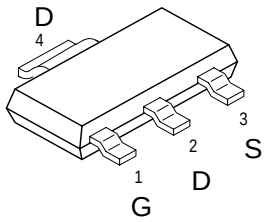
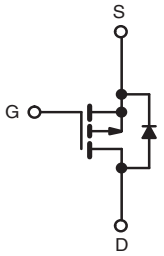
Description

The SOT-223 package is designed for surface-mounting using vapor phase, infrared, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOP packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25 W is possible in a typical surface mount application.



Features

- V_{DS} (V) = -60V
- I_D = -8A (V_{GS} = -10V)
- $R_{DS(ON)}$ < 62mΩ (V_{GS} = -10V)



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	-60	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at - 10 V	T_C = 25 °C	I_D	-8	A
Pulsed Drain Current [a]			I_{DM}	-14	
Linear Derating Factor				0.025	W/°C
Linear Derating Factor (PCB Mount) [e]				0.017	
Single Pulse Avalanche Energy [b]			E_{AS}	140	mJ
Repetitive Avalanche Current [a]			I_{AR}	-1.8	A
Repetitive Avalanche Energy [a]			E_{AR}	0.31	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	3.1	W
Maximum Power Dissipation (PCB Mount) [e]	T_A = 25 °C			2.0	
Peak Diode Recovery dV/dt [c]			dV/dt	-4.5	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +150	°C
Soldering Recommendations (Peak Temperature) [d]	for 10 s			300	

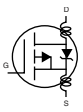
Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. V_{DD} = - 25 V, starting T_J = 25 °C, L = 50 mH, R_g = 25 Ω, I_{AS} = - 1.8 A (see fig. 12).
c. I_{SD} ≤ - 6.7 A, dI/dt ≤ 90 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C.
d. 1.6 mm from case.

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient (PCB Mount) [a]	R_{thJA}		60	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}		40	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	-60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA		-0.059		V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	-2.0		-4.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -60 V, V_{GS} = 0 V			- 100	µA
		V_{DS} = -48 V, V_{GS} = 0 V, T_J = 125 °C			-500	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = -10 V, I_D = -8 A [b]			62	mΩ
Forward Transconductance	g_{fs}	V_{DS} = - 25 V, I_D = -8 A [b]	1.3			S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		270		pF
Output Capacitance	C_{oss}			170		
Reverse Transfer Capacitance	C_{rss}			31		
Total Gate Charge	Q_g	V_{GS} = - 10 V, I_D = - 6.7 A, V_{DS} = - 48 V, see fig. 6 and 13 [b]			12	nC
Gate-Source Charge	Q_{gs}				3.8	
Gate-Drain Charge	Q_{gd}				5.1	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 30 V, I_D = - 6.7 A, R_g = 24 Ω, R_D = 4.0 Ω, see fig. 10 [b]		11		ns
Rise Time	t_r			63		
Turn-Off Delay Time	$t_{d(off)}$			9.6		
Fall Time	t_f			31		
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 		4.0		nH
Internal Source Inductance	L_S			6.0		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 			- 1.8	A
Pulsed Diode Forward Current [a]	I_{SM}				- 14	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = - 1.8 A, V_{GS} = 0 V [b]			- 5.5	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = - 6.7 A, dI/dt = 100 A/µs [b]		80	160	ns
Body Diode Reverse Recovery Charge	Q_{rr}			0.096	0.19	µC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature

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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

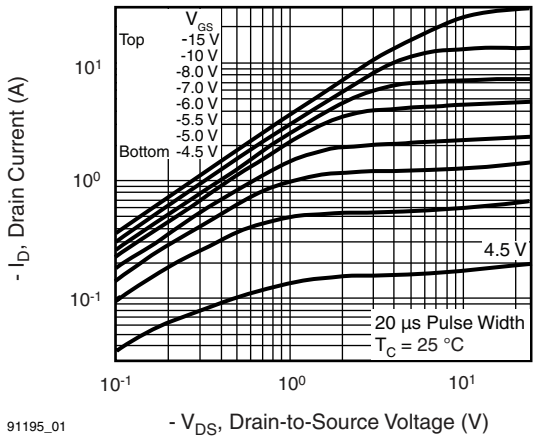


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

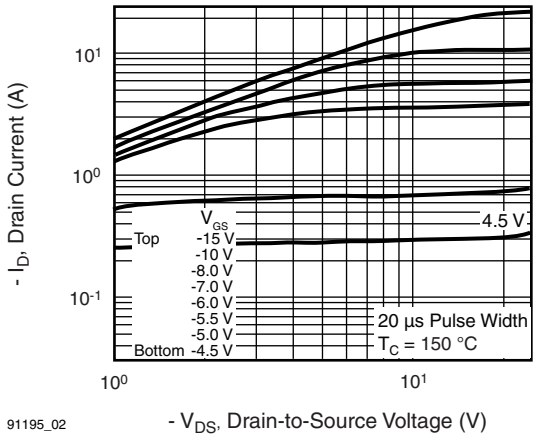


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

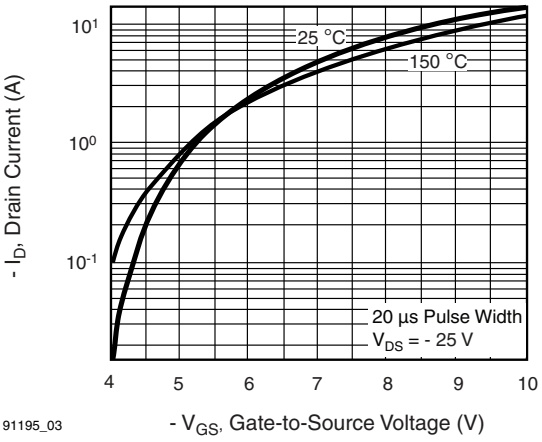


Fig. 3 - Typical Transfer Characteristics

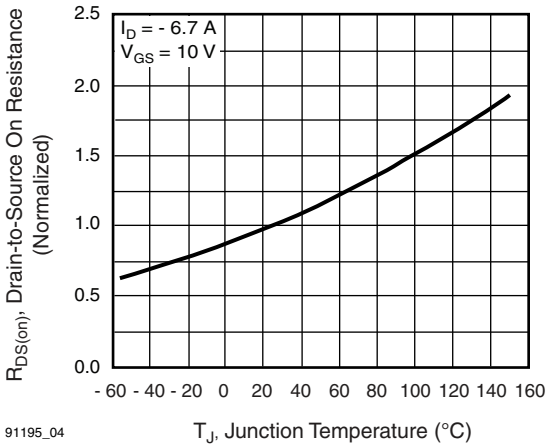


Fig. 4 - Normalized On-Resistance vs. Temperature

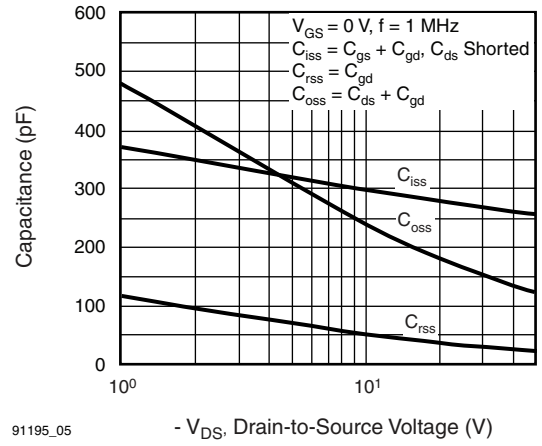


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

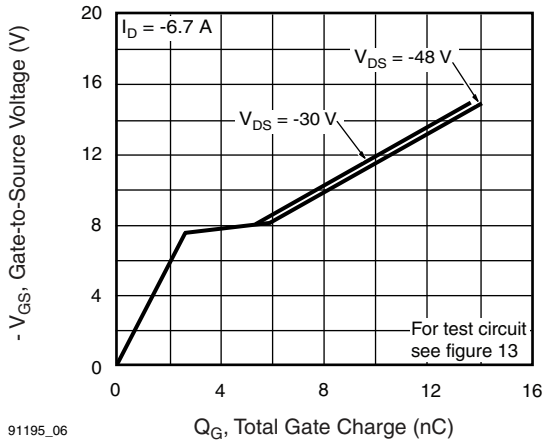


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

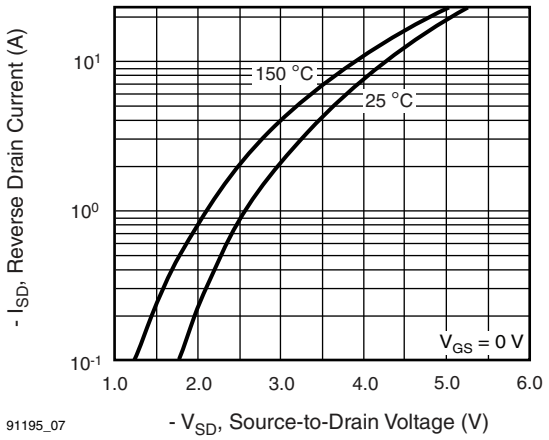


Fig. 7 - Typical Source-Drain Diode Forward Voltage

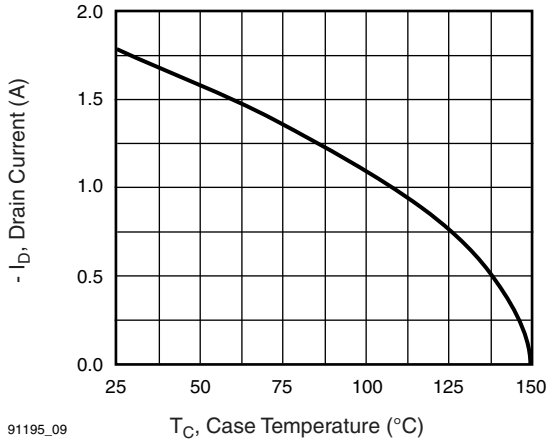


Fig. 9 - Maximum Drain Current vs. Case Temperature

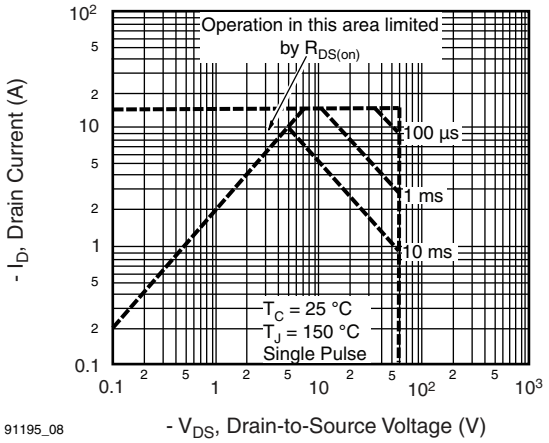


Fig. 8 - Maximum Safe Operating Area

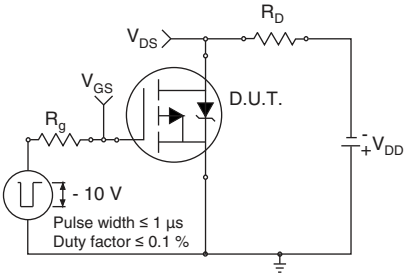


Fig. 10a - Switching Time Test Circuit

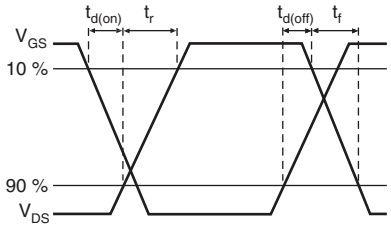


Fig. 10b - Switching Time Waveforms

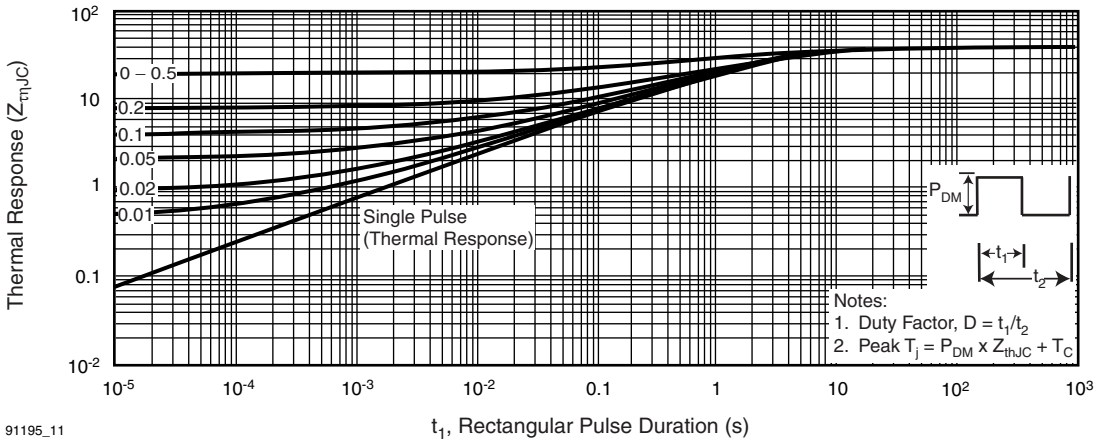


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

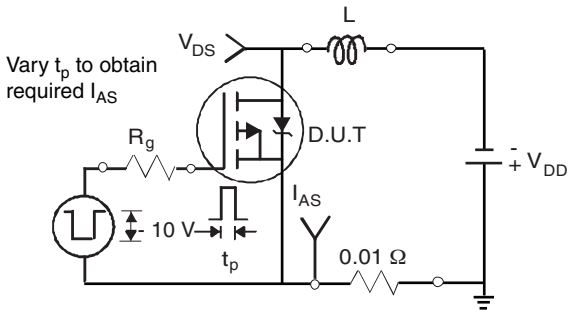


Fig. 12a - Unclamped Inductive Test Circuit

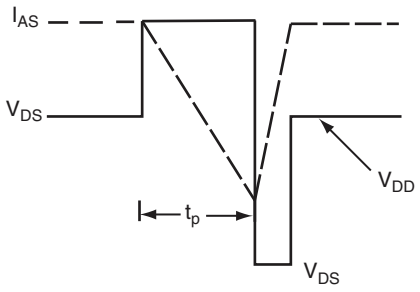


Fig. 12b - Unclamped Inductive Waveforms

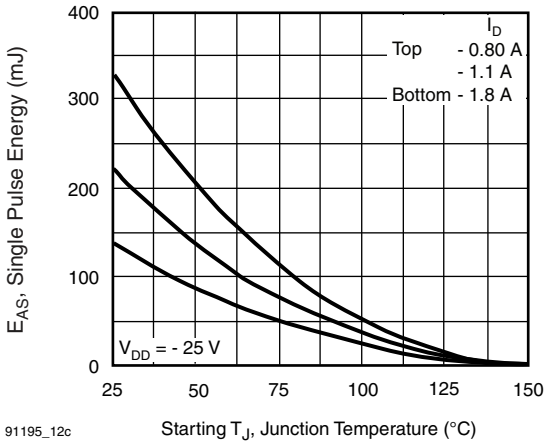


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

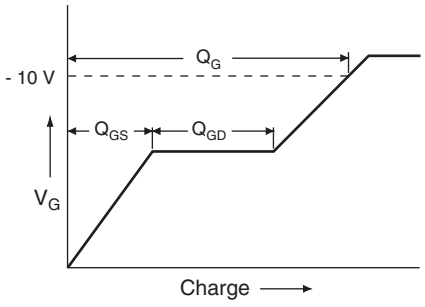


Fig. 13a - Basic Gate Charge Waveform

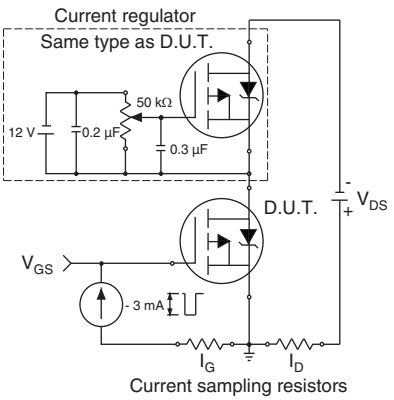
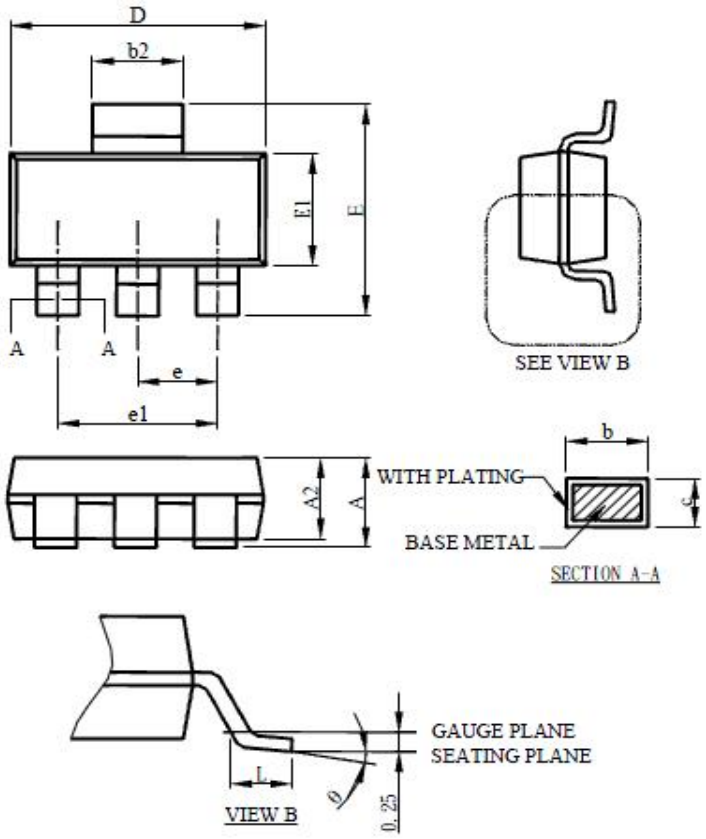


Fig. 13b - Gate Charge Test Circuit

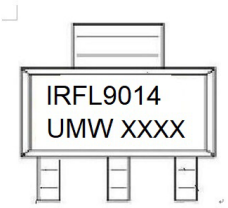
Package Mechanical Data SOT-223



SYMBOL	SOT-223	
	MILLIMETERS	
	MIN.	MAX.
A		1.80
A1	0.02	0.10
A2	1.55	1.65
b	0.66	0.84
b2	2.90	3.10
c	0.23	0.33
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30 BSC	
e1	4.60 BSC	
L	0.90	
θ	0°	8°

Note:
1.Refer to JEDEC TO-261AA.
2.Dimension D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs, and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRFL9014TR	SOT-223	2500	Tape and reel

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