UMW IRFL024ZTR

55V N-Channel MOSFET

1.Description

This Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 150°C junction operating temperature, fast switching speed and improved repetitive avalanche rating.

2.1Features

- $V_{DS\ (V)}$=55V
- I_D=5.1A
- $R_{DS(ON)}$≤57.5mΩ(V_{GS}=10V)

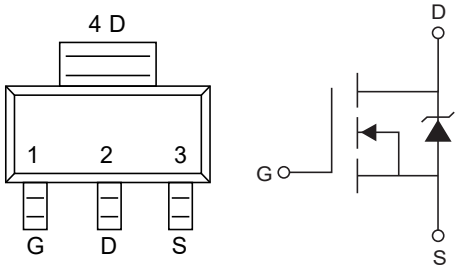
2.2Features

- Advanced Process Technology
- Ultra Low On-Resistance
- 150°C Operating Temperature
- Fast Switching

3.Pinning information

Pin	Symbol	Description
1	G	GATE
2,4	D	DRAIN
3	S	SOURCE

SOT-223 top view



4.Absolute Maximum Ratings

Parameter		Symbol	Max.	Units
Continuous Drain Current, V_{GS} @ 10V(Silicon Limited) ⑦	T_A=25°C	I_D	5.1	A
Continuous Drain Current, V_{GS} @ 10V ⑦	T_A=70°C		4.1	A
Pulsed Drain Current ①		I_{DM}	41	A
Power Dissipation ⑦	T_A=25°C	P_D	2.8	W
Power Dissipation ⑧	T_A=25°C		1	W
Linear Derating Factor ⑦			0.02	W/°C
Gate-to-Source Voltage		V_{GS}	±20	V
Single Pulse Avalanche Energy ②		$E_{AS\ (Thermally\ limited)}$	13	mJ
Single Pulse Avalanche Energy Tested Value ⑥		$E_{AS\ (Tested\ )}$	32	mJ

Avalanche Current ①	I_{AR}	See Fig.16a,	A
Repetitive Avalanche Energy ⑤	E_{AR}	16b, 13, 15	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to 150	°C

5.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Ambient (PCB mount, steady state) ⑦	R_{thJA}		45	°C/W
Junction-to-Ambient (PCB Mount, steady state) ⑧	R_{thJA}		120	°C/W

6.Electrical Characteristic (T_J=25°C unless otherwise noted)

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	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to 25°C,I_D=1mA		0.053		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=3.1A ③		46.2	57.5	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2		4	V
Forward Transconductance	g_{FS}	V_{DS}=25V, I_D=3.1A	6.2			S
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=55V, V_{GS}=0V			20	μA
		V_{DS}=55V, V_{GS}=0V, T_J=125°C			250	μA
Gate-to-Source Forward Leakage	I_{GSS}	V_{GS}=20V			200	nA
Gate-to-Source Reverse Leakage		V_{GS}=-20V			-200	nA
Total Gate Charge	Q_g	I_D=3.1A,V_{DS}=44V,V_{GS}=10V③		9.1	14	nC
Gate-to-Source Charge	Q_{gs}			1.9		nC
Gate-to-Drain ("Miller") Charge	Q_{gd}			3.9		nC
Tum-On Delay Time	$t_{D(on)}$	V_{DD}=28V, I_D=3.1A R_G=53Ω, V_{GS}=10V ③		7.8		ns
Rise Time	t_r			21		ns
Turn-Off Delay Time	$t_{D(off)}$			30		ns
Fall Time	t_f			23		ns
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz		340		pF
Output Capacitance	C_{oss}			68		pF
Reverse Transfer Capacitance	C_{rss}			39		pF
Output Capacitance	C_{oss}	V_{GS}=0V, V_{DS}=1V, f=1MHz		210		pF
Output Capacitance	C_{oss}	V_{GS}=0V, V_{DS}=44V, f=1MHz		55		pF
Effective Output Capacitance	C_{oss}eff.	V_{GS}=0V, V_{DS}=0V to 44V ④		93		pF

Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			5.1	A
Pulsed Source Current (Body Diode) ①	I_{SM}				41	A
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=3.1A,V_{GS}=0V③			1.3	V
Reverse Recovery Time	t_{rr}	T_J=25°C,I_F=3.1A,V_{DD}=28V		15	23	ns
Reverse Recovery Charge	Q_{rr}	di/dt=100A/μs ③		9.8	15	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. 14).

② Limited by T_{Jmax}, starting T_J=25°C, L=2.8mH, R_G=25Ω, I_{AS}=3.1A, V_{GS}=10V. Part not recommended for use above this value.

③ Pulse width ≤ 1ms; duty cycle ≤ 2%.

④ C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑤ Limited by TJmax , see Fig.16a, 16b, 13, 15 for typical repetitive avalanche performance.

⑥ This value determined from sample failure population. 100% tested to this value in production.

⑦ When mounted on 1 inch square copper board.

⑧ When mounted on FR-4 board using minimum recommended footprint.

7.1Typical Characterisitics

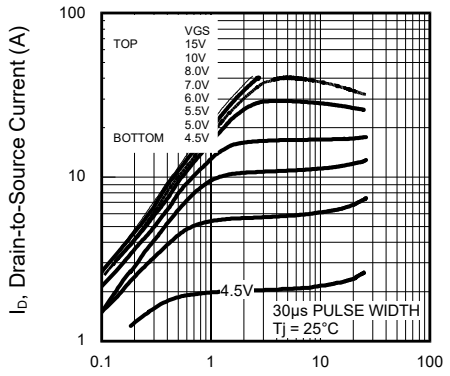


Figure 1: Typical On-Resistance vs. Gate Voltage

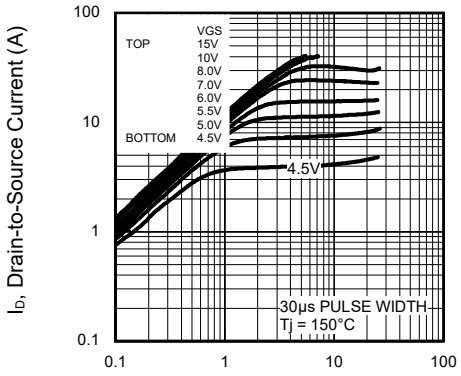


Figure 2: Typical Output Characteristics

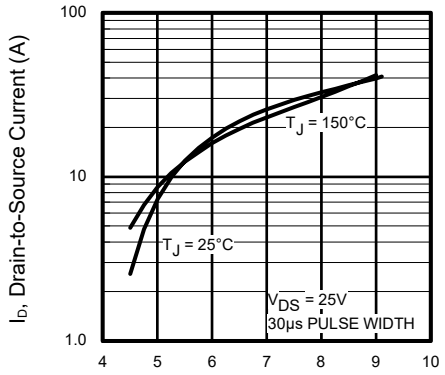


Figure 3: Typical Output Characteristics

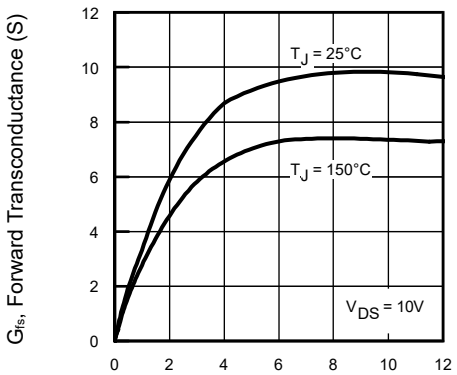


Figure 4: Typical Forward Transconductance Vs. Drain Current

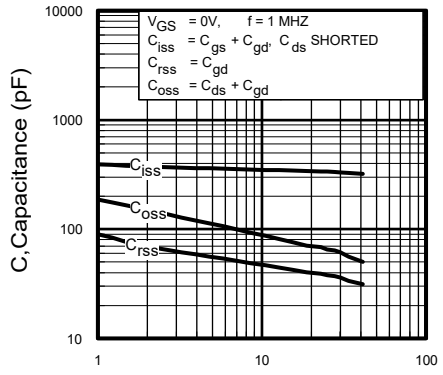


Figure 5: Typical Capacitance vs. Drain-to-Source Voltage

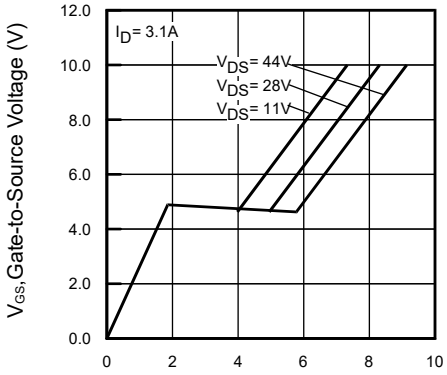


Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage

7.2Typical Characterisitics

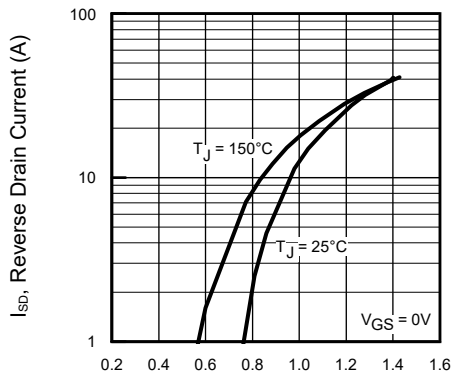


Figure 7: Typical Capacitance vs. Drain-to-Source Voltage

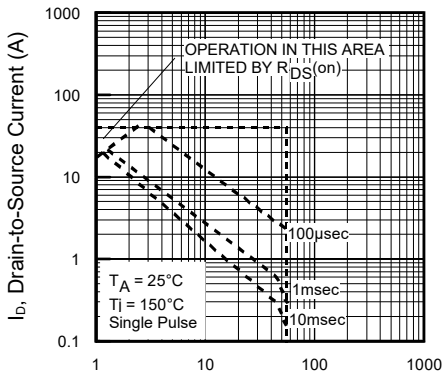


Figure 8: Maximum Safe Operating Area

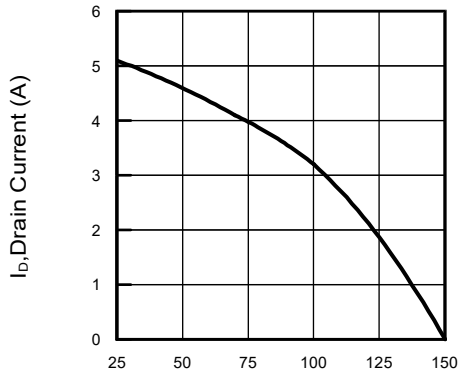


Figure 9: Maximum Drain Current Vs. Ambient Temperature

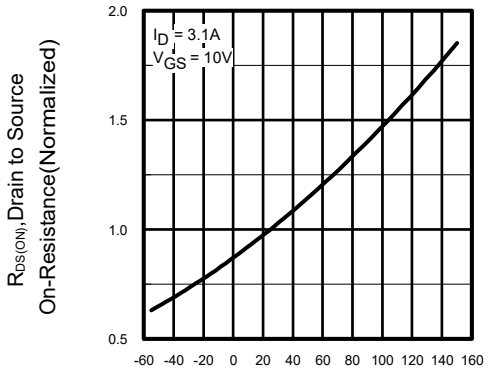


Figure 10: Normalized On-Resistance Vs. Temperature

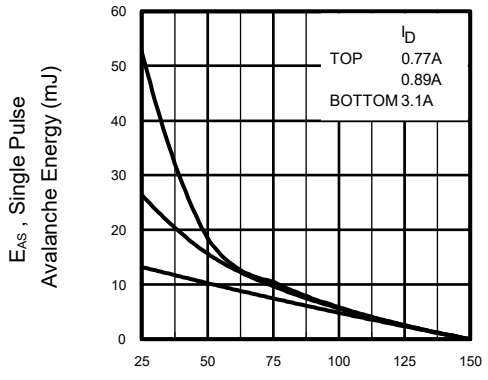


Figure 11: Typical On-Resistance vs. Drain Current

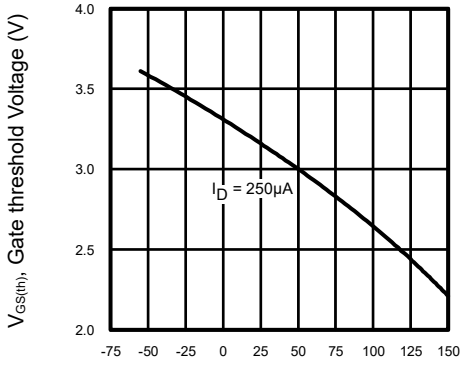


Figure 12: Threshold Voltage Vs. Temperature

7.3Typical Characterisitics

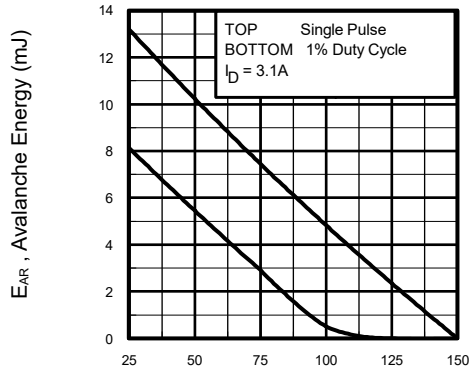


Figure 13: Maximum Avalanche Energy vs. Temperature

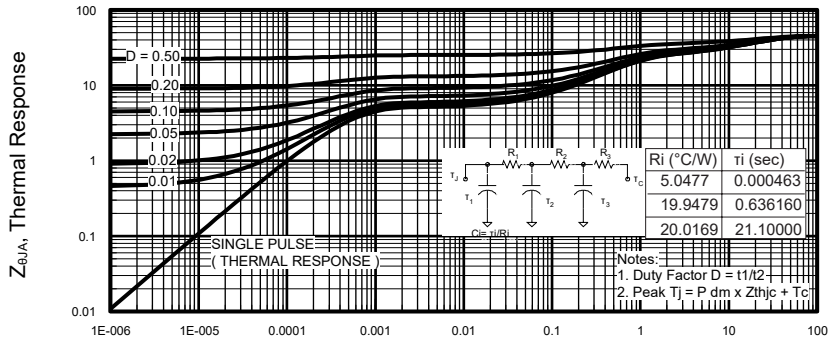


Figure 14: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

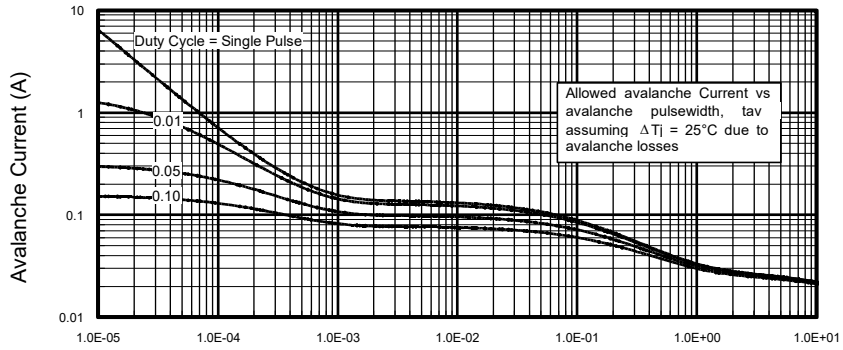


Figure 15: Typical Avalanche Current vs.Pulse width

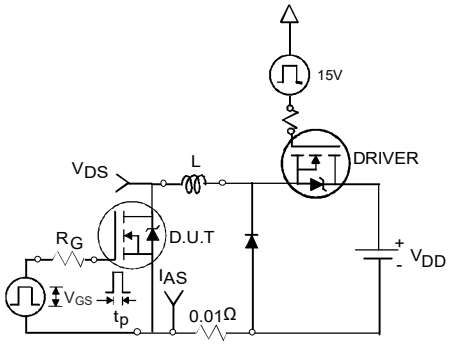


Figure 16a: Unclamped Inductive Test Circuit

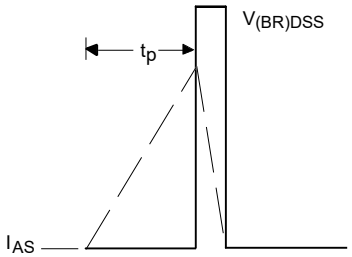


Figure 16b: Unclamped Inductive Waveforms

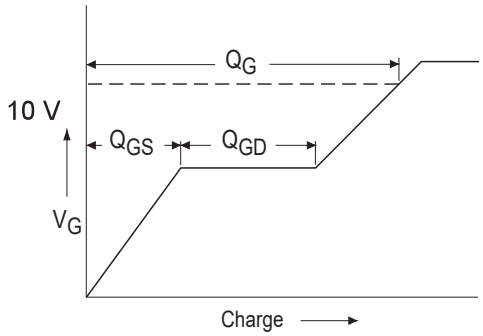


Figure 17a: Gate Charge Test Circuit

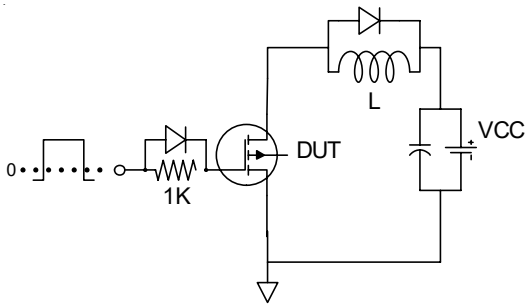
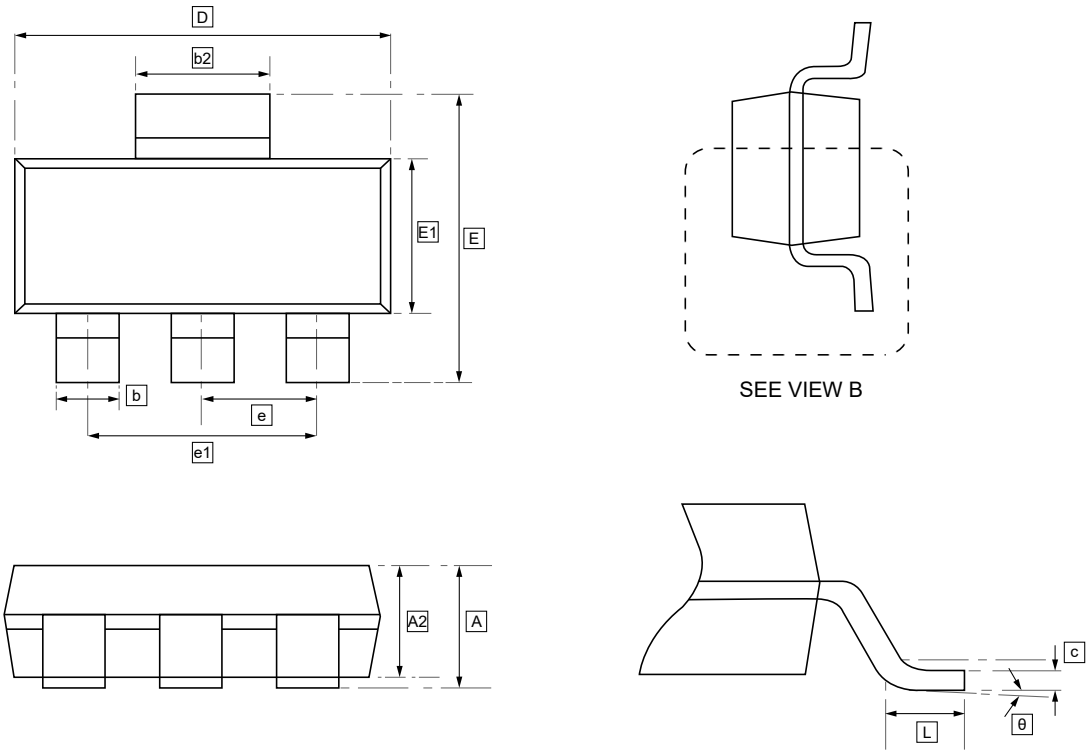


Figure 17b: Threshold Voltage Vs. Temperature

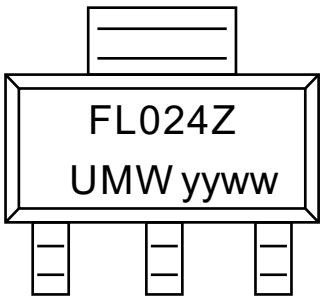
8.SOT-223 Package Outlie Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b2	c	D	E	E1	e	e1	L	θ
Min	1.50	0.02	1.50	0.66	2.90	0.23	6.30	6.70	3.30	2.30	4.60	0.90	0°
Max	1.80	0.10	1.70	0.84	3.10	0.33	6.70	7.30	3.70	BSC	BSC	1.10	8°

9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFL024ZTR	SOT-223	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.

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