

# 承 认 书

## SPECIFICATION FOR APPROVAL

客户名称:	佛山电器照明股份有限公司		
客户料号:	18X001040024		
产品名称:	MOSFET		
产品型号:	4N65TF		
产品商标:			
环保要求:	ROHS2.0 REACH		
版 次:	V1.0		
拟制:	张少	日期:	2018年07月21日
审核:	王兴龙	日期:	2018年07月21日
批准:	王兴龙	日期:	2018年07月21日
客户确认:			

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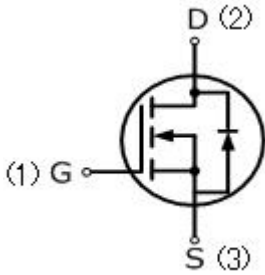


## 4N65TF

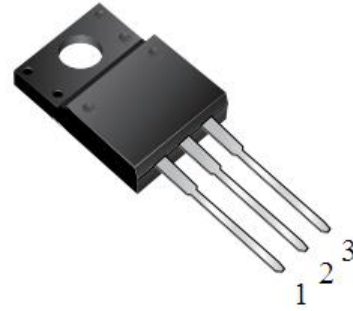
4 Amps, 650 Volts N-CHANNEL MOSFET

### FEATURE

- 4A, 650V,  $R_{DS(ON)MAX}=2.6\ \Omega @V_{GS}=10V/2A$
- Low gate charge
- Low  $C_{iss}$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



TO-220TF



### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	4N65TF	UNIT
Drain-Source Voltage	$V_{DSS}$	650	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	
Continuous Drain Current	$I_D$	4	A
Pulsed Drain Current (Note 1)	$I_{DM}$	16	
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	150	mJ
Reverse Diode dv/dt (Note 3)	dv/dt	2.63	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	$T_L$	260	$^\circ\text{C}$
Mounting Torque	6-32 or M3 screw	10	lbf • in
		1.1	N • m

### Thermal Characteristics

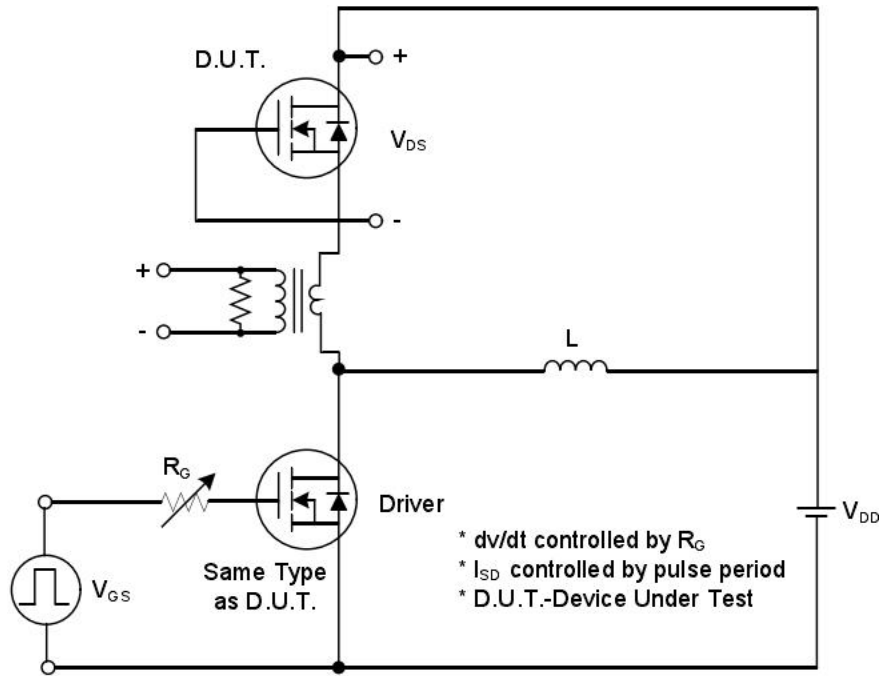
Parameter	Symbol	MAX	Units
Maximum Junction-to-Case	$R_{thJC}$	3.47	$^\circ\text{C}/\text{W}$
Maximum Power Dissipation	$P_D$	34	W

<b>Electrical Characteristics</b> ( $T_c=25^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650	—	—	V
Breakdown Temperature Coefficient	$\Delta BV_{DSS} / \Delta T_J$	Reference to $25^\circ\text{C}$ , $I_D=250\mu A$	—	0.67	—	$V/^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$	—	—	10	$\mu A$
Gate-Body Leakage Current, Forward	$I_{GSSF}$	$V_{GS}=30V, V_{DS}=0V$	—	—	100	nA
Gate-Body Leakage Current, Reverse	$I_{GSSR}$	$V_{GS}=-30V, V_{DS}=0V$	—	—	-100	nA
<b>On Characteristics</b>						
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	—	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2A$	—	2.1	2.6	$\Omega$
Pulse width $t_p \leq 380\mu s$ , $\delta \leq 2\%$						
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V$ , $f=1.0\text{MHz}$	—	425	—	pF
Output Capacitance	$C_{oss}$		—	55	—	pF
Reverse Transfer Capacitance	$C_{rss}$		—	5.8	—	pF
<b>Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=325V, I_D=4A$ , $R_G=10\Omega$ (Note3,4)	—	10	—	ns
Turn-On Rise Time	$t_r$		—	11	—	ns
Turn-Off Delay Time	$t_{d(off)}$		—	31	—	ns
Turn-Off Fall Time	$t_f$		—	16	—	ns
Total Gate Charge	$Q_g$	$V_{DS}=325V, I_D=4A$ , $V_{GS}=10V$ (Note3,4)	—	14.5	—	nC
Gate-Source Charge	$Q_{gs}$		—	3	—	nC
Gate-Drain Charge	$Q_{gd}$		—	6	—	nC
<b>Drain-Source Body Diode Characteristics and Maximum Ratings</b>						
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V$	—	—	1.5	V
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=4A, T_J=25^\circ\text{C}$ $dI_F/dt=100A/\mu s$ (Note3)	—	320	—	ns
Reverse Recovery Charge	$Q_{rr}$		—	2.0	—	nC
Pulse width $t_p \leq 380\mu s$ , $\delta \leq 2\%$						

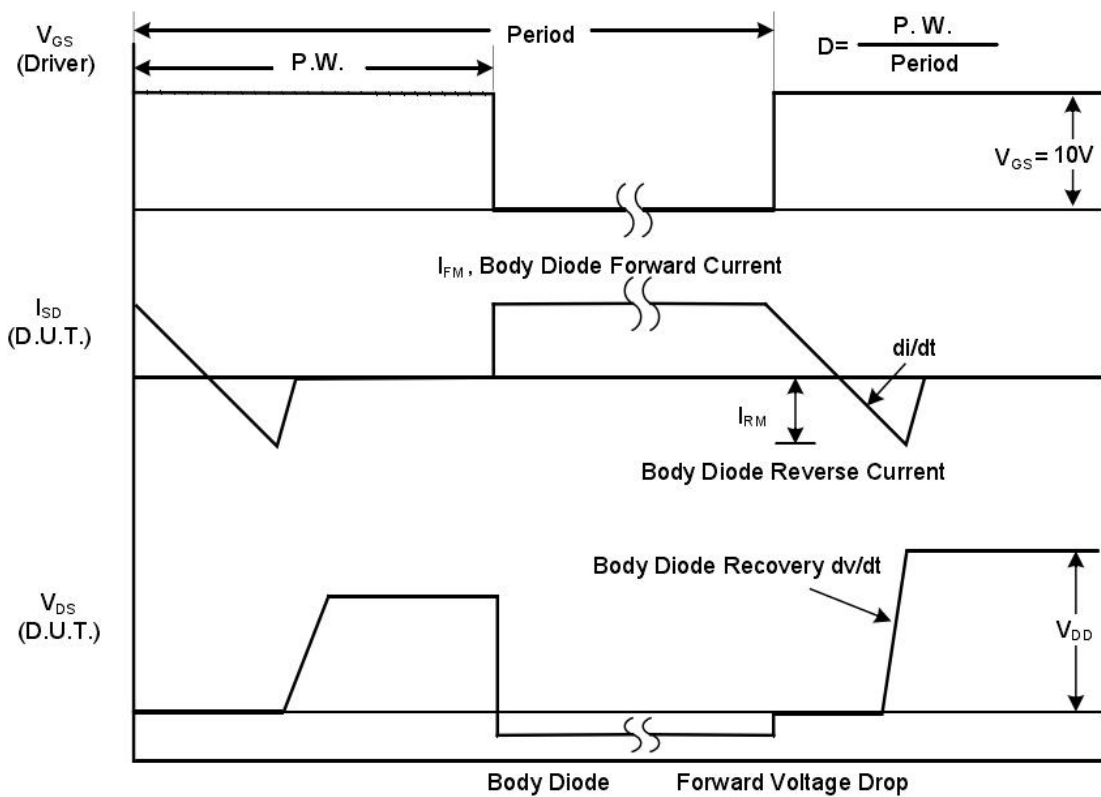
### Notes

1. Repetitive Rating: pulse width limited by maximum junction temperature .
2.  $V_{DD}=50V$ , starling,  $L=18.8\text{mH}$ ,  $R_g=25\Omega$ ,  $I_{AS}=4A$ ,  $T_J=25^\circ\text{C}$ .
3.  $dI/dt=$ \_A/us, starting  $T_J=25^\circ\text{C}$ . Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
4. Repetitive rating; pulse width limited by maximum junction temperature.

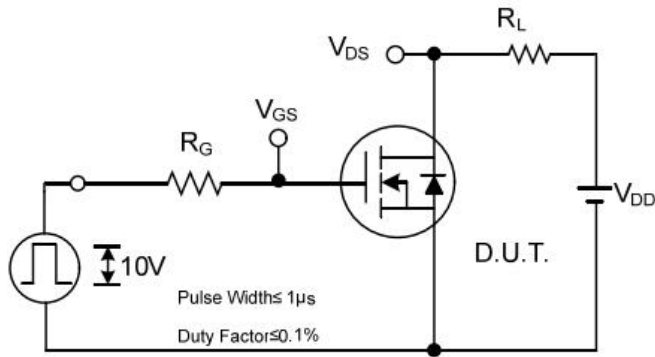
**TEST CIRCUIT AND WAVEFORM**



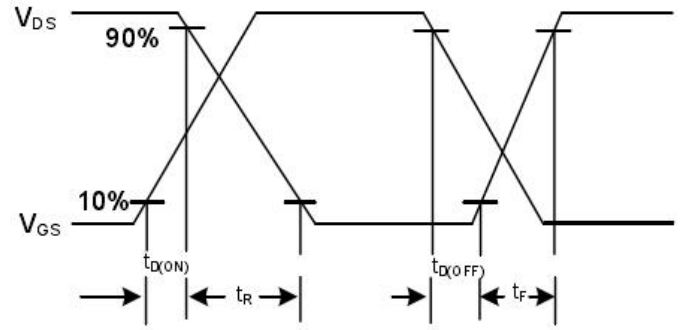
**Peak Diode Recovery dv/dt Test Circuit**



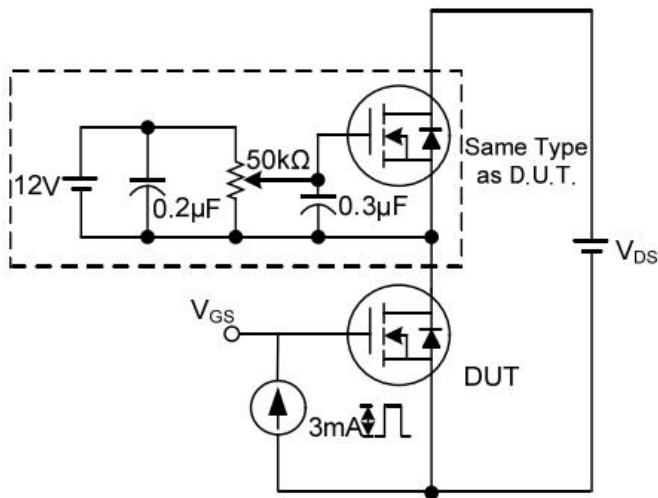
**Peak Diode Recovery dv/dt Waveforms**



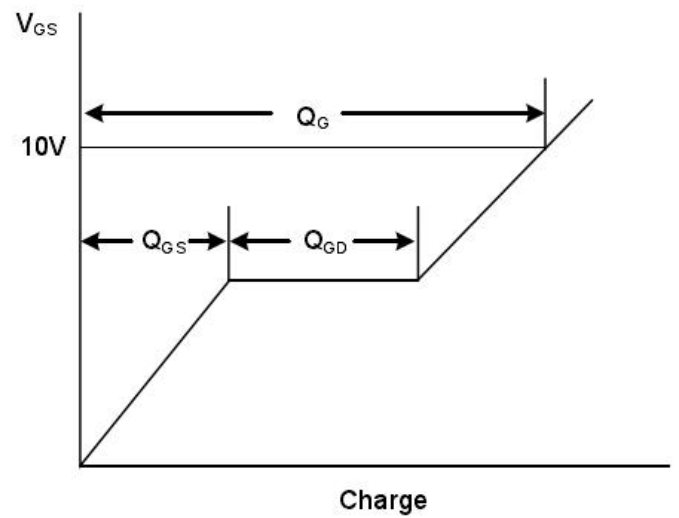
**Switching Test Circuit**



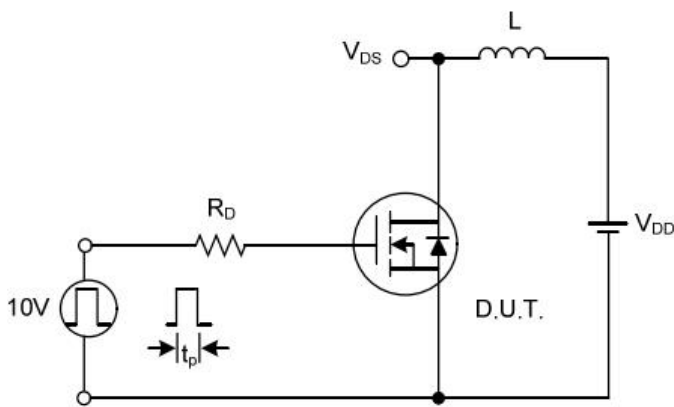
**Switching Waveforms**



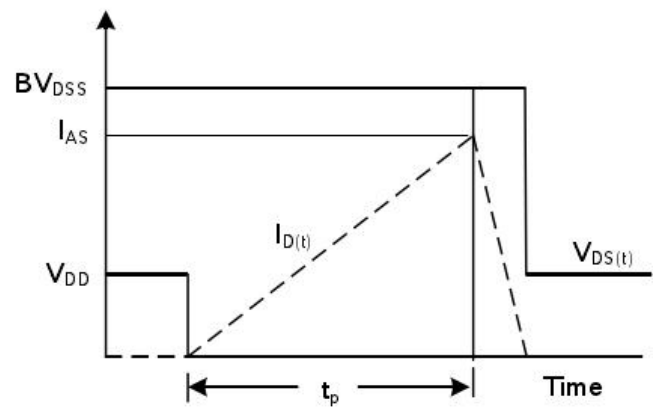
**Gate Charge Test Circuit**



**Gate Charge Waveform**

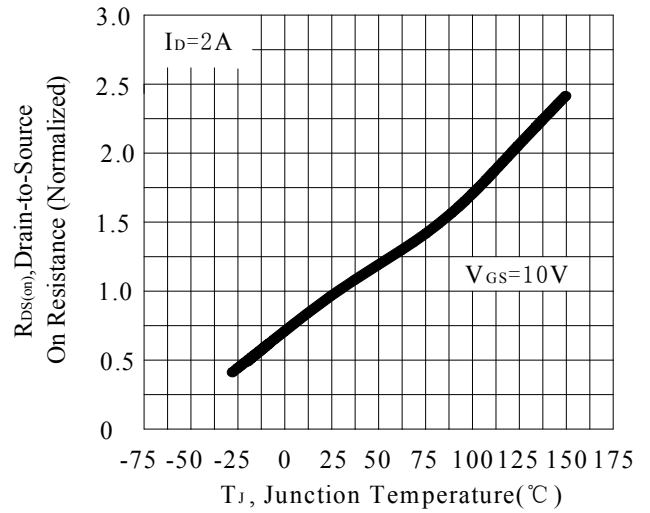
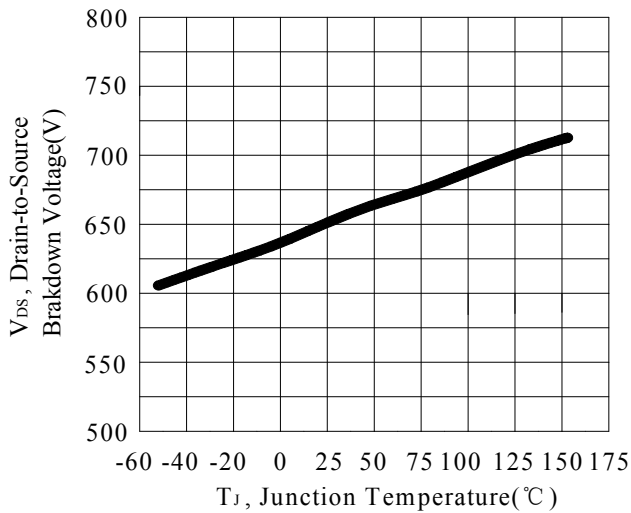
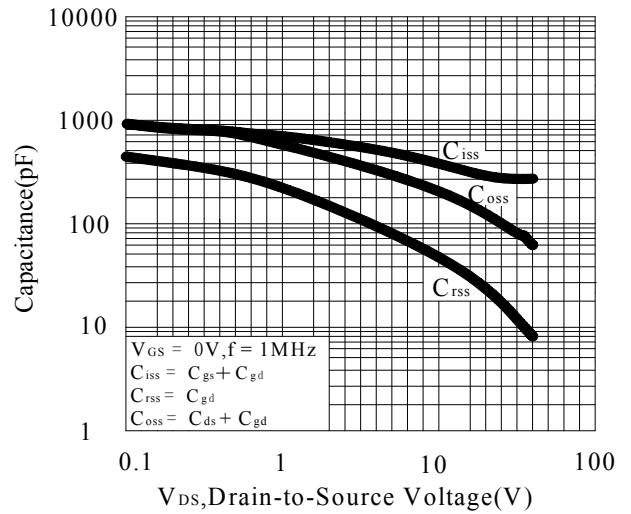
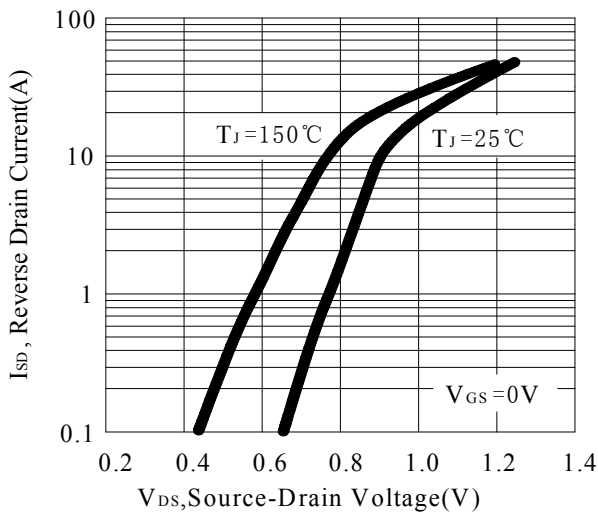
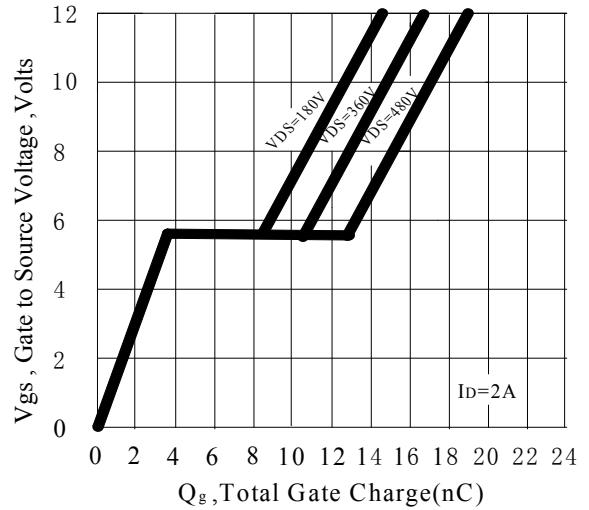
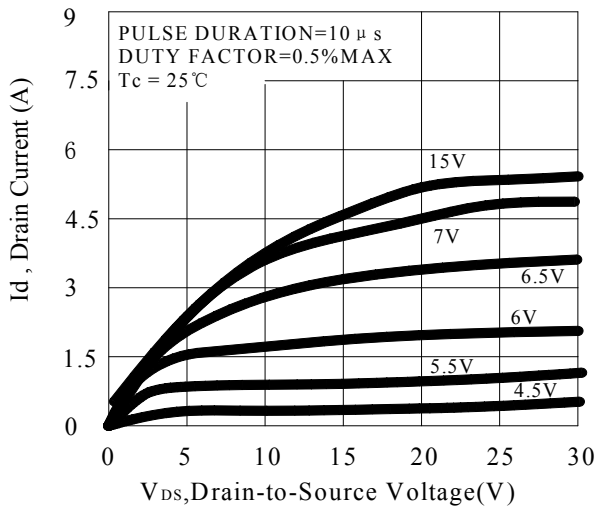


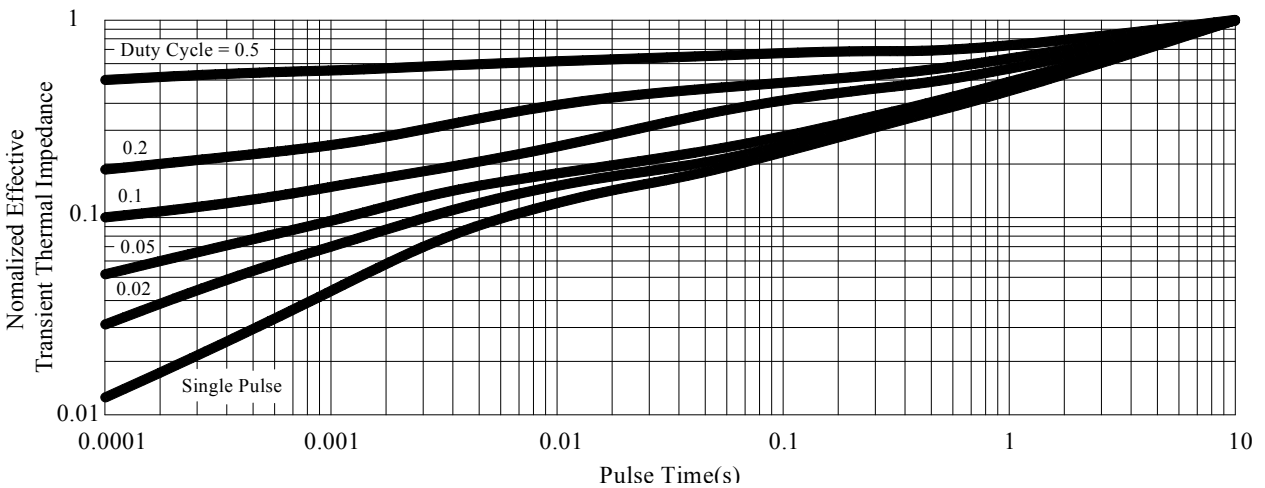
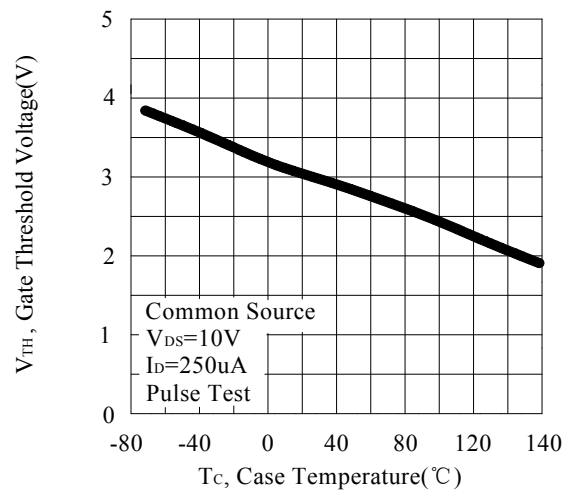
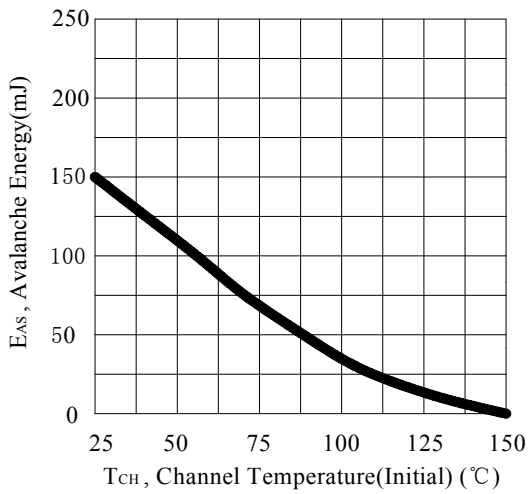
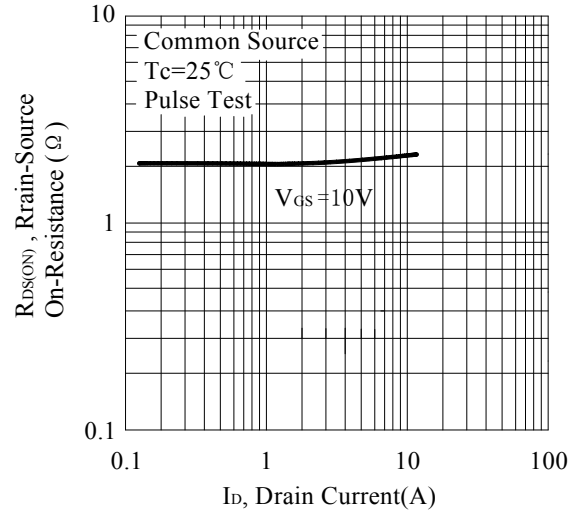
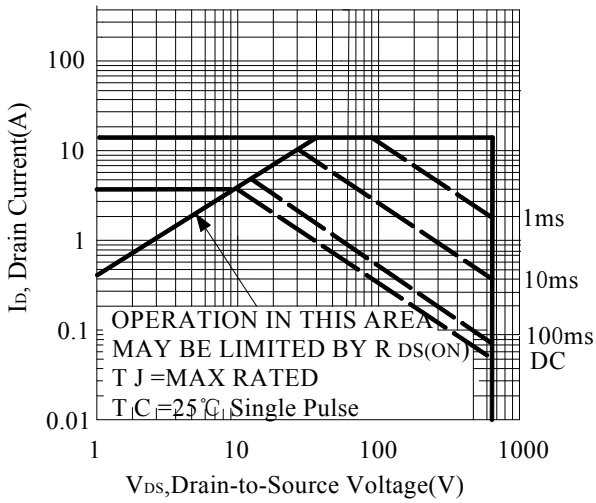
**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

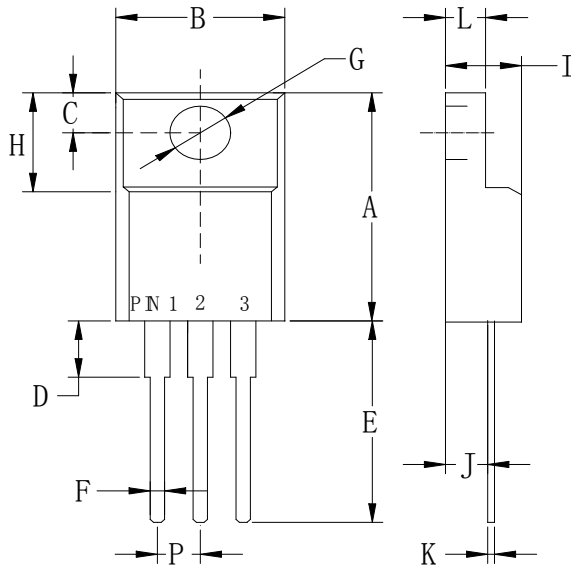
## RATING AND CHARACTERISTIC CURVES





**PACKAGE OUTLINE DIMENSIONS**

**TO-220TF**



TO-220TF		
Dim	Min	Max
A	.590 (15.0)	.650 (16.5)
B	.393 (10.0)	.414 (10.5)
C	.118 (3.00)	.138 (3.50)
D	.118 (3.00)	.146 (3.70)
E	.512 (13.0)	.551 (14.0)
F	.028 (0.70)	.035 (0.90)
G	.114 (2.90)	.138 (3.50)
H	.255 (6.50)	.280 (7.10)
I	.173 (4.40)	.197 (5.00)
J	.102 (2.60)	.110 (2.80)
K	.018 (0.45)	.026 (0.65)
L	.092 (2.35)	.109 (2.75)
P	.890 (2.25)	.113 (2.85)



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