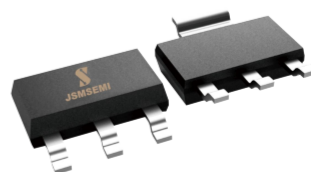


### Description

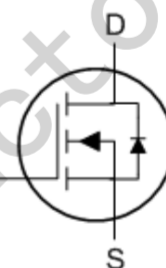
The IRFL210TRPBF is the high cell density trench N-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications.

The IRFL210TRPBF meets the RoHS and Green Product requirement with full function reliability approved.

- Green Device Available
- Super Low Gate Charge
- Excellent Cdv/dt effect decline
- Advanced high cell density Trench technology



**SOT-223**



### Product Summary

|                  |     |          |
|------------------|-----|----------|
| $V_{DS}$         | 200 | V        |
| $R_{DS(ON),max}$ | 0.6 | $\Omega$ |
| $I_D$            | 3   | A        |

### Absolute Maximum Ratings

| Symbol                     | Parameter                                  | Rating     | Units            |
|----------------------------|--------------------------------------------|------------|------------------|
| $V_{DS}$                   | Drain-Source Voltage                       | 200        | V                |
| $V_{GS}$                   | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_A=25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V_1$ | 3          | A                |
| $I_D@T_A=70^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V_1$ | 1.3        | A                |
| $I_{DM}$                   | Pulsed Drain Current <sup>2</sup>          | 8          | A                |
| $P_D@T_A=25^\circ\text{C}$ | Total Power Dissipation <sup>3</sup>       | 42         | 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> | ---  | 85   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 30   | $^\circ\text{C/W}$ |

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

| Symbol       | Parameter                                      | Conditions                                               | Min. | Typ. | Max.      | Unit     |
|--------------|------------------------------------------------|----------------------------------------------------------|------|------|-----------|----------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                             | 200  | ---  | ---       | V        |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=1A$                                  | ---  | 0.6  | 1.0       | $\Omega$ |
|              |                                                | $V_{GS}=4.5V$ , $I_D=1A$                                 | ---  | 0.7  | 1.1       | $\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                         | 1.2  | 2    | 3         | V        |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=200V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$     | ---  | ---  | 1         | $\mu A$  |
|              |                                                | $V_{DS}=200V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$     | ---  | ---  | 5         |          |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                           | ---  | ---  | $\pm 100$ | nA       |
| $g_{fs}$     | Forward Transconductance                       | $V_{DS}=10V$ , $I_D=1A$                                  | ---  | 10   | ---       | S        |
| $Q_g$        | Total Gate Charge (10V)                        | $V_{DS}=160V$ , $V_{GS}=10V$ , $I_D=1A$                  | ---  | 15   | ---       | nC       |
| $Q_{gs}$     | Gate-Source Charge                             |                                                          | ---  | 2.9  | ---       |          |
| $Q_{gd}$     | Gate-Drain Charge                              |                                                          | ---  | 5    | ---       |          |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DD}=100V$ , $V_{GS}=10V$ , $R_G=3\Omega$<br>$I_D=1A$ | ---  | 22   | ---       | ns       |
| $T_r$        | Rise Time                                      |                                                          | ---  | 30   | ---       |          |
| $T_{d(off)}$ | Turn-Off Delay Time                            |                                                          | ---  | 44   | ---       |          |
| $T_f$        | Fall Time                                      |                                                          | ---  | 12   | ---       |          |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=25V$ , $V_{GS}=0V$ , $f=1\text{MHz}$             | ---  | 900  | ---       | pF       |
| $C_{oss}$    | Output Capacitance                             |                                                          | ---  | 125  | ---       |          |
| $C_{rss}$    | Reverse Transfer Capacitance                   |                                                          | ---  | 4.5  | ---       |          |

**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                             | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|--------------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,4</sup> | $V_G=V_D=0V$ , Force Current                           | ---  | ---  | 1    | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$        | ---  | ---  | 1    | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=1A$ , $dI/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$ | ---  | 85   | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                        | ---  | 250  | ---  | nC   |

Note:

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
3. The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
4. The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

### Typical Characteristics

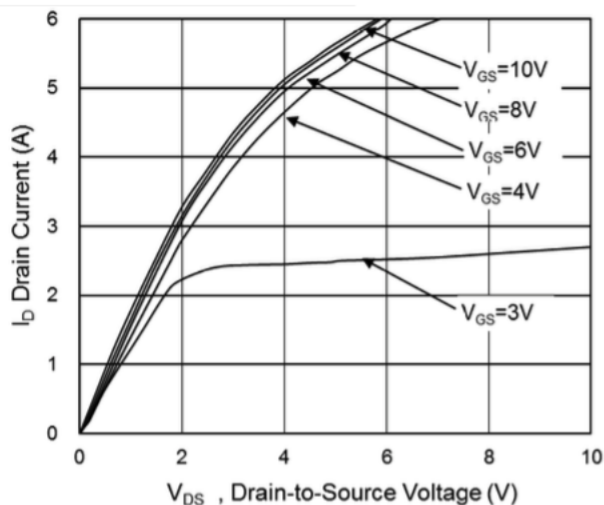


Fig.1 Typical Output Characteristics

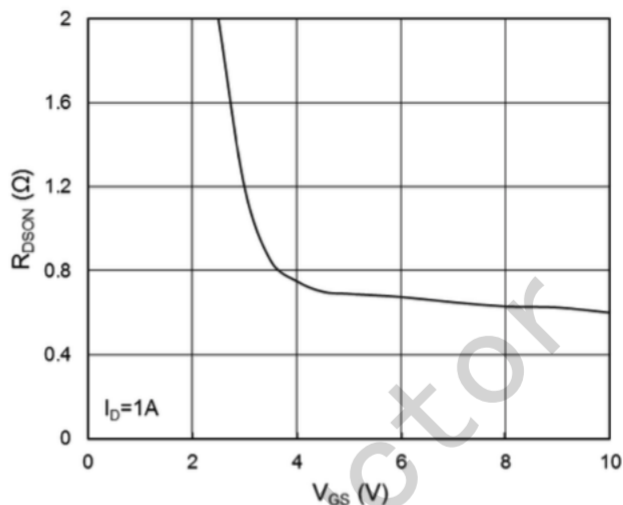


Fig.2 On-Resistance vs G-S Voltage

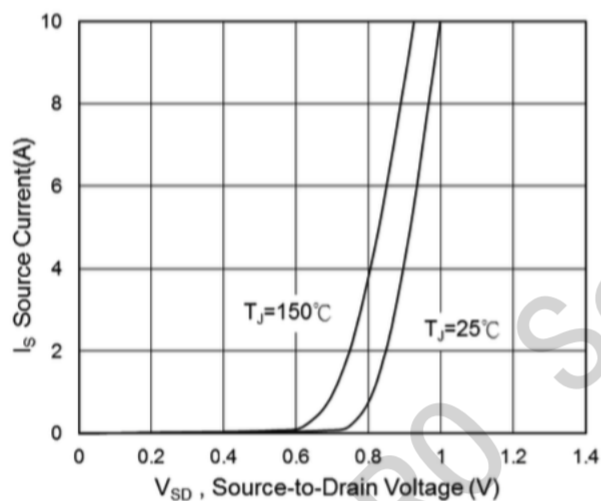


Fig.3 Forward Characteristics of Reverse

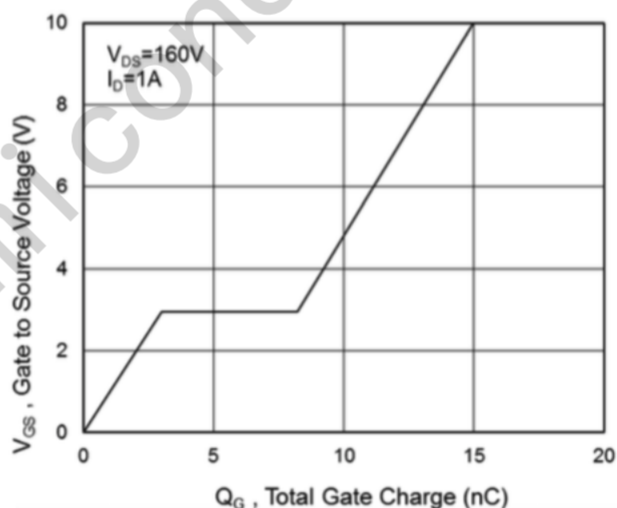


Fig.4 Gate-Charge Characteristics

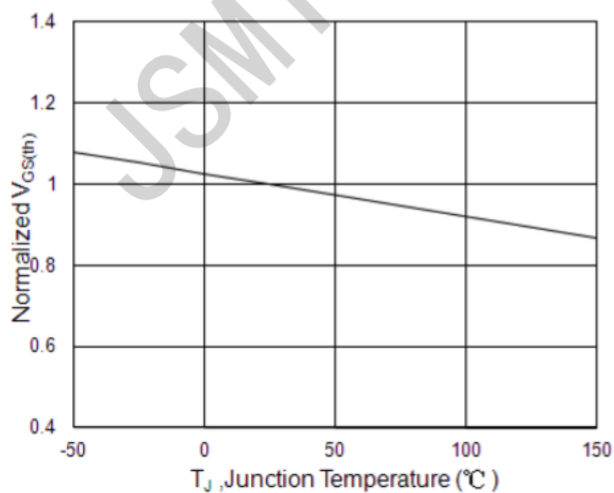


Fig.5  $V_{GS(th)}$  vs  $T_J$

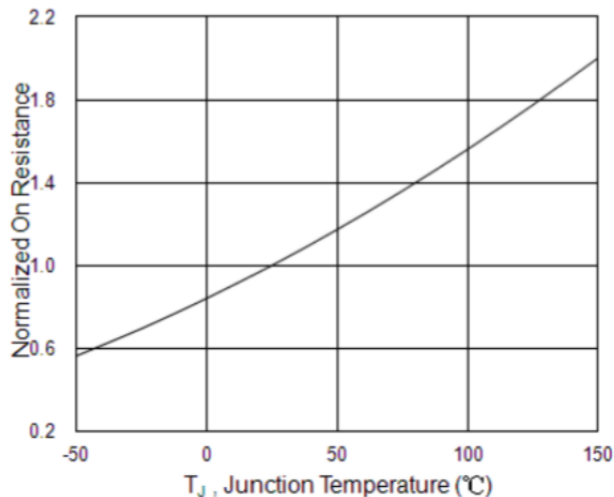


Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$

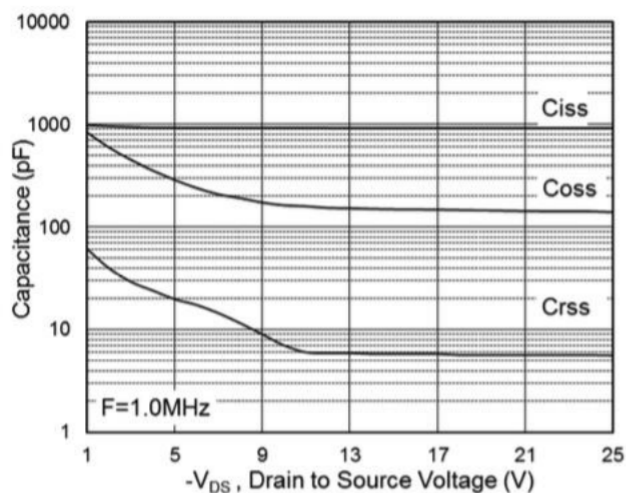


Fig.7 Capacitance

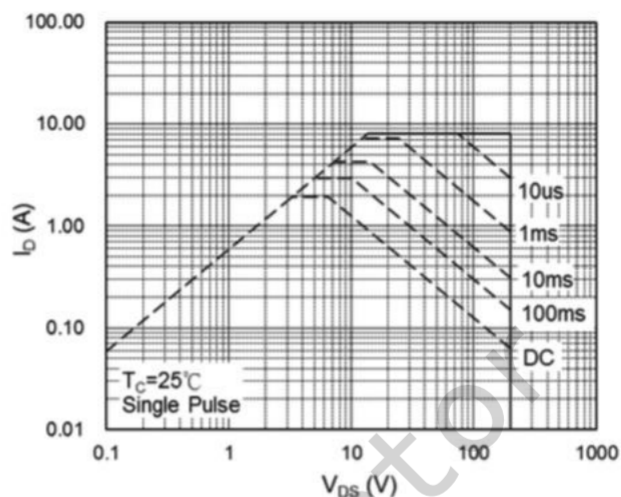


Fig.8 Safe Operating Area

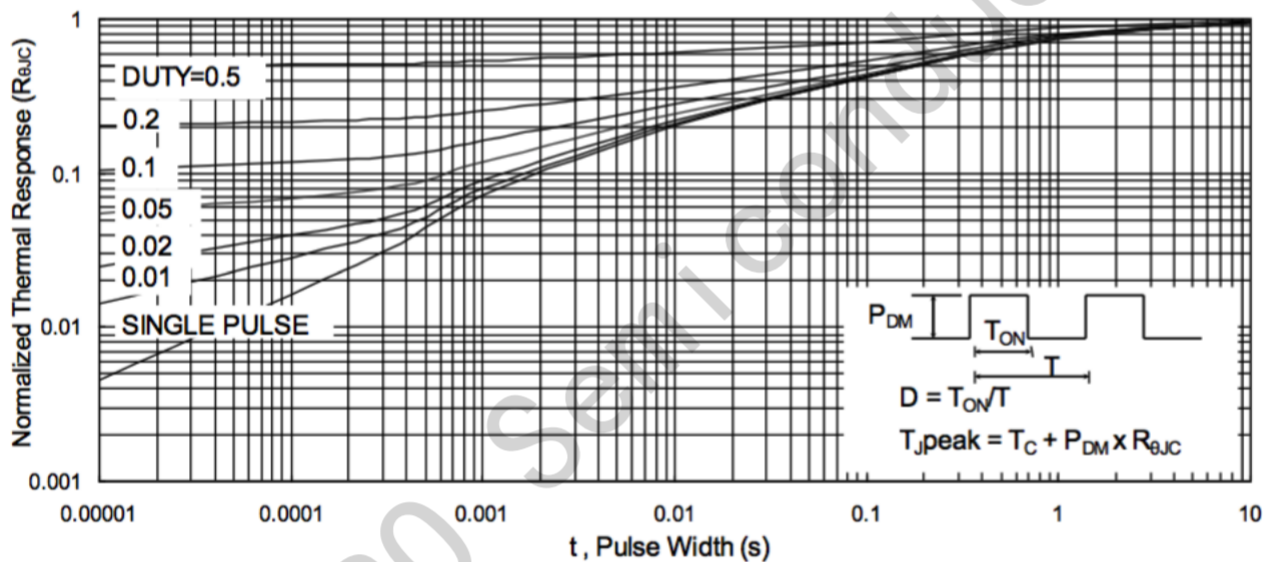


Fig.9 Normalized Maximum Transient Thermal Impedance

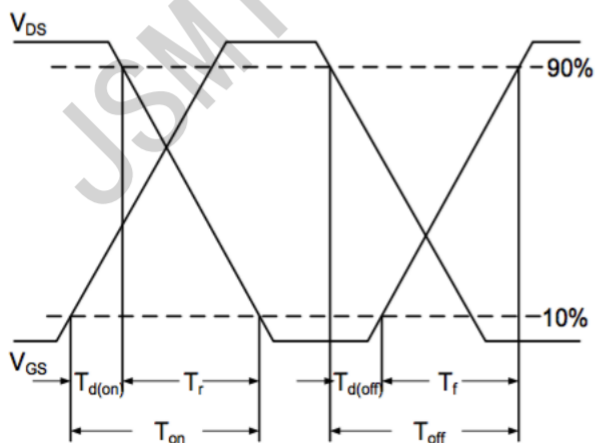


Fig.10 Switching Time Waveform

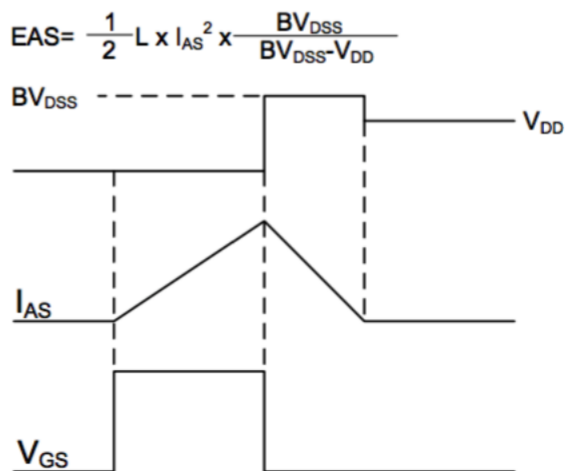


Fig.11 Gate Charge Waveform

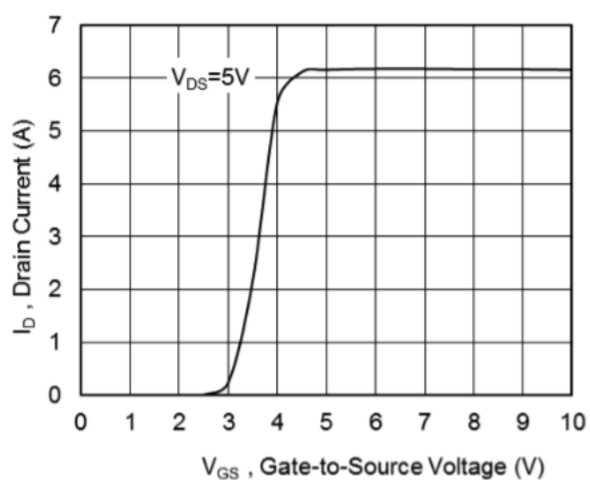
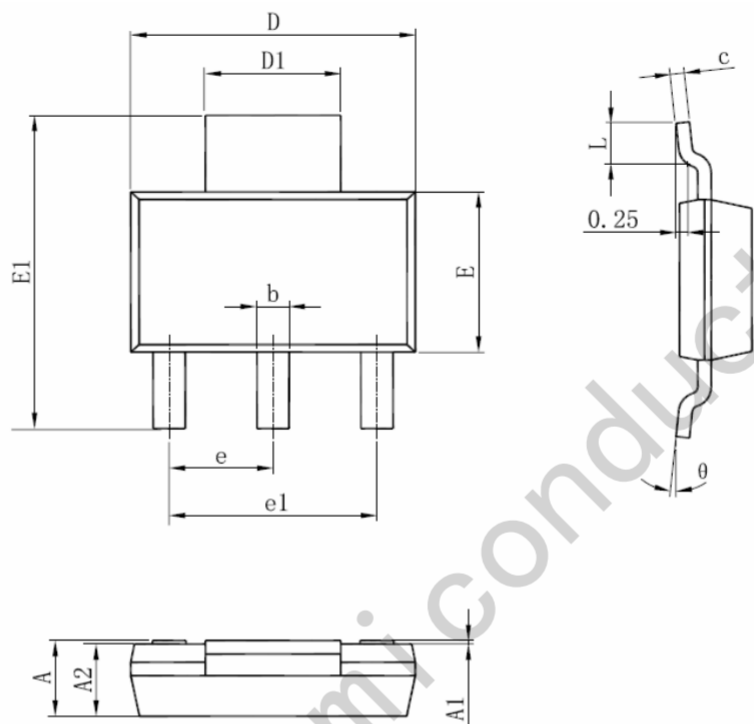


Fig.12 Transfer Characteristics

## Package Information

SOT-223



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.520                     | 1.800 | 0.060                | 0.071 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.500                     | 1.700 | 0.059                | 0.067 |
| b      | 0.660                     | 0.820 | 0.026                | 0.032 |
| c      | 0.250                     | 0.350 | 0.010                | 0.014 |
| D      | 6.200                     | 6.400 | 0.244                | 0.252 |
| D1     | 2.900                     | 3.100 | 0.114                | 0.122 |
| E      | 3.300                     | 3.700 | 0.130                | 0.146 |
| E1     | 6.830                     | 7.070 | 0.269                | 0.278 |
| e      | 2.300(BSC)                |       | 0.091(BSC)           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 0.900                     | 1.150 | 0.035                | 0.045 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |