

IrDA Infrared Communication Module

RPM841-H11

RPM841-H11 is an infrared communication module for IrDA Ver. 1.2 (Low Power). The infrared LED, PIN photo diode, LSI are all integrated into a single package. This module is designed with power down function and low current consumption at stand-by mode. The ultra small package makes it a perfect fit for mobile devices.

●Features

- 1) Infrared LED, PIN photo diode, LED driver & Receiver frequency formation circuit built in. Improvement of EMI noise protection because of Shield Case.
- 2) Applied to SIR (2.4 to 115.2kbps)
- 3) Surface mount type.
- 4) Power down function built in.
- 5) Super small package (W=6.8mm, D=2.44mm, H=1.5mm).
- 6) Infrared remote control transmission driver built-in.

●Applications

Mobile phone, PDA, DVC, Digital Still Camera, Printer, Handy Terminal etc.

●Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|-----------------------|------------------------------|------------------------------|------|
| Supply voltage | V _{max} | 7.0 * | V |
| Input voltage | V _{in} (3, 4, 5pin) | -0.3 to V _{cc} +0.3 | V |
| Operation temperature | T _{opr} | -30 to +85 | °C |
| Storage temperature | T _{stg} | -40 to +100 | °C |

* This applies to all pins basis ground pins (7pin)

●Recommended operating conditions (Ta=25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--------------------|---------------------|------|------|------|------|
| Supply voltage | V _{cc} | 2.4 | 3.0 | 3.6 | V |
| LED supply voltage | VLEDV _{cc} | 2.6 | 3.0 | 5.5 | V |

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●Block diagram and application circuit

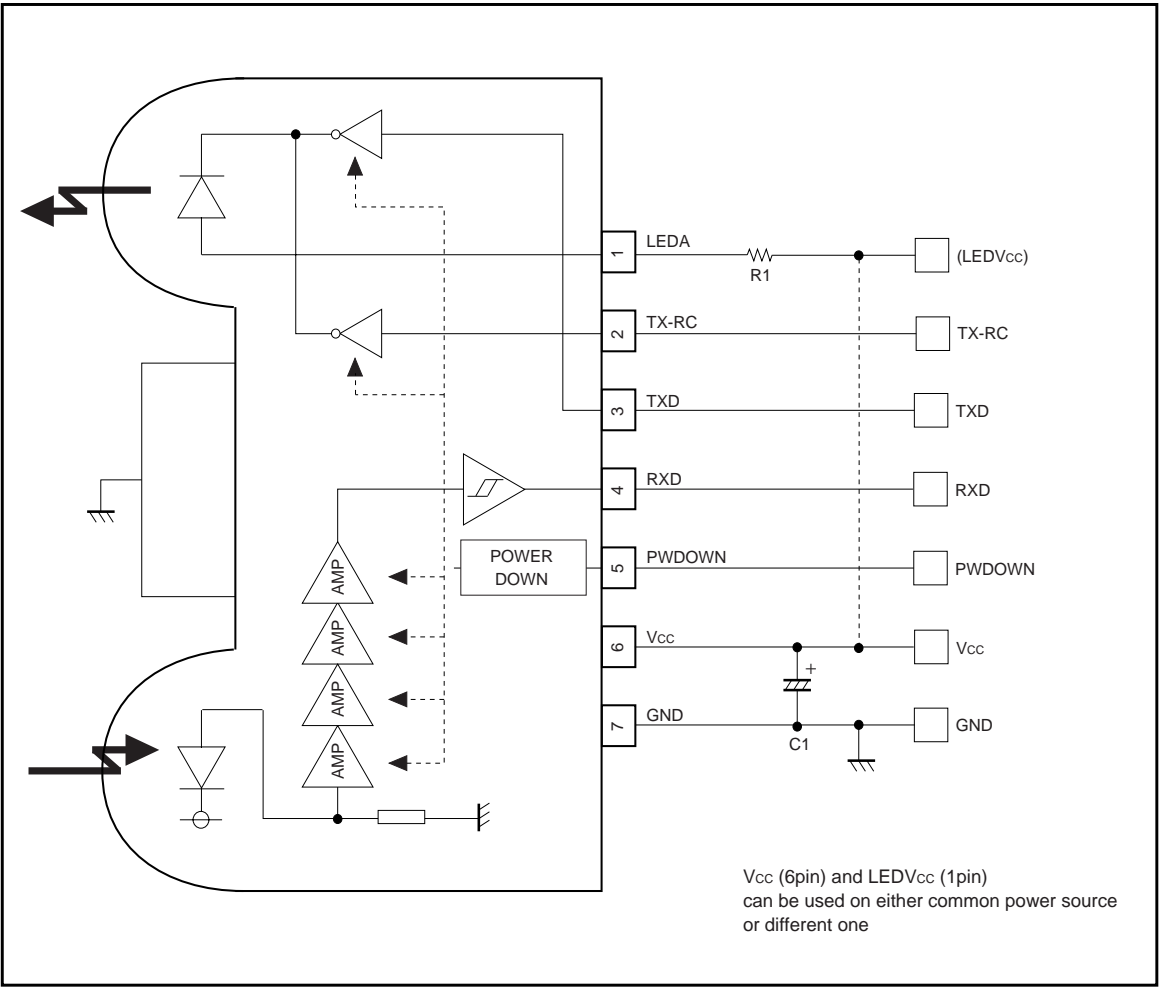


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●Terminal description

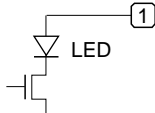
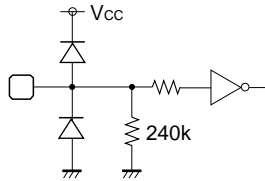
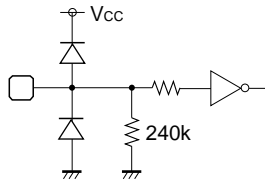
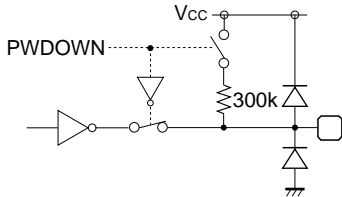
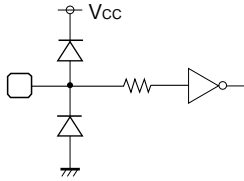
| Pin No | Terminal | Circuit | Function |
|--------|-----------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | LEDA |  | LED ANODE Terminal Other power source can be used difference between LEDV _{cc} and V _{cc} . |
| 2 | TX-RC |  | RC Transmitting Data Input Terminal H : LED Emitting (Remote Control Mode) CMOS Logic Level Input Holding TX-RC='H' status, LED will be turn off approximately 48μs. |
| 3 | TXD |  | Transmitting Data Input Terminal TXD input at PWDOWN=L H : LED Emitting CMOS Logic Level Input Holding TXD="H" status, LED will be turn off approximately 48μs. |
| 4 | RXD |  | Receiving Data Output Terminal CMOS Logic Level Output When PWDOWN (5pin)= 'H', the RXD output will be pulled up to V _{cc} at approximately 300kΩ. |
| 5 | PWDOWN |  | Power-down Control Terminal H : POWERDOWN L : OPERATION CMOS Logic Level Input When input is 'H', it will stop the receiving circuit and Pin-PD current. |
| 6 | V _{cc} | | Power Supply Terminal For preventing from infection, connect a capacitor between V _{cc} (6pin) and GND (7pin). |
| 7 | GND | | Ground Terminal |
| - | Shield Case | | Connect to Ground. |

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●Electrical characteristics (Unless otherwise noted, $V_{CC}=3.0V$, $V_{LEDV_{CC}}=3.0V$, $T_a=25^{\circ}C$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---------------------------|------------------|---------------------|------|---------------------|------|------------------------------------------|
| Consumption current1 | I _{CC1} | – | 90 | 120 | μA | PWDOWN=0V At no input light |
| Consumption current2 | I _{CC2} | – | 0.01 | 0.2 | μA | PWDOWN=V _{CC} At no input light |
| Data rate | | 2.4 | – | 115.2 | kbps | |
| PWDOWN input high voltage | VPDH | 2/3*V _{CC} | – | V _{CC} | V | V _{CC} =2.4 to 3.6V |
| PWDOWN input low voltage | VPDL | 0 | – | 1/3*V _{CC} | V | V _{CC} =2.4 to 3.6V |
| PWDOWN input high current | IPDH | –1.0 | 0 | 1.0 | μA | PWDOWN=V _{CC} |
| PWDOWN input low current | IPDL | –1.0 | 0 | 1.0 | μA | PWDOWN=0V |

<Transmitter>

| | | | | | | |
|-------------------------------|---------|---------------------|------|---------------------|----|----------------------------------------------|
| TXD input high voltage | VTXH | 2/3*V _{CC} | – | V _{CC} | V | V _{CC} =2.4 to 3.6V |
| TXD input low voltage | VTXL | 0 | – | 1/3*V _{CC} | V | V _{CC} =2.4 to 3.6V |
| TX-RC input high voltage | VTX-RCH | 1.5 | – | V _{CC} | V | V _{CC} =2.4 to 3.6V |
| TX-RC input low voltage | VTX-RCL | 0 | – | 0.5 | V | V _{CC} =2.4 to 3.6V |
| TXD/TX-RC input high current | ITXH | 6.2 | 12.5 | 25 | μA | TXD=V _{CC} or TX-RC=V _{CC} |
| TXD/TX-RC input low current | ITXL | –1.0 | 0 | 1.0 | μA | TXD=0V or TX-RC=0V |
| LED anode current (IrDA Mode) | ILEDA1 | – | 50 | 70 | mA | TXD=V _{CC} |
| LED anode current (RC Mode) | ILEDA2 | – | 211 | 245 | mA | TX-RC=V _{CC} , R ₁ =2.2Ω |

<Receiver>

| | | | | | | |
|-------------------------|-------------------|----------------------|-----|-----------------|----|----------------------------------------|
| RXD output high voltage | VRXH | V _{CC} -0.4 | – | V _{CC} | V | IRXH=–200μA |
| RXD output low voltage | VRXL | 0 | – | 0.4 | V | IRXL=200μA |
| RXD output rise Time | t _{RR} | – | 25 | 100 | ns | C _L =15pF |
| RXD output fall Time | t _{FR} | – | 25 | 100 | ns | C _L =15pF |
| RXD output pulse width | tw _{RXD} | 1.7 | 2.6 | 3.5 | μs | C _L =15pF, 2.4 to 115.2kbps |
| Receiver latency time | t _{RT} | – | 40 | 200 | μs | |





●Optical characteristics (Unless otherwise noted, $V_{CC}=3.0V$, $V_{LEDV_{CC}}=3.0V$, $T_a=25^{\circ}C$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|----------------------------------|--------------------------------|------|------|------|--------------------|------------------------------------------------------|
| Peak wave length1 (IrDA Mode) | λ _{P1} | 880 | 888 | 892 | nm | I _{LED} =50mA, Duty20% |
| | | 850 | – | 900 | nm | I _{LED} =50mA, Duty20%, –20 to 60°C |
| Peak wave length2 (RC Mode) | λ _{P2} | 880 | 890 | 920 | nm | I _{LED} =200mA, Duty20% |
| Intensity1 (IrDA Mode) | IE1 | 4 | 12 | 28 | mW/sr | –15° ≤ θ _L ≤ 15° R ₁ =2.2Ω |
| Intensity2 (RC Mode) | IE2 | 25 | 50 | 120 | mW/sr | –15° ≤ θ _L ≤ 15° R ₁ =2.2Ω |
| Half-angle | θ _L /2 | ±15 | – | – | deg | |
| Optical pulse width1 (IrDA Mode) | TWLED1 | 1.42 | 1.63 | 2.02 | μs | TXD=1.63μs pulse input R ₁ =2.2Ω |
| Optical pulse width2 (RC Mode) | TWLED2 | 9.5 | 10 | 10.5 | μs | TX-RC=10μs pulse input R ₁ =2.2Ω |
| Rise time / Fall time | T _r /T _f | – | 20 | 120 | ns | 10% to 90% |
| Optical over shoot | | – | – | 25 | % | |
| Edge jitter | T _j | –40 | – | 40 | ns | |
| Minimum Irradiance in angular | E _{emin} | – | 4.0 | 8.1 | μW/cm ² | –15° ≤ θ _L ≤ 15° |
| Maximum Irradiance in angular | E _{emax} | 500 | – | – | mW/cm ² | –15° ≤ θ _L ≤ 15° |
| Input half-angle | θ _D /2 | ±15 | – | – | deg | |
| Maximum emitting time | TLED _{max} | 20.5 | 48 | 96 | μs | TXD=0 → V _{CC} or TX-RC=0 → V _{CC} |


1. This product is not designed for protection against radioactive rays.
2. This product does not include laser transmitter.
3. This product includes one PIN photo diode.
4. This product does not include optical load.

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●LED Operation Mode Table

| PWDOWN (5pin) | TX-RC (4pin) | TXD (7pin) | LED Emitting Mode | IrDA Receiver Operation Condition |
|------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------|--------------------------------------|
| L | L | L | OFF | ON |
| L | L |  | IrDA | ON |
| L |  | L | RC | ON |
| H | L | L | OFF | OFF |
| H | L |  | OFF | OFF |
| H |  | L | RC | OFF |

Notes

- Please be sure to set up the TX-RC (2pin) and the TXD (3pin) input to be "L" (under 0.3V) except transmitting data (for $< 90\mu\text{s}$, ON Duty $\leq 50\%$).
-  of TX-RC (2pin) and TXD (3pin) in the table above is supposed to be the pulse input.
- When either TX-RC (2pin) input TXD (3pin) input keeps the state of "H" (more than approximately 48 μs), LED will be turned off due to LED pulse width limiting circuit if the pulse is input from the other terminal. Therefore, don't use as the normal transmitting is impossible.
- Please input the pulse when both TX-RC (2pin) and TXD (3pin) are "L".

●Interface operating timing

(Emitting side)

(1) When TXD output for IrDA and TXD output for controller are different lines.

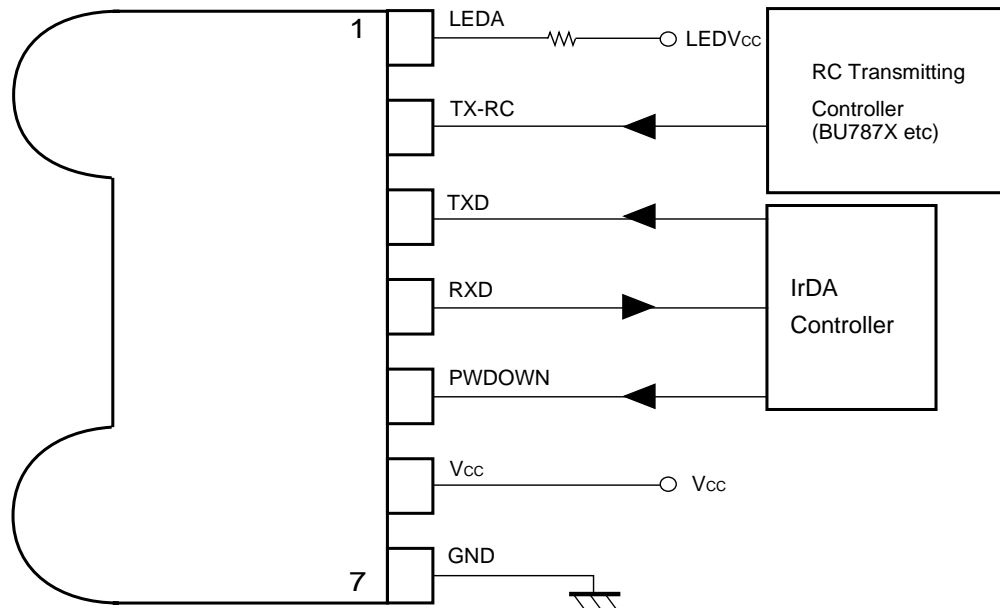


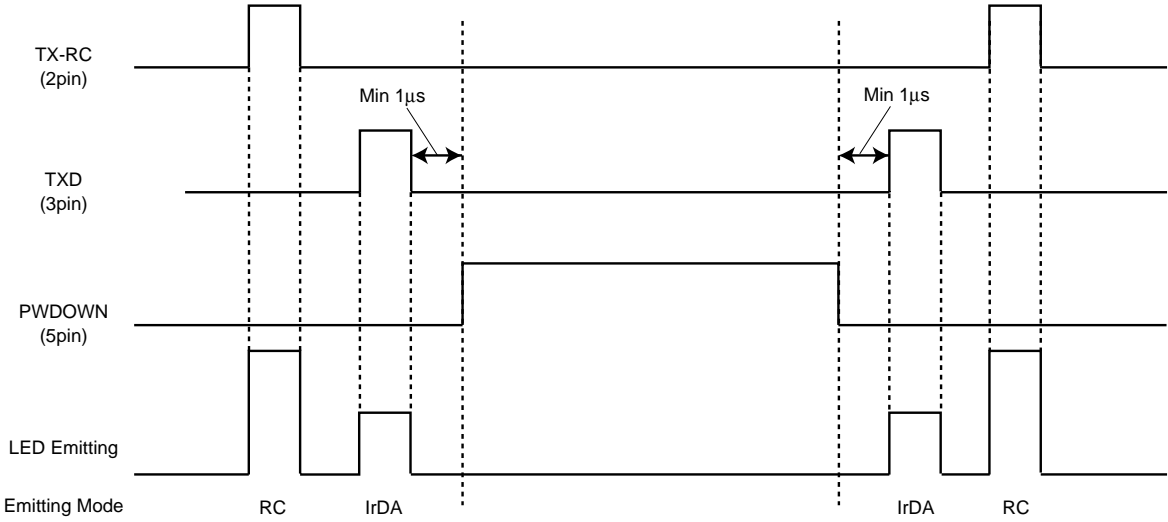


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(2-a) RC transmitting mode at IrDA receiver active condition.



| Input | | | Condition | |
|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------|------------------|
| PWDOWN | TX-RC | TXD | LED Mode | Receiver circuit |
| L | L | L | OFF | ON |
| L | L |  | IrDA | ON |
| L |  | L | RC | ON |
| H | L | L | OFF | OFF |

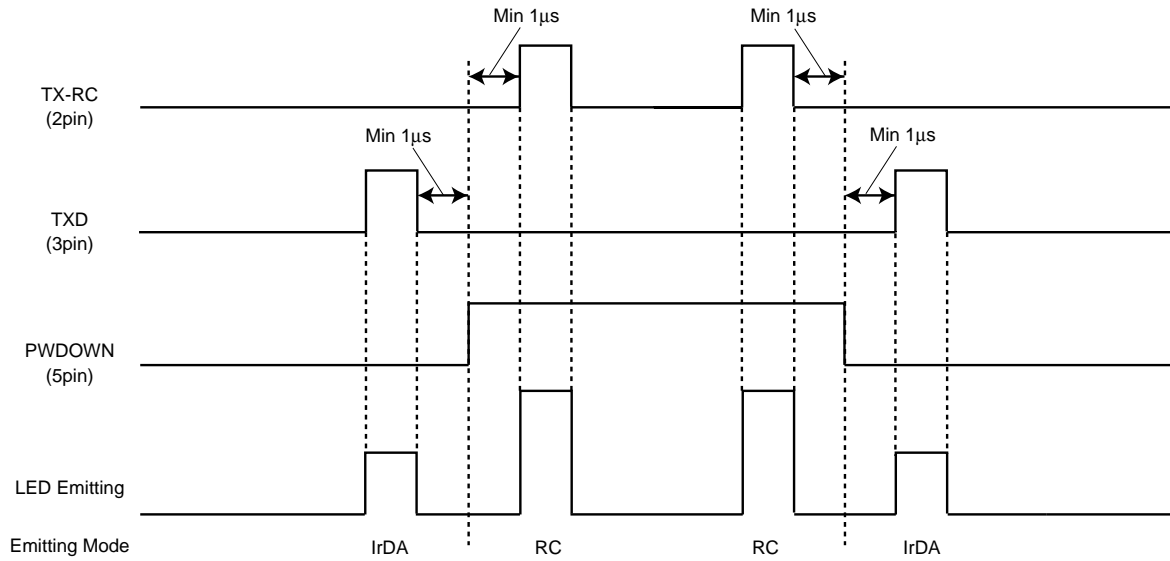


*If TX-RC or TXD input pulse width is wider than 48µs, output LED emitting pulse will be turn off approximately 48µs.

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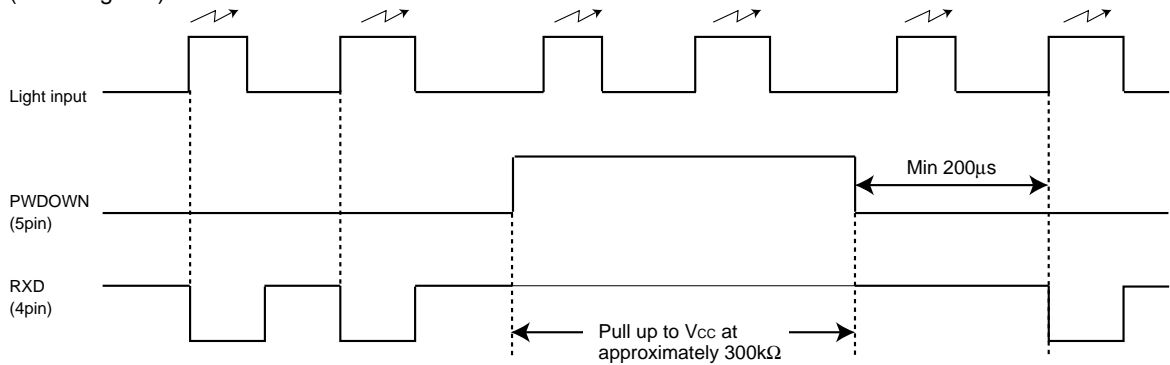
(2-b) RC transmit mode at IrDA receiver power down condition.

| Input | | | Condition | |
|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------|------------------|
| PWDOWN | TX-RC | TXD | LED Mode | Receiver circuit |
| L | L | L | OFF | ON |
| L | L |  | IrDA | ON |
| H |  | L | RC | OFF |
| H | L | L | OFF | OFF |



*If TX-RC or TXD input pulse width is wider than 48µs, output LED emitting pulse will be turn off approximately 48µs.

(Receiving side)



*RXD output width is fixed approximately 2.6µs.

Note RXD output become stable after 200µs since PWDOWN is changed from H to L.
RXD output could be unstable at H to L within 200µs.

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●Attached components

Recommended values

| Part symbol | Recommended value | Notice |
|-------------|-------------------------------------------------------|---------------------------------------------------------------------|
| C1 | 1μF, tantalum or ceramic Ex.) TCFGA1A105M8R (ROHM) | Bigger capacitance is recommended with much noise from power supply |
| R1 | 2.2Ω±5%, 1/8W (VLEDV _{cc} =3V) | At LED Emitting Duty=25% |

[LED current set-up method for Remote control mode]

In case of using R1 with different condition from the above, formula is as follows :

LED resistance value : R1[Ω], LED average consumption current : ILED[mA], Supply voltage : VLEDV_{cc}[V],

minimum necessary of irradiant intensity Ie1 [mW / sr]

(Including LED's distribution within ±15deg)

$$R1=166 \times (VLEDV_{cc}-1.31) / Ie1-7.2$$

$$ILED=Duty \times (VLEDV_{cc}-1.31) / (R1+5.8)$$

Duty : LED duty at emitting

* Please set up to be $ILED / Duty < 250[mA]$ (Duty ≤ 25%)

* At IrDA Mode, LED current is constantly approximately 50mA.

(Reference) In case of using R1, typical intensity (Ie1_{typ}) and maximum intensity (Ie1_{max}) on axis are described as below.

$$Ie1_{typ}=280 \times (VLEDV_{cc}-1.31) / (R1+5.8)$$

$$Ie1_{max}=560 \times (VLEDV_{cc}-1.31) / (R1+5.8)$$

●Notes

1) LEDV_{cc} (1pin), V_{cc} (6pin)

- Other power source can be used difference between LEDV_{cc} and V_{cc}.

2) Caution in designing board lay-out

To get maximum potential from RPM841-H11, please keep in mind following instruction.

- The line of RXD (4pin) should be connected at backside via through hole close to RPM841-H11 pin lead. Better not to be close to photo diode side (7pin).

⇒This is to minimize feedback supplied to photo diode from RXD.

- As for C1 between 6-7 pin should be placed close to RPM841-H11.
- Better to be placed more than 1.0cm in radius from photo diode (pin7 side) and also away from the parts which generates noise, such as DC/DC converter.

3) Notes

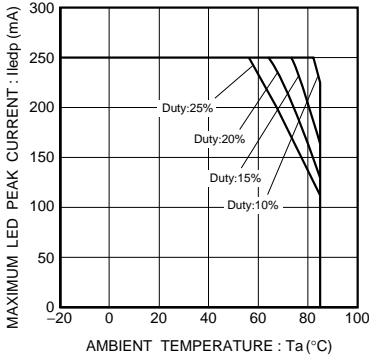
- Please be sure to set up the TX-RC (2pin) and the TXD (3pin) input to be "L" (under 0.3V) except transmitting data (for < 90μs, ON duty ≤ 50%).
- Power down current might increase if exposed by strong light (ex. direct sunlight) at powerdown mode.
- Please use by the signal format at IrDA operating mode which is specified by IrDA Ver1.2 (2.4k to 115.2kbps). There might be on error if used by different signal format.
- Please pay attention to the lens carefully.
Dusts of scratch on the lens may effect the characteristics of product. Please handle it with care.

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4) Eye safe
 · IEC60825-1 (IEC60825-1 amendment2), Class 1 Eye Safe.

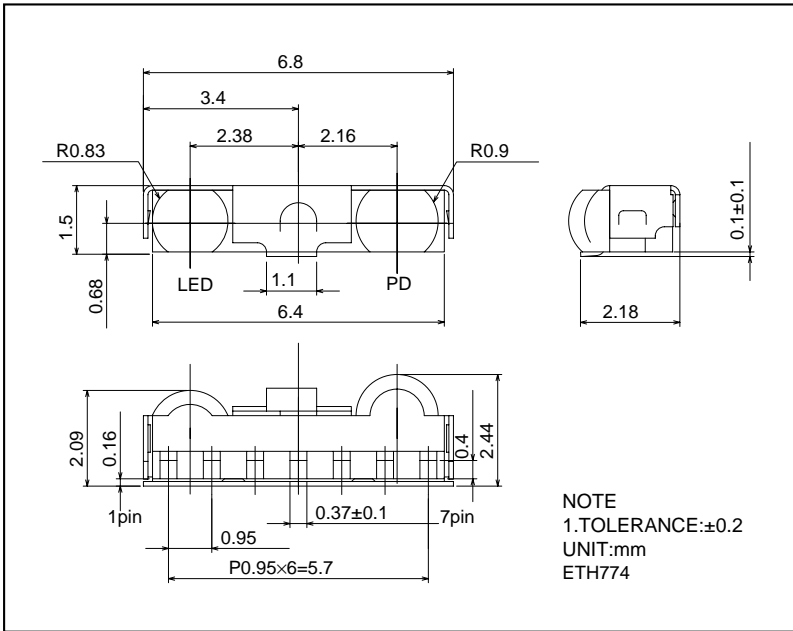
5) LED current derating and ambient temperature
 The relation between LED peak current and maximum ambient temperature is shown below.
 We recommend you to use within the range as indicated in below.

When glass-epoxy board (50×50×1.6mm) mounted.



●External dimensions (Unit : mm)

RPM841-H11



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