

1.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.

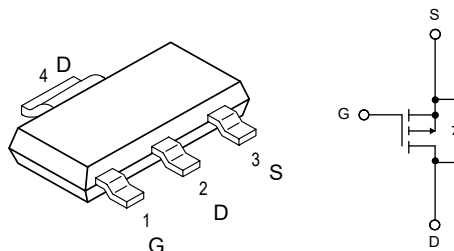
2.Features

- $V_{DS(V)} = -60V$
- $I_D = -1.8A$
- $R_{DS(ON)} < 0.5\Omega (V_{GS} = -10V)$

3.Pinning information

Pin	Symbol	Description
1	G	GATE
2,4	D	DRAIN
3	S	SOURCE

SOT-223
top view



4.Absolute Maximum Ratings $T_c=25^\circ C$ unless otherwise noted

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DS}	-60	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current (V_{GS} at -10V, $T_c=25^\circ C$)		I_D	-1.8	A
Pulsed Drain Current ^a		I_{DM}	-14	A
Linear Derating Factor			0.025	$^\circ C/W$
Linear Derating Factor (PCB Mount) ^e			0.017	$^\circ C/W$
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	$T_c=25^\circ C$	P_D	3.1	W
Maximum Power Dissipation (PCB Mount) ^e	$T_A=25^\circ C$		2	W



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	°C

Notes:

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

5. Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}		60	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}		40	°C/W

Notes:

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



6. Electrical Characteristics $T_J=25^{\circ}\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V_{DS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	-60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D=1\text{mA}$, Reference to 25°C		-0.059		V/ $^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	-2		-4	V
Gate-Source Leakage	I_{GSS}	$V_{GS}=\pm 20\text{V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-60\text{V}$, $V_{GS}=0\text{V}$			-100	μA
		$V_{DS}=-48\text{V}$, $V_{GS}=0\text{V}$, $T_J=125^{\circ}\text{C}$			-500	μA
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10\text{V}$, $I_D=1.1\text{A}^b$			0.05	Ω
Forward Transconductance	g_{FS}	$V_{DS}=-25\text{V}$, $I_D=1.1\text{A}^b$	1.3			S
Input Capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$ $f=1\text{MHz}$, see fig. 5		270		pF
Output Capacitance	C_{oss}			170		pF
Reverse Transfer Capacitance	C_{rss}			31		pF
Total Gate Charge	Q_g	$V_{GS}=-10\text{V}$, $I_D=-6.7\text{A}$			12	nC
Gate-Source Charge	Q_{gs}	$V_{DS}=-48\text{V}$			3.8	nC
Gate-Drain Charge	Q_{gd}	see fig. 6 and 13 ^b			5.1	nC
Turn-On Delay Time	$t_{D(on)}$	$V_{DD}=-30\text{V}$, $I_D=-6.7\text{A}$ $R_G=24\Omega$, $R_D=4\Omega$ see fig. 10 ^b		11		ns
Rise Time	t_r			63		ns
Turn-Off Delay Time	$t_{D(off)}$			9.6		ns
Fall Time	t_f			31		ns
Internal Drain inductance	L_D	Between lead, 6mm (0.25in.) from package and center of die contact		4		nH
Internal Source inductance	L_S			6		nH



Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			-1.8	A
Pulsed Source Current (Body Diode) ^a	I_{SM}				-14	
Diode Forward Voltage	V_{SD}	$T_J=25^{\circ}\text{C}, I_S=-1.8\text{A}, V_{GS}=0\text{V}^b$			-5.5	V
Reverse Recovery Time	t_{rr}	$T_J=25^{\circ}\text{C}, I_F=-6.7\text{A}$		80	160	ns
Reverse Recovery Charge	Q_{rr}	$dI/dt=100\text{A}/\mu\text{s}^b$		0.096	0.19	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

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

b. Pulse width $\leq 300 \mu\text{s}$; duty cycle $\leq 2\%$.



7.1 Typical Characteristics

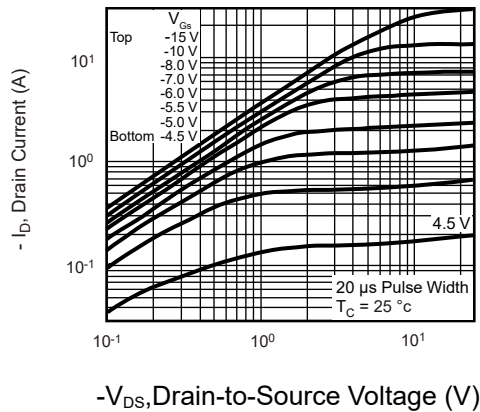
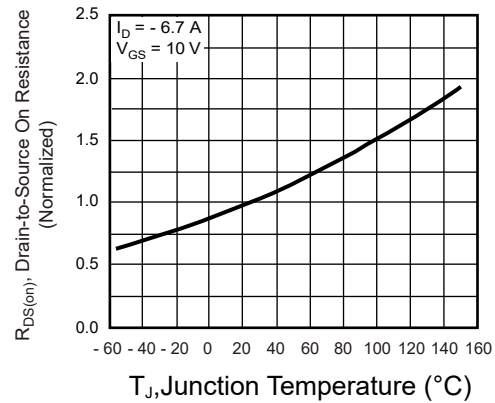
Figure 1: Typical Output Characteristics, $T_C = 25\text{ }^{\circ}\text{C}$ 

Figure 2: Normalized On-Resistance vs. Temperature

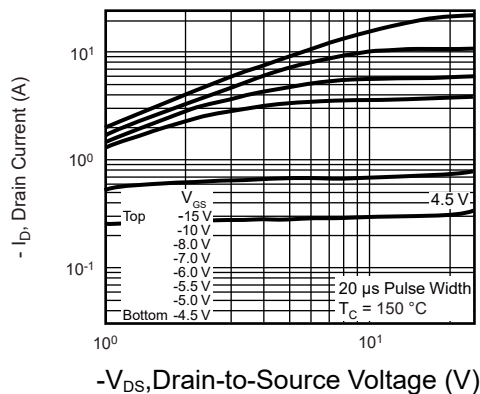
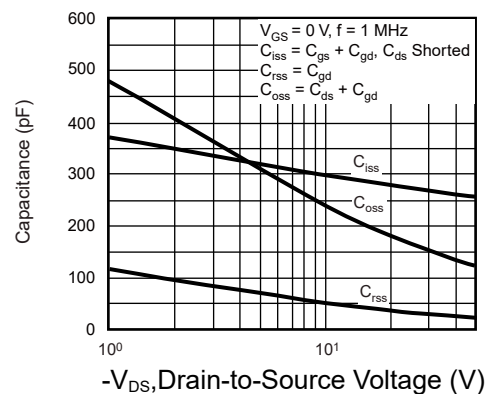
Figure 3: Typical Output Characteristics, $T_C = 150\text{ }^{\circ}\text{C}$ 

Figure 4: Typical Capacitance vs. Drain-to-Source Voltage

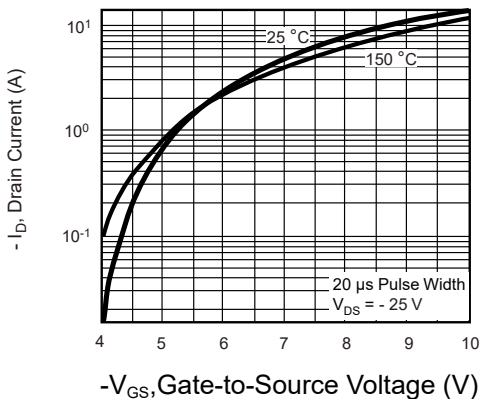


Figure 5: Typical Transfer Characteristics

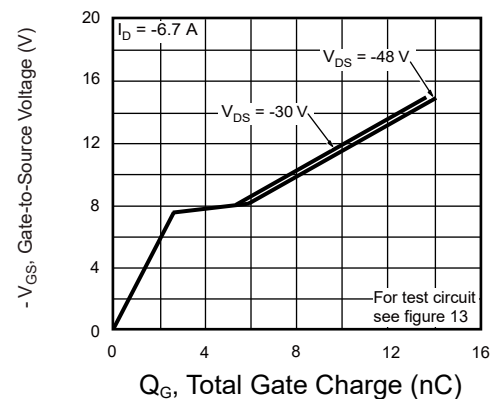


Figure 6: Typical Gate Charge vs. Gate-to-Source Voltage



7.2 Typical Characteristics

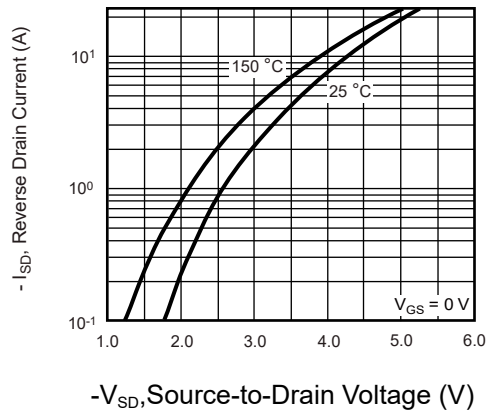


Figure 7: Typical Source-Drain
Diode Forward Voltage

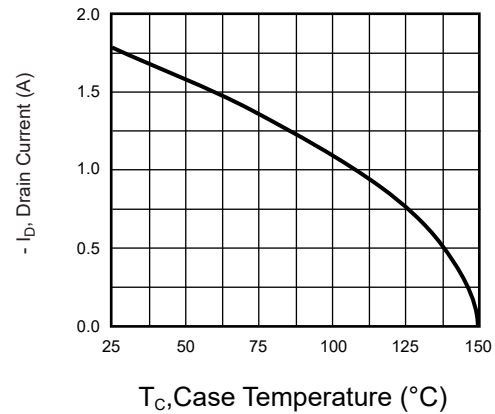


Figure 8: Maximum Drain Current vs.
Case Temperature

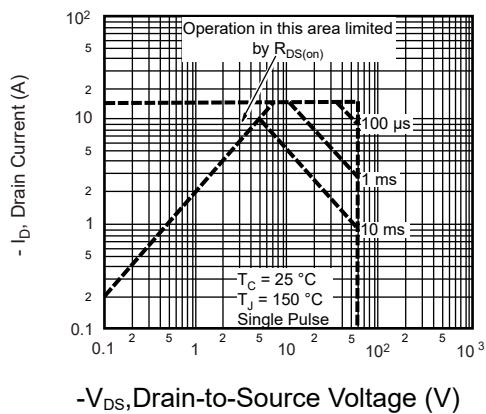


Figure 9: Maximum Safe Operating Area

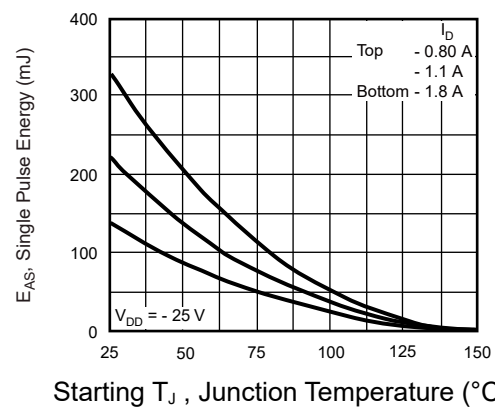


Figure 10: Maximum Avalanche Energy vs.
Drain Current

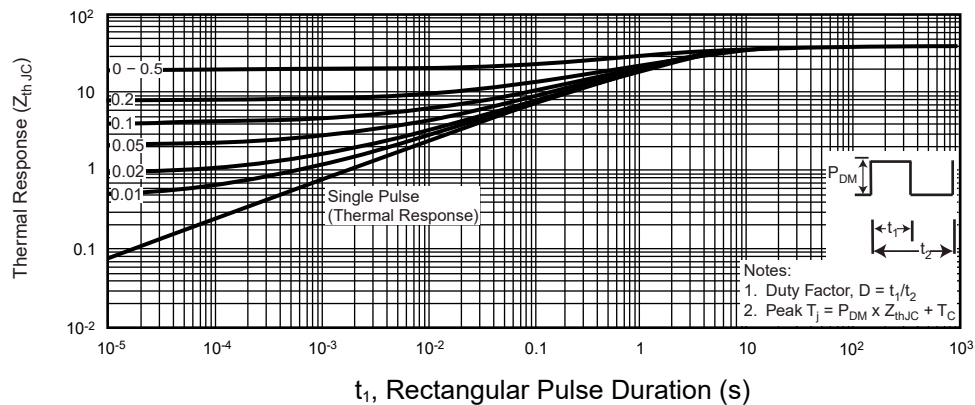


Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

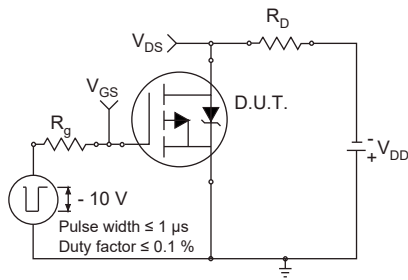


Figure 12a: Switching Time Test Circuit

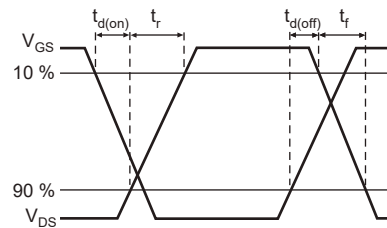


Figure 12b: Switching Time Waveforms

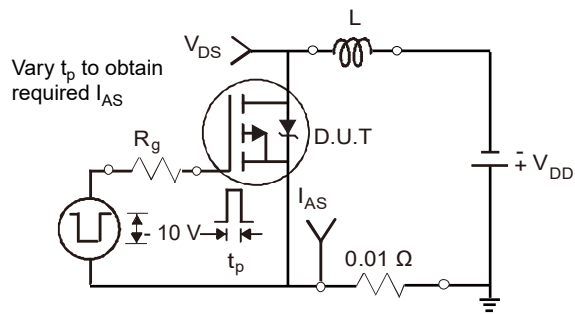


Figure 13a: Unclamped Inductive Test Circuit

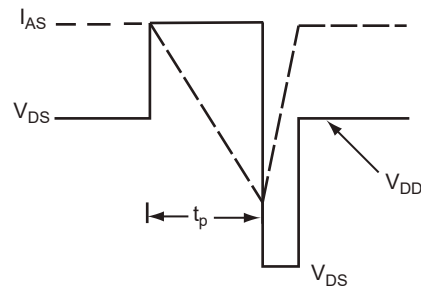


Figure 13b: Unclamped Inductive Waveforms

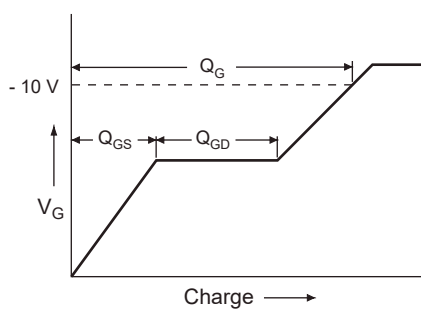


Figure 14a: Basic Gate Charge Waveform

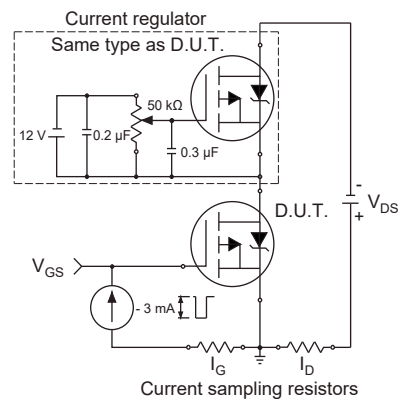
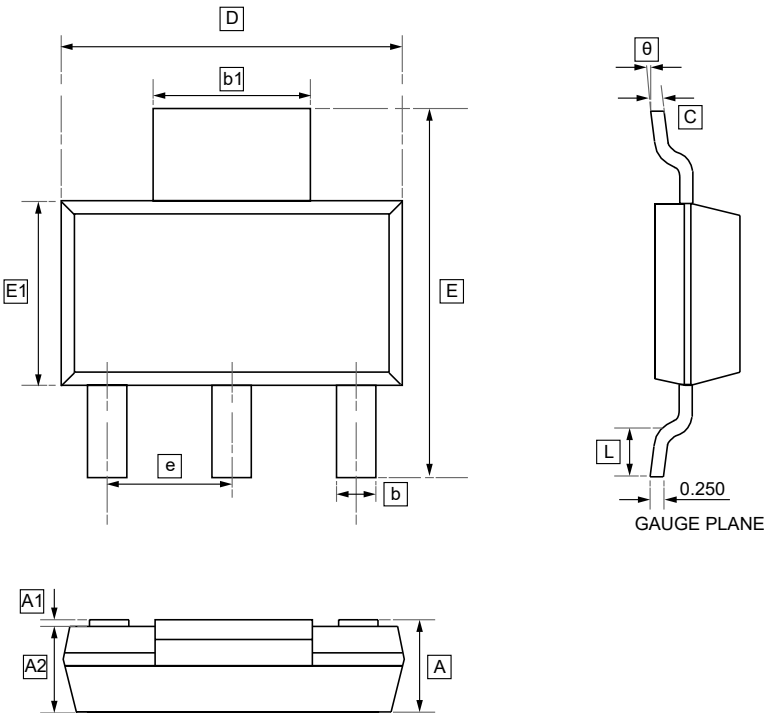


Figure 14b: Gate Charge Test Circuit



8.SOT-223 Package Outline Dimensions

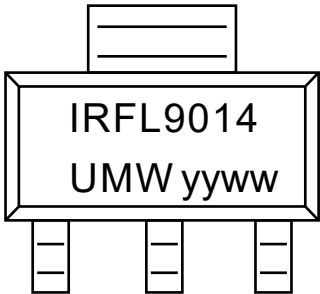


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	D	E	E1	e	L	θ
Min	-	0.020	1.500	0.660	2.900	0.230	6.300	6.700	3.300	2.300	0.750	0°
Max	1.800	0.100	1.700	0.840	3.100	0.350	6.700	7.300	3.700	BSC	-	10°



9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFL9014TR	SOT-223	2500	Tape and reel



10.Disclaimer

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