

SuperMOS – SOT-23 20V  $BV_{DSS}$ , 45m $\Omega$   $R_{DS(on)}$ , N-channel MOSFET

## 1. Description

The IRLML2502TRPBF-ES is N-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 IRLML2502TRPBF-ES is Pb-free.

## 2. Features

- 20V,  $R_{DS(ON)}=45m\Omega$ (TYP.) @ $V_{GS}=4.5V$   
 $R_{DS(ON)}=62m\Omega$ (TYP.) @ $V_{GS}=2.5V$
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- ESD Protected
- 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 |
|-------------------|---------|---------|--------------|-------------|-------------------|---------------------|-----------|
| IRLML2502TRPBF-ES | SOT-23  | 2302    | Halogen free | Tape & Reel | 3,000 PCS         | UL 94V-0            | 7 inches  |

Table-1 Ordering information

## 5. Pin Configuration and Functions

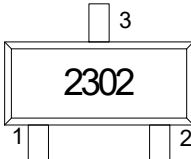
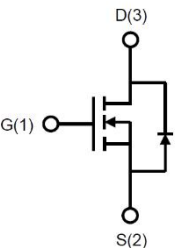
| Pin | Function | Outline                                                                             | Circuit Diagram                                                                       |
|-----|----------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 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           |                           | $BV_{DSS}$ | 20         | V    |
| Gate-Source Voltage            |                           | $V_{GS}$   | ±12        | V    |
| Continuous Drain Current       | $T_A=25^{\circ}\text{C}$  | $I_D$      | 3.3        | A    |
|                                | $T_A=100^{\circ}\text{C}$ |            | 2.1        |      |
| Maximum Power Dissipation      |                           | $P_D$      | 0.9        | mW   |
| Pulsed Drain Current           |                           | $I_{DM}$   | 13.2       | A    |
| Operating Junction Temperature |                           | $T_J$      | 150        | °C   |
| Lead Temperature               |                           | $T_L$      | 260        | °C   |
| Storage Temperature Range      |                           | $T_{stg}$  | -55 to 150 | °C   |

### Thermal resistance ratings

| Single Operation                       |                 |         |      |
|----------------------------------------|-----------------|---------|------|
| Parameter                              | Symbol          | Typical | Unit |
| Junction-to-Ambient Thermal Resistance | $R_{\theta JA}$ | 138     | °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                                          | 20   |      |      | V    |
| Zero Gate Voltage Drain Current           | I <sub>DSS</sub>    | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V                                           |      |      | 1.0  | uA   |
| Gate-to-source Leakage Current            | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                          |      |      | ±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                            | 0.4  | 0.7  | 1.0  | V    |
| Drain-to-source On-resistance             | R <sub>DS(on)</sub> | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A                                           |      | 45   | 55   | mΩ   |
|                                           |                     | V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A                                           |      | 62   | 85   |      |
| CHARGES, CAPACITANCES AND GATE RESISTANCE |                     |                                                                                     |      |      |      |      |
| Input Capacitance                         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, f=1MHz, V <sub>DS</sub> =10V                                   |      | 200  | -    | pF   |
| Output Capacitance                        | C <sub>OSS</sub>    |                                                                                     |      | 35   | -    |      |
| Reverse Transfer Capacitance              | C <sub>RSS</sub>    |                                                                                     |      | 28   | -    |      |
| Total Gate Charge                         | Q <sub>G(TOT)</sub> | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =2A                     |      | 3    | -    | nC   |
| Gate-to-Source Charge                     | Q <sub>GS</sub>     |                                                                                     |      | 0.5  | -    |      |
| Gate-to-Drain Charge                      | Q <sub>GD</sub>     |                                                                                     |      | 0.7  | -    |      |
| SWITCHING CHARACTERISTICS                 |                     |                                                                                     |      |      |      |      |
| Turn-On Delay Time                        | t <sub>d(ON)</sub>  | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =2A, R <sub>G</sub> =3Ω |      | 3    | -    | ns   |
| Rise Time                                 | t <sub>r</sub>      |                                                                                     |      | 11   | -    |      |
| Turn-Off Delay Time                       | t <sub>d(OFF)</sub> |                                                                                     |      | 20   | -    |      |
| Fall Time                                 | t <sub>f</sub>      |                                                                                     |      | 8    | -    |      |
| BODY DIODE CHARACTERISTICS                |                     |                                                                                     |      |      |      |      |
| Forward Voltage                           | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =3A                                             |      |      | 1.5  | V    |

7. Typical Characteristic

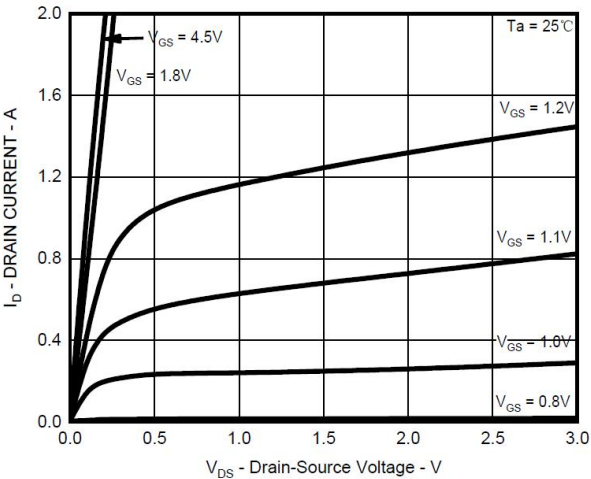


Fig.1 Output Characteristics

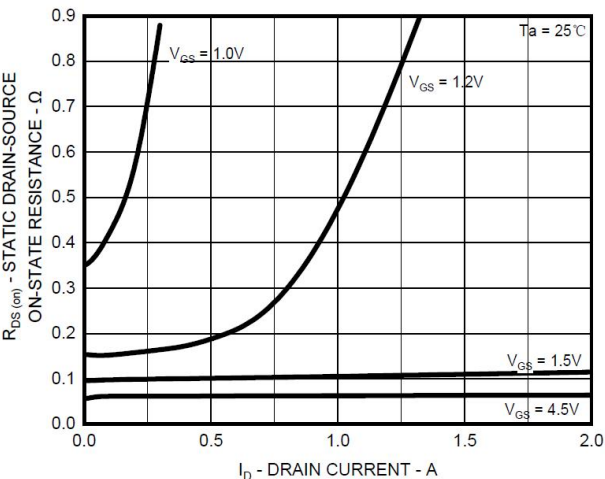


Fig.2 On-Resistance vs. Drain Current (I)

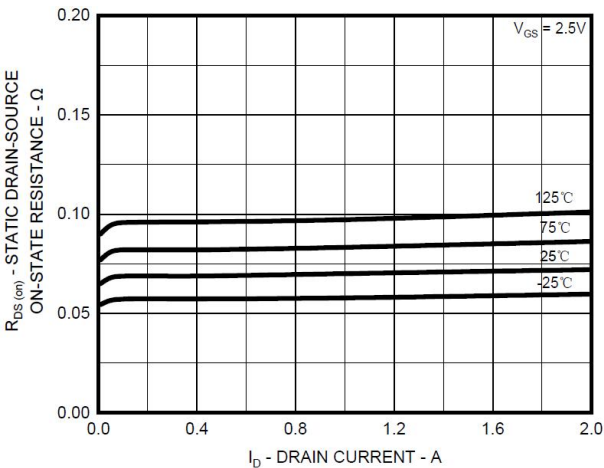


Fig.3 On-Resistance vs. Drain Current (II)

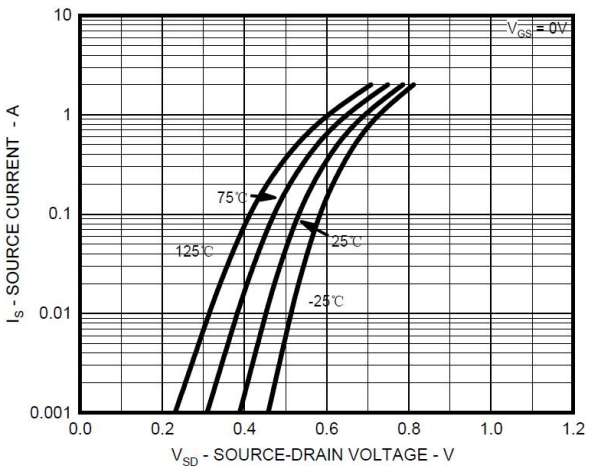


Fig.4 Diode Forward Voltage vs. Current

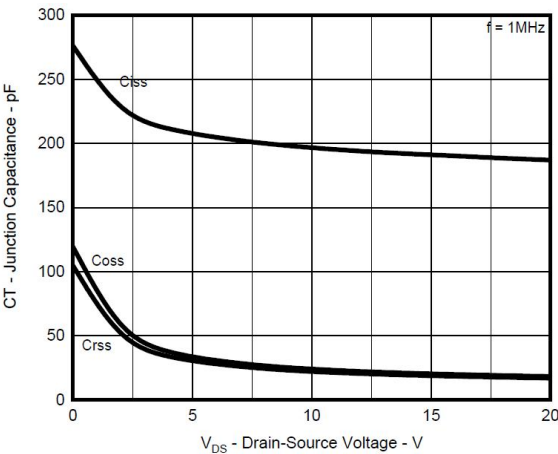


Fig.5 Capacitance Characteristics

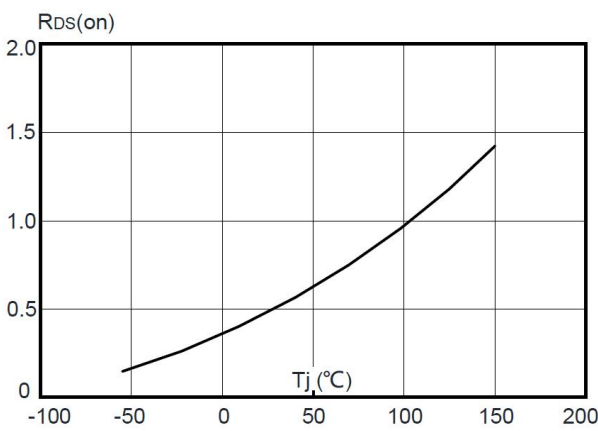
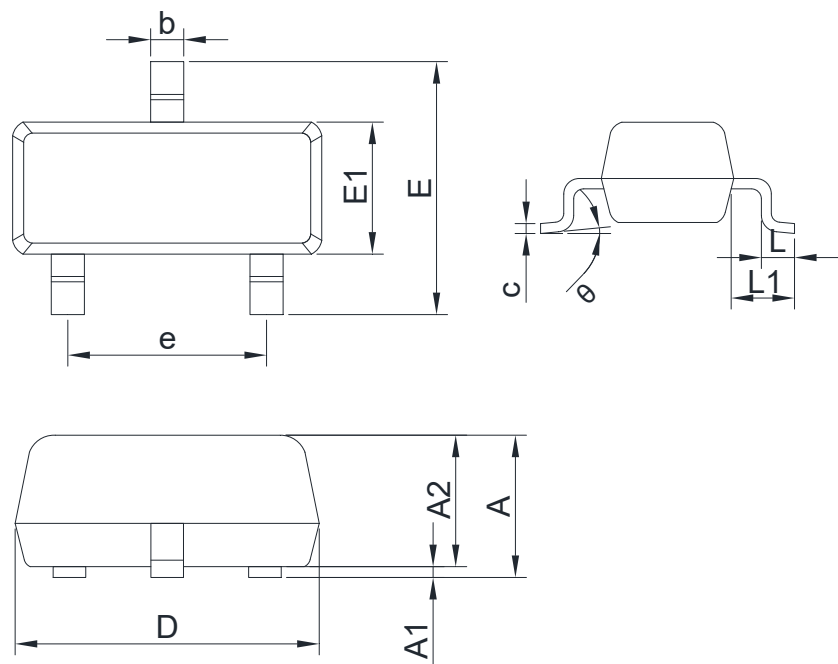


Fig.6 Normalized on Resistance vs Junction

|  |                    |
|--|--------------------|
|  | <b>Temperature</b> |
|--|--------------------|

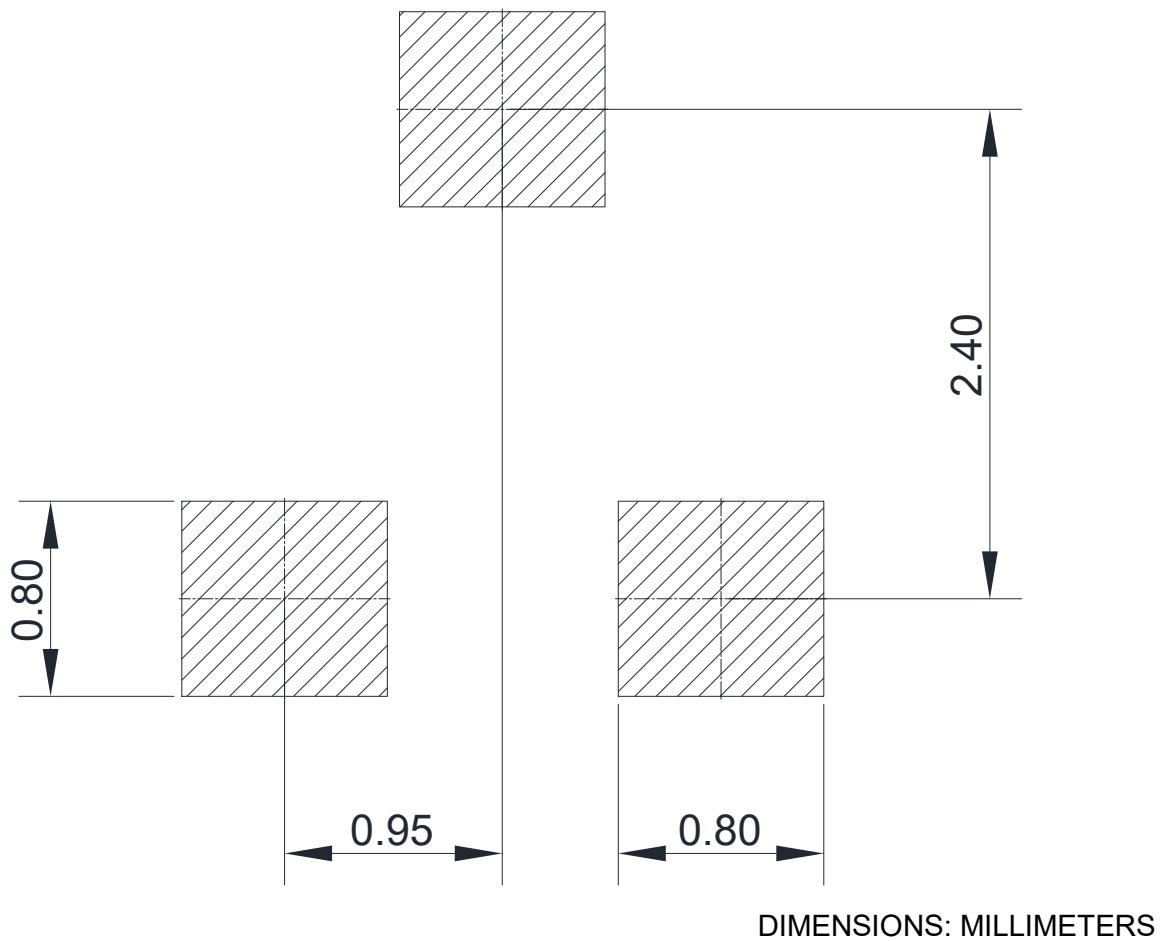
8. Dimension (SOT-23)

POD(Z)



| COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER |      |      |        |       |       |
|---------------------------------------------|------|------|--------|-------|-------|
| SYMBOL                                      | MIN  | MAX  | SYMBOL | MIN   | MAX   |
| A                                           | 0.90 | 1.20 | E      | 2.25  | 2.55  |
| A1                                          | 0.00 | 0.10 | E1     | 1.20  | 1.40  |
| A2                                          | 0.90 | 1.10 | e      | 1.80  | 2.00  |
| b                                           | 0.30 | 0.50 | L      | 0.30  | 0.50  |
| c                                           | 0.07 | 0.18 | L1     | 0.475 | 0.625 |
| D                                           | 2.80 | 3.04 | θ      | 0°    | 8°    |

## 9. Recommended Soldering Footprint



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