

**Features:**

8.0A, 650V,  $R_{DS(on)}(T_c) = 1.1 \text{ } @V_{GS}=10V$

Low Gate Charge

Low  $C_{oss}$

100% Avalanche Capability

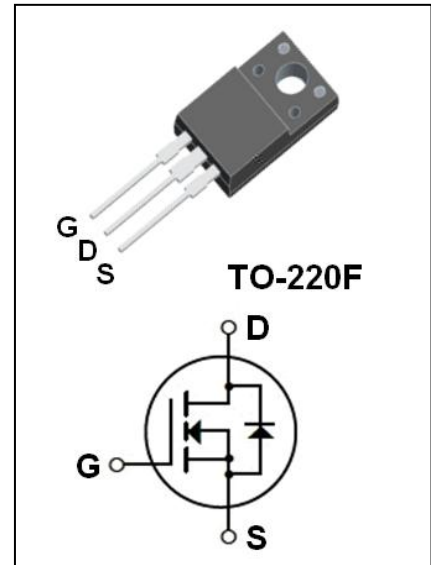
Fast Switching

Low  $r_{DS(on)}$  /  $r_{DS(on)}$  vs  $I_D$

**Applications:**

High Frequency Switching Mode Power Supply

Automotive Power Factor Correction



**Absolute Maximum Ratings (T<sub>c</sub> = 25°C)**

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage (I <sub>D</sub> = 0)	650	V
$I_D$	Drain Current (Continuous, T <sub>c</sub> = 25°C)	8.0*	A
		5.1*	A
$I_{DM}$	Drain Current (Pulse, N = 1)	32*	A
$V_{GSS}$	Gate-Source Voltage	±30	V
$E_{AS}$	Switching Energy (N = 2)	600	J
$I_{AR}$	Average Rectifier Current (N = 1)	8.0	A
$E_{AR}$	Reverse Recovery Energy (N = 1)	15.0	J
/	Power Dissipation (N = 3)	4.5	W
$P_D$	Power Dissipation (T <sub>c</sub> = 25°C)	51	W
		0.41	W/°C
$T_J$	Operating Junction Temperature	150	°C
$T_{stg}$	Storage Temperature Range	-55 ~ +150	°C

\* Data in parentheses are limited by the maximum power dissipation of the device.

**Thermal Characteristics**

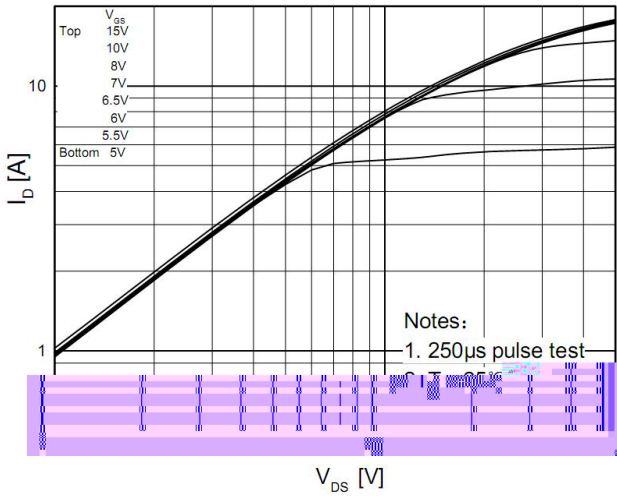
Symbol	Parameter	Value	Unit
$R_{JC}$ <td>Thermal Resistance, Junction to Case</td> <td>2.44</td> <td>°C/W</td>	Thermal Resistance, Junction to Case	2.44	°C/W
$R_{JA}$ <td>Thermal Resistance, Junction to Ambient</td> <td>62.5</td> <td>°C/W</td>	Thermal Resistance, Junction to Ambient	62.5	°C/W

**Electrical Characteristics (T<sub>J</sub> = 25°C)**

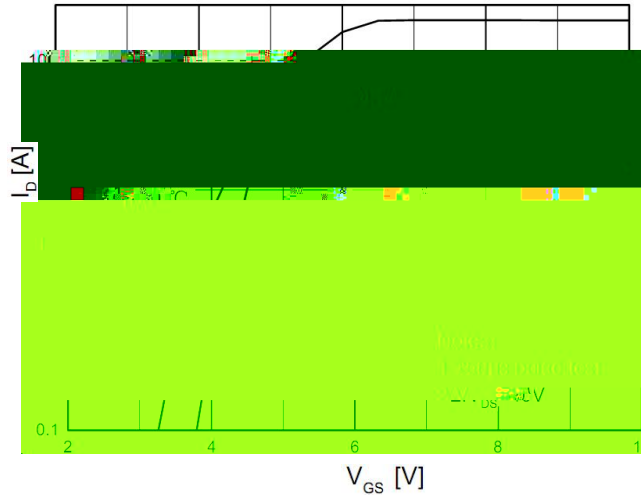
S	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250 A	650	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250 A (R <sub>θJC</sub> = 25°C)	--	0.7	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	--	--	1	A
		V <sub>DS</sub> =520V, T <sub>J</sub> =125°C	--	--	10	A
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V	--	--	100	A
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V	--	--	-100	A
<b>On Characteristics</b>						
V <sub>GS(on)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 A	2.0	--	4.0	V
R <sub>DS(on)</sub>	Source-Drain On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =4.0A	--	1.1	1.3	Ω
f <sub>FS</sub>	Fast Turn-off Frequency	V <sub>DS</sub> =40V, I <sub>D</sub> =4.0A (N=4)	--	7	--	ns
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz	--	1400	--	pF
C <sub>oss</sub>	Output Capacitance		--	175	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	16	--	pF
<b>Switching Characteristics</b>						
t <sub>TO</sub>	Turn-On Delay Time	V <sub>DD</sub> = 325V, I <sub>D</sub> = 8.0A, R <sub>G</sub> = 25Ω (N=4,5)	--	13.5	--	ns
t <sub>TR</sub>	Turn-On Rise Time		--	105	--	ns
t <sub>TO</sub>	Turn-Off Delay Time		--	128	--	ns
t <sub>TF</sub>	Turn-Off Fall Time		--	49	--	ns
Q <sub>g</sub>	Turn-On Gate Charge	V <sub>DS</sub> = 520V, I <sub>D</sub> = 8.0A, V <sub>GS</sub> = 10V (N=4,5)	--	31	--	nC
Q <sub>s</sub>	Turn-On Source Charge		--	6.5	--	nC
Q <sub>d</sub>	Turn-Off Drain Charge		--	14.7	--	nC
<b>Thermal Resistance and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Collector-Diode Forward Current		--	--	8.0	A
I <sub>SM</sub>	Maximum Pulsed Drain Forward Current		--	--	32	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 8.0A	--	--	1.4	V
Q <sub>g</sub>	Turn-Off Gate Charge	V <sub>GS</sub> = 0V, I <sub>S</sub> = 8.0A,	--	325	--	ns
		I <sub>F</sub> / I <sub>S</sub> = 100A / (N=4)	--	2.7	--	nC

- Notes:
- R<sub>θJC</sub> = 25°C, P<sub>W</sub> = 1.0W, L = 18.5mm, I<sub>M</sub> = 8.0A, T<sub>J</sub> = 25°C.
  - L = 18.5mm, I<sub>AS</sub> = 8.0A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, S<sub>a</sub> = 1.0cm<sup>2</sup>, T<sub>J</sub> = 25°C.
  - I<sub>SD</sub> = 8.0A, I<sub>F</sub> = 200A, V<sub>DD</sub> = BV<sub>DSS</sub>, S<sub>a</sub> = 1.0cm<sup>2</sup>, T<sub>J</sub> = 25°C.
  - P<sub>W</sub> = 300μs, I<sub>D</sub> = 8.0A, R<sub>θJC</sub> = 25°C.
  - E<sub>a</sub> = 1.0V, I<sub>B</sub> = 1.0A.

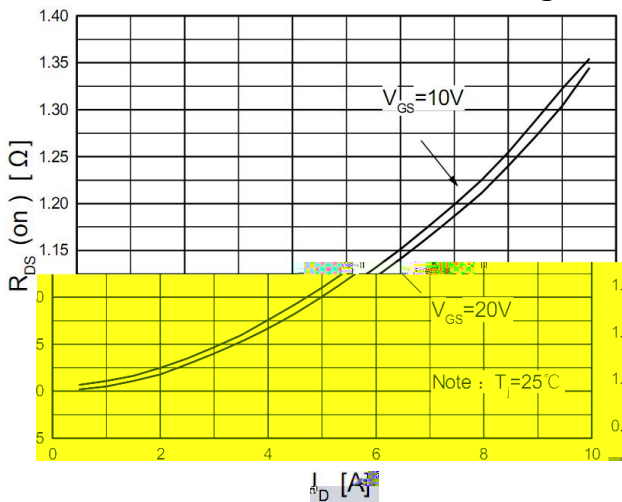
**O -Regi Cha ac e i ic**



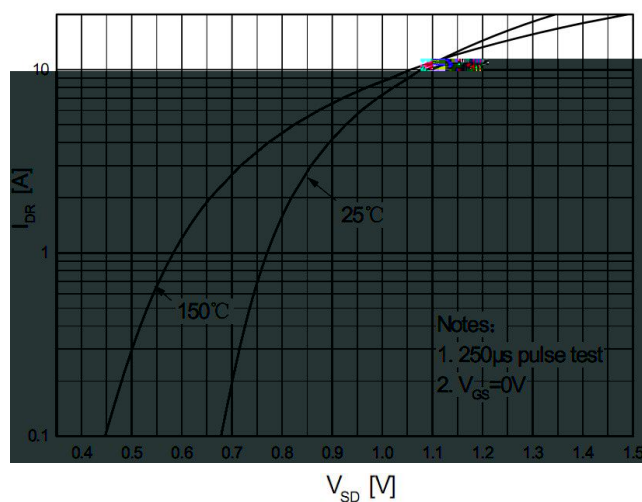
**T a fe Cha ac e i ic**



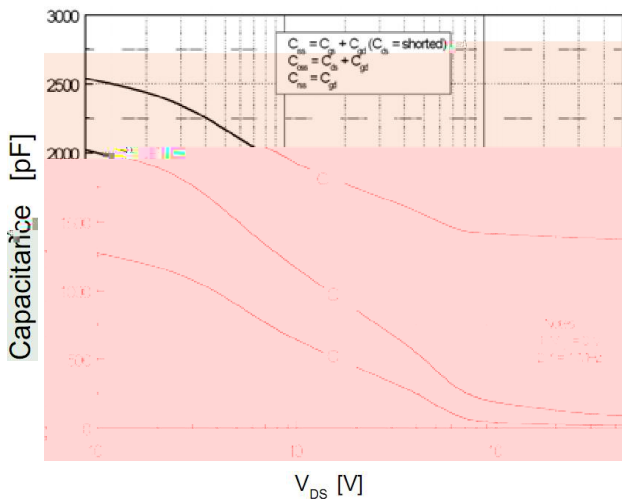
**O -Re i a ce Va i a i .  
D a i C e a d G a e V l a g e**



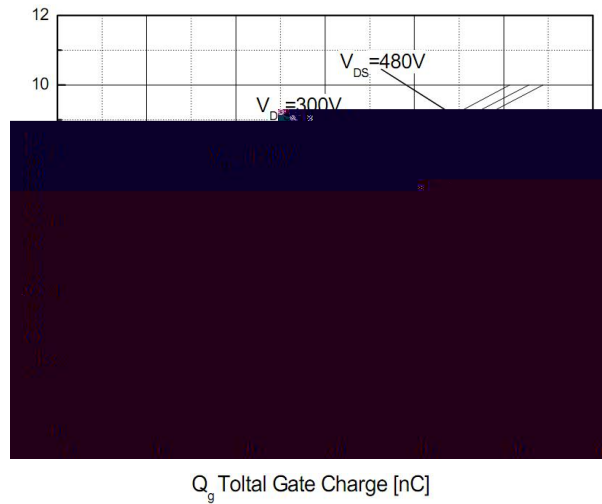
**B d D i d e F a d V l a g e V a i a i .  
. S c e C e a d T e m e a e**



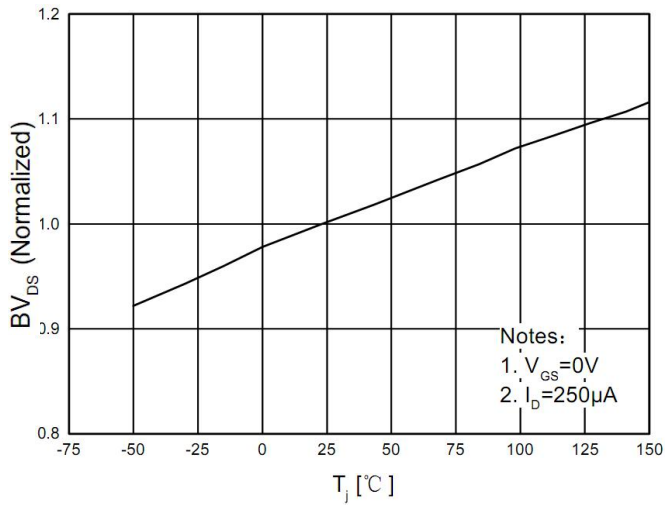
**Ca a c i a ce Cha ac e i ic**



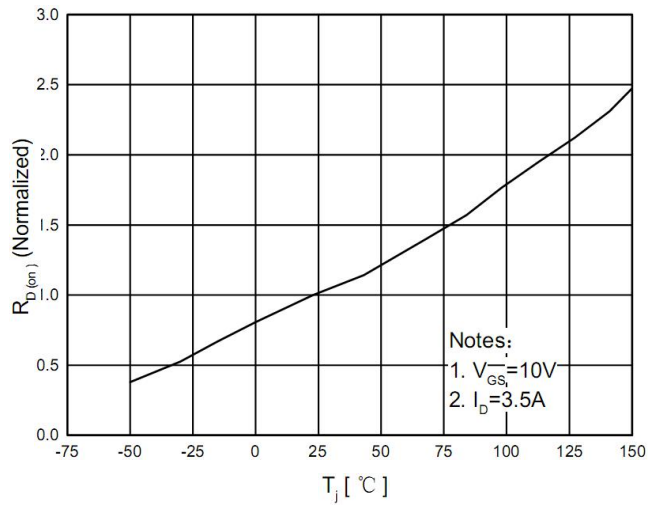
**G a e Cha g e Cha ac e i ic**



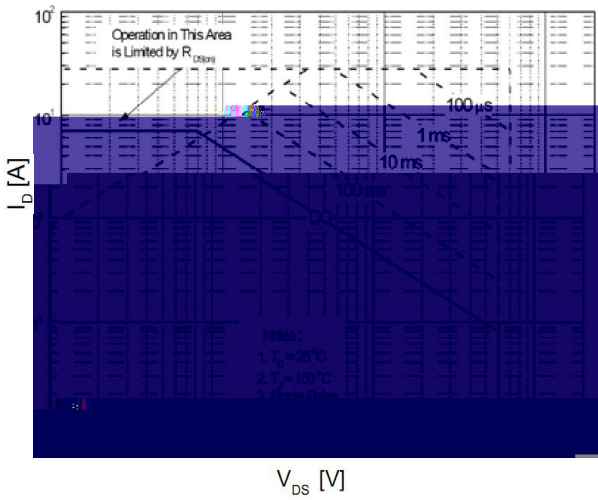
**Breakdown Voltage Variation  
vs. Temperature**



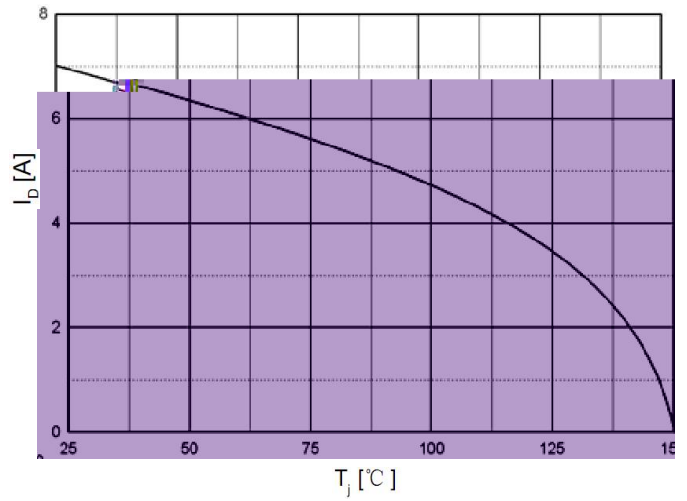
**On-Resistance Variation  
vs. Temperature**



**Maximum Safe Operating Area**



**Maximum Drain Current  
vs. Temperature**



## TO-220F Package Dimension

UNIT:      a

SYMBOL	·	a	SYMBOL	·	a
A	9.80	10.60	D	2.54	
A1	7.00		D1	1.15	1.55
A2	2.90	3.40	D2	0.60	1.00
A3	9.10	9.90	D3	0.20	0.50
B1	15.40	16.40	E	2.24	2.84
B2	4.35	4.95	E1		0.70
B3	6.00	7.40	E2		1.0 × 45°
C	3.00	3.70	E3	0.35	0.65
C1	15.00	17.00	E4	2.30	3.30
C2	8.80	10.80			30°

