IrDA infrared communication IC (SIR compatible)

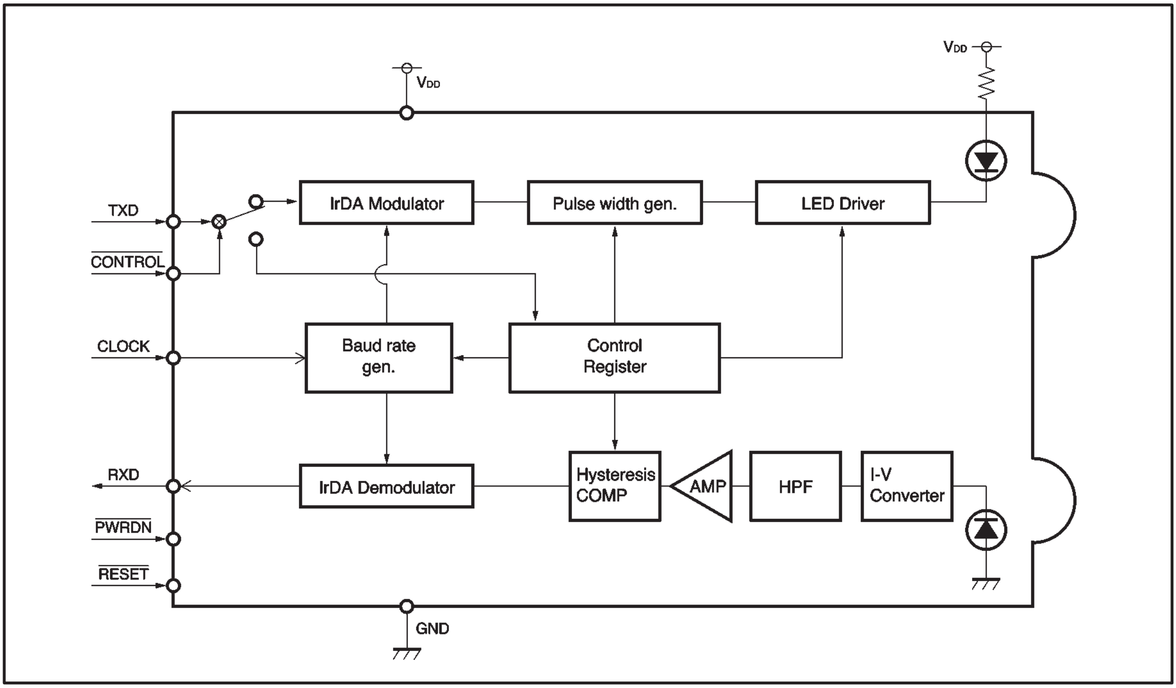
RPM-801CB Series

The RPM-801CB Series is an infrared communication IC that is compatible with the IrDA (1.0). The infrared LED, PIN photodiode and modulator / demodulator circuit have been combined on to a single package. LED current can be controlled using external resistor, and an internal register is provided for setting the baud rate and pulse width of the transmitted light. Connection to a UART requires just three lines (transmit, receive, and control) and a clock.

●Applications
Cellular telephones, pagers, PDA, PHS, notebook PCs, and printers.

●Features
1) Low power consumption.
2) Infrared emitting, receiver, and modulator / demodulator on the chip.
3) Compatible with the IrDA (1.0).
4) Built-in powerdown mode.
5) Power supply voltage input range 2.7V to 5.5V.
6) External clock input.
7) Light emitting pulse width can be varied.

●Block diagram



●Pin descriptions

Pin No.	Pin name	Function
1	LED	LED anode
2	V_{DD}	Power supply
3	CONTROL	Register write control pin When Low, the TXD input becomes the data setting input for the internal register.
4	TXD	Transmit/control write data input pin Transmit data (light emitting output) or register data setting input p
5	RXD	Receive data output pin Data output pin for the received data (light input).
6	CLOCK	Clock input pin External clock input pin.
7	$\overline{PWRDN}$	Power down control input pin The IC is in the power down state when this is Low.
8	$\overline{RESET}$	Internal register reset input pin When on, the internal registers are reset.
9	GND	Ground

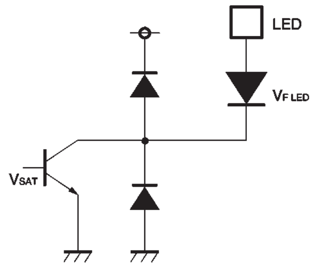
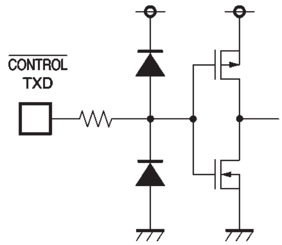
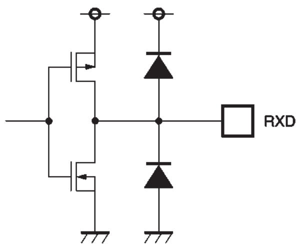
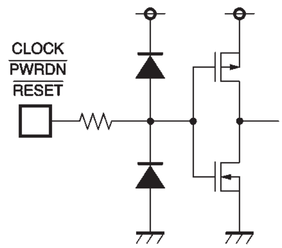
●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{DD}	−0.3～+7.0	V
Operating temperature	Topr	−10～+60	℃
Storage temperature	Tstg	−20～+85	℃

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{DD}	2.7	3.0	5.5	V

●Input / output circuits

Pin No.	Pin name	Function	Equivalent circuit
1	LED	LED anode Connect a resistor to limit the LED current.	
2	V_{DD}	Power supply	
3	$\overline{CONTROL}$	Register write control pin Transmit : High, Register set : Low	
4	TXD	Transmit / register write data input Data 1 : High, Data 0 : Low	
5	RXD	Receive data output Data 1 : High, Data 0 : Low	
6	CLOCK	Clock input	
7	$\overline{PWRDN}$	Power down control Power down : Low	
8	$\overline{RESET}$	Internal register reset Reset : Low	
9	GND	Ground	

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{DD} = 3V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Power supply current 1	I_{DD1}	—	—	3.5	mA	Stand-by for receiving
Power supply current 2	I_{DD2}	—	—	10	μA	Power down,No ambient light
Power supply current 3	I_{DD3}	—	—	300	mA	Max. LED current drive
Control input high voltage	V_{IH}	$V_{DD}-0.5$	—	—	V	
Control input low voltage	V_{IL}	—	—	0.8	V	
Control input high current	I_{IH}	—	—	−2.0	μA	
Control input low current	I_{IL}	—	—	2.0	μA	
TXD input high voltage	V_{IH}	$V_{DD}-0.5$	—	—	V	
TXD input low voltage	V_{IL}	—	—	0.8	V	
TXD input high current	I_{IH}	—	—	−2.0	μA	
TXD input low current	I_{IL}	—	—	2.0	μA	
CLOCK input high voltage	V_{IH}	$V_{DD}-0.5$	—	—	V	
CLOCK input low voltage	V_{IL}	—	—	0.8	V	
CLOCK input high current	I_{IH}	—	—	−2.0	μA	
CLOCK input low level current	I_{IL}	—	—	2.0	μA	
$\overline{\text{PWRDN}}$ input high voltage	V_{IH}	$V_{DD}-0.5$	—	—	V	
$\overline{\text{PWRDN}}$ input low voltage	V_{IL}	—	—	0.8	V	
$\overline{\text{PWRDN}}$ input high current	I_{IH}	—	—	−2.0	μA	
$\overline{\text{PWRDN}}$ input low current	I_{IL}	—	—	2.0	μA	
$\overline{\text{RESET}}$ input high voltage	V_{IH}	$V_{DD}-0.5$	—	—	V	
$\overline{\text{RESET}}$ input low voltage	V_{IL}	—	—	0.8	V	
$\overline{\text{RESET}}$ input high current	I_{IH}	—	—	−2.0	μA	
$\overline{\text{RESET}}$ input low current	I_{IL}	—	—	2.0	μA	
RXD output high voltage	V_{OH}	$V_{DD}-0.5$	—	—	V	I_{OH}=2.0mA
RXD output low voltage	V_{OL}	—	—	0.5	V	I_{OL}=2.0mA

●Circuit operation

(1) IrDA format

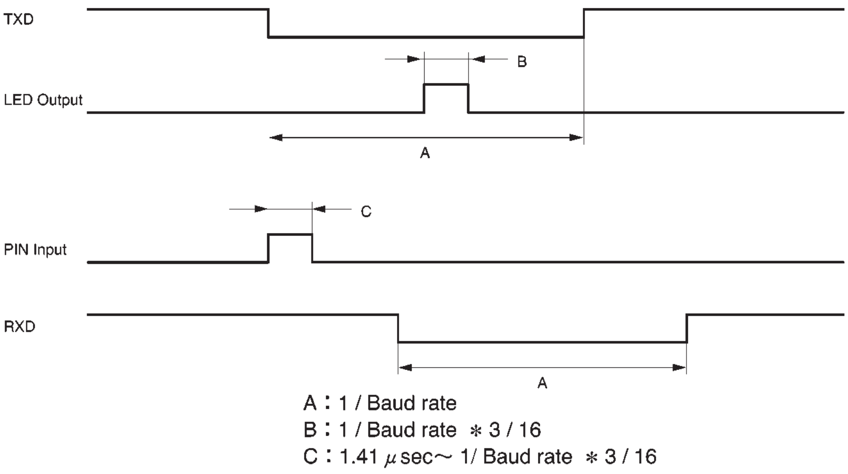


Fig.1

(2) Register function

Control character format

As shown in the Fig.2, the control character is made up of four address bits, four data bits, a start bit and a stop bit.

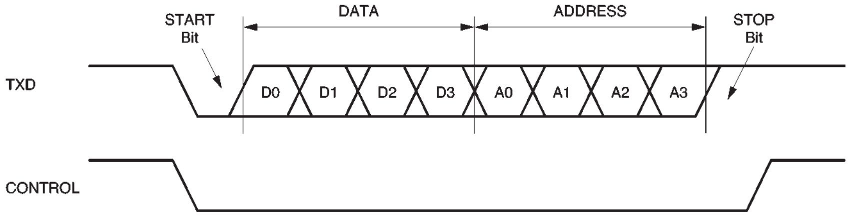


Fig.2

(3) Explanation of the registers

Register table

No.	Address	Function
1	0000	Control register 1
2	0001	Control register 2
3	0010	Clock divider register 1
4	0011	Clock divider register 2
5	0100	Output pulse width register 1
6	0101	Output pulse width register 2

1) Control register 1

	D3	D2	D1	D0
	ECHO	ECAN	RXEN	TXEN
Reset	0	0	0	0

ECHO 0 No control character echo back
ECHO 1 Control character echo back
ECAN 0 Reception of transmitted (self emitted) data not cancelled
ECAN 1 Reception of transmitted (self emitted) data cancelled
RXEN 0 Receiver off
RXEN 1 Receiver on
TXEN 0 Transmitter off
TXEN 1 Transmitter on

2) Control register 2

	D3	D2	D1	D0
	0	0	0	LOAD
Reset	0	0	0	0

LOAD 0 Do not load the clock divider register value
LOAD 1 Load the clock divider register value

∗ The LOAD bit automatically becomes 0 after the clock divider register value is loaded.

3) Clock divider register value 1

	D3	D2	D1	D0
	DIV3	DIV2	DIV1	DIV0
Reset	0	0	0	1

4) Clock divider register value 2

	D3	D2	D1	D0
	0	0	0	DIV4
Reset	0	0	0	0

DIV4	Value	DIV3	DIV2	Value	DIV1	DIV0	Value
0	1	0	0	1	0	0	1
1	1/3	0	1	1/2	0	1	1/2
—	—	1	0	1/4	1	0	1/4
—	—	1	1	1/8	1	1	1/8

Baud rate = M × input clock frequency / 8
M = (DIV4 select value) × (DIV3,2 select value) × (DIV1,0 select value)

∗ At reset, the value is set to 1 / 2.
The reset baud rate is therefore: 1 / 2 × input clock frequency / 8.

5) Output pulse width register 1

	D3	D2	D1	D0
	PW3	PW2	PW1	PW0
Reset	0	0	0	0

6) Output pulse width register 2

	D3	D2	D1	D0
	0	0	0	PW4
Reset	0	0	0	0

PW4	Value	PW3	PW2	Value	PW1	PW0	Value
0	1	0	0	1	0	0	1
1	3	0	1	2	0	1	2
—	—	1	0	4	1	0	4
—	—	1	1	8	1	1	8

Output pulse width = N $\times$ input clock period / 2
N = (PW4 value) $\times$ (PW3,2 value) $\times$ (PW1,0 value)
Note) N $\leqq$ 4 / M
M = (DIV4 multiplier) $\times$ (DIV3,2 multiplier) $\times$ (DIV1,0 multiplier)

(4) Timing chart

1) Reset operation

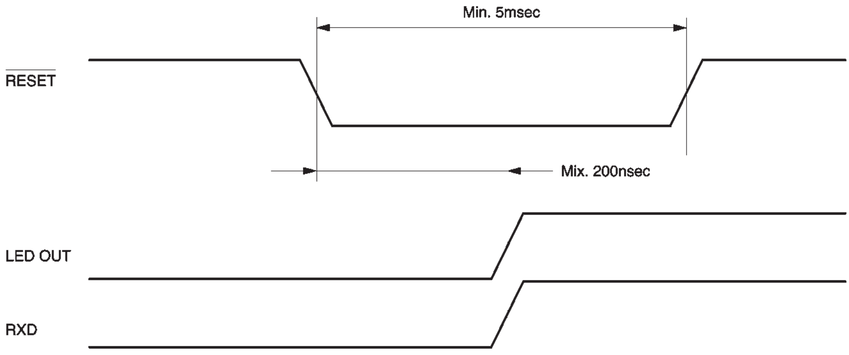


Fig.3

2) Register write

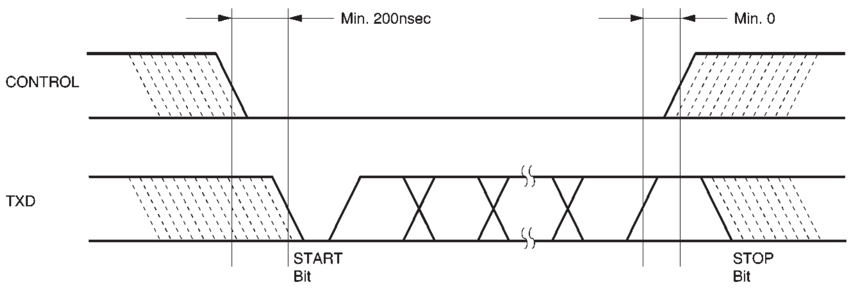


Fig.4

3) Echo back

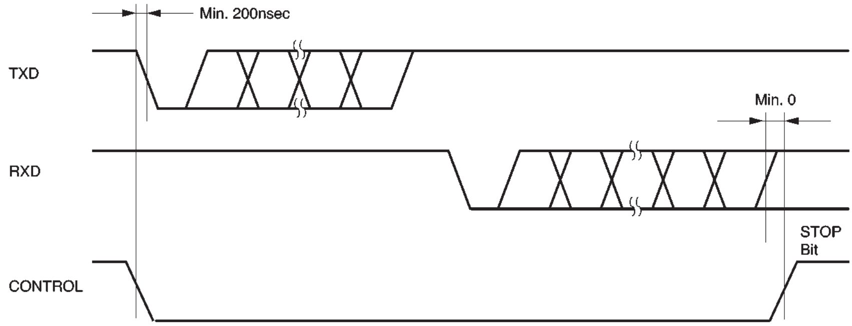


Fig.5

4) Transmit

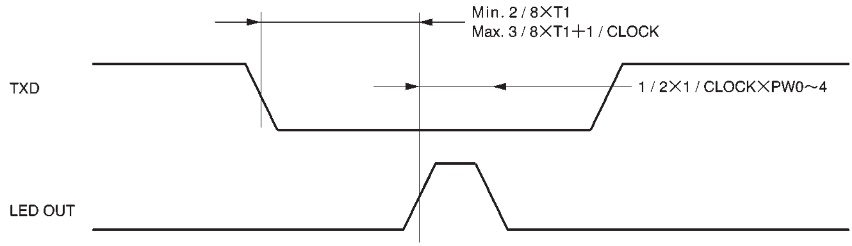


Fig.6

5) Receive

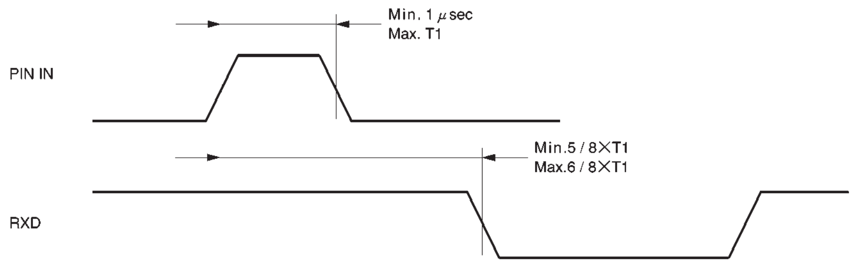


Fig.7

6) Echo cancel

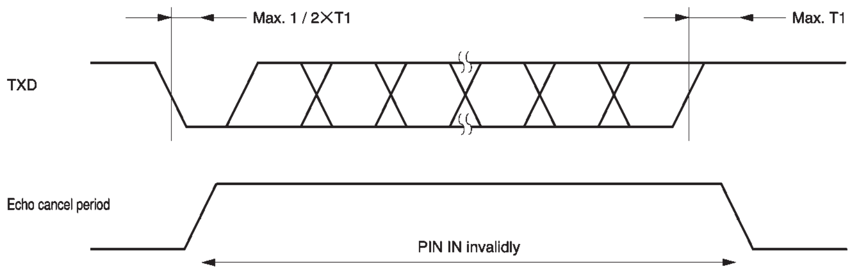


Fig.8

7) Power down

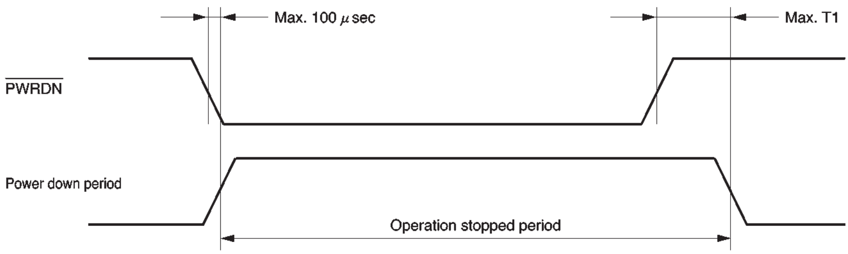


Fig.9

∗ T1 is 1 / baud rate.

●Application example

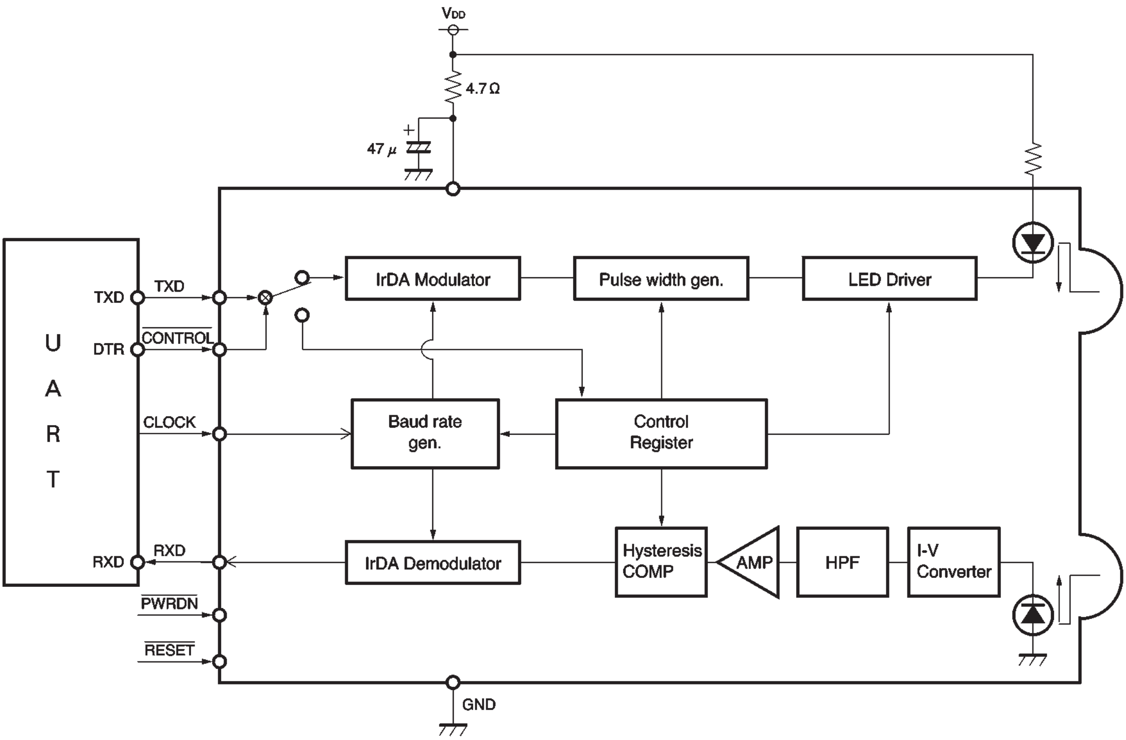


Fig.10

●Operation notes

After the power is applied or after a reset via RESET, the baud rate generator is set to Clock / 16, so perform the control register setting operation at a communication rate of Clock / 16.

To perform infrared communication after the power is applied or after a reset via RESET, first set the value 3 into control register 1 (both receiver and transmitter on).

Determine the clock frequency according to the content of the clock divider registers 1 and 2.

Set the pulse width in accordance with IrDA specifications.

●Electrical characteristics curves

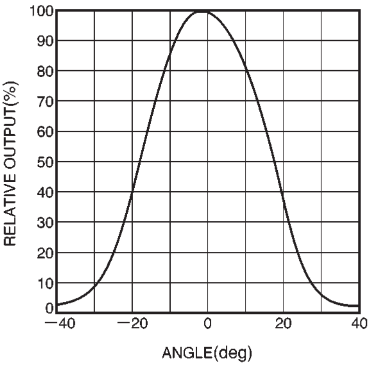


Fig.11 Light transmitter characteristics

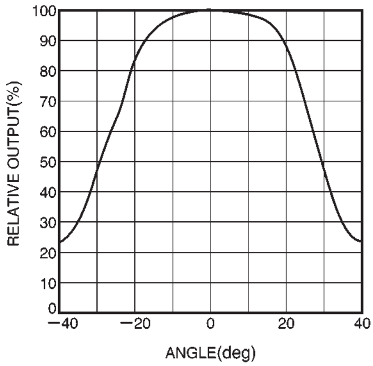
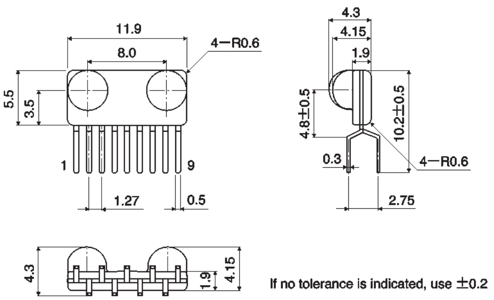


Fig.12 Light receiver characteristics

●External dimensions (Unit: mm)



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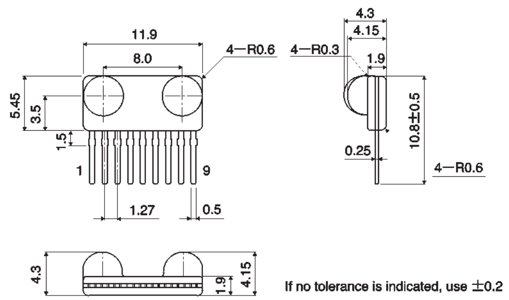
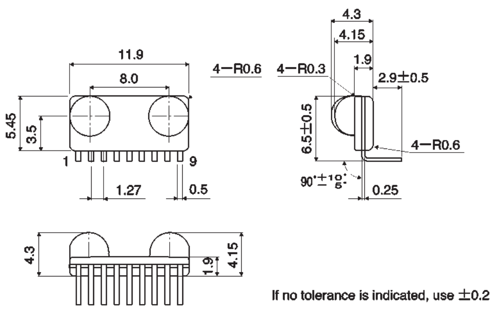


RSIP-9



RSIP-9 (V1)