

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.

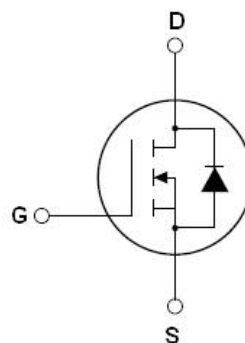
Features

- 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
NCE3N170PF	TO-3PF	NCE3N170PF



TO-3PF

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

Parameter	Symbol	NCE3N170PF	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	88	W
Derate above 25°C		0.58	W/ $^{\circ}\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	210	mJ
Single pulse avalanche current (Note 2)	I_{AS}	2.9	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	NCE3N170	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	1.7	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	50	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$ 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}			5.7		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

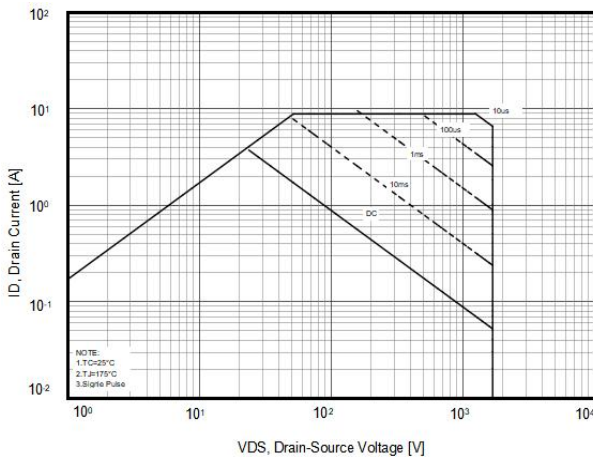


Figure2. Source-Drain Diode Forward Voltage

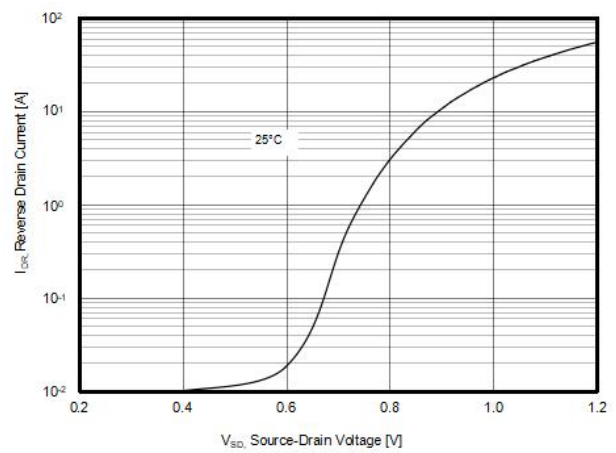


Figure3. $R_{DS(ON)}$ vs Junction Temperature

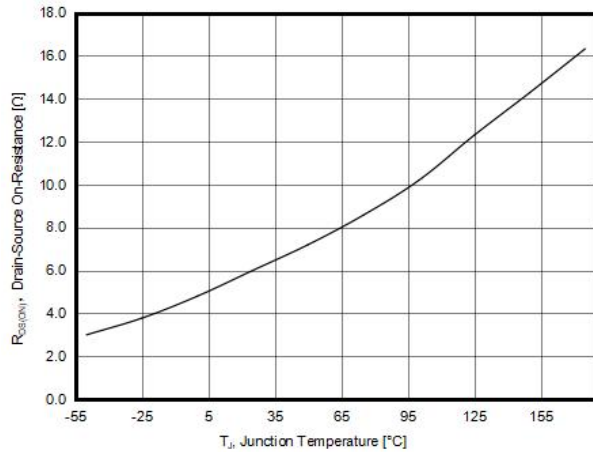


Figure4. BV_{DSS} vs Junction Temperature

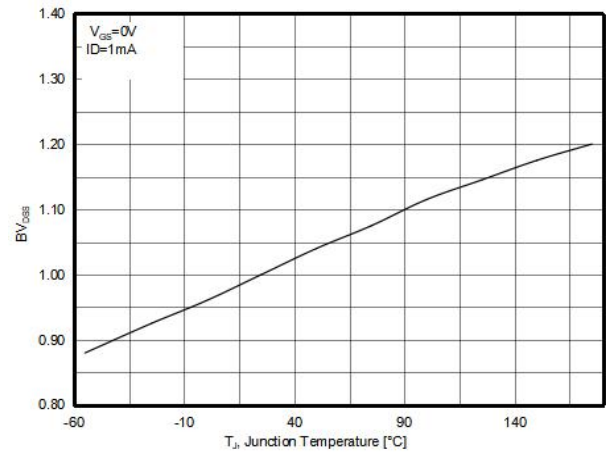


Figure5. Maximum I_D vs Junction Temperature

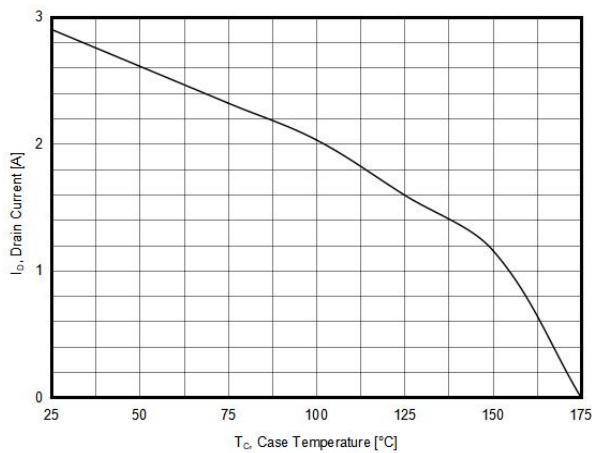


Figure6. Output characteristics

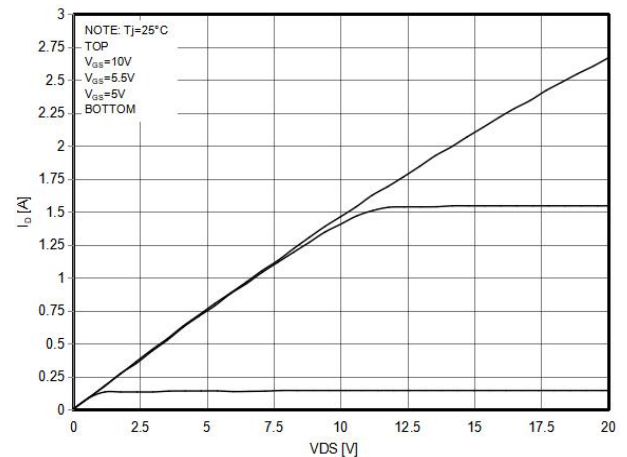


Figure7. Capacitance

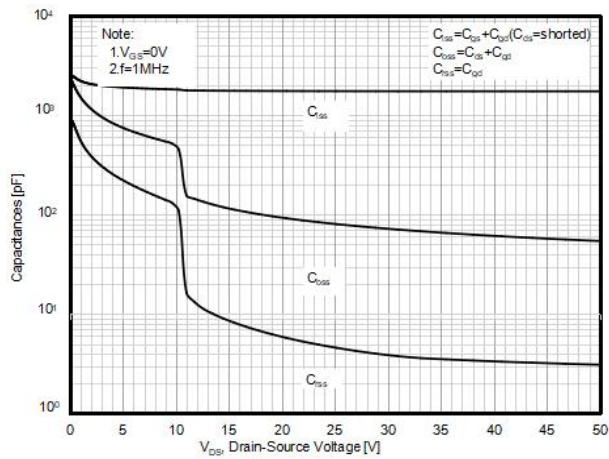


Figure8. Transfer characteristics

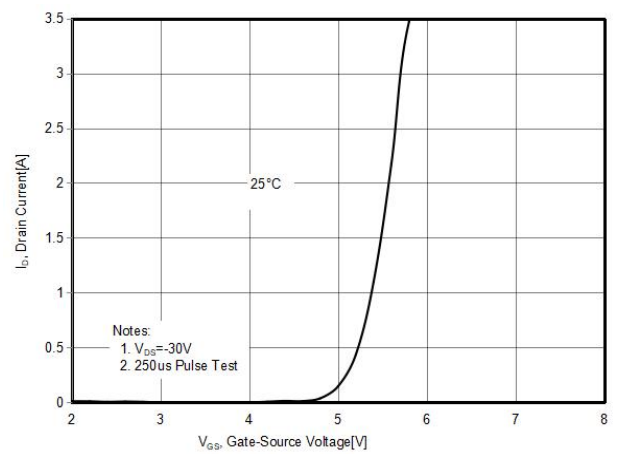


Figure9. Static drain-source on resistance

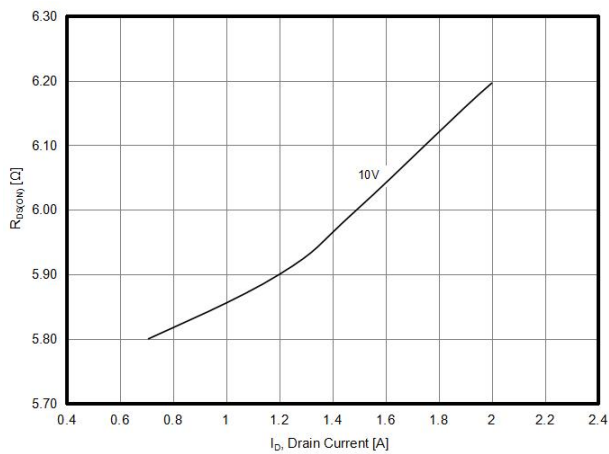
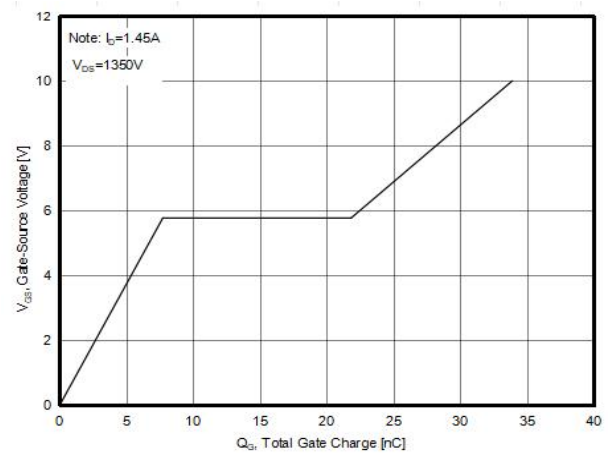
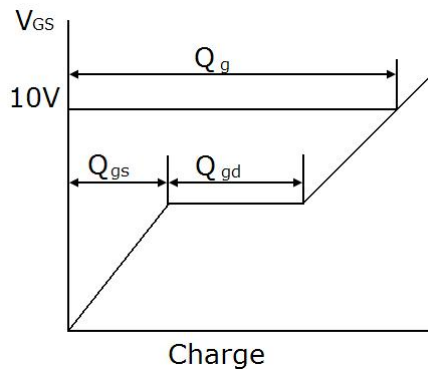
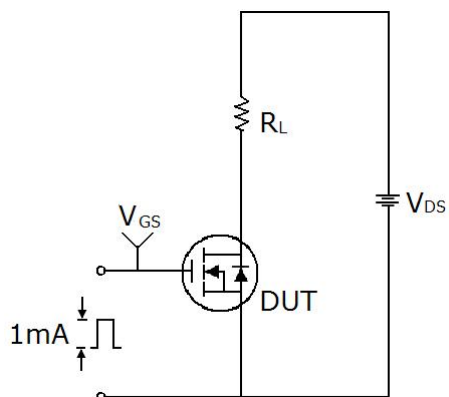


Figure9. Gate charge waveforms

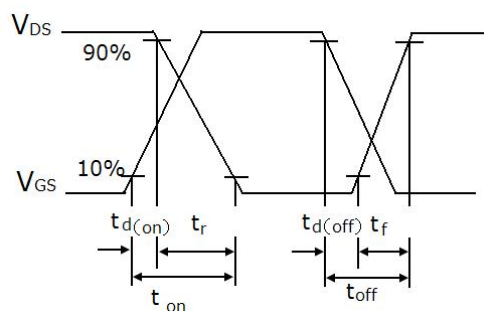
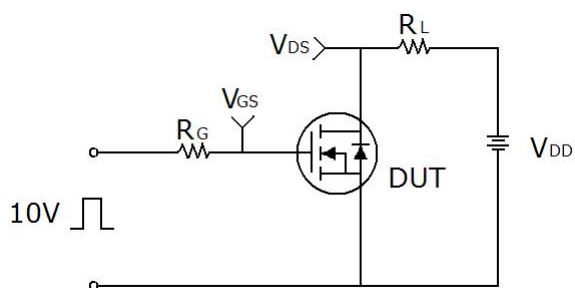


Test circuit

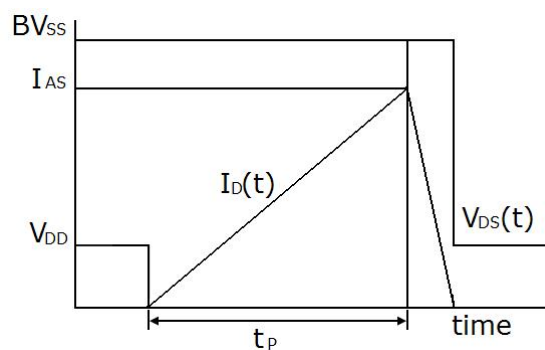
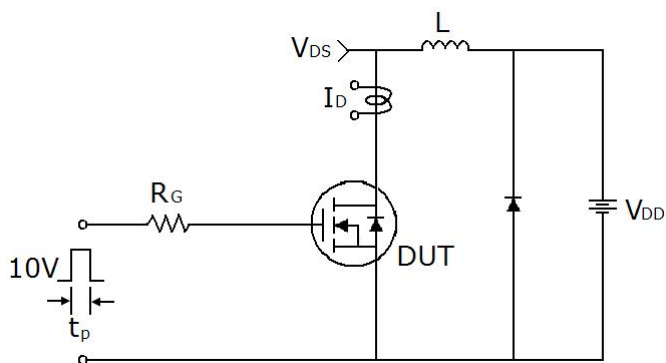
1) Gate charge test circuit & Waveform



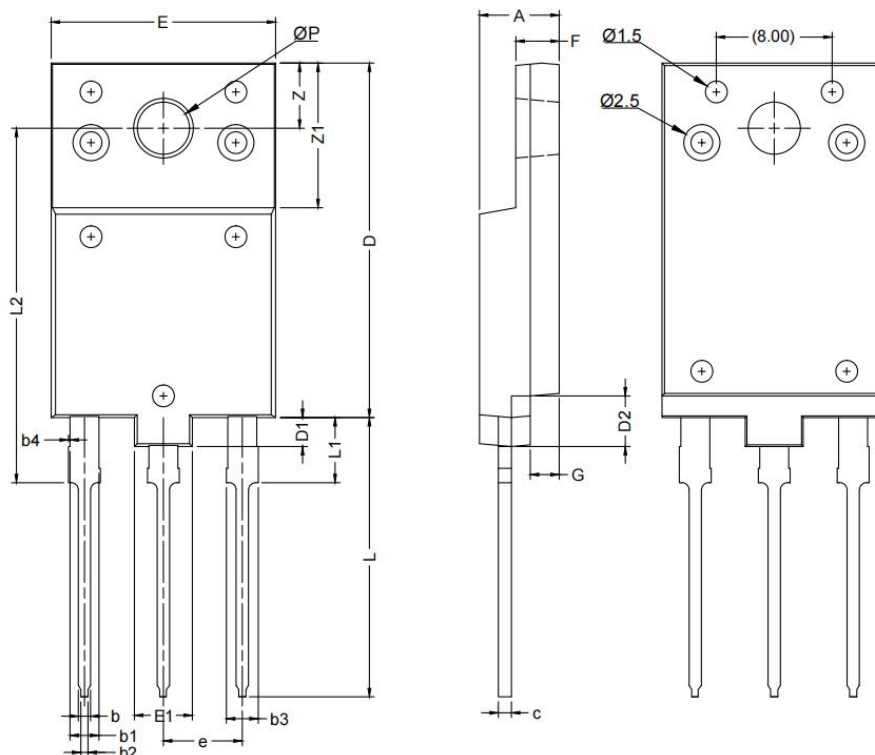
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-3PF-B Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	5.300	5.700	0.209	0.224
b	0.650	0.950	0.026	0.037
b4		0.200		0.008
C	0.800	1.000	0.031	0.039
D	24.200	24.800	0.953	0.976
D1	1.800	2.200	0.071	0.087
D2	3.300	3.700	0.130	0.146
E	15.300	15.700	0.602	0.618
E1	3.800	4.200	0.150	0.165
F	2.800	3.200	0.110	0.126
e	5.450 BSC		0.215 BSC	
L	19.000	19.600	0.748	0.772
L1	4.200	4.800	0.165	0.189
L2	24.200	24.800	0.953	0.976
P	3.400	3.800	0.134	0.150
Z	4.300	4.700	0.169	0.185
Z1	9.700	10.300	0.382	0.406
G	1.800	2.200	0.071	0.087
S	3.100	3.500	0.122	0.138

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