# UMW IRF5305STRL

-55V P-Channel MOSFET

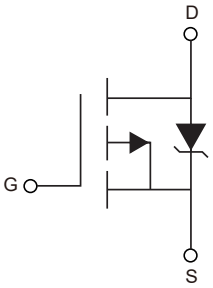
## 1.Features

- $V_{DS\ (V)}$=-55V
- $I_D$=-31A($V_{GS}$=-10V)
- $R_{DS(ON)}$<60mΩ($V_{GS}$=-10V)

## 2.Pinning information

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

**TO-263**




## 3.Absolute Maximum Ratings

| Parameter | | Symbol | Rating | Units |
|---|---|---|---|---|
| Continuous Drain Current, $V_{GS}$=-10V ⑤ | $T_C$=25°C | $I_D$ | -31 | A |
| Continuous Drain Current, $V_{GS}$=-10V ⑤ | $T_C$=100°C | | -22 | A |
| Pulsed Drain Current ①⑤ | | $I_{DM}$ | -110 | A |
| Power Dissipation | $T_C$=25°C | $P_D$ | 3.8 | W |
| Power Dissipation | | | 110 | W |
| Linear Derating Factor | | | 0.71 | W/°C |
| Gate-to-Source Voltage | | $V_{GS}$ | ±20 | V |
| Single Pulse Avalanche Energy ②⑤ | | $E_{AS}$ | 280 | mJ |
| Avalanche Current ① | | $I_{AR}$ | -16 | A |
| Repetitive Avalanche Energy ① | | $E_{AR}$ | 11 | mJ |
| Peak Diode Recovery dv/dt ③⑤ | | dv/dt | -5.8 | V/ns |
| Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Soldering Temperature, for 10 seconds | | | 300 (1.6mm from case) | °C |

## 4.Thermal resistance rating

| Parameter | Symbol | Typ | Max | Units |
|---|---|---|---|---|
| Junction-to-Case | $R_{\theta JC}$ | | 1.4 | °C/W |
| Junction-to-Ambient (PCB Mounted.steady-state) ** | $R_{\theta JA}$ | | 40 | °C/W |

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

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=-250μA, $V_{GS}$=0V | -55 | | | V |
| Breakdown Voltage Temp. Coefficient | $\Delta V_{(BR)DSS}/\Delta T_J$ | $I_D$=-1mA,Reference to 25°C | | -0.034 | | V/°C |
| Static Drain-to-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=-10V, $I_D$=-16A ④ | | | 60 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-250μA | -1.1 | -2 | -3 | V |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-25V, $I_D$=-16A ⑤ | 8 | | | S |
| Drain-to-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=-55V, $V_{GS}$=0V | | | -25 | μA |
| | | $V_{DS}$=-44V,$V_{GS}$=0V,$T_J$=150°C | | | -250 | μA |
| Gate-to-Source Forward Leakage | $I_{GSS}$ | $V_{GS}$=20V | | | 100 | nA |
| Gate-to-Source Reverse Leakage | | $V_{GS}$=-20V | | | -100 | nA |
| Total Gate Charge | $Q_g$ | $I_D$=-16A | | | 63 | nC |
| Gate-to-Source Charge | $Q_{gs}$ | $V_{DS}$=-44V, $V_{GS}$=-10V | | | 13 | nC |
| Gate-to-Drain ("Miller") Charge | $Q_{gd}$ | See Fig.6 and 13 ④⑤ | | | 29 | nC |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{DD}$=-28V, $I_D$=-16A<br>$R_G$=6.8Ω, $R_D$=1.6Ω<br>See Fig.10 ④⑤ | | 14 | | ns |
| Rise Time | $t_r$ | | | 66 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | | 39 | | ns |
| Fall Time | $t_f$ | | | 63 | | ns |
| Internal Drain inductance | $L_S$ | Between lead,<br>and center of die contact | | 7.5 | | nH |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=-25V<br>$f$=1MHz, See Fig. 5 ⑤ | | 1200 | | pF |
| Output Capacitance | $C_{oss}$ | | | 520 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 250 | | pF |

| Source-Drain Ratings and Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Continuous Source Current (Body Diode) | $I_S$ | MOSFET symbol showing the integral reverse p-n junction diode. | | | -31 | A |
| Pulsed Source Current (Body Diode) ① | $I_{SM}$ | | | | -110 | |
| Diode Forward Voltage | $V_{SD}$ | $T_J$=25°C, $I_S$=-16A, $V_{GS}$=0V ④ | | | -1.3 | V |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C, $I_F$=-16A dI/dt=100A/μs ④⑤ | | 71 | 110 | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | | 170 | 250 | nC |
| Forward Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$+$L_D$) | | | | |

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.(See fig.11)

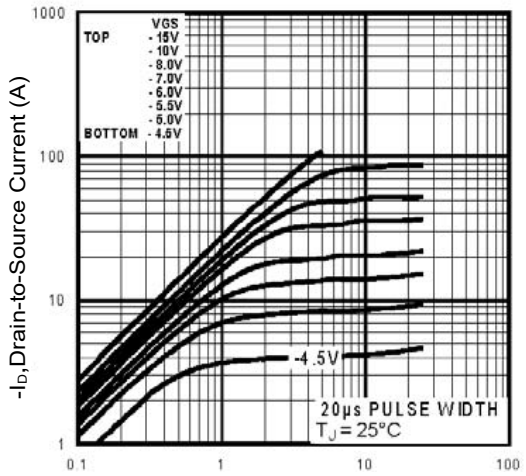
② $V_{DD}$=-25V, Starting $T_J$=25°C, L=2.1mH, $R_G$=25Ω, $I_{AS}$=-16A.(See figure.12)

③ $I_{SD}$ ≤ -16A, di/dt ≤-280A/μs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$≤ 175°C.

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

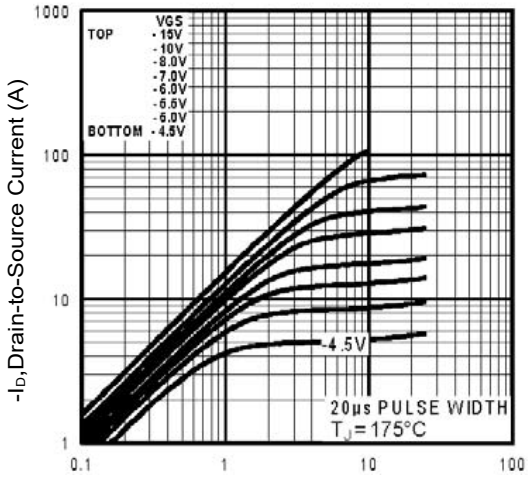
⑤ Uses IRF5305 data and test conditions.

## 6.1Typical Characterisitics



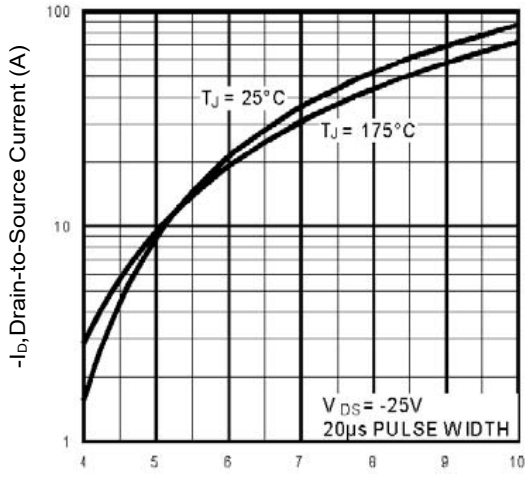

-$V_{DS}$,Drain-to-Source Voltage (V)

Figure 1: Typical Output Characteristics



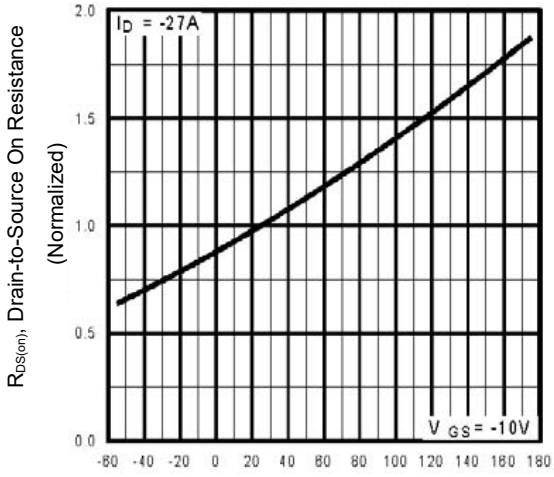

-$V_{DS}$,Drain-to-Source Voltage (V)

Figure 2: Typical Output Characteristics




-$V_{GS}$, Gate-to-Source Voltage (V)

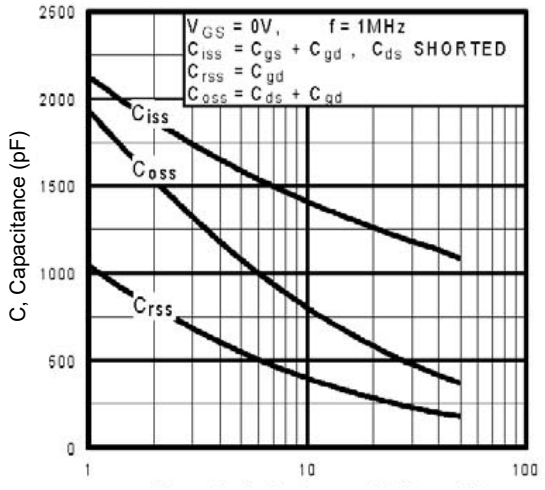
Figure 3: Typical Transfer Characteristics




$T_J$, Junction Temperature (°C)

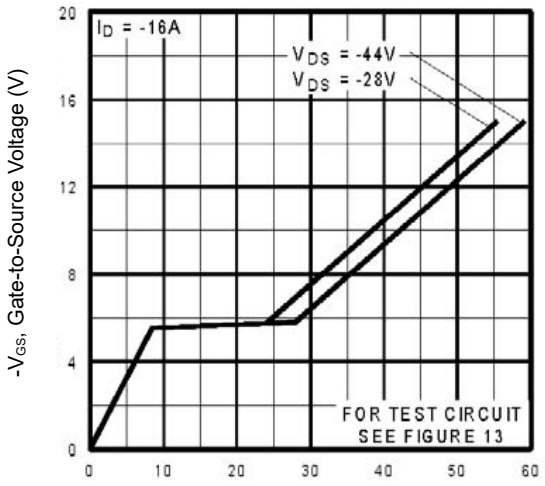
Figure 4: Nomalized On-ResistanceVs. Temperature

## 6.2Typical Characterisitics



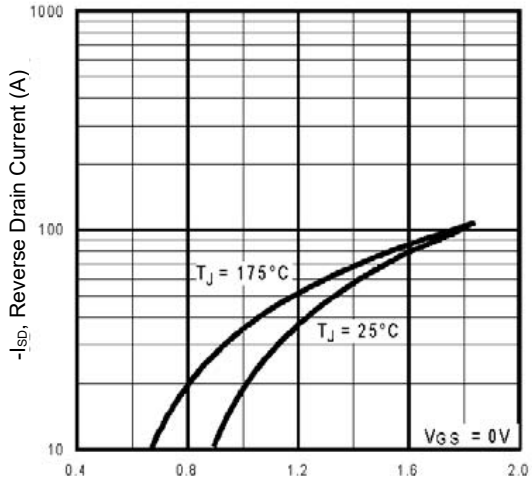

$-V_{DS}$ ,Drain-to-Source Voltage (V)

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



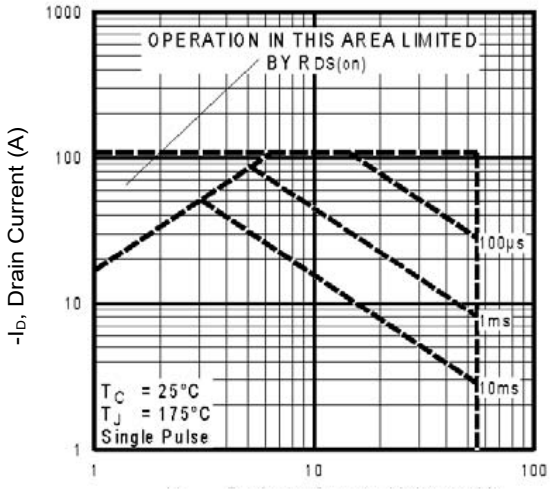

$Q_G$, Total Gate Charge (nC)

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




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

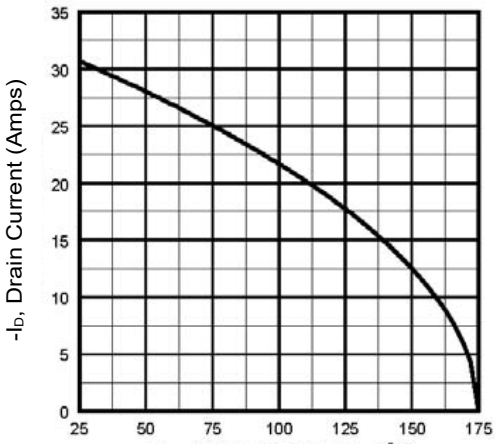
Figure 7: Typical Source-Drain Diode Forward Voltage




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

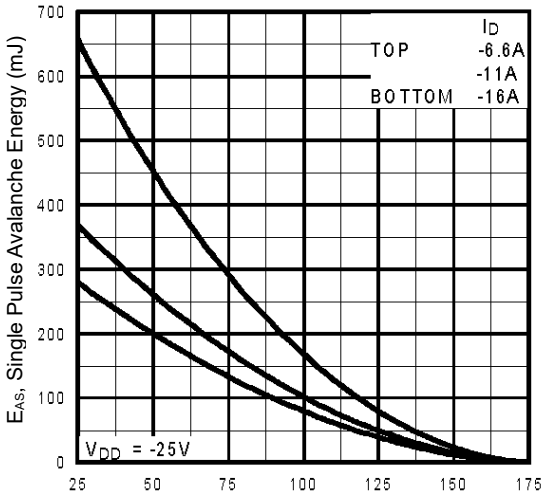
Figure 8: Maximum Safe Operating Area

## 6.3Typical Characterisitics



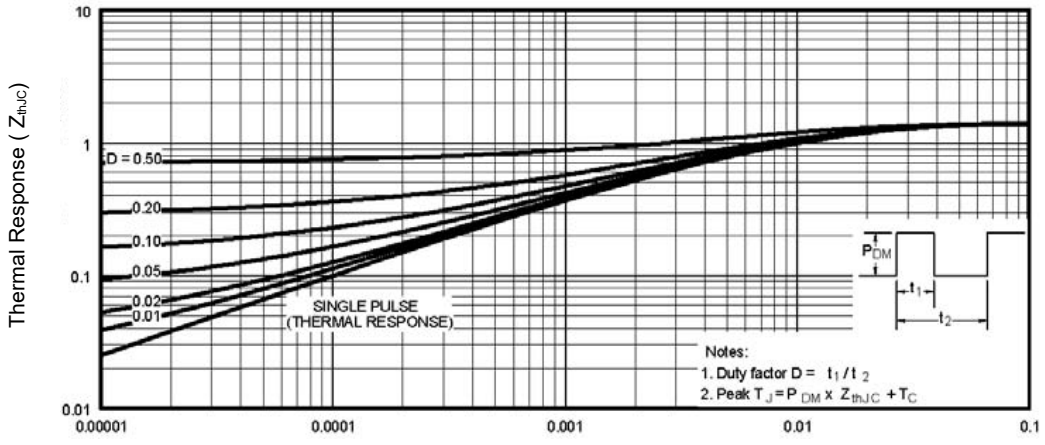

$T_C$, Case Temperature (°C)

Figure 9: Maximum Drain Current Vs. Case Temperature




Starting $T_J$, Junction Temperature (°C)

Figure 10: Maximum Avalanche Energy Vs. Drain Current




$t_1$ , Rectangular Pulse Duration (sec)

Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

## 6.4Typical Characterisitics

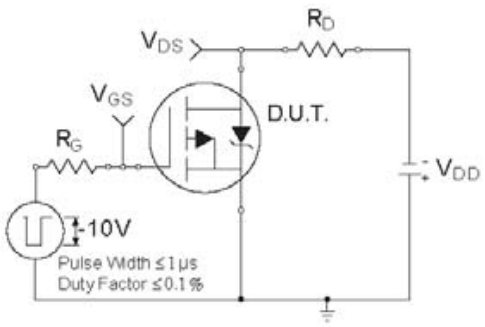



Figure 12a: Switching Time Test Circuit

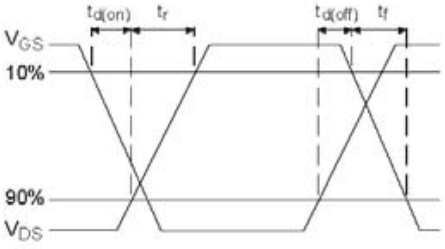



Figure 12b: Switching Time Waveforms

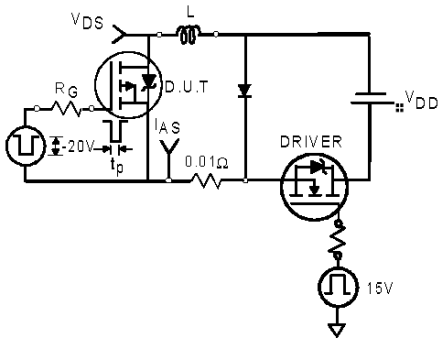



Figure 13a: Unclamped Inductive Test Circuit

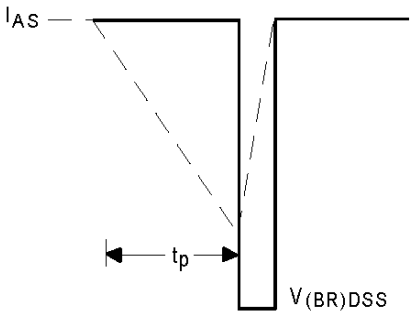



Figure 13b: Unclamped Inductive Waveforms

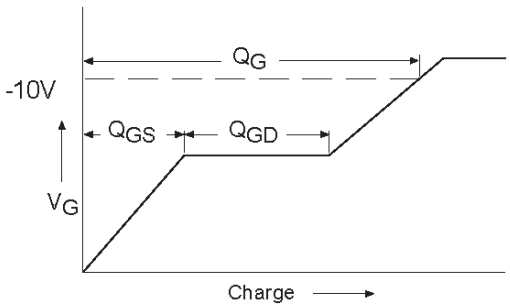



Figure 14a: Basic Gate Charge Waveform

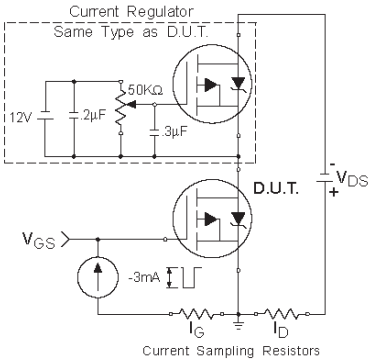
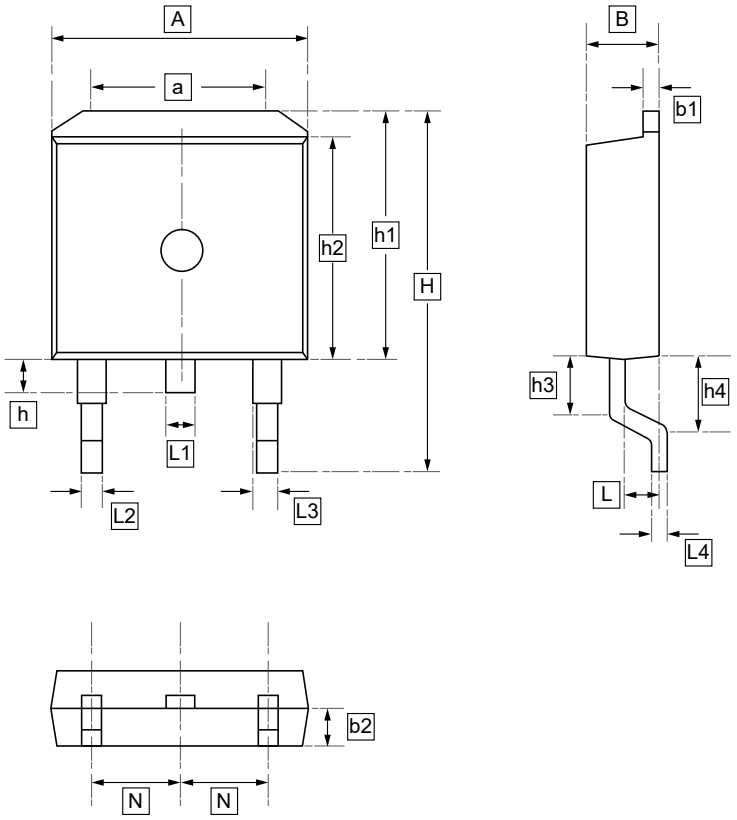



Figure 14b: Gate Charge Test Circuit

## 7.TO-263 Package Outline Dimensions

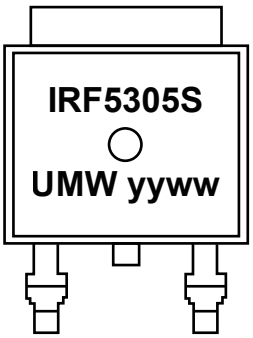



**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | a | B | b1 | b2 | H | h | h1 | h2 | h3 | h4 | L | L1 | L2 | L3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min | 9.6 | 7.2 | 4.3 | 1.25 | 2.2 | 15.2 | 1.34 | 10.3 | 9.1 | 1.34 | 2.5 | 2.2 | 1.2 | 0.7 | 1.2 |
| Max | 10.0 | 7.6 | 4.7 | 1.35 | 2.6 | 15.8 | 1.74 | 10.7 | 9.3 | 1.74 | 2.9 | 2.6 | 1.4 | 0.9 | 1.4 |

| Symbol | L4 | N |
|---|---|---|
| Min | 0.4 | 2.4 |
| Max | 0.6 | 2.5 |

## 8.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW IRF5305STRL | TO-263 | 800 | Tape and reel |

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