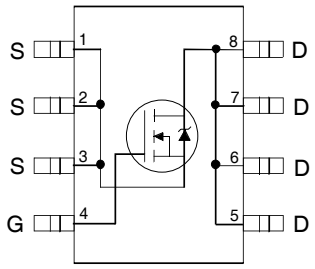
Description

The UMW IRF8707TR has been optimized for parameters that are critical in synchronous buck operation including Rds(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.



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Applications

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

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
- V_{DS}(V) = 30V
- I_D = 11A (V_{GS}= 10V)
- $R_{DS(ON)}$ <11.9mΩ (V_{GS} = 10V)
- $R_{DS(ON)}$ <17.5mΩ (V_{GS} = 4.5V)

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	11	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	9.1	
I_{DM}	Pulsed Drain Current ①	88	
P_D @T_A = 25°C	Power Dissipation	2.5	W
P_D @T_A = 70°C	Power Dissipation	1.6	
	Linear Derating Factor	0.02	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JL}$	Junction-to-Drain Lead ⑤		20	°C/W
$R_{\theta JA}$	Junction-to-Ambient ④⑤		50	

Notes ① through ⑤ are on page 9

Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30			V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		0.022		V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance		9.3	11.9	mΩ	V_{GS} = 10V, I_D = 11A ③
			14.2	17.5		V_{GS} = 4.5V, I_D = 8.8A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.80	2.35	V	V_{DS} = V_{GS}, I_D = 25μA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient		-5.8		mV/°C	V_{DS} = V_{GS}, I_D = 25μA
I_{DSS}	Drain-to-Source Leakage Current			1.0	μA	V_{DS} = 24V, V_{GS} = 0V
				150		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage			100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage			-100		V_{GS} = -20V
gfs	Forward Transconductance	25			S	V_{DS} = 15V, I_D = 8.8A
Q_g	Total Gate Charge		6.2	9.3	nC	V_{DS} = 15V V_{GS} = 4.5V I_D = 8.8A See Figs. 15 & 16
Q_{gs1}	Pre-Vth Gate-to-Source Charge		1.4			
Q_{gs2}	Post-Vth Gate-to-Source Charge		0.7			
Q_{gd}	Gate-to-Drain Charge		2.2			
Q_{godr}	Gate Charge Overdrive		1.9			
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})		2.9			
Q_{oss}	Output Charge		3.7		nC	V_{DS} = 16V, V_{GS} = 0V
R_g	Gate Resistance		2.2	3.7	Ω	
$t_{d(on)}$	Turn-On Delay Time		6.7		ns	V_{DD} = 15V, V_{GS} = 4.5V I_D = 8.8A R_G = 1.8Ω See Fig. 18
t_r	Rise Time		7.9			
$t_{d(off)}$	Turn-Off Delay Time		7.3			
t_f	Fall Time		4.4			
C_{iss}	Input Capacitance		760		pF	V_{GS} = 0V V_{DS} = 15V f = 1.0MHz
C_{oss}	Output Capacitance		170			
C_{rss}	Reverse Transfer Capacitance		82			

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②		53	mJ
I_{AR}	Avalanche Current ①		8.8	A

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)			3.1	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①			88	A	
V_{SD}	Diode Forward Voltage			1.0	V	T_J = 25°C, I_S = 8.8A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time		12	18	ns	T_J = 25°C, I_F = 8.8A, V_{DD} = 15V
Q_{rr}	Reverse Recovery Charge		13	20	nC	di/dt = 300A/ s ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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.

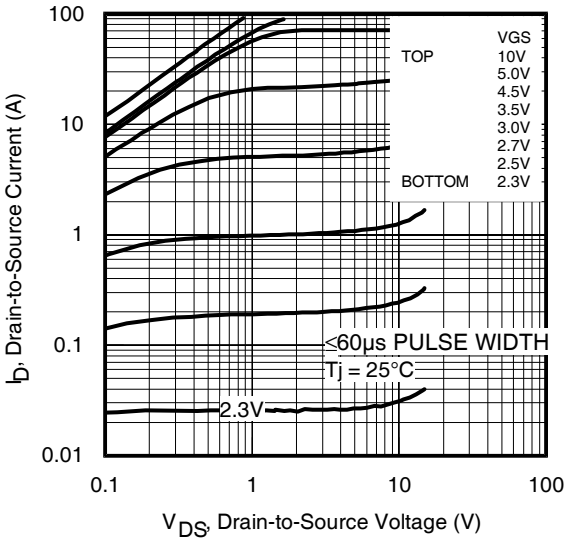


Fig 1. Typical Output Characteristics

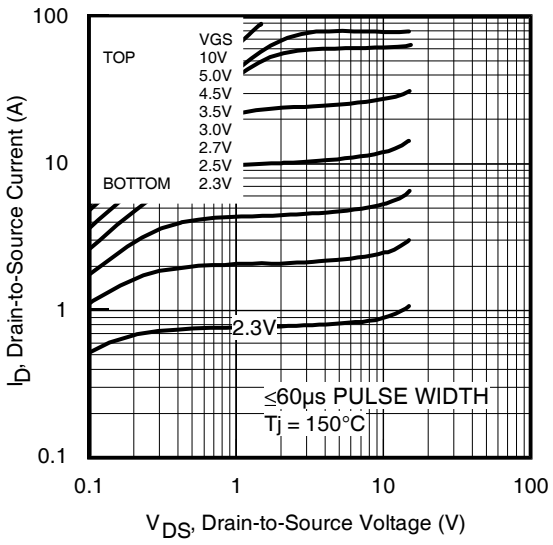


Fig 2. Typical Output Characteristics

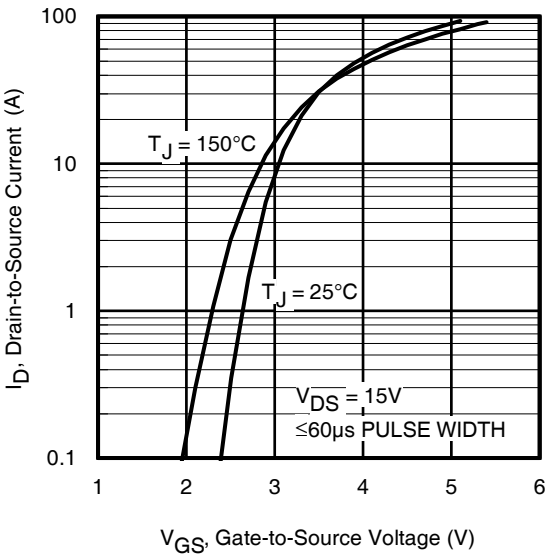


Fig 3. Typical Transfer Characteristics

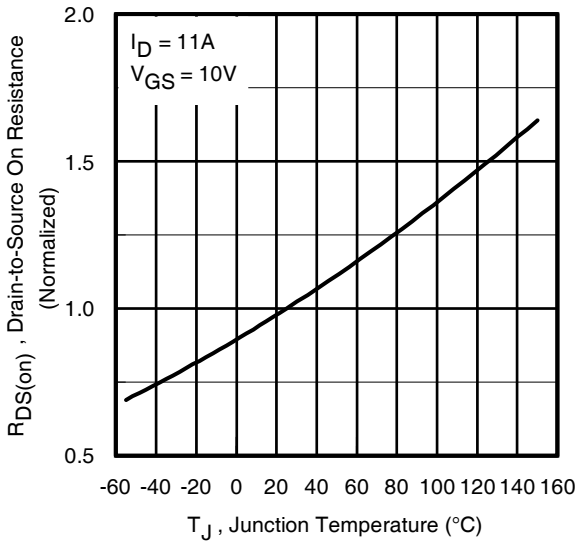


Fig 4. Normalized On-Resistance vs. Temperature

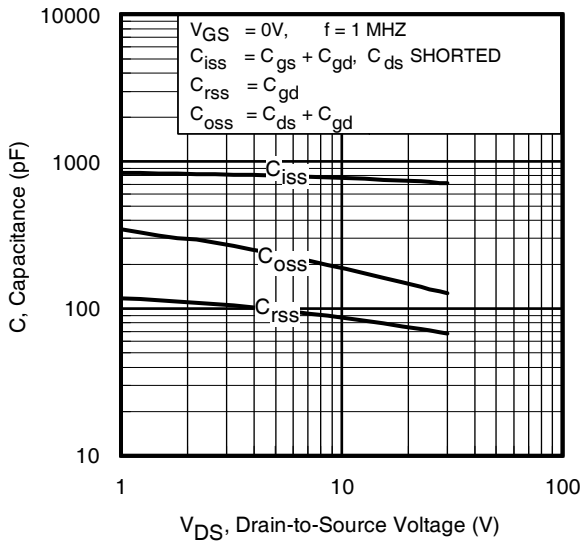


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

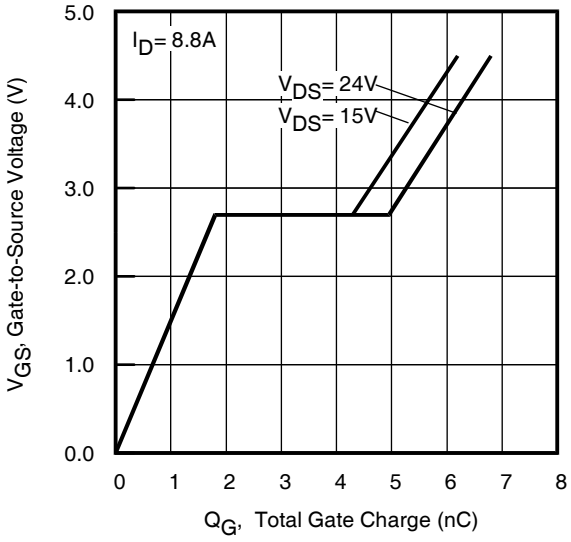


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

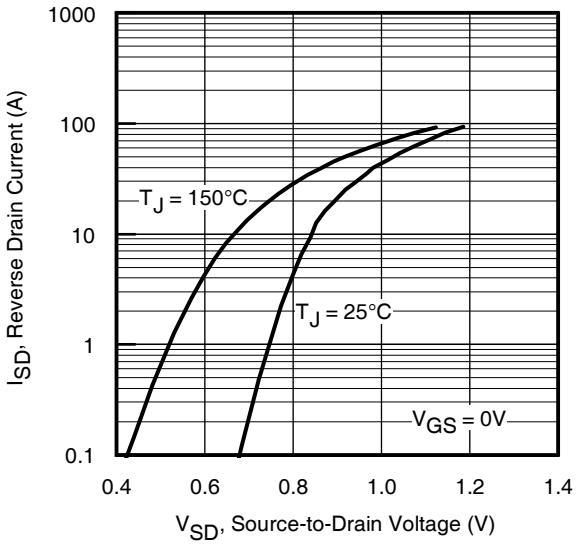


Fig 7. Typical Source-Drain Diode Forward Voltage

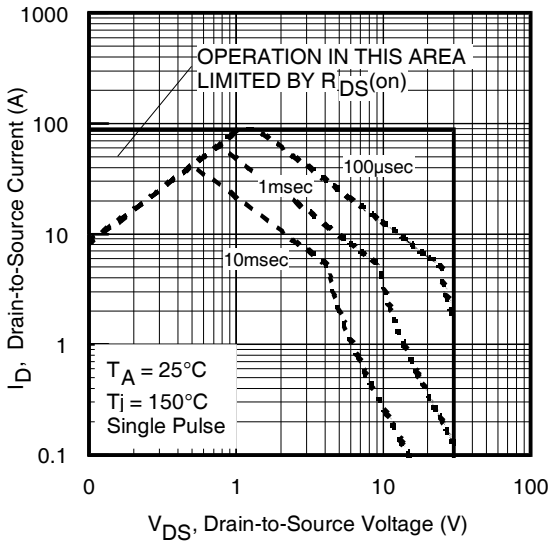


Fig 8. Maximum Safe Operating Area

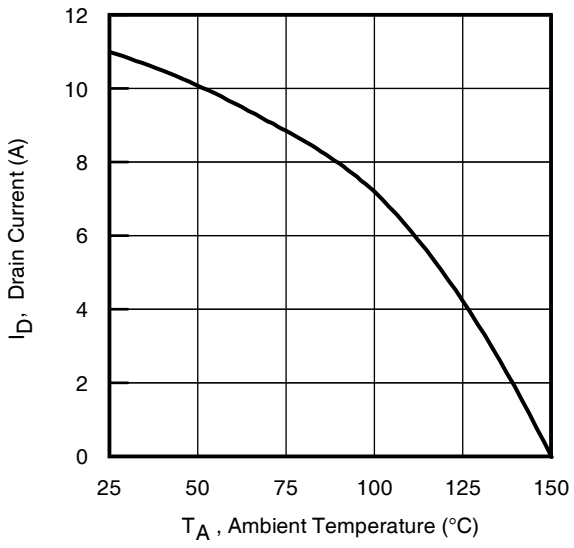


Fig 9. Maximum Drain Current vs. Ambient Temperature

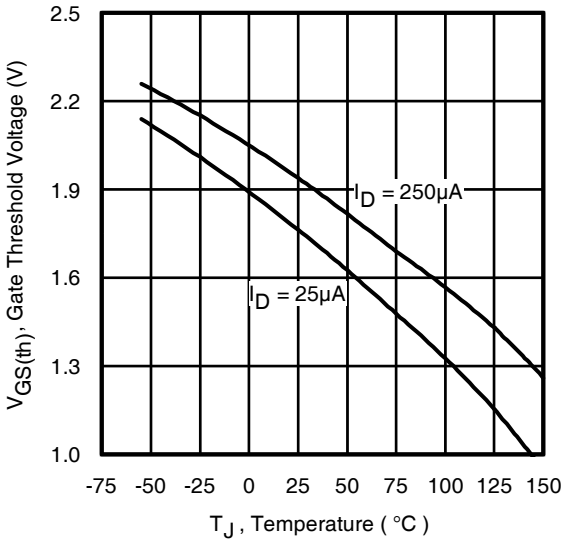


Fig 10. Threshold Voltage vs. Temperature

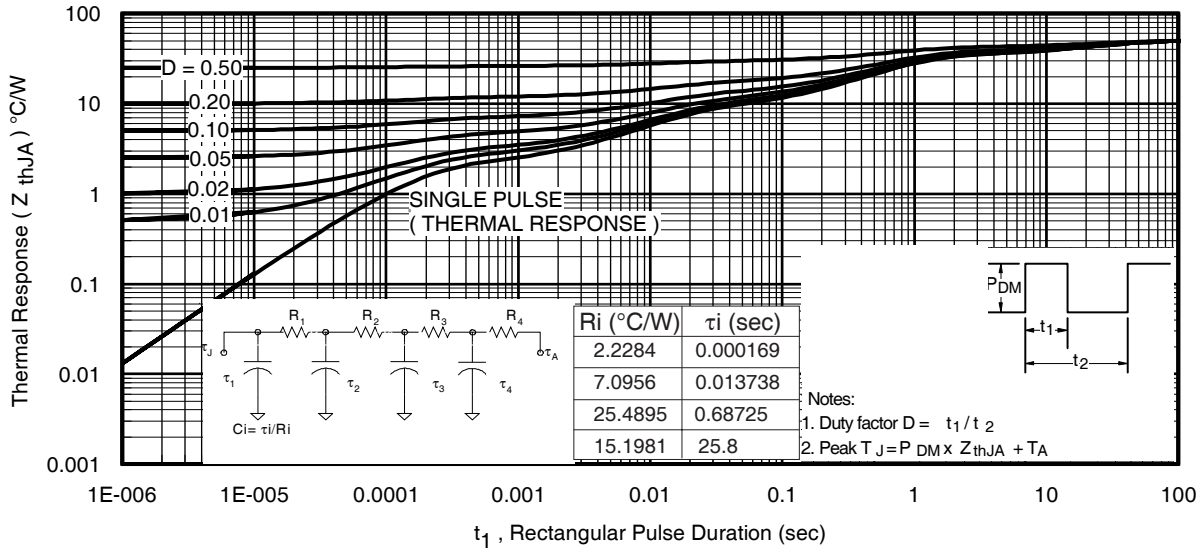


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

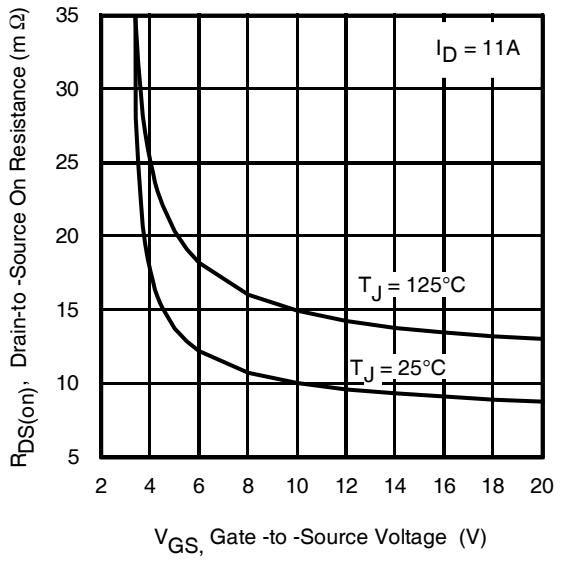


Fig 12. On-Resistance vs. Gate Voltage

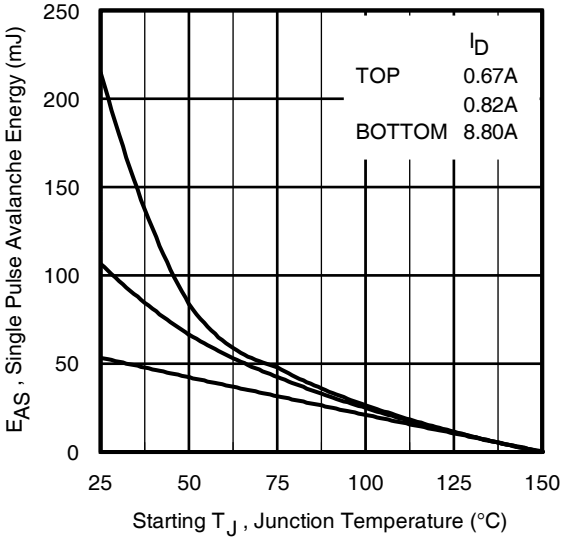


Fig 13. Maximum Avalanche Energy vs. Drain Current

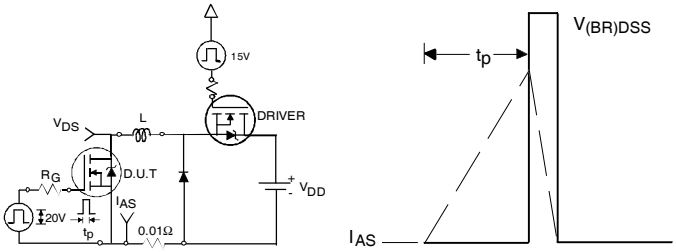


Fig 14. Unclamped Inductive Test Circuit and Waveform

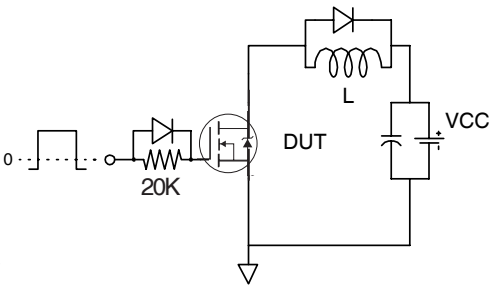


Fig 15. Gate Charge Test Circuit

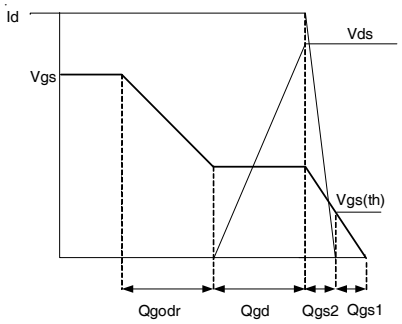
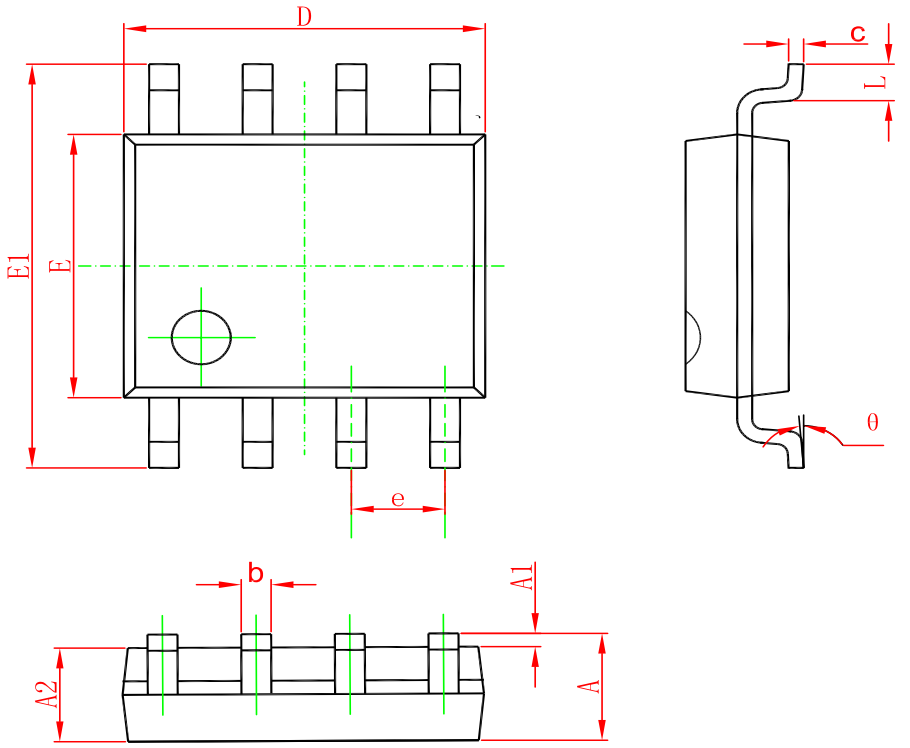


Fig 16. Gate Charge Waveform

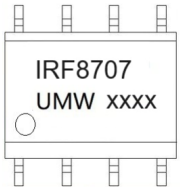
PACKAGE OUTLINE DIMENSIONS

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRF8707TR	SOP-8	3000	Tape and reel