MH248 Hall-effect sensor is a temperature stable, stress-resistant , micro-power switch. Superior high-temperature performance is made possible through a dynamic offset cancellation that utilizes chopper-stabilization. This method reduces the offset voltage normally caused by device over molding, temperature dependencies, and thermal stress.

MH248 includes the following on a single silicon chip: voltage regulator, Hall voltage generator, small-signal amplifier, chopper stabilization, Schmitt trigger, open-drain output. Advanced CMOS wafer fabrication processing is used to take advantage of low-voltage requirements, component matching, very low input-offset errors, and small component geometries.

This device requires the presence of omni-polar magnetic fields for operation.

MH248 is rated for operation between the ambient temperatures –40℃ and + 85℃ for the E temperature range. The four package styles available provide magnetically optimized solutions for most applications. Package types SO is an SOT-23(1.1 mm nominal height),SQ is an QFN2020-3(0.5 mm nominal height),Tsot-23 is an ST(0.7 mm nominal height) ,a miniature low-profile surface-mount package, while package UA is a three-lead ultra-mini SIP for through-hole mounting.

The package type is in a lead Halogen Free version was verified by third party Lab.

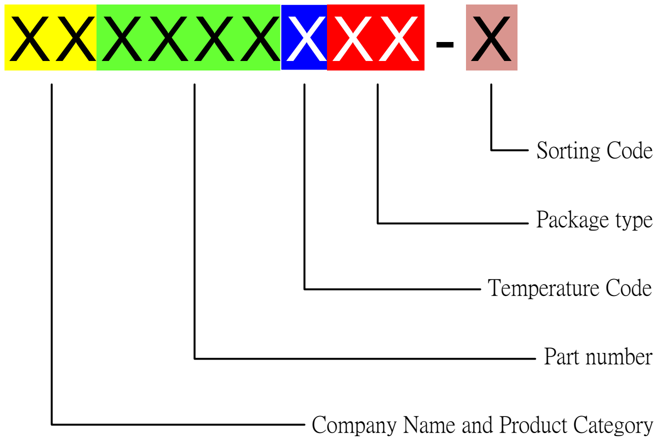
Features and Benefits

- CMOS Hall IC Technology
- Solid-State Reliability
- Micro power consumption for battery-powered applications
- Omni polar, output switches with absolute value of North or South pole from magnet
- Operation down to 2.5 V and Max at 3.5V.
- High Sensitivity for direct reed switch replacement applications
- Multi Small Size option
- Custom sensitivity selection is available in optional package.
- Pb Free/Green chip is qualified by third party lab.

Applications

- Solid state switch
- Handheld Wireless Handset Awake Switch (Flip Cell/PHS Phone/Note Book/Flip Video Set)
- Lid close sensor for battery powered devices
- Magnet proximity sensor for reed switch replacement in low duty cycle applications

Ordering Information



Company Name and Product Category

MH:MST Hall Effect/MP:MST Power IC

Part number

181,182,183,184,185,248,249,276,477,381,381F,381R,382…..

If part # is just 3 digits, the forth digit will be omitted.

Temperature range

E: 85 ℃, I: 105 ℃, K: 125 ℃, L: 150 ℃

Package type

UA:TO-92S,VK:TO-92S(4pin),VF:TO-92S(5pin),SO:SOT-23, SQ:QFN-3,ST:TSOT-23,SN:SOT-553,SF:SOT-89(5pin), SS:TSOT-26,SD:DFN-6

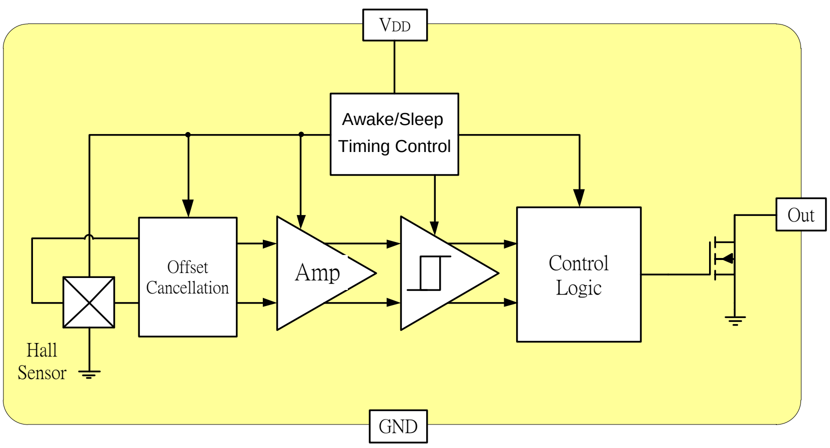
Sorting

α, β,Blank…..

Part No.	Temperature Suffix	Package Type
MH248EUA	E (-40℃ to + 85℃)	UA (TO-92S)
MH248ESO	E (-40℃ to + 85℃)	SO (SOT-23)
MH248EST	E (-40℃ to + 85℃)	ST (TSOT-23)
MH248ESQ	E (-40℃ to + 85℃)	SQ (QFN2020-3)
MH248ESO-α	E (-40℃ to + 85℃)	SO (SOT-23)
MH248ESO-β	E (-40℃ to + 85℃)	SO (SOT-23)
MH248ESO-γ	E (-40℃ to + 85℃)	SO (SOT-23)

Custom sensitivity selection is available by MST sorting technology

Functional Diagram



***Note**: Static sensitive device; please observe ESD precautions. Reverse V_{DD} protection is not included. For reverse voltage protection, a 100 Ω resistor in series with V_{DD} is recommended.*

Absolute Maximum Ratings At (Ta=25℃)

Characteristics		Values	Unit
Supply voltage,(V_{DD})		5	V
Output Voltage,(V_{out})		5	V
Reverse voltage, (V_{DD}) (V_{OUT})		-0.3	V
Magnetic flux density		Unlimited	Gauss
Output current(I_{OUT})		2	mA
Operating temperature range, (Ta)		-40 to +85	℃
Storage temperature range, (Ts)		-55 to +150	℃
Maximum Junction Temp,(Tj)		150	℃
Thermal Resistance	(θ_{JA}) UA / SO / ST / SQ	206 / 543 / 310 / 543	℃/W
	(θ_{JC}) UA / SO / ST /SQ	148 / 410 / 223 / 410	℃/W
Package Power Dissipation, (P_D)	UA / SO / ST / SQ	606 / 230 / 400 / 230	mW

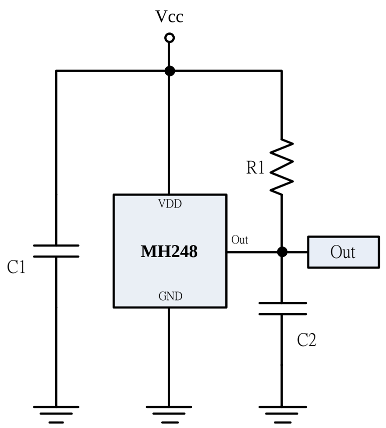
Note: *Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.*

Electrical Specifications

DC Operating Parameters T_A=+25℃, V_{DD}=3.0V

Parameters	Test Conditions	Min	Typ	Max	Units
Supply Voltage,(V_{DD})	Operating	2.5		3.5	V
Supply Current,(I_{DD})	Awake State		2.5	4.0	mA
	Sleep State		8.0	12	μA
	Average		10	16	μA
Output Leakage Current,(I_{off})	Output off			1	uA
Output Low Voltage,(V_{sat})	I_{OUT}=1mA			0.3	V
Awake mode time,(T_{aw})	Operating		70		uS
Sleep mode time,(T_{SL})	Operating		70		mS
Duty Cycle,(D,C)			0.1		%

Typical Application circuit



C1：10nF
C2：100pF
R1：100KΩ

MH248E UA/SQ Magnetic Specifications

DC Operating Parameters T_A=+25 ℃, V_{DD}=3.0V

Parameter	*Symbol*	*Test Conditions*	*Min.*	*Typ.*	*Max.*	*Units*
Operating Point	B_{OPS}	S pole to branded side, B > BOP, Vout On	6		60	Gauss
	B_{OPN}	N pole to branded side, B > BOP, Vout On	-60		-6	Gauss
Release Point	B_{RPS}	S pole to branded side, B < BRP, Vout Off	5		59	Gauss
	B_{RPN}	N pole to branded side, B < BRP, Vout Off	-60		-5	Gauss
Hysteresis	B_{HYS}	|BOPx - BRPx|		7		Gauss

MH248E SO/ST Magnetic Specifications

DC Operating Parameters T_A=+25 ℃, V_{DD}=3.0V

Parameter	*Symbol*	*Test Conditions*	*Min.*	*Typ.*	*Max.*	*Units*
Operating Point	B_{OPS}	N pole to branded side, B > BOP, Vout On	6		60	Gauss
	B_{OPN}	S pole to branded side, B > BOP, Vout On	-60		-6	Gauss
Release Point	B_{RPS}	N pole to branded side, B < BRP, Vout Off	5		59	Gauss
	B_{RPN}	S pole to branded side, B < BRP, Vout Off	-60		-5	Gauss
Hysteresis	B_{HYS}	|BOPx - BRPx|		7		Gauss

MH248ESO-α Magnetic Specifications

DC Operating Parameters T_A=+25 ℃, V_{DD}=3.0V

Parameter	*Symbol*	*Test Conditions*	*Min.*	*Typ.*	*Max.*	*Units*
Operating Point	B_{OPS}	N pole to branded side, B > BOP, Vout On	21		40	Gauss
	B_{OPN}	S pole to branded side, B > BOP, Vout On	-60		-6	Gauss
Release Point	B_{RPS}	N pole to branded side, B < BRP, Vout Off			39	Gauss
	B_{RPN}	S pole to branded side, B < BRP, Vout Off	-59			Gauss
Hysteresis	B_{HYS}	|BOPx - BRPx|		7		Gauss

MH248ESO-β Magnetic Specifications

DC Operating Parameters T_A=+25 ℃, V_{DD}=3.0V

Parameter	*Symbol*	*Test Conditions*	*Min.*	*Typ.*	*Max.*	*Units*
Operating Point	B_{OPS}	N pole to branded side, B > BOP, Vout On	31		60	Gauss
	B_{OPN}	S pole to branded side, B > BOP, Vout On	-60		-6	Gauss
Release Point	B_{RPS}	N pole to branded side, B < BRP, Vout Off			59	Gauss
	B_{RPN}	S pole to branded side, B < BRP, Vout Off	-59			Gauss
Hysteresis	B_{HYS}	|BOPx - BRPx|		7		Gauss

MH248ESO-γ Magnetic Specifications

DC Operating Parameters T_A=+25℃, V_{DD}=3.0V

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Operating Point	B_{OPS}	N pole to branded side, B > BOP, Vout On	12		35	Gauss
	B_{OPN}	S pole to branded side, B > BOP, Vout On	-60		-6	Gauss
Release Point	B_{RPS}	N pole to branded side, B < BRP, Vout Off			34	Gauss
	B_{RPN}	S pole to branded side, B < BRP, Vout Off	-59			Gauss
Hysteresis	B_{HYS}	|BOPx - BRPx|		7		Gauss

MH248E UA / SO / ST / SQ Output Behavior versus Magnetic Polar

DC Operating Parameters Ta = -40 to 85℃, V_{DD}=2.5V to 3.5V

Parameter	Test condition	OUT(UA,SO,ST,SQ)
South pole	B<Bop[(-60)~(-6)]	Low
Null or weak magnetic field	B=0 or B < BRP	Open(Pull-up Voltage)
North pole	B>Bop(60~6)	Low

MH248ESO-α Output Behavior versus Magnetic Polar

DC Operating Parameters Ta = -40 to 85℃, V_{DD}=2.5V to 3.5V

Parameter	Test condition	OUT(ESO-α)
South pole	B<Bop[(-60)~(-6)]	Low
Null or weak magnetic field	B=0 or B < BRP	Open(Pull-up Voltage)
North pole	B>Bop(21~40)	Low

MH248ESO-β Output Behavior versus Magnetic Polar

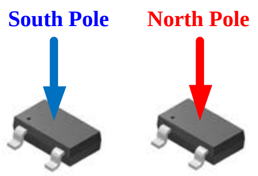
DC Operating Parameters Ta = -40 to 85℃, V_{DD}=2.5V to 3.5V

Parameter	Test condition	OUT(ESO-β)
South pole	B<Bop[(-60)~(-6)]	Low
Null or weak magnetic field	B=0 or B < BRP	Open(Pull-up Voltage)
North pole	B>Bop(30~60)	Low

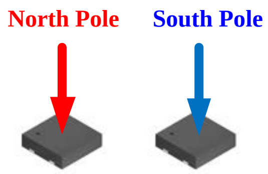
MH248ESO-γ Output Behavior versus Magnetic Polar

DC Operating Parameters Ta = -40 to 85℃, V_{DD}=2.5V to 3.5V

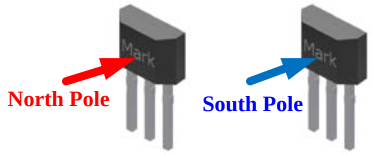
Parameter	Test condition	OUT(ESO-γ)
South pole	B<Bop[(-60)~(-6)]	Low
Null or weak magnetic field	B=0 or B < BRP	Open(Pull-up Voltage)
North pole	B>Bop(12~35)	Low



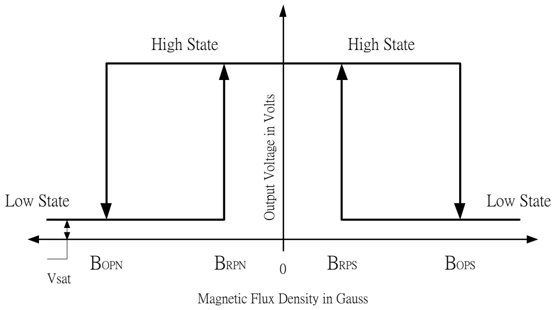
SO/ST package



SQ package

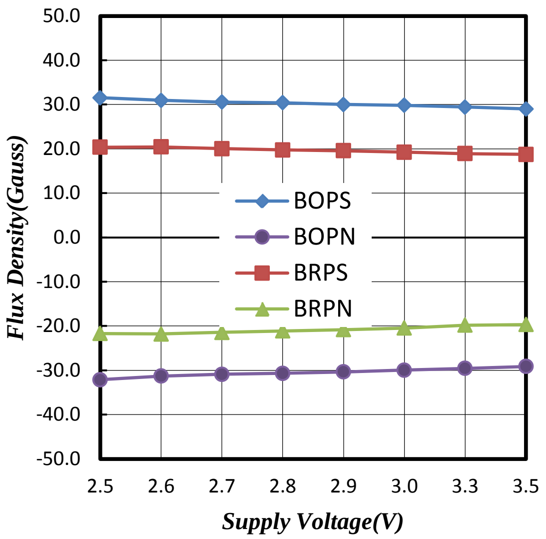


UA package

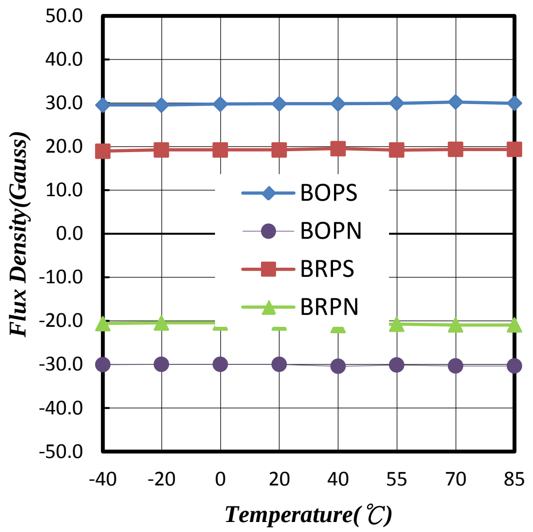


Performance Graph

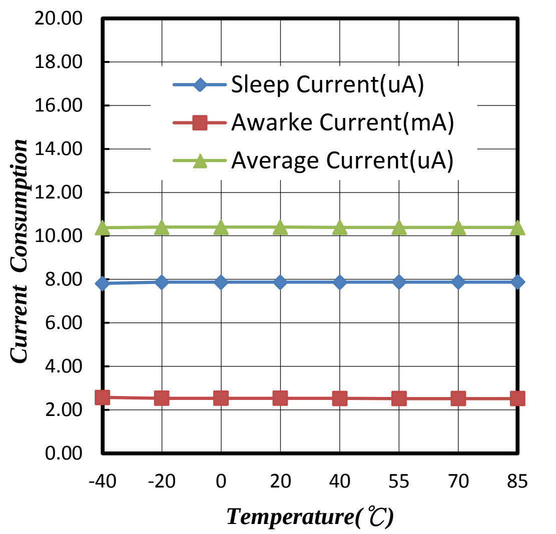
Typical Supply Voltage(V_{DD}) Versus Flux Density



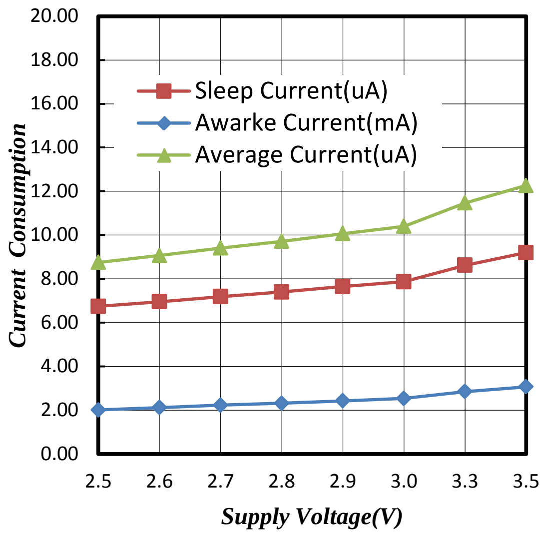
Typical Temperature(T_A) Versus Flux Density



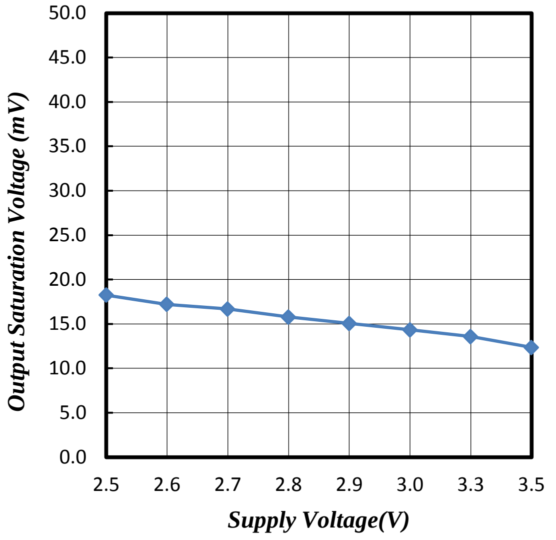
Typical Temperature(T_A) Versus Supply Current(I_{DD})



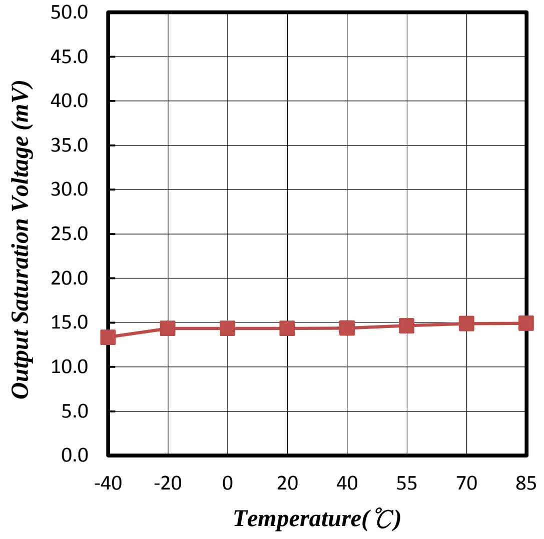
Typical Supply Voltage(V_{DD}) Versus Supply Current(I_{DD})



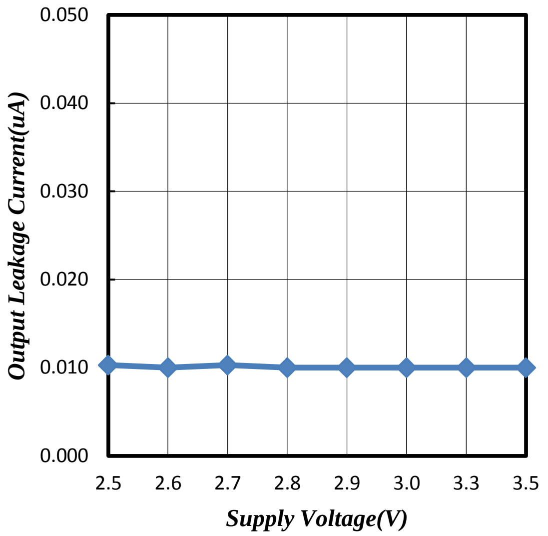
Typical Supply Voltage(V_{DD}) Versus Output Voltage(V_{DSON})



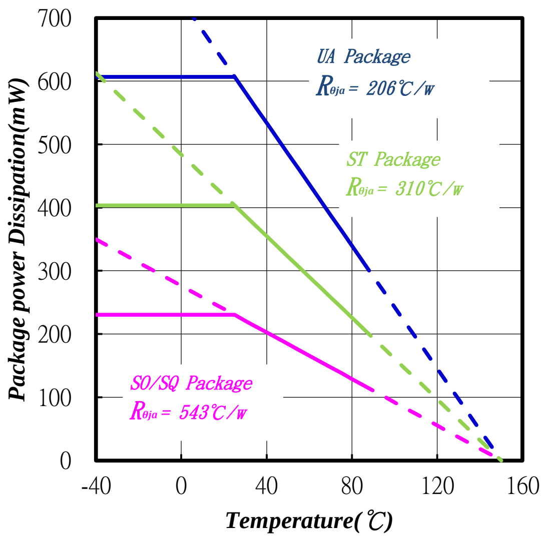
Typical Temperature(T_A) Versus Output Voltage(V_{DSON})



Typical Supply Voltage(V_{DD}) Versus Leakage Current(I_{OFF})



Power Dissipation versus Temperature(T_A)



Package Power Dissipation

The power dissipation of the Package is a function of the pad size. This can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by $T_{J(max)}$, the maximum rated junction temperature of the die, $R_{\theta JA}$, the thermal resistance from the device junction to ambient, and the operating temperature, Ta. Using the values provided on the data sheet for the package, PD can be calculated as follows:

$$P_D = \frac{T_{J(max)} - Ta}{R_{\theta ja}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature Ta of 25°C, one can calculate the power dissipation of the device which in this case is 606 milliwatts.

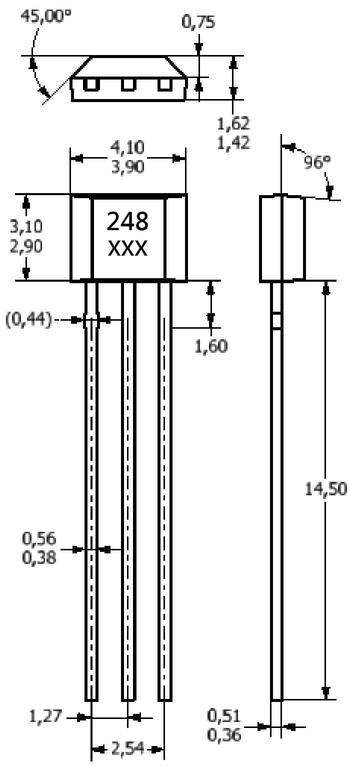
$$P_D(UA) = \frac{150°C - 25°C}{206°C/_W} = 606mW$$

The 206℃/W for the UA package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 606 milliwatts. There are other alternatives to achieving higher power dissipation from the Package. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

Sensor Location, Package Dimension and Marking

MH248 Package

UA Package



NOTES:

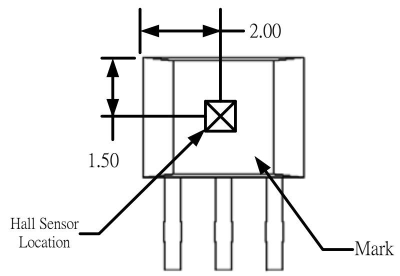
1).Controlling dimension: mm 2).Leads must be free of flash
and plating voids

3).Do not bend leads within
1 mm of lead to package
interface.

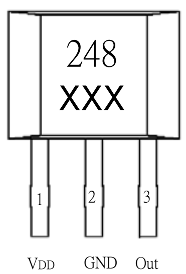
4).PINOUT:

Pin 1	VDD
Pin 2	GND
Pin 3	Output

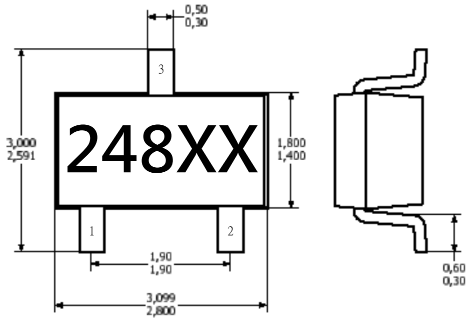
Hall Chip location

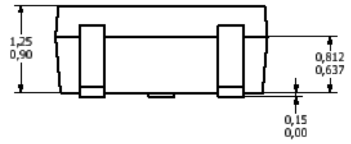


Output Pin Assignment
(Top view)

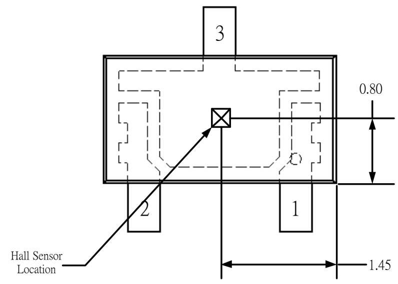


SO Package
(Top View)





Hall Plate Chip Location
(Bottom view)



NOTES:

1. PINOUT (See Top View at left :)

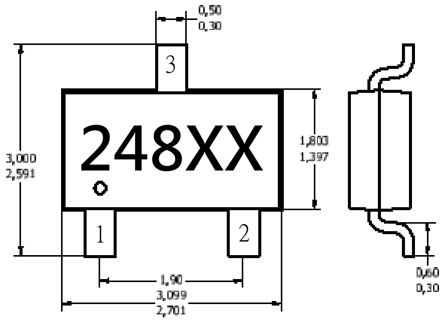
   Pin 1 V_{DD}

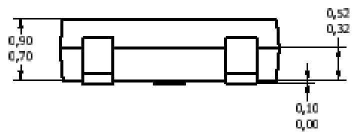
   Pin 2 Output

   Pin 3 GND

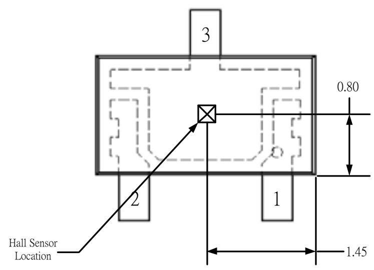
2. Controlling dimension: mm
3. Lead thickness after solder plating will be 0.254mm maximum

ST Package (TSOT-23)
(Top View)





Hall Plate Chip Location
(Bottom view)



NOTES:

1. PINOUT (See Top View at left:)

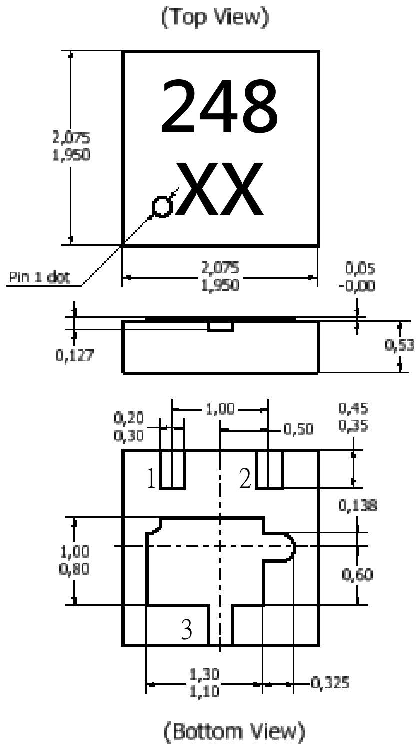
   Pin 1 V_{DD}

   Pin 2 Output

   Pin 3 GND

2. Controlling dimension: mm;

SQ Package



NOTES:

3. PINOUT (See Top View at left)

   Pin 1 VDD

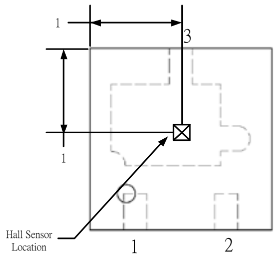
   Pin 2 Output

   Pin 3 GND

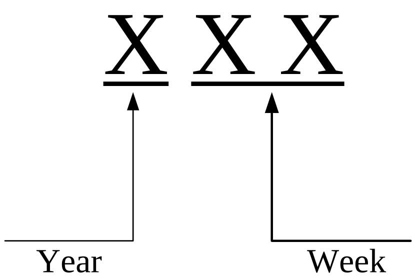
4. Controlling dimension: mm;
5. Chip rubbing will be 10mil maximum;
6. Chip must be in PKG. center.

Hall Plate Chip Location

(Top view)

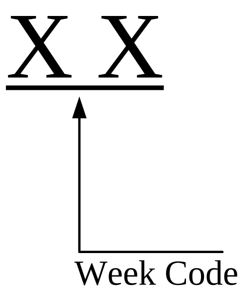


MH248 UA(TO-92S) Package Date Code



EX：2013 Year_8 Week → 308

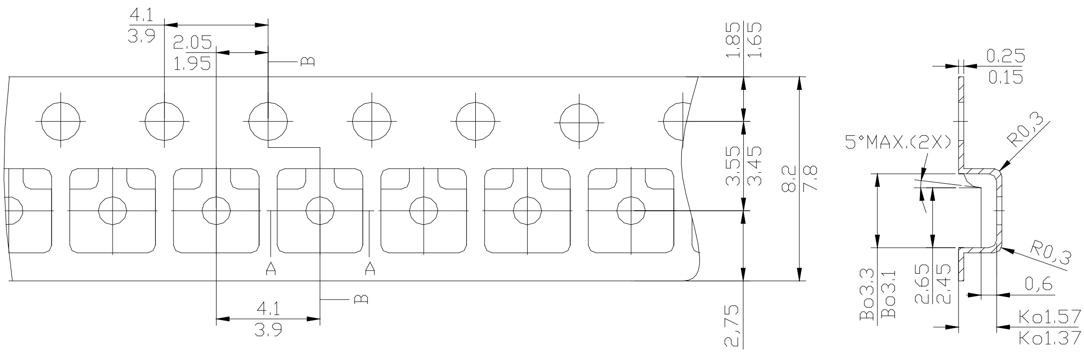
MH248 SO(SOT-23)/ ST(TSOT-23)/ SQ(QFN2020-3) Package Date Code

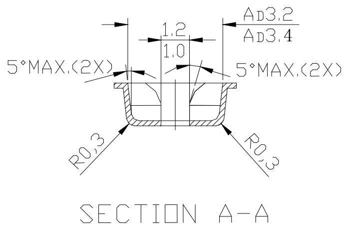


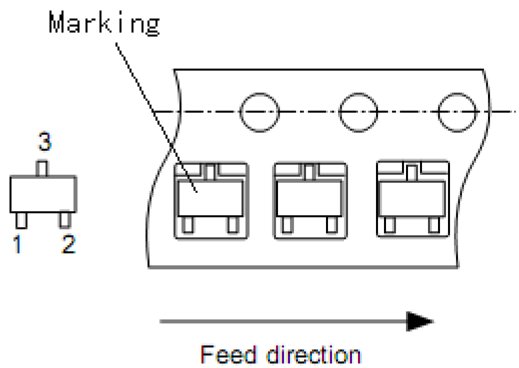
week	1	2	3	4	5	6	7	8	9	10	11	12	13
code	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM
week	14	15	16	17	18	19	20	21	22	23	24	25	26
code	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ
week	27	28	29	30	31	32	33	34	35	36	37	38	39
code	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM
week	40	41	42	43	44	45	46	47	48	49	50	51	52
code	RN	RO	RP	RQ	RR	RS	RT	RU	RV	RW	RX	RY	RZ

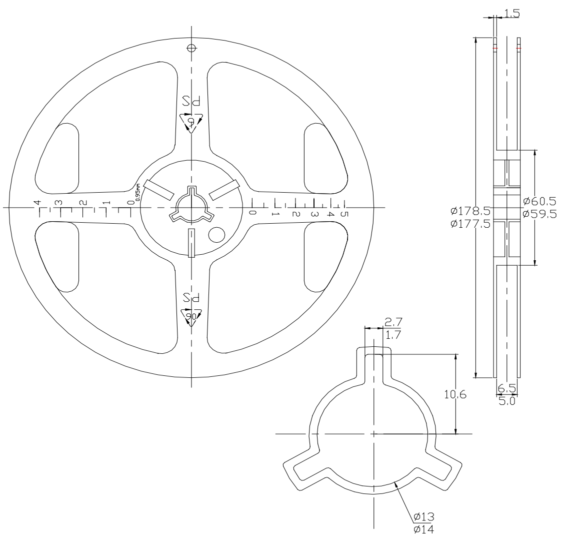
EX：2013 Year_8 Week → QH

SOT-23 & TSOT-23 package Tape On Reel Dimension





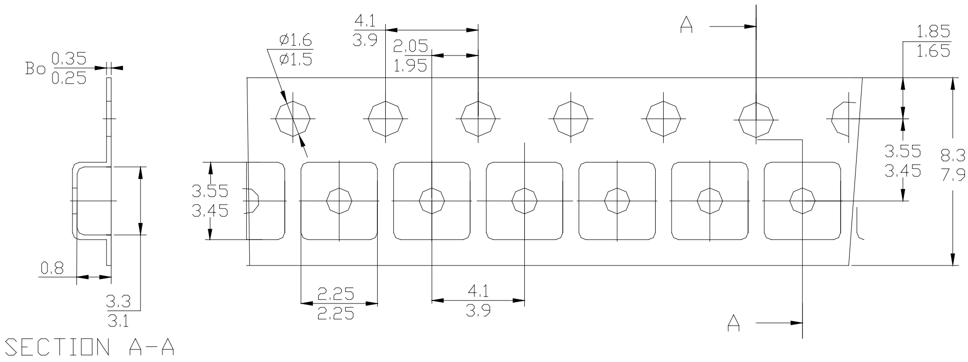


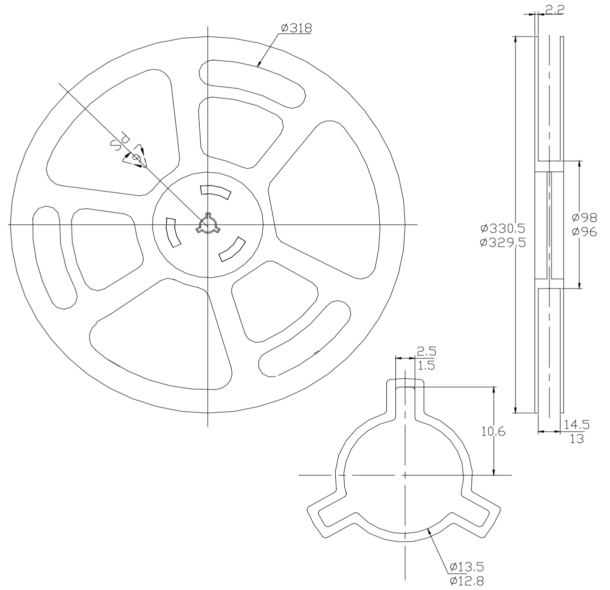


NOTES:

1. Material: Conductive polystyrene;
2. DIM in mm;
3. 10 sprocket hole pitch cumulative tolerance ±0.2;
4. Camber not to exceed 1mm in 100mm;
5. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole;
6. (S.R. OHM/SQ) Means surface electric resistivity of the carrier tape.

QFN2020-3 Tape On Reel Dimension

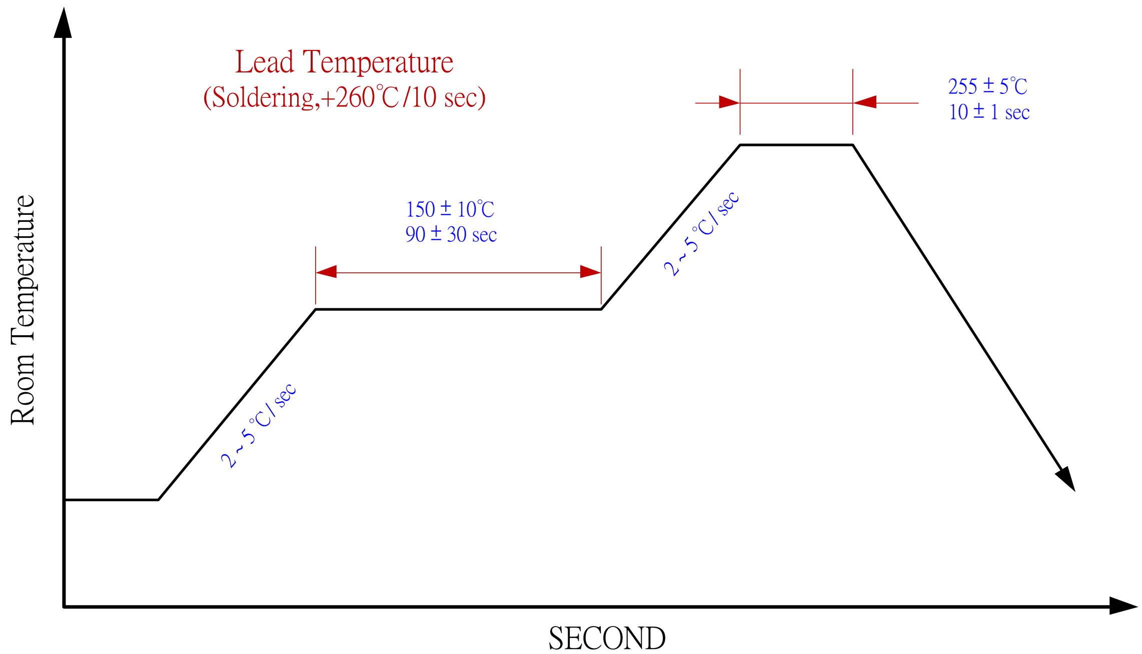




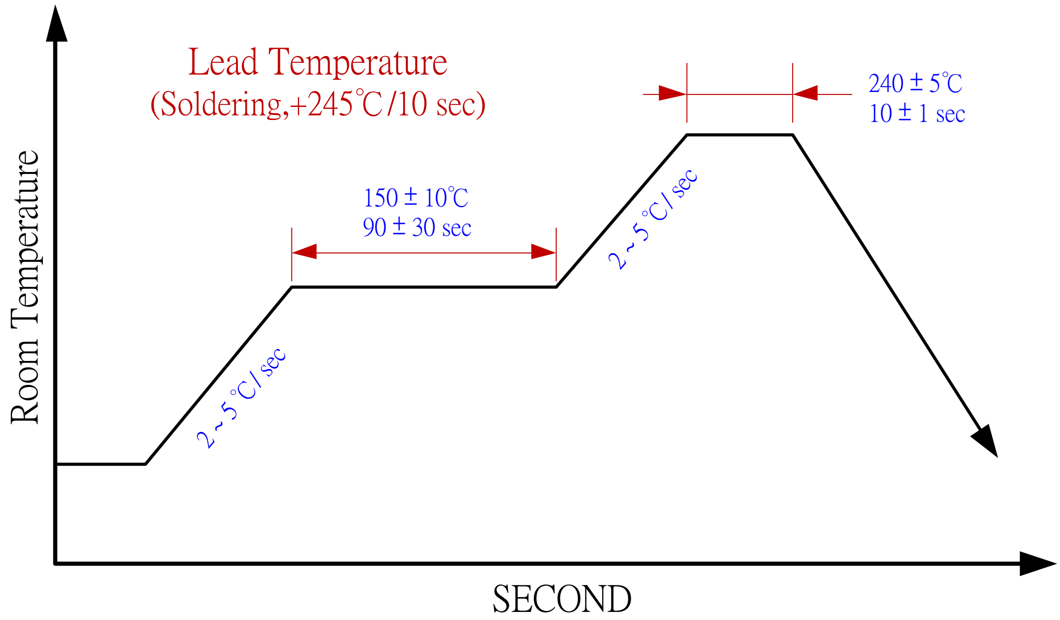
NOTES:

7. Material: Conductive polystyrene;
8. DIM in mm;
9. 10 sprocket hole pitch cumulative tolerance ±0.2;
10. Camber not to exceed 1mm in 100mm;
11. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole;
12. (S.R. OHM/SQ) Means surface electric resistivity of the carrier tape.

IR reflow curve



SO/ST/SQ Soldering Condition



UA Soldering Condition

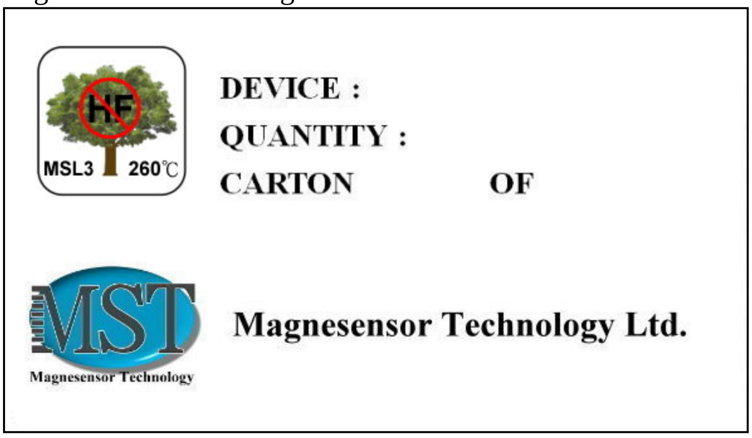
Packing specification:

Package	Bag	Box	Carton
TO-92S-3L	1,000pcs/bag	10bag/box	8 box/carton
SOT-23-3L	3,000pcs/reel	10 reel/box	box/carton
TSOT-23-3L	3,000pcs/reel	10 reel/box	box/carton
QFN2020-3	3,000pcs/reel	10 reel/box	box/carton

TO-92S-3L	Weight	SOT-23-3L TSOT-23-3L	Weight	QFN2020-3	Weight
1000pcs/bag	0.11kg	3000pcs/reel	0.18kg	3000pcs/reel	0.13kg
10 bags/box	1.24kg	10 reels/box	1.99kg	10 reels/box	1.40kg
8 boxes/carton	10.09kg	2 boxes/carton	4.9kg	2boxes/carton	3.70kg

Inner box label **:** Size: 3.4cm*6.4cm
Bag and inner box Halogen Free Label

Carton label **:** Size: 5.6 cm * 9.8 cm
Bag and inner box Halogen Free Label



Combine:

When combine lot, one reel could have two D/C and no more than two DC. One carton could have two devices, no more than two;