

High ESD Performance Hall-Effect Switch IC

1 Product Description

The MT896X-EN 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 2.8V to 26V, 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.

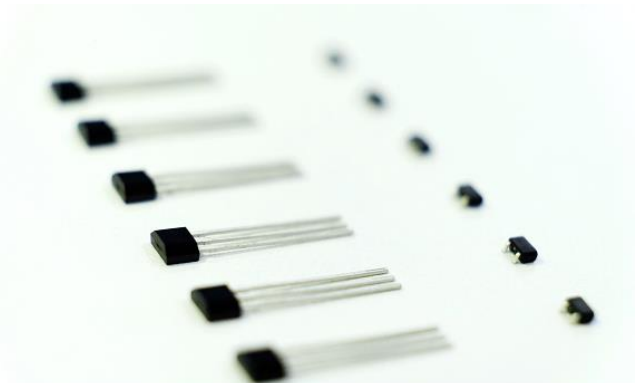
The MT896X-EN family provides a variety of packages to customers: SOT-23 (Thin Outline) for surface mount and flat TO-92 for through-hole mount. All packages are RoHS compliant.

2 Features

- AEC-Q100 Automotive Qualified for MT896X-EN
- BCD Technology
- Latch Switch
- 2.8~26V Operating Vcc Range
- Package Option:
Flat TO-92 / SOT-23 (Thin Outline)
- Open-Drain Output
- -30V Reversed Power Supply Protection
- Output Limiting Current Protection
- RoHS Compliant: (EU)2023/863

3 Product Overview of MT896X-EN

Part No.	Description
MT896XA-EN	Flat TO-92, bulk packaging (1000pcs/bag)
MT896XET-EN	SOT-23 (Thin Outline), tape & reel (3000pcs/bag)



4 Applications

- Automotive, Home appliances,
- Industrial
- Speed Detection
- Magnetic Encoder
- Brushless DC Motor Communication

5. Pin Configuration and Function

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

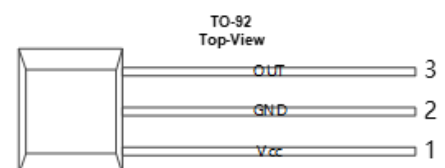
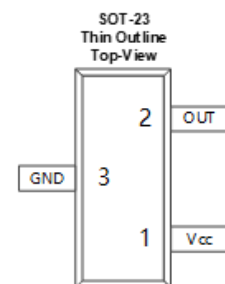


Figure.1

Pin Configuration & Function

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Reversion History

1	Originally Version	
2	1.1 Version	Add MT8963-EN Series

6 Definition of Switching Function

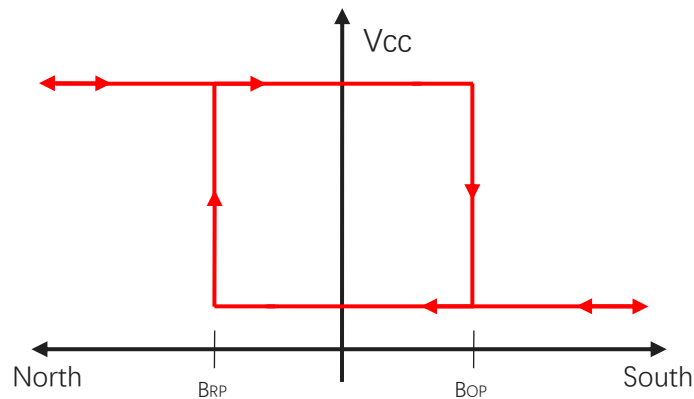


Figure.2 Definition of Switching Function

7 Functional Block Diagram

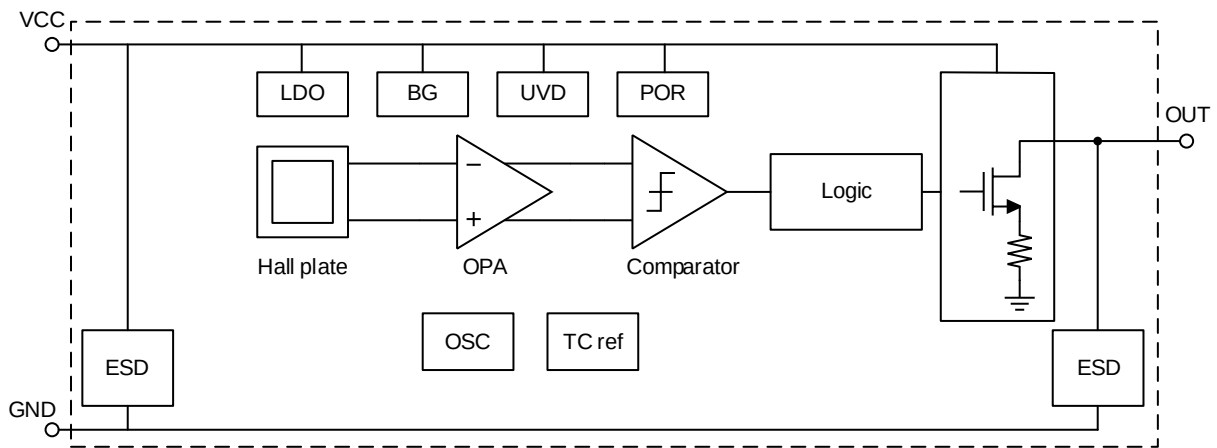


Figure.3 Functional Block Diagram

8 Electrical and Magnetic Characteristics

8.1 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	-30	-	V
VOUT	Output Voltage	-	30	V
IOUT	Continuous Output Current	-	45	mA
TA	Operating Ambient Temperature	-40	150	°C
TS	Storage Temperature	-50	150	°C
TJ	Junction Temperature	-	165	°C
B	Magnetic Flux Density	No Limit		Gs

8.2 Electrical Specifications

$V_{CC}=2.8V\sim 26V$ (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	2.8	-	26	V
I_{CC}	Supply Current	$B < B_{RP}$	-	4.0	-	mA
I_{OCP}	Short Circuit Protection Current	$B > B_{OP}$, $V_{OUT}=V_{CC}$	-	40	-	mA
V_{DSON}	Output Saturation Voltage	$I_{OUT}=20mA$, $B > B_{OP}$	-	-	0.4	V
I_{OFF}	Output Leakage Current	$V_{OUT}=26V$	-	-	10	μA
T_R	Output Rise Time	$R_L=10K\Omega$, $C_L=20pF$	-	-	1.0	μs
T_F	Output Fall Time	$R_L=10K\Omega$, $C_L=20pF$	-	-	1.0	μs
$V_{UDRESET}$	Under Voltage Lockout Threshold		-	2.6	-	V
V_{UDRLS}	Under Voltage Release Threshold		-	2.8	-	V
T_{PO}	Power on Time	$dV_{CC}/dt > 5V/\mu S$ $B > B_{OP(MAX)}$	-	-	50	μs
P_{OS}	Power on State		$V_{pull-up}$			-
F_C	Chopping Frequency		-	800	-	KHz
F_S	Sampling Frequency		-	100	-	KHz
R_{TH}	Thermal Resistance of SOT-23 (Thin Outline)		-	301	-	$^{\circ}C/W$
	Thermal Resistance of Flat TO-92		-	230	-	$^{\circ}C/W$

8.3 ESD Ratings

Symbol		Reference	Values	Unit
V_{ESD}	Human-body model (HBM)	AEC-Q100-002	8000	V
	Charged-device model (CDM)	AEC-Q100-011	1500	V

8.4 Magnetic Characteristics

At $V_{CC}=2.8V\sim 26V$ (unless otherwise specified)

Part No.	Symbol	Min	Typ	Max	Unit
MT8962-EN Series	BOP, $T_A = 25^\circ C$	35	50	65	Gs
	BRP, $T_A = 25^\circ C$	-65	-50	-35	Gs
	BHYST, $T_A = 25^\circ C$	70	100	130	Gs
MT8963-EN Series	BOP, $T_A = 25^\circ C$	55	80	105	Gs
	BRP, $T_A = 25^\circ C$	-105	-80	-55	Gs
	BHYST, $T_A = 25^\circ C$	110	160	210	Gs

8.5 Characteristic Performance

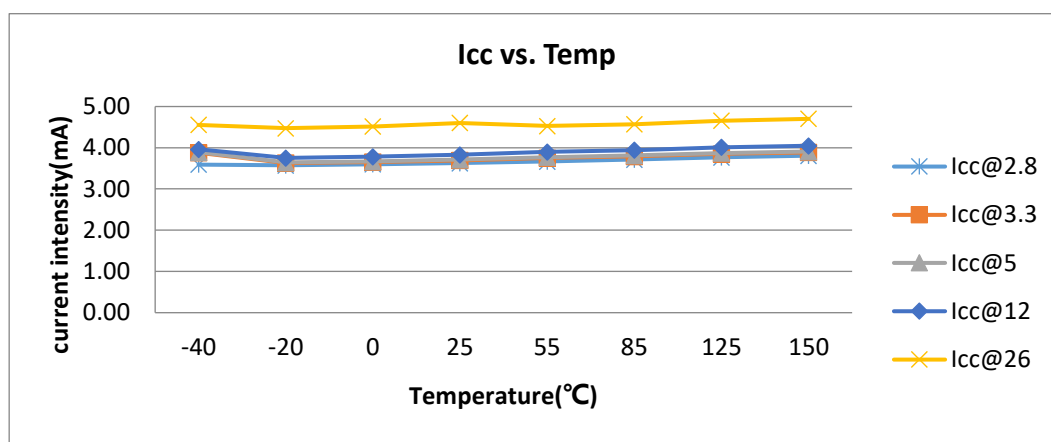


Figure.4 Supply Current vs. Temperature

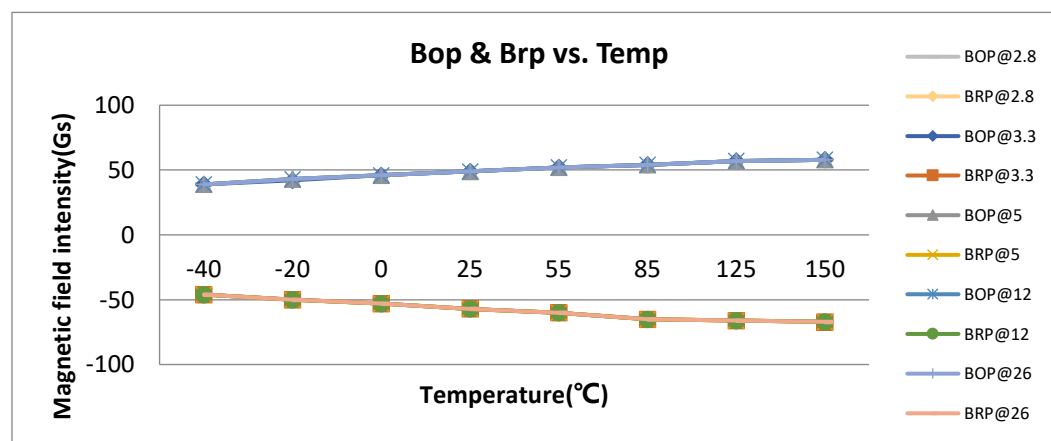


Figure.5 Magnetic Characteristics vs. Temperature (BOP & BRP), MT8962-EN as example

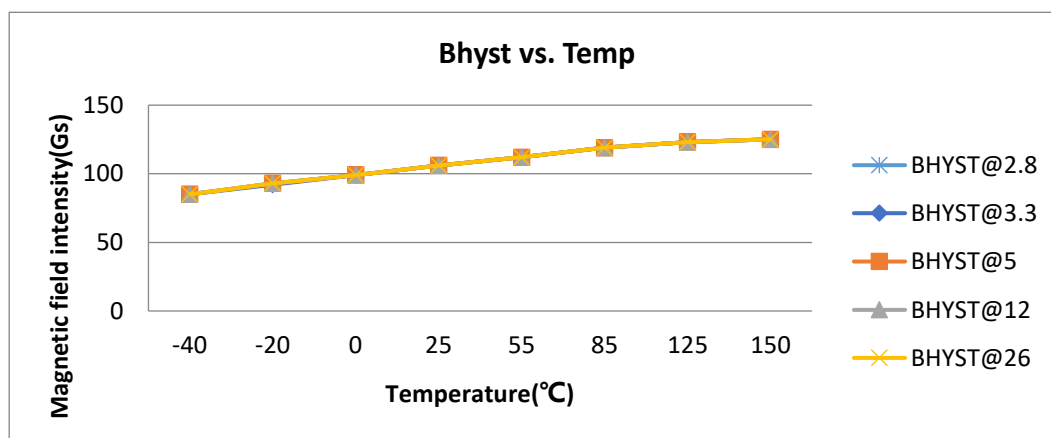


Figure.6 Magnetic Characteristics vs. Temperature (BHyst), MT8962-EN as example

8.6 Power on Status

During power-on, the output voltage keeps high when the V_{CC} reach to the $V_{CC}(\text{Min})$, which is the pull-up voltage, until the device is ready to respond appropriately to the input magnetic field, the power on status keeps longer than TPO.

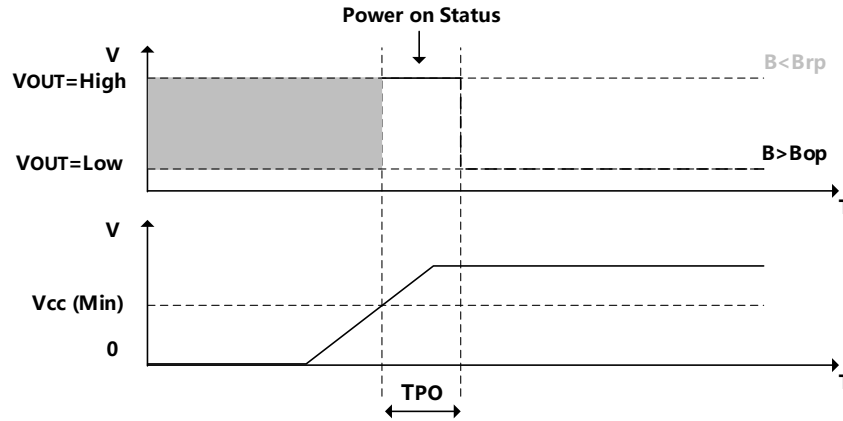


Figure.7 Power on Status

8.7 Under Voltage Protection

After power on, when the V_{CC} lower than the $V_{UDRESET}$ which caused by the unstable power supply, the device will jump into the status of under voltage protection, the device will lock the output & do not reactive to the input magnetic field. Until V_{CC} back to V_{UDRLS}

If the V_{CC} lower than 2.0V after power on, the device will re-start

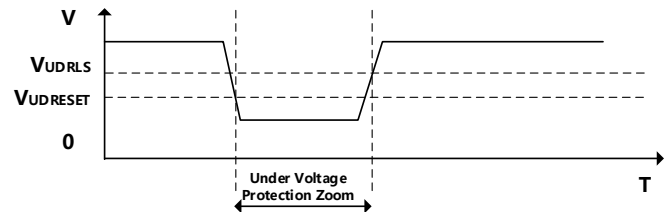


Figure.8 Under Voltage Protection

9 Typical Application Circuit

Note: Recommended value for R_L is 1KOhms to 10KOhms

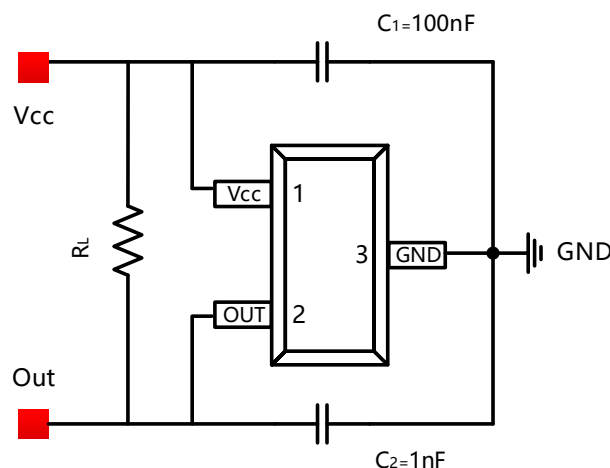


Figure.9 Typical Application Circuit

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

10.1 SOT-23 (Thin Outline) Package Information

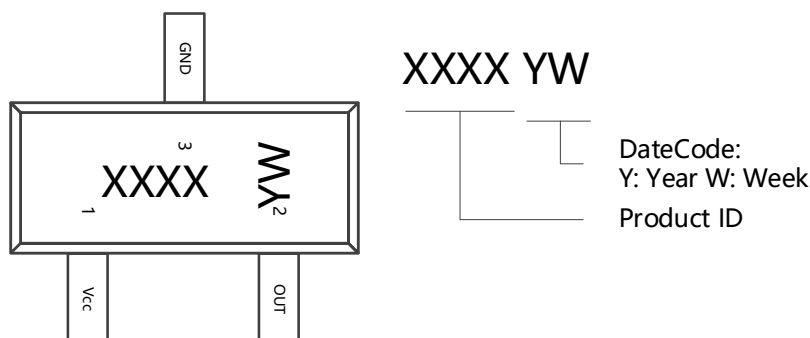


Figure.10 SOT-23 (Thin Outline) Chip Marking Spec

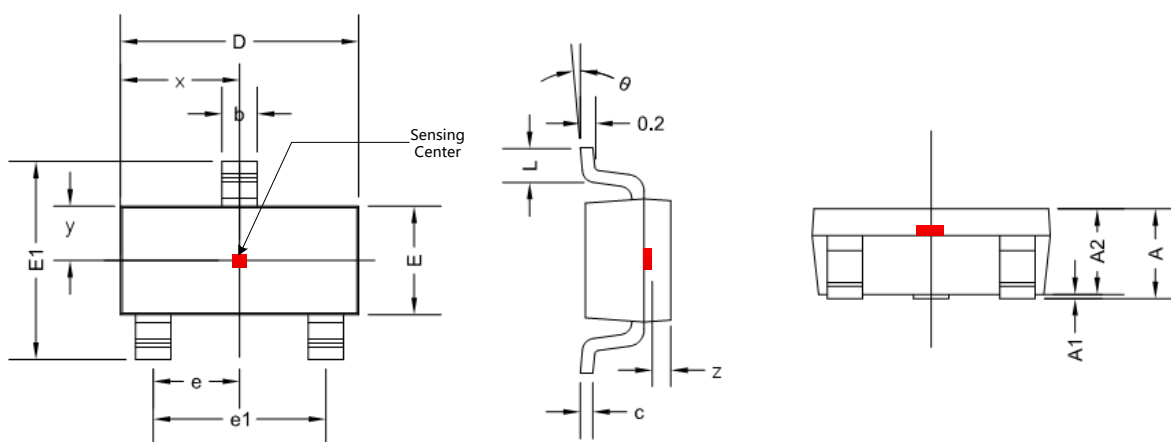


Figure.11 SOT-23 (Thin Outline) Package Drawing

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	1.554 TYP		0.061 TYP	
y	0.787 TYP		0.031 TYP	
z	0.220 TYP		0.008 TYP	

10.2 Flat TO-92 Package Information

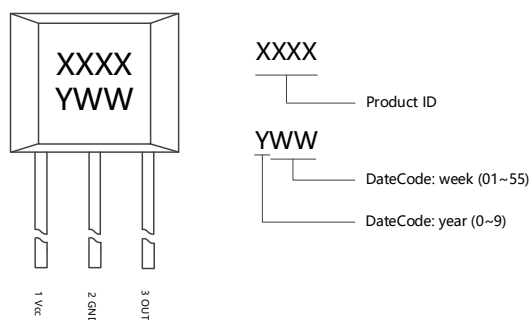


Figure.12 Flat TO-92 Chip Marking Spec

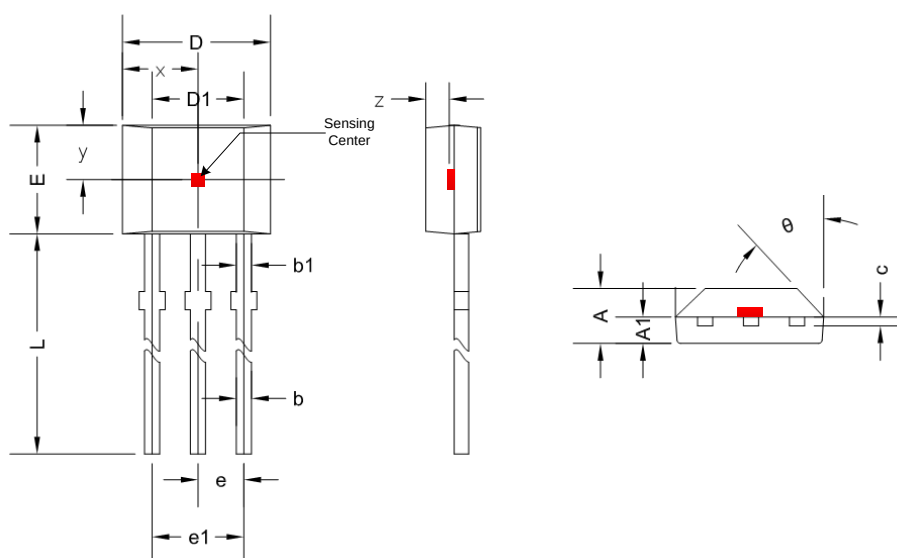


Figure.13 Flat TO-92 Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.620	0.056	0.064
A1	0.660	0.910	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	2.072 TYP		0.081 TYP	
y	1.707 TYP		0.068 TYP	
z	0.440 TYP		0.016 TYP	

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