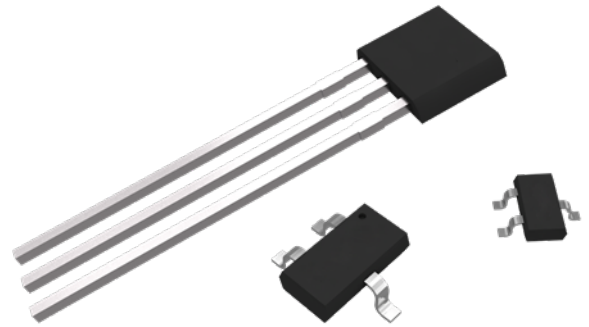


High ESD Performance Hall-Effect Switch IC

1 Product Description

The MT72xx 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 MT72xx 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

- AEC-Q100 Automotive Qualified for MT720x-xxx
- BCD Technology
- Latch Switch & Uni-Polar & Omni-Polar
- 2.8~26V Operating Vcc Range
- Package Option:
Flat TO-92 / SOT-23 / SOT-23 (Thin Outline)
- Open-Drain Output
- -30V Reversed Power Supply Protection
- Output Limiting Current Protection
- Robust ESD Performance (HBM=11kV)
- RoHS Compliant: (EU)2023/863

4 Applications

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

5. Pin Configuration and Function

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

3 Product Overview of MT72xx-xxx

Part No.	Description
MT72xxA-xxx	Flat TO-92, bulk packaging (1000pcs/bag)
MT72xxAT-xxx	SOT-23, tape & reel (3000pcs/bag)
MT72xxET-xxx	SOT-23 (Thin Outline), tape & reel (3000pcs/bag)

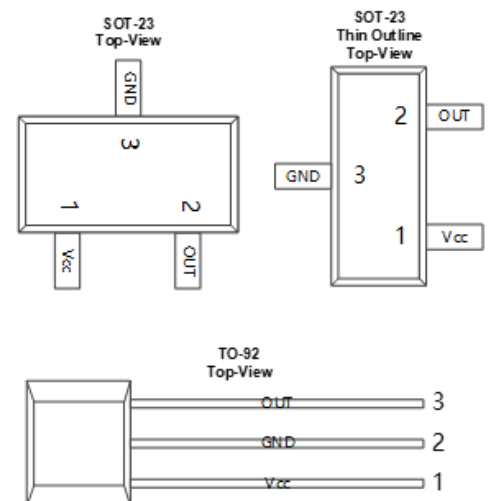


Figure.1 Pin Configuration & Function

Table of Contents

1	Product Description.....	1
2	Features.....	1
3	Product Overview of MT72xx-xxx.....	1
4	Applications.....	1
5	Pin Configuration and Function.....	1
6	Functional Block Diagram	3
7	Definition of Product Name.....	3
8	Definition of Switching Function	4
9	Electrical and Magnetic Characteristics.....	5
	9.1 Absolute Maximum Ratings.....	5
	9.2 ESD Ratings.....	5
	9.3 Electrical Specifications	6
	9.4 Magnetic Characteristics.....	7
	9.5 Power on Status.....	8
	9.6 Under Voltage Protection.....	8
10	Typical Application Circuit.....	8
11	Package Material Information.....	9
	11.1 SOT-23 Package Information.....	9
	11.2 SOT-23 (Thin Outline) Package Information.....	10
	11.3 Flat TO-92 Package Information.....	11
12	Copy Rights and Disclaimer.....	12

Reversion History

1	Originally Version	
2	1.1 Version	Update the ESD Ratings
3	1.2 Version	Update TO-92S Package Outline
4	1.3 Version	Update Magnetic Characteristics of MT72X1 series

6 Functional Block Diagram

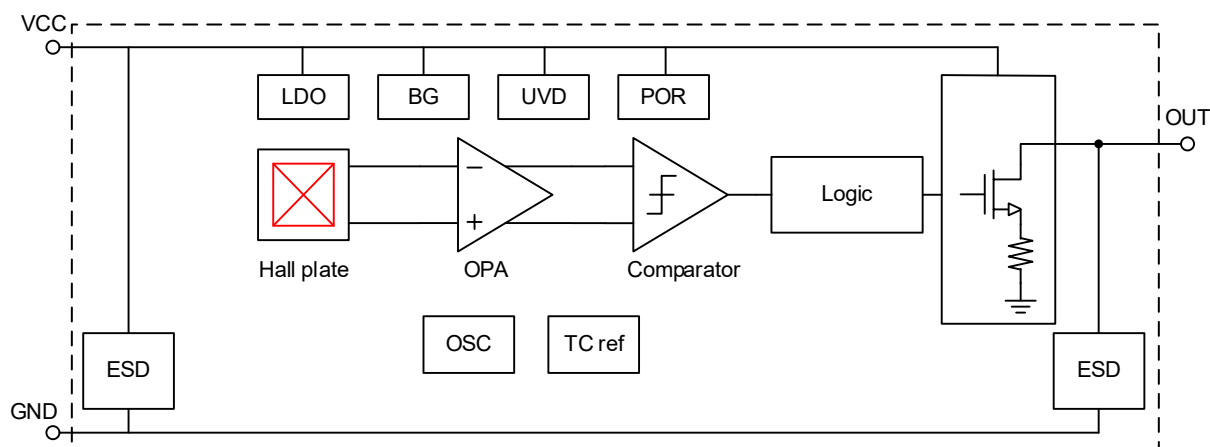


Figure.2 Functional Block Diagram (Open Drain Output as Example)

7 Definition of Product Name

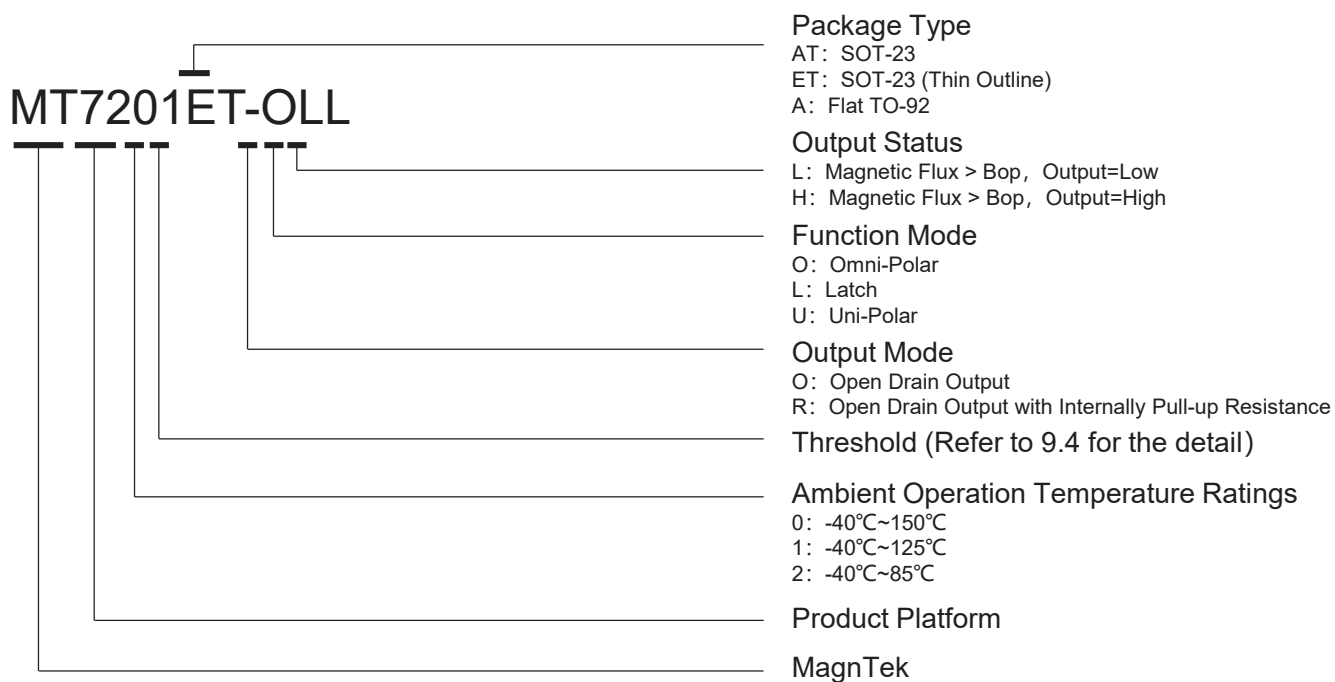


Figure.3 Definition of Product Name

8 Definition of Switching Function

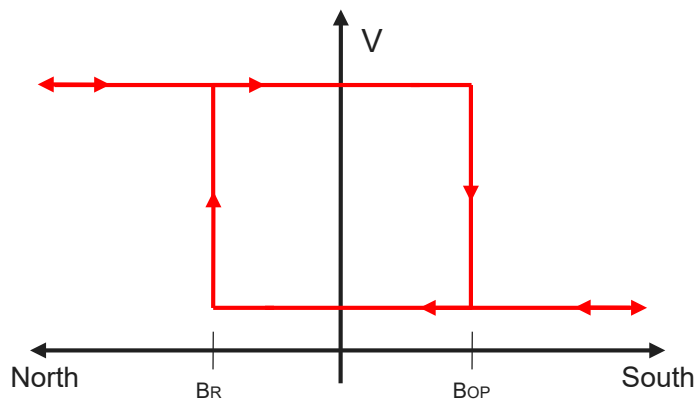


Figure.4 Function of Latch (MT72xxET/A-XLL)

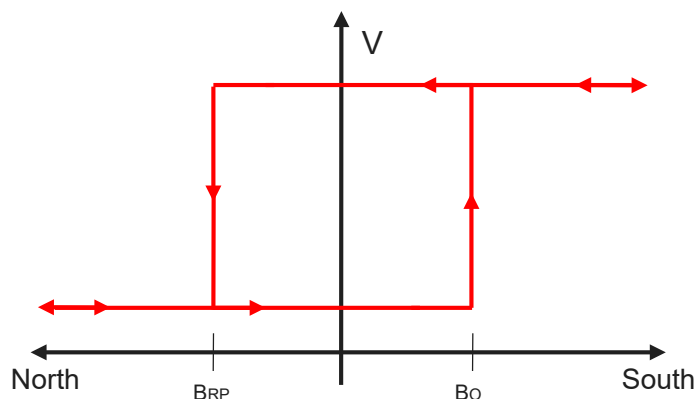


Figure.5 Function of Latch (MT72xxET/A-XLH)

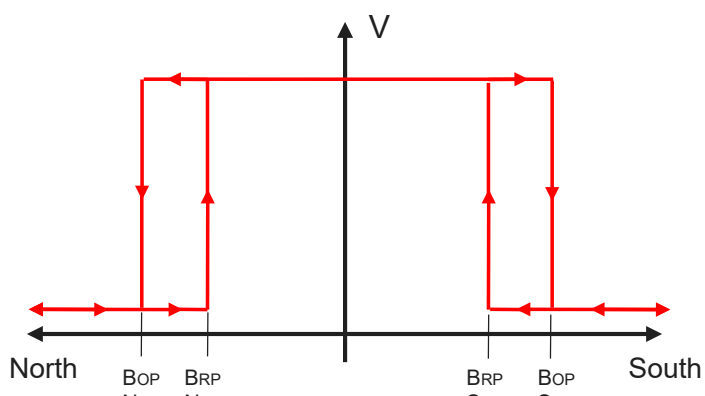


Figure.6 Function of Omni-Polar (MT72xxET/A-XOL)

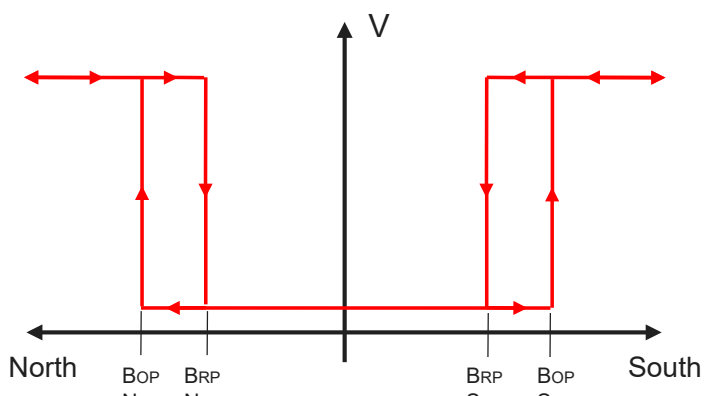


Figure.7 Function of Omni-Polar (MT72xxET/A-XOH)

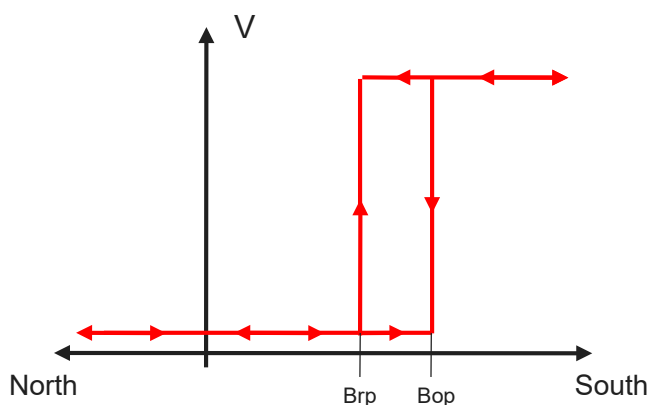


Figure.8 Function Uni-polar (MT72xxET/A-XUH)

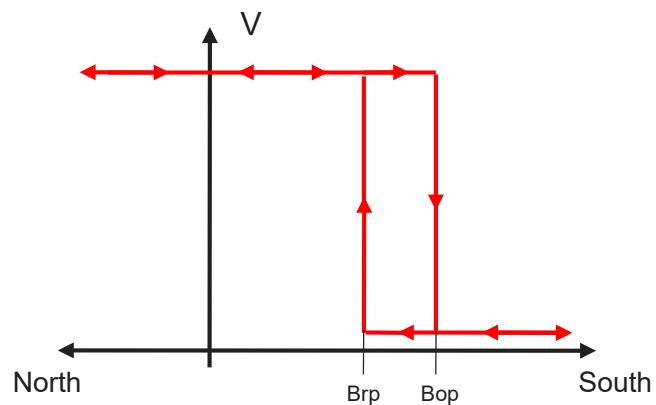


Figure.9 Function of Uni-Polar (MT72xxET/A-XUL)

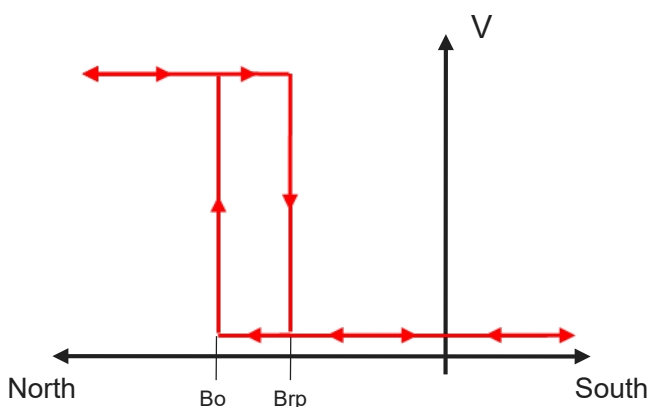


Figure.10 Function Uni-polar (MT72xxAT-XUH)

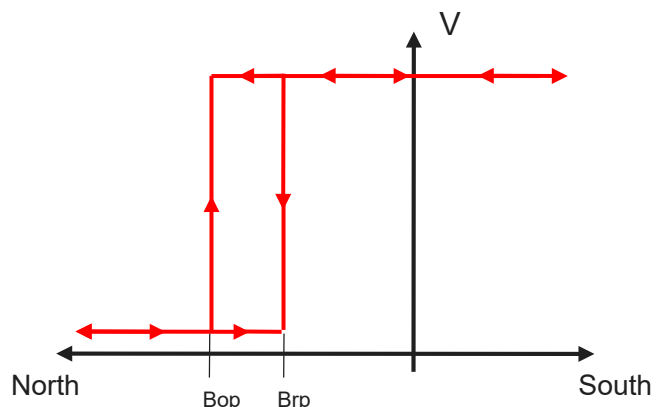


Figure.11 Function of Uni-Polar (MT72xxAT-XUL)

9 Electrical and Magnetic Characteristics

9.1 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	-30	-	V
V _{OUT}	Output Voltage	-	30	V
I _{OUT}	Continuous Output Current	-	45	mA
T _A	Operating Ambient Temperature (MT720X-XXX Series)	-40	150	°C
	Operating Ambient Temperature (MT721X-XXX Series)	-40	125	°C
	Operating Ambient Temperature (MT722X-XXX Series)	-40	85	°C
T _S	Storage Temperature	-50	150	°C
T _J	Junction Temperature	-	165	°C
B	Magnetic Flux Density	No Limit		Gs

9.2 ESD Ratings

Symbol		Reference	Values	Unit
V _{ESD}	Human-body model (HBM)	AEC-Q100-002	9000	V
	Charged-device model (CDM)	AEC-Q100-011	1500	V

9.3 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 (Latch)	MT72xx-XLL: $B < B_{RP}$ MT72xx-XLH: $B > B_{OP}$	-	4.0	-	mA
	Supply Current (Uni-Polar & Omni-Polar)	MT72xx-XXL: $B < B_{RP}$ MT72xx-XXH: $B > B_{OP}$	-	2.5	-	mA
I_{OCP}	Short Circuit Protection Current	MT72xx-XXL: $B > B_{OP}$ MT72xx-XXH: $B < B_{RP}$ $V_{OUT}=V_{CC}$	-	40	-	mA
V_{DSON}	Output Saturation Voltage	$I_{OUT}=20mA$, MT72xx-XXL: $B > B_{OP}$ MT72xx-XXH: $B < B_{RP}$	-	-	0.4	V
I_{OFF}	Output Leakage Current	$V_{OUT}=26V$ MT72xx-XXL: $B < B_{RP}$ MT72xx-XXH: $B > B_{OP}$	-	-	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	$dV_{CC}/dt > 5V/\mu S$	-	-	50	μs
P_{OS}	Power on State		$V_{pull-up}$			-
R_{PU}	Internal Pull-up Resistor	MT72xx-RXX		10		K Ω
F_C	Chopping Frequency		-	800	-	KHz
F_S	Sampling Frequency (Latch)		-	100	-	KHz
	Sampling Frequency (Uni-Polar & Omni-Polar)		-	25	-	KHz
R_{TH}	Thermal Resistance of SOT-23		-	301	-	$^{\circ}C/W$
	Thermal Resistance of SOT-23 (Thin Outline)		-	301	-	$^{\circ}C/W$
	Thermal Resistance of Flat TO-92		-	230	-	$^{\circ}C/W$

9.4 Magnetic Characteristics

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

Part No.	Symbol	Min	Typ	Max	Unit
MT72X1-XLX 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
MT72X2-XLX Series	BOP, $T_A = 25^{\circ}C$	10	20	30	Gs
	BRP, $T_A = 25^{\circ}C$	-30	-20	-10	Gs
	BHYST, $T_A = 25^{\circ}C$	20	40	60	Gs
MT72X1-XUX Series	BOP, $T_A = 25^{\circ}C$	20	35	50	Gs
	BRP, $T_A = 25^{\circ}C$	10	25	40	Gs
	BHYST, $T_A = 25^{\circ}C$	3	10	17	Gs
MT72X2-XUX Series	BOP, $T_A = 25^{\circ}C$	60	85	110	Gs
	BRP, $T_A = 25^{\circ}C$	25	50	75	Gs
	BHYST, $T_A = 25^{\circ}C$	20	35	50	Gs
MT72X3-XUX Series	BOP, $T_A = 25^{\circ}C$	110	140	170	Gs
	BRP, $T_A = 25^{\circ}C$	75	105	135	Gs
	BHYST, $T_A = 25^{\circ}C$	20	35	50	Gs
MT72X5-XUX Series	BOP, $T_A = 25^{\circ}C$	210	255	300	Gs
	BRP, $T_A = 25^{\circ}C$	165	210	255	Gs
	BHYST, $T_A = 25^{\circ}C$	30	45	60	Gs
MT72X1-XOX Series	BOP, $T_A = 25^{\circ}C$	± 20	± 35	± 50	Gs
	BRP, $T_A = 25^{\circ}C$	± 10	± 25	± 40	Gs
	BHYST, $T_A = 25^{\circ}C$	3	10	17	Gs
MT72X2-XOX Series	BOP, $T_A = 25^{\circ}C$	± 60	± 85	± 110	Gs
	BRP, $T_A = 25^{\circ}C$	± 25	± 50	± 75	Gs
	BHYST, $T_A = 25^{\circ}C$	20	35	50	Gs
MT72X3-XOX Series	BOP, $T_A = 25^{\circ}C$	± 110	± 140	± 170	Gs
	BRP, $T_A = 25^{\circ}C$	± 75	± 105	± 135	Gs
	BHYST, $T_A = 25^{\circ}C$	20	35	50	Gs

9.5 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.

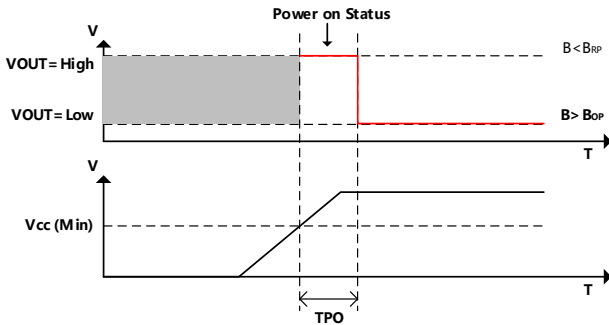


Figure.12 Power on Status (MT72xx-XXL)

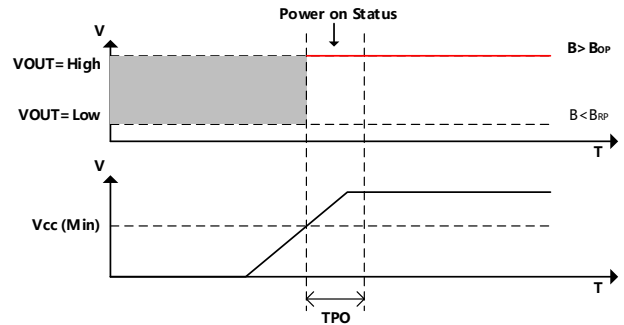


Figure.13 Power on Status (MT72xx-XXH)

9.6 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

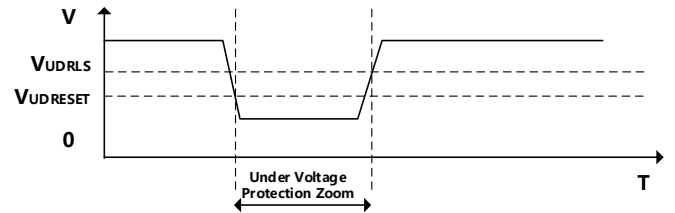


Figure.14 Under Voltage Protection

10 Typical Application Circuit

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

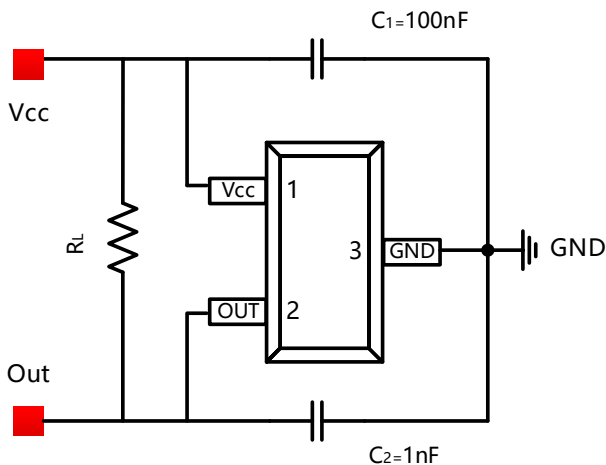


Figure.15 Typical Application Circuit of MT72xx-OXX

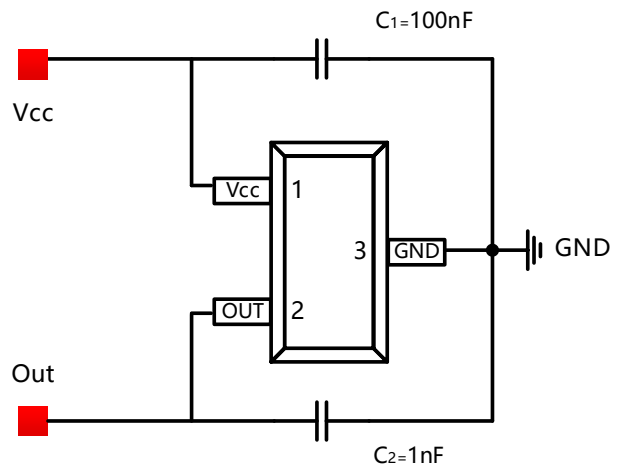


Figure.16 Typical Application Circuit of MT72xx-RXX

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

11.1 SOT-23 Package Information

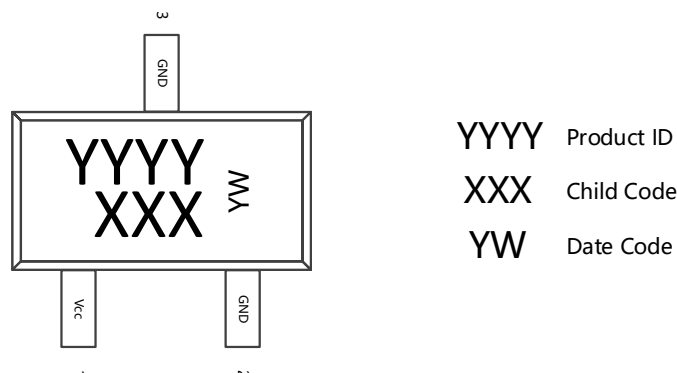


Figure.17 SOT-23 Chip Marking Spec

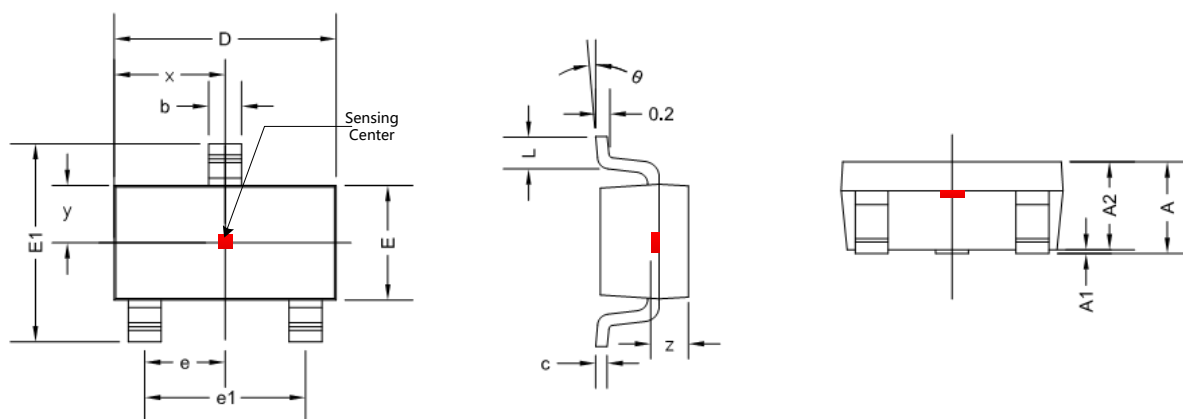


Figure.18 SOT-23 Package Drawing

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	0.700 TYP		0.027 TYP	

11.2 SOT-23 (Thin Outline) Package Information

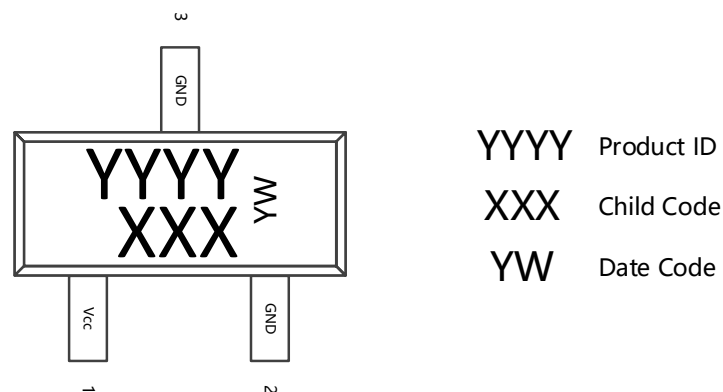


Figure.19 SOT-23 (Thin Outline) Chip Marking Spec

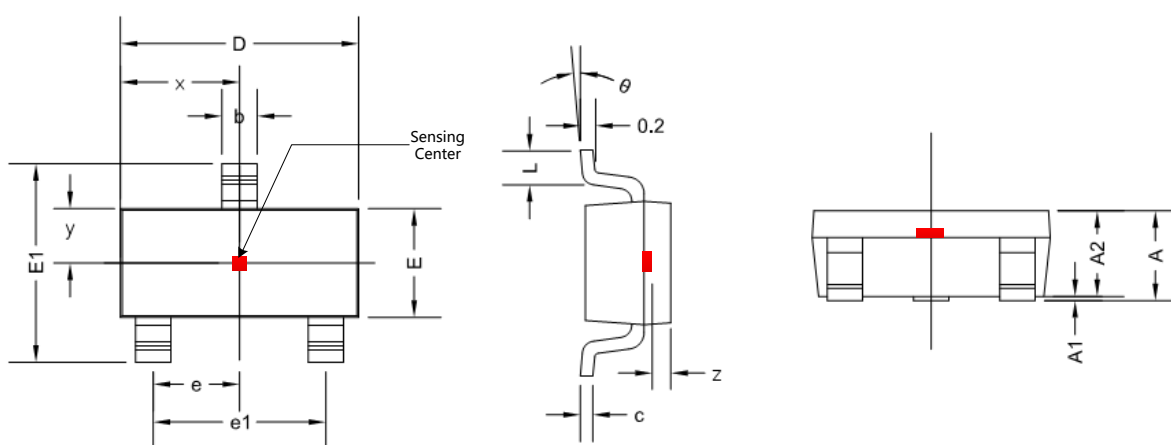


Figure.20 SOT-23 (Thin Outline) Package Drawing

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
theta	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	

11.3 Flat TO-92 Package Information

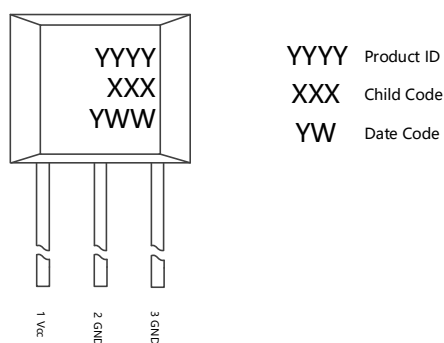


Figure.21 Flat TO-92 Chip Marking Spec

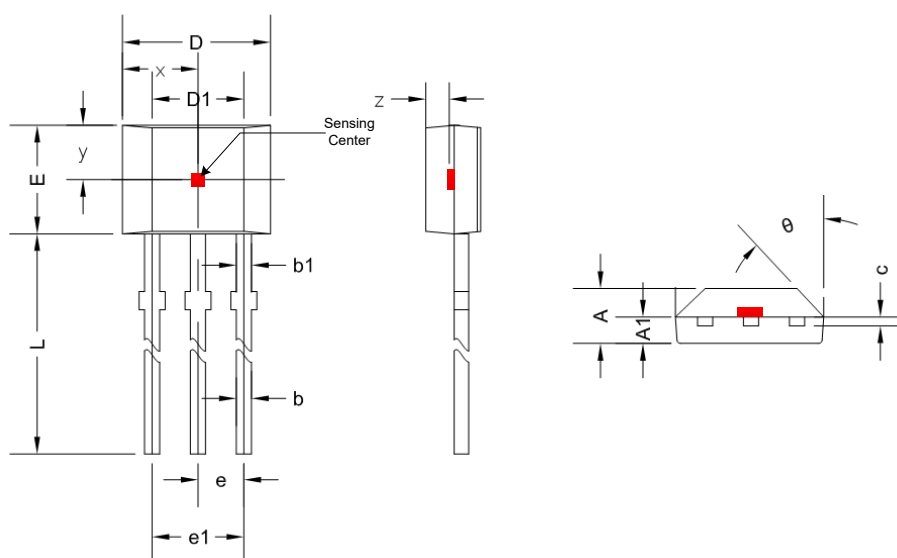


Figure.22 Flat TO-92 Package Drawing

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	0.330	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	4.000	4.100	0.157	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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