

N-Channel Enhancement Mode Power MOSFET

General Description

The series of Power MOSFETs use advanced technology and design. This high voltage MOSFET fits Switched applications.

Features

- High speed switching
- Intrinsic capacitances and Qg minimized
- 100% Avalanche Tested

Application

- Switched applications

$V_{DS\ min@T_{jmax}}$	1850	V
$R_{DS(ON)TYP}$	6	Ω
I_D	2.9	A
Q_g	33	nC



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE3N170F	TO-220F	NCE3N170F



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}	1700	V
Gate-Source Voltage ($V_{DS}=0V$) DC	V_{GS}	± 30	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	2.9	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	2.03	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	8.7	A
Maximum Power Dissipation ($T_c=25^\circ\text{C}$)	P_D	48.3	W
Derate above 25°C		0.32	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	210	mJ
Single pulse avalanche current (Note 2)	I_{AS}	3	A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	$-55...+175$	$^\circ\text{C}$

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	3.1	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62.5	$^{\circ}\text{C}/\text{W}$

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	1700			V
Zero Gate Voltage Drain Current(Tc=25℃)	I _{DSS}	V _{DS} =1700V,V _{GS} =0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I _{DSS}	V _{DS} =1700V,V _{GS} =0V			100	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	3	4	5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =1.45A		6	8	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =40V,V _{GS} =0V, F=1.0MHz		1700		pF
Output Capacitance	C _{oss}			60		pF
Reverse Transfer Capacitance	C _{rss}			3.3		pF
Total Gate Charge	Q _g	V _{DS} =1350V,I _D =1.45A, V _{GS} =10V		33		nC
Gate-Source Charge	Q _{gs}			7.7		nC
Gate-Drain Charge	Q _{gd}			14		nC
Intrinsic gate resistance	R _G	f = 1 MHz open drain		2		Ω
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =850V,I _D =1.45A, R _G =3Ω,V _{GS} =10V		22		nS
Turn-on Rise Time	t _r			8		nS
Turn-Off Delay Time	t _{d(off)}			48		nS
Turn-Off Fall Time	t _f			49		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			2.9	A
Pulsed Source-drain current(Body Diode)	I _{SDM}				8.7	A
Forward On Voltage	V _{SD}	T _J =25℃,I _{SD} =2.9A,V _{GS} =0V		0.8	1.1	V
Reverse Recovery Time	t _{rr}	T _J =25℃,I _F =2.9A, di/dt=100A/μs		1500		nS
Reverse Recovery Charge	Q _{rr}			5.6		uC
Peak Reverse Recovery Current	I _{rrm}			7.5		A

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

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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

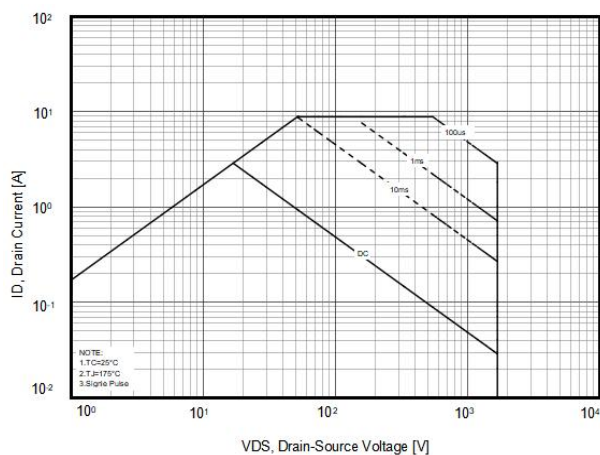


Figure2. Source-Drain Diode Forward Voltage

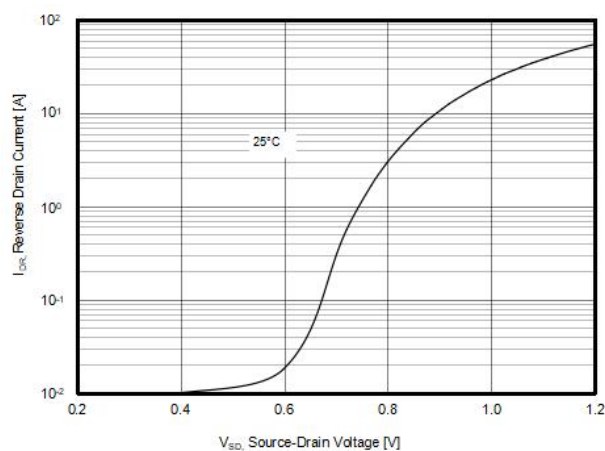


Figure3. $R_{DS(ON)}$ vs Junction Temperature

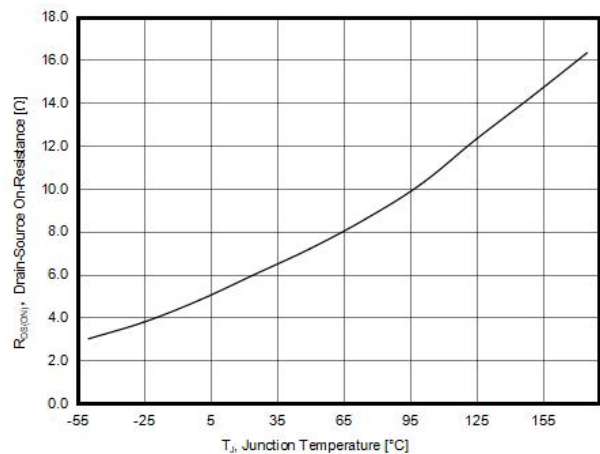


Figure4. BV_{DSS} vs Junction Temperature

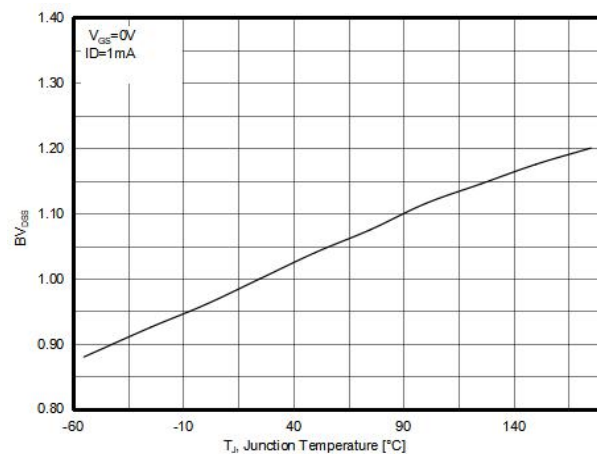


Figure5. Maximum I_D vs Junction Temperature

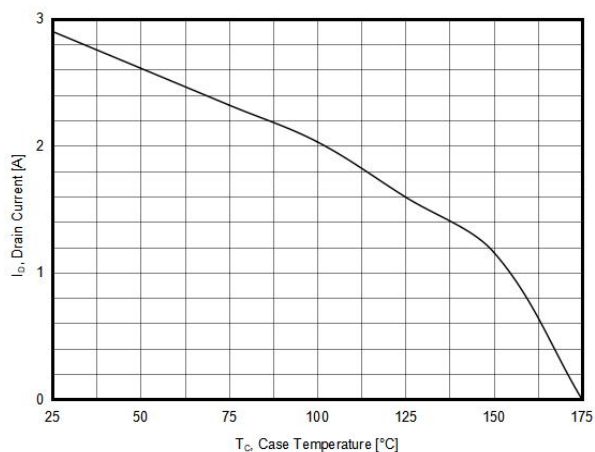


Figure6. Output characteristics

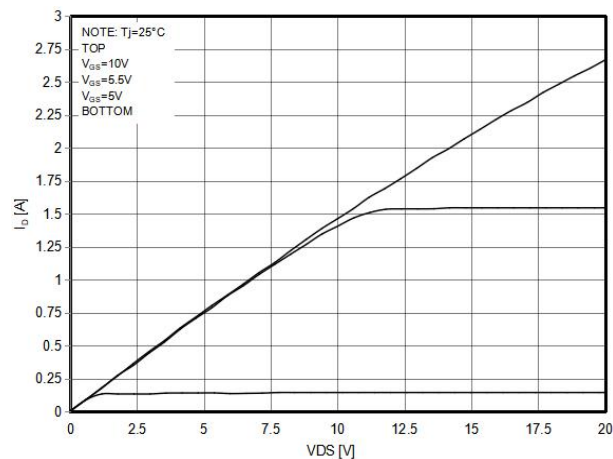


Figure7. Capacitance

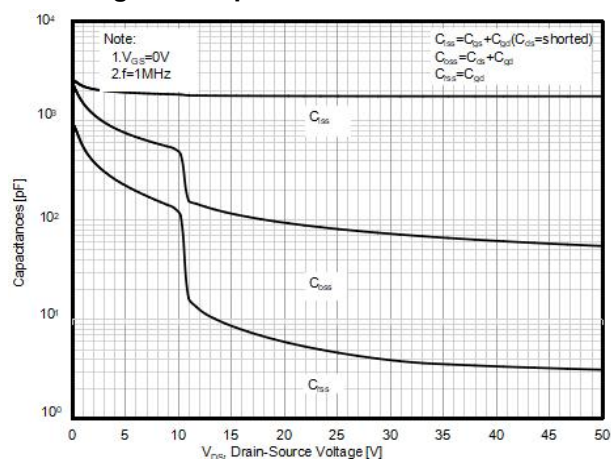


Figure8. Transfer characteristics

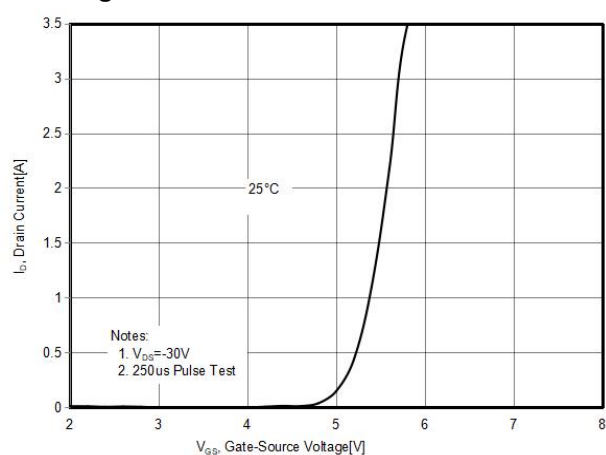


Figure9. Static drain-source on resistance

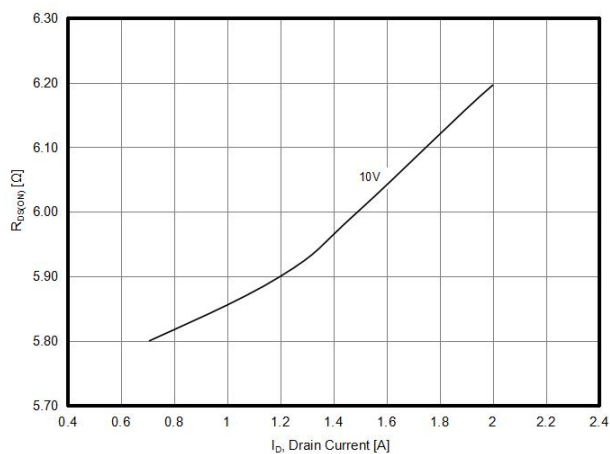
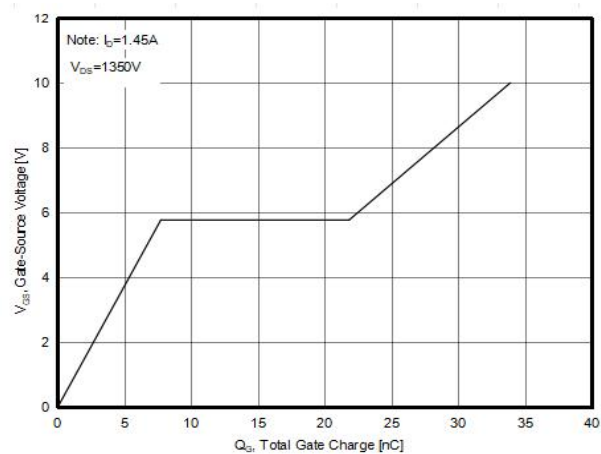


Figure9. Gate charge waveforms

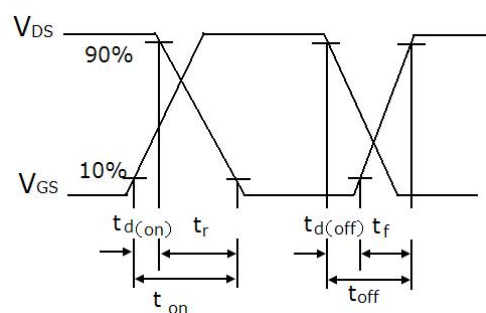
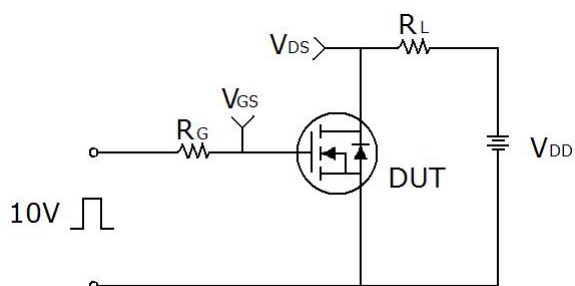


Test circuit

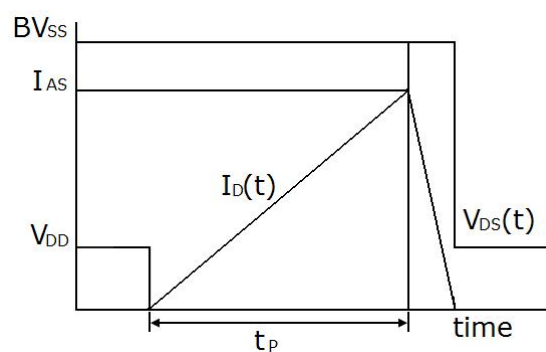
1) Gate charge test circuit & Waveform



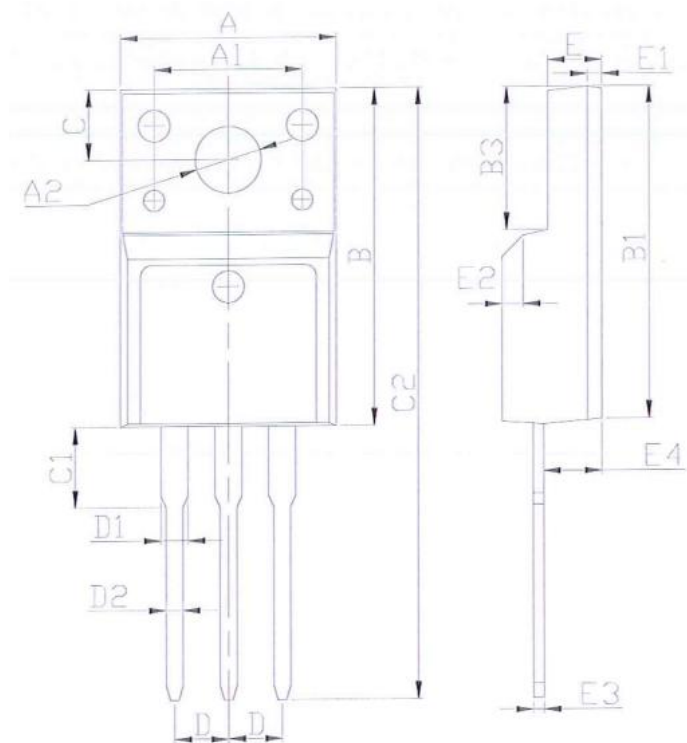
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-220F-L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	9.86	10.46	0.387	0.411
A1	6.80	7.20	0.267	0.283
A2	2.92	3.32	0.115	0.130
A3	9.40	10.00	0.369	0.393
B	15.40	16.40	0.605	0.644
B1	15.10	16.10	0.593	0.633
B2	4.40	5.00	0.173	0.196
B3	6.40	7.00	0.251	0.275
C	3.05	3.55	0.120	0.139
C1	2.95	3.55	0.116	0.139
C2	28.20	29.20	1.108	1.147
D	2.54 BSC		0.100 BSC	
D1	--	1.47	--	0.058
D2	0.60	1.00	0.024	0.039
E	2.30	2.80	0.090	0.110
E1	0.45	0.95	0.018	0.037
E2	45.0°		45.00°	
E3	0.30	0.70	0.012	0.028
E4	2.45	3.05	0.096	0.120

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