# UMW IRF7809AVTR

30V N-Channel MOSFET

## 1.Description

The IRF7809AV has been optimized for all parameters that are critical in synchronous buck converters including $R_{DS(ON)}$, gate charge and Cdv/dt-induced turn-on immunity.

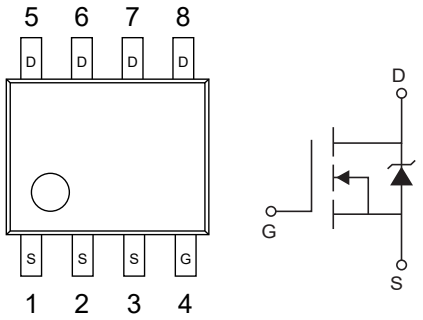
## 2.Features

- $V_{DS\ (V)}$=30V
- $I_D$=15A
- $R_{DS(ON)}$<7mΩ($V_{GS}$=4.5V)

## 3.Pinning information

| Pin | Symbol | Description |
|---|---|---|
| 1,2,3 | S | SOURCE |
| 4 | G | GATE |
| 5,6,7,8 | D | DRAIN |

**SOP-8**




## 4.Absolute Maximum Ratings $T_A$=25°C unless otherwise noted

| Parameter | | Symbol | Rating | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±12 | |
| Continuous Drain Current, $V_{GS}$≥4.5V | $T_A$=25°C | $I_D$ | 15 | A |
| | $T_L$=90°C | | 14.6 | |
| Pulsed Drain Current ① | | $I_{DM}$ | 100 | |
| Power Dissipation ④ | $T_A$=25°C | $P_D$ | 2.5 | W |
| | $T_L$=90°C | | 3 | W |
| Junction & Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |
| Continuous Source Current (Body Diode) | | $I_S$ | 2.5 | A |
| Pulsed Source Current ① | | $I_{SM}$ | 50 | A |

## 5.Thermal resistance rating

| Parameter | Symbol | Typ | Max | Units |
|---|---|---|---|---|
| Maximum Junction-to-Ambient ③ | $R_{\theta JA}$ | | 50 | °C/W |
| Maximum Junction-to-Lead | $R_{\theta JL}$ | | 20 | °C/W |

## 6.Electrical Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 30 | | | V |
| Static Drain-Source on Resistance | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=15A ② | | 7 | 9 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1 | 1.2 | 1.4 | V |
| Drain Source Leakage Current | $I_{DSS}$ | $V_{DS}$=24V, $V_{GS}$=0V | | | 30 | μA |
| | | $V_{DS}$=24V,$V_{GS}$=0V,$T_J$=100°C | | | 150 | μA |
| Gate-Source Leakage Current* | $I_{GSS}$ | $V_{GS}$=±12V | | | ±100 | nA |
| Total Gate Chg Cont FET | $Q_g$ | $V_{GS}$=5V, $I_D$=15A, $V_{DS}$=20V | | 41 | 62 | nC |
| Total Gate Chg Sync FET | $Q_g$ | $V_{GS}$=5V, $V_{DS}$<100mV | | 36 | 54 | nC |
| Pre-Vth Gate-Source Charge | $Q_{gs1}$ | $V_{DS}$=20V, $I_D$=15A | | 7 | | nC |
| Pre-Vth Gate-Source Charge | $Q_{gs2}$ | | | 2.3 | | nC |
| Gate to Drain Charge | $Q_{gd}$ | $I_D$=15A, $V_{DS}$=16V | | 12 | | nC |
| Switch Chg($Q_{gs2}$ + $Q_{gd}$) | $Q_{sw}$ | | | 14 | 21 | nC |
| Output Charge* | $Q_{oss}$ | $V_{DS}$=16V,$V_{GS}$=0V | | 30 | 45 | nC |
| Gate Resistance | $R_G$ | | | 1.5 | 3 | Ω |
| Turn-on Delay Time | $t_{D(on)}$ | $V_{DD}$ =16V, $I_D$=15A, $V_{GS}$=5V Clamped Inductive Load | | 14 | | ns |
| Rise Time | $t_r$ | | | 36 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | | 96 | | ns |
| Fall Time | $t_f$ | | | 10 | | ns |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=16V | | 3780 | | pF |
| Output Capacitance | $C_{oss}$ | | | 1060 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | | 130 | pF |
| Diode Forward Voltage* | $V_{SD}$ | $I_S$=15A ②, $V_{GS}$=0V | | | 1.3 | V |
| Reverse Recovery Charge ④ | $Q_{rr}$ | di/dt ~ 700A/μs $V_{DS}$=16V, $V_{GS}$=0V, $I_S$=15A | | 120 | | nC |
| Reverse Recovery Charge (with Parallel Schottky) ④ | $Q_{rr(s)}$ | di/dt ~ 700A/μs (with 10BQ040) $V_{DS}$=16V, $V_{GS}$=0V, $I_S$=15A | | 150 | | nC |

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width ≤ 400μs; duty cycle ≤ 2%.

③ When mounted on 1 inch square copper board, t< 10 sec.

④ Typ= measured-$Q_{OSS}$.

⑤ Typical values measured at $V_{GS}$= 4.5V, $I_F$=15A.

## 7.1Typical Characterisitics

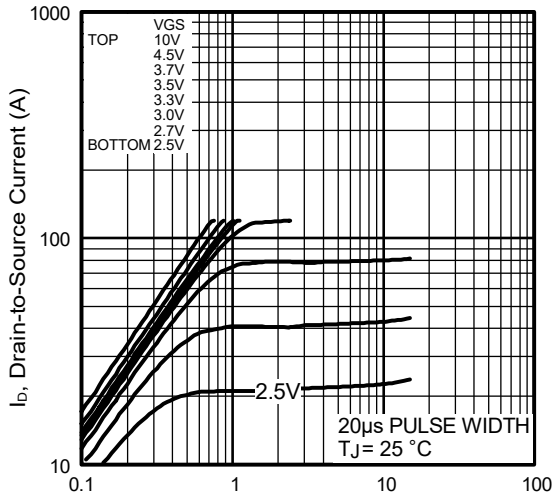



Fig 1. Typical Output Characteristics

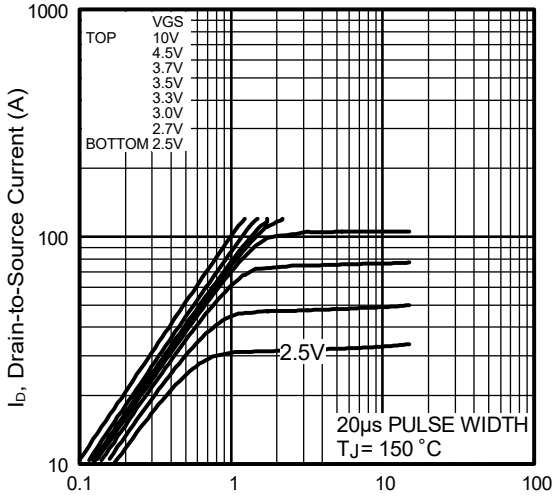



Fig 2. Typical Output Characteristics

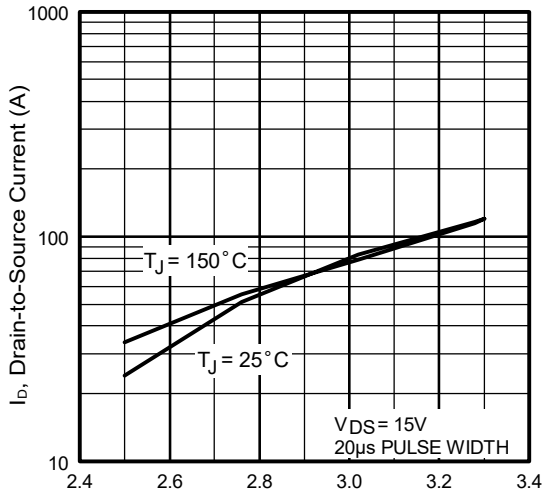



Fig 3. Typical Transfer Characteristics

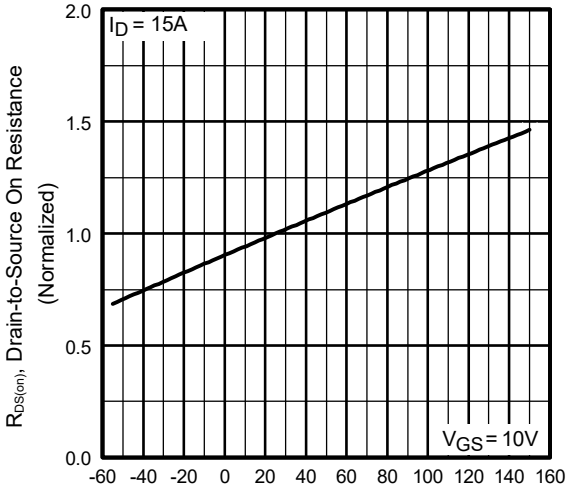
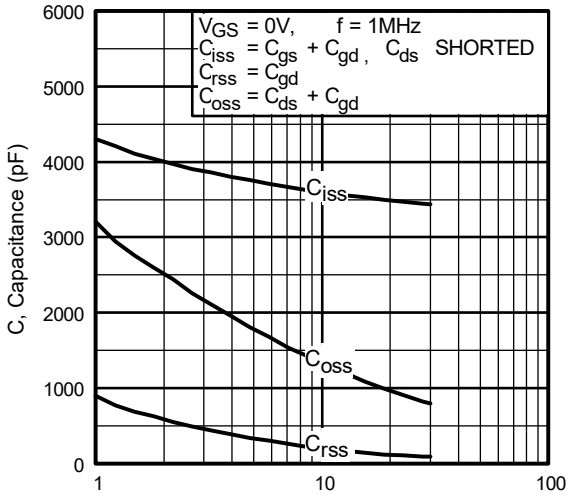


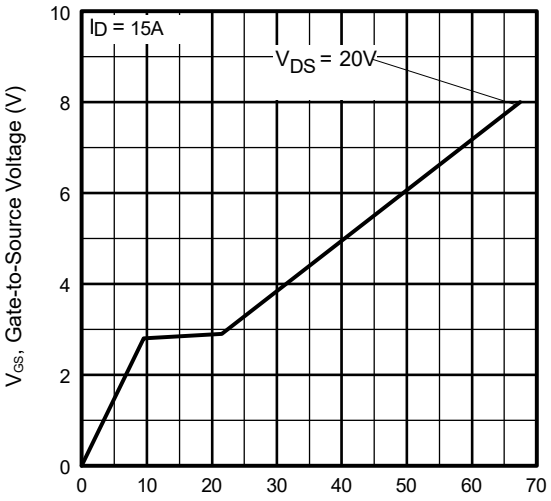

Fig 4. Nomalized On-ResistanceVs. Temperature

## 7.2Typical Characterisitics



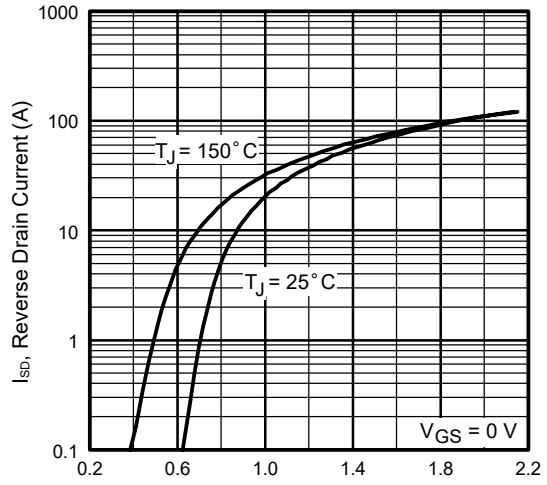

$V_{DS}$ ,Drain-to-Source Voltage (V)

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



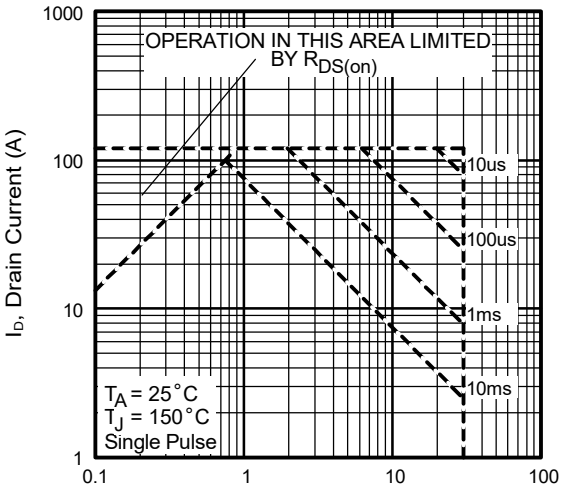

$Q_G$, Total Gate Charge (nC)

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




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

Fig 7. Typical Source-Drain Diode Forward Voltage




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

Fig 8. Maximum Safe Operating Area

## 7.3Typical Characterisitics

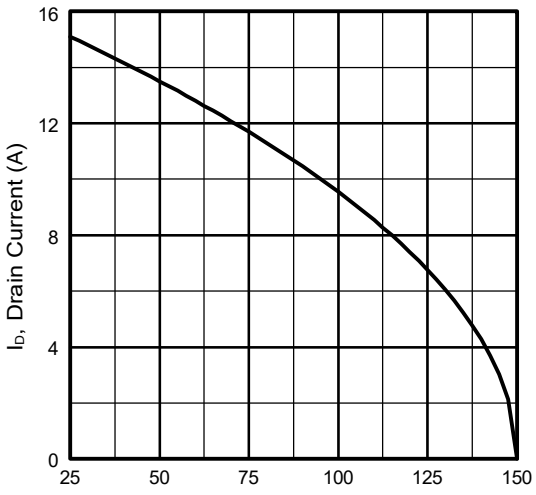



Fig 9. Maximum Drain Current vs. Case Temperature

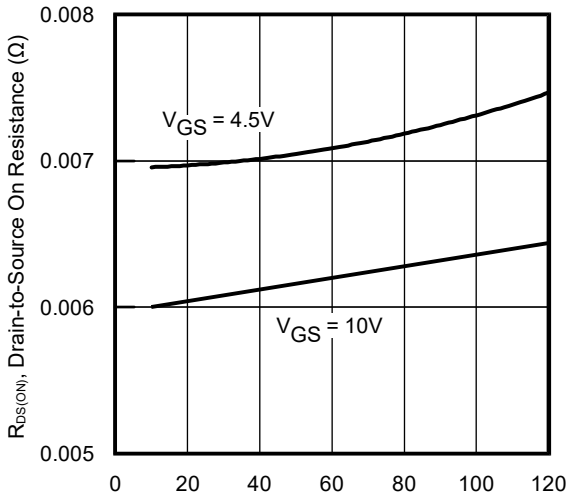



Fig 10. On-Resistance vs. Gate Voltage

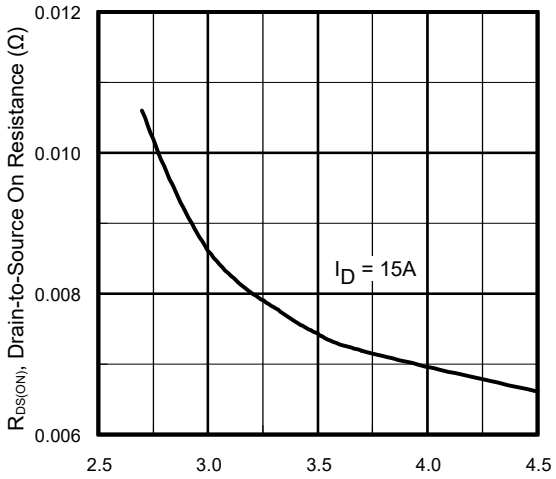



Fig 11. On-Resistance vs. Gate Voltage

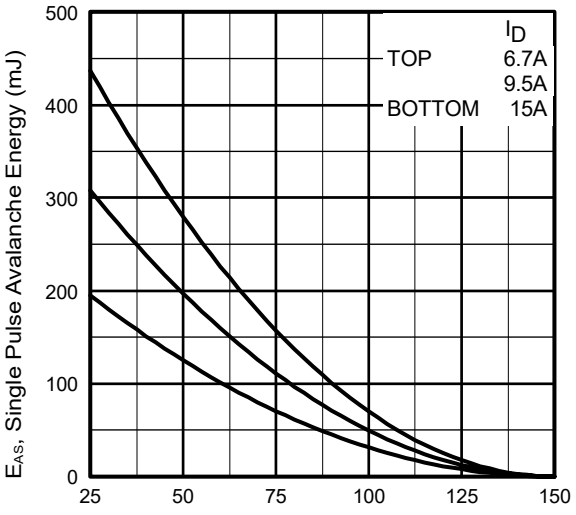



Fig 12. Maximum Avalanche EnergyVs. Drain Curent

## 7.4Typical Characterisitics

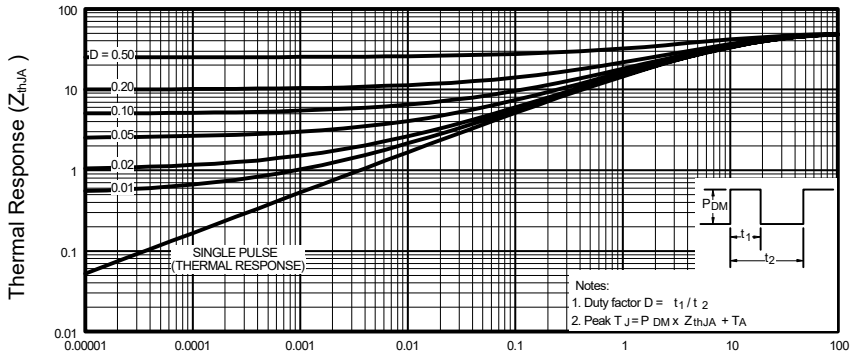



Figure 13: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

## 7.5Typical Characterisitics

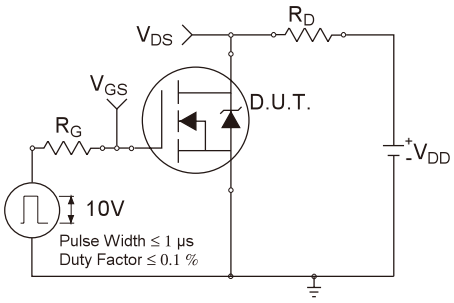



Fig 14a. Switching Time Test Circuit

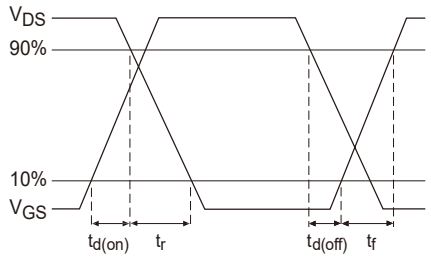
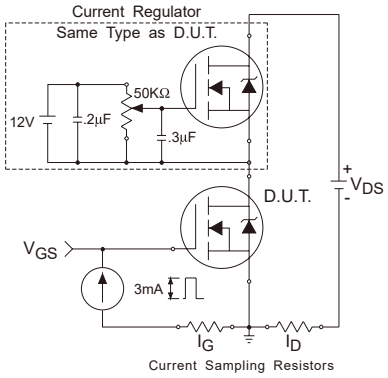



Fig 14b. Switching Time Waveforms



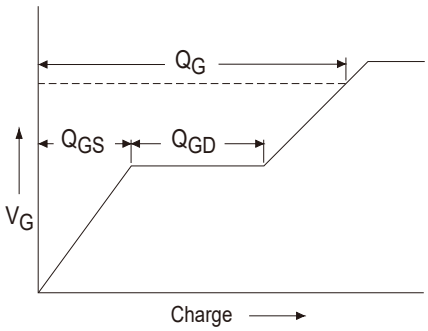




Fig 15a&b. Basic Gate Charge Test Circuit and Waveform

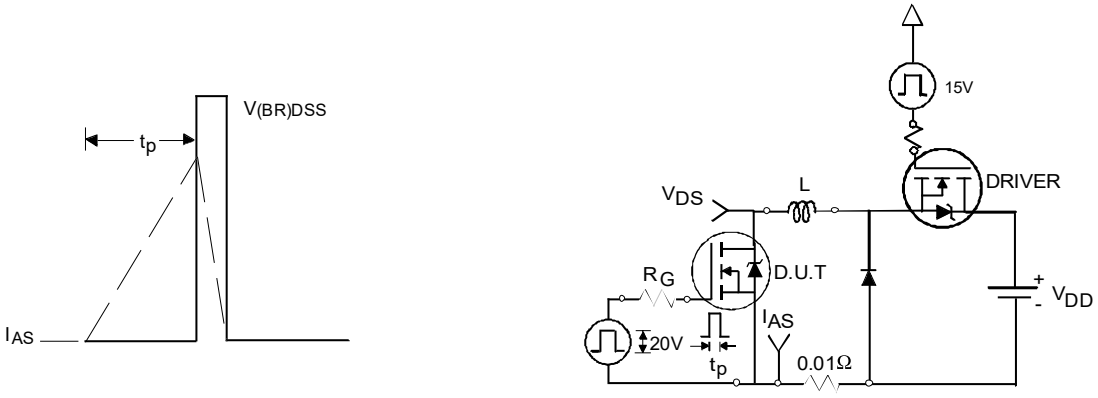
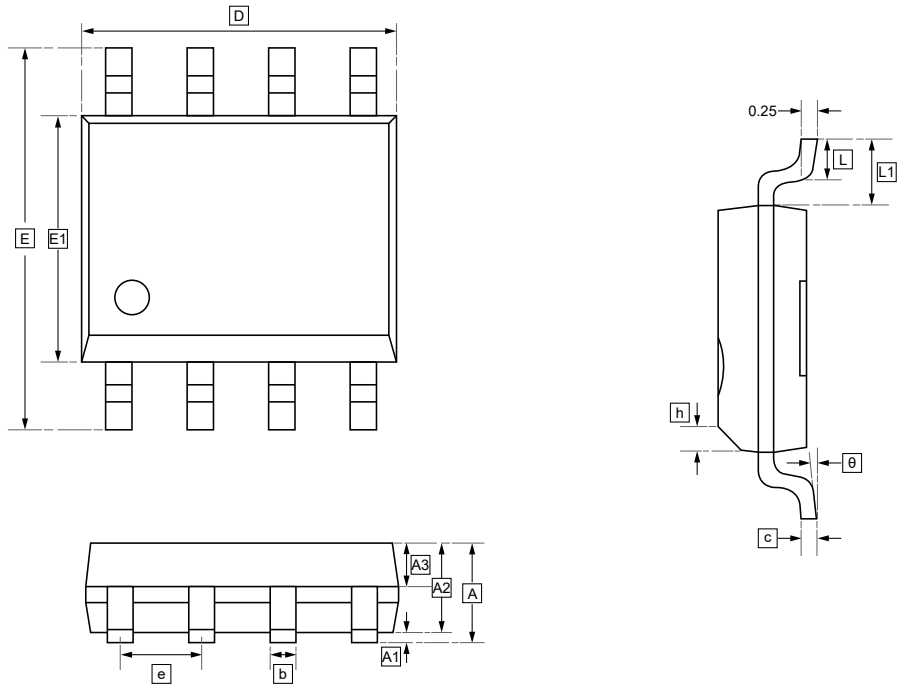



Fig 16a&b. Unclamped Inductive Test circuit and Waveforms

## 8.SOP-8 Package Outline Dimensions

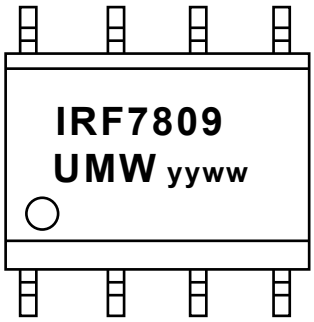



**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | A1 | A2 | A3 | b | c | D | E | E1 | e | h | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Min** | - | 0.05 | 1.30 | 0.60 | 0.39 | 0.20 | 4.70 | 5.80 | 3.80 | 1.24 | 0.30 | 0.50 |
| **Max** | 1.75 | 0.20 | 1.50 | 0.70 | 0.47 | 0.24 | 5.10 | 6.20 | 4.00 | 1.30 | 0.50 | 0.80 |

| Symbol | L1 | θ |
|---|---|---|
| **Min** | 1.00 | 0° |
| **Max** | 1.10 | 8° |

## 9.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW IRF7809AVTR | SOP-8 | 3000 | Tape and reel |

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