SHARP

RY5HD01

Technical Information

Infrared Transceiver Module

FEATURES

- Fully Compliant to IrDA1.1 - 4 Mbps
- 3.3 V Low Voltage Operation
- Compatible with the Legacy IrDA (IrDA1) and SHARP ASK
- Backward Compatible with Slower Speeds
- Excellent Noise Immunity
- Single RX Output for Multiple Infrared Port Design
- Optimized Interface to Sharp UIRCC Modem ASIC
- Supported by All Interface Chips

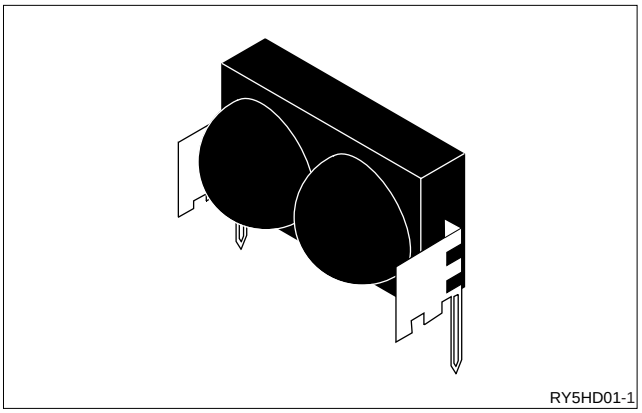

Figure 1. RY5HD01

DESCRIPTION

The Sharp RY5HD01, a 3.3 V low voltage operating infrared transceiver module, provides the interface between logic and IR signals for through-air, serial, half-duplex IR wireless data links and is designed to satisfy the IrDA physical layer specifications.

The Sharp RY5HD01 contains a high speed, high efficiency, low power consumption AlGaAs LED, a silicon PIN photodiode, and the low power driven new bipolar integrated circuit. The IC contains a LED driver circuit and a receiver, that provides single RX out supporting both 9.6 to 115.2 kbps IrDA 1.0 signals, and 1M/4 Mbps IrDA1.1 signals. This single RX output design provides manufacturers with multiple infrared port capability in one application, wherever the infrared port is desired to be located.

Though the RY5HD01 transceiver module is operated at 3.3 V, the module can still work at 5.0 V without any performance desiccation. The manufacturers surely would get the advantage of an energy saving design in any application field, while having alternatives for other components.

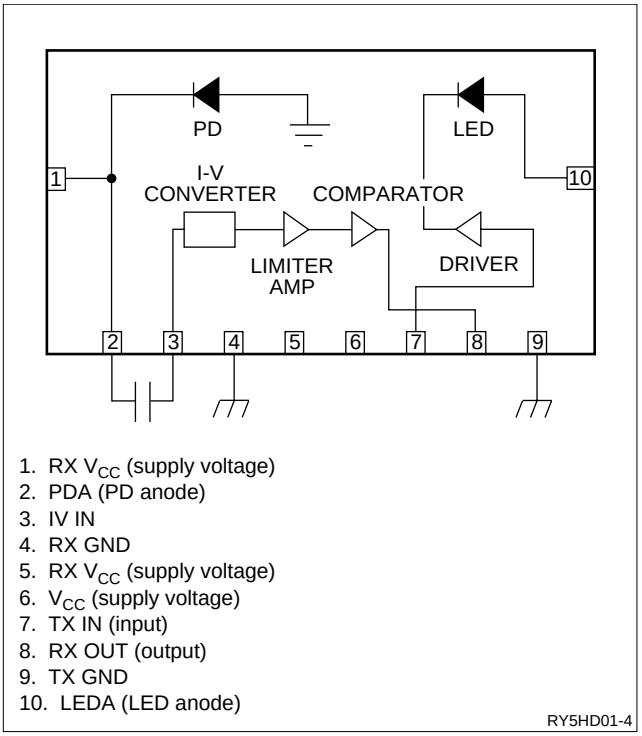

Figure 2. RY5HD01 Internal Block Diagram

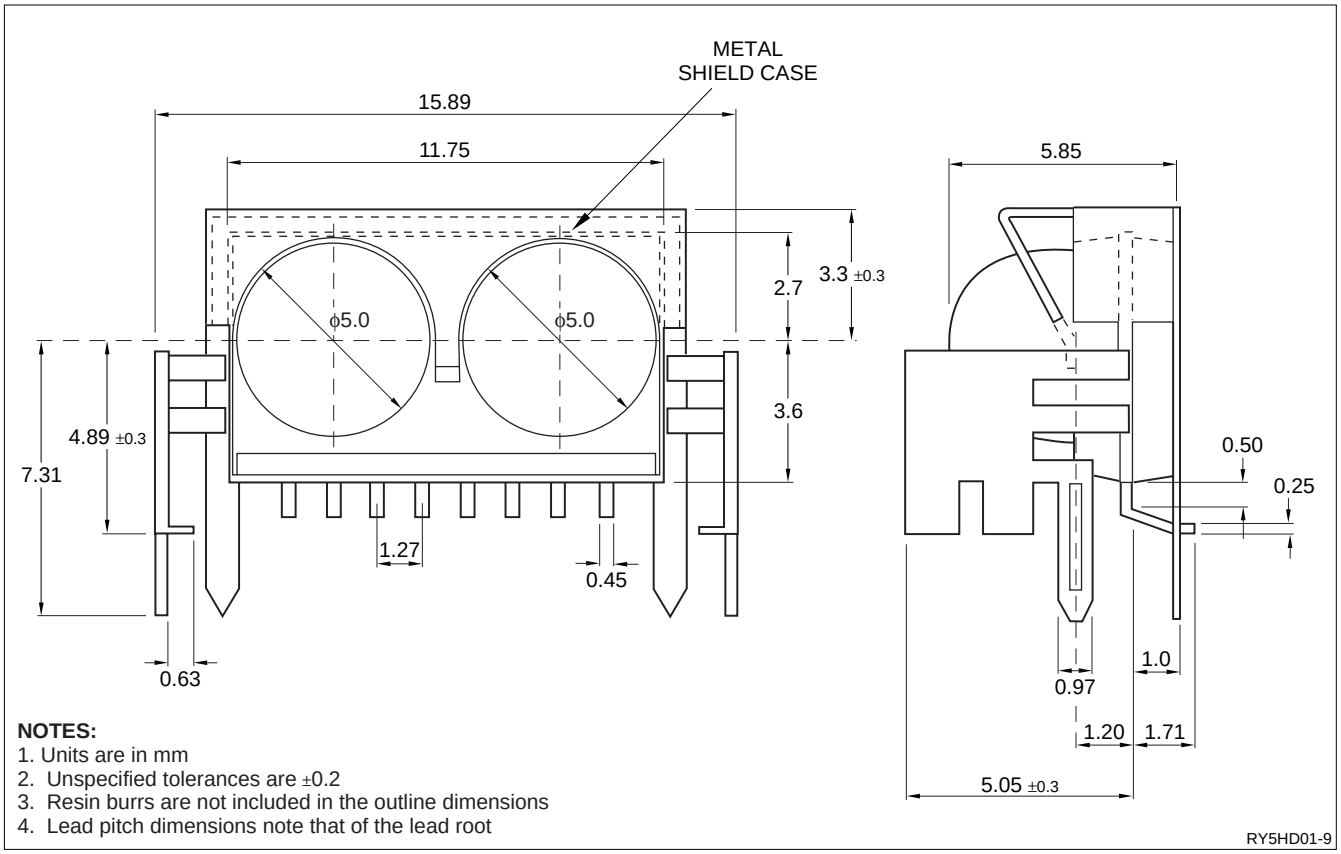

Figure 3. Outline Dimensions

Table 1. PINOUTS

PIN	DESCRIPTION	SYMBOL
1	Receiver Supply Voltage	RX V_{CC}
2	Photodiode Output	PDA
3	I-V Converter Input	IV IN
4	Receiver Ground	RX GND
5	Receiver Supply Voltage	RX V_{CC}
6	Supply Voltage	V_{CC}
7	Transmitter Data Input	TX IN
8	Receiver Data Output	RX OUT
9	Transmitter Ground	TX GND
10	IRLED anode	LEDA

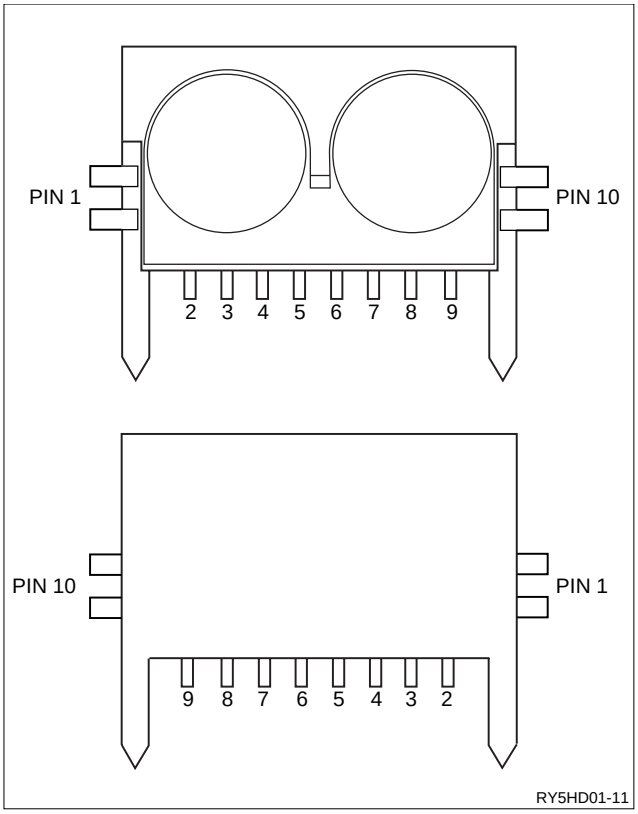

Figure 4. Pin Locations

APPLICATION CIRCUIT EXAMPLES

Recommended application circuit and passives are shown in Figure 5 as well as in Table 2.

Table 2. Component Values

COMPONENTS	RECOMMENDED VALUE
C1	1000 pF ±10% Ceramic
C2	2.2 µF ±10% Ceramic
C3	2.2 µF ±10% Ceramic
C4	82 pF ±10% Ceramic
C5	47 µF ±10% Aluminum
R1	10 Ω +±5% 0.125 Watt
R2	10 Ω ±5% 0.125 Watt
R3	300 Ω ±5% 0.125 Watt
R4	2.2 Ω ±5% 0.5 Watt

NOTE: V_{CC} = 3.3 V.

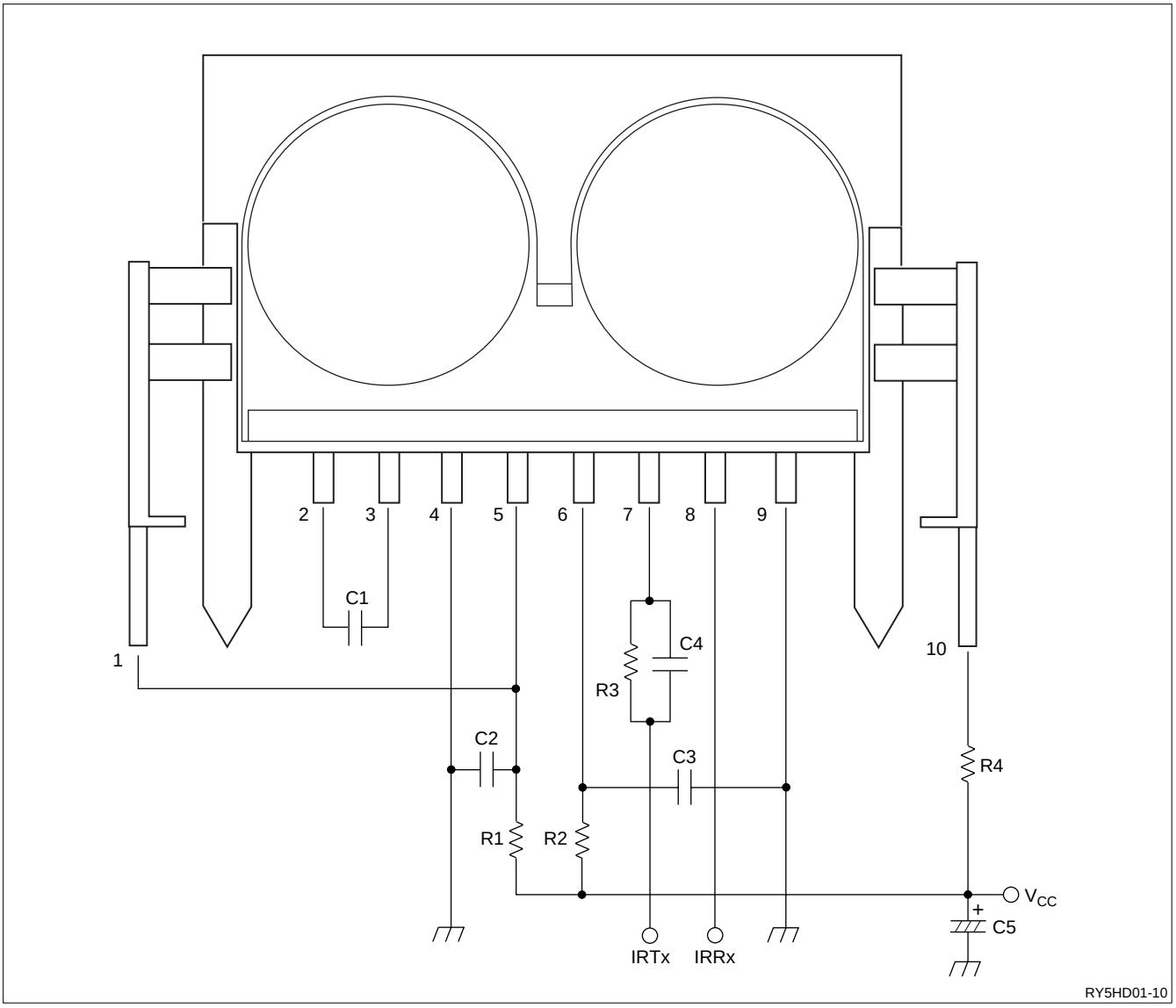

Figure 5. Application Circuit Example

Table 3. Truth Table

INPUT		OUTPUT	
TX IN	**Infrared Light**	**LED**	**RXOUT**
V_{IH}	NV	High (ON)	X
V_{IL}	High (ON)	Low (OFF)	Low
V_{IL}	Low (OFF)	Low (OFF)	High

NOTES:
1. X = Don't Care
2. NV = Not Valid

Table 5. Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARKS
Storage Temperature	T_{STG}	-20	+85	°C	
Operating Temperature	T_{OPR}	0	+70	°C	
Supply Voltage	V_{CC}	—	6.0	V	
Receiver Signal Duty Ratio	—	—	50	%	
Input Voltage Range	—	0.2	V_{CC} + 0.2	V	Represents period of H level transmitting signal at TX pinouts. The frequency should be over 1 kHz.

Table 4. Recommended Operating Conditions

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS
Operating Temperature	T_{OPR}	0	+ 70	°C	
Supply Voltage	V_{CC}	3.0	3.6	V	
Logic High Transmitter Input Voltage (TXIN)	V_{IH2}	2.3	3.3	V	
Logic Low Transmitter Input Voltage (TXIN)	V_{IL2}	0.0	0.45	V	
Logic High Receiver Input Irradiance	E_{IH}	0.0036	500	mW/cm^2	Bit Rate = 9.6 kbps to 115.2 kbps (in-band signals)
	E_{IH}	0.0090	500	mW/cm^2	Bit Rate = 1.152 Mbps to 4 Mbps (in-band signals)[1], Sharp ASK
Receiver Signal Rate (RXOUT)		9.6	4,000	kbps	
Ambient Light					See IrDA Serial Infrared Physical Layer Link Specification Appendix A for ambient lights.

NOTE:
1. An in-band optical signal is a pulse/sequence where the peak wavelength, λp, is defined as $850nm \leq \lambda p \leq 900nm$, and the pulse characteristics are compliant with the IrDA Serial Infrared Physical Layer Link Specification.

ELECTRICAL AND OPTICAL SPECIFICATIONS

Specifications hold over the Recommended Operating Conditions, unless otherwise noted herein. All typical are at 25°C and 3.3 V, ambient light on receiver surface under 1001x, unless otherwise noted herein.

Table 6. Electrical and Optical Specifications

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
RECEIVER SIDE						
High Level Output Voltage	V_{OH1}	2.1	2.5	—	V	
Low Level Output Voltage	V_{OL1}	—	0.1	0.6	V	
Viewing Angle	2Φ	30	—	—	Degrees	
Low Level Pulse Width	tw1	1.0	—	22	µs	Bit Rate = 9.6 kbps (pulse width 19.53 µs)
	tw2	1.0	—	7.0	µs	Bit Rate = 115.2 kbps (pulse width 1.63 µs)
	tw3	100	—	700	ns	Bit Rate = 1.152 Mbps (pulse width 217 ns)
	tw4	85	—	165	ns	Bit Rate = 4 Mbps (pulse width 125 ns)
	tw5	0.5	—	1.6	µs	ASK [f = 500 kHz] (pulse width 217 ns)
Current Consumption	I_{CC1}	3.0	4.0	6.0	mA	All mode, nb signal.
		—	20	—	mA	Maximum value for typ. consumption
Rise Time	tr	—	—	30	ns	
Fall Time	tf	—	—	30	ns	
Maximum Reception Distance	L2	≥1.00	—	—	m	2Φ ½ ≤ 15°, Bit Rate = 115.2 kbps, BER = 10^{-3}
	L3 L4	≥1.00	—	—	m	2Φ ½ ≤ 15°, Bit Rate = 1.152 Mbps, BER = 10^{-3} 2Φ ½ ≤ 15°, Bit Rate = 4.0 Mbps, BER = 10^{-3}
	L1	≥1.00	—	—	m	2Φ ½ ≤ 15°, Bit Rate = 115.2 kbps, BER = 10^{-3}
TRANSMITTER SIDE						
Radiant Intensity	I_E	100	—	—	mW/sr	V_{IH2} = 2.3V, I_{LEDA} = 400 mA
Peak Emission Wavelength	λP2	—	880	—	nm	
Peak LED Current	I_{LEDA}	—	400	—	mA	All mode
Current Consumption	I_{CC3}	50	75	112	mA	Bit Rate = 115.2 kbps (TXIN Duty 3/16)
	I_{CC4} I_{CC5}	66	100	150	mA	Bit Rate = 1.152 Mbps (TXIN Duty 1/4) Bit Rate = 4.0 Mbps (TXIN Duty 1/4)
	I_{CC2}	133	200	300	mA	ASK, TXIN Duty 1/2 500 kHz
Rise Time	tr (IE)	—	—	40	ns	Bit Rate = 4 Mbps (pulse width 125 ns)
Fall Time	tf (IE)	—	—	40	ns	Bit Rate = 4 Mbps (pulse width 125 ns)
Transmitter Data Input Current (Logic High)	I_{IH2}	3.0	—	5.1	mA	VI = 3.3 V, Duty Ratio 50%, freq. ≥ 1 kHz
Transmitter Data Input Current (Logic Low)	I_{IL2}	-1	—	1	µA	VI = 0.0 V
High Level Input Voltage	V_{IH2}	2.1	—	V_{CC}	V	
Low Level Input Voltage	V_{IL2}	0.0	—	0.5	V	

OUTPUT WAVEFORM (CL ≤ 30 pF)

The jitter should be measured from the point of pulse reference portion, shown in Figure 6. In this measurement, the transmitter (RY5HD01) should also be adjusted to the recommended radiant intensity shown in Table 7.

Table 7. Title Needed

BIT RATE	RADIANT INTENSITY
9.6 kbps to 115.2 kbps	40 mW/sr
1.152 Mbps to 4 Mbps, ASK	100 mW/sr

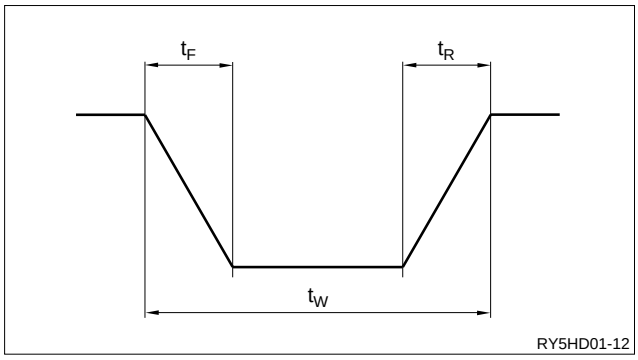

Figure 6. Output Waveform

APPLYING POWER SAVING CIRCUITRY TO RY5HD01

Though the Sharp RY5HD01 IR transceiver module is designed to be operated at 3.3 V, power saving circuit may be required depending on the applications.

Figure 7 shows an example of application circuit together with power down circuit.

By applying the circuit (marked by dot lines), the IR port can be managed manually to shut-down the function and save the battery powers.

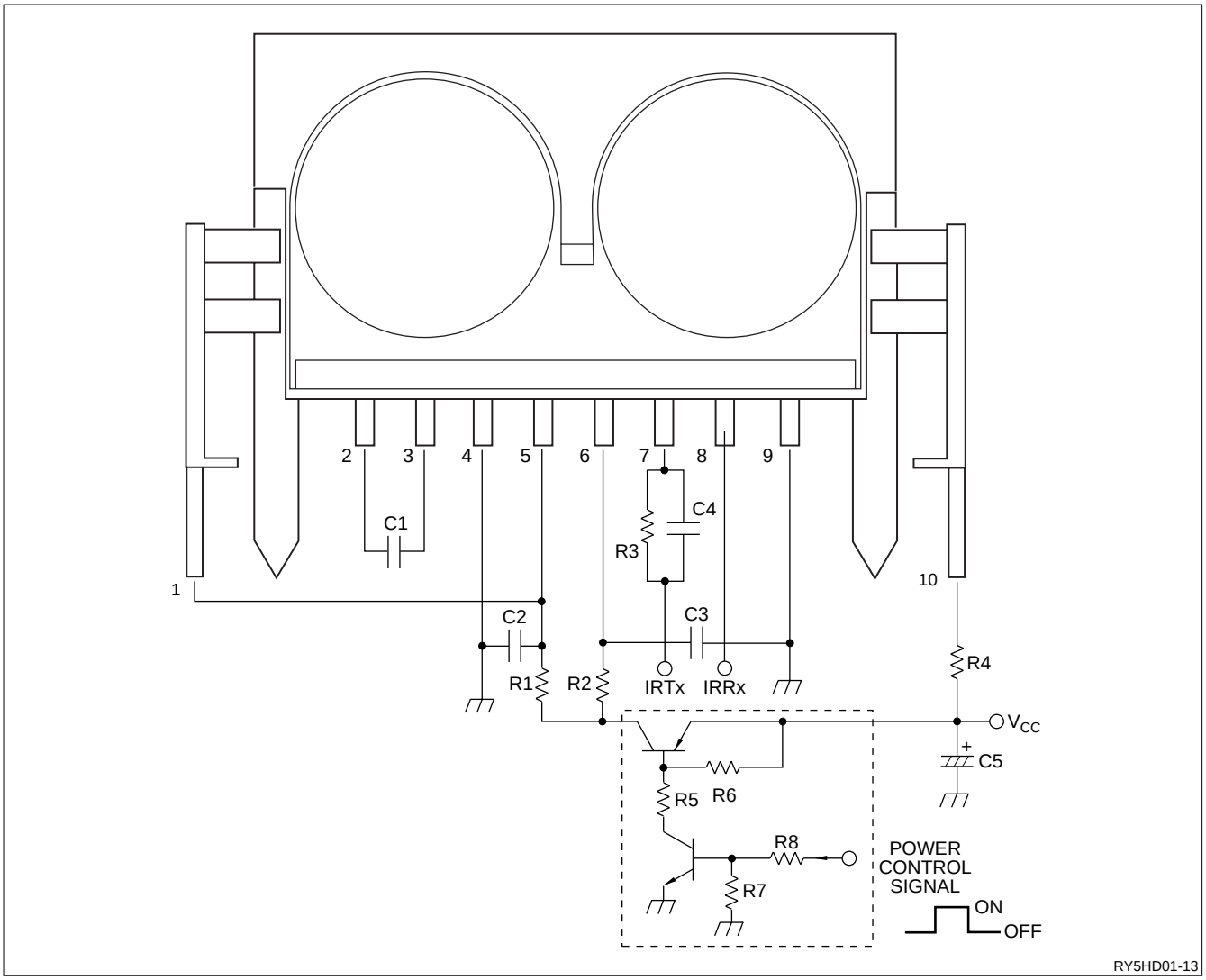

Figure 7. Application Circuit Example

PRECAUTION ON USE

If the surface of the IRLED and PD are dirty or dusty, communication capabilities may be effected. In such cases, wipe them gently with a soft cloth and avoid scratching the surfaces. If solvent is required, use methyl alcohol or ethyl alcohol, and be careful not to let the solvent seep inside of the transceiver module. Please also note that the lot numbers are stamped on the backside of the transceiver modules.

Avoid using the transceiver modules under the dew condensed conditions.

If the electronic noise of the power supply is large, attach an external low pass filter close to the transceiver module pinout. The electronic noise of the power supply is particularly concerned in the IrDA-SIR communication mode.

The noises may be observed on the pinouts because of the noises through the receiver and the emitter windows, although the metal shield blocks the electromagnetic/electrostatic noise from inside and outside of the unit. Possible noise sources are DC/DC converters and the LCD backlight supply. Please keep the transceiver module mounted apart from such noise sources.

The IR transceiver modules do not transfer signals with 100% accuracy due to the effect of ambient light. These IR transceiver modules are intended to be used in the consumer electronics for home use in principle, and must not be used for applications such as power control, security, medical equipment, and others that may have a threat to personal safety.

LIFE SUPPORT POLICY

SHARP components should not be used in medical devices with life support functions or in safety equipment (or similiar applications where component failure would result in loss of life or physical harm) without the written approval of an officer of the SHARP Corporation.

LIMITED WARRANTY

SHARP warrants to its Customer that the Products will be free from defects in material and workmanship under normal use and service for a period of one year from the date of invoice. Customer's exclusive remedy for breach of this warranty is that SHARP will either (i) repair or replace, at its option, any Product which fails during the warranty period because of such defect (if Customer promptly reported the failure to SHARP in writing) or, (ii) if SHARP is unable to repair or replace, refund the purchase price of the Product upon its return to SHARP. This warranty does not apply to any Product which has been subjected to misuse, abnormal service or handling, or which has been altered or modified in design or construction, or which has been serviced or repaired by anyone other than Sharp. The warranties set forth herein are in lieu of, and exclusive of, all other warranties, express or implied. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR USE AND FITNESS FOR A PARTICULAR PURPOSE, ARE SPECIFICALLY EXCLUDED. In no event will Sharp be liable, or in any way responsible, for any incidental or consequential economic or property damage.

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