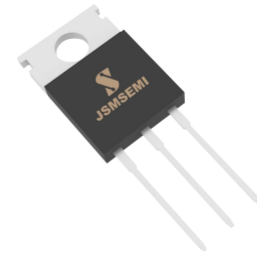


## Description:

This P-Channel MOSFET uses advanced trench technology and design to provide excellent  $R_{DS(on)}$  with low gate charge.

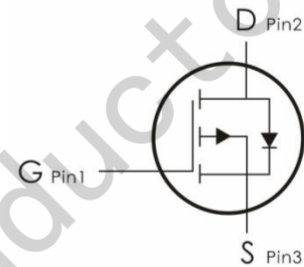
It can be used in a wide variety of applications.



TO-220

## Features:

- 1)  $V_{DS}=-100V, I_D=-20A, R_{DS(on)}<90m\ \Omega @V_{GS}=-10V$
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low  $R_{DS(on)}$ .
- 5) Excellent package for good heat dissipation.



## Absolute Maximum Ratings: ( $T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain-Source Voltage	-100	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current- $T_C=25^\circ C$	-20	A
	Continuous Drain Current- $T_C=100^\circ C$	-14	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	-85	A
$P_D$	Total Power Dissipation	58	W
$E_{AS}$	Single Pulsed Avalanche Energy	177	mJ
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ C$

**Thermal Characteristics:**

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.15	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	62	$^{\circ}\text{C}/\text{W}$

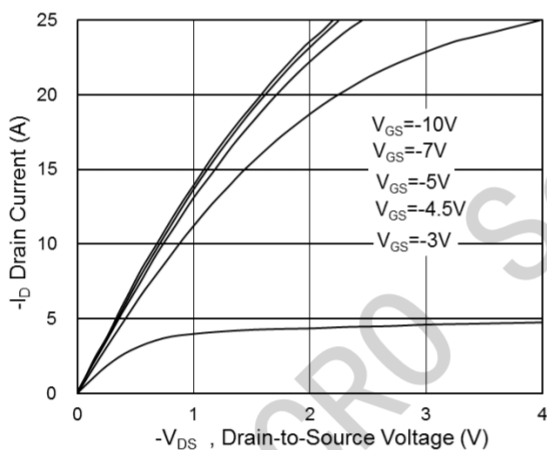
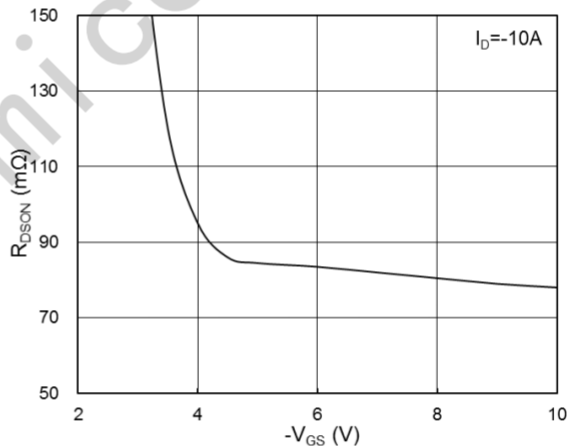
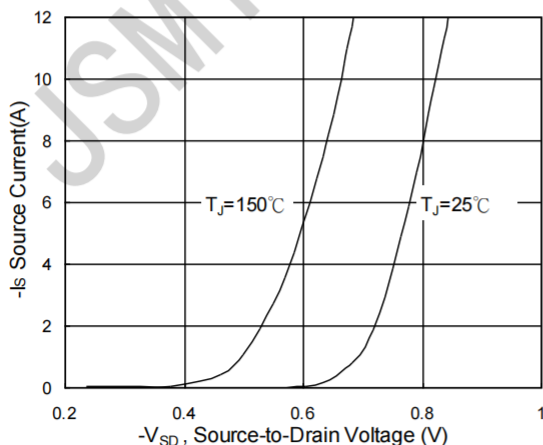
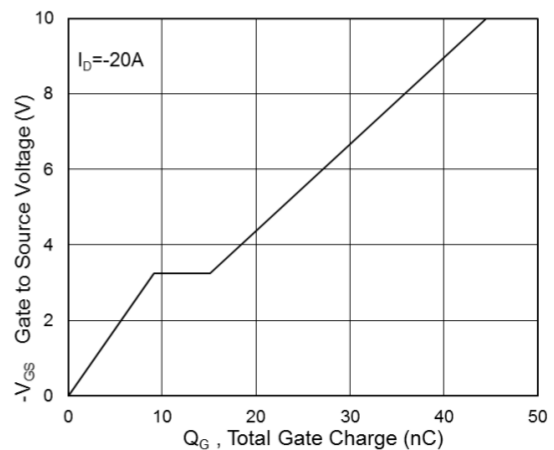
**Electrical Characteristics:** ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

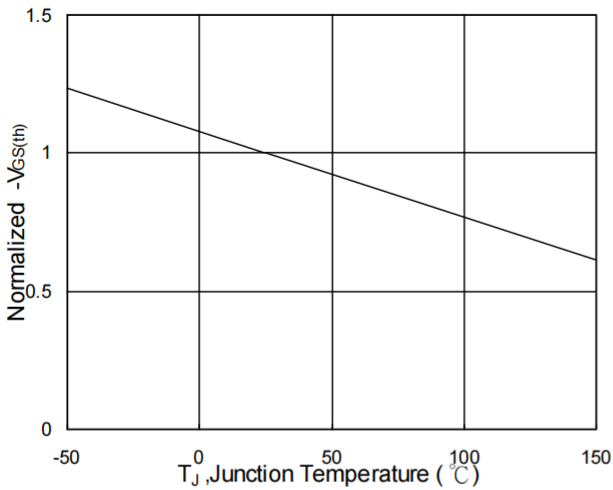
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_D=-250\ \mu\text{A}$	-100	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS}=0\text{V}, V_{DS}=-100\text{V}$	---	---	-50	$\mu\text{A}$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20\text{V}, V_{DS}=0\text{A}$	---	---	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	GATE-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\ \mu\text{A}$	-1.2	-1.7	-2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}, I_D=-10\text{A}$	---	78	90	m $\Omega$
		$V_{GS}=-4.5\text{V}, I_D=-8\text{A}$	---	86	110	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=-20\text{V}, V_{GS}=0\text{V}, f=1\text{MHz}$	---	3020	---	pF
$C_{oss}$	Output Capacitance		---	120	---	
$C_{rss}$	Reverse Transfer Capacitance		---	73	---	
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time <sup>2,3</sup>	$V_{DD}=-50\text{V}, I_D=-10\text{A},$ $V_{GS}=-10\text{V}, R_G=3.3\ \Omega$	---	11	---	ns
$t_r$	Rise Time <sup>2,3</sup>		---	27	---	ns
$t_{d(off)}$	Turn-Off Delay Time <sup>2,3</sup>		---	78	---	ns
$t_f$	Fall Time <sup>2,3</sup>		---	53	---	ns
$Q_g$	Total Gate Charge <sup>2,3</sup>	$V_{GS}=-10\text{V}, V_{DS}=-50\text{V},$	---	44	---	nC

<b>Q<sub>gs</sub></b>	Gate-Source Charge <sup>2,3</sup>	I <sub>D</sub> =-20A	---	9	---	nC
<b>Q<sub>gd</sub></b>	Gate-Drain "Miller" Charge <sup>2,3</sup>		---	5.5	---	nC
<b>Drain-Source Diode Characteristics</b>						
<b>V<sub>SD</sub></b>	Drain Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A	---	---	-1.2	V
<b>I<sub>S</sub></b>	Continuous Source Current <sup>1,5</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-20	A
<b>T<sub>rr</sub></b>	Reverse Recovery Time	I <sub>F</sub> =-8A, di/dt=-100A/μs,	---	38.7	---	nS
<b>Q<sub>rr</sub></b>	Reverse Recovery Charge	T <sub>J</sub> =25°C	---	22.4	---	nC

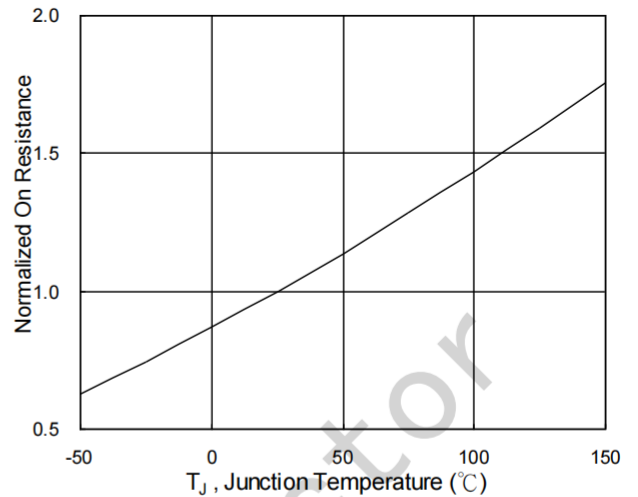
**Notes:**

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=-25V, V<sub>GS</sub>=-10V, L=0.88mH, I<sub>AS</sub>=-18.9A
4. The power dissipation is limited by 150°C junction temperature
5. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

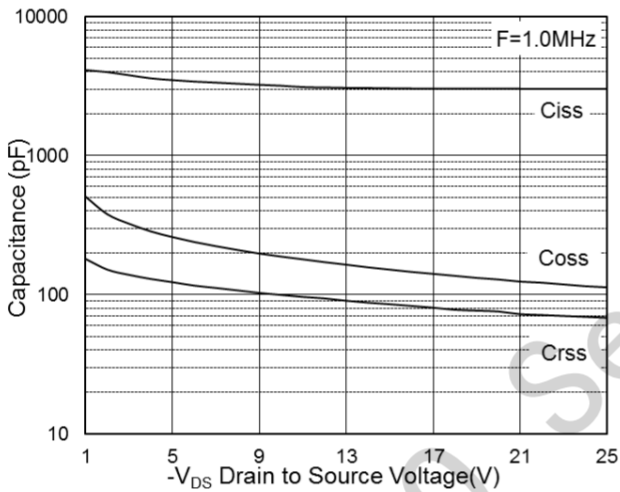
**Typical Characteristics:** (T<sub>C</sub>=25°C unless otherwise noted)

**Fig.1 Typical Output Characteristics**

**Fig.2 On-Resistance vs G-S Voltage**

**Fig.3 Typical S-D Diode Forward Voltage**

**Fig.4 Gate-Charge Characteristics**



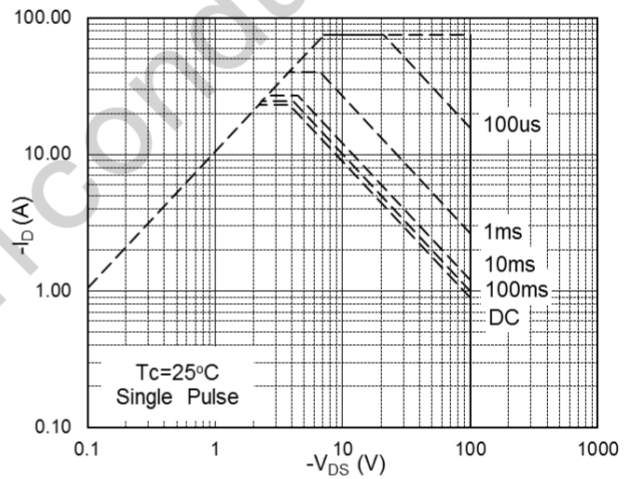
**Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$**



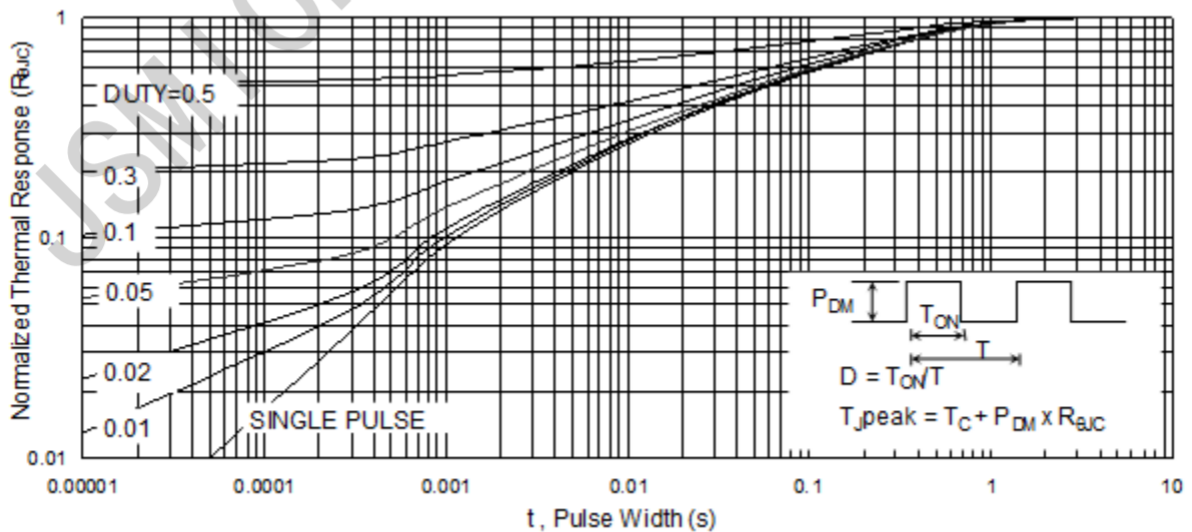
**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**



**Fig.7 Capacitance**



**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

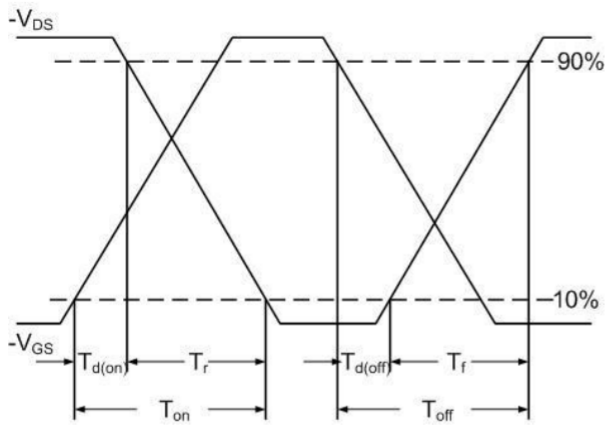


Fig.10 Switching Time Waveform

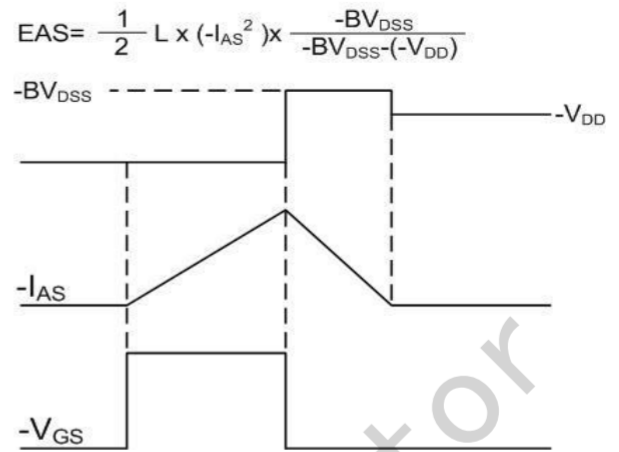
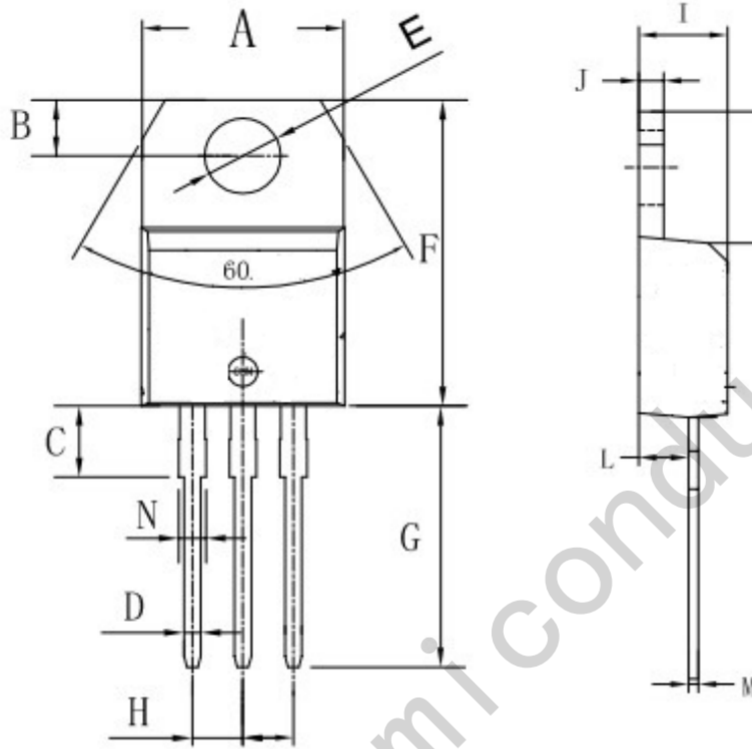


Fig.11 Unclamped Inductive Waveform

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## Package Information

TO-220



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	9.8	10.4	0.385	0.409
B	2.65	3.1	0.104	0.122
C	2.8	4.2	0.110	0.165
D	0.7	0.92	0.027	0.036
E	3.75	3.95	0.147	0.155
F	14.8	16.1	0.582	0.633
G	13.05	13.6	0.513	0.535
H	2.4	2.7	0.094	0.106
I	4.38	4.61	0.172	0.181
J	1.15	1.36	0.045	0.053
K	5.85	6.82	0.230	0.268
L	2.35	2.75	0.092	0.108
M	0.35	0.65	0.013	0.025
N	1.18	1.42	0.046	0.055

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