

Features

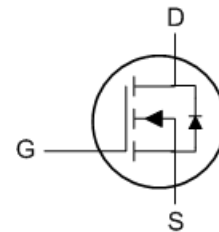
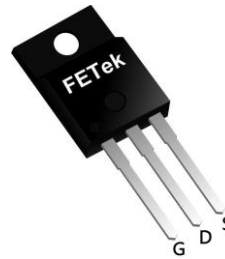
- Advanced Trench MOS Technology
- Low Gate Charge
- Low $R_{DS(ON)}$
- 100% EAS Guaranteed
- Green Device Available

Application

- Motor Control.
- DC/DC Converter.
- Synchronous rectifier applications.

Product Summary


BVDSS	RDSON	ID
60V	6mΩ	54A

TO220F Pin Configuration

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	54	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	34	A
I_{DM}	Pulsed Drain Current ²	216	A
EAS	Single Pulse Avalanche Energy ³	92.5	mJ
I_{AS}	Avalanche Current	43	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	31.3	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	4	$^\circ C/W$

**Electrical Characteristics (T_J=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	60	---	---	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =15A	---	4.8	6	mΩ
		V _{GS} =4.5V, I _D =15A	---	7	9	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.5	2	2.5	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =48V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =48V, V _{GS} =0V, T _J =55°C	---	---	5	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	1.3	---	Ω
Q _g	Total Gate Charge (10V)	V _{DS} =30V, V _{GS} =10V, I _D =15A	---	33.4	---	nC
Q _g	Total Gate Charge (4.5V)		---	17.8	---	
Q _{gs}	Gate-Source Charge		---	5.8	---	
Q _{gd}	Gate-Drain Charge		---	7.9	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =30V, V _{GS} =10V, R _G =3.3Ω, I _D =15A	---	7.5	---	ns
T _r	Rise Time		---	6	---	
T _{d(off)}	Turn-Off Delay Time		---	29	---	
T _f	Fall Time		---	7.5	---	
C _{iss}	Input Capacitance	V _{DS} =30V, V _{GS} =0V, f=1MHz	---	1625	---	pF
C _{oss}	Output Capacitance		---	438	---	
C _{rss}	Reverse Transfer Capacitance		---	25	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,5,6}	V _G =V _D =0V, Force Current	---	---	54	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V
t _{rr}	Reverse Recovery Time	I _F =20A, dI/dt=400A/μs,	---	23	---	nS
Q _{rr}	Reverse Recovery Charge	T _J =25°C	---	60	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. Single pulse width limited by junction temperature T_{J(MAX)}=150°C.
- 3.The EAS data shows Max. rating . The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=43A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

Typical Characteristics

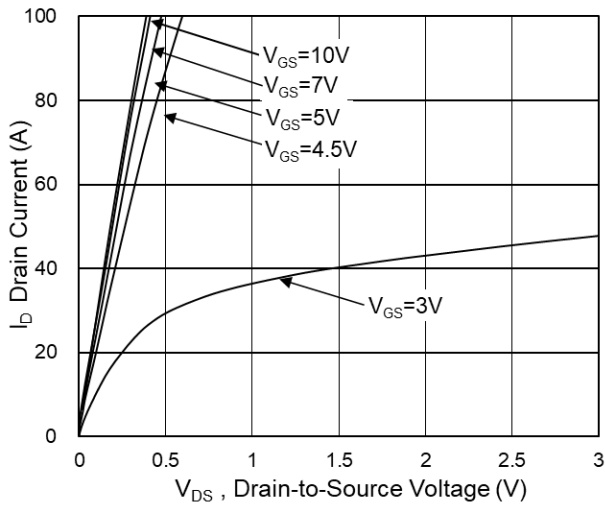


Fig.1 Typical Output Characteristics

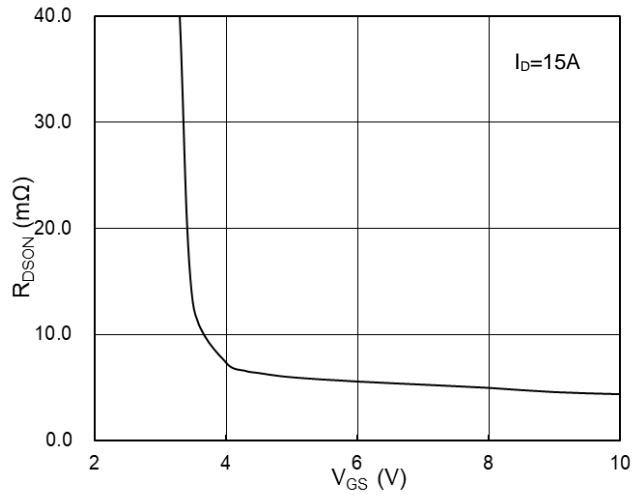


Fig.2 On-Resistance vs G-S Voltage

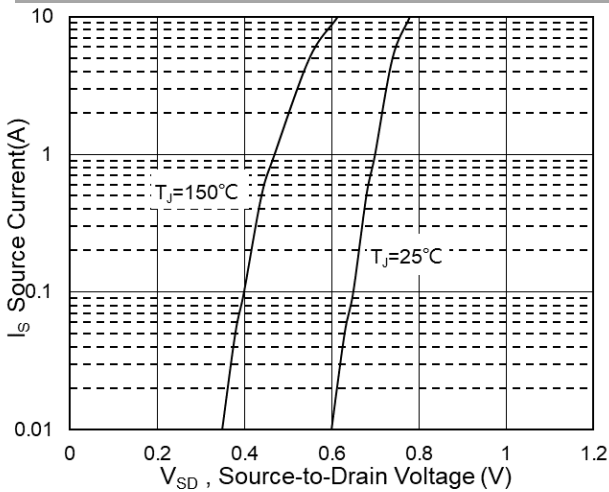


Fig.3 Source Drain Forward Characteristics

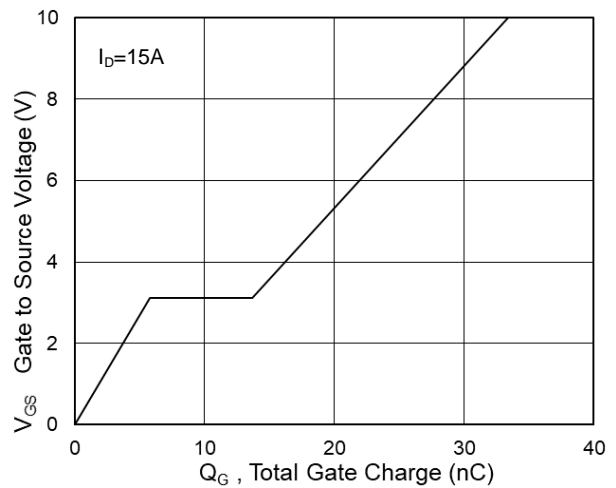


Fig.4 Gate-Charge Characteristics

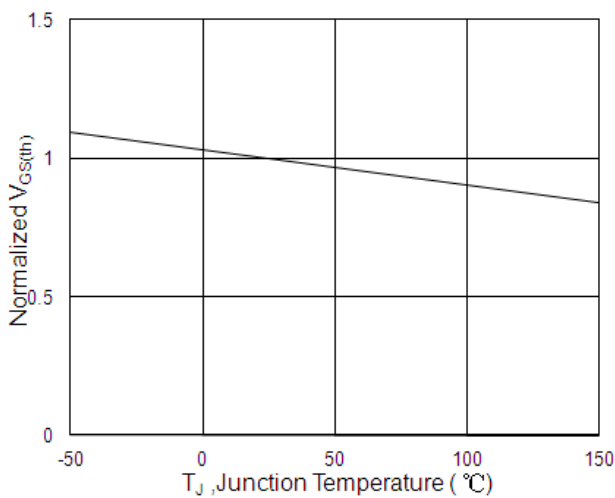


Fig.5 Normalized $V_{GS(th)}$ vs T_J

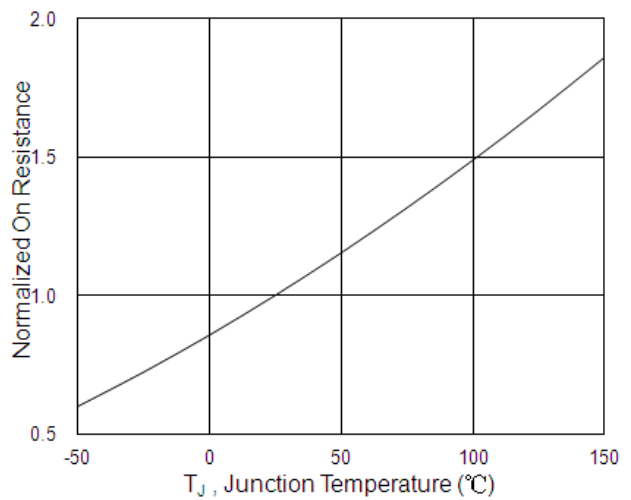


Fig.6 Normalized R_{DSON} vs T_J

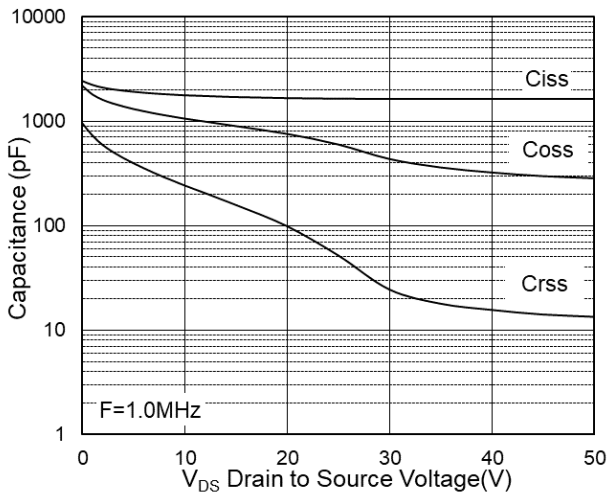


Fig.7 Capacitance

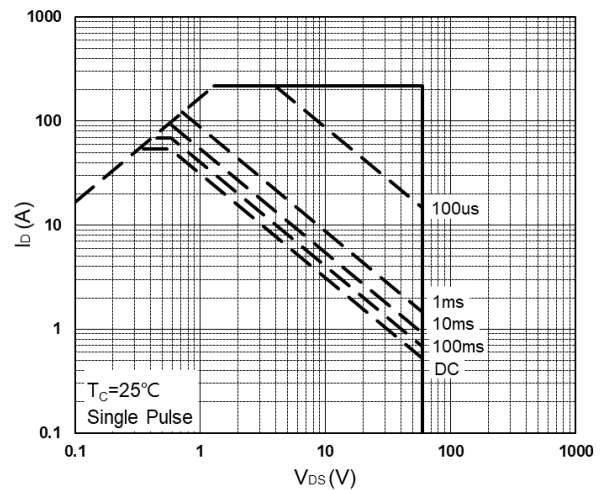


Fig.8 Safe Operating Area

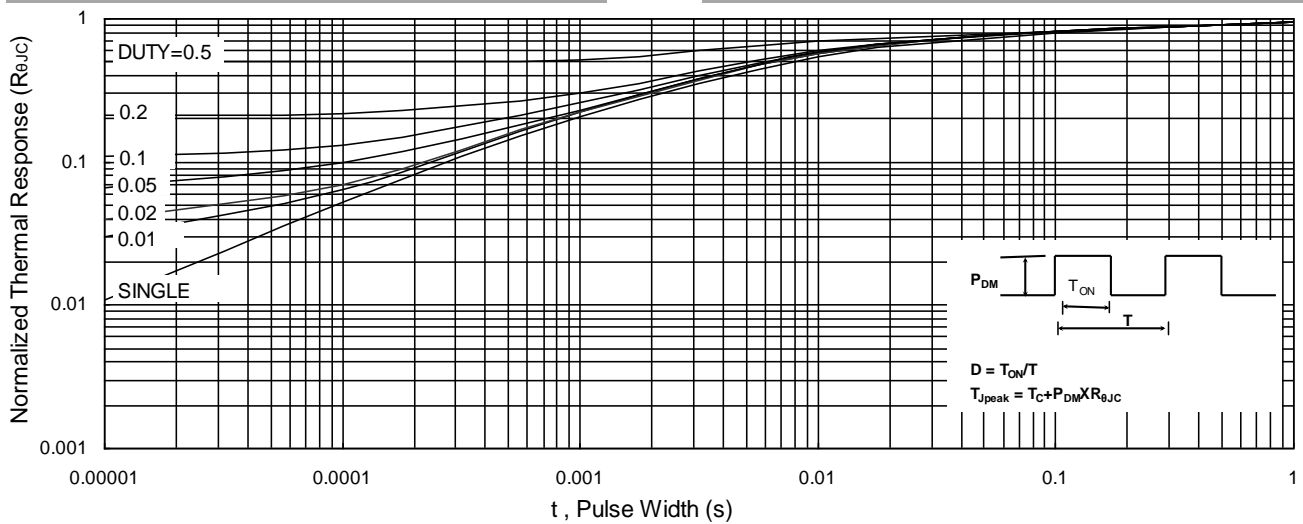


Fig.9 Normalized Maximum Transient Thermal Impedance

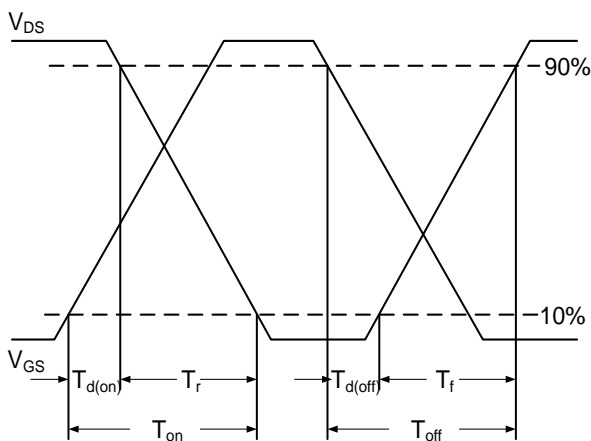


Fig.10 Switching Time Waveform

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

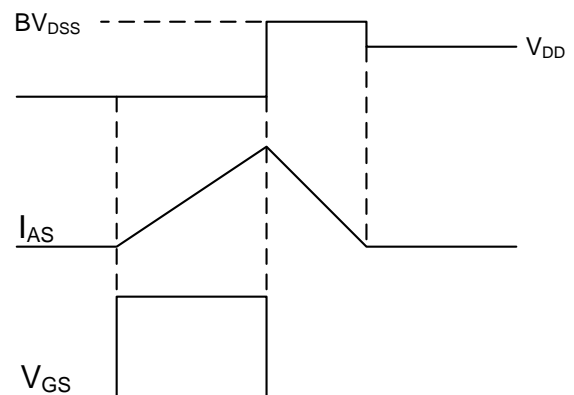


Fig.11 Unclamped Inductive Switching Waveform