

IrDA Infrared Communication Module

RPM970-H14

RPM970-H14 is an infrared communication module for IrDA Ver. 1.3 (Low Power). The infrared LED, PIN photo diode, and waveform shaping LSI are all integrated into one single package. This module is designed for low power consumption. The very small package makes it a perfect fit for mobile devices.

●Features

- 1) Infrared LED, PIN photo diode, LED driver and receiver frequency formation circuit built in.
Improvement of EMI noise protection by Shield Case.
- 2) Applied to SIR (9.6k to 115.2kbps), MIR (0.576,1.152Mbps) and FIR(4Mbps).
- 3) Surface mount type.
- 4) Power down function built in.
- 5) Adjustable communication distance by LED load resistance value.

●Applications

Cellular phone, PDA, DVC, Digital still camera, Printer, Handy terminal etc.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Units
Supply voltage	V _{CC} /V _{LEDA} /V _{IO}	6.5 *1	V
Input voltage	V _{in} (3,4,5pin)	-0.3 to V _{IO} +0.3	V
Operation temperature	T _{opr}	-25 to 85	°C
Storage temperature	T _{stg}	-30 to 100	°C
LED peak current	I _{fp}	400 *2	mA
Power dissipation	P _d	300 *3	mW

*1) This applies to all pins basis ground pin (8pin).

*2) LED Peak Current : < 90 μs, On duty < 25%

*3) When glass-epoxy board (70x70x1.6mm) mounted. In case of operating environment is over 25°C, 4mW would be reduced per each 1°C stepping up.

●Recommended operating conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply voltage	V _{CC}	2.4	3.0	3.6	V
	V _{LEDA}	2.7	3.0	5.5	V
	V _{IO}	1.7	3.0	V _{CC}	V

Photo Link Module

●Block diagram and application circuit

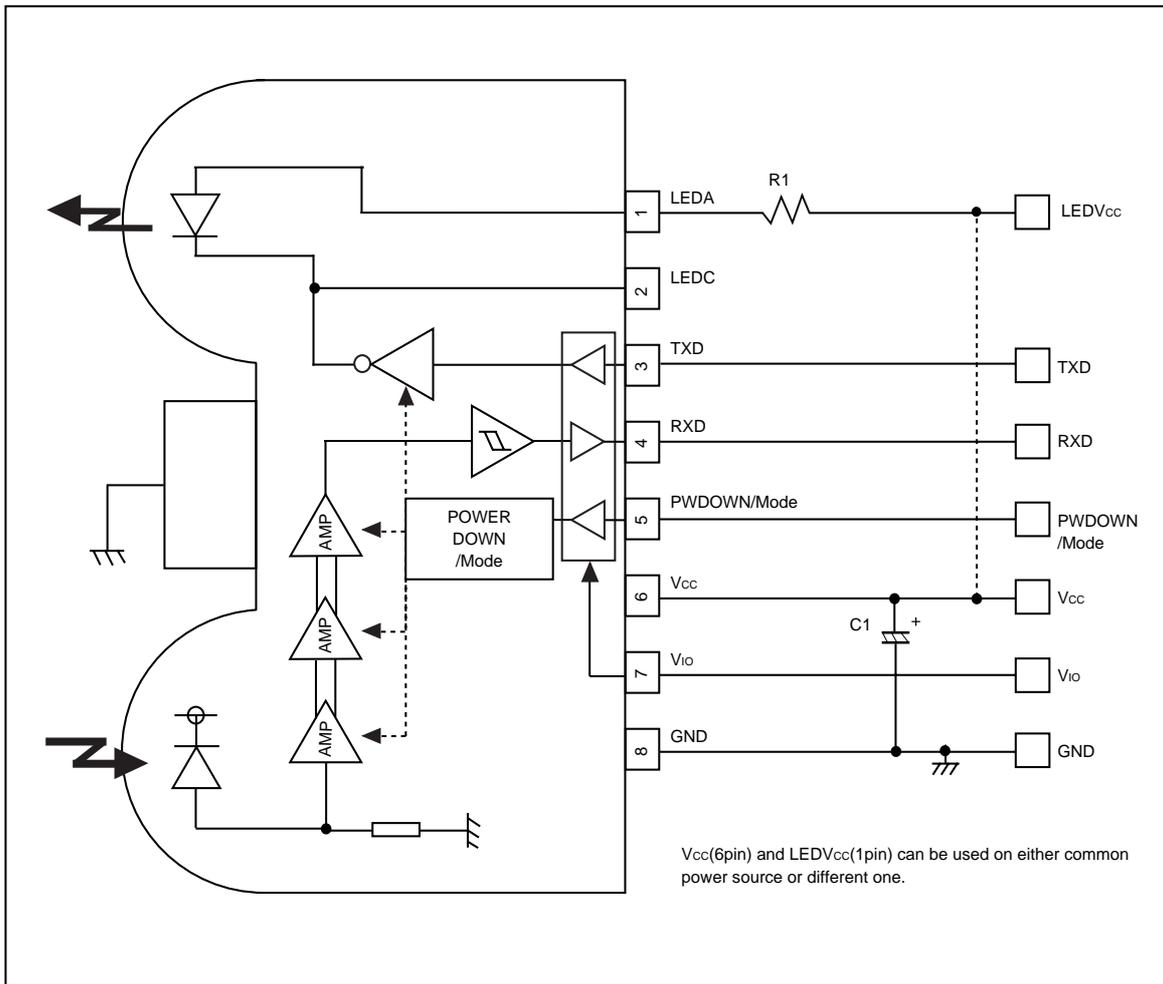


Photo Link Module

●Terminal description

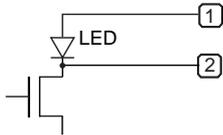
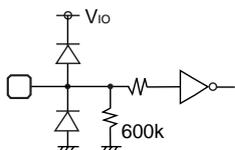
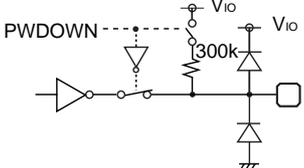
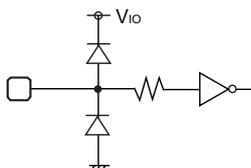
Pin No	Terminal	Circuit	Function
1	LEDA		LED Anode Terminal Other power source can be used difference between LEDV _{CC} and V _{CC} . LED current depends on LED load resistance value. Include internal current limiter (max.400mA).
2	LEDC		LED Cathode Terminal This terminal must be left open.
3	TXD		Transmitting Data Input Terminal H:LED radiant (PWDOWN=L) CMOS Logic Level Input. Holding TXD="H" status, LED will be turn off approximately 48 μs.
4	RXD		Receiving Data Output Terminal When PWDOWN(5pin)="H", the RXD output will be pulled up to V _{IO} at approximately 300 kΩ.
5	PWDOWN /Mode		Power-down Control and Mode Setting Terminal H: POWERDOWN L : OPERATION CMOS Logic Level Input. When input is "H", it will stop the receiving circuit, Pin-PD current and transmitting LED operation.
6	V _{CC}		V_{CC} Supply voltage for Transceiver circuits. For preventing from infection, connect a capacitor between GND(8pin).
7	V _{IO}		V_{IO} Supply voltage for I / O pins (PWDOWN,RXD,TXD).
8	GND		GROUND
-	Shield Case		Connect to Ground.

Photo Link Module

●Electrical characteristics (Unless otherwise noted, $V_{CC}=3V$, $V_{LEDV_{CC}}=3V$, $V_{IO}=3V$, $T_a=25^{\circ}C$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Consumption current 1	Icc1	400	800	1600	μA	PWDOWN=0V, At no input light
Consumption current 2	Icc2	–	0.01	0.2	μA	PWDOWN= V_{IO} , At no input light
Transmission rate(SIR / MIR mode)		9.6	–	1152	kbps	
Transmission rate(FIR mode)		–	4	–	Mbps	
PWDOWN input high voltage	VPDH	$2/3 * V_{IO}$	–	V_{IO}	V	$V_{IO}=1.7$ to 3.6 V ($V_{IO} \leq V_{CC}$)
PWDOWN input low voltage	VPDL	0	–	$1/3 * V_{IO}$	V	
PWDOWN input high current	IPDH	–1.0	0	1.0	μA	PWDOWN= V_{IO}
PWDOWN input low current	IPDL	–1.0	0	1.0	μA	PWDOWN=0V
< Transmitter >						
TXD input high voltage	VTXH	$2/3 * V_{IO}$	–	V_{IO}	V	$V_{IO}=1.7$ to 3.6 V ($V_{IO} \leq V_{CC}$)
TXD input low voltage	VTXL	0	–	$1/3 * V_{IO}$	V	
TXD input high current	ITXH	2.5	5	10	μA	TXD= V_{IO}
TXD input low current	ITXL	–1.0	0	1.0	μA	TXD=0V
LED anode current 1	ILED1	–	170	–	mA	$R1=5.6\Omega$
LED anode current 2	ILED2	180	260	400	mA	$R1=5.6\Omega$, $V_{LEDV_{CC}}=5.5V$
< Receiver >						
RXD output high voltage	VRXH	$V_{IO}-0.4$	–	V_{IO}	V	IRXH= –200 μA
RXD output low voltage	VRXL	0	–	0.4	V	IRXL=200 μA
RXD output rise time	tRR	–	20	–	ns	$C_L=15pF$
RXD output fall time	tFR	–	20	–	ns	$C_L=15pF$
RXD output pulse width(SIR / MIR)	twRXDS	228	380	532	ns	$C_L=15pF$, 9.6k to 1.152 Mbps
RXD output pulse width(FIR1)	twRXDF1	85	125	165	ns	$C_L=15pF$, 4 Mbps(125ns pulse)
RXD output pulse width(FIR2)	twRXDF2	195	250	290	ns	$C_L=15pF$, 4 Mbps(250ns pulse)
Receiver latency time	tRT	–	100	200	μs	

●Optical characteristics (Unless otherwise noted, $V_{CC}=3V$, $V_{LEDV_{CC}}=3V$, $V_{IO}=3V$, $T_a=25^{\circ}C$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Peak wave length	λP	850	870	900	nm	
Intensity1	IE1	25	63	200	mW / Sr	$-15 \text{ deg} \leq \theta L \leq 15 \text{ deg}$ $R1=5.6\Omega$
Half-angle	$\theta L / 2$	–	± 18	–	deg	
Rise time / Fall time	Tr / Tf	–	–	40	ns	10% to 90%
Optical over shoot		–	–	25	%	
Edge jitter	Tj	–25	–	25	ns	
Optical pulse width(MIR)	TweM	172	217	256	ns	tTXD=217ns
Optical pulse width(FIR)	TweF	115	125	135	ns	tTXD=125ns
Minimum irradiance in angular	Eemin	–	9	20	$\mu W / \text{cm}^2$	$-15 \text{ deg} \leq \theta L \leq 15 \text{ deg}$
Maximum irradiance in angular	Eemax	500	–	–	mW / cm^2	$-15 \text{ deg} \leq \theta L \leq 15 \text{ deg}$
Input half-angle	$\theta D / 2$	± 15	–	–	deg	
Maximum emitting time	TLEDmax	16	48	120	μs	TXD= V_{IO}

1. This product is not designed for protection against radioactive rays.
2. This product dose not include laser transmitter.
3. This product includes one PIN photo diode.
4. This product dose not include optical load.

Photo Link Module

●Timing chart

Mode Setting (SIR / MIR / FIR)

With RPM970-H14 there is a need for mode switch according to communication rate. For the mode setting, there are "PWDOWN/Mode" and "TXD". Please see below diagram for the set up of mode.

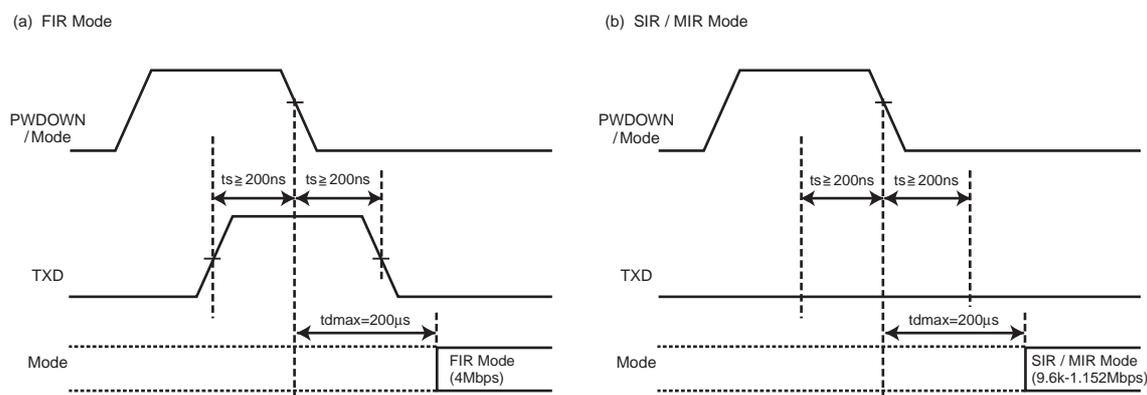


Fig. 1

●Attached components

Part symbol	Recommended value	Notice
C1	6.8 μF , Ceramic or tantalum Ex.)TCFGA1A685M8R (ROHM)	Bigger capacitance is recommended with much noise from power supply
R1	5.6 $\Omega \pm 5\%$, 1/4W (VLEDV _{CC} =3.0V)	More than 50cm distance, more than 10 $\mu\text{W}/\text{cm}^2$ at detecting side. (vs ver1.1)

In case of using R1 with different condition from the above, formula is as follows:

LED resistance value : R1 [Ω], LED average consumption current : ILED[mA], Supply voltage : VLEDV_{CC}[V] necessary d[cm] (Including LED's distribution within ± 15 deg)

$$R1 = T \times (VLEDV_{CC} - 1.45) / d^2 - 5 \text{ } [\Omega]$$

$$ILED = \text{Duty} \times (VLEDV_{CC} - 1.36) / (R1 + 4) \text{ } [A]$$

Duty : LED duty at emitting, T=17000

* At LED/Duty < 180mA

Photo Link Module

●Notes

1) $V_{LEDV_{CC}}$ (1pin), V_{CC} (6pin) and V_{IO} (7pin)

- Other power source can be used difference between V_{LEDA} and V_{CC} and V_{IO} . ($V_{IO} < V_{CC} + 0.3V$)

2) Caution in designing board lay-out

To get maximum potential from RPM970-H14, please keep in mind following instruction.

- The line of RXD (4pin) should be connected at backside via through hole close to RPM970-H14 pin lead. Better not to be close to photo diode side (8pin side).

⇒This is to minimize feedback supplied to photo diode from RXD.

- The parts which generate noise such as DC / DC converter should be placed at more than a radius of 1.0cm away from photo diode (8pin side).

- As for 1 between 6 - 8 pins, it should be placed close to RPM970-H14.

3) Notes

- Please be sure to set up the TXD (3pin) input to be "L" (under 0.6V) except transmitting data.
(For $< 90\mu$ sec. ON duty $< 25\%$).
- Powerdown current might increase if exposed by strong light (ex. direct sunlight) at powerdown mode.
- Please use by the signal format which is specified by IrDA Ver1.3 (Low Power) except 4 Mbps.
There might be on error if used by different signal format.

4) Eye safe

- EN60825-1(IEC60825-1 amendment 2), Class1 Eye safe.

5) $LEDV_{CC}$ voltage derating and ambient temperature

The relation among $LEDV_{CC}$ peak voltage, LED load resistance (R1) and maximum ambient temperature (T_{max}) is shown below.

We recommend you to use within the range as indicated in below.

a) When LED on-duty 25%

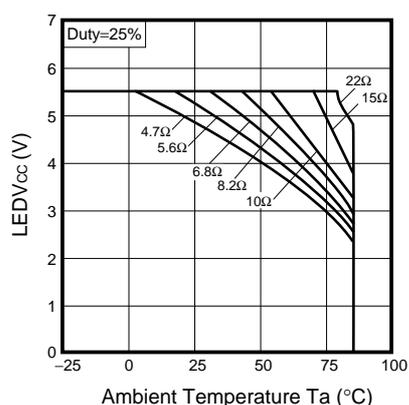
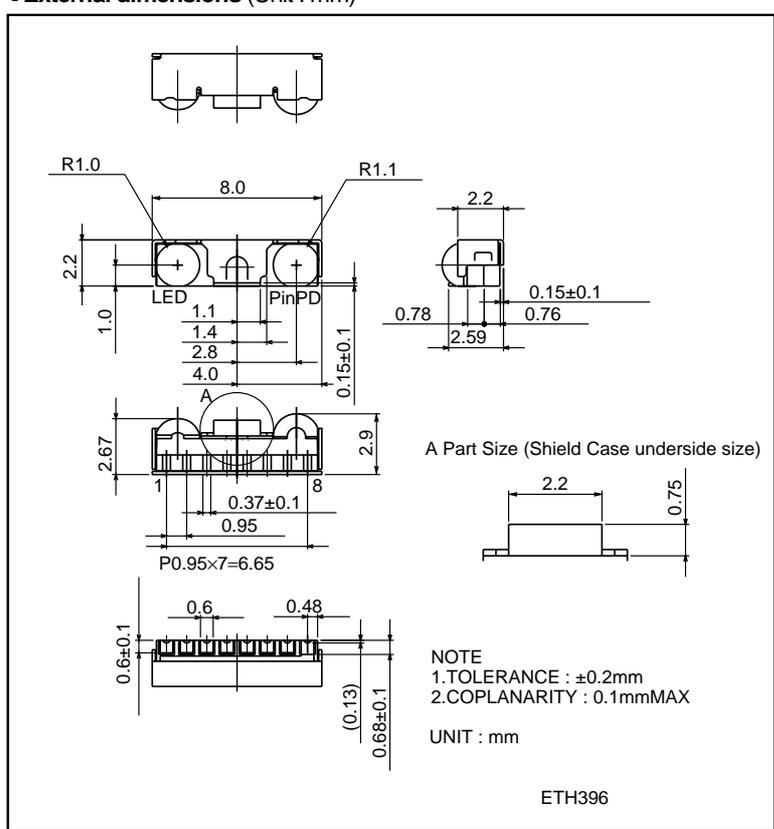


Photo Link Module

●External dimensions (Unit : mm)



Appendix

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).

Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.

In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.