UMW IRLML0040TR

40V N-Channel MOSFET

1.Description

The IRLML0040TR uses advanced trench technology to provide excellent $R_{DS(on)}$ with low gate charge. This device is suitable for use as a loads witch or in PWM applications.

2.Features

- $V_{DS\ (V)}$=40V
- $R_{DS(ON)}$<56mΩ(V_{GS}=10V)
- $R_{DS(ON)}$<78mΩ(V_{GS}=4.5V)

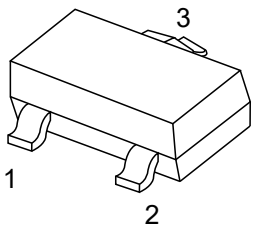
3.Benefits

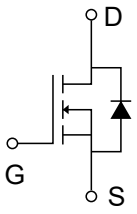
- Lower switching losses
- Multi-vendor compatibility
- Easier manufacturing
- Environmentally friendly
- Increased reliability

4.Pinning information

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

SOT-23





5.Maximum ratings (T_A=25°C unless otherwise noted)

Parameter		Symbol	Value	Units
Drain-Source Voltage		V_{DS}	40	V
Continuous Drain Current, V_{GS} @ 10V	T_A=25°C	I_D	3.6	A
Continuous Drain Current, V_{GS} @ 10V	T_A=70°C		2.9	
Pulsed Drain Current		I_{DM}	15	
Maximum Power Dissipation	T_A=25°C	P_D	1.3	W
Maximum Power Dissipation	T_A=70°C		0.8	
Linear Derating Factor			0.01	W/°C
Gate-to-Source Voltage		V_{GS}	±16	V
Junction and Storage Temperature Range		T_J,T_{STG}	-55 to 150	°C

6.Thermal resist ance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Ambient ③	$R_{\theta JA}$		100	°C/W
Junction-to-Ambient (t<10s) ④	$R_{\theta JA}$		99	°C/W

7.Electrical Characteristics T_J=25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=250μA, V_{GS}=0V	40			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D=1mA,Reference to 25°C		0.04		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=3.6A ②		40	50	mΩ
		V_{GS}=4.5V, I_D=2.9A ②		58	70	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=25μA	1	1.8	2.5	V
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=40V, V_{GS}=0V			20	μA
		V_{DS}=40V,V_{GS}=0V,T_J=125°C			250	
Gate-to-Source Forward Leakage	I_{GSS}	V_{GS}=16V			100	nA
Gate-to-Source Reverse Leakage		V_{GS}=-16V			-100	
Internal Gate Resistance	R_G			1.1		Ω
Forward Transconductance	g_{fs}	V_{DS}=10V, I_D=3.6A	6.2			S
Total Gate Charge	Q_g	V_{DS}=20V		2.6	3.9	nC
Gate-to-Source Charge	Q_{gs}	V_{GS}=4.5V ②		0.7		
Gate-to-Drain ("Miller") Charge	Q_{gd}	I_D=3.6A		1.4		
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=20V ②		5.1		ns
Rise Time	t_r	I_D=1A		5.4		
Turn-Off Delay Time	$t_{D(off)}$	R_G=6.8Ω		6.4		
Fall Time	t_f	V_{GS}=4.5V		4.3		
Input Capacitance	C_{iss}	V_{GS}=0V		266		pF
Output Capacitance	C_{oss}	V_{DS}=25V		49		
Reverse Transfer Capacitance	C_{rss}	f=1MHz		29		

Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			1.3	A
Pulsed Source Current (Body Diode) ①	I_{SM}				15	A
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=1.3A,V_{GS}=0V②			1.2	V
Reverse Recovery Time	t_{rr}	T_J=25°C, V_R=32V, I_F=1.3A		10		ns
Reverse Recovery Charge	Q_{rr}	dI/dt=100A/μs ②		9.3		nC

Notes:

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

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

③ Surface mounted on 1 in square Cu board.

8.1Typical Characterisitics

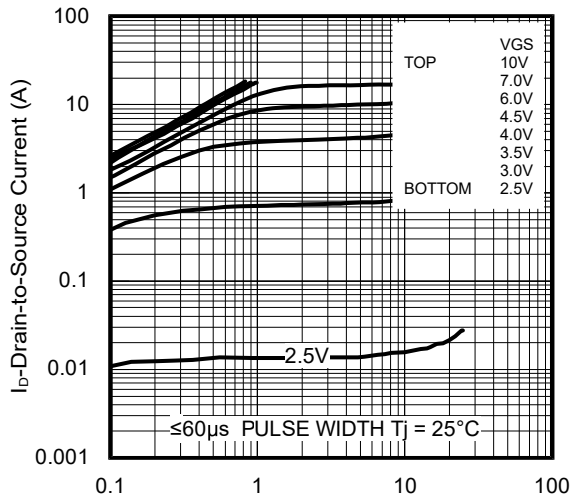


Fig 1. Typical Output Characteristics

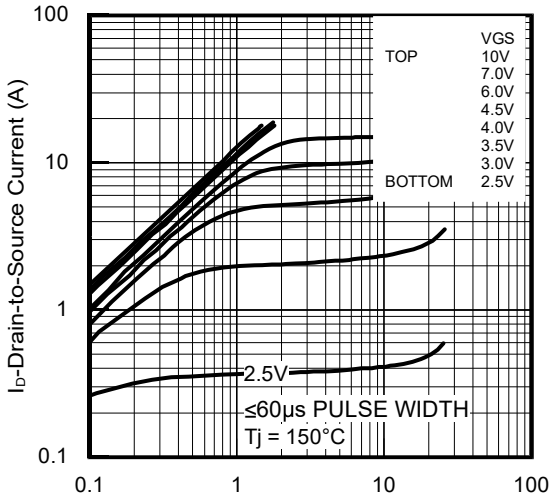


Fig 2. Typical Output Characteristics

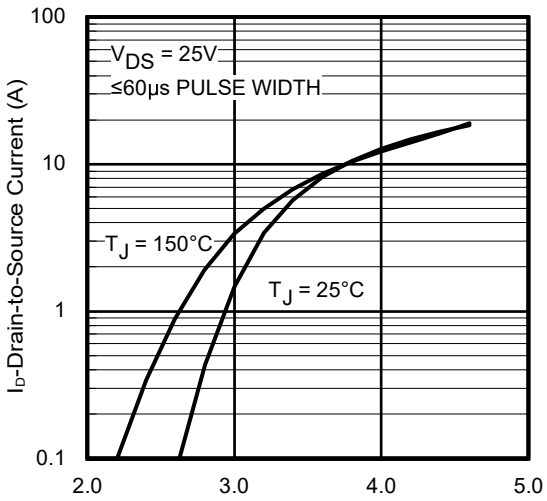


Fig 3. Typical Transfer Characteristics

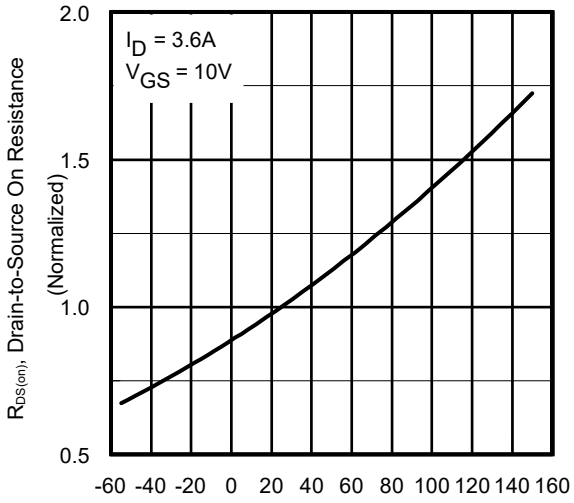
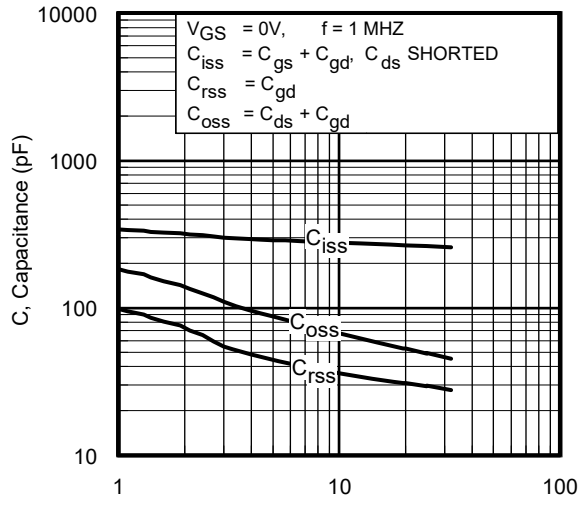


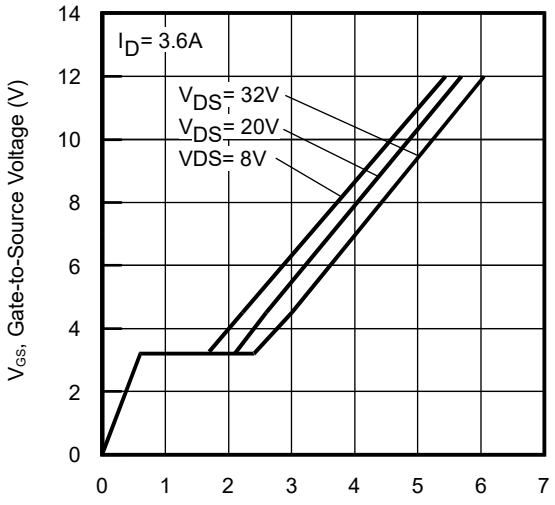
Fig 4. Nomalized On-ResistanceVs. Temperature

8.2Typical Characterisitics



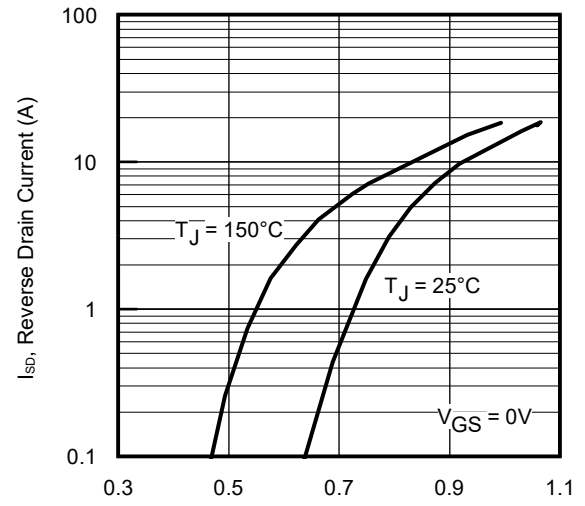
V_{DS} ,Drain-to-Source Voltage (V)

Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage



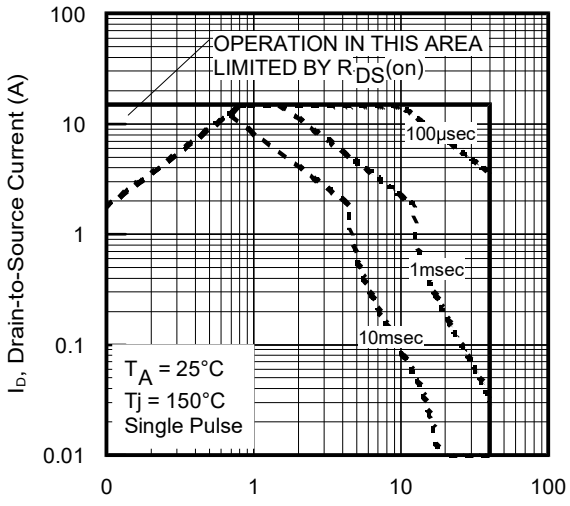
Q_G, Total Gate Charge (nC)

Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage



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

Fig 7. Typical Source-Drain Diode Forward Voltage



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

Fig 8. Maximum Safe Operating Area

8.3Typical Characterisitics

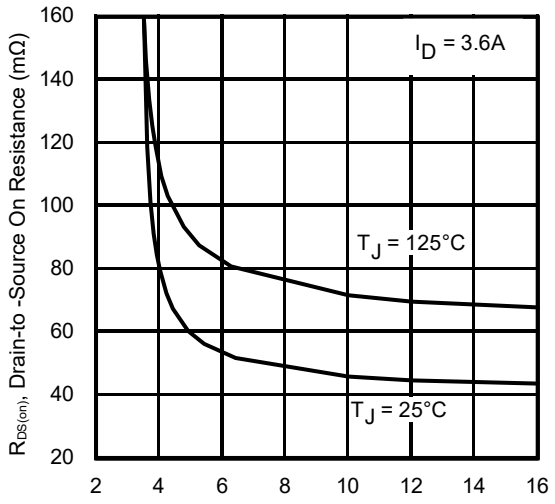


Fig 9. Typical On-Resistance vs. Gate Voltage

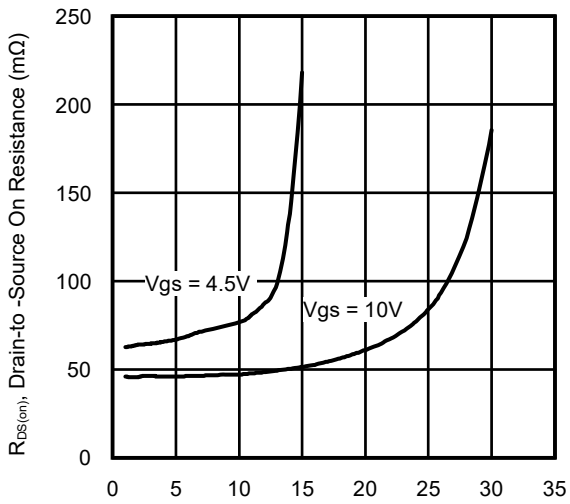


Fig 10. Typical On-Resistance vs. Drain Current

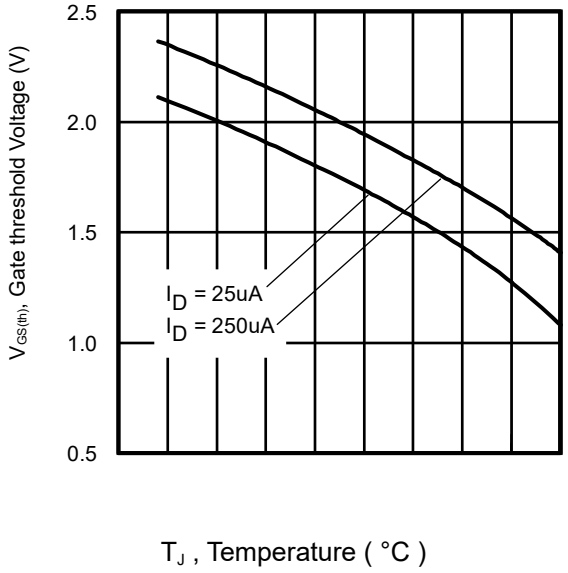


Fig 11. Typical Threshold Voltage vs. Junction Temperature

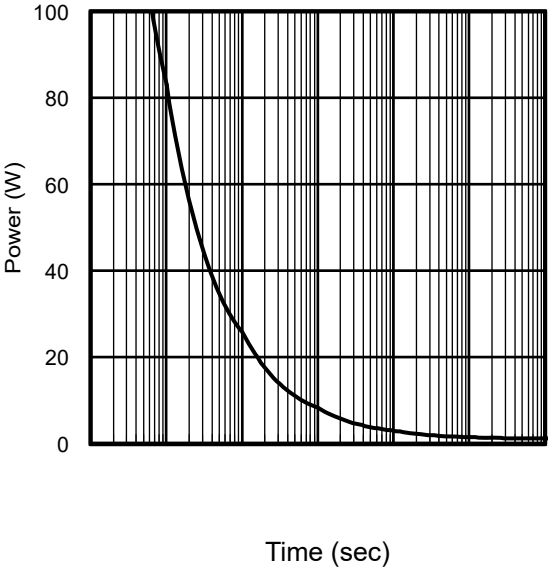


Fig 12. Typical Power vs. Time

8.4Typical Characterisitics

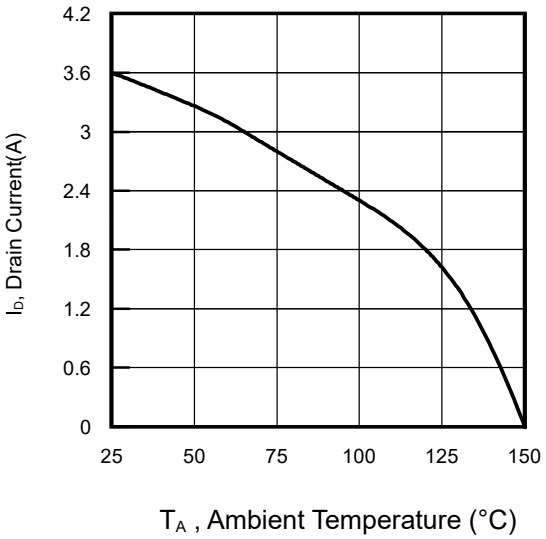


Fig 13. Maximum Drain Current vs. Ambient Temperature

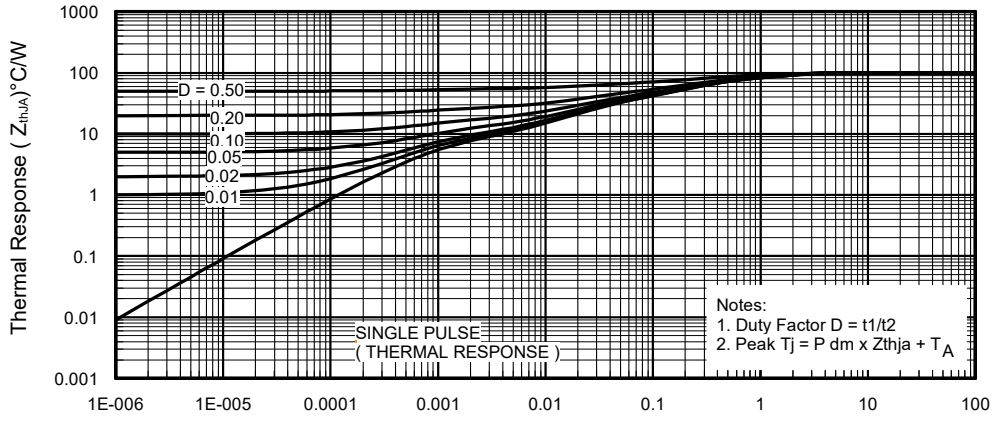


Fig 14. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

8.5Typical Characterisitics

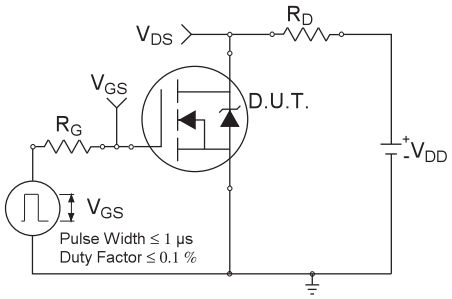


Fig 15a. Switching Time Test Circuit

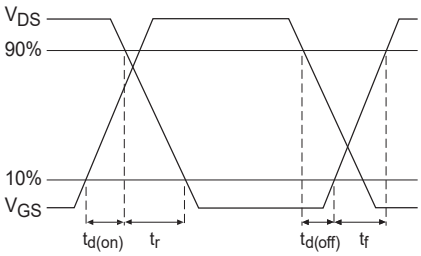


Fig 15b. Switching Time Waveforms

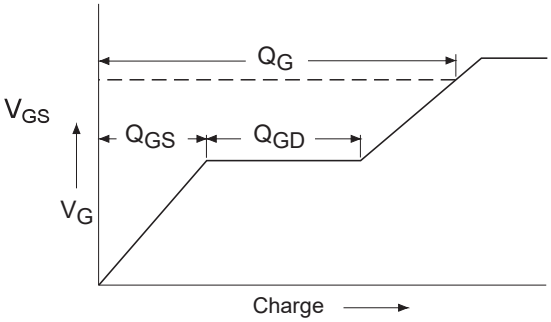


Fig 16a. Basic Gate Charge Waveform

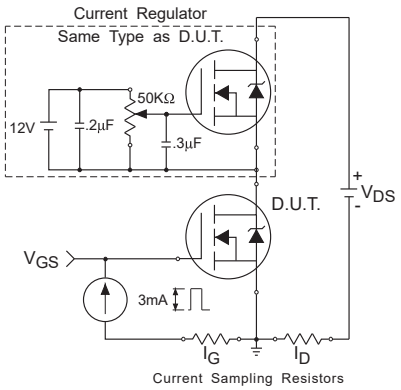
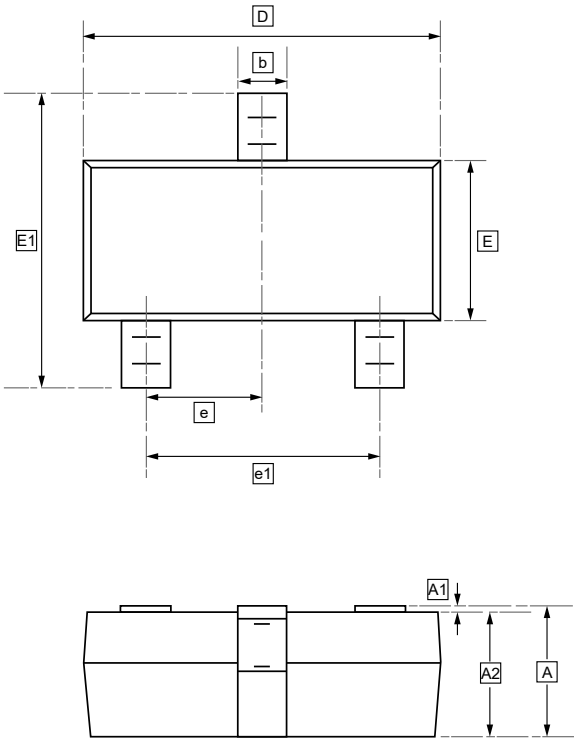


Fig 16b. Gate Charge Test Circuit

9.SOT-23 Package Outline Dimensions

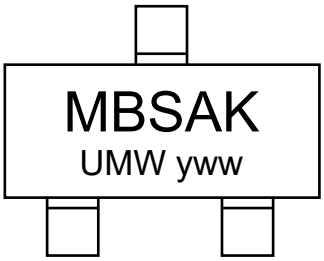


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	C	D	E	E1	e	e1	L	L1
Min	0.90	0.00	0.90	0.30	0.08	2.80	1.20	2.25	0.95	1.80	0.55	0.30
Max	1.15	0.10	1.05	0.50	0.15	3.00	1.40	2.55	TYP.	2.00	REF	0.50

Symbol	F	θ	θ1
Min	0.25	0°	2°
Max		8°	12°

10.Ordering information



yww: Batch Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRLML0040TR	SOT-23	3000	Tape and reel

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