UMW IRFR3910TR

100V N-Channel MOSFET

1.Description

The D-PAK is designed for surface mounting using vapor phase,infrared,or wave soldering techniques.Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.

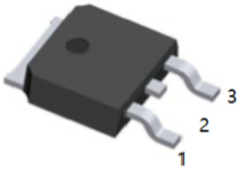
2.Features

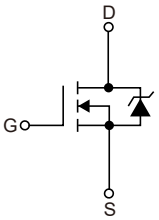
- $V_{DS\ (V)}$=100V
- I_D=16A
- $R_{DS(ON)}$=115mΩ(V_{GS}=10V)

3.Pinning information

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

TO-252(DPAK)
top view





4.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, V_{GS}=10V	T_C=25°C	I_D	16	A
Continuous Drain Current, V_{GS}=10V	T_C=100°C		12	A
Pulsed Drain Current ①		I_{DM}	60	A
Power Dissipation	T_C=25°C	P_D	79	W
Linear Derating Factor			0.53	W/°C
Gate-to-Source Voltage		V_{GS}	±20	V
Single Pulse Avalanche Energy ②⑥		E_{AS}	150	mJ
Avalanche Current ①⑥		I_{AR}	9	A
Repetitive Avalanche Energy ①⑥		E_{AR}	7.9	mJ
Peak Diode Recovery dv/dt ③		dv/dt	5	V/ns
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C
Soldering Temperature, for 10 seconds			300 (1.6mm from case)	°C

5.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case	$R_{\theta JC}$		1.9	°C/W
Junction-to-Ambient (PCB Mount) *	$R_{\theta JA}$		50	°C/W
Junction-to-Ambient	$R_{\theta JA}$		110	°C/W

6.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	100			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D=1mA,Reference to 25°C		0.12		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A ④			115	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2		4	V
Forward Transconductance	g_{FS}	V_{DS}=50V, I_D=9A ⑥	6.4			S
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=100V, V_{GS}=0V			25	μA
		V_{DS}=80V,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=9A			44	nC
Gate-to-Source Charge	Q_{gs}	V_{DS}=80V, V_{GS}=10V			6.2	nC
Gate-to-Drain ("Miller") Charge	Q_{gd}	See Fig.6 and 13 ④⑥			21	nC
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=50V, I_D=9A R_G=12Ω, R_D=5.5Ω See Fig.10 ④⑥		6.4		ns
Rise Time	t_r			27		ns
Turn-Off Delay Time	$t_{D(off)}$			37		ns
Fall Time	t_f			25		ns
Internal Drain inductance	L_D	Between lead, 6mm (0.25in.)from package and center of die contact ⑤		4.5		nH
Internal Source inductance	L_S			7.5		nH
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V f=1MHz, See Fig. 5 ⑥		640		pF
Output Capacitance	C_{oss}			160		pF
Reverse Transfer Capacitance	C_{rss}			88		pF

Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			16	A
Pulsed Source Current (Body Diode) ①⑥	I_{SM}				60	A
Diode Forward Voltage	V_{SD}	T_J=25°C, I_S=9A, V_{GS}=0V ④			1.3	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=9A dI/dt=100A/μs ④⑥		130	190	ns
Reverse Recovery Charge	Q_{rr}			650	970	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=3.1mH, R_G=25Ω, I_{AS}=9A.(See figure.12)

③ I_{SD} ≤ 9A, di/dt ≤520A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

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

⑤ This is applied for I-PAK, L_s of D-PAK is measured between lead andcenter of die contact.

⑥ Uses IRF530N data and test conditions.

**When mounted on 1" square PCB (FR-4 or G-10 Material)

For recommended footprint and soldering techniques refer to application note #AN-994.

7.1Typical Characterisitics

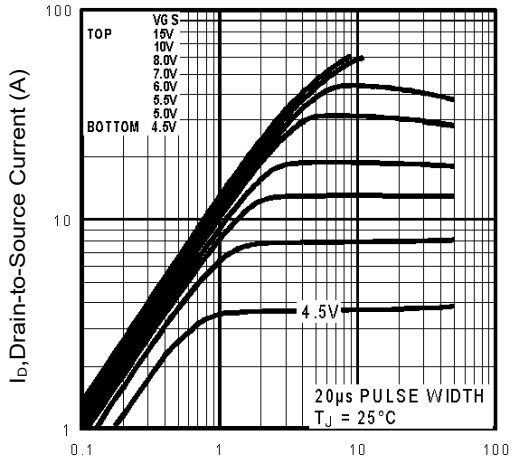


Figure 1: Typical Output Characteristics

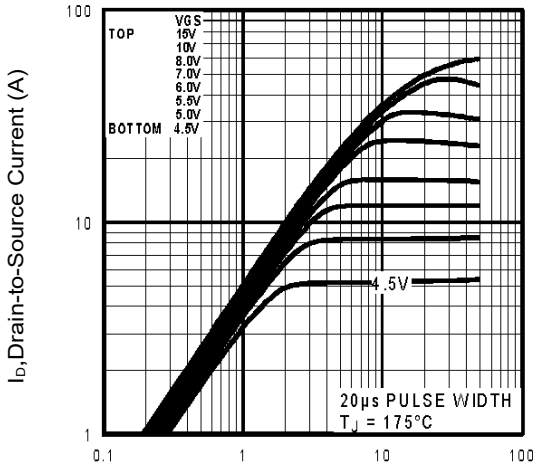


Figure 2: Typical Output Characteristics

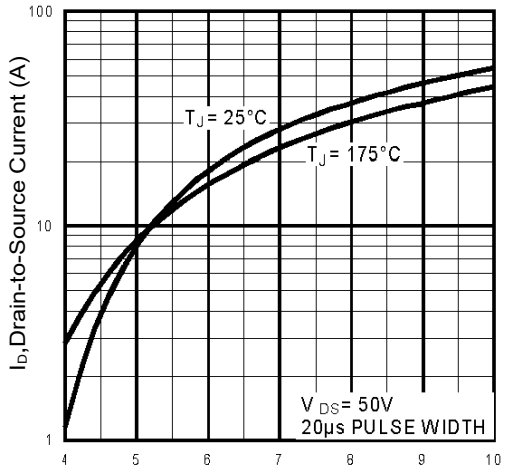


Figure 3: Typical Transfer Characteristics

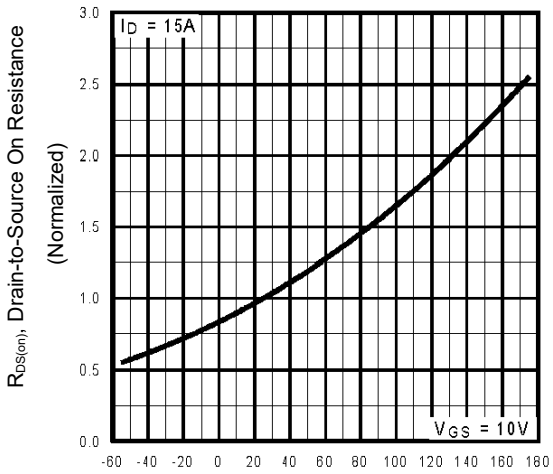
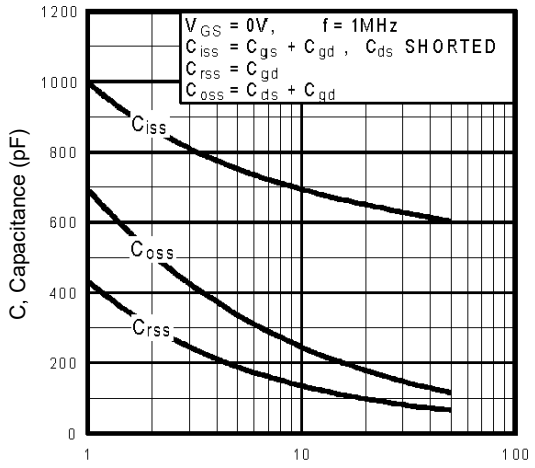


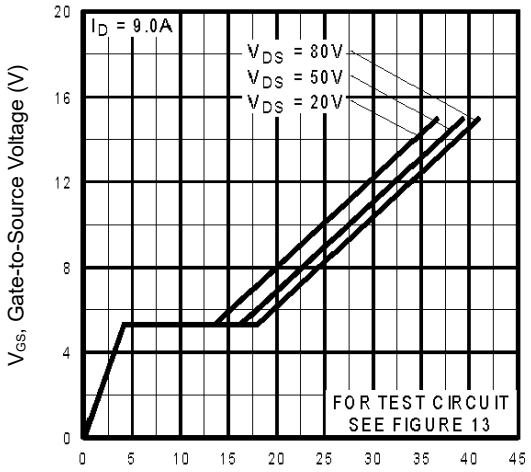
Figure 4: Nomalized On-ResistanceVs. Temperature

7.2Typical Characterisitics



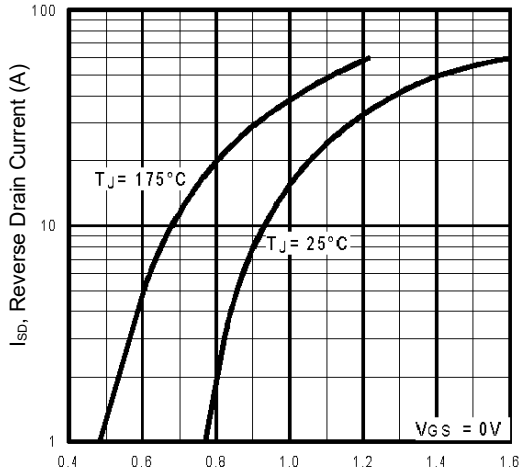
V_{DS} ,Drain-to-Source Voltage (V)

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



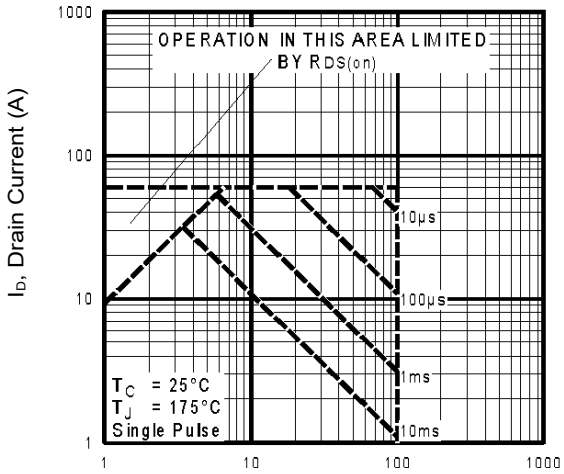
Q_G, Total Gate Charge (nC)

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

7.3Typical Characterisitics

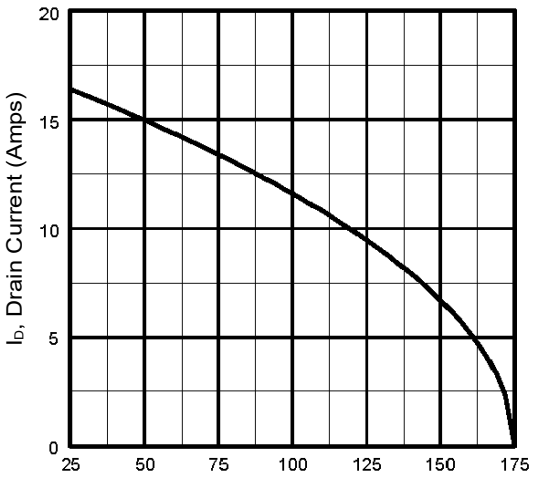


Figure 9: Maximum Drain Current Vs. Case Temperature

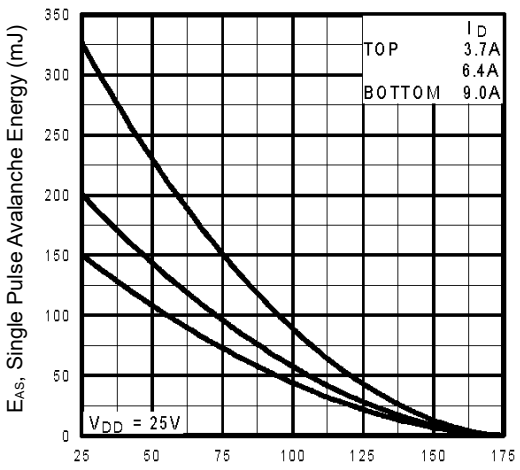


Figure 10: Maximum Avalanche Energy Vs. Drain Current

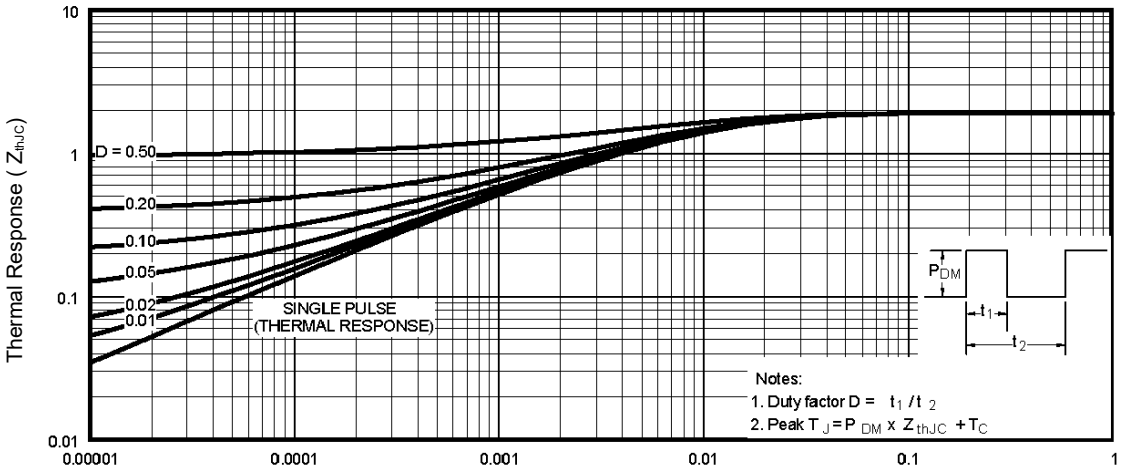


Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

7.4Typical Characterisitics

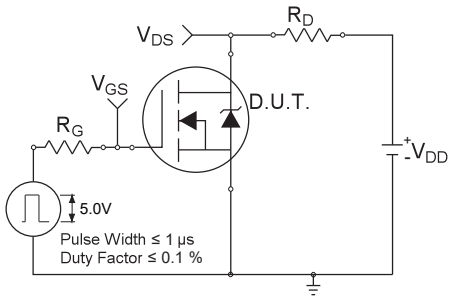


Figure 12a: Switching Time Test Circuit

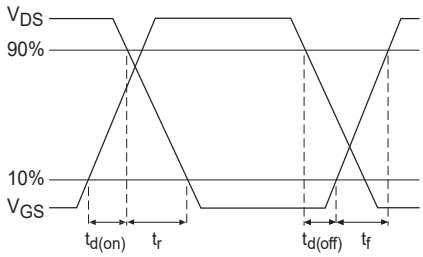


Figure 12b: Switching Time Waveforms

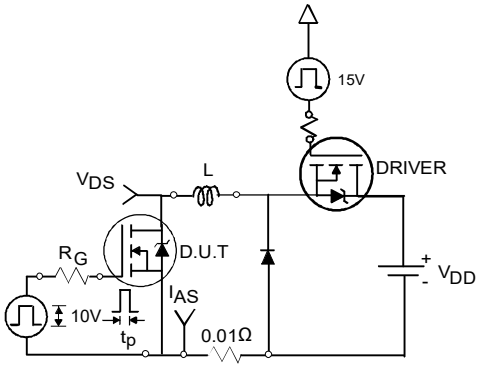


Figure 13a: Unclamped Inductive Test Circuit

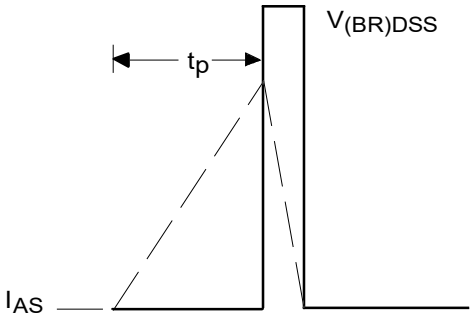


Figure 13b: Unclamped Inductive Waveforms

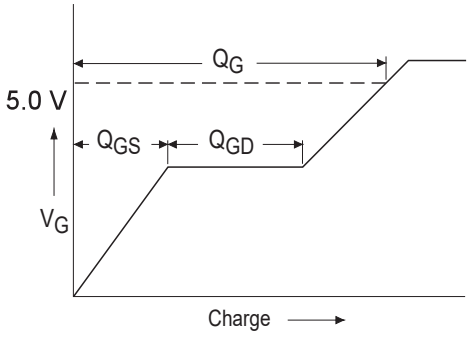


Figure 14a: Basic Gate Charge Waveform

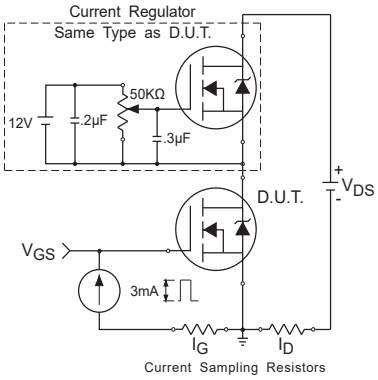
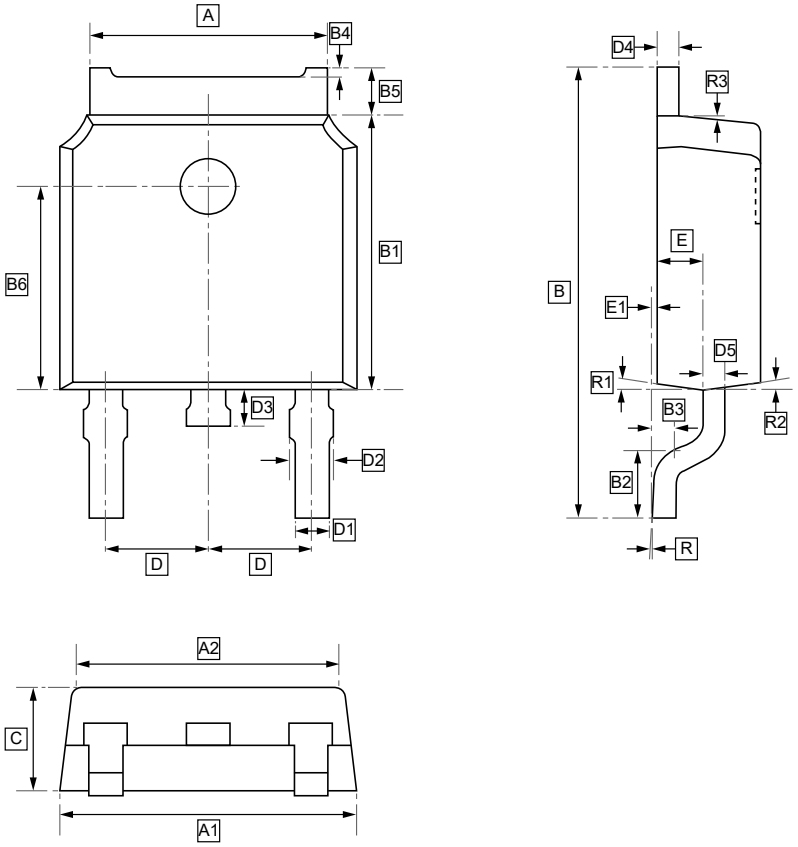


Figure 14b: Gate Charge Test Circuit

8.TO-252 Package Outline Dimensions

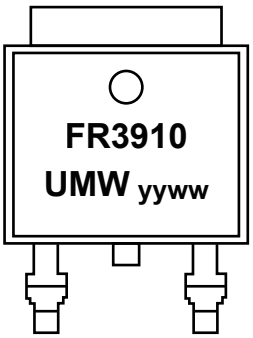


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	B2	B3	B4	B5	B6	C	D
Min	5.1	6.4	5.6	9.5	5.9	1.35	0.4	0.1	0.85	4.35	2.15	2.286
Max	5.5	6.8	6.0	10.3	6.3	1.65	0.6	(typ.)	1.05	4.65	2.45	(typ.)

Symbol	D1	D2	D3	D4	D5	E	E1	R	R1	R2	R3
Min	0.66	0.81	0.65	0.42	0.42	0.86	0.05	0°	7°	7°	7°
Max	0.86	1.01	0.95	0.58	0.58	1.16	0.05	6°	(typ.)	(typ.)	(typ.)

9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR3910TR	TO-252	2500	Tape and reel

10.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.