

60V N-Channel MOSFETs

General Description

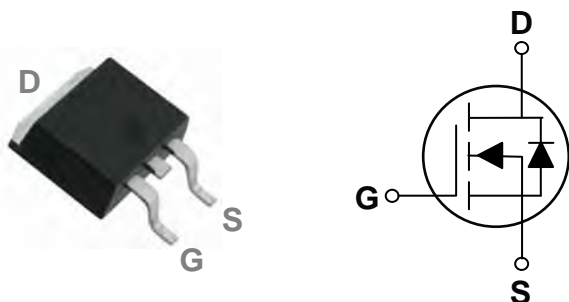
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
60V	21mΩ	38A

Features

- 60V,38A,RDS(ON)=21mΩ @VGS = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

TO-252 Pin Configuration



Applications

- Motor Drive
- Power Tools
- LED Lighting

Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
V _{DS}	Drain-Source Voltage	60	V
V _{GS}	Gate-Source Voltage	± 20	V
I _D	Drain Current – Continuous (T _C =25°C)	38	A
	Drain Current – Continuous (T _C =100°C)	24	A
I _{DM}	Drain Current – Pulsed ¹	152	A
EAS	Single Pulse Avalanche Energy ²	42	mJ
IAS	Single Pulse Avalanche Current ²	29	A
P _D	Power Dissipation (T _C =25°C)	63	W
	Power Dissipation – Derate above 25°C	0.5	W/°C
T _{STG}	Storage Temperature Range	-50 to 150	°C
T _J	Operating Junction Temperature Range	-50 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction to ambient	---	62	°C/W
R _{θJC}	Thermal Resistance Junction to Case	---	2	°C/W



FTK6906D

60V N-Channel MOSFETs

Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25\text{ }^\circ\text{C}$, $I_D=1mA$	---	0.07	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V, T_J=25\text{ }^\circ\text{C}$	---	---	1	μA
		$V_{DS}=48V, V_{GS}=0V, T_J=125\text{ }^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=20A$	---	17	21	m Ω
		$V_{GS}=4.5V, I_D=12A$	---	20	24	m Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.8	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	5	---	mV/ $^\circ\text{C}$
gfs	Forward Transconductance	$V_{DS}=10V, I_D=10A$	---	9	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=30V, V_{GS}=10V, I_D=15A$	---	28	42	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	3.5	7	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	6.5	10	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=30V, V_{GS}=10V, R_G=6\Omega$ $I_D=1A$	---	7.2	14	ns
T_r	Rise Time ^{2,3}		---	38	72	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	34	65	
T_f	Fall Time ^{2,3}		---	8.2	16	
C_{iss}	Input Capacitance	$V_{DS}=20V, V_{GS}=0V, F=1MHz$	---	1680	2440	pF
C_{oss}	Output Capacitance		---	115	170	
C_{rss}	Reverse Transfer Capacitance		---	85	125	
R_g	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	---	2.2	4.4	Ω

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	38	A
I_{SM}	Pulsed Source Current		---	---	152	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25\text{ }^\circ\text{C}$	---	---	1	V
t_{rr}	Reverse Recovery Time ²	$V_{GS}=0V, I_S=-1A, di/dt=100A/\mu s$	---	19.6	---	ns
Q_{rr}	Reverse Recovery Charge ²		$T_J=25\text{ }^\circ\text{C}$	---	14.2	---

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=29A, R_G=25\Omega$, Starting $T_J=25\text{ }^\circ\text{C}$.
3. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Essentially independent of operating temperature.

60V N-Channel MOSFETs

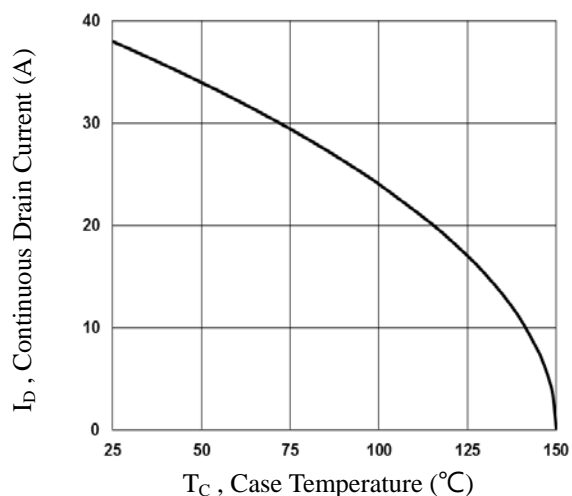


Fig.1 Continuous Drain Current vs. T_c

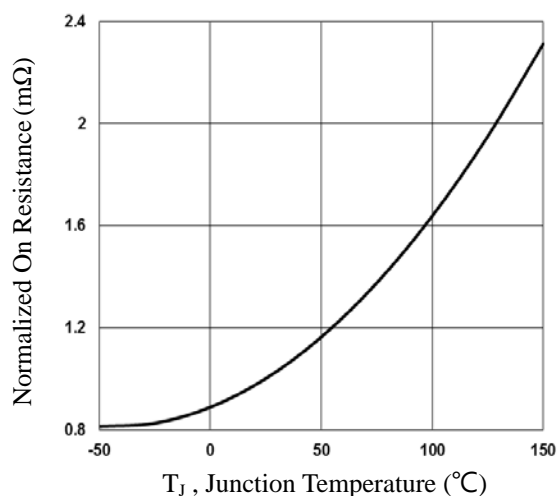


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

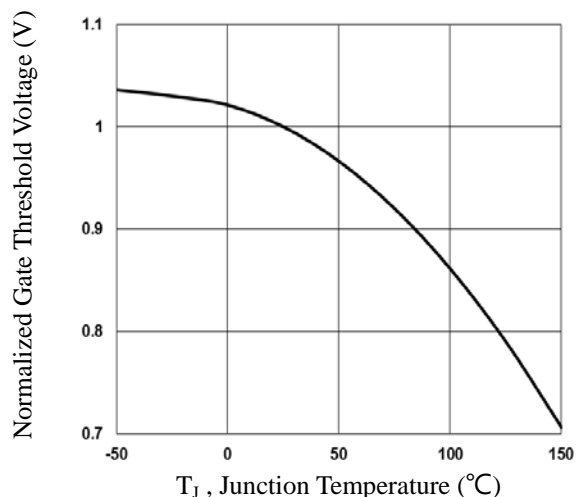


Fig.3 Normalized V_{th} vs. T_j

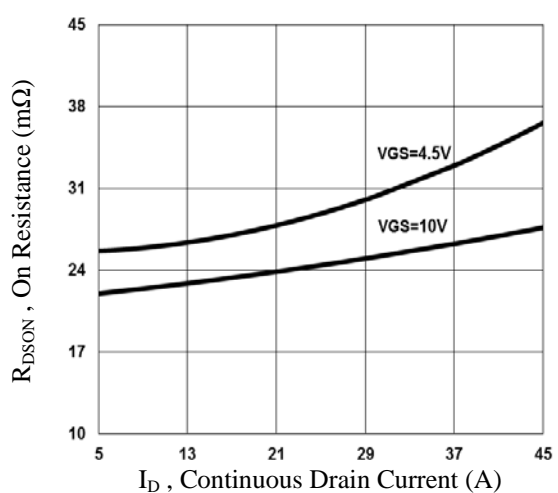


Fig.4 $R_{DS(on)}$ vs. Continuous Drain Current

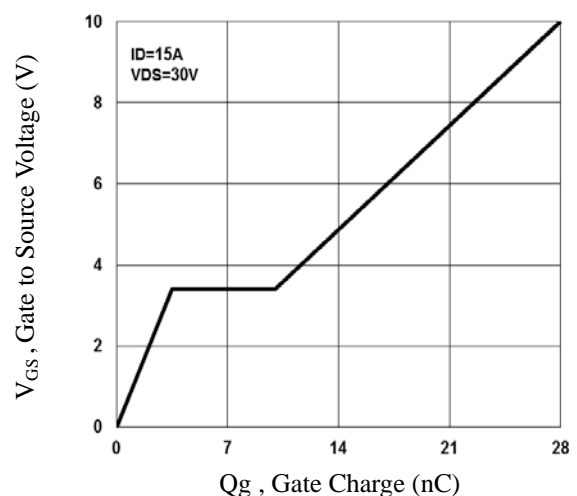


Fig.5 Gate Charge Waveform

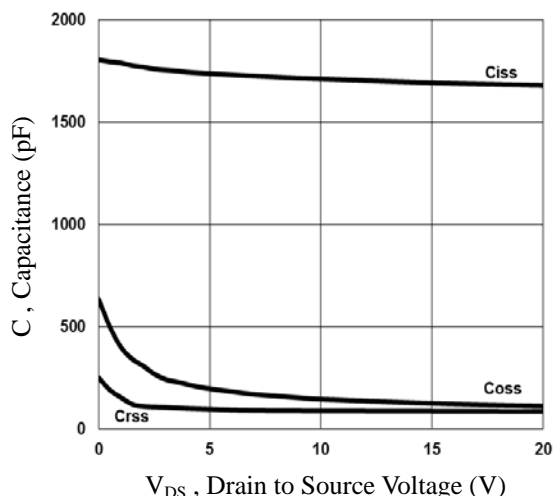


Fig.6 Capacitance Characteristics

60V N-Channel MOSFETs

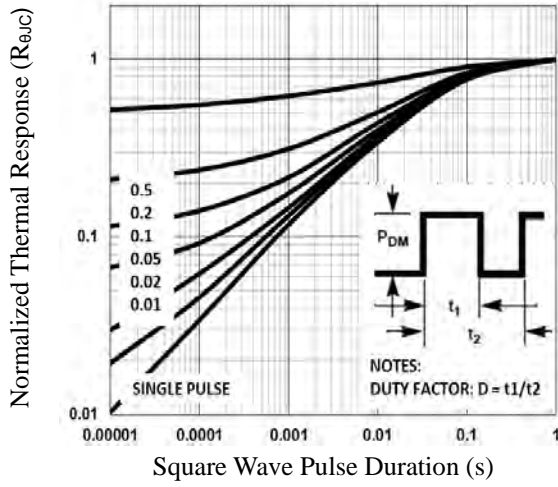


Fig.7 Normalized Transient Impedance

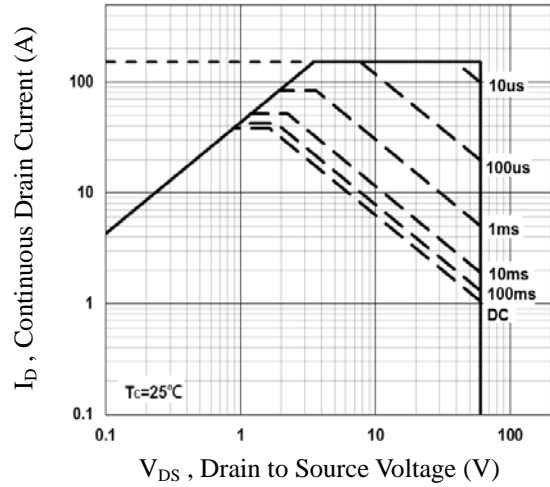


Fig.8 Maximum Safe Operation Area

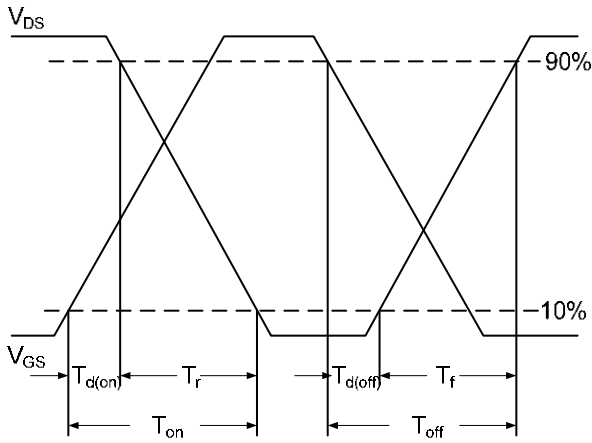


Fig.9 Switching Time Waveform

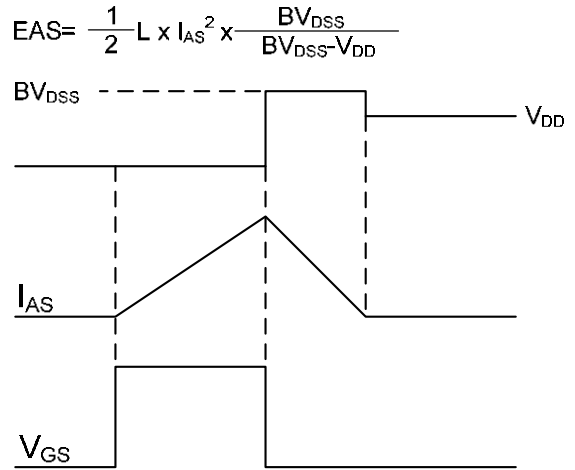
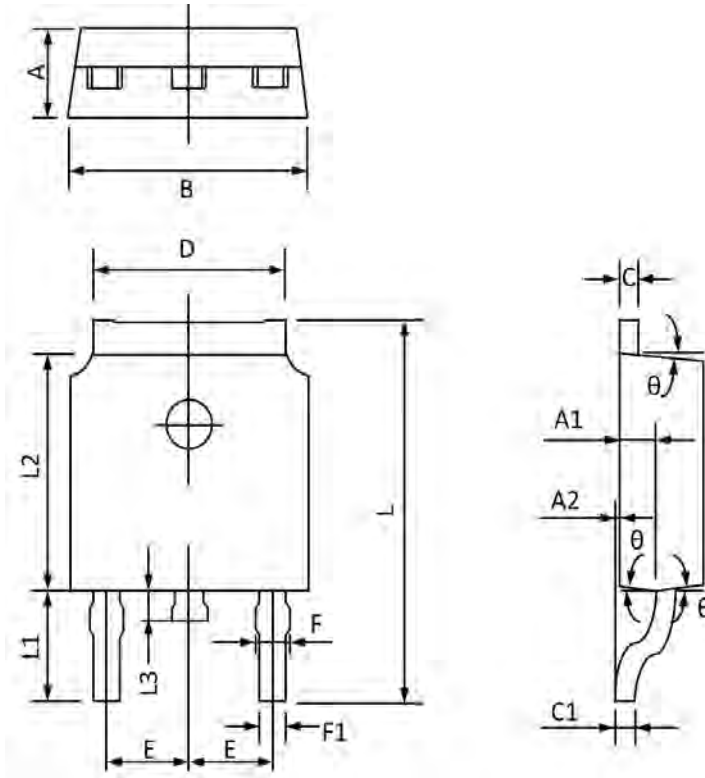


Fig.10 EAS Waveform

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

60V N-Channel MOSFETs

TO-252 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
θ	9°	3°	9°	3°