Photo Link Module

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	Topr	−30 to +85	°C
Storage temperature	Tstg	−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**

Vcc (6pin) and LEDVcc (1pin)
can be used on either common power source
or different one

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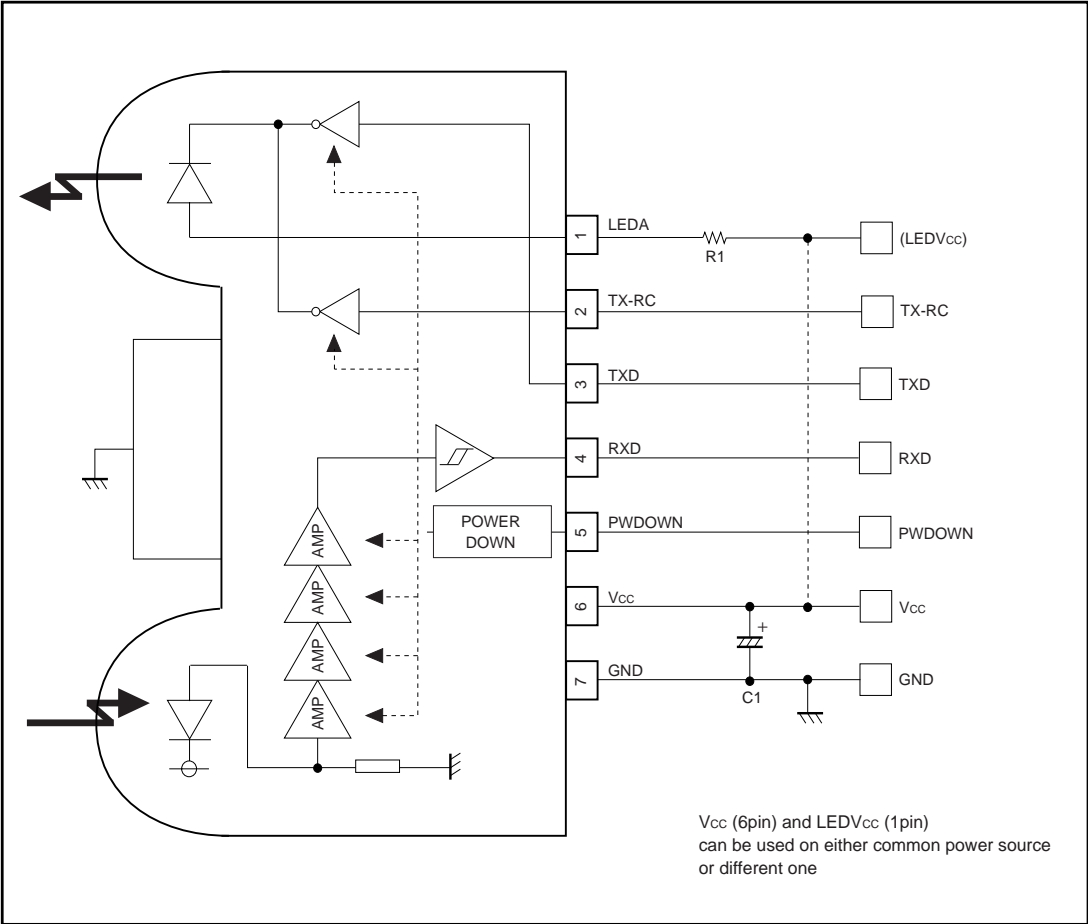
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●**Terminal description**

Pin No	Terminal	Circuit	Function
1	LEDA		**LED ANODE Terminal** Other power source can be used difference between LEDVcc and Vcc.
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 Vcc 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	Vcc		**Power Supply Terminal** For preventing from infection, connect a capacitor between Vcc (6pin) and GND (7pin).
7	GND		**Ground Termianl**
–	Shield Case		Connect to Ground.

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●**Electrical characteristics** (Unless otherwise noted, Vcc= 3.0V, VLEDVcc=3.0V, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Consumption current1	Icc1	–	90	120	μA	PWDOWN=0V At no input light
Consumption current2	Icc2	–	0.01	0.2	μA	PWDOWN=Vcc At no input light
Data rate		2.4	–	115.2	kbps	
PWDOWN input high voltage	VPDH	2/3∗Vcc	–	Vcc	V	Vcc=2.4 to 3.6V
PWDOWN input low voltage	VPDL	0	–	1/3∗Vcc	V	Vcc=2.4 to 3.6V
PWDOWN input high current	IPDH	−1.0	0	1.0	μA	PWDOWN=Vcc
PWDOWN input low current	IPDL	−1.0	0	1.0	μA	PWDOWN=0V
<Transmitter>						
TXD input high voltage	VTXH	2/3∗Vcc	–	Vcc	V	Vcc=2.4 to 3.6V
TXD input low voltage	VTXL	0	–	1/3∗Vcc	V	Vcc=2.4 to 3.6V
TX-RC input high voltage	VTX-RCH	1.5	–	Vcc	V	Vcc=2.4 to 3.6V
TX-RC input low voltage	VTX-RCL	0	–	0.5	V	Vcc=2.4 to 3.6V
TXD/TX-RC input high current	ITXH	6.2	12.5	25	μA	TXD=Vcc or TX-RC=Vcc
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=Vcc
LED anode current (RC Mode)	ILEDA2	–	211	245	mA	TX-RC=Vcc, R1=2.2Ω
<Receiver>						
RXD output high voltage	VRXH	Vcc−0.4	–	Vcc	V	IRXH=−200μA
RXD output low voltage	VRXL	0	–	0.4	V	IRXL=200μA
RXD output rise Time	tRR	–	25	100	ns	CL=15pF
RXD output fall Time	tFR	–	25	100	ns	CL=15pF
RXD output pulse width	twRXD	1.7	2.6	3.5	μs	CL=15pF, 2.4 to 115.2kbps
Receiver latency time	tRT	–	40	200	μs	

●**Optical characteristics** (Unless otherwise noted, Vcc= 3.0V, VLEDVcc=3.0V, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Peak wave length1 (IrDA Mode)	λP1	880	888	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	12	28	mW/sr	−15°≤θL≤15° R1=2.2Ω
Intensity2 (RC Mode)	IE2	25	50	120	mW/sr	−15°≤θL≤15° R1=2.2Ω
Half-angle	θL/2	±15	–	–	deg	
Optical pulse width1 (IrDA Mode)	TWLED1	1.42	1.63	2.02	μs	TXD=1.63μs pulse input R1=2.2Ω
Optical pulse width2 (RC Mode)	TWLED2	9.5	10	10.5	μs	TX-RC=10μs pulse input R1=2.2Ω
Rise time / Fall time	Tr/Tf	–	20	120	ns	10% to 90%
Optical over shoot		–	–	25	%	
Edge jitter	Tj	−40	–	40	ns	
Minimum Irradiance in angular	Eemin	–	4.0	8.1	μW/cm²	−15°≤θL≤+15°
Maximum Irradiance in angular	Eemax	500	–	–	mW/cm²	−15°≤θL≤+15°
Input half-angle	θD/2	±15	–	–	deg	
Maximum emitting time	TLEDmax	20.5	48	96	μs	TXD=0→Vcc or TX-RC=0→ Vcc

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.

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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 < 90μs. ON Duty ≦ 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 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 (2pin) and TXD (3pin) are "L".

● **Interface operating timing**

(Emitting side)

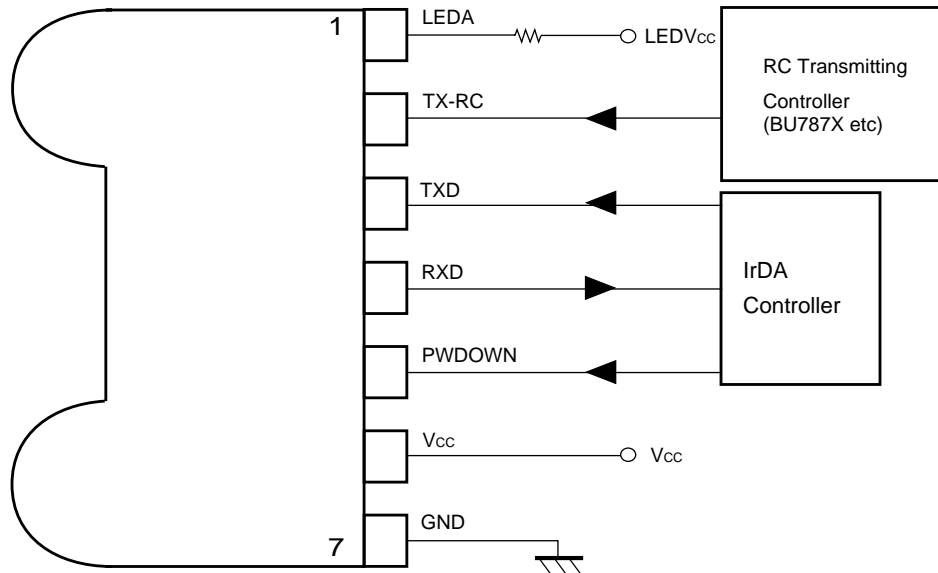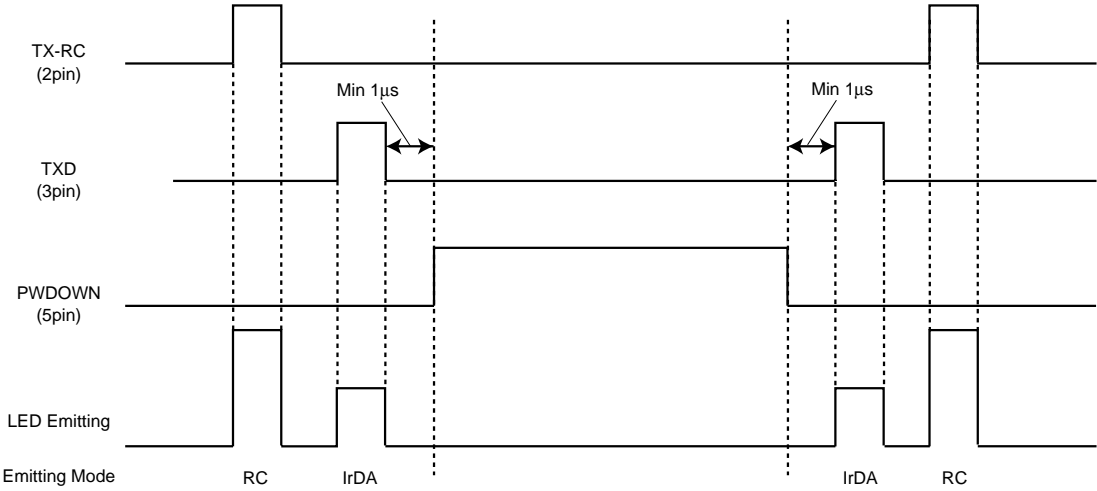 (1)   When TXD output for IrDA and TXD output for controller are different lines.

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

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

TX-RC (2pin)

Min 1μs   Min 1μs

TXD (3pin)

PWDOWN (5pin)

LED Emitting

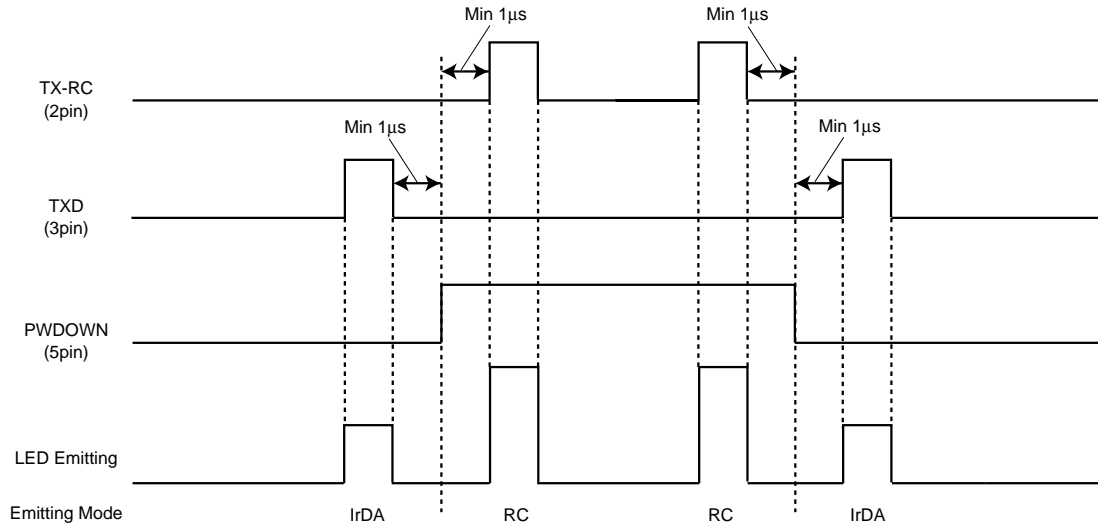Emitting Mode   RC   IrDA   IrDA   RC

∗If TX-RC or TXD input pulse width is wider than 48μs, output LED emitting pulse will be turn off approximately 48μs.
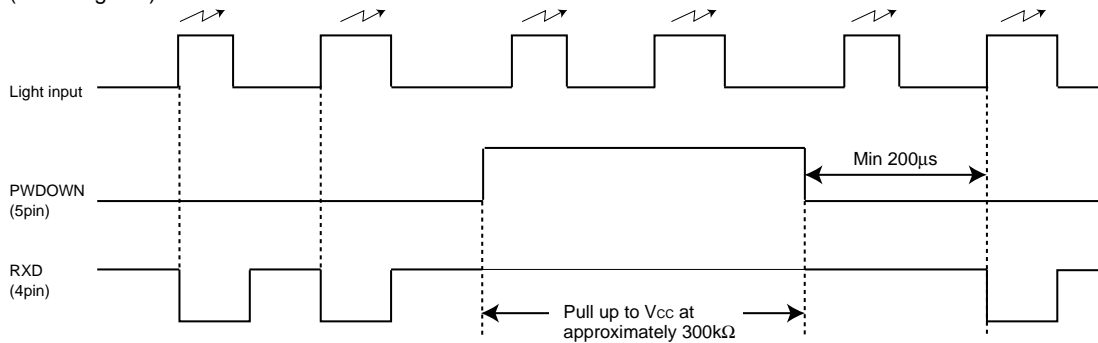
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(2-b) RC transmit mode at IrDA receiver power down condition.

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

TX-RC
(2pin)

Min 1μs   Min 1μs

TXD
(3pin)

Min 1μs   Min 1μs

PWDOWN
(5pin)

LED Emitting

Emitting Mode   IrDA   RC   RC   IrDA

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

(Receiving side)

Light input

PWDOWN
(5pin)

Min 200μs

RXD
(4pin)

Pull up to Vcc at
approximately 300kΩ

∗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 (VLEDVcc=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 : VLEDVcc[V],
minimum necessary of irradiant intensity Ie1 [mW / sr]
(Including LED's distribution within ±15deg)

$R1 = 166 \times (VLEDVcc - 1.31) / Ie1 - 7.2$
$ILED = Duty \times (VLEDVCC - 1.31) / (R1 + 5.8)$
        Duty : LED duty at emitting

∗ Please set up to be ILED / Duty $<$ 250[mA]   (Duty $\leq$ 25%)
∗ At IrDA Mode, LED current is constantly approximately 50mA.

(Reference) In case of using R1, typical intensity (Ie1typ) and maximum intensity (Ie1max) on
            axis are described as below.
            $Ie1typ = 280 \times (VLEDVcc - 1.31) / (R1 + 5.8)$
            $Ie1max = 560 \times (VLEDVcc - 1.31) / (R1 + 5.8)$

●**Notes**
1) LEDVcc (1pin), Vcc (6pin)
   · Other power source can be used difference between LEDVcc and Vcc.

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 $\leq$ 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.
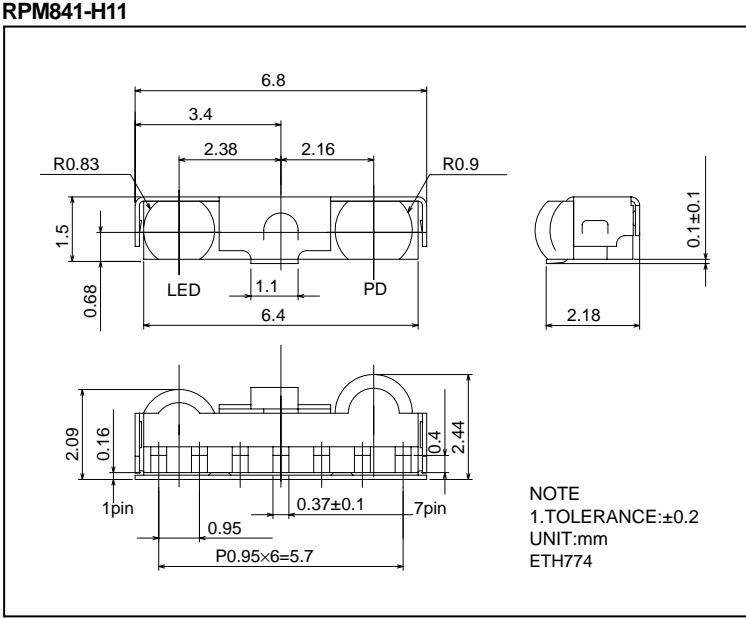
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4) Eye safe

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

5) LED current derating and 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 (50×50×1.6mm) mounted.
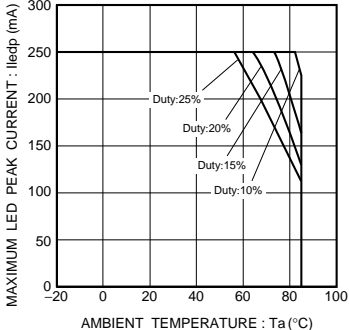
●**External dimensions** (Unit : mm)

RPM841-H11

NOTE
1.TOLERANCE:±0.2
UNIT:mm
ETH774

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Appendix1-Rev1.1