



### Description

The IRFR3709ZTRPBF uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



**TO-252-2L**

### General Features

$V_{DS} = 30V$   $I_D = 80 A$

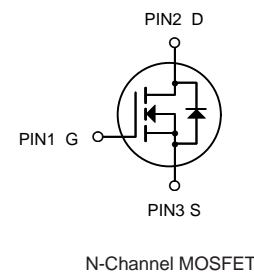
$R_{DS(ON)} < 6.8m\Omega @ V_{GS}=10V$

### Application

Battery protection

Load switch

Uninterruptible power supply



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
IRFR3709ZTRPBF	TO-252-2L	RFR3709 XXXX	2500

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_C=25^\circ C$ )	80	A
	Drain Current – Continuous ( $T_C=100^\circ C$ )	51	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	320	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	88	mJ
IAS	Single Pulse Avalanche Current <sup>2</sup>	42	A
$P_D$	Power Dissipation ( $T_C=25^\circ C$ )	54	W
	Power Dissipation – Derate above $25^\circ C$	0.43	W/ $^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction to ambient	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction to Case	2.3	$^\circ C/W$



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	---	---	V
$\Delta BVDSS/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D=1\text{mA}$	---	0.04	---	$\text{V}/^{\circ}\text{C}$
IDSS	Drain-Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	$\mu\text{A}$
		$V_{DS}=24V, V_{GS}=0V, T_J=125^{\circ}\text{C}$	---	---	10	$\mu\text{A}$
IGSS	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
RDS(ON)	Static Drain-Source On-Resistance <sup>3</sup>	$V_{GS}=10V, I_D=20A$	---	5	6.8	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=10A$	---	6.5	9	$\text{m}\Omega$
VGS(th)	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1	1.6	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4	---	$\text{mV}/^{\circ}\text{C}$
gfs	Forward Transconductance	$V_{DS}=10V, I_D=10A$	---	18	---	S
$Q_g$	Total Gate Charge <sup>3, 4</sup>	$V_{DS}=15V, V_{GS}=4.5V, I_D=20A$	---	11.1	---	nC
$Q_{gs}$	Gate-Source Charge <sup>3, 4</sup>		---	1.85	---	
$Q_{gd}$	Gate-Drain Charge <sup>3, 4</sup>		---	6.8	---	
$T_{d(on)}$	Turn-On Delay Time <sup>3, 4</sup>	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega$ $I_D=15A$	---	7.5	---	ns
$T_r$	Rise Time <sup>3, 4</sup>		---	14.5	---	
$T_{d(off)}$	Turn-Off Delay Time <sup>3, 4</sup>		---	35.2	---	
$T_f$	Fall Time <sup>3, 4</sup>		---	9.6	---	
Ciss	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, F=1\text{MHz}$	---	1160	---	pF
Coss	Output Capacitance		---	200	---	
Crss	Reverse Transfer Capacitance		---	180	---	
$R_g$	Gate resistance		$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	2.5	
EAS	Single Pulse Avalanche Energy	$V_{DD}=25V, L=0.1\text{mH}, I_{AS}=20A$	20	---	---	mJ
IS	Continuous Source Current	$V_G=V_D=0V$ , Force Current	---	---	80	A
ISM	Pulsed Source Current <sup>3</sup>		---	---	320	A
VSD	Diode Forward Voltage <sup>3</sup>	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	---	---	1	V
trr	Reverse Recovery Time	$V_{GS}=0V, I_S=1A, di/dt=100A/\mu s, T_J=25^{\circ}\text{C}$	---	---	---	ns
$Q_{rr}$	Reverse Recovery Charge		---	---	---	nC



### Typical Characteristics

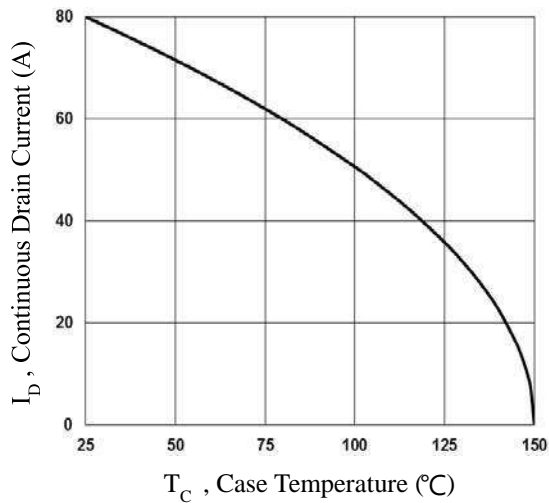


Fig.1 Continuous Drain Current vs.  $T_C$

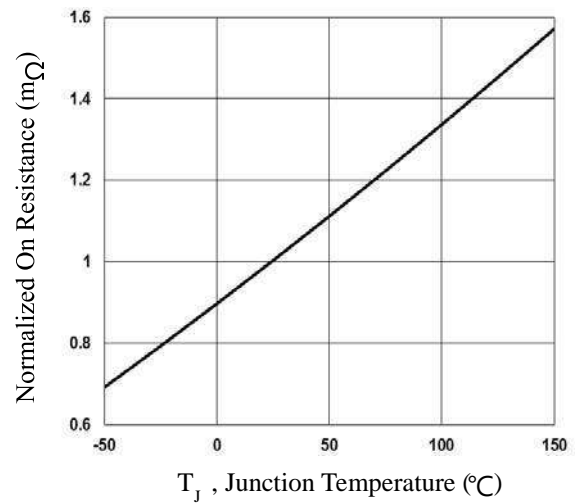


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

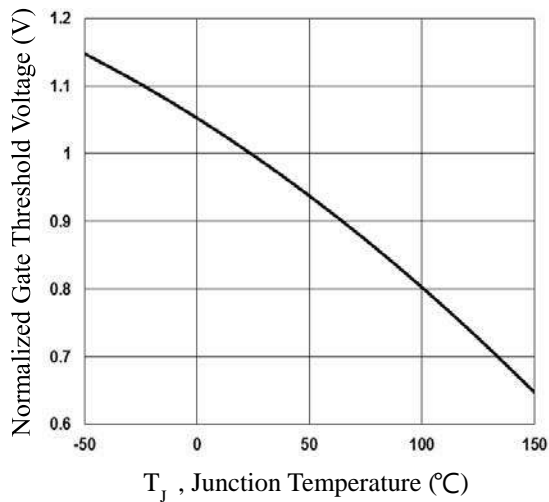


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

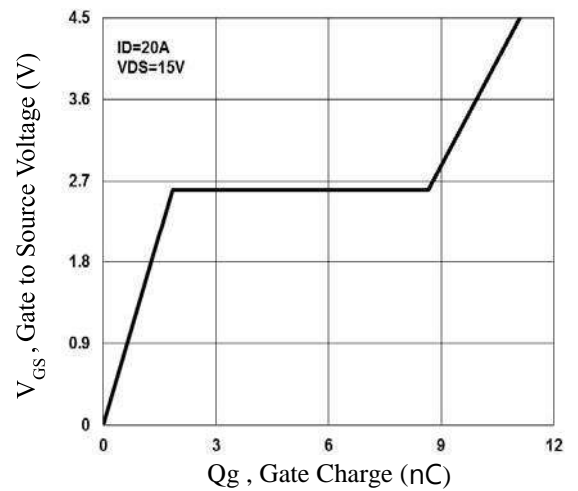


Fig.4 Gate Charge Waveform

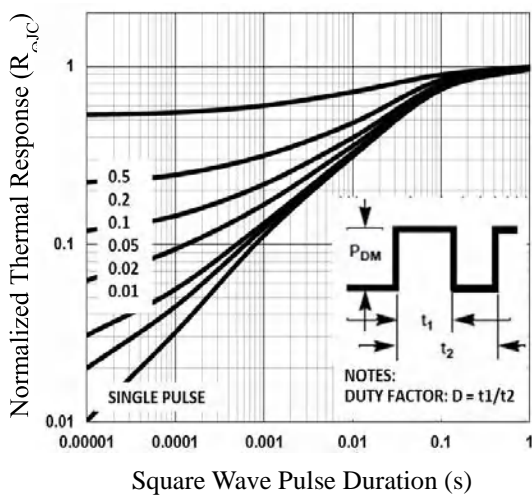


Fig.5 Normalized Transient Impedance

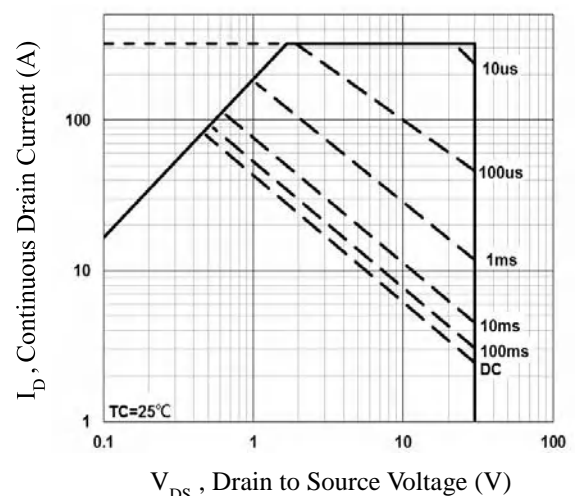


Fig.6 Maximum Safe Operation Area

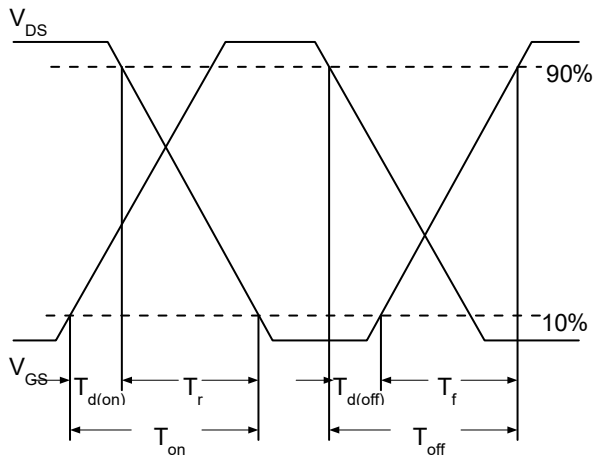


Fig.7 Switching Time Waveform

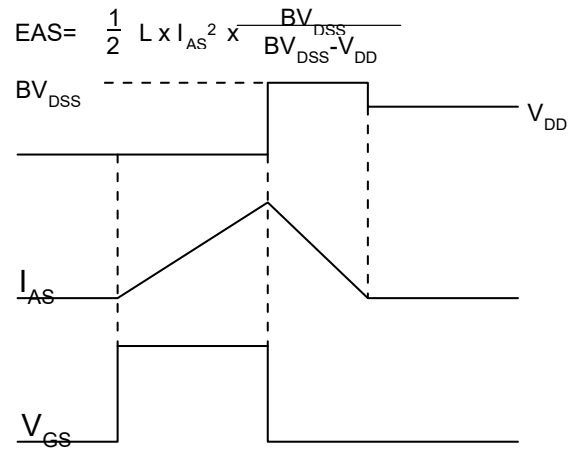
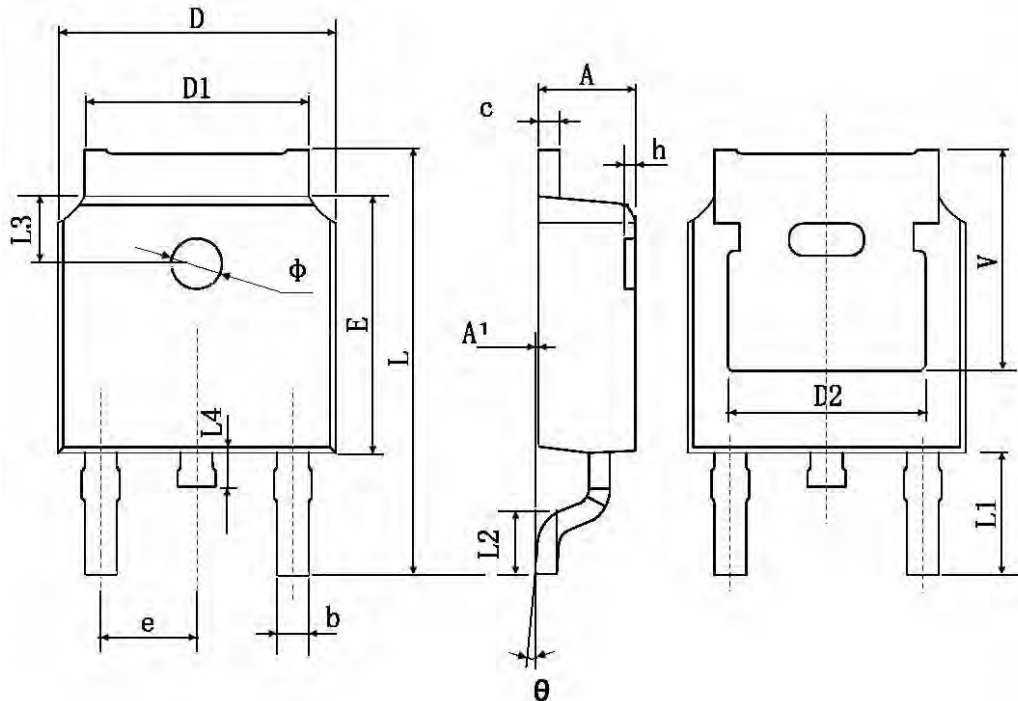


Fig.8 EAS Waveform



### TO-252-2L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	0.483 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	