

N-Channel Super Junction Power MOSFET IV

General Description

The series of devices use advanced trench gate super junction technology and design to provide ultra-low $R_{DS(ON)}$ and low gate charge and With a rapid recovery body diode. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, industrial power applications, Fast charger, new energy vehicle charging pile, on-board OBC etc.

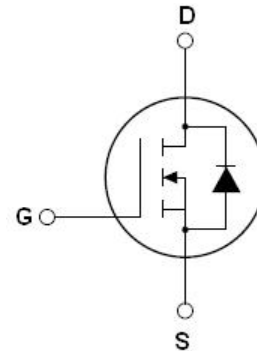
Features

- New technology for high voltage device
- Ultra low on-resistance and ultra low conduction losses
- Ultra Low Gate Charge cause lower driving requirements
- Diode reverse recovery speed is super fast
- High reliability
- ROHS compliant

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- On-board charger(OBC)

$V_{DS\ min@T_{jmax}}$	710	V
$R_{DS(ON)TYP}$	85	mΩ
ID	36	A
Qg	55	nC



Schematic diagram

✧ Intrinsic fast-recovery body diode

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65NF099D	TO-263	NCE65NF099D



TO-263

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 ($f>1\text{ Hz}$)	V_{GS}	± 30	V
Gate-Source Voltage ($V_{DS}=0V$) DC	V_{GS}	± 20	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	36	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	25.2	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	108	A
Maximum Power Dissipation($T_c=25^\circ\text{C}$)	P_D	346	W
Derate above 25°C		2.30	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	324	mJ
Avalanche current (Note 1)	I_{AS}	9	A
Repetitive Avalanche energy , t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	3.9	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...+175	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	0.43	°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}	$V_{GS}=0V, I_D=1mA$	650			V
Zero Gate Voltage Drain Current($T_c=25^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			10	μA
Zero Gate Voltage Drain Current($T_c=125^\circ C$)	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			400	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=500\mu A$	3	4	5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=18A$		85	99	m Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		2800	3200	pF
Output Capacitance	C_{oss}			96		pF
Reverse Transfer Capacitance	C_{rss}			6		pF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=18A,$ $V_{GS}=10V$		55	60	nC
Gate-Source Charge	Q_{gs}			16.5		nC
Gate-Drain Charge	Q_{gd}			25.5		nC
Gate plateau voltage	V_{gp}			7.3		V
Intrinsic gate resistance	R_G	$f = 1 MHz$ open drain		1.5		Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=18A,$ $R_G=1.7\Omega, V_{GS}=10V$		15		nS
Turn-on Rise Time	t_r			14		nS
Turn-Off Delay Time	$t_{d(off)}$			72		nS
Turn-Off Fall Time	t_f			14		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_c=25^\circ C$			36	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				108	A
Forward On Voltage	V_{SD}	$T_J=25^\circ C, I_{SD}=36A, V_{GS}=0V$		1.0	1.2	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ C, I_F=18A, di/dt=100A/\mu s$		160		nS
Reverse Recovery Charge	Q_{rr}			0.96		μC
Peak Reverse Recovery Current	I_{rrm}			12		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

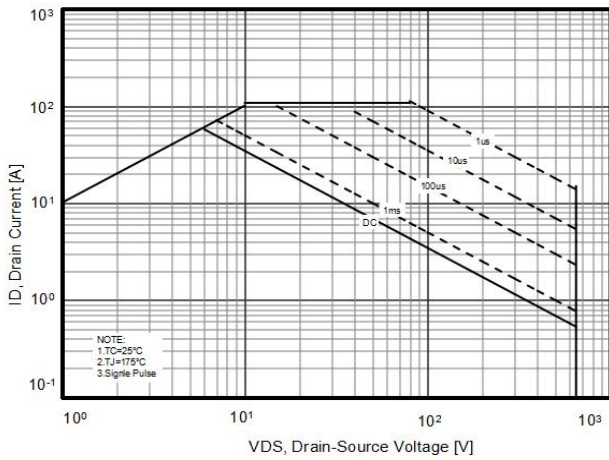


Figure2. Capacitance

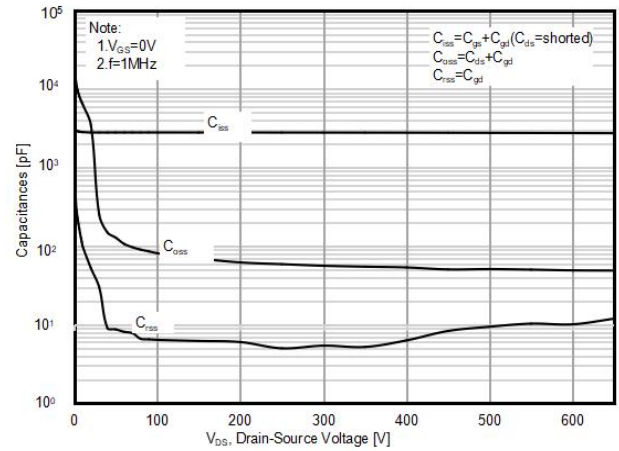


Figure3. Output characteristics

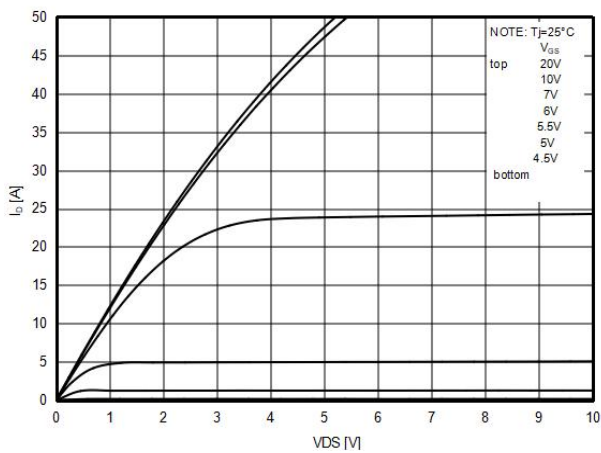


Figure4. Source-Drain Diode Forward Voltage

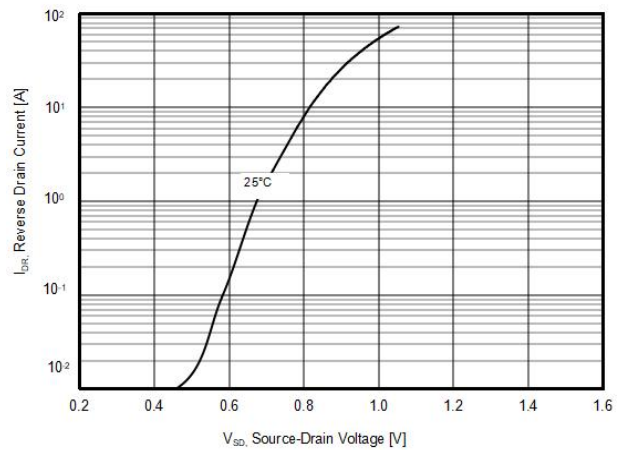


Figure5. Static drain-source on resistance

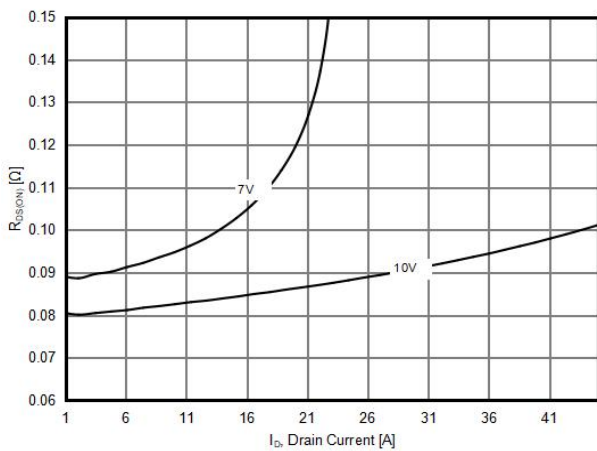


Figure6. Transfer characteristics

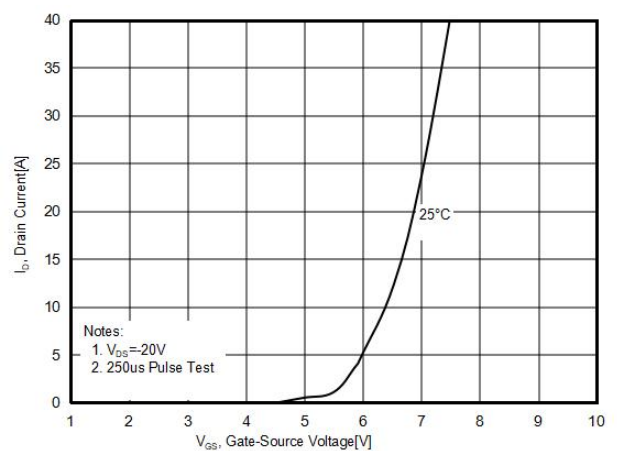


Figure7. $R_{DS(ON)}$ vs Junction Temperature

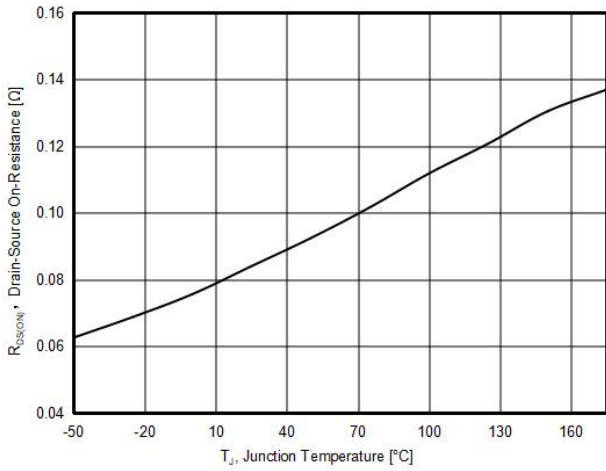


Figure8. BV_{DSS} vs Junction Temperature

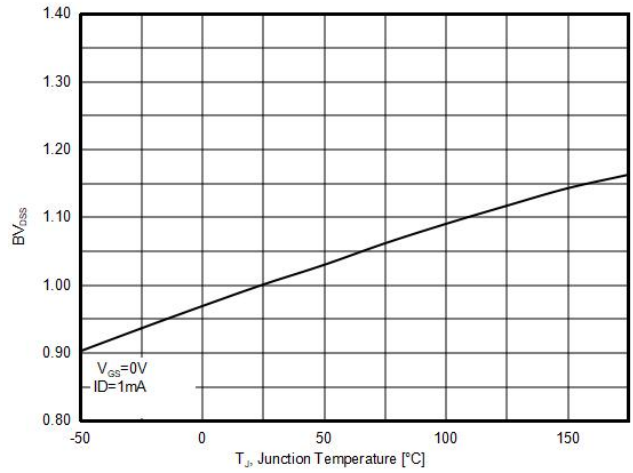


Figure9. Gate charge waveforms

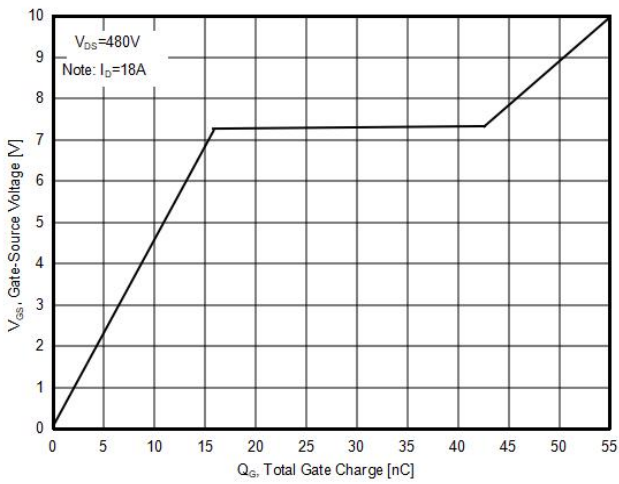
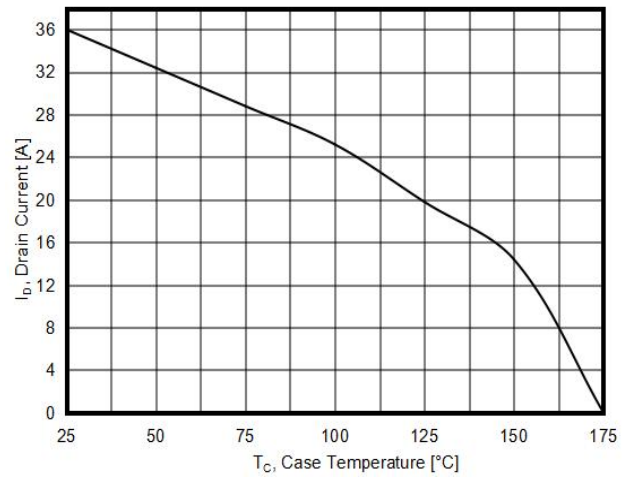
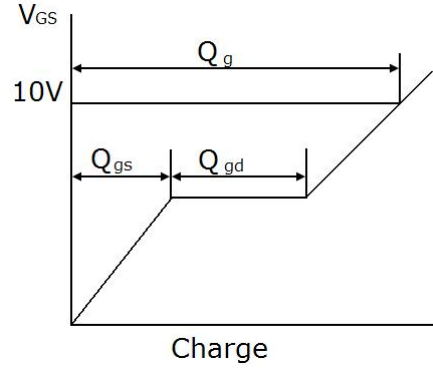
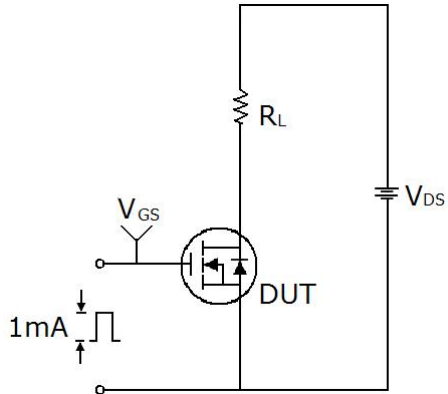


Figure10. Maximum I_D vs Junction Temperature

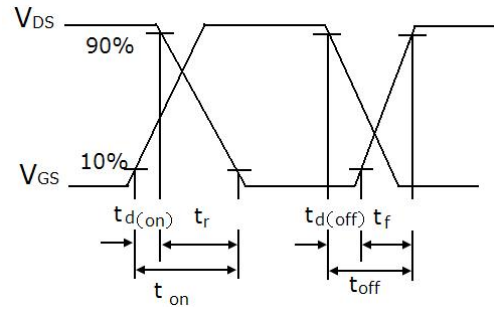
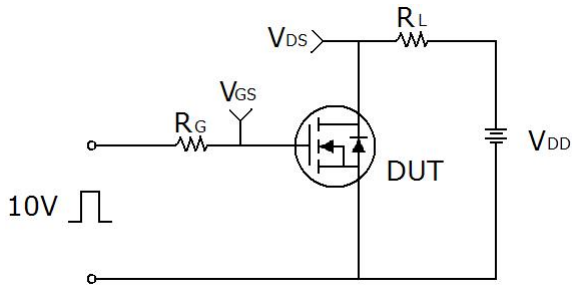


Test circuit

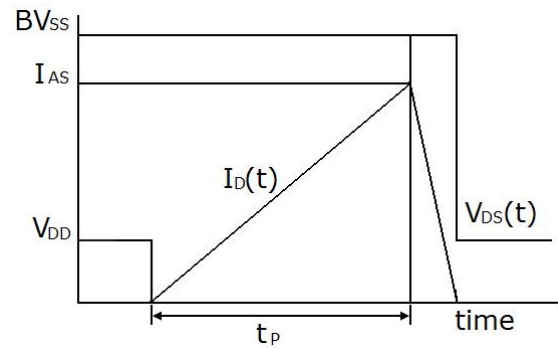
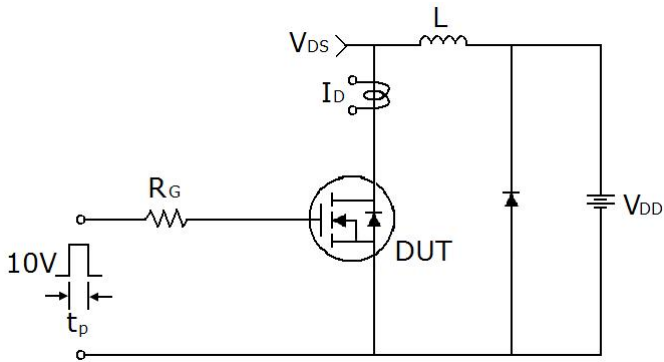
1) Gate charge test circuit & Waveform



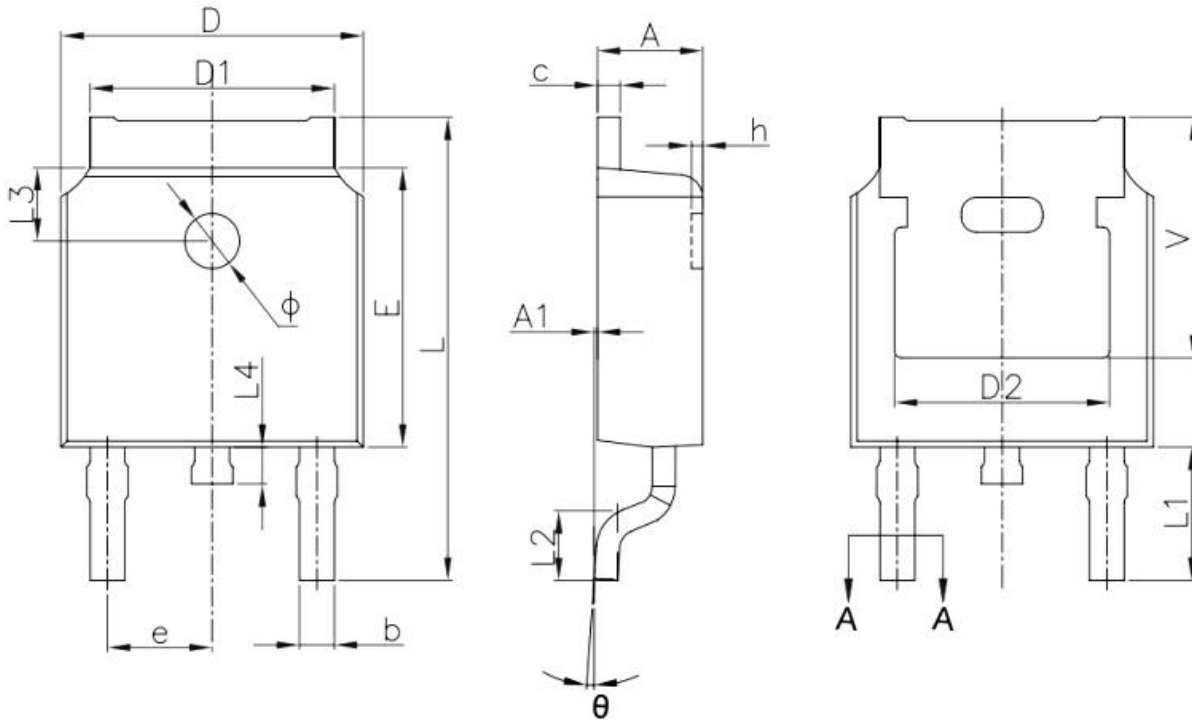
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-263 (E) Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.20	4.60	0.165	0.181
A1	-	0.25	-	0.010
A2	2.20	2.60	0.087	0.102
b	0.70	0.90	0.028	0.035
b2	1.17	1.37	0.046	0.054
c	0.40	0.60	0.016	0.024
c1	1.15	1.40	0.045	0.055
D	9.10	9.30	0.358	0.366
D1	7.63	8.23	0.300	0.324
E	10.05	10.45	0.396	0.411
E1	8.35	8.95	0.329	0.352
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	1.36REF		0.053REF	
L2	1.3REF		0.051REF	
L3	0.25REF		0.009REF	

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