# UMW RFD14N05LSM

60V N-Channel MOSFET

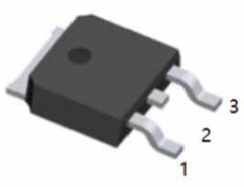
## 1.Features

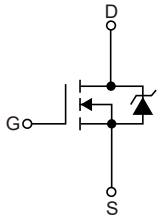
- $V_{DS\ (V)}$=60V
- $R_{DS(ON)}$<100mΩ($V_{GS}$=5V)
- 175°C Operating Temperature
- Can be Driven Directly from CMOS, NMOS, and TTL Circuits
- Peak Current vs Pulse Width Curve

## 2.Pinning information

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

**TO-252(DPAK)**
**top view**




## 3.Absolute Maximum Ratings $T_C$= 25°C

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Drain to Source Voltage (Note 1) | $V_{DSS}$ | 60 | V |
| Drain to Gate Voltage ($R_{GS}$= 20kΩ)(Note 1) | $V_{DGR}$ | 60 | V |
| Gate to Source Voltage | $V_{GS}$ | ±10 | V |
| Continuous Drain Current | $I_D$ | 14 | A |
| Pulsed Drain Current (Note 3) | $I_{DM}$ | Refer to Peak Current Curve | |
| Pulsed Avalanche Rating | $E_{AS}$ | Refer to UiS Curve | |
| Power Dissipation | $P_D$ | 48 | W |
| Derate above 25°C | | 0.32 | W/°C |
| Operating and Storage Temperature | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Maximum Temperature for Soldering | | | |
| Leads at 0.063in (1.6mm) from Case for 10s | $T_L$ | 300 | °C |
| Package Body for 10s, See Techbrief 334 | $T_{pkg}$ | 260 | °C |

Notes

1. $T_J$=25°C to 150°C.

## 4.Electrical Characteristic ($T_C$=25°C unless otherwise noted)

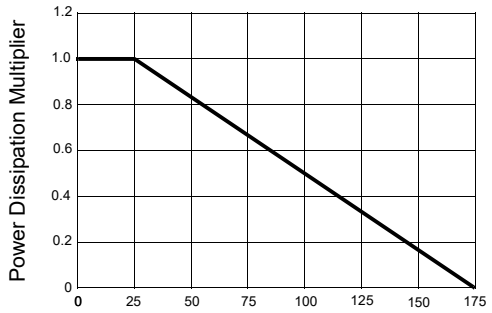
| Parameter | Symbol | Conditions | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Drain to Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA, Figure 13 | | 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA,Figure 12 | | 1 | | 2 | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=40V, $V_{GS}$=0V | | | | 1 | μA |
| | | $V_{DS}$=40V, $V_{GS}$=0V, $T_C$=150°C | | | | 50 | μA |
| Gate to Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±10V | | | | ±100 | nA |
| Drain to Source On Resistance (Note 2) | $R_{DS(ON)}$ | $V_{GS}$=5V, $I_D$=14A, Figures 9,11 | | | | 100 | mΩ |
| Turn-On Time | $t_{(on)}$ | $V_{DD}$=25V, $I_D$=7A<br>$R_L$=3.57Ω, $V_{GS}$=5V<br>$R_{GS}$=0.6Ω | | | | 60 | ns |
| Turn-On Delay Time | $t_{D(on)}$ | | | | 13 | | |
| Rise Time | $t_r$ | | | | 24 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | | | 42 | | ns |
| Fall Time | $t_f$ | | | | 16 | | ns |
| Turn-Off Time | $t_{(off)}$ | | | | | 100 | ns |
| Total Gate Charge | $Q_{g(tot)}$ | $V_{GS}$=0V to 10V | $V_{DD}$=40V, $I_D$=14A<br>$R_L$=2.86Ω<br>Figures 20, 21 | | | 40 | nC |
| Gate Charge at 5V | $Q_{g(5)}$ | $V_{GS}$=0V to 5V | | | | 25 | nC |
| Threshold Gate Charge | $Q_{g(th)}$ | $V_{GS}$=0V to 1V | | | | 1.5 | nC |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=-25V, $V_{GS}$=0V, f=1MHz<br>Figure 14 | | | 670 | | pF |
| Output Capacitance | $C_{oss}$ | | | | 185 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | | 50 | | pF |
| Thermal Resistance Junction to Case | $R_{\theta JC}$ | | | | | 3.125 | °C/W |
| Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | TO-252 | | | | 100 | °C/W |
| **Source to Drain Diode Specifications** | | | | | | | |
| Source to Drain Diode Voltage (Note 2) | $V_{SD}$ | $I_{SD}$=14A | | | | 1.5 | V |
| Diode Reverse Recovery Time | $t_{rr}$ | $I_{SD}$=14A, $dI_{SD}/dt$=100A/μs | | | | 125 | ns |

Notes:

2. Pulse Test: Pulse Width ≤300ms, Duty Cycle ≤2%.

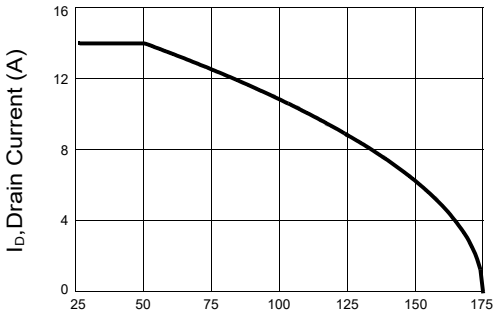
3. Repetitive Rating: Pulse Width limited by max junction temperature. See Transient Thermal Impedance Curve (Figure 3) and Peak Current Capability Curve (Figure 5).

## 5.1Typical characteristic



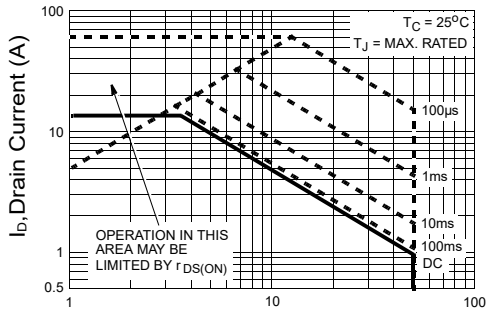

$T_C$,Case Temperature (°C)

Figure 1: Normalized Power Dissipation Vs Case Temperature



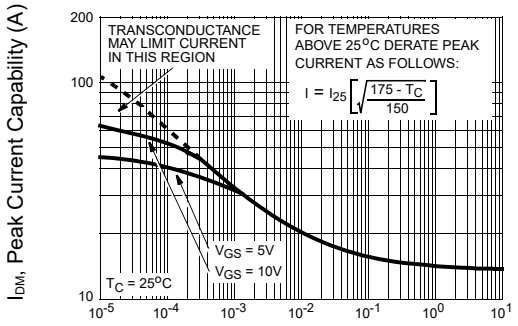

$T_C$,Case Temperature (°C)

Figure 2: Maximum Continuous Drain Current Vs Temperature



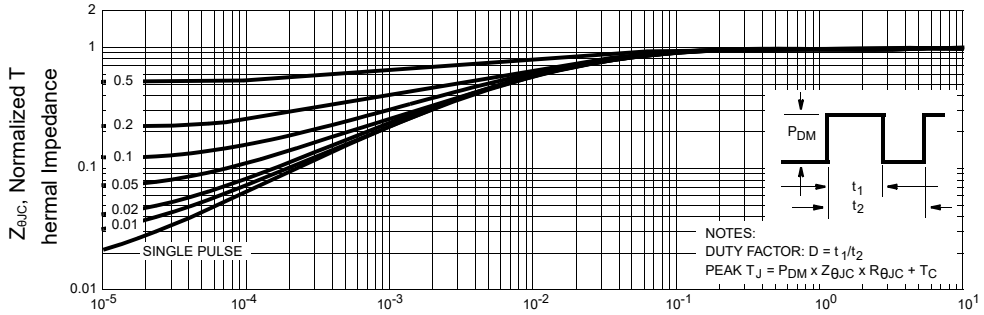

$V_{DS}$,Drain-to-Source Voltage (V)

Figure 3: Forward Bias Safe Operating Area




t, Pulse Width (s)

Figure 4: Peak Current Capability




t, Rectangular Pulse Duration (s)

Figure 5: Normalized Maximum Transient Thermal Impedance

## 5.2Typical characteristic

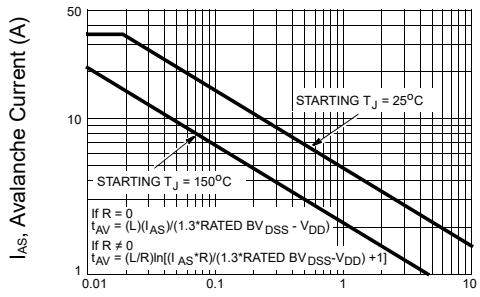



Figure 6: Unclamped Inductive Switching

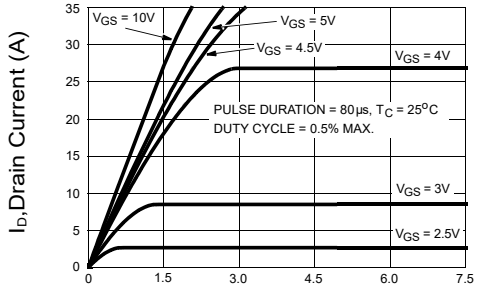



Figure 7: Saturation Characteristics

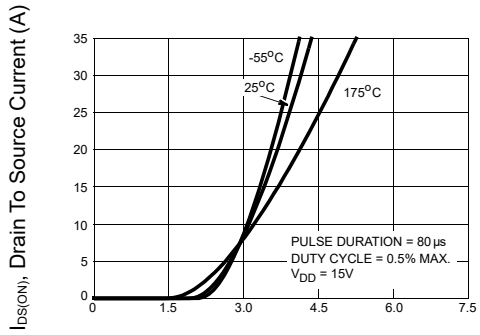



Figure 8: Transfer Characteristics

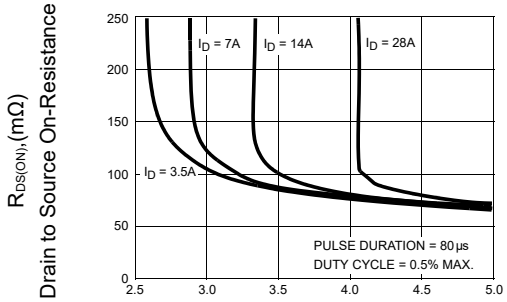



Figure 9: Drain To Source On Resistance Vs Gate Voltage And Drain Current

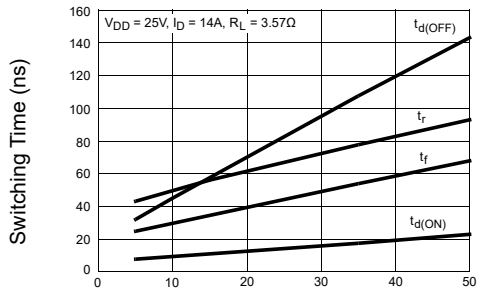



Figure 10: Switching Time Vs Gate Resistance

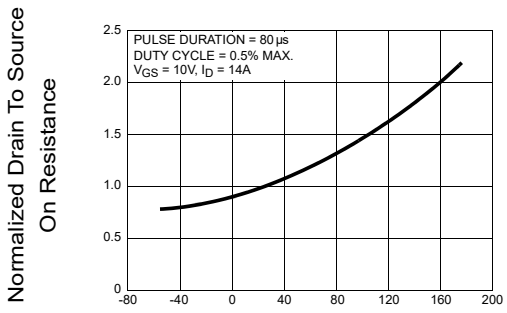



Figure 11: Normalized Drain To Source On Resistance Vs Junction Temperature

## 5.3Typical characteristic

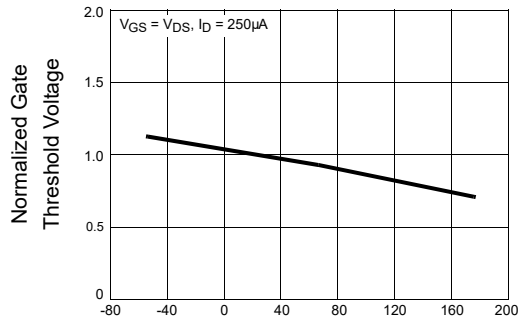



Figure 12: Normalized Gate Threshold Voltage Vs Junction Temperature

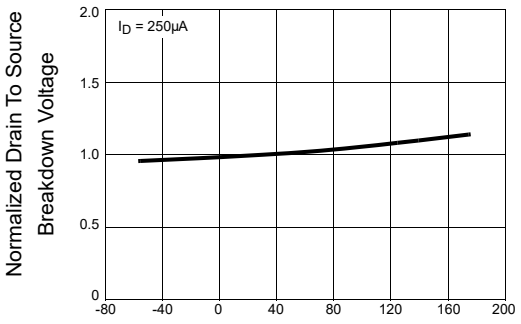



Figure 13: Normalized Drain To Source Breakdown Voltage Vs Junction Temperature

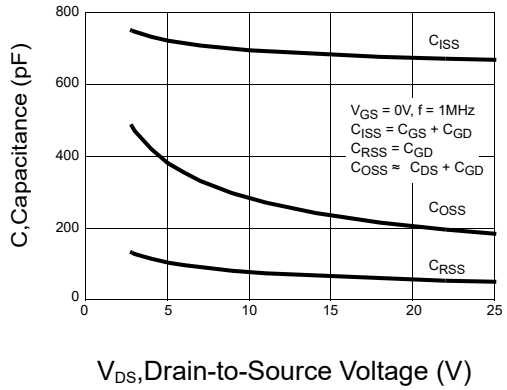



Figure 14: Capacitance Vs Drain To Source Voltage

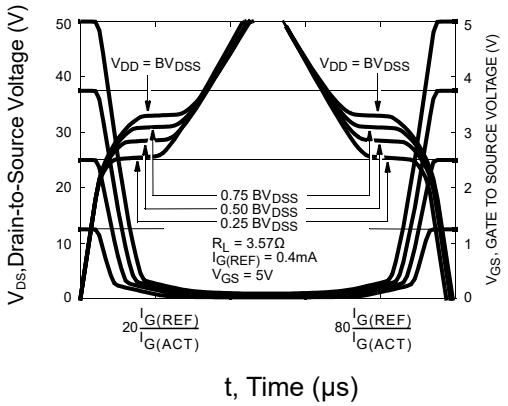



Figure 15: Transconductance Vs Drain Current

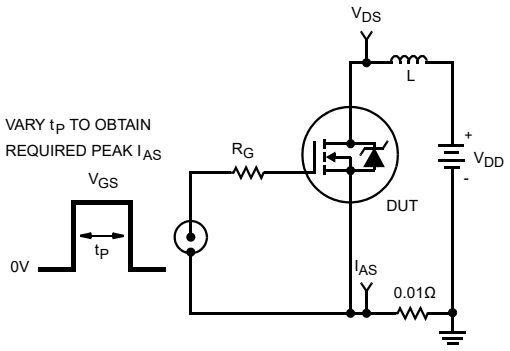



Figure 16: Unclamped Energy Test Circuit

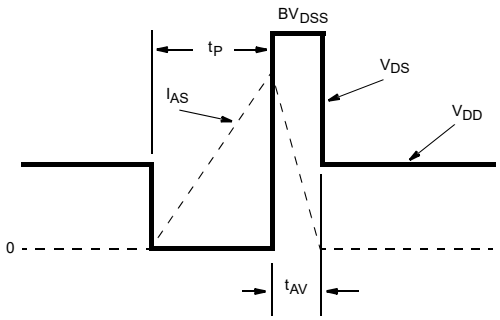



Figure 17: Unclamped Energy Waveforms

## 6.Test Circuits and Waveforms

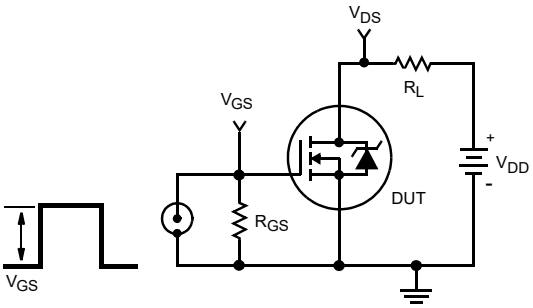



Figure 18: Switching Time Test Circuit

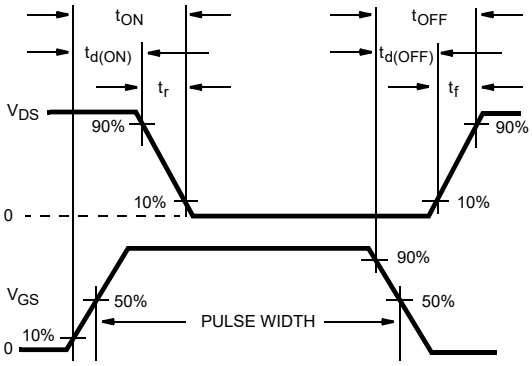



Figure 19: Resistive Switching Waveforms

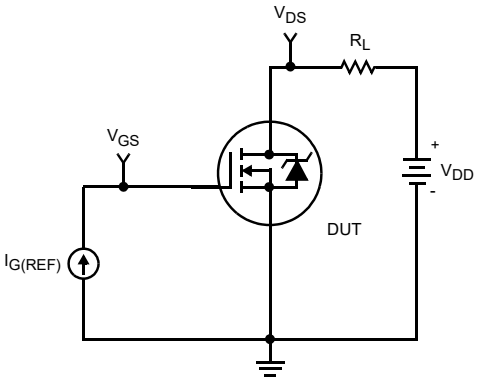



Figure 20: Gate Charge Test Circuit

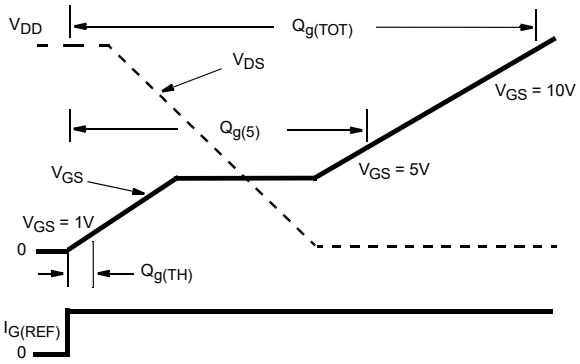
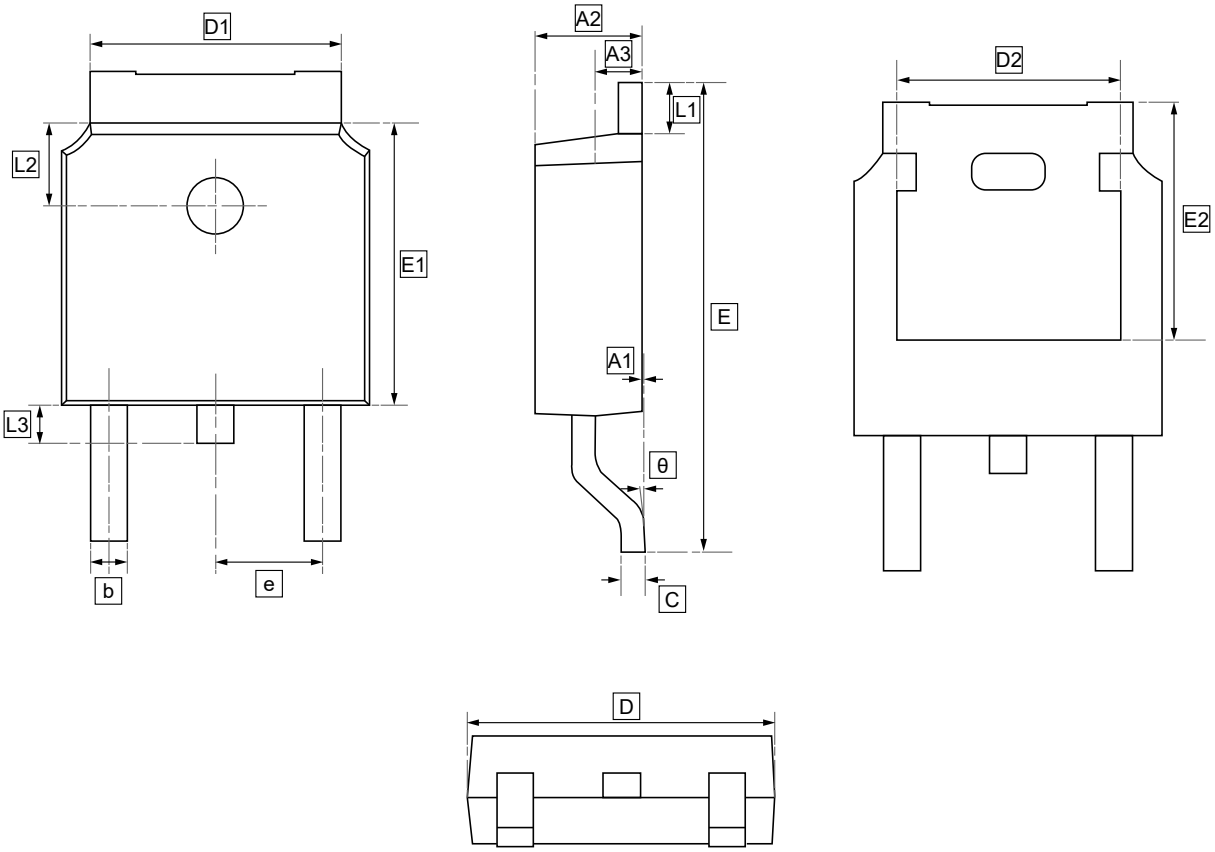



Figure 21: Gate Charge Waveforms

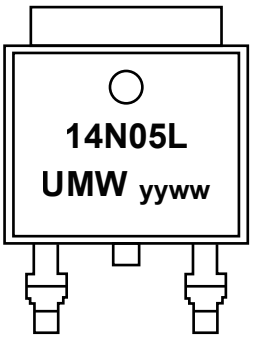
## 7.TO-252 Package Outline Dimensions




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

| Symbol | A1 | A2 | A3 | b | c | D | D1 | D2 | E | E1 | E2 | e | L1 | L2 | L3 | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min | 0.00 | 2.18 | 0.90 | 0.65 | 0.46 | 6.35 | 4.95 | 4.32 | 9.40 | 5.97 | 5.21 | 2.286 | 0.89 | 1.70 | 0.60 | 0.00 |
| Max | 0.13 | 2.39 | 1.10 | 0.85 | 0.61 | 6.73 | 5.46 | 4.90 | 10.41 | 6.22 | 5.38 | BSC | 1.27 | 1.90 | 1.00 | 8.00 |

## 8.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW RFD14N05LSM | TO-252 | 2500 | Tape and reel |

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