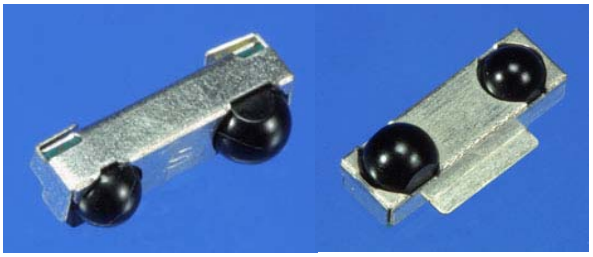
IrDA 115 kbit/s Standard 1 meter transceiver



GP2W0004YP / GP2W0004XP Technical Data

GP2W0004XP is the TOP View version of GP2W0004YP.

1. Features

- IrDA 115 kbit/s, 1 meter Transceiver
- Small Package Design integrates this IrDA Compliant Infrared Transceiver (W 9.21 x D 3.86 x H 2.71 mm)
- Receiver output provides a gated output pulse for the received input signal.
- Fits in the Mobile Phone Connector Dimensions
- Low Power Consumption and Built-in Shut-Down Mode (Max. 1 A)
- Wide Range Operating Voltage (V_{CC} = 2.4V ~ 5.5V)
- Wide Operating Temperature Range: -20 C to +85 C
- Split Voltage Design, LED Voltage is separate from operating voltage
- Internal Echo-Cancel Function, RX Data output disabled when the Transmit LED is active
- LED disabled during Shutdown mode
- Solder Reflow Capability for Automated Production Process
- Electrically and mechanically compatible with IRMS5000, HSDL-3000, CHX1010, MiniSIR2-1

2. Description

The SHARP GP2W0004YP is a wide operating voltage device, and one of the smallest IrDA one-meter transceiver modules. It 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.

An integral Electro-Magnetic Interference (EMI) shield is provided, as IR energy is inherently immune to EMI, however the receiving devices are very sensitive. The shield provides additional protection in noisy environments such as PCs and other digital products.

The SHARP GP2W0004YP infrared transceiver module contains a high speed, high efficiency, low power consumption AlGaAs LED, silicon PIN photodiode, and the low power driven bipolar integrated circuit. The IC contains an LED driver circuit, logic functions and receiver, providing the RX output. IrDA data rates of 2.4k to 115.2 kbit/s are supported at both the 20 cm and one meter distances. Emitter current of approximately I_F = 100 mA is used at the one meter range and the IrDA Low Power Option communication mode I_F = 27 mA. This dual mode communication capability provides wider application use in a final product, such as a wireless data link with PCs, PDAs, or any other IrDA compliant application already introduced to the market place.

The GP2W0004YP transceiver module may be operated over the power supply range of 2.4V to 5.5V without any performance degradation. This provides a single part with a wide variety of design applications. The LED voltage is separate and may be provided from a second source, allowing the main power supply voltage to directly interface to the IC controller. The LED may in this case be connected to the device battery or some other higher level source.

The GP2W0004YP also includes an integral echo-cancel function that disables the RX Data output when the Transmit LED is driven by TX data.

The transceiver module has a built-in shutdown mode for those applications that are very conscious about current consumption. This reduces the current consumption of the receiver circuit to 1 A (max.) during shutdown mode. During shutdown, the transmitter output is disabled, so that data on the input will not drive the LED when the IrDA transceiver one of several devices on an I/O line.

3. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	V_{CC}	0	6.0	V	
LED Supply Voltage	V_{LEDA}	0	7.0	V	
Operating Temperature	T_{OP}	-10	+70	°C	
Storage Temperature	T_{ST}	-20	+85	°C	
Soldering Temperature	T_{SOL}		240	°C	Solder reflow time 5 seconds.

4. Recommended Operating Conditions

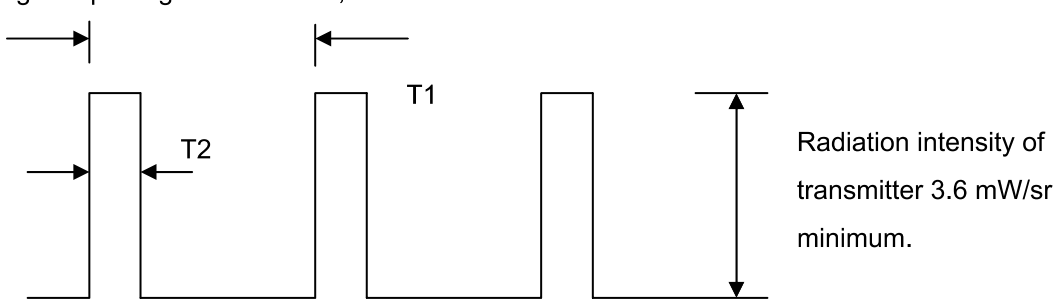
Parameter	Symbol	Operating Condition	Unit	Conditions
Supply Voltage	V_{CC}	2.4 to 5.5	V	
LED Supply Voltage	V_{LEDA}	Max. V_{CC} + 4.0	V	V_{CC} + 2.4 to 5.5V
Operating Temperature	Topr	-25 to +85	°C	
Logic High Transmitter Input Voltage (TXIN)	V_{IHTXD}	2/3 * V_{CC}	V	
Logic Low Transmitter Input Voltage (TXIN)	V_{ILTXD}	1/3 * V_{CC}	V	
Data Rate	BR	9.6 to 115.2	kbit/s	
Shutdown circuit high level input voltage	V_{IHSD}	V_{CC} – 0.5	V	
Shutdown circuit low level input voltage	V_{ILSD}	0	V	

1. An in-band optical signal is a pulse/sequence where the peak wavelength, p, is defined as 850 nm ≤ p ≤ 900 nm, and the pulse characteristics are compliant with the IrDA Physical Layer Link Specifications.
2. See IrDA Physical Layer Link Specification, Appendix A for ambient light conditions.

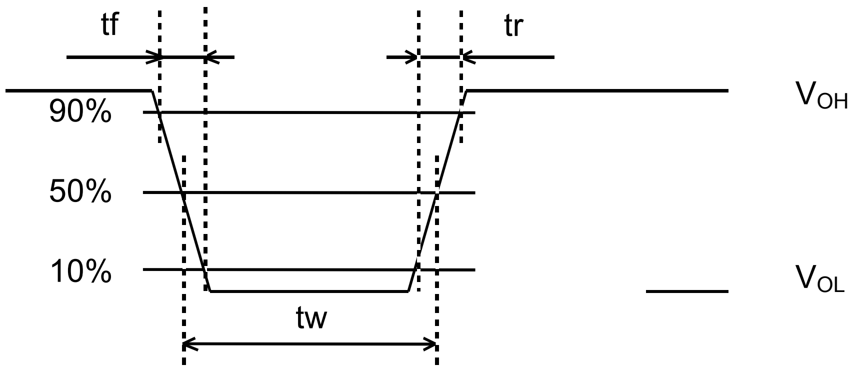
5. Electrical and Optical Specifications

Specifications hold over the Recommended Operating Conditions, unless otherwise noted. All typical values are at 25° C. The following drawings are typical signals and test conditions.

Drawing 1. Input Signal Waveform, Detector Side.

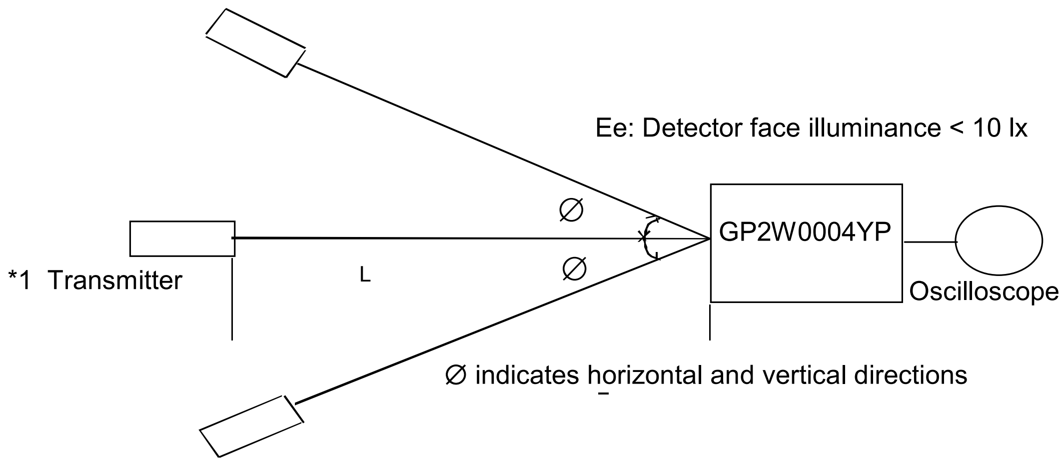


At BR = 2.4 kbit/s: T1 = 416.7 s, T2 = 78.1 s. At BR = 115.2 kbit/s: T1 = 8.68 s, T2 = 1.63 s.



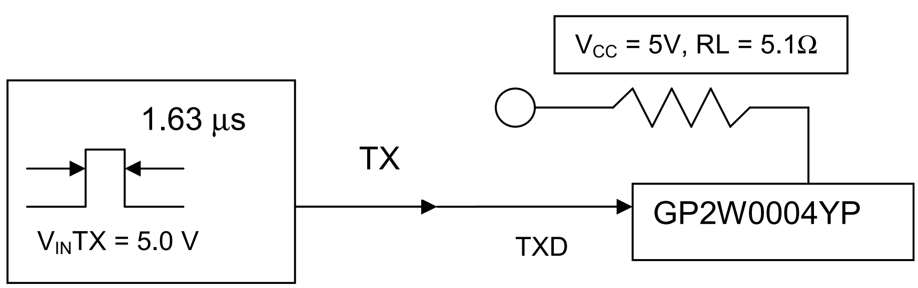
Drawing 2, Output Waveform Specification

Drawing 3, Standard Optical System, Detector side.



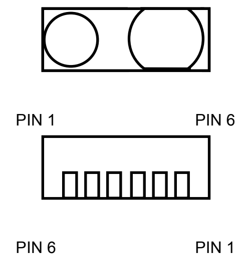
*1: Transmitter shall use GP2W0004YP ($_P$ = 870 nm typical.) Radiated intensity is adjusted by inserting optical filter material in front of the transmitter to set a radiation intensity of 3.6 mW/sr.

Recommended circuit, emitter side.



6. Pinouts

PIN #	Description	Symbol
1	LED Anode	LEDA
2	Transmitter Data Input	TXD
3	Receiver Data Output	RXD
4	Shut Down Circuit Input	SD
5	Supply Voltage	V_{CC}
6	Ground	GND



7. Application Electrical Design Hints

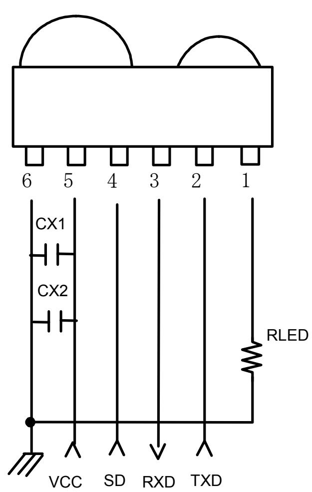
The following figure and table shows the recommended application circuit and passive values for GP2W0004YP. The following table provides an idea for external passive values and is only applicable for design reference. See Section 3 for technical reference data in optical / electrical characteristics. Complete detail is provided in the device specification.

7-1 Application Circuit and External Passives

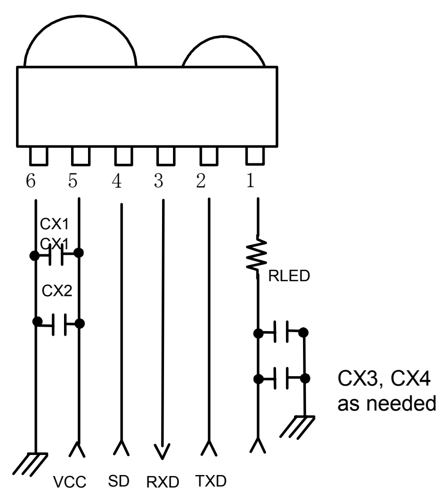
The following application circuit and external passives enables GP2W0004YP to operate at both one meter and 20 cm low power option communication mode at V_{CC} = 3.0V.

Components	Recommended Values
CX1	47 F, 6.3 V or as appropriate
CX2	1500 pF, 25 V, or as needed
RL	2.2 , 5%, 1/2W, 1 meter at V_{CC} = 3.0V
	33 , 1%, 1/8W, 20 cm Low Power option at V_{CC} = 3.0V)

All recommended values are at V_{CC} = 3.0V



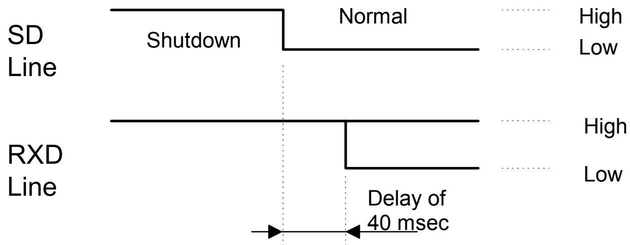
Standard Power Supply Connection



Independent VLED Power Supply

7-2 Shutdown Mode

The “Shutdown” pin is an active high input terminal, and controls power saving and logic functions as described in the chart below. When Shutdown is asserted, the Receive Data output is in the pull-up mode (more than 200 k-Ω) which will hold the Received Data line high, and the radiated Infrared transmit output is disabled. Signals applied to the Transmit Data In pin will not create an output signal.



HIGH	Shutdown Mode, RX output pulled high, TX inhibit asserted
LOW	Normal Mode, RX output and TX work normally

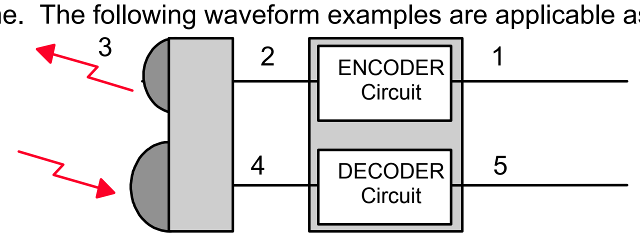
Shutdown mode affects the power consumption of the device. The transmitter and receiver circuits do not conduct current during the shutdown mode.

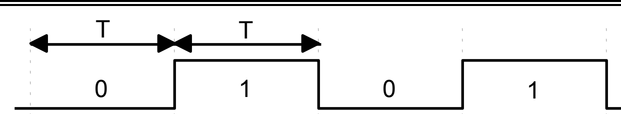
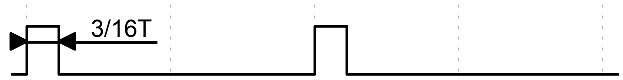
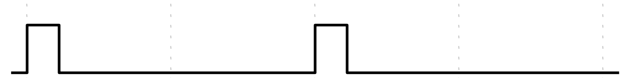
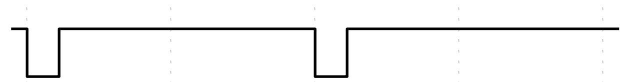
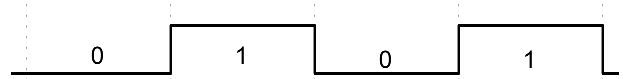
Echo Cancel Function

When the device is operating in the Normal mode, and Transmit data is applied to the device, the Receiver output will be inhibited. This prevents a local echo of the transmitted data from being received by the system microprocessor. The Received Data line again becomes active 200 μs after the Transmit Data line stays low.

7-3 Example of Signal Wave Form

The following drawing provides examples of each waveform when correctly operating GP2W0004YP in a manner conforming to IrDA standards. Note that the IrDA bit stream is inverted in the encoder and decoder circuits, and the output pulse is sent during a “0” bit time. The following waveform examples are applicable as a design and evaluation reference only, to understand the GP2W0004YP hardware implementation, as well as performing system measurements.



No.	Signal Description	Waveform
1	Transmitting Data Waveform	
2	Encoder Circuit Output Waveform	
3	Transmitter Output Optical Signal Waveform	
4	GP2W0004YP Receiver Output Waveform	
5	Receiving Data Waveform	

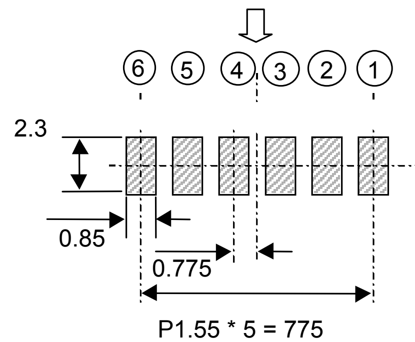
T = 1 / Data Rate Data Rate: 2.4 kbit/s, 9.6 kbit/s, 19.2 kbit/s, 38.4 kbit/s, 57.6 kbit/s, 115.2 kbit/s

8 Application Mechanical Design Hints

8-1. Recommended Foot Print

The following figure shows the basic recommended footprint for PCB design when using the SHARP GP2W0004YP infrared transceiver module. All values in the following figure are applicable as a design reference, and are in mm (UNIT). Confirm any design changes with the complete specification.

GP2W0004YP
Lens (PD/LED) side

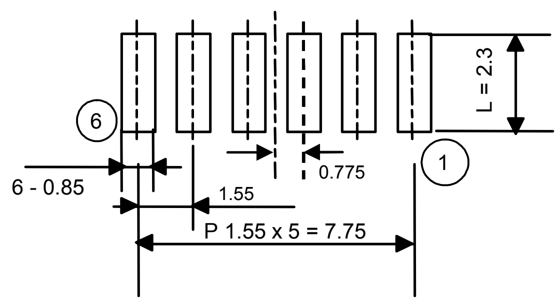


View from parts side

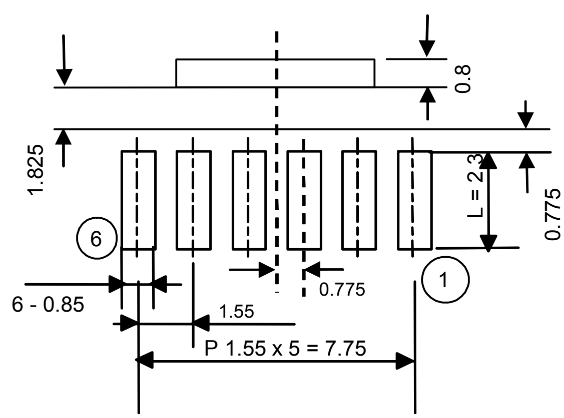
Solder Paste Footprint

Solder Paste footprint drawing for GP2W0004YP. Note that the shield contact for GP2W0004YP is now applied through the Ground pin in position 6. The shield is soldered to the back of the transceiver at the ground pin, and a separate contact for a ground tab is no longer required.

For complete mechanical dimensions, refer to the full specification for GP2W0004YP. The footprint for GP2W0004XP does have an additional solder tab as shown below. The basic footprint is the same. For both, the distance L = 2.3 mm is used for metal solder masks of 0.152 mm thickness. When a mask of 0.127 mm must be used, then L = 2.7 mm.



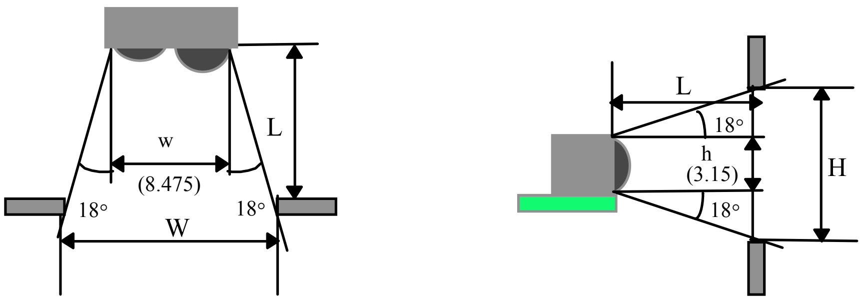
GP2W0004YP solder Paste Footprint



GP2W0004XP solder Paste Footprint

8-2. Design Hints for Cabinet and IR Cosmetic Window

The following figure and calculations explain the example and design hints for the cabinet and IR cosmetic window with ±18° viewing angles, in the vertical and horizontal axes. All values for the transceiver dimensions are applicable only for design reference, and in mm (UNIT).

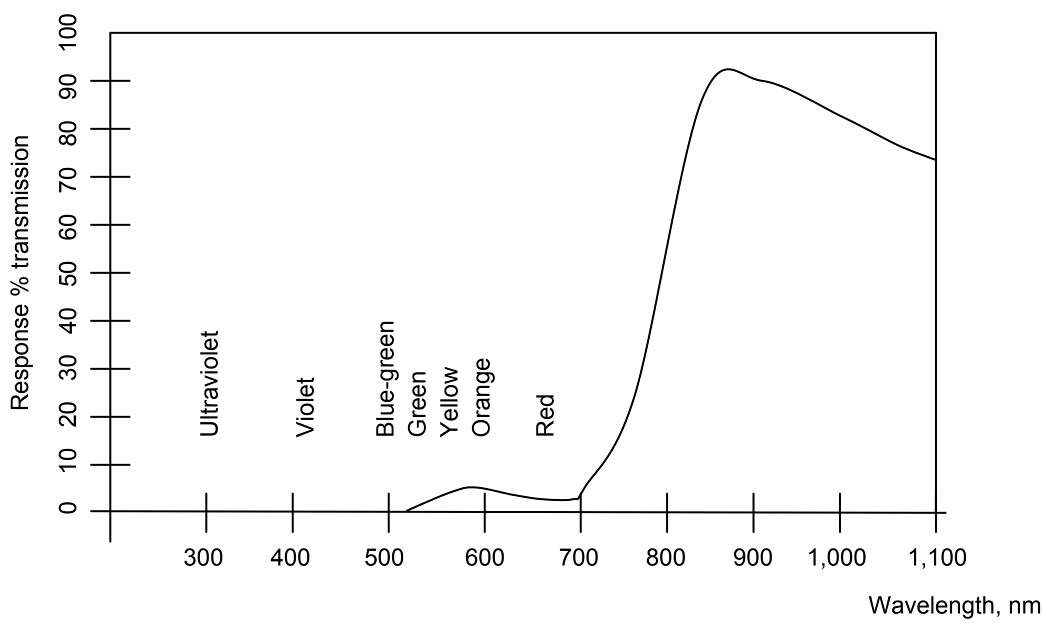


The optical window size should be the minimum size of W x H rectangular or elliptical in order not to reduce IrDA data transfer performance. The dimensions for W are calculated by the formula: W = 2 x L x tan 18 + w and the dimensions for H can be calculated by the formula: H = 2 x L x tan 18 + h in the case where the viewing angle is + 18°, which conforms to or exceeds the IrDA Serial Infrared Physical Layer Link Specifications. Any values to be calculated with above the formula must be given in mm.

Product Packaging

Many products that use infrared communication locate their reception component behind dark plastic. This often fits in with the overall design and coloring of the product, and has an intentional design purpose as well.

The photodiode used in optical receivers is sensitive to a range of light wavelengths, not only the wavelength intended for reception. Visible light has many component factors and sources in a room. The dark plastic used in product faceplates can be formulated to act as a high-pass filter, reducing the amount of visible light and other wavelengths landing on the photodiode and raising the internal noise currents.



The reduction of unwanted wavelengths provides for a quieter and more sensitive receiver. The wavelength used for IrDA Data communication is 880 nm. The characteristic of any plastic used in a final product should keep this in mind and not attenuate this wavelength.

A simple material for test purposes is to obtain a roll of standard color film. (This is not an exact, quantitative test, however it can be used to determine a sense of what is happening.) Pull the film all of the way out of the can and expose it to indoor or outdoor light for 5 seconds or so. Have the film developed, but first inform the person operating the developer what you are doing so that your intent is understood, and the material is processed correctly. Otherwise you may be informed that the roll has been overexposed and the material was discarded as unusable. The resulting developed negative stock should be dark and difficult to see through, and will have some characteristics as an infrared filter, as shown below. One or more layers will provide a variable attenuation filter that you can tailor for experimental purposes.

Other light sources may produce different filtering results. The graph above was produced by exposing the film to a “cool white” fluorescent lamp for five seconds. The filter transmission data is excerpted from an article in Electronic Design, December 2, 1996, written by David A. Johnson. The response of the material is fairly steep near 830 nm, and has reasonable pass characteristics above 880 nm.

The drawing above shows the basic characteristic of the highpass filter. The exact position of the slope and increasing response will depend on the film material selected, and the light used to expose it. The intent is to supress visible light, and neighboring wavelengths, and pass the desired 880 nm.

Other glass and plastic filters are available on the market, and vendors carry plastic materials that may be cut, bent or molded. The key to selecting a plastics vendor is to ask them about the wavelength characteristics of their materials. The more they know, the more likely they will be able to help you in a knowledgeable manner when working on both the industrial design and wavelength pass characteristics of your IR window. If the vendor does not know what you are talking about, you need to find a knowledgeable source for filter materials.

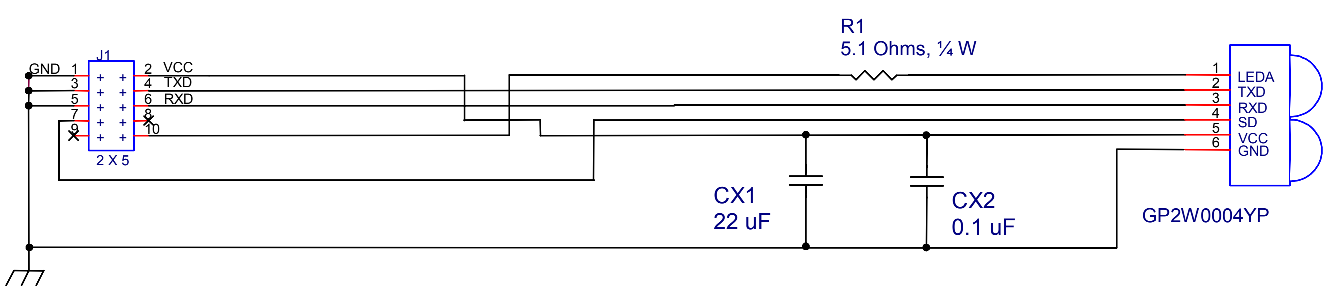
8-3. Evaluation Board

The following circuit diagram is the recommended evaluation circuit for the GP2W0004YP devices. This circuit is provided on an evaluation board for test and evaluation purposes. Please request samples through your Sharp support office or Sales Representative, or Distributor.

The resistor value for RL is adjusted based on the supply voltage. The 5.1-Ohm value is selected for VLEDA between 3.6 and 4.5 V. This has been loaded on the test boards as a nominal value. Change it for your operating conditions per the table below.

RL	1.0 Ω @ 0.5 Watt, for 2.4 ≤ VLEDA ≤ 3.3V Operation
	3.0 Ω @ 0.5 Watt, for 3.0 ≤ VLEDA ≤ 3.6V Operation
	5.1 Ω @ 0.5 Watt, for 3.6 ≤ VLEDA ≤ 4.5V Operation
	7.5 Ω @ 0.5 Watt, for 4.5 ≤ VLEDA ≤ 5.5V Operation

The forward current through the LED is adjusted by the resistor value, and directly controls the operating range of the LED. The capacitor values shown on the board are nominal for this test application. The final values are dependent on the amount and frequency of noise in the final system. Capacitor values need to be properly tailored for the final application. This test and evaluation board is not intended for production applications, and should be used for test and evaluation purposes only.



GP2W0004YP Test Circuit

9. Moisture-Proof Packing Information

9-1 Scope

This section describes the specifications of GP2W0004YP moisture-proof packing, and is only applicable for reference. The same section of the official specifications should be consulted for detailed packing information.

9-2 Packing Specifications

9-2-1. Packing Material

The GP2W0004YP reel will be moisture-proof packed for factory shipment. The following table describes the materials used for each item of the moisture-proof packing:

Item	Material
Aluminum Laminate Bag	Aluminum Polyethylene
Label	Paper
Desiccant	-
Outer Case	Paper
Pads	Paper

9-2-2. Packing Method

1. Seal the aluminum laminate bag that contains tape reel (contains 2,000 devices per reel) and desiccant.
2. Fill necessary information on the label and paste it on the aluminum laminate bag.
3. Pack 4 aluminum laminated bags (contains 1 reel each) into the designated outer case. Paper pads are placed on the bottom and top of the outer case, as well as between each layer of the aluminum laminated bags.

Packing Shape	Product	Q'ty per reel	Q'ty per bag
Tape reel (330 mm)	1 model	2,000 pcs per reel	1 reel per laminated bag

NOTICE) Minimum order / shipment quantity should be 1 laminated bag (1 reel of 2,000 pieces).

4. The outer case is sealed with craft tape, with indication of model name, quantity, and out-going inspection date on the case. (total of 8,000 pieces per carton)

9-3 Storage, Treatment after Unsealing

9-3-1. Storage Conditions

The delivered product should be stored with the conditions shown below:
Storage temperature: 10 °C to 30 °C
Humidity: below 60% RH

9-3-2. Treatment after Unsealed

1. After unsealing, mount devices within the temperature condition of 10 °C to 30 °C, at the humidity condition of below 60% RH, within 3 days (72 hours).
2. If long-term storage is needed, devices should either be stored in 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, at the humidity condition of below 60% RH. Mount devices within 2 weeks.

9-3-3. Baking before Mounting

In the event that the devices are not maintained in the storage conditions described above, or the enclosed desiccant indicator has turned pink, baking must be applied before the devices are to be mounted: Please also note that baking should only be applied once.

NOTICE)
Baking is not done with the devices in the reel, as it will melt. To complete the baking properly, devices should either be temporarily mounted to a PCB with adhesive, or placed in a metal tray. Any device that has been out of dry pack for more than 72 hours should be dried in some manner prior to any surface-mount reflow process. Otherwise these devices should be mounted and soldered by hand.

Recommended Condition: 100 °C, 12 to 24 hours

IMPORTANT NOTICE
This document is a Technical Supplement for the Sharp GP2W0004YP Infrared Transceiver. Any information under this document, such as Specifications, is applicable only for GP2W0004YP and GP2W0004XP, and is subject to change at any time without notice.
In absence of confirmation by device Specification Sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogues, data books, Preliminary Information, etc. Contact SHARP, or SHARP local representatives in order to obtain the latest version of the device Specification Sheets before using any SHARP devices.

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