MT856X

Latch, Hall-Effect Magnetic Position Sensor

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1 Product Description

The MT856X 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 3.0V to 24V, temperature compensation circuitry, small-signal amplifier, Hall IC with dynamic offset cancellation system, Schmitt trigger and open drain output. It also includes an clamp diode at output and reversed power supply protection enhances the robustness of Hall IC.

When the magnetic flux density (B) is greater than the operating point (B_{OP}), the output turns on (Low). The output is held steady till the magnetic flux density (B) is less than the releasing point (B_{RP}), at which point it turns off (High).

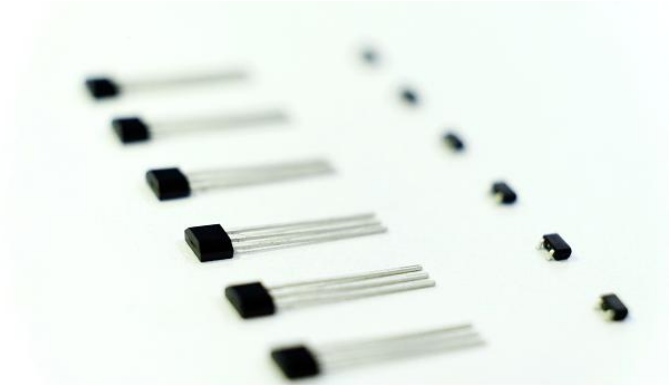
The MT856X family provides a variety of packages to customers: SOT-23/SOT-23 (Thin Outline) for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.

2 Features

- BCD Technology
- Latch Switch
- 3.0~24V Operating Vcc Range
- -40℃~150℃ Operating Temperature
- Package Option:
  Flat TO-92
  SOT-23
  SOT-23 (Thin Outline)
- Magnetic Sensitivity Option:
  MT8562 (B_{OP}=20Gs, B_{RP}=-20Gs)
- Open Drain Output
- -16V Reversed Power Supply Protection
- Output Limiting Current Protection
- RoHS Compliant: (EU)2015/863

3 Product Overview of MT856X

Part No.	Description
MT856XA	Flat TO-92, bulk packaging (1000pcs/bag)
MT856XAT	SOT-23, tape & reel (3000pcs/bag)
MT856XET	SOT-23 (Thin Outline), tape & reel (3000pcs/bag)

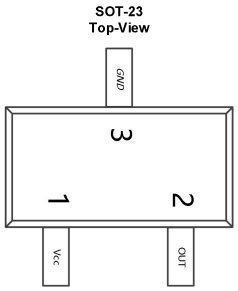


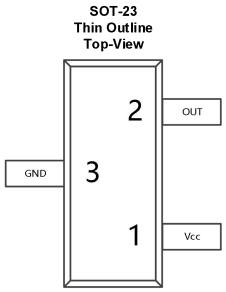
4 Applications

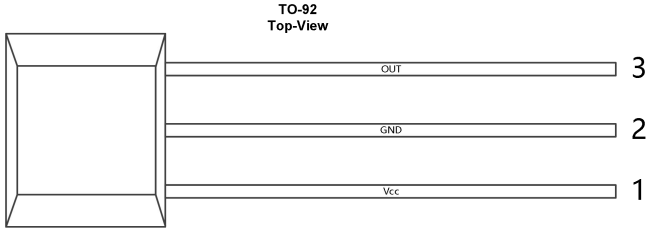
- Home appliances, Industrial
- Position Detection
- Magnetic Encoder
- Proximity Switch

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	Open Drain	Ground







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Reversion History

1	Originally Version	
2	1.1 Version	Update Copy Rights and Disclaimer
3	1.2 Version	Update the marking spec of SOT-23 & SOT-23 (Thin Outline)
4	1.3 Version	Update the Logo of MagnTek

6 Definition of Switching Function

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

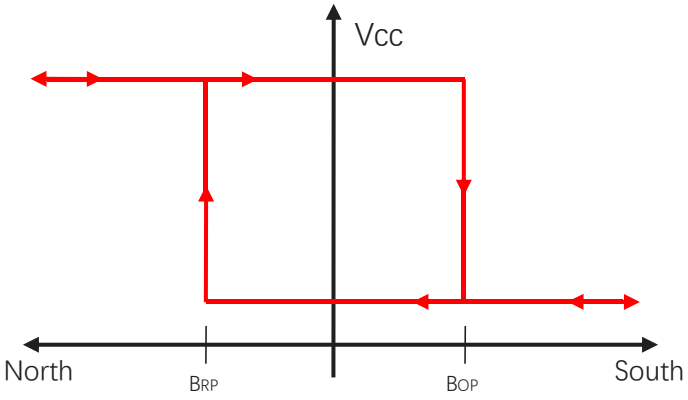


Figure.2 Switching Function of Flat TO-92 & SOT-23 (Thin Outline)

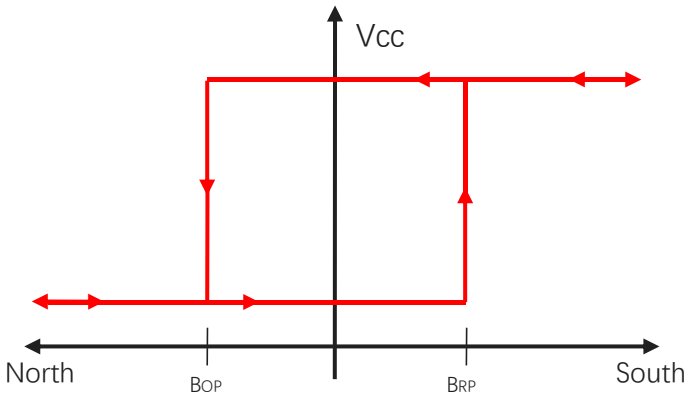


Figure.3 Switching Function of SOT-23

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 MT856X device is sensitive to the magnetic field component that is perpendicular to the top of the package

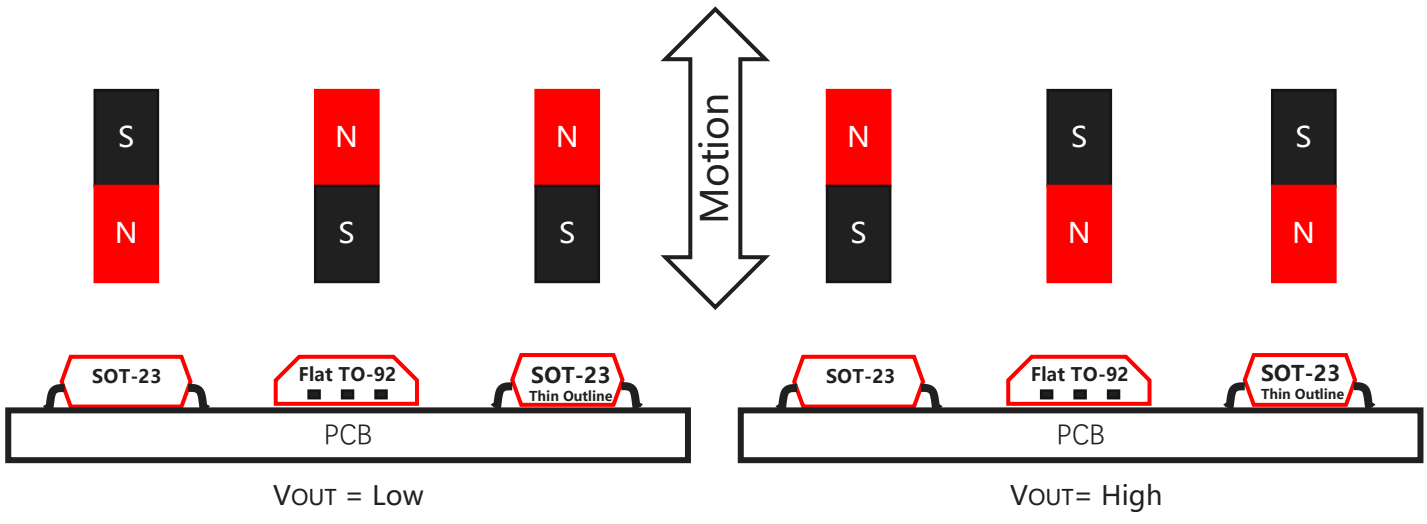


Figure.4 Flux Direction Polarity

9 Functional Block Diagram

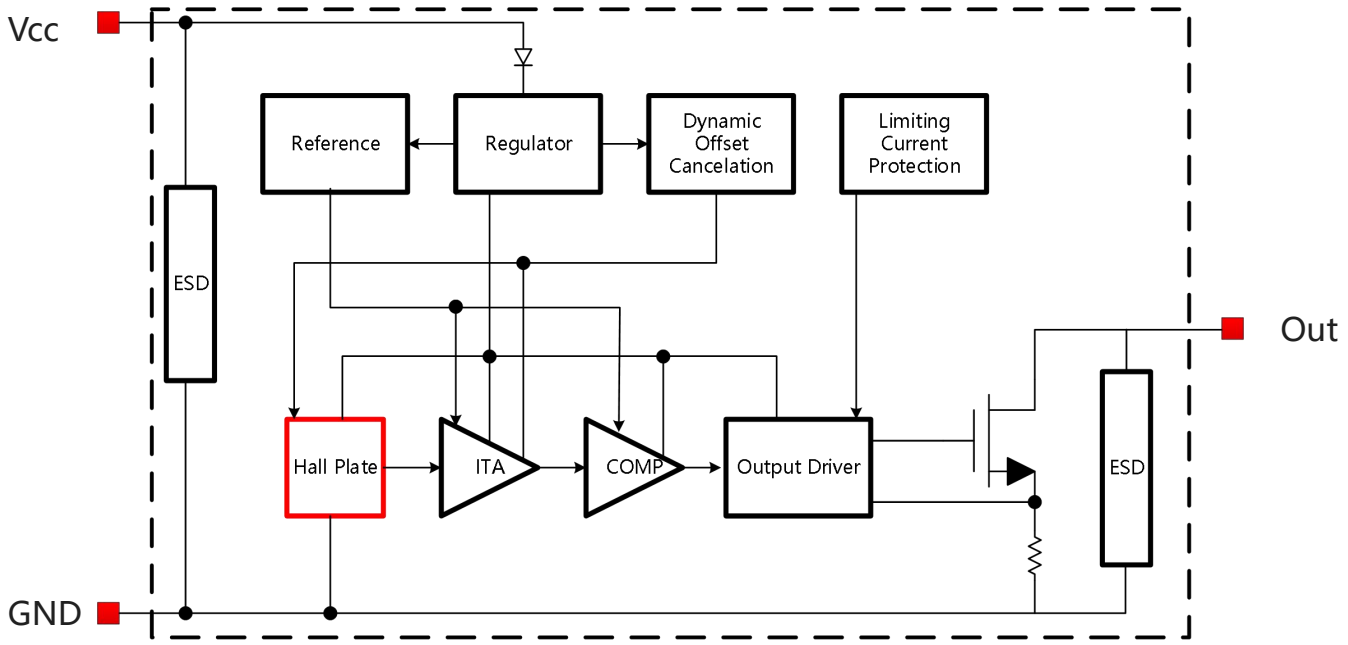


Figure.5 Functional Block Diagram

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	-	30	V
V_{RCC}	Reverse Battery Voltage	-16	-	V
V_{OUT}	Output Voltage	-	30	V
I_{OUT}	Continuous Output Current	-	55	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 ℃, Vcc=3.0V~24V (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	3.0	-	24	V
I_{CC}	Supply Current	B<B_{RP}	-	1	1.5	mA
I_{OCP}	Short Circuit Protection Current	B>B_{OP}, V_{OUT}=V_{CC}	-	50	-	mA
V_{DSON}	Output Saturation Voltage	I_{OUT}=20mA, B>B_{OP}	-	-	0.4	V
I_{OFF}	Output Leakage Current	V_{OUT}=24V, B<B_{RP}	-	-	10	uA
T_R	Output Rise Time	C_L=20pF	-	-	1.0	us
T_F	Output Fail Time	C_L=20pF	-	-	1.0	us
T_{PO}	Power on Time	dV_{CC}/dt>5V/uS B>B_{OP} (MAX)	-	-	15	us
F_C	Chopping Frequency		-	400	-	KHz
F_S	Sampling Frequency		-	25	-	KHz
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}=3.0V~24V (unless otherwise specified)

Part No.	Symbol	Min	Typ	Max	Unit
MT8562 Series	B_{OP}, T_A =25℃	10	20	30	Gs
	B_{RP}, T_A =25℃	-30	-20	-10	Gs
	B_{HYST}, T_A =25℃	20	40	60	Gs

10.4 ESD Ratings

Symbol		Reference	Level	Unit
V_{ESD}	Human-body model (HBM)	AEC-Q100-002	Class H2	Grade
	Charged-device model (CDM)	AEC-Q100-011	Class C3	Grade

10.5 Characteristic Performance

At Vcc=5V

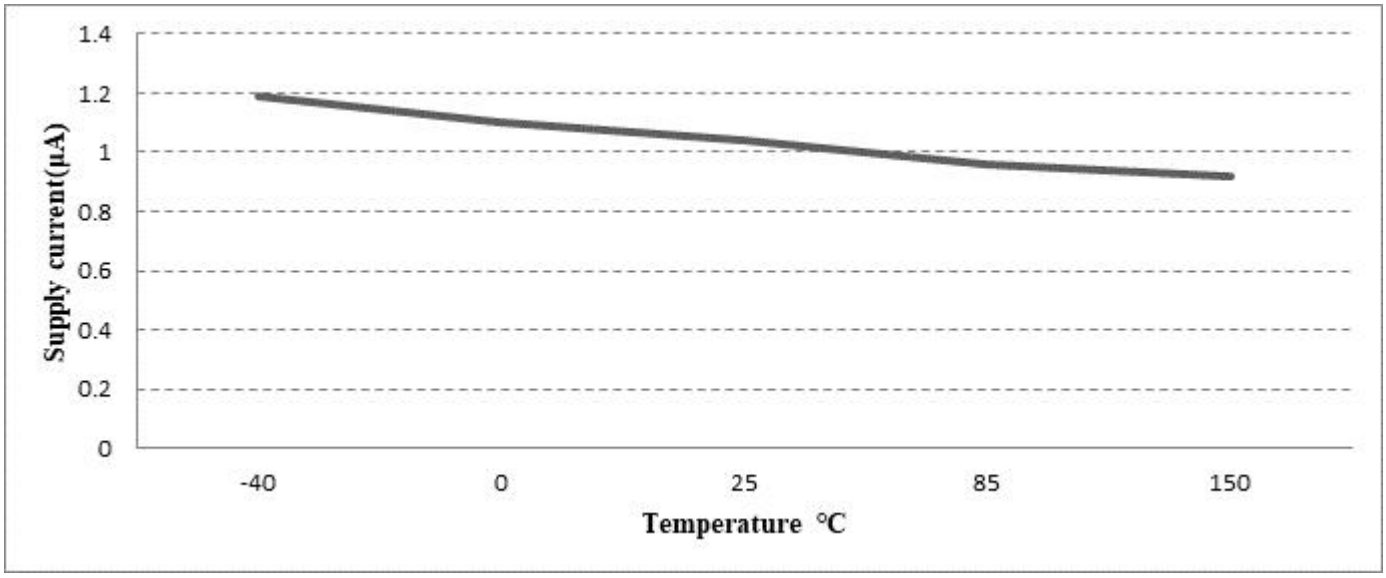


Figure.6 Supply Current vs. Temperature

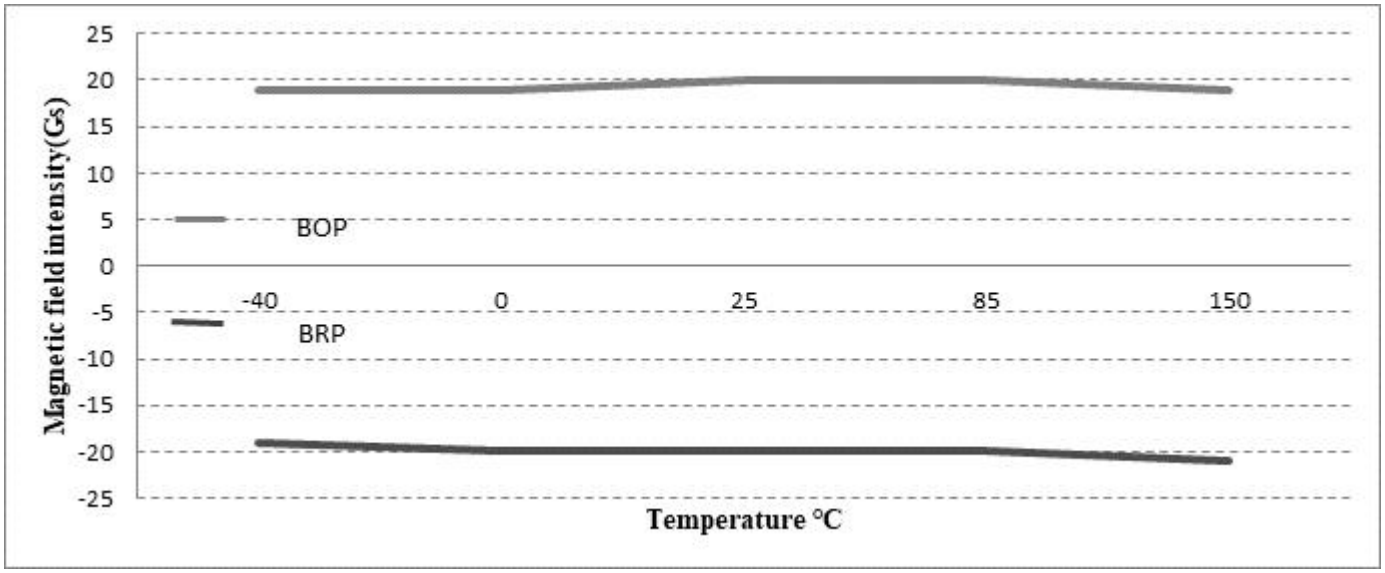


Figure.7 Magnetic Characteristics vs. Temperature (BOP & BRP)

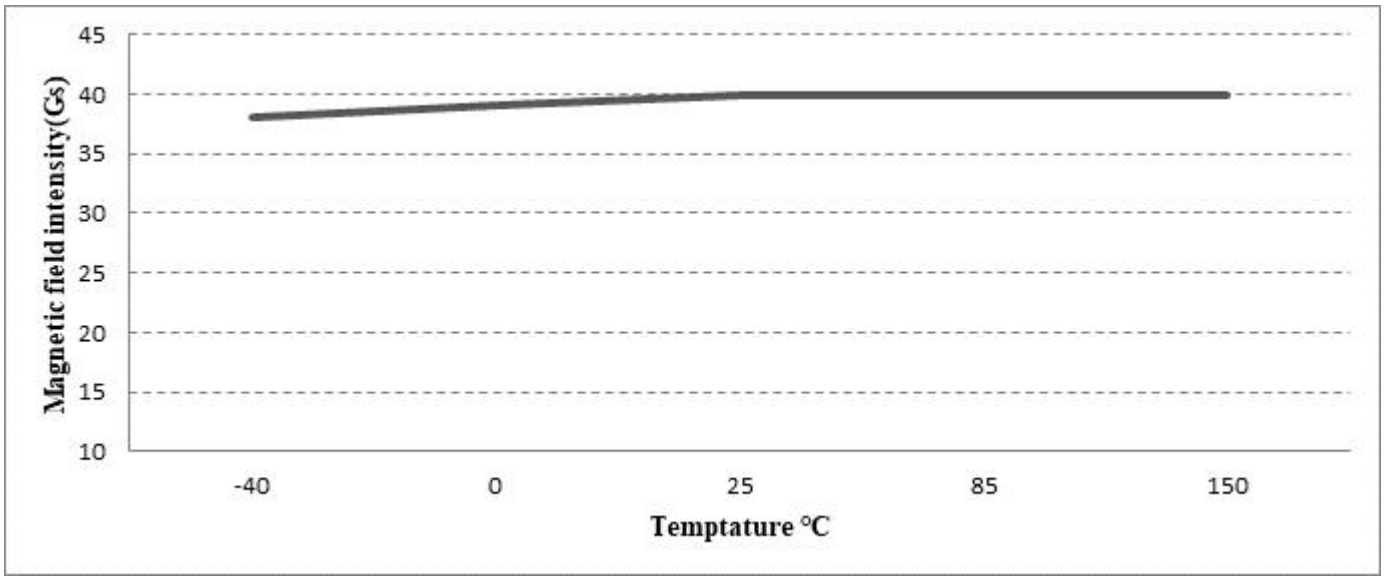


Figure.8 Magnetic Characteristics vs. Temperature (BHYST)

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10.6 Typical Output Waveform

MT856XA as example

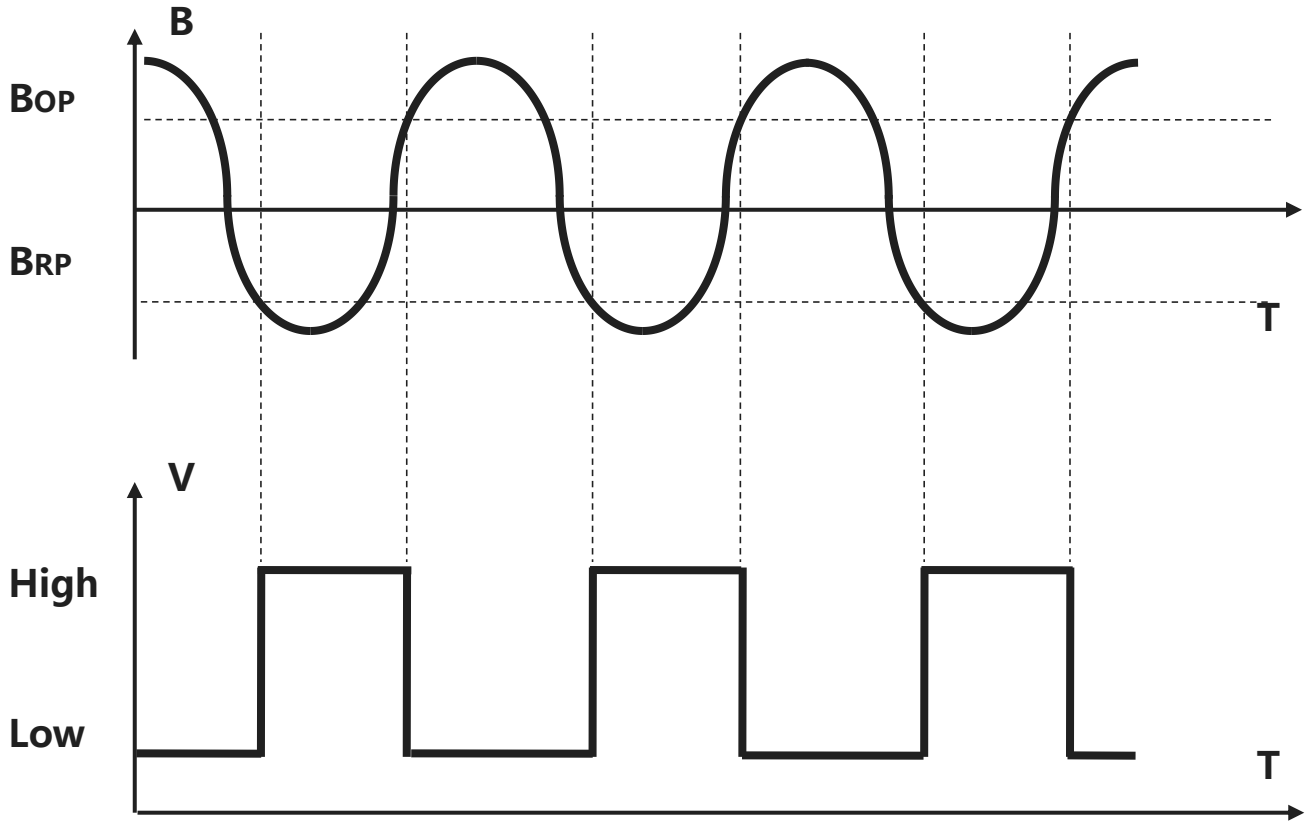


Figure.9 Digital Output vs. Magnetic Flux Density

11 Typical Application Circuit

MT856XAT as example
Note: Recommended value for R_L is 10KOhms

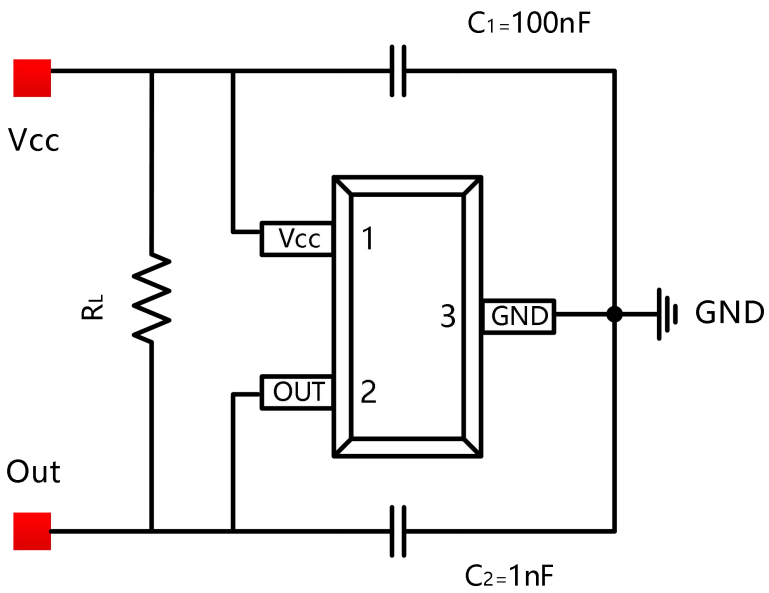


Figure.10 Typical Application Circuit

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

12.1 SOT-23 Package Information

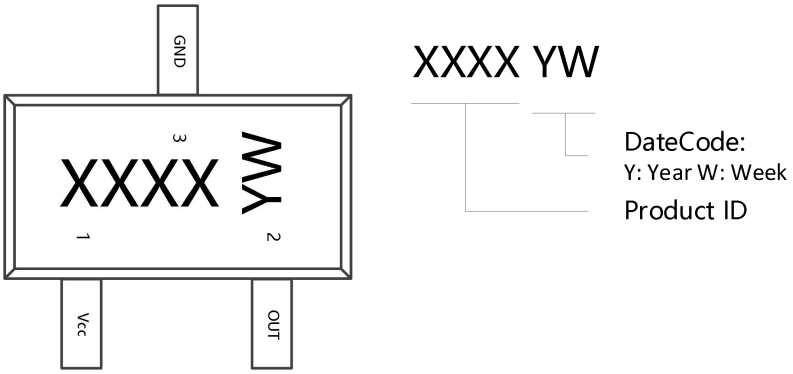


Figure.10 SOT-23 Chip Marking Spec

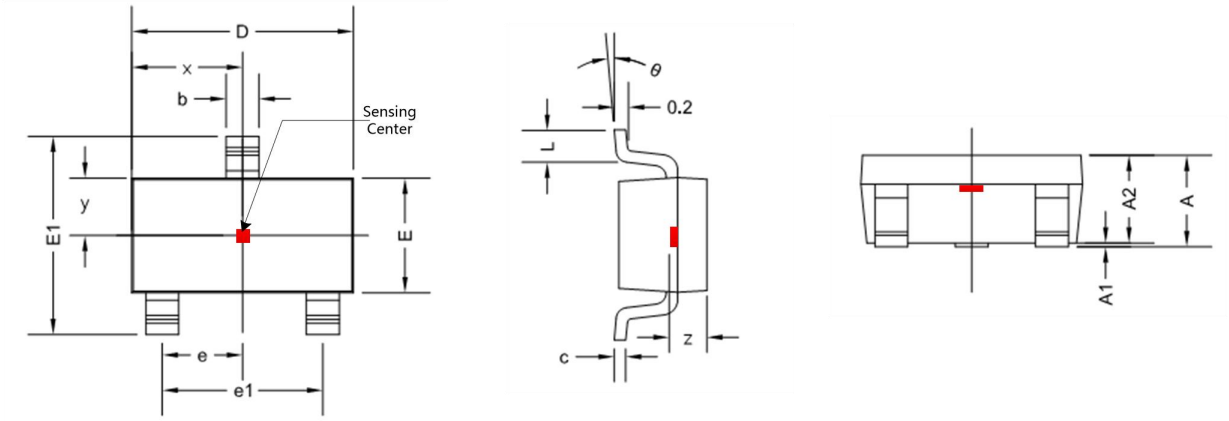


Figure.11 SOT-23 Package Drawing

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

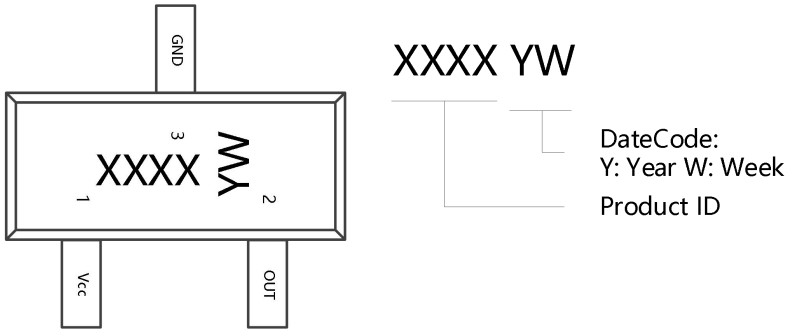


Figure.12 SOT-23 (Thin Outline) Chip Marking Spec

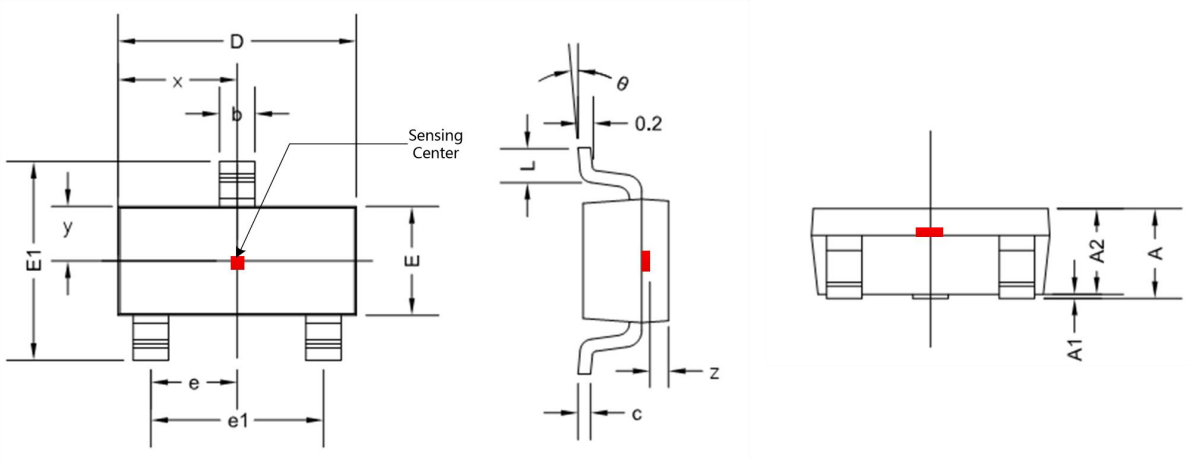


Figure.13 SOT-23 (Thin Outline) Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.132	0.202	0.005	0.008
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e		0.950 TYP		0.037 TYP
e1	1.800	2.000	0.071	0.079
L		0.550 REF		0.022 REF
L1	0.300	0.500	0.012	0.020
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

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12.3 Flat TO-92 Package Information

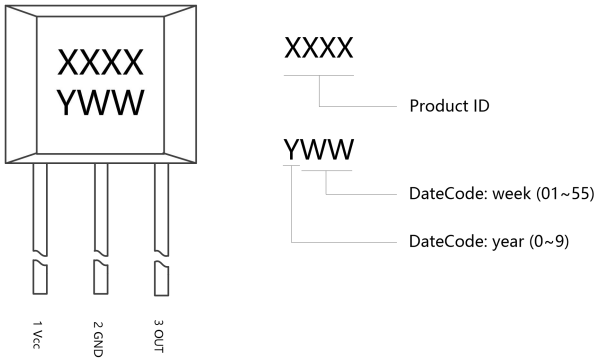


Figure.14 Flat TO-92 Chip Marking Spec

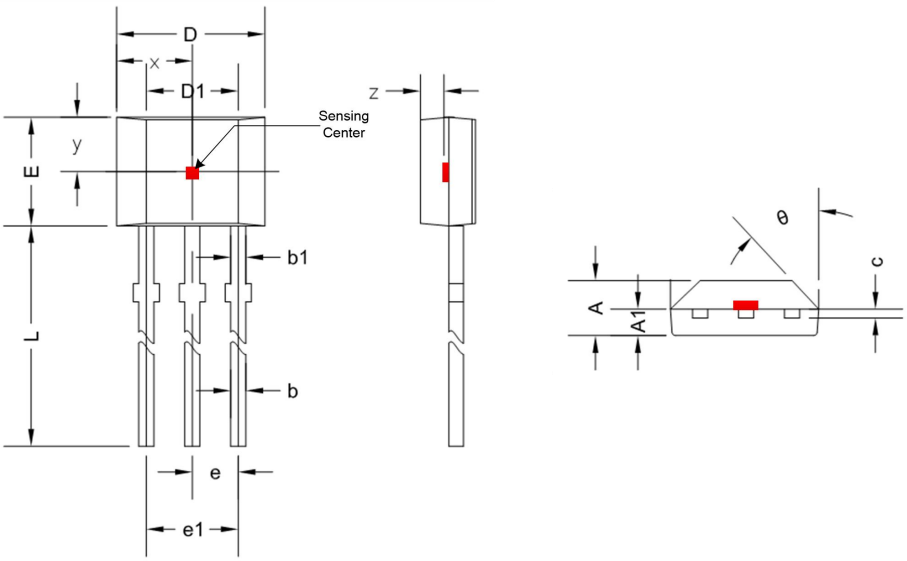


Figure.15 Flat TO-92 Package Drawing

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	

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