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(V_{GS}=10V)
- $R_{DS(ON)}$≤57.5mΩ(V_{GS}=10V)

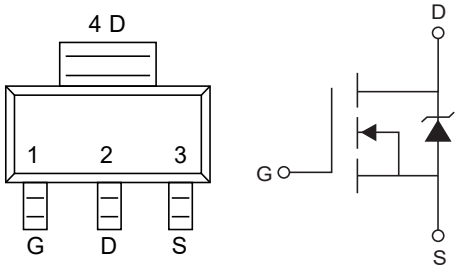
2.2Features

- 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	
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

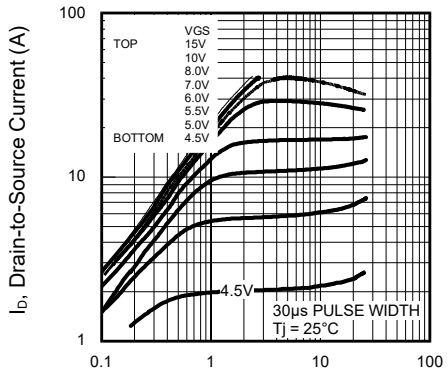


Figure 1: Typical On-Resistance vs. Gate Voltage

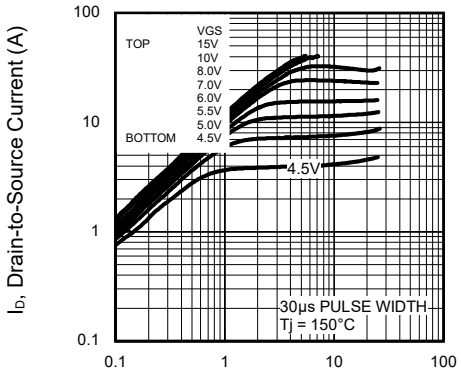


Figure 2: Typical Output Characteristics

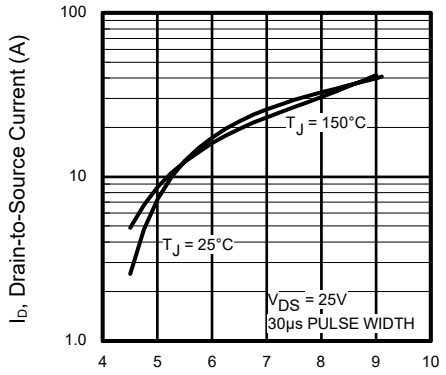


Figure 3: Typical Output Characteristics

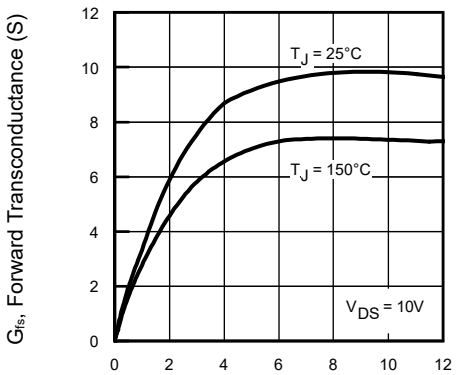


Figure 4: Typical Forward Transconductance Vs. Drain Current

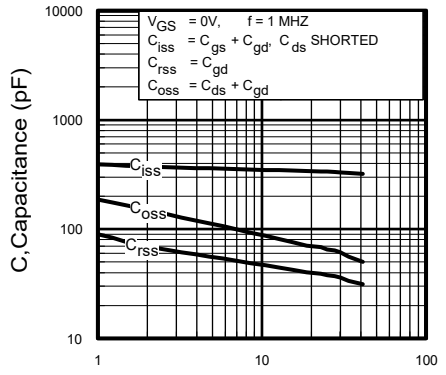


Figure 5: Typical Capacitance vs. Drain-to-Source Voltage

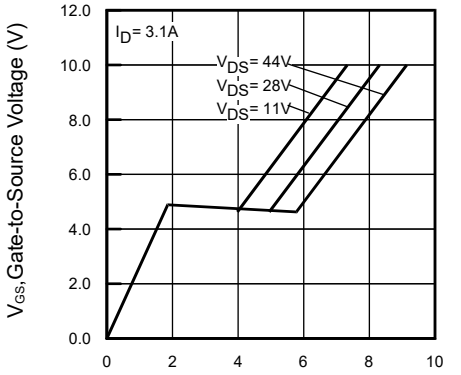


Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage

7.2Typical Characterisitics

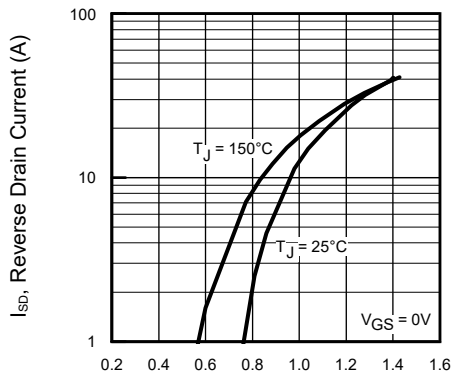


Figure 7: Typical Capacitance vs. Drain-to-Source Voltage

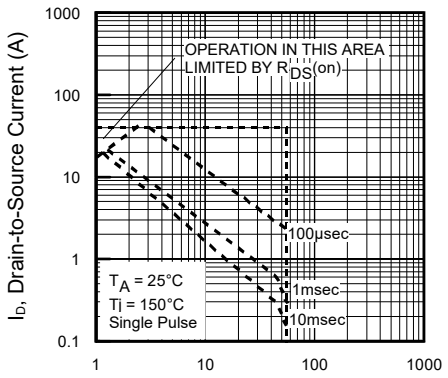


Figure 8: Maximum Safe Operating Area

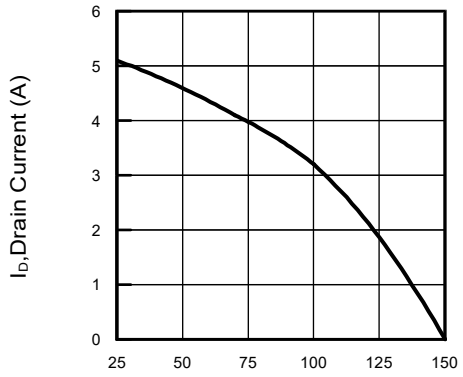


Figure 9: Maximum Drain Current Vs. Ambient Temperature

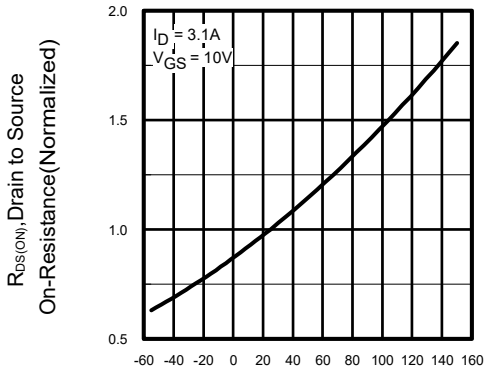


Figure 10: Normalized On-Resistance Vs. Temperature

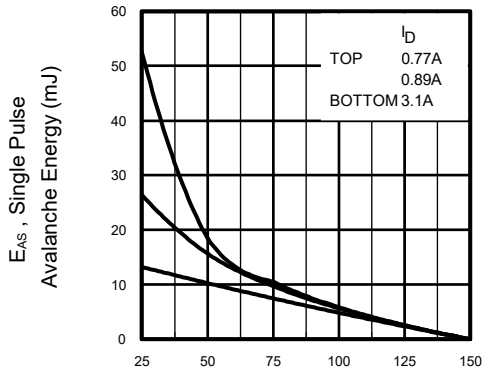


Figure 11: Typical On-Resistance vs. Drain Current

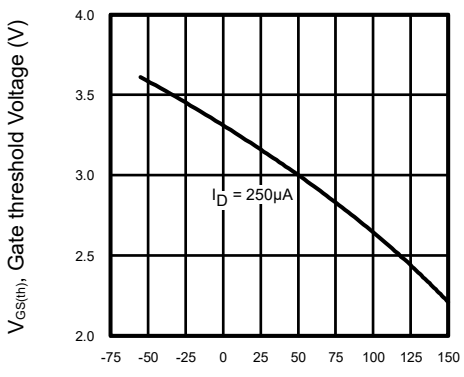


Figure 12: Threshold Voltage Vs. Temperature

7.3Typical Characterisitics

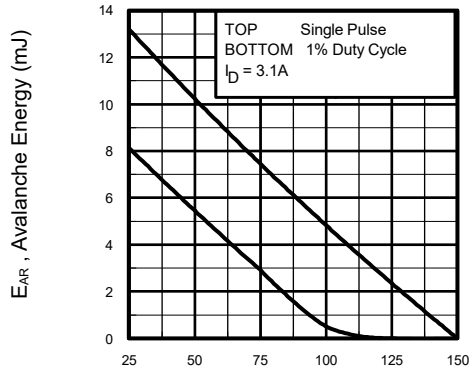


Figure 13: Maximum Avalanche Energy vs. Temperature

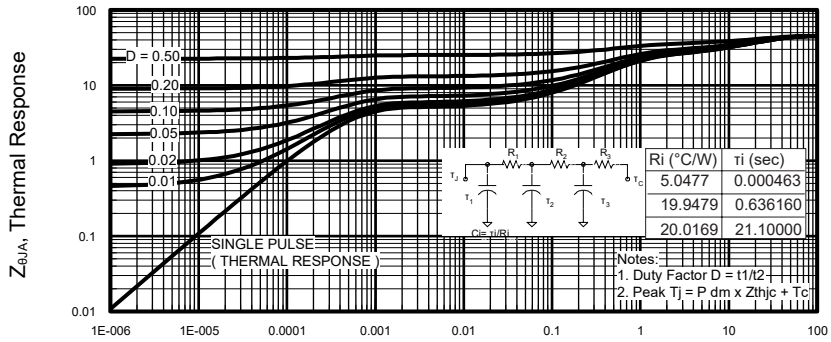


Figure 14: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

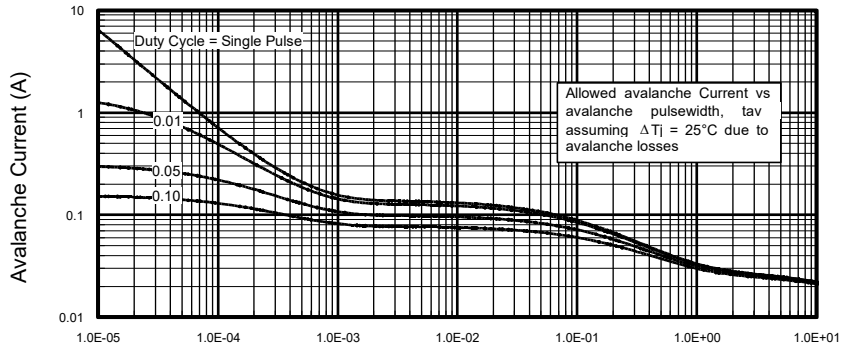


Figure 15: Typical Avalanche Current vs.Pulse width

7.4Typical Characterisitics

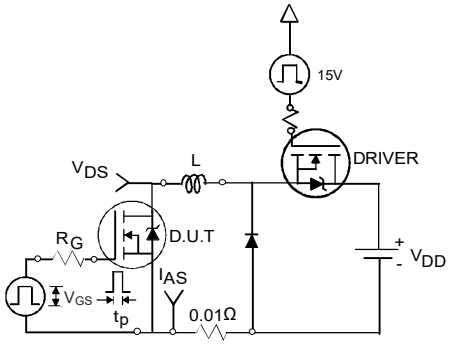


Figure 16a: Unclamped Inductive Test Circuit

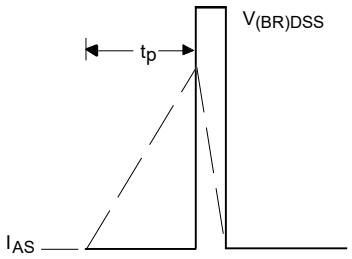


Figure 16b: Unclamped Inductive Waveforms

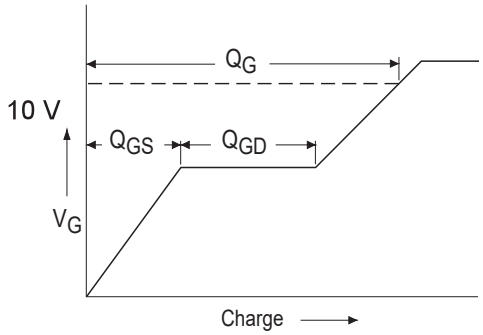


Figure 17a: Gate Charge Test Circuit

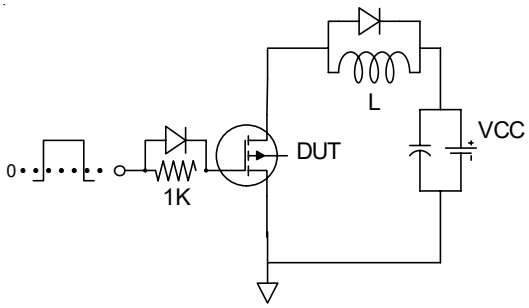
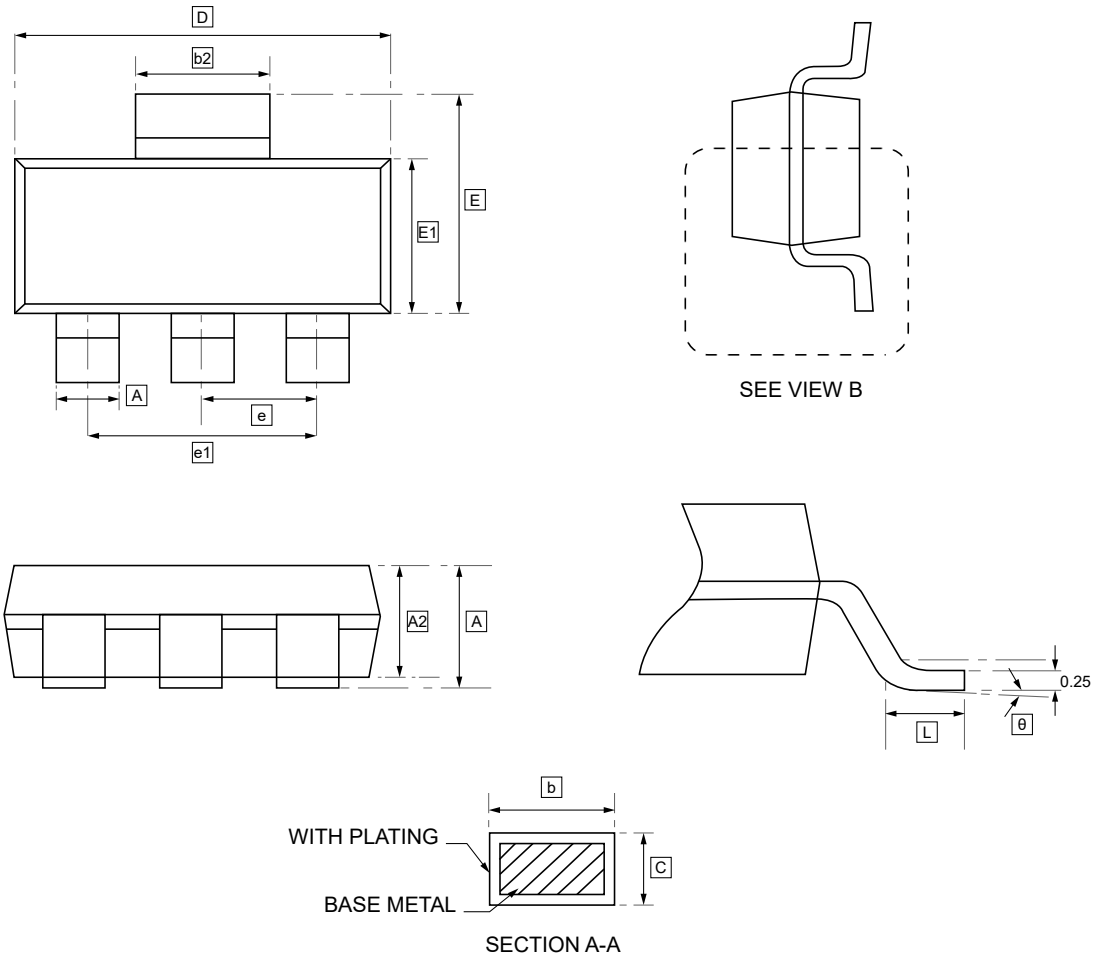


Figure 17b: Threshold Voltage Vs. Temperature

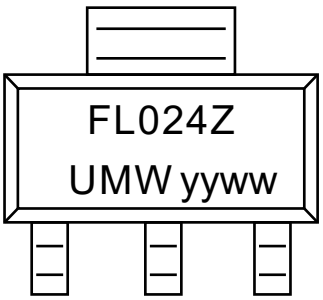
8.SOT-223 Package Outlie Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b2	c	D	E	E1	e	e1	L	θ
Min		0.02	1.55	0.66	2.90	0.23	6.30	6.70	3.30	2.30	4.60	0.90	0°
Max	1.80	0.10	1.65	0.84	3.10	0.33	6.70	7.30	3.70	BSC	BSC		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

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