

SuperMOS –SOP8 -30V  $BV_{DSS}$ ,  $4.1m\Omega$   $R_{DS(on)}$ , P-channel MOSFET

## 1. Description

The IRF9310TRPBF(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 IRF9310TRPBF(ES) is Pb-free.

## 2. Features

- -30V,  $R_{DS(on)}=4.1m\Omega$ (Typ.) @ $V_{GS}=-10V$   
 $R_{DS(on)}=6.4m\Omega$ (Typ.) @ $V_{GS}=-4.5V$
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

## 3. Applications

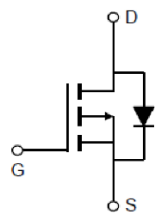
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

100% UIS TESTED

## 4. Ordering Information

| Part Number      | Package | Marking      | Material     | Packing     | Quantity per reel | Flammability Rating | Reel Size |
|------------------|---------|--------------|--------------|-------------|-------------------|---------------------|-----------|
| IRF9310TRPBF(ES) | SOP8    | PE03R053/LOT | Halogen free | Tape & Reel | 3,000 PCS         | UL 94V-0            | 13 inches |

## 5. Pin Configuration and Functions

| Pin     | Function | Outline                                                                                       | Circuit Diagram                                                                       |
|---------|----------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 4       | Gate     | Note b<br> |  |
| 1/2/3   | Source   |                                                                                               |                                                                                       |
| 5/6/7/8 | Drain    |                                                                                               |                                                                                       |

## 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                   | $T_A=25^{\circ}\text{C}$  | $I_D$      | -21        | A                  |
|                                            | $T_A=100^{\circ}\text{C}$ |            | -12.6      |                    |
| Maximum Power Dissipation                  |                           | $P_D$      | 4.2        | W                  |
| Pulsed Drain Current                       |                           | $I_{DM}$   | -84        | A                  |
| Single Pulse Avalanche Energy <sup>a</sup> |                           | $E_{AS}$   | 225        | mJ                 |
| Operating Junction Temperature             |                           | $T_J$      | -55 to 150 | $^{\circ}\text{C}$ |
| Lead Temperature                           |                           | $T_L$      | 260        | $^{\circ}\text{C}$ |
| Storage Temperature Range                  |                           | $T_{stg}$  | -55 to 150 | $^{\circ}\text{C}$ |

### Thermal resistance ratings

| Single Operation               |                 |         |         |                      |
|--------------------------------|-----------------|---------|---------|----------------------|
| Parameter                      | Symbol          | Typical | Maximum | Unit                 |
| Junction-to-Ambient Resistance | $R_{\theta JA}$ |         | 30      | $^{\circ}\text{C/W}$ |

Note:

- The EAS test condition is  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=-15\text{V}$ ,  $V_G=-10\text{V}$ ,  $R_G=25\text{ohm}$ ,  $L=0.5\text{mH}$ ,  $I_{AS}=-30\text{A}$ .
- This diagram is only an electrical schematic, and the actual pin size is based on POD.

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## Electrical Characteristics

At TA = 25°C unless otherwise specified

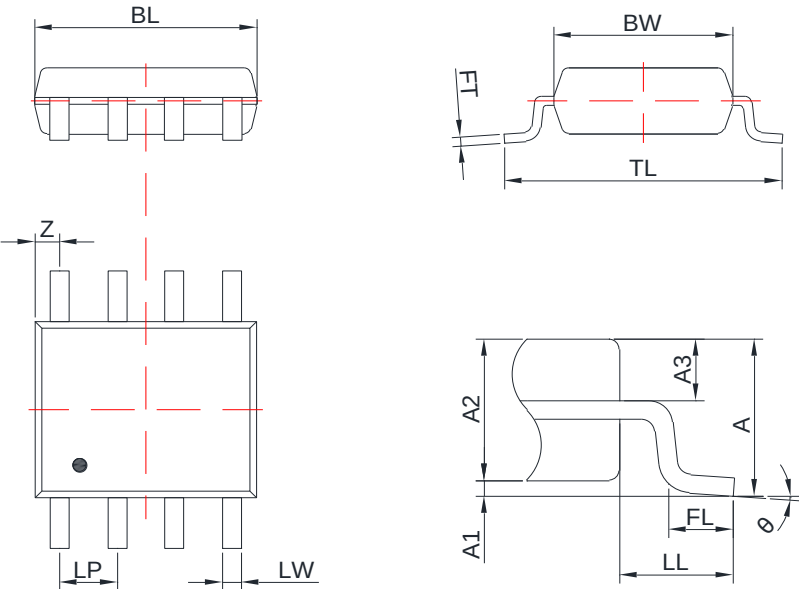
| Parameter                                 | Symbol              | Test Conditions                                                                           | Min. | Typ. | Max. | Unit |
|-------------------------------------------|---------------------|-------------------------------------------------------------------------------------------|------|------|------|------|
| 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                                 | -1.2 | -1.6 | -2.2 | V    |
| Drain-to-source On-resistance             | R <sub>DS(on)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-15A                                               |      | 4.1  | 5.3  | mΩ   |
|                                           |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A                                              |      | 6.4  | 8.3  |      |
| CHARGES, CAPACITANCES AND GATE RESISTANCE |                     |                                                                                           |      |      |      |      |
| Input Capacitance                         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, f=1MHz,<br>V <sub>DS</sub> =-15V                                     |      | 3910 |      | pF   |
| Output Capacitance                        | C <sub>OSS</sub>    |                                                                                           |      | 692  |      |      |
| Reverse Transfer Capacitance              | C <sub>RSS</sub>    |                                                                                           |      | 561  |      |      |
| Total Gate Charge                         | Q <sub>G(TOT)</sub> | V <sub>GS</sub> =0 to -10V,<br>V <sub>DS</sub> =-15V, I <sub>D</sub> =-15A                |      | 78   |      | nC   |
| Gate-to-Source Charge                     | Q <sub>GS</sub>     |                                                                                           |      | 13   |      |      |
| Gate-to-Drain Charge                      | Q <sub>GD</sub>     |                                                                                           |      | 18   |      |      |
| SWITCHING CHARACTERISTICS                 |                     |                                                                                           |      |      |      |      |
| Turn-On Delay Time                        | t <sub>d(ON)</sub>  | V <sub>GS</sub> =-10V, V <sub>DD</sub> =-15V,<br>I <sub>D</sub> =-15A, R <sub>G</sub> =3Ω |      | 17.5 |      | ns   |
| Rise Time                                 | t <sub>r</sub>      |                                                                                           |      | 50   |      |      |
| Turn-Off Delay Time                       | t <sub>d(OFF)</sub> |                                                                                           |      | 108  |      |      |
| Fall Time                                 | t <sub>f</sub>      |                                                                                           |      | 70   |      |      |
| BODY DIODE CHARACTERISTICS                |                     |                                                                                           |      |      |      |      |
| Forward Voltage                           | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-15A                                                 |      |      | -1.2 | V    |

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7. Dimension (SOP8)

POD A(Y)



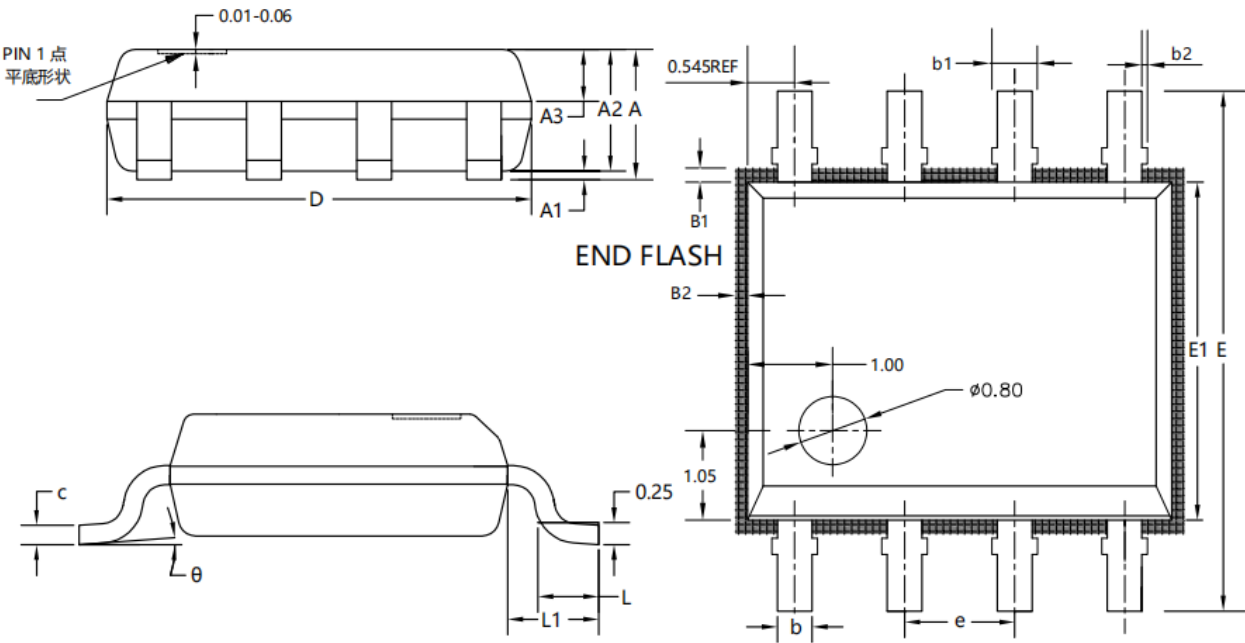
COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

| Symbol | Dimensions |      | Symbol | Dimensions |      |
|--------|------------|------|--------|------------|------|
|        | Min.       | Max. |        | Min.       | Max. |
| A      | 1.75       |      | FL     | 0.50       | 0.80 |
| A1     | 0.05       | 0.15 | LP     | 1.25       | 1.30 |
| A2     | 1.40       | 1.50 | LL     | 1.1 BSC    |      |
| A3     | 0.623 BSC  |      | LW     | 0.38       | 0.43 |
| BL     | 4.92       | 5.08 | TL     | 5.90       | 6.10 |
| BW     | 3.70       | 4.10 | Z      | 0.54       |      |
| FT     | 0.20       | 0.21 | θ      | 0°         | 8°   |

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POD B(C)



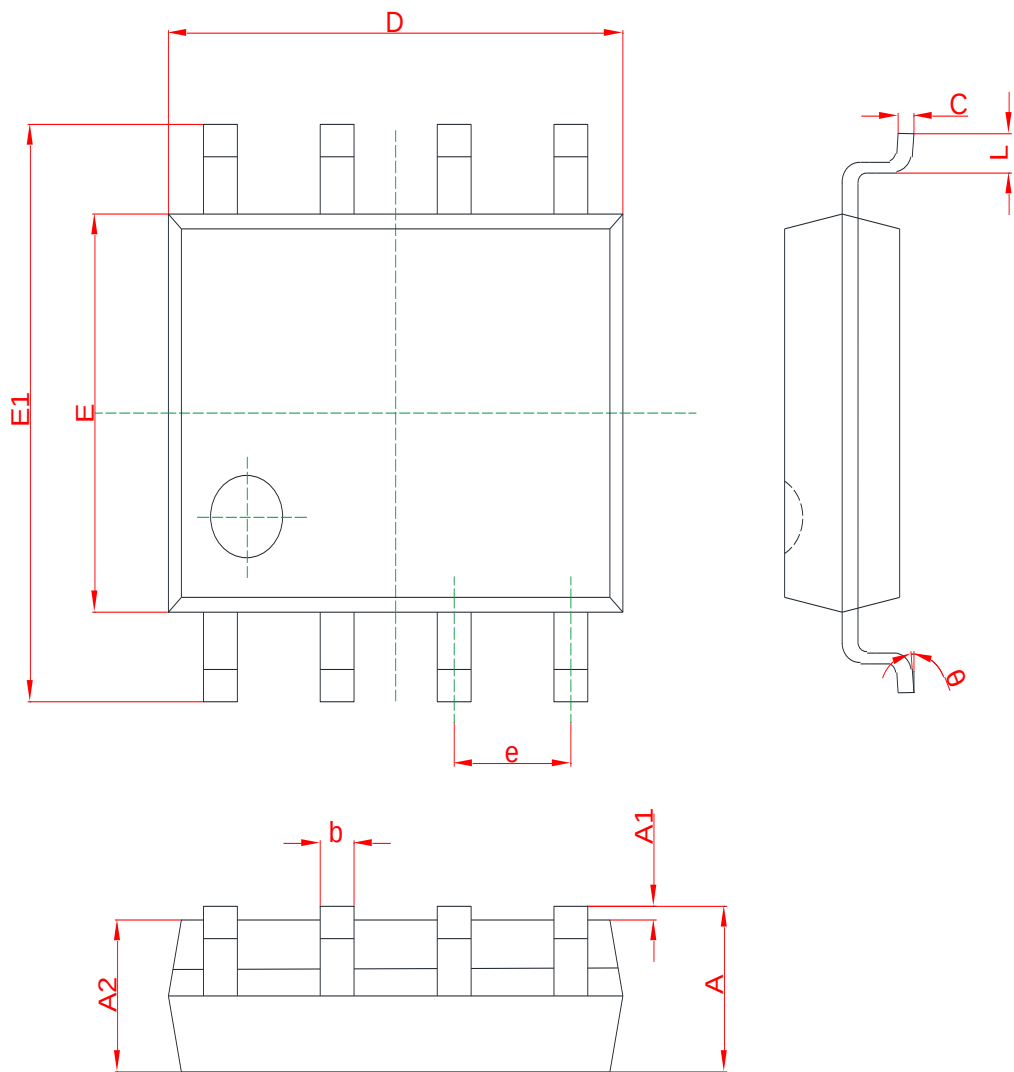
COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

| Symbol | Dimensions |      |      | Symbol   | Dimensions |      |      |
|--------|------------|------|------|----------|------------|------|------|
|        | Min.       | NOM. | Max. |          | Min.       | NOM. | Max. |
| A      | 1.55       | 1.65 | 1.75 | L        | 0.50       | 0.60 | 0.70 |
| A1     | 0.06       | 0.11 | 0.16 | L1       | 0.90       | 1.05 | 1.20 |
| A2     | 1.35       | 1.45 | 1.55 | $\theta$ | 0°         | 4°   | 8°   |
| A3     | 0.60       | 0.70 | 0.80 | B1       | 0.14MAX    |      |      |
| b      | 0.30       | 0.40 | 0.50 | B2       | 0.12MAX    |      |      |
| c      | 0.17       | 0.20 | 0.25 | b1       | 0.66MAX    |      |      |
| D      | 4.80       | 4.90 | 5.00 | b2       | 0          | 0.04 | 0.08 |
| E      | 5.80       | 6.00 | 6.20 | e        | 1.27BSC    |      |      |
| E1     | 3.80       | 3.90 | 4.00 |          |            |      |      |

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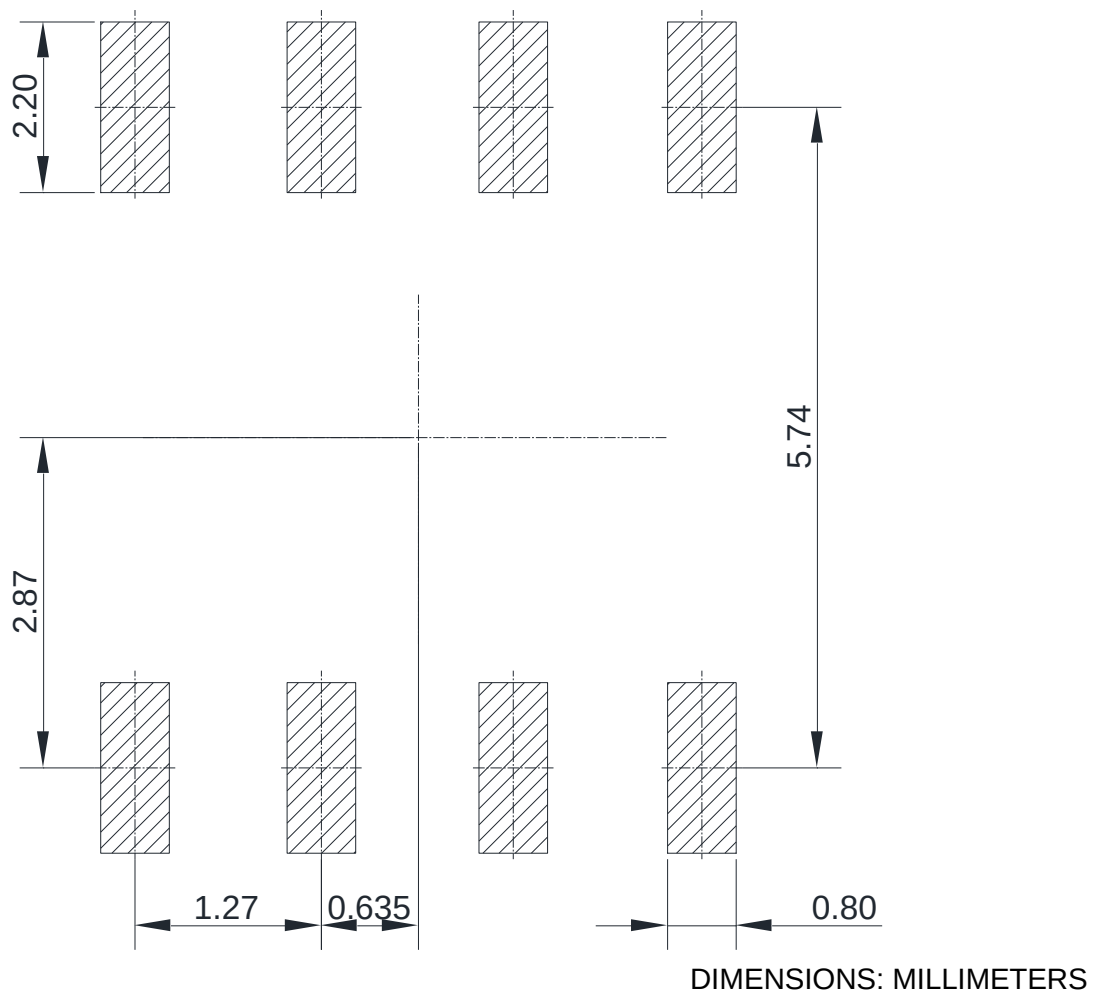
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POD C(X)



| Symbol | Dimensions |      | Symbol | Dimensions |      |
|--------|------------|------|--------|------------|------|
|        | Min.       | Max. |        | Min.       | Max. |
| L      | 0.40       | 0.60 | e      | 1.27 TYP   |      |
| D      | 4.95       | 5.05 | c      | 0.15       | 0.25 |
| E      | 3.8        | 4.0  | A2     | 1.33       | 1.50 |
| E1     | 5.80       | 6.20 | A1     | 0.04       | 0.20 |
| b      | 0.4 TYP    |      | θ      | 0°         | 8°   |

## 8. Recommended Soldering Footprint



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