UMW IRLR9343TR

-55V P-Channel MOSFET

1.Features

- $V_{DS\ (V)}$=-55V
- I_D=-20A
- $R_{DS(ON)}$<97mΩ(V_{GS}=-10V)
- $R_{DS(ON)}$<130mΩ(V_{GS}=-4.5V)

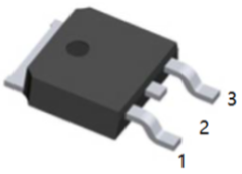
2.Description

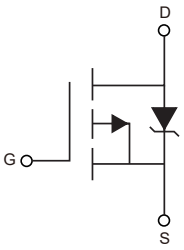
- Advanced Process Technology
- Key Parameters Optimized for Class-D Audio Amplifier Applications
- Low Q_g and Q_{sw} for Better THD and Improved Efficiency
- Low Q_{rr} for Better THD and Lower EMI
- 175°C Operating Junction Temperature for Ruggedness
- Low $R_{DS(ON)}$ for Improved Efficiency
- Multiple Package Options
- Repetitive Avalanche Capability for Robustness and Multiple Package Options

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
Drain- Source Voltage		V_{DS}	-55	V
Gate-to-Source Voltage		V_{GS}	±20	V
Continuous Drain Current, V_{GS}=-10V	T_C=25°C	I_D	-20	A
Continuous Drain Current, V_{GS}=-10V	T_C=100°C		-14	A
Pulsed Drain Current ①		I_{DM}	-60	A
Power Dissipation	T_C=25°C	P_D	79	W
Power Dissipation	T_C=100°C		39	W
Linear Derating Factor			0.53	W/°C
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-40 to 175	°C
Clamping Pressure ⑥				N

5.Thermal Resistance Rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case ⑤	$R_{\theta JC}$		1.9	°C/W
Junction-to-Ambient (PCB Mounted) ⑤ ⑧	$R_{\theta JA}$		50	°C/W
Junction-to-Ambient (free air) ⑤	$R_{\theta JL}$		110	°C/W

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=-250μA, V_{GS}=0V	-55			V
Breakdown Voltage Temp. Coefficient	$\Delta BV_{DSS}/\Delta T_J$	I_D=-1mA,Reference to 25°C		-52		mV/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-3.4A ③		93	97	mΩ
		V_{GS}=-4.5V, I_D=-2.7A ③		110	130	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-1.1	-2	-3	V
Gate Threshold Voltage Coefficient	$\Delta V_{GS(th)}/\Delta T_J$			-3.7		mV/°C
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=-55V, V_{GS}=0V			-2	μA
		V_{DS}=-55V,V_{GS}=0V,T_J=125°C			-25	μA
Gate-to-Source Forward Leakage	I_{GSS}	V_{GS}=-20V			-100	nA
Gate-to-Source Reverse Leakage		V_{GS}=20V			100	nA
Forward Transconductance	g_{FS}	V_{DS}=-25V, I_D=-14A	5.3			S
Total Gate Charge	Q_g	V_{DS}=-44V, V_{GS}=-10V I_D=-14A, See Fig. 6 and 19		31	47	nC
Gate-to-Source Charge	Q_{gs}			7.1		nC
Gate-to-Drain Charge	Q_{gd}			8.5		nC
Gate Charge Overdrive	Q_{gdor}			15		nC
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=-28V, V_{GS}=-10V ③ I_D=-14A, R_G=2.5Ω		9.5		ns
Rise Time	t_r			24		ns
Turn-Off Delay Time	$t_{D(off)}$			21		ns
Fall Time	t_f			9.5		ns
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-50V f=1.0MHz, See Fig.5		660		pF
Output Capacitance	C_{oss}			160		pF
Reverse Transfer Capacitance	C_{rss}			72		pF
Effective Output Capacitance	C_{oss}			280		pF
Internal Drain Inductance	L_D	Between lead, 6mm (0.25in.) from package and center of die contact ④		4.5		nH
Internal Source Inductance	L_S			7.5		

Avalanche Characteristics						
Single Pulse Avalanche Energy ②	E_{AS}				120	mJ
Avalanche Current ⑦	I_{AR}		See Fig. 14, 15			A
Repetitive Avalanche Energy ⑦	E_{AR}		17a, 17b			mJ
Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			-20	A
Pulsed Source Current (Body Diode) ①	I_{SM}				-60	
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=-14A,V_{GS}=0V③			-1.2	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=-14A dI/dt=100A/μs ③		57	86	ns
Reverse Recovery Charge	Q_{rr}			120	180	nC

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J=25°C, L=1.2mH, R_G=25Ω, I_{AS}=-14A.

③ Pulse width ≤ 400μs; duty cycle ≤ 2%.

④ This only applies for I-Pak, LS of D-Pak is measured between lead and center of die contact.

⑤ R_θ is measured at T_J approximately 90°C.

⑥ Contact factory for mounting information.

⑦ Limited by Tjmax. See Figs. 14, 15, 17a, 17b for repetitive avalanche information.

⑧When D-Pak mounted on 1" square PCB (FR-4 or G-10 Material) .For recommended footprint and soldering techniques refer to application note #AN-994.

⑨ Refer to D-Pak package for Part Marking, Tape and Reel information.

7.1Typical Characterisitics

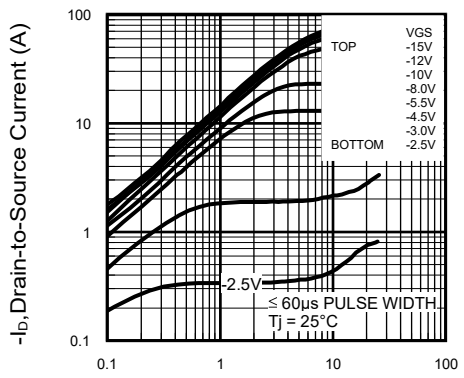


Figure 1: Typical Output Characteristics

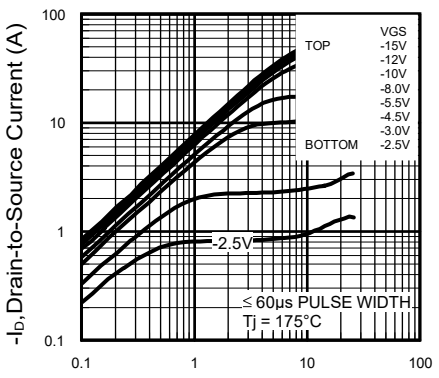


Figure 2: Typical Output Characteristics

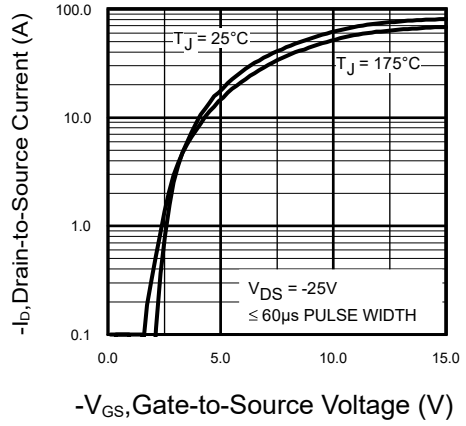


Figure 3: Typical Output Characteristics

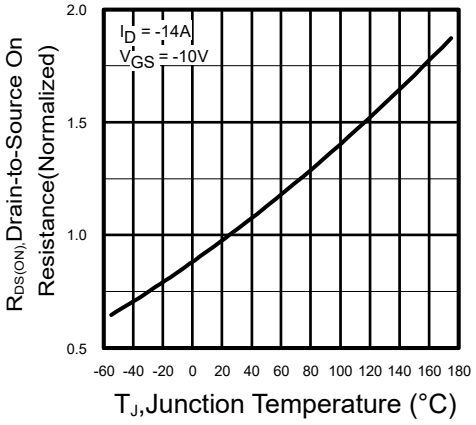


Figure 4: Normalized On-Resistance vs. Temperature

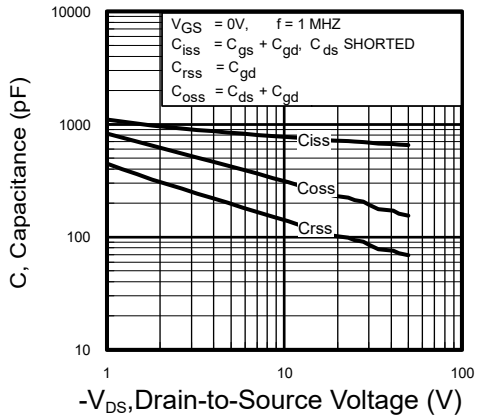


Figure 5: Typical Output Characteristics

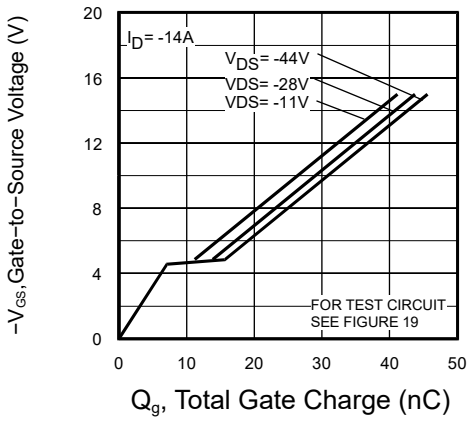


Figure 6: Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

7.2Typical Characterisitics

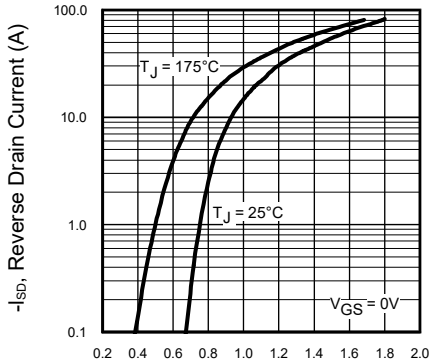


Figure 7: Typical Source-Drain Diode Forward Voltage

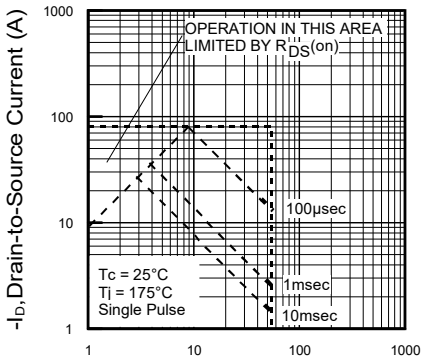


Figure 8: -V_{DS},Drain-to-Source Voltage (V)

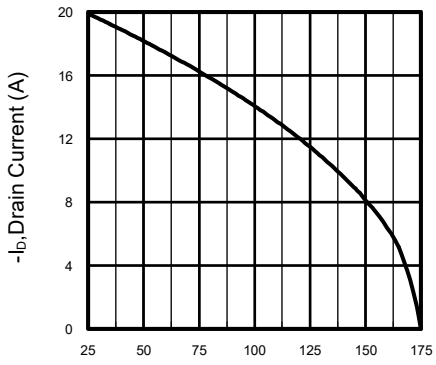


Figure 9: Maximum Drain Current vs. Case Temperature

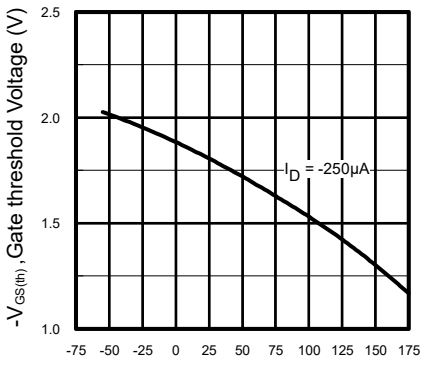


Figure 10: Threshold Voltage vs. Temperature

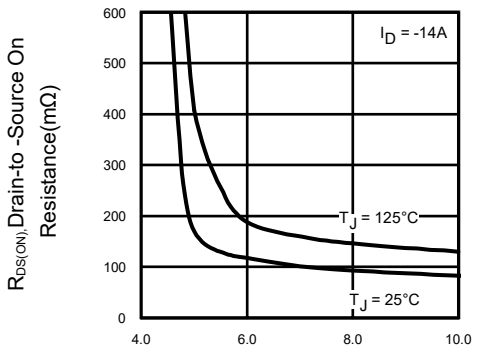


Figure 11: On-Resistance Vs. Gate Voltage

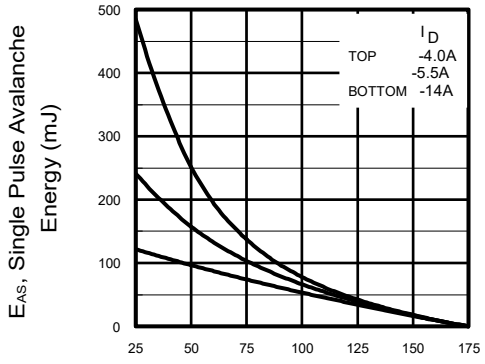


Figure 12: Maximum Avalanche Energy Vs. Drain Current

7.3Typical Characterisitics

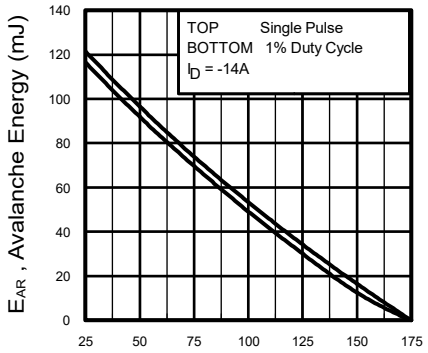


Figure 13: Maximum Avalanche Energy Vs. Temperature

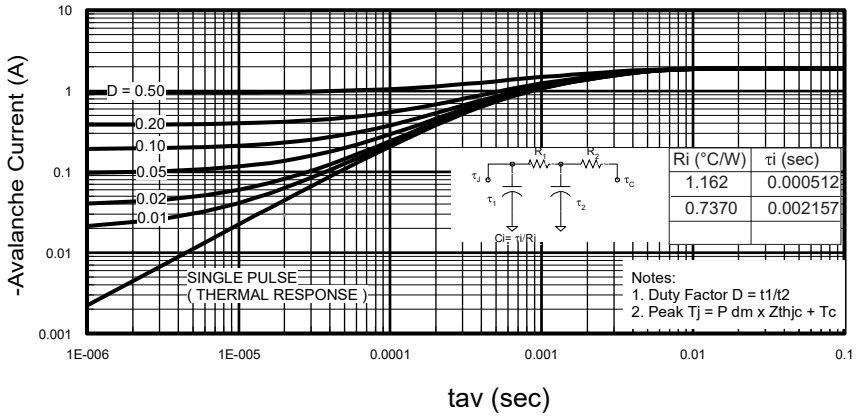


Figure 14: Typical Avalanche Current Vs.Pulsewidth

7.4Typical Characterisitics

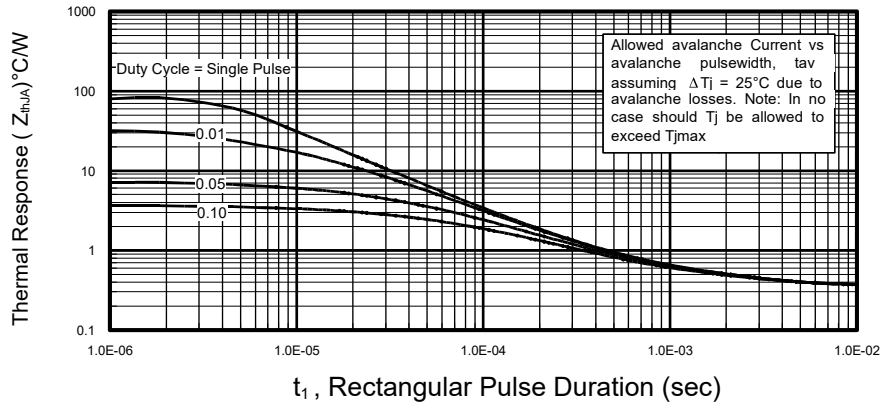


Fig 15. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

Notes on Repetitive Avalanche Curves , Figures 14, 15:

1. Avalanche failures assumption:

Purely a thermal phenomenon and failure occurs at a temperature far in excess of Tjmax. This is validated for every part type.

2. Safe operation in Avalanche is allowed as long asTjmax is not exceeded.

3. Equation below based on circuit and waveforms shown in Figures 17a, 17b.

4. $P_{D\ (ave)}$ = Average power dissipation per single avalanche pulse.

5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).

6. I_{av} = Allowable avalanche current.

7. ΔT = Allowable rise in junction temperature, not to exceed

T_{jmax} (assumed as 25°C in Figure 14, 15).

tav = Average time in avalanche.

D = Duty cycle in avalanche = tav ·f

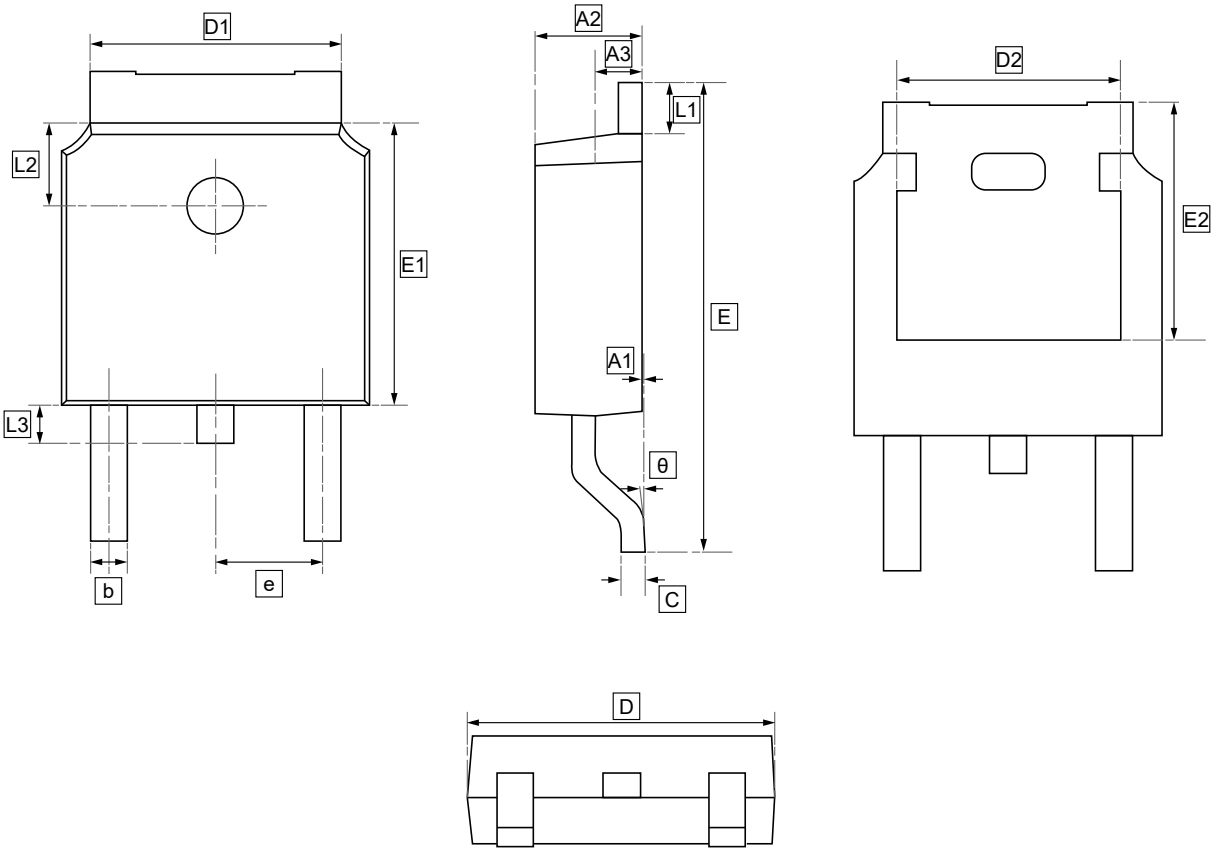
$Z_{thJC(D,\ tav)}$ = Transient thermal resistance, see figure 11.

$P_{D\ (ave)} = 1/2\ (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$

$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$

$E_{AS\ (AR)} = PD_{\ (ave)} \cdot t_{av}$

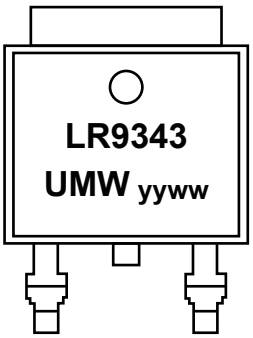
8.TO-252 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38	BSC	1.27	1.90	1.00	8.00

9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRLR9343TR	TO-252	2500	Tape and reel

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