0.127	0.000	0.005	
b	0.660	0.860	0.026	0.034	
С	0.460	0.580	0.018	0.023	
D	6.500	6.700	0.256	0.264	
D1	5.100	5.460	0.201	0.215	
D2	0.48	3 TYP.	0.190 TYP.		
E	6.000	6.200	0.236	0.244	
е	2.186	2.386	0.086	0.094	
L	9.800	10.400	0.386	0.409	
L1	2.90	0 TYP.	0.114 TYP.		
L2	1.400	1.700	0.055	0.067	
L3	1.600 TYP.		0.063 TYP.		
L4	0.600	1.000	0.024	0.039	
Ф	1.100	1.300	0.043	0.051	
θ	0°	8°	0°	8°	
h	0.000	0.300	0.000	0.012	
V	5.350 TYP.		0.211	TYP.	

# 新加華CEPOWER

#### NCE70R900I, NCE70R900K

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