

N-Channel Super Junction Power MOSFET III

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.

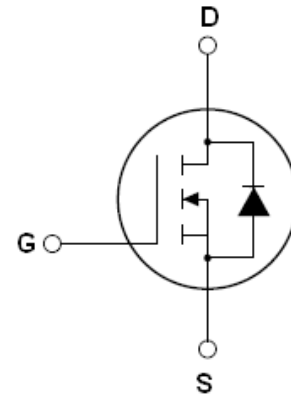
Features

- 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)

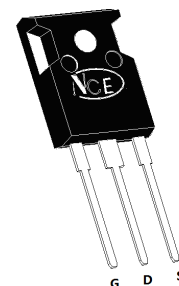
V_{DS}	650	V
$R_{DS(ON) TYP.}$	62	m Ω
I_D	53	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65TF068T	TO-247	NCE65TF068T



TO-247

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

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
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	53	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	33	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	212	A
Maximum Power Dissipation($T_c=25^\circ\text{C}$)	P_D	435	W
Derate above 25°C		3.48	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	1440	mJ
Avalanche current (Note 1)	I_{AR}	24	A
Repetitive Avalanche energy , t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	2	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	50	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}	0.29	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	°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}	$V_{GS}=0V, I_D=500\mu A$	650			V
Zero Gate Voltage Drain Current($T_C=25^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			3	μA
Zero Gate Voltage Drain Current($T_C=125^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			300	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.5	4.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=27A$		62	78	m Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=100V, V_{GS}=0V,$ $F=1.0MHz$		4070	4500	PF
Output Capacitance	C_{oss}			141		PF
Reverse Transfer Capacitance	C_{rss}			2.2		PF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=53A,$ $V_{GS}=10V$		65	85	nC
Gate-Source Charge	Q_{gs}			22		nC
Gate-Drain Charge	Q_{gd}			17		nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=27A,$ $R_G=3.3\Omega, V_{GS}=10V$		28		nS
Turn-on Rise Time	t_r			19		nS
Turn-Off Delay Time	$t_{d(off)}$			98	160	nS
Turn-Off Fall Time	t_f			11	20	nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_C=25^\circ C$			53	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				212	A
Forward on voltage	V_{SD}	$T_J=25^\circ C, I_{SD}=53A, V_{GS}=0V$		0.9	1.3	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ C, I_F=27A, di/dt=100A/\mu s$ $V_{DD}=300V$		200		nS
Reverse Recovery Charge	Q_{rr}			2.5		μC
Peak Reverse Recovery Current	I_{rrm}			25		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

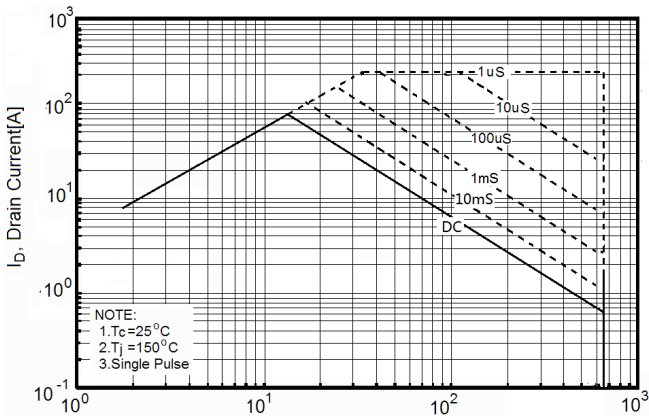


Figure3. Source-Drain Diode Forward Voltage

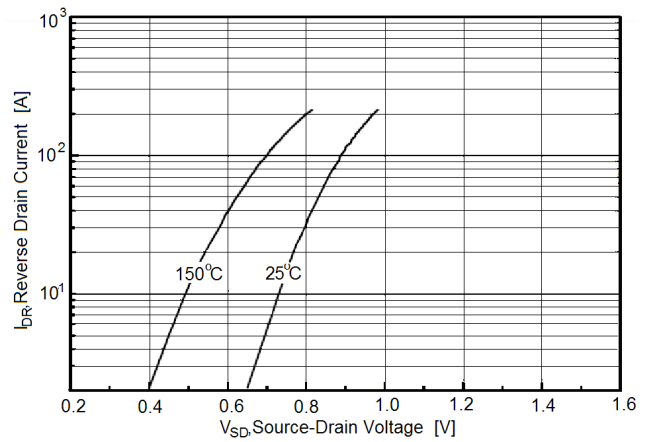


Figure4. Output Characteristics

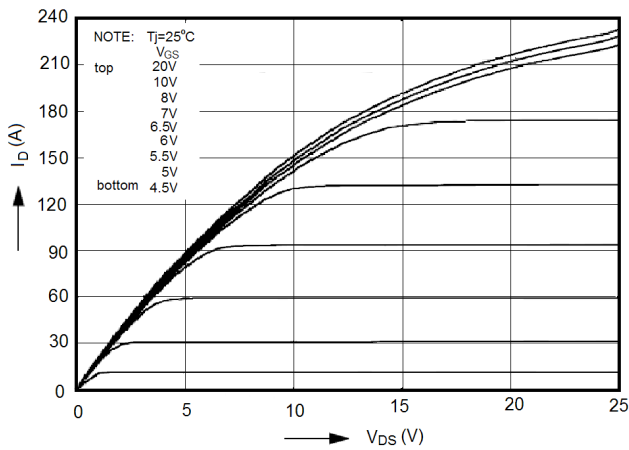


Figure5. Transfer Characteristics

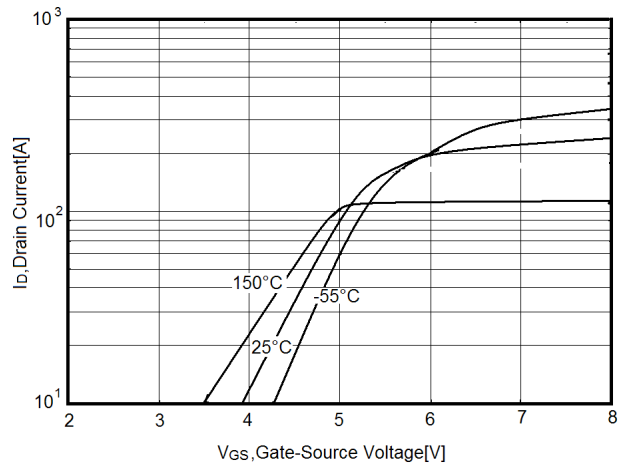


Figure6. Static drain-source on resistance

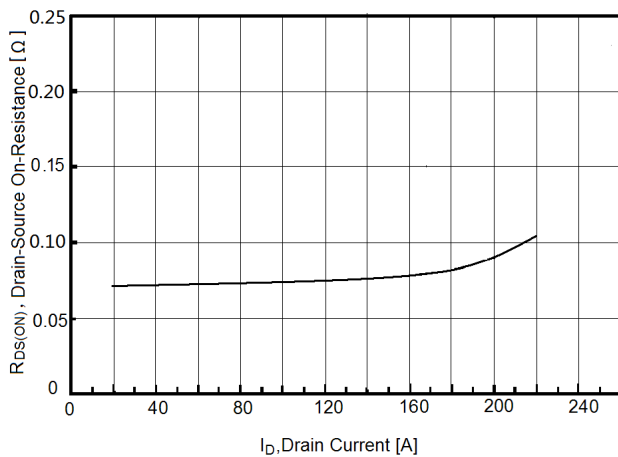


Figure7. $R_{DS(ON)}$ vs Junction Temperature

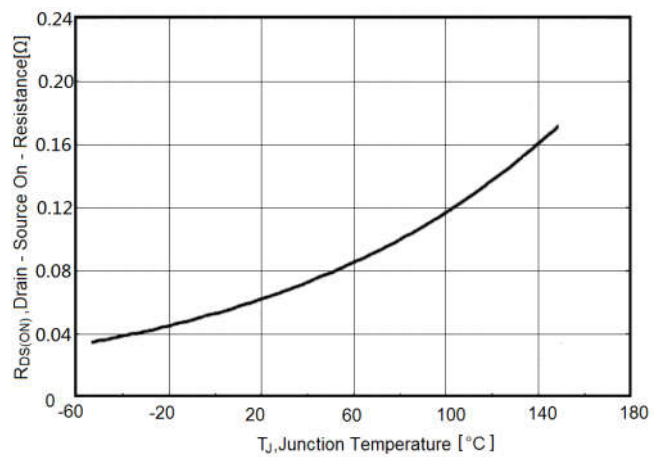


Figure8. BV_{DSS} vs Junction Temperature

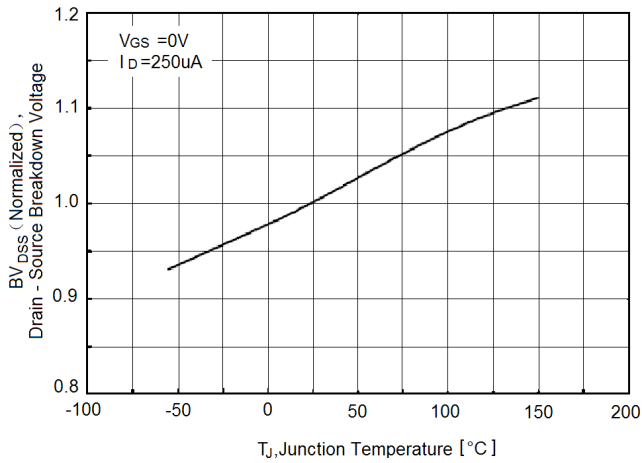


Figure9. Maximum I_D vs Junction Temperature

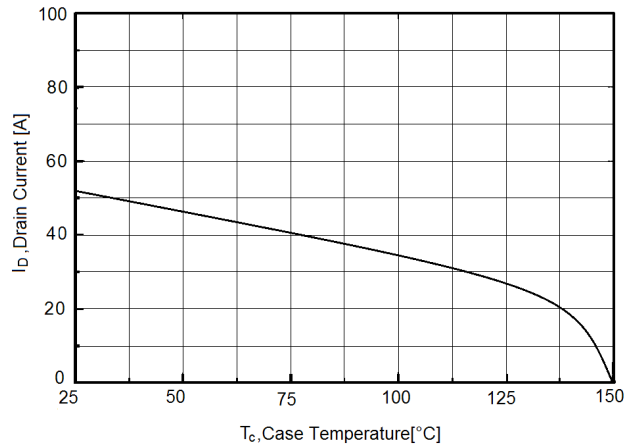


Figure10. Gate Charge Waveforms

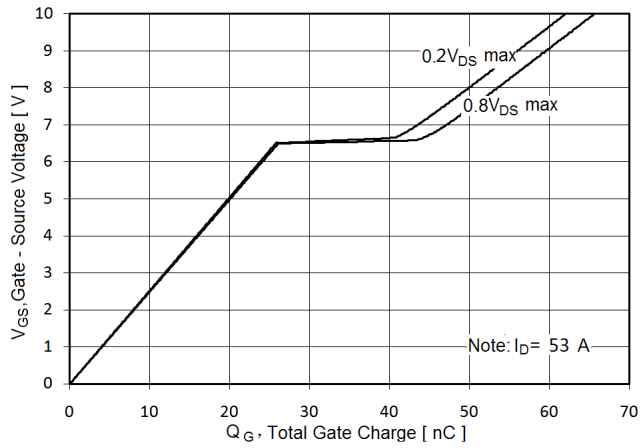
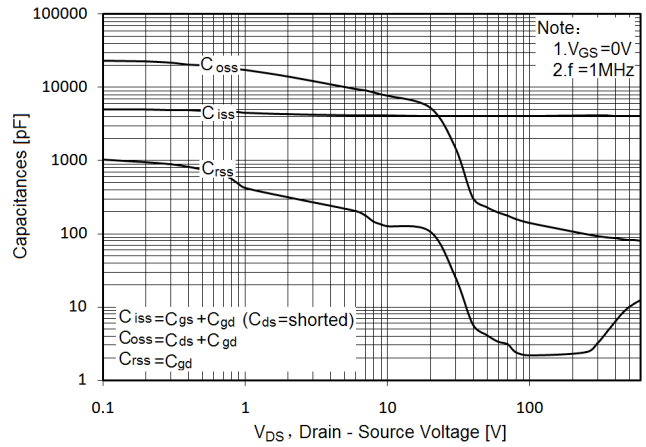
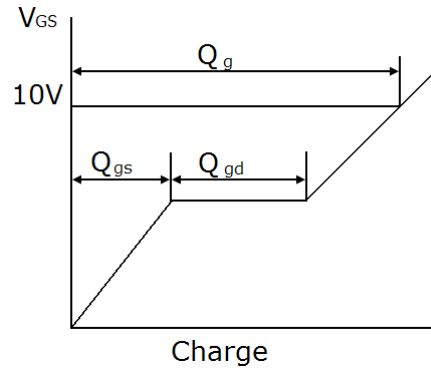
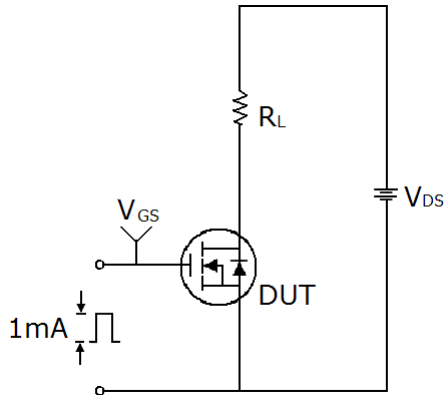


Figure11. Capacitance

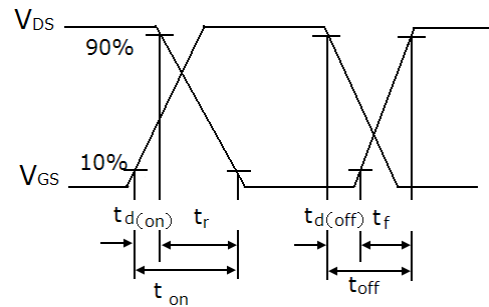
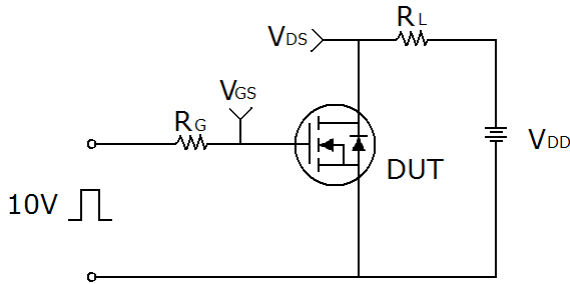


Test circuit

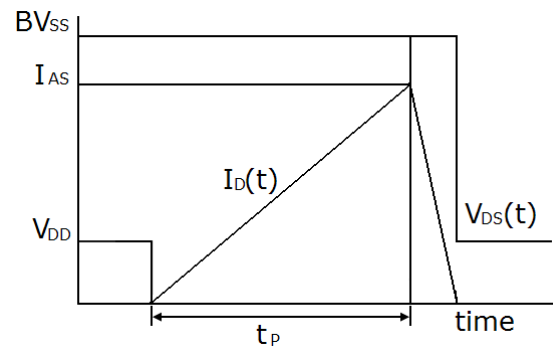
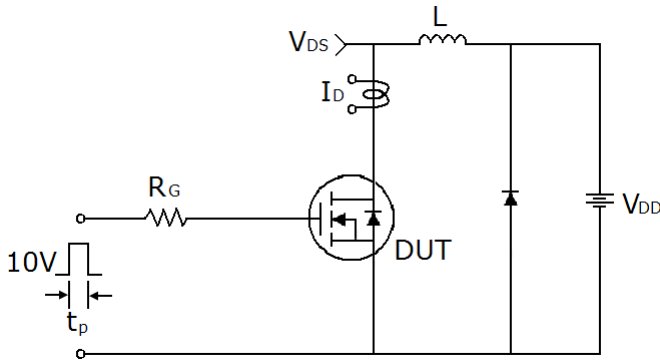
1) Gate charge test circuit & Waveform



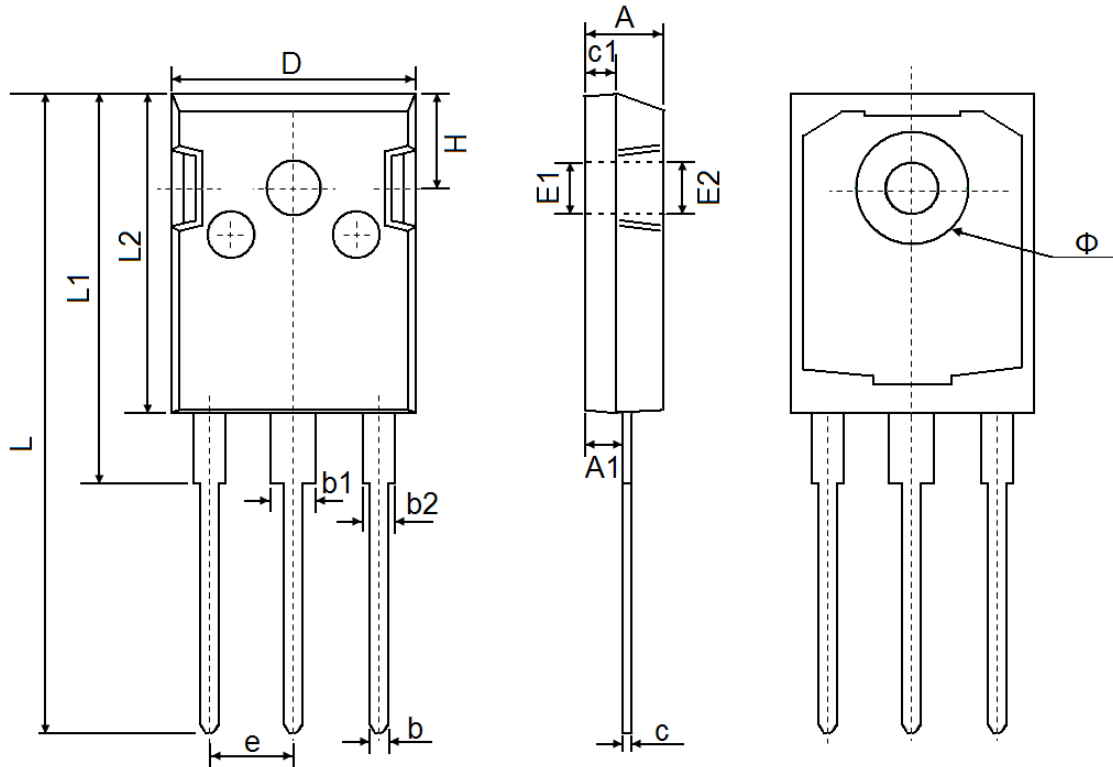
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-247 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	

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