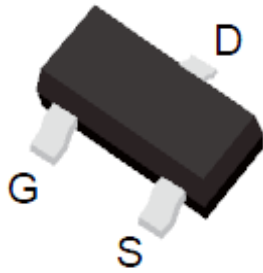


**-3A, -20V, P-Channel MOSFET****Features**

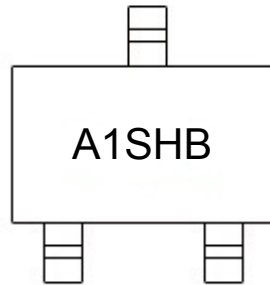
$R_{DS(ON)} < 150\text{m}\Omega @ V_{GS} = -4.5\text{V}$
 $R_{DS(ON)} < 230\text{m}\Omega @ V_{GS} = -2.5\text{V}$
 Industry-standard pinout SOT-23 Package
 Compatible with Existing Surface Mount Techniques
 RoHS Compliant, Halogen-Free

FEATURE

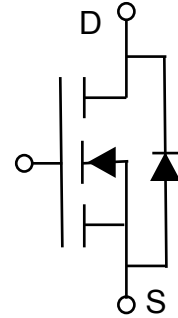
- High Density Cell Design
For Ultra Low On-Resistance
- Advanced trench process technology



SOT-23 top view



Marking and pin Assignment



Schematic Diagram

Package Marking and Ordering Information

Device model	Marking	Packing	Device Package	Reel (PCS)	BOX (PCS)	Per Carton (PCS)
H2301	A1SHB	Tape and Reel	SOT-23	3000	45000	180000

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DSS}		-20	V
Gate-Source Voltage	V_{GSS}		± 10	
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	-3	A
Pulsed Drain Current ^{Note1}	I_{DM}	$T_C = 25^\circ\text{C}$	-10	
Single Pulsed Avalanche Energy ^{Note2}	E_{AS}		2.25	mJ
Power Dissipation	P_D	$T_A = 25^\circ\text{C}$ $T_A = 75^\circ\text{C}$	1.25 0.8	W
Operating and Storage Temperature	T_J, T_{stg}		-55 to +150	$^\circ\text{C}$
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	PCB mounted ² PCB mounted ³	100 165	$^\circ\text{C}/\text{W}$

**Electrical Characteristics** ($T_J=25^{\circ}\text{C}$ unless otherwise specified)**Off Characteristic**

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	-20	--	--	V
Zero gate voltage drian current	I_{DSS}	$V_{DS}=-20V, V_{GS}=0V$ $V_{DS}=-16V, V_{GS}=0V, T_J=55^{\circ}\text{C}$	--	--	-1.0 -10	μA
Gate-source leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 10V$	--	--	± 100	nA

On Characteristics

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Drain-Source on-Resistance ^{Note3}	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-3A$	--	120	120	m Ω
		$V_{GS}=-2.5V, I_D=-2A$	--	170	230	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.4	--	1	V
Forward Transconductance ¹	g_{fs}	$V_{DS}=-5V, I_D=-2.8A$	--	6.5	--	S

Dynamic Characteristics

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
lutput capacitance	C_{ISS}	$V_{GS}=-0V$ $V_{DS}=-6V$ $f=1.0MHz$	--	415	--	pF
Output capacitance	C_{OSS}		--	223	--	
Reverse transfer capacitance	C_{RSS}		--	87	--	
Gate to source charge	Q_{gs}	$V_{DS}=-6V$ $I_D=-2.3A$ $V_{GS}=-4.5V$	--	0.85	--	nC
Gate to drain charge	Q_{gd}		--	1.7	--	
Gate charge total	Q_g		--	5.8	10	

**Switching Characteristics**

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=-6V$ $V_{GS}=-4.5V$ $I_D=-1A$ $R_L=6\Omega$ $R_G=6\Omega$	--	13	25	nS
Rise time	t_r		--	36	60	
Turn-off delay time	$t_{d(off)}$		--	42	70	
Fall time	t_f		--	34	60	

Drain-Source Diode Characteristics and Maximum Ratings

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Maximum Continuous Drain to Source Diode Forward Current	I_S	$T_C=25^\circ C$	--	--	-1.6	A
Drain to Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-1A$	--	-0.8	-1.2	V

Notes:

- 1、Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
- 2、PulseTest: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
- 3、Repetitive rating; pulse width limited by max. junction temperature.
- 4、Surface mounted on 1 in square Cu board.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

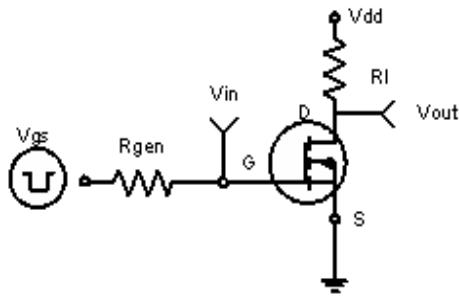


Figure 1: Switching Test Circuit

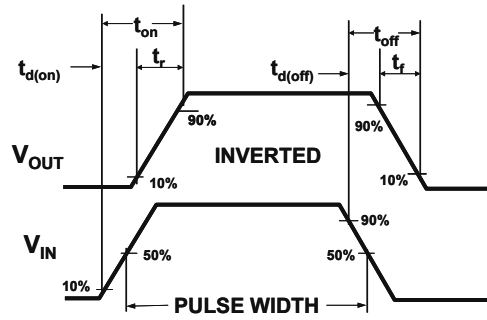


Figure 2: Switching Waveforms

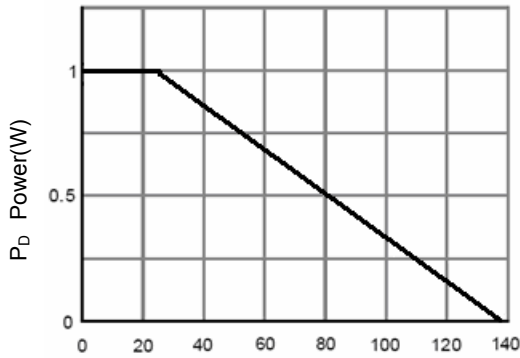


Figure 3 Power Dissipation

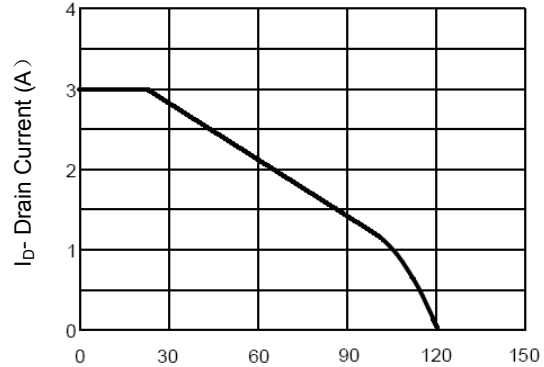


Figure 4 Drain Current

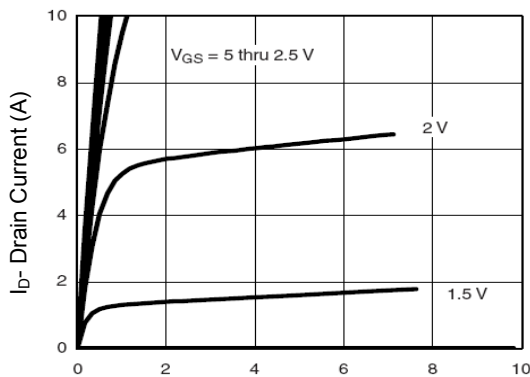


Figure 5 Output CHARACTERISTICS

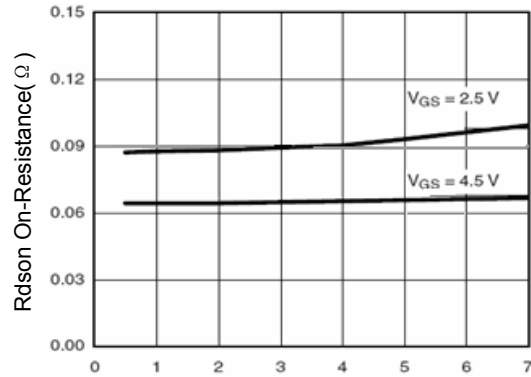


Figure 6 Drain-Source On-Resistance

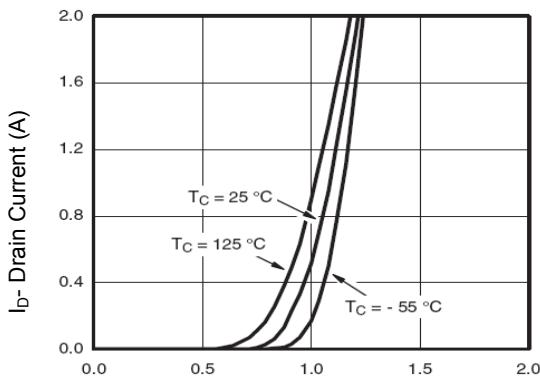


Figure 7 Transfer Characteristics

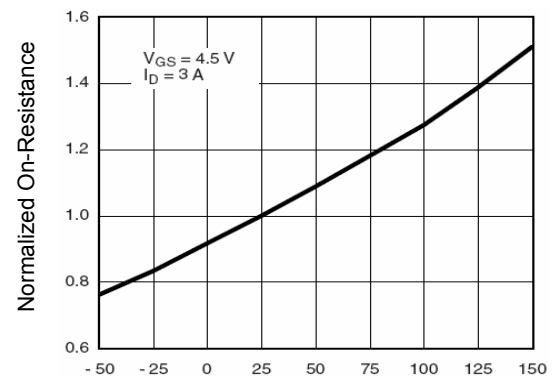


Figure 8 Drain-Source On-Resistance

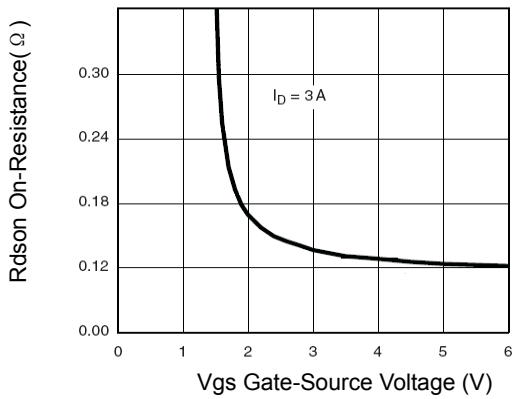


Figure 9 Rdson vs Vgs

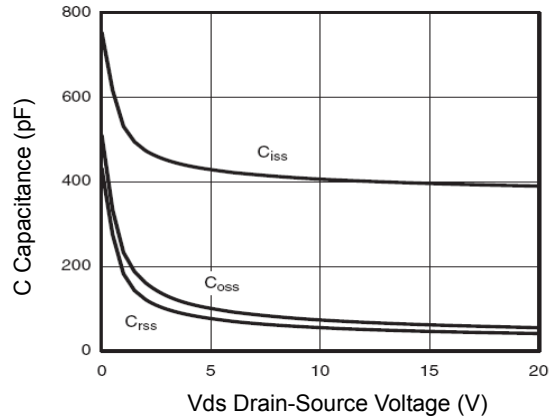


Figure 10 Capacitance vs Vds

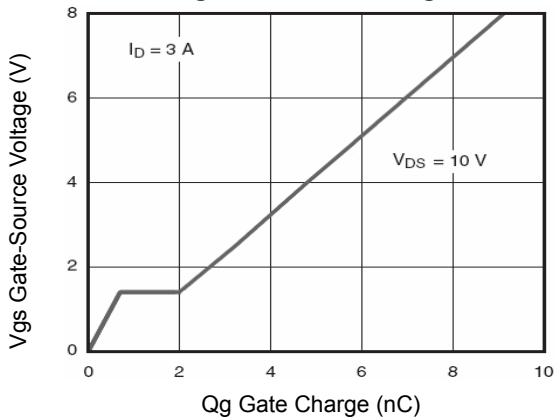


Figure 11 Gate Charge

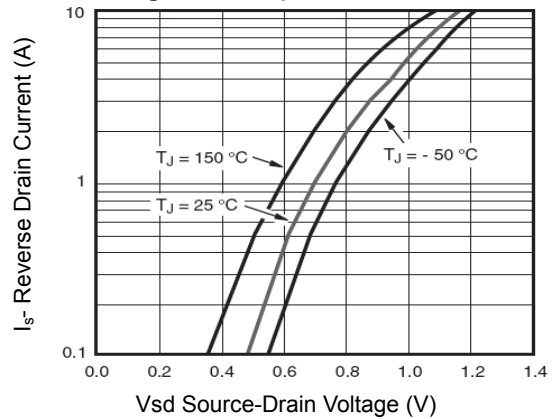


Figure 12 Source- Drain Diode Forward

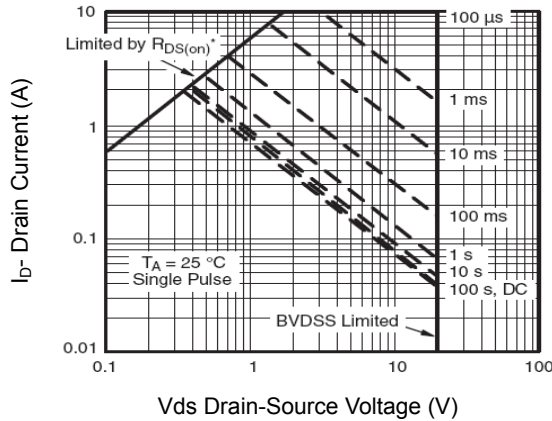


Figure 13 Safe Operation Area

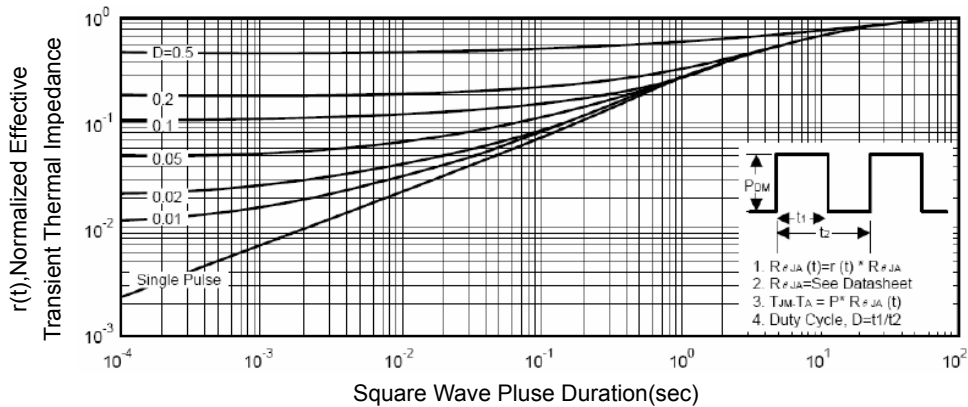
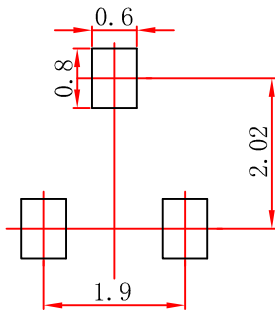
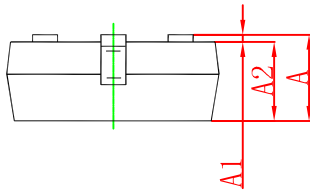
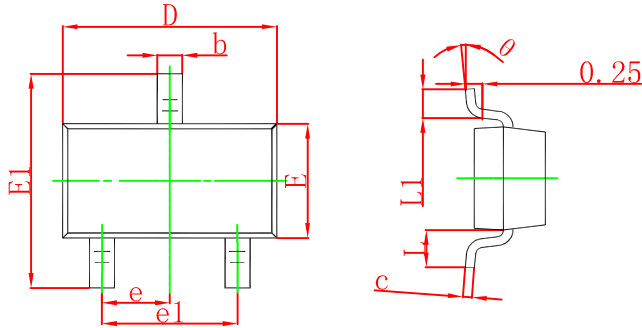


Figure 14 Normalized Maximum Transient Thermal Impedance



SOT-23 Package Mechanical Data



- Note:
1. Controlling dimension: in millimeters.
 2. General tolerance: $\pm 0.05\text{mm}$.
 3. The pad layout is for reference purposes only.

REF.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	0.00	0.10	0.00	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.08	0.15	0.003	0.006
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.95 TYP.		0.037 TYP.	
e1	1.80	2.00	0.071	0.079
L	0.55 TYP.		0.022 TYP.	
L1	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°



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