

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.

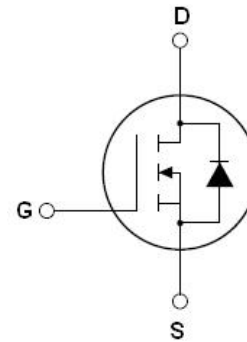
Features

- 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
NCE3N170T	TO-247	NCE3N170T



TO-247

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	187	W
Derate above 25°C		1.24	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	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	0.8	$^{\circ}\text{C} / \text{W}$
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	50	$^{\circ}\text{C} / \text{W}$

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°C)	I_{DSS}	$V_{DS}=1700V, V_{GS}=0V$			1	μA
Zero Gate Voltage Drain Current(Tc=125°C)	I_{DSS}	$V_{DS}=1700V, V_{GS}=0V$			100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	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}	$V_{DS}=40V, V_{GS}=0V,$ $F=1.0\text{MHz}$		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	$f = 1 \text{ MHz open drain}$		2		Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=850V, I_D=1.45A,$ $R_G=3\Omega, V_{GS}=10V$		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}	$T_C=25^{\circ}\text{C}$			2.9	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				8.7	A
Forward On Voltage	V_{SD}	$T_j=25^{\circ}\text{C}, I_{SD}=2.9A, V_{GS}=0V$		0.8	1.1	V
Reverse Recovery Time	t_{rr}	$T_j=25^{\circ}\text{C}, I_f=2.9A,$ $di/dt=100A/\mu\text{s}$		1500		nS
Reverse Recovery Charge	Q_{rr}			5.6		μC
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

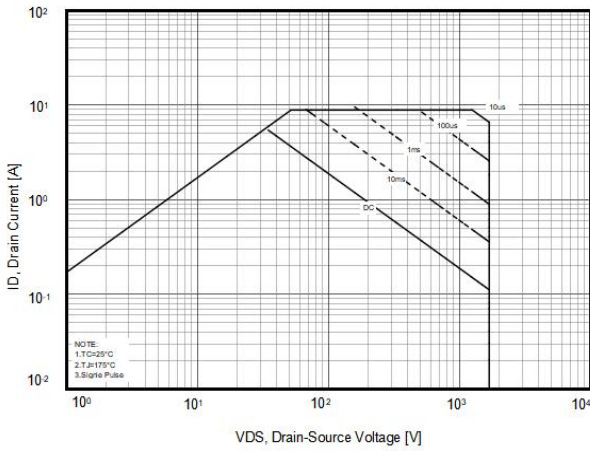


Figure2. Source-Drain Diode Forward Voltage

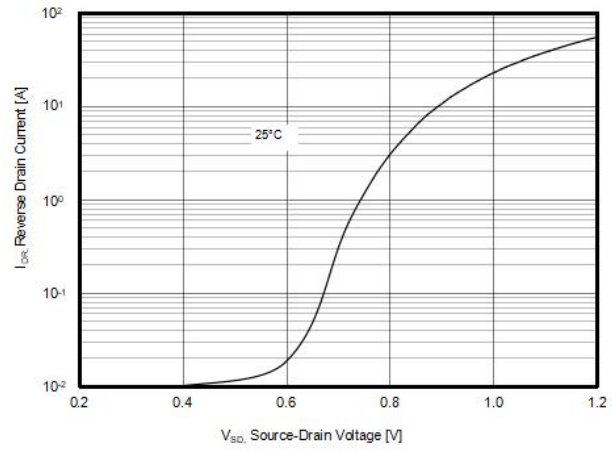


Figure3. R_{DS(ON)} vs Junction Temperature

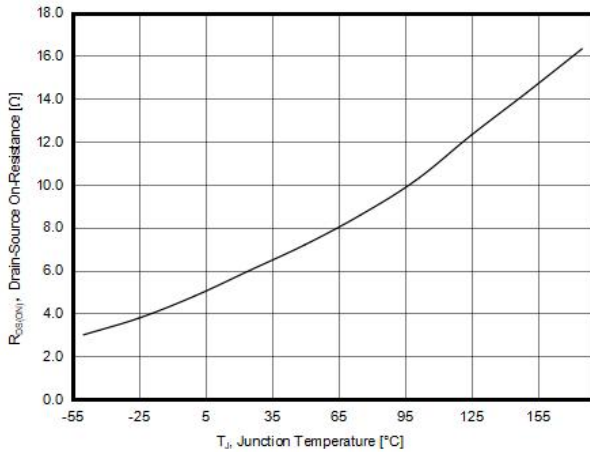


Figure4. BV_{DSS} vs Junction Temperature

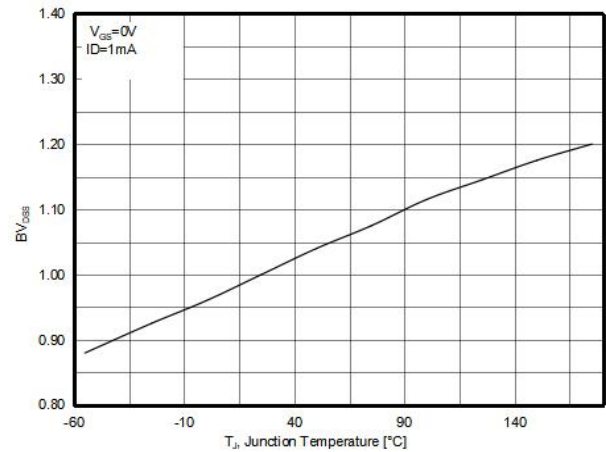


Figure5. Maximum ID vs Junction Temperature

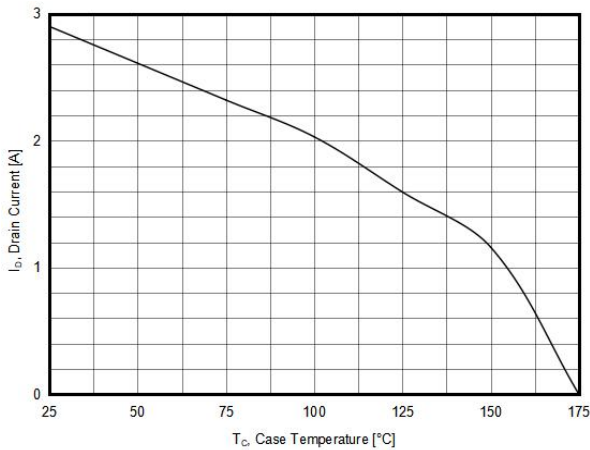


Figure6. Output characteristics

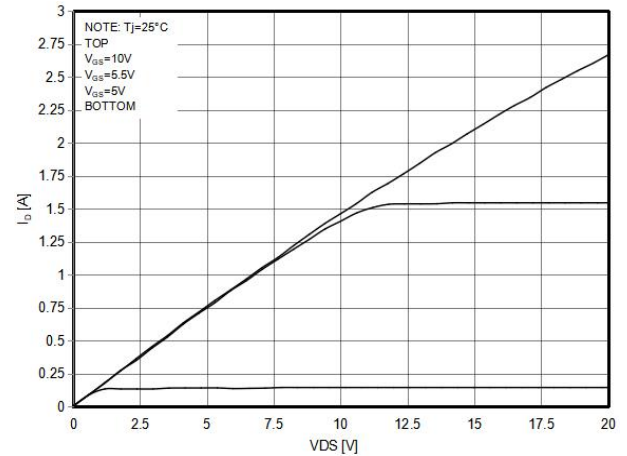


Figure7. Capacitance

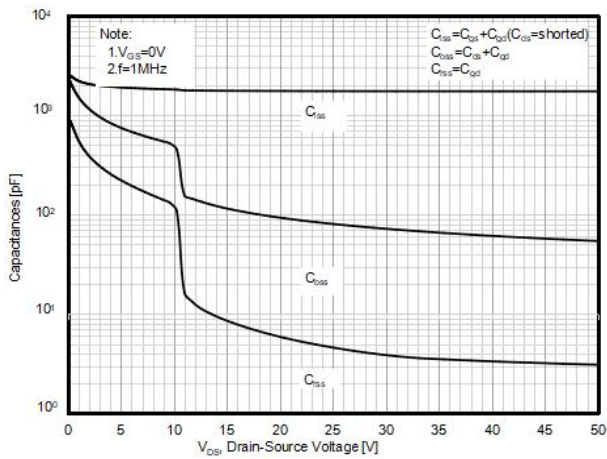


Figure8. Transfer characteristics

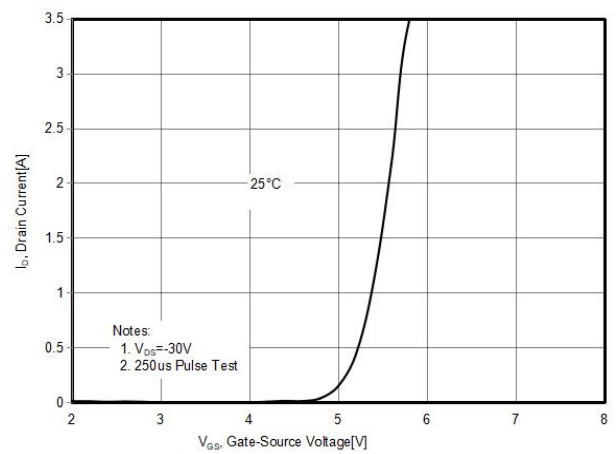


Figure9. Static drain-source on resistance

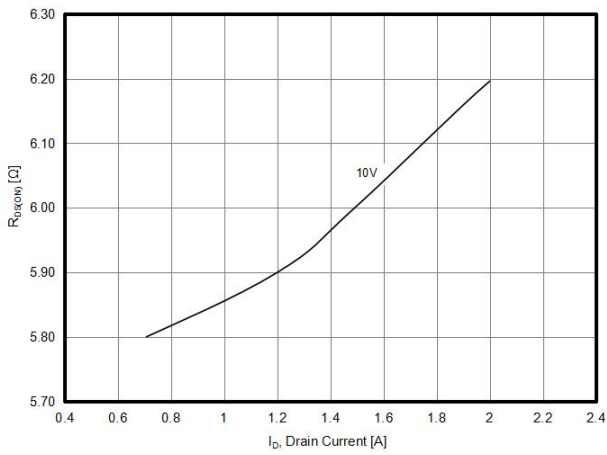
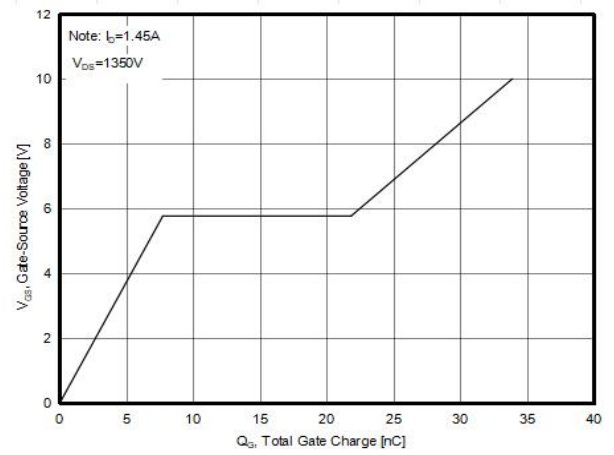
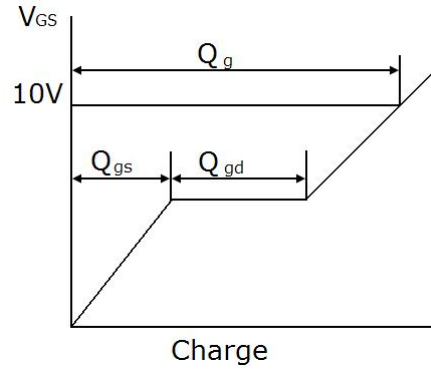
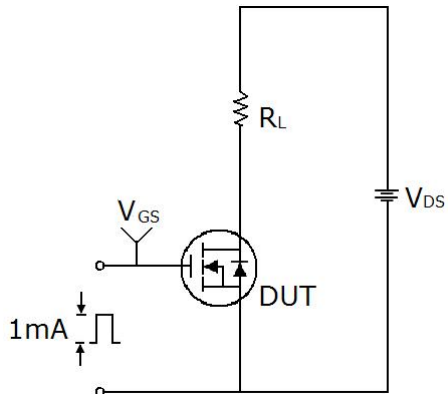


Figure9. Gate charge waveforms

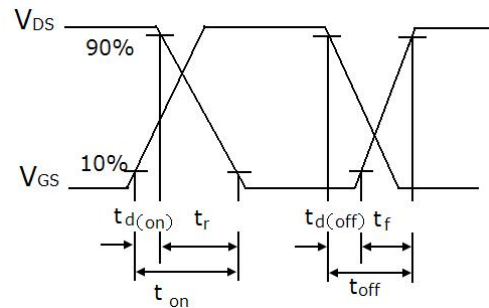
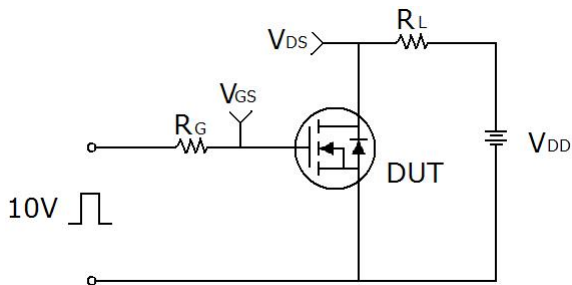


Test circuit

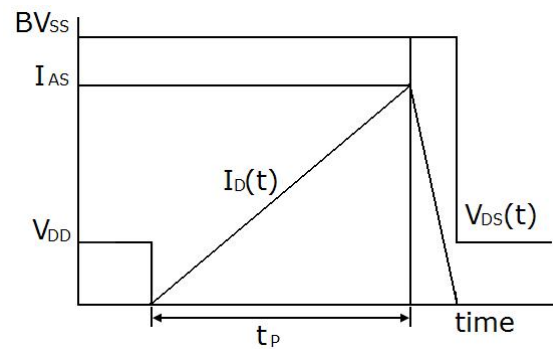
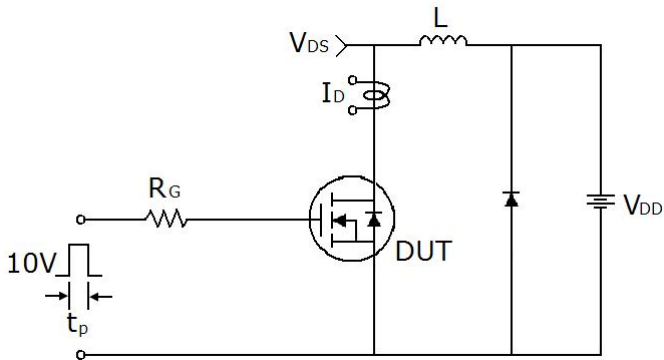
1) Gate charge test circuit & Waveform



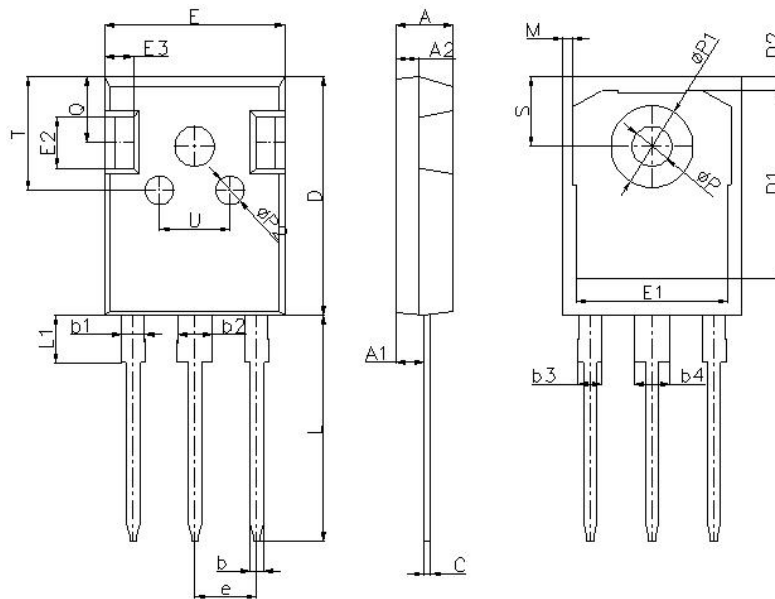
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-247-E Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.077	0.081
b2	2.96	3.06	0.117	0.120
b3	-	2.25	-	0.089
b4	-	3.25	-	0.128
C	0.59	0.66	0.023	0.026
D	20.90	21.10	0.823	0.831
D1	16.25	16.85	0.640	0.663
D2	1.05	1.35	0.041	0.053
E	15.70	15.90	0.618	0.626
E1	13.10	13.50	0.516	0.531
E2	4.40	4.60	0.173	0.181
E3	2.40	2.60	0.094	0.102
e	5.436BSC		0.214BSC	
L	19.80	20.10	0.780	0.791
L1	-	4.30	-	0.169
M	0.35	0.95	0.014	0.037
Q	5.60	6.00	0.220	0.236
S	6.05	6.25	0.238	0.246
T	9.80	10.20	0.386	0.402
U	6.00	6.40	0.236	0.252

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