# UMW IRF7105TR

25V N-Channel MOSFET
-25V P-Channel MOSFET

## 1.Description

The SOP-8 has been modified through a customized eadframe "or enhanced therma characterstics and multiple-die capability making it ideal in a variety of power applications.

## 2.1Features

- Advanced Process Technology Ultra
- Low On-ResistanceSurface Mount
- Dynamic dv/dt Rating
- Fast SwitchingLead-Free

## 2.2Features(N-Ch)

- $V_{DS\ (V)}$=25V
- $I_D$=3.5A
- $R_{DS(ON)}$<100mΩ($V_{GS}$=10V)
- $R_{DS(ON)}$<160mΩ($V_{GS}$=4.5V)

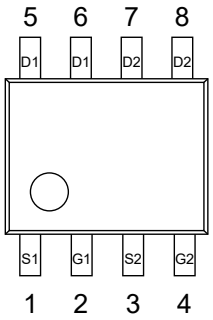
## 2.3Features(P-Ch)

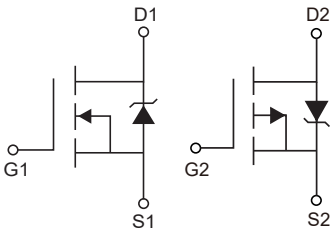
- $V_{DS\ (V)}$=-25V
- $I_D$=-2.3A
- $R_{DS(ON)}$<250mΩ($V_{GS}$=-10V)
- $R_{DS(ON)}$<400mΩ($V_{GS}$=-4.5V)

## 3.Pinning information

| Pin | Symbol | Description |
|---|---|---|
| 2,4 | G1,G2 | GATE |
| 1,3 | S1,S2 | SOURCE |
| 5,6,7,8 | D1,D2 | DRAIN |

**SOP-8**




## 4.Absolute Maximum Ratings

| Parameter | | Symbol | N-Channel | P-Channel | Units |
|---|---|---|---|---|---|
| Continuous Drain Current, $V_{GS}$=10V | $T_A$= 25°C | $I_D$ | 3.5 | -2.3 | A |
| Continuous Drain Current, $V_{GS}$=10V | $T_A$=70°C | | 2.8 | -1.8 | A |
| Pulsed Drain Current ① | | $I_{DM}$ | 14 | -10 | A |
| Power Dissipation | $T_C$= 25°C | $P_D$ | 2 | | W |
| Linear Derating Factor | | | 0.016 | | W/°C |
| Gate-to-Source Voltage | | $V_{GS}$ | ±20 | | V |
| Peak Diode Recovery dv/dt ② | | dv/dt | 3 | -3 | V/ns |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | | °C |

## 5.Thermal Characteristics

| Parameter | Symbol | Max. | Units |
|---|---|---|---|
| Maximum Junction-to-Ambient ④ | $R_{\theta JA}$ | 62.5 | °C/W |

## 6.Electrical Characteristics $T_J$=25°C

| Parameter | Symbol | | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Drain-to-Source Breakdown VoltageBreakdown Voltage | $V_{(BR)DSS}$ | N-Ch | $I_D$=250μA, $V_{GS}$=0V | 25 | | | V |
| | | P-Ch | $I_D$=-250μA, $V_{GS}$=0V | -25 | | | V |
| Breakdown Voltage Temp Coefficient Current | $\frac{\Delta V_{(BR)DSS}}{\Delta T_J}$ | N-Ch | $I_D$=1mA,Reference to 25°C | | 0.03 | | V/°C |
| | | P-Ch | $I_D$=-1mA,Reference to 25°C | | -0.015 | | V/°C |
| Static Drain-to-Source On-Resistance | $R_{DS(ON)}$ | N-Ch | $V_{GS}$=10V, $I_D$=1A ③ | | 83 | 100 | mΩ |
| | | N-Ch | $V_{GS}$=4.5V, $I_D$=0.5A ③ | | 140 | 160 | mΩ |
| | | P-Ch | $V_{GS}$=-10V, $I_D$=-1A ③ | | 160 | 250 | mΩ |
| | | P-Ch | $V_{GS}$=-4.5V, $I_D$=-0.5A ③ | | 300 | 400 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | N-Ch | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1 | | 3 | V |
| | | P-Ch | $V_{DS}$=$V_{GS}$, $I_D$=-250μA | -1 | | -3 | V |
| Forward Transconductance | $g_{fs}$ | N-Ch | $V_{DS}$=15V, $I_D$=3.5A ③ | | 4.3 | | S |
| | | P-Ch | $V_{DS}$=-15V, $I_D$=-3.5A ③ | | 3.1 | | S |
| Drain-to-Source Leakage Current | $I_{DSS}$ | N-Ch | $V_{DS}$=20V, $V_{GS}$=0V | | | 2 | μA |
| | | | $V_{DS}$=-20V, $V_{GS}$=0V | | | -2 | μA |
| | | P-Ch | $V_{DS}$=20V, $V_{GS}$=0V, $T_J$=55°C | | | 25 | μA |
| | | | $V_{DS}$=-20V, $V_{GS}$=0V, $T_J$=55°C | | | -25 | μA |
| Gate-to-Source ForwardLeakage | $I_{GSS}$ | N-P | $V_{GS}$=±20V | | | ±100 | nA |
| Total Gate Charge | $Q_g$ | N-Ch | N-Ch: ③<br>$I_D$=2.3A, $V_{DS}$=12.5V, $V_{GS}$=10V<br>P-Ch:<br>$I_D$=-2.3A,$V_{DS}$=-12.5V,$V_{GS}$=-10V | | 9.4 | 27 | nC |
| | | P-Ch | | | 10 | 25 | nC |
| Gate-to-Source Charge | $Q_{gs}$ | N-Ch | | | | 1.7 | nC |
| | | P-Ch | | | 1.9 | | nC |
| Gate-to-Drain ("Miller") Charge | $Q_{gd}$ | N-Ch | | | | 3.1 | nC |
| | | P-Ch | | | | 2.8 | nC |
| Turn-On Delay Time | $t_{D(on)}$ | N-Ch | N-Ch: ③<br>$V_{DD}$=25A, $I_D$=1A<br>$R_G$=6Ω, $R_D$=25Ω | | 7 | 20 | ns |
| | | P-Ch | | | 12 | 40 | ns |
| Rise Time | $t_r$ | N-Ch | | | 9 | 20 | ns |
| | | P-Ch | | | 13 | 40 | ns |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tum-Off Delay Time | $t_{D(off)}$ | N-Ch | P-Ch: ③<br>$V_{DD}$=-25A, $I_D$=-1A<br>$R_G$=6Ω, $R_D$=25Ω | | 45 | 90 | ns |
| | | P-Ch | | | 45 | 90 | ns |
| Fall Time | $t_f$ | N-Ch | | | 25 | 50 | ns |
| | | P-Ch | | | 37 | 50 | ns |
| Internal Drain Inductace | $L_S$ | N-P | Between lead ,6mm (0.25in)from | | 4 | | nH |
| Interna l Source Inductance | $L_D$ | N-P | package and center of die contact | | 6 | | nH |
| Input Capacitance | $C_{iss}$ | N-Ch | N-Ch:<br>$V_{GS}$=0V, $V_{DS}$=15V, f=1MHz<br>P-Ch:<br>$V_{GS}$=0V, $V_{DS}$=-15V, f=1MHz | | 330 | | pF |
| | | P-Ch | | | 290 | | pF |
| Output Capacitance | $C_{oss}$ | N-Ch | | | 250 | | pF |
| | | P-Ch | | | 210 | | pF |
| ReverseTransferCapacitance | $C_{rss}$ | N-Ch | | | 61 | | pF |
| | | P-Ch | | | 67 | | pF |
| Continuous Source Current (Body Diode) | $I_S$ | N-Ch | | | | 2 | A |
| | | P-Ch | | | | -2 | A |
| Pulsed Source Current (Body Diode) ① | $I_{SM}$ | N-Ch | | | | 14 | A |
| | | P-Ch | | | | -9.2 | A |
| Diode Forward Voltage | $V_{SD}$ | N-Ch | $T_J$=25°C, $I_S$=1.3A,$V_{GS}$=0V ③ | | | 1.2 | V |
| | | P-Ch | $T_J$=25°C, $I_S$=-1.3A,$V_{GS}$=0V ③ | | | -1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | N-Ch | N-Ch: $T_J$=25°C<br>$I_F$=1.3A, $d_{iF}/d_t$=100A/μs<br>P-Ch: $T_J$=25°C<br>$I_F$=-1.3A, $d_{iF}/d_t$=100A/μs ③ | | 36 | 54 | ns |
| | | P-Ch | | | 69 | 100 | ns |
| Reverse Recovery Charge | $Q_{rr}$ | N-Ch | | | 41 | 75 | nC |
| | | P-Ch | | | 90 | 180 | nC |
| Forward Turn-On Time | $t_{on}$ | N-P | Intrinsic turn-on time is neglegible<br>(turn-on is dominated by $L_S$+$L_D$) | | | | |

Notes:

① Repetitive rating; pulse width limited bymax.junction temperature.

② N-Channel $I_{SD}$≤3.5A, di/dt ≤ 90A/μs, $V_{DD}$≤$V_{(BR)DSS}$, $T_J$≤ 150°C.

P-Channel $I_{SD}$≤ -2.3A, di/dt ≤ 90Aμs, $V_{DD}$≤$V_{(BR)DSS}$, $T_J$≤ 150°C.

③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

④ Surface mounted on FR-4 board, t≤ 10sec.

## 7.1Typical Characterisitics (N-Channel)

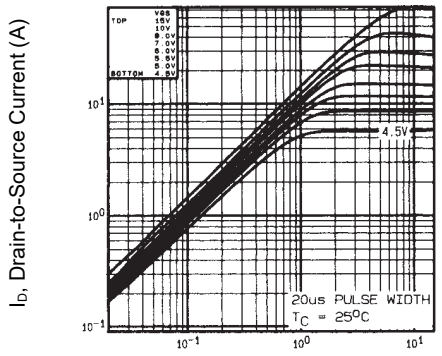



Figure 1: Typical Output Characteristics

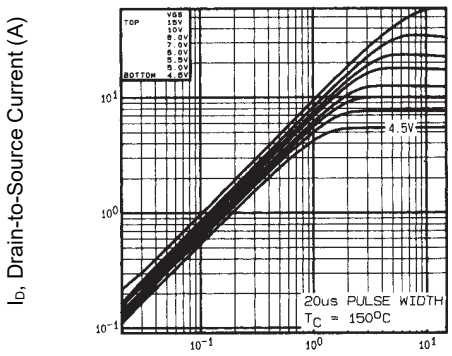



Figure 2: Typical Output Characteristics

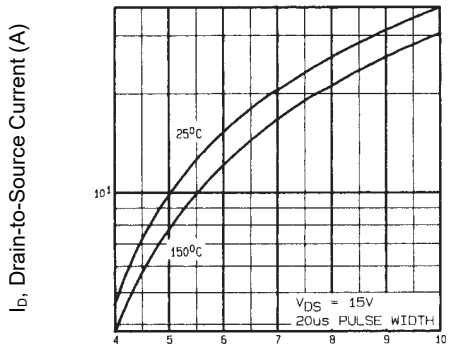



Figure 3: Typical Output Characteristics

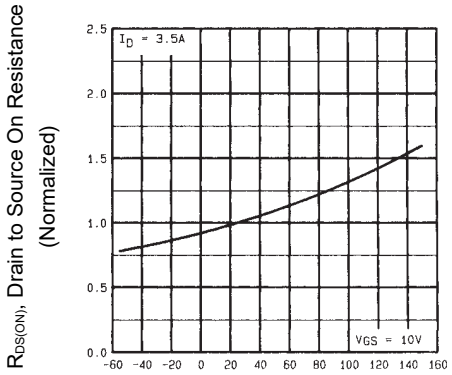



Figure 4: Normalized On-ResistanceVs. Temperature

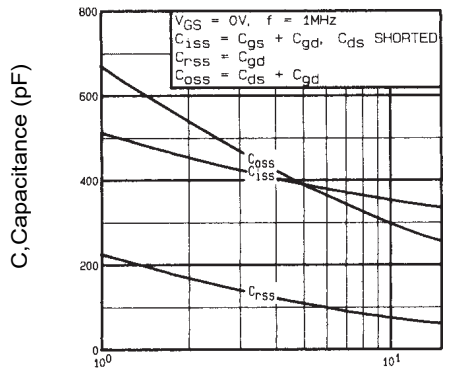



Figure 5: Typical Capacitance vs. Drain-to-Source Voltage

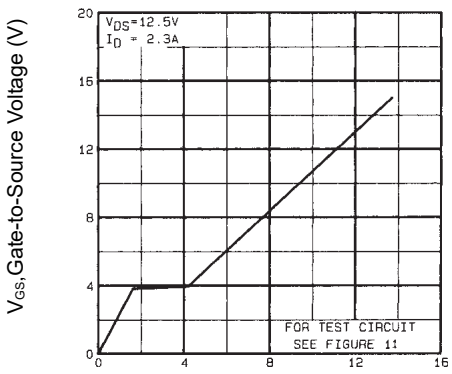



Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage

## 7.2Typical Characterisitics (N-Channel)

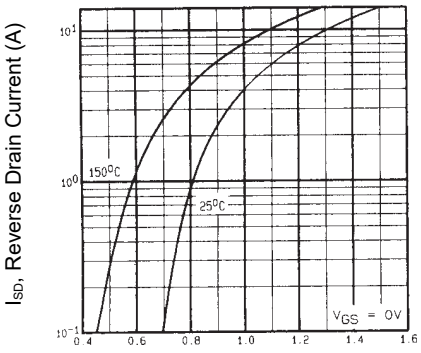



Figure 7: Typical Capacitance vs. Drain-to-Source Voltage

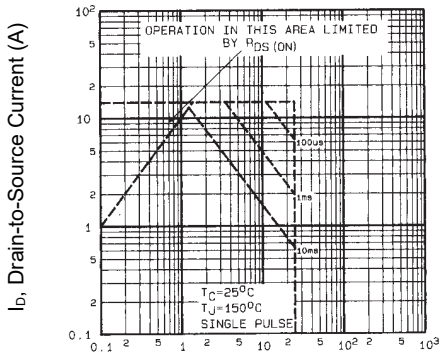



Figure 8: Maximum Safe Operating Area

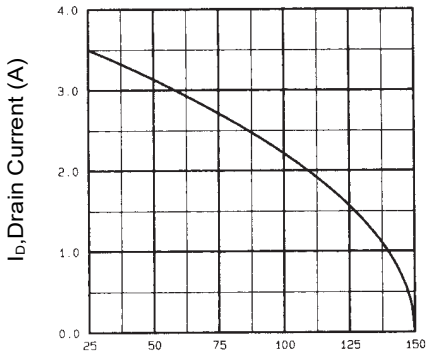



Figure 9: Maximum Drain Current Vs. Ambient Temperature

## 7.3Typical Characterisitics (N-Channel)

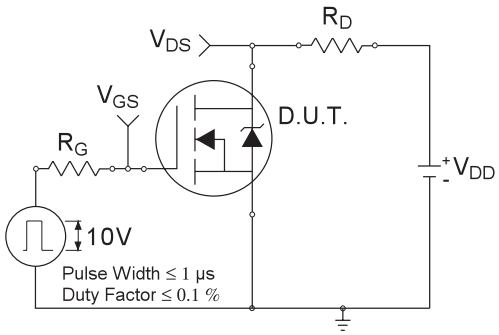



Figure 10a: Switching Time Test Circuit

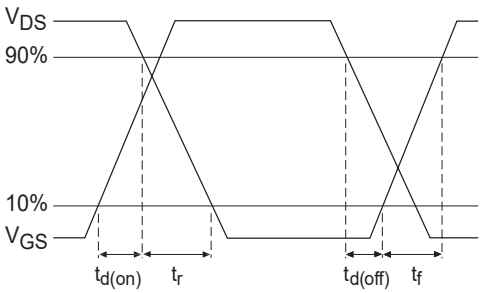



Figure 10b: Switching Time Waveforms

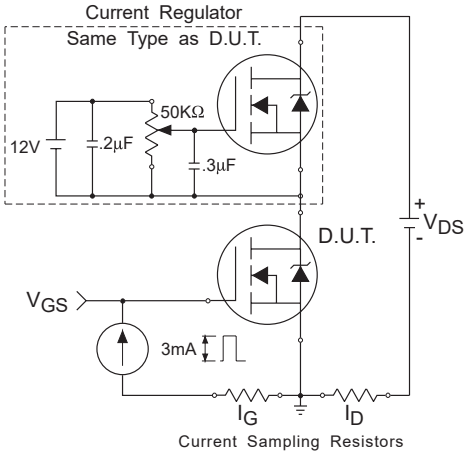



Figure 11a: Gate Charge Test Circuit

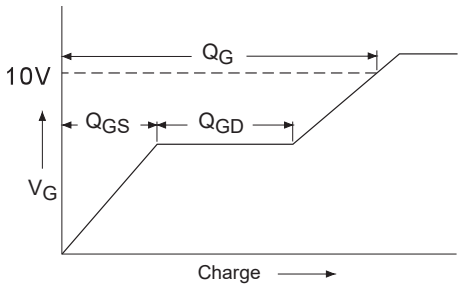



Figure 11b: Basic Gate Charge Wavefomm

## 7.4Typical Characterisitics (P-Channel)

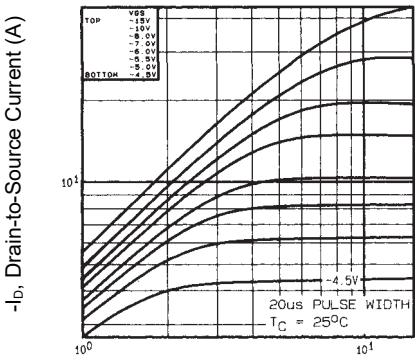



Figure 12: Typical Output Characteristics

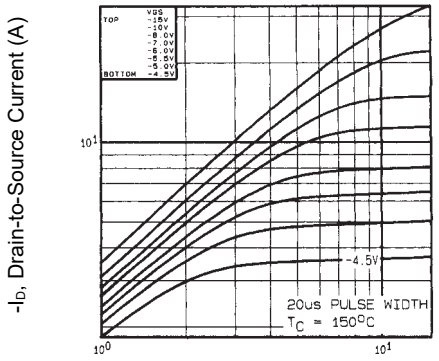



Figure 13: Typical Output Characteristics

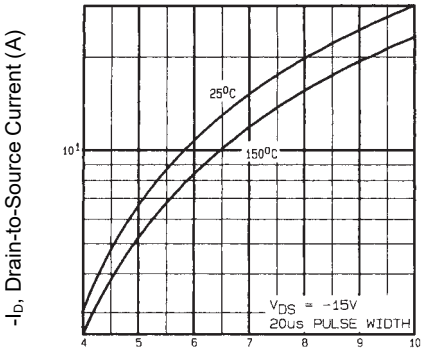



Figure 14: Typical Transfer Characteristics

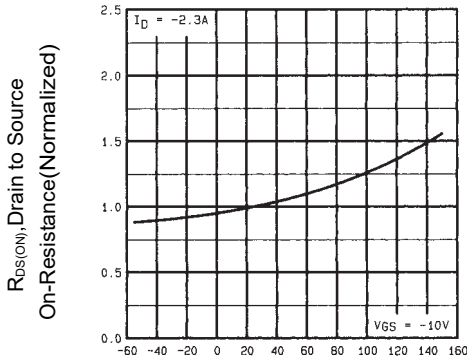



Figure 15: Normalized On-Resistance Vs. Temperature

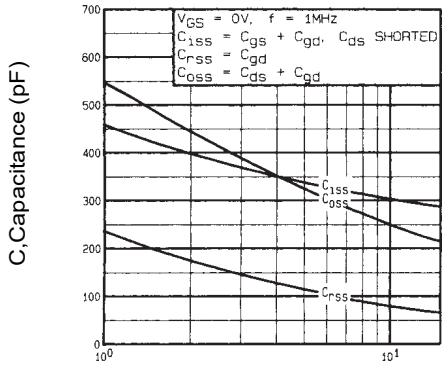



Figure 16: Typical Capacitance Vs. Drain-to-Source Voltage

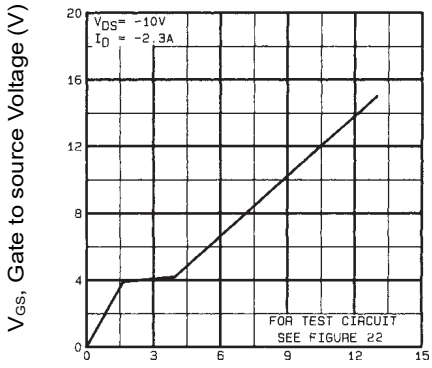



Figure 17: Typical Gate Charge Vs. Gate-to-Source Voltage

## 7.5Typical Characterisitics (P-Channel)

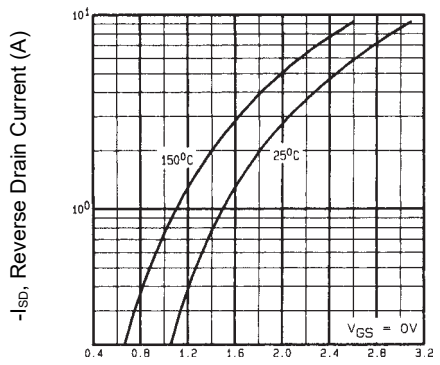



Figure 18: Typical Capacitance vs. Drain-to-Source Voltage

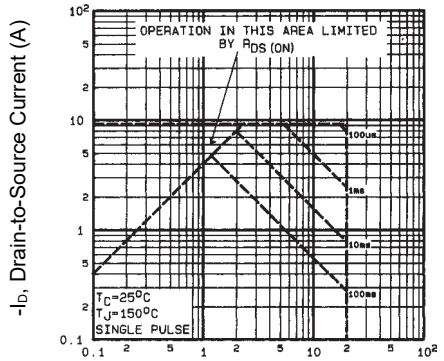



Figure 19: Maximum Safe Operating Area

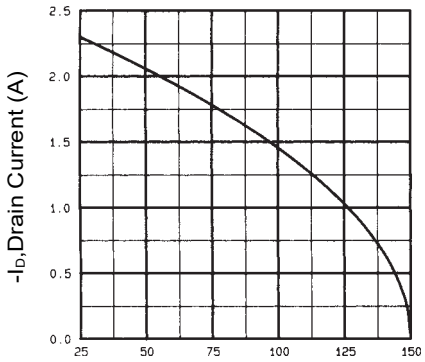



Figure 20: Maximum Drain Current Vs. Ambient Temperature

## 7.6Typical Characterisitics (P-Channel)

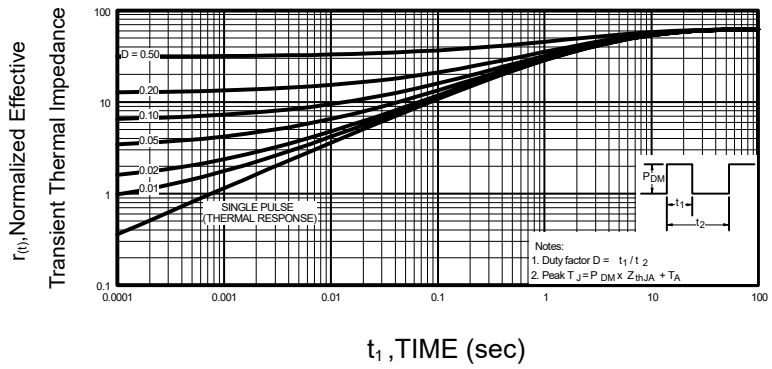



Figure 21: Transient Thermal Response Curve

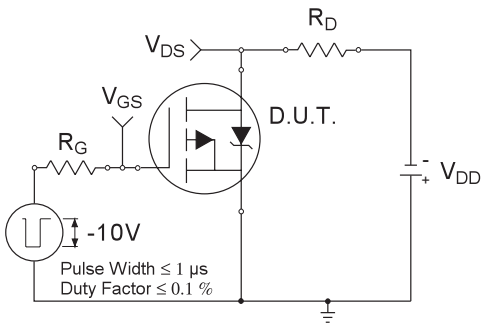



Figure 22a: Switching Time Test Circuit

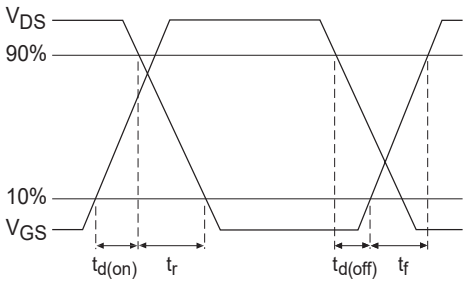



Figure 22b: Switching Time Waveforms

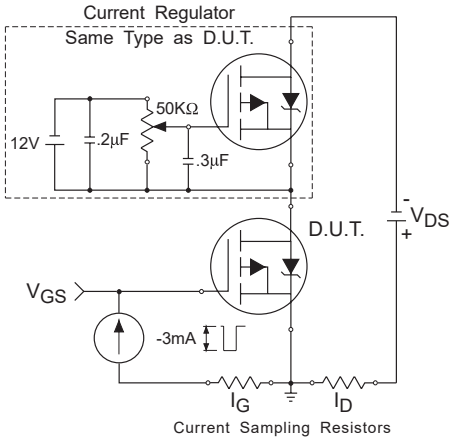



Figure 23a: Gate Charge Test Circuit

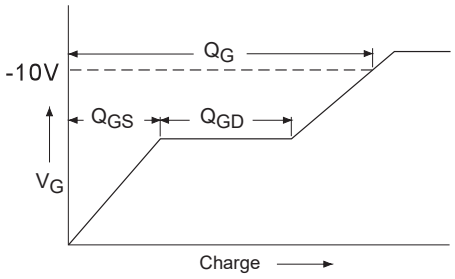
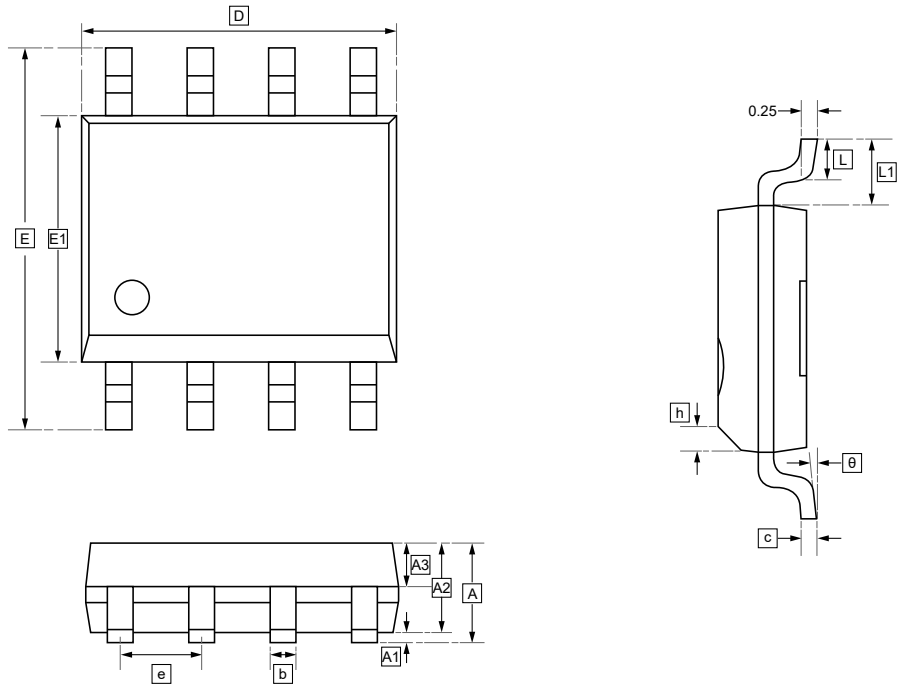



Figure 23b: Basic Gate Charge Wavefomm

## 8.SOP-8 Package Outline Dimensions

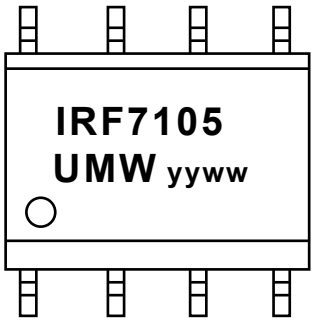



**DIMENSIONS (mm are the original dimensions)**

| 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 IRF7105TR | SOP-8 | 3000 | Tape and reel |

## 10.Disclaimer

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