

**Features**

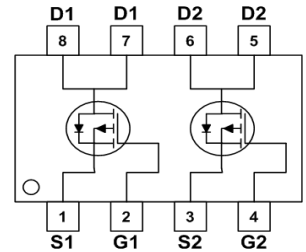
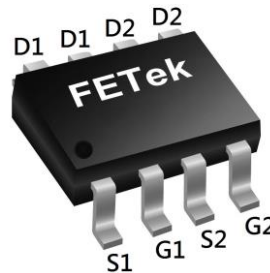
- ★ Advanced Trench MOS Technology
- ★ 100% EAS Guaranteed
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Green Device Available

**Applications**

- ★ Power Management.
- ★ DC Motor Control.

**Product Summary**


BVDSS	RDSON	ID
-60V	70mΩ	-3.7A

**SOP8 Pin Configuration**

**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-3.7	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-3	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-7.5	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	35.4	mJ
$I_{AS}$	Avalanche Current	-26.6	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation <sup>4</sup>	1.5	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 <sup>1</sup>	---	85	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	36	$^\circ C/W$

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

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 $25^\circ\text{C}$ , $I_D=-1\text{mA}$	---	-0.03	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V, I_D=-3A$	---	---	70	m $\Omega$
		$V_{GS}=-4.5V, I_D=-2A$	---	---	105	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.2	---	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.56	---	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-48V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=-48V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	-5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
gfs	Forward Transconductance	$V_{DS}=-5V, I_D=-3A$	---	15	---	S
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	13.5	---	$\Omega$
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-48V, V_{GS}=-4.5V, I_D=-3A$	---	9.86	---	nC
$Q_{gs}$	Gate-Source Charge		---	3.08	---	
$Q_{gd}$	Gate-Drain Charge		---	2.95	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$	---	28.8	---	ns
$T_r$	Rise Time		---	19.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	60.8	---	
$T_f$	Fall Time		---	7.2	---	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	1447	---	pF
$C_{oss}$	Output Capacitance		---	97.3	---	
$C_{rss}$	Reverse Transfer Capacitance		---	70	---	

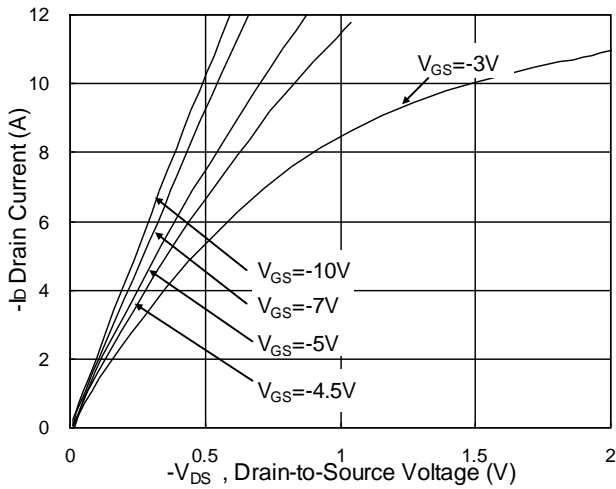
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,5</sup>	$V_G=V_D=0V$ , Force Current	---	---	-3.7	A
$I_{SM}$	Pulsed Source Current <sup>2,5</sup>		---	---	-7.5	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1.2	V

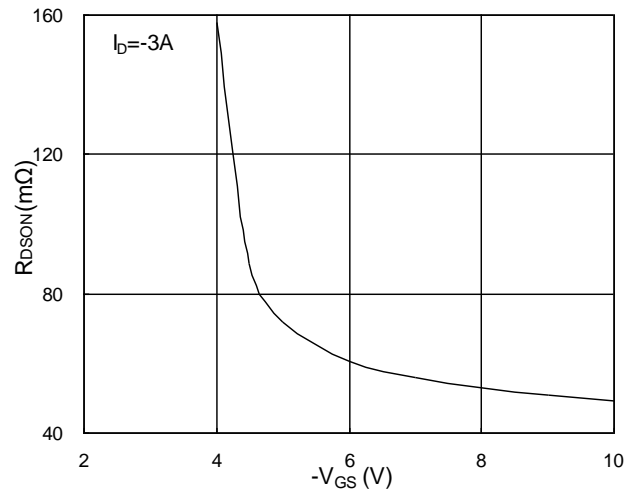
Note :

- 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  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-26.6A$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  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.

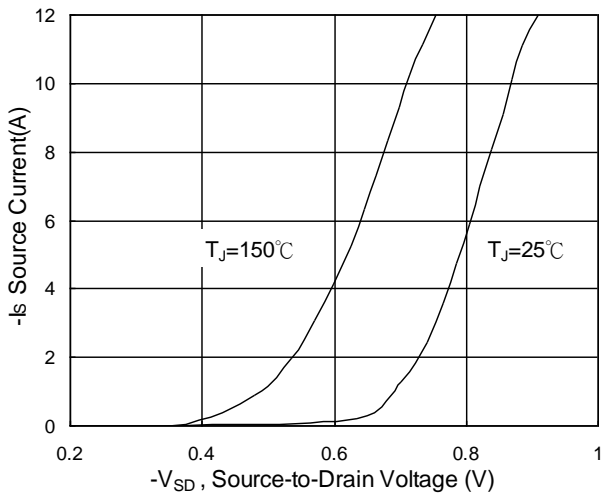
**Typical Characteristics**



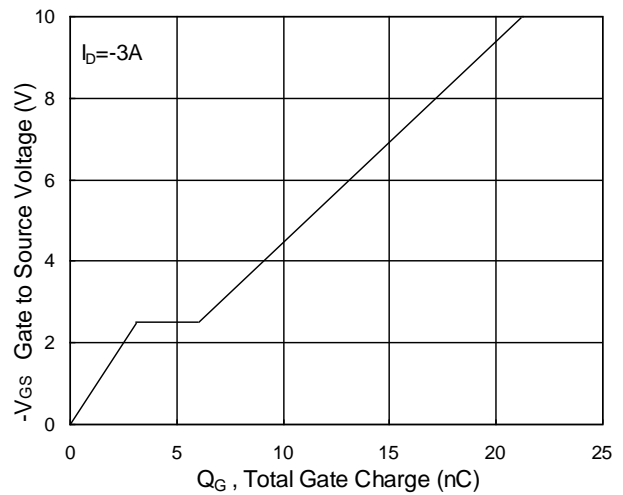
**Fig.1 Typical Output Characteristics**



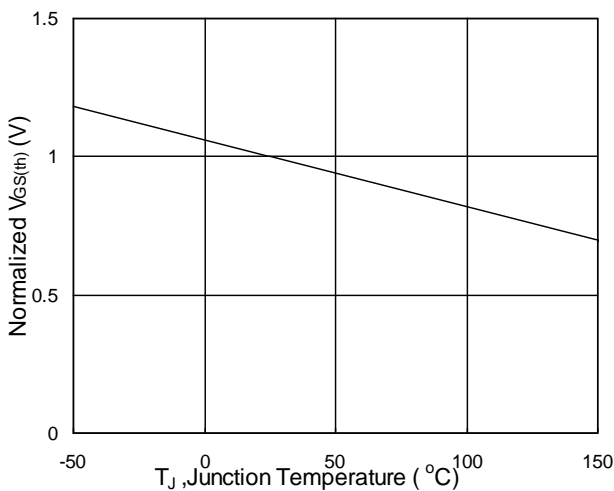
**Fig.2 On-Resistance v.s Gate-Source**



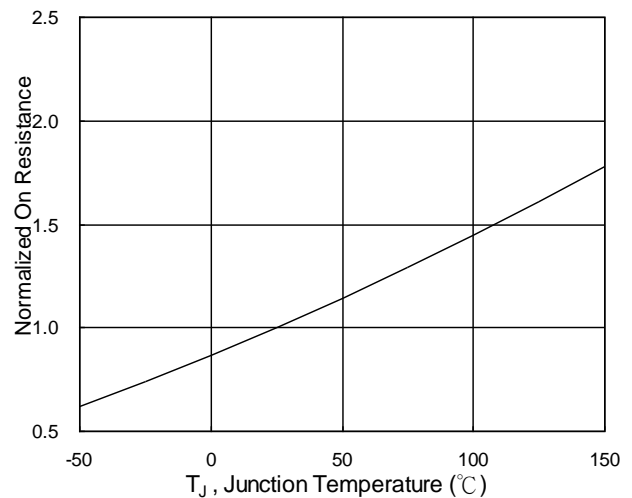
**Fig.3 Forward Characteristics of Reverse**



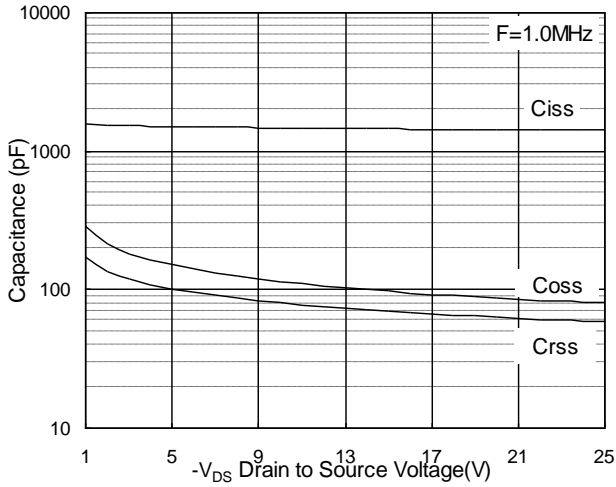
**Fig.4 Gate-Charge Characteristics**



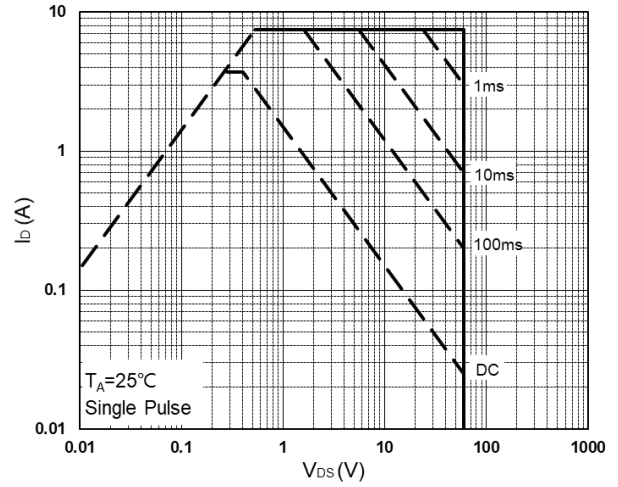
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



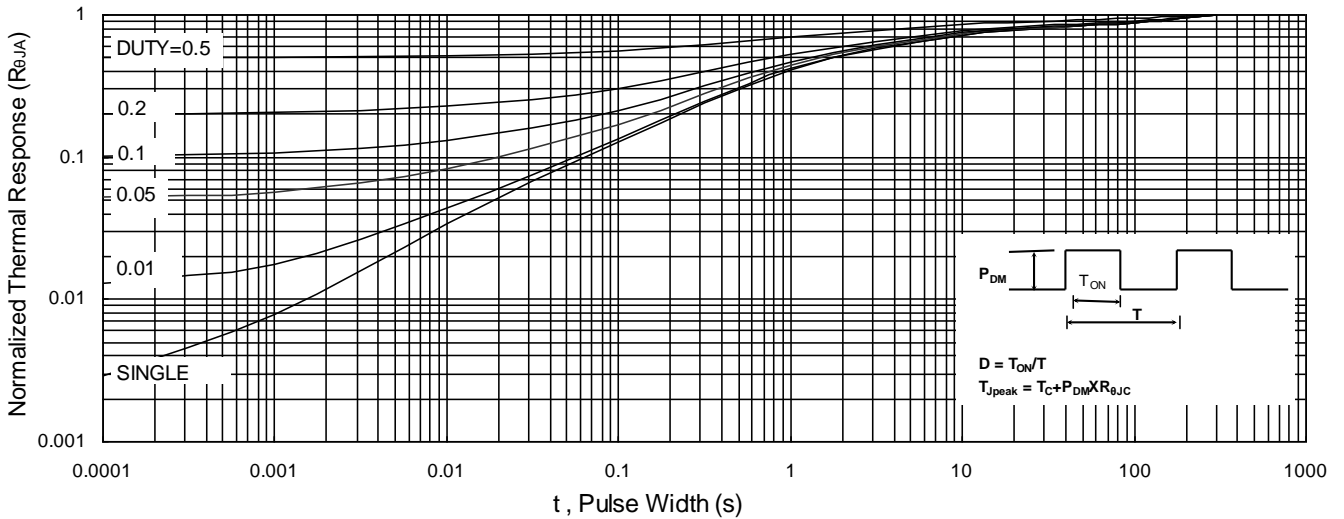
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



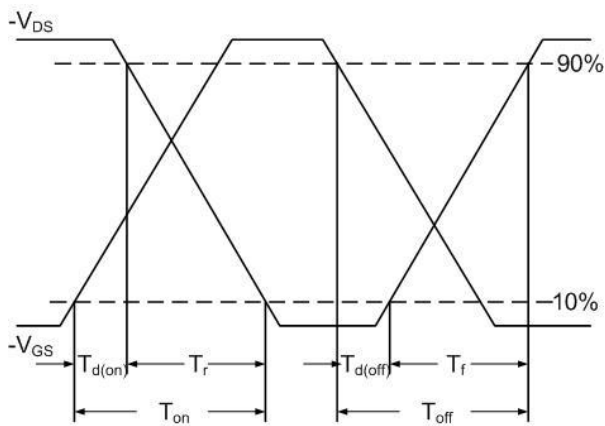
**Fig.7 Capacitance**



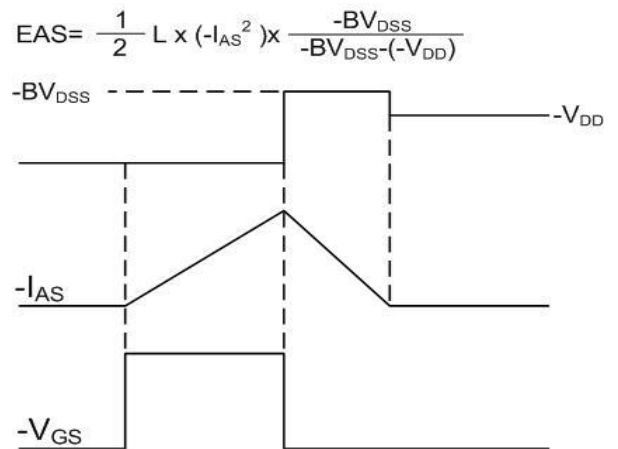
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Waveform**