UMW IRF9389TR

30V N-Channel MOSFET
-30V P-Channel MOSFET

1.Features

N-Ch:

- $V_{DS\ (V)}$=30V
- I_D=6.8A
- $R_{DS(ON)}$<27mΩ(V_{GS}=10V)

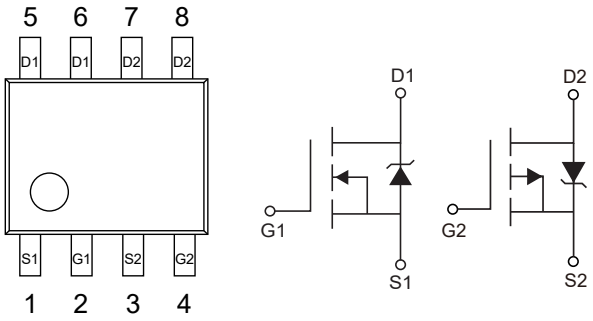
P-Ch:

- $V_{DS\ (V)}$=-30V
- I_D=-4.6A
- $R_{DS(ON)}$<64mΩ(V_{GS}=-10V)

2.Pinning information

Pin	Symbol	Description
2,4	G1,G2	GATE
1,3	S1,S2	SOURCE
5,6,7,8	D1,D2	DRAIN

SOP-8



3.Absolute Maximum Ratings

Parameter		Symbol	N-Channel	P-Channel	Units
Gate-to-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current (V_{GS}=10V)	T_A= 25°C	I_D	6.8	-4.6	A
	T_A=70°C		5.4	-3.7	A
Pulsed Drain Current ①		I_{DM}	34	-23	A
Power Dissipation	T_A= 25°C	P_D	2		W
Power Dissipation	T_A=70°C		1.3		W
Linear Derating Factor			0.016		W/°C
Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

4.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Drain Lead ④	$R_{\theta JL}$		20	°C/W
Junction-to-Ambient ③	$R_{\theta JA}$		62.5	°C/W

5.Electrical Characteristics T_J=25°C

Parameter	Symbol		Conditions	Min	Typ	Max	Units
Drain-to-Source Breakdown Voltage	BV_{DSS}	N-Ch	I_D=250μA, V_{GS}=0V	30			V
		P-Ch	I_D=-250μA, V_{GS}=0V	-30			V
Breakdown Voltage Temp Coefficient Current	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	N-Ch	I_D=1mA,Reference to 25°C		0.03		V/°C
		P-Ch	I_D=-1mA,Reference to 25°C		0.02		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	N-Ch	V_{GS}=10V, I_D=6.8A ②		22	27	mΩ
		N-Ch	V_{GS}=4.5V, I_D=5.4A ②		33	40	mΩ
		P-Ch	V_{GS}=-10V, I_D=-4.6A ②		51	64	mΩ
		P-Ch	V_{GS}=-4.5V, I_D=-3.7A ②		82	103	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	N-Ch	V_{DS}=V_{GS}, I_D=10μA	1.3	1.8	2.3	V
		P-Ch	V_{DS}=V_{GS}, I_D=-10μA	-1.3	-1.8	-2.3	V
Drain-to-Source Leakage Current	I_{DSS}	N-Ch	V_{DS}=24V, V_{GS}=0V			1	μA
		P-Ch	V_{DS}=-24V, V_{GS}=0V			-1	μA
		N-Ch	V_{DS}=24V, V_{GS}=0V, T_J=125°C			150	μA
		P-Ch	V_{DS}=-24V, V_{GS}=0V, T_J=125°C			-150	μA
Gate-to-Source Forward Leakage	I_{GSS}	N-Ch	V_{GS}=20V			100	nA
		P-Ch	V_{GS}=-20V			-100	nA
Gate-to-Source Reverse Leakage		N-Ch	V_{GS}=20V			100	nA
		P-Ch	V_{GS}=-20V			-100	nA
Forward Transconductance	g_{fs}	N-Ch	V_{DS}=15V, I_D=5.4A	8.2			S
		P-Ch	V_{DS}=-15V, I_D=-3.7A	4.1			S
Total Gate Charge	Q_g	N-Ch	N-Ch: I_D=6.8A, V_{DS}=15V, V_{GS}=10V P-Ch: I_D=-4.6A,V_{DS}=-15V,V_{GS}=-10V		6.8	14	nC
		P-Ch			8.1	16	nC
Gate-to-Source Charge	Q_{gs}	N-Ch			1.4		nC
		P-Ch			1.3		nC
Gate-to-Drain ("Miller") Charge	Q_{gd}	N-Ch			0.98		nC
		P-Ch			2.1		nC

Gate Resistance	R_G	N-Ch			2.2	4.4	Ω
		P-Ch			9.4	19	Ω
Turn-On Delay Time	$t_{D(on)}$	N-Ch			5.1		ns
		P-Ch	N-Ch: ②		8		ns
Rise Time	t_r	N-P	V_{DD}=15A, V_{GS}=4.5V		4.8		ns
		N-P	I_D=1A, R_G=6.2Ω		14		ns
Tum-Off Delay Time	$t_{D(off)}$	N-Ch	P-Ch: ②		4.9		ns
		P-Ch	V_{DD}=-15A, V_{GS}=-4.5V		17		ns
Fall Time	t_f	N-Ch	I_D=-1A, R_G=6.8Ω		3.9		ns
		P-Ch			15		ns
Input Capacitance	C_{iss}	N-Ch			398		pF
		P-Ch	N-Ch:		383		pF
Output Capacitance	C_{oss}	N-Ch	V_{GS}=0V, V_{DS}=15V, f=1MHz		82		pF
		P-Ch	P-Ch:		104		pF
ReverseTransferCapacitance	C_{rss}	N-Ch	V_{GS}=0V, V_{DS}=-15V, f=1MHz		36		pF
		P-Ch			64		pF
Continuous Source Current (Body Diode)	I_S	N-Ch				2	A
		P-Ch				-2	A
Pulsed Source Current (Body Diode) ①	I_{SM}	N-Ch				34	A
		P-Ch				-23	A
Diode Forward Voltage	V_{SD}	N-Ch	T_J=25°C, I_S=2A,V_{GS}=0V ②			1.2	V
		P-Ch	T_J=25°C, I_S=-2A,V_{GS}=0V ②			-1.2	V
Reverse Recovery Time	t_{rr}	N-Ch	N-Ch: T_J=25°C, I_F=2A		8.4	13	ns
		P-Ch	V_{DD}=15V, di/dt=102/μs ②		11	17	ns
Reverse Recovery Charge	Q_{rr}	N-Ch	P-Ch: T_J=25°C, I_F=-2A		2.3	3.5	nC
		P-Ch	V_{DD}=-15V, di/dt=102/μs ②		4.8	7.2	nC

Notes:

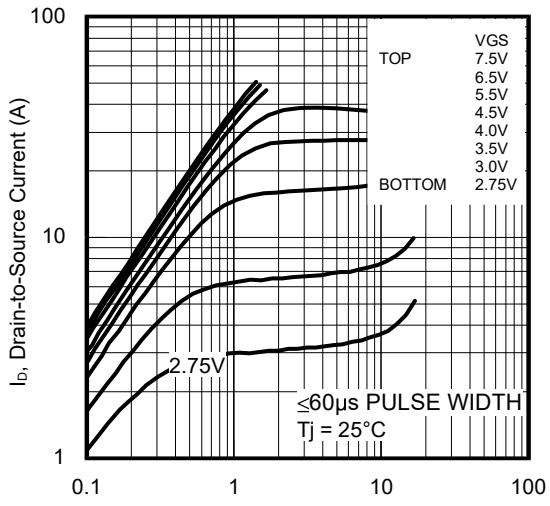
① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 16)

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

③ Surface mounted on 1 in square Cu board

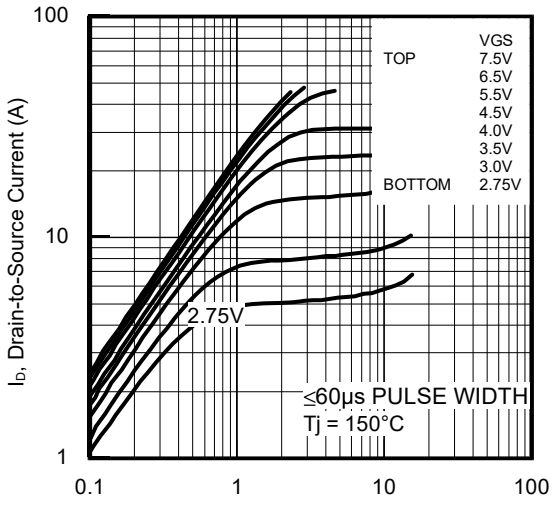
④ R_θ is measured at T_J approximately 90°C.

6.1Typical Characterisitics (N-Channel)



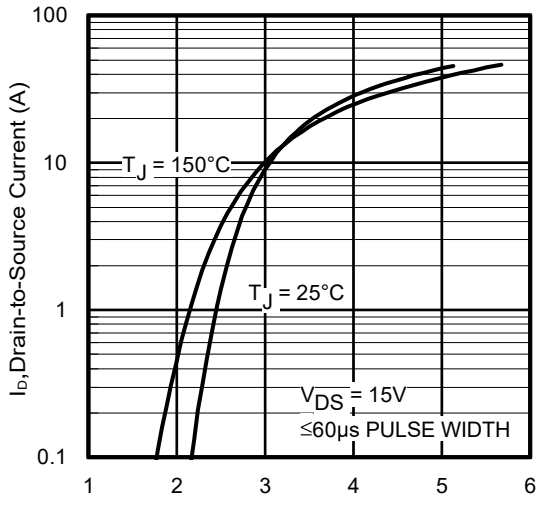
V_{DS},Drain-to-Source Voltage (V)

Fig 1. Typical Output Characteristics



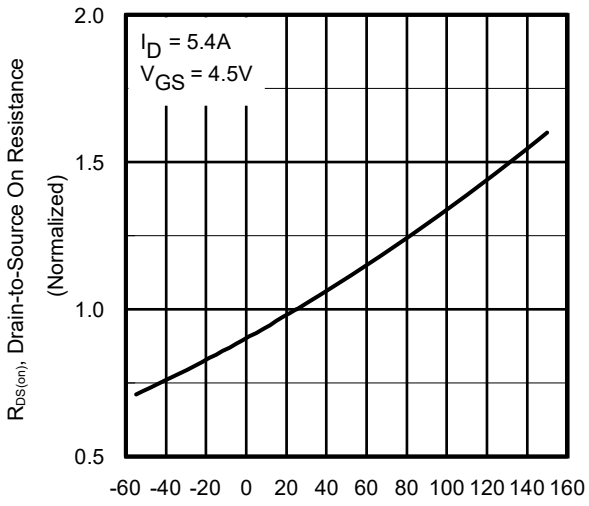
V_{DS},Drain-to-Source Voltage (V)

Fig 2. Typical Output Characteristics



V_{GS}, Gate-to-Source Voltage (V)

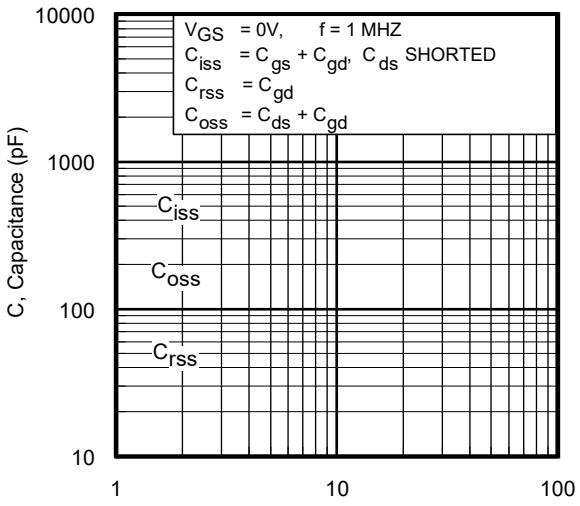
Fig 3. Typical Transfer Characteristics



T_J, Junction Temperature (°C)

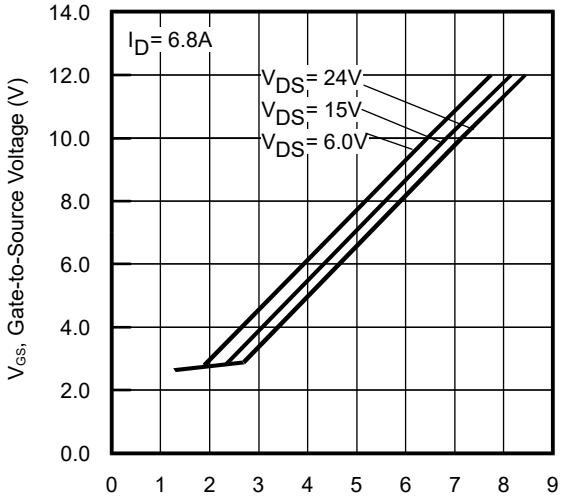
Fig 4. Nomalized On-ResistanceVs. Temperature

6.2Typical Characterisitics (N-Channel)



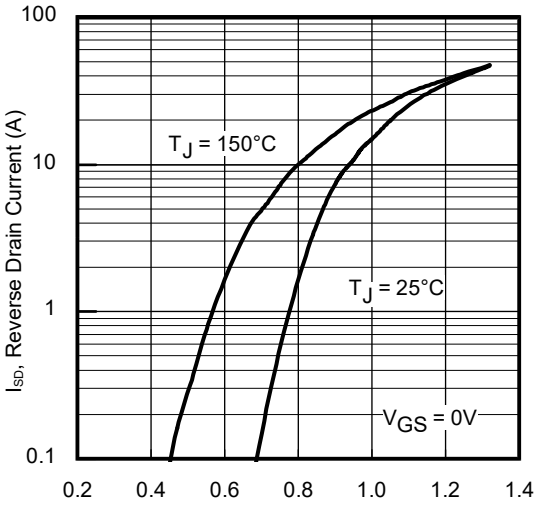
V_{DS}, Drain to Source Voltage (V)

Fig 5. Capacitance vs V_{DS}



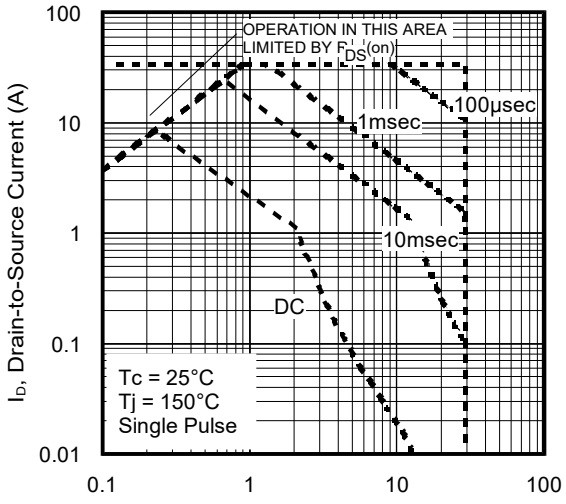
Q_G, Total Gate Charge (nC)

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



V_{SD}, Source-to-Drain Voltage (V)

Fig 7. Typical Source-Drain Diode Forward Voltage



V_{DS}, Drain-to-Source Voltage (V)

Fig 8. Maximum Safe Operating Area

6.3Typical Characterisitics (N-Channel)

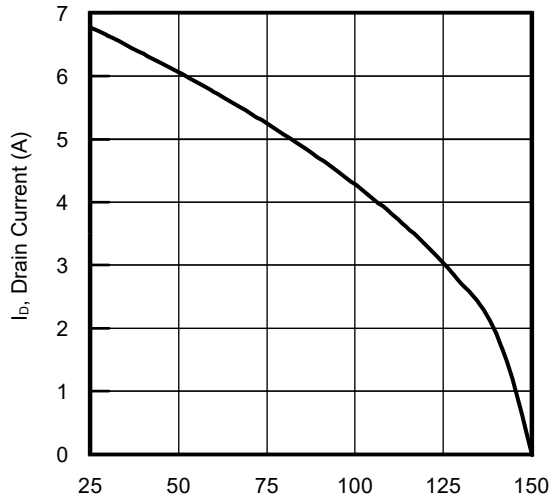


Fig 9. Maximum Drain Current vs. Ambient Temperature

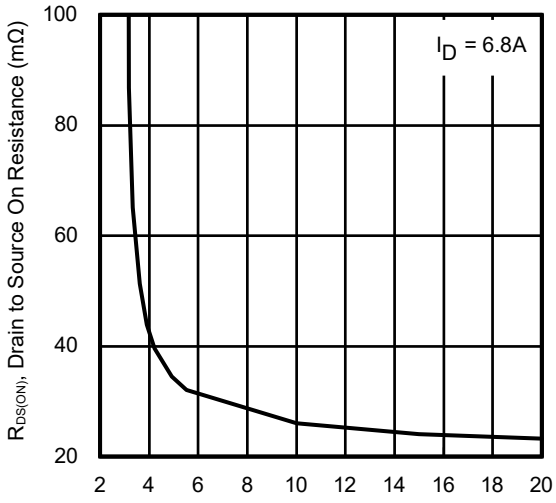


Fig 10. Typical On-Resistance vs. Gate Voltage

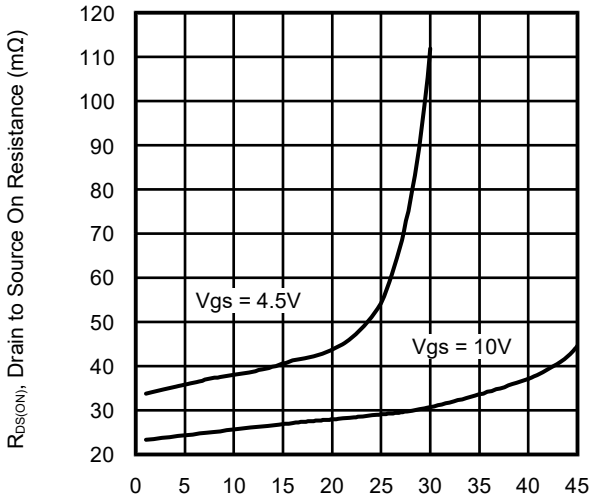


Fig 11. Typical On-Resistance vs. Drain Current

6.4Typical Characterisitics (N-Channel)

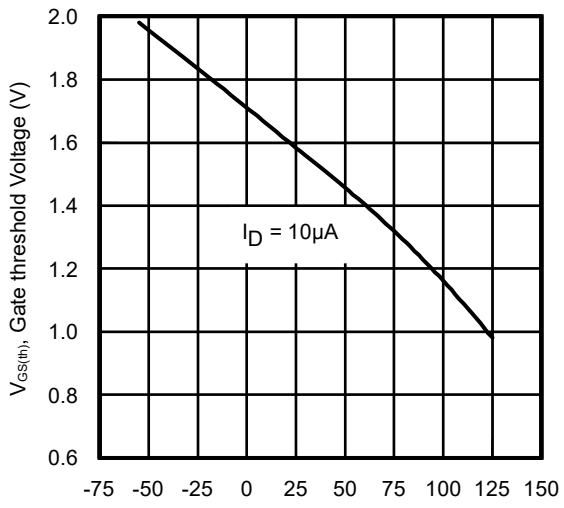


Fig 12. Threshold Voltage vs. Temperature

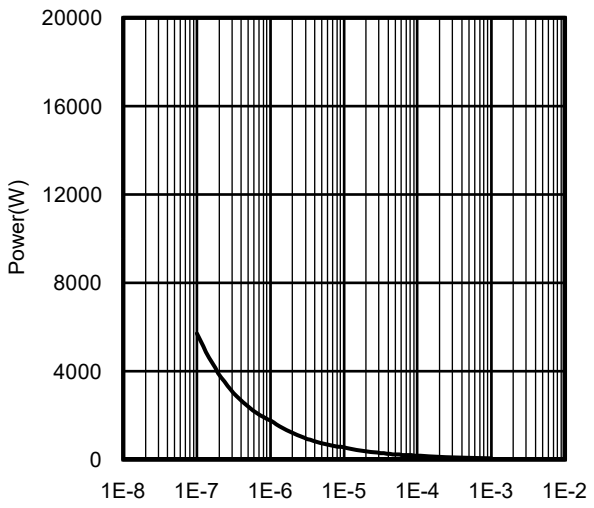


Fig 13. Typical Power vs. Time

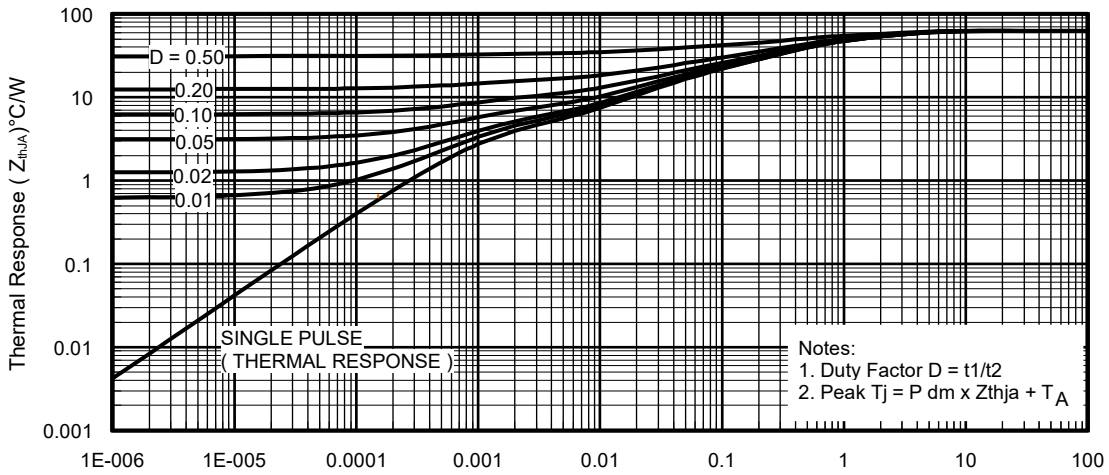


Fig 14. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

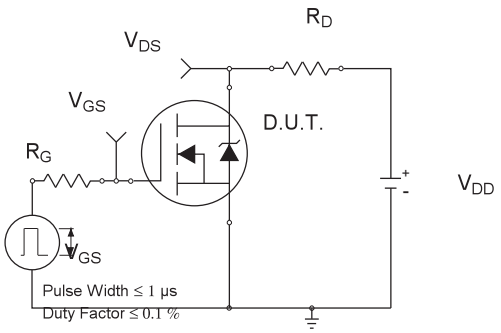


Fig 15a. Switching Time Test Circuit

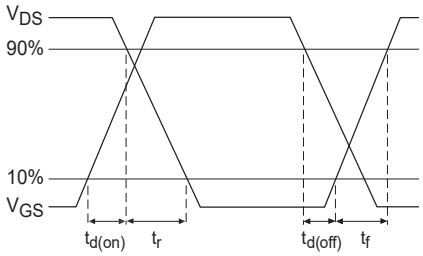


Fig 15b. Switching Time Waveforms

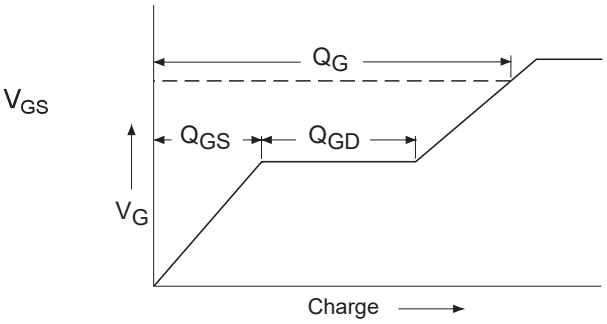


Fig 16a. Basic Gate Charge Waveform

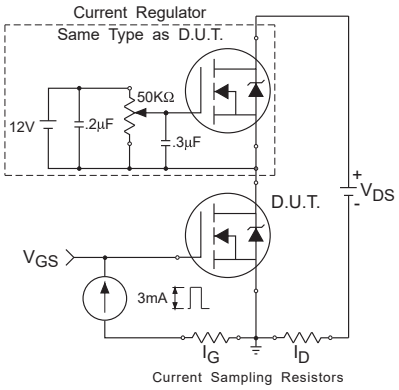


Fig 16b. Gate Charge Test Circuit

6.5Typical Characterisitics (P-Channel)

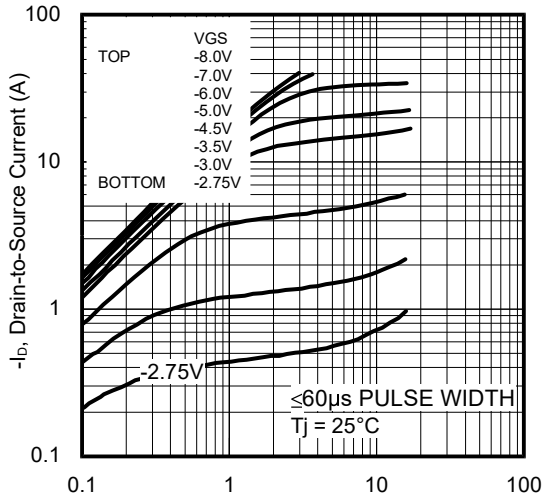


Fig 17. Typical Output Characteristics

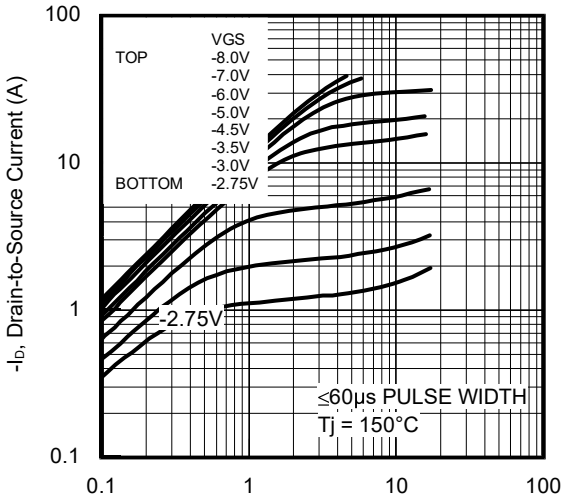


Fig 18. Typical Output Characteristics

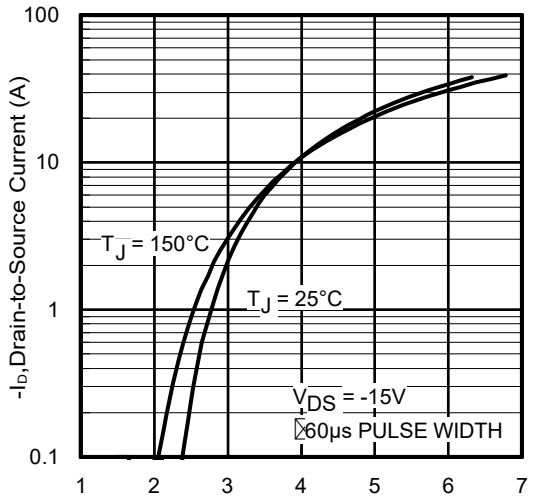


Fig 19. Typical Transfer Characteristics

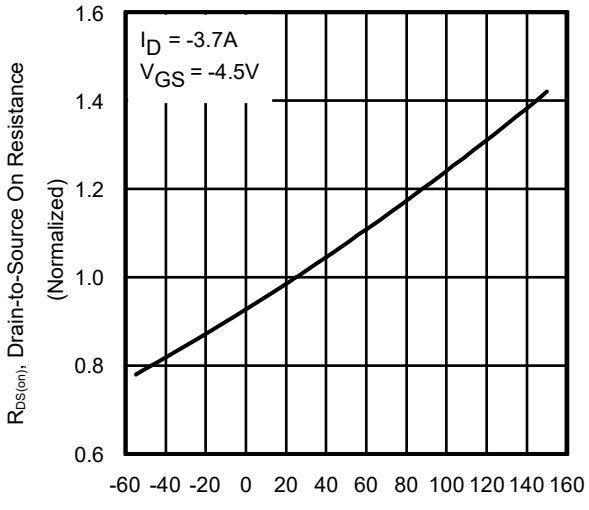
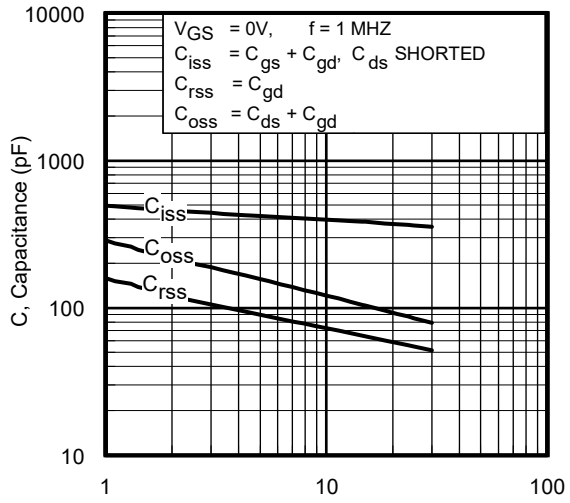


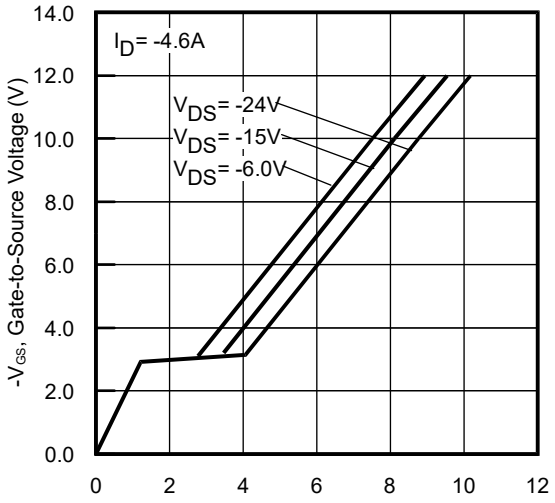
Fig 20. Nomalized On-ResistanceVs. Temperature

6.6Typical Characterisitics (P-Channel)



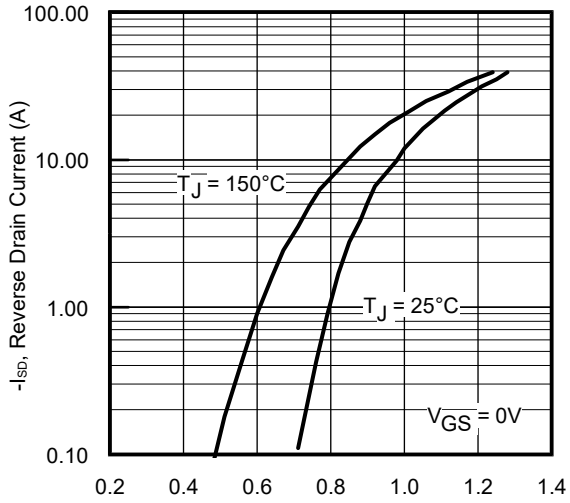
V_{DS}, Drain to Source Voltage (V)

Fig 21. Capacitance vs V_{DS}



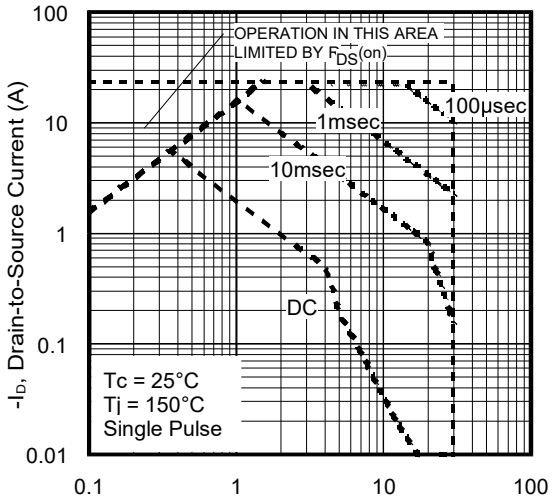
Q_G, Total Gate Charge (nC)

Fig 22. Typical Gate Charge Vs. Gate-to-Source Voltage



$-V_{SD}$, Source-to-Drain Voltage (V)

Fig 23. Typical Source-Drain Diode Forward Voltage



$-V_{DS}$, Drain-to-Source Voltage (V)

Fig 24. Maximum Safe Operating Area

6.7Typical Characterisitics (P-Channel)

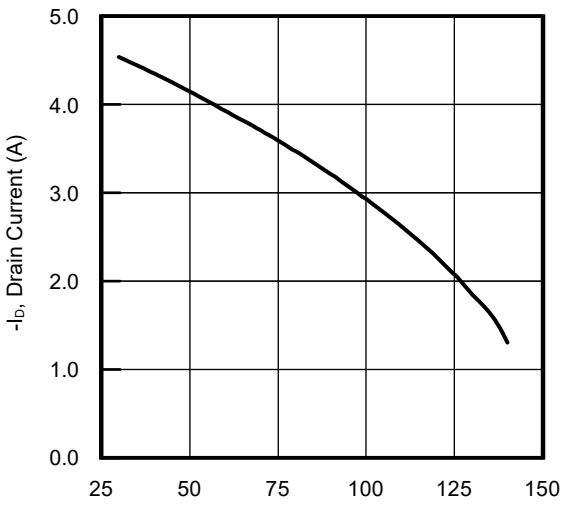


Fig 25. Maximum Drain Current vs. Ambient Temperature

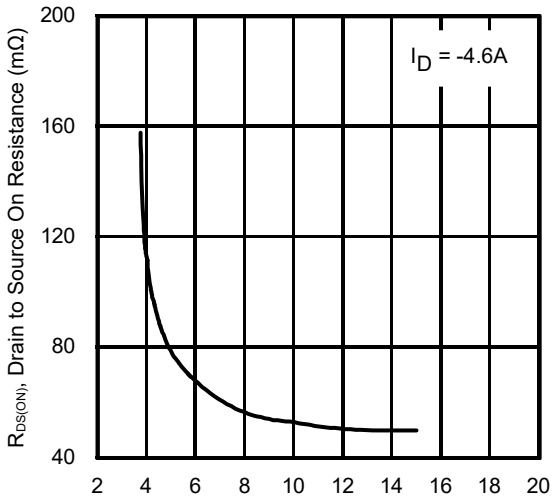


Fig 26. Typical On-Resistance vs. Gate Voltage

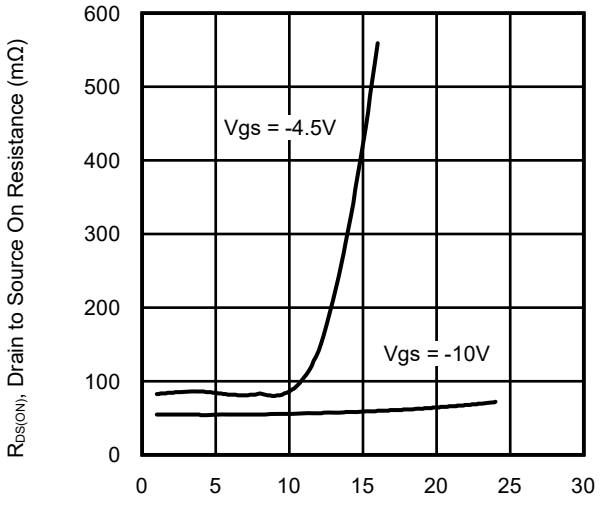


Fig 27. Typical On-Resistance vs. Drain Current

6.8Typical Characterisitics (P-Channel)

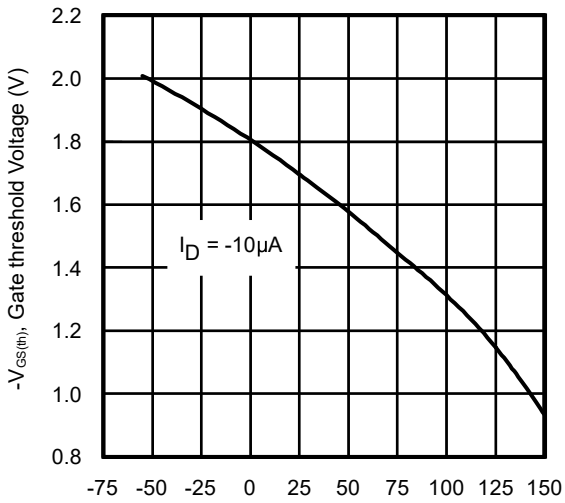


Fig 28. Threshold Voltage vs. Temperature

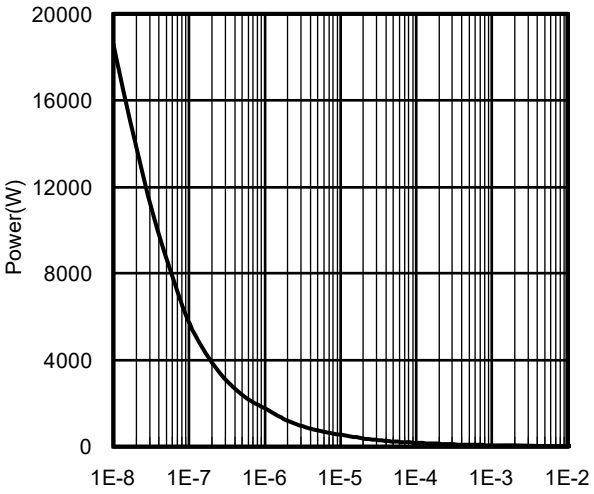


Fig 29. Typical Power vs. Time

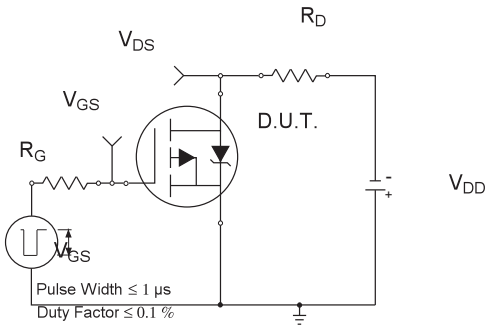


Fig 30a. Switching Time Test Circuit

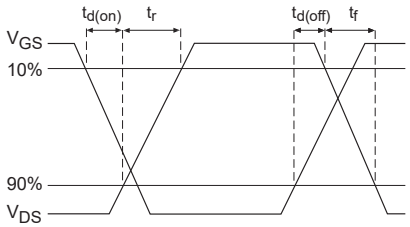


Fig 30b. Switching Time Waveforms

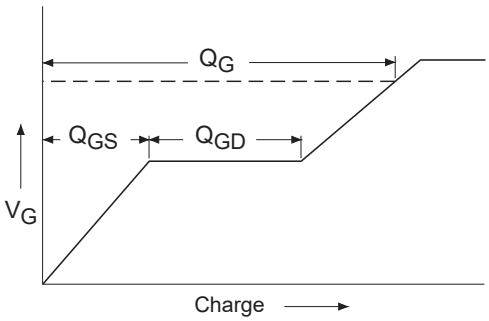


Fig 31a. Basic Gate Charge Waveform

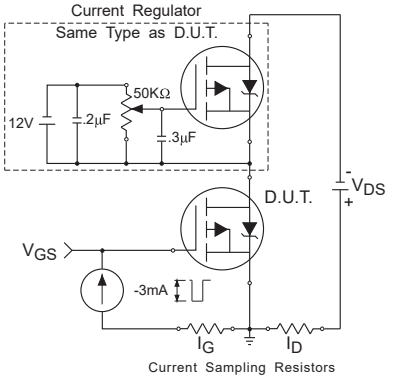
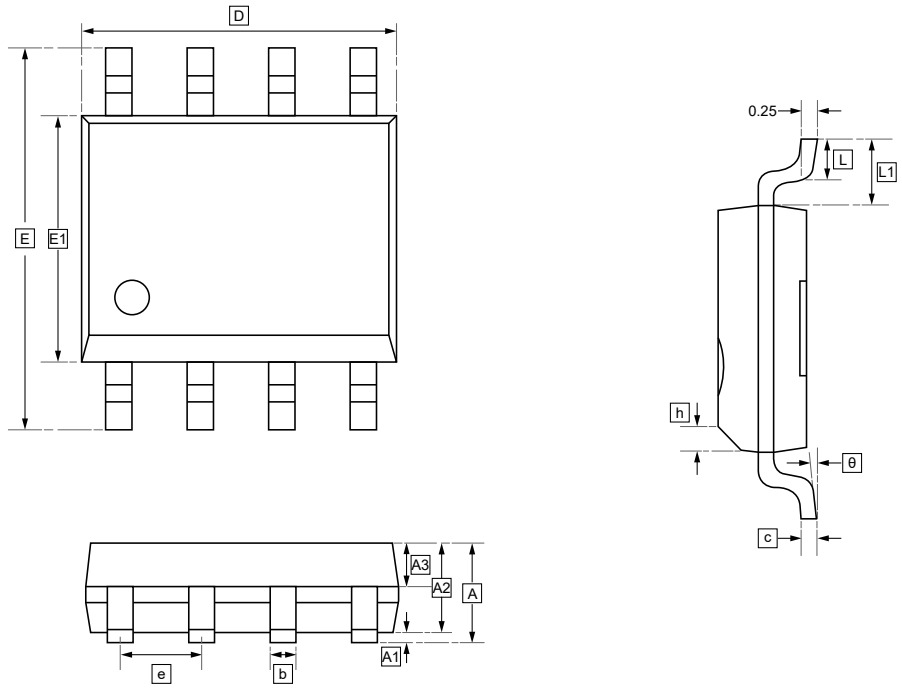


Fig 31b. Gate Charge Test Circuit

7.SOP-8 Package Outline Dimensions

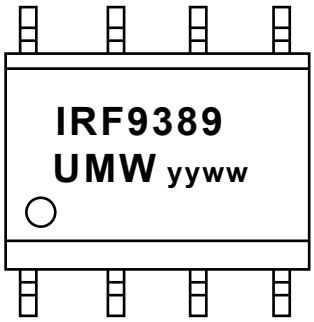


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	c	D	E	E1	e	h	L
Min	-	0.05	1.30	0.60	0.39	0.20	4.80	5.80	3.80	1.24	0.30	0.50
Max	1.75	0.20	1.50	0.70	0.47	0.24	5.00	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

8.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRF9389TR	SOP-8	3000	Tape and reel

9.Disclaimer

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