

## Omni-polar, High Voltage & Low Power Consumption Hall-Effect Switch IC

### 1 Product Description

The MT855X 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.

The product responds to either North pole or South pole magnetic fields. The output will be turned on (Low) when the magnetic flux density (B) is larger than the operating point (BOP), and be turned off (High) when the magnetic flux density (B) is lower than the releasing point (BRP).

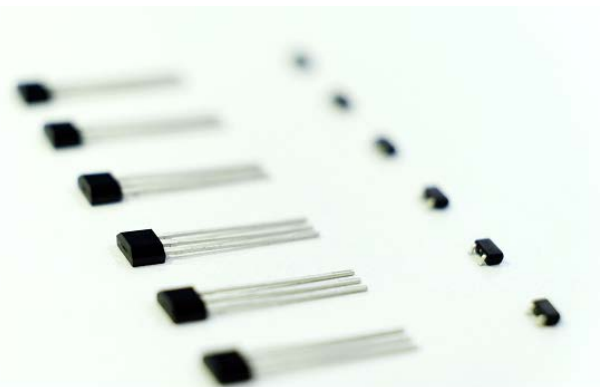
The MT855X family provides a variety of packages to customers: SOT-23 for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.

### 2 Features

- BCD Technology
- Omni-polar Switch
- 3.0~24V Operating Vcc Range
- -40°C~125°C Operating Temperature
- Package Option:
  - Flat TO-92
  - SOT-23
- Magnetic Sensitivity Option:
  - MT8551 (BOP=±32Gs, BRP=±27Gs)
  - MT8552 (BOP=±80Gs, BRP=±60Gs)
  - MT8553 (BOP=±60Gs, BRP=±45Gs)
- Open Drain Output
- -16V Reversed Power Supply Protection
- Output Limiting Current Protection
- RoHS Compliant: (EU)2015/863

### 3 Product Overview of MT855X

Part No.	Description
MT855XA	Flat TO-92, bulk packaging (1000pcs/bag)
MT855XAT	SOT-23, 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
Flat TO-92	1	3	2
Description	Power	Open Drain	Ground

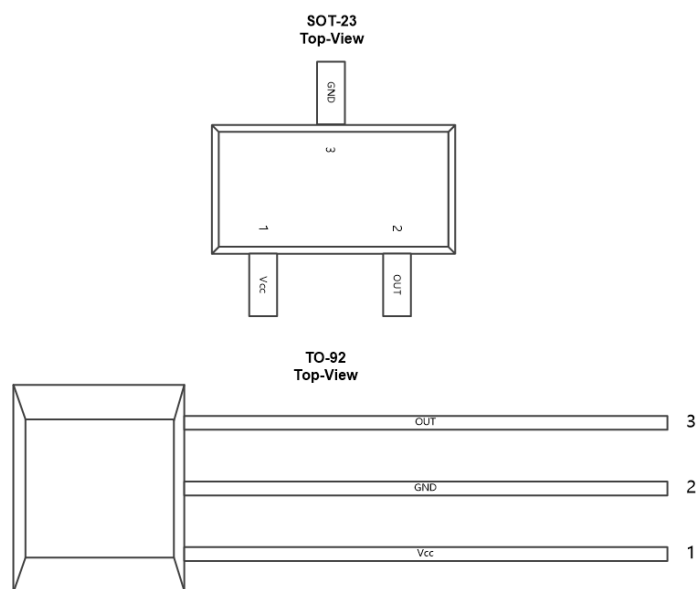


Figure.1 Pin Configuration & Functions

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## Reversion History

1	Originally Version	
2	1.1 Version	Update Package Type Update Electrical Specifications Update Copy Rights and Disclaimer
3	1.2 Version	Update Electrical Specifications
4	1.3 Version	Update MT8552 & MT8553 Series Update the marking spec of SOT-23
5	1.4 Version	Update the Magnetic Spec of MT8551
6	1.5 Version	Update the Magnetic Spec of MT8553

### 6 Definition of Switching Function

Figure.2 shows the device functionality and hysteresis

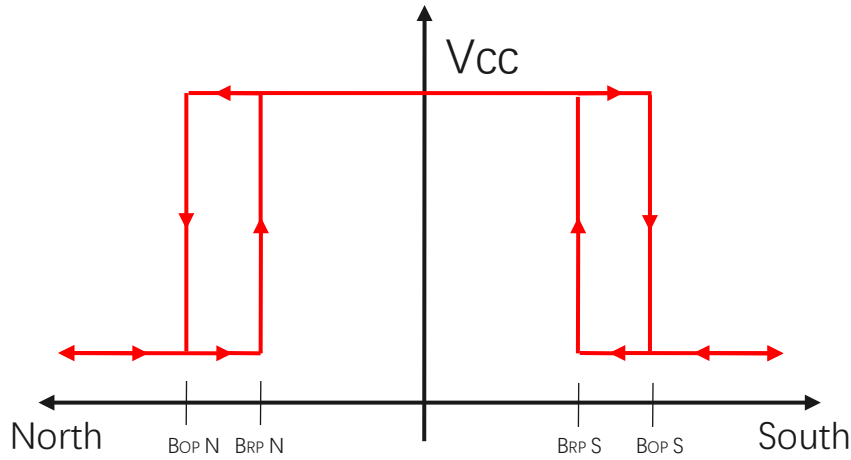


Figure.2 Omni-polar Switching Function

### 7 Function Description

**B<sub>OP</sub>:** Operating Point, Magnetic flux density applied on the branded side of the package which turns the output driver ON ( $V_{OUT}=Low$ )

**B<sub>RP</sub>:** Releasing Point, Magnetic flux density applied on the branded side of the package which turns the output driver OFF ( $V_{OUT}=High$ )

**B<sub>HYST</sub>:** 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 MT855X device is sensitive to the magnetic field component that is perpendicular to the top of the package

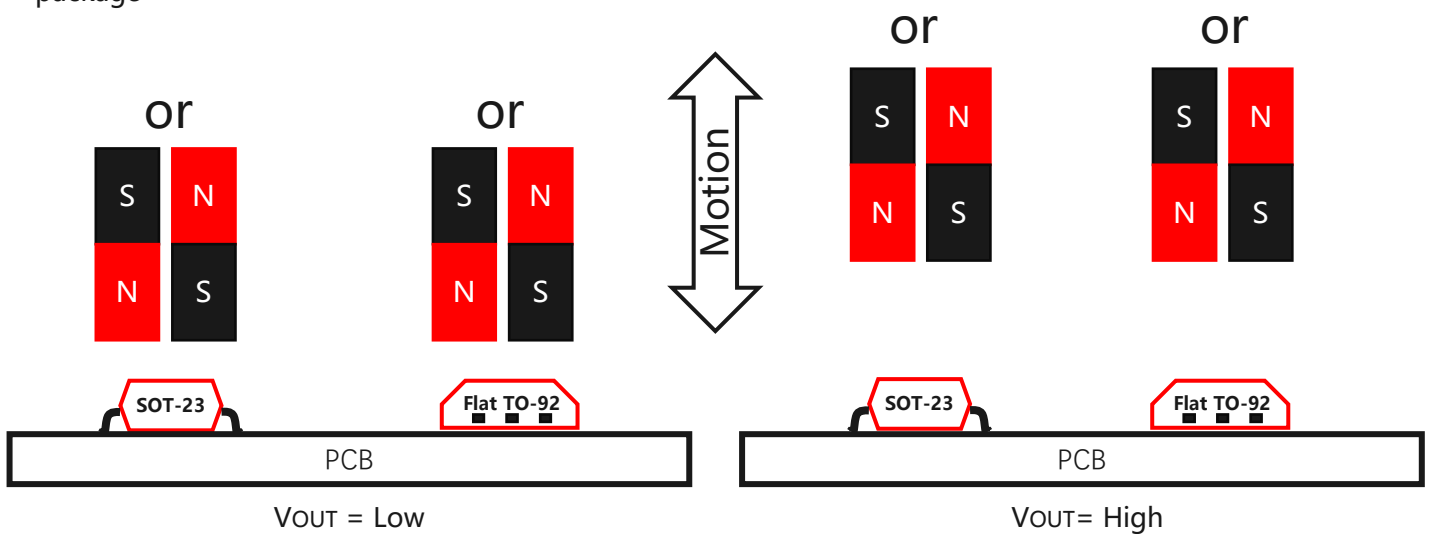


Figure.3 Flux Direction Polarity

## 9 Functional Block Diagram

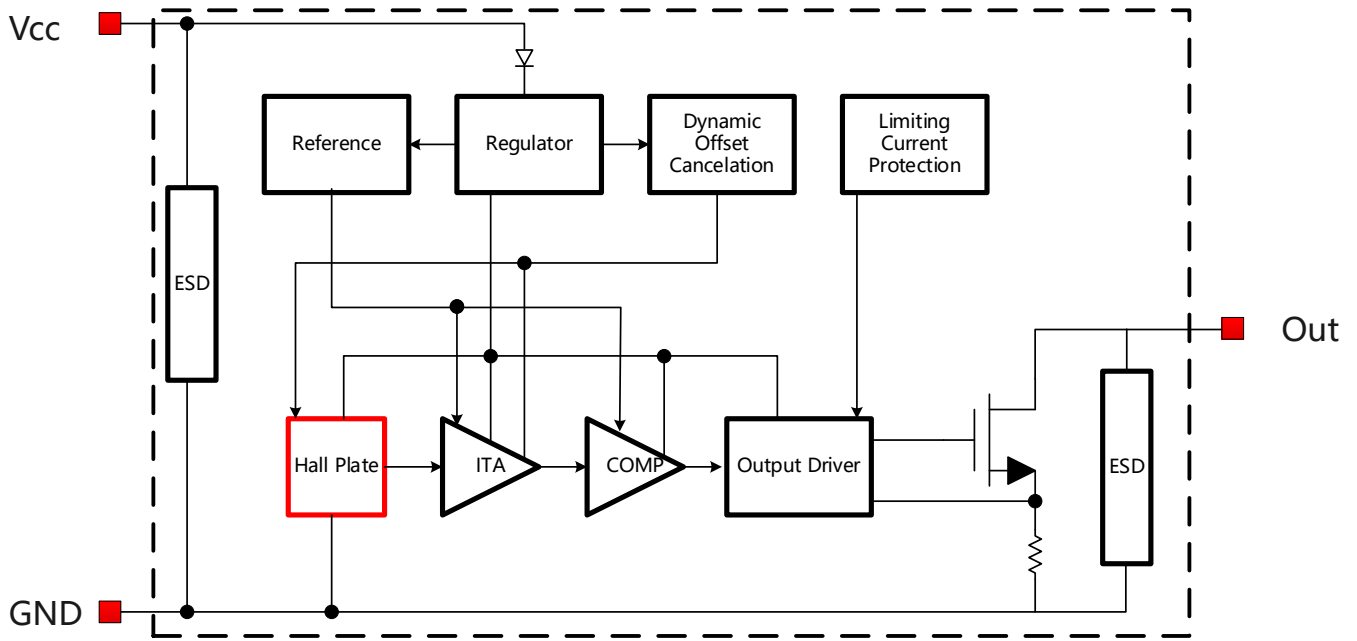


Figure.4 Functional Block Diagram

## 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
VCC	Supply Voltage	-	30	V
VRCC	Reverse Battery Voltage	-16	-	V
VOUT	Output Voltage	-	30	V
IOUT	Continuous Output Current	-	55	mA
TA	Operating Ambient Temperature	-40	125	°C
TS	Storage Temperature	-50	150	°C
TJ	Junction Temperature	-	165	°C
B	Magnetic Flux Density	No Limit		Gs

## 10.2 Electrical Specifications

At  $T_A = -40 \sim 125^\circ\text{C}$ ,  $V_{CC} = 3.0\text{V} \sim 24\text{V}$  (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	$I_{OUT} = 20\text{mA}$ , $ B  >  B_{OP} $	-	-	0.4	V
$I_{OFF}$	Output Leakage Current	$V_{OUT} = 24\text{V}$ , $ B  <  B_{RP} $	-	-	10	$\mu\text{A}$
$T_R$	Output Rise Time	$C_L = 20\text{pF}$	-	-	1.0	$\mu\text{s}$
$T_F$	Output Fall Time	$C_L = 20\text{pF}$	-	-	1.0	$\mu\text{s}$
$T_{PO}$	Power on Time	$dV_{CC}/dt > 5\text{V}/\mu\text{s}$ $ B  >  B_{OP} $ (MAX)	-	-	15	$\mu\text{s}$
$F_C$	Chopping Frequency		-	400	-	KHz
$F_S$	Sampling Frequency		-	25	-	KHz
$R_{TH}$	Thermal Resistance of SOT-23		-	301	-	$^\circ\text{C}/\text{W}$
	Thermal Resistance of TO-92		-	230	-	$^\circ\text{C}/\text{W}$

## 10.3 Magnetic Characteristics

At  $V_{CC} = 3.0\text{V} \sim 24\text{V}$  (unless otherwise specified)

Part No.	Symbol	Min	Typ	Max	Unit
MT8551 Series	$B_{OP}$ , $T_A = 25^\circ\text{C}$	23	$\pm 32$	41	Gs
	$B_{RP}$ , $T_A = 25^\circ\text{C}$	18	$\pm 27$	36	Gs
	$B_{HYST}$ , $T_A = 25^\circ\text{C}$	-	5	-	Gs
MT8552 Series	$B_{OP}$ , $T_A = 25^\circ\text{C}$	$\pm 55$	$\pm 80$	$\pm 105$	Gs
	$B_{RP}$ , $T_A = 25^\circ\text{C}$	$\pm 35$	$\pm 60$	$\pm 85$	Gs
	$B_{HYST}$ , $T_A = 25^\circ\text{C}$	10	20	30	Gs
MT8553 Series	$B_{OP}$ , $T_A = 25^\circ\text{C}$	$\pm 35$	$\pm 60$	$\pm 85$	Gs
	$B_{RP}$ , $T_A = 25^\circ\text{C}$	$\pm 20$	$\pm 45$	$\pm 70$	Gs
	$B_{HYST}$ , $T_A = 25^\circ\text{C}$	5	15	25	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

MT8551 At V<sub>CC</sub>=5V

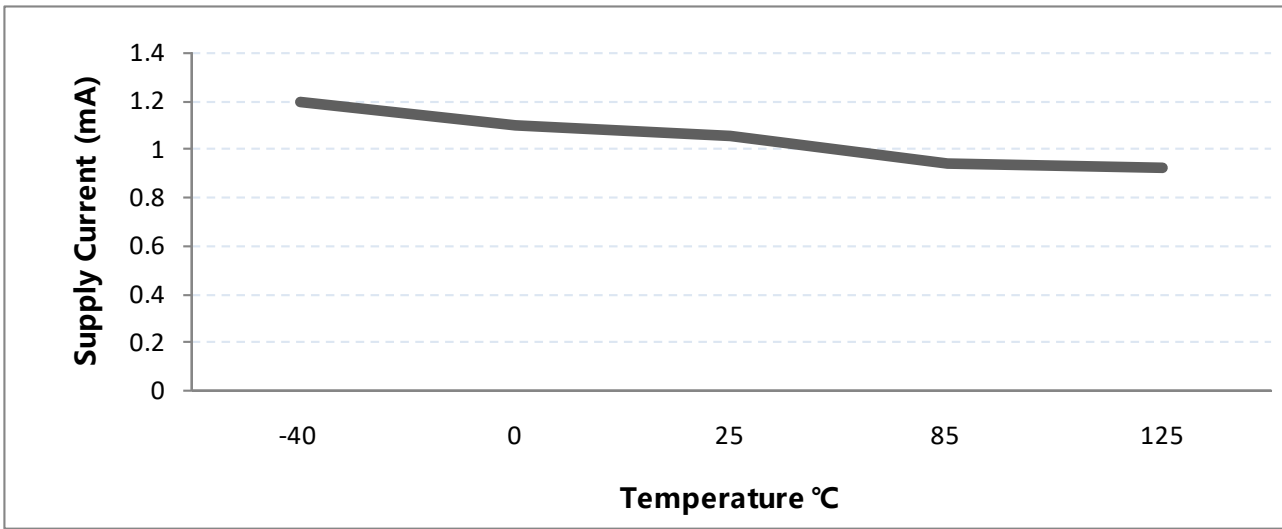


Figure.5 Supply Current vs. Temperature

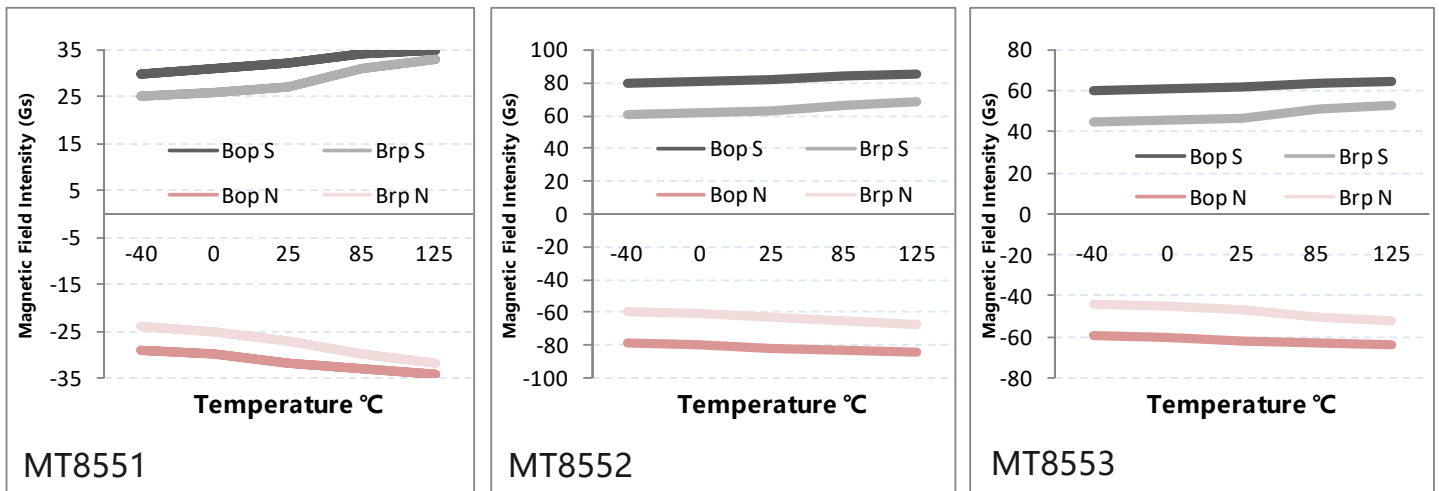


Figure.6 Magnetic Characteristics vs. Temperature (BOP & BRP)

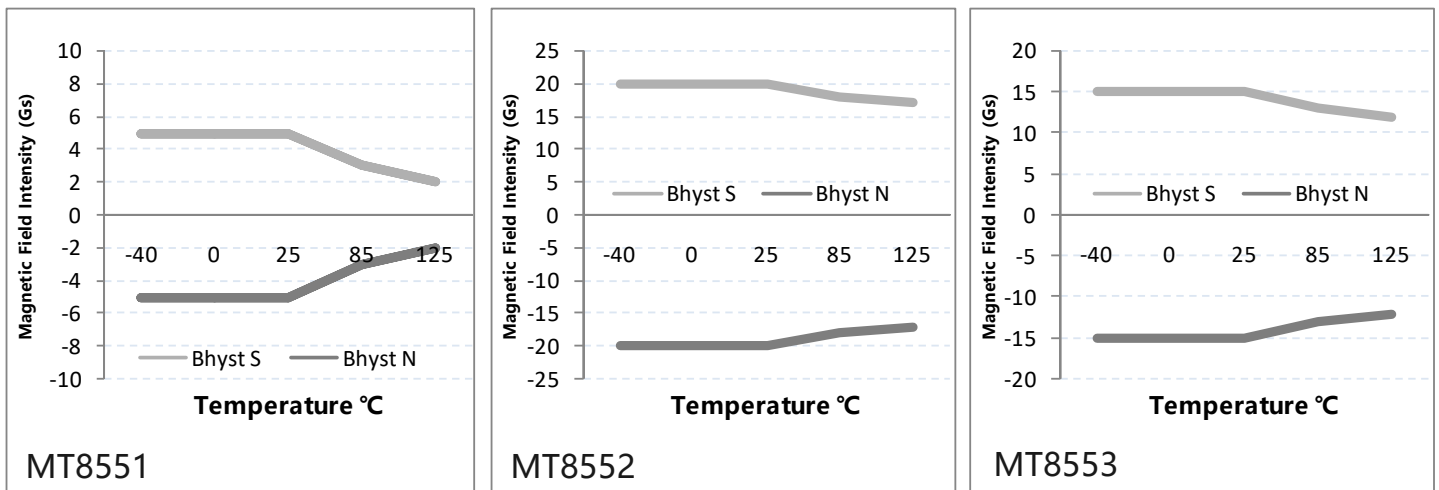
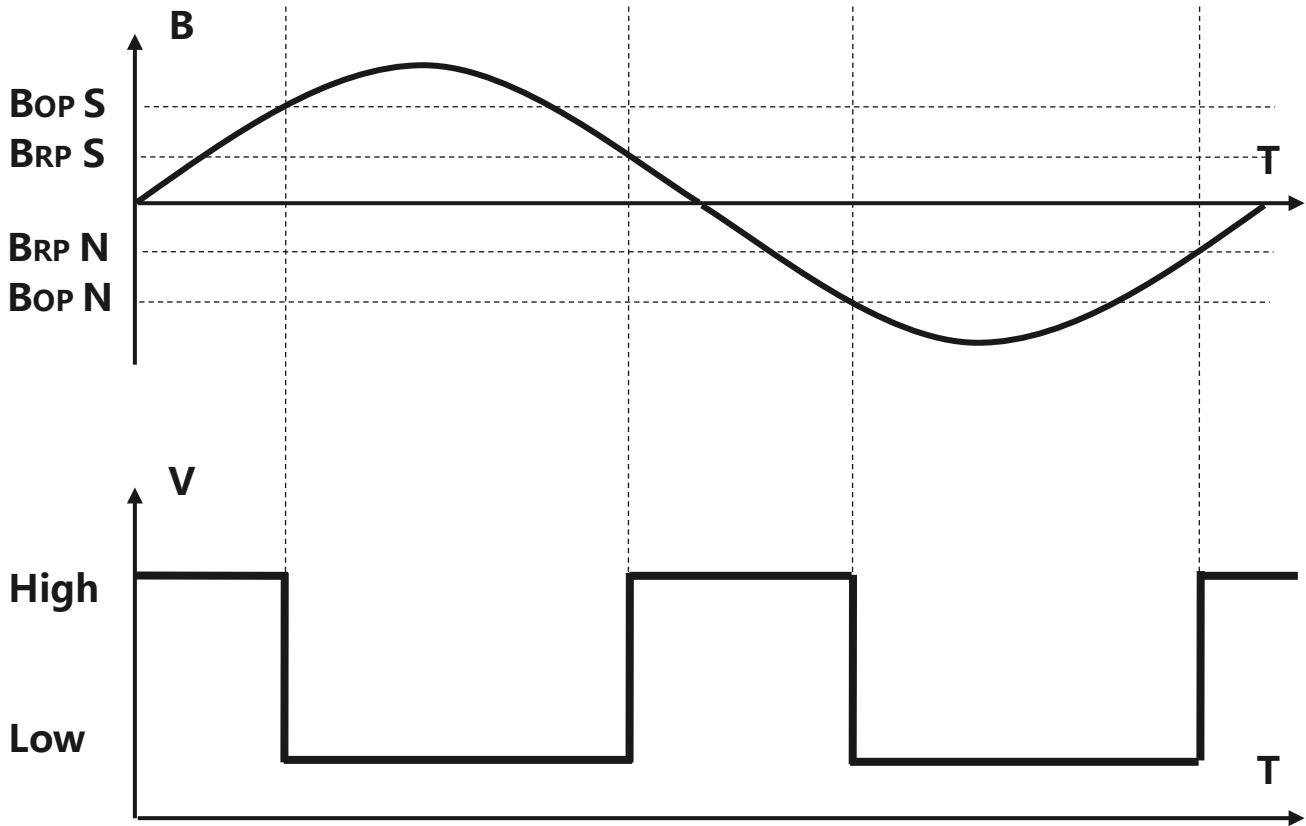


Figure.7 Magnetic Characteristics vs. Temperature (BHYST)

### 10.6 Typical Output Waveform

MT8551A as example

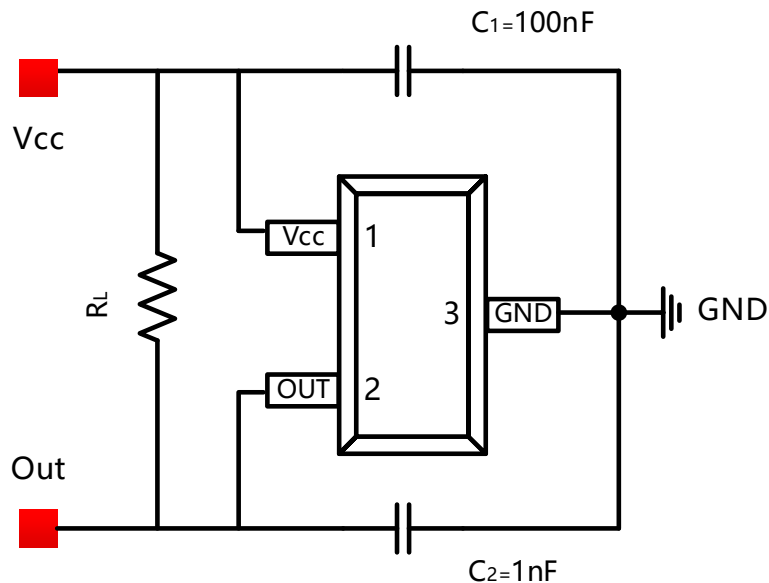


**Figure.8** Digital Output vs. Magnetic Flux Density

### 11 Typical Application Circuit

MT8551AT as example

Note: Recommended value for  $R_L$  is 10KOhms



**Figure.9** Typical Application Circuit

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

### 12.1 SOT-23 Package Information

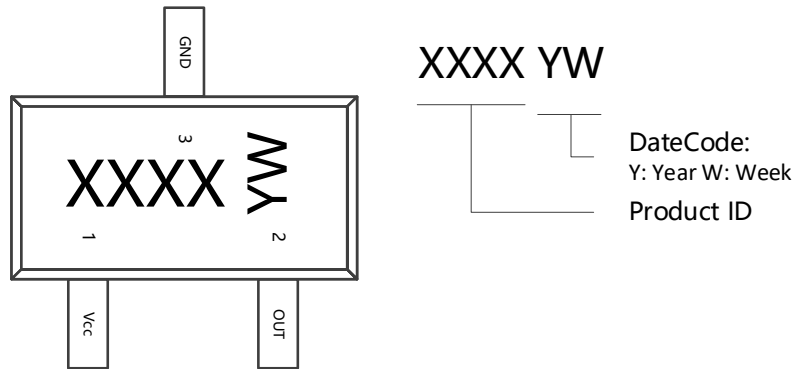


Figure.10 SOT-23 Chip Marking Spec

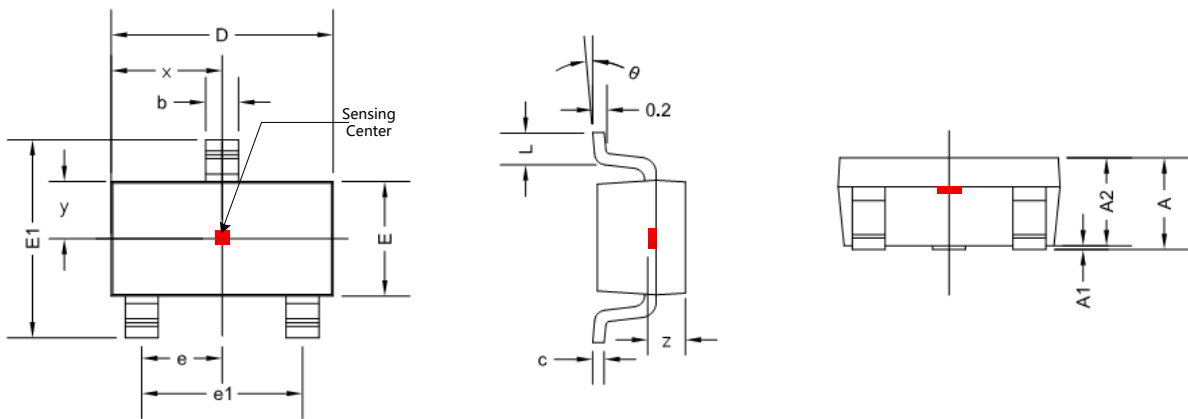


Figure.11 SOT-23 Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
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
$\theta$	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	



### 12.3 Flat TO-92 Package Information

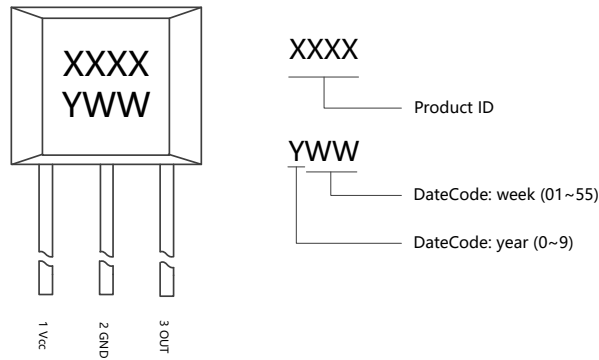


Figure.12 Flat TO-92 Chip Marking Spec

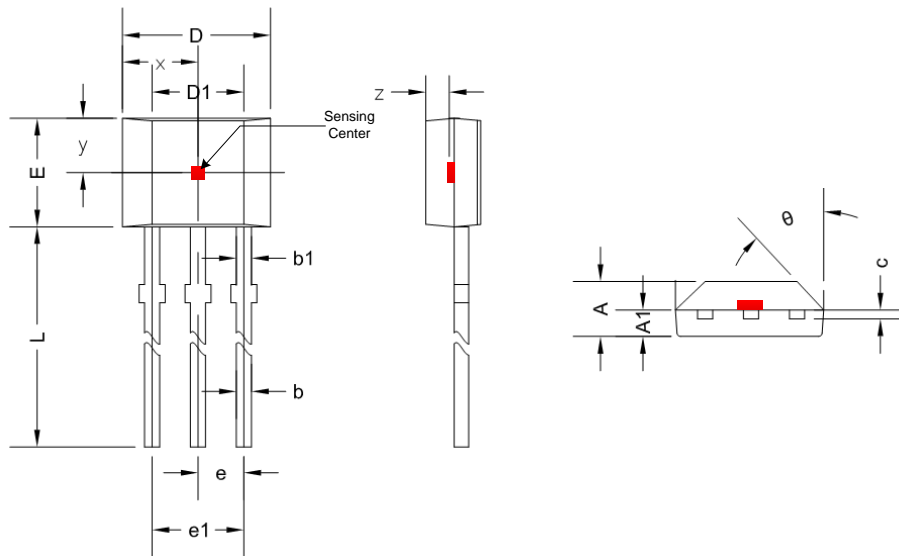


Figure.13 Flat TO-92 Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.620	0.056	0.064
A1	0.660	0.860	0.026	0.034
b	0.350	0.480	0.013	0.019
b1	0.400	0.510	0.016	0.020
c	0.330	0.510	0.013	0.020
D	3.900	4.100	0.154	0.161
D1	2.280	2.680	0.090	0.106
E	3.050	3.250	0.120	0.128
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.350	14.750	0.565	0.581
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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