SPECIFICATIONS		SHEET No.	1 of 11
		DATE	2012. 08. 22.
PART NAME	IR RECEIVER MODULE	TYPE No.	AO-R123H7G(HS)
CODE NO.		FILE No.	OQSS-R-523

1. Application

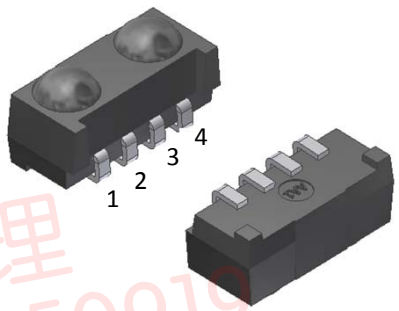
This Specification is applied to inspection and approval of the IR Receiver Module for TV, DVD, STB etc

2. Description

The Series are miniaturized receiver for infrared remote control system.
The PIN Photodiode and preamplifier are assembled on lead frame. The epoxy pacakge is designed as IR Filter.
The module has excellent performance even in disturbed ambient light application and provides protection against uncontrolled output pulses.

3. Features

1)High ripple rejection
2)Wide operating supply voltage : 2.7V ~ 6.0V
3)Low current consumption : 3.0V(0.4㎃), 5.0V(0.5㎃)
4)Band pass filter center frequency : 37.9KHz
5)Epoxy IR filter characteristic : 940㎚
6)Maximum interference safety against optical and electrical disturbance
7)Internal filter for a high frequency lighting fluorescent lamp
8)Internal pull-up output : 50㏀



1.4=GND 2=VCC 3=OUT

4. Absolute Maximum Ratings

1)Supply voltage : 0 ~ 7.0V
2)Supply current : 0 ~ 3.0㎃
3)Output current : 0 ~ 2.0㎃
4)Operating temperature : -20℃ ~ +80℃
5)Storage temperature : -30℃ ~ +85℃
6)Reflow soldering temperature (Pb Free) : 260℃(Max 10 sec)

5. Cautions

1)Store and use where there is no force causing transformation or change in quality.
2)Store and use where there is no extreme humidity.
3)In order to prevent damage from static electricity, make sure that the human body and the soldering iron are connected to ground before using.
4)The ripple noise from power supply lines may shorten detecting distance of IR receiver module.
Thus, in order to ensure more reliable operating please add RC filter(R=100Ω, C=47㎌) between Vcc and GND.
5)When a disturbance signal is applied to the series, it can still receive the data signal.
However the sensitivity is reduced to the level that no unexpected pulses will occur.
Some examples of such disturbance signals which can be suppressed pulses by the series.
ⓐDC light(Ex. From tungsten lamp or sunlight)
ⓑContinuous signal at center frequency or any other frequency
ⓒSignals from fluorescent lamps with electronic ballast with high or low modulation.

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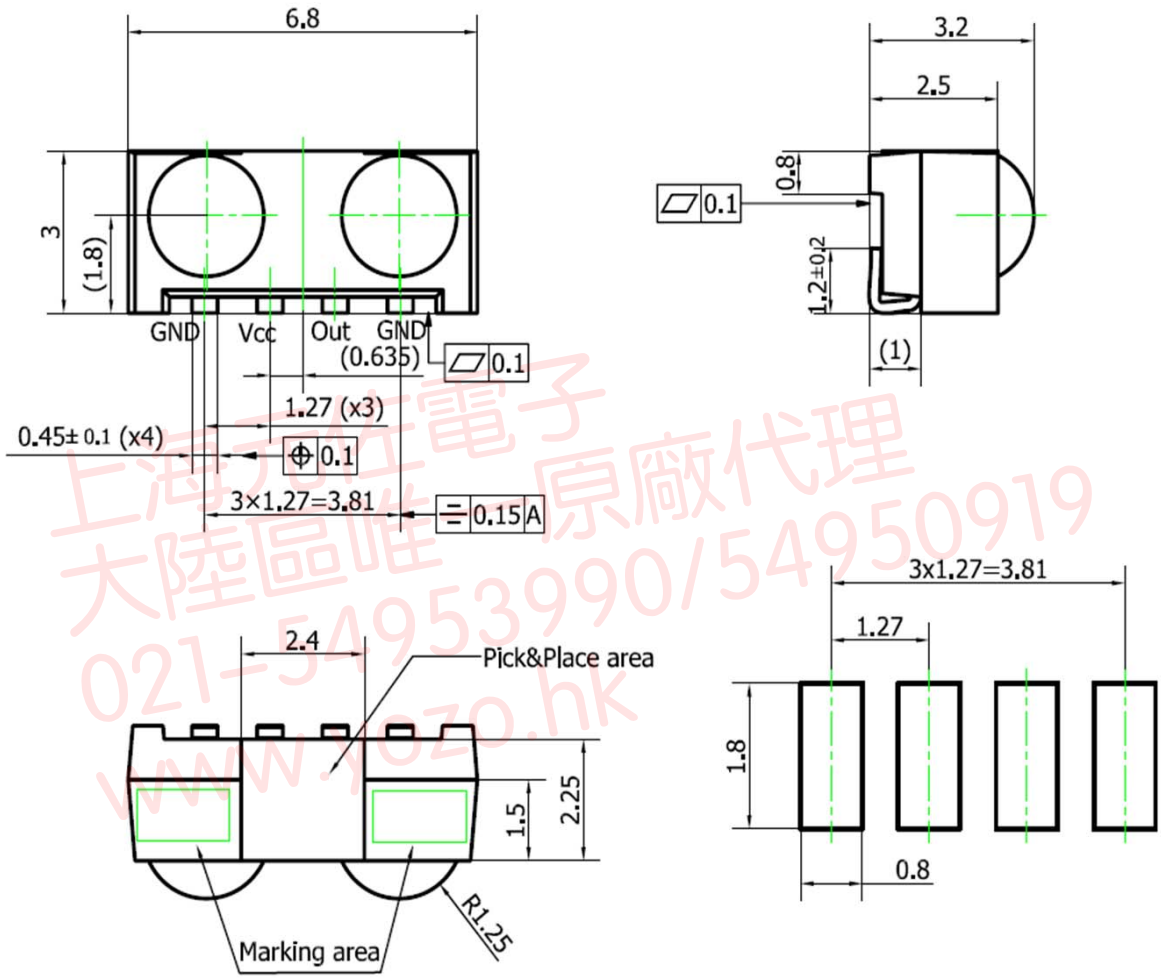
6. Appearance & Dimensions

1)Package Dimension(Unit: ㎜)

Note

Unit mm

G.T ±0.2



2)Laser-Marking on IR receiver module

3)Marking example..

No	Specification	Remark
①	Year	0 ~ 9
②	Month	A ~ L(1~12)
③	Day	1 ~ 31
④	Lot	01 ~ 99

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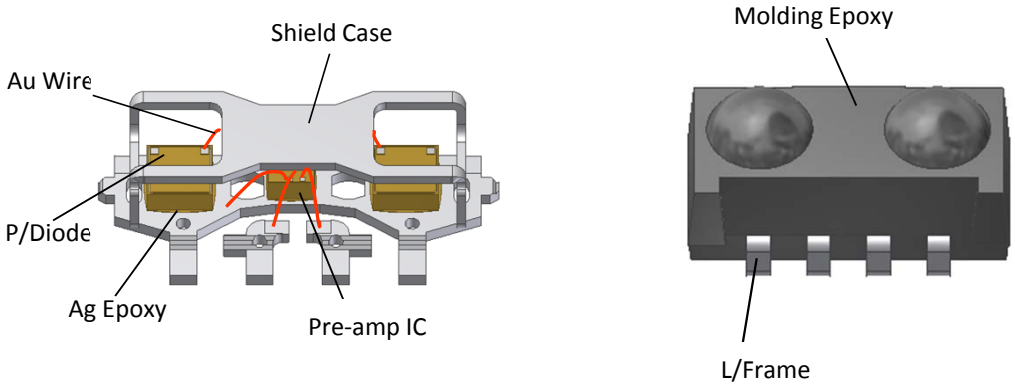
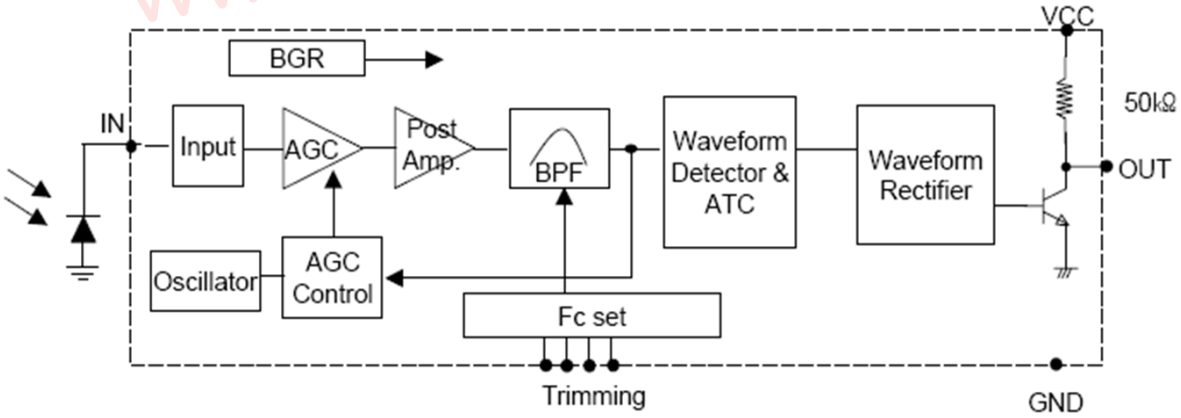
7. Schematic Diagram

1)Internal structure figure



No	Part Name	Materials(Method)	Remark
①	Pre-amp IC	Silicon	
②	PIN Photo Diode	Silicon	
③	Lead Frame	Cu Alloy	
④	Die Attach	Ag Paste	
⑤	Wire	Wire (Wire Bonding)	
⑥	Molding	Non-fireproof epoxy resin	Transfer Mold
⑦	Shield Case	Fe (Sn Plated)	

2)Function Block Diagram



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3)Circuit Description of Function Block Diagram

The function of the IC is described with above function block diagram.
Photo current generated by infrared radiation burst signal equivalently goes through the input pad of IC called "Input Block".
The DC part is separated in the coupling cap of the each amplifier and AC signal pass to a pre-amplifier followed by an automatic gain control amplifier, a post amplifier and a band pass filter.
The final evaluation is done by a waveform detector & ATC, waveform rectifier stage.
The "Automatic Gain Control" is responsible for the dynamic control if stable working point to suppress the influences of disturbing sources. The digital output signal, which is an envelope signal of the incoming optical burst without the carrier frequency, has active low polarity.
The detail of the each block is as below.

①Input Block reacts to the photo diode as a frequency-dependent load resistance.

②AGC-Amplifier generates most of the voltage gain of the whole circuitry where by the amplification.

③Post-Amplifier generates a signal gain to be fit to band pass filter input by limiting signal amplitude.
The most go the voltage gain is decided by a load resistance and emitter resistance.

④Band Pass Filter is an important part of the circuit to get a good performance in disturbed ambient.
It is designed to achieve a specified frequency response and exhibit different characteristics depending on current value of each element.

⑤AGC Control & Oscillator stage ensures that the receiver is immune disturbances.
It reacts to the noise or disturbance by changing the gain of the amplifier. In case of ambient light.
The AGC sets the gain the most sensitive value so that there is no unexpected output pulse.
The AGC does not react to the useful signal if signal gap time is enough.
The AGC distinguishes useful data from disturbance signals and the distinguishing marks are burst length and envelope duty cycle.

⑥Waveform Detector & ATC is consisted of two comparator.
Compare with fixed threshold voltage in comparator and 1'st receiving B.P.F filter's output and detect burst signal. Also, ATC changes comparator 2'nd threshold voltage level according to filter output signal size. This does function that protect that pulse width changes by size of filter output signals.

⑦Waveform Rectifier so consisted of integrator and Schmitt-trigger.
The integrator is triggered when the signal value reaches the comparator threshold voltage.
It needs several cycles from the comparator output in series until the integrator is loaded and the output is triggered. The design of integrator and Schmitt Trigger is carried out so that the output pulse width is close to the optical burst length at the input.

8. Electro-Optical Characteristics (At 25℃ unless otherwise notes)

1)Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	0 ~ 6.0	V
Output Current	Iout	0 ~ 2.5	mA
Operating Temperature	Topr	-20 ~ +80	℃
Storage Temperature	Tstg	-30 ~ +85	℃
Soldering Temperature(*1)	Tsol	260, t<5sec	℃
Reflow Soldering Temperature(*1)	Tsol	260, t<10sec	℃
Moisture Sensitive Level(*2)	Level 5a (≤30℃/60%RH 24Hours)		

(*1)Pb Free Solder

(*2)JEDEC Standard J-STD-020C

2)Recommended operating Conditions

Parameter	Symbol	Rating	Unit
Operating Voltage	Vcc	2.7 ~ 6.0	V
Input Frequency	fin	36 ~ 40	kHz

3)Elector_Optical Characteristics [Vcc=5.0V, Vcc=3.0V]

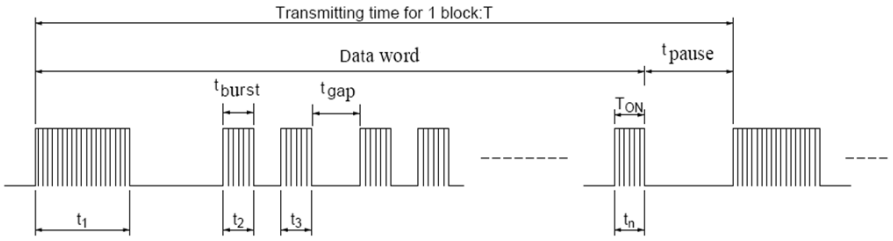
Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Voltage	Vcc			2.7	-	5.5	V
Supply Current	Icc	No Input Signal	Vcc=5V	0.2	0.5	0.7	mA
			Vcc=3V		0.45		
Peak Wavelength (※1)	λp			-	940	-	nm
B.P.F Center Frequency (※2)	fo			-	37.9	-	kHz
High Level Output Voltage (※1)	V_{OH}	30cm over the ray axis		4.5	5.0	-	V
Low Level Output Voltage (※1)	V_{OL}			-	0.2	0.4	V
High Level Output Pulse Width (※1)	t_{WH}	Burst Wave = 600μs		400	-	800	μs
Low Level Output Pulse Width (※1)	t_{WL}	Period = 1.2ms		400	-	800	μs
Arrival Distance (※1)	D	±0°		20	-	-	m
		±30°		15	-	-	m
Output Form	Active Low Output						

※ 1. 600/600μs burst wave is transmitted by standard(Fig.2, Fig.3) transmitter. However, it measured after the initial transmission pulse is 10(60ms) pulse.

※ 2. The following band pass frequencies are available.(36.7kHz/37.9kHz/40kHz)
Carrier frequencies adjusted by zener-diode fusing method.

4) Measurement Conditions

① Fig.1 Burst wave, Output wave



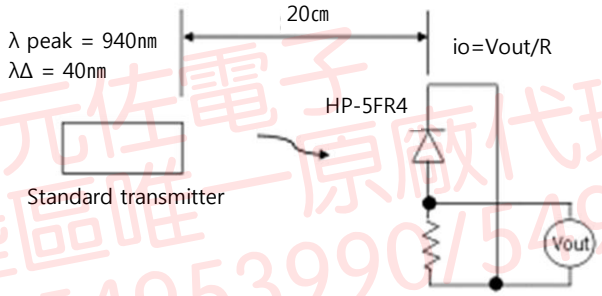
※ LCD Dimming have to be higher than Duty 25% And frequency 80Hz(= period 12.5ms)

1) Data word length = Max. 100msec 4) tBurst = Min. 450usec

2) tpause = Min. 59msec 5) tGap = Min. 450usec

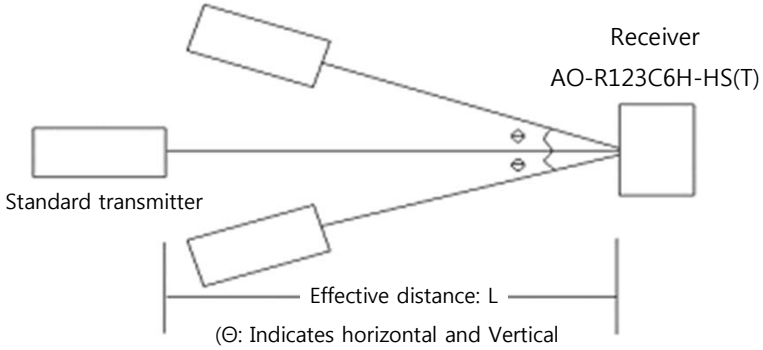
3) Duty(Σtburst /T) = Max. 30% 6) above (1)~(5) should be all meet and all remote control button should be operated properly.

② Fig.2 Application Circuit



When standard transmitter output the signal at Fig.1 standard photodiode output become Io=5uAp-p under the measurement condition Fig.2. (The radiant intensity of standard transmitter : 50mW/sr)
HP-5FR4 : standard photodiode has short current Isc=32uA at E=1000(lx)

③ Fig.3 Test Condition of Arrival Distance



☞ Ambient light source : Detecting surface's illumination shall be 100Lux under ordinary white fluorescence lamp without high frequency lighting.

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5) Disturbance Suppression

When a disturbance signal is applied to the AO-R123H7G(HS)., Series, It can receive the data signal. However the sensitivity is reduced to that level that no unexpected pulses will occur.

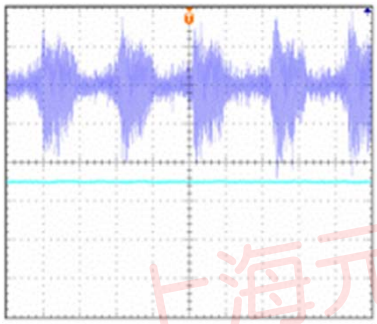
Some examples for such disturbance signals which are suppressed by the AO-R123H7G(HS).. Series :

a. Signals from fluorescent lamps with electronic ballast (please refer to Fig.1)

b. Continuous signal at 37.9kHz or at any other frequency

c. DC light (from tungsten lamp or sunlight)

[Fig.1 Fluorescent Lamp with Modulation]



The signals shown in [Fig. 1] come from a fluorescent lamp with electronic ballast Which is operated at 60 Hz and 120Hz power line frequency. A different kind of disturbance signal is caused by fluorescent lamps with electronic ballast.

Typically the oscillating frequency of the optical disturbance signal of such lamps is in the range between 20kHz and 50kHz. This frequency is twice of the electrical oscillating frequency of the driver circuit in the lamp ballast.

All AO-R123H7G(HS). Series IR receiver modules can suppress such disturbance signals efficiently

There will be unexpected output pulses due to such lamps. However, sensitivity will be reduced according to the strength of the disturbance signal. More critical are the electronic ballasts with high modulation of the oscillating amplitude are more critical

6) Cautions

① The performance of remote control system depends on environment condition and ability of peripheral parts. Thus, it is highly recommended to evaluate the performance of the receiver module. Using the final product after the receiver module is assembled with peripheral components such as resistor, condenser, MICOM, and so on.

② The ripple noise from power supply line may shorten detecting distance of IR receiver module. Thus, in order to ensure more reliable operation, please add RC filter (R=100Ω, C=47μF) between Vcc and GND.

③ Store and use where there is no force causing transformation or change in quality.

④ Store and use where there is no extreme humidity.

⑤ In order to prevent damage from static electricity, make sure that the human body and the soldering iron are connected to ground before using.

⑥ In order to prevent electrostatic discharge of integrated circuit, human body and soldering iron, etc. shall be grounded.

⑦ Please use this device away from the dew drop.
Be aware that a dew drop rusts shield case and others, and it may affect the normal operation.

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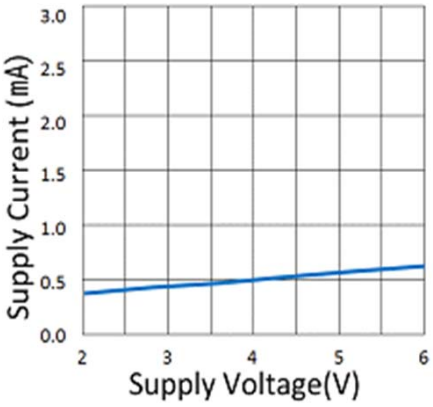
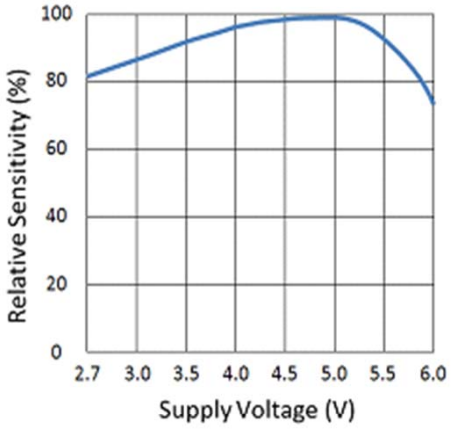
7) Graph of Electrical/Optical Characteristics

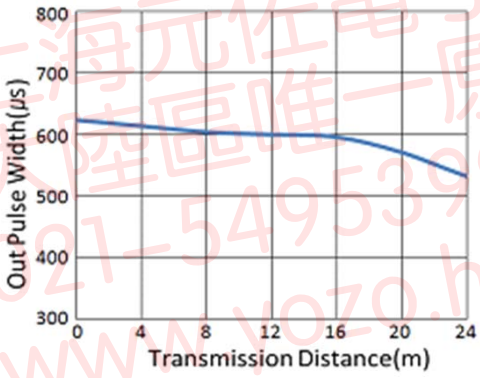
[Fig.1] Supply Current vs. Voltage



[Fig.2] Sensitivity vs. Supply Voltage



[Fig.3] Output Pulse Width vs. Distance



8) Standard Inspection

All output products shall be inspected based on following items.

① Detecting distance.
② Current consumption.
③ High level output voltage.
④ Low level output voltage.
⑤ Output Pulse Width

9) Others

In case any trouble or question arise, both parties agree to make full discussion covering the said problem.

9. Reliability Test Item and Standard.

1) All output products shall satisfy below Reliability test items.
2) Related sampling quantity and acceptance/failure judgment standard accordance with MIL standard MIL-STD-833 is as listed below.

①Confidence Level: 90%
②LPTD: 10% / 20%

No	Test Item	Test Conditions	Judgment Standard	Fail@ Sample(n)
1	High Temp. Storage (※ 2)	Ta=+120℃, t=500HR's	VOH(Vcc=5V) High level output voltage VOH>4.5V Low level output voltage VOL<0.4V Icc(Vcc=5.0V) Consumption Current Icc<1.5㎃ D(Vcc=5.0V) Arrival Distance: D>8m	C=0/n=22
2	Low Temp. Storage (※ 2)	Ta=-30℃, t=500HR's		C=0/n=22
3	High Temp. Bias (※ 1, ※ 2)	Ta=+85℃, t=500HR's		C=0/n=22
4	High Temp./High Hum.(※ 2)	Ta=+85℃, 90%RH, t=500HR's		C=0/n=22
5	Temperature Cycle(※ 2)	Ta=-20℃(0.5HR) to +85℃(0.5HR) 20 Cycle		C=0/n=22
6	P.C.T(※ 2)	Ta=+121℃, 100%RH, P=2atm, t=4HR's		C=0/n=22
7	Solder Heat(※ 2, ※ 5)	Ta=260±5℃, t=5s		C=0/n=11
10	Solder ability(※ 5)	Solder Temp.: 260±5℃, t=5s Pb Free Solder: Sn/Cu	Leads shall be covered By solder more than 95%	C=0/n=11

※1. Supply voltage of load test is 5V.(Standard Jig of OEC)
※2. Electro-optical characteristics shall be satisfied after leaving 2 hours in the normal condition.
※3. Temperature cycle test shall repeat above condition 20 times under no load.
※4. The test devices shall be dropped three time on the hard wooden board from a height of 75cm.
※5. For 5sec (after mounting on PCB with thickness of 1.6mm)

In case any trouble or question arises related to above test items, both parties agree to make full discussion and covering the said matters.

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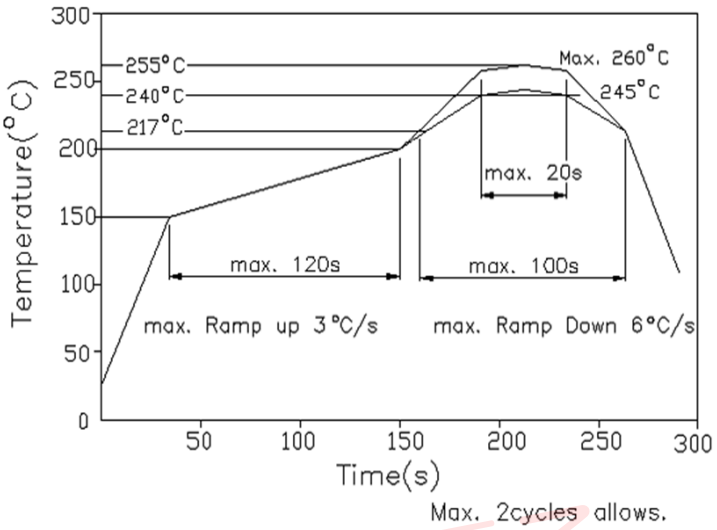
10. Lead(Pb)-free Reflow Solder Profile



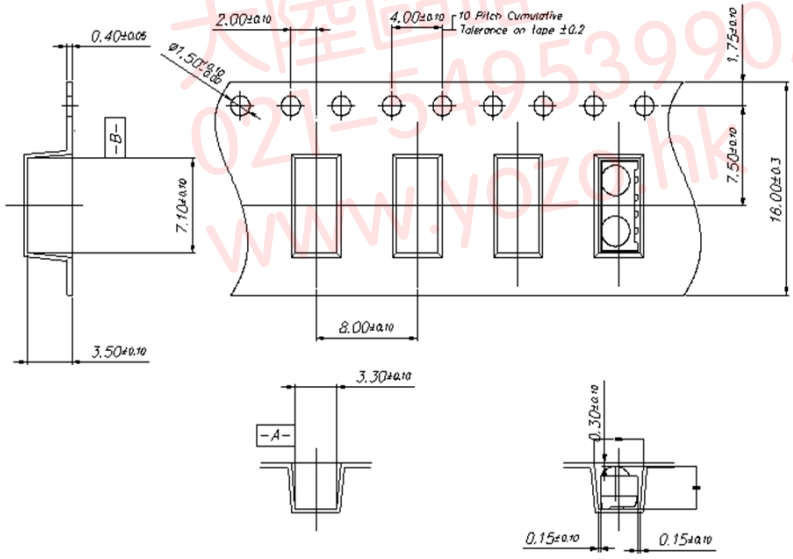
Max. 2cycles allows.

Manual Soldering

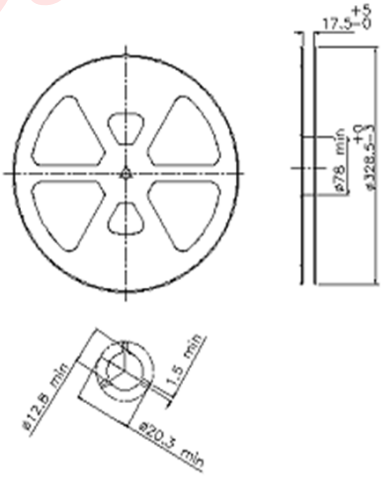
- Use a soldering iron of 25W or less. Adjust the Temperature of the soldering iron below 300℃(three seconds)

11. Taping and Reel Dimensions in millimeters

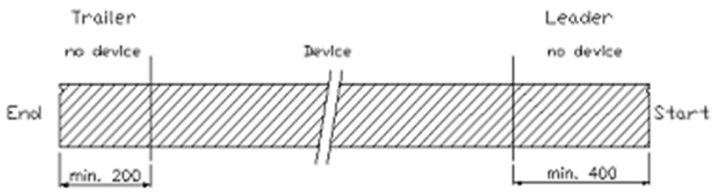
1) Taping



2) Reel



3) Leader and Trailer



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