

## 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.

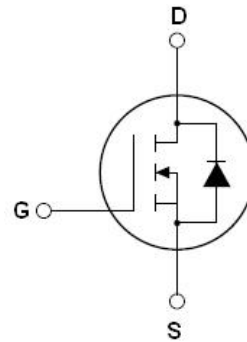
### Features

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

### Application

- Switched applications

$V_{DS\ min@T_{jmax}}$	1650	V
$R_{DS(ON)TYP}$	5.5	$\Omega$
$I_D$	3	A
$Q_g$	32	nC



Schematic diagram

### Package Marking And Ordering Information

Device	Device Package	Marking
NCE3N150PF	TO-3PF	NCE3N150PF



TO-3PF

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

Parameter	Symbol	NCE3N150PF	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	1500	V
Gate-Source Voltage ( $V_{DS}=0V$ ) DC	$V_{GS}$	$\pm 30$	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	3	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	2.10	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	9	A
Maximum Power Dissipation ( $T_c=25^\circ\text{C}$ )	$P_D$	88	W
Derate above $25^\circ\text{C}$		0.58	W/ $^\circ\text{C}$
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	$^\circ\text{C}$

\* limited by maximum junction temperature

**Table 2. Thermal Characteristic**

Parameter	Symbol	NCE3N150	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	1.7	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	50	$^{\circ}C/W$

**Table 3. Electrical Characteristics ( $T_J=25^{\circ}C$  unless otherwise noted)**

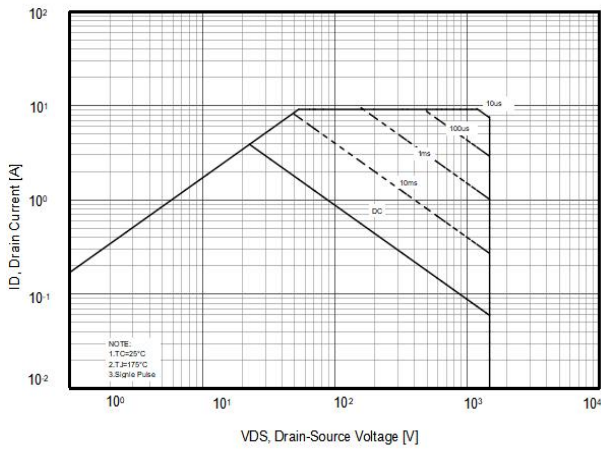
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/off states</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=1mA$	1500			V
Zero Gate Voltage Drain Current( $T_c=25^{\circ}C$ )	$I_{DSS}$	$V_{DS}=1500V, V_{GS}=0V$			1	$\mu A$
Zero Gate Voltage Drain Current( $T_c=125^{\circ}C$ )	$I_{DSS}$	$V_{DS}=1500V, V_{GS}=0V$			100	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3	4	5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=1.5A$		5.5	7.5	$\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=40V, V_{GS}=0V,$ $F=1.0MHz$		1700		pF
Output Capacitance	$C_{oss}$			61		pF
Reverse Transfer Capacitance	$C_{rss}$			5.5		pF
Total Gate Charge	$Q_g$	$V_{DS}=1200V, I_D=1.5A,$ $V_{GS}=10V$		32		nC
Gate-Source Charge	$Q_{gs}$			8.7		nC
Gate-Drain Charge	$Q_{gd}$			12		nC
Intrinsic gate resistance	$R_G$	$f = 1 MHz$ open drain		2		$\Omega$
<b>Switching times</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=750V, I_D=1.5A,$ $R_G=3\Omega, V_{GS}=10V$		22		nS
Turn-on Rise Time	$t_r$			45		nS
Turn-Off Delay Time	$t_{d(off)}$			42		nS
Turn-Off Fall Time	$t_f$			58		nS
<b>Source- Drain Diode Characteristics</b>						
Source-drain current(Body Diode)	$I_{SD}$	$T_C=25^{\circ}C$			3	A
Pulsed Source-drain current(Body Diode)	$I_{SDM}$				9	A
Forward On Voltage	$V_{SD}$	$T_J=25^{\circ}C, I_{SD}=3A, V_{GS}=0V$		0.8	1.1	V
Reverse Recovery Time	$t_{rr}$	$T_J=25^{\circ}C, I_F=3A,$ $di/dt=100A/\mu s$		390		nS
Reverse Recovery Charge	$Q_{rr}$			2.2		$\mu C$
Peak Reverse Recovery Current	$I_{rrm}$			11		A

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

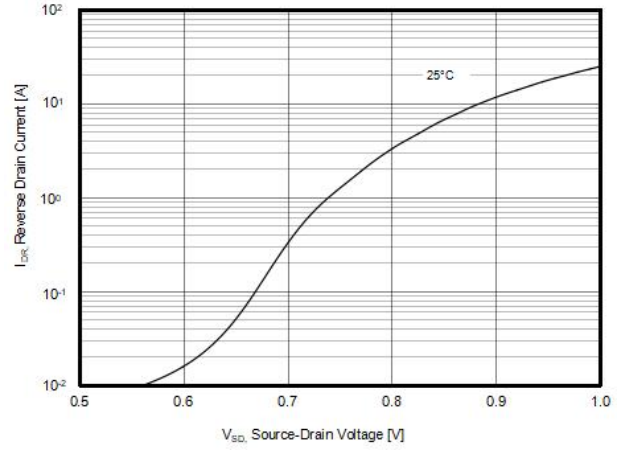
2.  $T_J=25^{\circ}C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

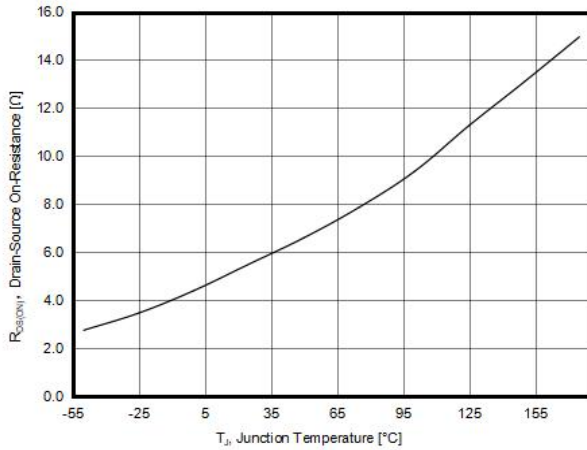
**Figure1. Safe operating area**



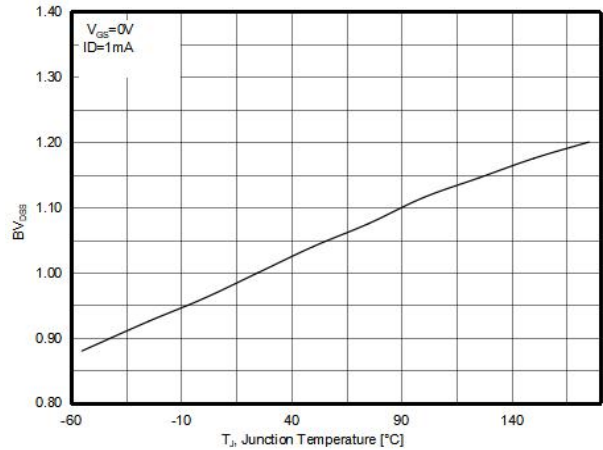
**Figure2. Source-Drain Diode Forward Voltage**



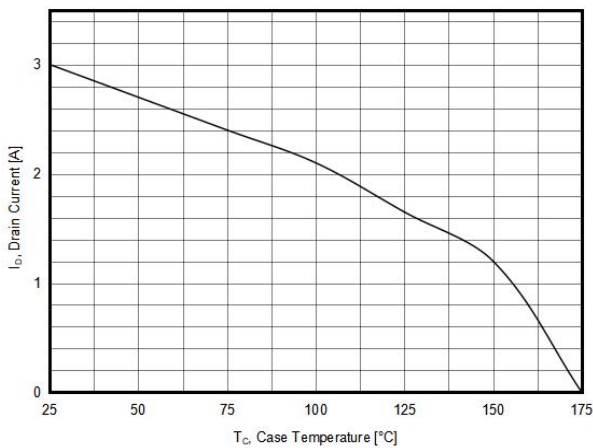
**Figure3.  $R_{DS(ON)}$  vs Junction Temperature**



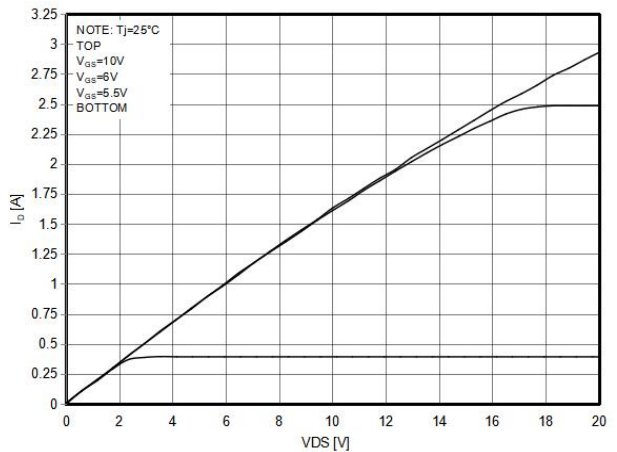
**Figure4.  $BV_{DSS}$  vs Junction Temperature**



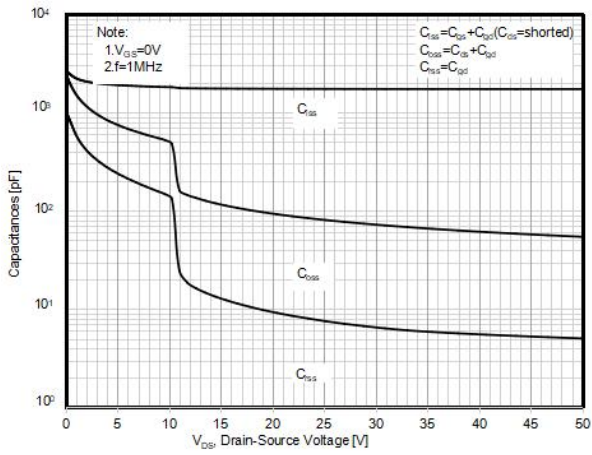
**Figure5. Maximum  $I_D$  vs Junction Temperature**



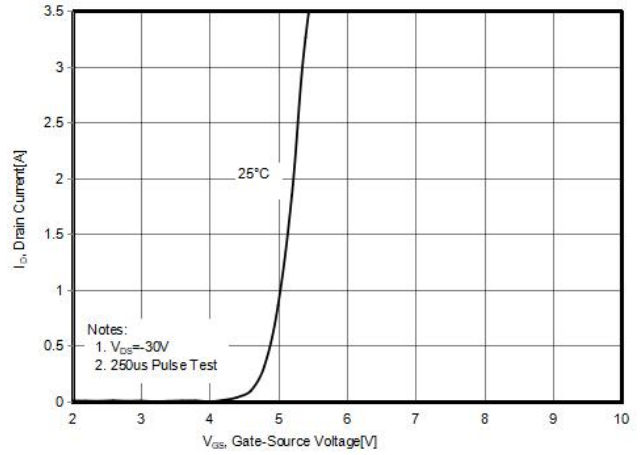
**Figure6. Output characteristics**



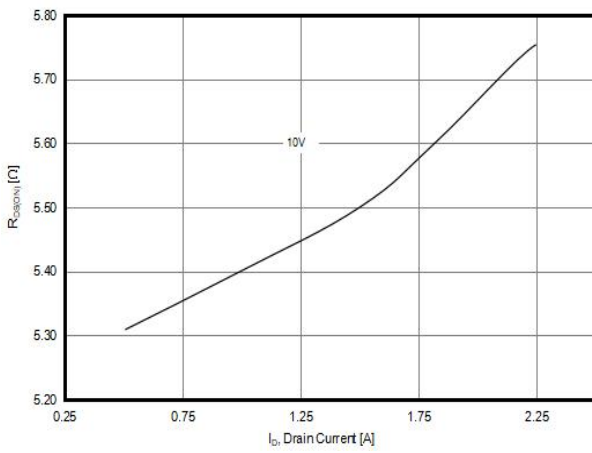
**Figure7. Capacitance**



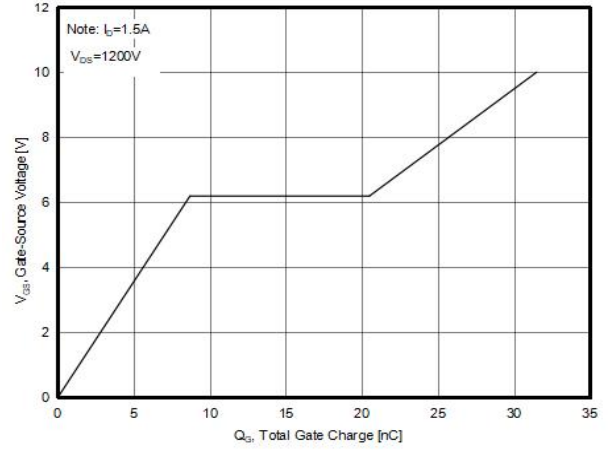
**Figure8. Transfer characteristics**



**Figure9. Static drain-source on resistance**



**Figure9. Gate charge waveforms**

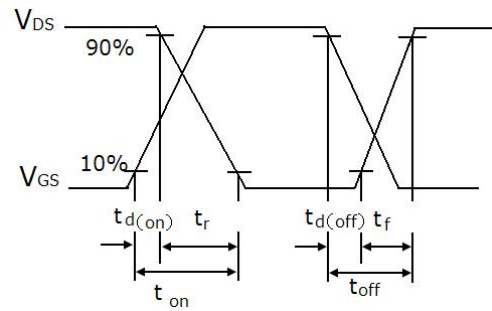


## Test circuit

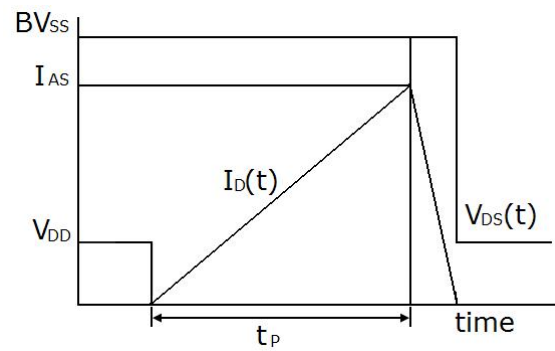
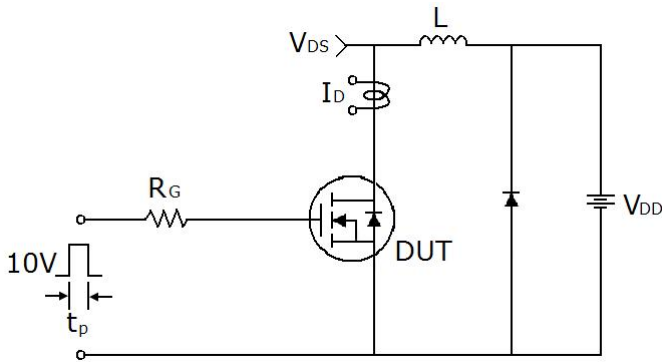
### 1) Gate charge test circuit & Waveform



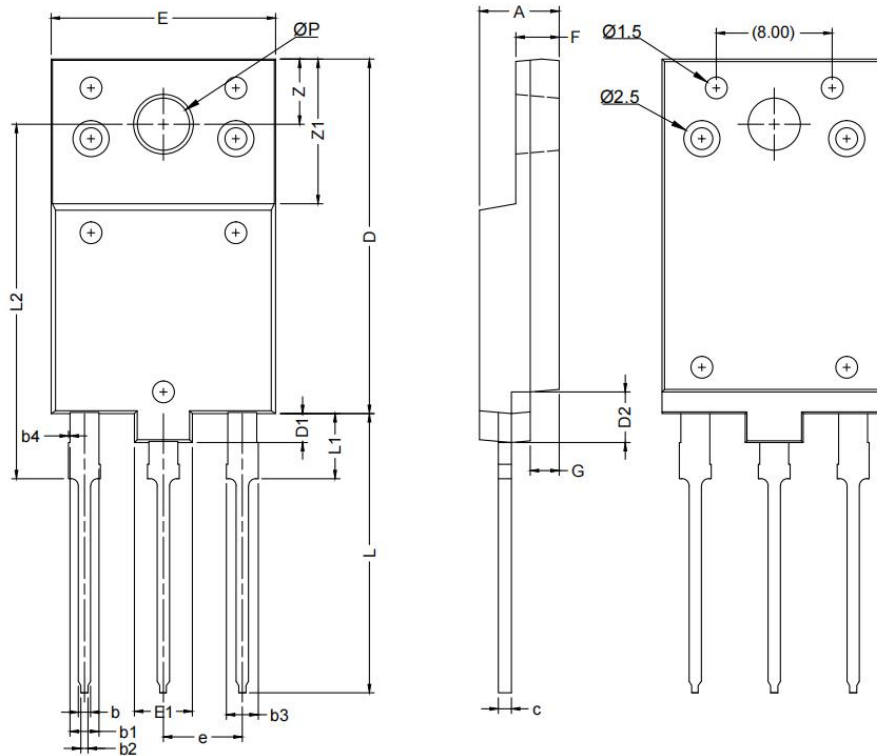
### 2) Switch Time Test Circuit:



### 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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