MT871X

Uni-polar, Hall-Effect Switch IC

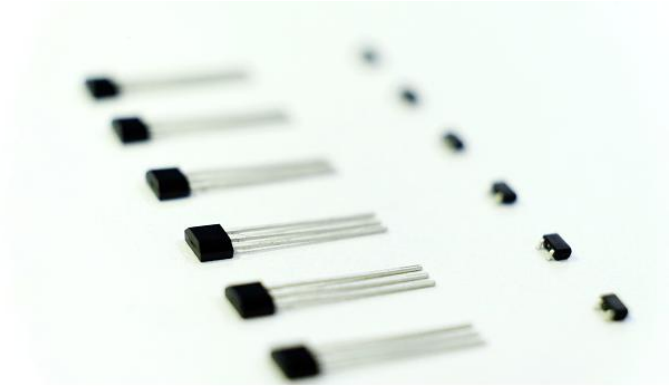
MagnTek

1 Product Description

The MT871X family is produced by BCD technology with both high performance and high reliability. The Hall IC internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltage of 2.4V to 24V, temperature compensation circuitry, small-signal amplifier, Hall IC with dynamic offset cancellation system, Schmitt trigger and an open collector output. It also includes an clamp diode at output and reversed power supply protection enhances the robustness of Hall IC.

The Hall IC designed to respond to a single poles. While the magnetic flux density(B) is larger than operating point (B_{OP}), the output will be turned on (Low), the output is held until the magnetic flux density(B) is lower than releasing point (B_{RP}), then turn off (High).

The MT871X family provides a variety of packages to customers: SOT-23/SOT-23 (Thin Outline) for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.



2 Features

- BCD Technology
- Uni-polar Switch
- 2.4～24V Operating Vcc Range
- -40℃~150℃ Operating Temperature
- Package Option:
  Flat TO-92
  SOT-23
  SOT-23 (Thin Outline)
- Magnetic Sensitivity Option:
  MT8711 (B_{OP}=85Gs, B_{RP}=55Gs)
  MT8712 (B_{OP}=130Gs, B_{RP}=100Gs)
  MT8713 (B_{OP}=30Gs, B_{RP}=20Gs)
- Open Drain Output
- -27V Reversed Power Supply Protection
- Output Limiting Current Protection
- RoHS Compliant: (EU)2015/863

3 Product Overview of MT871X

Part No.	Description
MT871XA	Flat TO-92, bulk packaging (1000pcs/bag)
MT871XAT	SOT-23, tape & reel (3000pcs/bag)
MT871XET	SOT-23 (thin outline), tape & reel (3000pcs/bag)

4 Applications

- Home appliances
- DC Fan，Electric tools
- Industrial
- Magnetic Encoder

5. Pin Configuration and Functions

	Vcc	Out	GND
SOT-23	1	2	3
SOT-23 Thin Outline	1	2	3
Flat TO-92	1	3	2
Description	Power	Output Open-Drain	Ground

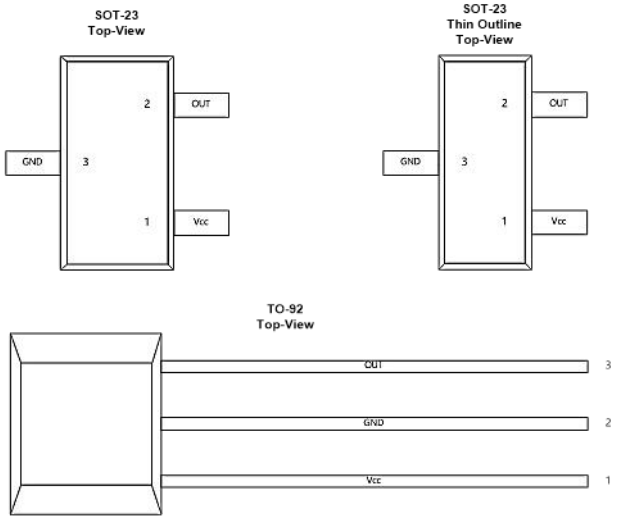


Figure.1 Pin Configuration & Functions

Table of Contents

Reversion History

Rev1.0 Originally Version
Rev1.1 Update Supply Current
Rev1.2 Update Small SOT-23 Package Outline Dimensions

6 Definition of Switching Function

Figure.2 & Figure.3 shows the device functionality and hysteresis

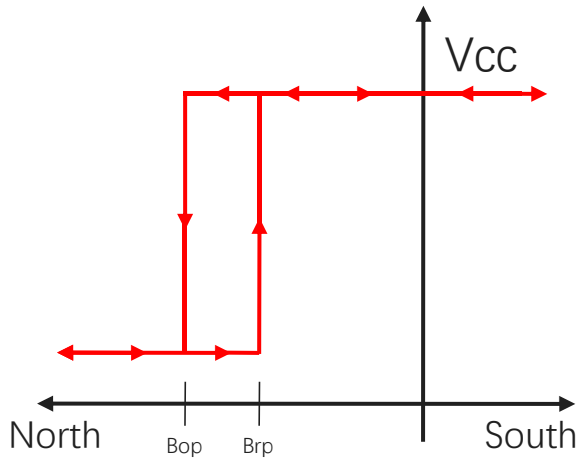


Figure.2 Switching Function Uni-polar (North)
SOT-23

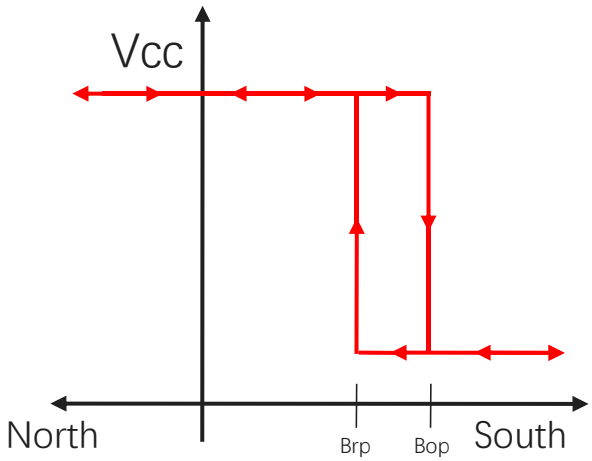


Figure.3 Switching Function Uni-polar (South)
Flat TO-92 / SOT-23 (Thin Outline)

7 Function Description

B_{OP}: Operating Point, Magnetic flux density applied on the branded side of the package which turns the output driver ON (V_{OUT}=Low)

B_{RP}: Releasing Point, Magnetic flux density applied on the branded side of the package which turns the output driver OFF (V_{OUT}=High)

B_{HYST}: Hysteresis Window, $|B_{OP} - B_{RP}|$
Devices that have a lower magnetic threshold (V_{OUT}=High) detect magnets at a farther distance. Higher thresholds (V_{OUT}=Low) generally require a closer distance or larger magnet.

8 Feature Description

The MT871X device is sensitive to the magnetic field component that is perpendicular to the top of the package

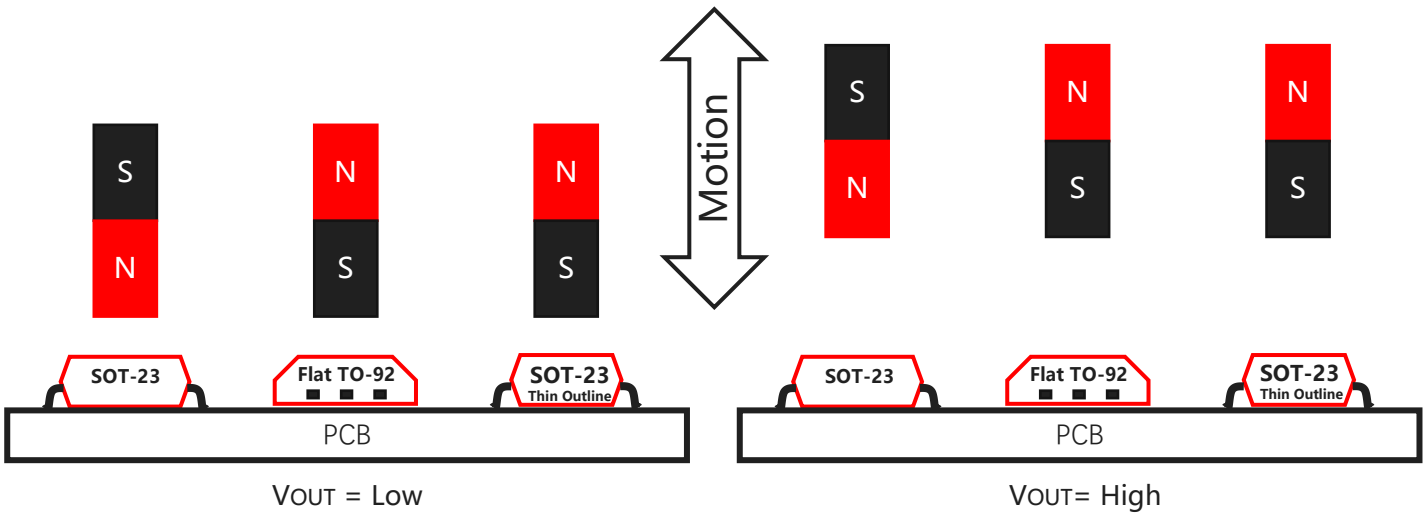


Figure.4 Flux Direction Polarity

9 Functional Block Diagram

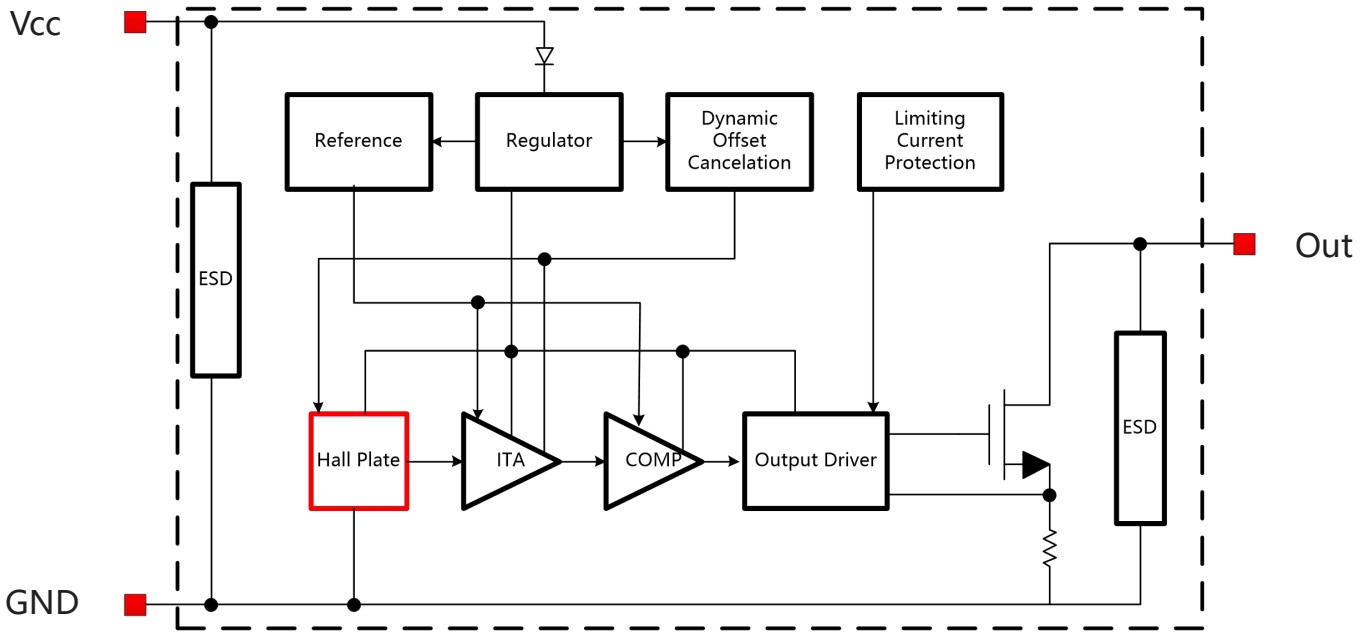


Figure.5 Functional Block Diagram

10 Electrical and Magnetic Characteristics

10.1 Absolute Maximum Ratings

Absolute maximum ratings are limited values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Symbol	Parameters	Min	Max	Units
V_{CC}	Supply Voltage	-	27	V
V_{RCC}	Reversed Power Supply Protection	-27	-	V
V_{OUT}	Output Voltage	-	27	V
I_{OUT}	Continuous Output Current	-	25	mA
T_A	Operating Ambient Temperature	-40	150	℃
T_S	Storage Temperature	-50	150	℃
T_J	Junction Temperature	-	165	℃
B	Magnetic Flux Density	No Limit		Gs

10.2 Electrical Specifications

At T_A=-40~150℃, V_{CC}=2.4V~24V (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	2.4	-	24	V
I_{CC}	Supply Current	V_{CC}=5V	-	0.6	-	mA
I_{AW}	Awake Current	V_{CC}=5V	-	1.2	-	mA
V_{OL}	Output Low Voltage	I_{OUT}=10mA, |B|>|B_{OP}|	-	-	0.4	V
F_{SW}	Sampling Frequency	V_{CC}=5V	-	15	-	KHz
T_{PO}	Power on Time	dVcc/dt>5V/us, |B|>|B_{OP}|	-	-	25	us
R_{TH}	Thermal Resistance of SOT-23		-	301	-	℃/W
	Thermal Resistance of SOT-23 (Thin Outline)		-	301	-	℃/W
	Thermal Resistance of TO-92		-	230	-	℃/W

10.3 Magnetic Characteristics

At V_{CC}=2.4V~24V (unless otherwise specified)

Part No.	Symbol	Min	Typ	Max	Unit
MT8711 Series	B_{OP}, T_A =25℃	65	85	105	Gs
	B_{RP}, T_A =25℃	35	55	75	Gs
	B_{HYST}, T_A =25℃	20	30	40	Gs
MT8712 Series	B_{OP}, T_A =25℃	110	130	150	Gs
	B_{RP}, T_A =25℃	80	100	120	Gs
	B_{HYST}, T_A =25℃	20	30	40	Gs
MT8713 Series	B_{OP}, T_A =25℃	20	30	40	Gs
	B_{RP}, T_A =25℃	10	20	30	Gs
	B_{HYST}, T_A =25℃	3	10	17	Gs

10.4 ESD Ratings

Symbol		Reference	Values	Unit
V_{ESD}	Human-body model (HBM)	AEC-Q100-002	±6000	V
	Charged-device model (CDM)	AEC-Q100-011	±1000	V

10.5 Characteristic Performance

At Vcc=5V

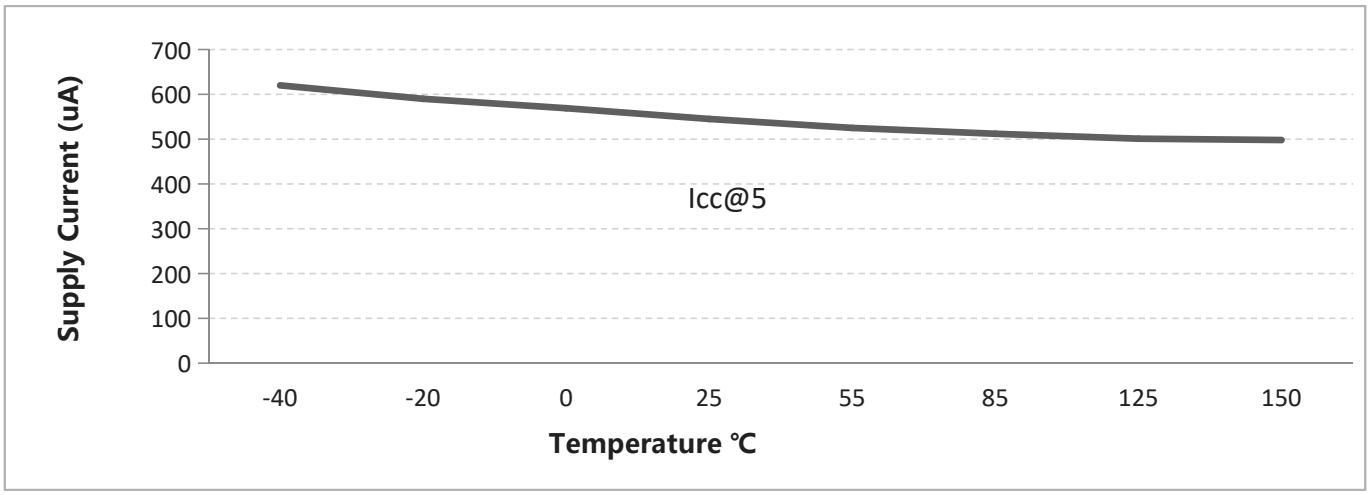


Figure.6 Supply Current vs. Temperature

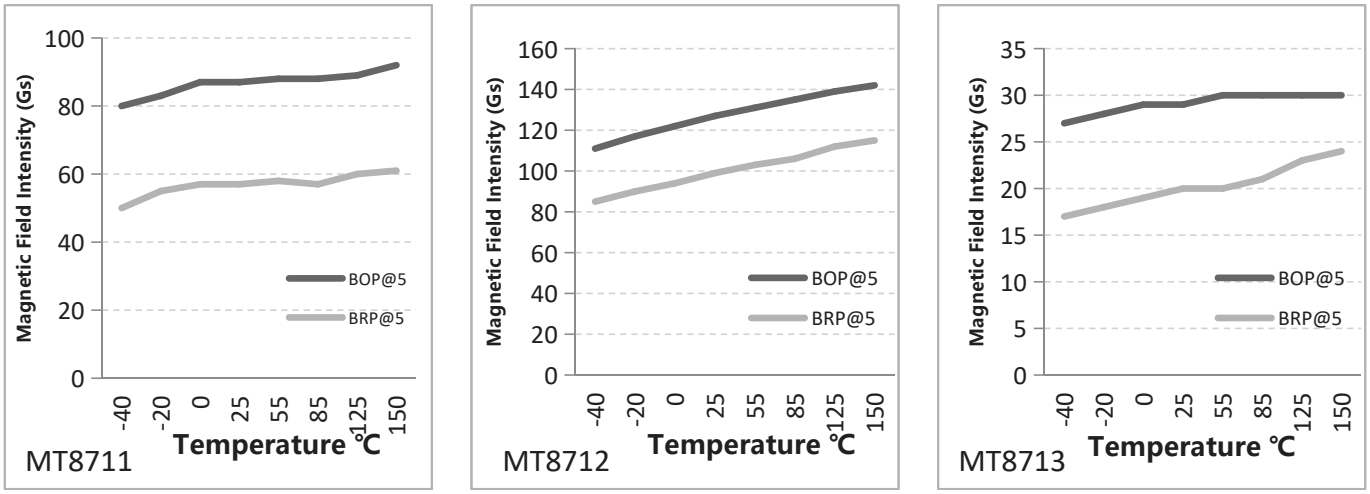


Figure.7 Magnetic Characteristics vs. Temperature (BOP & BRP)

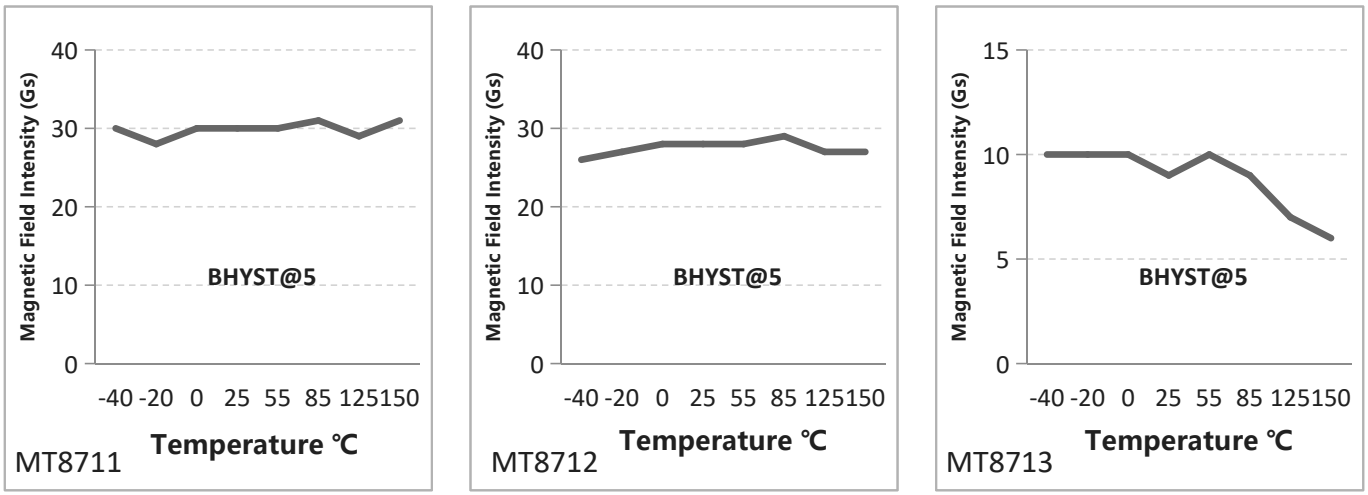


Figure.8 Magnetic Characteristics vs. Temperature (BHYST)

10.6 Typical Output Waveform

MT871XA as example

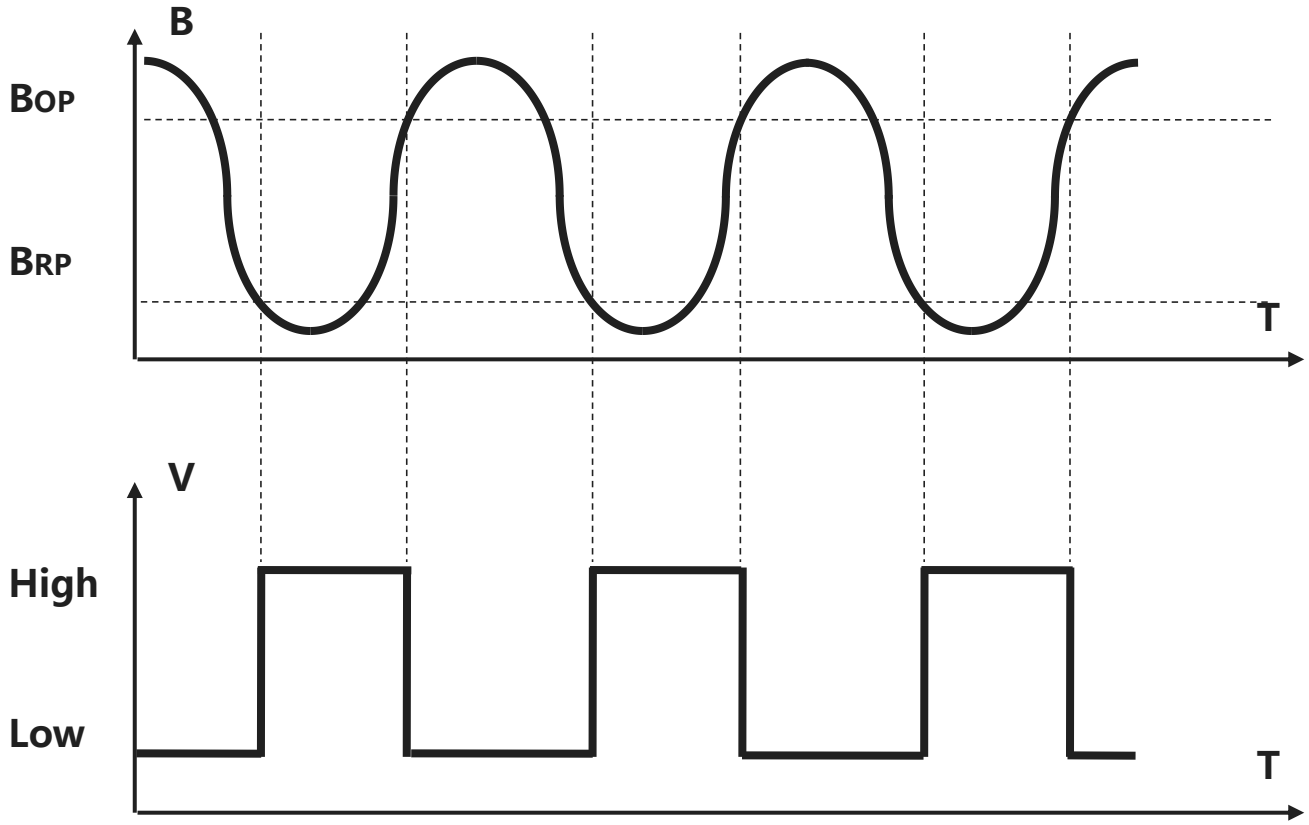


Figure.9 Digital Output vs. Magnetic Flux Density

11 Typical Application Circuit

MT871XAT as example

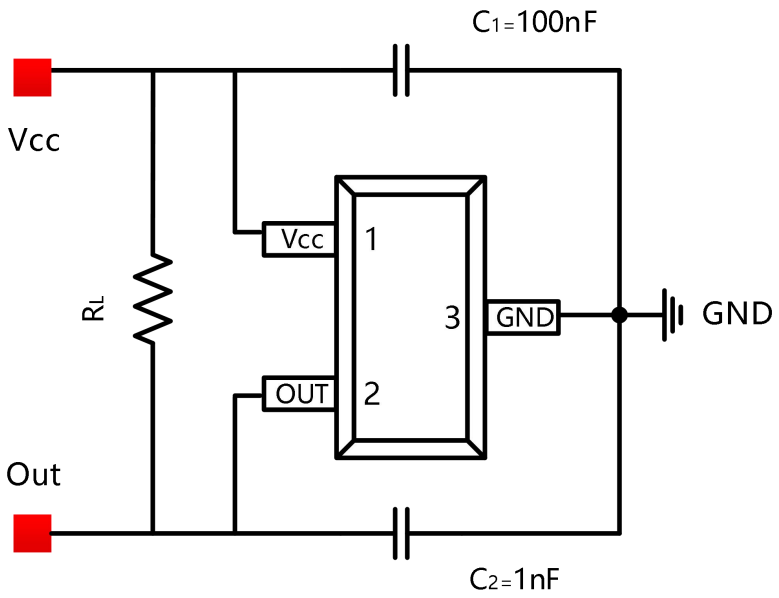


Figure.10 Typical Application Circuit

12 Package Material Information (For Reference Only – Not for Tooling Use)

12.1 SOT-23 Package Information

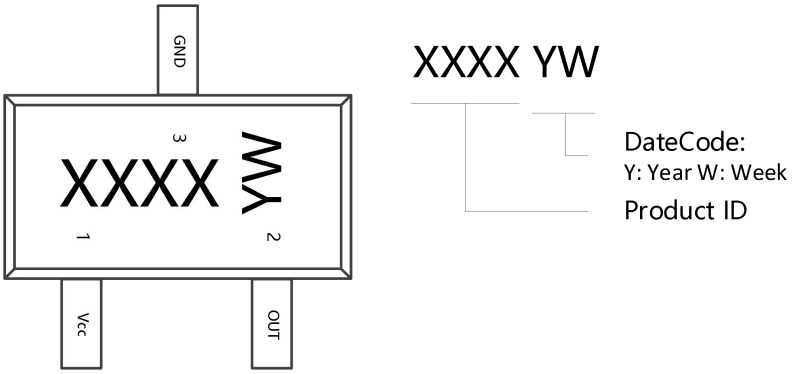


Figure.11 SOT-23 Chip Marking Spec

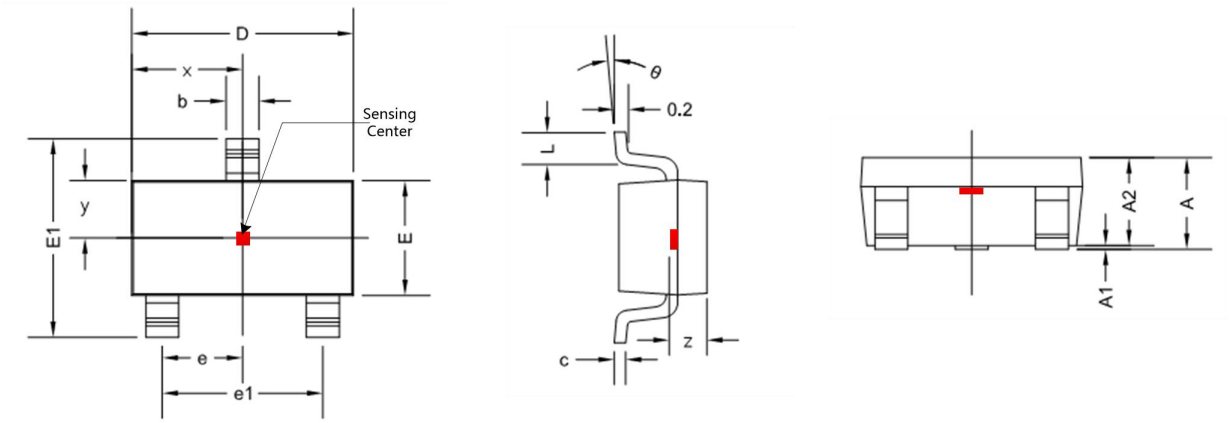


Figure.12 SOT-23 Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.300	0.041	0.051
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.300	0.500	0.012	0.020
c	0.080	0.220	0.003	0.009
D	2.800	3.020	0.110	0.119
E	1.500	1.700	0.059	0.067
E1	2.600	3.000	0.102	0.118
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0 °	8 °	0 °	8 °
x	1.460 TYP		0.057 TYP	
y	0.800 TYP		0.032 TYP	
z	0.600 TYP		0.024 TYP	

12.2 SOT-23 (Thin Outline) Package Information

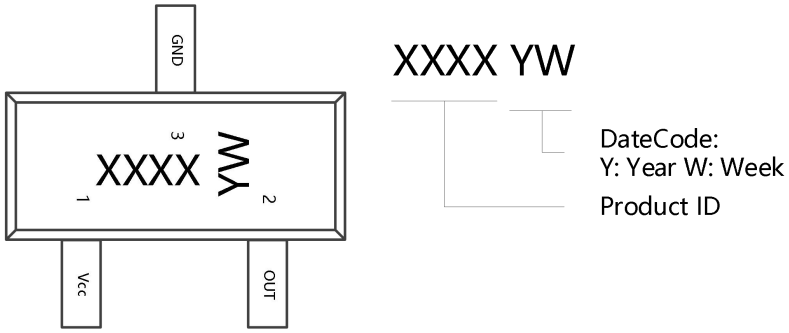


Figure.13 SOT-23 (Thin Outline) Chip Marking Spec

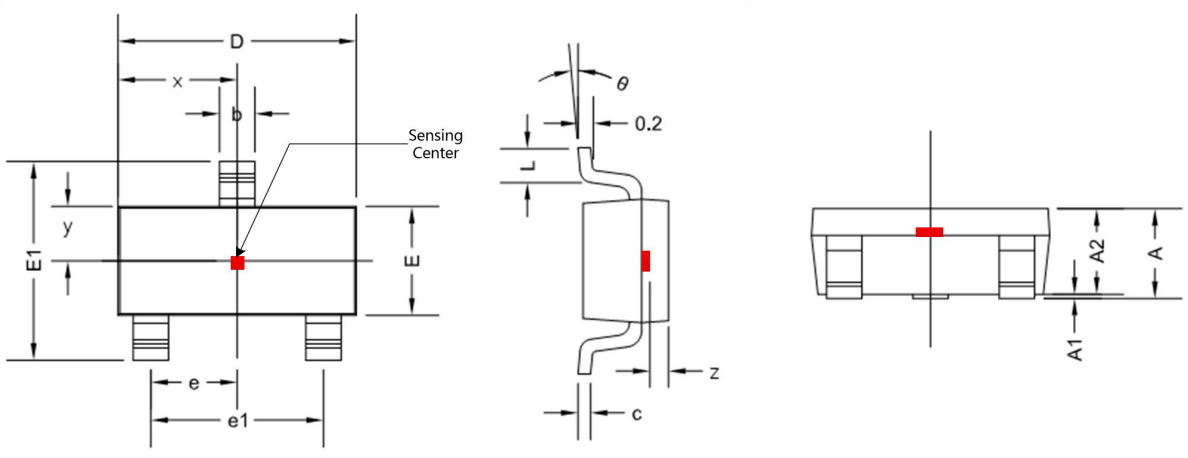


Figure.14 SOT-23 (Thin Outline) Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.890	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.880	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.080	0.202	0.003	0.008
D	2.800	3.040	0.110	0.120
E1	2.100	2.640	0.083	0.104
E	1.200	1.400	0.048	0.055
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.236
L1	0.540	0.550	0.021	0.022
θ	0°	8°	0°	8°
x	1.460 TYP		0.057 TYP	
y	0.650 TYP		0.026 TYP	
z	0.500 TYP		0.020 TYP	

12.2 Flat TO-92 Package Information

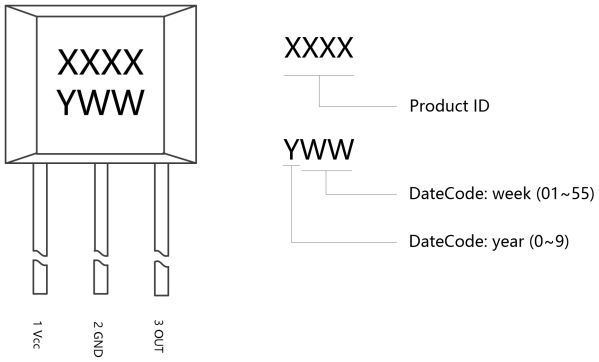


Figure.13 Flat TO-92 Chip Marking Spec

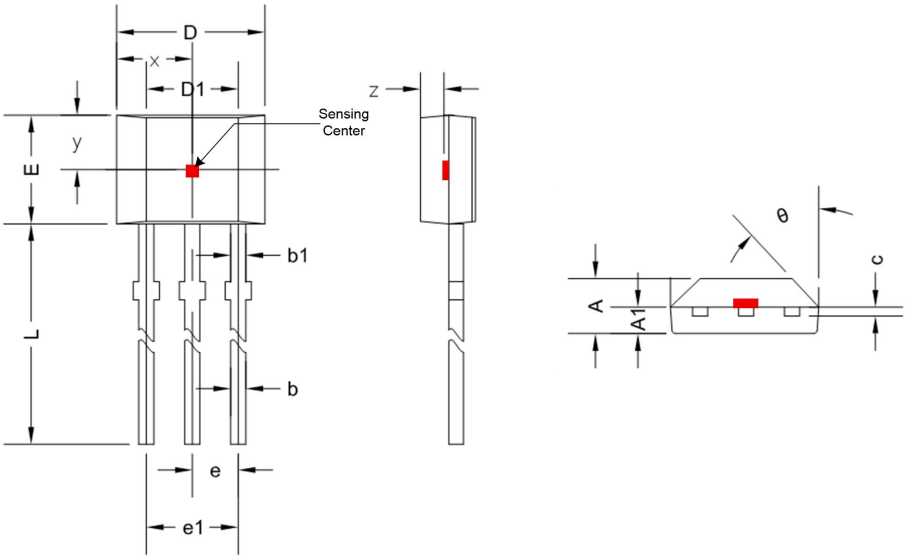


Figure.14 Flat TO-92 Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.620	0.056	0.064
A1	0.660	0.910	0.026	0.036
b	0.330	0.560	0.013	0.022
b1	0.400	0.510	0.016	0.020
c	0.330	0.510	0.013	0.020
D	3.900	4.200	0.154	0.165
D1	2.280	2.680	0.090	0.106
E	2.900	3.280	0.114	0.128
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	13.500	16.200	0.531	0.638
θ	45 ° TYP		45 ° TYP	
x	2.025 TYP		0.080 TYP	
y	1.545 TYP		0.061 TYP	
z	0.500 TYP		0.020 TYP	

13 Copy Rights and Disclaimer

1. This document may not be reproduced or duplicated, in any form, in whole or in part without prior written consent of MagnTek . Copyrights © 2019, MagnTek Incorporated.

2. MagnTek reserves the right to make changes to the information published in this document at anytime without notice.

3. MagnTek’ s products are limited for use in normal commercial applications. MagnTek’ s products are not to be used in any device or system, including but not limited to medical life support equipment and system.

For the latest version of this document, please visit our website: www.magntek.com.cn