

IR Receiver Modules for Remote Control Systems

Description

The FM-6038LM-5DN is miniaturized receiver for infrared remote control system.

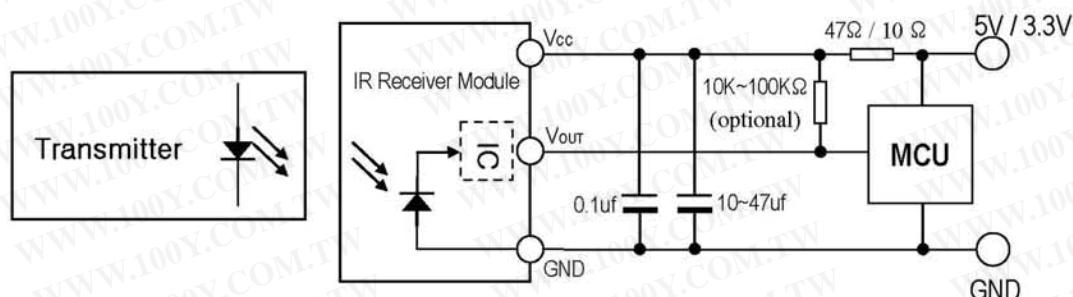
The PIN Photodiode and preamplifier are assembled on lead frame. The epoxy package is designed as IR filter. The module has excellent performance even in disturbed ambient light application and provides protection against uncontrolled output pulses.



Features

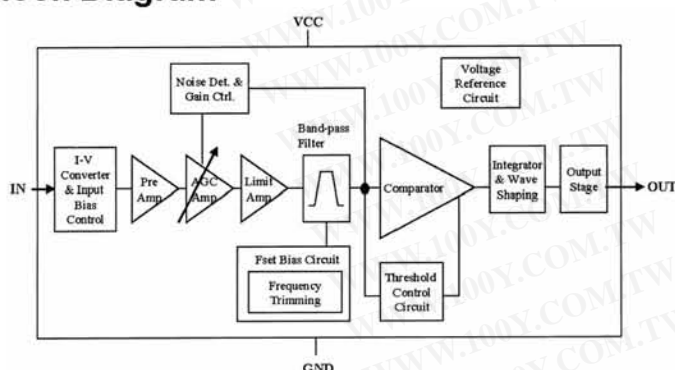
- Transfer Mold Package.
- Supply Voltage Range: 2.7V to 5.5 V
- Supply Current : 0.4mA
- Epoxy IR filter characteristic : 940nm
- Maximum interference safety against optical and electrical disturbance.
- Internal filter for a high frequency lighting fluorescent lamp.
- Internal Pull-Up output.
- Meet 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



B.P.F Center Frequency

Model No.	Carrier Frequency (fo)
FM-6032LM-5DN	32.7 K
FM-6036LM-5DN	36.0 K
FM-6038LM-5DN	37.9 K
FM-6040LM-5DN	40.0 K

Suitable Data Format

NEC code	◆ ◆	Toshiba code	◆	Matsushita code	◆
RC5 code	◆ ◆	Sharp code	◆	Mitsubishi code	◆
RC6 code	◆ ◆	Sony 12-bit code	◆	JVC code	◆
RCMM code	◇	Sony 15-bit code	◇	Continuous code	◇
RCA code	◇	Sony 20-bit code	◇	Disturbance suppression	◆ ◆

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

Absolute Maximum Ratings

(Ta = 25°C)

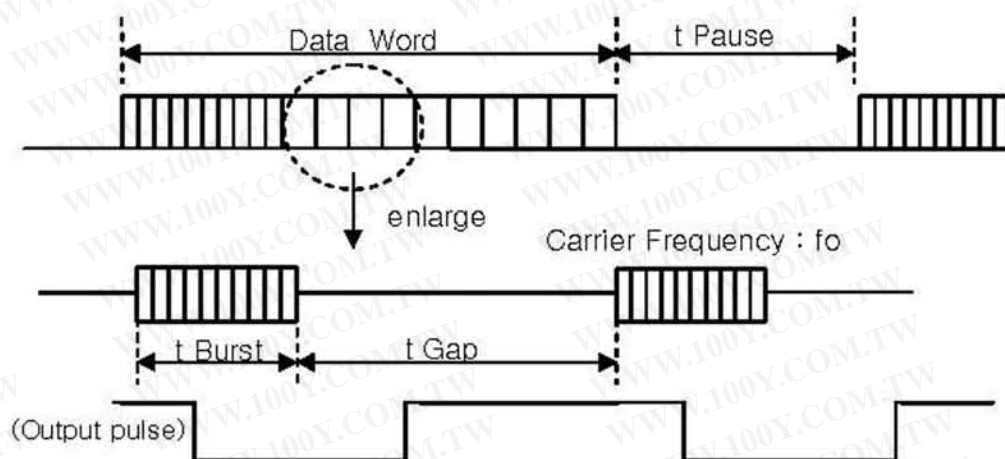
Parameter	Symbol	Ratings	Unit
Supply Voltage	V _{CC}	6.0	V
Supply Current	I _{CC}	2.0	mA
Operating Temperature	T _{opr}	-20 ~ +80	°C
Storage Temperature	T _{stg}	-30 ~ +90	°C
Soldering Temperature	T _{sd}	260°C, Max 5 sec	°C

Electro-optical Characteristics

(Ta = 25°C)

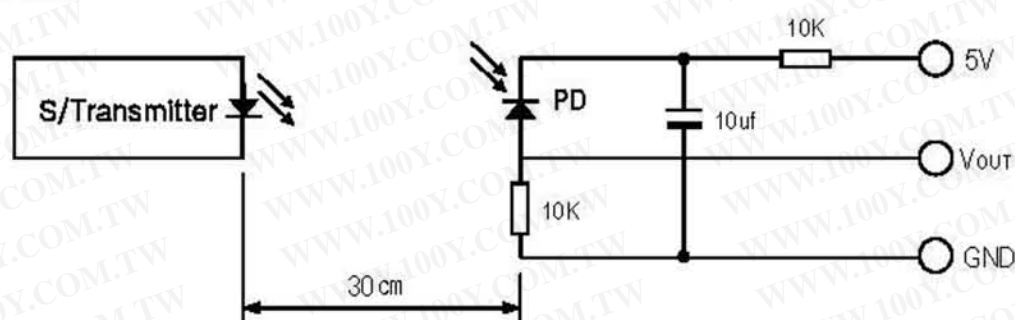
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Current	I _{CC}	0.3	0.4	0.5	mA	No signal
Output Voltage	V _{oh}	V _{CC} -0.5	-	-	V	No external pull-up resistor (I _{sink} < 1mA)
	V _{ol}	-	0.2	0.4	V	
Peak Wave Length	λ _p	-	940	-	nm	
Max. Voltage gain	A _v	65	72	80	dB	V _{in} =30uVp-p
BPF Bandwidth	f _{BW}	3.0	5.0	7.0	kHz	-3dB Bandwidth V _{in} =30uVp-p
Internal Pull-up Resistor	R _{pul}	-	94	-	KΩ	
Arrival Distance	L	±0°	20	-	-	Fig 1,2,3
		±30°	15	-	-	
		±45°	10	-	-	
Output Pulse width	T _{pw}	400	600	800	us	Burst Wave =600us Period = 1.2ms

[Fig.1] Data Signal diagram



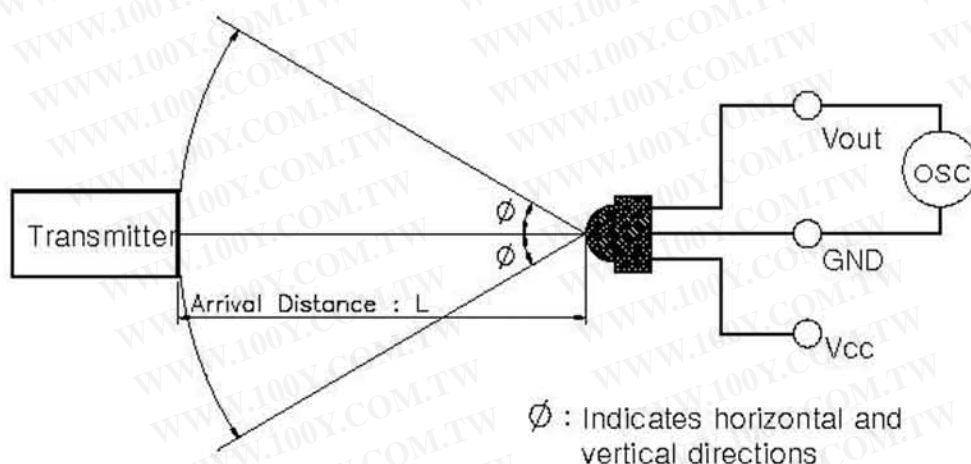
- t_{Gap} : Signal gap time between two burst in pulses of carrier. Minimum Gap Time ≥ 16 pulses
- t_{Burst} : Length of a burst in pulses of the carrier frequency. Minimum Burst ≥ 12 pulses
- t_{pause} : Data pause between two data words. Minimum Data Pause Time $\geq 22\text{ms}$

[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 $V_{\text{out}} 200\text{mVp-p}$ upon P_0 measuring circuit standard Transmitter

[Fig.3] Test condition of arrival distance

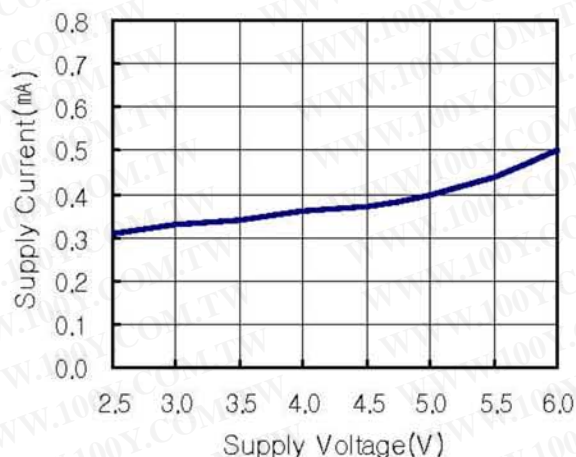


[Measurement condition for arrival distance]

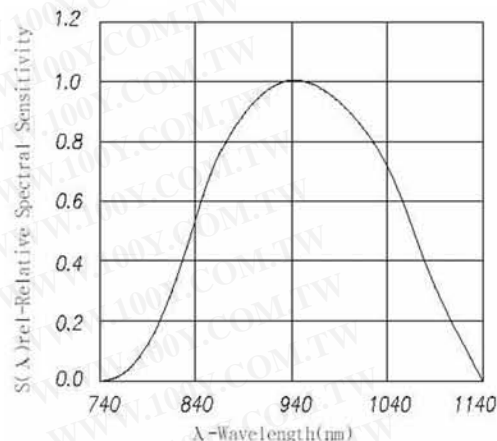
- ☞ Ambient light source : Detecting surface illumination shall be irradiate $200 \pm 50\text{Lux}$ under ordinary white fluorescence lamp without high frequency lighting

Electrical/Optical Characteristics

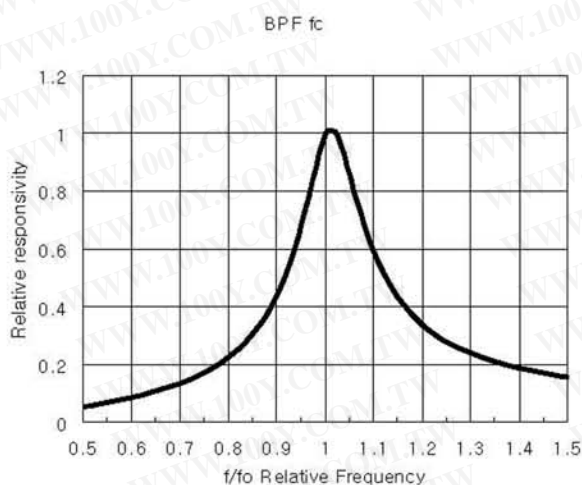
[Fig.4] Supply Current vs. Voltage



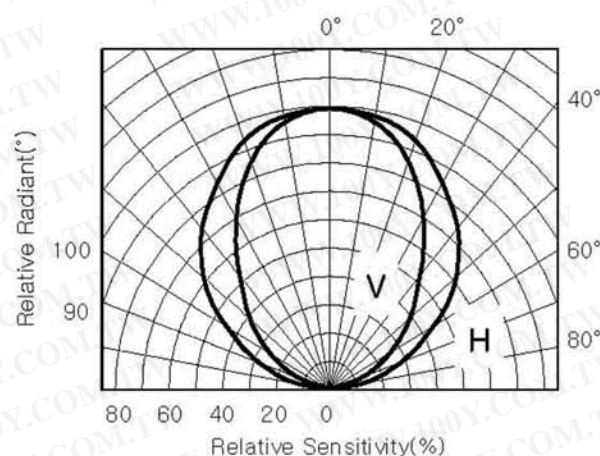
[Fig.5] Relative Spectral Sensitivity vs. Wavelength



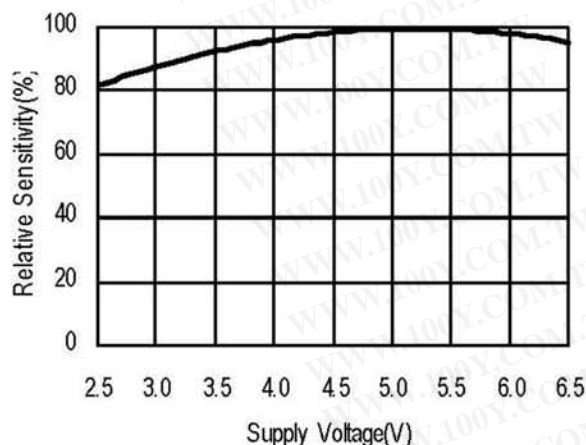
[Fig.6] BPF Fc Curve



[Fig.7] Directivity (Horizontal/Vertical)



[Fig.8] Sensitivity vs. Supply Voltage



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



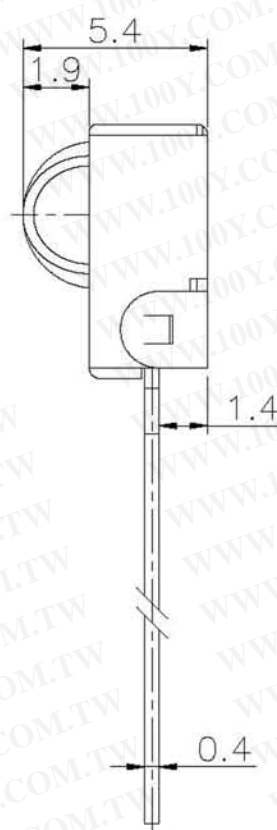
1) Package Dimension (Unit : mm)

1) Package Dimension (Unit : mm)



1.PIN CONFIG

- ① Vout
② GND
③ Vcc

 $2.G.T \pm 0.3$ 

3) Laser Marking of Method

No.	Classification	Remark
①	Management No.	-
②	Center Freq.	A(32) , B(36) , C(38) , D(40)
③	Year	0~9
④	Month	1~9 , A(10) , B(11) , C(12)
⑤,⑥	Date	01~31
⑦,⑧	Product Lot No.	01~99



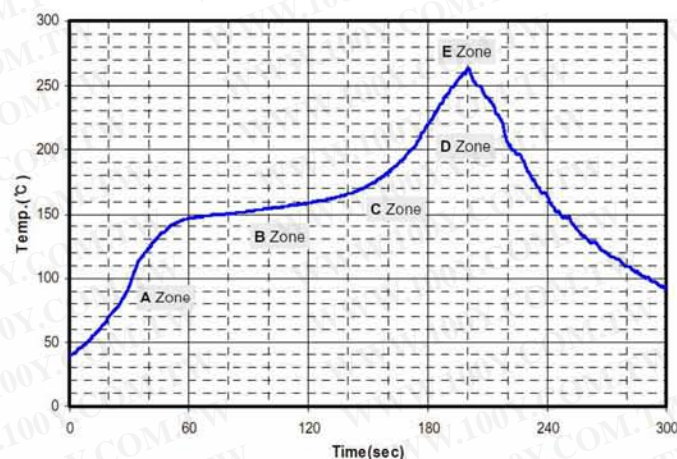
Reflow soldering

- 1) Following soldering paste recommended.

Melting temperature : 235 ~ 260 °C

Composition : Pb-Free

- 2) Recommended thickness of metal mask is between 0.2mm and 0.25mm for screen printing.



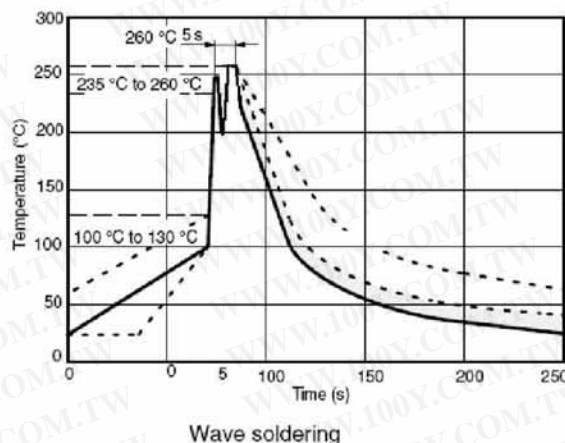
ZONE	Time	Temperature
A	70 ~ 100 sec	4 °C/s max.
B	60 ~ 120 sec	140 ~ 160 °C
C	50 ~ 70 sec	4 °C/s max.
D	60 sec max.	210 ~ 230 °C
E	10 sec max.	260 °C max.

Wave soldering

- 1) Following soldering Bar & Wire recommended.

Melting temperature : 245 ~ 260 °C

Composition : Pb-Free



Wave soldering

Manual Soldering

- 1) Use the Pb-Free solder or the solder containing silver.
- 2) Soldering iron below 320°C within 3 seconds.

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%

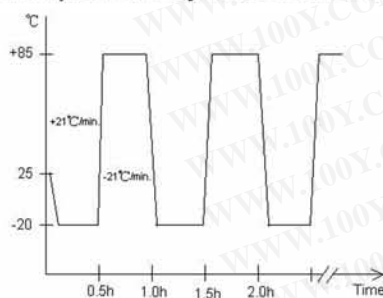
② LTPD : 10% / 20%

No.	Test Item	Test Conditions	Judgment Standard	Fail (c) / Samples (n)
1	High Temp. Storage (※2)	Ta=+90℃, t=500hr	Vcc=5.0V High level output voltage VOH > 4.5V Low level output voltage VOL < 0.4V Consumption current Icc < 0.5mA Arrival Distance D > 20m	C=0 / n=22
2	Low Temp. Storage (※2)	Ta=-30℃, t=500hr		C=0 / n=22
3	High Temp. Operating (※1, ※2)	Ta=+85℃, Vcc=5.0V t=500hr		C=0 / n=22
4	Low Temp. Operating (※1, ※2)	Ta=-20℃, Vcc=5.0V t=500hr		C=0 / n=22
5	High Temp. / High Hum. Bias (※1, ※2)	Ta=+85℃, 85%RH Vcc=5.0V, t=500hr		C=0 / n=22
6	Temperature Cycle (※2, ※3)	Ta=-20℃(0.5h) to +85℃(0.5h) 20cycle		C=0 / n=22
7	P.C.T (※2)	Ta=+121℃ 100%RH P=1atm, t=4hr		C=0 / n=22
8	Solder Heat (※2)	Ta=+320±5℃, 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℃, 10s, 3 times Pb free solder : Sn/3.0Ag/0.5Cu	Leads shall be covered By solder more than 95%	C=0 / n=11

※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 = -20℃ (0.5h), +85℃ (0.5h), 20cycle

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

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

※5. Reflow Soldering.

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

Moisture Sensitivity

Optical characteristics of the device can be adversely affected during the soldering process by the release and vaporization of moisture that has been previously absorbed into the package molding compound.

To ensure the package molding compound contains the smallest amount of absorbed moisture possible, each device is dry-baked prior to being packed for shipping.

Devices are packed in a sealed aluminized envelope with silica gel to protect them from ambient moisture during shipping, handling and storage before use.

The FM-xxxx series IR receiver has been assigned a moisture sensitivity level of **MSL 3** and the devices should be stored under the following conditions:

Temperature Range	5°C to 50°C
Relative Humidity	60% maximum
Total Time	6 months from the date code on the aluminized envelope if unopened
Opened Time	168 hours or fewer

Re-baking will be required if the devices have been stored unopened for more than 6 months or if the aluminized envelope has been open for more than 168 hours. If re-baking is required, it should be done at 90°C for 4 hours.

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
Shielding Bag	Polyethylene	120 x 160 x 0.15	200 pcs
Box-#1	Corrugated Cardboard	135 x 217 x 73	1,000 pcs
Box-#2	Corrugated Cardboard	395 x 300 x 240	10,000 pcs
Box-#3	Corrugated Cardboard	620 x 410 x 530	40,000 pcs



1. Put 200pcs of products in a Shielding Bag.

2. Put 5pcs of Shielding Bag.



4. Put 4pcs of #2 packing boxes in a #3 packing box.

3. Put them(10pcs of #1) in a #2 packing box.



ISSUED DATE	2009 / 10 / 09
PREPARED by	James Chen
CHECK by	
FINAL DATE	2009 / 10 / 09

Page 10