

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.

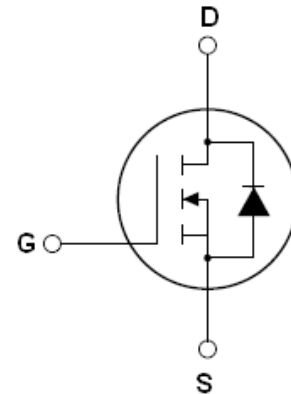
Features

- 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)

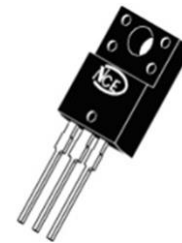
V_{DS}	700	V
$R_{DS(ON)TYP}$	260	m Ω
I_D	15	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE70T260EF	TO-220F	NCE70T260EF



TO-220F

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 ($f>1$ Hz)	V_{GS}	± 30	V
Continuous Drain Current at $T_C=25^\circ\text{C}$	$I_D(DC)$	15*	A
Continuous Drain Current at $T_C=100^\circ\text{C}$	$I_D(DC)$	10*	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	60*	A
Maximum Power Dissipation($T_C=25^\circ\text{C}$)	P_D	33.2	W
Derate above 25°C		0.265	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	304	mJ
Avalanche current (Note 1)	I_{AR}	3	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	1.6	mJ

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

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	3.76	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	80	°C/W

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	700			V
Zero Gate Voltage Drain Current($T_C=25^\circ C$)	I_{DSS}	$V_{DS}=700V, V_{GS}=0V$			1	μA
Zero Gate Voltage Drain Current($T_C=125^\circ C$)	I_{DSS}	$V_{DS}=700V, V_{GS}=0V$			100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	3.5	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=8A$		260	300	m Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		1160		pF
Output Capacitance	C_{oss}			79		pF
Reverse Transfer Capacitance	C_{rss}			5.3		pF
Total Gate Charge	Q_g	$V_{DS}=400V, I_D=15A,$ $V_{GS}=10V$		32		nC
Gate-Source Charge	Q_{gs}			8.4		nC
Gate-Drain Charge	Q_{gd}			12.8		nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=420V, I_D=8A,$ $R_G=2.3\Omega, V_{GS}=10V$		15		nS
Turn-on Rise Time	t_r			11		nS
Turn-Off Delay Time	$t_{d(off)}$			63		nS
Turn-Off Fall Time	t_f			10		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_C=25^\circ C$			15	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				60	A
Forward On Voltage	V_{SD}	$T_J=25^\circ C, I_{SD}=15A, V_{GS}=0V$		0.9	1.2	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ C, I_F=7.5A, di/dt=100A/\mu s$		240		nS
Reverse Recovery Charge	Q_{rr}			2		μC
Peak Reverse Recovery Current	I_{rrm}			17		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. Source-Drain Diode Forward Voltage

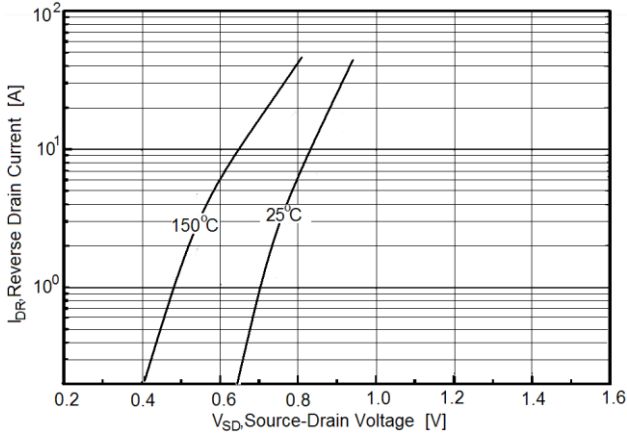


Figure2. Output characteristics

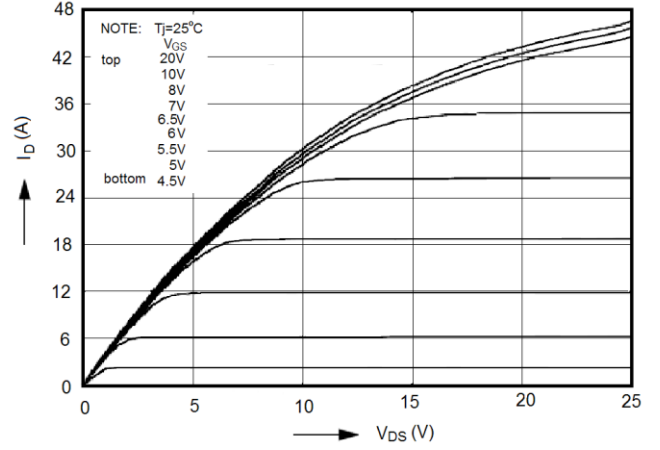


Figure3. Transfer characteristics

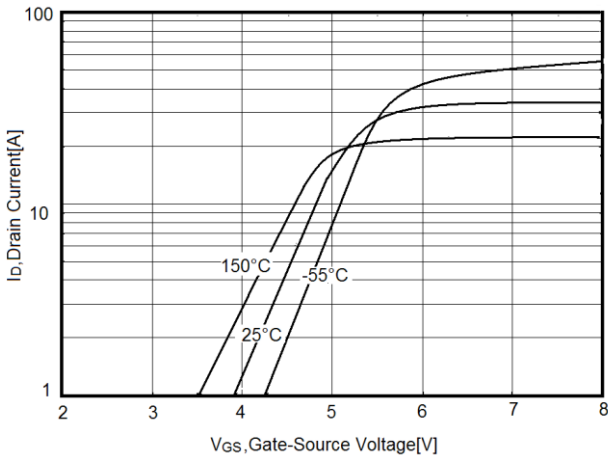


Figure4. Static drain-source on resistance

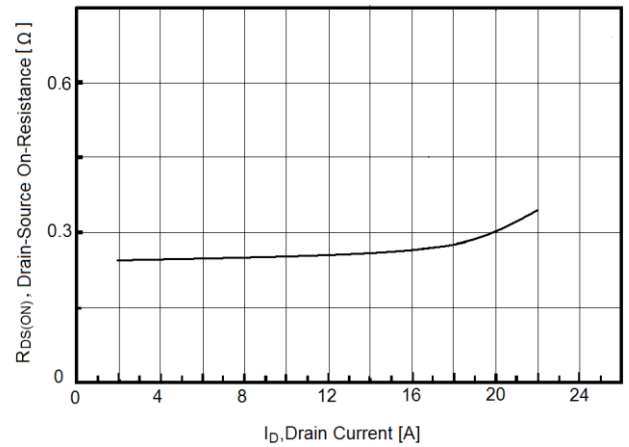


Figure5. $R_{DS(ON)}$ vs Junction Temperature

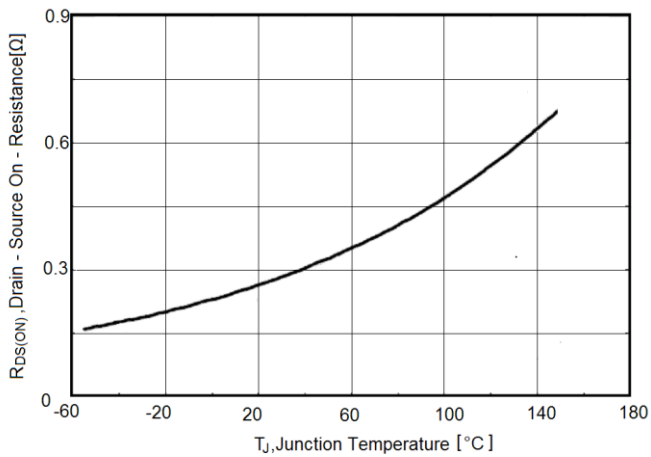
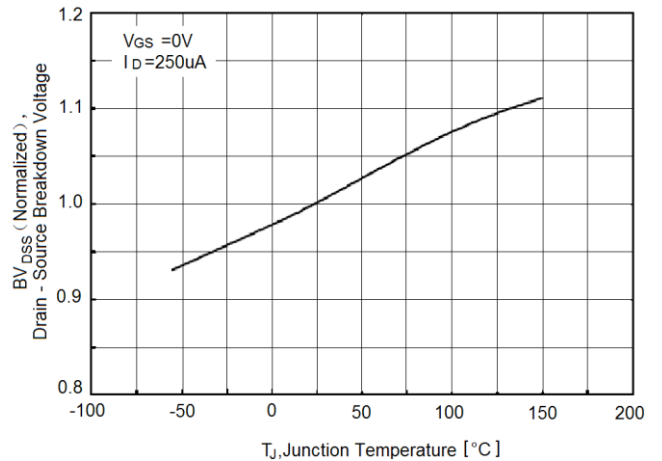


Figure6. BV_{DSS} vs Junction Temperature



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure7. Maximum I_D vs Junction Temperature

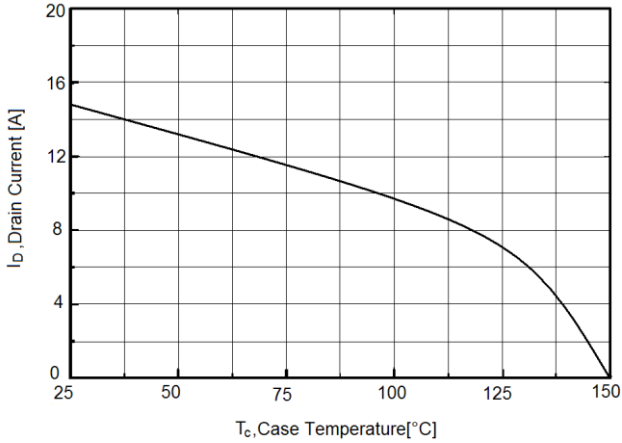


Figure8. Gate charge waveforms

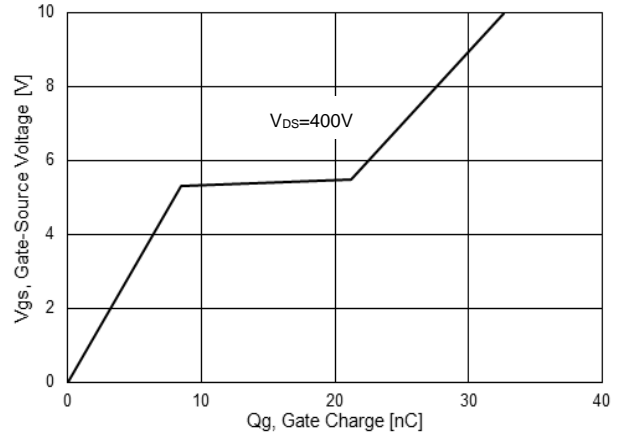


Figure9. Capacitance

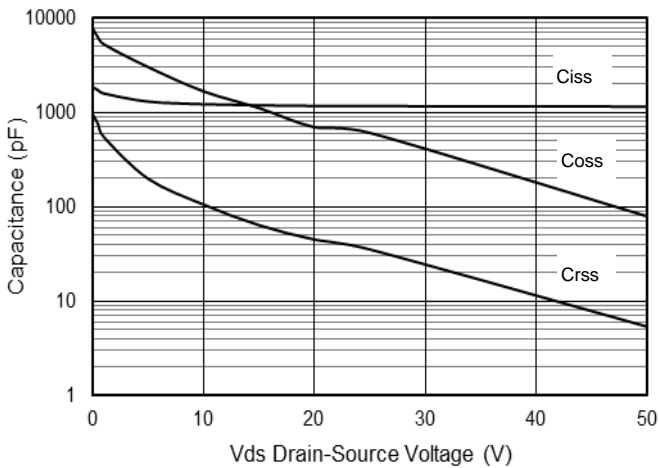


Figure10. Safe operating area

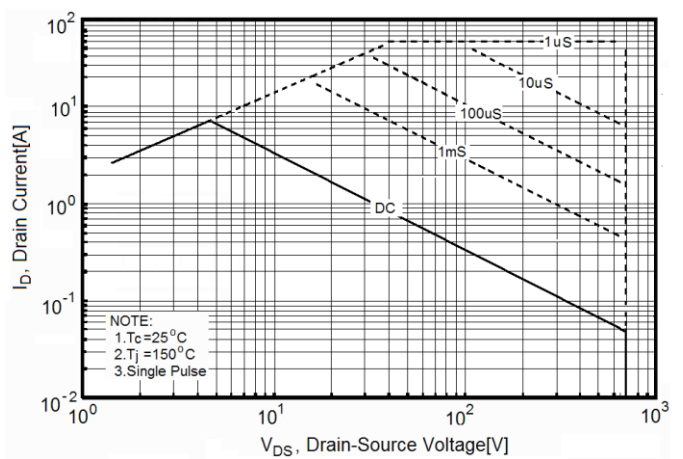
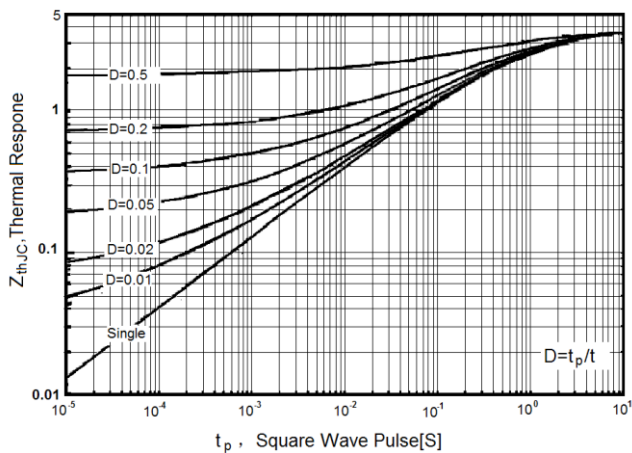
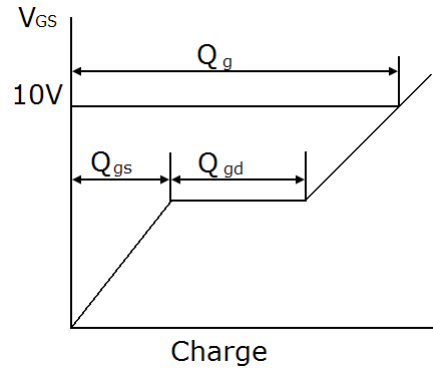
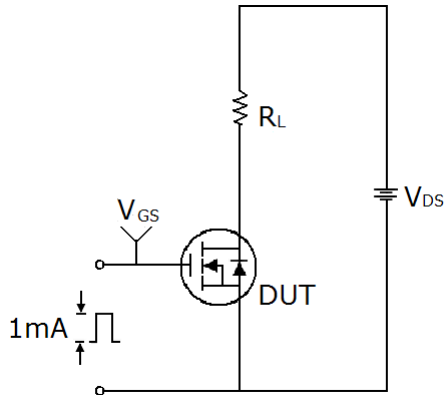


Figure11. Transient Thermal Impedance

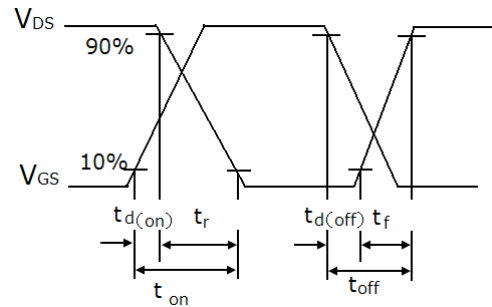
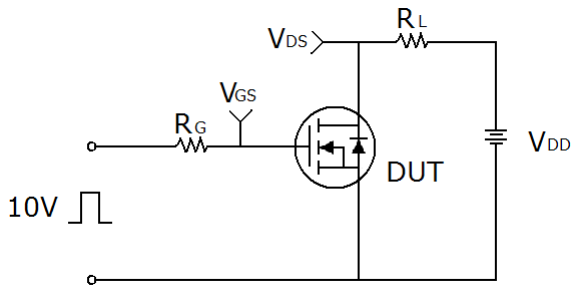


Test circuit

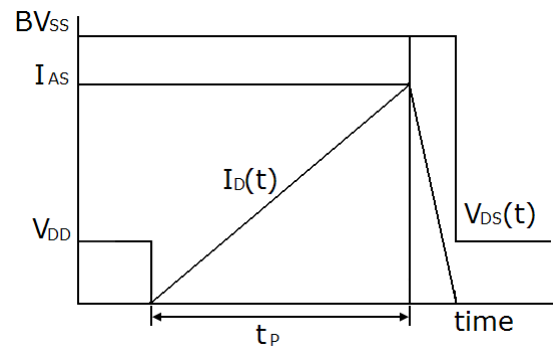
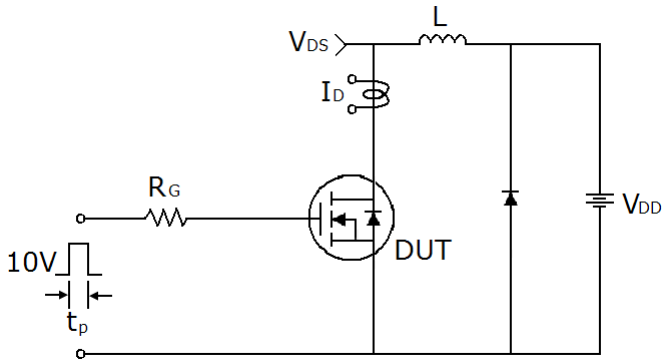
1) Gate charge test circuit & Waveform



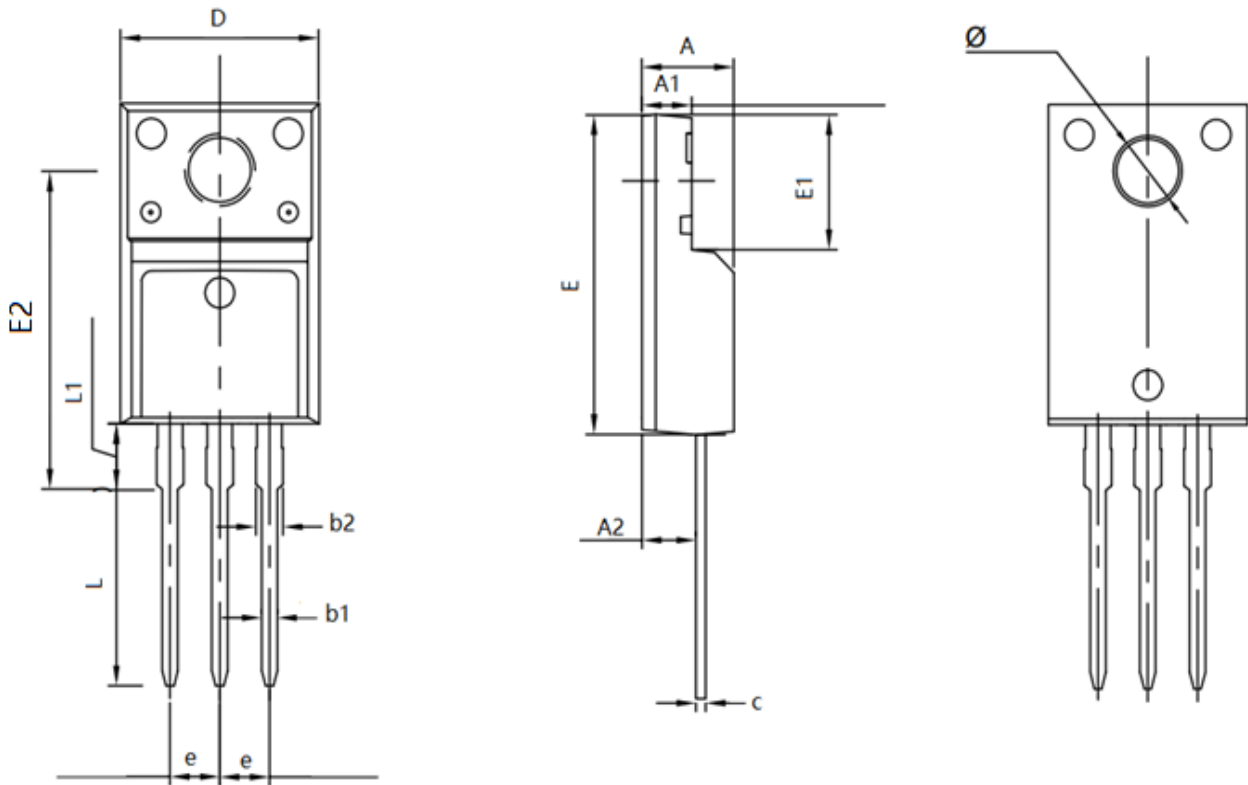
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-220F Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.500	4.900	0.177	0.193
A1	2.340	2.740	0.092	0.108
A2	2.560	2.960	0.101	0.117
b1	0.700	0.900	0.028	0.035
b2	1.180	1.580	0.046	0.062
c	0.400	0.600	0.016	0.024
D	9.960	10.360	0.392	0.408
E	15.670	15.970	0.617	0.629
E1	6.500	6.900	0.256	0.272
E2	15.500	16.100	0.610	0.634
e	2.540 TYP		0.100 TYP	
Φ	3.080	3.280	0.121	0.129
L	12.640	13.240	0.498	0.521
L1	3.030	3.430	0.119	0.135

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