UMW IRFR7440TR

40V N-Channel MOSFET

1.Features

- $V_{DS(V)}$=40V
- I_D=90A
- $R_{DS(ON)}$<2.4mΩ(V_{GS}=10V)

2.1Applications

- Brushed Motor drive applications
- BLDC Motor drive applications
- PWM Inverterized topologies
- Battery powered circuits

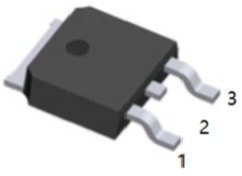
2.2Applications

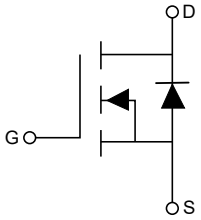
- Half-bridge and full-bridge topologies
- Electronic ballast applications
- Synchronous rectifier applications
- Resonant mode power supplies
- OR-ing and redundant power switches
- DC/DC and AC/DC converters

3.Pinning information

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

TO-252(DPAK)
top view





4.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, Vas @ 10V(Silicon Limited)	T_C=25°C	I_D	180 ①	A
Continuous Drain Current, Vas @ 10V (Silicon Limited)	T_C=100°C		125 ①	A
Continuous Drain Current, Vas @ 10V (Wire Bond Limited)	T_C=25°C		90	A
Pulsed Drain Current ②		I_{DM}	760	A
Maximum Power Dissipation	T_C=25°C	P_D	140	W
Linear Derating Factor			0.95	W/°C
Gate-to-Source Voltage		V_{GS}	±20	V
Peak Diode Recovery ④		dv/dt	4.4	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	$E_{AS(Thermally\ limited)}$	160	mJ
Single Pulse Avalanche Energy ⑩	$E_{AS(Thermally\ limited)}$	376	mJ
Avalanche Current ②	I_{AR}	See Fig 15,16,	A
Repetitive Avalanche Energy ②	E_{AR}	23a, 23b	mJ
Junction-to-Case ⑨	$R_{\theta JC}$	1.05	°C/W
Junction-to-Ambient (PCB Mount) ⑧	$R_{\theta JA}$	50	°C/W
Junction-to-Ambient ⑨	$R_{\theta JA}$	110	°C/W

5.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	40			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D=1mA, Reference to 25°C		28		mV/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=90A ⑤		1.9	2.4	mΩ
		V_{GS}=6V, I_D=50A ⑤		2.8		mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=100μA	2.2	3	3.9	V
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=40V, V_{GS}=0V			1	μA
		V_{DS}=40V, 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
Internal Gate Resistance	R_g			2.6		Ω
Forward Transconductance	g_{FS}	V_{DS}=10V, I_D=90A	280			S
Total Gate Charge	Q_g	I_D=90A, V_{DS}=20V, V_{GS}=10V⑤		89	134	nC
Gate-to-Source Charge	Q_{gs}			26		nC
Gate-to-Drain ("Miller") Charge	Q_{gd}			26		nC
Total Gate Charge Sync.(Q_g-Q_{gd})	Q_{sync}	I_D=90A, V_{DS}=0V, V_{GS}=10V		63		nC
Tum-On Delay Time	$t_{D(on)}$	V_{DD}=20V, I_D=30A R_G=2.7Ω, V_{GS}=10V ⑤		11		ns
Rise Time	t_r			39		ns
Turn-Off Delay Time	$t_{D(off)}$			51		ns
Fall Time	t_f			34		ns
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V See Fig. 5, f=1MHz		4610		pF
Output Capacitance	C_{oss}			690		pF
Reverse Transfer Capacitance	C_{rss}			460		pF
Effective Output Capacitance (Energy Related)	C_{oss}eff.(ER)	V_{GS}=0V, V_{DS}=0V to 32V ⑦ See Fig. 12		855		pF
Effective Output Capacitance (Time Related)	C_{oss}eff.(TR)	V_{GS}=0V, V_{DS}=0V to 32V ⑥		1210		pF

Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			180①	A
Pulsed Source Current (Body Diode) ②	I_{SM}				760	A
Diode Forward Voltage	V_{SD}	T_J=25°C,I_S=90A,V_{GS}=0V		0.9	1.3	V
Reverse Recovery Time	t_{rr}	T_J=25°C, V_R=34V		34		ns
		T_J=125°C, I_F=90A		35		ns
Reverse Recovery Charge	Q_{rr}	T_J=25°C, di/dt=100A/μs ⑤		33		nC
		T_J=125°C		34		nC
Reverse Recovery Current	I_{RRM}	T_J=25°C		1.8		A

Notes:

① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 90A. 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 TJmax, starting T_J = 25°C, L = 0.04mH, R_G = 50Ω, I_{AS} = 90A, V_{GS} =10V.

④ I_{SD} ≤ 100A, di/dt ≤ 1306A/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 Coss 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).

⑨ R_θ is measured at T_J approximately 90°C.

⑩ Limited by TJmax starting T_J = 25°C, L= 1mH, R_G = 50Ω, I_{AS} = 27A, V_{GS} =10V.

6.1 Typical Characterisitics

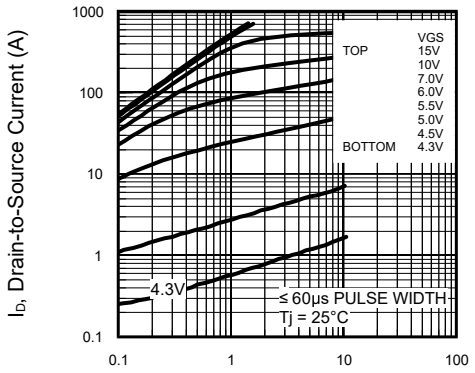


Figure 1: Typical Output Characteristics

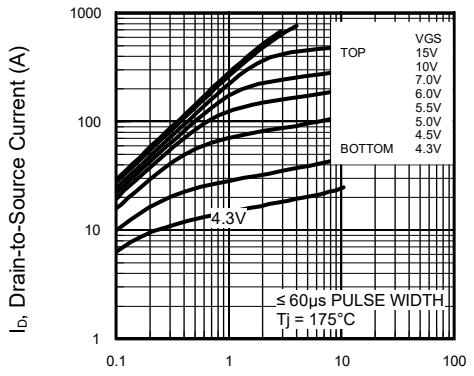


Figure 2: Typical Output Characteristics

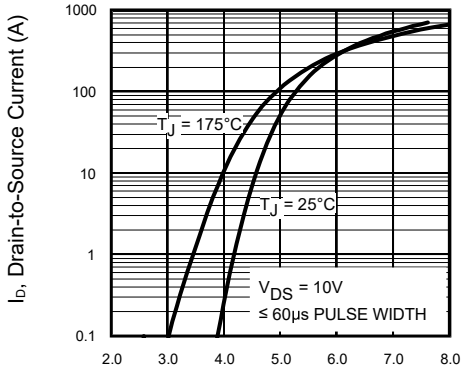


Figure 3: Typical Transfer Characteristics

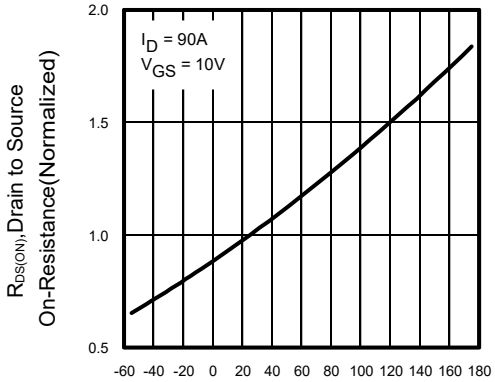


Figure 4: Normalized On-Resistance vs. Temperature

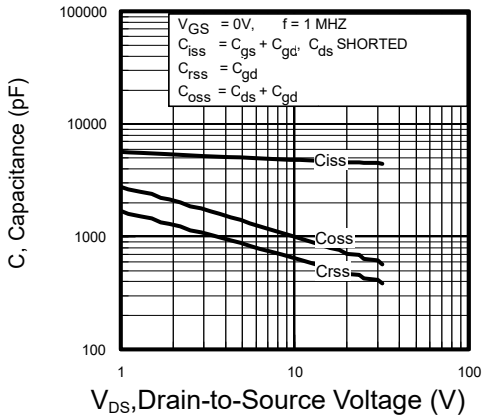


Figure 5: Typical Capacitance vs. Drain-to-Source Voltage

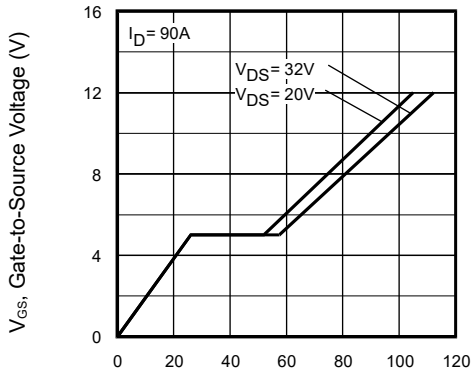


Figure 6: Typical Gate Charge vs. Gate-to-Source Voltage

6.2 Typical Characterisitics

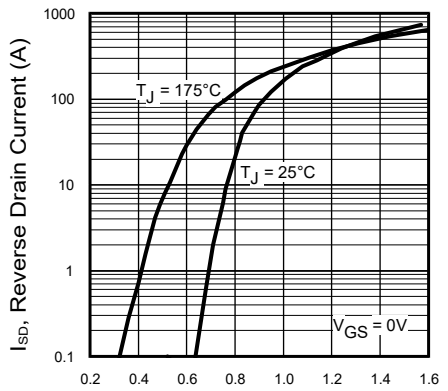


Figure 7: Typical Source-Drain Diode Forward Voltage

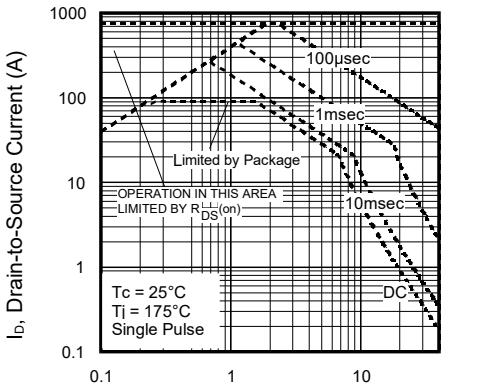


Figure 8: Maximum Safe Operating Area

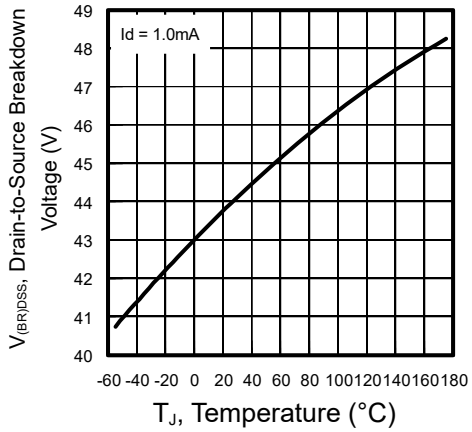


Figure 9: Drain-to-Source Breakdown Voltage

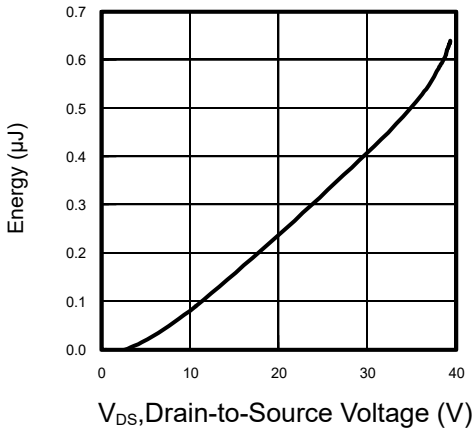


Figure 10: Typical C_{OSS} Stored Energy

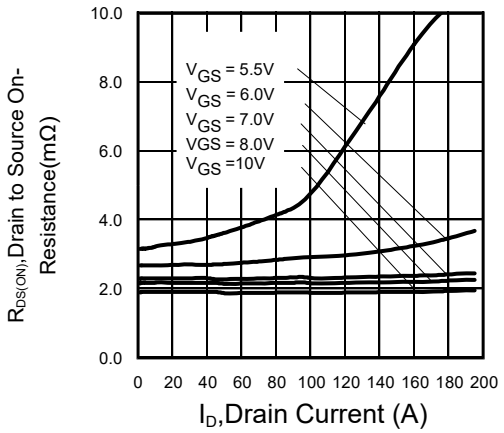


Figure 11: Typical On-Resistance vs. Drain Current

6.3 Typical Characterisitics

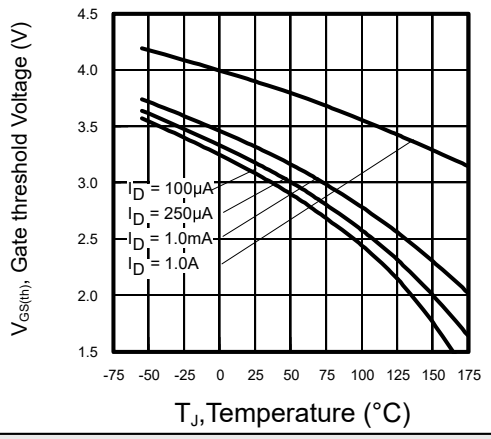


Figure 12: Threshold Voltage vs. Temperature

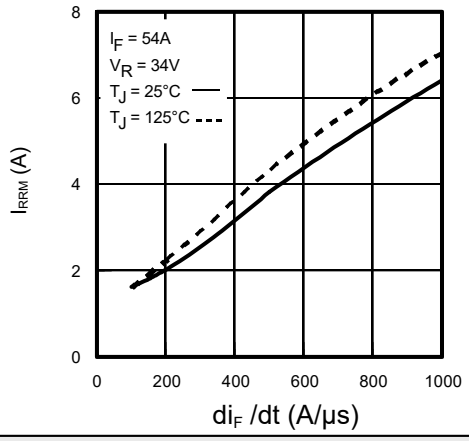


Figure 13: Typical RecOvery Current vs.d_{if}/dt

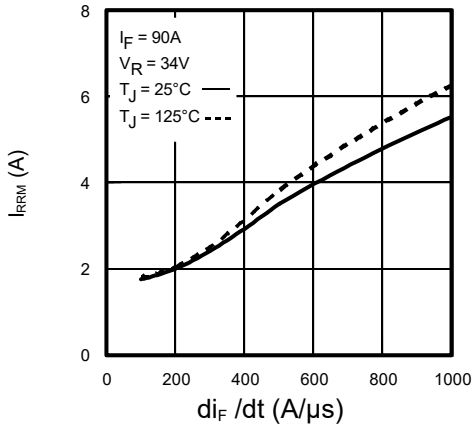


Figure 14: Typical Recovery Current vs.d_{if}/dt

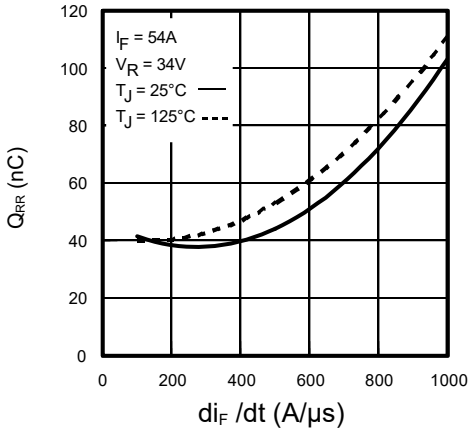


Figure 15: Typical Stored Charge vs. d_{if}/dt

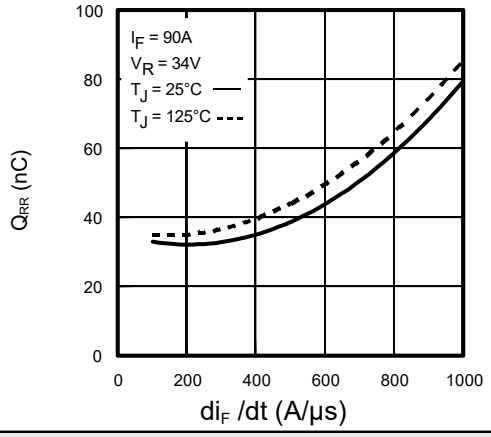


Figure 16: Typical Stored Charge vs.d_{if}/dt

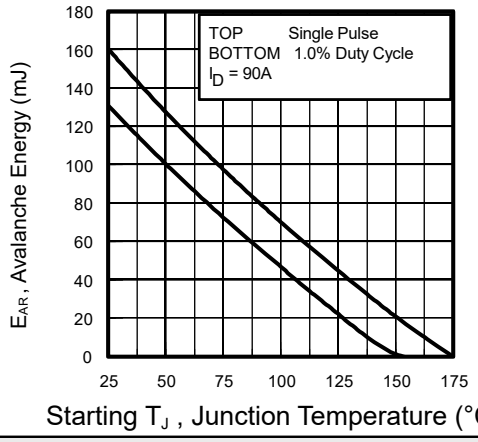


Figure 17: Maximum Avalanche Energy vs. Temperature

6.4 Typical Characterisitics

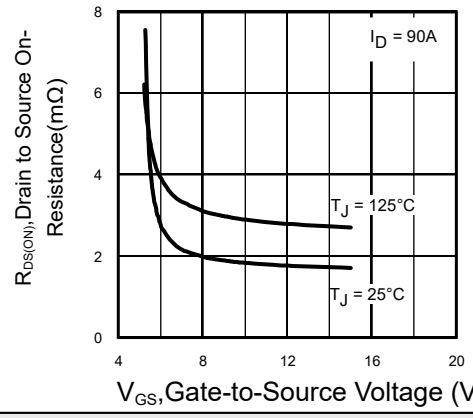


Figure 18: Typical On-Resistance vs. Gate Voltage

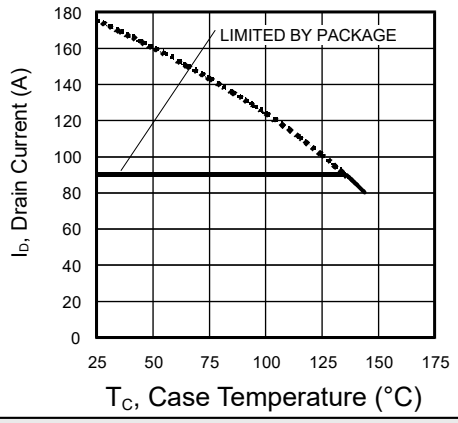


Figure 19: Maximum Drain Current vs. Case Temperature

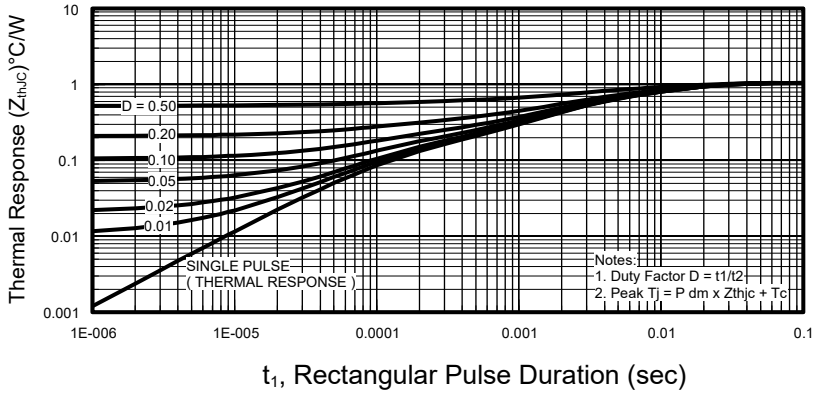


Figure 20: Maximum Effective Transient Thermal Impedance, Junction-to-Case

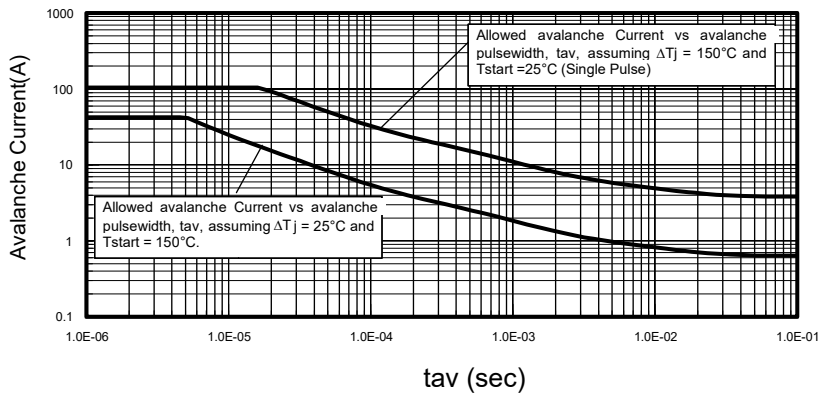
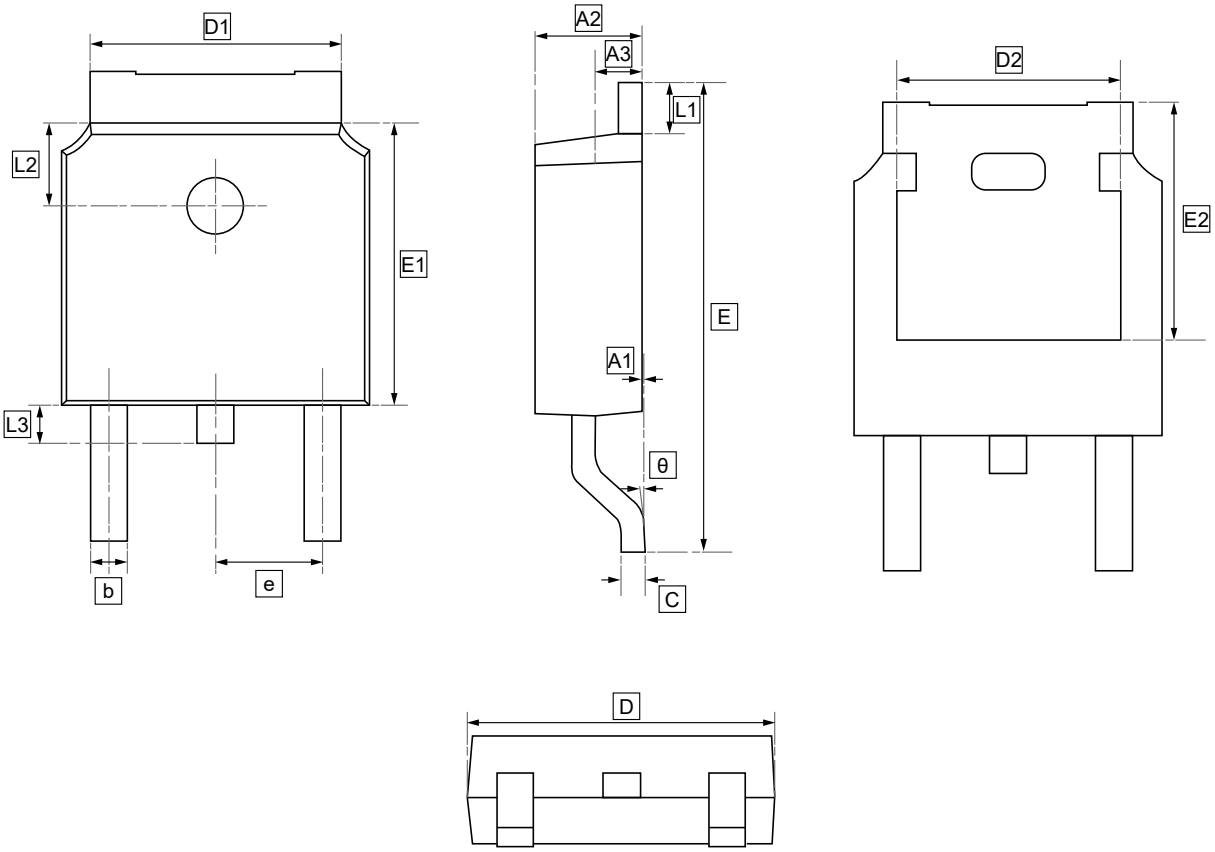


Figure 21: Typical Avalanche Current vs.Pulsewidth

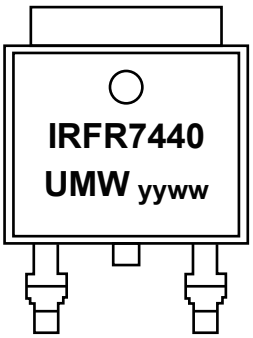
7.TO-252 Package Outline Dimensions



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

8.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR7440TR	TO-252	2500	Tape and reel

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