

SuperMOS – SOT-23 -30V  $BV_{DSS}$ , 46m $\Omega$   $R_{DS(on)}$ , P-channel MOSFET

## 1. Description

The IRLML9301TRPBF(ES) is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product IRLML9301TRPBF(ES) is Pb-free.

## 2. Features

- 30V,  $R_{DS(ON)}=46m\Omega$ (Typ.) @ $V_{GS}=-10V$   
 $R_{DS(ON)}=62m\Omega$ (Typ.) @ $V_{GS}=-4.5V$
- Fast Switching
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

## 3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

## 4. Ordering Information

| Part Number        | Package | Marking | Material     | Packing     | Quantity per reel | Flammability Rating | Reel Size |
|--------------------|---------|---------|--------------|-------------|-------------------|---------------------|-----------|
| IRLML9301TRPBF(ES) | SOT-23  | R7      | Halogen free | Tape & Reel | 3,000 PCS         | UL 94V-0            | 7 inches  |

Table-1 Ordering information

## 5. Pin Configuration and Functions

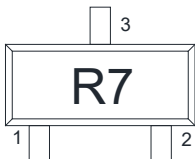
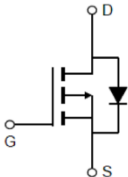
| Pin | Function | Outline                                                                             | Circuit Diagram                                                                       |
|-----|----------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1   | Gate     |  |  |
| 2   | Source   |                                                                                     |                                                                                       |
| 3   | Drain    |                                                                                     |                                                                                       |

Table-2 Pin configuration

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

| Parameter                      |                          | Symbol     | Limit       | Unit               |
|--------------------------------|--------------------------|------------|-------------|--------------------|
| Drain-Source Voltage           |                          | $BV_{DSS}$ | -30         | V                  |
| Gate-Source Voltage            |                          | $V_{GS}$   | $\pm 20$    | V                  |
| Continuous Drain Current       | $T_A=25^{\circ}\text{C}$ | $I_D$      | -3.8        | A                  |
|                                | $T_A=75^{\circ}\text{C}$ |            | -2.9        |                    |
| Maximum Power Dissipation      | $T_A=25^{\circ}\text{C}$ | $P_D$      | 1.4         | W                  |
| Pulsed Drain Current           |                          | $I_{DM}$   | -15.2       | A                  |
| Operating Junction Temperature |                          | $T_J$      | 150         | $^{\circ}\text{C}$ |
| Storage Temperature Range      |                          | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$ |

Thermal resistance ratings

| Single Operation                       |                 |         |         |                      |
|----------------------------------------|-----------------|---------|---------|----------------------|
| Parameter                              | Symbol          | Typical | Maximum | Unit                 |
| Junction-to-Ambient Thermal Resistance | $R_{\theta JA}$ |         | 90      | $^{\circ}\text{C/W}$ |

## Electrical Characteristics

At TA = 25°C unless otherwise specified

| Parameter                                 | Symbol              | Test Conditions                                                                        | Min. | Typ. | Max. | Unit |
|-------------------------------------------|---------------------|----------------------------------------------------------------------------------------|------|------|------|------|
| OFF CHARACTERISTICS                       |                     |                                                                                        |      |      |      |      |
| Drain-to-Source Breakdown Voltage         | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                            | -30  |      |      | V    |
| Zero Gate Voltage Drain Current           | I <sub>DSS</sub>    | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V                                             |      |      | -1   | uA   |
| Gate-to-source Leakage Current            | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                             |      |      | ±100 | nA   |
| ON CHARACTERISTICS                        |                     |                                                                                        |      |      |      |      |
| Gate Threshold Voltage                    | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                              | -0.9 | -1.5 | -2.0 | V    |
| Drain-to-source On-resistance             | R <sub>DS(on)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-3A                                             |      | 46   | 60   | mΩ   |
|                                           |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A                                            |      | 62   | 80   |      |
| CHARGES, CAPACITANCES AND GATE RESISTANCE |                     |                                                                                        |      |      |      |      |
| Input Capacitance                         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz                                     |      | 550  |      | pF   |
| Output Capacitance                        | C <sub>OSS</sub>    |                                                                                        |      | 75   |      |      |
| Reverse Transfer Capacitance              | C <sub>RSS</sub>    |                                                                                        |      | 63   |      |      |
| Total Gate Charge                         | Q <sub>G(TOT)</sub> | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-4A                      |      | 6.5  |      | nC   |
| Gate-to-Source Charge                     | Q <sub>GS</sub>     |                                                                                        |      | 1.1  |      |      |
| Gate-to-Drain Charge                      | Q <sub>GD</sub>     |                                                                                        |      | 1.3  |      |      |
| SWITCHING CHARACTERISTICS                 |                     |                                                                                        |      |      |      |      |
| Turn-On Delay Time                        | t <sub>d(ON)</sub>  | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =3.5Ω, R <sub>G</sub> =3Ω |      | 14   |      | ns   |
| Rise Time                                 | t <sub>r</sub>      |                                                                                        |      | 60   |      |      |
| Turn-Off Delay Time                       | t <sub>d(OFF)</sub> |                                                                                        |      | 19   |      |      |
| Fall Time                                 | t <sub>f</sub>      |                                                                                        |      | 11   |      |      |
| BODY DIODE CHARACTERISTICS                |                     |                                                                                        |      |      |      |      |
| Forward Voltage                           | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1.0A                                             |      | -0.7 | -1.5 | V    |

7. Typical Characteristic

Figure 1. On-Regin Characteristics

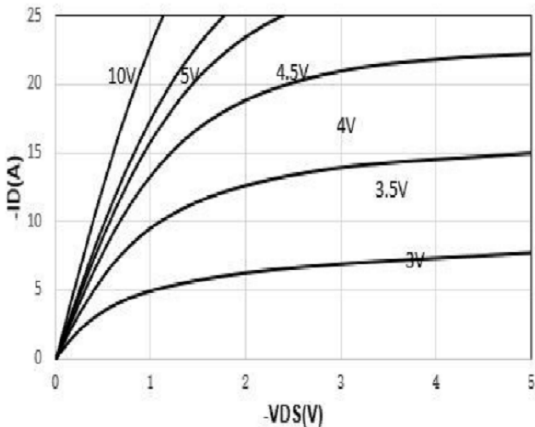


Figure 2. Transfer Characteristics

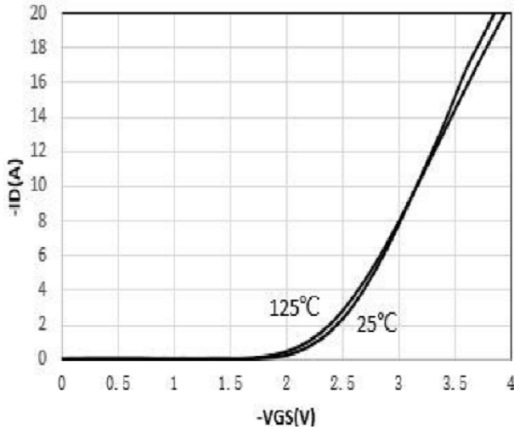


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

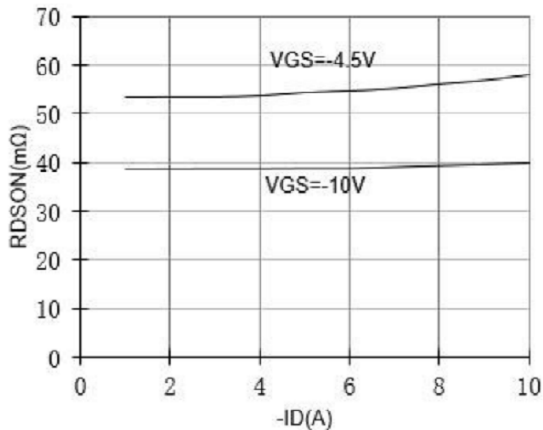


Figure 4. On-Resistance vs. Junction Temperature

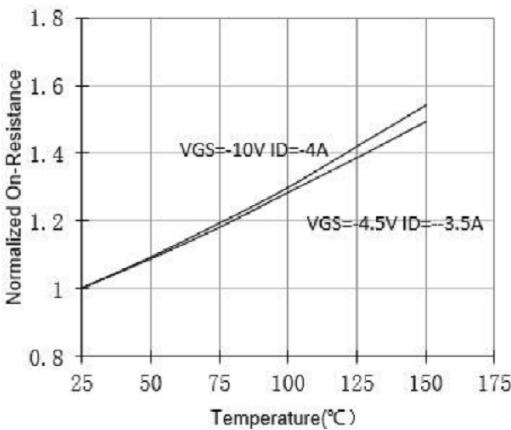


Figure 5. On-Resistance vs. Gate-Source Voltage

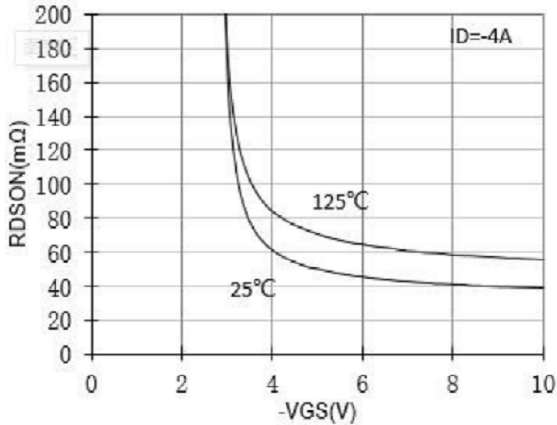
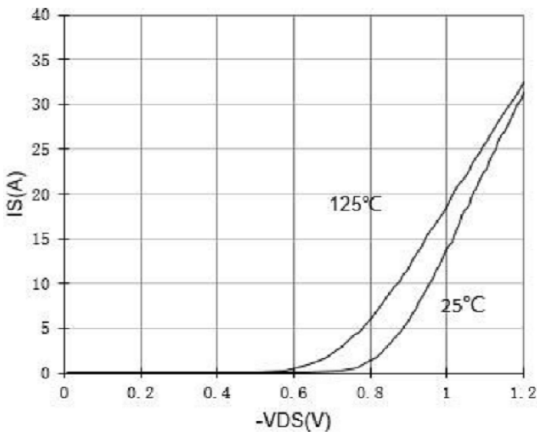
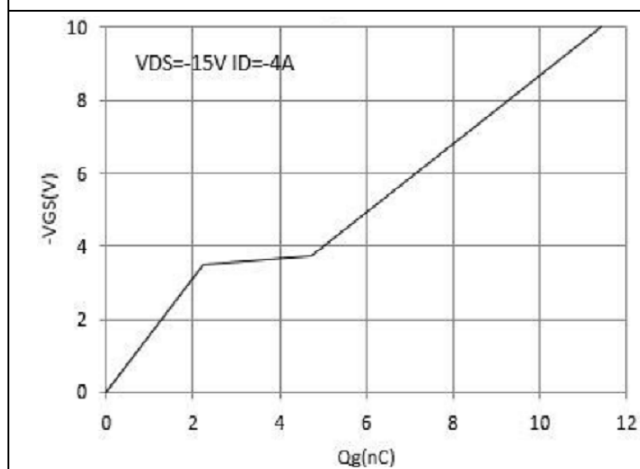


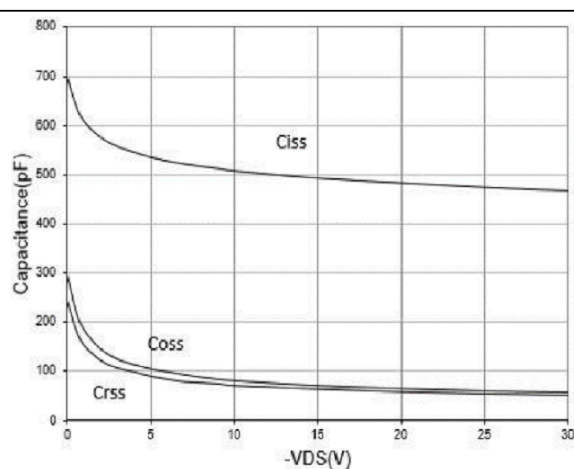
Figure 6. Body-Diode Characteristics



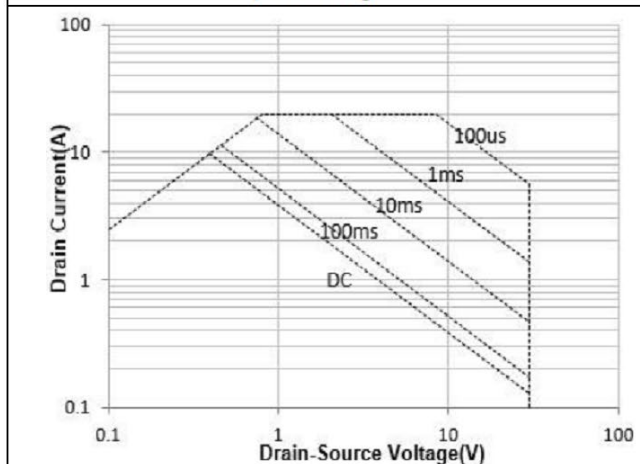
**Figure 7. Gate-Charge Characteristics**



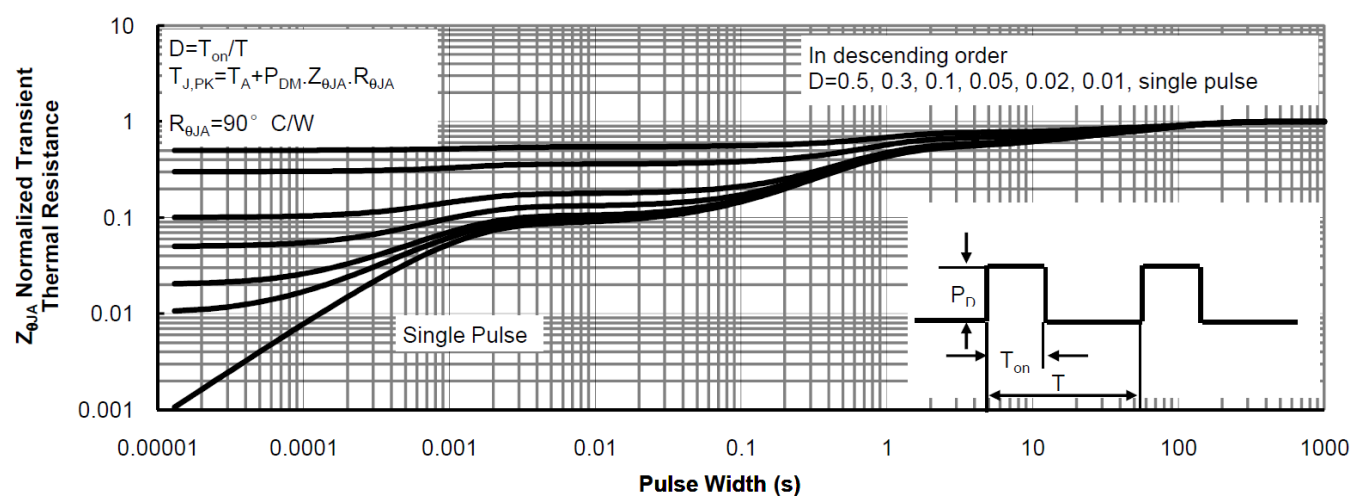
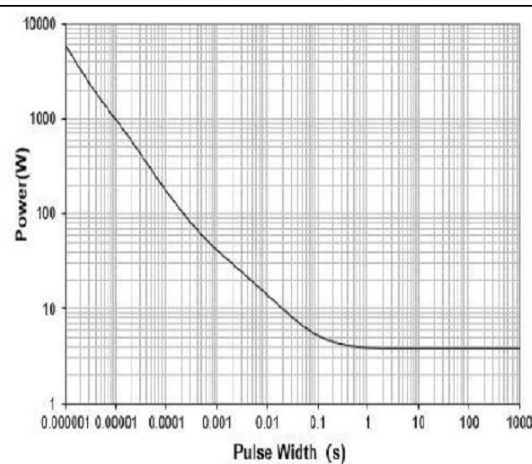
**Figure 8. Capacitance Characteristics**



**Figure 9. Maximum Forward Biased Safe Operating Area**

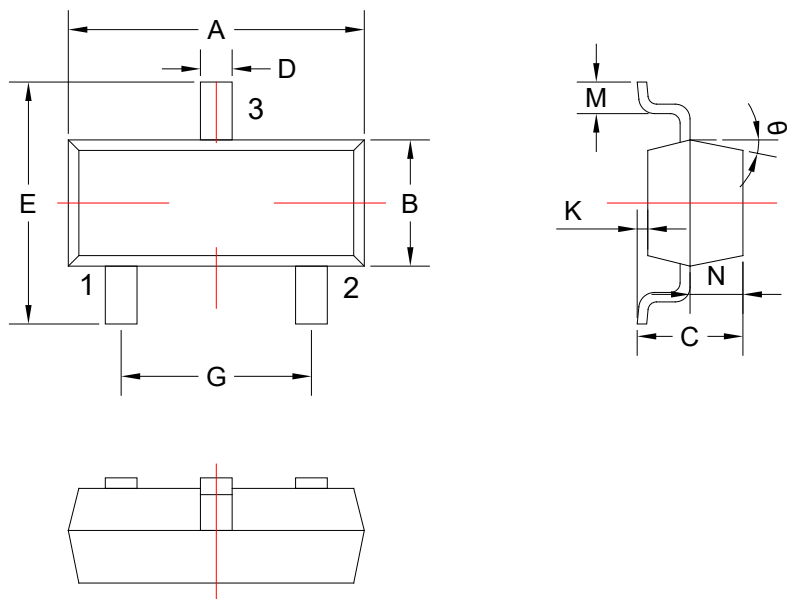


**Figure 10. Single Pulse Power Rating Junction-to-Ambient**



**Figure 11: Normalized Maximum Transient Thermal Impedance**

8. Dimension (SOT-23)



| COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER |      |      |        |      |      |
|---------------------------------------------|------|------|--------|------|------|
| SYMBOL                                      | MIN  | MAX  | SYMBOL | MIN  | MAX  |
| A                                           | 2.85 | 3.04 | G      | 1.80 | 2.00 |
| B                                           | 1.20 | 1.40 | K      | 0    | 0.10 |
| C                                           | 0.90 | 1.10 | M      | 0.20 | -    |
| D                                           | 0.40 | 0.50 | N      | 0.50 | 0.70 |
| E                                           | 2.25 | 2.55 | θ      | 5°   | 9°   |

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