N-Channel Enhancement Mode Power MOSFET

General Description

The series of Power MOSFETs, the silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar technology, which use advanced technology and design.

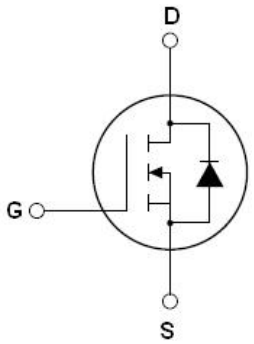
Features

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

Application

- Switched applications
- Uninterruptible Power Supply
- Power Factor Correction

$V_{DS\ min@Tjmax}$	1320	V
$R_{DS(ON)TYP}$	5.7	Ω
ID	3	A
Qg	25.6	nC



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE3N120PF	TO-3PF-3L	NCE3N120PF



TO-3PF-3L

Table 1. Absolute Maximum Ratings (T_J=25℃)

Parameter	Symbol	NCE3N120PF	Unit
Drain-Source Voltage (VGS=0V)	V_{DS}	1200	V
Gate-Source Voltage (VDS=0V) DC	V_{GS}	±30	V
Continuous Drain Current at Tc=25°C	$I_{D\ (DC)}$	3	A
Continuous Drain Current at Tc=100°C	$I_{D\ (DC)}$	2.1	A
Pulsed drain current (Note 1)	$I_{DM\ (pluse)}$	9	A
Maximum Power Dissipation(Tc=25°C) Derate above 25°C	P_D	136.4 0.91	W W/°C
Single pulse avalanche energy (Note 2)	E_{AS}	225	mJ
Single pulse avalanche current (Note 2)	I_{AS}	3	A
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55...+175	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	NCE3N120PF	Unit
Thermal Resistance，Junction-to-Case（Maximum）	R_{thJC}	1.10	°C /W
Thermal Resistance，Junction-to-Ambient （Maximum）	R_{thJA}	50	°C /W

Table 3. Electrical Characteristics (T_J=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250uA	1200			V
Zero Gate Voltage Drain Current(Tc=25℃)	I_{DSS}	V_{DS}=1200V,V_{GS}=0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I_{DSS}	V_{DS}=1200V,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	3.5	4.3	5.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=1.5A		5.7	7.5	Ω
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=40V,V_{GS}=0V, F=1.0MHz		918		pF
Output Capacitance	C_{oss}			41		pF
Reverse Transfer Capacitance	C_{rss}			3.4		pF
Total Gate Charge	Q_g	V_{DS}=960V,I_D=1.5A, V_{GS}=10V		25.6		nC
Gate-Source Charge	Q_{gs}			6.3		nC
Gate-Drain Charge	Q_{gd}			10.9		nC
Intrinsic gate resistance	R_G	f = 1 MHz open drain		1.6		Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=600V,I_D=1.5A, R_G=3Ω,V_{GS}=10V		10		nS
Turn-on Rise Time	t_r			10		nS
Turn-Off Delay Time	$t_{d(off)}$			19		nS
Turn-Off Fall Time	t_f			28		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	T_C=25°C			3	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				9	A
Forward On Voltage	V_{SD}	Tj=25°C,I_{SD}=3A,V_{GS}=0V		0.8	1.1	V
Reverse Recovery Time	t_{rr}	Tj=25°C,I_F=1.5A, di/dt=100A/μs		220		nS
Reverse Recovery Charge	Q_{rr}			0.88		uC
Peak Reverse Recovery Current	I_{rrm}			8		A

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

2. Tj=25℃,VDD=50V,VG=10V, R_G=25Ω

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. $R_{DS(ON)}$ vs Junction Temperature

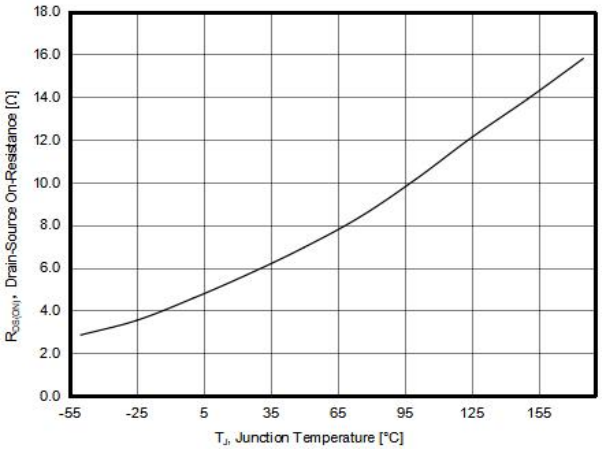


Figure2. BV_{DSS} vs Junction Temperature

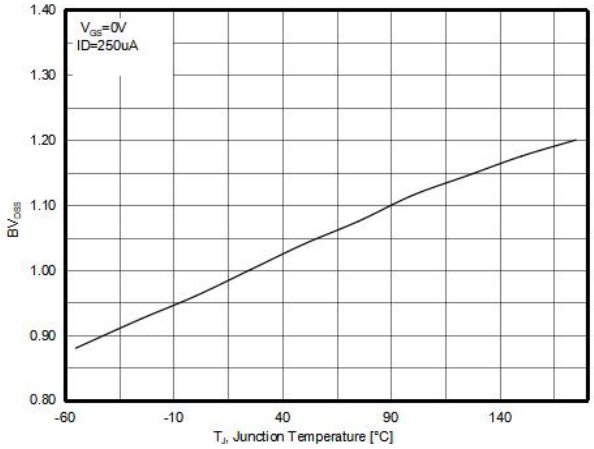


Figure3. Maximum I_D vs Junction Temperature

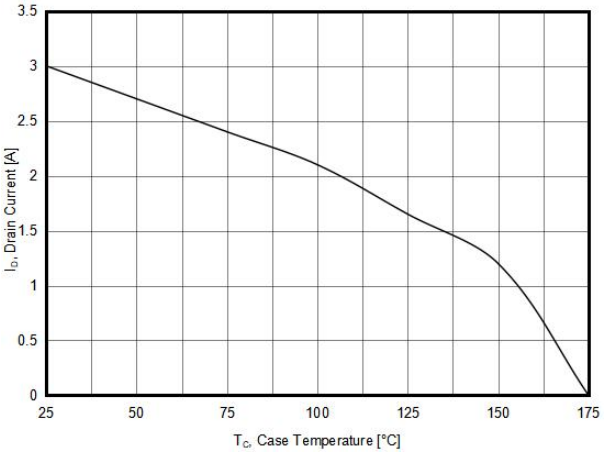


Figure4. Capacitance

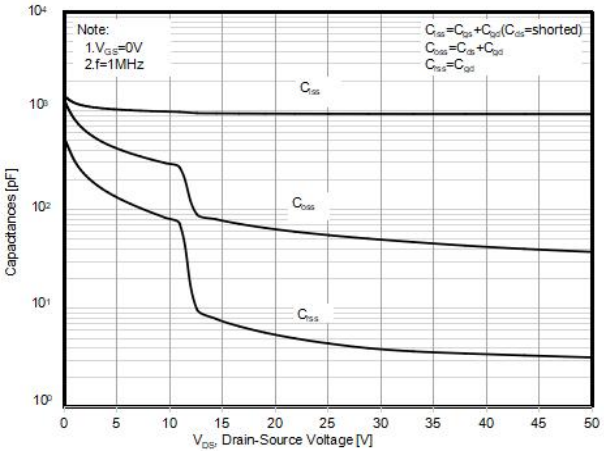


Figure5. Static drain-source on resistance

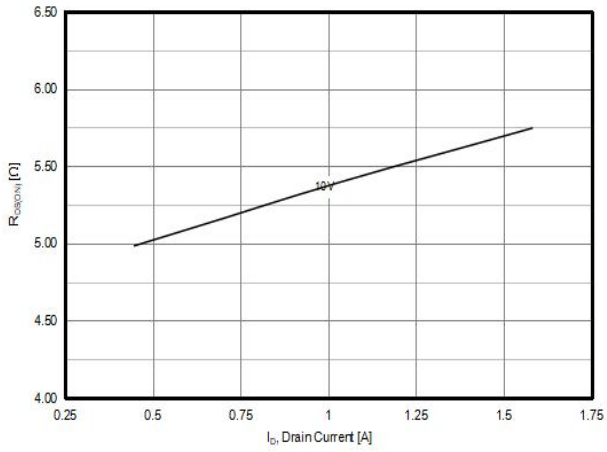


Figure6. Gate charge waveforms

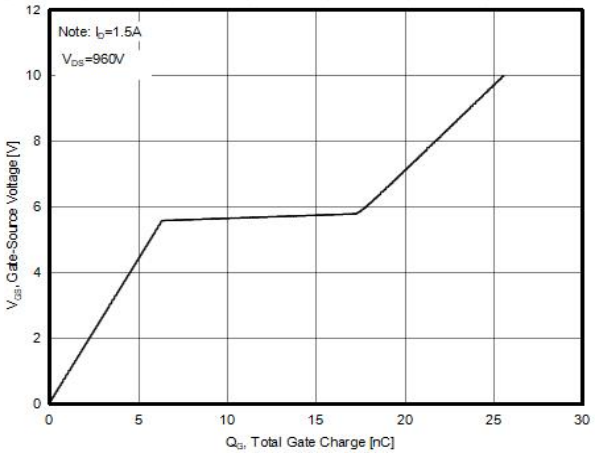


Figure7. Transfer characteristics

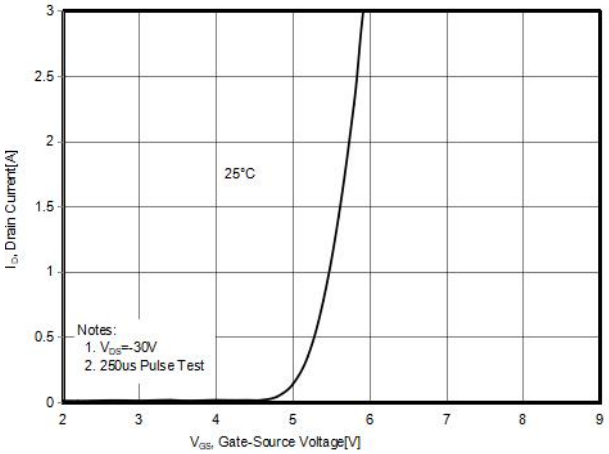


Figure8. Source-Drain Diode Forward Voltage

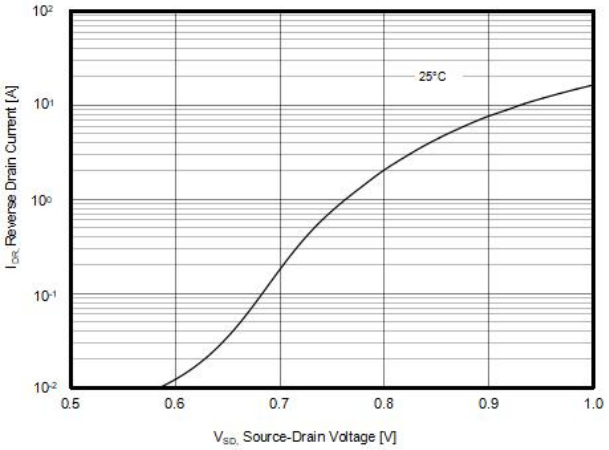


Figure9. Output characteristics

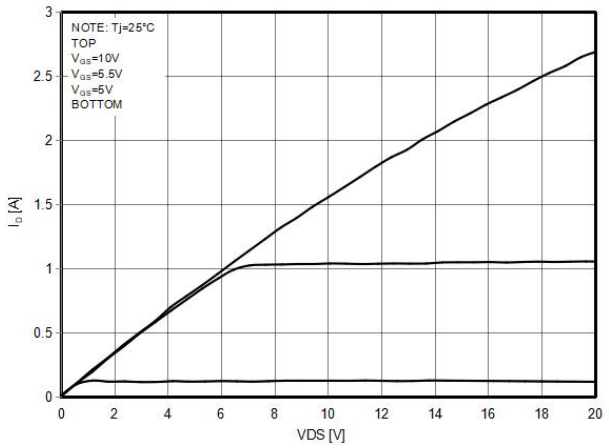


Figure10. Safe operating area

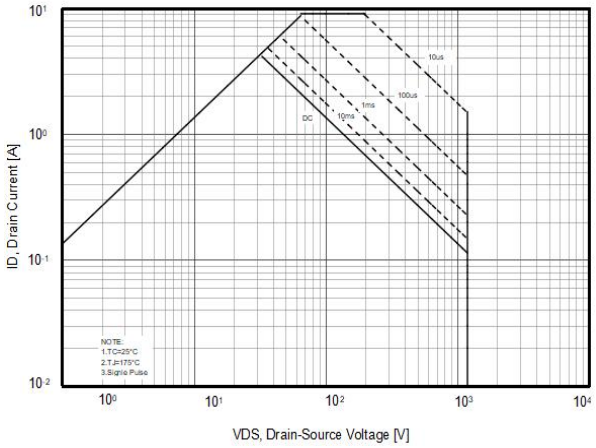
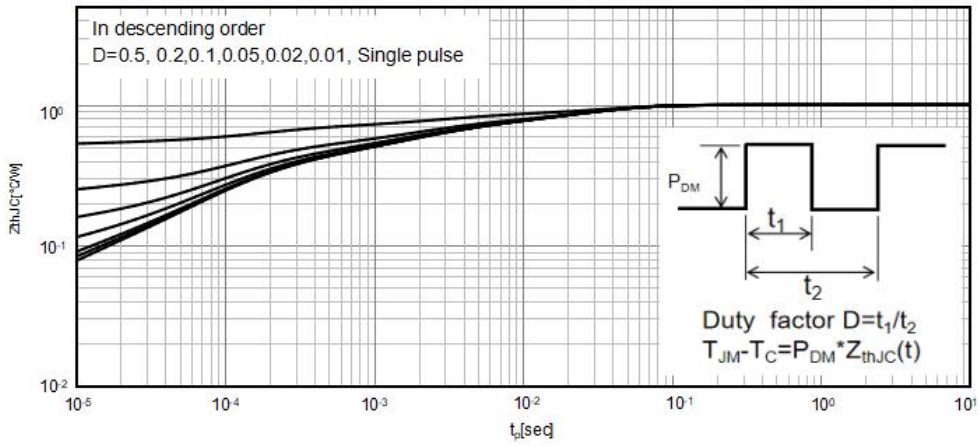
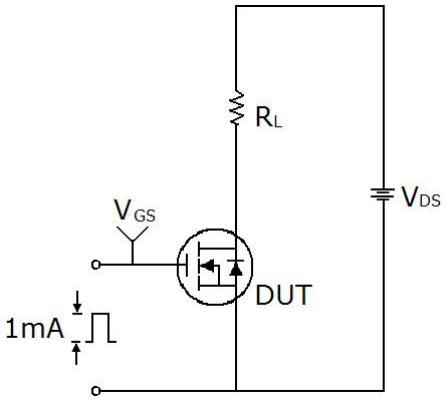


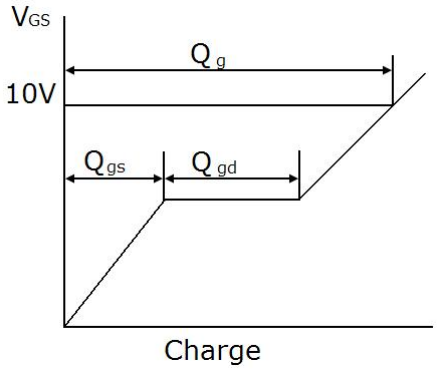
Figure11. Transient Thermal Impedance



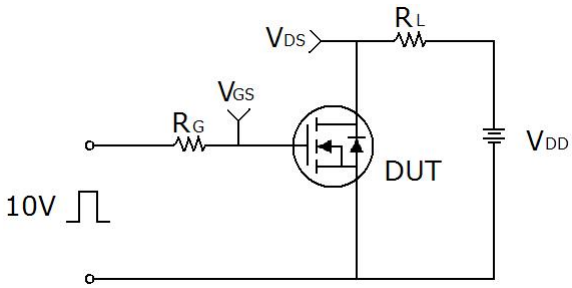
Test circuit

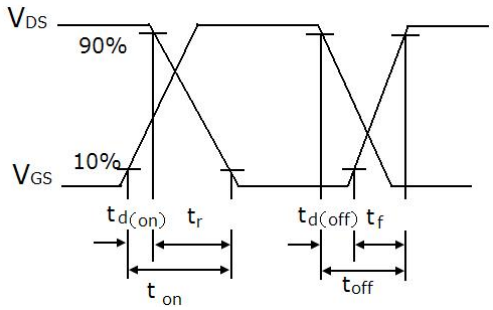
1）Gate charge test circuit & Waveform



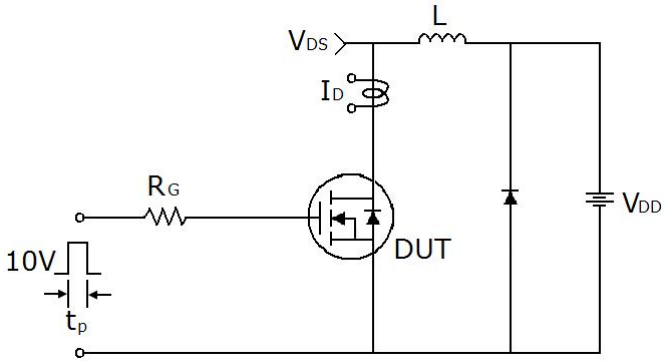


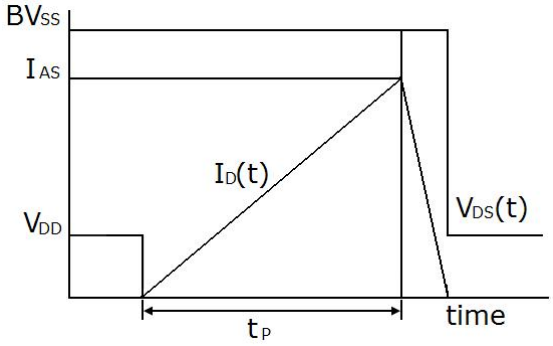
2）Switch Time Test Circuit：



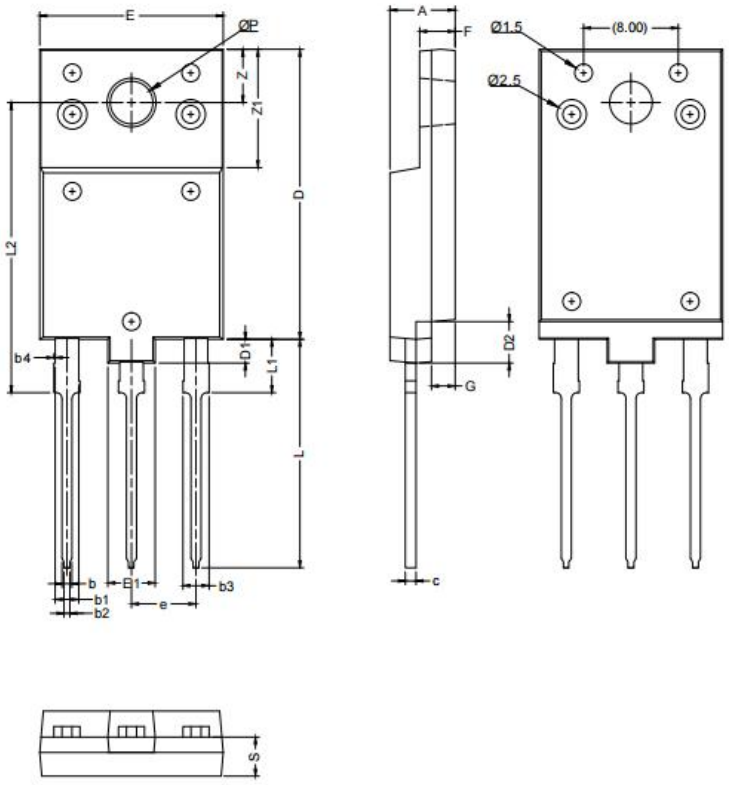


3）Unclamped Inductive Switching Test Circuit & Waveforms





TO-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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