UMW IRFR3707ZTR

30V N-Channel MOSFET

1.Features

- V_{DSS}=30V
- $R_{DS(ON)}$<9.5mΩ(V_{GS}=10V)
- Q_g=9.6nC

2.Applications

- High Frequency Synchronous Buck
- Converters for Computer Processor Power

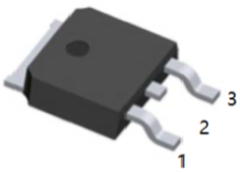
3.Benefits

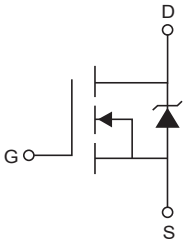
- Very Low $R_{DS(ON)}$ at 4.5V V_{GS}
- Fully Characterized Avalanche Voltage and Current
- Lead-Free
- Ultra - Low Gate Impedance

4.Pinning information

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

TO-252(DPAK)
top view





5.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Drain- Source Voltage		V_{DS}	30	V
Gate-to-Source Voltage		V_{GS}	±20	A
Continuous Drain Current, V_{GS}=10V	T_C=25°C	I_D	56 ④	A
Continuous Drain Current, V_{GS}=10V	T_C=100°C		39 ④	A
Pulsed Drain Current ①		I_{DM}	220	A
Maximum Power Dissipation	T_C=25°C	P_D	50	W
Maximum Power Dissipation	T_C=100°C		25	W
Linear Derating Factor			0.33	W/°C
Operating Junction and Storage Temperature Range		T_J	-55 to 175	°C
Soldering Temperature, for 10 seconds (1.6mm from case)		T_{STG}	300	°C

5.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case	$R_{\theta JC}$		3	°C/W
Junction-to-Ambient (PCB Mount) ⑤	$R_{\theta JA}$		50	°C/W
Junction-to-Ambient	$R_{\theta JA}$		110	°C/W

7.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	30			V
Breakdown Voltage Temp. Coefficient	$\Delta BV_{DSS}/\Delta T_J$	I_D=1mA,Reference to 25°C		0.023		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=15A ③		7.5	9.5	mΩ
		V_{GS}=4.5V, I_D=12A ③		10	12.5	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	1	1.7	2.5	V
Gate Threshold Voltage Coefficient	$\Delta V_{GS(th)}/\Delta T_J$			-5		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=12A	71			S
Total Gate Charge	Q_g	V_{DS}=15V, V_{GS}=4.5V I_D=12A, See Fig. 16		9.6	14	nC
Pre-Vth Gate-to-Source Charge	Q_{gs1}			2.6		nC
Post-Vth Gate-to-Source Charge	Q_{gs2}			0.9		nC
Gate-to-Drain Charge	Q_{gd}			3.5		nC
Gate Charge Overdrive	Q_{gdor}			2.6		nC
Switch Charge (Q_{gs2} + Q_{gd})	Q_{sw}			4.4		nC
Output Charge	Q_{oss}	V_{DS}=15V, V_{GS}=0V		5.8		nC
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=16V, V_{GS}=4.5V ③ I_D=12A Clamped Inductive Load		8		ns
Rise Time	t_r			11		ns
Turn-Off Delay Time	$t_{D(off)}$			12		ns
Fall Time	t_f			3.3		ns
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=15V f = 1.0MHz		1150		pF
Output Capacitance	C_{oss}			260		pF
Reverse Transfer Capacitance	C_{rss}			120		pF

Avalanche Characteristics						
Single Pulse Avalanche Energy ②	E_{AS}				42	mJ
Avalanche Current ①	I_{AR}				12	A
Repetitive Avalanche Energy ①	E_{AR}				5	mJ
Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			56④	A
Pulsed Source Current (Body Diode) ①	I_{SM}				220	
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=12A,V_{GS}=0V ③			1	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=12A, V_{DS}=15V dI/dt=100A/μs ③		25	38	ns
Reverse Recovery Charge	Q_{rr}			17	26	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=0.58mH, R_G=25Ω, I_{AS}=12A.

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

④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.

8.1Typical Characterisitics

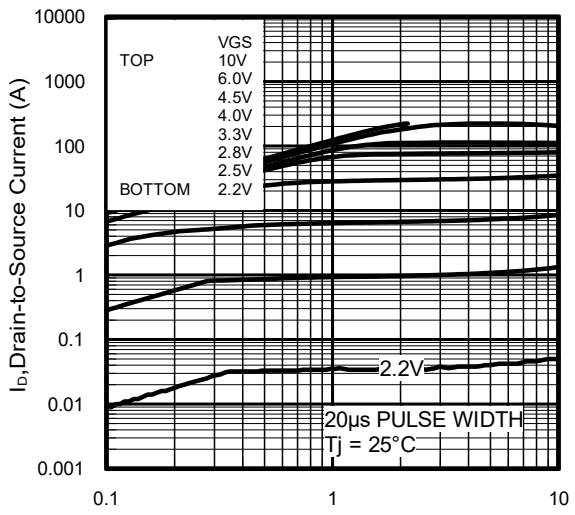


Figure 1: Typical Output Characteristics

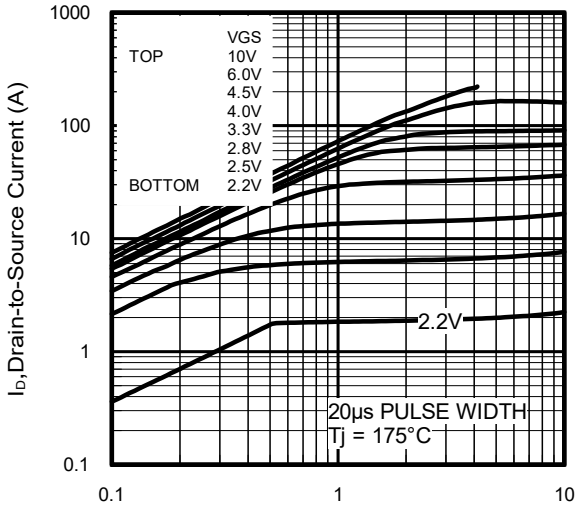


Figure 2: Typical Output Characteristics

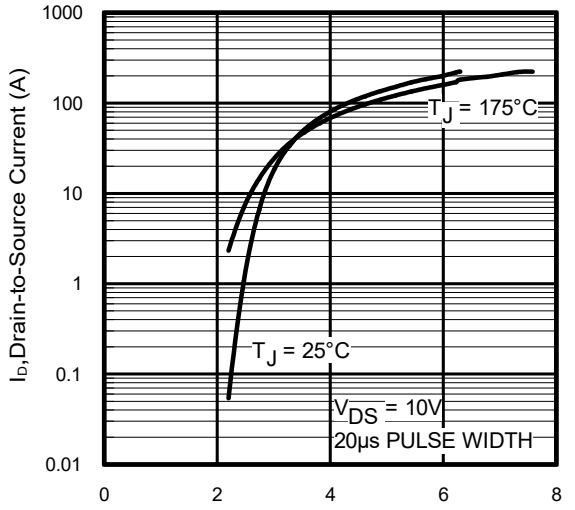


Figure 3: Typical Transfer Characteristics

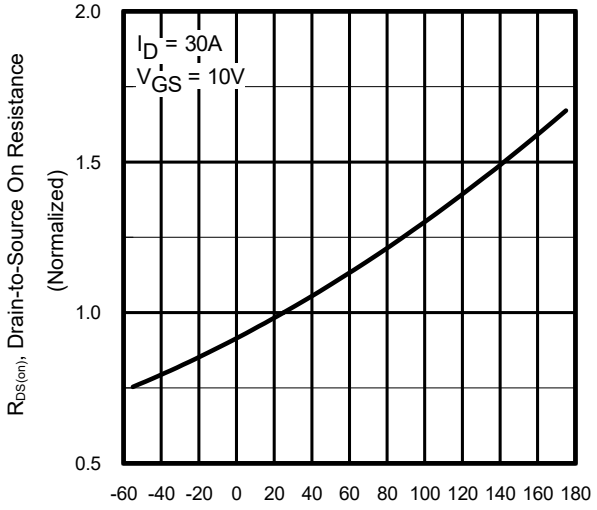


Figure 4: Nomalized On-ResistanceVs. Temperature

8.2Typical Characterisitics

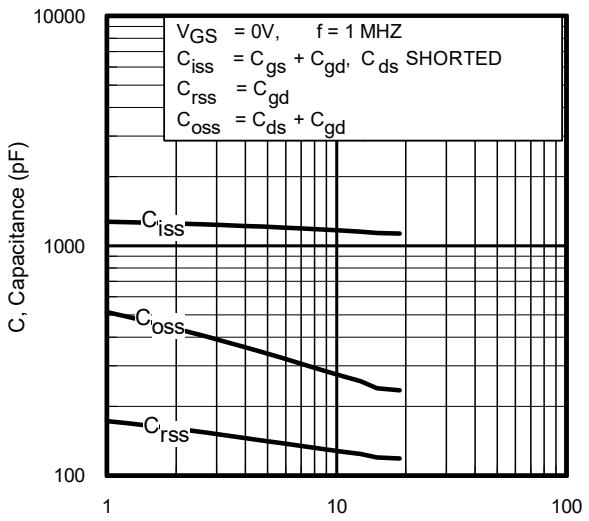


Figure 5: Typical Capacitance Vs. Drain-to-Source Voltage

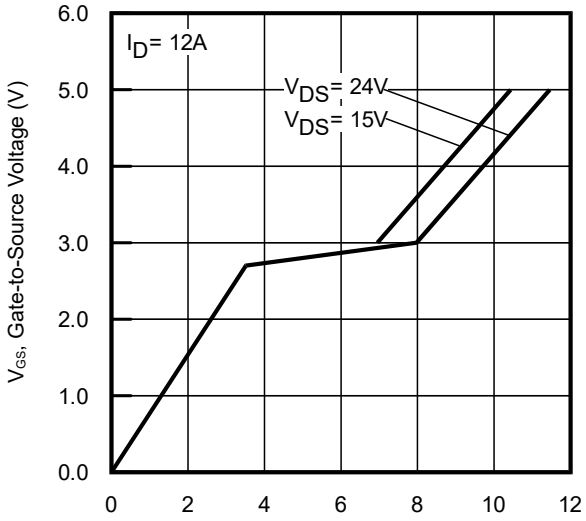


Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage

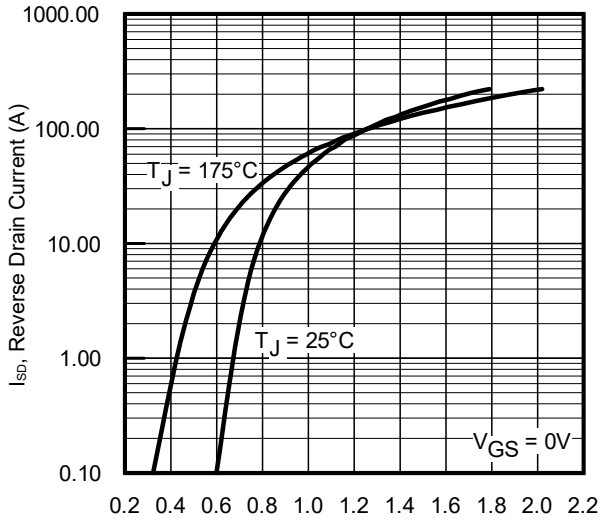


Figure 7: Typical Source-Drain Diode Forward Voltage

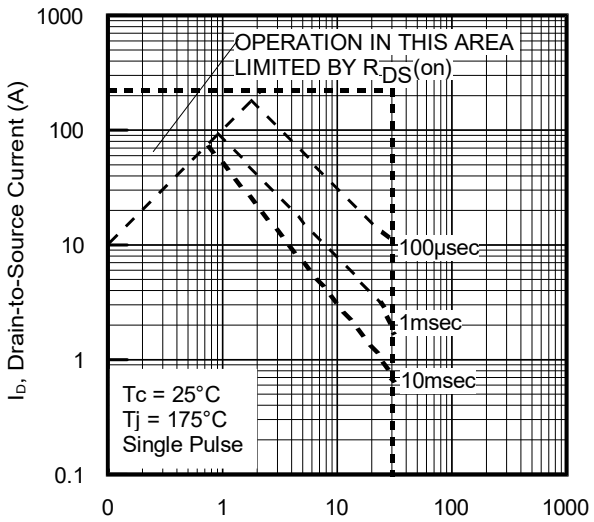


Figure 8: Maximum Safe Operating Area

8.3Typical Characterisitics

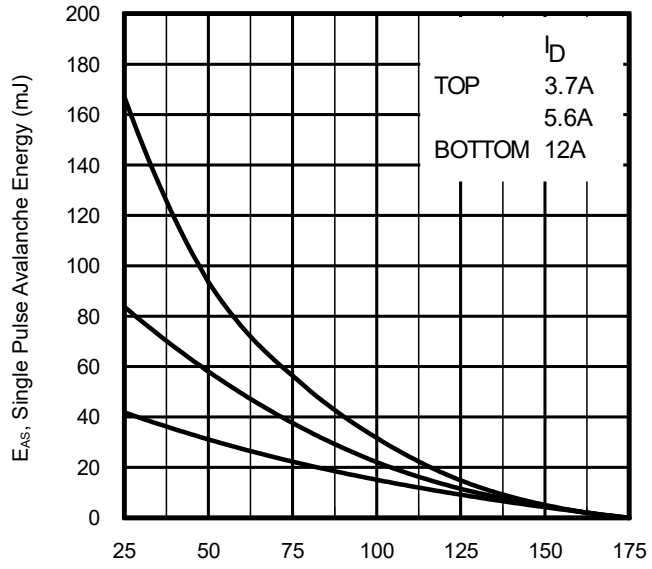


Figure 9: Maximum Avalanche Energy Vs. Drain Current

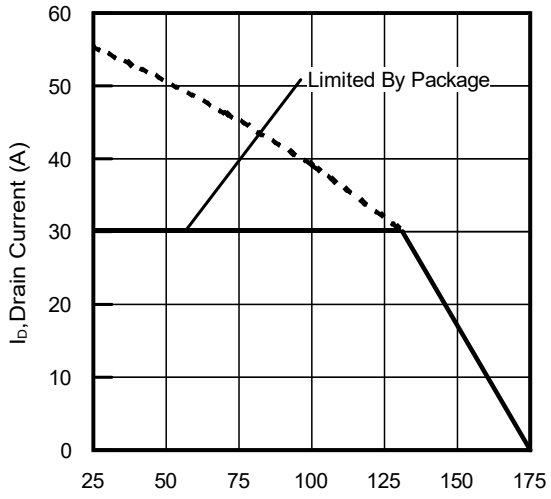


Figure 10: Maximum Drain Current vs. Case Temperature

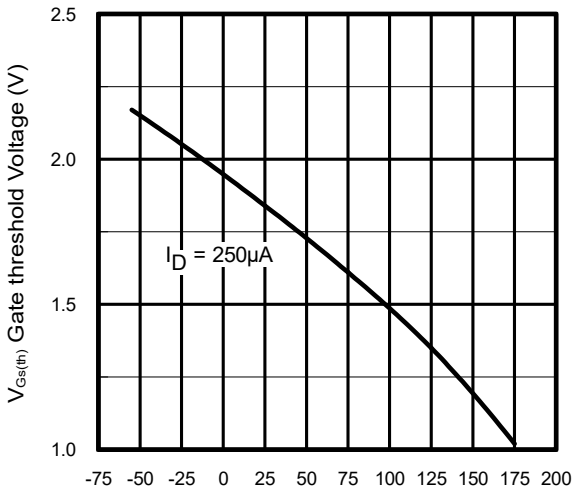


Figure 11: Threshold Voltage vs. Temperature

8.4Typical Characterisitics

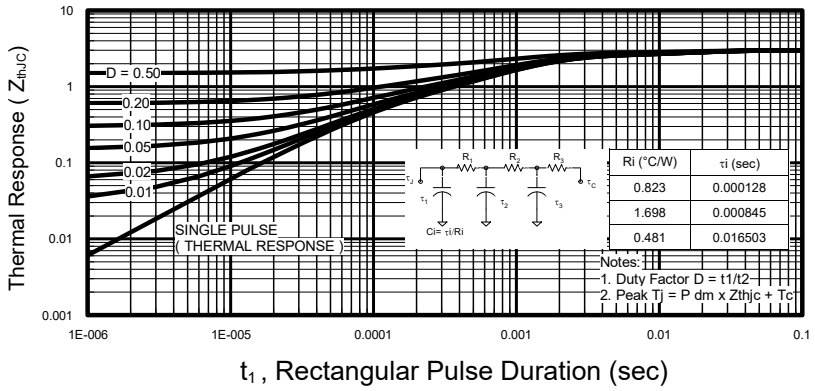


Figure 12: Maximum Effective Transient Thermal Impedance, Junction-to-Case

8.5Typical Characterisitics

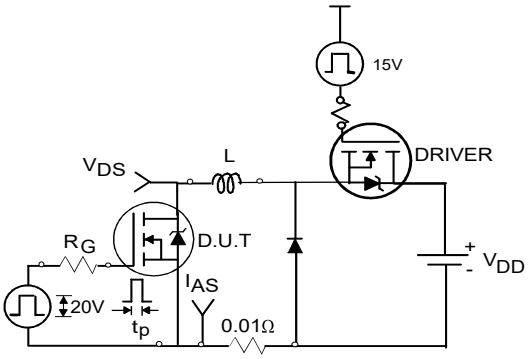


Figure 13a: Unclamped Inductive Test Circuit

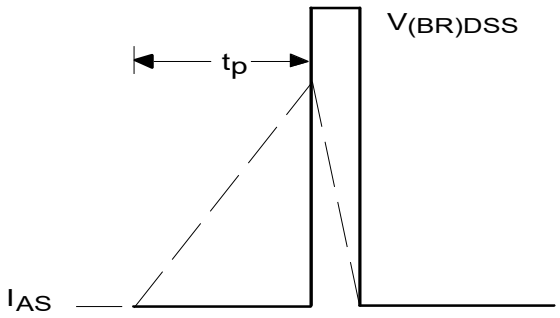


Figure 13b: Unclamped Inductive Waveforms

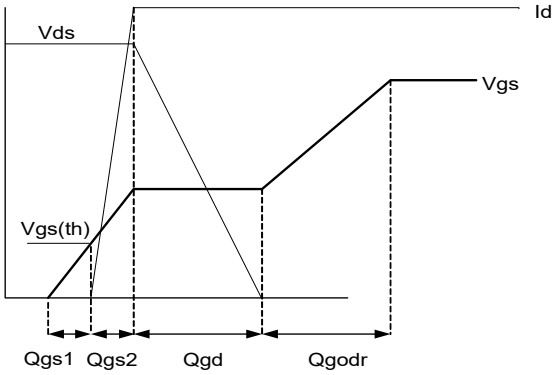


Figure 14a: Switching Time Test Circuit

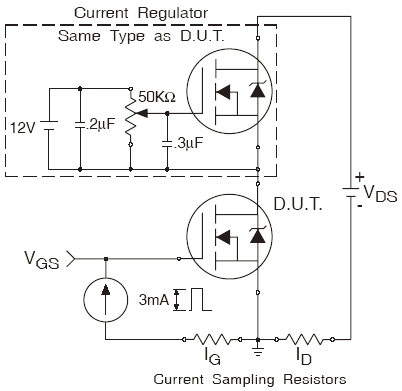


Figure 14b: USwitching Time Waveforms

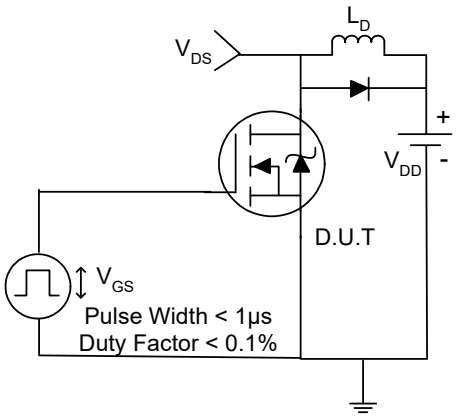


Figure 15: Gate Charge Test Circuit

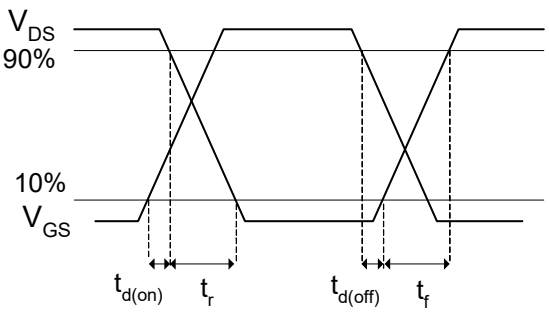
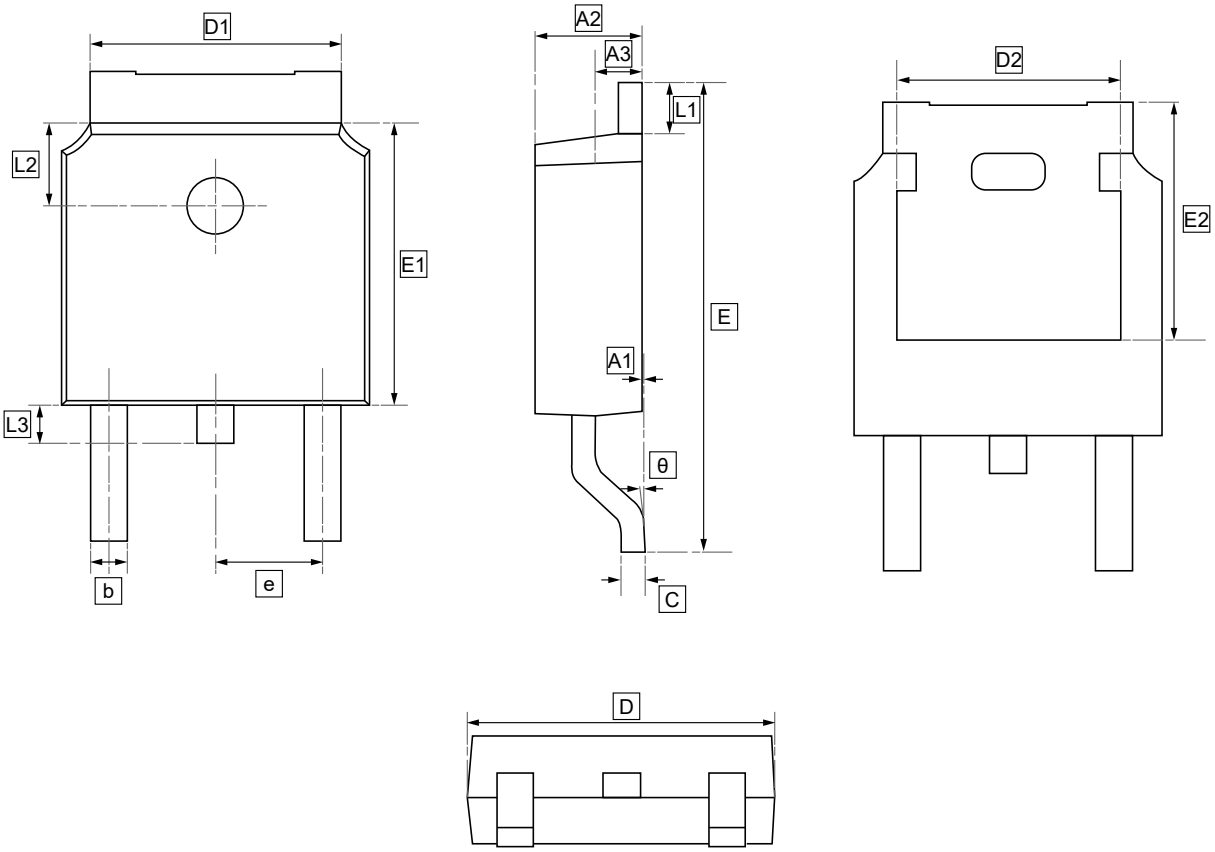


Figure 15: Gate Charge Test Circuit

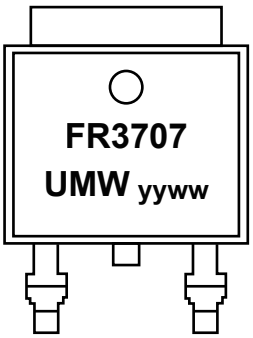
9.TO-252 Package Outline Dimensions



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

10.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR3707ZTR	TO-252	2500	Tape and reel

11.Disclaimer

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