

CND0313A

Infrared Optical Module (IrDA)

Infrared data link for cellular phones, peripheral devices

■ Features

- Compliant with IrDA Ver.1.4
- Light emitting function for remote controller
- Corresponding low I/O (interface) voltage: 1.5 V
- Corresponding reflow solder (260°C)
- Ultra-small side view package (1.45 mm × 6.7 mm × 2.15 mm)

■ Type

- GaAlAs LED + IC + PIN Photodiode

■ Absolute Maximum Ratings $T_a = 25^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Parameter	Symbol	Rating	Unit
Operating supply voltage	V_{CC}	− 0.5 to +3.8	V
LED operating supply voltage	V_{LEDA}	− 0.5 to +7.0	V
Input/output supply voltage	V_{IO}	− 0.5 to +3.8	V
TX Input voltage	V_{TX}	− 0.5 to +3.8	V
Shutdown input voltage	V_{SD}	− 0.5 to +3.8	V
LED operating supply current *	I_{LEDA}	300	mA
Operating ambient temperature	T_{opr}	−20 to +70	°C
Storage temperature	T_{stg}	−30 to +85	°C

Note) *: $t_w \leq 90 \mu\text{s}$, Duty $\leq 25 \%$

■ Operating Condition

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating supply voltage	V_{CC}		2.5	2.85	3.3	V
LED operating supply voltage	V_{LEDA}		3.0		4.5	V
Input/output supply voltage	V_{IO}		1.5	1.85	V_{CC}	V

■ Electrical-Optical Characteristics $V_{LEDA} = 3.0 \text{ V to } 4.5 \text{ V}$, $V_{CC} = 2.85 \text{ V}$, $V_{IO} = 1.85 \text{ V}$, $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Shut down supply current *Fig. 1	I_{CCSD}	$V_{TXD} = 0.5 \text{ V}$ $V_{IO} \geq V_{SD} \geq V_{IO} - 0.5 \text{ V}$ (SD = High)	—	0.01	0.2	μA
High level supply current (Idle) *Fig. 1	I_{CCH}	(FIR mode / RC mode) $E_I = 0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	—	580	800	μA
		(SIR mode) $E_I = 0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	—	300	400	
Low level supply current (Active) *Fig. 1	I_{CCL}	(FIR mode / RC mode) $E_I = 9.0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	—	980	1270	μA
		(SIR mode) $E_I = 9.0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	—	350	460	
TX High level supply current (Active) *Fig. 1	I_{CCTXH}	(FIR mode / RC mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5 \text{ V}$ (TXD = High) $E_I = 0 \text{ mW/cm}^2$, $V_{SD} \leq 0.5 \text{ V}$	—	1200	1560	μA
		(SIR mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5 \text{ V}$ (TXD = High) $E_I = 0 \text{ mW/cm}^2$, $V_{SD} \leq 0.5 \text{ V}$	—	600	780	
High level input/output supply current (Idle) *Fig. 1	I_{IOH}	(FIR mode / RC mode) $E_I = 0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	0	0	5	μA
		(SIR mode) $E_I = 0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	0	0	5	
Low level input/output supply current (Active) *Fig. 1	I_{IOL}	(FIR mode / RC mode) $E_I = 9.0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	—	360	470	μA
		(SIR mode) $E_I = 9.0 \text{ mW/cm}^2$, $V_{TXD} = 0.5 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$	—	100	130	
TX High level input/output supply current (Active) *Fig. 1	I_{IOTXH}	(FIR mode / RC mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5 \text{ V}$ (TXD = High) $E_I = 0 \text{ mW/cm}^2$, $V_{SD} \leq 0.5 \text{ V}$	—	80	120	μA
		(SIR mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5 \text{ V}$ (TXD = High) $E_I = 0 \text{ mW/cm}^2$, $V_{SD} \leq 0.5 \text{ V}$	—	40	60	
SD High level input voltage	V_{IHSD}		$V_{IO} - 0.5$	—	$V_{IO} + 0.3$	V
SD Low level input voltage	V_{ILSD}		0 -0.3	—	0.5	V
Maximum reception distance *Fig. 1, 4	L_{max}	$V_{SD} \leq 0.5 \text{ V}$ $\theta_T = 0^\circ \pm 15^\circ$ LEDie = 3.6 mW/sr (SIR mode) LEDie = 9 mW/sr (FIR mode)	20	—	—	cm
RC maximum reception distance *Fig. 1, 10	L_{maxR}	$V_{LEDA} = 3.0 \text{ V}$, $V_{SD} \leq 0.5 \text{ V}$ $\theta_T = 0^\circ \pm 15^\circ$, Carrier duty = 1/3 940 nm Radiant intensity ratio = 57.5 % RC Receiver sensitivity *2 = 0.05 $\mu\text{W/cm}^2$	5.14	—	—	m
Data Rates *1	—		0.0096	—	4.0	Mbps

Note) *1: Fully Compliant to IrDA1.4 Low Power Specification from 9.6 kbps to 115.2 kbps, 4 Mbps.

*2: Definition of RC receiver sensitivity

RC receiver sensitivity is adjusted so that RC transfer distance is 4 m at transmitter LED radiant intensity = 8 mW/sr, peak wave length = 940 nm and duty = 50 %, where irradiance is 0.05 $\mu\text{W/cm}^2$.

■ Electrical-Optical Characteristics (continued) $V_{\text{LEDA}} = 3.0 \text{ V to } 4.5 \text{ V}$, $V_{\text{CC}} = 2.85 \text{ V}$, $V_{\text{IO}} = 1.85 \text{ V}$, $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

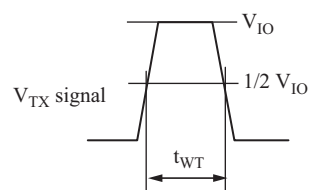
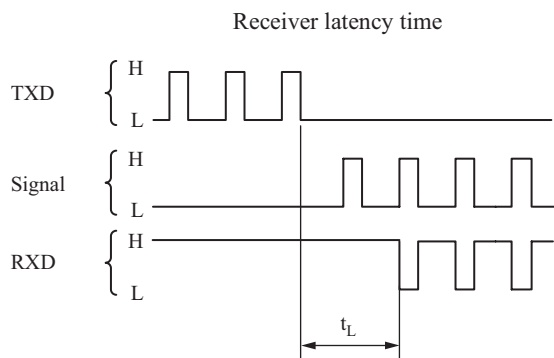
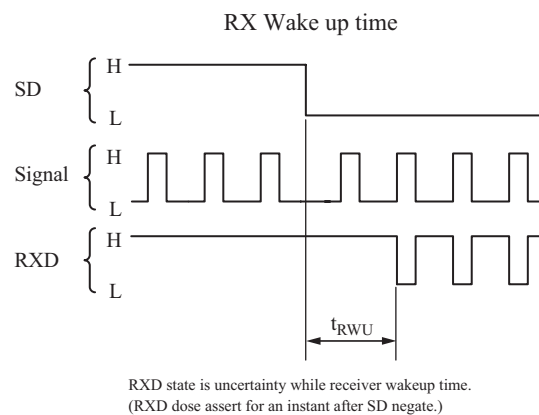
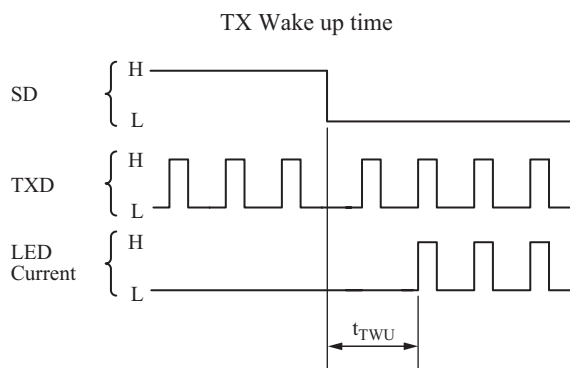
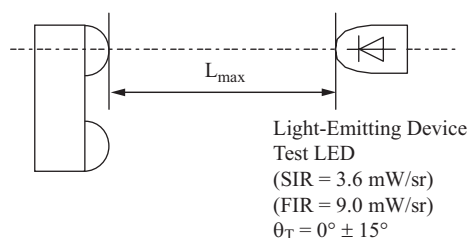
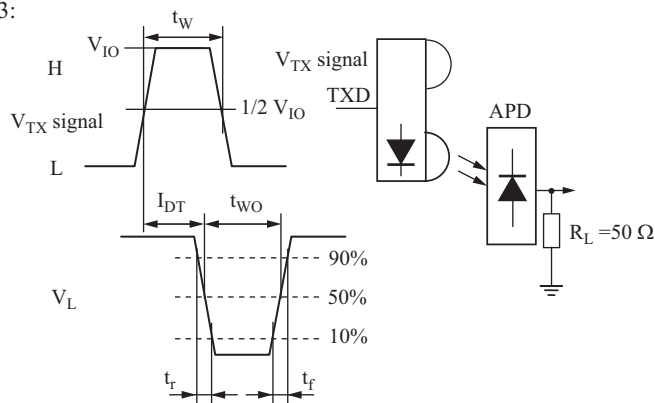
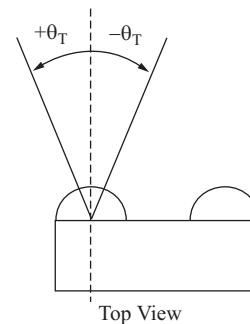
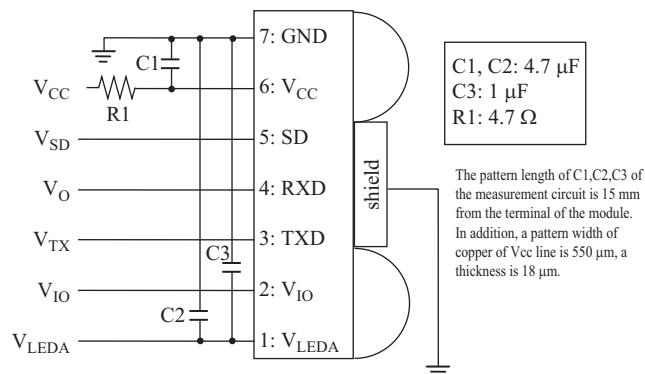
Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Transmitter							
Peak emission wavelength *Fig. 1		λ_p	(FIR mode / RC mode) $V_{\text{LEDA}} = 3.2 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty1/4	880	890	900	nm
			(SIR mode) $V_{\text{LEDA}} = 3.2 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty3/16	875	885	900	
LED operating supply current *Fig. 1		I_{LEDA}	(FIR Mode/RC Mode) $V_{\text{LEDA}} = 4.3 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty1/4	165	207	248	mA
			(FIR Mode/RC Mode) $V_{\text{LEDA}} = 3.0 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty1/4	160	200	240	
			(SIR Mode) $V_{\text{LEDA}} = 4.3 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty3/16	70	91	109	
			(SIR Mode) $V_{\text{LEDA}} = 3.0 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty3/16	69	90	108	
Center radiant intensity *3	$\theta_{\text{T}} = 0$ *Fig. 1, 2	I_{e}	(FIR Mode/RC Mode) $V_{\text{LEDA}} = 3.0 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty1/4	30	70	105	mW/sr
			(SIR Mode) $V_{\text{LEDA}} = 3.0 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty3/16	15	35	52	
	$\theta_{\text{T}} = \pm 15$ *Fig.1, 2, 10	I_{e15}	(FIR Mode/RC Mode) $V_{\text{LEDA}} = 3.0 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty1/4	23	38	57	mW/sr
			(SIR Mode) $V_{\text{LEDA}} = 3.0 \text{ V}$, $V_{\text{SD}} \leq 0.5 \text{ V}$, Duty3/16	7	19	28	
TX high level input voltage		$V_{\text{IH(TX)}}$		$V_{\text{IO}} - 0.5$	—	$V_{\text{CC}} + 0.3$	V
TX low level input voltage		$V_{\text{IL(TX)}}$		0 −0.3	—	0.5	V
TX pulse width (SIR) *Fig. 1, 8		$t_{\text{WT(SIR)}}$	Bit Rate = 115.2 kbps, $V_{\text{T}} = 1/2 \times V_{\text{IO}}$	—	1.6	—	μs
TX pulse width (FIR) *Fig. 1, 8		$t_{\text{WT(FIR)}}$	Bit Rate = 4.0 Mbps, $V_{\text{T}} = 1/2 \times V_{\text{IO}}$	—	125	—	ns
Optical pulse width (FIR1) *Fig. 1, 3		$t_{\text{WO(FIR1)}}$	$V_{\text{SD}} \leq 0.5 \text{ V}$, TXD $t_{\text{r}} / t_{\text{f}} \leq 20 \text{ ns}$, $t_{\text{w}} = 125 \text{ ns} \pm 1 \text{ ns}$, (Single pulse)	115	125	135	ns
Optical pulse width (FIR2) *Fig. 1, 3		$t_{\text{WO(FIR2)}}$	$V_{\text{SD}} \leq 0.5 \text{ V}$, TXD $t_{\text{r}} / t_{\text{f}} \leq 20 \text{ ns}$, $t_{\text{w}} = 250 \text{ ns} \pm 1 \text{ ns}$, (Double pulse)	240	250	260	ns
TX half-angle		θ_{T}		±15	—	—	°
Rise time *Fig. 1, 3		t_{r}	$R_{\text{L}} = 50 \Omega$	—	—	40	ns
Fall time *Fig. 1, 3		t_{f}	$R_{\text{L}} = 50 \Omega$	—	—	40	ns
TX wake up time *Fig. 5		t_{TWU}		200	—	1 000	μs
Intensity delay time *Fig. 1, 3		I_{DT}		—	—	200	ns
Maximum pulse width		t_{WLEDmax}	TXD = Low → High	20	50	100	μs
Overshoot		O_{S}		—	—	25	%

Note) *3: Eye-Safety IEC60825-1 Class1 Eye safe

■ Electrical-Optical Characteristics (continued) $V_{\text{LEDA}} = 3.0 \text{ V to } 4.5 \text{ V}$, $V_{\text{CC}} = 2.85 \text{ V}$, $V_{\text{IO}} = 1.85 \text{ V}$, $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Receiver						
Minimum input irradiance *Fig. 1	E_{Imin1}	(SIR mode) Bit Rate = 115.2 kbps, $V_{\text{SD}} \leq 0.5 \text{ V}$, $\theta_T = 0^\circ \pm 15^\circ$	—	—	9.0	$\mu\text{W}/\text{cm}^2$
	E_{Imin2}	(FIR Mode) Bit Rate = 4.0 Mbps, $V_{\text{SD}} \leq 0.5 \text{ V}$, $\theta_T = 0^\circ \pm 15^\circ$	—	—	22.5	
Maximum input irradiance *Fig. 1	E_{Imix}	$V_{\text{SD}} \leq 0.5 \text{ V}$, $\theta_T = 0^\circ \pm 15^\circ$	500	—	—	mW/cm^2
RX high level output voltage *Fig. 1	$V_{\text{OH(RX)}}$	Non signal condition $E_{\text{I}} = 0$ $I_{\text{OH}} = -200 \mu\text{A}$, $V_{\text{SD}} \leq 0.5 \text{ V}$	$V_{\text{IO}} - 0.3$	—	V_{IO}	V
RX low level output voltage *Fig. 1	$V_{\text{OL(RX)}}$	$I_{\text{OL}} = 1.8 \text{ mA}$, $V_{\text{SD}} \leq 0.5 \text{ V}$	0	—	0.5	V
RX half angle	θ_R		± 15	—	—	°
Output pulse width (SIR) *Fig. 1, 9	$t_{\text{WR(SIR)}}$	$V_{\text{SD}} \leq 0.5 \text{ V}$, $C_{\text{L}} = 15 \text{ pF}$, 9.6 kbps to 115.2 kbps	1.0	—	4.0	μs
Output pulse width (FIR1) *Fig. 1, 9	$t_{\text{WR(FIR1)}}$	$V_{\text{SD}} \leq 0.5 \text{ V}$, $C_{\text{L}} = 15 \text{ pF}$, 4 Mbps, $t_{\text{W}} = 125 \text{ ns} \pm 10 \text{ ns}$ (Single pulse)	85	—	165	ns
Output pulse width (FIR2) *Fig. 1, 9	$t_{\text{WR(FIR2)}}$	$V_{\text{SD}} \leq 0.5 \text{ V}$, $C_{\text{L}} = 15 \text{ pF}$, 4 Mbps, $t_{\text{W}} = 250 \text{ ns} \pm 10 \text{ ns}$ (Double pulse)	195	—	290	ns
RX wake up time *Fig. 1, 6	t_{Rwu}	$V_{\text{SD}} \leq 0.5 \text{ V}$, $E_{\text{I}} = 17.0 \mu\text{W}/\text{cm}^2$	—	100	200	μs
Receiver latency time *Fig. 1, 7	t_{L}	$V_{\text{SD}} \leq 0.5 \text{ V}$, $E_{\text{I}} = 17.0 \mu\text{W}/\text{cm}^2$	—	100	200	μs
Rise time *Fig. 1, 9	t_{r}	$V_{\text{SD}} \leq 0.5 \text{ V}$, $C_{\text{L}} = 15 \text{ pF}$	—	10	—	ns
Fall time *Fig. 1, 9	t_{f}	$V_{\text{SD}} \leq 0.5 \text{ V}$, $C_{\text{L}} = 15 \text{ pF}$	—	10	—	ns

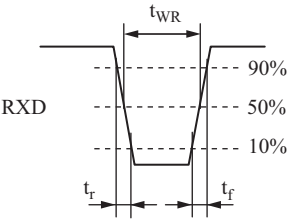
Note) Measurement circuit



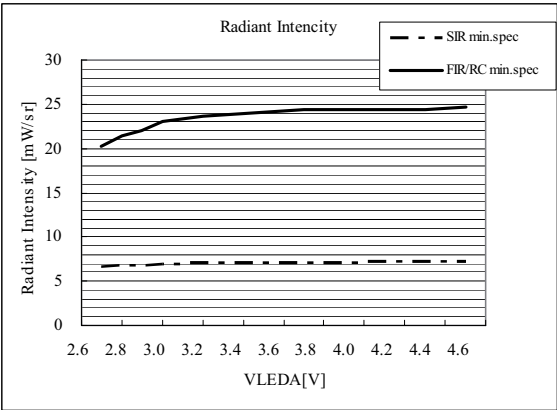
■ Electrical-Optical Characteristics (continued)

Note) Measurement circuit (continued)

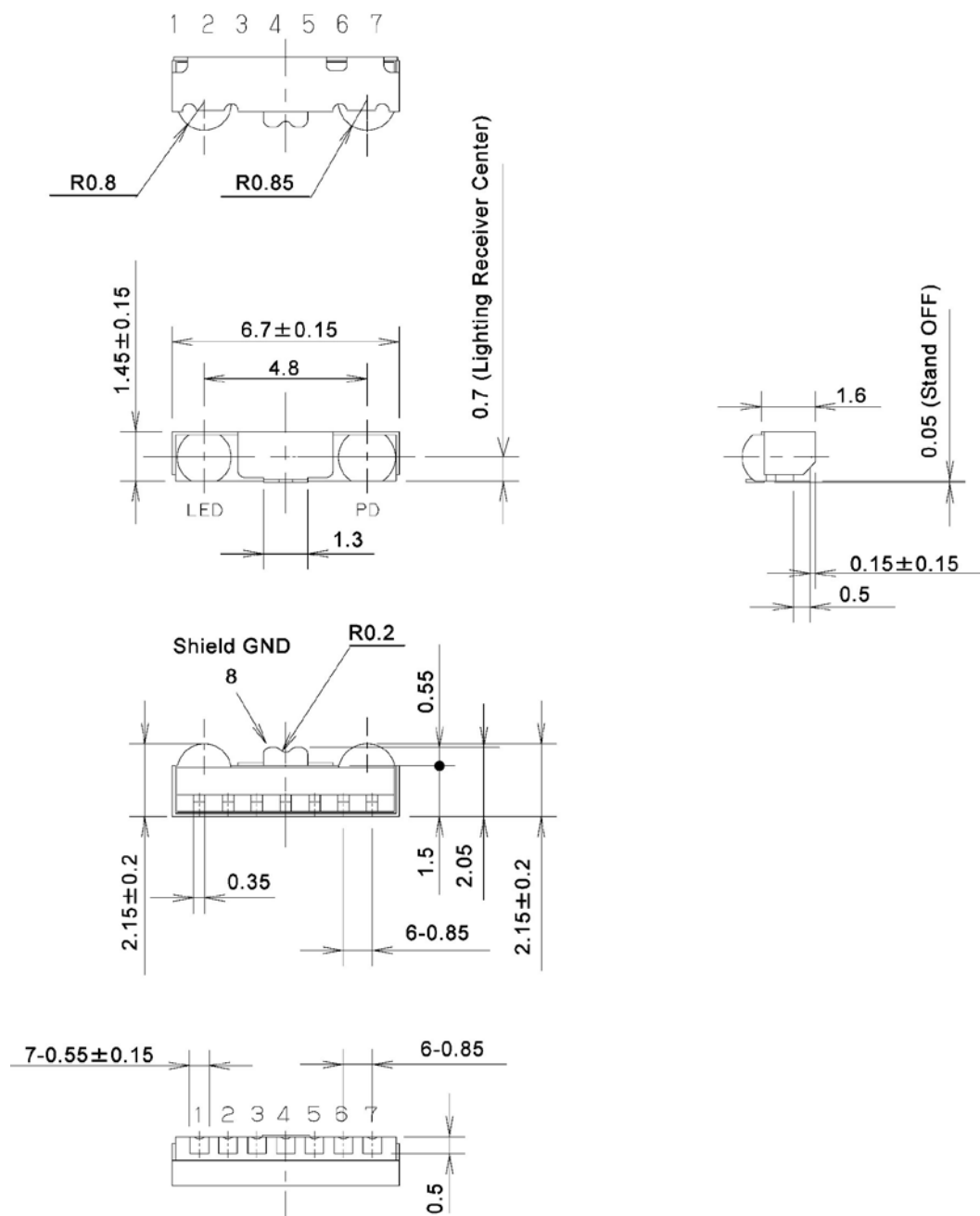
*Fig. 9:



*Fig. 10:



■ Package (Unit: mm)



• Pin name

- | | |
|---------------|---------------|
| 1. V_{LEDA} | 5. SD |
| 2. V_{IO} | 6. V_{CC} |
| 3. TXD | 7. GND |
| 4. RXD | 8. Shield GND |

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