2012

Product Catalog

ROHM SEMICONDUCTOR

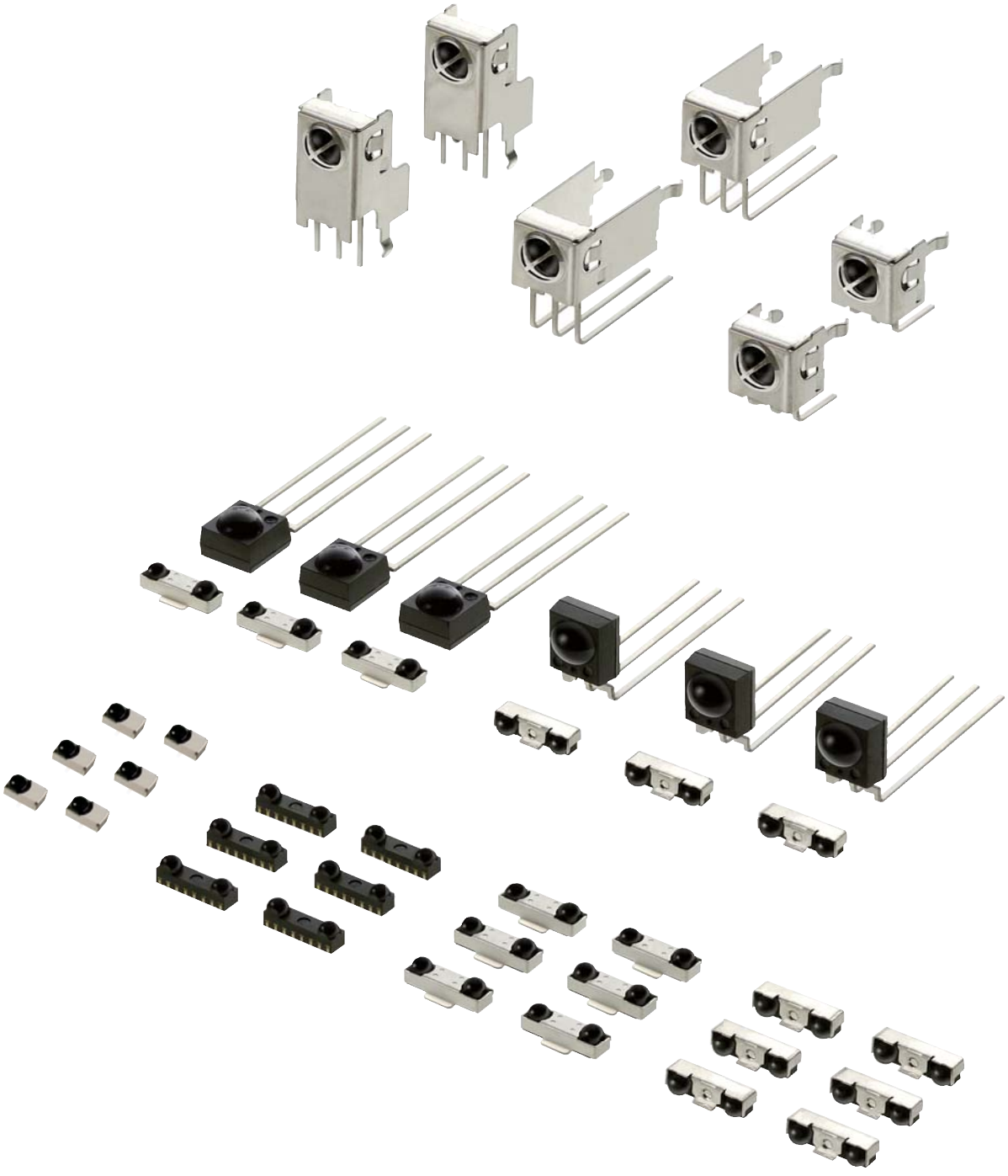
Opto Electronics

Remote Control Receiver Modules

ROHM Co.,Ltd.

Remote Control Receiver Modules

ROHM surface mount remote control receiver modules are the smallest in their class and feature excellent noise resistance along with superior reliability.



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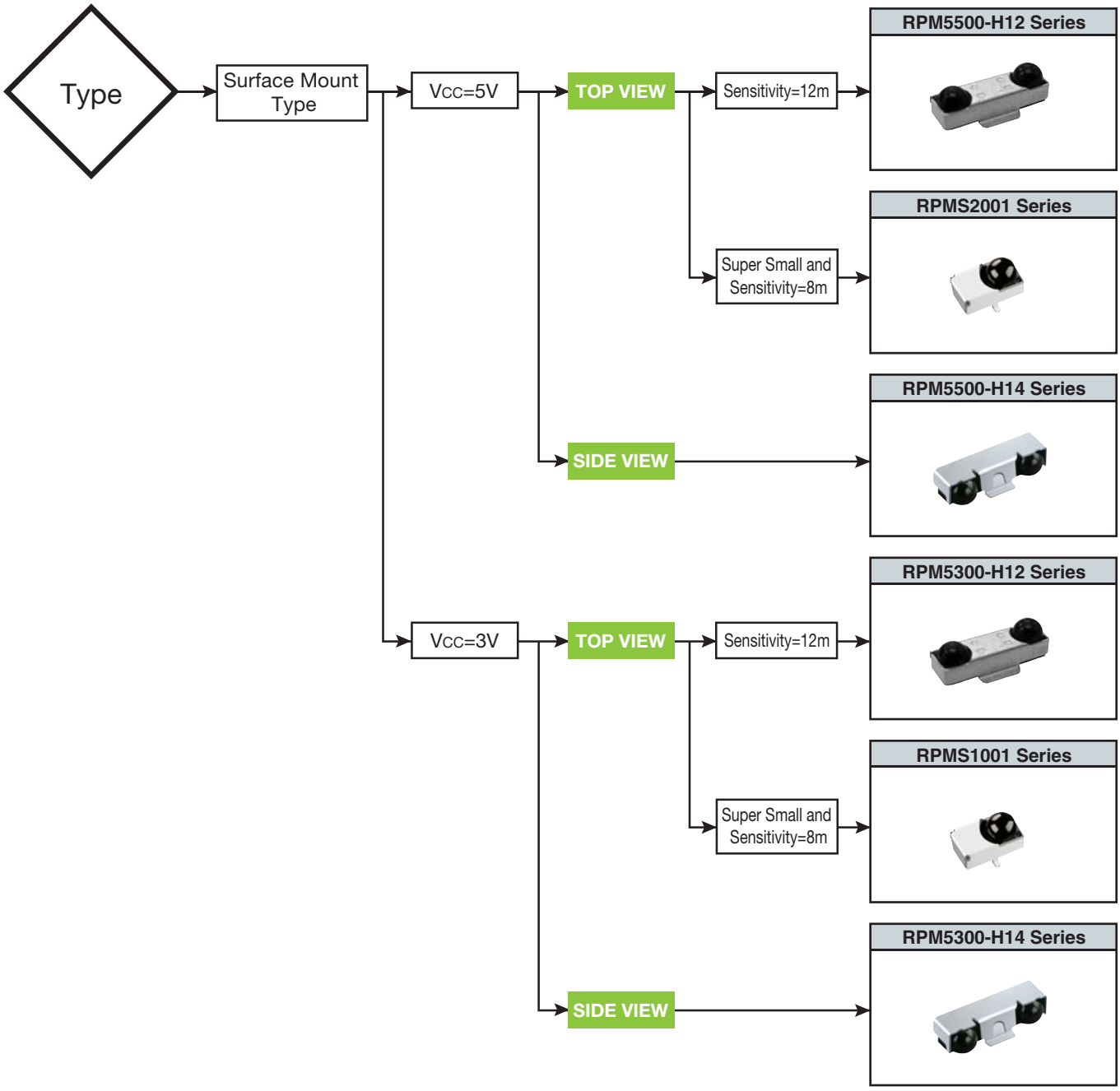
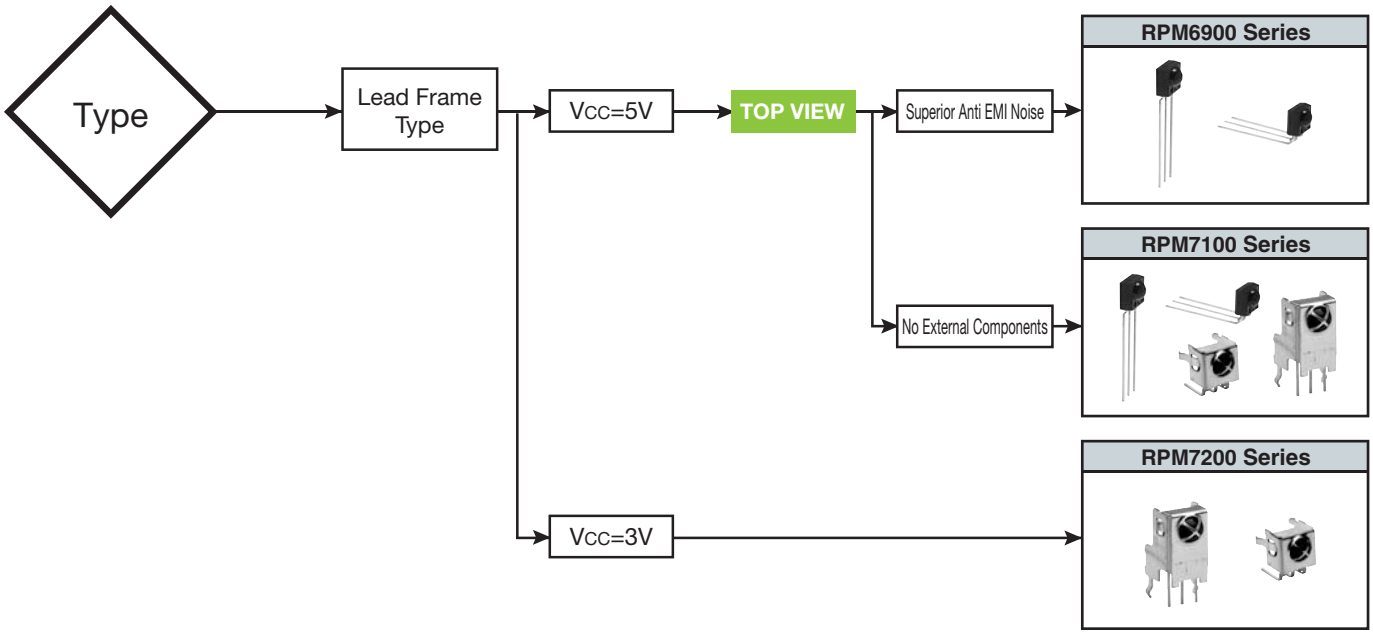
Surface Mount Remote Control Receiver Modules



Lead Frame Remote Control Receiver Modules



Lineup

Surface Mount Remote Control Receiver Modules

Dual-Receiver Type

Type	fo (kHz)	Part No.	Features	Supply voltage (V)	Characteristics						Lens Direction		Package	RoHS
					Current consumption (mA)	Effective Distance (m)	VOL Max.(V)	VOH Min.(V)	θ50% Horizontal (deg)	θ50% Vertical (deg)	SIDE VIEW	TOP VIEW		
RPM5537 Series	36.7	**RPM5537-H12**	5V Operation Dual lens make the receiving characteristics wide and high sensitive.	4.5 to 5.5	0.95	12	0.5	4.5	42	38		○	Fig.2	Yes
		RPM5537-H14									○		Fig.1	Yes
RPM5538 Series	37.9	**RPM5538-H12**		4.5 to 5.5	0.95	12	0.5	4.5	42	38		○	Fig.2	Yes
		RPM5538-H14									○		Fig.1	Yes
RPM5540 Series	40.0	**RPM5540-H12**		4.5 to 5.5	0.95	12	0.5	4.5	42	38		○	Fig.2	Yes
		RPM5540-H14									○		Fig.1	Yes
RPM5337 Series	36.7	**RPM5337-H12**	3V Operation Dual lens make the receiving characteristics wide and high sensitive.	2.7 to 3.6	0.3	12	0.5	2.5	42	38		○	Fig.2	Yes
		RPM5337-H14									○		Fig.1	Yes
RPM5338 Series	37.9	**RPM5338-H12**		2.7 to 3.6	0.3	12	0.5	2.5	42	38		○	Fig.2	Yes
		RPM5338-H14									○		Fig.1	Yes
RPM5340 Series	40.0	**RPM5340-H12**		2.7 to 3.6	0.3	12	0.5	2.5	42	38		○	Fig.2	Yes
		RPM5340-H14									○		Fig.1	Yes

Ultra-Compact Type

Type	fo (kHz)	Part No.	Features	Supply voltage (V)	Characteristics						Lens Direction		Package	RoHS
					Current consumption (mA)	Effective Distance (m)	VOL Max.(V)	VOH Min.(V)	θ50% Horizontal (deg)	θ50% Vertical (deg)	SIDE VIEW	TOP VIEW		
RPMS2371 Series	36.7	**RPMS2371-H19**	Super small package Good characteristics against Sunlight noise	4.5 to 5.5	0.95	8	0.5	4.5	34	32		○	Fig.3	Yes
RPMS2381 Series	37.9	**RPMS2381-H19**		4.5 to 5.5	0.95	8	0.5	4.5	34	32		○	Fig.3	Yes
RPMS2401 Series	40.0	**RPMS2401-H19**		4.5 to 5.5	0.95	8	0.5	4.5	34	32		○	Fig.3	Yes
RPMS1371 Series	36.7	**RPMS1371-H19**		2.7 to 3.6	0.3	8	0.5	2.5	34	32		○	Fig.3	Yes
RPMS1381 Series	37.9	**RPMS1381-H19**		2.7 to 3.6	0.3	8	0.5	2.5	34	32		○	Fig.3	Yes
RPMS1401 Series	40.0	**RPMS1401-H19**		2.7 to 3.6	0.3	8	0.5	2.5	34	32		○	Fig.3	Yes

Lead Frame Remote Control Receiver Modules

5V Type : RPM6900 Series (Superior Anti-Noise Characteristics)

Type	fo (kHz)	Part No.	Features	Supply voltage (V)	Characteristics						Lens Direction	Height to lens (mm)	Package	RoHS
					Current consumption (mA)	Effective Distance (m)	VOL Max.(V)	VOH Min.(V)	θ50% Horizontal (deg)	θ50% Vertical (deg)				
RPM6933 Series	33.3	**RPM6933**	Internal photo IC ensures excellent anti-noise characteristics	4.5 to 5.5	1.5	15	0.5	4.5	42	35	SIDE VIEW	5.5	Fig.4	Yes
		RPM6933-V4									TOP VIEW	4.8	Fig.7	Yes
RPM6936 Series	36.0	**RPM6936**									SIDE VIEW	5.5	Fig.4	Yes
		RPM6936-V4									TOP VIEW	4.8	Fig.7	Yes
RPM6937 Series	36.7	**RPM6937**									SIDE VIEW	5.5	Fig.4	Yes
		RPM6937-V4									TOP VIEW	4.8	Fig.7	Yes
RPM6938 Series	37.9	**RPM6938**									SIDE VIEW	5.5	Fig.4	Yes
		RPM6938-V4									TOP VIEW	4.8	Fig.7	Yes
RPM6940 Series	40.0	**RPM6940**									SIDE VIEW	5.5	Fig.4	Yes
		RPM6940-V4									TOP VIEW	4.8	Fig.7	Yes
RPM6957 Series	56.9	**RPM6957**									SIDE VIEW	5.5	Fig.4	Yes
		RPM6957-V4									TOP VIEW	4.8	Fig.7	Yes

5V Type : RPM7100 Series

Type	fo (kHz)	Part No.	Features	Supply voltage (V)	Characteristics						Lens Direction	Height to lens (mm)	Package	RoHS
					Current consumption (mA)	Effective Distance (m)	VOL Max.(V)	VOH Min.(V)	θ50% Horizontal (deg)	θ50% Vertical (deg)				
RPM7136-R Series	36.0	**RPM7136-R**	Multimedia Application	4.5 to 5.5	0.85	15	0.5	4.5	45	35	SIDE VIEW	5.5	Fig.4	Yes
		RPM7136-H5R										9.6	Fig.5	Yes
		RPM7136-H13R										15.0	Fig.6	Yes
		RPM7136-V4R									TOP VIEW	4.8	Fig.7	Yes
		RPM7136-H8R										7.2	Fig.8	Yes
		RPM7136-H9R										12.0	Fig.9	Yes
		RPM7136-H4R										15.9	Fig.10	Yes
RPM7137-R Series	36.7	**RPM7137-R**		4.5 to 5.5	0.95	15	0.5	4.5	45	35	SIDE VIEW	5.5	Fig.4	Yes
		RPM7137-H5R										9.6	Fig.5	Yes
		RPM7137-H13R										15.0	Fig.6	Yes
		RPM7137-V4R									TOP VIEW	4.8	Fig.7	Yes
		RPM7137-H8R										7.2	Fig.8	Yes
		RPM7137-H9R										12.0	Fig.9	Yes
		RPM7137-H4R										15.9	Fig.10	Yes
RPM7138-R Series	37.9	**RPM7138-R**	Standard Application	4.5 to 5.5	0.95	15	0.5	4.5	45	35	SIDE VIEW	5.5	Fig.4	Yes
		RPM7138-H5R										9.6	Fig.5	Yes
		RPM7138-H13R										15.0	Fig.6	Yes
		RPM7138-V4R									TOP VIEW	4.8	Fig.7	Yes
		RPM7138-H8R										7.2	Fig.8	Yes
		RPM7138-H9R										12.0	Fig.9	Yes
		RPM7138-H4R										15.9	Fig.10	Yes
RPM7140-R Series	40.0	**RPM7140-R**		4.5 to 5.5	0.95	15	0.5	4.5	45	35	SIDE VIEW	5.5	Fig.4	Yes
		RPM7140-H5R										9.6	Fig.5	Yes
		RPM7140-H13R										15.0	Fig.6	Yes
		RPM7140-V4R									TOP VIEW	4.8	Fig.7	Yes
		RPM7140-H8R										7.2	Fig.8	Yes
		RPM7140-H9R										12.0	Fig.9	Yes
		RPM7140-H4R										15.9	Fig.10	Yes
RPM7157-R Series	56.9	**RPM7157-R**		4.5 to 5.5	1.00	15	0.5	4.5	45	35	SIDE VIEW	5.5	Fig.4	Yes
		RPM7157-H5R										9.6	Fig.5	Yes
		RPM7157-H13R										15.0	Fig.6	Yes
		RPM7157-V4R									TOP VIEW	4.8	Fig.7	Yes
		RPM7157-H8R										7.2	Fig.8	Yes
		RPM7157-H9R										12.0	Fig.9	Yes
		RPM7157-H4R										15.9	Fig.10	Yes

3V Type : RPM7200 Series

Type	fo (kHz)	Part No.	Features	Supply voltage (V)	Characteristics						Lens Direction	Height to lens (mm)	Package	RoHS
					Current consumption (mA)	Effective Distance (m)	VOL Max.(V)	VOH Min.(V)	θ50% Horizontal (deg)	θ50% Vertical (deg)				
RPM7236-R Series	36.0	**RPM7236-H5R**	Multimedia Application	2.7 to 3.6	0.3	15	0.5	2.5	45	35	SIDE VIEW	9.6	Fig.5	Yes
		RPM7236-H13R										15.0	Fig.6	Yes
		RPM7236-H8R										7.2	Fig.8	Yes
		RPM7236-H9R									TOP VIEW	12.0	Fig.9	Yes
		RPM7236-H4R										15.9	Fig.10	Yes
RPM7237-R Series	36.7	**RPM7237-H5R**		2.7 to 3.6	0.3	15	0.5	2.5	45	35	SIDE VIEW	9.6	Fig.5	Yes
		RPM7237-H13R										15.0	Fig.6	Yes
		RPM7237-H8R										7.2	Fig.8	Yes
		RPM7237-H9R									TOP VIEW	12.0	Fig.9	Yes
		RPM7237-H4R										15.9	Fig.10	Yes
RPM7238-R Series	37.9	**RPM7238-H5R**	Standard Application	2.7 to 3.6	0.3	15	0.5	2.5	45	35	SIDE VIEW	9.6	Fig.5	Yes
		RPM7238-H13R										15.0	Fig.6	Yes
		RPM7238-H8R										7.2	Fig.8	Yes
		RPM7238-H9R									TOP VIEW	12.0	Fig.9	Yes
		RPM7238-H4R										15.9	Fig.10	Yes
RPM7240-R Series	40.0	**RPM7240-H5R**		2.7 to 3.6	0.3	15	0.5	2.5	45	35	SIDE VIEW	9.6	Fig.5	Yes
		RPM7240-H13R										15.0	Fig.6	Yes
		RPM7240-H8R										7.2	Fig.8	Yes
		RPM7240-H9R									TOP VIEW	12.0	Fig.9	Yes
		RPM7240-H4R										15.9	Fig.10	Yes

Dimensions

Fig.1 <SIDE VIEW>

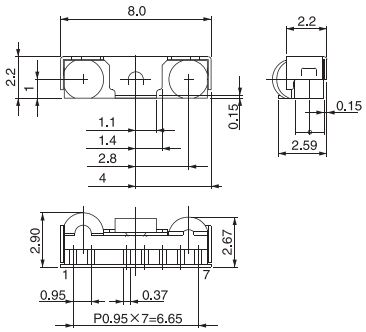


Fig.2 <TOP VIEW>

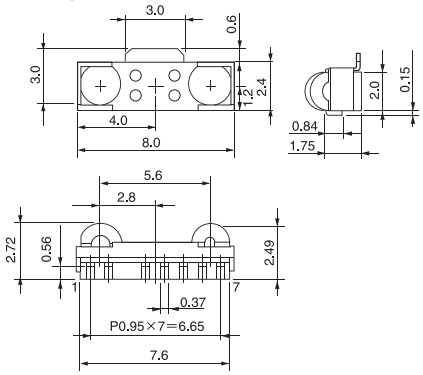


Fig.3 <TOP VIEW>

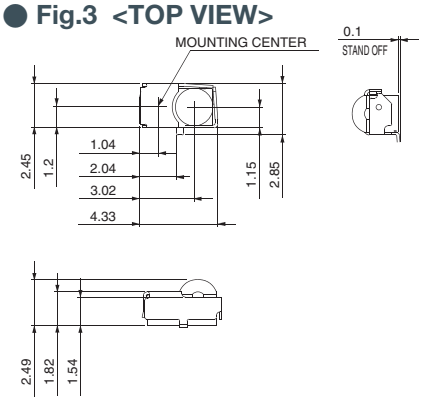


Fig.4 <SIDE VIEW>

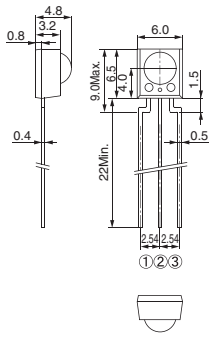


Fig.5 <SIDE VIEW>

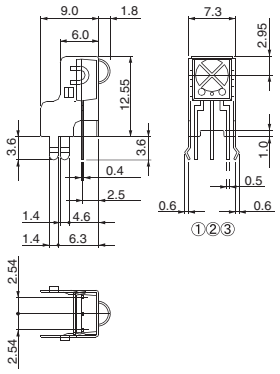


Fig.6 <SIDE VIEW>

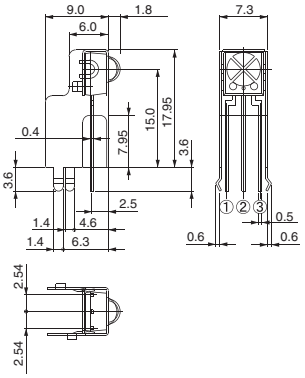


Fig.7 <TOP VIEW>

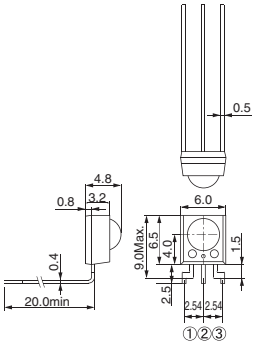


Fig.8 <TOP VIEW>

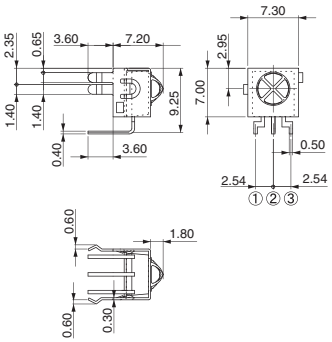


Fig.9 <TOP VIEW>

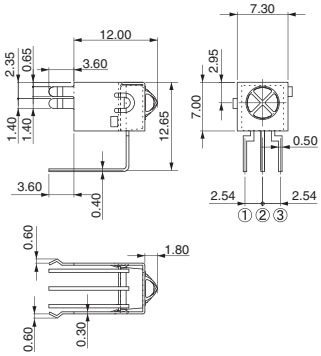
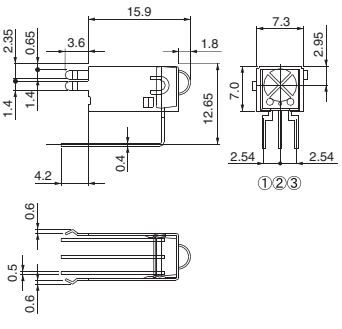


Fig.10 <TOP VIEW>



Packaging Specifications

Surface Mount Remote Control Receiver Modules

Packing Style	Part No.	Lens Direction	Taping Type No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Embossed taping	RPM5537-H14	SIDE VIEW	E2A	2500	2500
	RPM5538-H14				
	RPM5540-H14				
	RPM5337-H14				
	RPM5338-H14				
	RPM5340-H14				
	RPM5537-H12				
	RPM5538-H12				
	RPM5540-H12				
	RPM5337-H12				
	RPM5338-H12				
	RPM5340-H12	TOP VIEW	E4A		
	RPMS2371-H19				
	RPMS2381-H19				
	RPMS2401-H19				
	RPMS1371-H19				
	RPMS1381-H19				
	RPMS1401-H19				

Lead Frame Remote Control Receiver Modules

5V Type : RPM6900 Series (Superior Anti-Noise Characteristics)

Packing Style	Part No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Bulk : Tube	RPM6933	80	2000
	RPM6936		
	RPM6937		
	RPM6938		
	RPM6940		
	RPM6957		
	RPM6933-V4	80	2000
	RPM6936-V4		
	RPM6937-V4		
	RPM6938-V4		
	RPM6940-V4		
	RPM6957-V4		

3V Type : RPM7200 Series

Packing Style	Part No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Bulk : Tube	RPM7236-H4R	50	1000
	RPM7237-H4R		
	RPM7238-H4R		
	RPM7240-H4R		
	RPM7236-H5R	50	1000
	RPM7237-H5R		
	RPM7238-H5R		
	RPM7240-H5R		
	RPM7236-H8R	50	1000
	RPM7237-H8R		
	RPM7238-H8R		
	RPM7240-H8R		
	RPM7236-H9R	50	1000
	RPM7237-H9R		
	RPM7238-H9R		
	RPM7240-H9R		
	RPM7236-H13R	50	1000
	RPM7237-H13R		
	RPM7238-H13R		
	RPM7240-H13R		

5V Type : RPM7100 Series

Packing Style	Part No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Bulk : Tube	RPM7136-R	80	2000
	RPM7137-R		
	RPM7138-R		
	RPM7140-R		
	RPM7157-R		
	RPM7136-V4R	80	2000
	RPM7137-V4R		
	RPM7138-V4R		
	RPM7140-V4R		
	RPM7157-V4R		
	RPM7136-H4R	50	1000
	RPM7137-H4R		
	RPM7138-H4R		
	RPM7140-H4R		
	RPM7157-H4R		
	RPM7136-H5R	50	1000
	RPM7137-H5R		
	RPM7138-H5R		
	RPM7140-H5R		
	RPM7157-H5R		
	RPM7136-H8R	50	1000
	RPM7137-H8R		
	RPM7138-H8R		
	RPM7140-H8R		
	RPM7157-H8R		
	RPM7136-H9R	50	1000
	RPM7137-H9R		
	RPM7138-H9R		
	RPM7140-H9R		
	RPM7157-H9R		
	RPM7136-H13R	50	1000
	RPM7137-H13R		
	RPM7138-H13R		
	RPM7140-H13R		
	RPM7157-H13R		

Basic Principles of Remote Control

About Remote Control Receiver Modules

A remote control receiver module is an optical communications module that utilizes infrared rays. Conventional modules use a cubic structure (1.5x1.5cm) consisting of a PCB containing a PIN photodiode, receiver IC, capacitors, and a shield casing. However, since ROHM released a single-package model, one-package mold resin types have become the norm.

ROHM offers 2 leaded (5.0V RPM7100-Hx, 3.0V RPM7200-Hx) and 4 surface mount (5.0V RPM5500, RPMS2001, 3.0V RPM5300, RPMS1001) series.
Both types utilize a dual-chip structure incorporating a PIN photodiode and receiver IC. Malfunctions due to noise are prevented by reducing supply ripple, resulting in broad compatibility.

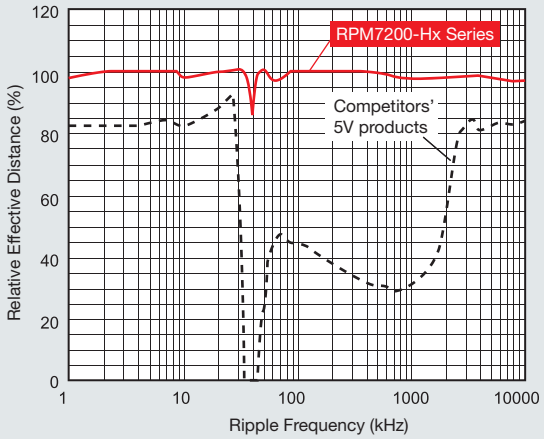


Fig.1 Relative Effective Distance vs. Power Supply Ripple Frequency of RPM7200-Hx

Remote Control Optical Signals

Remote controls utilize infrared rays, which are longer in wavelength than visible light (dominant wavelength approx. 950nm).

Using Infrared Rays

Remote controls are mainly used indoors under artificial lighting, which include large amounts of visible light components with very little infrared. Therefore, infrared light is used to prevent interference from normal light sources, improving the signal-to-noise ratio. In addition, ROHM remote control receiver modules integrate a filter function that further eliminates optical noise.

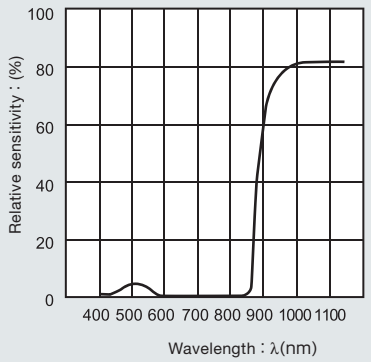


Fig.2 Relative Sensitivity of RPM7100-Hx/RPM7200-Hx

Remote Control Receiver Modules and Data Communication

Structure

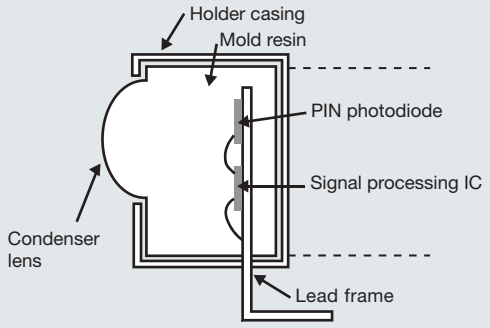


Fig.3 Structure of RPM7100-Hx/RPM7200-Hx

ROHM remote control receiver modules are comprised of a photodiode and signal processing IC die bonded to a metal lead frame. Gold wires are used to ensure high reliability. The components are then sealed with mold resin to eliminate visible optical noise and the entire structure except for the condenser lens is covered in a metal shield casing.

Remote Control System : Signal Flow

The remote control receiver module receives an optical signal from the remote control unit and converts it to electronic format.

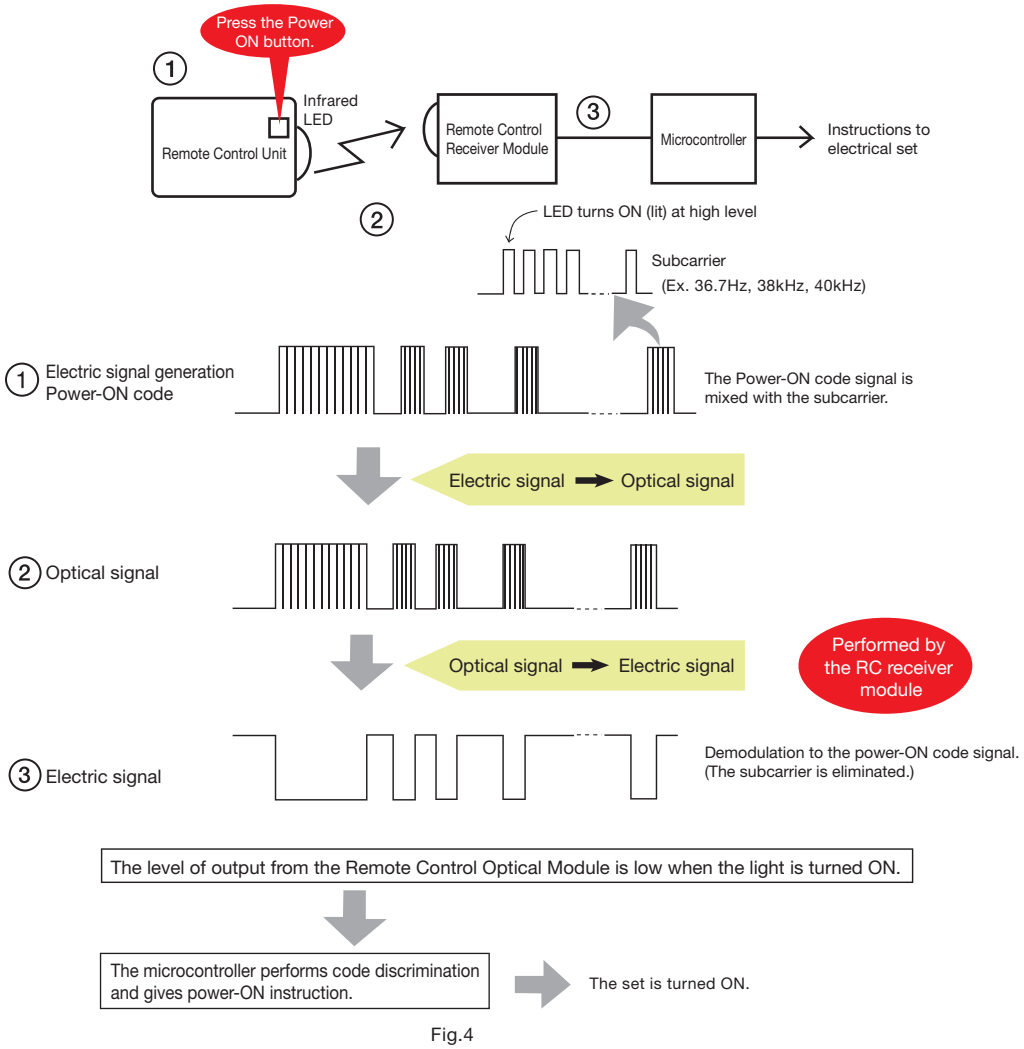


Fig.4

Block Diagram and Operation

Block Diagram

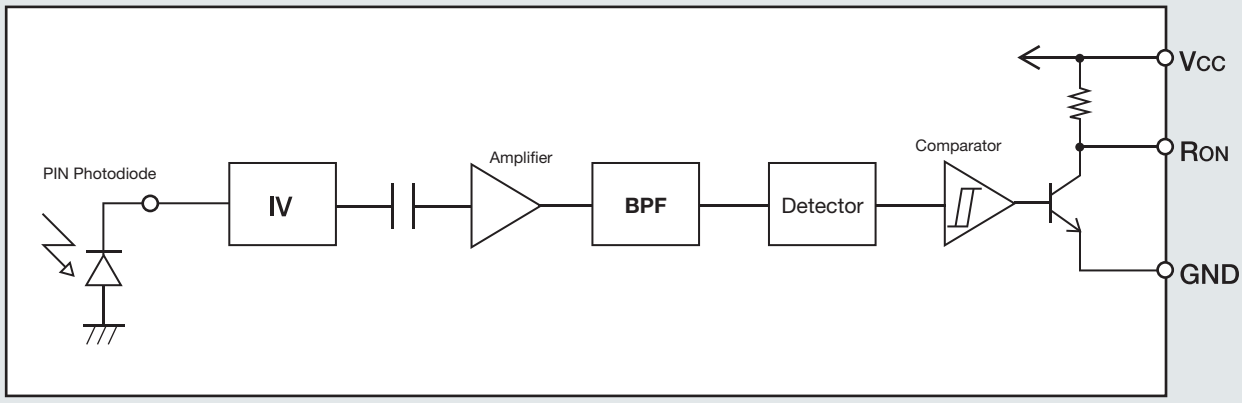


Fig.5 Block Diagram

Operation of Each Block

・Photodiode

The photodiode receives an optical signal transmitted from the control unit and converts it into a current signal. Mold resin is used to cut off visible light, allowing only the optical signal to pass. Figure 6 shows the spectral sensitivity characteristics of the mold resin and photodiode.

・IV

Current signals received from the photodiode is converted to voltage. An automatic gain control function is included to suppress excessively strong optical signal input to within a permissible range.

・Amplifier

This amplifies the voltage signal to an optimal level. The amplitude of abnormally high inputs are limited to the IV block.

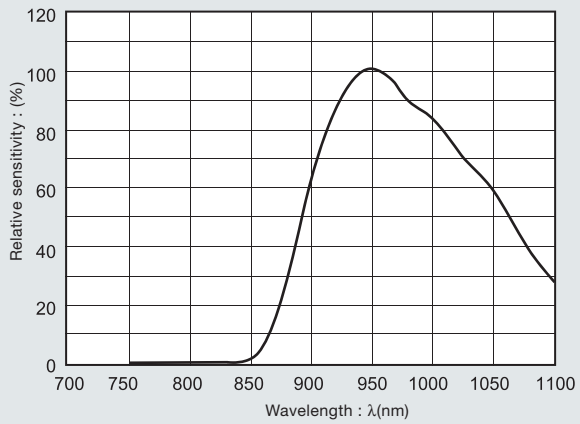


Fig.6 Relative Spectral Sensitivity Characteristics of RPM7100-Hx/RPM7200-Hx

・BPF (Band Pass Filter)

Remote transmission signals are modulated by the subcarrier. The BPF only extracts the pure signal components from the received signal received, which includes noise.

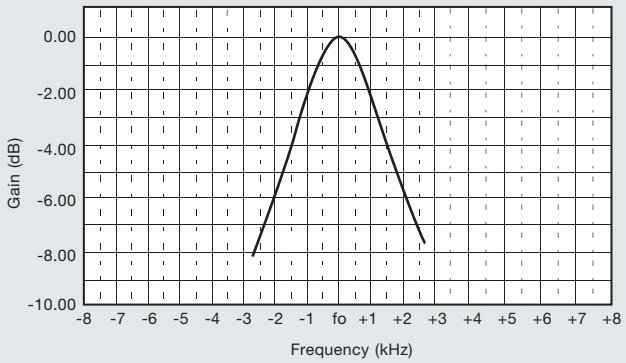


Fig.7 BPF Characteristics

・Detector

This block includes a detector and integrator.

The detector automatically determines the level of detection (a) based on the BPF output and sets the timing for integration.

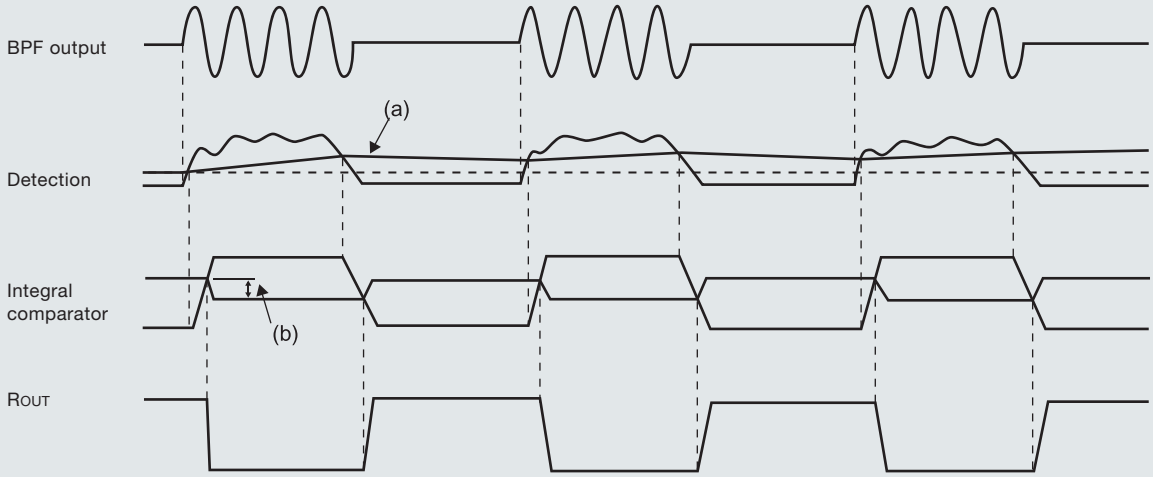


Fig.8 Waveform Shaping

・Comparator

The output of the detection block is converted into binary. Hysteresis (b) prevents chattering that results from noise.

Remote Control Transmission Signals

Various methods are used for signal transmission, since no unified standards exist. The same PPM (pulse position modulation) code is used to discriminate 1 and 0 based on the pulse time interval.
The amplitude of the subcarrier is modified according to the pulse train. Therefore, the sub-carrier frequency range is between 33 and 57kHz.

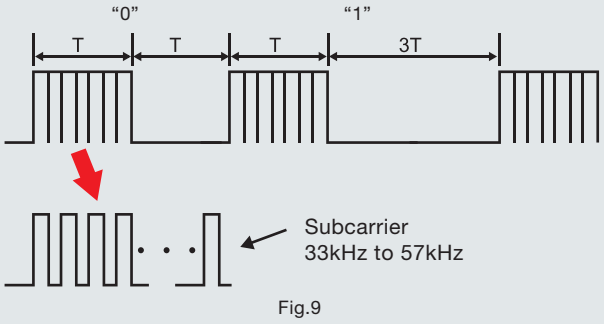


Fig.9

Overview of AEHA's (Association for Electric Home Application) Format

Application : Applicable to infrared remote control systems for home appliances with a subcarrier range up to 40kHz for data transmission

Subcarrier : 33kHz and 40kHz Max.

Signal format : A frame includes a leader, custom code, parity, data code, and trailer, the outline of which is shown below.

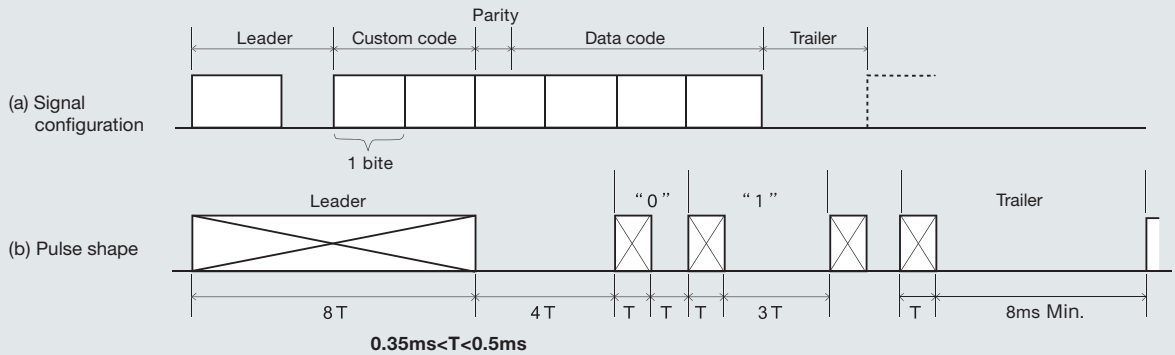


Fig.10

In this format, the leader is used to determine the start of transmission, the custom code is registered and used to prevent the remote control and controlled equipment from malfunctioning and the parity bit along with the custom code is used to confirm that the signal is addressed to the correct equipment. The trailer signifies the completion of transmission.
Device and appliance manufacturers must register their transmission method based on AEHA's format in order to prevent malfunctions.
Various techniques are used. For example, one system transmits data codes three times and gives on OK only when the leader code is received correctly at least twice. Another method transmits the lead and trailer signals and performs operation only upon detection of both signals.

Design Precautions - Transmitter

Transmitter

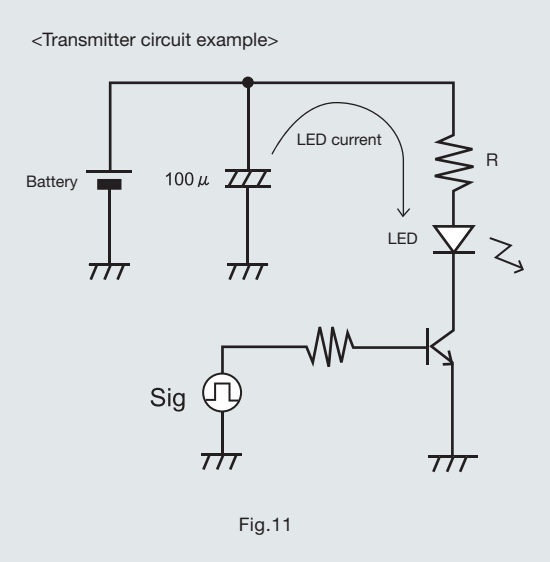


Fig.11

A resistor R sets the LED forward current and adjusts the optical power output of the transmitter.

A 5mm high intensity LED is typically used.

An electrolytic capacitor C supplies the LED current.

<Transmission Frequency Precautions>
Verify that the subcarrier frequency of the transmitter coincides with the center frequency of the remote control receiver module. Otherwise, the effective distance may be reduced or no receiving may occur.

Transmission Format

- Leader Pulse

The remote control receiver module covers a wide input range and automatically controls the receiving sensitivity via leader pulses. The pulse immediately after the start of input may fluctuate if no leader pulse is present (i.e. the receiving pulse output width may be wider than the transmission pulse width).

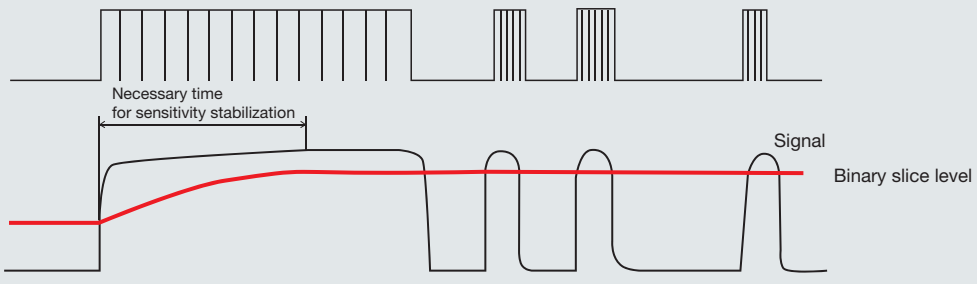


Fig.12 Automatic Sensitivity Adjustment

Transmission Format

・Transmission Pulse Width

Specifications of the output pulse width (Transmission pulse: 600µs)

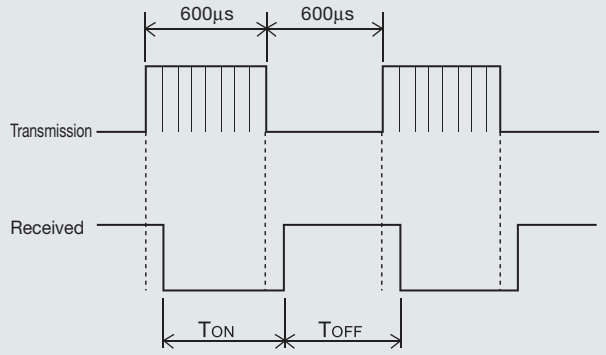


Fig.13

Output pulse width	Min.	Typ.	Max.	Unit
TON/TOFF	**400**	**600**	**800**	**µs**

The received output pulse may fluctuate by ±200µs based on the transmission signal.

Transmission pulse width (ON/OFF) : Both **200µs**

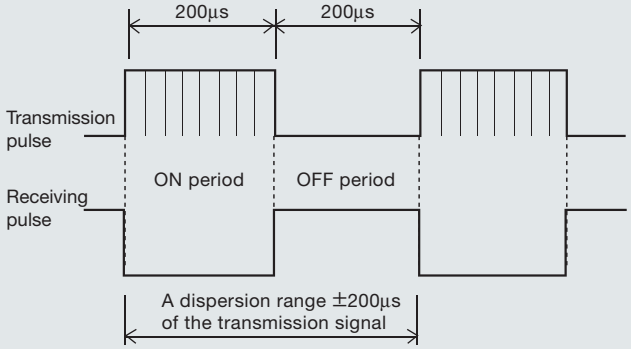


Fig.14

In a worst case scenario, the dispersion pulse output range may be 400µs, resulting in no reception.

・Countermeasures against output pulse dispersion

Making the transmission pulse width as wide as possible (for both ON and OFF) will reduce the likelihood of malfunction.

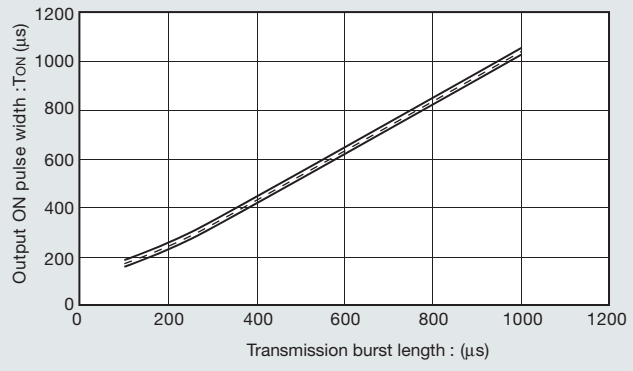


Fig.15 Output ON Pulse Width vs. Transmission Burst Length

Design Precautions - Receiver

Design of Beam Spread Angle

・Installation of Sensor Window and Remote Control Receiver Module

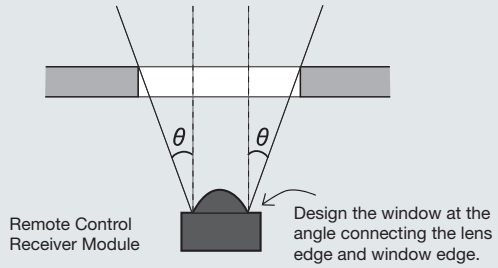


Fig.16 Sensor Window

If the specified beam spread angle is θ1, design the sensor window to satisfy the following condition, as shown in the figure on the right-hand side : θ>θ1.
If the angle is specified from the lens top, there will be no optical signal incidence at the edge of the lens. Therefore, the Remote Control Receiver Module will not fully demonstrate its performance.

・Light Guide Tube

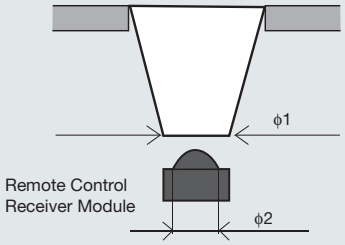


Fig.17 Light Guide Tube

Apply the condition below, on the condition that the diameter of light guide tube on the Remote Control Receiver Module is f1 and that of the lens of the Remote Control Receiver is f2.

$$\phi 1 > \phi 2$$

The maximum sensitivity is obtained by beaming the optical signal at the whole surface of the lens.

Environmentally Robust Noise Design

Remote control receiver modules normally are very sensitive to optical signals. Therefore, a number of countermeasures are in place to combat the various noise sources, which may result in malfunction if the noise becomes too excessive.

・Various Types of Optical Noise

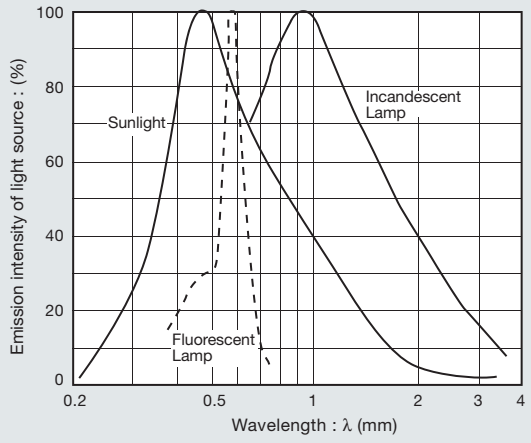


Fig.18 Optical Noise Wavelength Characteristics

Rapid Fluorescent Lamp

The light emission frequency of a standard fluorescent lamp is 100Hz or 120Hz in most of the countries. It normally depends on governmental policy. Although the light emission frequency is sufficiently lower than the subcarrier frequency of the remote control, the harmonics may cause a malfunction (or a reduction in the effective distance)

High Frequency Modulation Type Fluorescent Lamp

In order to reduce light flickering, the light emission frequency of an inverter fluorescent lamp is modified. The frequency is normally around 45kHz, which is close to the subcarrier of the remote controller and becomes noise that cannot be easily removed.
With the incidence of inverter fluorescent light, the effective distance will be shorter in comparison with the case of the rapid fluorescent lamp.

Incandescent Lamp and Sunlight

Lighting apparatus becomes an optical noise source. In many cases, this noise source is radiate from the upper side. Therefore, at the time of designing the window of the set, limit the incidence of light from the upper side.

・Countermeasures of Set for Optical Noise

Lighting devices are the main sources of optical noise. In many cases, this noise source is radiated from the upper side. Therefore, when designing the set window, limit the incidences of light from the upper side.

・Other Noise Sources

Power Supply Noise

Power supply noise can originate from the digital block or result from insufficient smoothing. The noise is manifested as ripples, which may reduce the effective communication distance. ROHM RC receiver modules are designed to minimize this distance reduction.

Electromagnetic Noise

The following devices are considered sources of electromagnetic noise.

- CRTs
- LCDs (i.e. due to horizontal synch signals at 38kHz)
- Fluorescent lamps
- Power supply circuits

Grounding and Pattern Design

・Output Pull-up Resistance

<Circuit diagram>

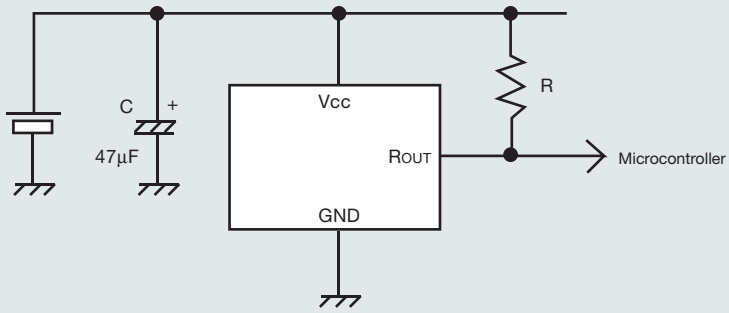


Fig.19 Pull-up Circuit Diagram

The pull-up resistance connected to the output must limit the absorption current of the RC receiver module to within a specified range. Otherwise, the low level voltage may become excessive.

$$R > \frac{V_{CC} - V_{OL}}{I_{sink}}$$

Isink : Specified Absorption Current Max.

Type	Isink(µA)
5V Series	**400**
3V Series	**200**

・Holder Grounding

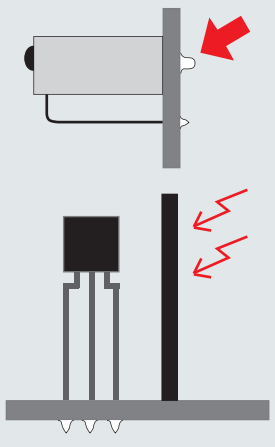


Fig.20 Shield

Connect the holder to the ground pattern

The RC receiver module is very sensitive. Therefore, in order to protect against external noise the casing should be grounded.

RPM7100-Hx Series Holderless Model

Installation of a grounded metal shield in the direction of external noise is an effective counter-measure.

・Vcc and Ground Pattern Design

The RC receiver module must be sensitive enough to receive infrared signals from a distance. Although sufficient countermeasures against power supply ripple were integrated, the user should take additional countermeasures to protect against unforeseen circumstances.

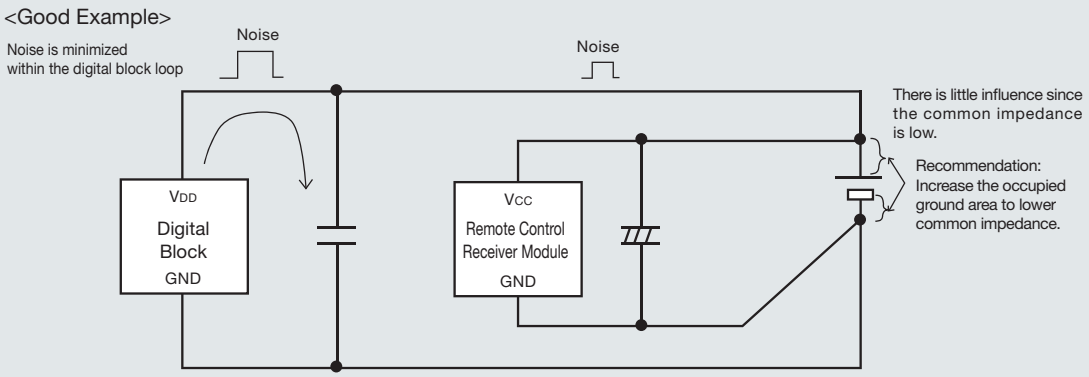


Fig.21 Countermeasure against Line Noise

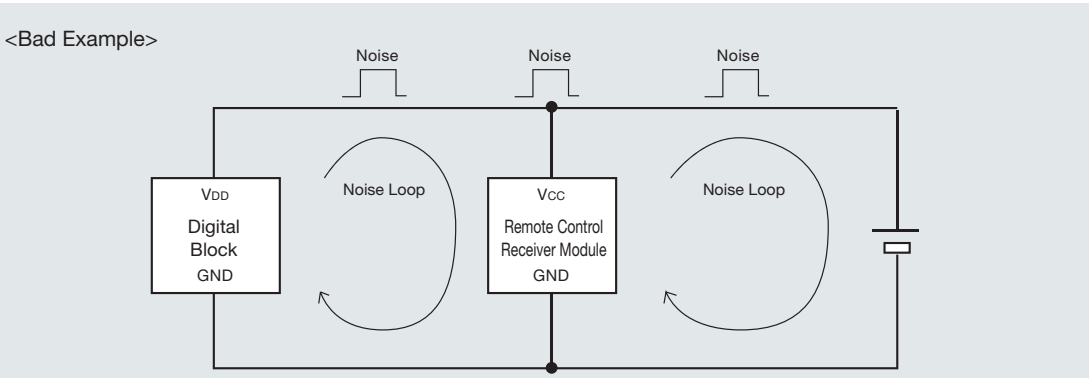


Fig.22 Countermeasure against Line Noise

In the above circuit the noise from the digital block has an adverse effect on the RC receiver module.

Expanding Effective Distance

Wide Pulse Width Jitter

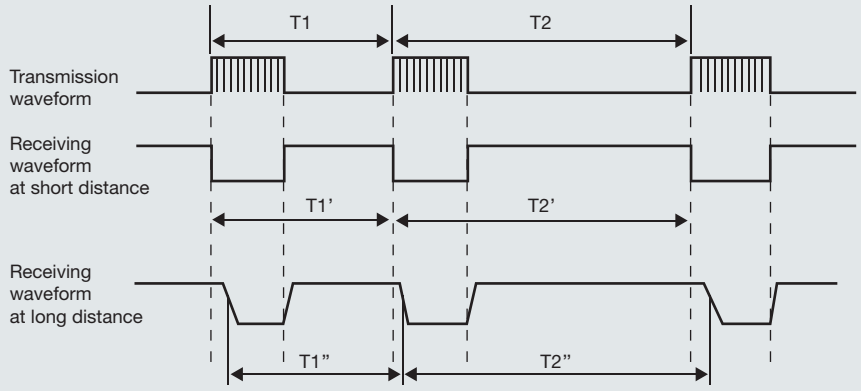


Fig.23 Jitter Countermeasure

If the communications distance is relatively long, angled, or contains optical noise, the output pulse jitter will become larger, increasing the error of pulse intervals T1 and T2. In order to correct for this, T1" and T2" include margins based on software discrimination, making it possible to increase the effective distance.

Pulse Split

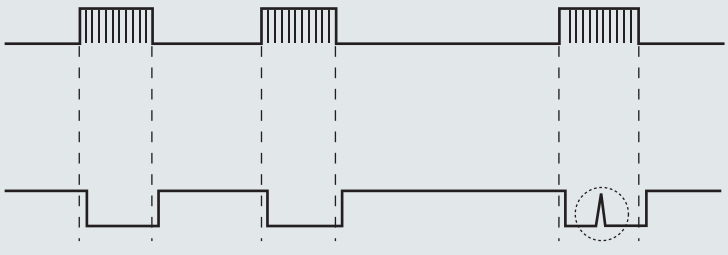


Fig.24 ON Pulse Split

Incidence of excessive external noise	→	Pulse splits can be caused by external noise (i.e. optical, electromagnetic)

Malfunction Countermeasures

Strong external noise (e.g. due to optical/electromagnetic noise, power supply ripples) may cause noise pulses to be generated at the output terminal regardless of whether there is an input signal or not.

Receiving Code Discrimination

A receiver discrimination program should be used to handle pulse splits located midway.

➡ In the above case, it is ideal to use the lead pulse and the code.

Falling Edge Discrimination (Single Pulse)

Receiver discrimination using a non-coded signal (i.e. the falling edge of a single pulse) is not recommended since noise pulses can be generated at the output due to external noise.

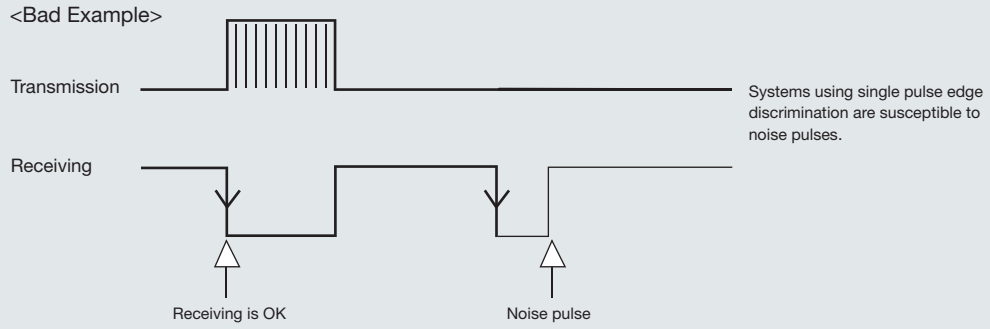


Fig.25 Single Transmission Pulse

Subcarrier

Ensure that the subcarrier coincides with the center frequency of the RC receiver module. Otherwise, the effective distance may be shortened or the RC receiver module may fail to receive the signal.

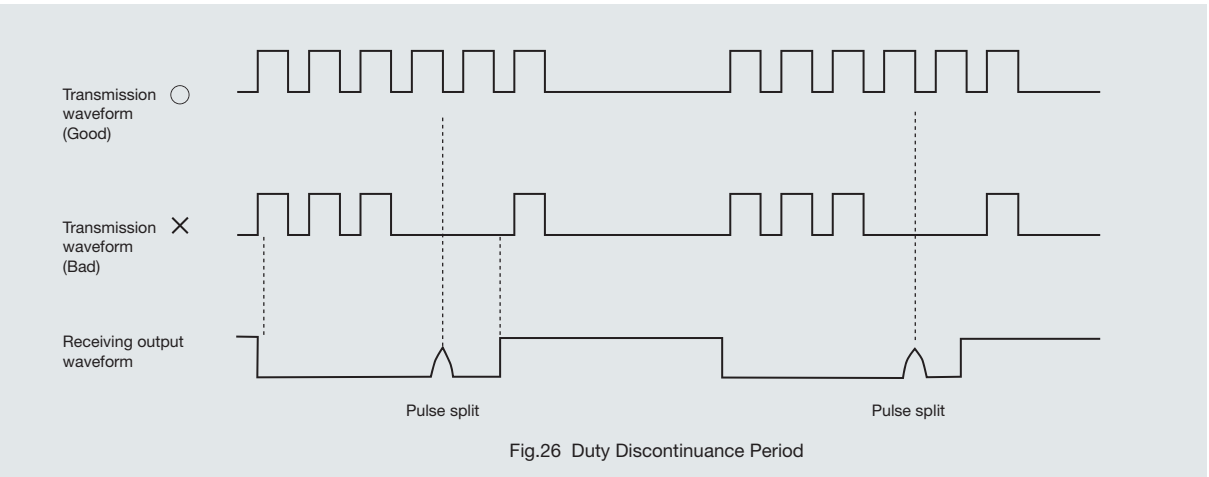


Fig.26 Duty Discontinuance Period

Recommended Soldering Conditions

Surface Mount Type

Solder Profile (Reflow)

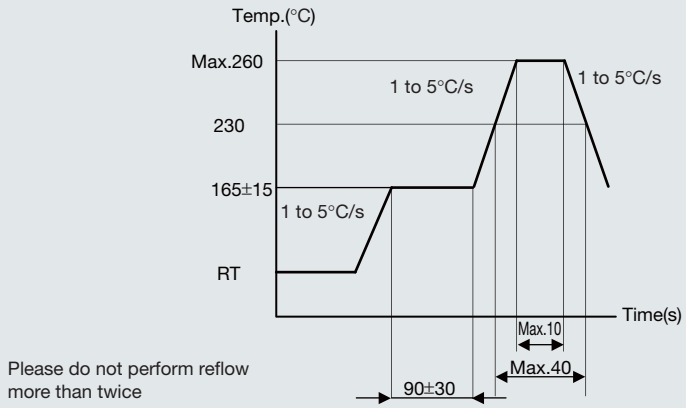


Fig.27

Recommended hand solder conditions (solder iron) :

350°C (Max.), 3s (Max.)/pin

Lead frame type

1. Do not apply temperatures exceeding the maximum storage temperature of the epoxy resin
2. Do not apply force to the epoxy resin at high temperature
3. Adhere to the following recommendations:

(1) The distance between holes on the board should be the same as that between the terminal leads of the component in order to prevent excessive stress, which may lead to open circuits. In addition, lead forming should be performed before the soldering process.

(2) Do not apply stress to the leads during the soldering process

(3) Refer to the conditions in the table below

	Condition
Pre-heating and solder bath	Pre-heating : Less than 90°C Solder bath : Less than 265°C Soldering area : 3mm away from the bottom of the epoxy resin. Dip time : Less than 5 seconds. No more than twice.
Soldering iron	Temperature : Less than 400°C±10°C. within 3 seconds, 2 times Soldering area : 3mm away from the bottom of the epoxy resin.

Notes

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