

IR Receiver Modules for Remote Control Systems

Description

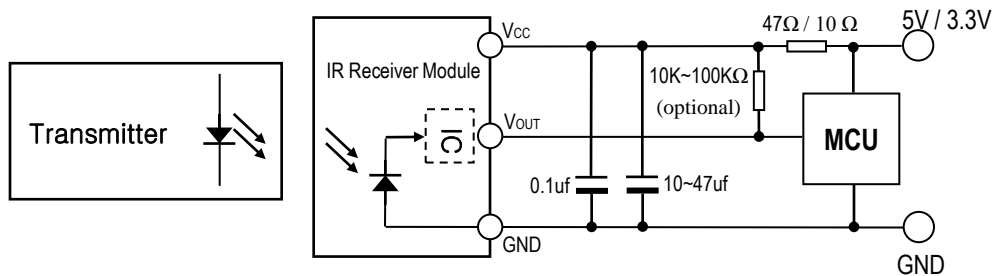
The **FM-9038FN-5DW** is a CMOS IC for use in infrared remote control system. Small-sized, light-weight, and low current consumption modules have been achieved by using resin mold. The demodulated output signal can directly be decoded by a microprocessor. The main benefit is the reliable function even in disturbed ambient and the protection against uncontrolled output pulses.



Features

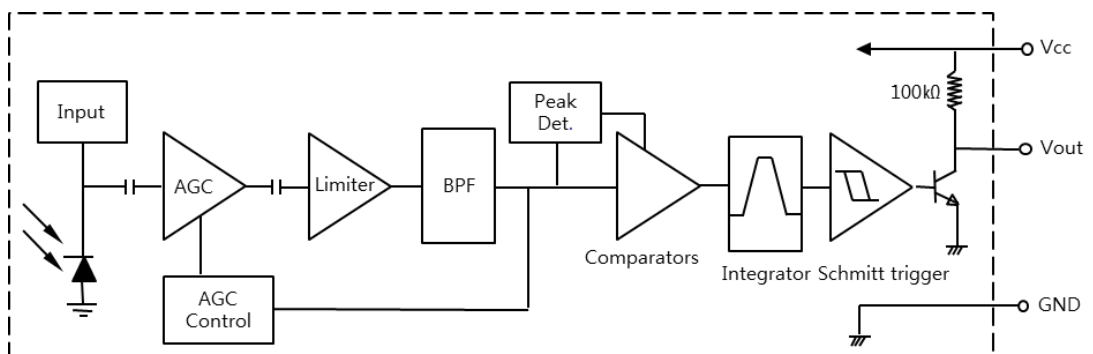
- Supply Voltage Range: 2.7V to 5.5V
- Supply Current : 0.4mA
- TTL and CMOS compatibility
- Photo detector and preamplifier in one package.
- Internal filter for PCM frequency
- Enhanced Immunity against all kinds of disturbance light
- Operation with short burst possible (> 6 pulses / burst)
- Meet RoHS

Application Circuit



R-C filter recommended to suppress power supply disturbances.
R-C filter should be connected closely between Vcc pin and GND pin.

Block Diagram



Suitable Data Format

NEC code	◆	RCS-80 code	◆	Sony 20-bit code	◇
RC5 code	◆	R-2000 code	◆	Zenith code	◆
RC6 code	◆	RCA code	◆	Toshiba code	◆
r-step code	◆	Sharp code	◆	r-step code	◆
RCMM code	◆	Sony 12-bit code	◆	High data rate code	◆
XMP code	◆	Sony 15-bit code	◆	Disturbance suppression	◆

Note : ◆ : Suitable for this IR code ; ◇ : Not recommended

Absolute Maximum Ratings

(Ta = 25°C)

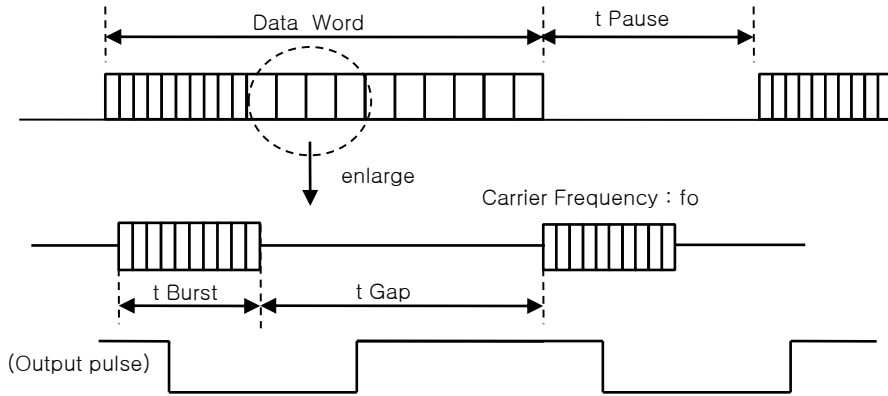
Parameter	Symbol	Ratings	Unit
Supply Voltage	V _{cc}	6.5	V
Output Current	I _{sink}	2.5	mA
Operating Temperature	T _{opr}	-20 ~ +80	°C
Storage Temperature	T _{stg}	-30 ~ +85	°C
Soldering Temperature	T _{sd}	260°C, Max 5 sec	°C

Electro-optical Characteristics

(Ta = 25°C)

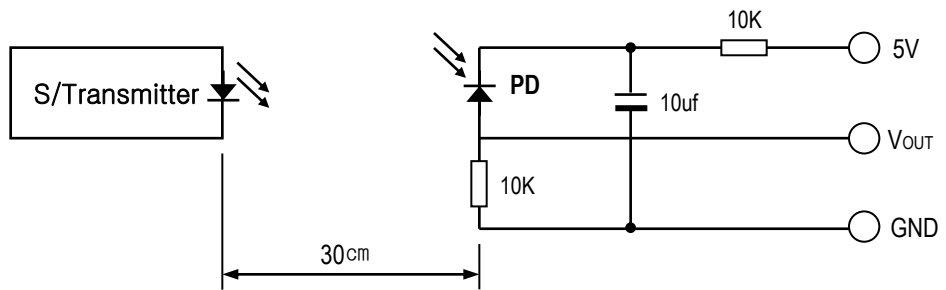
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Supply Current	ICC	0.25	0.4	0.5	mA	No signal	
Output Voltage	V _{oh}	V _{cc} -0.5	-	-	V		
	V _{ol}	-	0.2	0.4	V		
Peak Wave Length	λ _p	-	940	-	nm		
Internal Pull-up Resistor	R _{pul}	-	100	-	kΩ		
BPF frequency	f _c	-	37.9	-	KHz		
Arrival Distance	L	±0°	15	-	-	m	Fig 1,2,3
		±30°	10	-	-	m	
		±45°	8	-	-	m	
Output Pulse width	T _{pw}	150	200	300	us	Input Burst Wave 160us	

[Fig.1] Data Signal diagram



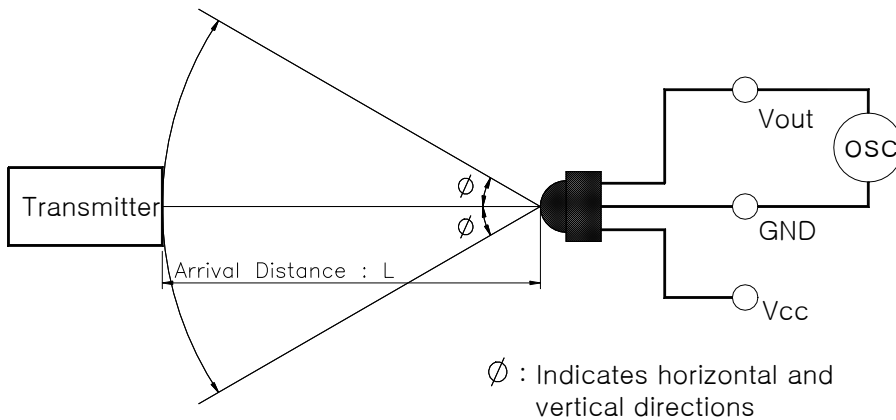
- t_{Gap} : Signal gap time between two burst in pulses of carrier. Minimum Gap Time $\geq 300\mu s$
- t_{Burst} : Length of a burst in pulses of the carrier frequency. Minimum Burst $\geq 150\mu s$
- t_{pause} : Data pause between two data words. Minimum Data Pause Time $\geq 5ms$

[Fig.2] Transmitter



※ The specifications shall be satisfied under the following conditions. The standard transmitter shall be specified of the burst wave form adjusted to V_{out} 200mVp-p upon P_o measuring circuit Standard Transmitter

[Fig.3] Test condition of arrival distance

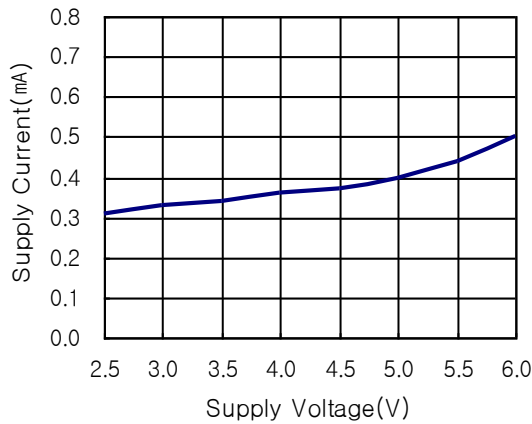


[Measurement condition for arrival distance]

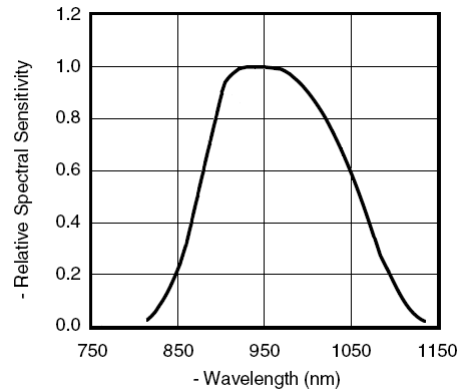
☞ Ambient light source : Detecting surface illumination shall be irradiate $200 \pm 50Lux$ under ordinary white fluorescence lamp without high frequency lighting

Electrical/Optical Characteristics

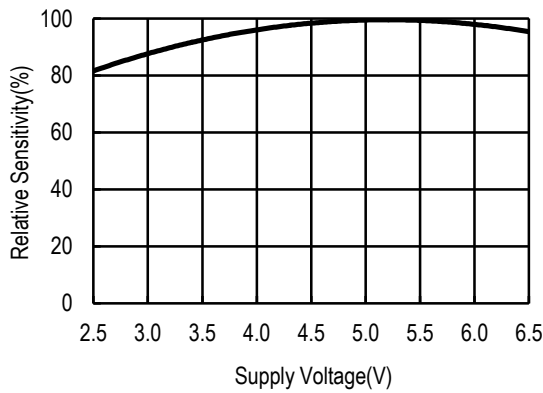
[Fig.4] Supply Current vs. Voltage



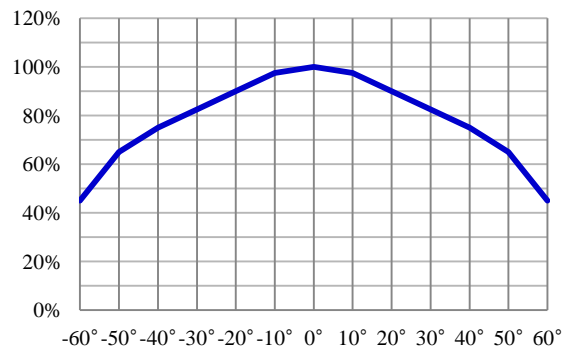
[Fig.5] Relative Spectral Sensitivity vs. Wavelength



[Fig.6] Sensitivity vs. Supply Voltage



[Fig.7] Directivity

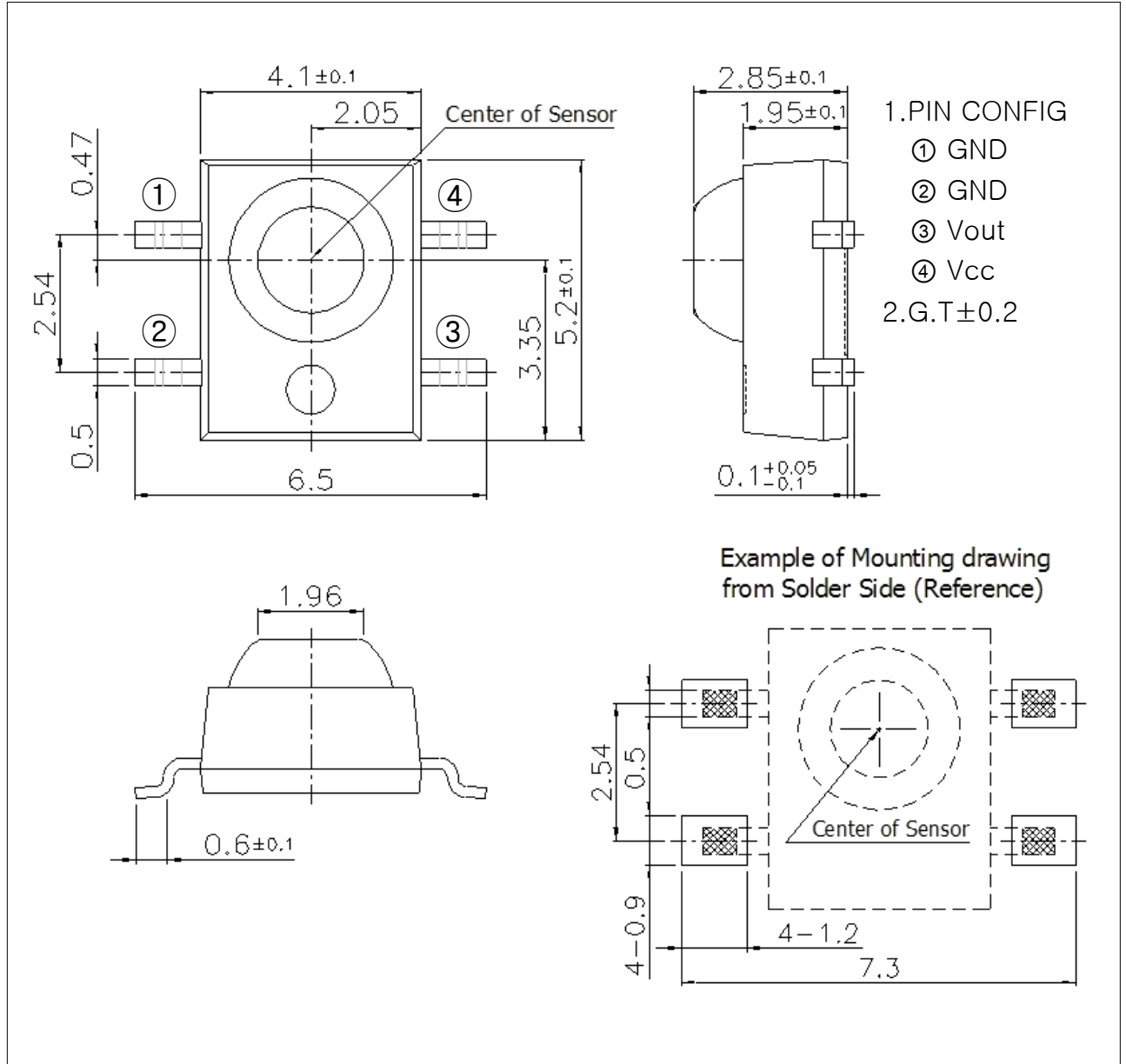


ESD Test Results

Parameter	Conditions	Specification	Results
Machine Model	C=200pF, R=0Ω	Min ±200V	>±200V
Human Body Model	C=100pF, R=1.5kΩ	Min ±2000V	>±2000V
Charged Device Model	R=100MΩ, R=1Ω	Min ±400V	>±400V

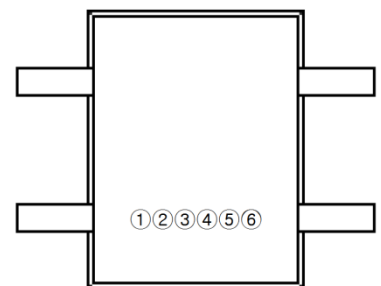
Appearance & Dimensions

Package Dimension (Unit : mm)



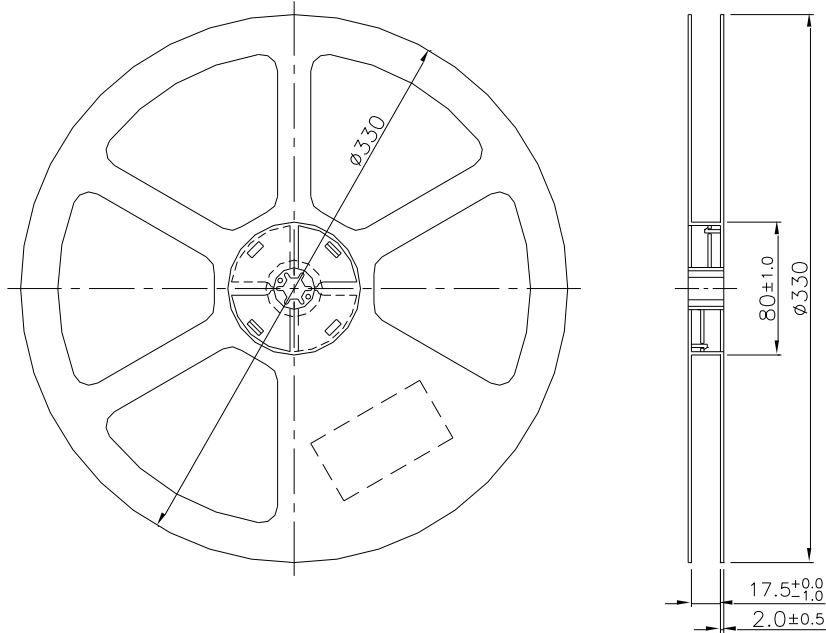
2) Back side Laser Marking of Method

No.	Classification	Remark
①	Management No.	J(5DN) , G(5DW) , S(5DR)
②	Center Freq.	A(32) , B(36) , C(38) , D(40) , E(56)
③	Year	0~9
④	Month	1~9 , X(10) , Y(11) , Z(12)
⑤,⑥	Product Lot No.	01~99

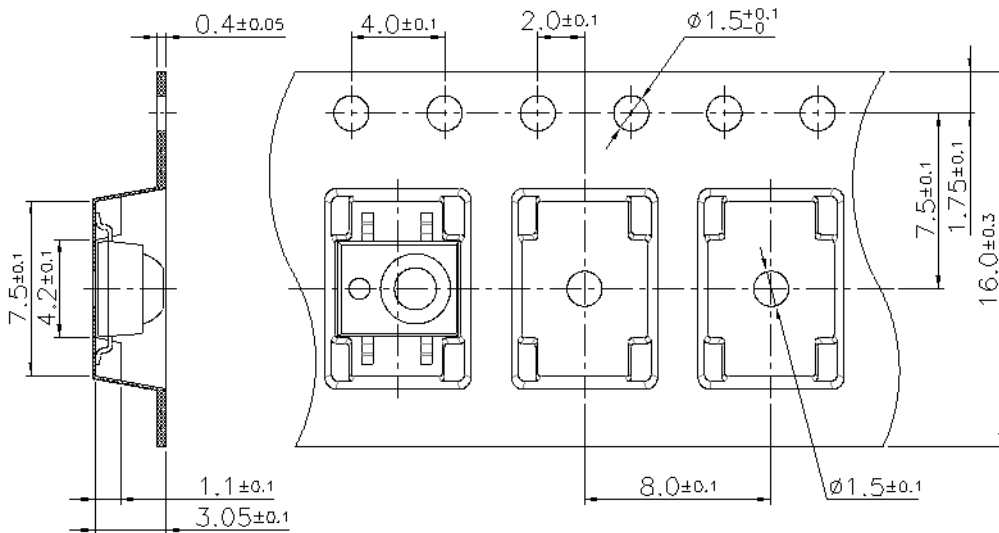


Tape and Reel Packing Specifications (Unit : mm)

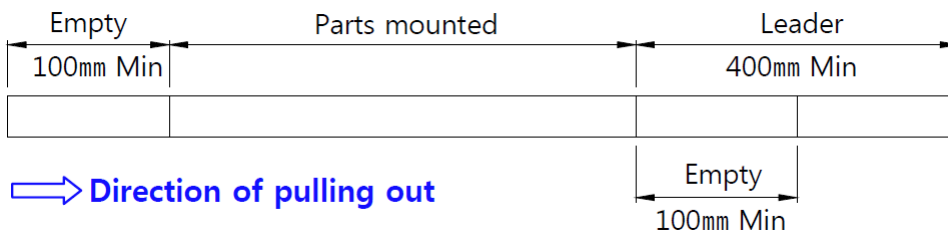
1. Shape and Dimensions of Reels



2. Dimension of Tapes



3. Configuration of Tapes



Reflow soldering

1) Following soldering paste recommended.

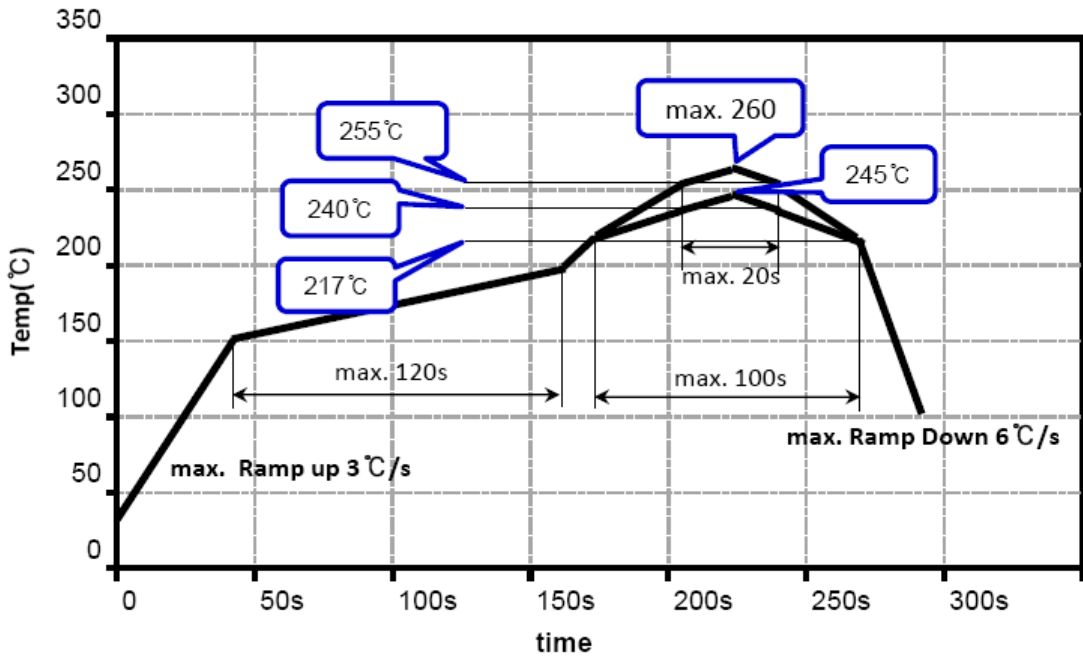
Melting temperature : 245 ~ 260°C

Composition : Pb-Free

2) Recommended thickness of metal mask is between 0.12mm and 0.15mm for screen printing.

3) The below illustrated temperature profile at the top surface of the product is requested for soldering.

The components should be limited to a maximum of three passes through this solder reflow profile.



Manual Soldering

1) Use the Pb-Free solder or the solder containing silver.

2) Soldering iron below 320°C within 3 seconds.

Cleaning

Perform cleaning after soldering strictly in conformance to the following conditions.

1) Cleaning agent : Alcohol.

2) Temperature and time : 30 seconds under the temperature below 50°C or 3 minutes below 30°C.

3) Ultrasonic cleaning : Below 20W.

Moisture-Proof Packing

- 1) To avoid moisture absorption by the resin, the product the product is packed in an aluminum envelope with silica gel.
- 2) Since the optical characteristics of the device may be affected by exposure to moisture in the air before soldering and they should therefore be stored after opening the moisture proof bag under the following conditions.
 - . Temperature : 10 to 30°C
 - . Humidity : 60% RH or less
 - . Time : 72h
- 3) Moisture Sensitivity Level (MSL) = 4

Baking

Product that has been in a condition of moisture resistant packaging for 6 months or longer. or for which 72 hours or longer have elapsed since the moisture resistant packaging was opened. should be baked according to the following conditions prior to use.

Baking conditions

60°C and < 5% RH, 96h or longer (Reels)

125°C and <5% RH, 48h or longer (Bulk)

Mounting Precautions

- 1) Do not apply stress to the resin at high temperature.
- 2) The resin part is easily scratched, so avoid friction with hard materials.
- 3) When installing the assembly board in equipment, ensure that this product does not come into contact with other components.

The MSL is an indicator for the maximum allowable time period (floor life time) in which a moisture sensitive plastic device, once removed from the dry bag, can be exposed to an environment with a maximum temperature of 30°C and a maximum relative humidity of 60% RH. Before the solder reflow process.

Level	Floor Life (out of bag) at factory ambient ≤30°C/60% RH or as stated
1	Unlimited at ≤30°C/85% RH
2	1 year
2a	4 Week
3	168 hours
4	72 hours
5	48 hours
5a	24 hours

Please note : MSL 5a classified devices come in standard pack material, not in dry bags.

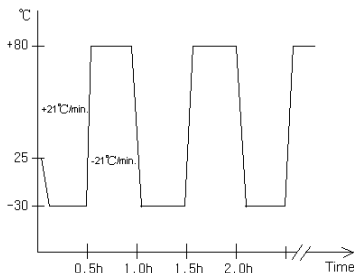
Reliability Test Item and Standard

- 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-883 is as listed below.

- ① Confidence level : 90%
 ② LTPD : 10% / 20%

No.	Test Item	Test Conditions	Judgment Standard	Fail (c) / Samples (n)
1	High Temp. Storage (※2)	Ta=+80°C, t=240hr	Vcc=5.0V High level output voltage VOH > 4.5V Low level output voltage VOL < 0.4V Consumption current Icc < 1.0mA Arrival Distance D > 12m	C=0 / n=22
2	Low Temp. Storage (※2)	Ta=-30°C, t=240hr		C=0 / n=22
3	High Temp. Operating (※1,※2)	Ta=+70°C, Vcc=5.0V t=240hr		C=0 / n=22
4	Low Temp. Operating (※1,※2)	Ta=-20°C, Vcc=5.0V t=240hr		C=0 / n=22
5	High Temp. / High Hum. Bias (※1,※2)	Ta=+60°C, 90%RH Vcc=5.0V, t=240hr		C=0 / n=22
6	Temperature Cycle (※2,※3)	Ta=-30°C (0.5h) to +80°C (0.5h) 20cycle		C=0 / n=22
7	P.C.T (※2)	Ta=+121°C 100%RH P=1atm, t=4hr		C=0 / n=22
8	Solder Heat (※2)	Ta=+320±5°C, 3s		C=0 / n=11
9	Variable frequency Vibration(※2)	Frequency range : 10 to 55Hz/sweep 1min Overall amplitude : 1.5mm X,Y,Z / 2h each		C=0 / n=11
10	Falling (※4)	Height=75cm, 3 times		C=0 / n=11
11	Solder ability (※5)	Soldering Temp. : +260±5°C, 10s, 3 times Pb free solder : Sn/3.0Ag/0.5Cu		Leads shall be covered By solder more than 95%

- ※1. Supply voltage of load test is 5V. (Standard Jig of Opto-Sensor)
- ※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.



*Temperature Cycle: Ta = -30°C (0.5h), +80°C (0.5h), 20cycle

*Temperature Variation rate: +21°C /min, -21°C /min.

- ※4. The test devices shall be dropped three time on the hard wooden board from a height of 75cm.
- ※5. Reflow Soldering.

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

Packing Specifications

1) Label Specification (Bar Code Sticker)



Label Dimensions (Unit : mm)

Label Type	L	W	Remark
Label #1	65	40	

2) Box Specifications & Packing Method

(Unit : mm)

Packing Type	Materials	L x W x H	Quantity
Plastic Reel	Plastic	13" – 16mm	2,000 pcs
Al Shielding Bag	Aluminum	450 x 510 x 0.15mm	2,000 pcs
Box - #1	Corrugated Cardboard	680 x 425 x 430mm	24,000 pcs



1. Put 2,000pcs of products in a reel.



2. Vacuum packing of the reel with Al-shielding bag. (Silica : 10g)
Humidity indicator card (60%)



3. Put them(12 reels) in Box - #1