The MH481, a linear Hall-effect sensor, is composed of Hall sensor, linear amplifier and totem-pole output stage. It features low noise output, which makes it unnecessary to use external filtering. It also can provide increased temperature stability and accuracy. The linear Hall sensor has a wide operating temperature range of -40℃ to +105℃, appropriate for commercial, consumer, and industrial environments.

The high sensitivity of Hall-effect sensor accurately tracks extremely weak changes in magnetic flux density. The linear sourcing output voltage is set by the supply voltage and in proportion to variations of the magnetic flux density. Typical operation current is 2.5 mA and operating voltage range is 3.0 volts to 6.5 volts.

The UA package style available provides magnetically optimized solutions for most applications. The SQ package is a three-lead ultra-mini SMD and SG is the industrial standard package in SMT process.

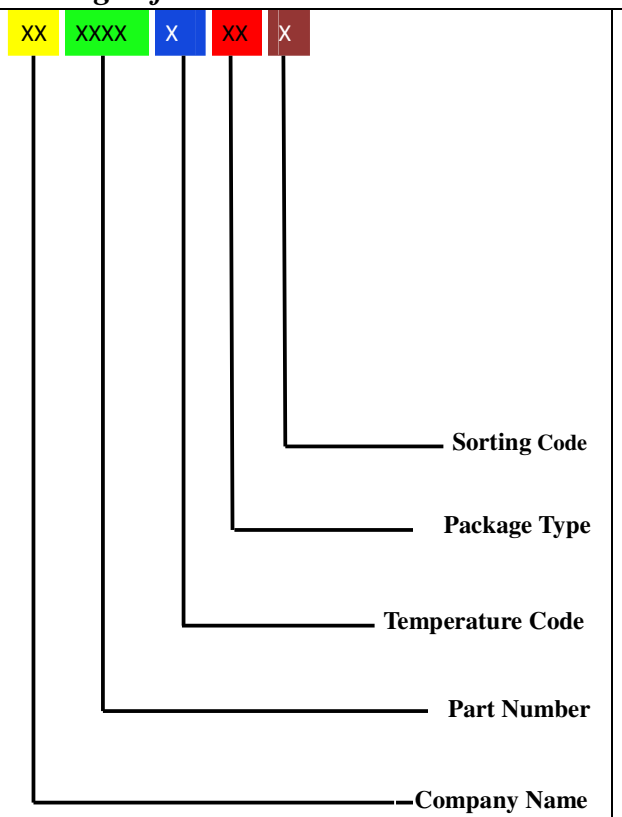
Features and Benefits

- Operating Voltage Range: 3.0V~6.5V
- Power consumption of 2.5 mA at 5 V_{DC} for energy efficiency
- Low-Noise Operation
- Linear output for circuit design flexibility
- Totem-Pole for a stable and accurate output
- Responds to either positive or negative gauss
- Small package for SMD
- Magnetically Optimized Package for SIP
- Cost competitive
- Robust ESD performance

Applications

- Current sensing
- Motor control
- Position sensing
- Magnetic code reading
- Rotary encoder
- Ferrous metal detector
- Vibration sensing
- Liquid level sensing
- Weight sensing

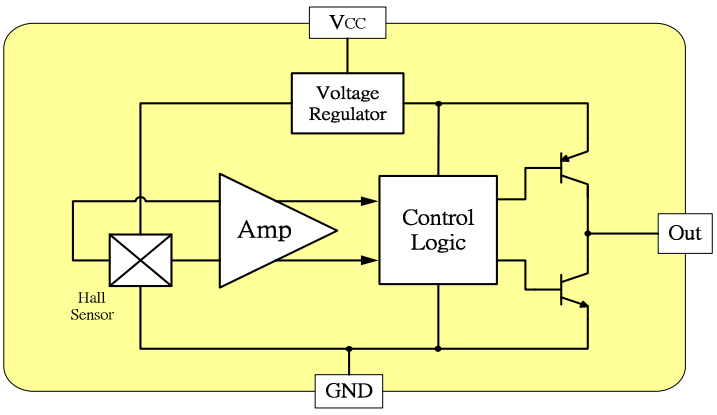
Ordering Information



Sorting Code	α , β ,Blank…..
Package Type	UA:TO-92S,SO:SOT-23,ST:Tsot-23,SQ:QFN
Temperature Code	E: 85^{O} C, K: 125^{O} C, L: 150^{O} C
Part Number	181,182,185,186,187,189,281,282,248,249…
Company Name	MH: Magnesensor Technology

Part No.	Temperature Suffix	Package Type
MH481IUA	I (-40℃ to + 105℃)	UA (TO-92S)
MH481ISG	I (-40℃ to + 105℃)	SG (SOT89-3)
MH481ISQ	I (-40℃ to + 105℃)	SQ (QFN2020-3)

Function Block Diagram, Current Sourcing Output



Absolute Maximum Ratings

Characteristics		Values	Unit
Supply Voltage,(*Vcc*)		8	V
Reverse Voltage , (*Vcc*)		-0.5	V
Magnetic Flux Density		Unlimited	Gauss
Output Current , (*Iout*)		10	mA
Operating Temperature Range, (*Ta*)	"I" version	-40 to +105	℃
Storage temperature range, (*Ts*)		-65 to +150	℃
Maximum Junction Temp,(*Tj*)		150	℃
Thermal Resistance	(θ_{ja}) UA / SQ / SG	206 / 543 / 156	℃/W
	(θ_{jc}) UA / SQ / SG	148 / 410 / 34	℃/W
Package Power Dissipation, (P_D)	UA / SQ / SG	606 / 230 / 800	mW

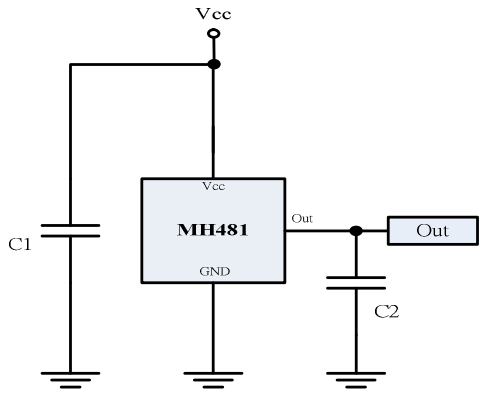
***Note**: Do not apply reverse voltage to V_{CC} and V_{OUT} Pin ,it may cause a malfunction or damaged the device.*

Electrical Specifications

DC Operating Parameters T_A=+25℃, V_{CC}=5V (Unless otherwise specified)

Parameters	Test Conditions	Min	Typ	Max	Units
Supply Voltage,(*Vcc*)	Operating	3.0		6.5	V
Supply Current,(*Icc*)	B=0 Gauss		2.5	5.0	mA
Output Current ,(*Io*)	Vcc>3V	1.0	1.5		mA
Null Output Voltage, (V_{Null})	B=0 Gauss	2.3	2.5	2.7	V
Output Bandwidth, (*Bw*)			20		kHz
Output Voltage Span, (*Vos*)		2.95	3.2		V
Magnetic Range Gauss		±500	±800		Gauss
Linearity	% of Span		0.7		
Response Time			3		uS
Sensitivity		1.8		2.2	mV/G
Electro-Static Discharge	HBM	3			kV

Typical application circuit

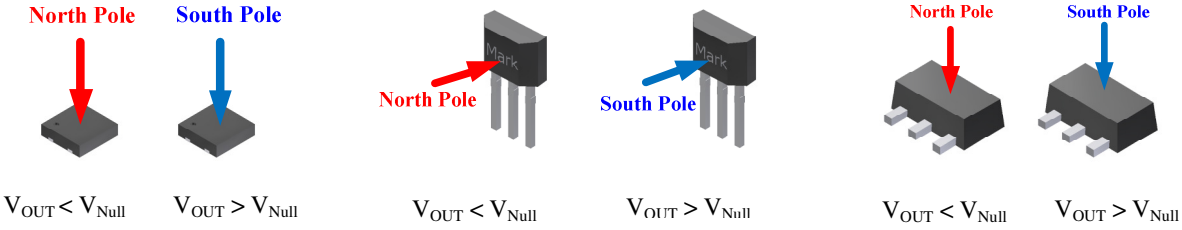


C1：1000PF

C2：10PF

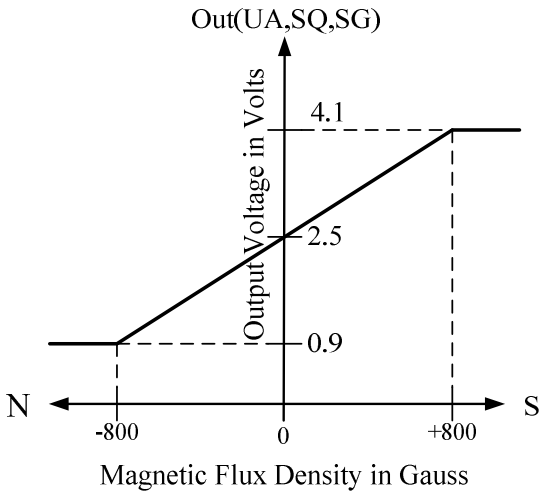
Output Behavior versus Magnetic Pole

DC Operating Parameters : T_a = 25℃, V_{CC}= 5V



$V_{OUT} < V_{Null}$ $V_{OUT} > V_{Null}$ $V_{OUT} < V_{Null}$ $V_{OUT} > V_{Null}$ $V_{OUT} < V_{Null}$ $V_{OUT} > V_{Null}$

SQ package **UA package** **SG package**



Output Voltage

The output voltage of linear Hall Effect Sensor is an analog signal and which is proportional to the magnetic flux density. The basis of its output voltage will be changed by the supply voltage. Therefore, under the different supply voltage, the output voltage is proportional to magnetic flux density. V_{OUT} can be calculated as follows:

$$V_{OUT} = \frac{1}{2} \times V_{CC} + B_M \times \text{Sensitivity}$$

While $$\text{Sensitivity} = \left[\frac{1}{2} \times (V_{CC} - 1) - \left(\frac{T_a - 25}{20} \times 0.09 \right) \right] \times \frac{1}{1000}$$

V_{OUT} is output voltage of IC (V)

V_{CC} is supply voltage of IC (V)

B_M is magnetic flux density on IC (Gauss)

Sensitivity can be calculated via the supply voltage (V_{CC}) and ambient temperature (T_a)

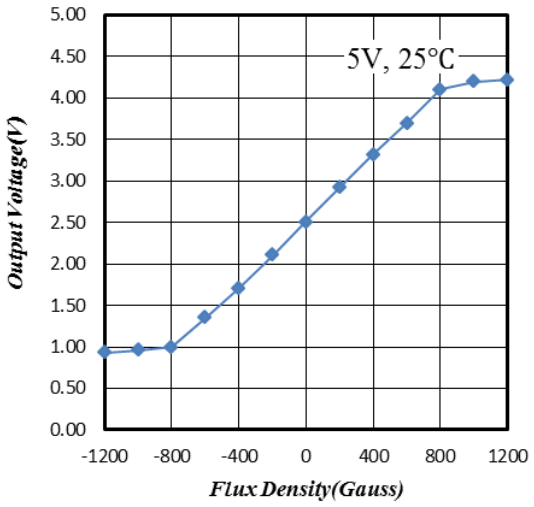
T_a is ambient temperature of IC(℃)

The range of parameters that can meet the above formula: the supply voltage is from 3V to 6.5V;

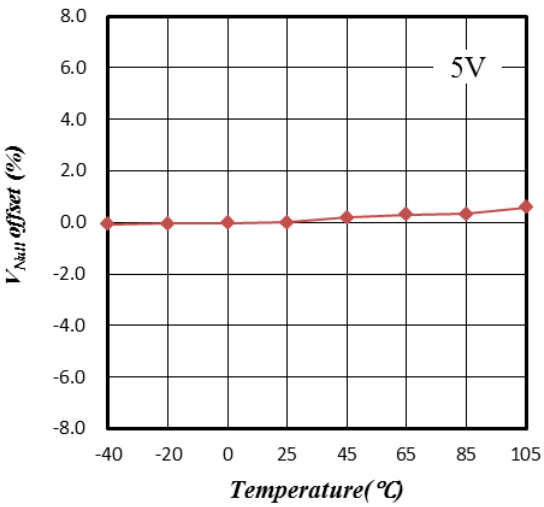
T_a is between 25℃ to 105℃, the magnetic flux density is between -800Gauss ~ +800Gauss. If T_a is lower than 25 ° C, the temperature effect $\left(\frac{T_a - 25}{20} \times 0.09\right)$ on Sensitivity is negligible.

Performance Graph

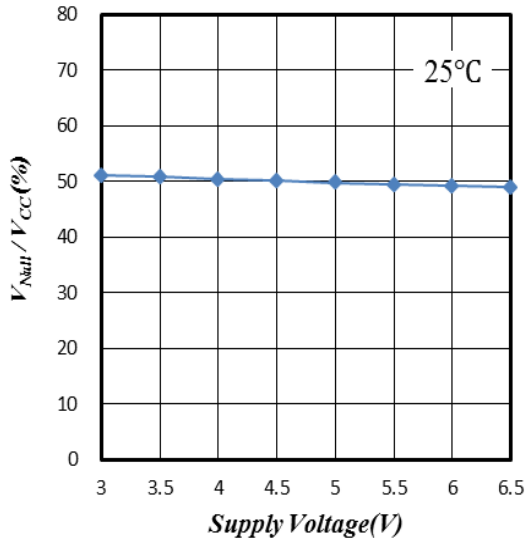
Typical Flux Density Versus Output Voltage



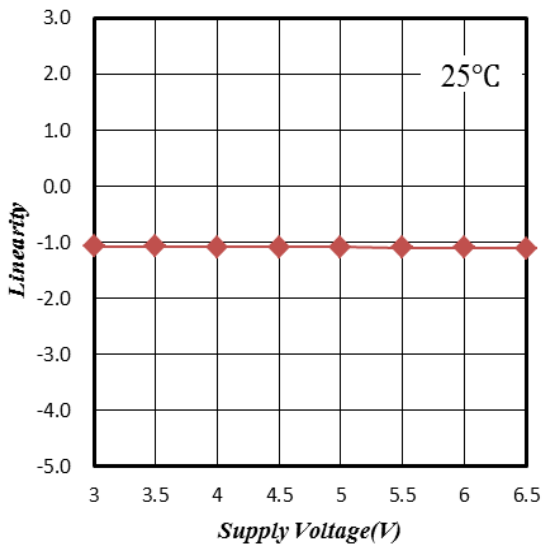
Typical Temperature(T_A) Versus Output Voltage Offset



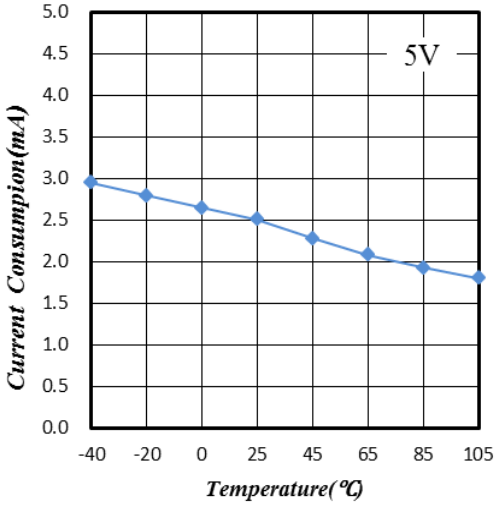
Typical Supply Voltage(V_{CC}) Versus Ratio of V_{out} to V_{CC}



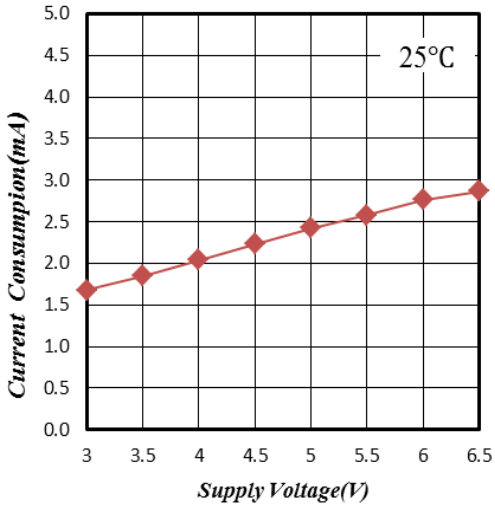
Typical Supply Voltage(V_{CC}) Versus Linearity



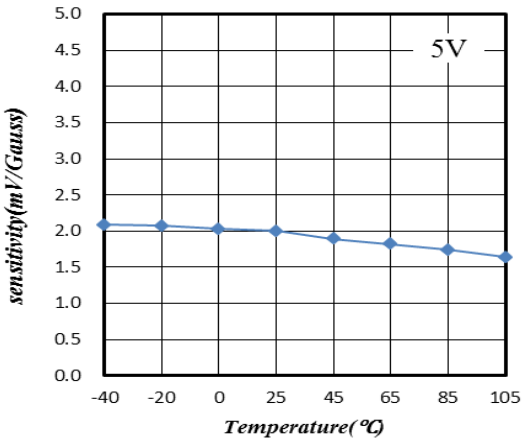
Typical Temperature(T_A) Versus Supply Current(I_{CC})



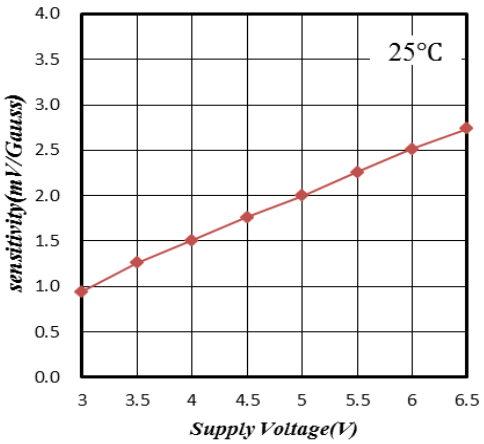
Typical Supply Voltage(V_{CC}) Versus Supply Current(I_{CC})



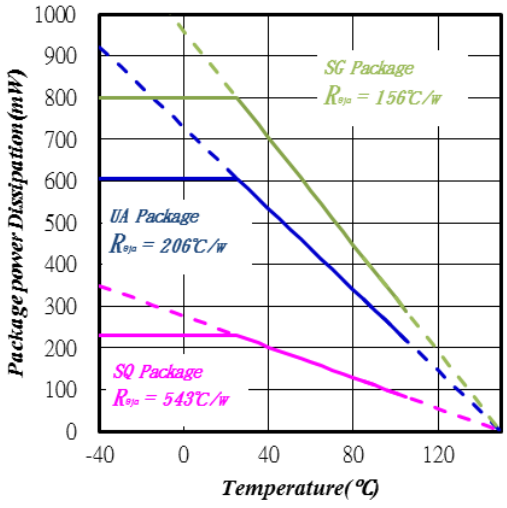
Typical Temperature(T_A) Versus Sensitivity



Typical Supply Voltage(V_{CC}) Versus Sensitivity



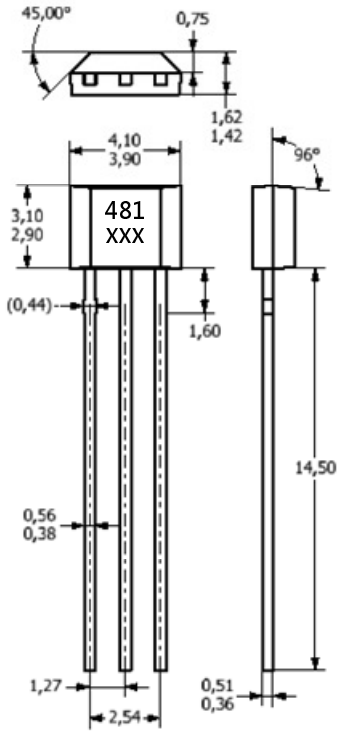
Power Dissipation Versus Temperature(T_A)



Sensor Location, package dimension and marking

MH481 Package

UA Package



NOTES:

1).Controlling dimension: mm

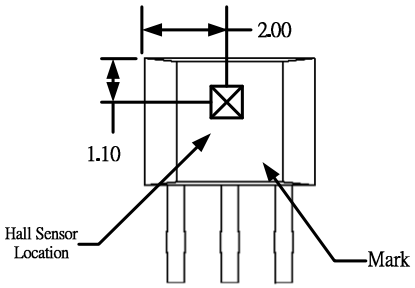
2).Leads must be free of flash and plating voids

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

4).PINOUT:

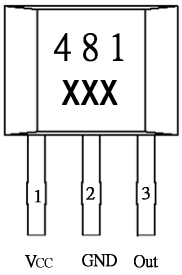
Pin 1	VCC
Pin 2	GND
Pin 3	Output

Hall Chip location

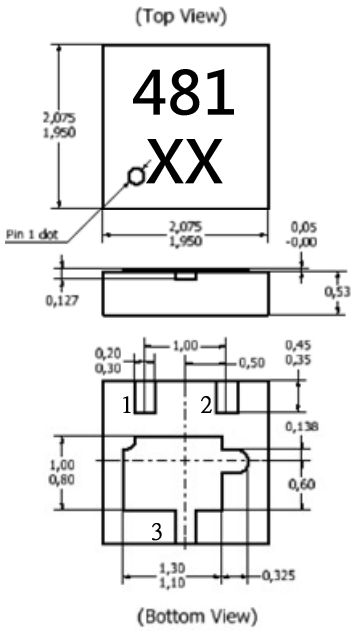


Output Pin Assignment

(Top view)



SQ Package



NOTES:

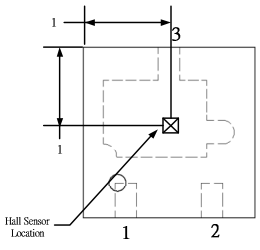
1. PINOUT (See Top View at left)

Pin 1	VCC
Pin 2	Output
Pin 3	GND

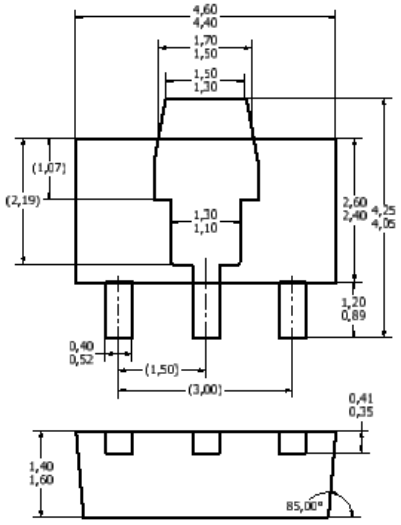
2. Controlling dimension: mm;
3. Chip rubbing will be 10mil maximum;
4. Chip must be in PKG. center.

Hall Plate Chip Location

(Top view)



SG Package

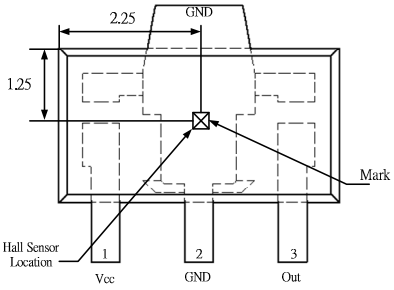


NOTES:

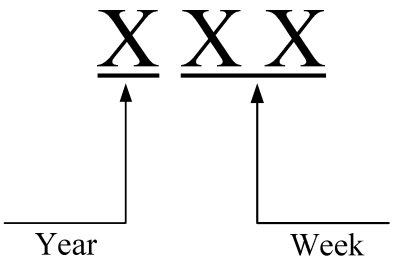
5. PINOUT (See Top View at left)
   Pin 1 VCC
   Pin 2 GND
   Pin 3 Output
6. Controlling dimension: mm;
7. Chip rubbing will be 10mil maximum;
8. Chip must be in PKG. center.

Hall Plate Chip Location

(Top view)

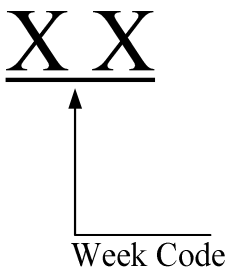


MH481 UA(TO-92S)/SG(SOT89-3) Package Date Code



EX：2013 Year_17 Week → 317

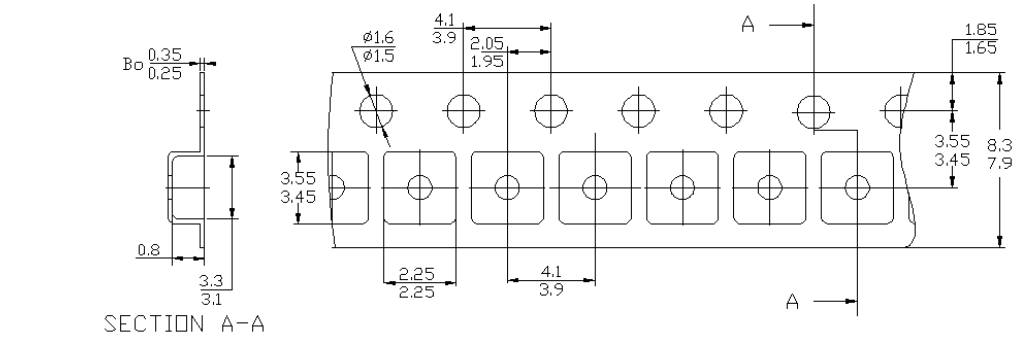
MH481 SQ(QFN2020-3) Package Date Code

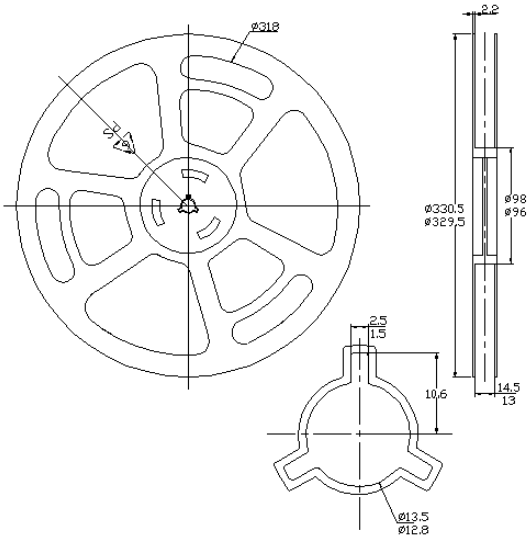


week	1	2	3	4	5	6	7	8	9	10	11	12	13
code	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM
week	14	15	16	17	18	19	20	21	22	23	24	25	26
code	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ
week	27	28	29	30	31	32	33	34	35	36	37	38	39
code	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM
week	40	41	42	43	44	45	46	47	48	49	50	51	52
code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

EX：2013 Year_17 Week → QQ

QFN2020-3 Tape On Reel Dimension

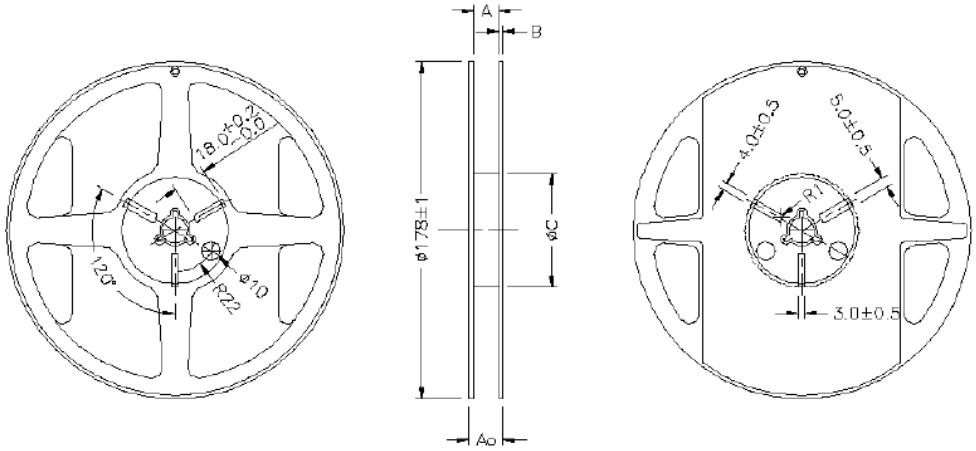


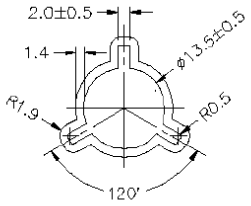


NOTES:

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.

SG SOT89-3 Tape On Reel Dimension

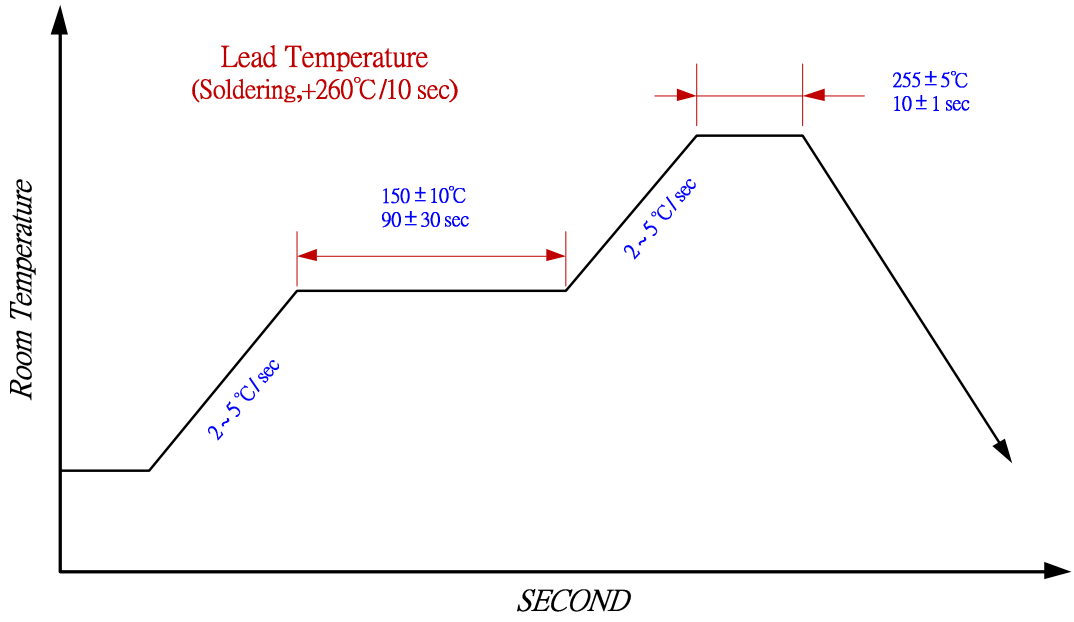




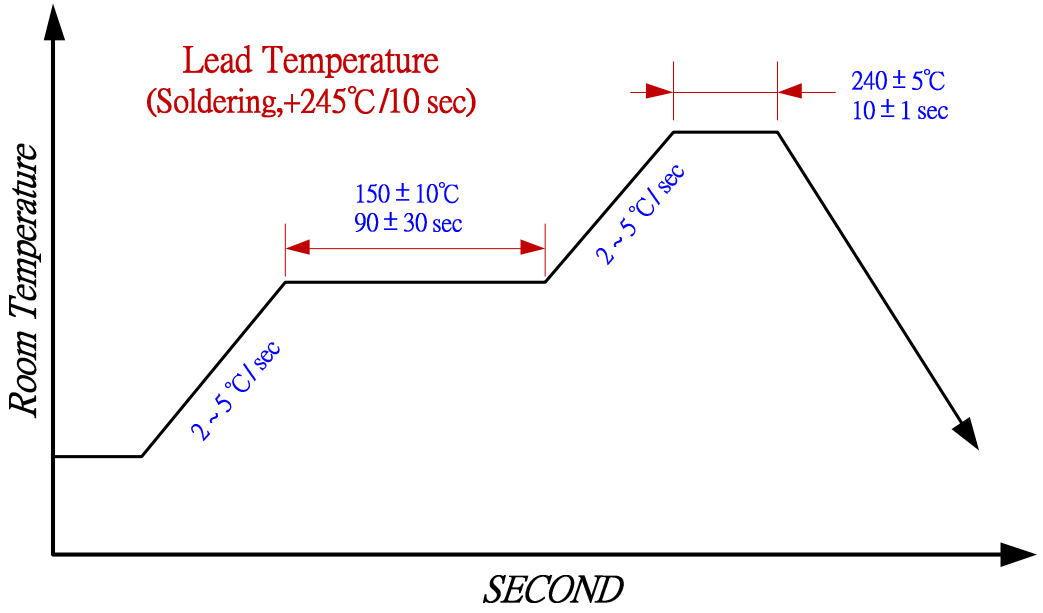
Width of carrier tape	8	12	16				
A±0.05	9.0	13.0	17.0				
Ao±0.05	12.0	16.0	20.0				
B	1.5	1.5	1.5				
øC +1 -0	60	60	60				

NOTE :
1. Material : Anti-static polystyrene.
2. Surface resistivity 10 ohm/square

IR reflow curve



SQ/SG Soldering Condition



UA Soldering Condition

Packing specification:

Package	Per Reel/Bag	Per inner box	Per carton
TO-92S-3L	1,000pcs / bag	10bags / box	8 boxes / carton
QFN2020-3	3,000pcs / reel	10 reels / box	2 boxes / carton
SG(SOT89-3)	1,000 pcs / reel	4 reels / box	2 boxes/carton

TO-92S-3L	Weight	QFN2020-3	Weight	SG(SOT89-3)	Weight
1000pcs / bag	0.11kg	3000pcs / reel	0.13kg	1000pcs / reel	0.148kg
10 bags / box	1.24kg	10 reels / box	1.40kg	4 reels / box	0.732kg
8 boxes / carton	10.09kg	2boxes / carton	3.70kg	2 boxes/carton	2.5kg

Inner box label **：** Size: 3.4cm*6.4cm

Bag and inner box labels are Halogen free.

Carton label **：** Size: 5.6 cm * 9.8 cm

Bag and inner box Halogen Free Label

Combined Lots:

When combining lots, one reel could have two D/C,no more than two DC. One carton could have two devices, no more than two.