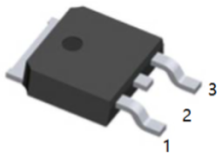
55V N-Channel MOSFET

Description

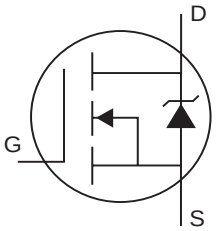
- Ultra Low On-Resistance
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

- V_{DS}(V) = 50V
- I_D = 27A (V_{GS}= 10V)
- $R_{DS(ON)}$ < 45mΩ (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	27⑤	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	19	
I_{DM}	Pulsed Drain Current ①⑦	100	
P_D @T_C = 25°C	Power Dissipation	68	W
	Linear Derating Factor	0.45	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②⑦	65	mJ
I_{AR}	Avalanche Current①⑦	16	A
E_{AR}	Repetitive Avalanche Energy①⑦	6.8	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		2.2	°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		45			V_{GS} = 10V, I_D = 16A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0		4.0	V	V_{DS} = V_{GS}, I_D = 250μA
g_{fs}	Forward Transconductance	6.5			S	V_{DS} = 25V, I_D = 16A⑦
I_{DSS}	Drain-to-Source Leakage Current			25	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			100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage			-100		V_{GS} = -20V
Q_g	Total Gate Charge			34		I_D = 16A
Q_{gs}	Gate-to-Source Charge			6.8	nC	V_{DS} = 44V
Q_{gd}	Gate-to-Drain ("Miller") Charge			14		V_{GS} = 10V, See Fig. 6 and 13 ④⑦
$t_{d(on)}$	Turn-On Delay Time		7.0			V_{DD} = 28V
t_r	Rise Time		49		ns	I_D = 16A
$t_{d(off)}$	Turn-Off Delay Time		31			R_G = 18Ω
t_f	Fall Time		40			R_D = 1.8Ω, See Fig. 10 ④⑦
L_D	Internal Drain Inductance		4.5		nH	Between lead, 6mm (0.25in.) from package and center of die contact⑥
L_S	Internal Source Inductance		7.5			
C_{iss}	Input Capacitance		700			V_{GS} = 0V
C_{oss}	Output Capacitance		240		pF	V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance		100			f = 1.0MHz, See Fig. 5⑦
	Parameter	**Min.**	**Typ.**	**Max.**	**Units**	**Conditions**
I_S	Continuous Source Current (Body Diode)			27⑤	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①⑦			100		
V_{SD}	Diode Forward Voltage			1.6	V	T_J = 25°C, I_S = 16A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time		57	86	ns	T_J = 25°C, I_F = 16A
Q_{rr}	Reverse RecoveryCharge		130	200	nC	di/dt = 100A/μs ④⑦
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. (See fig. 11)

② V_{DD} = 25V, starting T_J = 25°C, L = 410μH R_G = 25Ω, I_{AS} = 16A. (See Figure 12)

③ I_{SD} ≤ 16A, di/dt ≤ 420A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C

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

⑤ Calculated continuous current based on maximum allowable junction temperature; Package limitation current = 20A

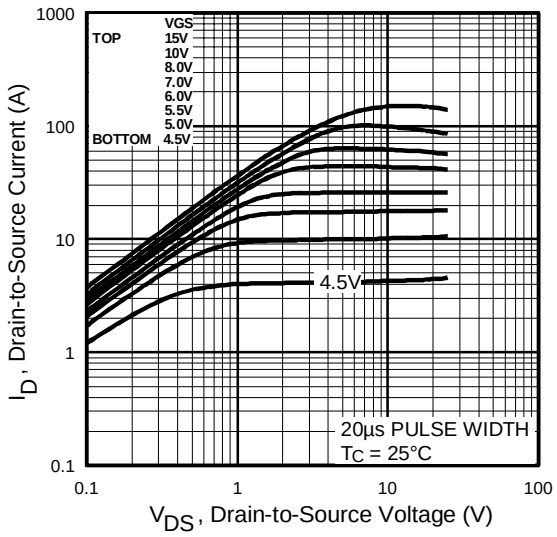


Fig 1. Typical Output Characteristics

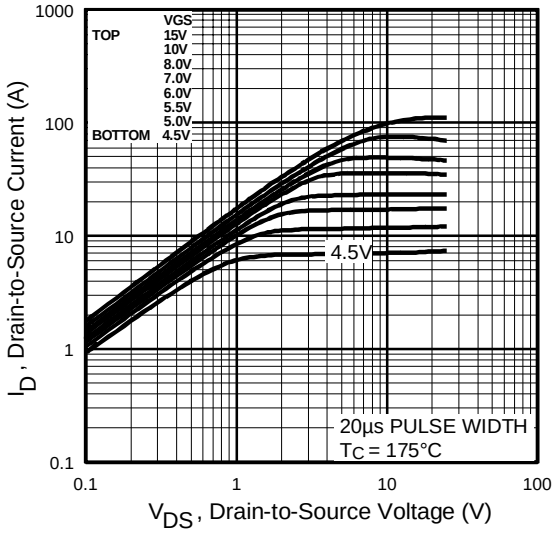


Fig 2. Typical Output Characteristics

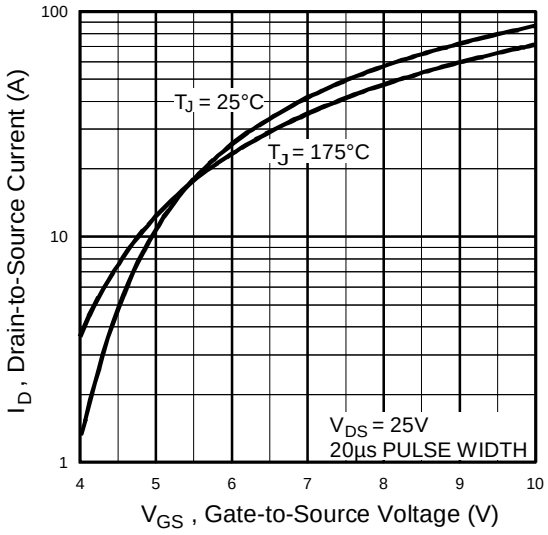


Fig 3. Typical Transfer Characteristics

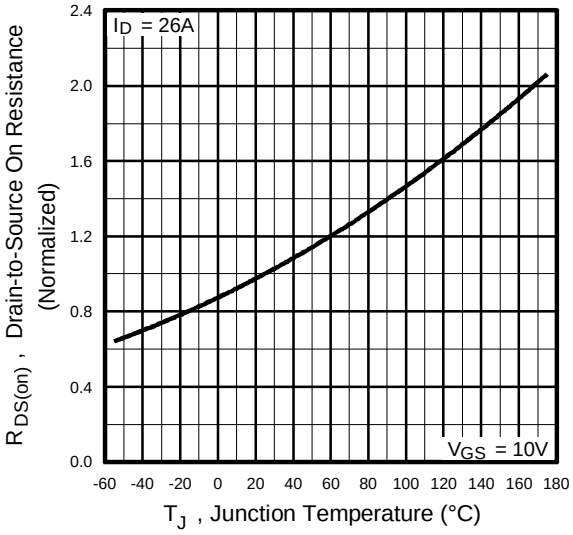


Fig 4. Normalized On-Resistance Vs. Temperature

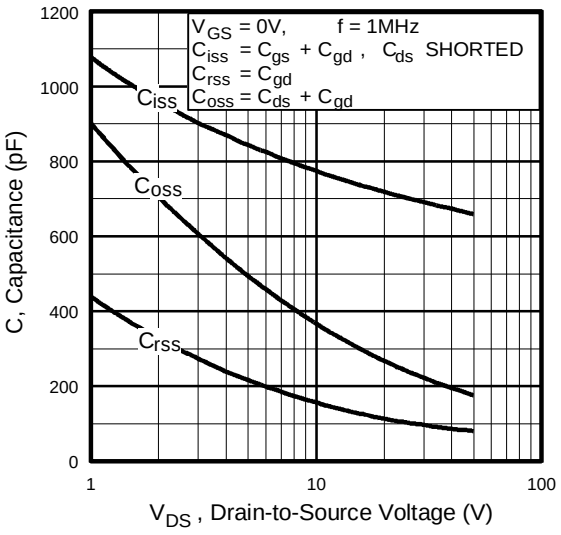


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

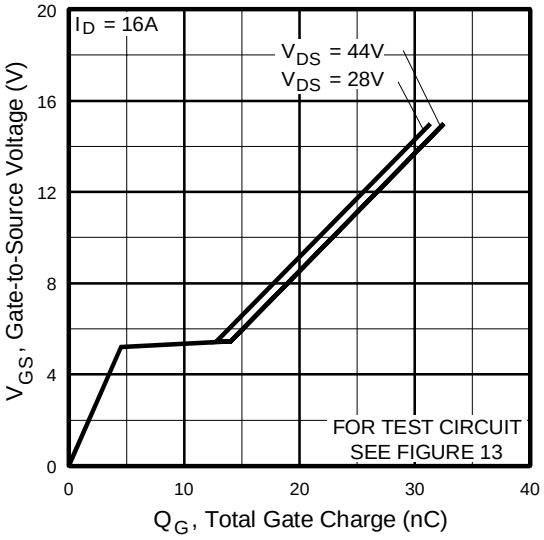


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

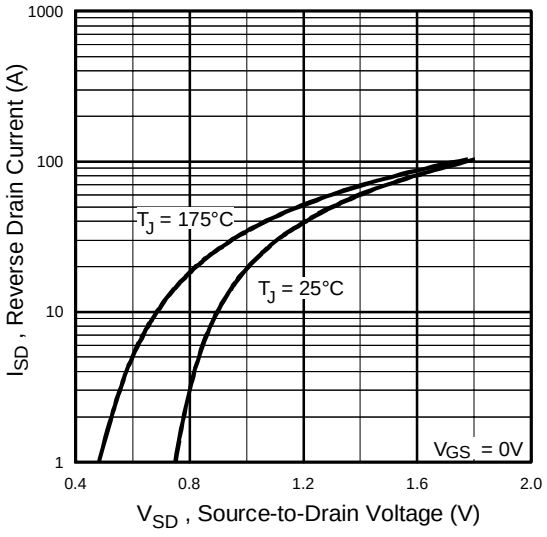


Fig 7. Typical Source-Drain Diode Forward Voltage

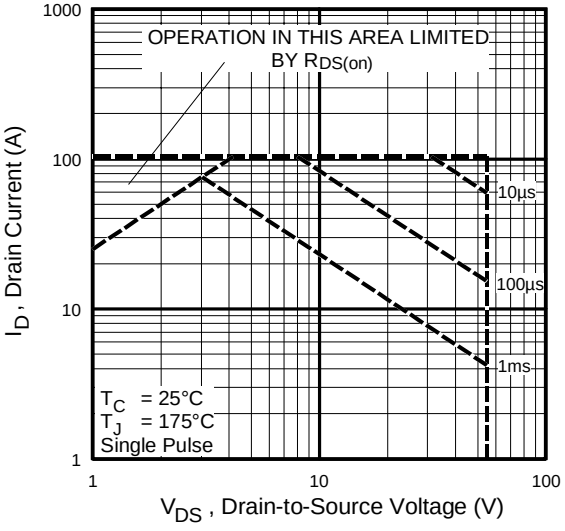


Fig 8. Maximum Safe Operating Area

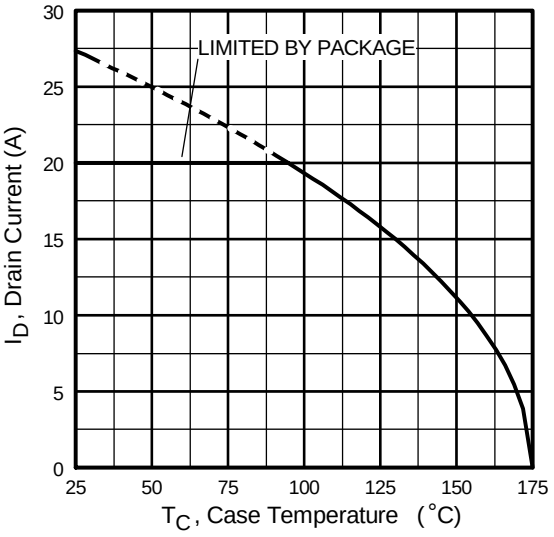


Fig 9. Maximum Drain Current Vs. Case Temperature

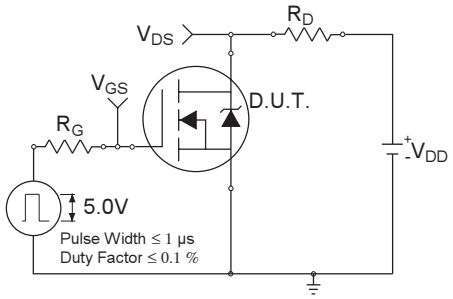


Fig 10a. Switching Time Test Circuit

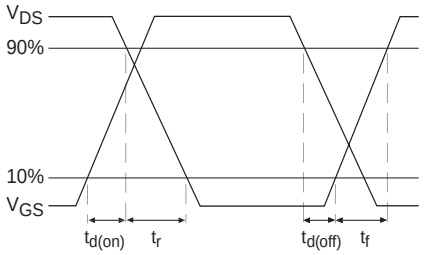


Fig 10b. Switching Time Waveforms

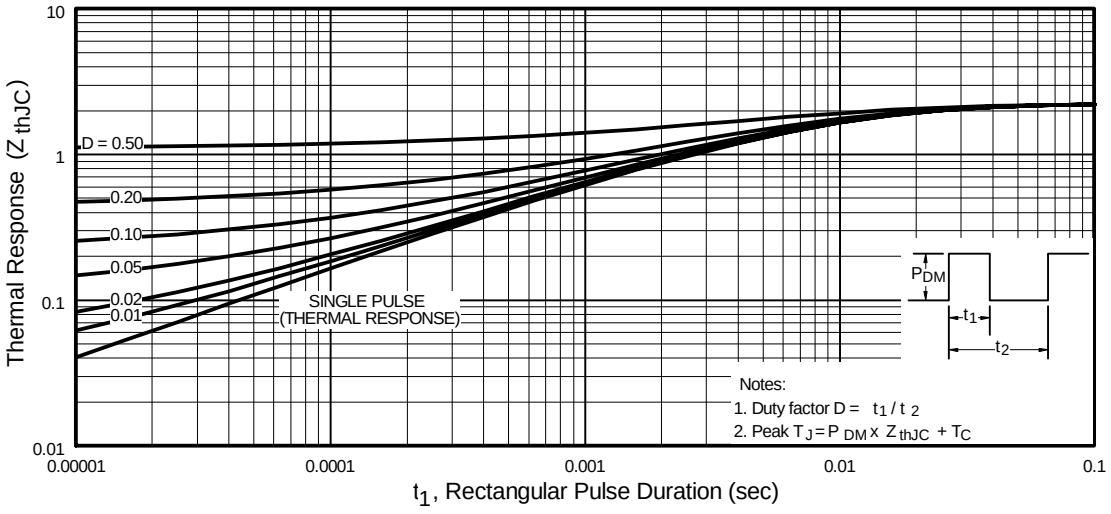


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

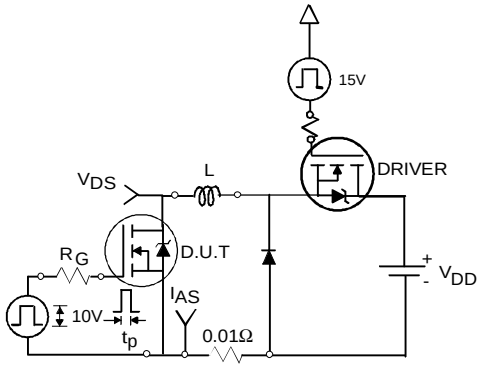


Fig 12a. Unclamped Inductive Test Circuit

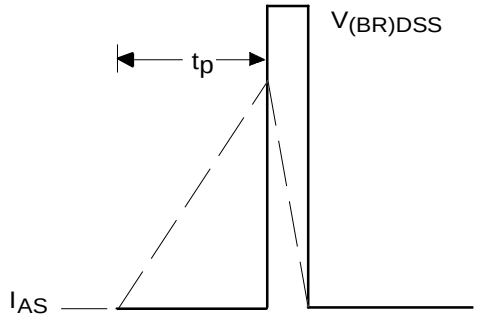


Fig 12b. Unclamped Inductive Waveforms

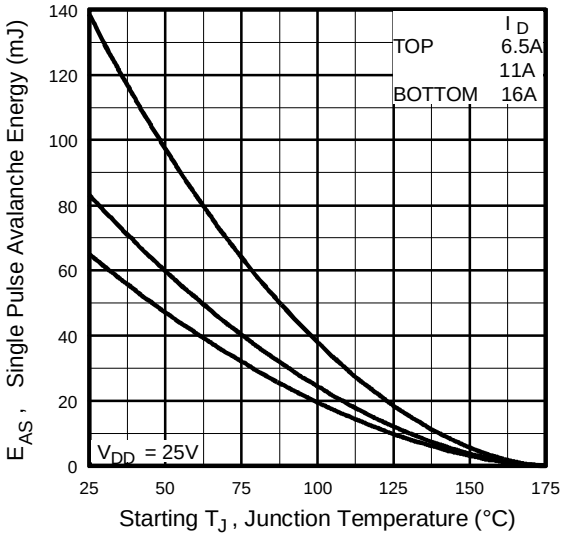


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

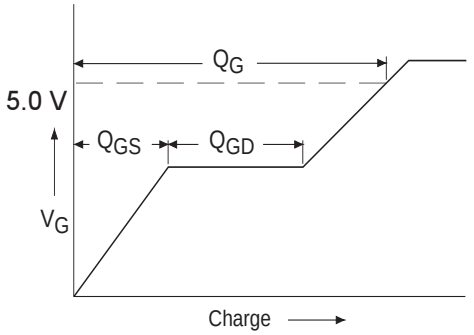


Fig 13a. Basic Gate Charge Waveform

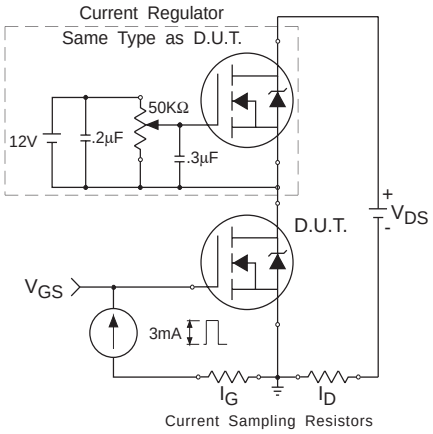
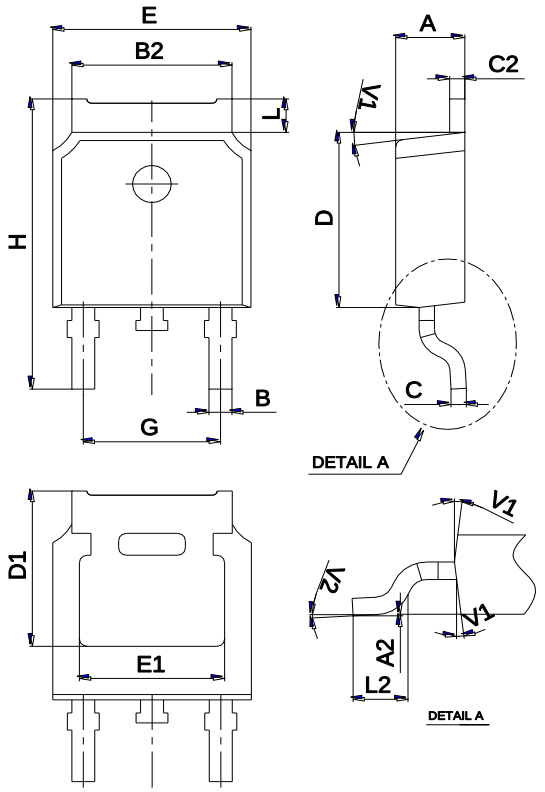


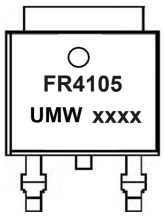
Fig 13b. Gate Charge Test Circuit

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 IRFR4105TR	TO-252	2500	Tape and reel

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