

## 650V N-Channel Mosfet

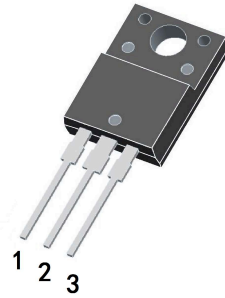
### FEATURES

- $R_{DS(ON)} \leq 0.54 \Omega$  ( 0.46 $\Omega$  Typ.)  
@ $V_{GS}=10V$

### APPLICATIONS

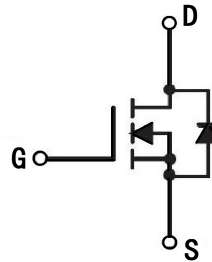
- Load Switch
- PWM Application
- Power management

### TO-220F



1. GATE
2. DRAIN
3. SOURCE

### N-CHANNEL MOSFET



### MAXIMUM RATINGS (Tc=25°C unless otherwise noted)

Symbol	Parameter	Max.	Units	
$V_{DSS}$	Drain-Source Voltage	650	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	V	
$I_D$	Continuous Drain Current	$T_C = 25^\circ C$	16	A
		$T_C = 100^\circ C$	10	A
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>	64	A	
$E_{AS}$	Single Pulsed Avalanche Energy <sup>note2</sup>	470	mJ	
$P_D$	Power Dissipation	$T_C = 25^\circ C$	98	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.27	$^\circ C/W$	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ C/W$	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ C$	

**MOSFET ELECTRICAL CHARACTERISTICS Tc=25 °C unless otherwise specified**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V,$ $T_J = 25^\circ C$	-	-	1	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS} = 10V, I_D = 8A$	-	0.46	0.54	$\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	-	2200	-	pF
$C_{oss}$	Output Capacitance		-	213	-	pF
$C_{riss}$	Reverse Transfer Capacitance		-	13.7	-	pF
$Q_g$	Total Gate Charge	$V_{DD} = 520V, I_D = 8A,$ $V_{GS} = 10V$	-	71	-	nC
$Q_{gs}$	Gate-Source Charge		-	10	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	32	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 325V, I_D = 8A,$ $R_G = 25\Omega$	-	35	-	ns
$t_r$	Turn-on Rise Time		-	50	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	160	-	ns
$t_f$	Turn-off Fall Time		-	65	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	16	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	64	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0V, I_{SD} = 8A$	-	-	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0V, I_S = 8A,$ $di/dt = 100A/\mu s$	-	430	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	6.5	-	$\mu C$

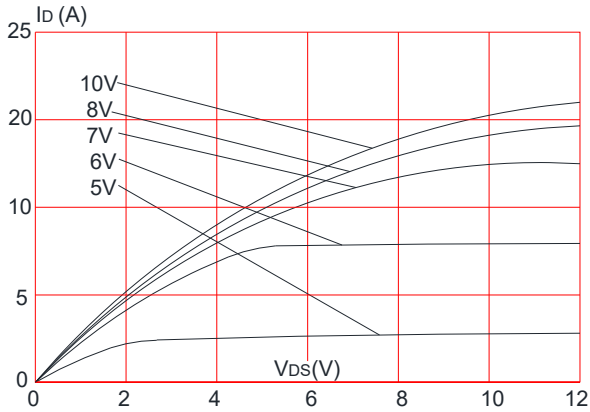
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition:  $T_J = 25^\circ C, V_{DD} = 50V, V_G = 10V, L = 10mH, I_{AS} = 9.7A$

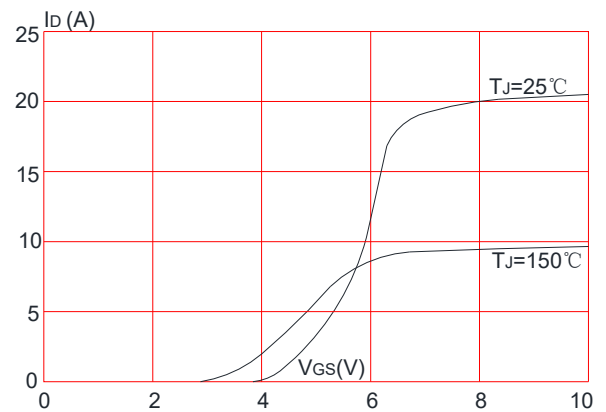
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

## TYPICAL PERFORMANCE CHARACTERISTICS

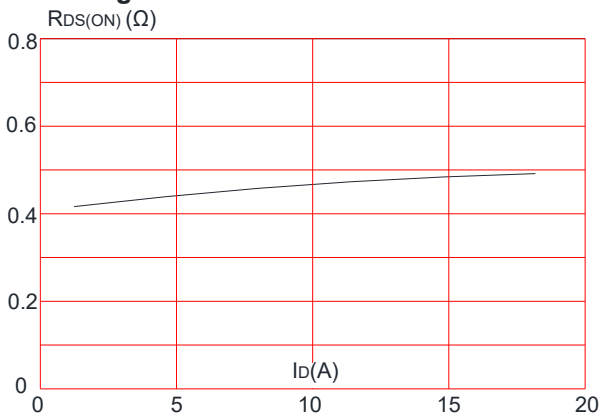
**Figure 1: Output Characteristics**



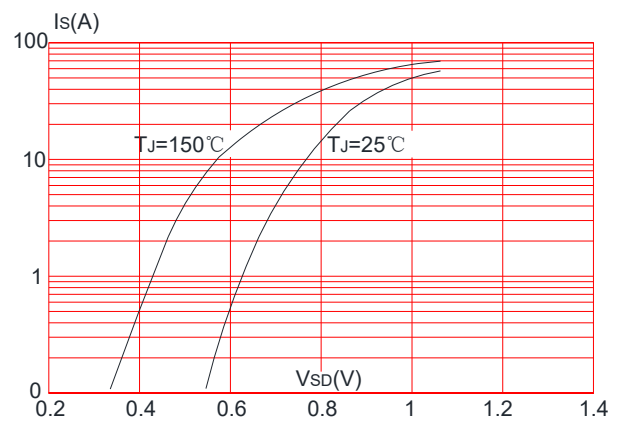
**Figure 2: Typical Transfer Characteristics**



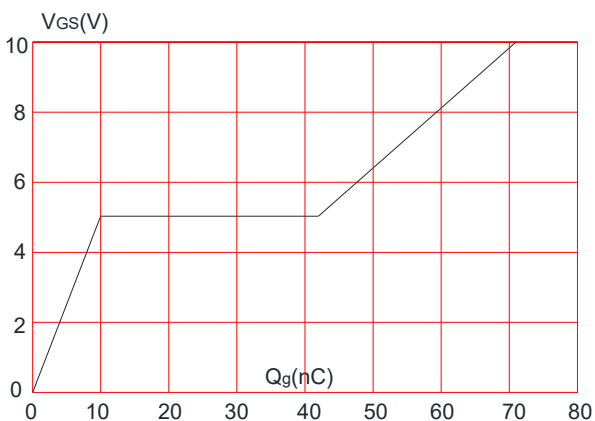
**Figure 3: On-resistance vs. Drain Current**



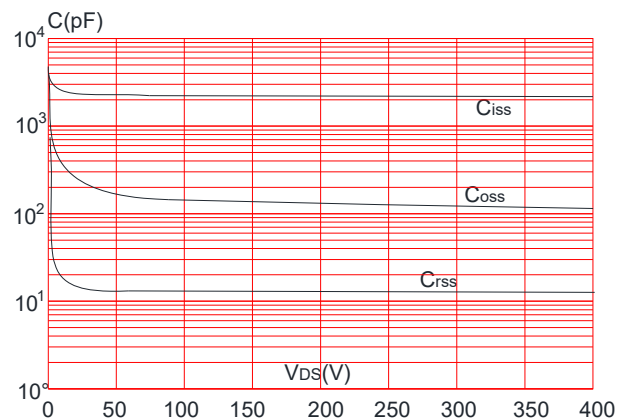
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**



**Figure 6: Capacitance Characteristics**



TYPICAL PERFORMANCE CHARACTERISTICS(cont.)

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

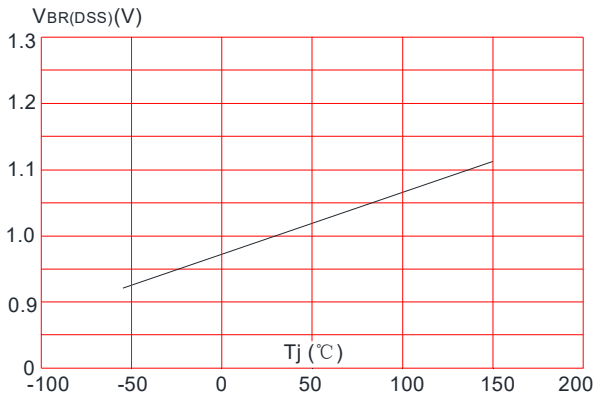


Figure 8: Normalized on Resistance vs. Junction Temperature

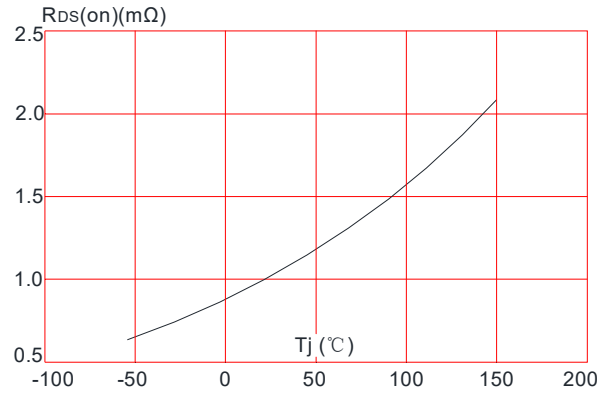


Figure 9: Maximum Safe Operating Area

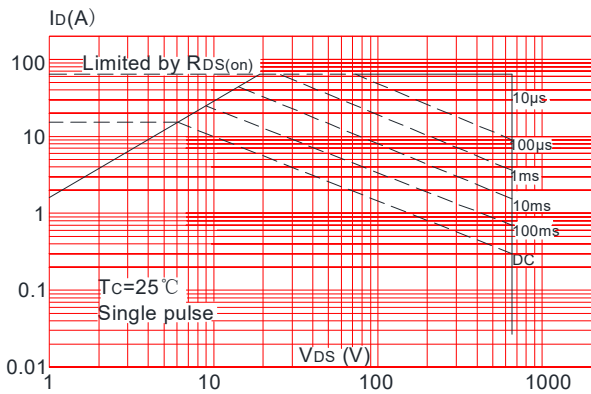


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

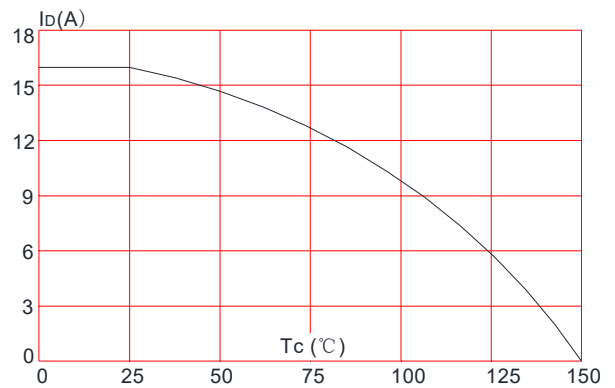
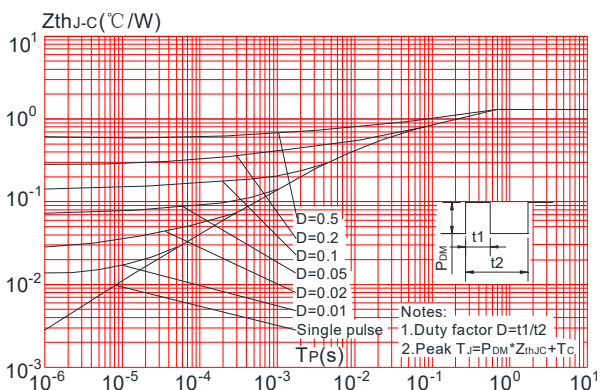
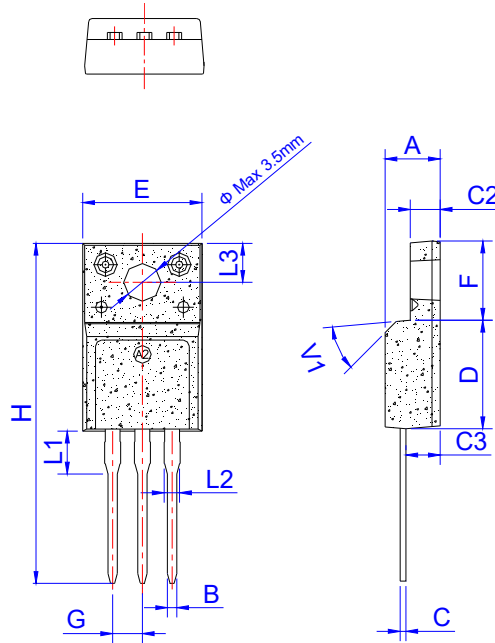


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



TO-220F PACKAGE OUTLINE DRAWING



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.50		4.90	0.177		0.193
B	0.74	0.80	0.83	0.029	0.031	0.033
C	0.47		0.65	0.019		0.026
C2	2.45		2.75	0.096		0.108
C3	2.60		3.00	0.102		0.118
D	8.80		9.30	0.346		0.366
E	9.80		10.4	0.386		0.410
F	6.40		6.80	0.252		0.268
G		2.54			0.1	
H	28.0		29.8	1.102		1.173
L1		3.63			0.143	
L2	1.14		1.70	0.045		0.067
L3		3.30			0.130	
V1		45°			45°	