

# EVVOSEMI<sup>®</sup>

THINK CHANGE DO



ESD



TVS



MOS



LDO



Diode



Sensor



DC-DC

## Product Specification

|              |             |         |
|--------------|-------------|---------|
| ▶ Domestic   | Part Number | IRFZ48V |
| ▶ Overseas   | Part Number | IRFZ48V |
| ▶ Equivalent | Part Number | IRFZ48V |

EV is the abbreviation of name EVVO

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

### Product Summary

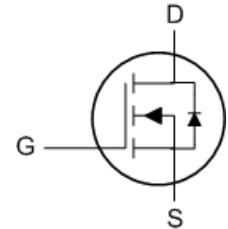
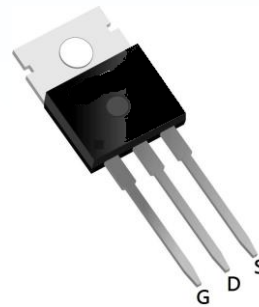
| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 60V   | 12mΩ  | 60A |

### Description

The IRFZ48V is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The IRFZ48V meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### TO220 Pin Configuration



### Absolute Maximum Ratings

| Symbol                      | Parameter                                  | Rating     | Units            |
|-----------------------------|--------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | 60         | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 60         | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 38         | A                |
| $I_D@T_A=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 9.2        | A                |
| $I_D@T_A=70^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 7.5        | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>          | 165        | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup> | 73         | mJ               |
| $I_{AS}$                    | Avalanche Current                          | 38         | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>       | 86.8       | 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 | $^\circ\text{C}$ |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit               |
|-----------------|--------------------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 62   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 1.44 | $^\circ\text{C/W}$ |

**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 $25^\circ\text{C}$ , $I_D=1mA$                  | ---  | 0.052 | ---       | $V/^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=30A$                                     | ---  | ---   | 12        | $m\Omega$           |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=15A$                                    | ---  | ---   | 15        |                     |
| $V_{GS(th)}$                 | 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           |                                                              | ---  | -5.76 | ---       | $mV/^\circ\text{C}$ |
| $I_{DSS}$                    | 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                       | $V_{DS}=5V$ , $I_D=30A$                                      | ---  | 42    | ---       | S                   |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                         | ---  | 1.5   | ---       | $\Omega$            |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=48V$ , $V_{GS}=4.5V$ , $I_D=15A$                     | ---  | 28.7  | ---       | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                              | ---  | 10.5  | ---       |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                              | ---  | 9.9   | ---       |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=30V$ , $V_{GS}=10V$ , $R_G=3.3\Omega$ ,<br>$I_D=15A$ | ---  | 10.4  | ---       | ns                  |
| $T_r$                        | Rise Time                                      |                                                              | ---  | 9.2   | ---       |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                              | ---  | 63    | ---       |                     |
| $T_f$                        | Fall Time                                      |                                                              | ---  | 4.8   | ---       |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                        | ---  | 3240  | ---       | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                              | ---  | 210   | ---       |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                              | ---  | 146   | ---       |                     |

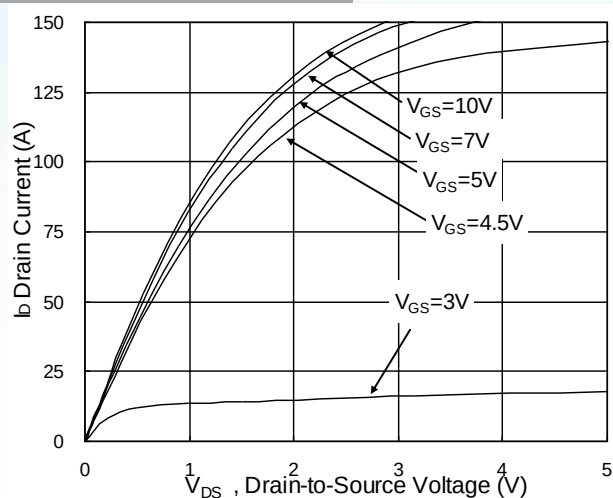
**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                              | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|---------------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,5</sup> | $V_G=V_D=0V$ , Force Current                            | ---  | ---  | 60   | A    |
| $I_{SM}$ | Pulsed Source Current <sup>2,5</sup>     |                                                         | ---  | ---  | 165  | 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                    | $I_F=15A$ , $dI/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$ | ---  | 18   | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                         | ---  | 14   | ---  | nC   |

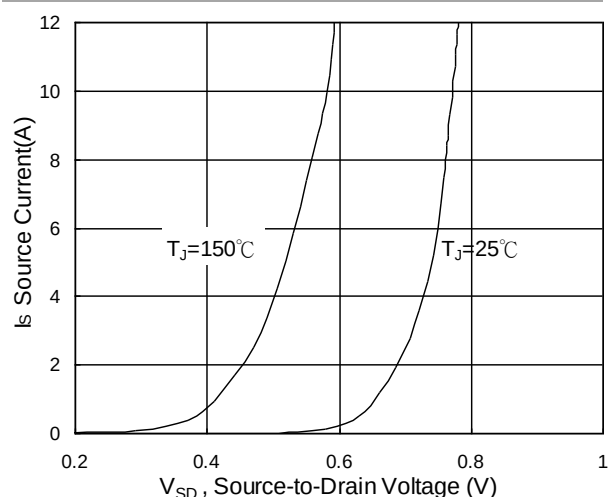
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z 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  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1mH$ ,  $I_{AS}=38A$
- 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.

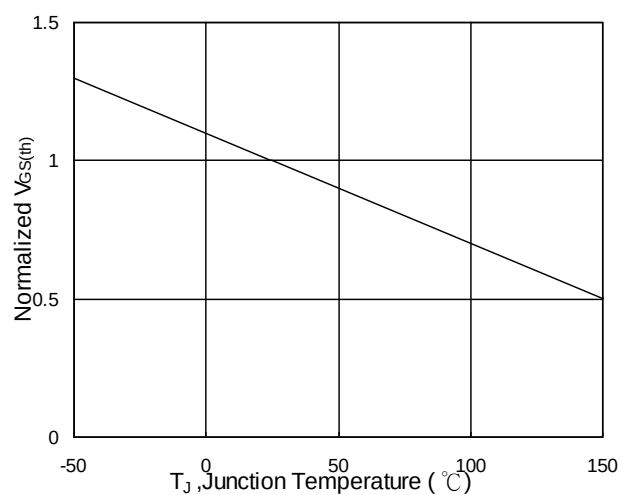
## Typical Characteristics



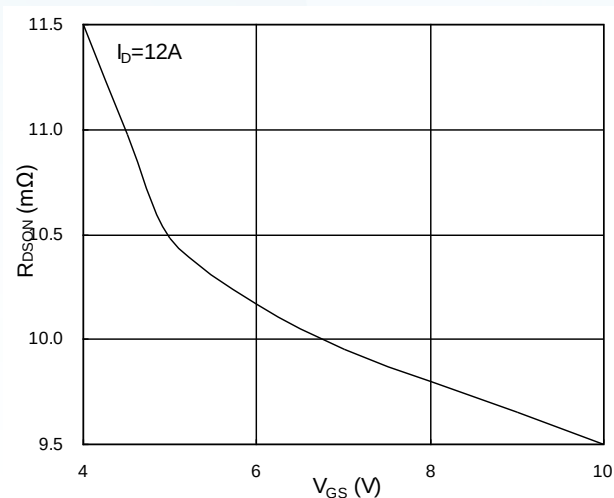
**Fig.1 Typical Output Characteristics**



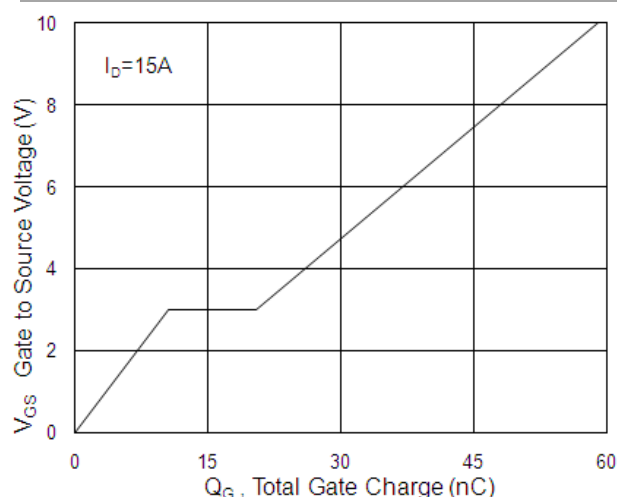
**Fig.3 Forward Characteristics of Reverse**



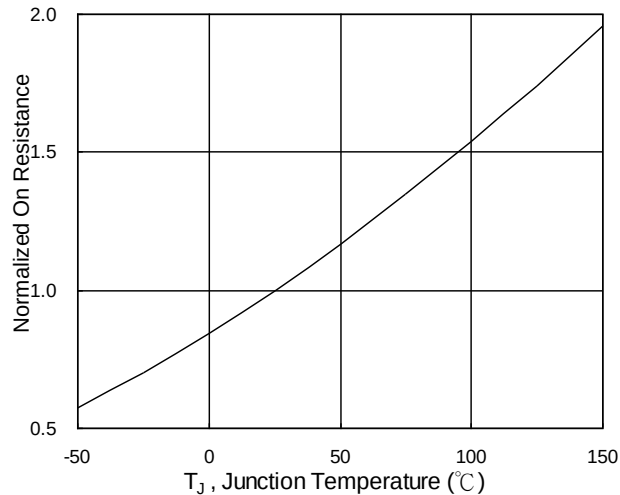
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



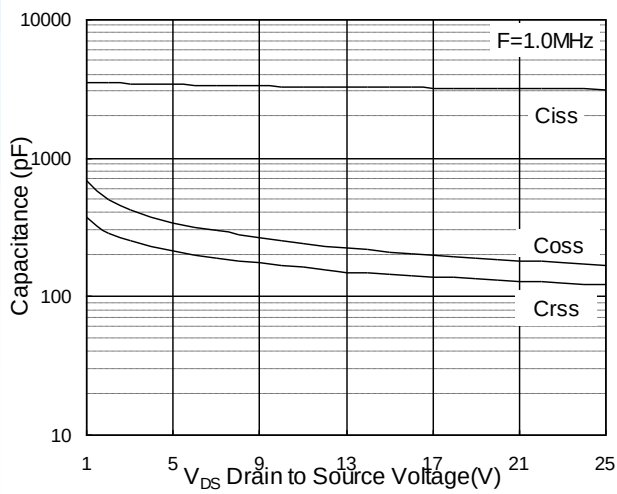
**Fig.2 On-Resistance v.s Gate-Source**



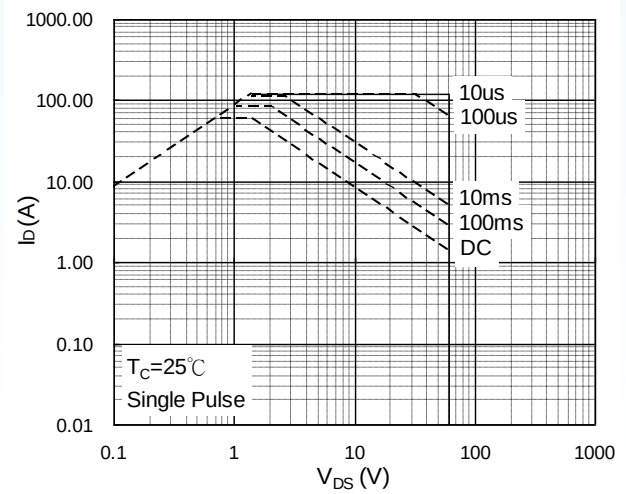
**Fig.4 Gate-Charge Characteristics**



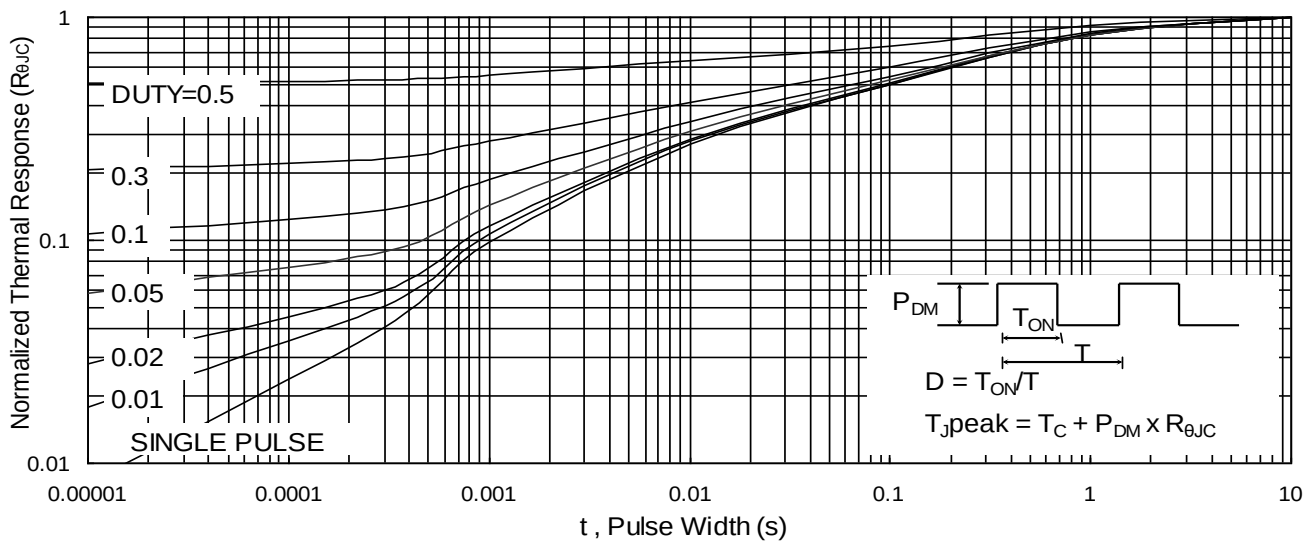
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



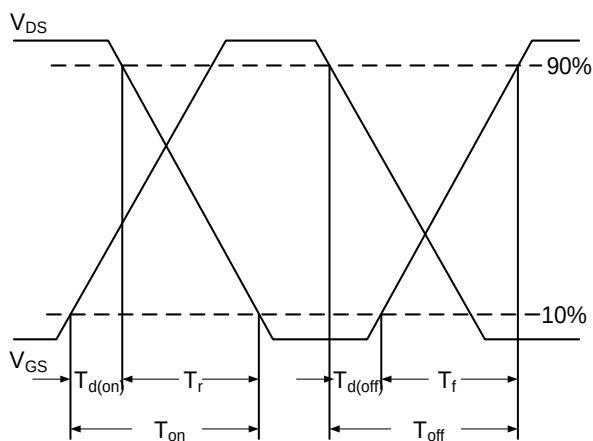
**Fig.7 Capacitance**



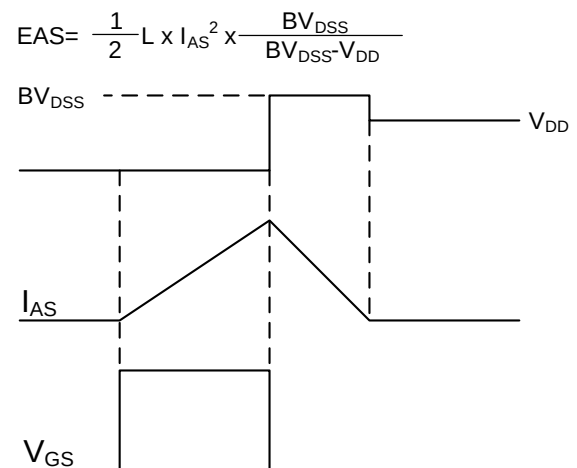
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**



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