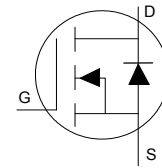
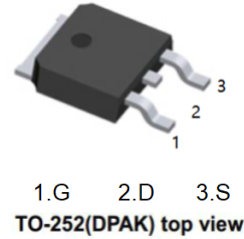


### Application

- Optimized for UPS/Inverter Applications
- Low Voltage Power Tools

### Benefits

- Fully Characterized Avalanche Voltage and Current
- Lead-Free, RoHS Compliant
- $V_{DS}(V) \approx 30V$
- $I_D = 90A$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 2.2m\Omega$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 3.1m\Omega$  ( $V_{GS} = 4.5V$ )



### Absolute Maximum Rating

| Symbol                    | Parameter                                                  | Max.         | Units |
|---------------------------|------------------------------------------------------------|--------------|-------|
| $V_{DS}$                  | Drain-to-Source Voltage                                    | 30           | V     |
| $V_{GS}$                  | Gate-to-Source Voltage                                     | $\pm 20$     |       |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited) | 179①         | A     |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited) | 127①         |       |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited) | 90           |       |
| $I_{DM}$                  | Pulsed Drain Current ②                                     | 357          |       |
| $P_D @ T_C = 25^\circ C$  | Maximum Power Dissipation                                  | 125          | W     |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation                                  | 63           | W     |
|                           | Linear Derating Factor                                     | 0.83         | W/°C  |
| $T_J$                     | Operating Junction and                                     | -55 to + 175 | °C    |
| $T_{STG}$                 | Storage Temperature Range                                  |              |       |
|                           | Soldering Temperature, for 10 seconds (1.6mm from case)    |              |       |

### Thermal Resistance

| Symbol          | Parameter                         | Typ. | Max. | Units |
|-----------------|-----------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ⑤                |      | 1.2  | °C/W  |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB Mount) ⑦ |      | 50   |       |
| $R_{\theta JA}$ | Junction-to-Ambient               |      | 110  |       |

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol                                | Parameter                                           | Min. | Typ.             | Max. | Units | Conditions                                                                                         |
|---------------------------------------|-----------------------------------------------------|------|------------------|------|-------|----------------------------------------------------------------------------------------------------|
| BV <sub>DSS</sub>                     | Drain-to-Source Breakdown Voltage                   | 30   |                  |      | V     | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                       |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>   | Breakdown Voltage Temp. Coefficient                 |      | 18               |      | mV/°C | Reference to 25°C, I <sub>D</sub> = 1mA ②                                                          |
| R <sub>DS(on)</sub>                   | Static Drain-to-Source On-Resistance                |      | 1.6              | 2.2  | mΩ    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 90A ④                                                      |
|                                       |                                                     |      | 2.6              | 3.1  |       | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 72A ④                                                     |
| V <sub>GS(th)</sub>                   | Gate Threshold Voltage                              | 1.2  | 1.7              | 2.2  | V     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 100μA                                         |
| ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub> | Gate Threshold Voltage Coefficient                  |      | -7.0             |      | mV/°C |                                                                                                    |
| I <sub>DSS</sub>                      | Drain-to-Source Leakage Current                     |      |                  | 1.0  | μA    | V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V                                                        |
|                                       |                                                     |      |                  | 150  |       | V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C                                |
| I <sub>GSS</sub>                      | Gate-to-Source Forward Leakage                      |      |                  | 100  | nA    | V <sub>GS</sub> = 20V                                                                              |
|                                       | Gate-to-Source Reverse Leakage                      |      |                  | -100 |       | V <sub>GS</sub> = -20V                                                                             |
| g <sub>fs</sub>                       | Forward Transconductance                            | 189  |                  |      | S     | V <sub>DS</sub> = 15V, I <sub>D</sub> = 72A                                                        |
| Q <sub>g</sub>                        | Total Gate Charge                                   |      | 36               | 54   | nC    | V <sub>DS</sub> = 15V<br>V <sub>GS</sub> = 4.5V<br>I <sub>D</sub> = 72A                            |
| Q <sub>gs1</sub>                      | Pre-V <sub>th</sub> Gate-to-Source Charge           |      | 10               |      |       |                                                                                                    |
| Q <sub>gs2</sub>                      | Post-V <sub>th</sub> Gate-to-Source Charge          |      | 7.7              |      |       |                                                                                                    |
| Q <sub>gd</sub>                       | Gate-to-Drain Charge                                |      | 10               |      |       |                                                                                                    |
| Q <sub>godr</sub>                     | Gate Charge Overdrive                               |      | 8.3              |      |       |                                                                                                    |
| Q <sub>sw</sub>                       | Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> ) |      | 20               |      |       |                                                                                                    |
| R <sub>G</sub>                        | Gate Resistance                                     |      | 2.0              |      | Ω     |                                                                                                    |
| t <sub>d(on)</sub>                    | Turn-On Delay Time                                  |      | 19               |      | ns    | V <sub>DD</sub> = 15V<br>I <sub>D</sub> = 72A<br>R <sub>G</sub> = 1.8Ω<br>V <sub>GS</sub> = 4.5V ④ |
| t <sub>r</sub>                        | Rise Time                                           |      | 98               |      |       |                                                                                                    |
| t <sub>d(off)</sub>                   | Turn-Off Delay Time                                 |      | 28               |      |       |                                                                                                    |
| t <sub>f</sub>                        | Fall Time                                           |      | 30               |      |       |                                                                                                    |
| C <sub>iss</sub>                      | Input Capacitance                                   |      | 4945             |      | pF    | V <sub>GS</sub> = 0V                                                                               |
| C <sub>oss</sub>                      | Output Capacitance                                  |      | 908              |      |       | V <sub>DS</sub> = 15V                                                                              |
| C <sub>rss</sub>                      | Reverse Transfer Capacitance                        |      | 493              |      |       | f = 1.0MHz                                                                                         |
| I <sub>S</sub>                        | Continuous Source Current<br>(Body Diode) ②         |      | 179 <sup>①</sup> |      | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.                            |
| I <sub>SM</sub>                       | Pulsed Source Current<br>(Body Diode) ②             |      | 357              |      |       |                                                                                                    |
| V <sub>SD</sub>                       | Diode Forward Voltage                               |      |                  | 1.0  | V     | T <sub>J</sub> = 25°C, I <sub>S</sub> = 72A, V <sub>GS</sub> = 0V ④                                |
| t <sub>rr</sub>                       | Reverse Recovery Time                               |      | 31               | 47   | ns    | T <sub>J</sub> = 25°C I <sub>F</sub> = 72A, V <sub>DD</sub> = 15V<br>di/dt = 360A/μs ④             |
| Q <sub>rr</sub>                       | Reverse Recovery Charge                             |      | 87               | 130  | nC    |                                                                                                    |
| E <sub>AS</sub> (Thermally limited)   | Single Pulse Avalanche Energy ③                     |      |                  |      | 180   | mJ                                                                                                 |
| E <sub>AS</sub> (tested)              | Single Pulse Avalanche Energy Tested Value ⑥        |      |                  |      | 279   |                                                                                                    |
| I <sub>A</sub>                        | Avalanche Current                                   |      |                  |      | 72    | A                                                                                                  |

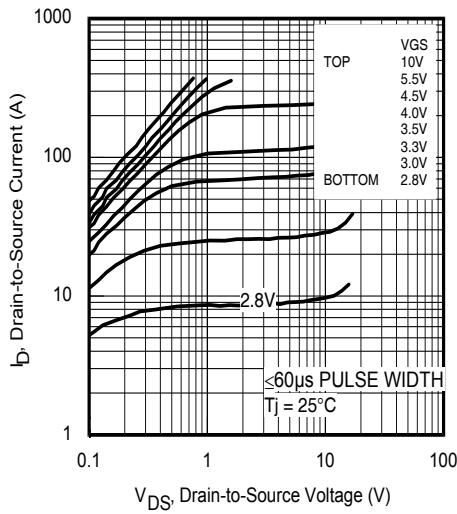


Fig 1. Typical Output Characteristics

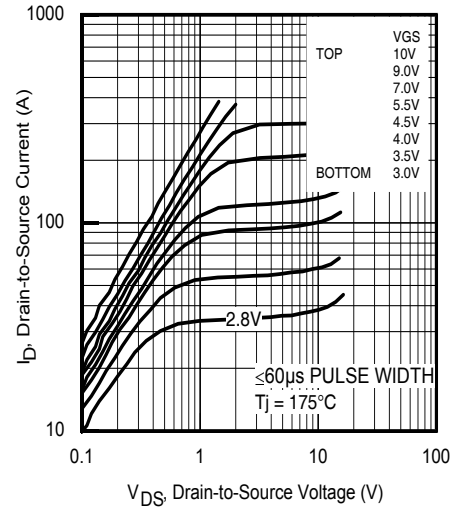


Fig 2. Typical Output Characteristics

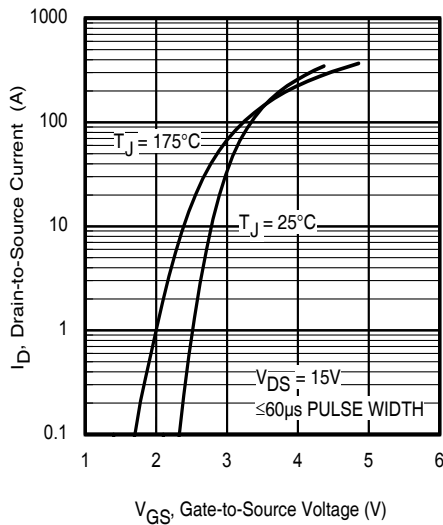


Fig 3. Typical Transfer Characteristics

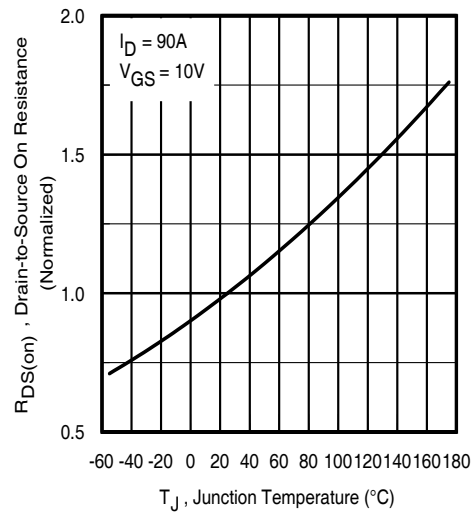


Fig 4. Normalized On-Resistance vs. Temperature

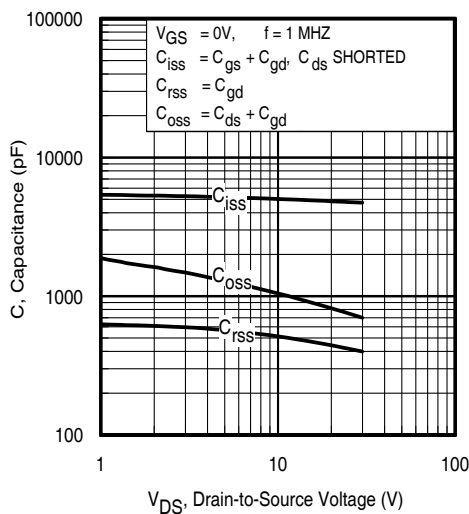


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

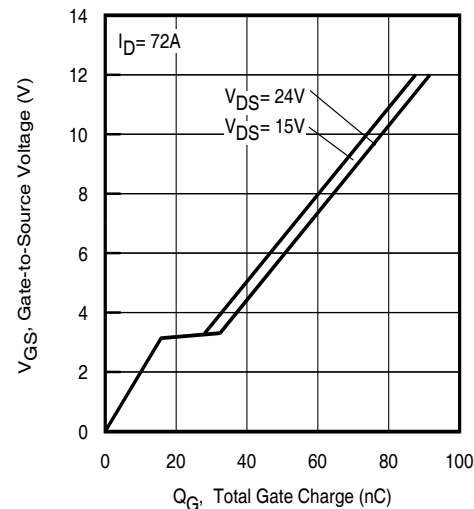


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

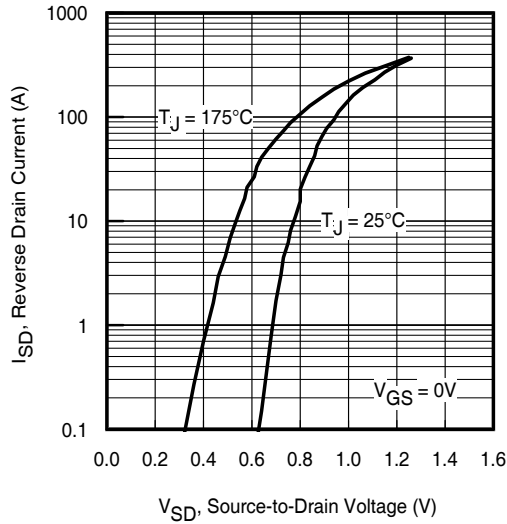


Fig 7. Typical Source-Drain Diode Forward Voltage

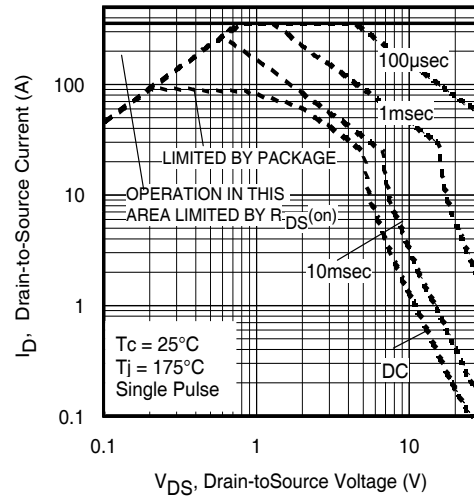


Fig 8. Maximum Safe Operating Area

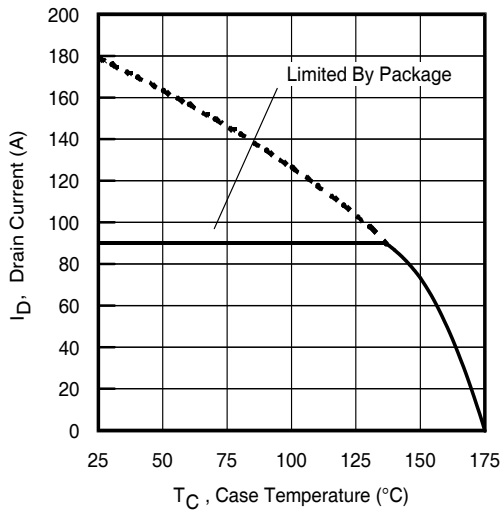


Fig 9. Maximum Drain Current vs. Case Temperature

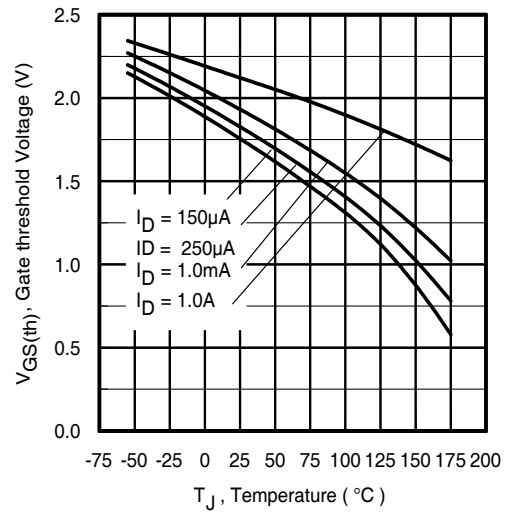


Fig 10. Threshold Voltage vs. Temperature

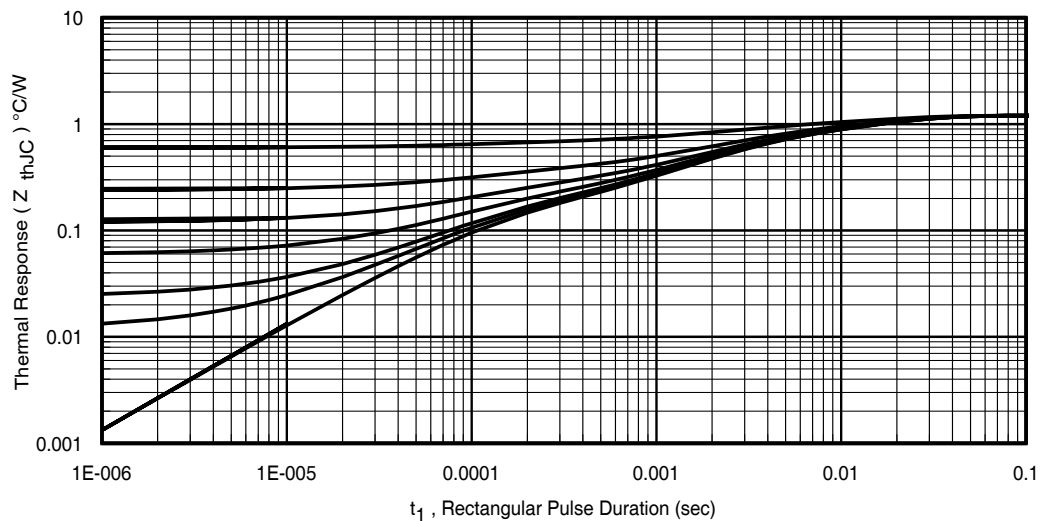
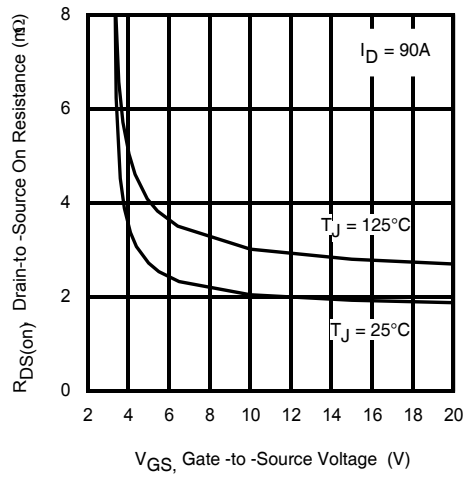
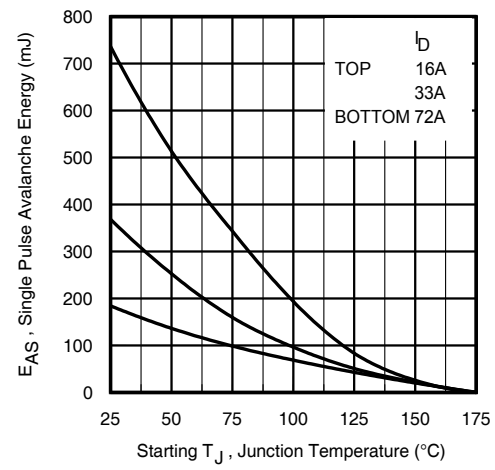


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

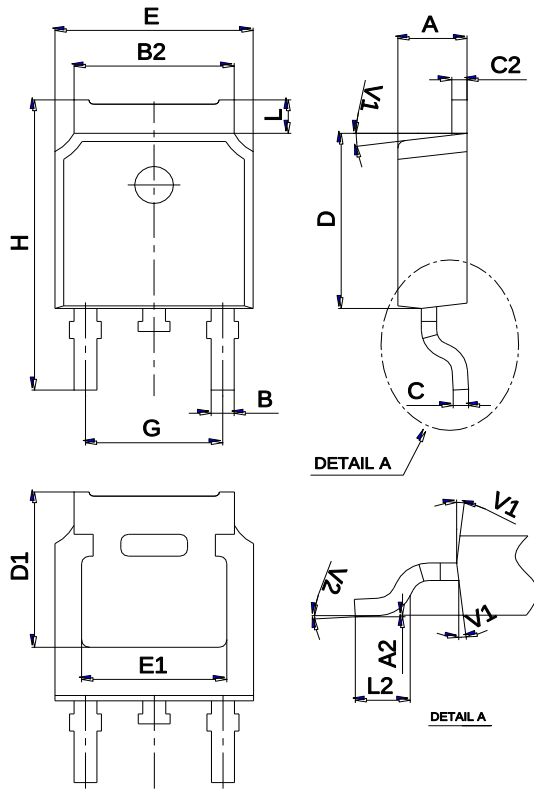


**Fig 12.** Typical On-Resistance vs. Gate Voltage



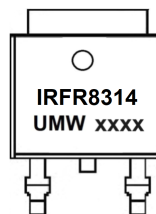
**Fig 13.** Maximum Avalanche Energy vs. Drain Current

## Package Mechanical Data TO-252



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

## Marking



## Ordering information

| Order code     | Package | Baseqty | Deliverymode  |
|----------------|---------|---------|---------------|
| UMW IRFR8314TR | TO-252  | 2500    | Tape and reel |