AnaSem
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Analog Semiconductor IC

MRX1518H Series

Low power consumption, 1.5mT High sensitivity CMOS MR Magnetic Sensor Switch

(**IMPORTANT:** Please check the last page for Genuine Product Labeling)

Rev. E13-01

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AnaSem
..... Future of the analog world

Low power consumption, 1.5mT High sensitivity CMOS MR Magnet Sensor Switch

MRX1518H Series

GENERAL DESCRIPTIONS

MRX1518H series are monolithic ICs with built-in MR magnet resistive element and CMOS switch. It becomes the non-contact switch with low current consumption, high sensitivity and reliability which is combined with magnet.

A horizontal magnetic field parallel to the electrode of the package can be detected by an arbitrary polarity. (N pole ⇔ S pole)

HALOGEN

RoHS COMPLIANCE

REACH COMPLIANCE

FEATURES

- CMOS + MR monolithic structure
- Low current consumption ····· 1.6μA (V_{IN}=1.8V, Ta=25°C)
- High-sensitivity ····· Typ. 1.5mT
- Operating temperature range ····· -40 ~ +85°C
- Operating voltage range ····· 1.6V ~ 5.5V
- Detection pulse driving cycle ····· Typ. 50msec with 25μsec width
- Magnetic direction ····· Both direction / CMOS inverter one output
- Detection magnetic field ····· Horizontal direction of marked side of package (Electrode parallel both direction)
- Small package ····· SOT-23 (2.9×2.8×1.1mm)

APPLICATIONS

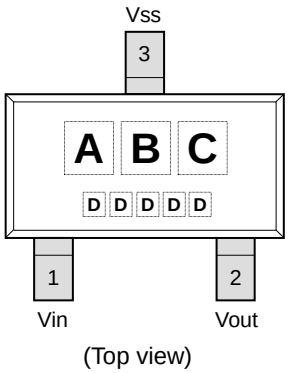
- Detection of opening and closing : Mobile phone, Notebook PC, Microwave oven, Washing machine, Rice cooker, Refrigerator, Electronic dictionary, Digital camera, etc.
- Detection of position : Air cylinder, Antitheft window, Digital door lock, etc.
- Detection of water level : Water purifier, Humidifier, Bidet, etc.
- Detection of rotation : Water meter, Gas meter, Wattmeter, Speed meter, etc.
- Power supply switch : Cordless phone, Electric toothbrush, etc.

PRODUCTS NUMBERING GUIDE

MRX1518H □□

Design version	A : CMOS output
Package form	T : SOT-23 (2.9×2.8×1.1mm)
Detection pulse cycle	H : Typ. 50msec with 25μsec width
Operating voltage	18 : 1.6V ~ 5.5V
Detection sensitivity	15 : Typ. 1.5mT

PIN CONFIGURATION / MARKING SPECIFICATION



(Top view)

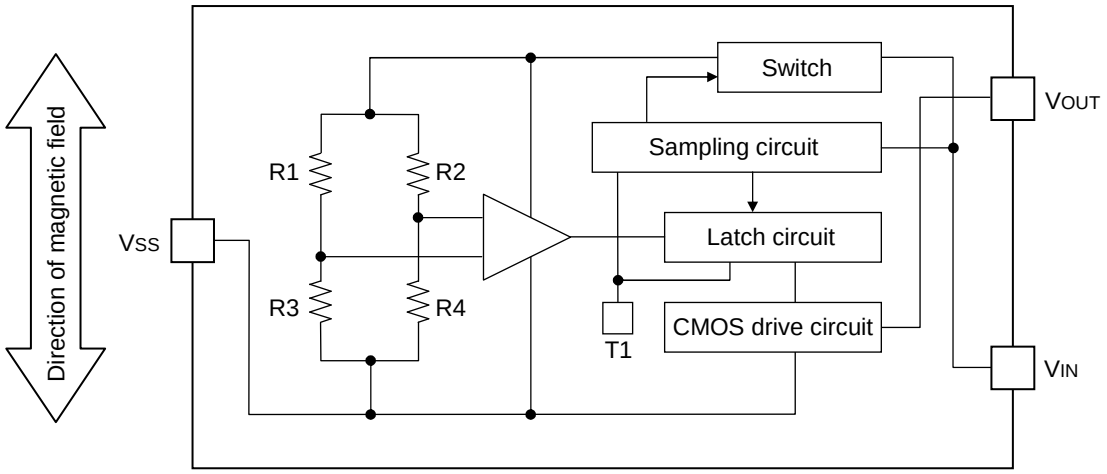
Pin Configuration

No.	Symbol	Descriptions
1	VIN	Voltage input
2	VOUT	Output
3	VSS	Power ground

Marking Specification

Code	Mark	Contents
A	M	Series name
BC	AA	Products specification & version
D	Internal rule	Lot number

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Items	Symbol	Min.	Typ.	Max.	Conditions	Unit
Operating temperature	TOPR	-40	-	+85		°C
Storage temperature	TSTG	-50	-	+125		°C
Supply voltage	VMAX	VIN-0.3	-	VIN+6.0		V
Assembly temp. condition	TASY	-	255	260	t=max:5sec/Tmax	°C

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{DD}=1.8V, Ta=25°C)

Items	Symbol	Min.	Typ.	Max.	Conditions	Unit
Operating voltage	V_{IN}	1.6	1.8	5.5		V
Current consumption	I_{AVG}	-	1.6	3.0	Avg. current at V_{IN}=1.8V	μA
Detection pulse driving cycle	ts	-	50	90	Pulse width : 1/2000	msec
"H"-level output voltage	V_{OH}	0.9V_{IN}	-	-	I_{OUT}=+1.0mA	V
"L"-level output voltage	V_{OL}	-	-	0.1V_{IN}	I_{OUT}=-1.0mA	V

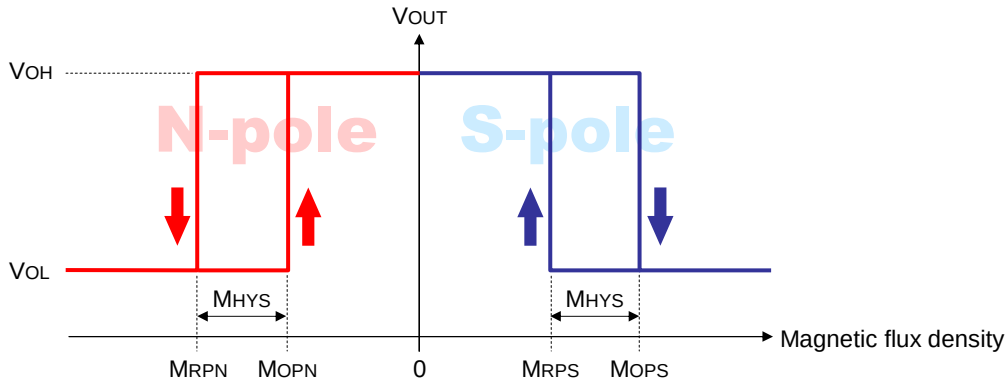
MAGNETIC CHARACTERISTICS

(Unless otherwise specified, V_{DD}=1.8V, Ta=25°C)

Items	Symbol	Min.	Typ.	Max.	Unit
Magnetic flux density at operating point (H→L)	M_{OPS}	1.0*	1.5	2.2	mT
	M_{OPN}	-2.2	-1.5	-1.0*	
Magnetic flux density at release point (L→H)	M_{RPS}	0.8	1.2	1.9*	mT
	M_{RPN}	-1.9*	-1.2	-0.8	
Width of hysteresis	M_{HYS}	0.1*	0.3	0.8*	mT

Note : The values with [*] marks are guaranteed by design, not tested in production.

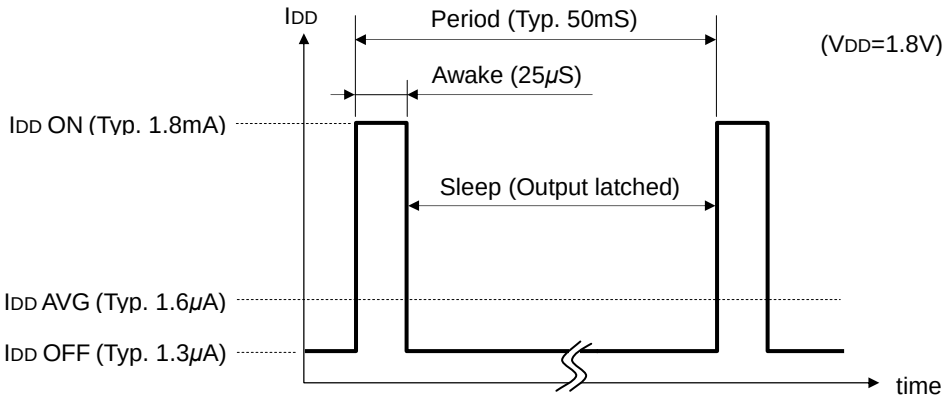
MAGNETIC-ELECTRIC CONVERSION CHARACTERISTIC



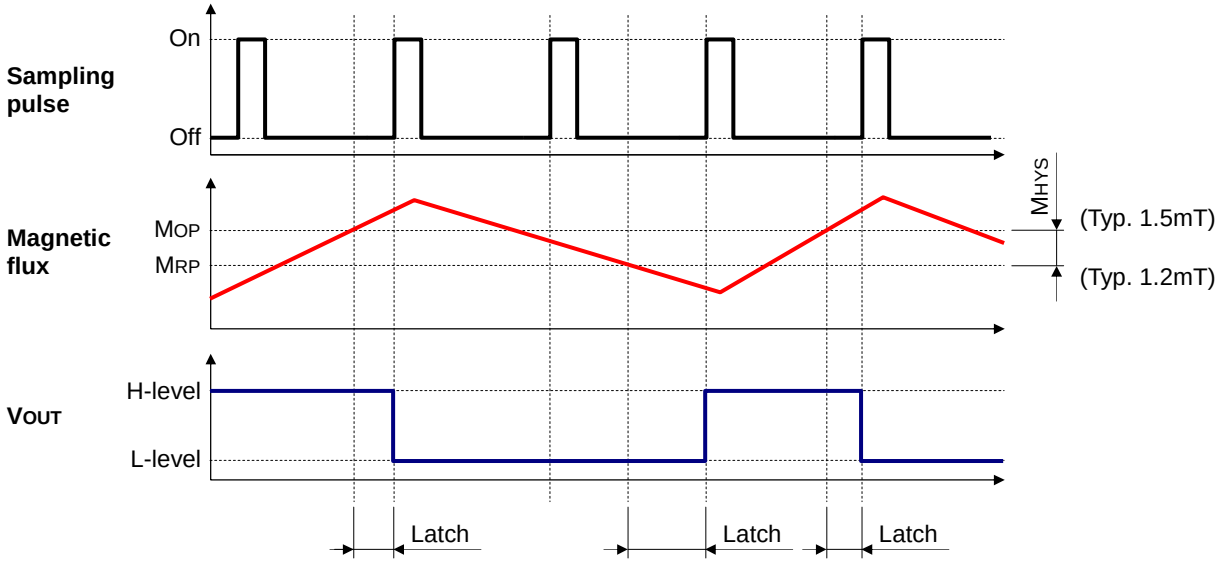
MAGNETIC FLUX DENSITY AND OUTPUT VOLTAGE LEVEL

Conditions		Output level
Magnet & Power	Magnet flux density	
Magnet = OFF / Power = ON	M = 0mT	High-level
Magnet = ON / Power = ON	M ≧ 2.2mT	Low-level
Magnet = OFF / Power = ON	M ≦ 0.8mT	High-level

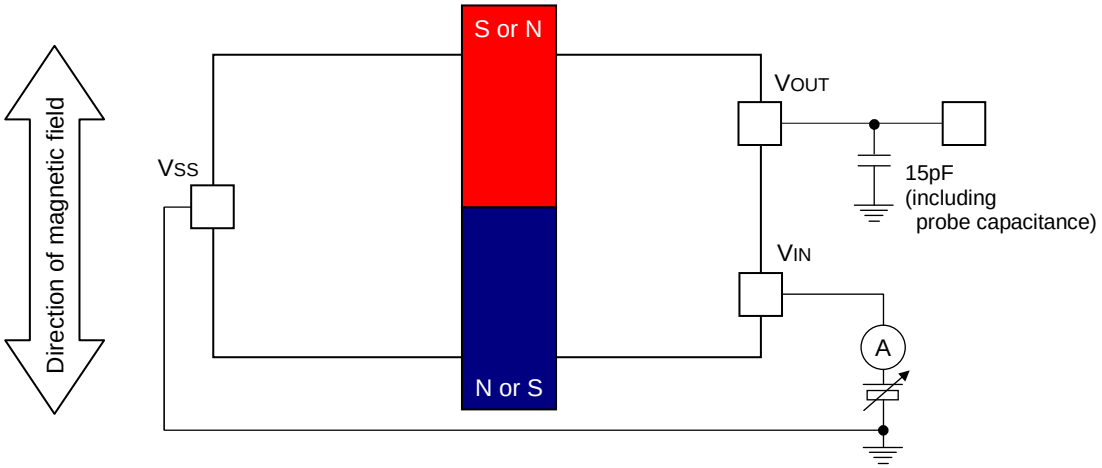
DETECTION PULSE DRIVING CYCLE (SAMPLING CYCLE)



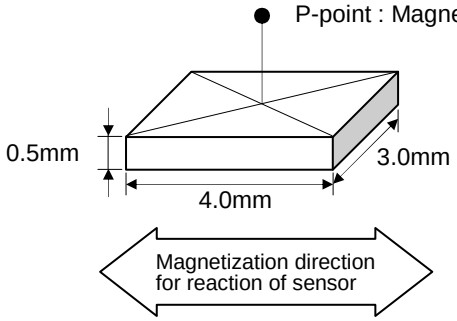
OUTPUT SWITCHING TIMING CHART



TEST CIRCUIT



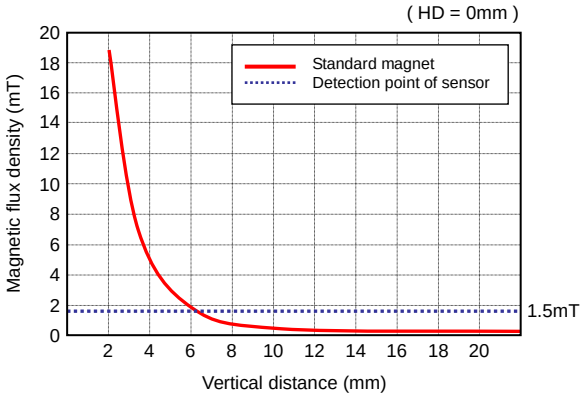
STANDARD MAGNET SPECIFICATIONS



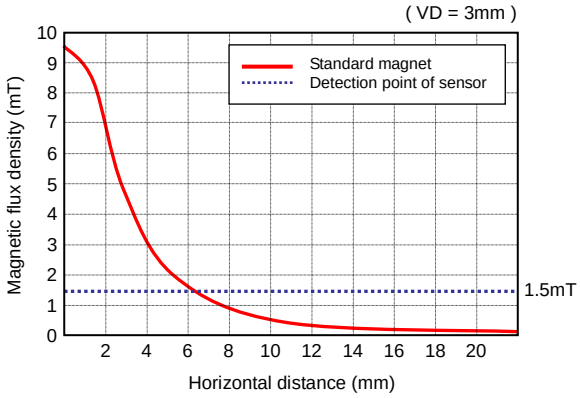
- Magnet maker : TDK Corp. / Japan
- Neodymium magnet
- Magnetic specification : NE047BW
- Size : 4.0 × 3.0 × 0.5mm

DETECTION DISTANCE SIMULATION (with standard magnet)

- **Vertical direction (VD)**

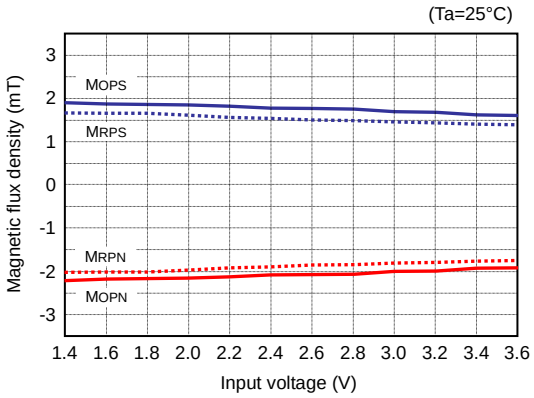


- **Horizontal direction (HD)**

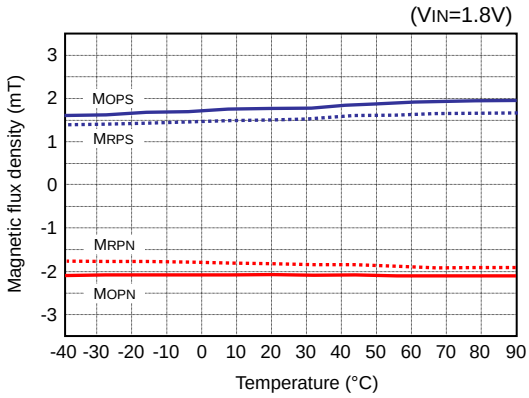


TYPICAL ELECTRIC CHARACTERISTICS

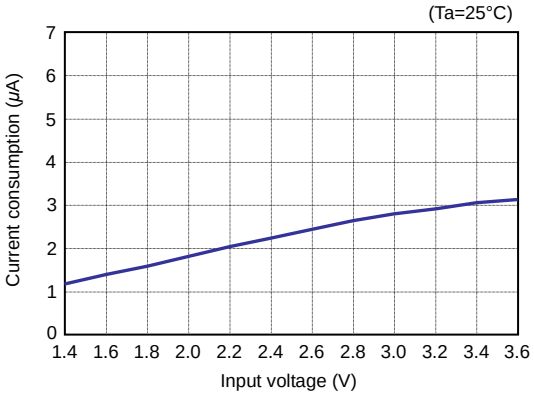
- **Magnetic flux density vs. Input voltage**



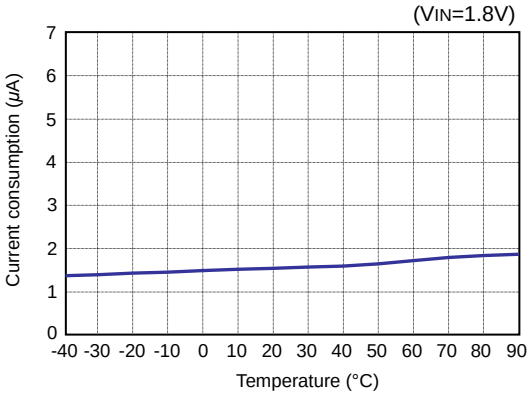
- **Magnetic flux density vs. Ambient temp.**



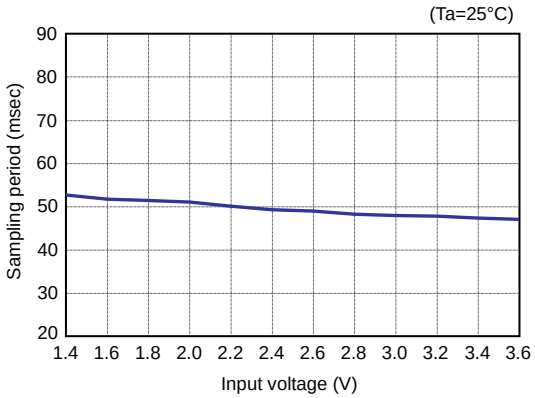
- **Current consumption vs. Input voltage**



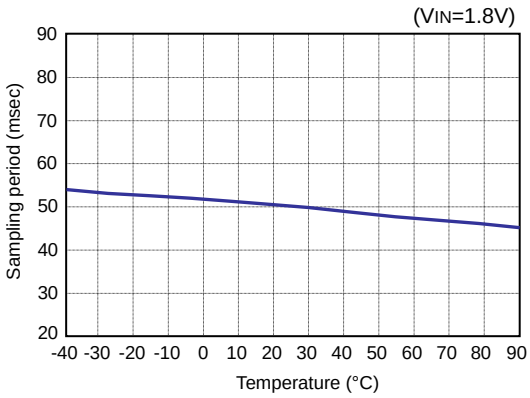
- **Current consumption vs. Ambient temp.**



- **Sampling period vs. Input voltage**



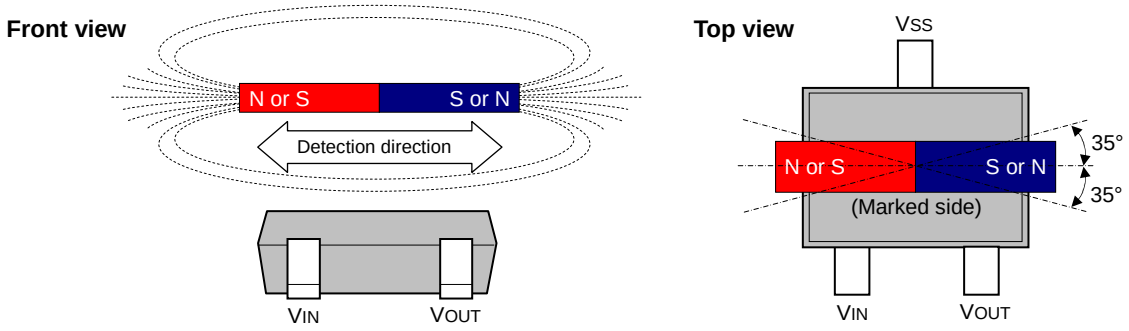
- **Sampling period vs. Ambient temp.**



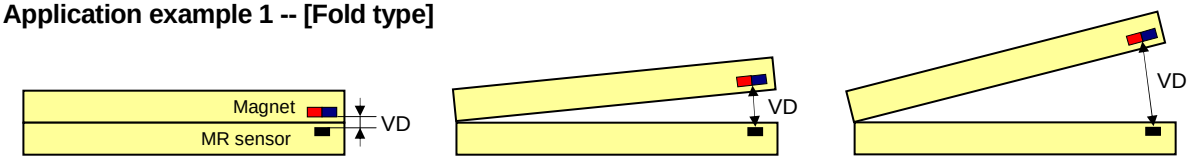
APPLICATION INFORMATIONS

- **Detection of magnetic field**

  To operate output switch, the magnetic field should be applied to the sensor with sufficient magnetic flux density and correct direction. MR series are designed to be ON-state (L-level output) when the horizontal direction magnetic field is applied in parallel to the marked side of sensor, with sufficient magnetic flux (M_{OPS} or M_{OPN} value) regardless of polarity of magnet. Because MR series detect the horizontal direction magnetic field, it has not influence of the reverse-magnetic field. And also, MR series detect the vertical direction magnetic field according to the level of magnetic flux, so that it is possible to apply to not only slide type but also fold type.



- **Application example 1 -- [Fold type]**

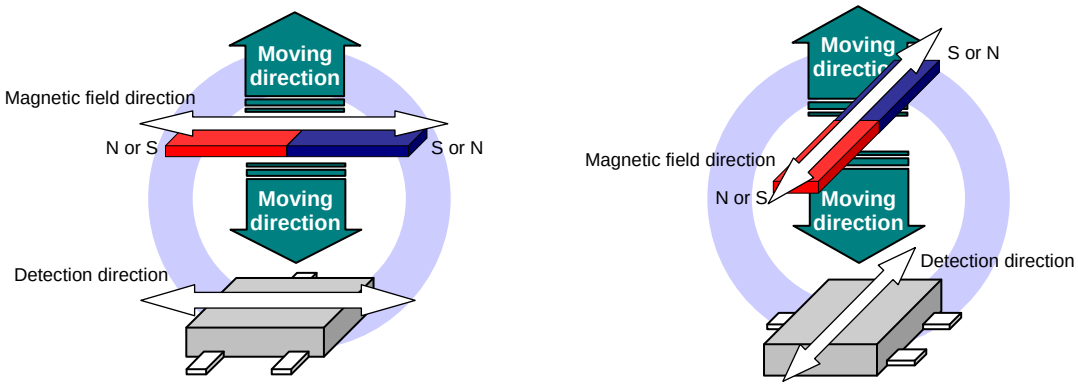


Position A
Output level = Low

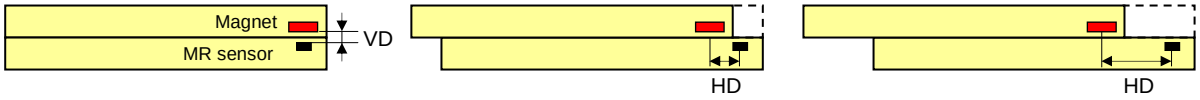
Position B
Output level = Low → High

Position C
Output level = High

In case MR series is used for fold type cellular phone, IC sense the conditions of opening and shutting of the cover by detection of the magnetic flux according to the distance between IC and magnet.
In position A, output is L-level (ON-state) because the detected magnetic flux is sufficient. The magnetic flux decrease according to the magnet is moved from IC (Position A→B). Then the IC is turned H-level (OFF-state) because the magnetic flux become M_{RP} or less (Position B→C).



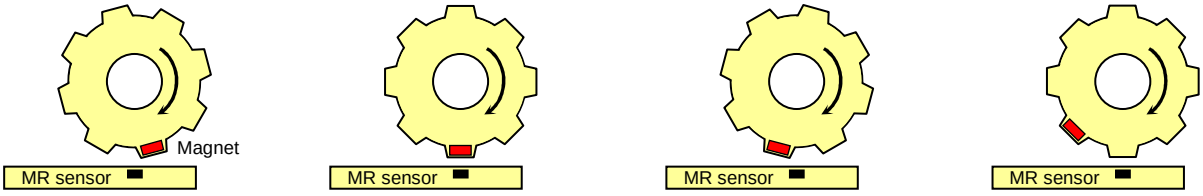
- **Application example 2 -- [Slide type & Rotary type]**



Position A
Output level = Low

Position B
Output level = Low → High

Position C
Output level = High



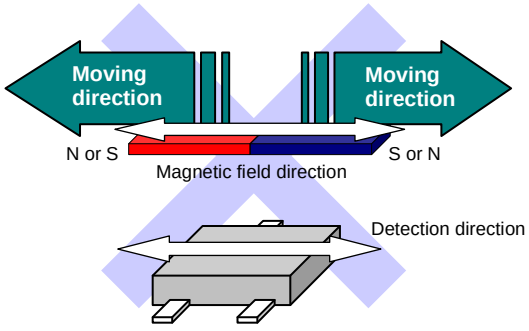
Position A
Output level = High → Low

Position B
Output level = Low

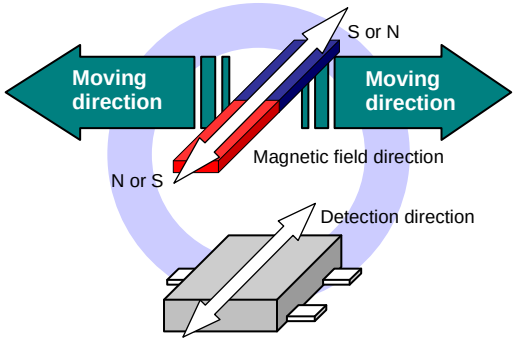
Position C
Output level = Low → High

Position D
Output level = High

In the detection of the slide type, there are two ways of arrangement of magnetic field detecting direction against moving direction. One is parallel and another is cross with moving direction.
In case of parallel positioning of magnetic field with moving direction [arrangement 1], the output of IC might be L-level (ON-state) → H-level (OFF-state) → L-level (ON-state) → H-level (OFF-state) due to reverse-magnetic field.
To prevent from this malfunction, it is recommended to arrange the detection direction of sensor and magnetic field to be crossed with moving direction of cover [arrangement 2].



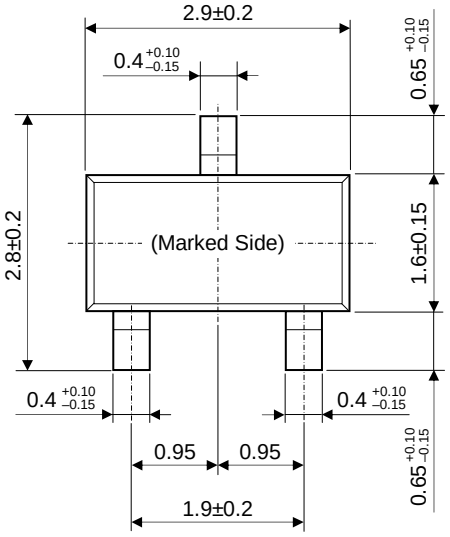
[Arrangement 1]
Parallel the direction of detection magnetic field with the moving direction

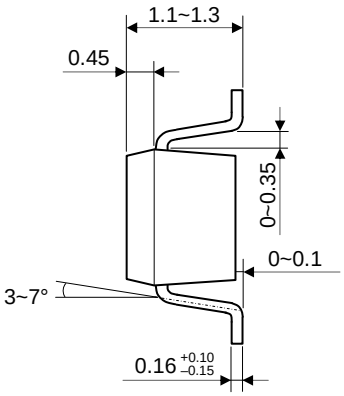


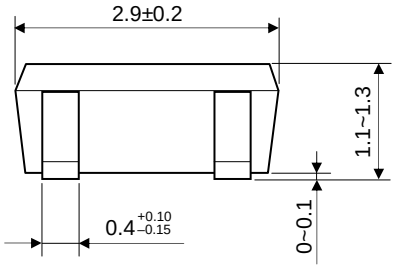
[Arrangement 2]
Cross the direction of detection magnetic field with the moving direction

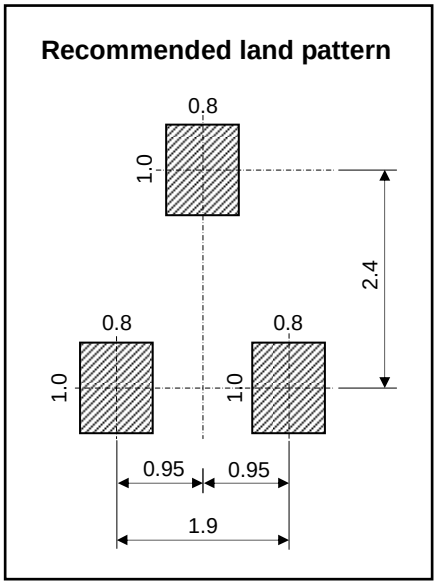
PACKAGE DIMENSIONS (SOT-23)

(Unit : mm)



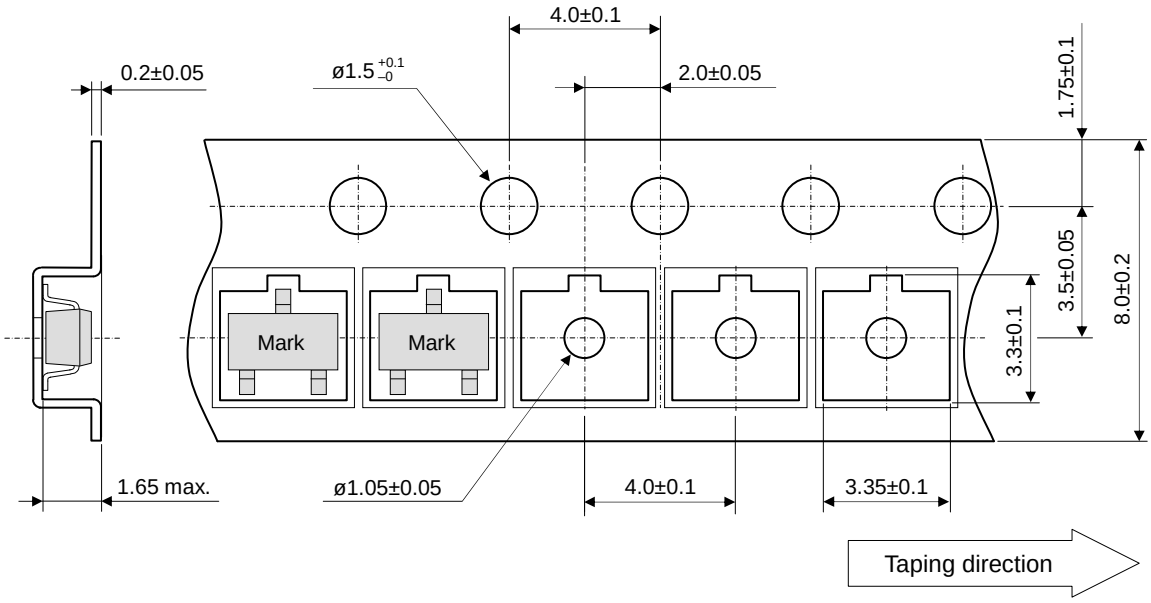






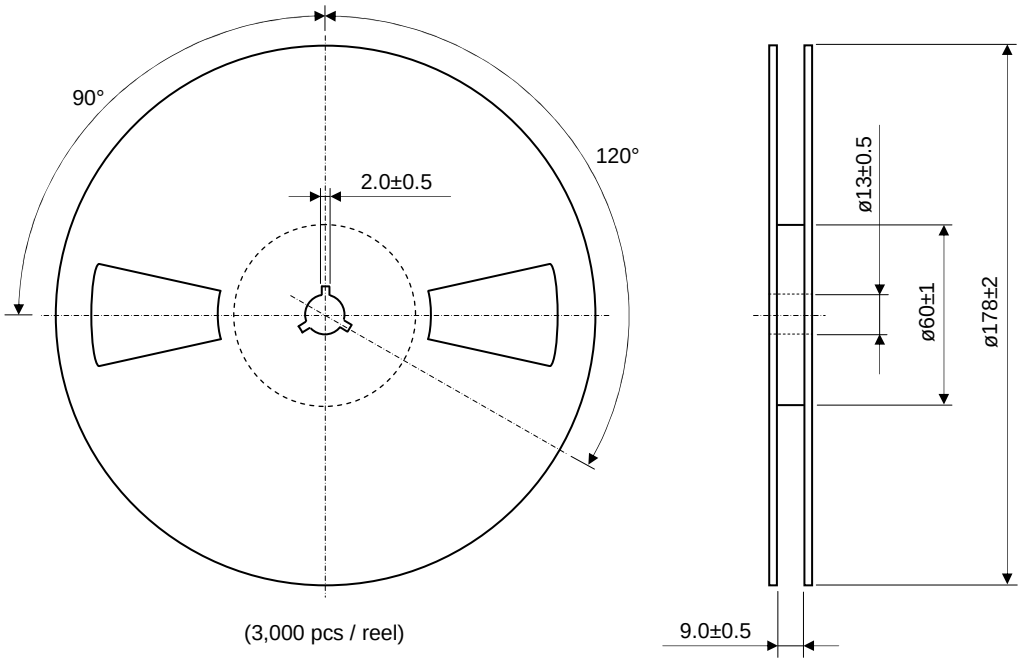
TAPING AND LOADING SPECIFICATIONS (SOT-23)

(Unit : mm)



REEL DIMENSIONS (SOT-23)

(Unit : mm)



(3,000 pcs / reel)

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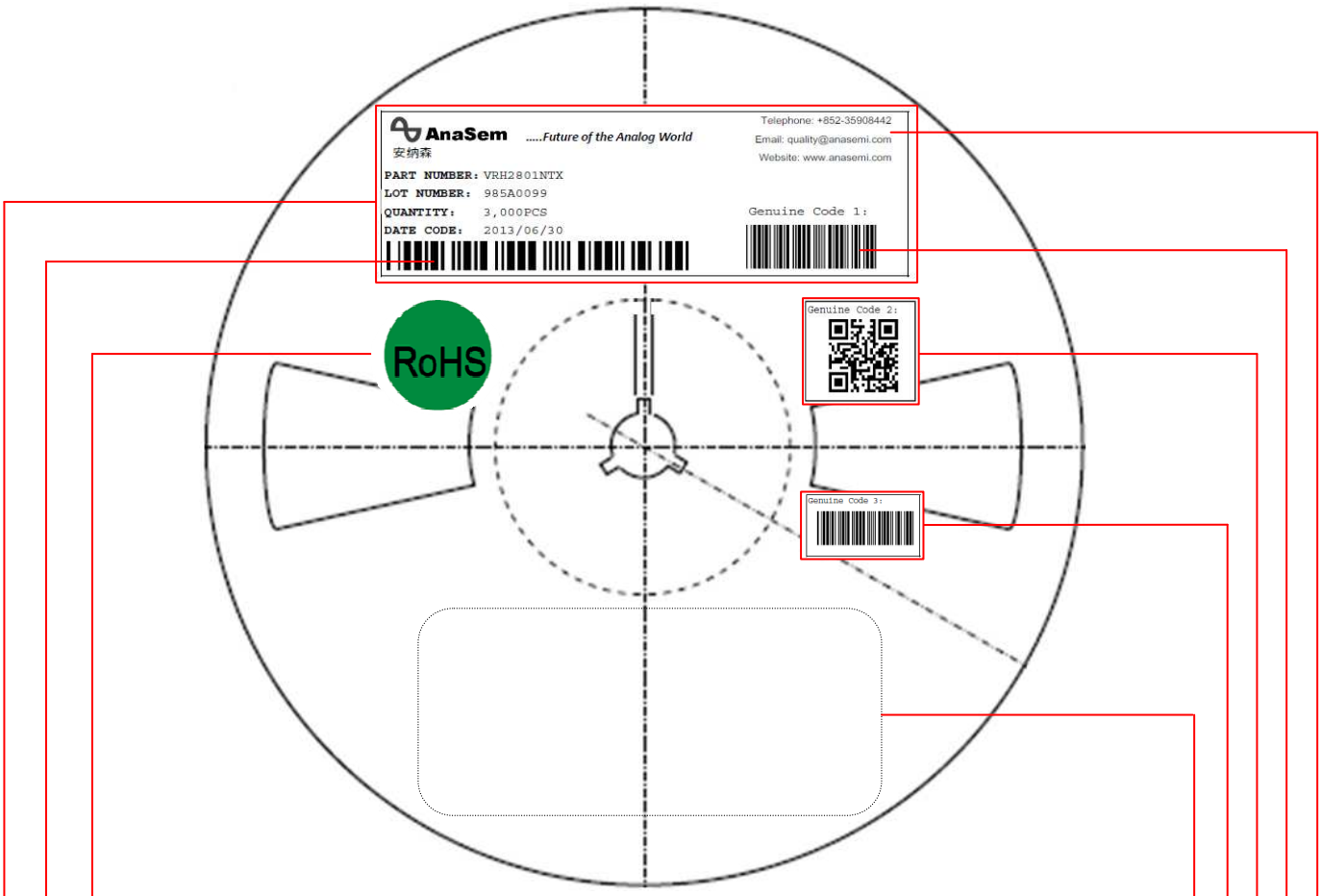
GENUINE PRODUCT LEGITIMATE LABEL DEFINITION



Green colored Circle “RoHS” Label

Ordinary Product Information Bar Code

AnaSem Logo and Brand Name (Black color Logo)

Other specific customized Labels

Our internal Outgoing Check Code 3

Our Internal QR Check Code 2

Our Internal Product Check Code 1

Genuine labels MUST include our correct contact information as shown