UMW IRF8707TR

30V N-Channel MOSFET

1.Description

The UMW IRF8707TR 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=11A
- $R_{DS(ON)}$<11.9mΩ(V_{GS}=10V)
- $R_{DS(ON)}$<17.5mΩ(V_{GS}=4.5V)

3.Application

- Control MOSFET of Sync-Buck Converters used for Notebook Processor Power
- Control MOSFET for Isolated DC-DC Converters in Networking Systems

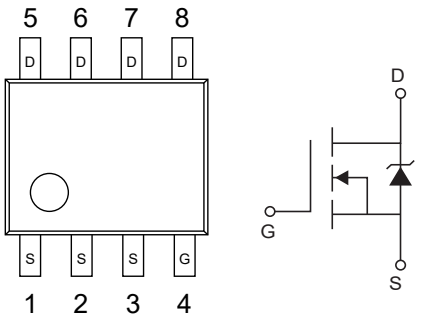
4.Benefits

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

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	11	A
Continuous Drain Current, V_{GS}=10V	T_A=70°C		9.1	A
Pulsed Drain Current ①		I_{DM}	88	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

Notes ① through ⑤ are on page 9

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		0.022		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=11A ③		9.3	11.9	mΩ
		V_{GS}=4.5V, I_D=8.8A ③		14.2	17.5	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=25μA	1.35	1.8	2.35	V
Gate Threshold Voltage Coefficient	$\Delta V_{GS(th)}$	V_{DS}=V_{GS}, I_D=25μA		-5.8		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=8.8A	25			S
Total Gate Charge	Q_g	V_{DS}=15V V_{GS}=4.5V I_D=8.8A See Fig. 15 & 16		6.2	9.3	nC
Pre-Vth Gate-to-Source Charge	Q_{gs1}			1.4		nC
Post-Vth Gate-to-Source Charge	Q_{gs2}			0.7		nC
Gate-to-Drain Charge	Q_{gd}			2.2		nC
Gate Charge Overdrive	Q_{godr}			1.9		nC
Switch Charge (Q_{gs2} + Q_{gd})	Q_{sw}			2.9		nC
Output Charge	Q_{oss}	V_{GS}=0V, V_{DS}=16V		3.7		nC
Gate Resistance	R_G			2.2	3.7	Ω
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=15V V_{GS}=4.5V I_D=8.8A R_G=1.8Ω, See Fig. 18		6.7		ns
Rise Time	t_r			7.9		ns
Turn-Off Delay Time	$t_{D(off)}$			7.3		ns
Fall Time	t_f			4.4		ns
Input Capacitance	C_{iss}	V_{GS}=0V V_{DS}=15V f=1.0MHz		760		pF
Output Capacitance	C_{oss}			170		pF
Reverse Transfer Capacitance	C_{rss}			82		pF

Avalanche Characteristics						
Single Pulse Avalanche Energy ②	E_{AS}				53	mJ
Avalanche Current ①	I_{AR}				8.8	A
Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the			3.1	A
Pulsed Source Current (Body Diode) ①	I_{SM}	integral reverse p-n junction diode.			88	A
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=8.8A,V_{GS}=0V ③			1	V
Reverse Recovery Time	t_{rr}	T_J=25°C,I_F=8.8A, V_{DD}=15V		12	18	ns
Reverse Recovery Charge	Q_{rr}	dI/dt=300A/μs ③		13	20	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.

② Starting T_J=25°C, L=1.38mH, R_G=25Ω, I_{AS}=8.8A.

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

④ When mounted on 1 inch square copper board.

⑤ R_θ is measured at T_J of approximately 90°C.

9.1Typical Characterisitics

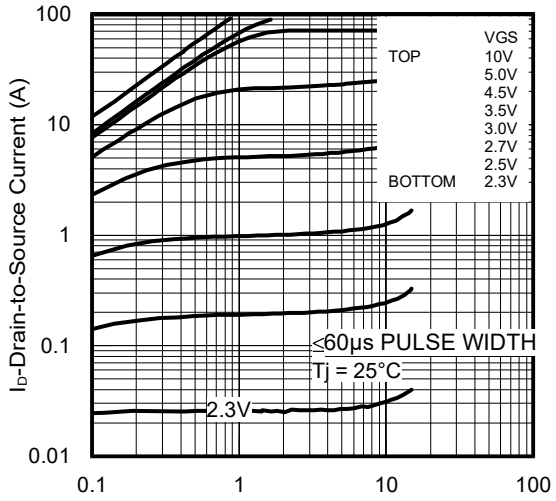


Fig 1. Typical Output Characteristics

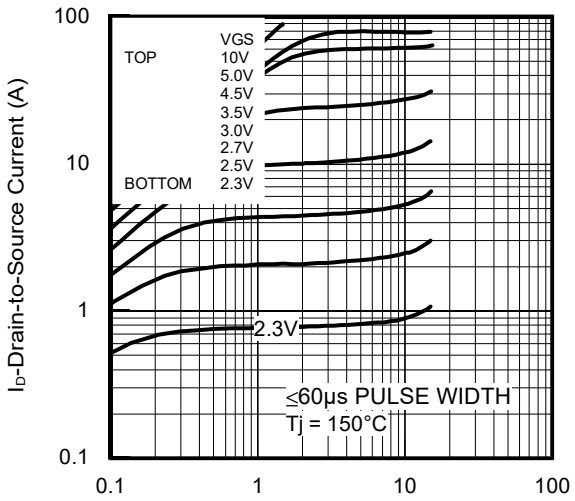


Fig 2. Typical Output Characteristics

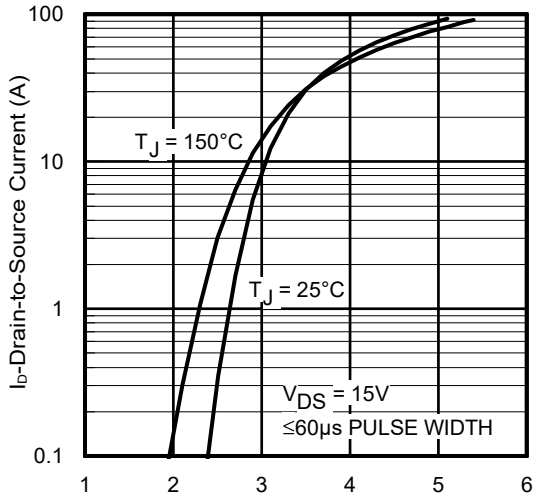


Fig 3. Typical Transfer Characteristics

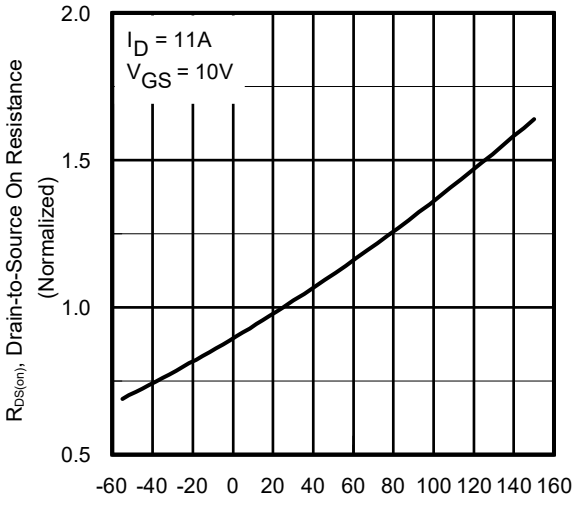
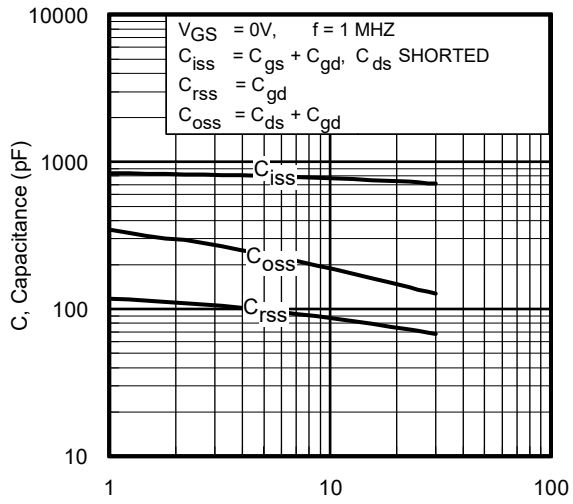


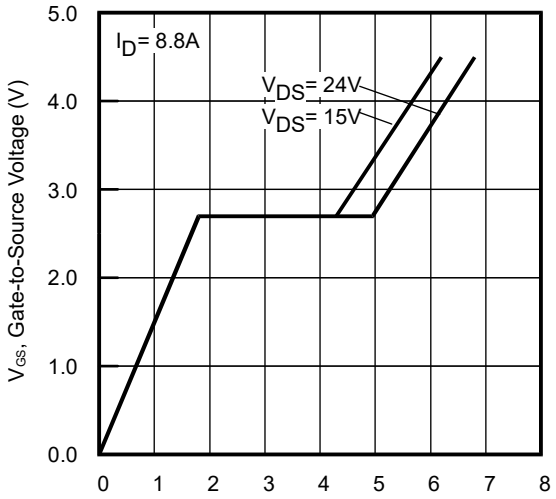
Fig 4. Nomalized On-ResistanceVs. Temperature

9.2Typical Characterisitics



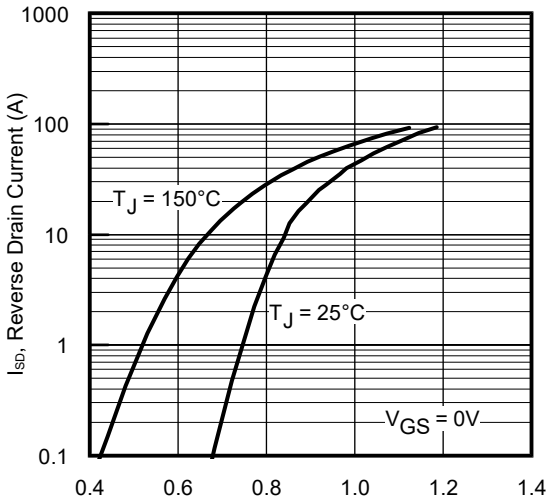
V_{DS} ,Drain-to-Source Voltage (V)

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



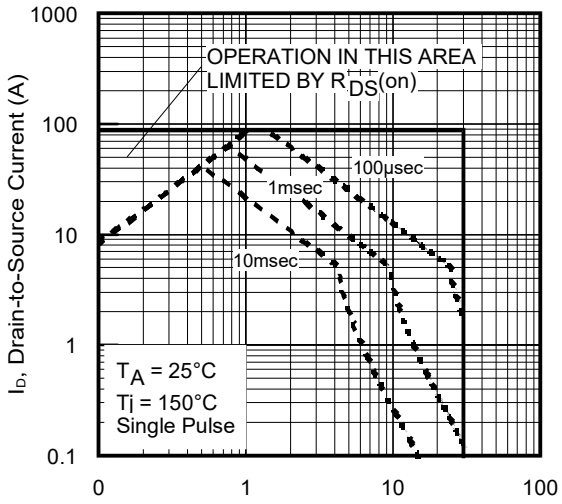
Q_G, Total Gate Charge (nC)

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

9.3Typical Characterisitics

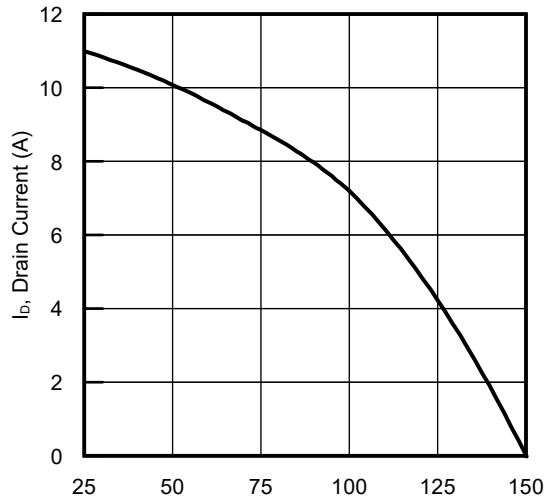


Fig 9. Maximum Drain Current Vs. Case Temperature

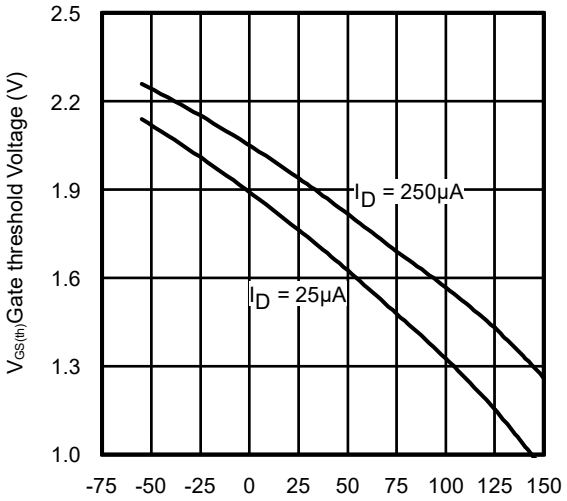


Fig 10. Threshold Voltage Vs. Temperature

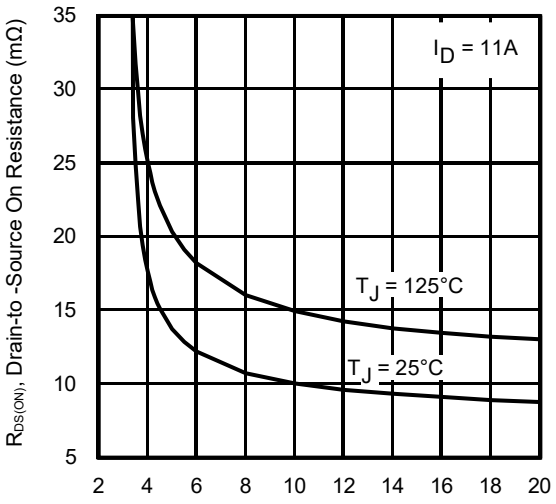


Fig 11. On-Resistance Vs. Drain Current

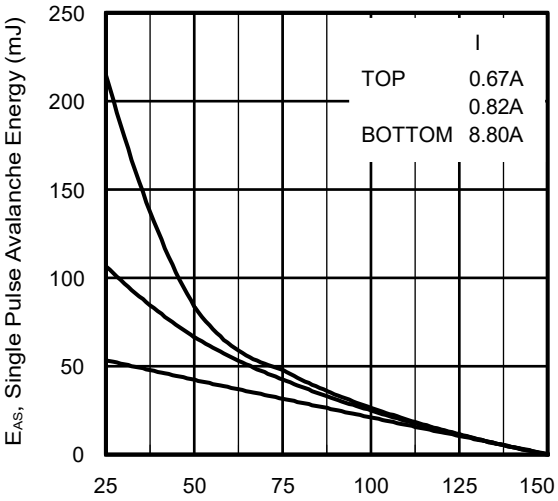


Fig 12. Maximum Avalanche Energy Vs. Drain Current

9.4Typical Characterisitics

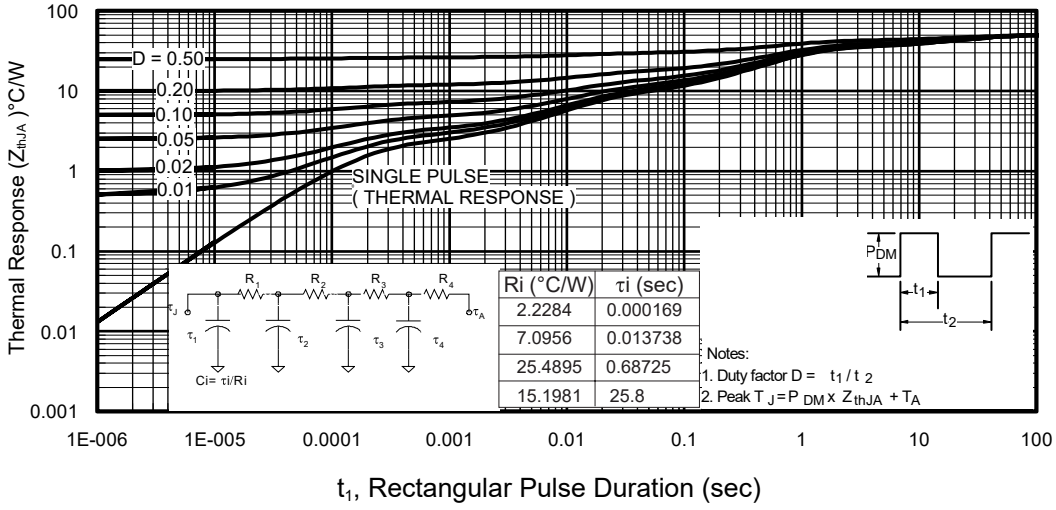


Fig 13. Maximum Effective Transient Themal Impedance, Junction-to-Ambient

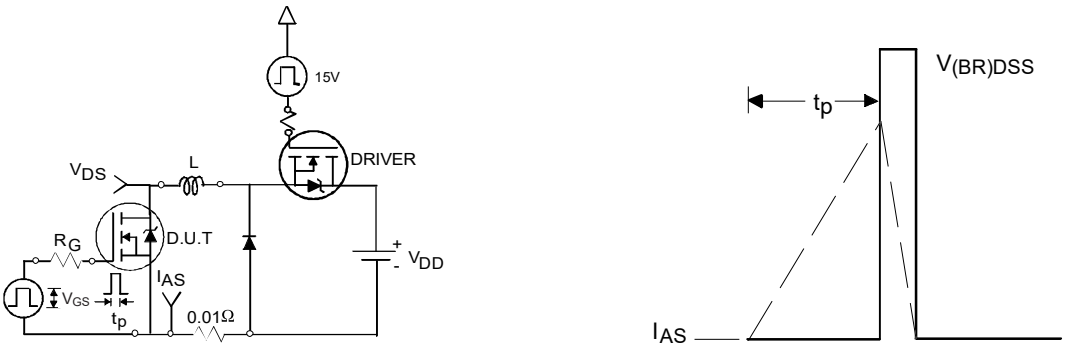


Fig 14.Unclamped Inductive Test Circuit and Waveform

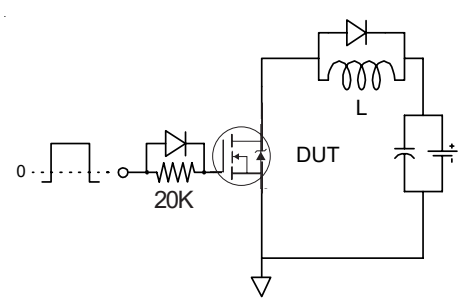


Fig 15. Gate Charge Test Circuit

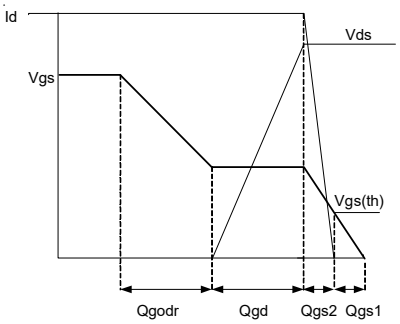
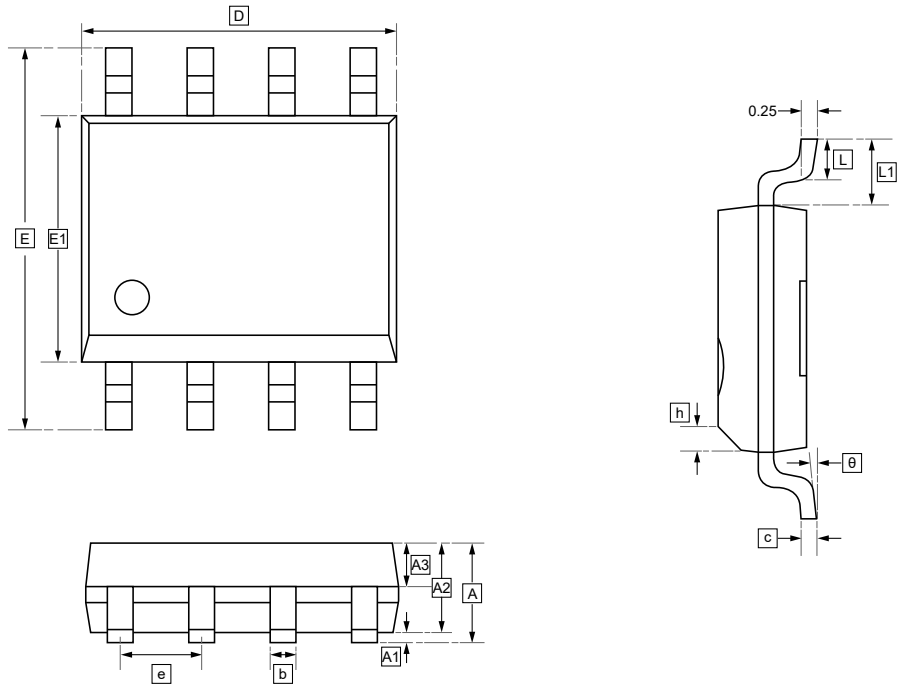


Fig 16. Gate Charge Waveform

10.SOP-8 Package Outline Dimensions

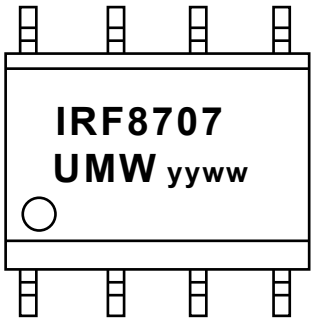


DIMENSIONS (mm are the original dimensions)

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°

11.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRF8707TR	SOP-8	3000	Tape and reel

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