# UMW IRLB8748PBF

30V N-Channel MOSFET

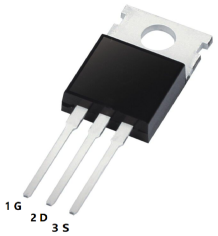
## 1.Features

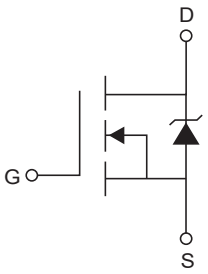
- $V_{DS\ (V)}$=30V
- ID=78A
- $R_{DS(ON)}$<4.8mΩ($V_{GS}$=10V)
- $R_{DS(ON)}$<6.8mΩ($V_{GS}$=4.5V)
- Very Low $R_{DS(ON)}$ at 4.5V $V_{GS}$
- Ultra-Low Gate Impedance
- Lead-Free
- Fully Characterized Avalanche Voltage and Current

## 2.Pinning information

| Pin | Symbol | Description |
|---|---|---|
| 1 | G | GATE |
| 2 | D | DRAIN |
| 3 | S | SOURCE |

**TO-220**




## 3.Absolute Maximum Ratings

| Parameter | | Symbol | Rating | Units |
|---|---|---|---|---|
| Drain-to-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-to-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current, $V_{GS}$=10V(Silicon Limited) | $T_C$=25°C | $I_D$ | 92 ④ | A |
| Continuous Drain Current, $V_{GS}$=10V (Silicon Limited) | $T_C$=100°C | | 65 | A |
| Continuous Drain Current, $V_{GS}$=10V (Package Limited) | $T_C$=25°C | | 78 | A |
| Pulsed Drain Current ① | | $I_{DM}$ | 370 | A |
| Maximum Power Dissipation ⑥ | $T_C$=25°C | $P_D$ | 75 | W |
| Maximum Power Dissipation ⑥ | $T_C$=100°C | | 38 | W |
| Linear Derating Factor | | | 0.5 | W/°C |
| Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Soldering Temperature, for 10 seconds (1.6mm from case) | | | 300 | °C |
| Mounting torque, 6-32 or M3 screw | | | 10lbin (1.1Nm) | |

## 4.Thermal resistance rating

| Parameter | Symbol | Typ | Max | Units |
|---|---|---|---|---|
| Junction-to-Case ⑥ | $R_{\theta JC}$ | | 2 | °C/W |
| Case-to-Sink, Flat Greased Surface | $R_{\theta CS}$ | 0.5 | | °C/W |
| Junction-to-Ambient ⑤ | $R_{\theta JA}$ | | 62 | °C/W |

## 5.Electrical Characteristics @ $T_J$= 25°C (unless otherwise specified)

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 30 | | | V |
| Breakdown Voltage Temp. Coefficient | $\Delta BV_{DSS}/\Delta T_J$ | $I_D$=1mA,Reference to 25°C | | 21 | | mV/°C |
| Static Drain-to-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=40A ③ | | 3.8 | 4.8 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=32A ③ | | 5.5 | 6.8 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=50μA | 1.35 | 1.8 | 2.35 | V |
| Gate Threshold Voltage Coefficient | $\Delta V_{GS(th)}/\Delta T_J$ | | | -7.1 | | mV/°C |
| Drain-to-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=24V, $V_{GS}$=0V | | | 1 | μA |
| | | $V_{DS}$=24V, $V_{GS}$=0V, $T_J$=125°C | | | 150 | μA |
| Gate-to-Source Forward Leakage | $I_{GSS}$ | $V_{GS}$=20V | | | 100 | nA |
| Gate-to-Source Reverse Leakage | | $V_{GS}$=-20V | | | -100 | nA |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=15V, $I_D$=32A | 196 | | | S |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V, $V_{GS}$=4.5V<br>$I_D$=32A | | 15 | 23 | nC |
| Pre-Vth Gate-to-Source Charge | $Q_{gs1}$ | | | 3.6 | | nC |
| Post-Vth Gate-to-Source Charge | $Q_{gs2}$ | | | 2.2 | | nC |
| Gate-to-Drain Charge | $Q_{gd}$ | | | 5.9 | | nC |
| Gate Charge Overdrive | $Q_{gdor}$ | | | 3.9 | | nC |
| Switch Charge ($Q_{gs2}$ + $Q_{gd}$) | $Q_{sw}$ | | | 8.1 | | nC |
| Output Charge | $Q_{oss}$ | $V_{DS}$=16V, $V_{GS}$=0V | | 11 | | nC |
| Gate Resistance | $R_g$ | | | 2 | 3.5 | Ω |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{DD}$=15V, $V_{GS}$=4.5V ③<br>$I_D$=32A, $R_G$=1.8Ω | | 14 | | ns |
| Rise Time | $t_r$ | | | 96 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | | 16 | | ns |
| Fall Time | $t_f$ | | | 34 | | ns |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0, $V_{DS}$=15V, $f$=1.0MHz | | 2139 | | pF |
| Output Capacitance | $C_{oss}$ | | | 464 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 199 | | pF |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Avalanche Characteristics** | | | | | | |
| Single Pulse Avalanche Energy ② | $E_{AS}$ | | | | 114 | mJ |
| Avalanche Current ① | $I_{AR}$ | | | | 32 | A |
| Repetitive Avalanche Energy ① | $E_{AR}$ | | | | 7.5 | mJ |
| **Diode Characteristics** | | | | | | |
| Continuous Source Current (Body Diode) | $I_S$ | MOSFET symbol showing the integral reverse p-n junction diode. | | | 92④ | A |
| Pulsed Source Current (Body Diode) ① | $I_{SM}$ | | | | 370 | A |
| Diode Forward Voltage | $V_{SD}$ | $T_J$=25°C,$I_S$=32A,$V_{GS}$=0V ③ | | | 1 | V |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C, $I_F$=32A, $V_{DD}$=15V | | 23 | 35 | ns |
| Reverse Recovery Charge | $Q_{rr}$ | dI/dt=200A/μs ③ | | 39 | 59 | nC |
| Forward Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$+$L_D$) | | | | |

## 6.1Typical Characterisitics

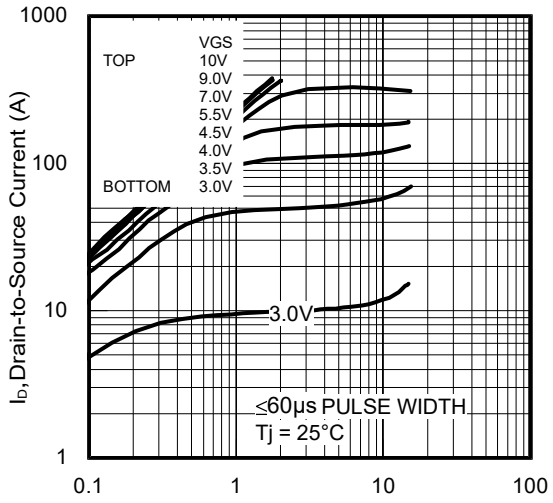



Figure 1: Typical Output Characteristics

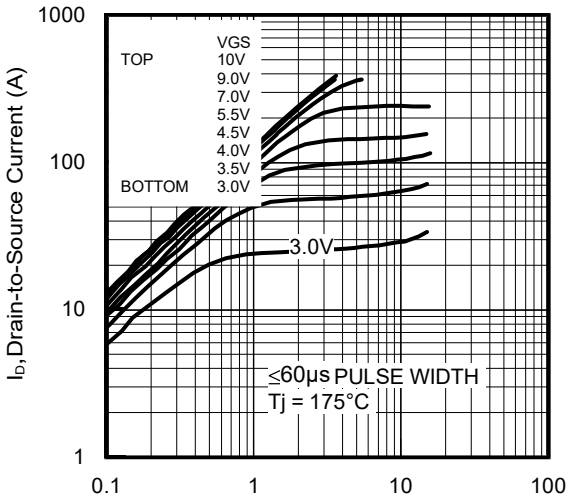



Figure 2: Typical Output Characteristics

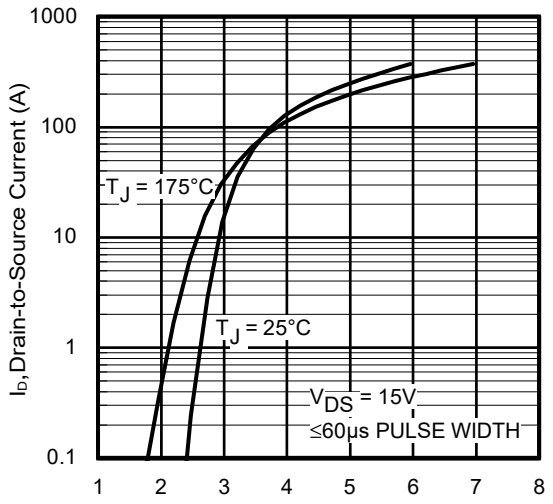



Figure 3: Typical Transfer Characteristics

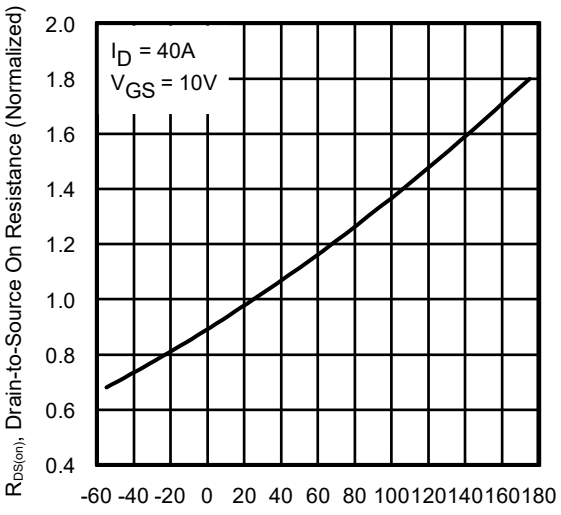
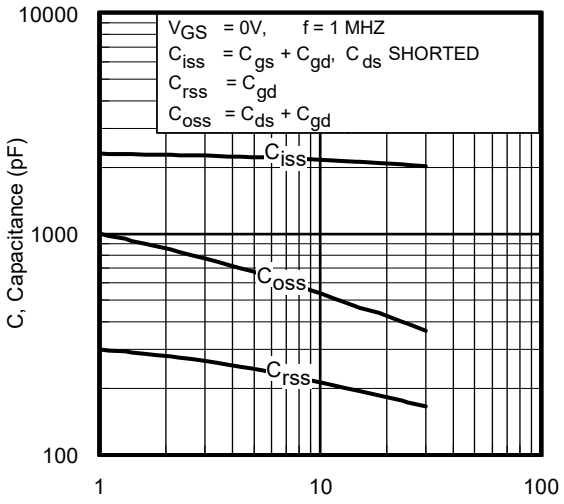


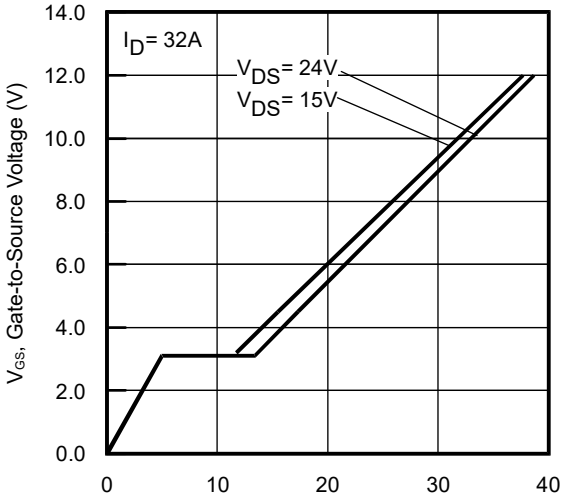

Figure 4: Nomalized On-ResistanceVs. Temperature

## 6.2Typical Characterisitics



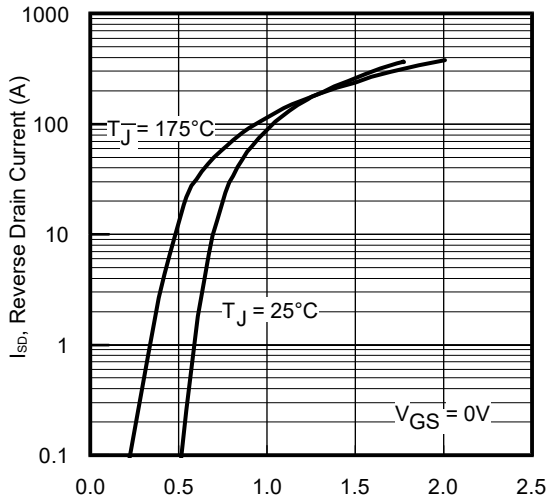

$V_{DS}$ ,Drain-to-Source Voltage (V)

Figure 5: Typical Capacitance Vs. Drain-to-Source Voltage



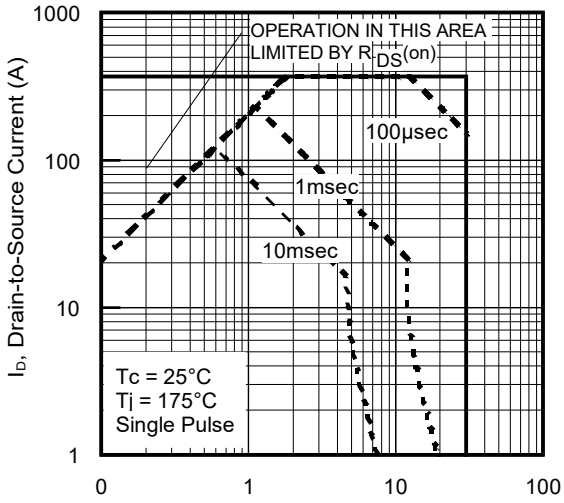

$Q_G$, Total Gate Charge (nC)

Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage




$V_{SD}$, Source-to-Drain Voltage (V)

Figure 7: Typical Source-Drain Diode Forward Voltage




$V_{DS}$, Drain-to-Source Voltage (V)

Figure 8: Maximum Safe Operating Area

## 6.3Typical Characterisitics

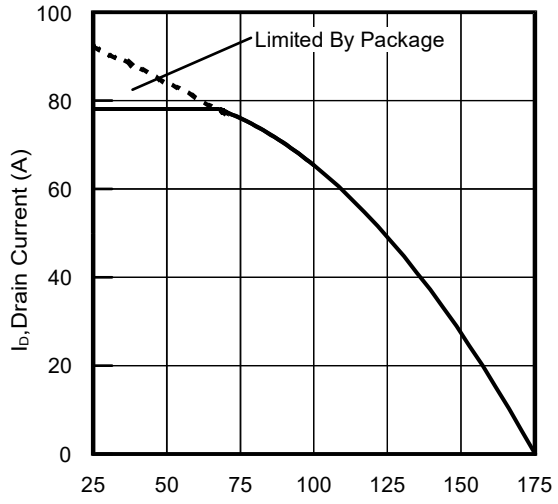



Figure 9: Maximum Drain Current vs. Case Temperature

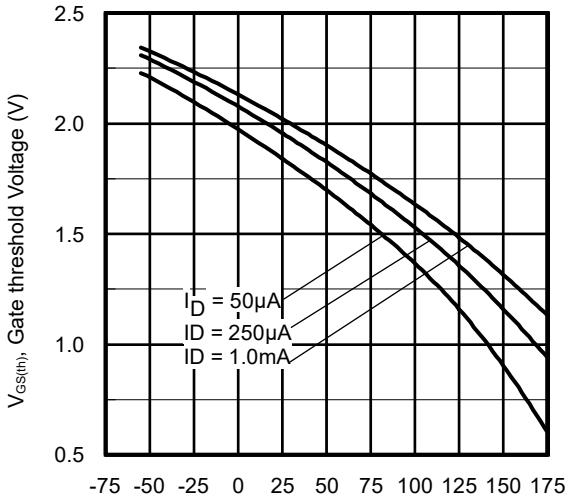



Figure 10: Threshold Voltage vs. Temperature

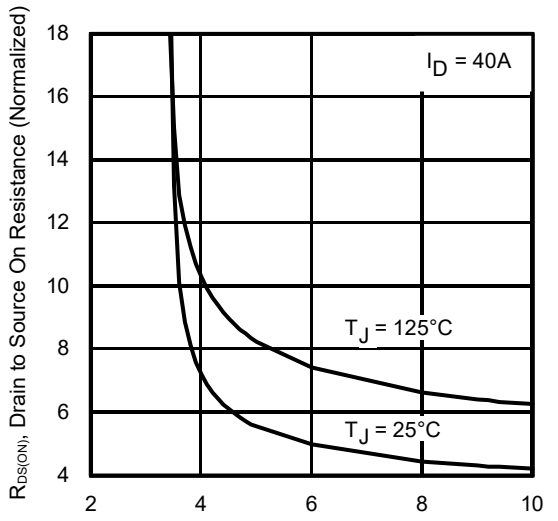



Figure 11: On-Resistance vs. Gate Voltage

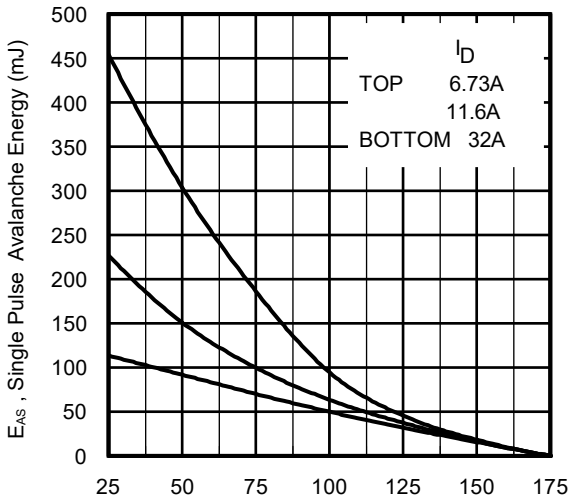



Figure 12: Maximum Avalanche Energy vs. Drain Current

## 6.4Typical Characterisitics

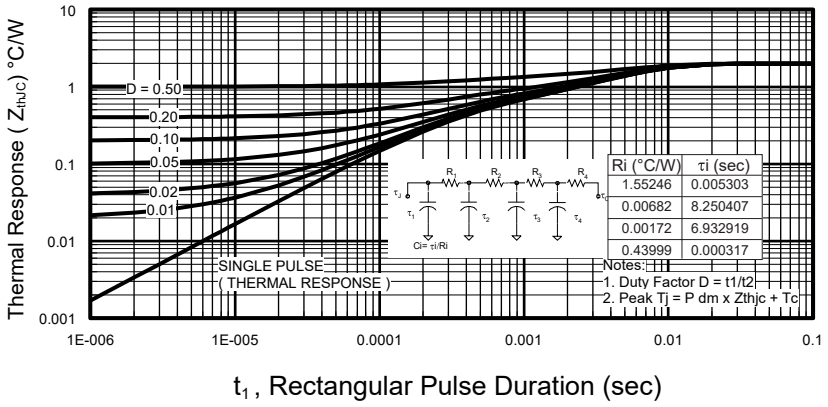



Figure 13: Maximum Effective Transient Thermal Impedance, Junction-to-Case

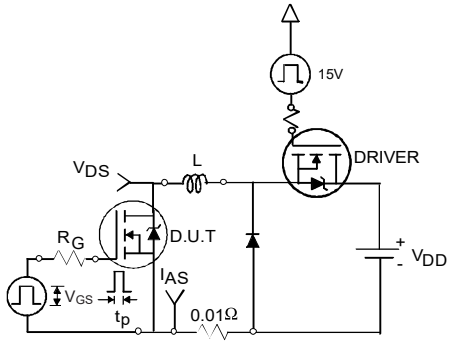



Figure 14a: Unclamped Inductive Test Circuit

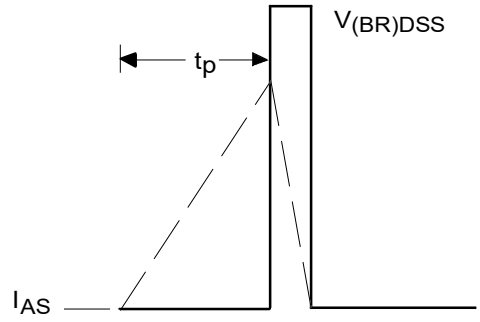



Figure 14b: Switching Time Test Circuit

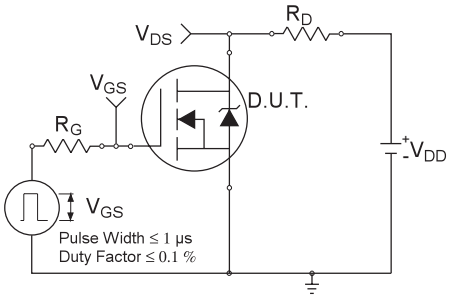



Figure 15a: Unclamped Inductive Waveforms

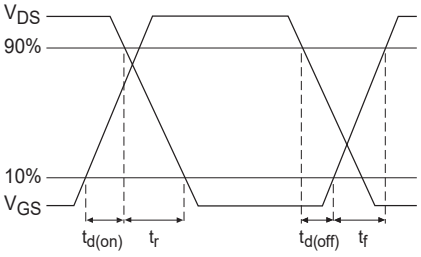
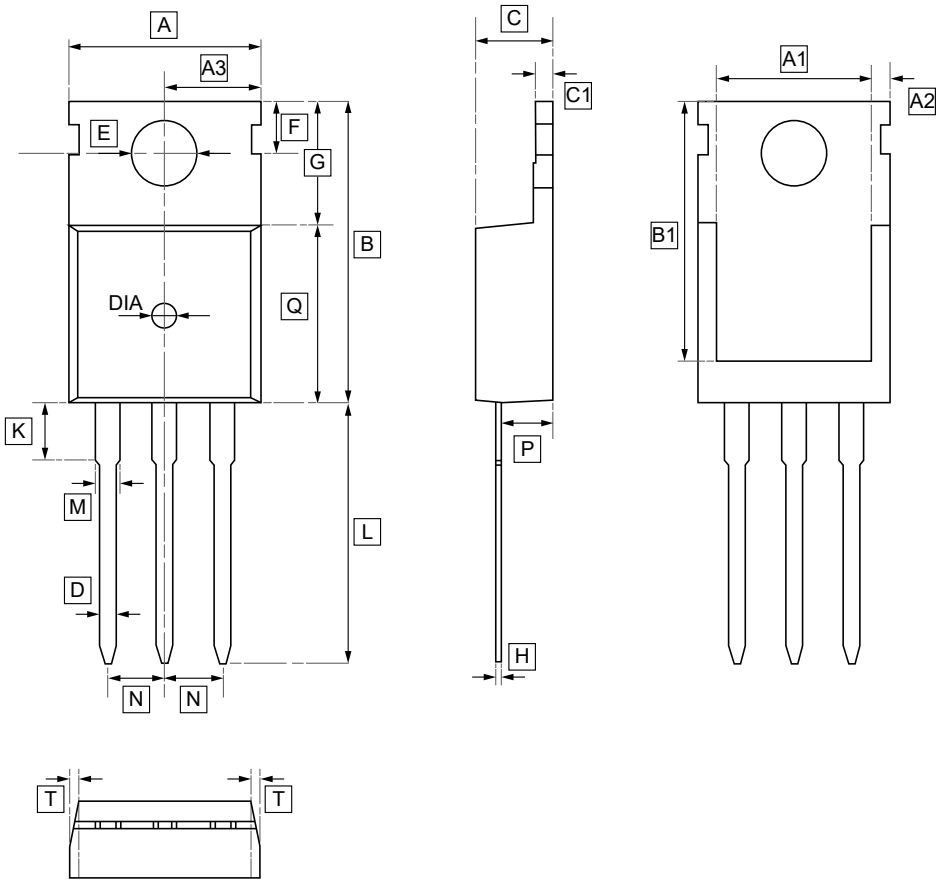



Figure 16b: Switching Time Waveforms

## 7.1 TO-220 Package Outline Dimensions

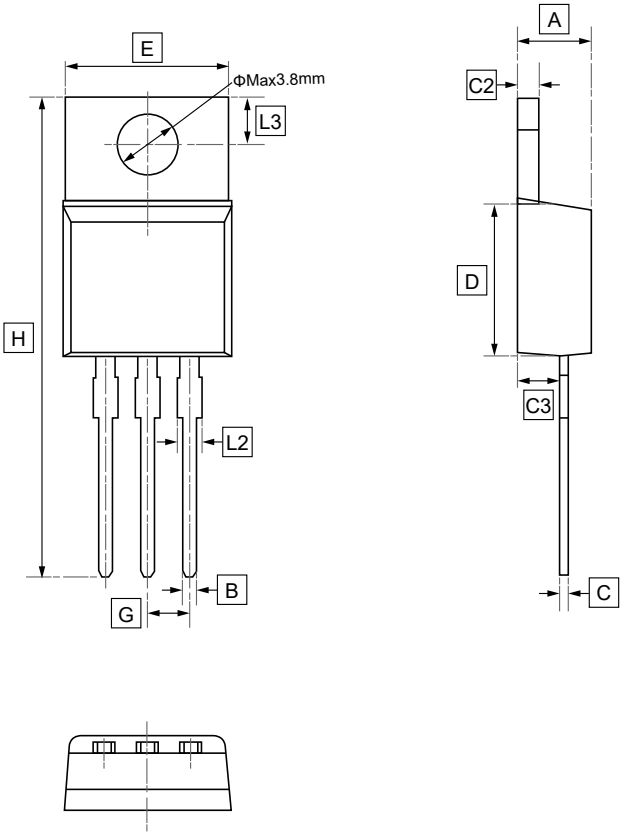



**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | A1 | A2 | A3 | B | B1 | C | C1 | D | E | F | G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min | 9.7 | 8.44 | 1.05 | 4.8 | 15.4 | 12.9 | 4.28 | 1.1 | 0.6 | 3.4 | 2.65 | 5.2 |
| Max | 10.3 | 8.84 | 1.25 | 5.2 | 16.2 | 13.5 | 4.68 | 1.5 | 1.0 | 3.8 | 3.25 | 5.8 |

| Symbol | H | K | L | L1 | M | N | P | Q | T | DIA |
|---|---|---|---|---|---|---|---|---|---|---|
| Min | 0.4 | 2.9 | 12.8 | 2.7 | 1.15 | 2.49 | 2.1 | 8.7 | W:0.35 | ⊙1.5 |
| Max | 0.6 | 3.3 | 13.6 | 3.3 | 1.35 | 2.59 | 2.7 | 9.3 | | (deep 0.2) |

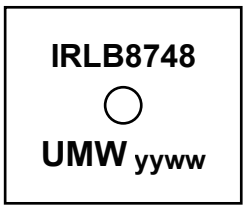
## 7.2 TO-220 Package Outline Dimensions




**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | B | C | C2 | C3 | D | E | G | H | L2 | L3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Min** | 4.30 | 0.60 | 0.28 | 1.17 | 2.30 | 8.80 | 9.80 | 2.44 | 28.55 | 1.10 | 2.59 |
| **Max** | 4.70 | 1.00 | 0.48 | 1.37 | 2.70 | 9.20 | 10.20 | 2.64 | 29.15 | 1.50 | 2.89 |

## 8.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW IRLB8748PBF | TO-220 | 1000 | Tube and box |

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