N-Channel Super Junction Power MOSFET Ⅱ

General Description

The series of devices use advanced 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.

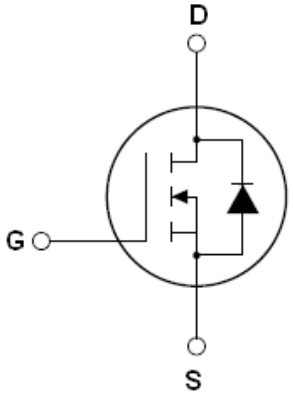
Features

- 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
$R_{DS(ON)\ MAX}$	1200	mΩ
I_D	4	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65R1K2Z	TO-92	NCE65R1K2Z

TO-92

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)	V_{GS}	±30	V
Continuous Drain Current at Tc=25°C	$I_{D\ (DC)}$	4	A
Continuous Drain Current at Tc=100°C	$I_{D\ (DC)}$	2.5	A
Pulsed drain current **(Note 1)**	$I_{DM\ (pluse)}$	12	A
Maximum Power Dissipation(Tc=25℃) Derate above 25°C	P_D	4 0.03	W W/°C
Single pulse avalanche energy **(Note2)**	E_{AS}	130	mJ
Avalanche current **(Note 1)**	I_{AR}	2	A
Repetitive Avalanche energy ， t_{AR} limited by T_{jmax} **(Note 1)**	E_{AR}	0.2	mJ

Parameter	Symbol	Value	Unit
Drain Source voltage slope, V_{DS} ≤480 V,	dv/dt	50	V/ns
Reverse diode dv/dt， V_{DS} ≤480 V,I_{SD}<I_D	dv/dt	15	V/ns
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}	31	°C /W
Thermal Resistance，Junction-to-Ambient （Maximum）	R_{thJA}	180	°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=250μA	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}=±30V,V_{DS}=0V			±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2.5	3	3.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=2A		1000	1200	mΩ
Dynamic Characteristics						
Forward Transconductance	g_{FS}	V_{DS} = 20V, I_D = 2.5A		4		S
Input Capacitance	C_{lss}	V_{DS}=50V,V_{GS}=0V, F=1.0MHz		280		PF
Output Capacitance	C_{oss}			26		PF
Reverse Transfer Capacitance	C_{rss}			2.3		PF
Total Gate Charge	Q_g	V_{DS}=480V,I_D=4A, V_{GS}=10V		6.5	10	nC
Gate-Source Charge	Q_{gs}			1.3		nC
Gate-Drain Charge	Q_{gd}			2.5		nC
Intrinsic gate resistance	R_G	f = 1 MHz open drain		2.5		Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=380V,I_D=2.5A, R_G=20Ω,V_{GS}=10V		6		nS
Turn-on Rise Time	t_r			3		nS
Turn-Off Delay Time	$t_{d(off)}$			48	60	nS
Turn-Off Fall Time	t_f			8	15	nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	T_C=25°C			4	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				12	A
Forward On Voltage	V_{SD}	Tj=25°C,I_{SD}=4A,V_{GS}=0V		1	1.3	V
Reverse Recovery Time	t_{rr}	Tj=25°C,I_F=4A,di/dt=100A/μs		150		nS
Reverse Recovery Charge	Q_{rr}			0.85		uC
Peak reverse recovery current	I_{rrm}			11		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

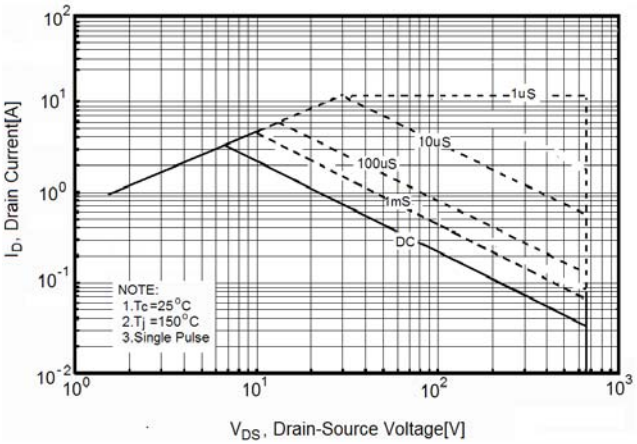


Figure2. Source-Drain Diode Forward Voltage

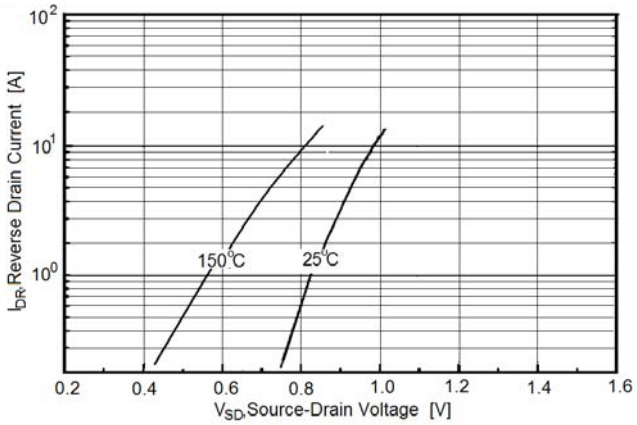


Figure3. Output characteristics

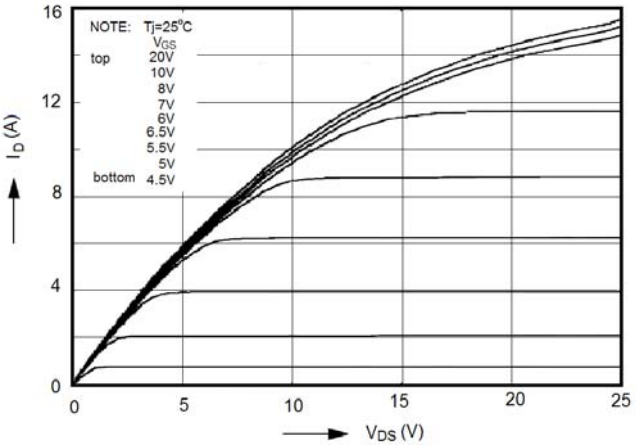


Figure4. Transfer characteristics

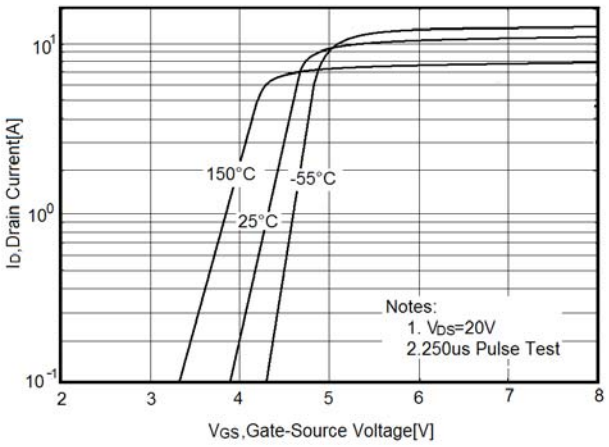


Figure5. Static drain-source on resistance

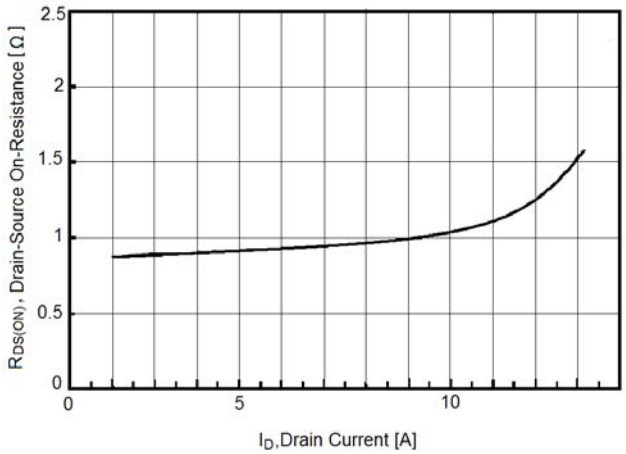


Figure6. $R_{DS(ON)}$ vs Junction Temperature

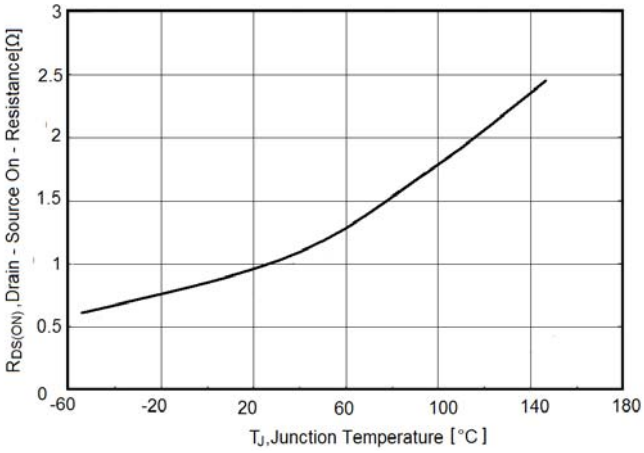


Figure7. BV_{DSS} vs Junction Temperature

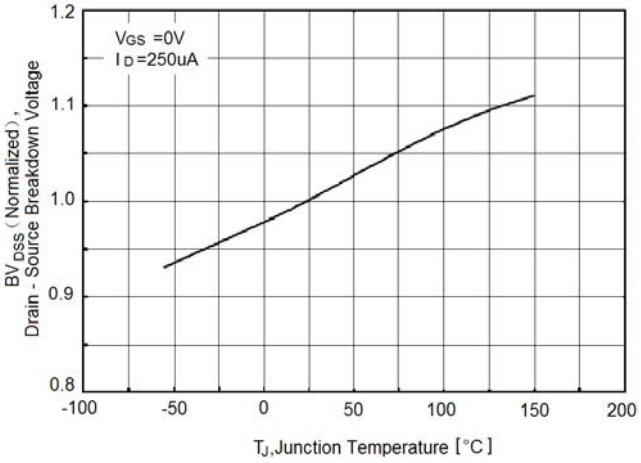


Figure8. Maximum I_D vs Junction Temperature

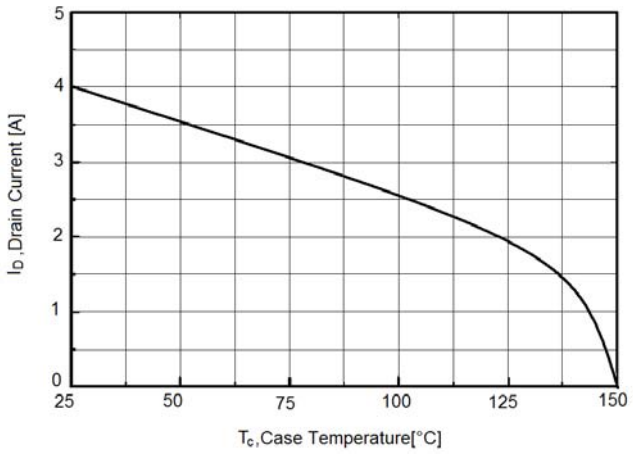


Figure9. Gate charge waveforms

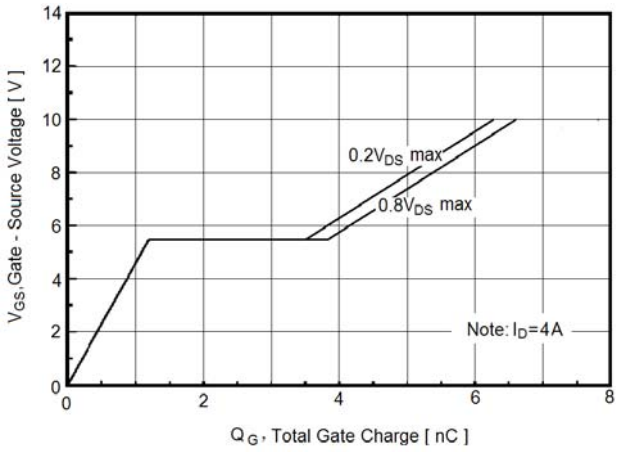
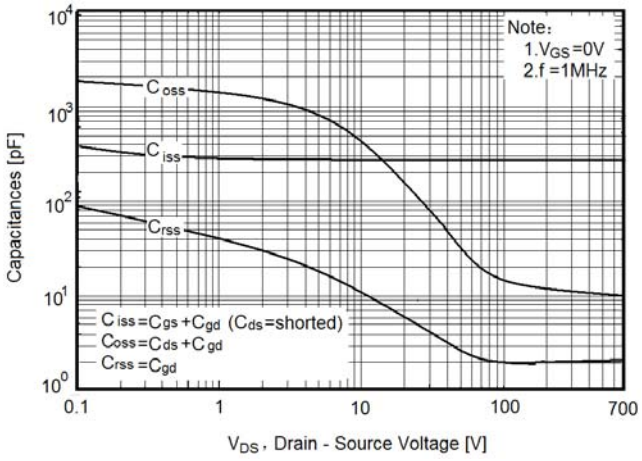
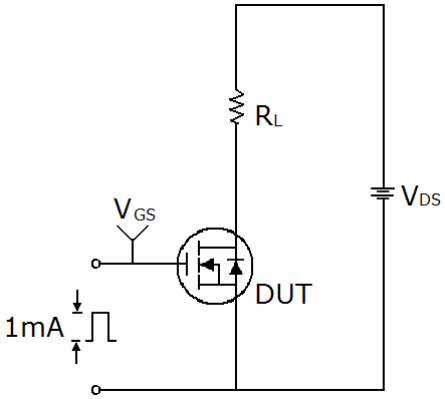


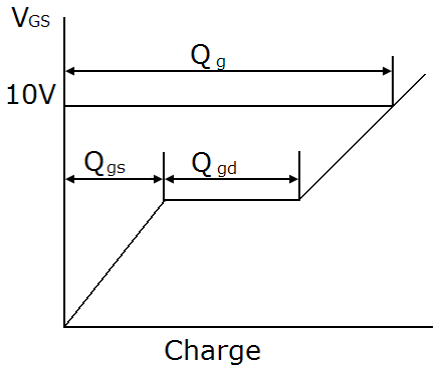
Figure10. Capacitance



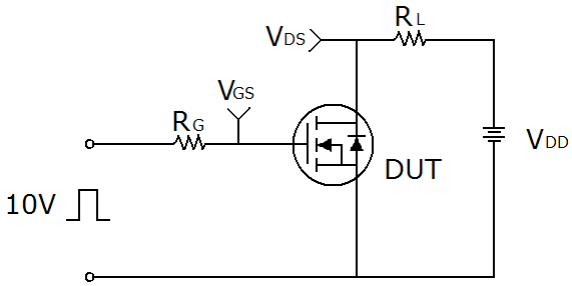
Test circuit

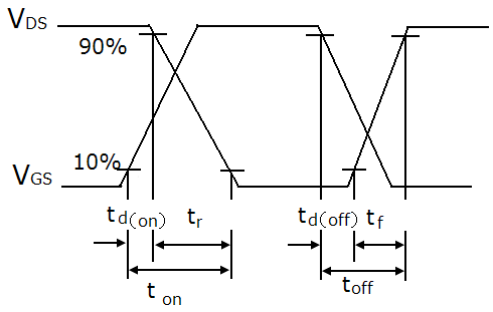
1）Gate charge test circuit & Waveform



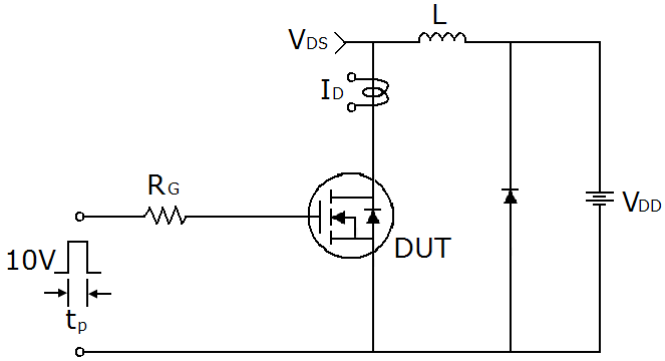


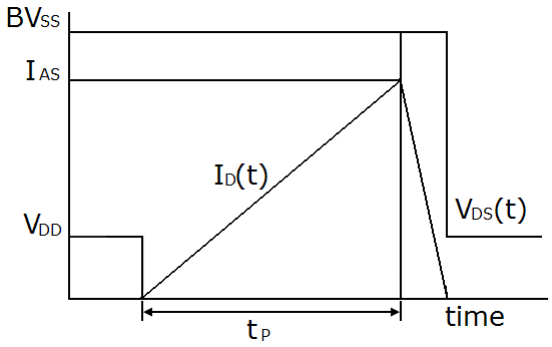
2）Switch Time Test Circuit:



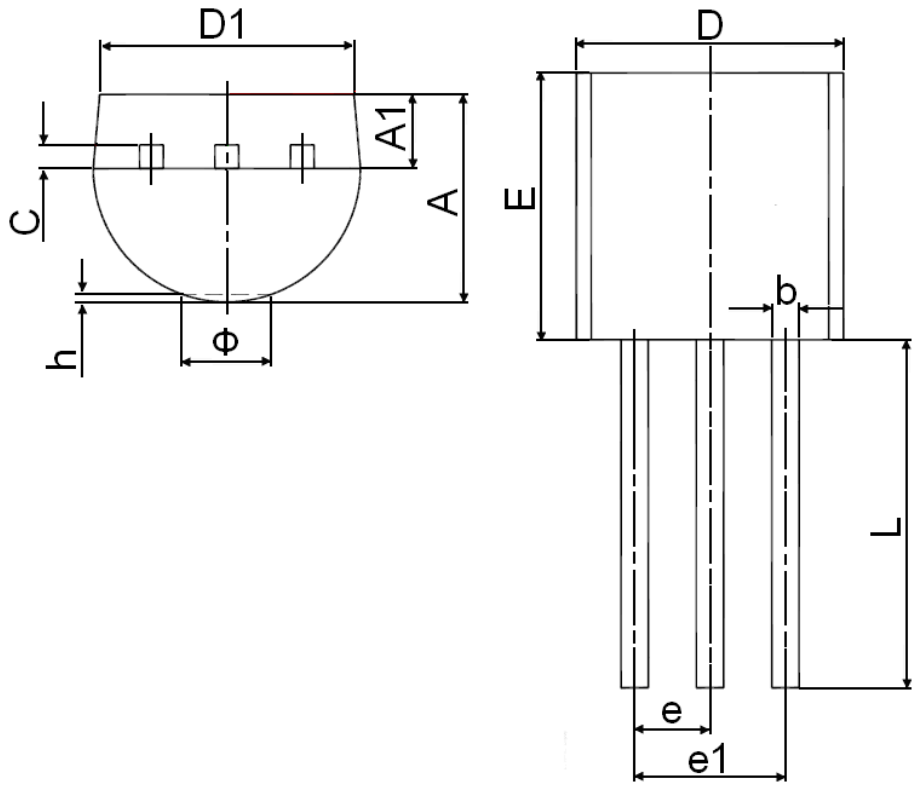


3）Unclamped Inductive Switching Test Circuit & Waveforms





TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.460	0.580	0.018	0.023
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270TYP		0.050TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

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