

### Features

- $V_{DS} = 60V$   $I_D = 12A$   
 $R_{DS(ON)} < 85 \text{ m}\Omega @ V_{GS}=10V$

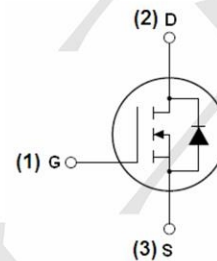
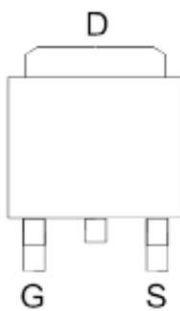
### Application

- Battery protection
- Load switch
- Uninterruptible power supply

### Package and Pin Configuration

(TO-252-3L)

Top View



### Marking:



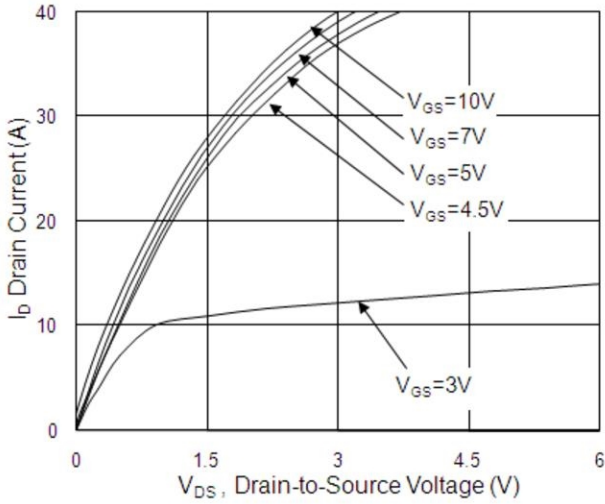
### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_C=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	12	A
$I_D @ T_C=100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	10	A
$I_D @ T_A=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	5	A
$I_D @ T_A=70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	4	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	47	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	22	mJ
$I_{AS}$	Avalanche Current	21	A
$P_D @ T_C=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	31.3	W
$P_D @ T_A=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	2	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	62	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	4	$^\circ\text{C/W}$

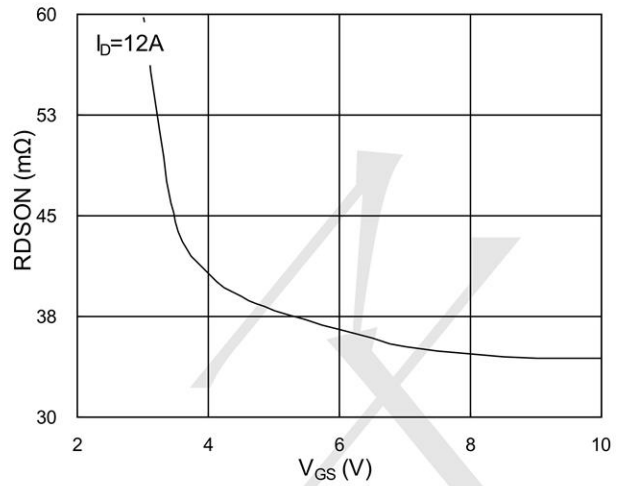
### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to $25^\circ\text{C}, I_D=1\text{mA}$	---	0.044	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=12A$	---	65	85	m $\Omega$
		$V_{GS}=4.5V, I_D=7A$	---	80	100	
$V_{GS(th)}$	Gate Threshold Voltage		1.0	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient	$V_{GS}=V_{DS}, I_D=250\mu A$	---	-4.8	---	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=48V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu\text{A}$
		$V_{DS}=48V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$g_{fs}$	Forward Transconductance	$V_{DS}=5V, I_D=10A$	---	25.3	---	S
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	2.5	---	$\Omega$
$Q_g$	Total Gate Charge (10V)		---	19	---	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=48V, V_{GS}=10V, I_D=12A$	---	2.5	---	
$Q_{gd}$	Gate-Drain Charge		---	5	---	
$T_{d(on)}$	Turn-On Delay Time		---	2.8	---	ns
$T_r$	Rise Time	$V_{DD}=30V, V_{GS}=10V, R_G=3.3$	---	16.6	---	
$T_{d(off)}$	Turn-Off Delay Time	$I_D=12A$	---	21.2	---	
$T_f$	Fall Time		---	5.6	---	
$C_{iss}$	Input Capacitance		---	560	---	pF
$C_{oss}$	Output Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	65	---	
$C_{rss}$	Reverse Transfer Capacitance		---	46	---	
$I_S$	Continuous Source Current <sup>1,6</sup>	$V_G=V_D=0V, \text{Force Current}$	---	---	12	A
$I_{SM}$	Pulsed Source Current <sup>2,6</sup>		---	---	47	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F=12A, \quad dI/dt=100A/\mu s$	---	12.2	---	nS
$Q_{rr}$	Reverse Recovery Charge	$T_J=25^\circ\text{C}$	---	7.3	---	nC

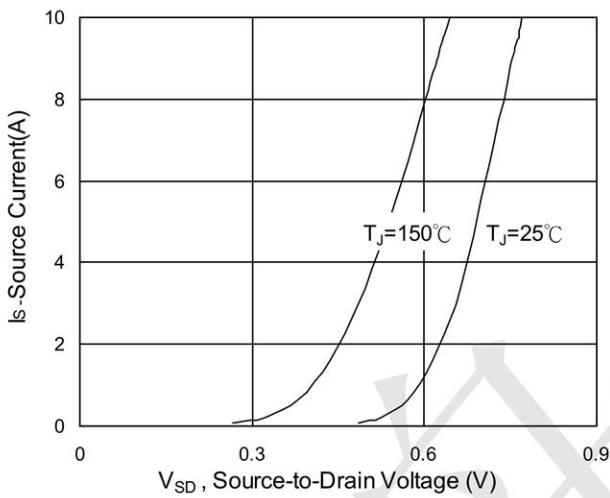
**Typical Characteristics**



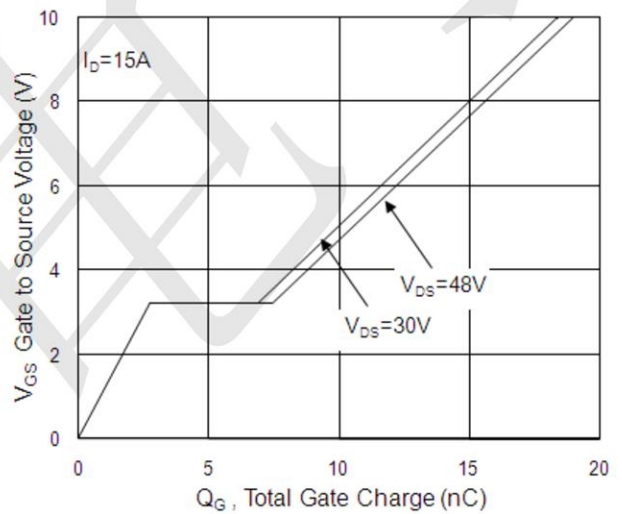
**Fig.1 Typical Output Characteristics**



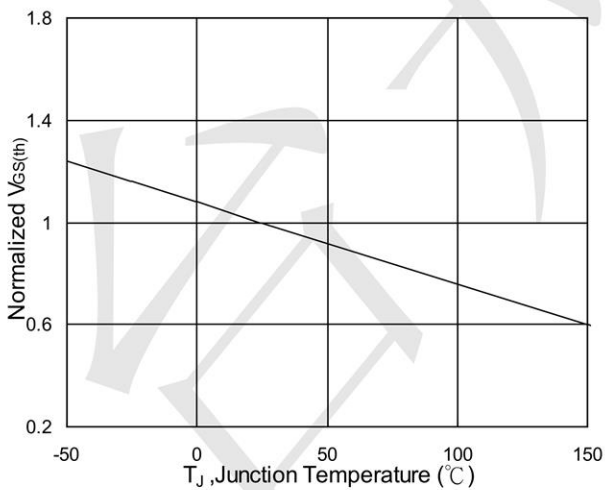
**Fig.2 On-Resistance vs. Gate-Source**



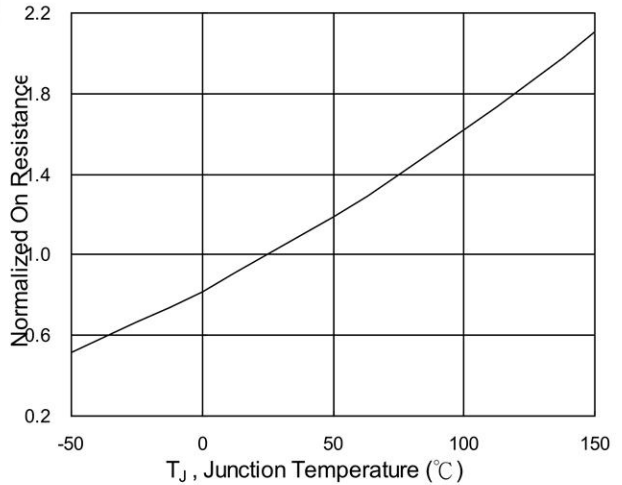
**Fig.3 Forward Characteristics Of Reverse**



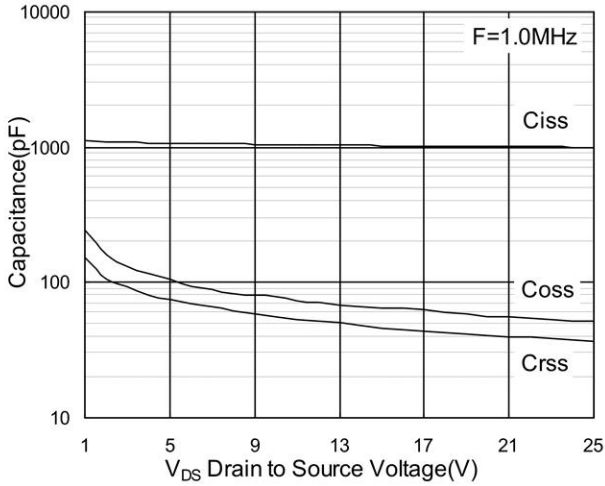
**Fig.4 Gate-Charge Characteristics**



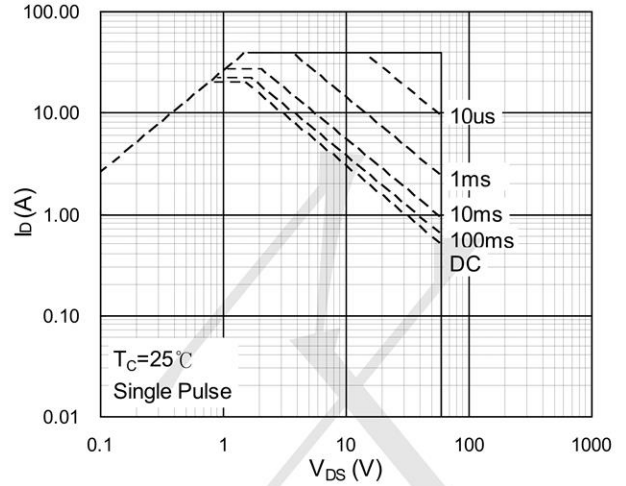
**Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$**



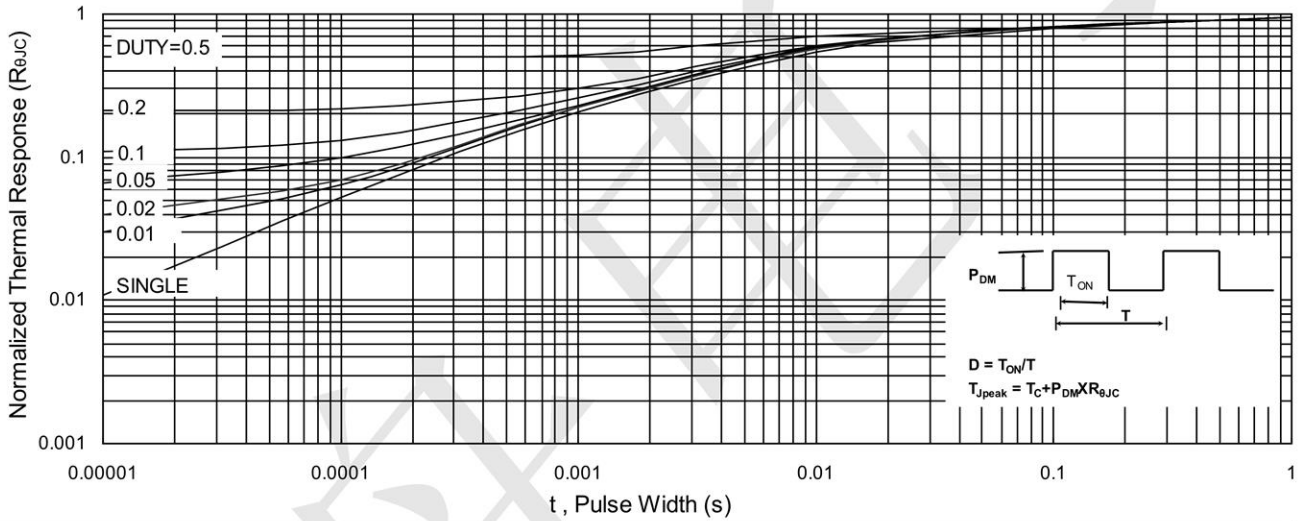
**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**



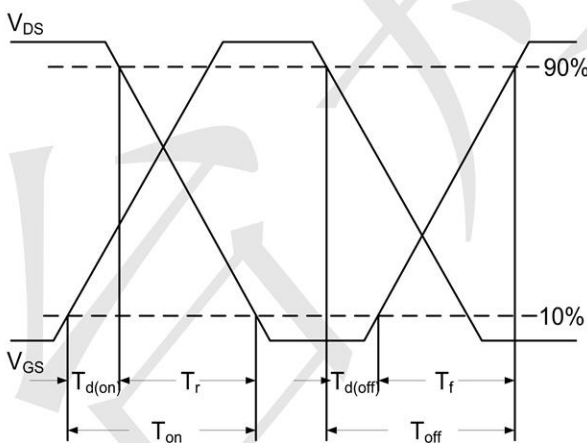
**Fig.7 Capacitance**



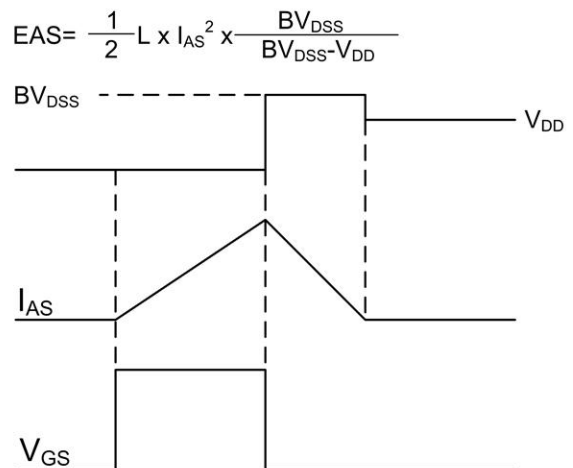
**Fig.8 Safe Operating Area**



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

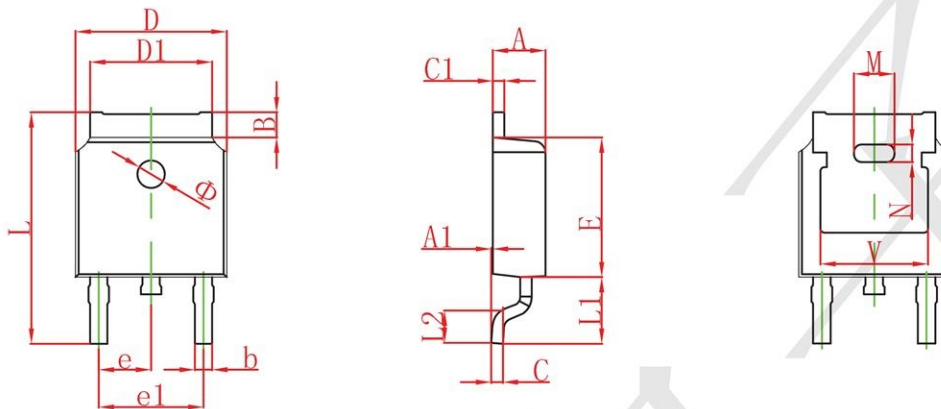


**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

**TO252 Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.380	0.087	0.094
A1	0.000	0.100	0.000	0.004
B	0.800	1.400	0.031	0.055
b	0.710	0.810	0.028	0.032
c	0.460	0.560	0.018	0.022
c1	0.460	0.560	0.018	0.022
D	6.500	6.700	0.256	0.264
D1	5.130	5.460	0.202	0.215
E	6.000	6.200	0.236	0.244
e	2.286 TYP.		0.090 TYP.	
e1	4.327	4.727	0.170	0.186
M	1.778REF.		0.070REF.	
N	0.762REF.		0.018REF.	
L	9.800	10.400	0.386	0.409
L1	2.9REF.		0.114REF.	
L2	1.400	1.700	0.055	0.067
V	4.830 REF.		0.190 REF.	
Φ	1.100	1.300	0.043	0.051