UMW IRFR1018ETR

60V N-Channel MOSFET

1.1Features

- $V_{DS(V)}$=60V
- I_D=56A
- $R_{DS(ON)}$<8.4mΩ(V_{GS}=10V)
- Improved Gate, Avalanche and
- Dynamic dv/dt Ruggedness

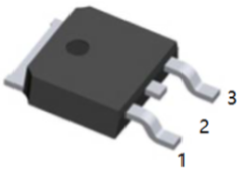
1.2Features

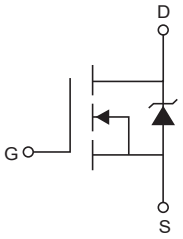
- Fully Characterized Capacitance and Avalanche SOA
- Enhanced body diode dV/dt and dI/dt Capability

2.Pinning information

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

TO-252(DPAK)
top view





3.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, V_{GS} @ 10V(Silicon Limited)	T_C=25°C	I_D	79 ①	A
Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	T_C=100°C		56 ①	A
Continuous Drain Current, V_{GS} @ 10V (Wire Bond Limited)	T_C=25°C		56	A
Pulsed Drain Current ②		I_{DM}	315	A
Maximum Power Dissipation	T_C=25°C	P_D	110	W
Linear Derating Factor			0.76	W/°C
Gate-to-Source Voltage		V_{GS}	±20	V
Peak Diode Recovery ④		dv/dt	21	V/ns
Operating Junction andStorage Temperature Range		T_J, T_{STG}	-55 to 175	°C
Soldering Temperature, for 10 seconds (1.6mm from case)			300	°C

Single Pulse Avalanche Energy ③	$E_{AS(Thermally\ limited)}$	88	mJ
Avalanche Current ②	I_{AR}	47	A
Repetitive Avalanche Energy ⑤	E_{AR}	11	mJ
Junction-to-Case ⑨	$R_{\theta JC}$	1.32	°C/W
Junction-to-Ambient (PCB Mount) ⑧⑨	$R_{\theta JA}$	50	°C/W
Junction-to-Ambient ⑨	$R_{\theta JA}$	110	°C/W

4.Electrical Characteristics @ T_J= 25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=250μA, V_{GS}=0V	60			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	Reference to 25°C,I_D=5mA②		0.073		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=47A ⑤		7.1	8.4	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=100μA			4	V
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=60V, V_{GS}=0V	2		20	μA
		V_{DS}=48V, V_{GS}=0V, T_J=125°C			250	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}=50V, I_D=47A	110			S
Total Gate Charge	Q_g	I_D=47A, V_{DS}=30V, V_{GS}=10V⑤		46	69	nC
Gate-to-Source Charge	Q_{gs}			10		nC
Gate-to-Drain ("Miller") Charge	Q_{gd}			12		nC
Total Gate Charge Sync.(Q_g-Q_{gd})	Q_{sync}	I_D=47A, V_{DS}=30V, V_{GS}=10V		34		nC
Internal Gate Resistance	$R_{G(int)}$			0.73		Ω
Tum-On Delay Time	$t_{D(on)}$	V_{DD}=39V, I_D=47A R_G=10Ω, V_{GS}=10V ⑤		13		ns
Rise Time	t_r			35		ns
Turn-Off Delay Time	$t_{D(off)}$			55		ns
Fall Time	t_f			46		ns
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=50V f=1MHz		2290		pF
Output Capacitance	C_{oss}			270		pF
Reverse Transfer Capacitance	C_{rss}			130		pF
Effective Output Capacitance (Energy Related)	C_{oss}eff.(ER)	V_{GS}=0V, V_{DS}=0V to 60V ⑦		390		pF
Effective Output Capacitance (Time Related)	C_{oss}eff.(TR)	V_{GS}=0V, V_{DS}=0V to 60V ⑥		630		pF

Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			79①	A
Pulsed Source Current (Body Diode) ②	I_{SM}				315	A
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=47A,V_{GS}=0V ⑤			1.3	V
Reverse Recovery Time	t_{rr}	T_J=25°C, V_R=51V		26	39	ns
		T_J=125°C, I_F=47A		31	47	ns
Reverse Recovery Charge	Q_{rr}	T_J=25°C, di/dt=100A/μs ⑤		24	36	nC
		T_J=125°C		35	53	nC
Reverse Recovery Current	I_{RRM}	T_J=25°C		1.8		A
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 56A by source bonding technology. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements.

② Repetitive rating; pulse width limited by max. junction temperature.

③ Limited by T_{Jmax}, starting T_J=25°C, L=0.08mH, R_G=25Ω, I_{AS}=47A, V_{GS}=10V. Part not recommended for use above this value.

④ I_{SD} ≤ 47A, di/dt ≤ 1668A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

⑤ Pulse width ≤ 400μs; duty cycle ≤ 2%.

⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑧ When mounted on 1" square PCB (FR-4 or G-10 Material). For recom mended footprint and soldering techniques refer to application note #AN-994.

⑨ R_θ is measured at T_J approximately 90°C.

6.1Typical Characterisitics

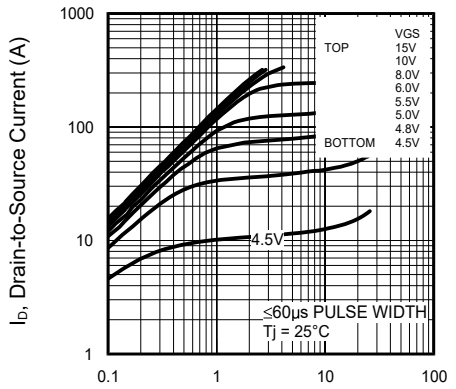


Figure 1: Typical On-Resistance vs. Gate Voltage

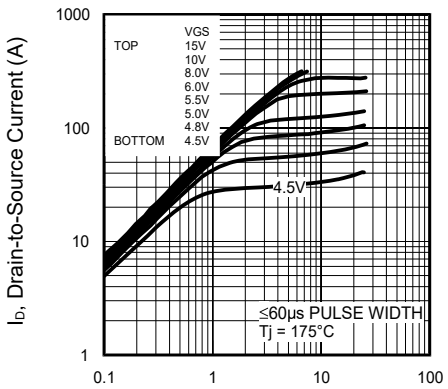


Figure 2: Typical Output Characteristics

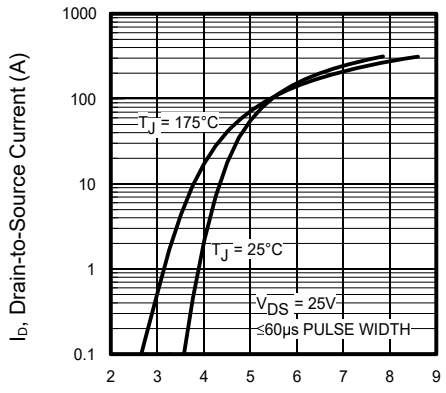


Figure 3: Typical Output Characteristics

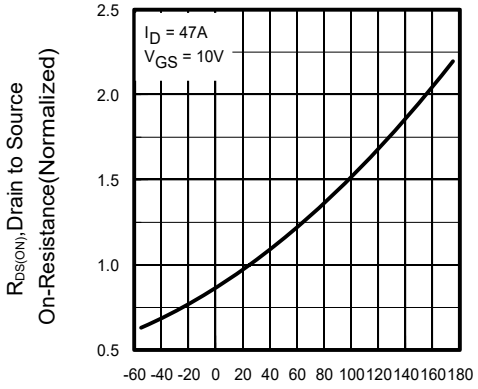


Figure 4: Normalized On-Resistance vs. Temperature

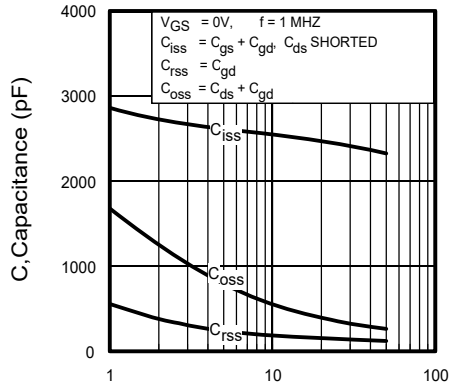


Figure 5: Typical Capacitance vs. Drain-to-Source Voltage

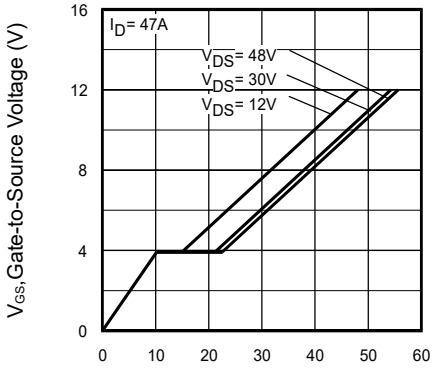


Figure 6: Typical Gate Charge vs.

6.2Typical Characterisitics

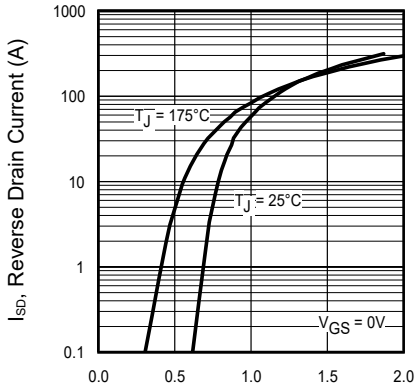


Figure 7: Typical Capacitance vs. Drain-to-Source Voltage

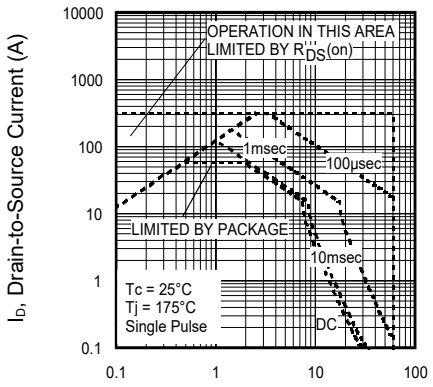


Figure 8: Maximum Safe Operating Area

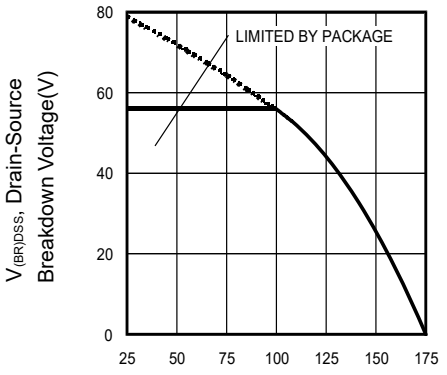


Figure 9: Drain-to-Source Breakdown Voltage

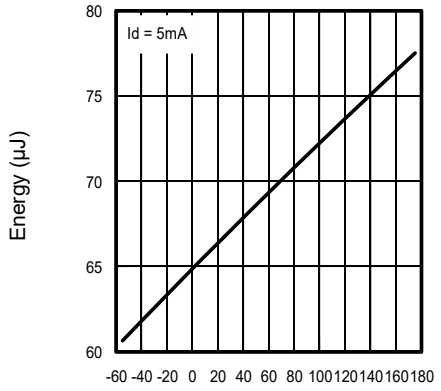


Figure 10: Typical C_{oss} Stored Energy

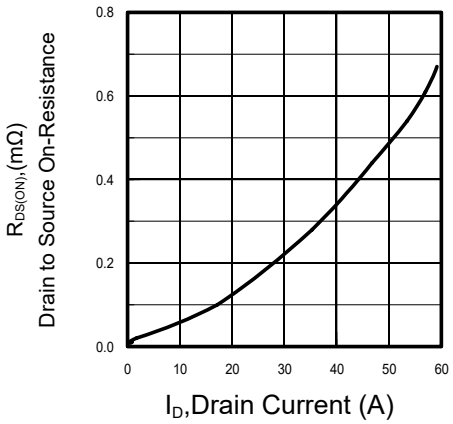


Figure 11: Typical On-Resistance vs. Drain Current

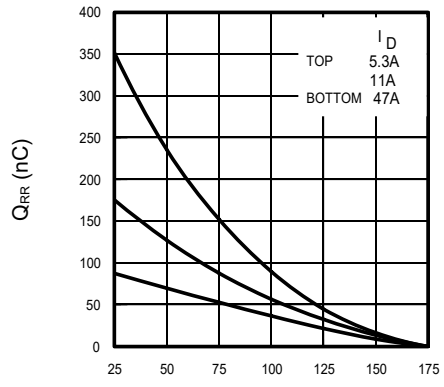


Figure 12: Typical Stored Charge vs. dif/dt

6.3Typical Characterisitics

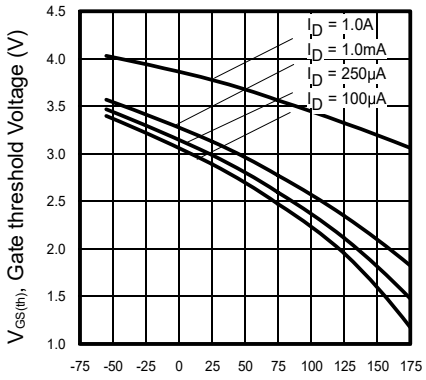


Figure 13: Threshold Voltage vs. Temperature

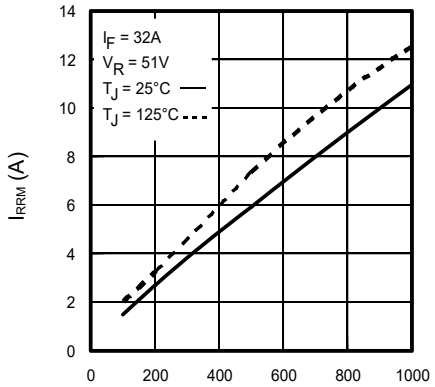


Figure 14: Typical Recovery Current vs. dif/dt

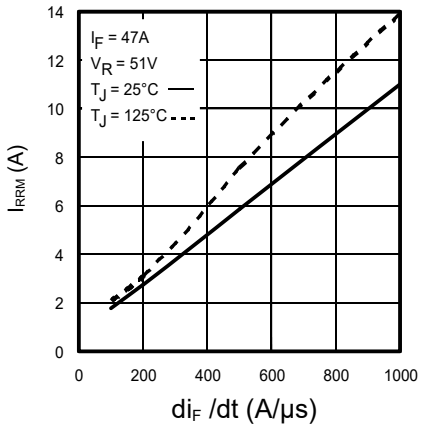


Figure 15: Typical Recovery Current vs. dif/dt

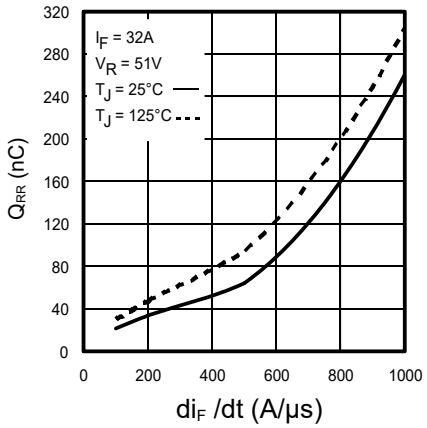


Figure 16: Typical Stored Charge vs. dif/dt

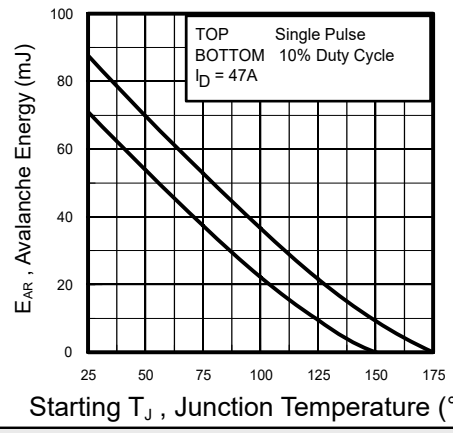


Figure 17: Typical On-Resistance vs. Drain Current

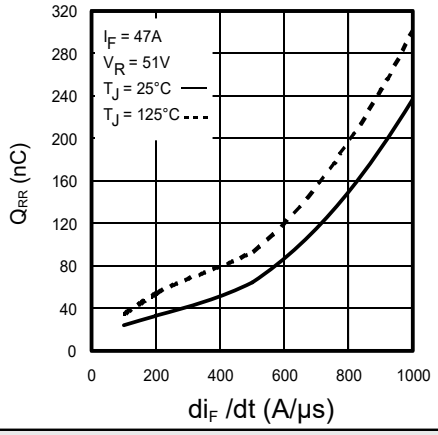


Figure 18: Typical Stored Charge vs. di_f/dt

6.4Typical Characterisitics

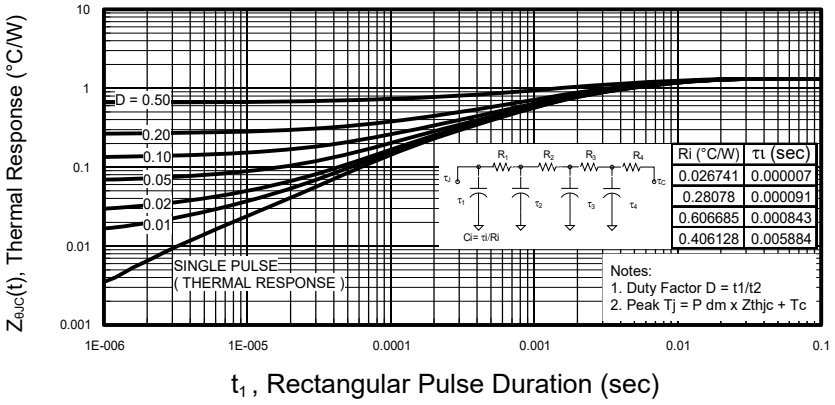


Figure 19: Maximum Effective Transient Thermal Impedance, Junction-to-Case

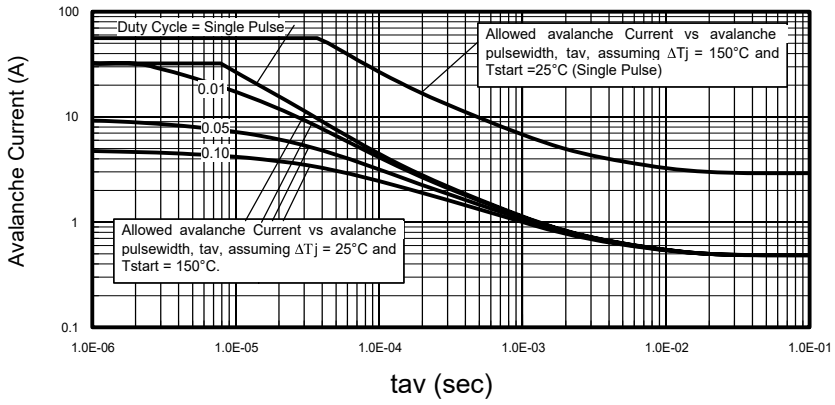
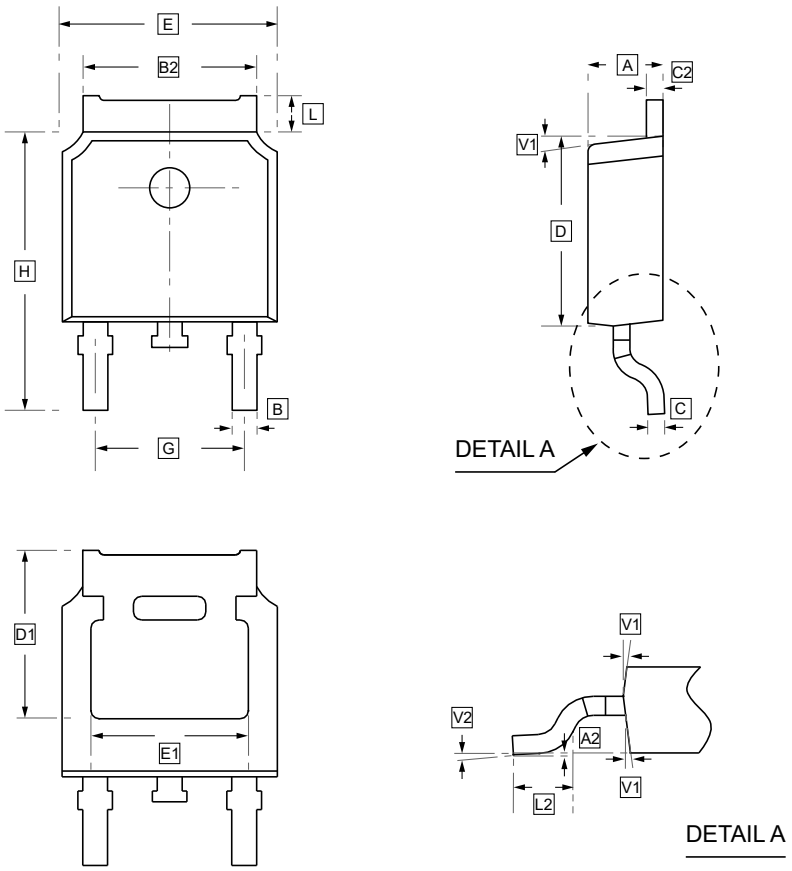


Figure 20: Typical Avalanche Current vs.Pulse width

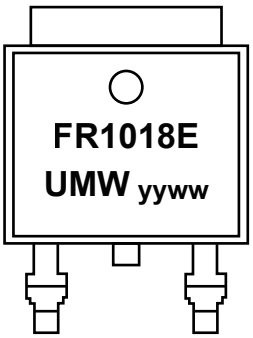
7.TO-252 PACKAGE OUTLINE DIMENSIONS



DIMENSIONS (mm are the original dimensions)

Symbol	A	A2	B	B2	C	C2	D	D1	E	E1	G	H	L	L2	V1	V2
Min	2.10	0	0.66	5.18	0.40	0.44	5.90	5.30	6.40	4.63	4.47	9.50	1.09	1.35		0°
Max	2.50	0.10	0.86	5.48	0.60	0.58	6.30	REF	6.80		4.67	10.70	1.21	1.65		6°

8.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR1018ETR	TO-252	2500	Tape and reel

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