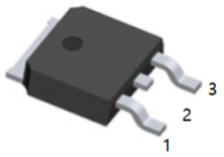
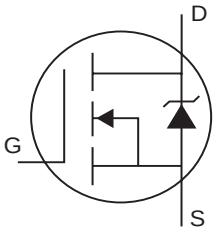
Description

- Advanced Process Technology
- Dynamic dv/dt Rating
- Fast Switching
- Fully Avalanche Rated
- Lead-Free
- V_{DS}(V) = 55V
- I_D =34A (V_{GS}= 10V)
- $R_{DS(ON)}$ < 16mΩ (V_{GS} =10V)



1.G 2.D 3.S

TO-252(DPAK) top view



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	56⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	40⑥	
I_{DM}	Pulsed Drain Current ①	220	
P_D @T_C = 25°C	Power Dissipation	110	W
	Linear Derating Factor	0.71	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	130	mJ
I_{AR}	Avalanche Current①	34	A
E_{AR}	Repetitive Avalanche Energy①	11	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case		1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*		50	
$R_{\theta JA}$	Junction-to-Ambient		110	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55			V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		0.052		V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance		11.8	16	mΩ	V_{GS} = 10V, I_D = 34A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0		4.0	V	V_{DS} = 10V, I_D = 250μA
g_{fs}	Forward Transconductance	30			S	V_{DS} = 25V, I_D = 34A
I_{DSS}	Drain-to-Source Leakage Current			20	μA	V_{DS} = 55V, V_{GS} = 0V
				250		V_{DS} = 44V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage			200	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage			-200		V_{GS} = -20V
Q_g	Total Gate Charge		70	110	nC	I_D = 34A
Q_{gs}	Gate-to-Source Charge		16	23		V_{DS} = 44V
Q_{gd}	Gate-to-Drain ("Miller") Charge		19	29		V_{GS} = 10V④
$t_{d(on)}$	Turn-On Delay Time		15		ns	V_{DD} = 28V
t_r	Rise Time		130			I_D = 34A
$t_{d(off)}$	Turn-Off Delay Time		55			R_G = 6.8Ω
t_f	Fall Time		78			V_{GS} = 10V ④
L_D	Internal Drain Inductance		4.5		nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	——	7.5	——		
C_{iss}	Input Capacitance		2430		pF	V_{GS} = 0V
C_{oss}	Output Capacitance		470			V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance		100			f = 1.0MHz, See Fig. 5
C_{oss}	Output Capacitance		2040			V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance		350			V_{GS} = 0V, V_{DS} = 44V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance ⑤		350			V_{GS} = 0V, V_{DS} = 0V to 44V

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)			56⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①			220		
V_{SD}	Diode Forward Voltage			1.3	V	T_J = 25°C, I_S = 34A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time		62	93	ns	T_J = 25°C, I_F = 34A
Q_{rr}	Reverse RecoveryCharge		170	260	nC	di/dt = 100A/μs ④
t_{on}	Forward Turn-On Time	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 = 0.22mH R_G = 25Ω, I_{AS} = 34A.

③ I_{SD} ≤ 34A, di/dt ≤ 190A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

⑤ C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}

⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A

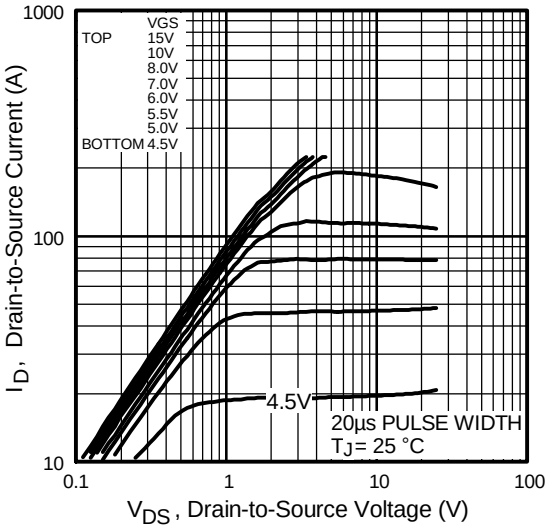


Fig 1. Typical Output Characteristics

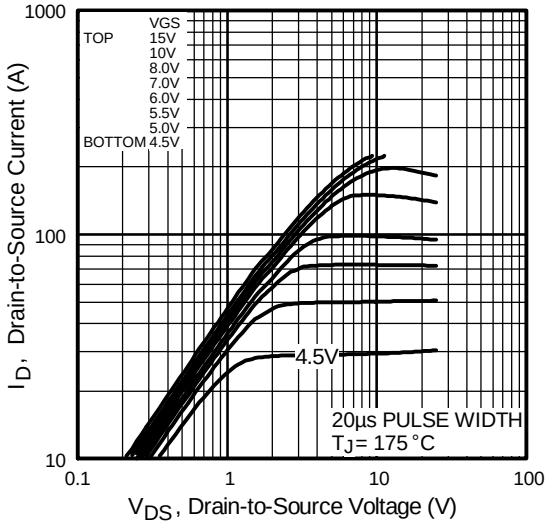


Fig 2. Typical Output Characteristics

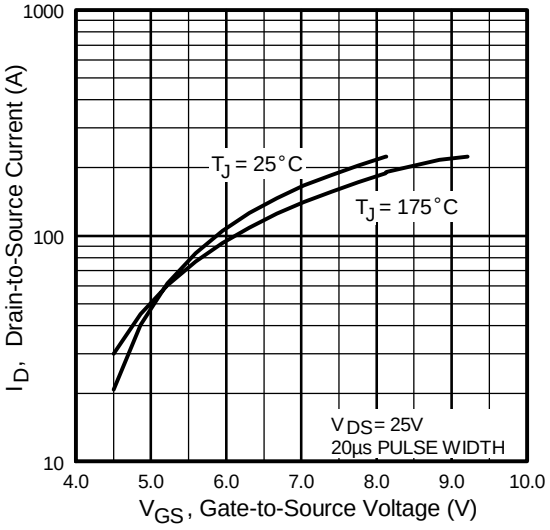


Fig 3. Typical Transfer Characteristics

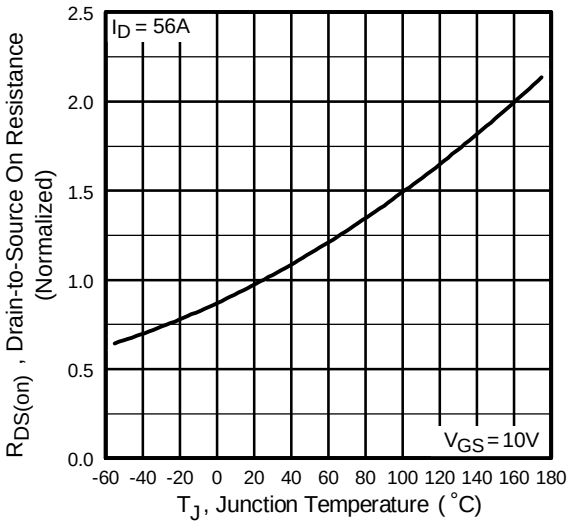


Fig 4. Normalized On-Resistance Vs. Temperature

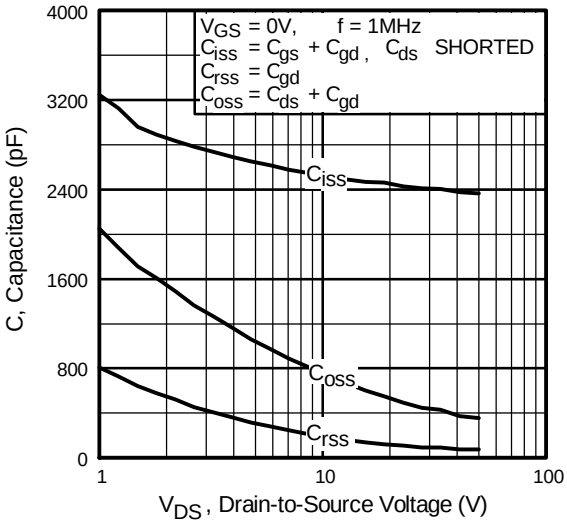


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

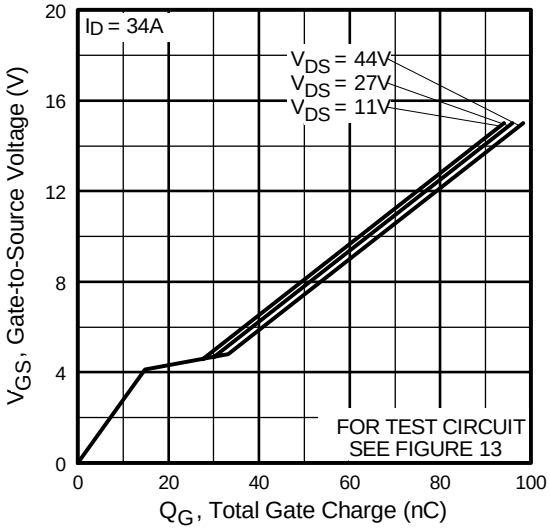


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

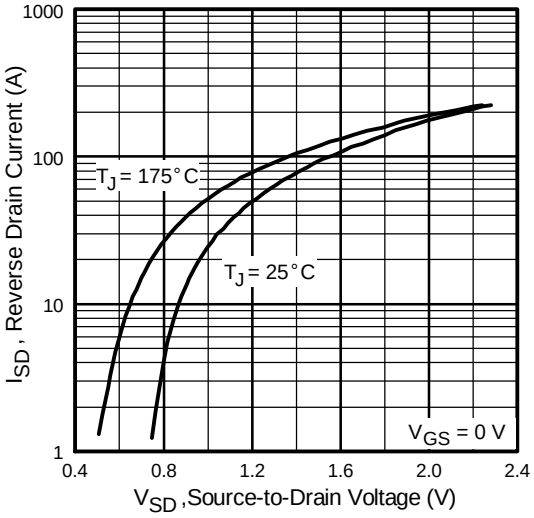


Fig 7. Typical Source-Drain Diode Forward Voltage

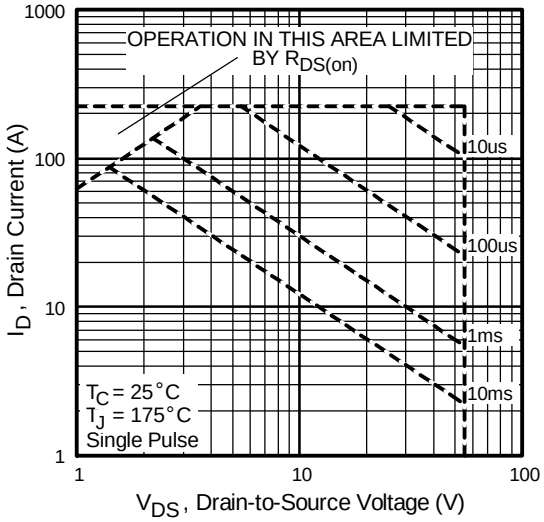


Fig 8. Maximum Safe Operating Area

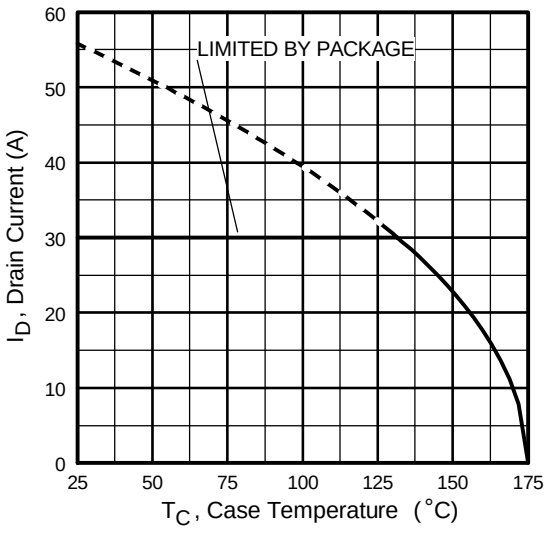


Fig 9. Maximum Drain Current Vs. Case Temperature

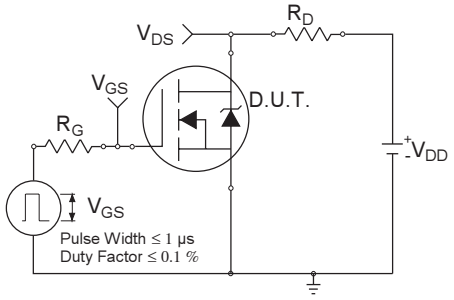


Fig 10a. Switching Time Test Circuit

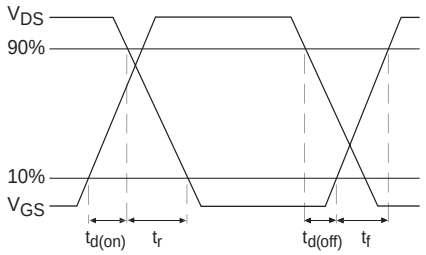


Fig 10b. Switching Time Waveforms

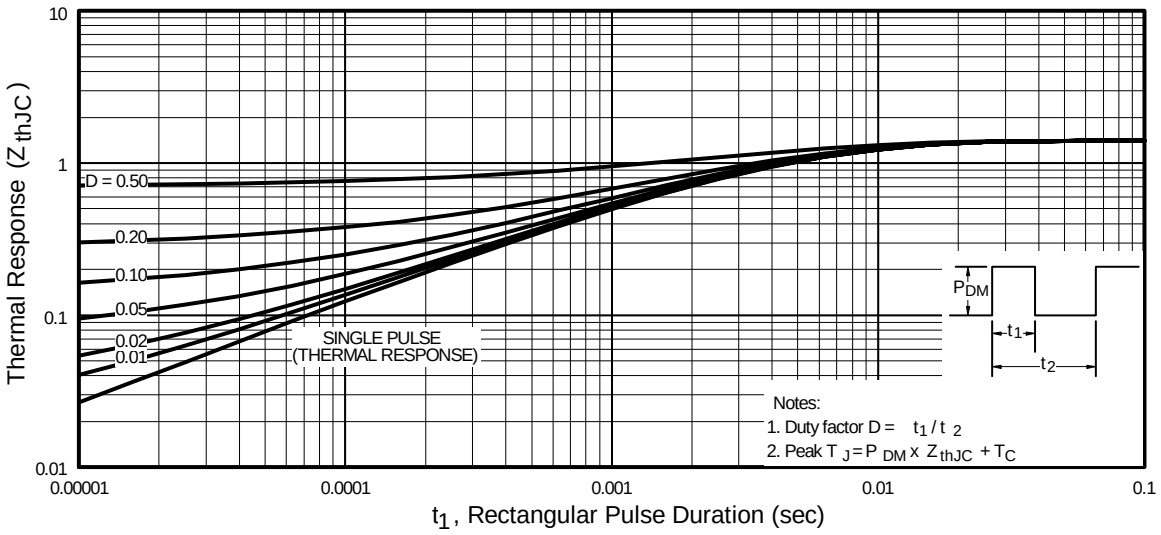


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

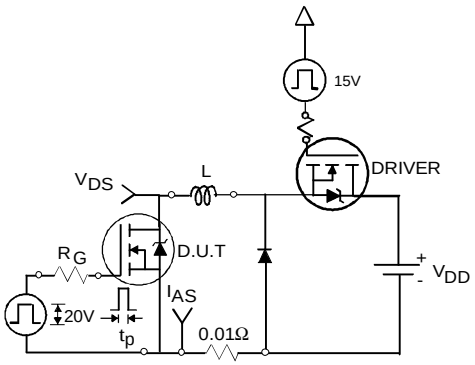


Fig 12a. Unclamped Inductive Test Circuit

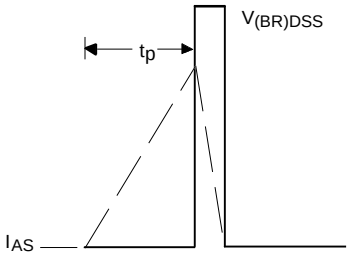


Fig 12b. Unclamped Inductive Waveforms

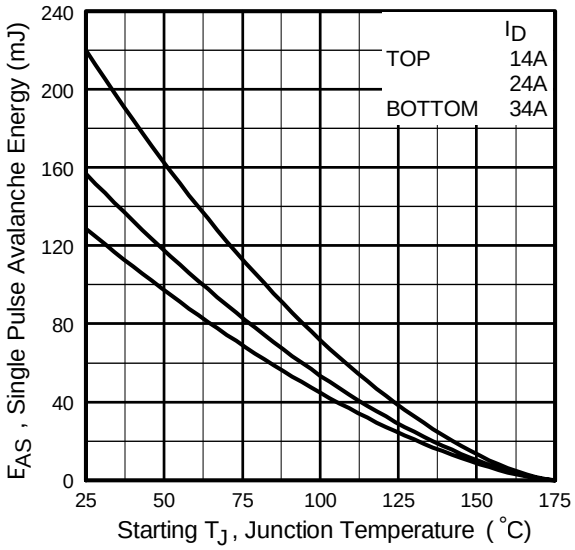


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

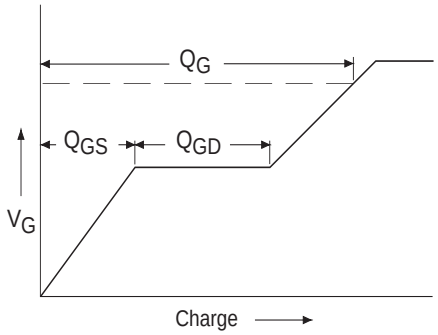


Fig 13a. Basic Gate Charge Waveform

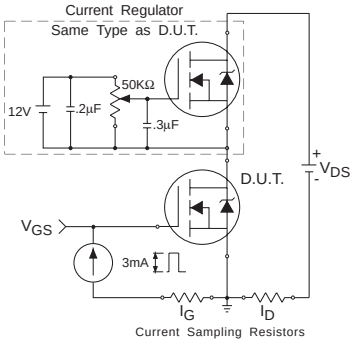
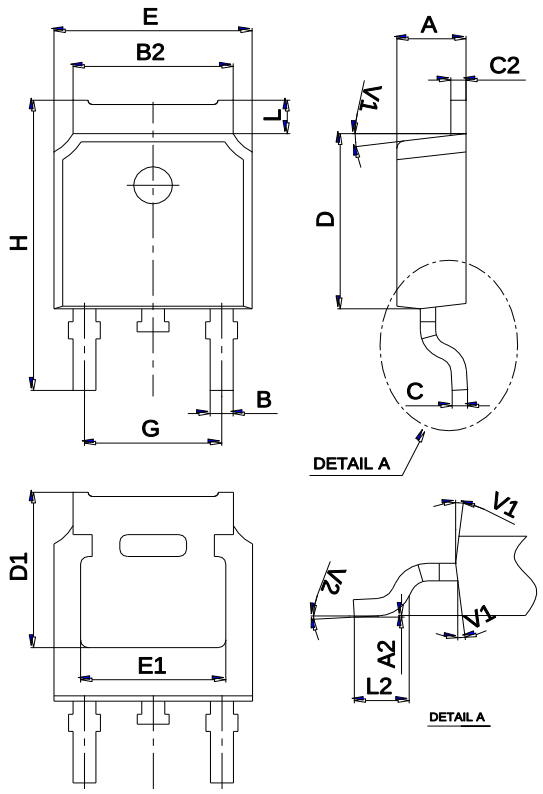


Fig 13b. Gate Charge Test Circuit

Package Mechanical Data TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Marking

Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRFR2405TR	TO-252	2500	Tape and reel

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