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)

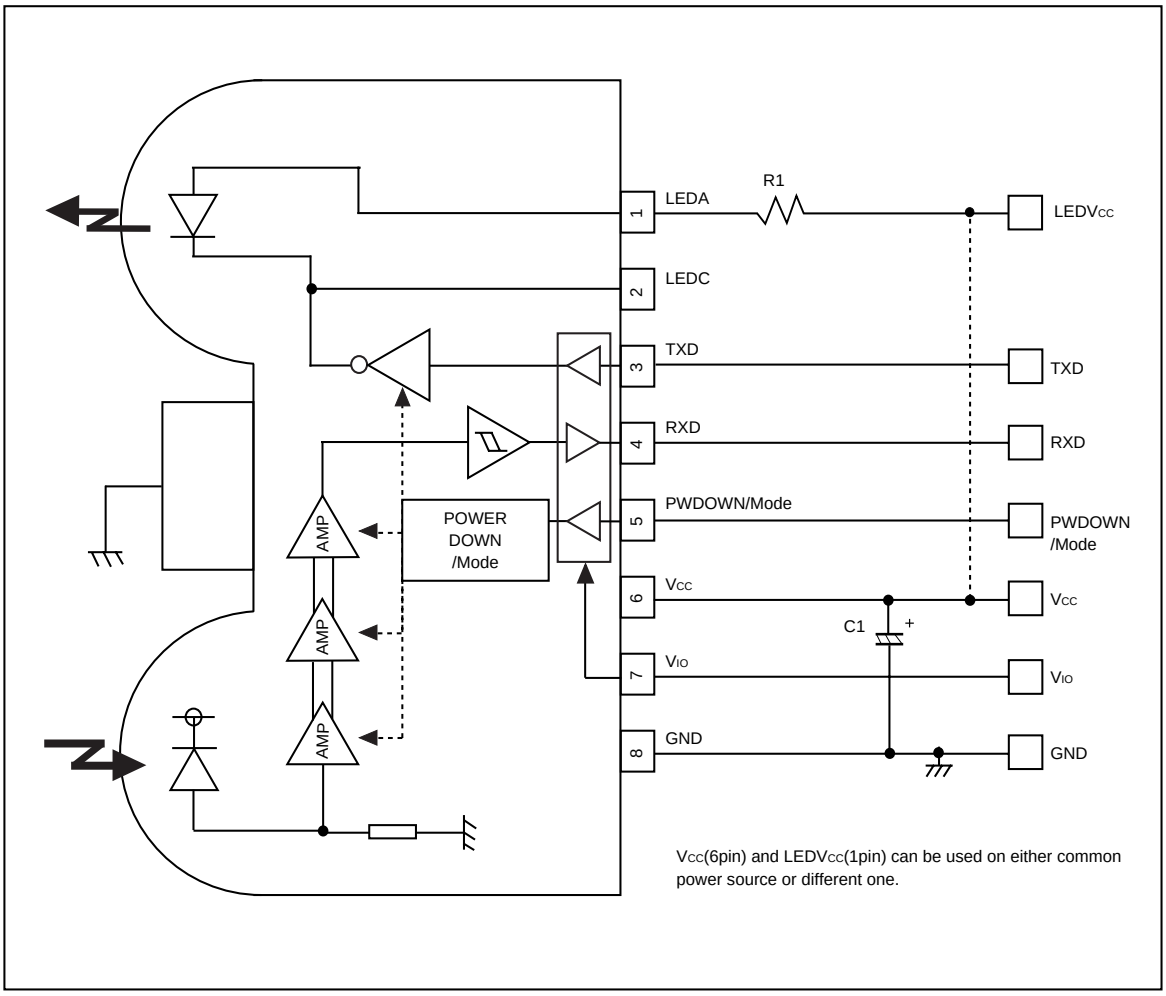
Parameter	Symbol	Limits	Units
Supply voltage	Vcc / V_{LEDA} / V_{IO}	6.5 *1	V
Input voltage	Vin(3,4,5pin)	–0.3 to V_{IO}+0.3	V
Operation temperature	Topr	–25 to 85	°C
Storage temperature	Tstg	–30 to 100	°C
LED peak current	Ifp	400*2	mA
Power dissipation	Pd	300*3	mW

*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.

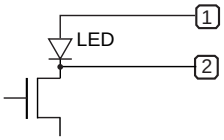
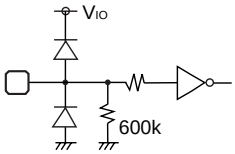
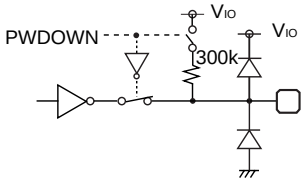
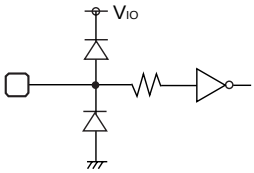
●Recommended operating conditions

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

●**Block diagram and application circuit**



●**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 SettingTerminal** 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.

●**Electrical characteristics** (Unless otherwise noted, V_{CC}=3V, VLEDV_{CC}=3V, VIO=3V, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Consumption current 1	$I_{CC}1$	400	800	1600	µA	PWDOWN=OV, At no input light
Consumption current 2	$I_{CC}2$	–	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=5.6Ω
LED anode current 2	ILED2	180	260	400	mA	R1=5.6Ω, VLEDV_{CC}=5.5V
< Receiver >						
RXD output high voltage	VRXH	V_{IO}–0.4	–	V_{IO}	V	IRXH= –200µA
RXD output low voltage	VRXL	0	–	0.4	V	IRXL=200µA
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, VLEDV_{CC}=3V, VIO=3V, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Peak wave length	λP	850	870	900	nm	
Intensity1	IE1	25	63	200	mW / Sr	–15 deg ≤ θ L ≤ 15 deg R1=5.6Ω
Half–angle	θL / 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	µW / cm^2	–15 deg ≤ θ L ≤ 15 deg
Maximum irradiance in augular	Eemax	500	–	–	mW / cm^2	–15 deg ≤ θ L ≤ 15 deg
Input half–angle	θD / 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.

●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.

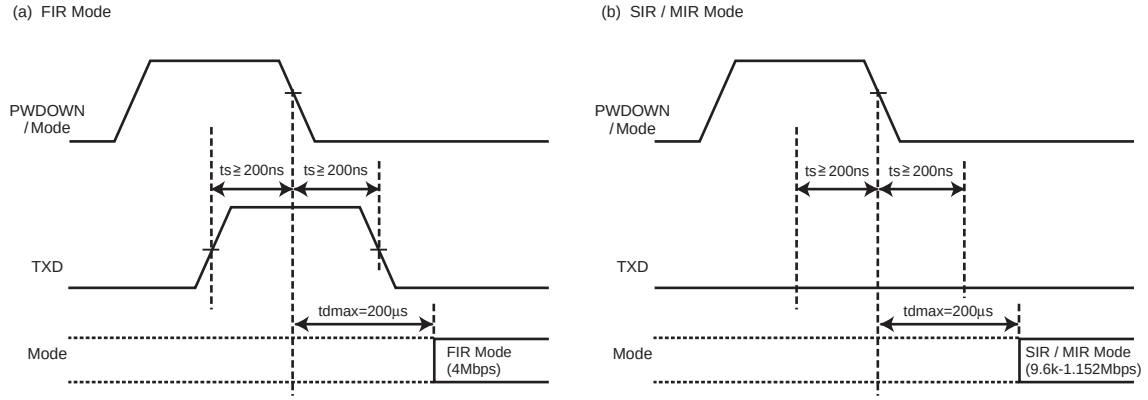


Fig. 1

●Attached components

Part symbol	Recommended value	Notice
C1	6.8µF, Ceramic or tantalum Ex.)TCFGA1A685M8R (ROHM)	Bigger capacitance is recommended with much noise from power supply
R1	5.6Ω ± 5%, 1/4W ($VLEDV_{CC}$=3.0V)	More than 50cm distance, more than 10µW/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)

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

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

Duty : LED duty at emitting, T=17000

※ At LED / Duty<180mA

●Notes

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

・Other power source can be used difference between VLEDA 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 < 90μ 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

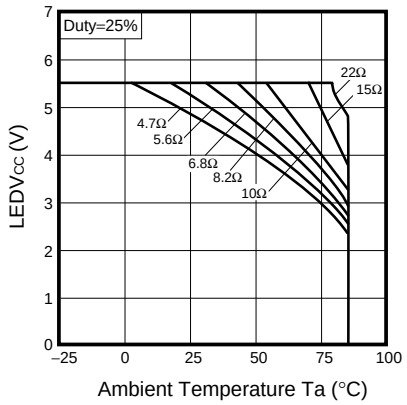
・EN60825-1(IEC60825-1 amendment 2), Class1 Eye safe.

5) LEDV_{CC} voltage derating and ambient temperature

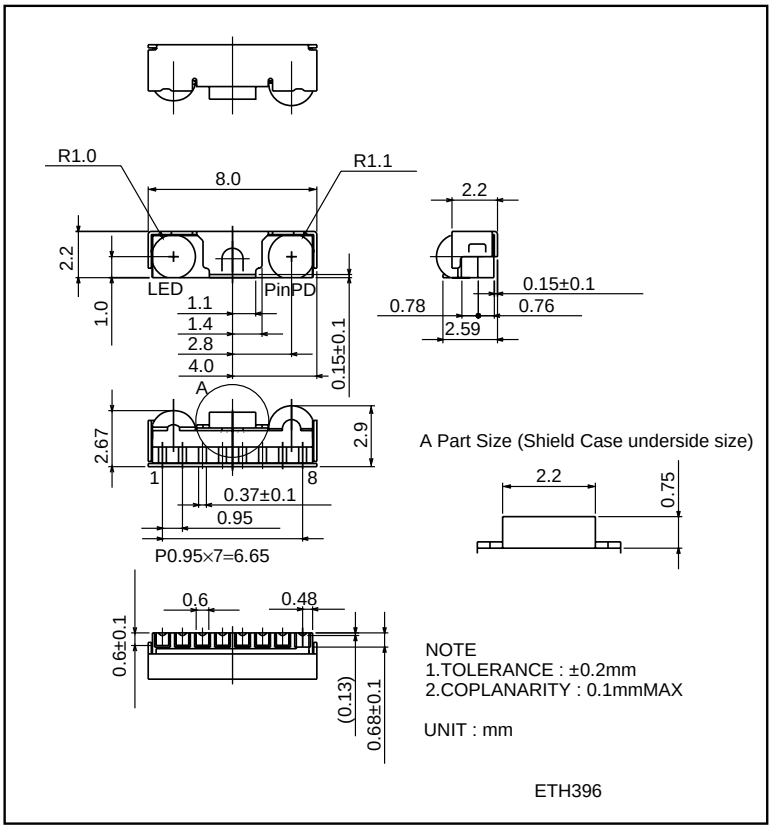
The relation among LEDV_{CC} peak voltage, LED load resistance (R1) and maximum ambient temperature (Tamax) is shown below.

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

a) When LED on-duty 25%



●**External dimensions** (Unit : mm)



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