UMW IRF8788TR

30V N-Channel MOSFET

1.Description

The UMW IRF8788TR has been optimized for parameters that are critical in synchronous buck operation including $R_{DS(ON)}$ and gate charge to reduce both conduction and switching losses. The reduced total losses make this product ideal for high efficiency DC-DC converters that power the latest generation of processors for notebook and Netcom applications.

2.Features

- $V_{DS\ (V)}$=30V
- I_D=24A
- $R_{DS(ON)}$<2.8mΩ(V_{GS}=10V)
- $R_{DS(ON)}$<3.8mΩ(V_{GS}=4.5V)

3.Application

- Synchronous MOSFET for Notebook Processor Power
- Synchronous Rectifier MOSFET for Isolated DC-DC Converters

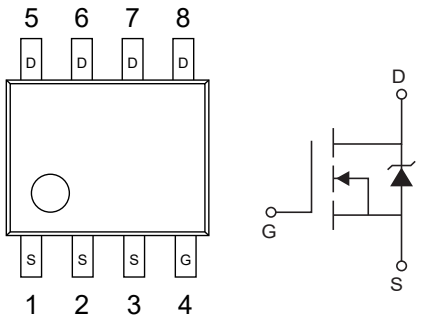
4.Benefits

- Very Low Gate Charge
- Very Low $R_{DS(ON)}$ at 4.5V V_{GS}
- Ultra-Low Gate Impedance
- 20V V_{GS} Max. Gate Rating Fully Characterized Avalanche
- Voltage and Current

5.Pinning information

Pin	Symbol	Description
1,2,3	S	SOURCE
4	G	GATE
5,6,7,8	D	DRAIN

SOP-8



6.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Drain- Source Voltage		V_{DS}	30	V
Gate-to-Source Voltage		V_{GS}	±20	V
Continuous Drain Current, V_{GS}=10V	T_A=25°C	I_D	24	A
Continuous Drain Current, V_{GS}=10V	T_A=70°C		19	A
Pulsed Drain Current ①		I_{DM}	190	A
Power Dissipation	T_A=25°C	P_D	2.5	W
Power Dissipation	T_A=70°C		1.6	W
Linear Derating Factor			0.02	W/°C
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

7.Thermal Resistance Rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Drain Lead ⑤	$R_{\theta JL}$		20	°C/W
Junction-to-Ambient ④ ⑤	$R_{\theta JA}$		50	°C/W

8.Electrical Characteristics T_J=25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V	30			V
Breakdown Voltage Temp. Coefficient	$\Delta BV_{DSS}/\Delta T_J$	I_D=1mA,Reference to 25°C		0.024		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=24A ③		2.3	2.8	mΩ
		V_{GS}=4.5V, I_D=19A ③		3.04	3.8	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=100μA	1.35	1.8	2.35	V
Gate Threshold Voltage Coefficient	$\Delta V_{GS(th)}$	V_{DS}=V_{GS}, I_D=100μA		-6.59		mV/°C
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=24V, V_{GS}=0V			1	μA
		V_{DS}=24V, V_{GS}=0V, T_J=125°C			150	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}=15V, I_D=19A	95			S
Total Gate Charge	Q_g	V_{DS}=15V V_{GS}=4.5V I_D=19A See Fig. 17a & 17b		44	66	nC
Pre-Vth Gate-to-Source Charge	Q_{gs1}			12		nC
Post-Vth Gate-to-Source Charge	Q_{gs2}			4.7		nC
Gate-to-Drain Charge	Q_{gd}			14		nC
Gate Charge Overdrive	Q_{godr}			13.3		nC
Switch Charge (Q_{gs2} + Q_{gd})	Q_{sw}			18.7		nC
Output Charge	Q_{oss}	V_{GS}=0V, V_{DS}=16V		22		nC
Gate Resistance	R_G			0.54	1.09	Ω
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=15V V_{GS}=4.5V I_D=19A R_G=1.8Ω, See Fig.15a & 15b		23		ns
Rise Time	t_r			24		ns
Turn-Off Delay Time	$t_{D(off)}$			23		ns
Fall Time	t_f			11		ns
Input Capacitance	C_{iss}	V_{GS}=0V V_{DS}=15V f=1.0MHz		5720		pF
Output Capacitance	C_{oss}			980		pF
Reverse Transfer Capacitance	C_{rss}			450		pF

Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			3.1	A
Pulsed Source Current (Body Diode) ①	I_{SM}				190	A
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=19A,V_{GS}=0V ③			1	V
		T_J=25°C, I_F=2.2A,V_{GS}=0V ③			0.75	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=19A,V_{DD}=15V dI/dt=230A/μs ③		24	36	ns
Reverse Recovery Charge	Q_{rr}			33	50	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

9.Avalanche Characteristics

Parameter	Symbol	Typ	Max	Units
Single Pulse Avalanche Energy ②	E_{AS}		230	mJ
Avalanche Current ①	I_{AR}		19	A

10.1Typical Characterisitics

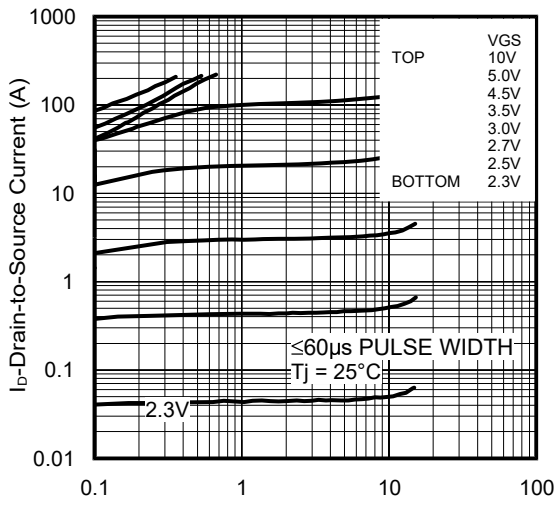


Fig 1. Typical Output Characteristics

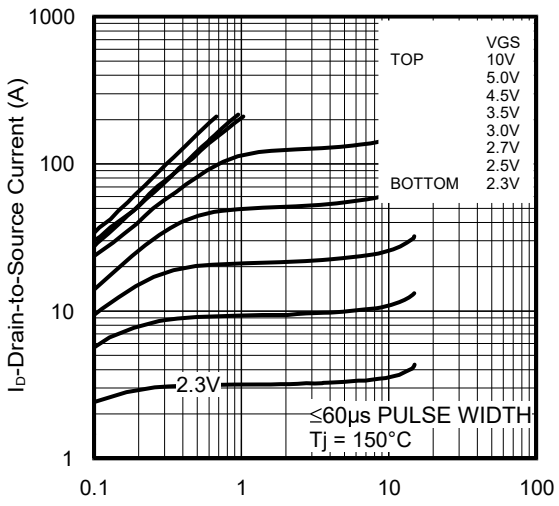


Fig 2. Typical Output Characteristics

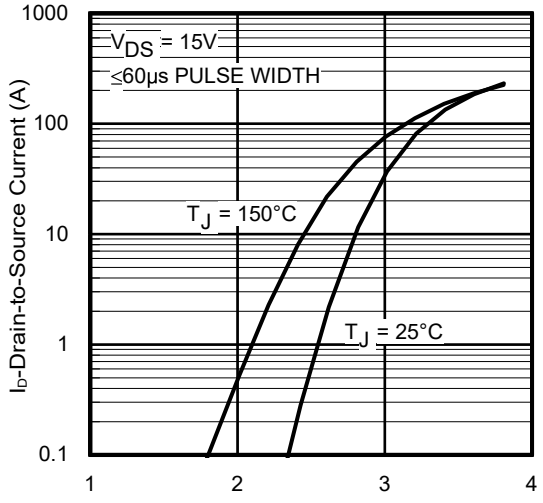


Fig 3. Typical Transfer Characteristics

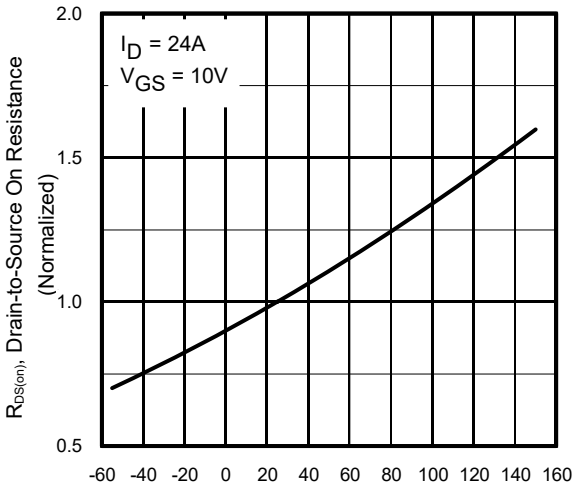
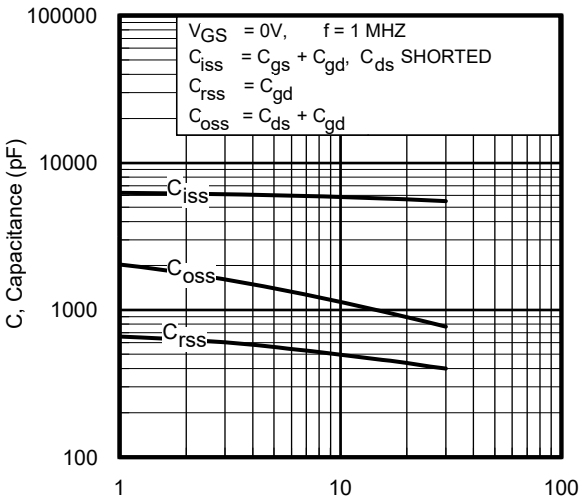


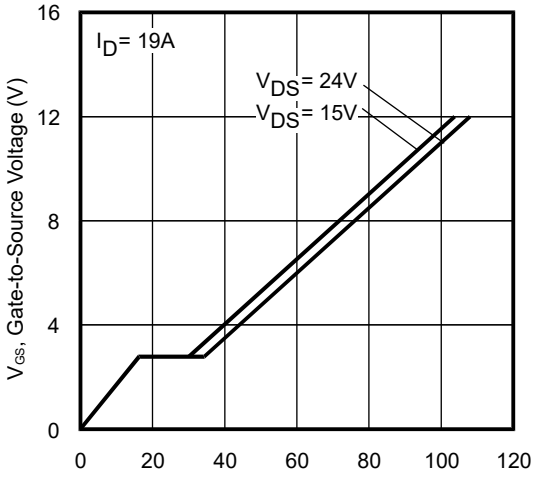
Fig 4. Nomalized On-ResistanceVs. Temperature

10.2Typical Characterisitics



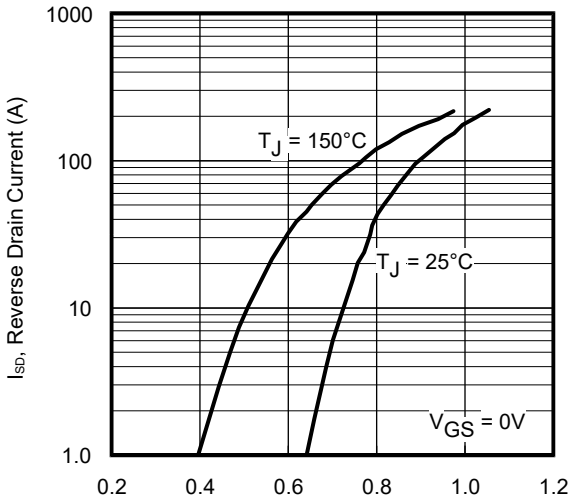
V_{DS} ,Drain-to-Source Voltage (V)

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



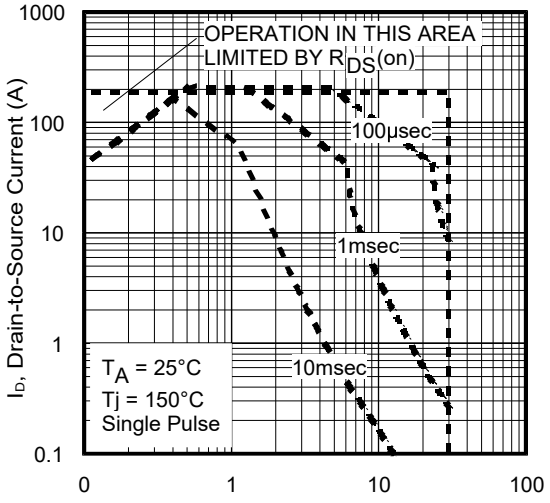
Q_G, Total Gate Charge (nC)

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

10.3Typical Characterisitics

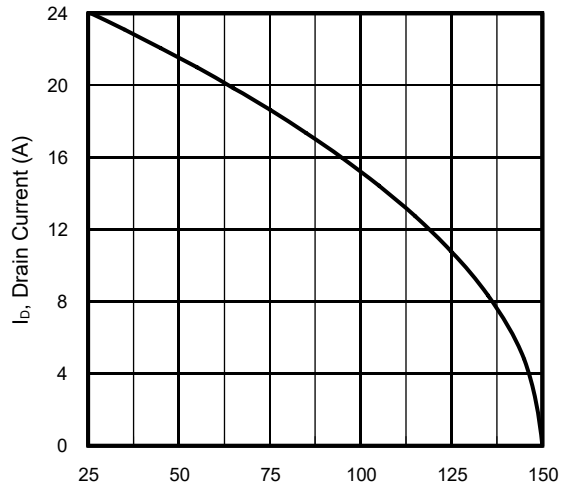


Fig 9. Maximum Drain Current Vs. Case Temperature

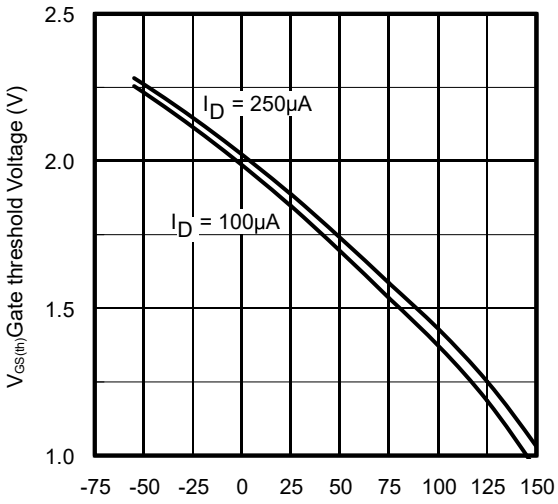


Fig 10. Threshold Voltage Vs. Temperature

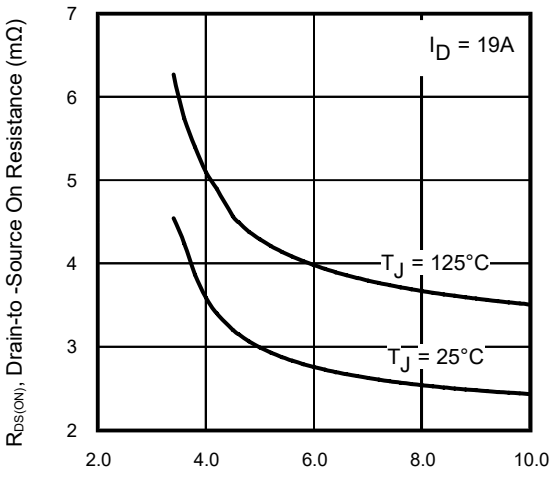


Fig 11. On-Resistance Vs. Drain Current

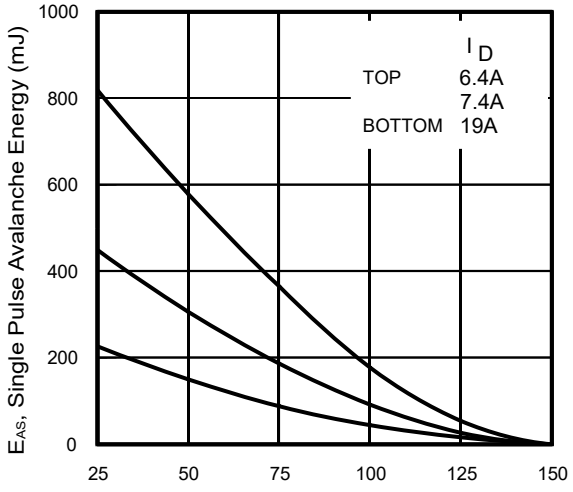
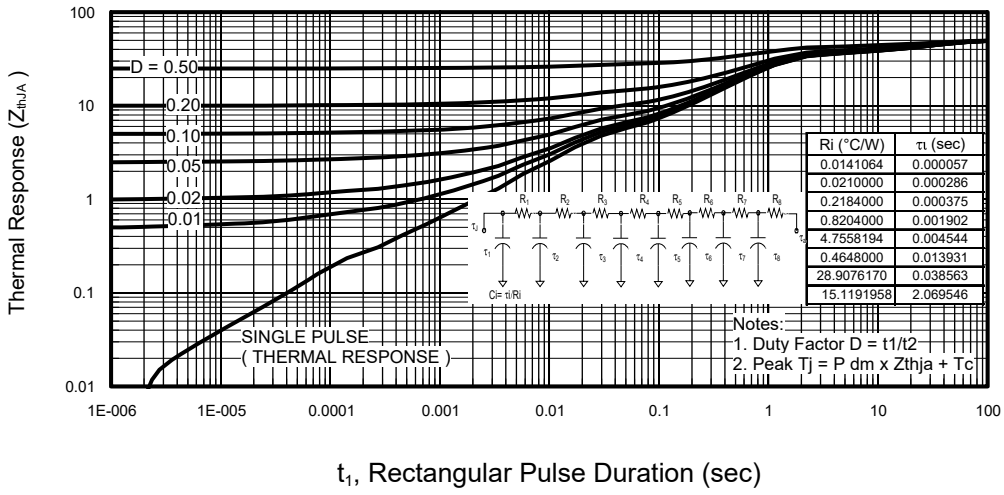


Fig 12. Maximum Avalanche Energy Vs. Drain Current

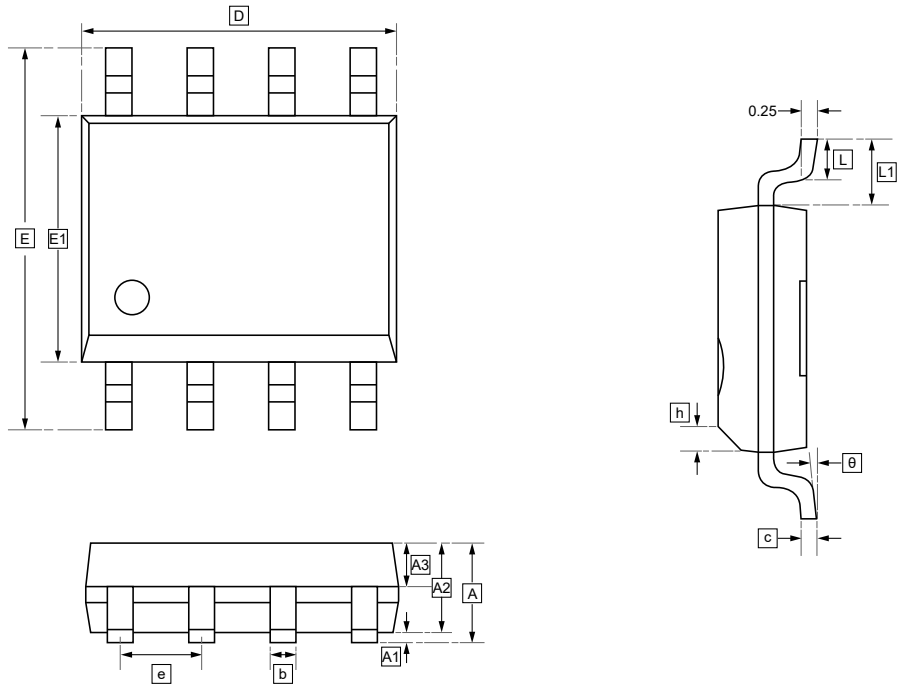
10.4Typical Characterisitics



t_1, Rectangular Pulse Duration (sec)

Fig 13. Maximum Effective Transient Themal Impedance, Junction-to-Ambient

11.SOP-8 Package Outline Dimensions

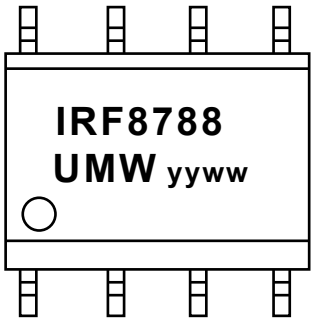


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	c	D	E	E1	e	h	L
Min	-	0.05	1.30	0.60	0.39	0.20	4.80	5.80	3.80	1.24	0.30	0.50
Max	1.75	0.20	1.50	0.70	0.47	0.24	5.00	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

12.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRF8788TR	SOP-8	3000	Tape and reel

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