

N-Channel Super Junction Power MOSFET III

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.

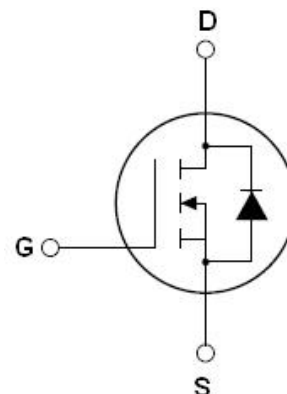
Features

- 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)

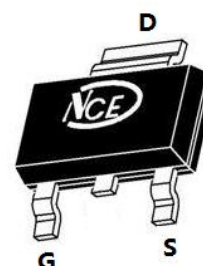
V_{DS}	700	V
$R_{DS(ON)TYP.}$	1100	m Ω
I_D	4	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE70T1K2R	SOT-223-2L	NCE70T1K2R



SOT-223-2L

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	700	V
Gate-Source Voltage ($V_{DS}=0V$), AC ($f>1\text{ Hz}$)	V_{GS}	± 30	V
Gate-Source Voltage ($V_{DS}=0V$)	V_{GS}	± 20	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	4	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	2.5	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	16	A
Maximum Power Dissipation($T_c=25^\circ\text{C}$)	P_D	5.2	W
Single pulse avalanche energy (Note2)	E_{AS}	27	mJ
Avalanche current (Note 1)	I_{AS}	0.7	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax}	E_{AR}	0.1	mJ

(Note 1)			
Parameter	Symbol	Value	Unit
Drain Source voltage slope, $V_{DS} \leq 480V$,	dv/dt	50	V/ns
Reverse diode dv/dt , $V_{DS} \leq 480V, I_{SD} < I_D$	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}	24	°C /W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	°C /W

Table 3. Electrical Characteristics ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	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			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	3		4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =2A		1100	1300	mΩ
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz		304	350	PF
Output Capacitance	C _{oss}			17		PF
Reverse Transfer Capacitance	C _{rss}			0.5		PF
Total Gate Charge	Q _g	V _{DS} =480V, I _D =4A, V _{GS} =10V		8.8	12	nC
Gate-Source Charge	Q _{gs}			2.3		nC
Gate-Drain Charge	Q _{gd}			4		nC
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =380V, I _D =2.5A, R _G =5Ω, V _{GS} =10V		8		nS
Turn-on Rise Time	t _r			4		nS
Turn-Off Delay Time	t _{d(off)}			52	70	nS
Turn-Off Fall Time	t _f			9	18	nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			4	A
Pulsed Source-drain current(Body Diode)	I _{SDM}				16	A
Forward On Voltage	V _{SD}	T _J =25℃, I _{SD} =4A, V _{GS} =0V		0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _J =25℃, I _F =2A, di/dt=100A/μs		200		nS
Reverse Recovery Charge	Q _{rr}			0.6		uC
Peak reverse recovery current	I _{rrm}			6		A

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

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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

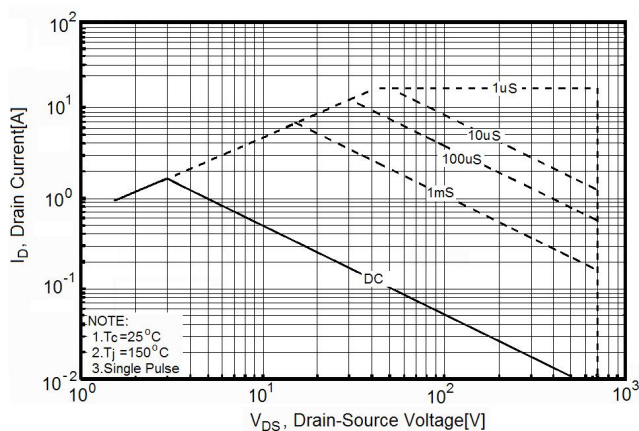


Figure2. Source-Drain Diode Forward Voltage

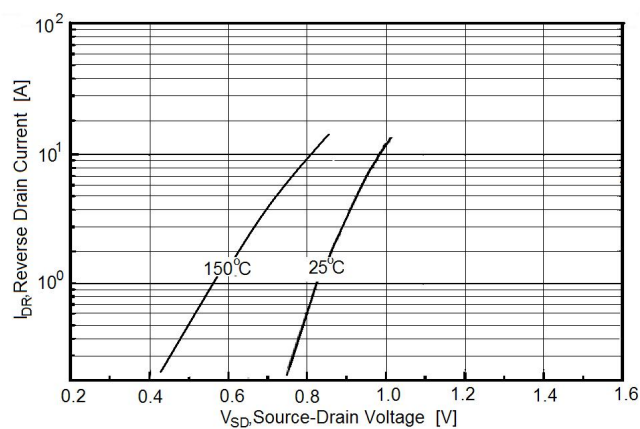


Figure3. Output characteristics

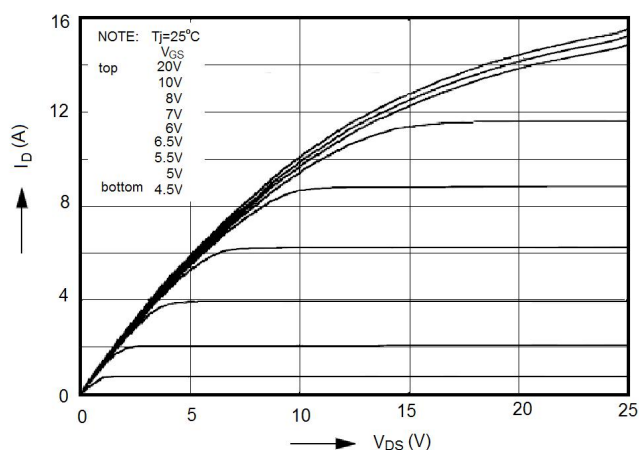


Figure4. Transfer characteristics

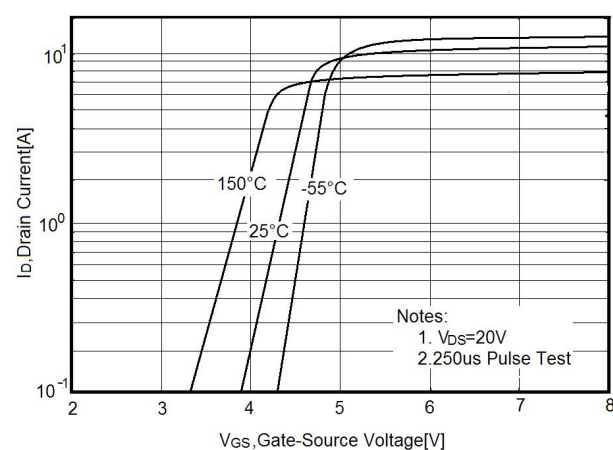


Figure5. Static drain-source on resistance

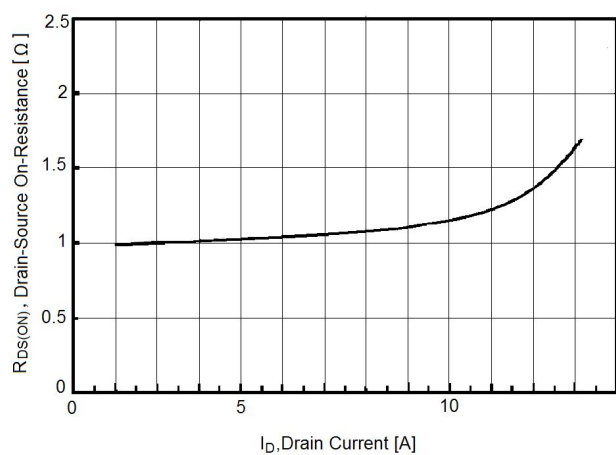


Figure6. $R_{DS(ON)}$ vs Junction Temperature

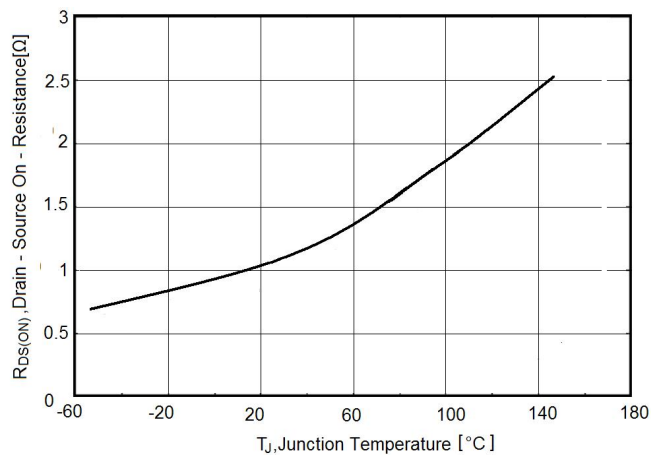


Figure7. BV_{DSS} vs Junction Temperature

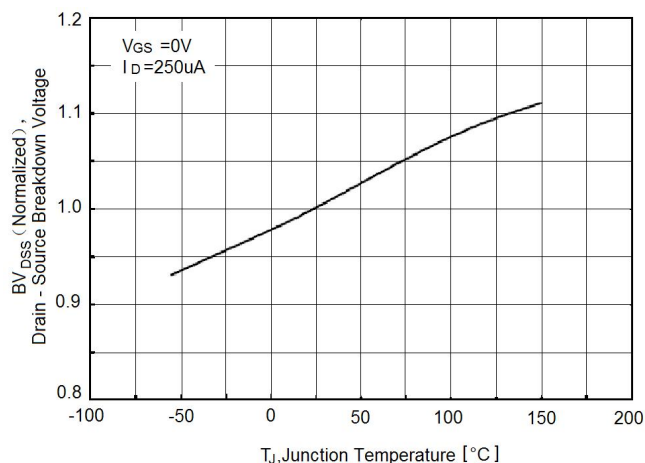


Figure8. Maximum I_D vs Junction Temperature

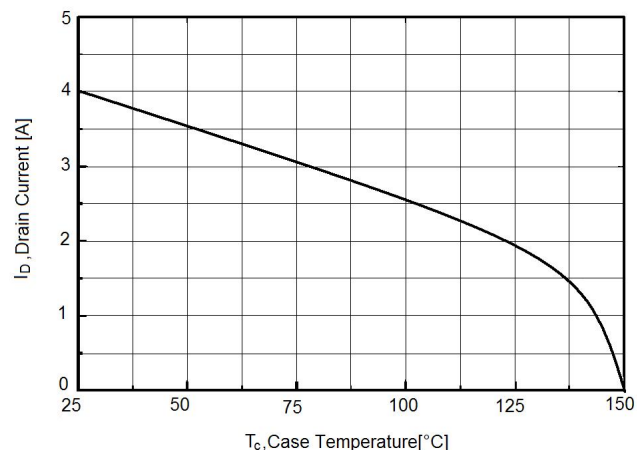


Figure9. Gate charge waveforms

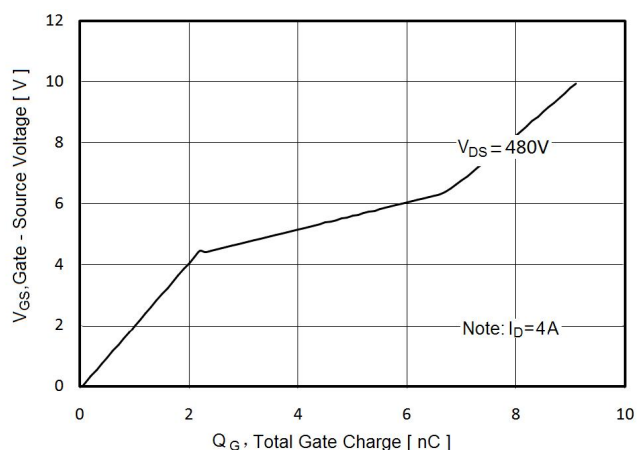


Figure10. Capacitance

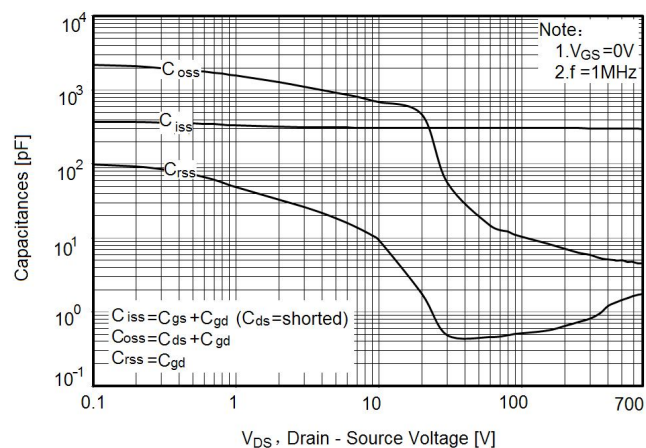
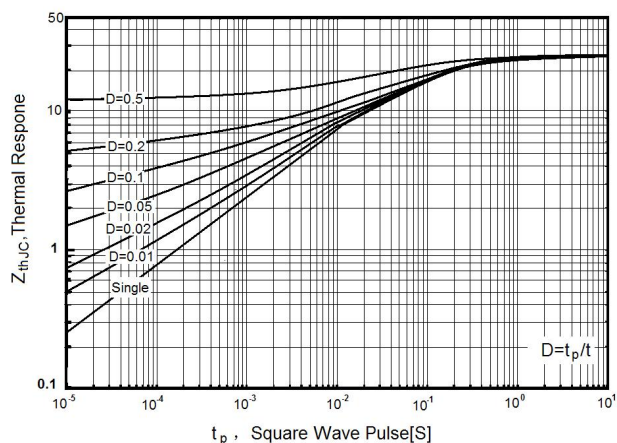
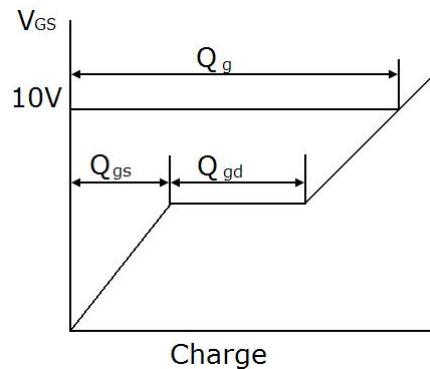


Figure11. Transient Thermal Impedance



Test circuit

1) Gate charge test circuit & Waveform



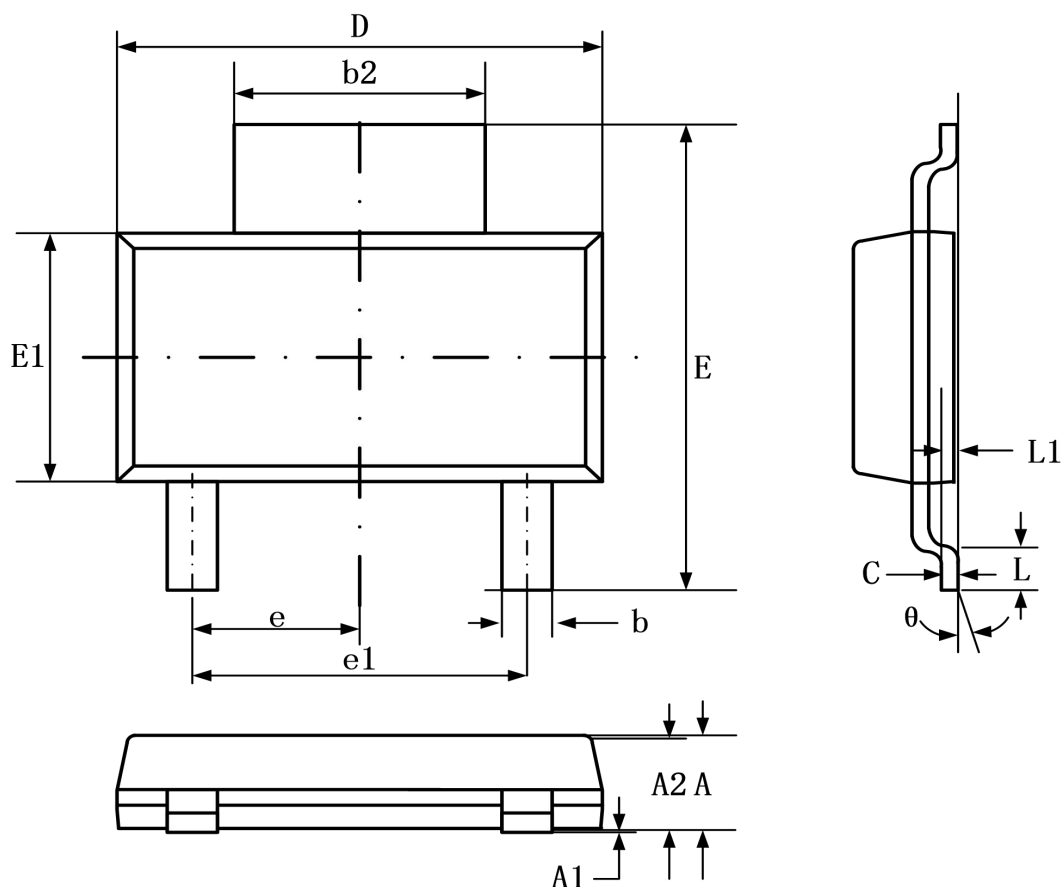
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms

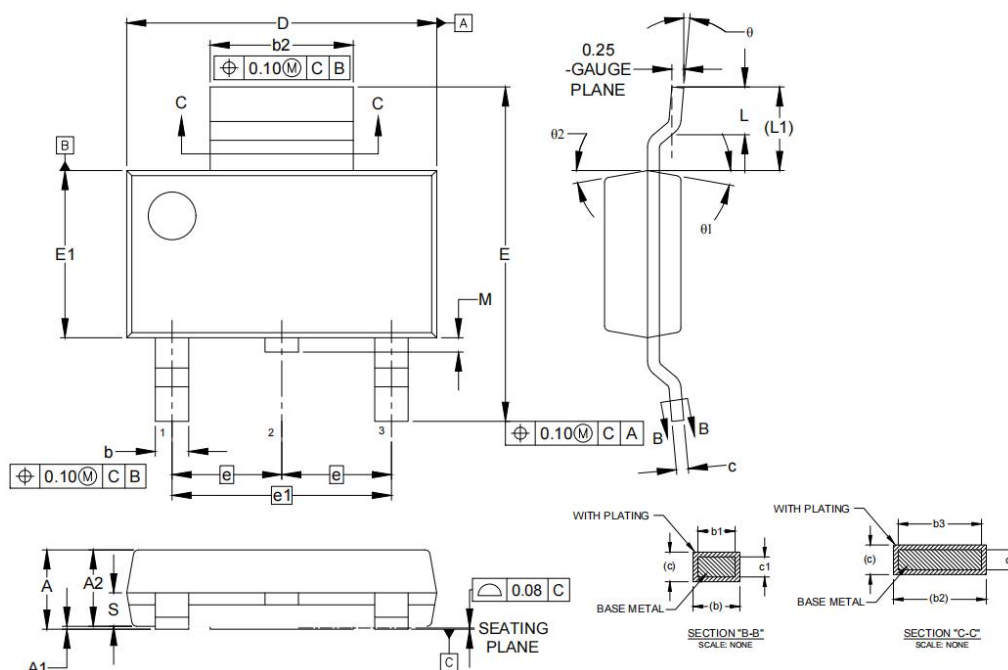


SOT-223-2L-B Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	---	1.80	---	0.071
A1	0.02	0.10	0.001	0.004
A2	1.50	1.70	0.059	0.067
b	0.66	0.84	0.026	0.033
b2	2.90	3.10	0.114	0.122
c	0.23	0.35	0.009	0.014
D	6.30	6.70	0.248	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	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°

SOT-223-2L-J Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.52	1.80	0.060	0.071
A1	0.02	0.10	0.001	0.004
A2	1.50	1.70	0.059	0.067
b	0.60	0.80	0.024	0.031
b1	0.60	0.78	0.024	0.031
b2	2.95	3.10	0.116	0.122
b3	2.95	3.05	0.116	0.120
c	0.24	0.32	0.009	0.013
c1	0.24	0.30	0.009	0.012
D	6.30	6.70	0.248	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	0.146
e	2.30 BSC.		0.091 BSC.	
e1	4.60 BSC.		0.182 BSC.	
L	0.90	1.10	0.035	0.043
L1	1.75 REF		0.069 REF	
M	---	0.50	---	0.020
S	0.70 REF		0.028 REF	
θ	0°	10°	0°	10°
θ1	10° REF		10° REF	
θ2	10° REF		10° REF	

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