MT827X

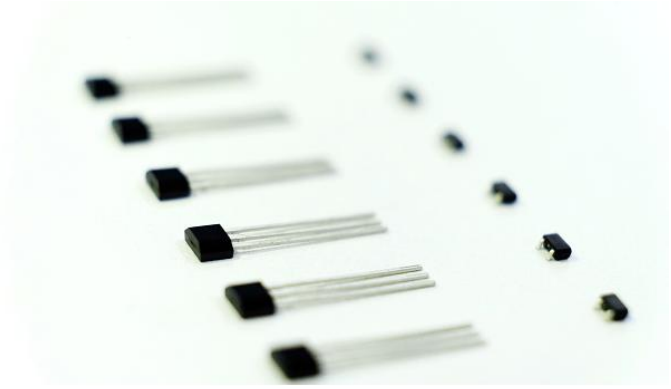
Omni-polar, Nano Power Hall-Effect Switch IC

1 Product Description

The MT827X family is produced with CMOS technology. The Hall IC internally includes high sensitivity horizontal hall plates, sleep/awake logics for mode control, a low-power on-chip oscillator, low noise analog signal chain with dynamic offset cancellation, hysteresis comparators and an output driver.

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 (B_{OP}), and be turned off (High) when the magnetic flux density (B) is lower than the releasing point (B_{RP}).

The MT827X 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 Feature

- CMOS Technology
- Omni-polar Switch
- 1.7～5.5V Operating Vcc Range
- -40℃~85℃ Operating Temperature
- Package Option:
  SOT-23
  Flat TO-92
- Magnetic Sensitivity Option:
  B_{OP}=±17Gs, B_{RP}=±11Gs
- Internal 100K pull-up resistor
- Nano Power Consumption:
  Average Supply Current =300nA (Vcc=1.7V)
- RoHS Compliant: 2011/65/EU

3 Product Overview of MT827X

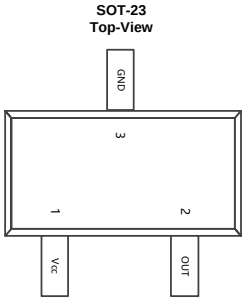
Part No.	Description
MT8271A	Flat TO-92, bulk packaging (1000pcs/bag)
MT8271AT	SOT-23, tape & reel (3000pcs/bag)

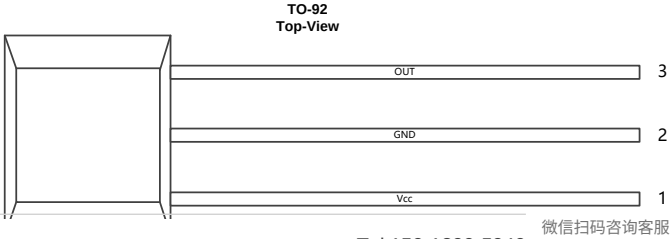
4 Application

- Home appliances, Industrial
- Position Detection
- Solid-State Switch
- Proximity Switch
- Smart Meter
- Handheld Device
- Consumer Device

5. Pin Configuration and Functions

	Vcc	Out	GND
SOT-23	1	2	3
Flat TO-92	1	3	2
Description	Power	Internal Pull-up Resistor	Ground





深圳市满度科技有限公司
Web:www.manduic.com
Tel:150-1290-5940
Email:sales@manduic.com
微信扫码咨询客服

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Reversion History

1	Originally Version	2018 Sep

6 Definition of Switching Function

Figure.2 shows the device functionality and hysteresis

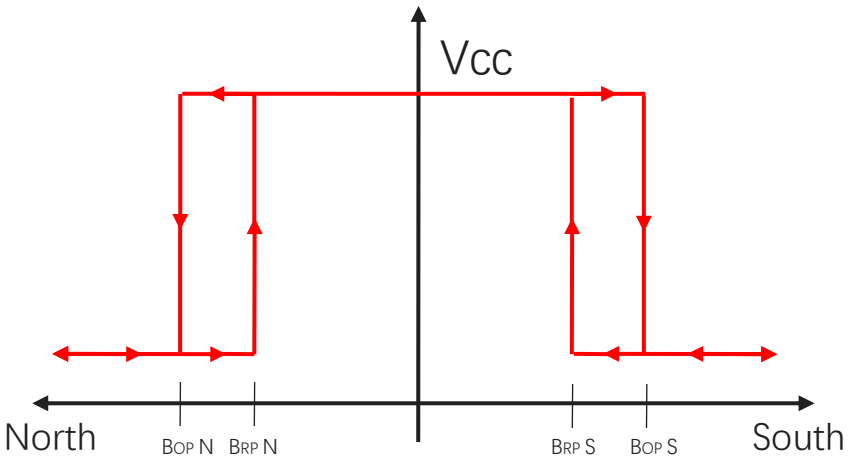


Figure.2 Omni-polar Switching Function

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 MT827X device is sensitive to the magnetic field component that is perpendicular to the top of the package

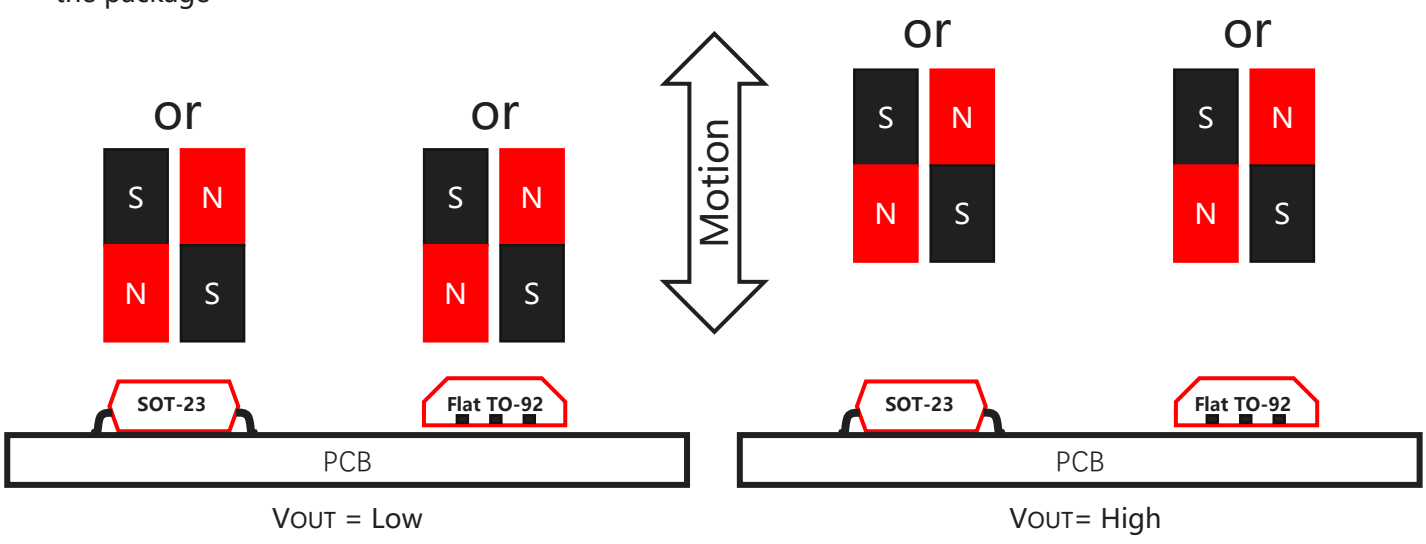


Figure.3 Flux Direction Polarity

9 Functional Block Diagram

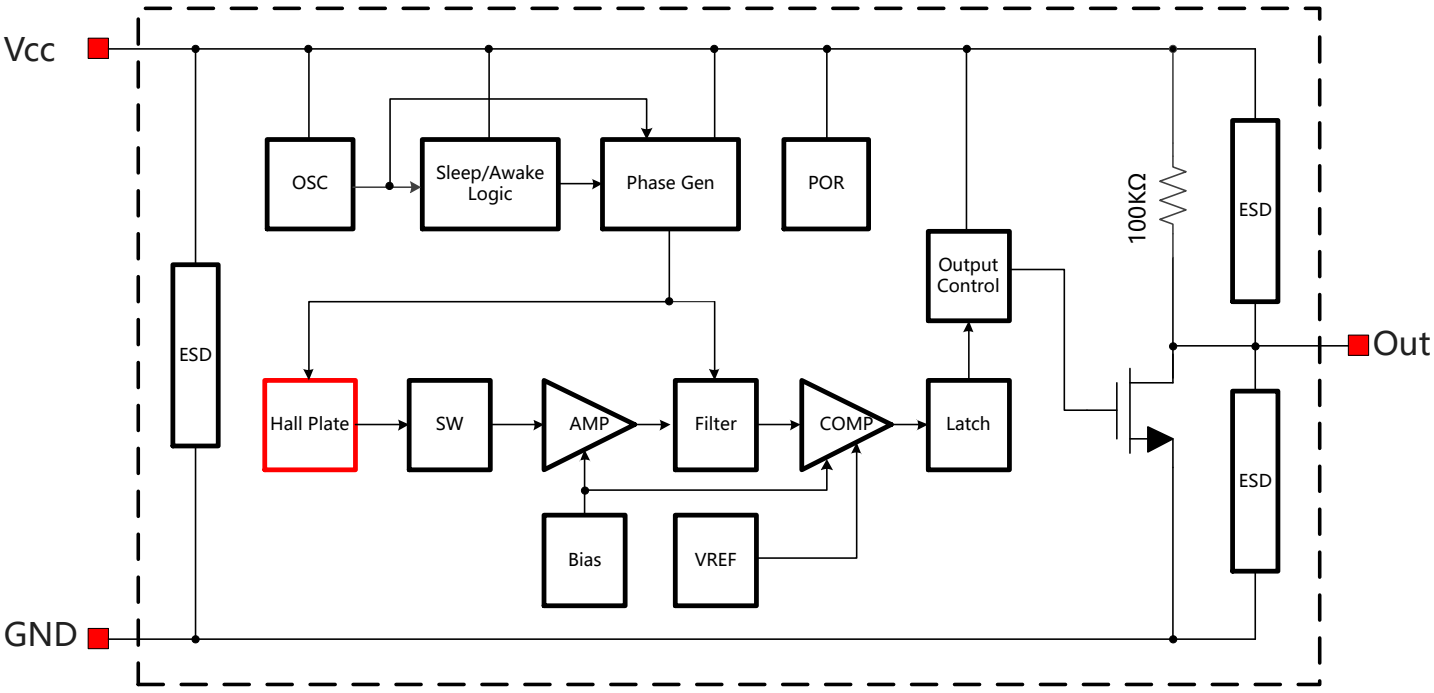


Figure.4 Functional Block Diagram

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
V_{CC}	Supply Voltage	-	7	V
V_{RCC}	Reverse Battery Voltage	-0.5	-	V
V_{OUT}	Output Voltage	-	7	V
I_{OUT}	Continuous Output Current	-	8	mA
T_A	Operating Ambient Temperature	-40	85	℃
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=-40~85 ℃, V_{CC}=1.7V~5.5V (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	1.7	3.6	5.5	V
I_{CC}	Supply Current	V_{CC}=3.6V, |B|<|B_{RP}|	-	1.0	2.0	uA
		V_{CC}=1.7V, |B|<|B_{RP}|	-	300	-	nA
V_{DSON}	Output Saturation Voltage	I_{OUT}=5mA, |B|>|B_{OP}|	-	-	0.4	V
I_{OFF}	Output Leakage Current	|B|<|BRP|, V_{OUT}=5.5V	-	-	1	uA
F_{SW}	Switching Frequency	V_{CC}=3.6V	10	20	40	Hz
T_{AW}	Awake Time	V_{CC}=3.6V	4	7	12	us
		V_{CC}=1.7V to 5.5V	2	7	20	us
T_{SL}	Sleep Time	V_{CC}=3.6V	25	50	100	ms
		V_{CC}=1.7V to 5.5V	25	50	100	ms
D.C.	Duty Cycle	V_{CC}=3.6V	-	0.014	-	%
		V_{CC}=1.7V to 5.5V	-	0.014	-	%
T_{PO}	Power on Time	dVcc/dt>5V/us, |B|>|B_{OP}|	-	-	120	us
R_{TH}	Thermal Resistance of SOT-23		-	301	-	℃/W
	Thermal Resistance of Flat TO-92		-	230	-	℃/W

10.3 Magnetic Characteristics

At V_{CC}=1.7V~5.5V (unless otherwise specified)

Part No.	Symbol	Min	Typ	Max	Unit
MT8271 Series	B_{OP}, T_A =25℃	±11	±17	±25	Gs
	B_{RP}, T_A =25℃	±5	±11	±19	Gs
	B_{HYST}, T_A =25℃	3	6	9	Gs

10.4 ESD Ratings

Symbol		Reference	Values	Unit
V_{ESD}	Human-body model (HBM)	AEC-Q100-002	±4000	V
	Charged-device model (CDM)	AEC-Q100-011	±1000	V

10.5 Characteristic Performance

At Vcc=3.6V

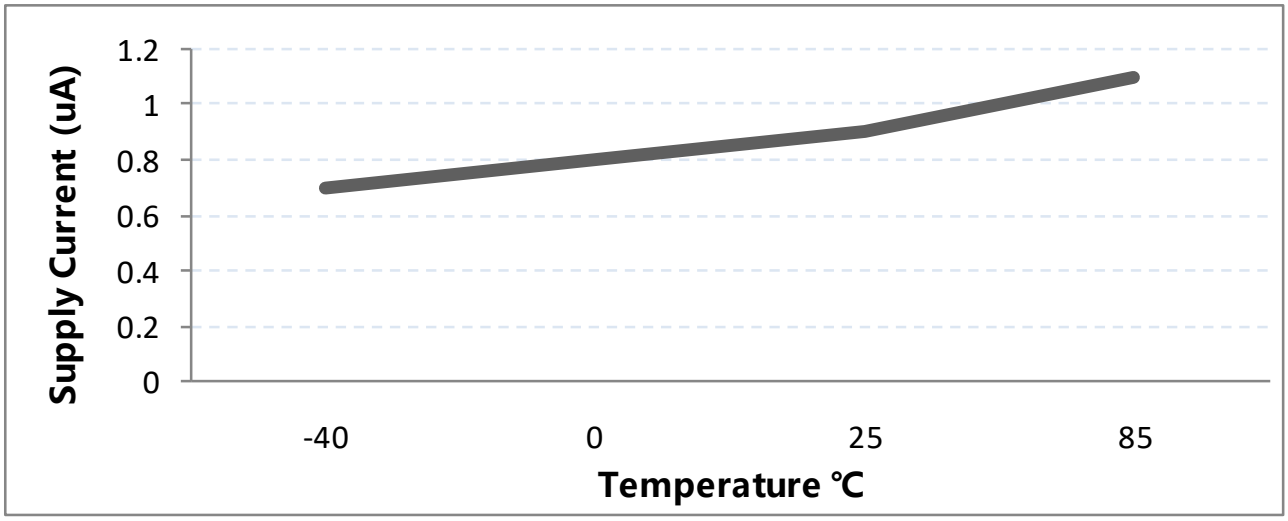


Figure.5 Average Supply Current vs. Temperature

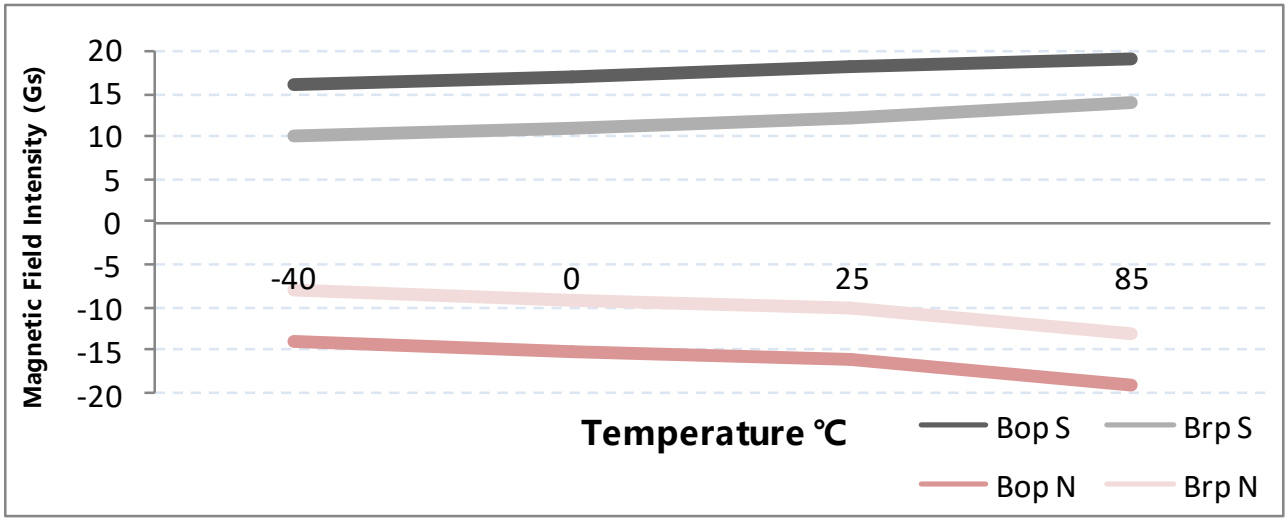


Figure.6 Magnetic Characteristics vs. Temperature (Bop & Brp)

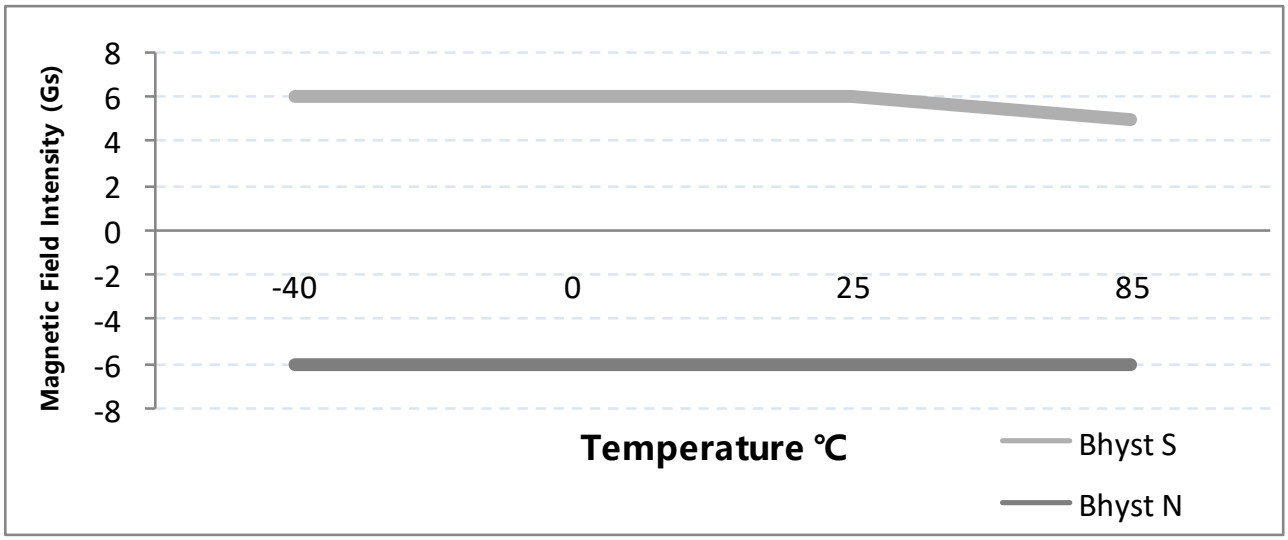


Figure.7 Magnetic Characteristics vs. Temperature (Bhyst)

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Tel:150-1290-5940
Web:www.manduic.com
Email:sales@manduic.com

10.6 Typical Output Waveform

MT8271A as example

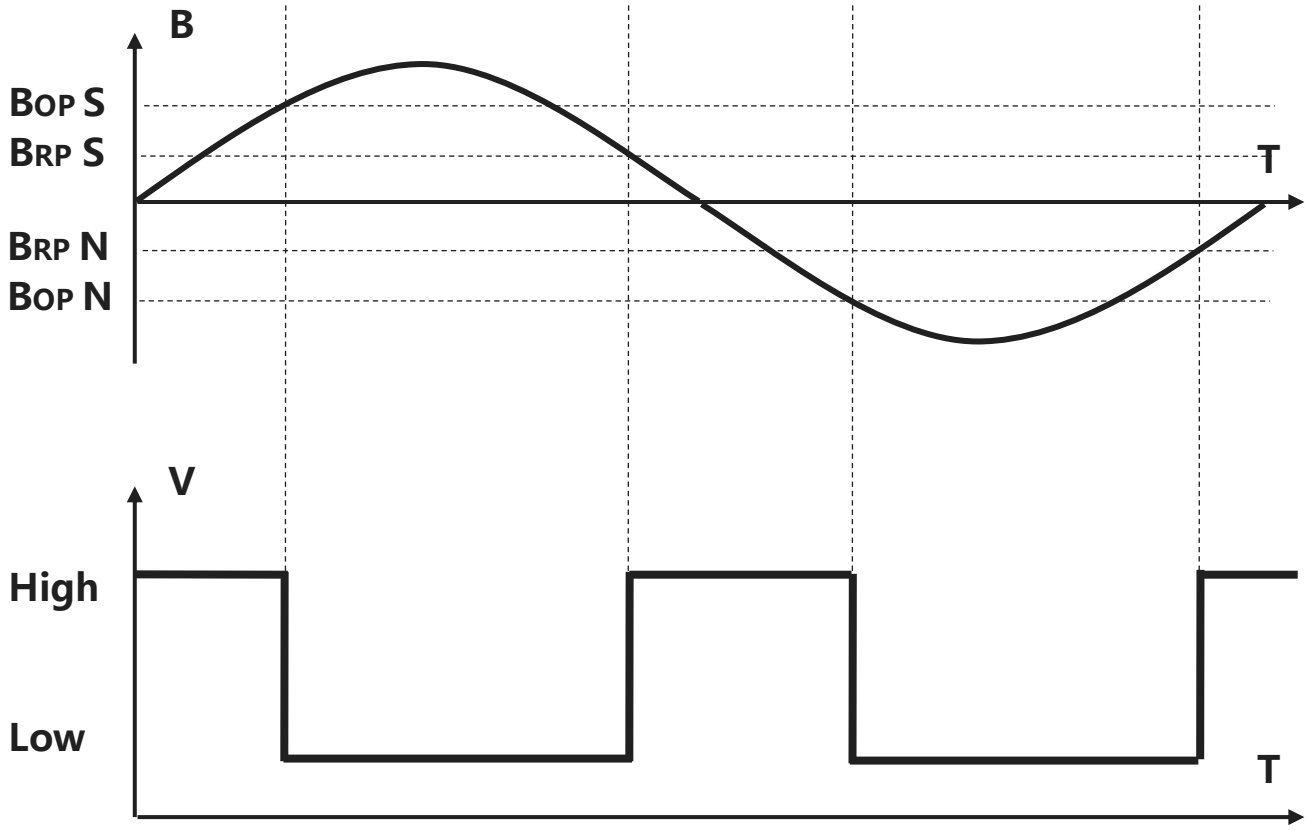


Figure.8 Digital Output vs. Magnetic Flux Density

11 Typical Application Circuit

MT8271AT as example

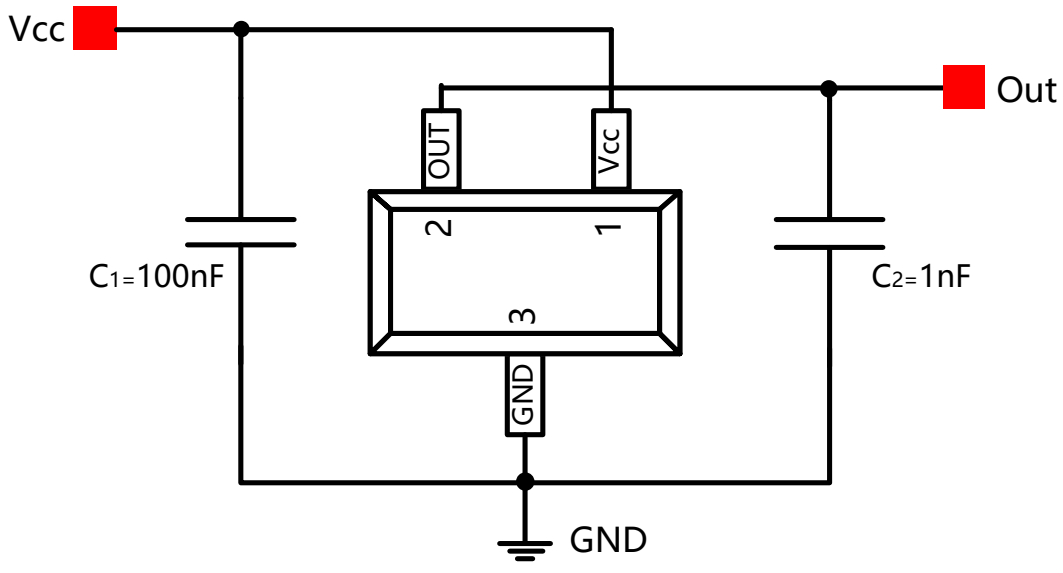


Figure.9 Typical Application Circuit

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

12.1 SOT-23 Package Information

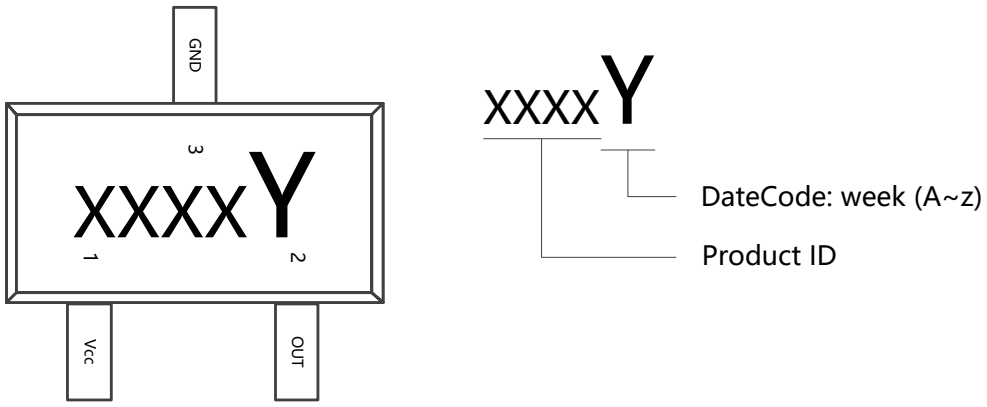


Figure.10 SOT-23 Chip Marking Spec

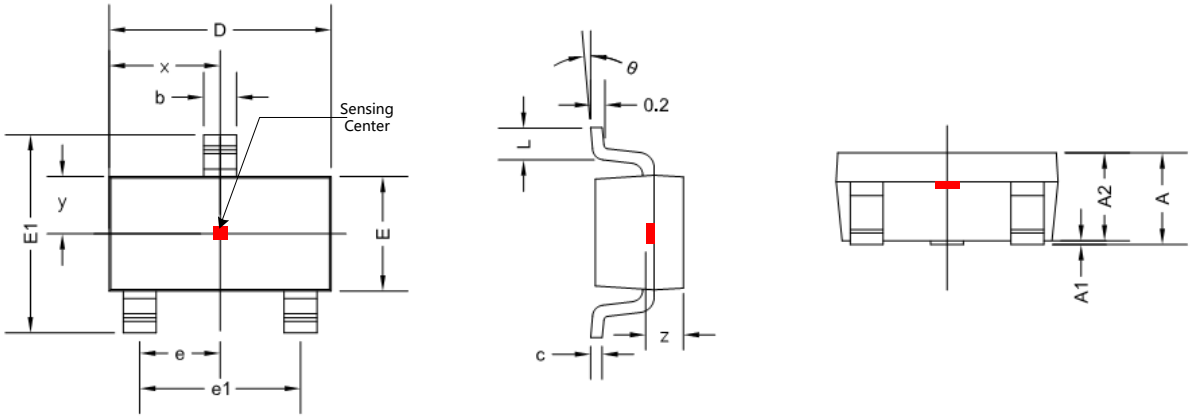


Figure.11 SOT-23 Package Drawing

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
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 Flat TO-92 Package Information

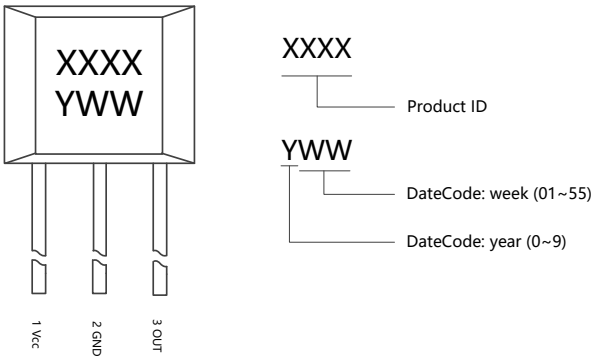


Figure.12 Flat TO-92 Chip Marking Spec

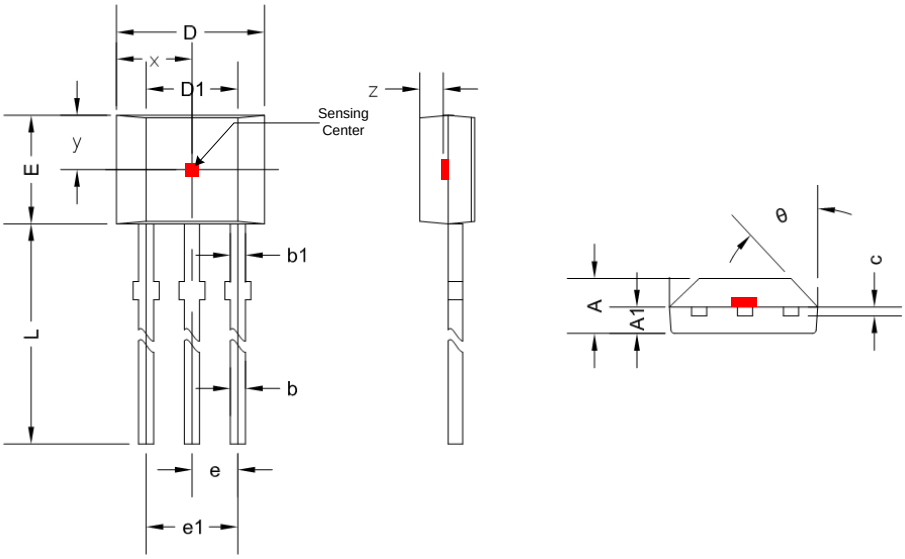


Figure.13 Flat TO-92 Package Drawing

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	

深圳市满度科技有限公司
Web:www.manduic.com
Tel:150-1290-5940
Email:sales@manduic.com