GP1H20

SHARP

Technical Data

IrDA 1.0 / IrDA 1.2 Low Power Compliant Compact Feature Type

1. Features

- IrDA 1.2 Low Power Option Compliant (I_F = 27 mA at Reception distance of 20 cm)
- Industry Smallest Package Design for IrDA 1.0 Compliant Infrared Transceiver (W 8.7 x D 4.2 x H 3.15 mm)
- Suitable and Fits in the Mobile Phone Connector Dimensions
- Low Power Consumption by Built-in Shut-Down Mode (Max. 1 mA)
- Wide Range Operating Voltage Provide Power Line Design Flexibility (V_{CC} = 2.7V ~ 5.5V)
- Soldering Reflow Capability for Automated Production Process
- SMD Package Enables both Vertical Mount and Horizontal Mount to PCBs

2. Description

The SHARP GP1H20, low operating smallest IrDA 1.0 compliant 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.

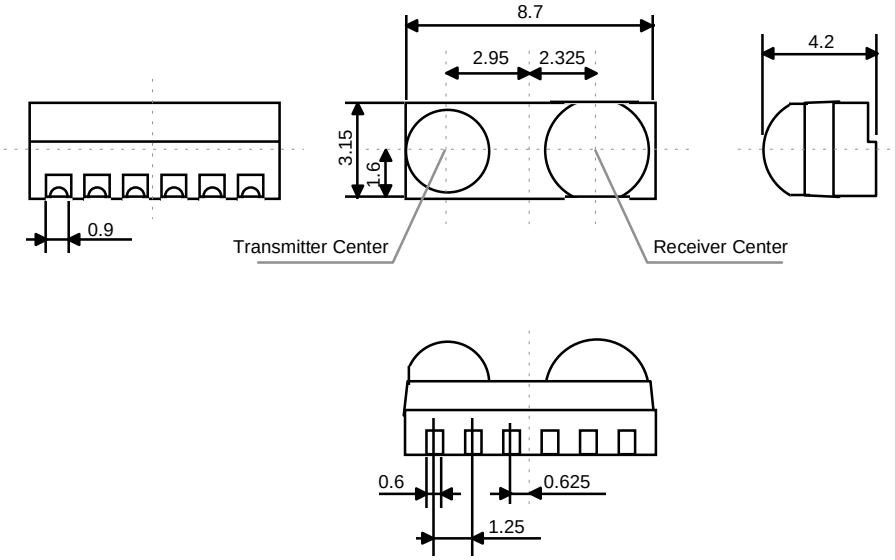
The SHARP GP1H20 infrared transceiver module contains a high speed, high efficiency, low power consumption AlGaAs LED, a silicon PIN photodiode, and the low power driven bipolar integrated circuit. The IC contains a LED driver circuit and a receiver, that provides the RX output supporting 2.4k to 115.2 kb/s IrDA signals, at both IrDA 1.0 communication mode (communication distance of 1.0m at emitter I_F = 300 mA), and IrDA 1.2 Low Power Option communication mode (communication distance of 0.2m at emitter I_F = 27 mA) This dual mode communication capability provides wider application use in final product, as a wireless data link with PCs, PDAs, or any other IrDA compliant application already introduced to the market place.

Though the GP1H20 transceiver module is operated at 2.7V, the module can still be operated at 5.5V without any performance desiccation. The manufacturers would surely get the advantage of energy saving design in any application field, with having alternatives of supply voltage, for other components.
Further more, the GP1H20 transceiver module does have the built-in shut-down mode for those who are very conscious about the current consumption, by reducing the current consumption down to 1 mA (max.) at the shut-down mode.

3. Outline Dimensions

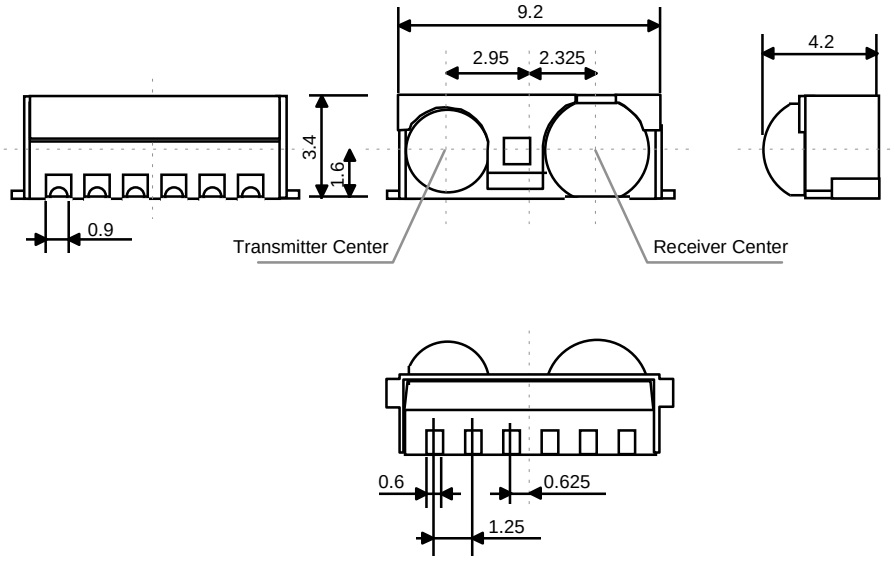
All dimensions given below is in mm. The dimensions below are only applicable for design reference, and subject to change without notice. The metal shield case for GP1H20 is also available as an option for excellent noise immunity, of which the Outline Dimensions are also provided on the next page. Contact local SHARP for the device specifications to ensure the outline dimensions.

(GP1H20)



UNIT: mm

(With SHIELD CASE)



UNIT: mm

1. Unspecified tolerance shall be determined.
2. Resin burr shall not be included in outline dimensions.
3. Package Material : Visible Light Cut-off Resin (Color: Black)
4. Pin Assignment : See “Pinout” for details.

4. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	V_{CC}	0	6.0	V	
Operating Temperature	T_{OP}	-10	+70	°C	
Storage Temperature	T_{ST}	-20	+85	°C	
Soldering Temperature	T_{SOL}		*(240)	°C	*TENTATIVE Value
Peak Forward LED Current	I_{FM}		400	mA	

5. Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	T_{OP}	-10	70	°C	
Supply Voltage	V_{CC}	2.7	5.5	V	
Logic High Transmitter Input Voltage (TXIN)	V_{IH}	2.4		V	
Logic Low Transmitter Input Voltage (TXIN)	V_{IL}		0.4	V	
Logic High Receiver Input Irradiance	E_{IH}	0.004		mW/cm^2	Bit Rate =2.4k ~ 115 kb/s (in band signals)[*1]
Receiver Signal Rate		2.4	115.2	kb/s	
Ambient Light					[*2]

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

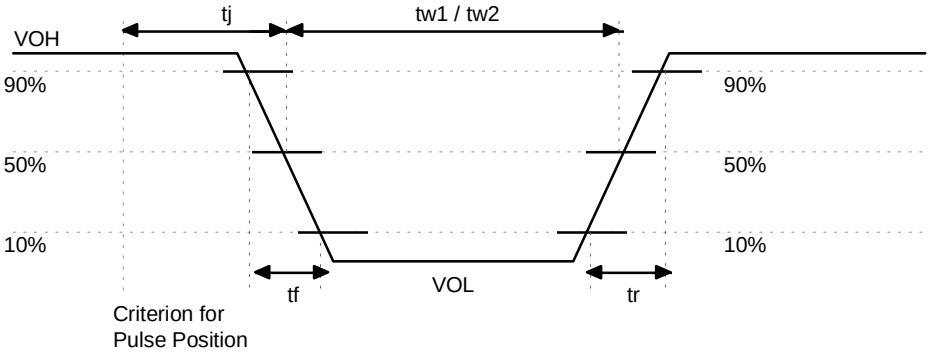
2. See IrDA Serial Infrared Physical Layer Link Specification Appendix A for ambient lights.

6. Electrical and Optical Specifications

Specifications hold over the Recommended Operating Conditions, unless otherwise noted herein. All typical values are at 25° C and 3.3V, ambient light on the receiver surface under 10 lz, unless otherwise noted herein.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	V_{CC}	2.7	-	5.5	V	
Maximum Reception Distance	L1	$\geq$ 0.2	-	-	m	$2\Phi 1/2 \leq 15^o$, IE = 3.6 mW/sr
	L2	$\geq$ 1.0	-	-	m	$2\Phi 1/2 \leq 15^o$, IE = 40 mW/sr
Data Rate	BR	2.4	-	115.2	kb/s	
Operating Temperature	T_{OP}	-10	-	70	^OC	
RECEIVER SIDE						
High Level Output Voltage	V_{OH}	4.5	-	-	V	V_{CC} = 5V
Low Level Output Voltage	V_{OL1}	-	-	0.6	V	V_{CC} = 5V, $^*I_{OL}$ = 400 uA
	V_{OL2}	-	-	0.6	V	V_{CC} = 3V, $^*I_{OL}$ = 400 uA
Viewing Angle	2Φ	30	-	-	degrees	
Low Level Pulse Width	tw_1	0.8	-	16	µsec	BR = 2.4 kb/s (pulse width 78.12 ms)
	tw_2	0.8	-	8	µsec	BR = 115.2 kb/s (pulse width 1.63 ms)
Current Consumption	I_{CC1}	-	1.0	1.4	mA	With no input signal, V_{CC} =5.0V
		-	0.7	1.0	mA	With no input signal, V_{CC} =3.0V
	I_{CC2}	-	-	1.0	µA	Shut-Down Mode
Rise Time	tr			1.2	µsec	see below
Fall Time	tf			0.2	µsec	see below
TRANSMITTER SIDE						
Radiant Intensity	I_{E1}	3.6	-	28.8	mW/sr	I_F = 27 mA, $2\Phi 1/2 \leq 15^o$
	I_{E2}	40		350	mW/sr	I_F = 300 mA, $2\Phi 1/2 \leq 15^o$
Peak Emission Wavelength	λp	850	870	900	nm	I_F = 20 mA
Peak LED Current	I_{LEDA}	-	300	-	mA	All mode
Rise Time	$tr_{(IE)}$	-	0.23	0.6	µsec	I_F = 27 mA, see below
Fall Time	$tf_{(IE)}$	-	0.17	0.6	µsec	I_F = 27 mA, see below
Transmitter Data Input Current (Logic High)	I_{IH}			2.3	mA	V_{IN} = 2.4V
Transmitter Data Input Current (Logic Low)	I_{IL}			TBD	µA	V_{IH} = 0.0V
High Level Input Voltage	V_{IH}	2.4			V	
Low Level Input Voltage	V_{IL}			0.4	V	

$^*I_{OL}$: Current goes into IC while RXD is ON state (Low Level Output)



GP1H20 Infrared Transceiver Module Output Waveform

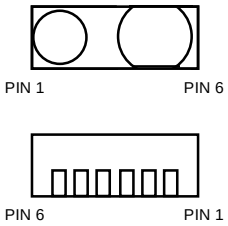
7. Truth Table

INPUTS			OUTPUTS		
TXIN	EI	SD	IE (LED)	RXD	
V_{IH}	X	V_{IH}	High (On)	NV	
V_{IH}	X	$V_{IL\ (or\ OPEN)}$	High (On)	High	SD mode
V_{IL}	E_{IH}	V_{IH}	Low (Off)	Low	
V_{IL}	E_{IH}	$V_{IL\ (or\ OPEN)}$	Low (Off)	High	SD mode
V_{IL}	E_{IL}	x	Low (Off)	High	

X ... Don't care NV ... Not Valid E_{IH} ... Optical inputs to Receiver E_{IL} ... No Optical inputs to Receiver

8. Pinouts

PIN #	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_{CC}



9. Application Electrical Design Hints

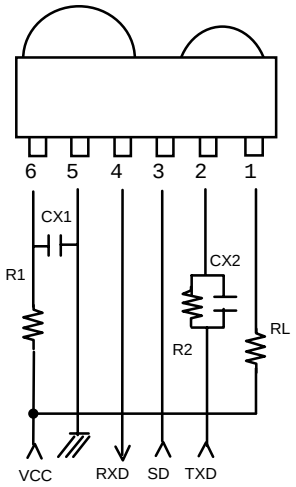
The following figure and table shows the recommended application circuit and passive values for GP1H20. The following table only provides an idea for external passive values and is only applicable to customers' design reference.
See Section 11 for technical reference data in optical / electrical characteristics.

9-1 Application Circuit and External Passives

Following application circuit and external passives enables GP1H20 to operate in both IrDA 1.0 and IrDA 1.2 low power option communication mode at V_{CC} = 3.0V.

Components	Recommended Values
CX1	47 µF
CX2	1500 pF
R1	47 Ω, 1/8W
R2	1k Ω, 1/8W
RL	2.2 Ω, 1/2W (IrDA 1.0 at V_{CC} = 3.0V)
	43 Ω, 1/8W (IrDA 1.2 Low Power at V_{CC} = 3.0V)

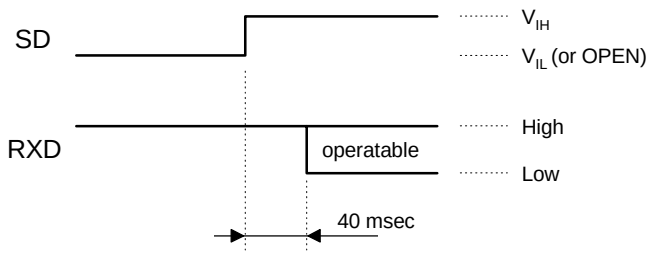
All recommended values are at V_{CC} = 3.0V



9-2 Shut Down Mode

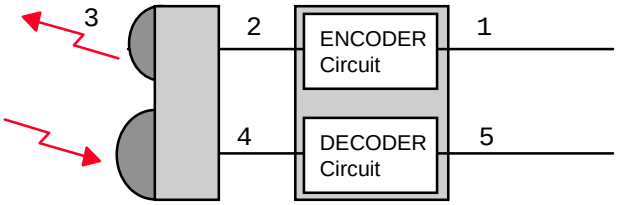
The "Shut-Down" pinout is an active Low terminal, and performs the power saving function in accordance with following chart:

Input	Performance
HIGH	Normal Mode
LOW	Shut Down Mode
OPEN	Shut Down Mode



9-3 Example of Signal Wave Form

Following wave form explains how each of the waveform looks like to operate GP1H20 in appropriate manner conforming to IrDA standard. Following waveform example is only applicable to design and evaluation reference only, to understand the GP1H20 IrDA 1.0 / IrDA 1.2 hardware implementation as well as system measurement.



No.	Signal Description	Waveform
1	Transmitting Data Waveform	
2	Encoder Circuit Output Waveform	
3	Transmitter Output Optical Signal Waveform	
4	GP1H20 Receiver Output Waveform	
5	Receiving Data Waveform	

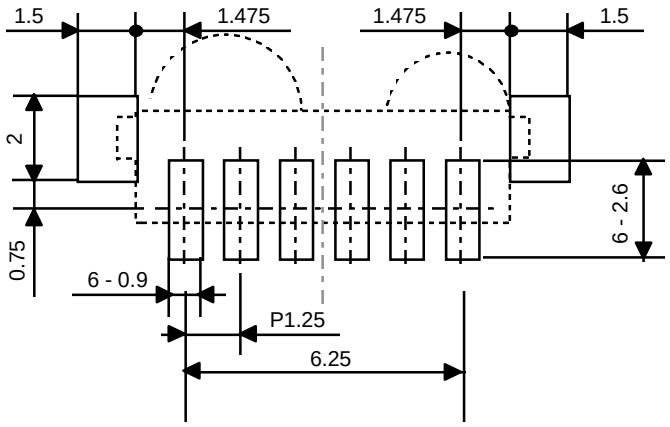
T = 1 / Data Rate

Data Rate: 2.4 kbps, 9.6 kbps
19.2 kbps, 38.4 kbps
57.6 kbps, 115.2 kbps

10. Application Mechanical Design Hints

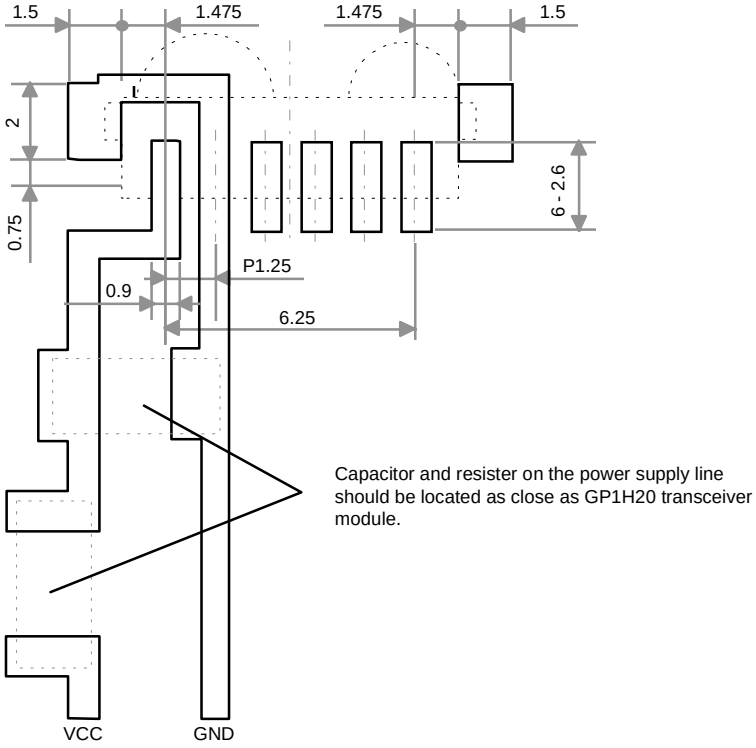
10-1. Recommended Foot Print

Following figure shows the basic recommended foot print for PCB design in using SHARP GP1H20 infrared transceiver module. All values in following figure are only applicable to design reference and in mm (UNIT).



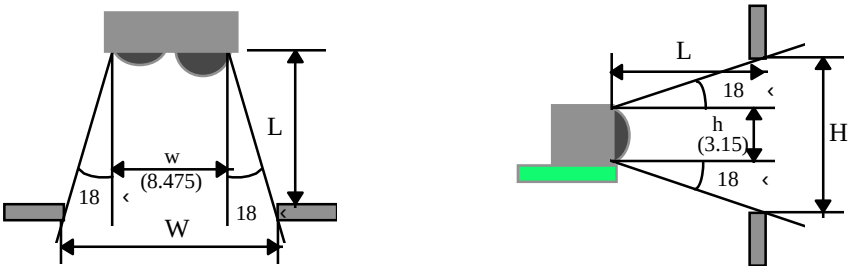
10-2. Electrical & Mechanical Design Hint

Following PCB footprint figure shows recommended location for the resisters and capacitors for better performance, especially for GP1H20 power supply (V_{CC}) line. The R1 and CX1 for this line (see section 9-1 for application circuit) should be mounted close to GP1H20 transceiver module for its better performance. All values in following figure are only applicable to design reference and in mm (UNIT).



10-3. Design Hints for Cabinet and IR Cosmetic Window

Following figure and calculation explain the example and designing hints for cabinet and IR cosmetic window with $\pm 18^{o}$ viewing angles, in vertical and horizontal axis. 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 can be calculated by the formula of:

$$W = 2 \times L \times \tan 18 + w$$

and the dimensions for H can be calculated by the formula of:

$$H = 2 \times L \times \tan 18 + h$$

in case of having viewing angle of + 18, which conforms or exceeds the IrDA Serial Infrared Physical Layer Link Specifications. Any values to be calculated with above formula must be given in mm.

(IMPORTANT NOTICE)

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