

# SHARP GP2W0001YP/GP2W0002YP

## IrDA Technical Information Low Power Infrared Transceiver



### FEATURES

- IrDA 1.2a Low Power Option Compatible:
  - $I_F = 27$  mA (TYP.) for an operating distance of 20 cm
- Small Package Design for IrDA 1.0 Compliant Infrared Transceiver 8.7 (W) × 4.2 (D) × 3.15 (H) mm
- Receiver output provides a full output pulse for the received input signal
- Fits within Mobile Phone Connector Dimensions
- Low Power Consumption and Built-in Shut-Down Mode (1  $\mu$ A MAX.)
- Wide Range of Operating Voltages provides power supply design flexibility ( $V_{CC} = 2.7$  V to 5.5 V)
- Solder Reflow Compatibility for automated production processes
- SMD Package allows both Vertical and Horizontal mounting on PCBs Description

### DESCRIPTION

The SHARP GP2W0001YP is one of the smallest transceiver modules. Even at low operating voltages, it provides a reliable interface between logic and IR signals for through-air, serial, half-duplex IR wireless data links and is designed to satisfy IrDA physical layer specifications.

The GP2W0002YP is the same module, and adds an integral Electro-Magnetic Interference (EMI) shield. While IR energy is inherently immune to EMI, the receiving devices themselves are not. This shield provides an additional level of protection in electromagnetically noisy environments such as PCs and other digital products.

The SHARP GP2W0001YP/GP2W0002YP infrared transceiver modules contain a high speed, high efficiency, low power consumption AlGaAs LED, silicon PIN photodiode, and a low power bipolar integrated circuit. The IC contains an LED driver circuit and a receiver, providing the Rx output. IrDA data rates of 2.4 Kbps to 115.2 Kbps are supported at both 20 cm and one-meter distances. At the one-meter range, emitter current is approximately  $I_F = 300$  mA and in the IrDA Low Power Option communication mode  $I_F = 27$  mA. This dual mode communication capability provides wider product applications, such as a wireless data link with PCs, PDAs, or any other IrDA compliant application already on the market.

The GP2W0001YP/GP2W0002YP transceiver modules may be operated over a power supply range of 2.7 V to 5.5 V without any performance degradation. This provides a single part with a wide variety of design applications.

For power-conscious applications, the transceiver module has a built-in Shutdown mode. This reduces the receiver's current consumption to 1  $\mu$ A (MAX.) during Shutdown. The transmitter and receiver circuits are separate, allowing the transmitter LED to be driven when in Shutdown mode.

### OUTLINE DIMENSIONS

The dimensions shown in Figure 1 and Figure 2 are only for design reference, and are subject to change without notice. The metal shield case version GP2W0002YP, (for excellent noise immunity) is shown in Figure 2. Contact your local SHARP office for the latest device specifications.

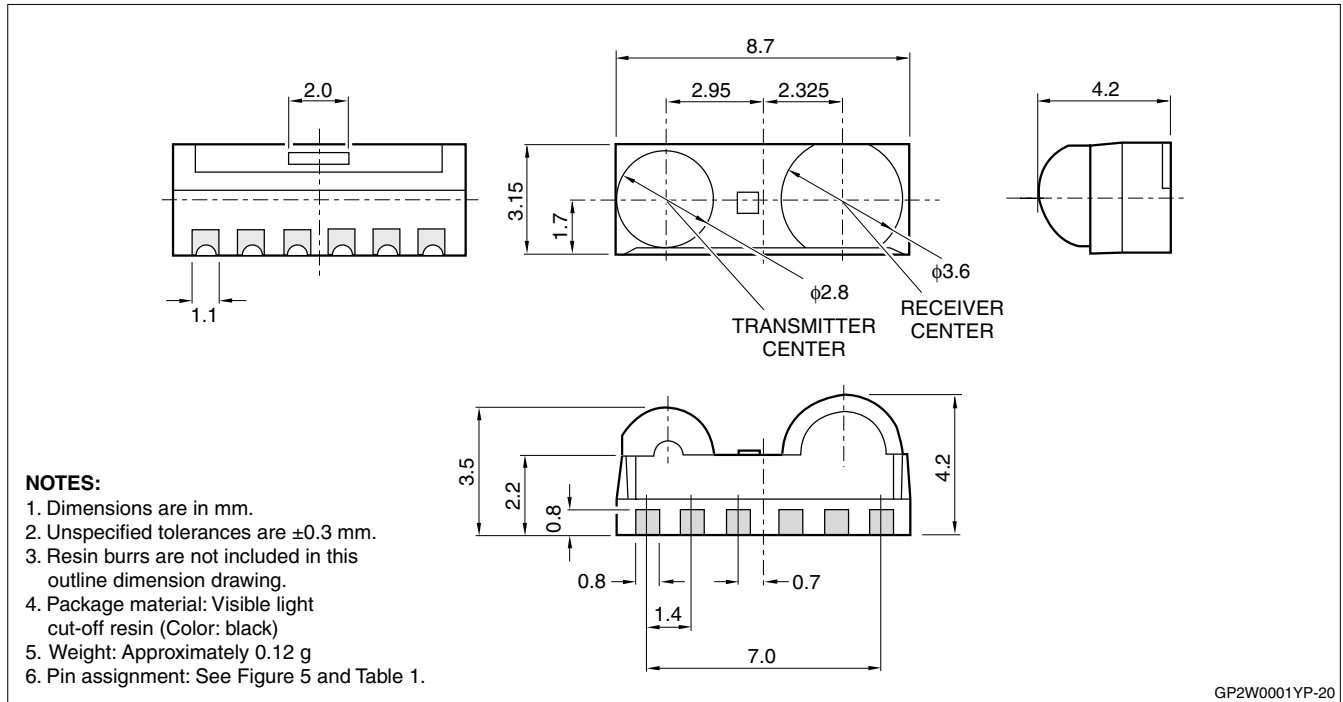


Figure 1. GP2W0001YP Outline Dimensions

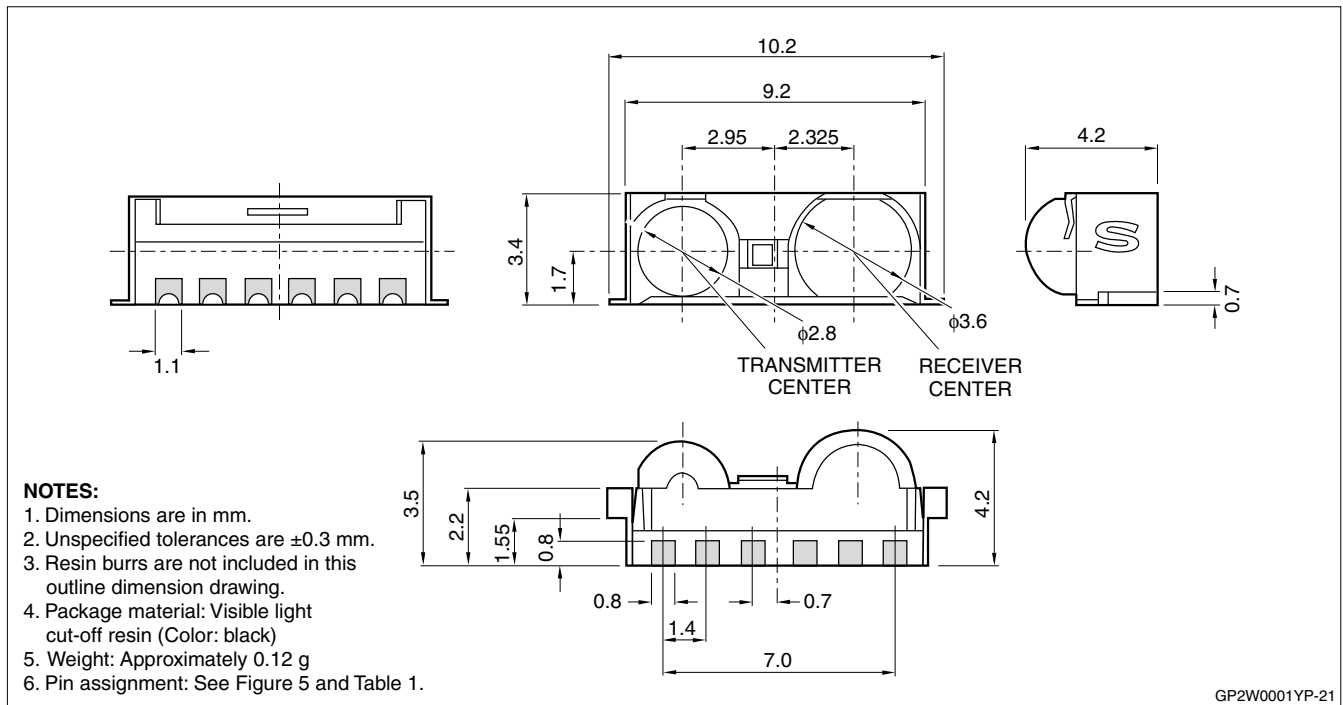
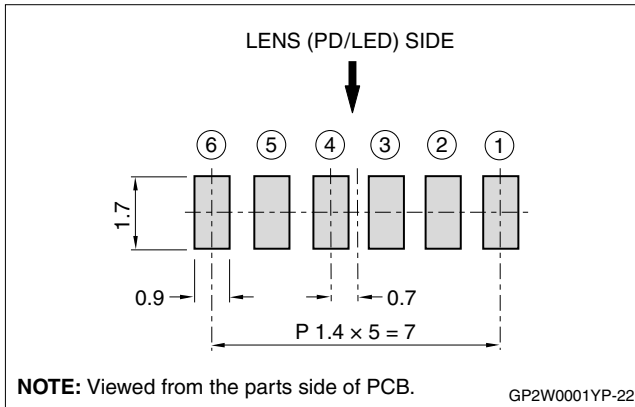


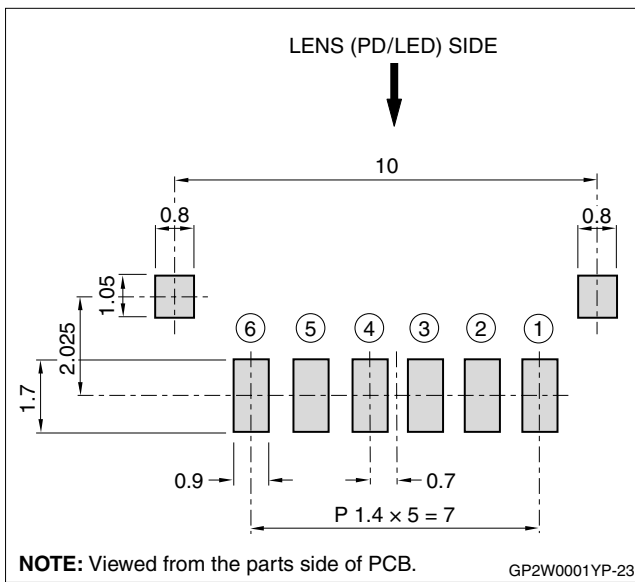
Figure 2. GP2W0002YP (with Shielding Case) Outline Dimensions

**Solder Paste Footprints**

Figure 3 and Figure 4 are the Solder Paste footprint drawings for both parts. Note that the GP2W0002YP footprint in Figure 4 is compatible with both parts.



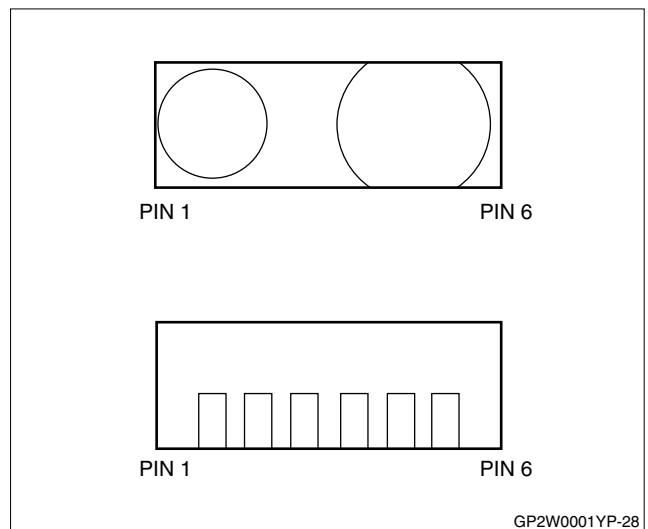
**Figure 3. GP2W0001YP Soldering Footprint**



**Figure 4. GP2W0002YP Soldering Footprint**

**Table 1. Pinouts**

PIN NO.	DESCRIPTION	SYMBOL
1	LED Anode	LEDA
2	Transmitter Data Input	TxD
3	Shut Down Circuit Input	SD
4	Receiver Data Output	RxD
5	Ground	GND
6	Supply Voltage	V <sub>CC</sub>



**Figure 5. Pin Locations**

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS	NOTE
Supply Voltage	$V_{CC}$	0	6.0	V		
Peak Forward LED Current	$I_{FM}$		500	mA	Pulse 78.1 ms, 3/16-duty cycle	1, 2, 3
Operating Temperature	$T_{OPR}$	-10	+70	°C		3
Soldering Temperature	$T_{SOL}$		230	°C	Solder reflow time: 5 seconds	
Storage Temperature	$T_{STG}$	-20	+85	°C		

### NOTES:

1. An in-band optical signal is a pulse/sequence where the peak wavelength,  $\lambda_p$ , is defined as  $850 \text{ nm} < \lambda_p < 900 \text{ nm}$ , and the pulse characteristics are compliant with the IrDA Physical Layer

2. See 'IrDA Physical Layer Link Specification, Appendix A' for ambient light conditions.

3. See Figure 6.

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTE
Supply Voltage	$V_{CC}$	2.7	5.5	V	
Logic High Transmitter Input Voltage (TxIN)	$V_{IHTXD}$	2.4	$V_{CC}$	V	1
Logic Low Transmitter Input Voltage (TxIN)	$V_{ILTXD}$		0.4	V	
Shutdown Circuit High Level Input Voltage	$V_{IHSD}$	$V_{CC} - 0.6$	$V_{CC}$	V	
Shutdown Circuit Low Level Input Voltage	$V_{ILSD}$	0.0	0.4	V	2
Data Rate	BR	2.4	115.2	Kbps	
Operating Temperature	$T_{OPR}$	-10	70	°C	

### NOTES:

1. Measured at the input circuit, not the device pin. Tx input should not exceed  $0.8 V_{CC}$ .
2. 0.4 or Open

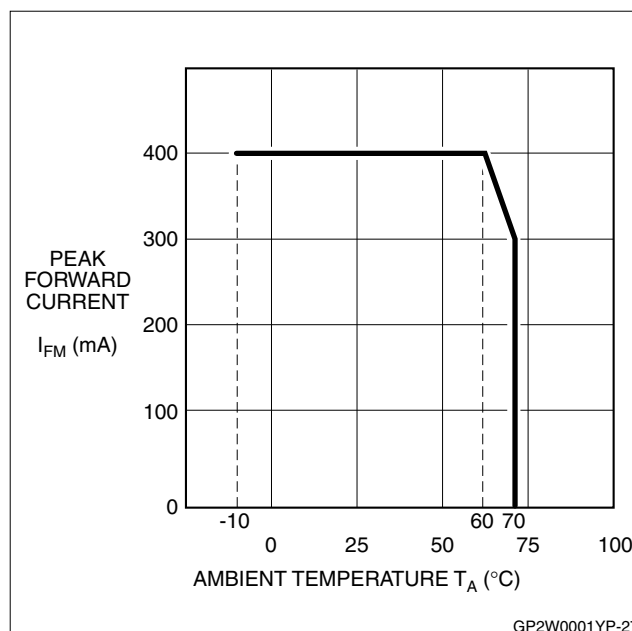


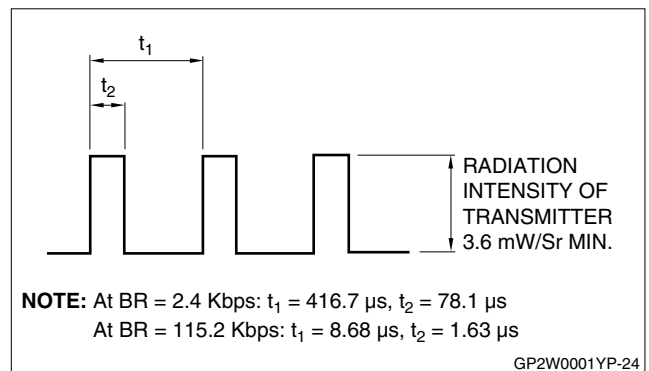
Figure 6. Peak Forward Current vs. Temperature

**ELECTRICAL AND OPTICAL SPECIFICATIONS**

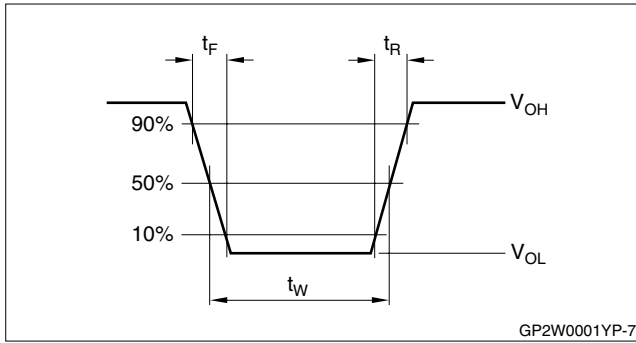
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS	NOTES
Supply Voltage	V <sub>CC</sub>	2.7		5.5	V		
Maximum Reception Distance	L1	≥ 0.2			m	2θ <sub>1/2</sub> ≤ 15°, I <sub>E</sub> = 3.6 mW/sr	
	L2	≥ 1.0			m	2θ <sub>1/2</sub> ≤ 15°, I <sub>E</sub> = 40 mW/sr	
Data Rate	BR	2.4		115.2	Kbps		
Operating Temperature	T <sub>OPR</sub>	-10		70	°C		
<b>RECEIVER</b>							
High Level Output Voltage	V <sub>OH</sub>	4.5			V	V <sub>CC</sub> = 5 V	
	V <sub>OH</sub>	2.5			V	V <sub>CC</sub> = 3 V	
Low Level Output Voltage	V <sub>OL1</sub>			0.6	V	V <sub>CC</sub> = 5 V, I <sub>OL</sub> = 400 mA RxD = ON	3
	V <sub>OL2</sub>			0.6	V	V <sub>CC</sub> = 3 V, I <sub>OL</sub> = 400 mA RxD = ON	3
Viewing Angle	2θ	30			degrees		
Low Level Pulse Width	t <sub>W1</sub>	0.8		16	μs	BR = 2.4 Kbps (pulse width 78.12 μs)	
	t <sub>W2</sub>	0.8		8	μs	BR = 115.2 Kb/s (pulse width 1.63 μs)	
Current Consumption	I <sub>CC1</sub>		1.0	1.4	mA	No input signal, V <sub>CC</sub> = 5.0 V, output open, V <sub>IHSD</sub> = V <sub>CC</sub> - 0.6 V	
			0.7	1.0	mA	No input signal, V <sub>CC</sub> = 3.0 V, output open, V <sub>IHSD</sub> = V <sub>CC</sub> - 0.6 V	
	I <sub>CC2</sub>			1.0	μA	Shut-down Mode	
Rise Time	t <sub>R</sub>			1.2	μs		3
Fall Time	t <sub>F</sub>			0.2	μs		3
<b>TRANSMITTER</b>							
Radiant Intensity	I <sub>E1</sub>	3.6		28.8	mW/sr	I <sub>F</sub> = 27 mA, 2θ <sub>1/2</sub> ≤ 15°	
	I <sub>E2</sub>	40		350	mW/sr	I <sub>F</sub> = 300 mA, 2θ <sub>1/2</sub> ≤ 15°	
Peak Emission Wavelength	λ <sub>p</sub>	850	870	900	nm	I <sub>F</sub> = 20 mA	
Peak LED Current	I <sub>LEDA</sub>		500		mA	All modes, PW = 78.1 μs or less, 3/16 duty cycle	
High Level Input Voltage	V <sub>IH</sub>	2.4		V <sub>CC</sub>	V	Measured at input circuit. Device pin will usually not exceed 0.8 V	
Low Level Input Voltage	V <sub>IL</sub>	0.0		0.4	V		

**NOTES:**

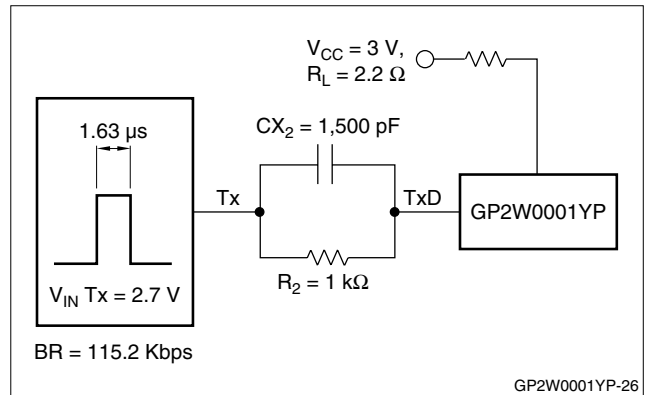
1. These specifications reflect the Recommended Operating Conditions, unless otherwise noted.
2. All typical values are at 25°C and 3.3 V, ambient light on the receiver surface under 10 Lux, unless otherwise noted.
3. See Figure 7, Figure 8, and Figure 9



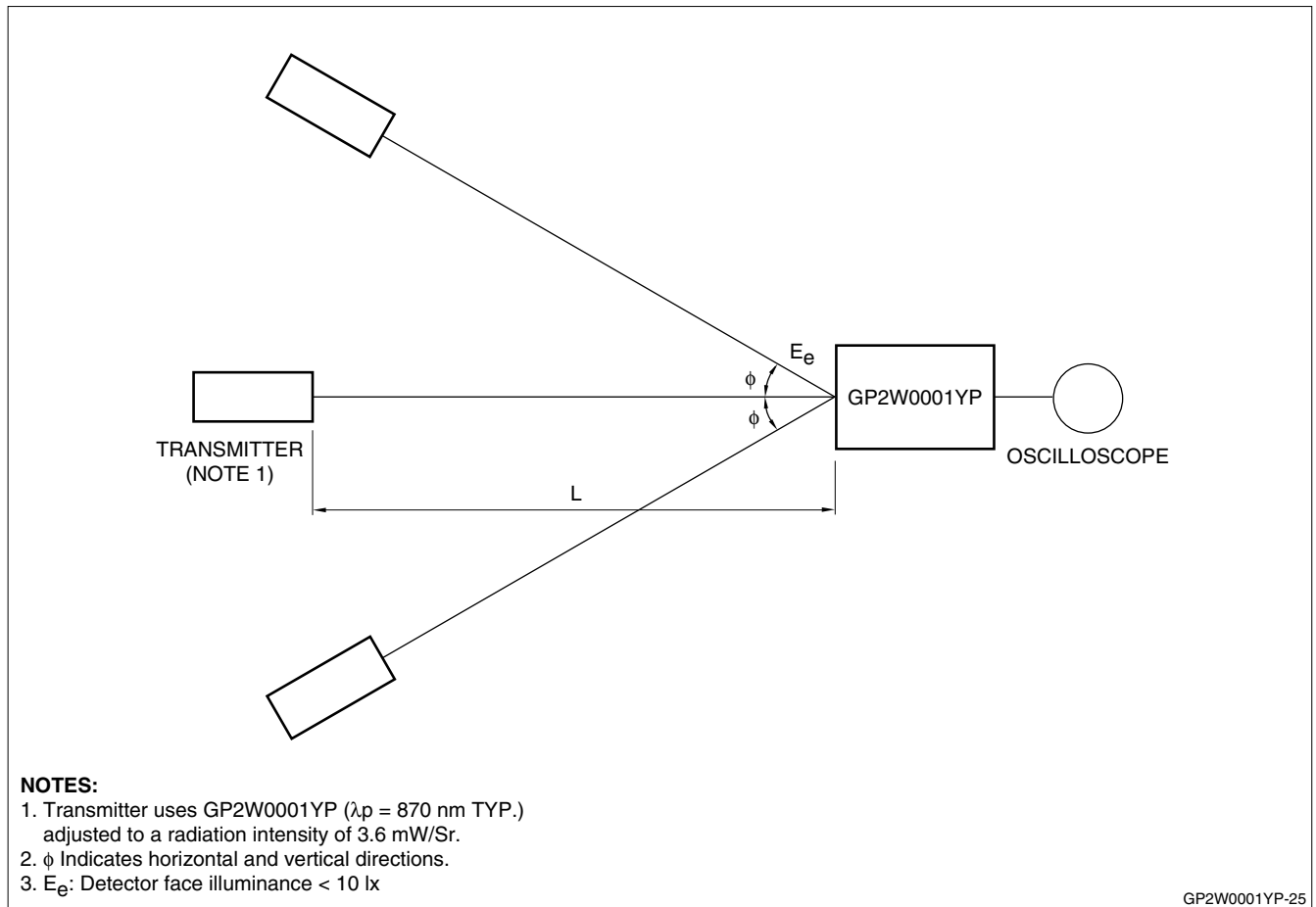
**Figure 7. Detector Input Signal Waveform**



**Figure 8. Output Waveform Specification**



**Figure 9. Recommended Emitter Circuit**



**Figure 10. Standard Optical Detector System**

**ELECTRICAL DESIGN APPLICATION TIPS**

Figure 11 shows a circuit application and passive component values for a GP2W0001YP. The values shown are only for reference. Contact your local Sharp office concerning technical reference data for optical/electrical characteristics.

**Circuit Application and External Passive Components**

The circuit application and the external passive components shown in Figure 11 enable the GP2W0001YP to operate at both one-meter and 20 cm low power option communication modes at  $V_{CC} = 3.0\text{ V}$ .

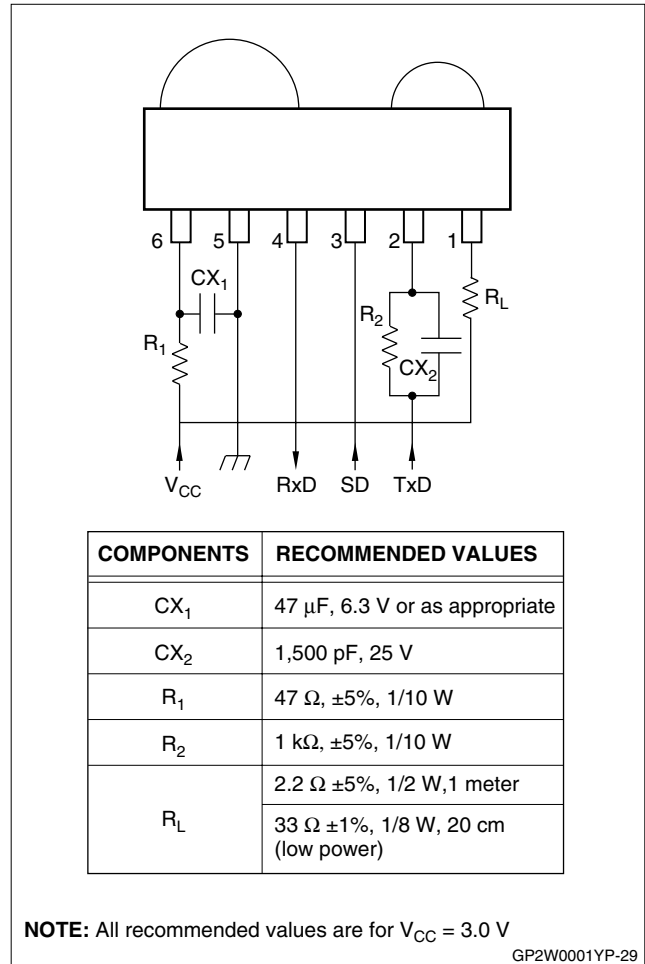
**SHUTDOWN MODE**

The ‘Shutdown’ pin is an active LOW terminal.

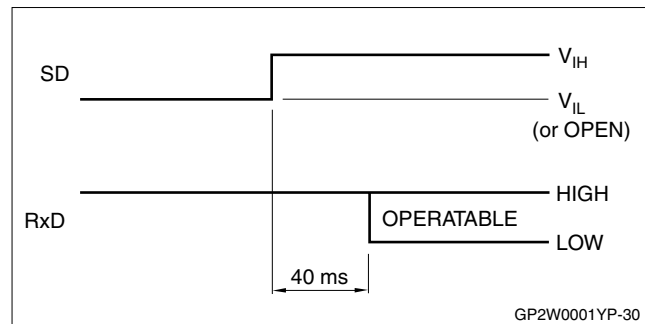
Shutdown mode only affects the power consumption of the receiver circuits. The transmitter LED can still be operated when SD is asserted. The two circuits are independent and not internally connected. The transmitter circuit does not consume current unless a drive signal is applied.

**Table 2. SD Pin Functions**

INPUT	PERFORMANCE
HIGH	Normal Mode
LOW	Shutdown Mode
OPEN	Shutdown Mode



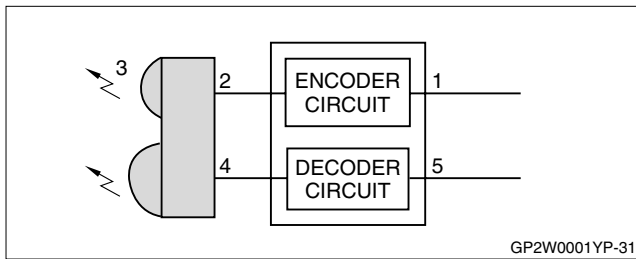
**Figure 11. External Components**



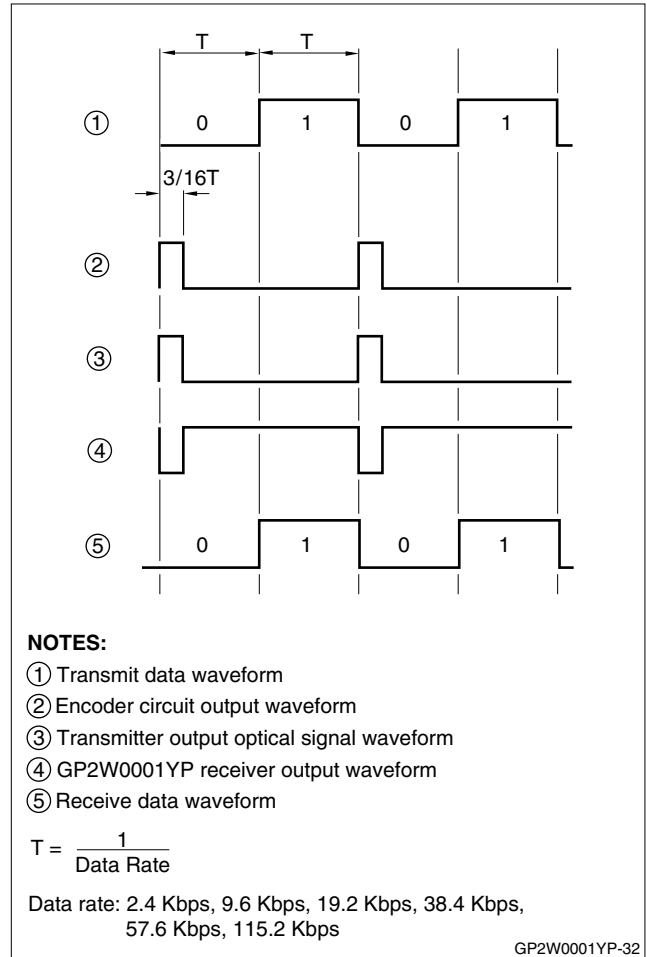
**Figure 12. Receiver Activation**

**Signal Waveform Example**

Figure 14 shows examples of each waveform when operating a GP2W0001YP to IrDA standards. Note that the IrDA bitstream is inverted in the encoder and decoder circuits, and the output pulse is sent during a '0' bit. The examples are for reference only, to help understand the GP2W0001YP hardware, and device signal measurements. The receiver output is not gated, and will send output for the entire period of the received IR input signal. Refer to Figure 14 for waveform reference points.



**Figure 13. GP2W0001YP Block Diagram**



**Figure 14. Signal Waveform Example**



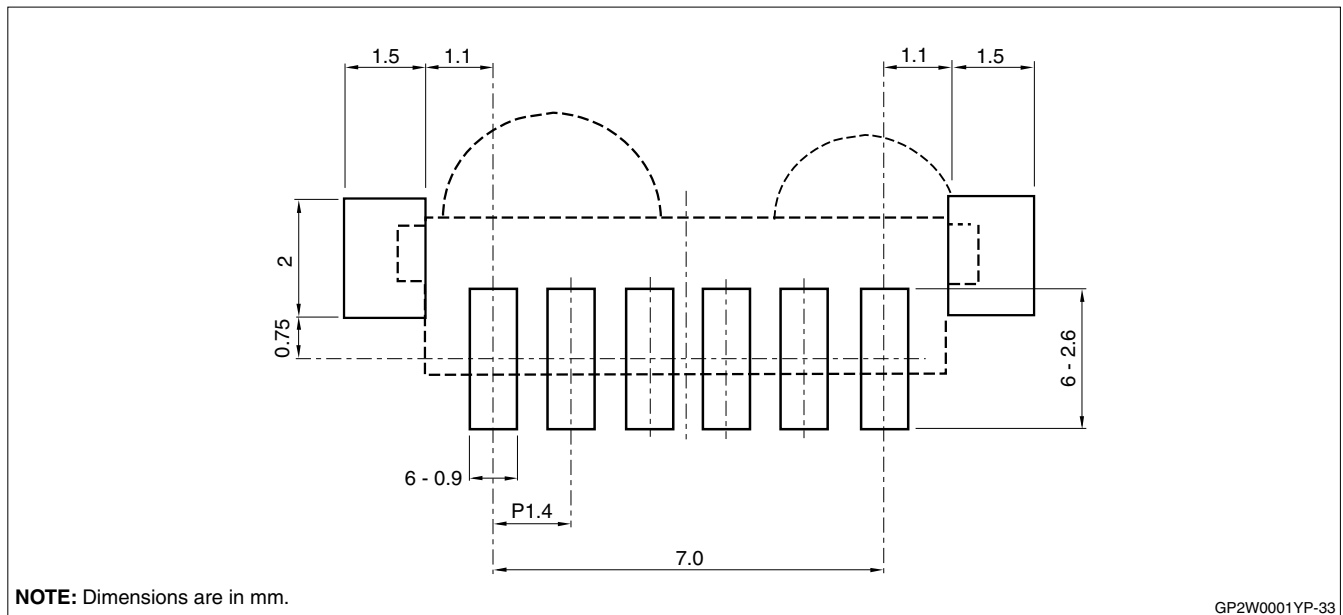
**MECHANICAL DESIGN  
APPLICATION TIPS**

**Recommended Footprint**

Figure 15 shows the basic recommended footprint for PCB design using the SHARP GP2W0001YP infrared transceiver module. All values shown here are for reference, and are in mm.

**Electro-Mechanical Design Tip**

Figure 16 gives a recommended set of locations for resistors and capacitors for better performance, particularly for the power supply ( $V_{CC}$ ) line.  $R_1$  and  $CX_1$ , as shown in Figure 16, should be mounted near the GP2W0001YP transceiver module for best performance. All values in Figure 16 are for reference and are in mm.



**Figure 15. Recommended Footprint**

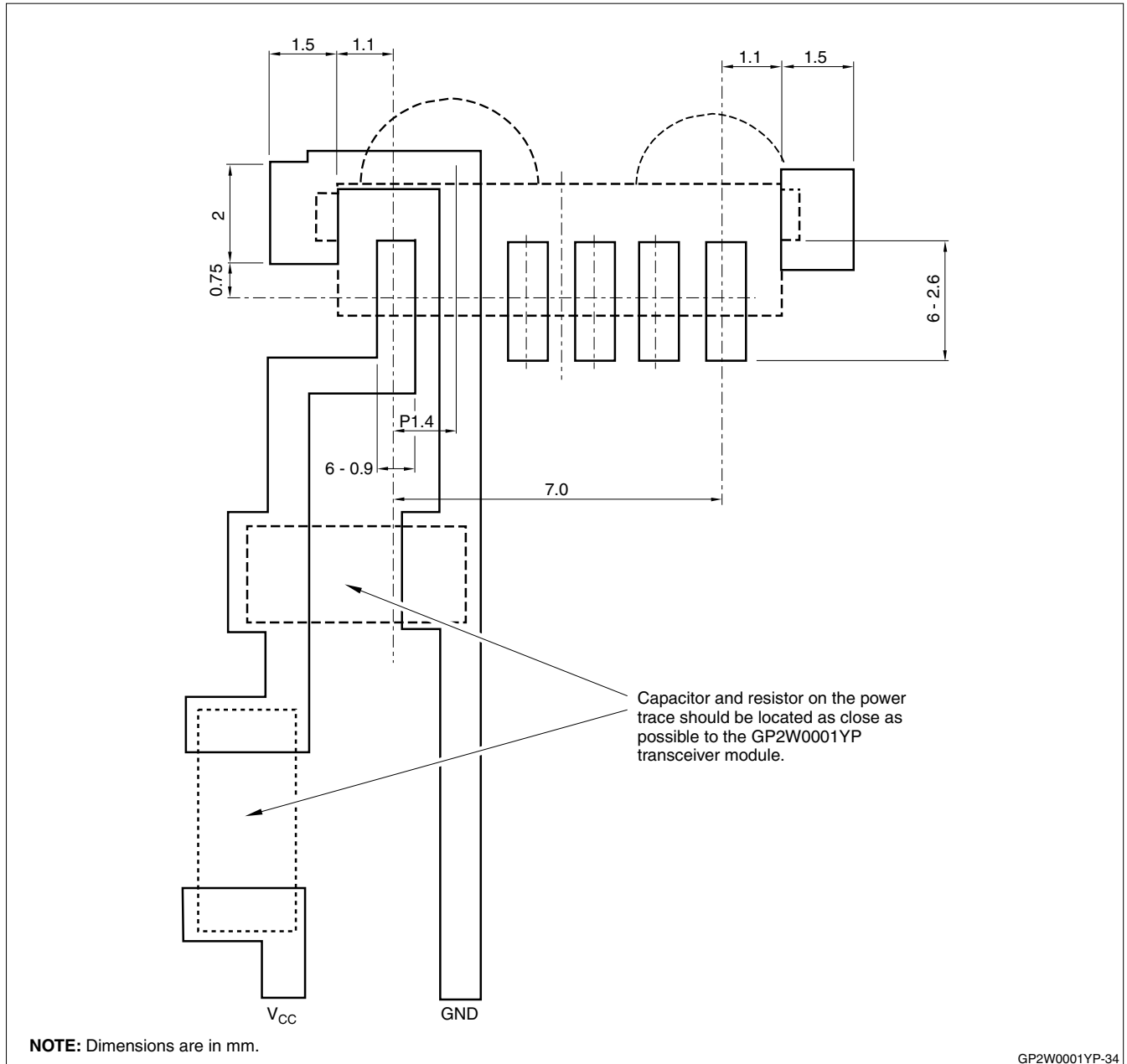


Figure 16. PCB Design Tip

**Cabinet and IR Cosmetic Window Design Tips**

Figure 17 with its calculations illustrates the design tips for a cabinet and an IR cosmetic window with ±18° viewing angles in the vertical and horizontal axes. All transceiver dimension values are for reference, and are in mm.

The optical window size should be the minimum size of W × H, either rectangular or elliptical, to maintain

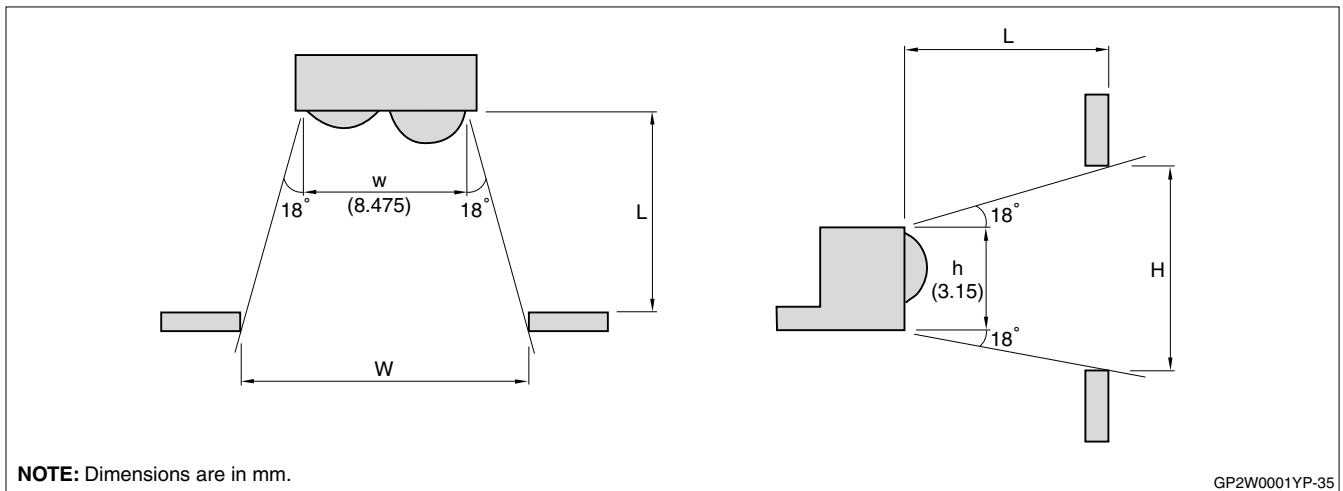
IrDA data transfer performance. The dimensions for W can be calculated by the formula:

$$W = 2 \times L \times \tan(18^\circ)$$

And the dimensions for H can be calculated by the formula:

$$H = 2 \times L \times \tan(18^\circ)$$

In the case where the viewing angle is +18°, which conforms to or exceeds the IrDA Serial Infrared Physical Layer Link Specifications. Values to be calculated with above the formula must be given in mm.



**Figure 17. Optical Window Tips**

## Evaluation Board

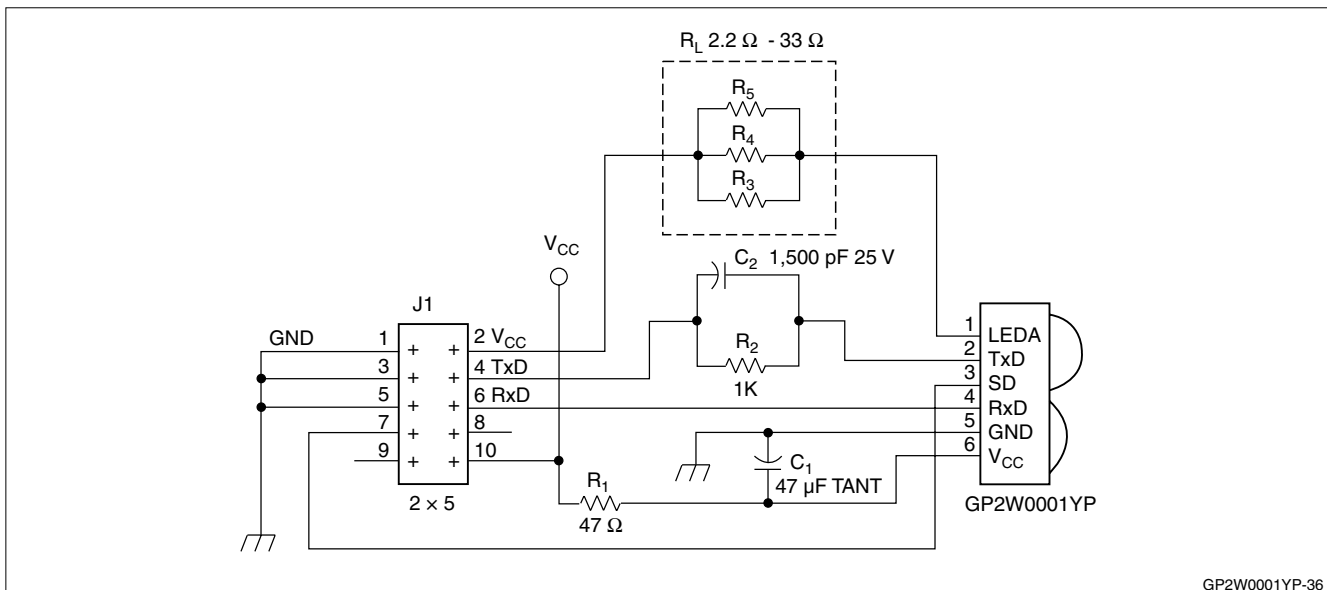
Figure 18 shows the recommended evaluation circuit for the GP2W0001YP/GP2W0002YP devices. This circuit is provided on an evaluation board for test and evaluation purposes. Samples are available through your Sharp support office or Sales Representative.

The resistor value for  $R_L$  is based on the supply voltage. For the one-meter range, the parallel combination of the three values should be adjusted to approximately  $2.2\ \Omega$  when  $V_{CC} = 3.3\ V$ , yielding a forward current of 300 mA with approximately 200 mW being dissipated in the resistors. For the 20 cm (reduced) range, the value is adjusted to  $33\ \Omega$ , the nominal forward current is 27 mA, and the resistive power dissipation will be approximately 31 mW.

When the  $33\ \Omega$  value and a forward current of 27 mA is used, a total of 31.3 mW is dissipated during LED on-time. This dissipation is within the rating of the SR1206 package. When used at a data rate of 115 Kbps, the maximum on time is 18.75% of a bit time when the LED is 'ON.' Since only the logical '0' values of a data string are sent, the overall duty cycle is below this value.

The board carries three positions to allow the use of a combination of standard resistor values. To create the  $2.2\ \Omega$  value, three  $6.6\ \Omega$  resistors are connected in parallel. For the  $43\ \Omega$  value, one  $43\ \Omega$  resistor can be used or three parallel resistors of  $130\ \Omega$ . The resistor positions on the board are in the SR1206 footprint, which supports one-quarter Watt resistors.

This test and evaluation board is not intended for production applications, and should not be subjected to long periods at elevated temperature. Operation of the board should be limited to free-air test conditions.



GP2W0001YP-36

Figure 18. GP2W0001YP Test Circuit

## MOISTURE-PROOF PACKING INFORMATION

### Scope

This section describes the specifications of GP2W0001YP/GP2W0002YP moisture-proof packing, and is only for reference. The official specifications should be consulted for packing information.

### Packing Material Specifications

The GP2W0001YP/GP2W0002YP reel is moisture-proof packed for shipment. Table 3 describes the materials used for each item of the moisture-proof packing.

### Packing Method

1. Seal the aluminum laminate bag that contains the tape reel (2,000 devices/reel) and desiccant.
2. Fill in the necessary information on the label and paste it on the aluminum laminate bag.
3. Pack 4 aluminum laminated bags (1 reel each) into the designated outer case, placing paper pads on the bottom and top of the outer case, as well as between each layer of the aluminum laminated bags. See Table 4.
4. Seal the outer case with craft tape, indicating the model name, quantity, and out-going inspection date on the case. (8,000 pieces total per carton)

### Storage and Treatment

#### STORAGE CONDITIONS

The product should be stored under these conditions:

- Storage temperature: 10°C to 30°C
- Humidity: below 60% RH

#### TREATMENT AFTER UNSEALING

1. After unsealing, devices should be mounted at a temperature of 10°C to 30°C, humidity below 60% RH, within 3 days.
2. For long term storage, devices should either be stored in a dry box, or re-sealed in a moisture-proof bag with desiccant and stored in an environment where the temperature is 10°C to 30°C, humidity below 60% RH. Devices must be mounted within 2 weeks.

#### BAKING BEFORE MOUNTING

If the devices are not kept in the storage conditions described above, or the desiccant indicator has turned pink, baking must be performed before devices are mounted: baking may only be done once.

- Recommended Baking Conditions: 100°C  
12 to 24 hours

**NOTE:** Do not bake the devices while they are still on the reel — the reel will melt. Parts should be either temporarily mounted to a PCB with adhesive, or placed in a metal tray. Any device that has been out of its dry pack for more than 72 hours should be dried in some manner prior to any automated surface mount reflow process. Otherwise these devices should be mounted and soldered by hand.

**Table 3. Packing Materials**

ITEM	MATERIAL
Aluminum Laminate Bag	Aluminum Polyethylene
Label	Paper
Desiccant	
Outer Case	Paper
Pads	Paper

**Table 4. Packing Quantities**

PACKING SHAPE	PRODUCT	QUANTITY PER REEL	QUANTITY PER BAG
Tape reel (∅ 330 mm)	1 model	2,000 pieces	1 reel

**NOTE:** Minimum order/shipment quantity should be one laminated bag (1 reel of 2,000 pieces).

**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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SHARP reserves the right to make changes in specifications at any time and without notice. SHARP does not assume any responsibility for the use of any circuitry described; no circuit patent licenses are implied.

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