UMW IRF9Z24N

-55V P-Channel MOSFET

1.Description

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts.

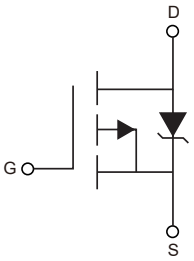
2.Features

- $V_{DS\ (V)}$=-55V
- I_D=-12A(V_{GS}=-10V)
- $R_{DS(ON)}$<170mΩ(V_{GS}=-10V)

3.Pinning information

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

TO-220



4.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, V_{GS}=-10V	T_C=25°C	I_D	-12	A
Continuous Drain Current, V_{GS}=-10V	T_C=100°C		-8.5	A
Pulsed Drain Current ①		I_{DM}	-48	A
Power Dissipation	T_C=25°C	P_D	45	W
Linear Derating Factor			0.3	W/°C
Gate-to-Source Voltage		V_{GS}	±20	V
Single Pulse Avalanche Energy②		E_{AS}	96	mJ
Avalanche Current①		I_{AR}	-7.2	A
Repetitive Avalanche Energy①		E_{AR}	4.5	mJ
Peak Diode Recovery dv/dt ③		dv/dt	-5	V/ns
Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C
Soldering Temperature, for 10 seconds			300 (1.6mm from case)	°C
Mounting torque, 6-32 or M3 screw			10 lbf•in (1.1N•m)	

5.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case	$R_{\theta JC}$		3.3	°C/W
Case-to-Sink, Flat, Greased Surface	$R_{\theta CS}$	0.5		°C/W
Junction-to-Ambient	$R_{\theta JA}$		62	°C/W

6.Electrical Characteristics @ T_J= 25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=-250μA, V_{GS}=0V	-55			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/T_J$	I_D=-1mA,Reference to 25°C		-0.05		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-7.2A ④			175	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=-7.2A	2.5			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=-7.2A			19	nC
Gate-to-Source Charge	Q_{gs}	V_{DS}=-44V, V_{GS}=-10V			5.1	nC
Gate-to-Drain ("Miller") Charge	Q_{gd}	See Fig. 6 and 13 ④			10	nC
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=-28V, I_D=-7.2A R_G=24Ω, R_D=3.7Ω See Fig. 10 ④		13		ns
Rise Time	t_r			55		ns
Turn-Off Delay Time	$t_{D(off)}$			23		ns
Fall Time	t_f			37		ns
Internal Drain inductance	L_D	Between lead, 6mm (0.25in.) from package and center of die contact		4.5		nH
Internal Source inductance	L_S			7.5		nH
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-25V f=1.0MHz, See Fig. 5		350		pF
Output Capacitance	C_{oss}			170		pF
Reverse Transfer Capacitance	C_{rss}			92		pF

Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			-12	A
Pulsed Source Current (Body Diode) ①	I_{SM}				-48	
Diode Forward Voltage	V_{SD}	T_J=25°C, I_S=-7.2A, V_{GS}=0V ④			-1.6	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=-7.2A dI/dt=-100A/μs ④		47	71	ns
Reverse Recovery Charge	Q_{rr}			84	130	μC
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 Starting T_J= 25°C,L= 3.7mH, R_G=25Ω,I_{AS}=-7.2A.(See Figure 12)

③ I_{SD} ≤7.2A, di/dt ≤ -280A/μs, V_{DD} ≤ $V_{(BR)DSS}$,T_J ≤ 175°C

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

7.1Typical Characterisitics

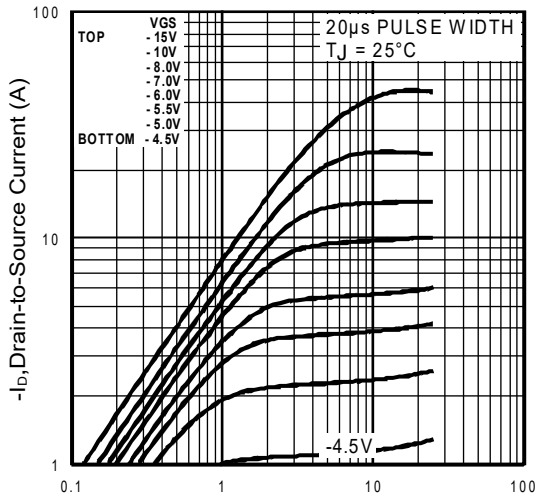


Figure 1: Typical Output Characteristics

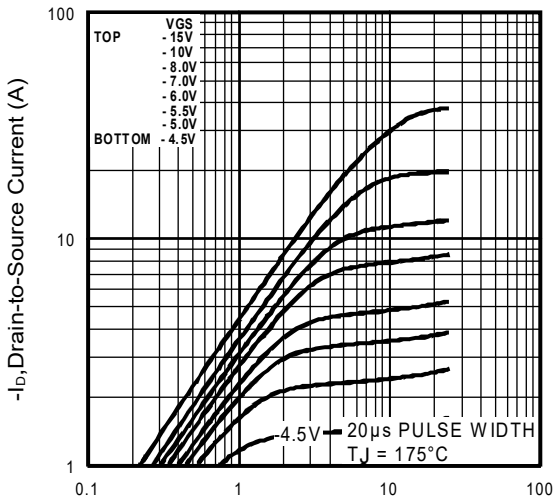


Figure 2: Typical Output Characteristics

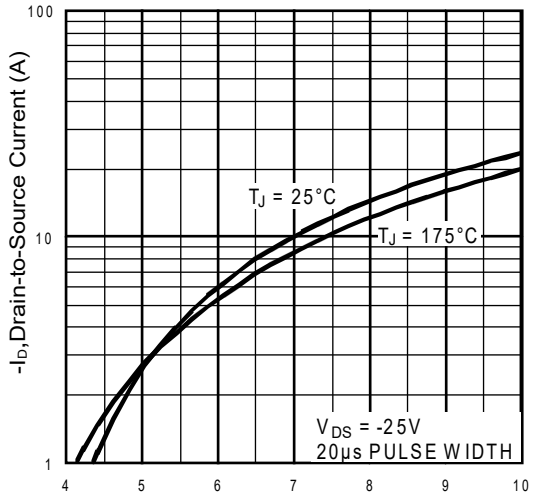


Figure 3: Typical Transfer Characteristics

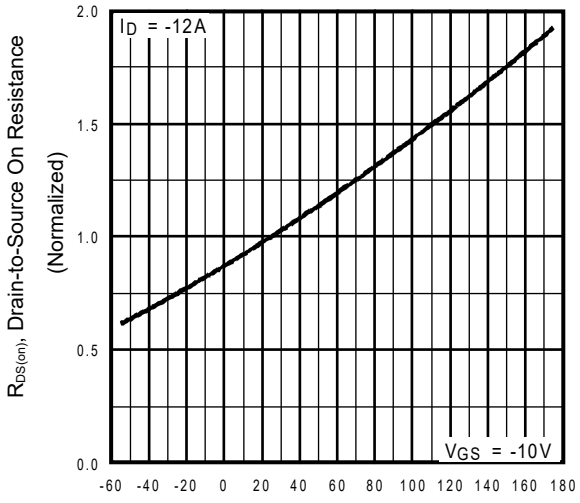
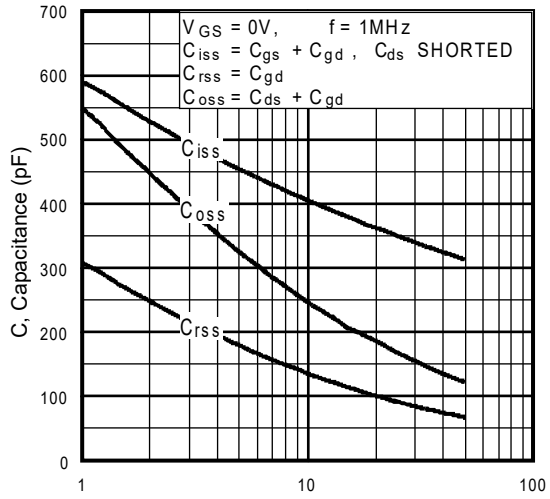


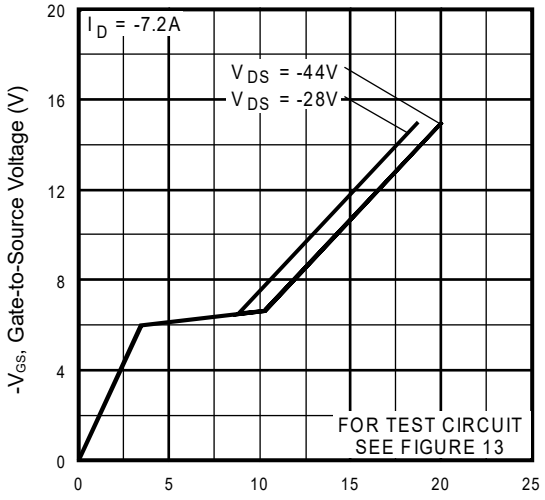
Figure 4: Nomalized On-ResistanceVs. Temperature

7.2Typical Characterisitics



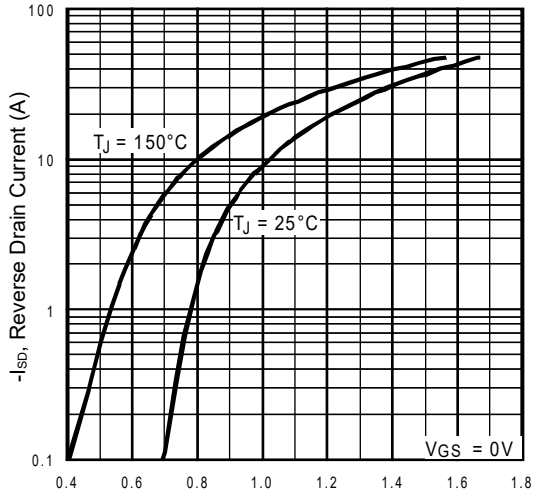
V_{DS} ,Drain-to-Source Voltage (V)

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



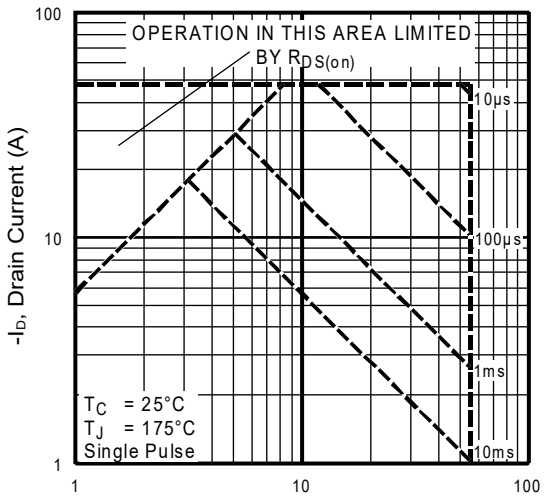
Q_G, Total Gate Charge (nC)

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

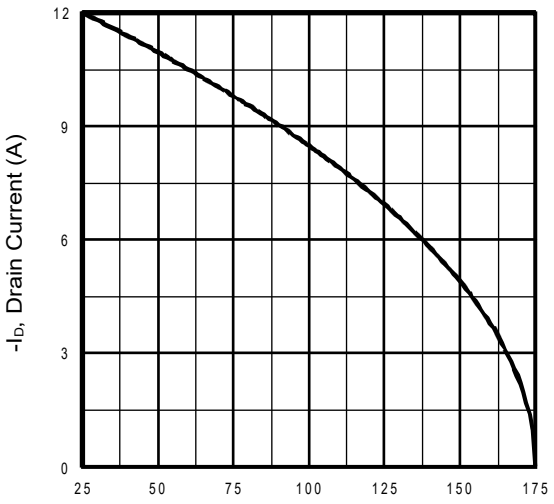


Figure 9: Maximum Drain Current Vs. Case Temperature

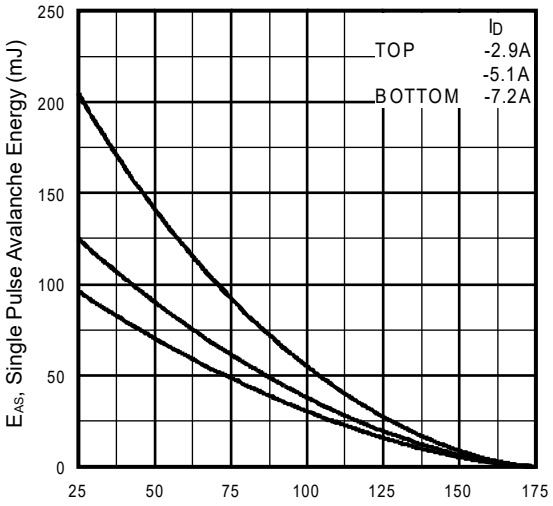


Figure 10: Maximum Avalanche Energy Vs. Drain Currente

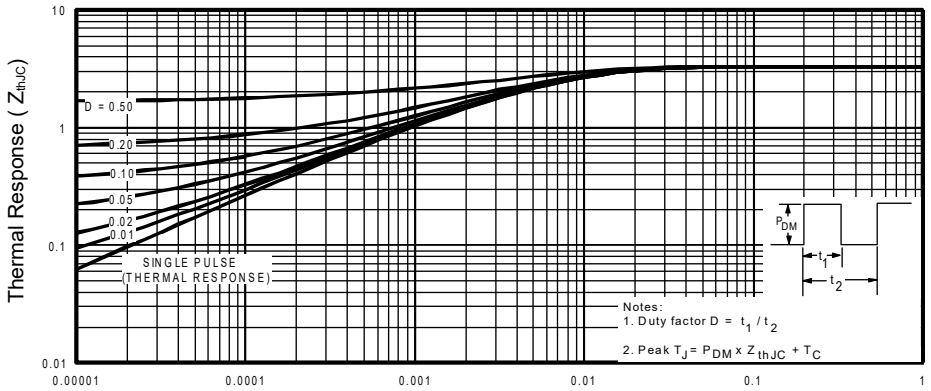


Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

7.4Typical Characterisitics

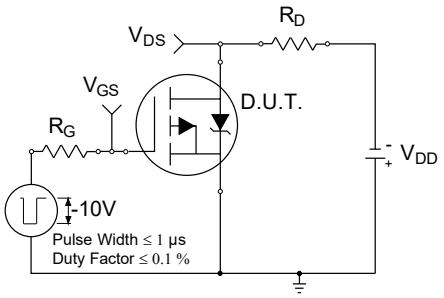


Figure 12a: Switching Time Test Circuit

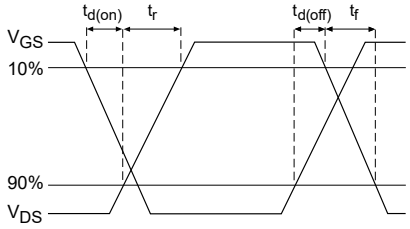


Figure 12b: Switching Time Waveforms

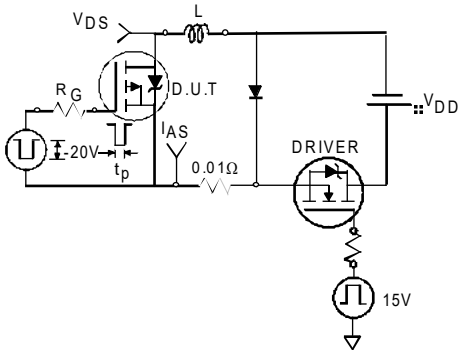


Figure 13a: Unclamped Inductive Test Circuit

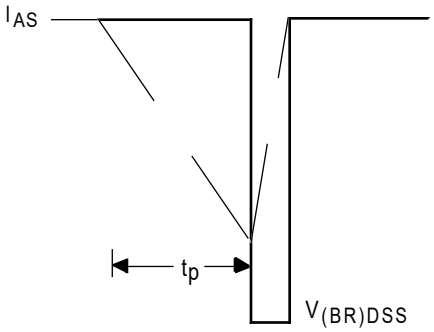


Figure 13b: Unclamped Inductive Waveforms

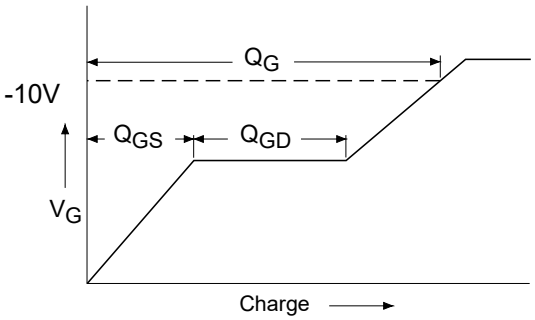


Figure 14a: Basic Gate Charge Waveform

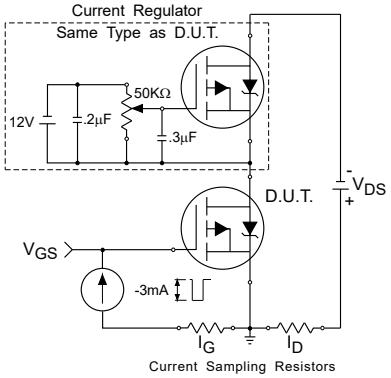
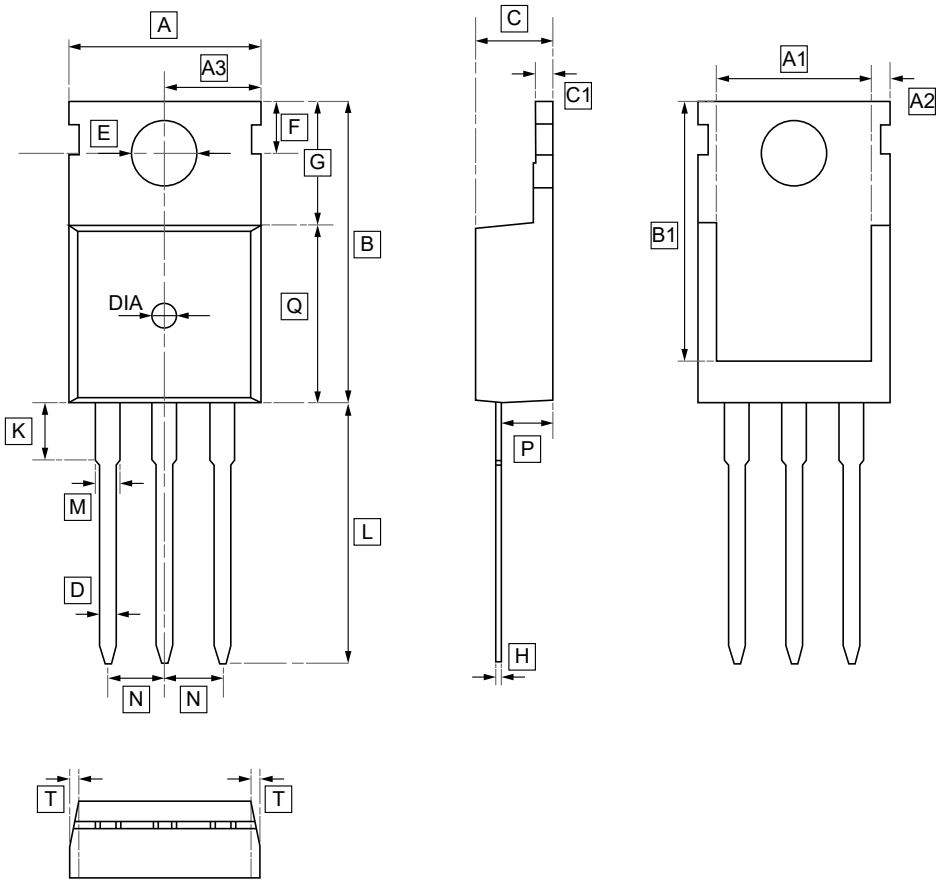


Figure 14b: Gate Charge Test Circuit

8.TO-220 Package Outline Dimensions

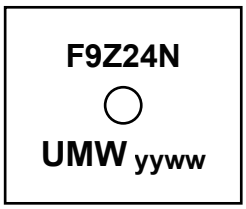


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	B	B1	C	C1	D	E	F	G
Min	9.7	8.44	1.05	4.8	15.4	12.9	4.28	1.1	0.6	3.4	2.65	5.2
Max	10.3	8.84	1.25	5.2	16.2	13.5	4.68	1.5	1.0	3.8	3.25	5.8

Symbol	H	K	L	L1	M	N	P	Q	T	DIA
Min	0.4	2.9	12.8	2.7	1.15	2.49	2.1	8.7	W:0.35	⊙1.5 (deep 0.2)
Max	0.6	3.3	13.6	3.3	1.35	2.59	2.7	9.3		

9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRF9Z24N	TO-220	1000	Tube and box

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