

### General Description

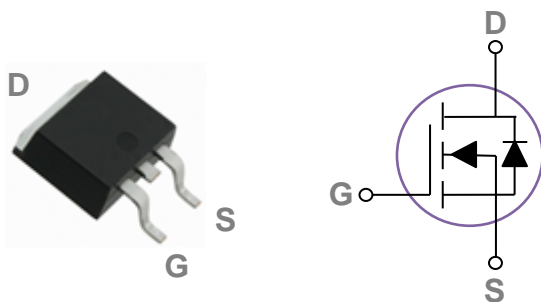
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

BVDSS	R <sub>DS(ON)</sub>	I <sub>D</sub>
65V	11.5mΩ	51A

### Features

- 65V,51A, R<sub>DS(ON)</sub> = 11.5mΩ @V<sub>GS</sub> = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

### TO252 Pin Configuration



### Applications

- Motor Drive
- Power Tools
- LED Lighting
- Quick Charger

### Absolute Maximum Ratings T<sub>C</sub>=25°C unless otherwise noted

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	65	V
V <sub>GS</sub>	Gate-Source Voltage	+20/-12	V
I <sub>D</sub>	Drain Current – Continuous (T <sub>C</sub> =25°C)	51	A
	Drain Current – Continuous (T <sub>C</sub> =100°C)	32	A
I <sub>DM</sub>	Drain Current – Pulsed <sup>1</sup>	204	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	51.2	mJ
IAS	Single Pulse Avalanche Current <sup>2</sup>	32	A
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> =25°C)	50.4	W
	Power Dissipation – Derate above 25°C	0.40	W/°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction to ambient	---	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction to Case	---	2.84	°C/W

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**
**Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	65	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.03	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =85°C	---	---	10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V	---	---	100	nA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>3</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	9.6	11.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	---	18.4	23	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1	1.5	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-5	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =3A	---	6	---	S

**Dynamic and switching Characteristics**

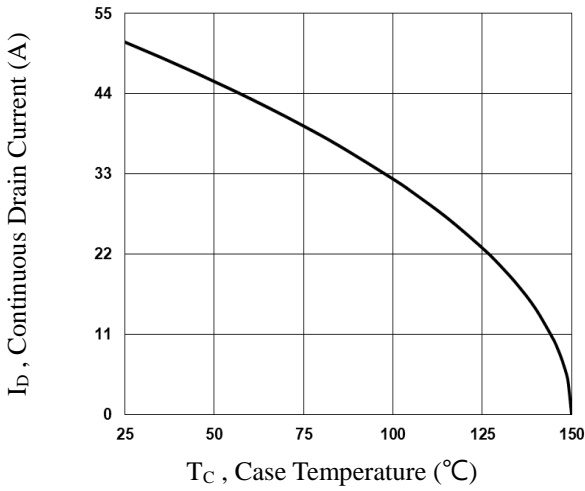
Q <sub>g</sub>	Total Gate Charge <sup>3, 4</sup>	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	15.3	30.6	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>3, 4</sup>		---	2.4	5.8	
Q <sub>gd</sub>	Gate-Drain Charge <sup>3, 4</sup>		---	5.4	10.8	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>3, 4</sup>	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω I <sub>D</sub> =1A	---	10	20	ns
T <sub>r</sub>	Rise Time <sup>3, 4</sup>		---	13.5	27	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>3, 4</sup>		---	28	56	
T <sub>f</sub>	Fall Time <sup>3, 4</sup>		---	20	40	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, F=1MHz	---	945	1890	pF
C <sub>oss</sub>	Output Capacitance		---	275	550	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	26	52	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	0.3	---	Ω

**Drain-Source Diode Characteristics and Maximum Ratings**

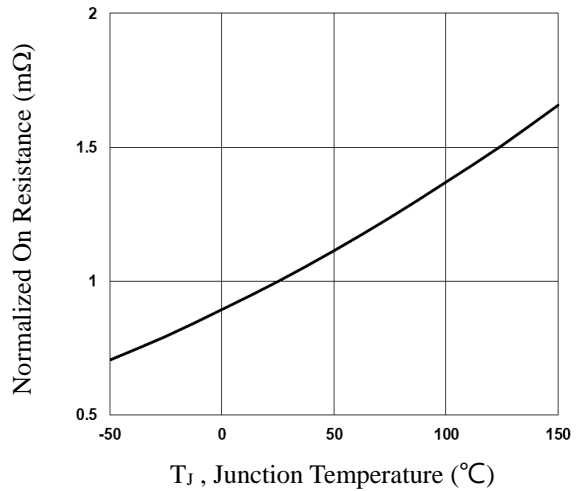
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
8I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	51	A
I <sub>SM</sub>	Pulsed Source Current <sup>3</sup>		---	---	102	A
V <sub>SD</sub>	Diode Forward Voltage <sup>3</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>S</sub> =10A, di/dt=100A/μs	---	35.3	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge	T <sub>J</sub> =25°C	---	25.5	---	nC

Note :

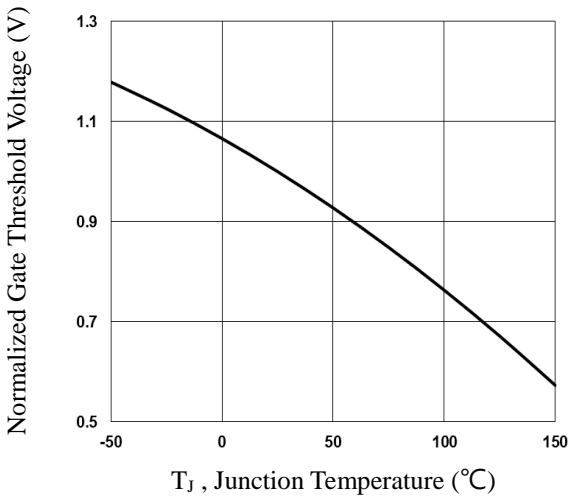
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=50V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=32A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



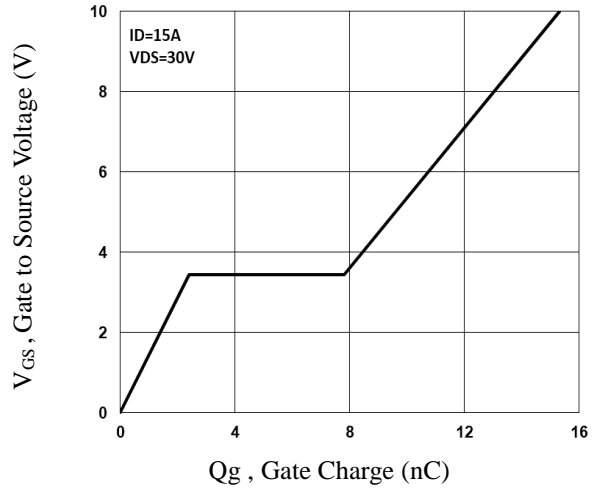
**Fig.1 Continuous Drain Current vs. T<sub>c</sub>**



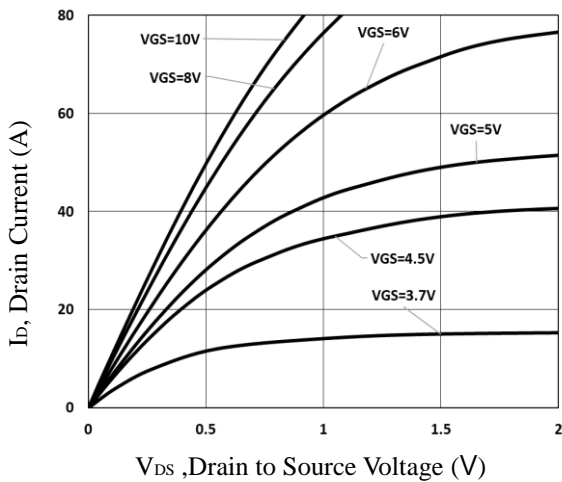
**Fig.2 Normalized R<sub>DS(on)</sub> vs. T<sub>j</sub>**



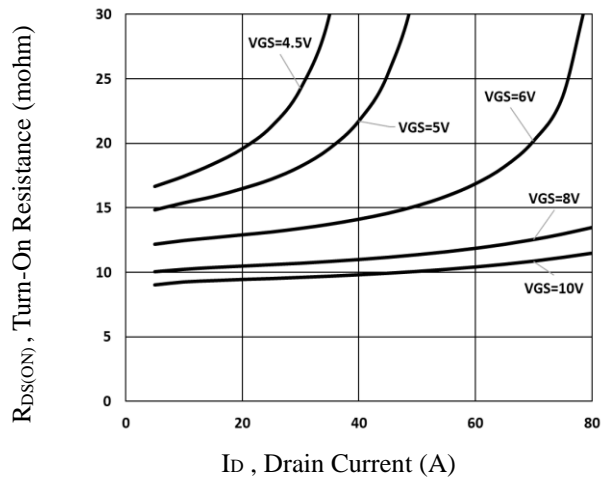
**Fig.3 Normalized V<sub>th</sub> vs. T<sub>j</sub>**



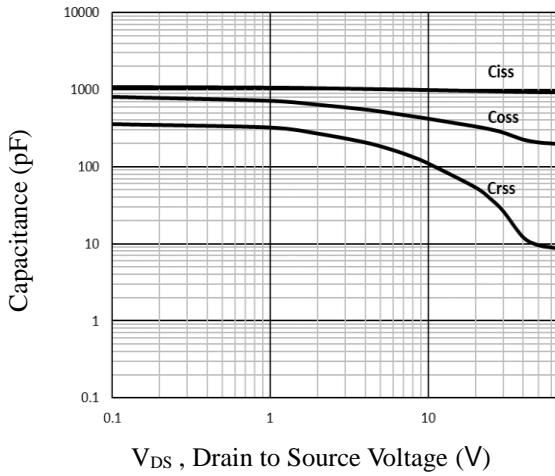
**Fig.4 Gate Charge Waveform**



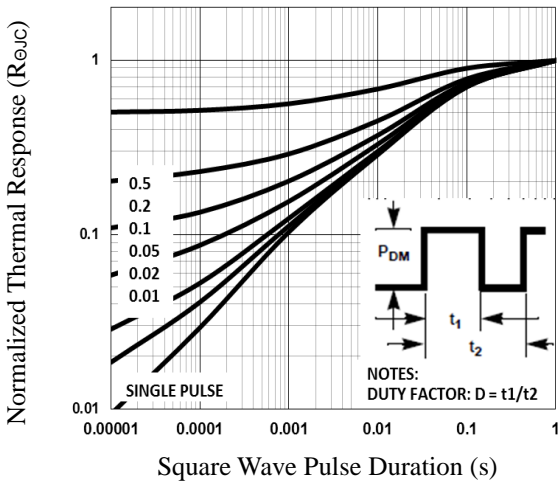
**Fig.5 Typical Output Characteristics**



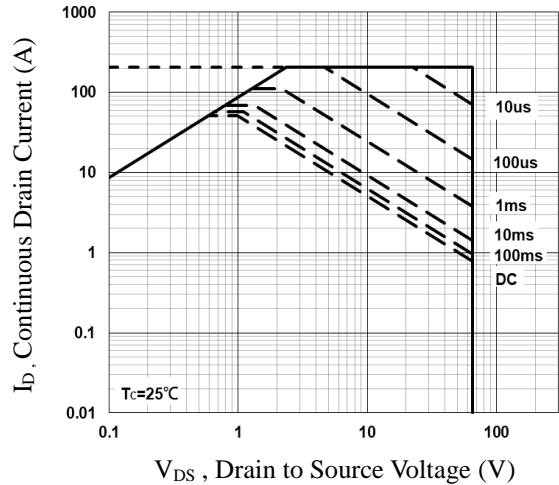
**Fig.6 Turn-On Resistance vs. I<sub>D</sub>**



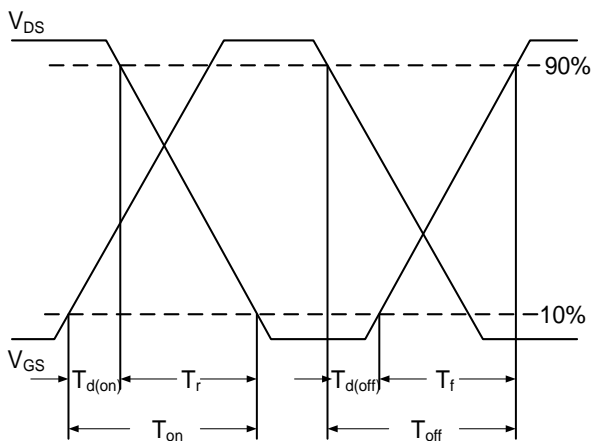
**Fig.7 Capacitance Characteristics**



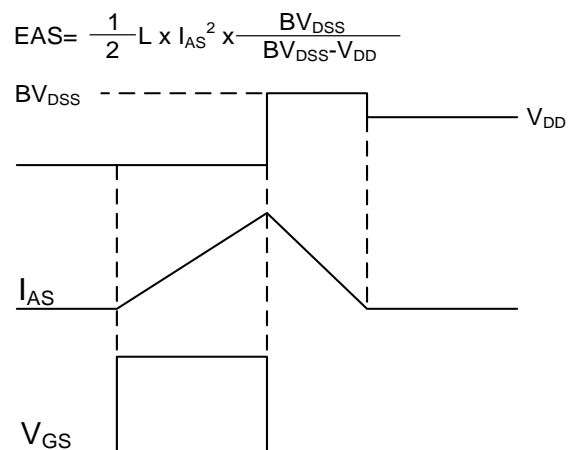
**Fig.8 Normalized Transient Response**



**Fig.9 Maximum Safe Operation Area**



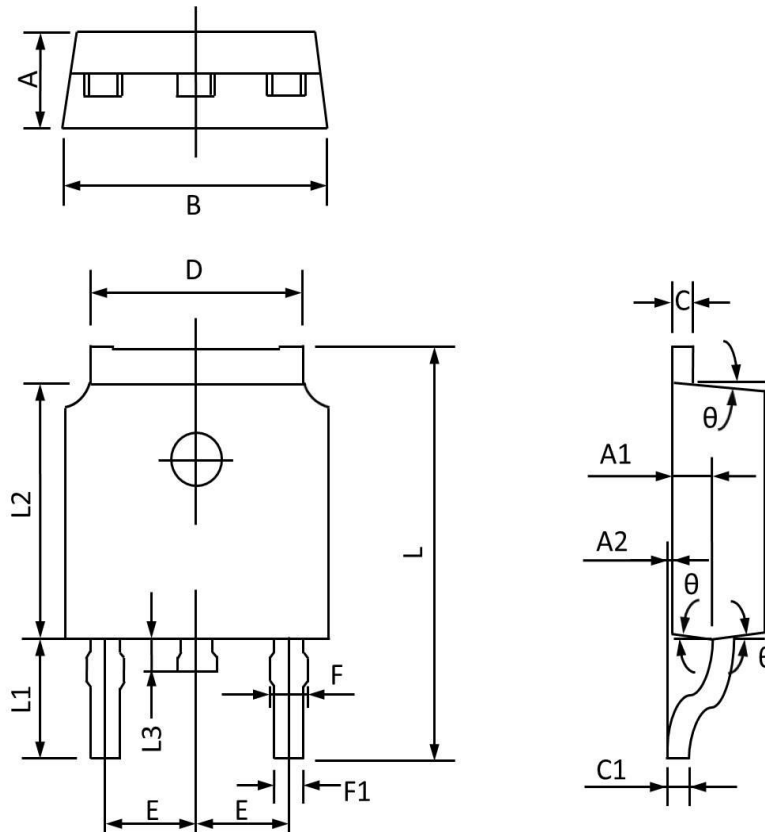
**Fig.10 Switching Time Waveform**



**Fig.11 EAS Waveform**

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

## TO252 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	2.400	2.200	0.094	0.087
A1	1.110	0.910	0.044	0.036
A2	0.150	0.000	0.006	0.000
B	6.800	6.400	0.268	0.252
C	0.580	0.450	0.023	0.018
C1	0.580	0.460	0.023	0.018
D	5.500	5.100	0.217	0.201
E	2.386	2.186	0.094	0.086
F	0.940	0.600	0.037	0.024
F1	0.860	0.500	0.034	0.020
L	10.400	9.400	0.409	0.370
L1	3.000	2.400	0.118	0.094
L2	6.200	5.400	0.244	0.213
L3	1.200	0.600	0.047	0.024
$\theta$	9°	3°	9°	3°