IrDA Infrared Communication Module

RPM882-H12

RPM882-H12 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) Low voltage operation as 1.5V of interface terminals to controller (TXD, RXD, PWDOWN, TX-RC).
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)

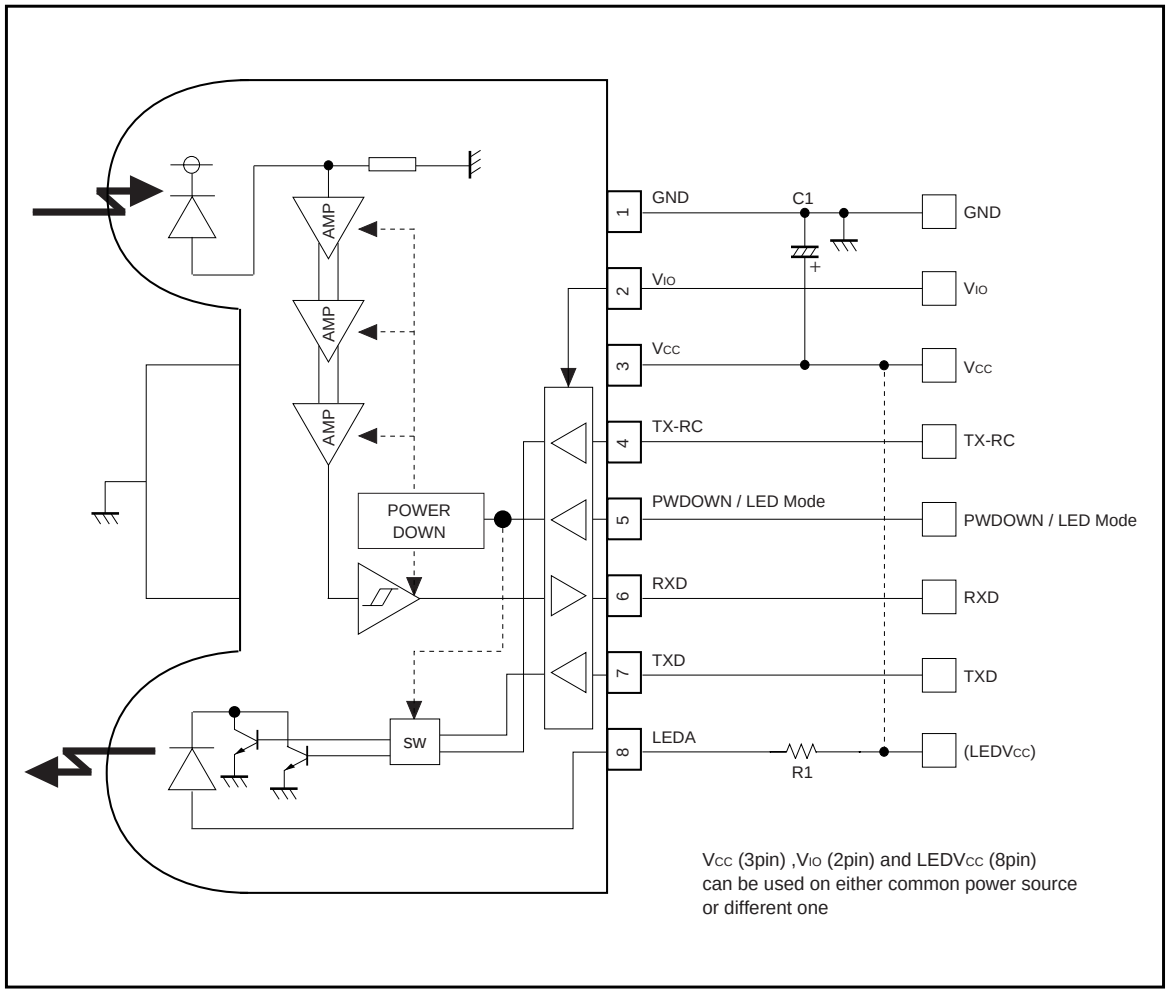
Parameter	Symbol	Limits	Unit
Supply voltage	V_{max}	7.0*1	V
Input voltage	V_{in} (4, 5, 6, 7pin)	−0.3 to V_{IO}+0.3	V
Operation temperature	Topr	−25 to +85	°C
Storage temperature	Tstg	−30 to +100	°C
LED peak current	I_{FP}	300*2	mA
Power dissipation	Pd	300*3	mW

∗1 This applies to all pins basis ground pins (1pin)
∗2 LED Peak Current< 90µs, On duty≤ 50%
∗3 When glass-epoxy board (70×70×1.6mm) mounted. In case operating environment is over 25°C, 4mW would be reduced per each 1°C stepping up.

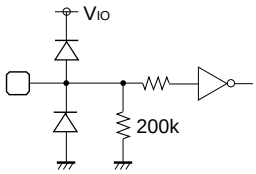
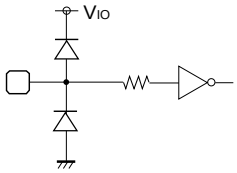
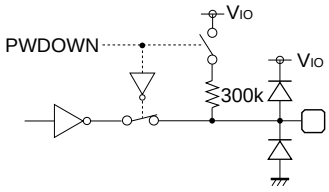
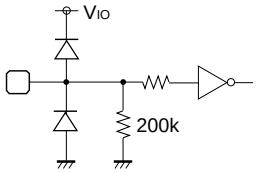
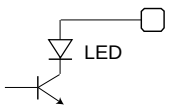
●Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	2.4	3.0	3.6	V
Interface supply voltage	V_{IO}	1.5	3.0	V_{CC}	V
LED supply voltage	VLEDV_{CC}	2.6	3.0	5.5	V

●**Block diagram and application circuit**



●**Terminal description**

Pin No	Terminal	Circuit	Function
1	GND		**Ground**
2	V_{IO}		**Supply voltage for I/O pins.** (TX-RC, PWDOWN, RXD, TXD)
3	V_{CC}		**Power Supply Terminal** For preventing from infection, connect a capacitor between V_{CC} (3pin) and GND (1pin).
4	TX-RC		**RC Transmitting Data Input Terminal** H : LED Emitting CMOS Logic Level Input Holding TX-RC='H' status, LED will be turn off approximately 48µs.
5	PWDOWN / LED Mode		**Power-down Control and LED Intensity switching Terminal** H : POWERDOWN (RC transmitting Mode) L : OPERATION CMOS Logic Level Input When input is 'H', it will stop the receiving circuit and Pin-PD current.
6	RXD		**Receiving Data Output Terminal** CMOS Logic Level Output When PWDOWN (5pin)= 'H', the RXD output will be pulled up to V_{IO} at approximately 300kΩ.
7	TXD		**Transmitting Data Input Terminal** IrDA TXD input at PWDOWN=L (Remote control transmitting input at PWDOWN=H). H : LED Emitting CMOS Logic Level Input Holding TXD="H" status, LED will be turn off approximately 48µs.
8	LEDA		**LED ANODE Terminal** Other power source can be used difference between LEDV_{CC} and V_{CC}. LED current depends on LED load resistance value at RC mode.
–	Shield Case		Connect to Ground.

●**Electrical characteristics** (Unless otherwise noted, V_{CC}= V_{IO}=3.0V, VLEDV_{CC}=3.0V, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Consumption current1	$I_{CC}1$	–	80	104	µA	PWDOWN=0V At no input light
Consumption current2	$I_{CC}2$	–	0.01	0.2	µA	PWDOWN=V_{IO} At no input light
Data rate		2.4	–	115.2	kbps	
PWDOWN input high voltage	VPDH	2/3∗V_{IO}	–	V_{IO}	V	V_{IO}=1.8 to 3.6V
		1.2				V_{IO}=1.5 to 1.8V
PWDOWN input low voltage	VPDL	0	–	1/3∗V_{IO}	V	V_{IO}=1.8 to 3.6V
				V_{IO}–1.2		V_{IO}=1.5 to 1.8V
PWDOWN input high current	IPDH	–1.0	0	1.0	µA	PWDOWN=V_{IO}
PWDOWN input low current	IPDL	–1.0	0	1.0	µA	PWDOWN=0V
<Transmitter>						
TXD/TX-RC input high voltage	VTXH	2/3∗V_{IO}	–	V_{IO}	V	V_{IO}=1.8 to 3.6V
		1.2				V_{IO}=1.5 to 1.8V
TXD/TX-RC input low voltage	VTXL	0	–	1/3∗V_{IO}	V	V_{IO}=1.8 to 3.6V
				V_{IO}–1.2		V_{IO}=1.5 to 1.8V
TXD/TX-RC input high current	ITXH	7.5	15	30	µA	TXD=V_{IO} or TX-RC=V_{IO}
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	28	40	52	mA	TXD=V_{IO}, R1=4.7Ω, PWDOWN=0V
LED anode current (RC Mode)	ILEDA2	150	200	245	mA	TX-RC=V_{IO}, R1=4.7Ω, PWDOWN=V_{IO}
<Receiver>						
RXD output high voltage	VRXH	V_{CC}–0.4	–	V_{IO}	V	IRXH=–200µA
RXD output low voltage	VRXL	0	–	0.4	V	IRXL=200µA
RXD output rise Time	tRR	–	35	–	ns	C_L=15pF
RXD output fall Time	tFR	–	35	–	ns	C_L=15pF
RXD output pulse width	twRXD	1.5	2.3	4.2	µs	C_L=15pF, 2.4 to 115.2kbps
Receiver latency time	tRT	–	100	200	µs	

●**Optical characteristics** (Unless otherwise noted, V_{CC}= V_{IO}=3.0V, VLEDV_{CC}=3.0V, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Peak wave length1 (IrDA Mode)	λP1	880	890	892	nm	ILED=50mA, Duty20%
		850	–	900	nm	ILED=50mA, Duty20%, –20 to 60°C
Peak wave length2 (RC Mode)	λP2	880	890	920	nm	ILED=200mA, Duty20%
Intensity1 (IrDA Mode)	IE1	4	13	28	mW/sr	$-15° \leq \theta_L \leq 15°$ R_1=4.7Ω
Intensity2 (RC Mode)	IE2	30	65	130	mW/sr	$-15° \leq \theta_L \leq 15°$ R_1=4.7Ω
Half-angle	θL/2	±15	±22	–	deg	
Optical pulse width1 (IrDA Mode)	TWLED1	1.42	1.63	2.02	µs	TXD=1.63µs pulse input R_1=4.7Ω
Optical pulse width2 (RC Mode)	TWLED2	9.5	10	10.5	µs	TX-RC=10µs pulse input R_1=4.7Ω
Rise time / Fall time	Tr/Tf	–	60	120	ns	10% to 90%
Optical over shoot		–	–	25	%	
Edge jitter	Tj	–40	–	40	ns	
Minimum Irradiance in angular	Eemin	–	3.6	6.8	µW/cm²	$-15° \leq \theta_L \leq +15°$
Maximum Irradiance in angular	Eemax	500	–	–	mW/cm²	$-15° \leq \theta_L \leq +15°$
Input half-angle	θD/2	±15	–	–	deg	
Maximum emitting time	TLEDmax	20.5	48	120	µs	TXD=0→V_{IO} or TX-RC=0→V_{IO}

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

●LED Operation Mode Table

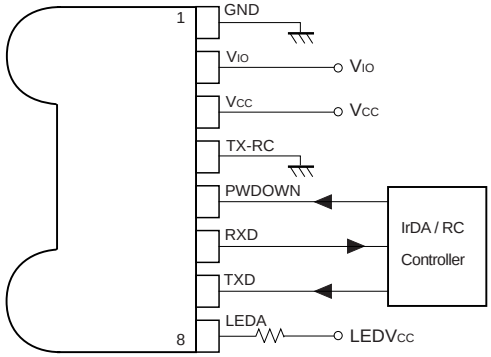
PWDOWN (5pin)	TX-RC (4pin)	TXD (7pin)	LED Emitting Mode	IrDA Receiver Operation Condition
L	L	L	OFF	ON
L	L	⎍	IrDA	ON
L	⎍	L	RC	ON
H	L	L	OFF	OFF
H	L	⎍	RC	OFF
H	⎍	L	RC	OFF

Notes) ・Please be sure to set up the TX-RC (4pin) and the TXD (7pin) input to be "L" (under 0.3V) except transmitting data (for < 90µs. ON Duty≤ 50%).
・⎍ of TX-RC (4pin) and TXD (7pin) in the table above is supposed to be the pulse input.
・When either TX-RC (4pin) input TXD (7pin) input keeps the state of "H" (more than appproximately 48µs), 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 (4pin) and TXD (7pin) are "L".

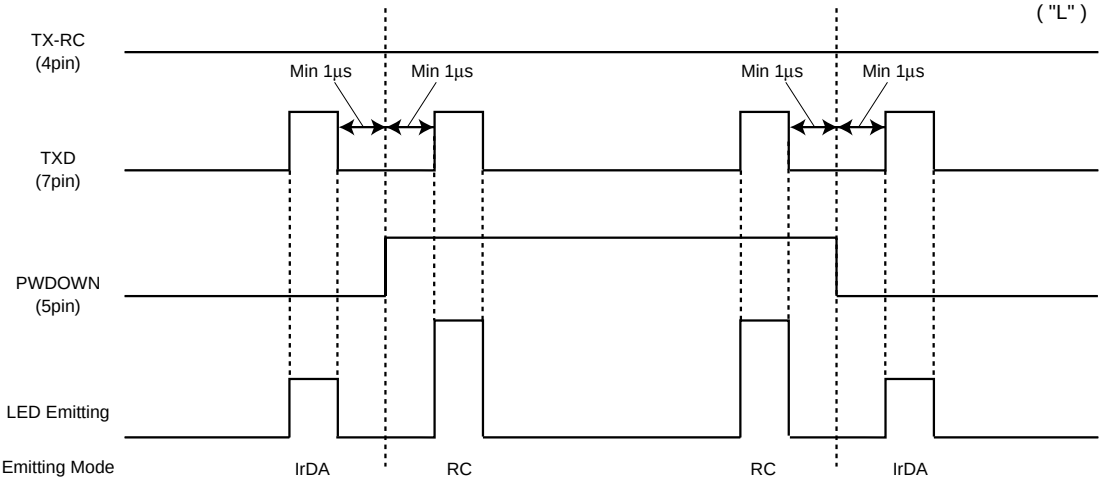
●Interface operating timing

(Emitting side)

(1) When TXD output for IrDA and TXD output for remote controller is 1 line.

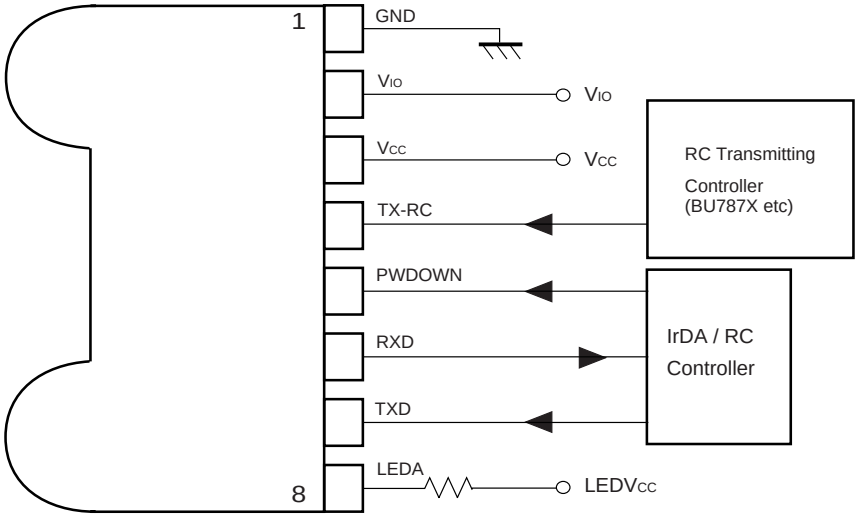


Input		Condition	
PWDOWN	TXD	LED Mode	Recriver circuit
L	L	OFF	ON
L	⎍	IrDA	ON
H	L	OFF	OFF
H	⎍	RC	OFF



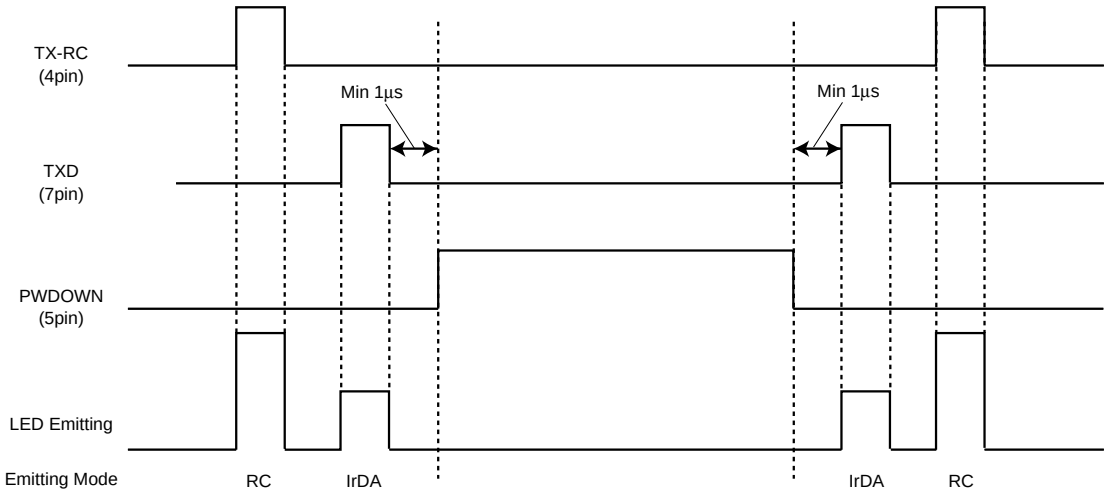
∗If TX-RC or TXD input pulse width is wider than 48µs, output LED emitting pulse will be turn off approximately 48µs.

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



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

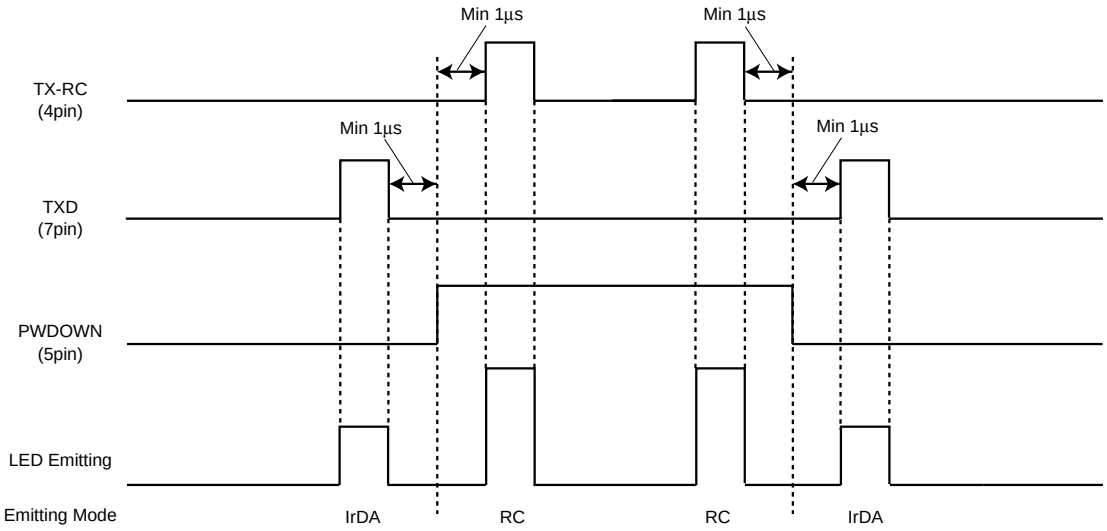
Input			Condition	
PWDOWN	TX-RC	TXD	LED Mode	Recriver circuit
L	L	L	OFF	ON
L	L	⎍	IrDA	ON
L	⎍	L	RC	ON
H	L	L	OFF	OFF



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

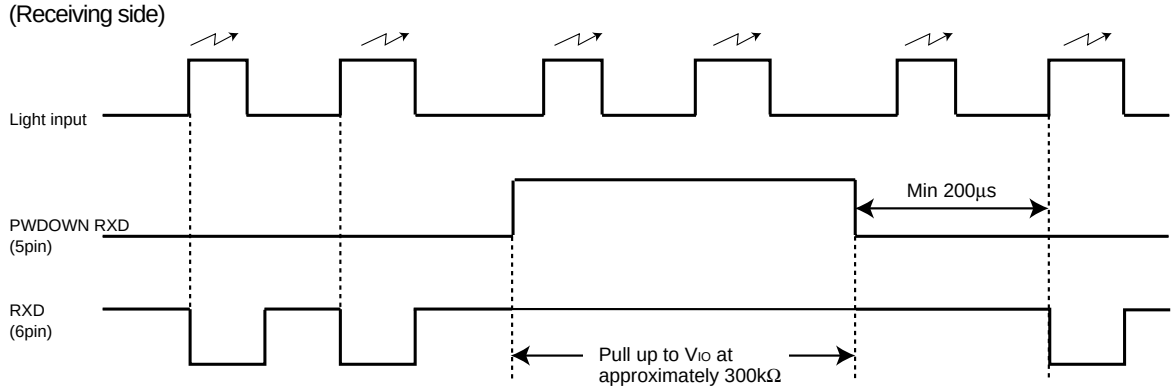
(2-b) RC transmit mode at IrDA receiver power down condition.

Input			Condition	
PWDOWN	TX-RC	TXD	LED Mode	Recriver 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 2.3µs.

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.

●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	4.7Ω±5%, 1/8W (V_{LEDVCC}=3V)	At LED Emitting Duty=20%

[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 : V_{LEDVCC}[V], minimum necessary of irradiant intensity le1 [mW / sr]
(Including LED's distribution within ±15deg)

$R1=166 \times (V_{LEDVCC}-1.28) / le1-5.0$
$ILED=Duty \times (V_{LEDVCC}-1.28) / (R1+3.5)$
Duty : LED duty at emitting

∗ Please set up to be ILED / Duty < 250[mA] (Duty ≤ 50%)
∗ At IrDA Mode, LED current is constantly approximately 40mA.

(Reference) In case of using R1, typical intensity (le1typ) and maximum intensity (le1max) on axis are described as below.
$le1typ=300 \times (V_{LEDVCC}-1.28) / (R1+3.5)$
$le1max=600 \times (V_{LEDVCC}-1.28) / (R1+3.5)$

●Notes

1) $LEDV_{CC}$ (8pin), V_{CC} (3pin) and V_{IO} (2pin)
・Other power source can be used difference between $LEDV_{CC}$ and V_{CC} and V_{IO}.
($V_{IO} < V_{CC}$ + 0.3V)

2) Caution in designing board lay-out
To get maximum potential from RPM882-H12, please keep in mind following instruction.
・The line of RXD (6pin) should be connected at backside via through hole close to RPM882-H12 pin lead. Better not to be close to photo diode side (1pin).
⇒This is to minimize feedback supplied to photo diode from RXD.
・As for C1 between 1-3 pin should be placed close to RPM882-H12.
・Better to be placed more than 1.0cm in radius from photo diode (pin1 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 (4pin) and the TXD (7pin) 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.

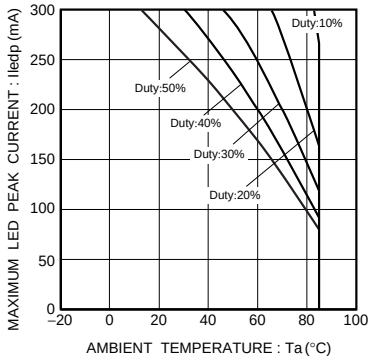
4) Eye safe

・IEC60825-1 (IEC60825-1 amendment2), Class 1 Eye Safe.

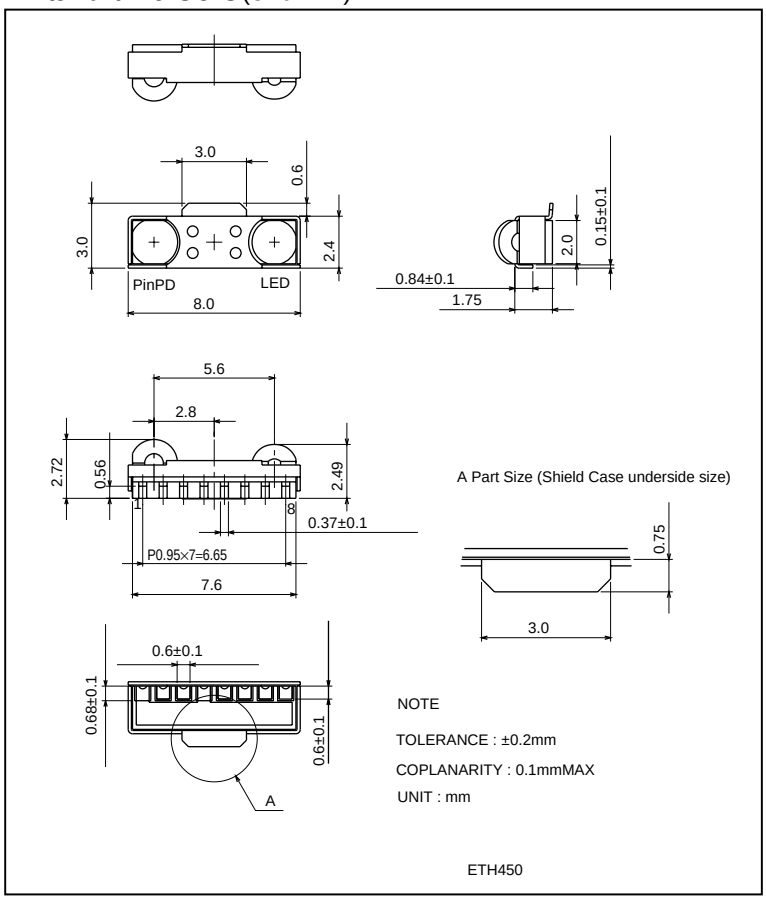
5) LED current derating and amdient temperature

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 (70×70×1.6mm) mounted.



●**External dimensions** (Unit : mm)



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