# UMW IRF7413TR

30V N-Channel MOSFET

## 1.Description

The IRF7413TR uses advanced trench technology to provide excellent $R_{DS(on)}$ with low gate charge. This device is suitable for use as a loads witch or in PWM applications.

## 2.Features

- $V_{DS\ (V)}$=30V
- $I_D$=13A
- $R_{DS(ON)}$＜12mΩ($V_{GS}$=10V)
- $R_{DS(ON)}$＜17mΩ($V_{GS}$=4.5V)

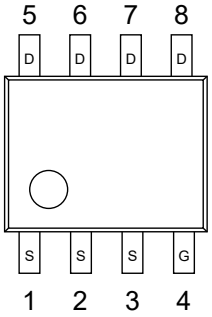
## 3.Application

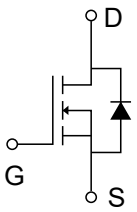
- Generation VTechnology
- Ultra Low On-Resistance
- N-Channel Mosfet
- Surface Mount
- Available in Tape &Reel
- Dynamic dv/dt Rating
- Fast Switching
- 100% Rg Tested
- Lead-Free

## 4.Pinning information

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

**SOP-8**




## 5.Maximum ratings ($T_A$=25°C unless otherwise noted)

| Parameter | | Symbol | Value | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current, $V_{GS}$ @ 10V | $T_A$=25°C | $I_D$ | 13 | A |
| Continuous Drain Current, $V_{GS}$ @ 10V | $T_A$=70°C | | 9.2 | |
| Pulsed Drain Current ① | | $I_{DM}$ | 58 | |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2.5 | W |
| Linear Derating Factor | | | 0.02 | mW/°C |

| | | | |
|---|---|---|---|
| Single Pulse Avalanche Energency ② | $E_{AS}$ | 260 | mJ |
| Peak Diode Recovery dv/dt ③ | dv/dt | 5 | V/ns |
| Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 150 | °C |

## 6.Thermal Resistance Rating

| Parameter | Symbol | Typ | Max | Units |
|---|---|---|---|---|
| Junction-to-Drain Lead | $R_{\theta JL}$ | | 20 | °C/W |
| Junction-to-Ambient ⑤ | $R_{\theta JA}$ | | 50 | °C/W |

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

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 30 | | | V |
| Breakdown Voltage Temp. Coefficient | $\Delta V_{(BR)DSS}/T_J$ | $I_D$=1mA,Reference to 25°C | | 0.034 | | V/°C |
| Static Drain-to-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=7.3A ④ | | | 12 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=3.7A ④ | | | 17 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1 | | 3 | V |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=10V, $I_D$=3.7A | 10 | | | S |
| Drain-to-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=30V, $V_{GS}$=0V | | | 12 | μA |
| | | $V_{DS}$=24V,$V_{GS}$=0V,$T_J$=125°C | | | 25 | |
| Gate-to-Source Forward Leakage | $I_{GSS}$ | $V_{GS}$=-20V | | | -100 | nA |
| Gate-to-Source Reverse Leakage | | $V_{GS}$=20V | | | 100 | |
| Total Gate Charge | $Q_g$ | $I_D$=7.3A | | 52 | 79 | nC |
| Gate-to-Source Charge | $Q_{gs}$ | $V_{DS}$=24V, $V_{GS}$=10V | | 6.1 | 9.2 | |
| Gate-to-Drain ("Miller") Charge | $Q_{gd}$ | See Fig. 6 and 9 ④ | | 16 | 23 | |
| Gate Resistance | $R_G$ | | | | 3.7 | Ω |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{DD}$=15V | | 8.6 | | ns |
| Rise Time | $t_r$ | $I_D$=7.3A | | 50 | | |
| Turn-Off Delay Time | $t_{D(off)}$ | $R_G$=6.2Ω | | 52 | | |
| Fall Time | $t_f$ | See Fig. 10 ④ | | 46 | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V | | 1800 | | pF |
| Output Capacitance | $C_{oss}$ | $V_{DS}$=25V | | 680 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | $f$=1.0MHz, See Fig. 5 | | 240 | | |

| Source-Drain Ratings and Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Continuous Source Current (Body Diode) | $I_S$ | MOSFET symbol showing the integral reverse p-n junction diode. | | | 3.1 | A |
| Pulsed Source Current (Body Diode) ① | $I_{SM}$ | | | | 58 | |
| Diode Forward Voltage | $V_{SD}$ | $T_J$=25°C,$I_S$=7.3A,$V_{GS}$=0V③ | | | 1 | V |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C, $I_F$=7.3A | | 74 | 110 | ns |
| Reverse Recovery Charge | $Q_{rr}$ | dI/dt=100A/μs | | 200 | 300 | nC |

Notes:

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

② Starting T,= 25'C,L= 9.8mH

$R_G$= 252, IAs =7.3A.(See Figure 12)

③ $I_{SD}$≤ 7.3A, di/dt ≤ 100A/μS, $V_{DD}$≤ $V_{(BR)DSS}$.TJ≤ 150°C

④ Pulse width ≤ 300us; duty cycle ≤ 2%

⑤ Surface mounted on FR-4 board

⑥ Rois measured at T,approximately 90°C

## 7.1Typical Characterisitics

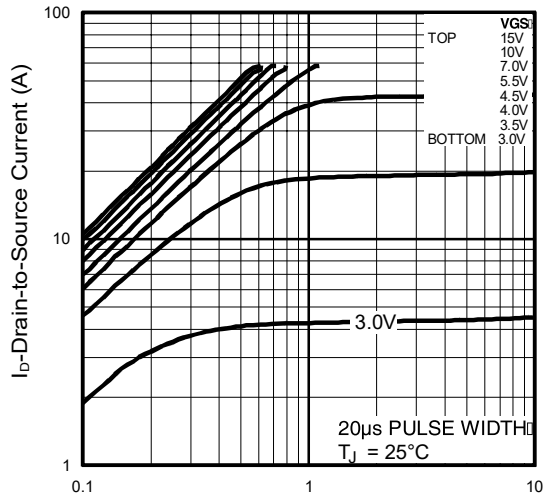



Fig 1. Typical Output Characteristics

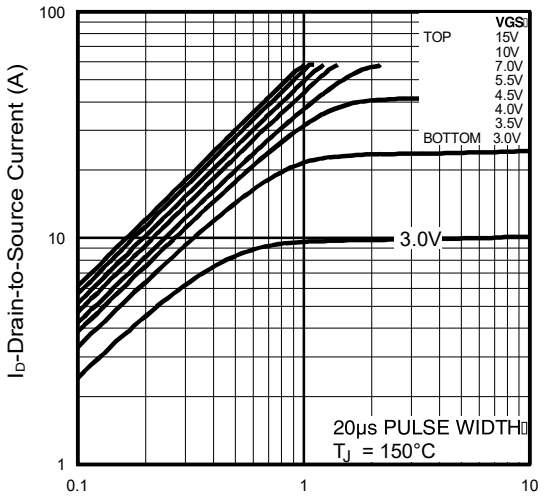



Fig 2. Typical Output Characteristics

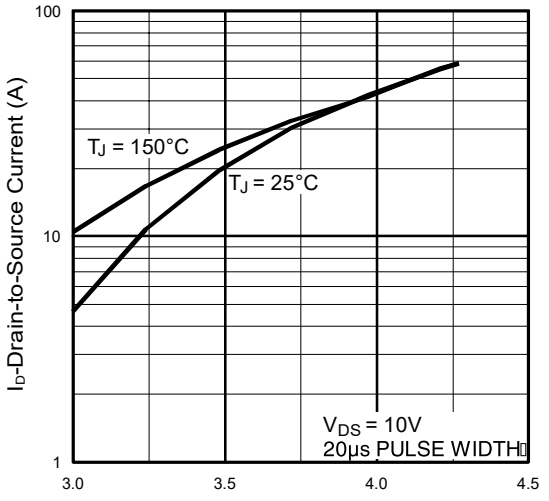



Fig 3. Typical Transfer Characteristics

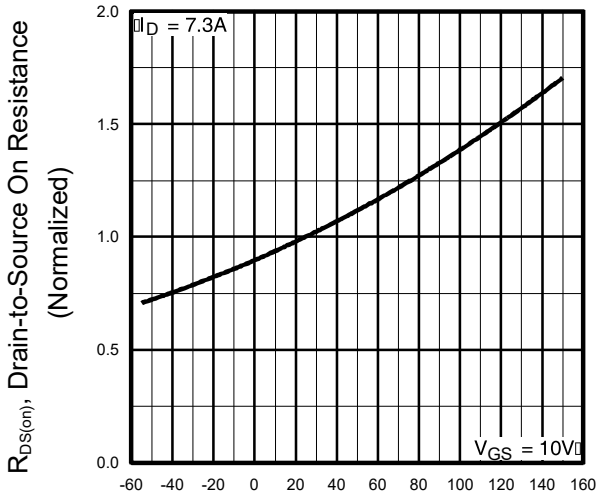
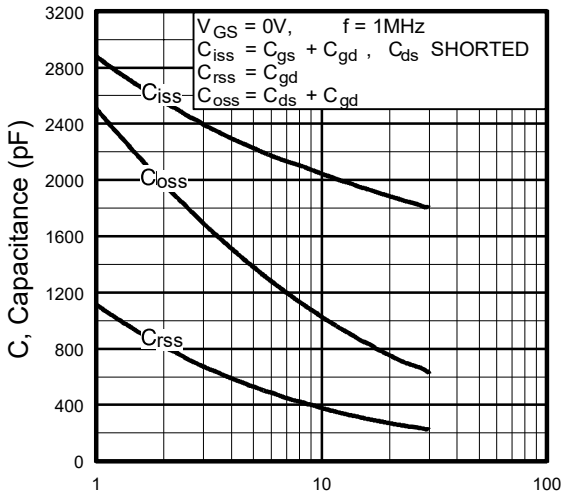


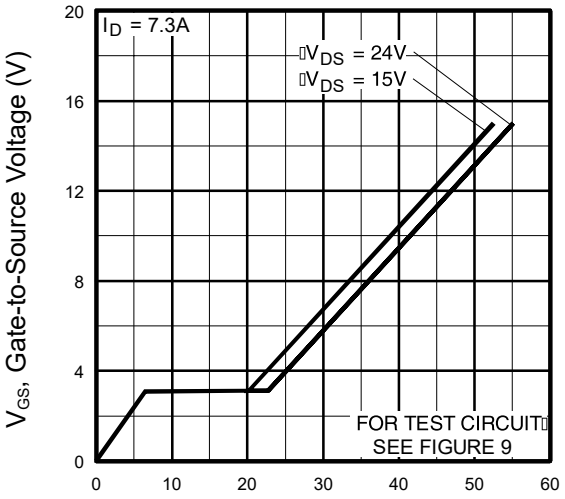

Fig 4. Nomalized On-ResistanceVs. Temperature

## 7.2Typical Characterisitics



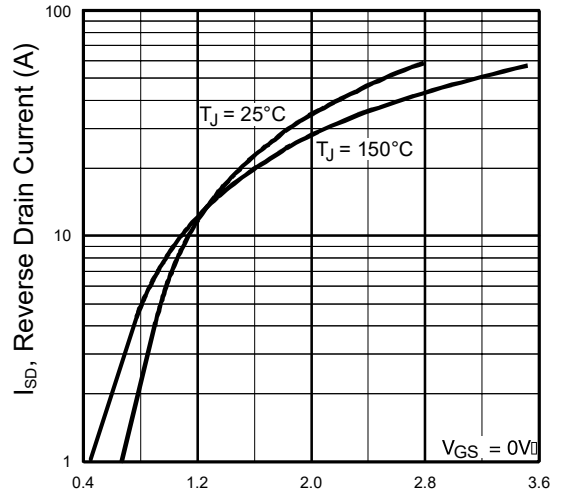

$V_{DS}$ ,Drain-to-Source Voltage (V)

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



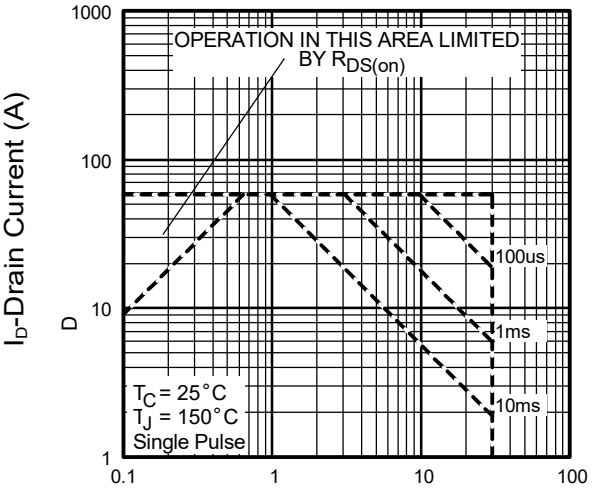

$Q_G$, Total Gate Charge (nC)

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

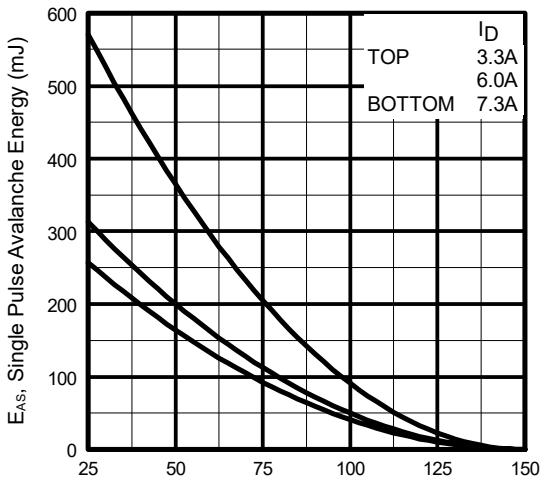



Fig 9. Maximum Avalanche EnergyVs. Drain Current

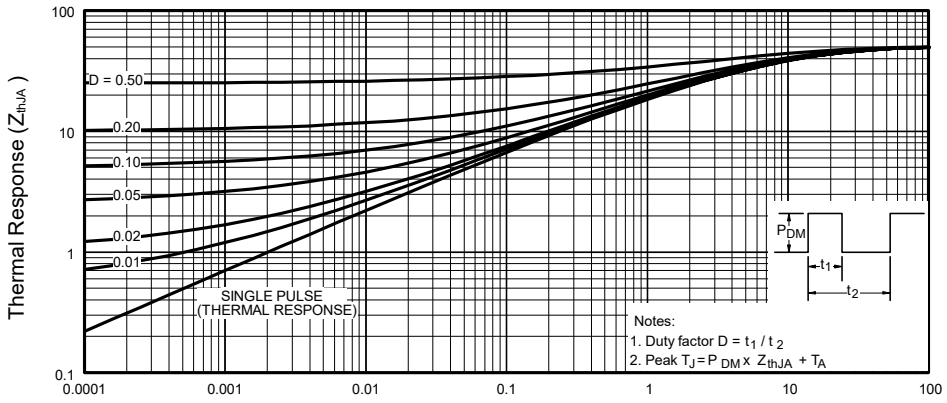



Fig 10. Maximum Effective Transient Themal Impedance, Junction-to-Ambient

## 7.4Typical Characterisitics

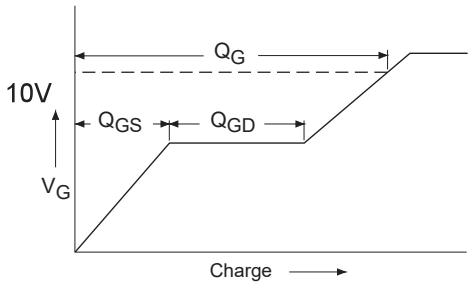



**Fig 9a.** Basic Gate Charge Waveform

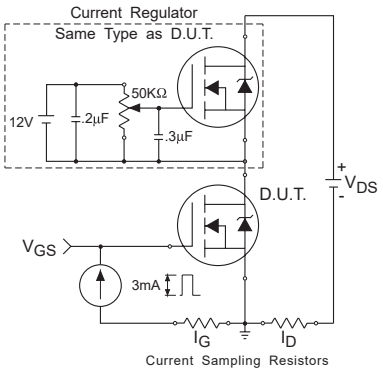



**Fig 9b.** Gate Charge Test Circuit

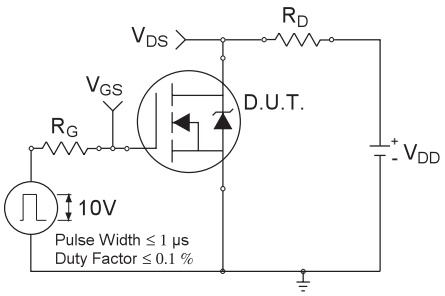



**Fig 10a.** Switching Time Test Circuit

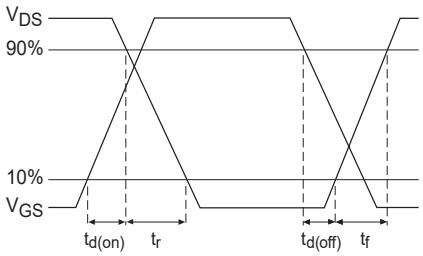



**Fig 10b.** Switching Time Waveforms

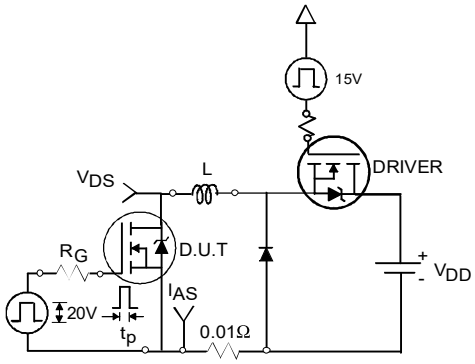



**Fig 12a.** Unclamped Inductive Test Circuit

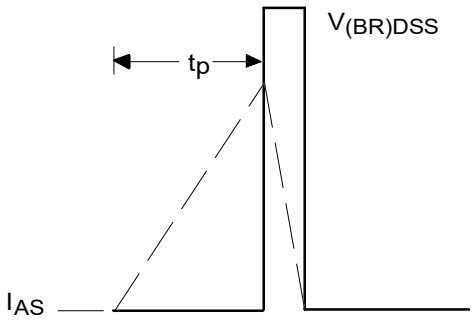
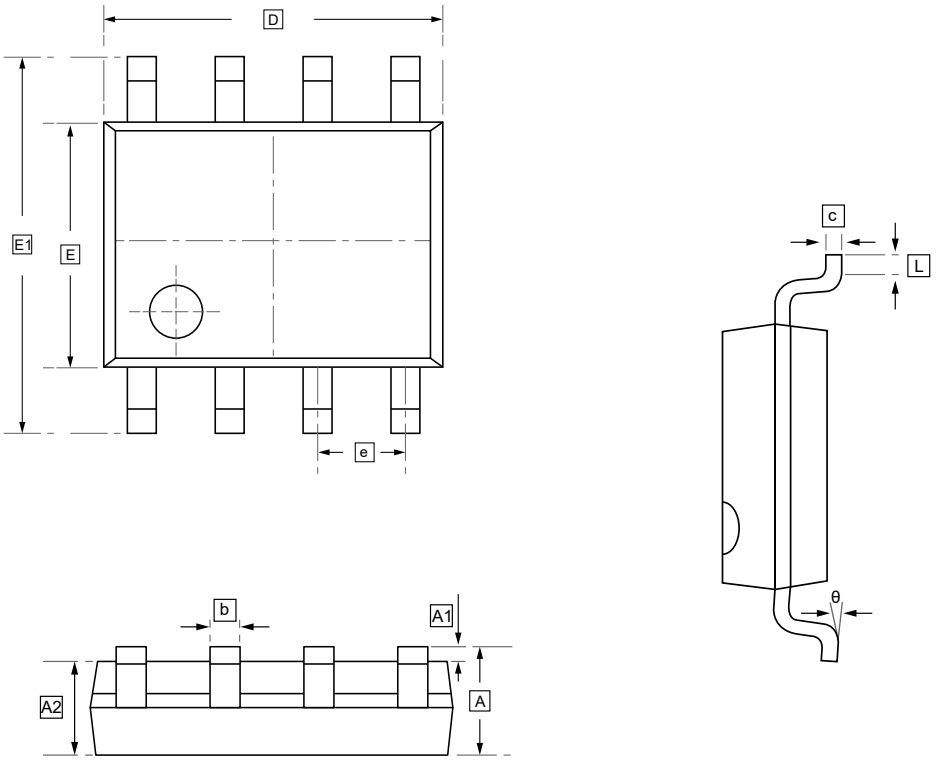



**Fig 12b.** Unclamped Inductive Waveforms

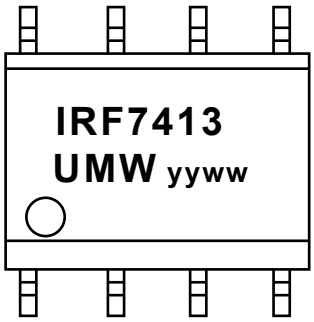
## 8.SOP-8 Package Outline Dimensions




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

| Symbol | A | A1 | A2 | b | c | D | E | E1 | e | L | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Min** | 1.350 | 0.000 | 1.350 | 0.330 | 0.170 | 4.700 | 3.800 | 5.800 | 1.270 | 0.400 | 0° |
| **Max** | 1.750 | 0.100 | 1.550 | 0.510 | 0.250 | 5.100 | 4.000 | 6.200 | BSC | 1.270 | 8° |

## 9.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW IRF7413TR | SOP-8 | 3000 | Tape and reel |

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