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°C±3°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) ∗: tw ≤ 90 μs, Duty ≤ 25 %

■ Operatong 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 V to 4.5 V, V_{CC} = 2.85 V, V_{IO} = 1.85 V, T_a = 25°C±3°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Shut down supply current *Fig. 1	I_{CCSD}	V_{TXD} = 0.5 V, $V_{IO} \geq V_{SD} \geq V_{IO} - 0.5$ V (SD = High)	—	0.01	0.2	µA
High level supply current (Idle) *Fig. 1	I_{CCH}	(FIR mode / RC mode) E_I = 0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	—	580	800	µA
		(SIR mode) E_I = 0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	—	300	400	
Low level supply current (Active) *Fig. 1	I_{CCL}	(FIR mode / RC mode) E_I = 9.0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	—	980	1 270	µA
		(SIR mode) E_I = 9.0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	—	350	460	
TX High level supply current (Active) *Fig. 1	I_{CCTXH}	(FIR mode / RC mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5$ V (TXD = High) E_I = 0 mW/cm², $V_{SD} \leq$ 0.5 V	—	1 200	1 560	µA
		(SIR mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5$ V (TXD = High) E_I = 0 mW/cm², $V_{SD} \leq$ 0.5 V	—	600	780	
High level input/output supply current (Idle) *Fig. 1	I_{IOH}	(FIR mode / RC mode) E_I = 0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	0	0	5	µA
		(SIR mode) E_I = 0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	0	0	5	
Low level input/output supply current (Active) *Fig. 1	I_{IOL}	(FIR mode / RC mode) E_I = 9.0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	—	360	470	µA
		(SIR mode) E_I = 9.0 mW/cm², V_{TXD} = 0.5 V, $V_{SD} \leq$ 0.5 V	—	100	130	
TX High level input/output supply current (Active) *Fig. 1	I_{IOTXH}	(FIR mode / RC mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5$ V (TXD = High) E_I = 0 mW/cm², $V_{SD} \leq$ 0.5 V	—	80	120	µA
		(SIR mode) $V_{IO} \geq V_{TXD} \geq V_{IO} - 0.5$ V (TXD = High) E_I = 0 mW/cm², $V_{SD} \leq$ 0.5 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 V θ_T = 0° ± 15° 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 V, $V_{SD} \leq$ 0.5 V θ_T = 0° ± 15°, Carrier duty = 1/3 940 nm Radiant intensity ratio = 57.5 % RC Receiver sensitivity *2 = 0.05 µW/cm²	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 µW/cm².

■ Electrical-Optical Characteristics (continued) V_{LEDA} = 3.0 V to 4.5 V, V_{CC} = 2.85 V, V_{IO} = 1.85 V, T_a = 25°C±3°C

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Transmitter							
Peak emission wavelength *Fig. 1		λ_P	(FIR mode / RC mode) V_{LEDA} = 3.2 V, V_{SD} ≤ 0.5 V, Duty1/4	880	890	900	nm
			(SIR mode) V_{LEDA} = 3.2 V, V_{SD} ≤ 0.5 V, Duty3/16	875	885	900	
LED operating supply current *Fig. 1		I_{LEDA}	(FIR Mode/RC Mode) V_{LEDA} = 4.3 V, VSD ≤ 0.5 V, Duty1/4	165	207	248	mA
			(FIR Mode/RC Mode) V_{LEDA} = 3.0 V, VSD ≤ 0.5 V, Duty1/4	160	200	240	
			(SIR Mode) V_{LEDA} = 4.3 V, V_{SD} ≤ 0.5 V, Duty3/16	70	91	109	
			(SIR Mode) V_{LEDA} = 3.0 V, V_{SD} ≤ 0.5 V, Duty3/16	69	90	108	
Center radiant intensity *3	θ_T = 0 *Fig. 1, 2	I_e	(FIR Mode/RC Mode) V_{LEDA} = 3.0 V, VSD ≤ 0.5 V, Duty1/4	30	70	105	mW/sr
			(SIR Mode) V_{LEDA} = 3.0 V, V_{SD} ≤ 0.5 V, Duty3/16	15	35	52	
	θ_T = ±15 *Fig.1, 2, 10	I_{e15}	(FIR Mode/RC Mode) V_{LEDA} = 3.0 V, V_{SD} ≤ 0.5 V, Duty1/4	23	38	57	mW/sr
			(SIR Mode) V_{LEDA} = 3.0 V, V_{SD} ≤ 0.5 V, Duty3/16	7	19	28	
TX high level input voltage		$V_{IH(TX)}$		V_{IO} − 0.5	—	V_{CC} + 0.3	V
TX low level input voltage		$V_{IL(TX)}$		0 − 0.3	—	0.5	V
TX pulse width (SIR) *Fig. 1, 8		$t_{WT(SIR)}$	Bit Rate = 115.2 kbps, V_T = 1/2 × V_{IO}	—	1.6	—	µs
TX pulse width (FIR) *Fig. 1, 8		$t_{WT(FIR)}$	Bit Rate = 4.0 Mbps, V_T = 1/2 × V_{IO}	—	125	—	ns
Optical pulse width (FIR1) *Fig. 1, 3		$t_{WO(FIR1)}$	V_{SD} ≤ 0.5 V, TXD t_r / t_f ≤ 20 ns, t_W = 125 ns ± 1 ns, (Single pulse)	115	125	135	ns
Optical pulse width (FIR2) *Fig. 1, 3		$t_{WO(FIR2)}$	V_{SD} ≤ 0.5 V, TXD t_r / t_f ≤ 20 ns, t_W = 250 ns ± 1 ns, (Double pulse)	240	250	260	ns
TX half-angle		θ_T		±15	—	—	°
Rise time *Fig. 1, 3		t_r	R_L = 50 Ω	—	—	40	ns
Fall time *Fig. 1, 3		t_f	R_L = 50 Ω	—	—	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

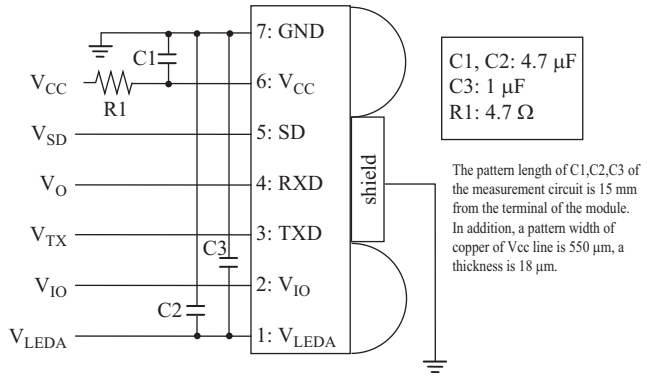
■ Electrical-Optical Characteristics (continued) V_{LEDA} = 3.0 V to 4.5 V, V_{CC} = 2.85 V, V_{IO} = 1.85 V, T_a = 25°C±3°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Receiver						
Minimum input irradiance *Fig. 1	$E_{I\ min1}$	(SIR mode) Bit Rate = 115.2 kbps, $V_{SD} \leq 0.5$ V, $\theta_T = 0° \pm 15°$	—	—	9.0	μW/cm²
	$E_{I\ min2}$	(FIR Mode) Bit Rate = 4.0 Mbps, $V_{SD} \leq 0.5$ V, $\theta_T = 0° \pm 15°$	—	—	22.5	
Maximum input irradiance *Fig. 1	$E_{I\ mix}$	$V_{SD} \leq 0.5$ V, $\theta_T = 0° \pm 15°$	500	—	—	mW/cm²
RX high level output voltage *Fig. 1	$V_{OH(RX)}$	Non signal condition $E_I = 0$ $I_{OH} = -200$ μA, $V_{SD} \leq 0.5$ V	$V_{IO} - 0.3$	—	V_{IO}	V
RX low level output voltage *Fig. 1	$V_{OL(RX)}$	$I_{OL} = 1.8$ mA, $V_{SD} \leq 0.5$ V	0	—	0.5	V
RX half angle	θ_R		±15	—	—	°
Output pulse width (SIR) *Fig. 1, 9	$t_{WR(SIR)}$	$V_{SD} \leq 0.5$ V, $C_L = 15$ pF, 9.6 kbps to 115.2 kbps	1.0	—	4.0	μs
Output pulse width (FIR1) *Fig. 1, 9	$t_{WR(FIR1)}$	$V_{SD} \leq 0.5$ V, $C_L = 15$ pF, 4 Mbps, $t_W = 125$ ns ± 10 ns (Single pulse)	85	—	165	ns
Output pulse width (FIR2) *Fig. 1, 9	$t_{WR(FIR2)}$	$V_{SD} \leq 0.5$ V, $C_L = 15$ pF, 4 Mbps, $t_W = 250$ ns ± 10 ns (Double pulse)	195	—	290	ns
RX wake up time *Fig. 1, 6	t_{Rwu}	$V_{SD} \leq 0.5$ V, $E_I = 17.0$ μW/cm²	—	100	200	μs
Receiver latency time *Fig. 1, 7	t_L	$V_{SD} \leq 0.5$ V, $E_I = 17.0$ μW/cm²	—	100	200	μs
Rise time *Fig. 1, 9	t_r	$V_{SD} \leq 0.5$ V, $C_L = 15$ pF	—	10	—	ns
Fall time *Fig. 1, 9	t_f	$V_{SD} \leq 0.5$ V, $C_L = 15$ pF	—	10	—	ns

■ Electrical-Optical Characteristics (continued)

Note) Measurement circuit

*Fig. 1:



C1, C2: 4.7 µF
C3: 1 µF
R1: 4.7 Ω

The pattern length of C1,C2,C3 of the measurement circuit is 15 mm from the terminal of the module. In addition, a pattern width of copper of Vcc line is 550 µm, a thickness is 18 µm.

*Fig. 2:

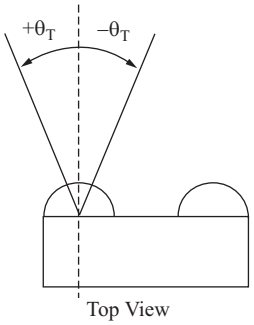


*Fig. 3:

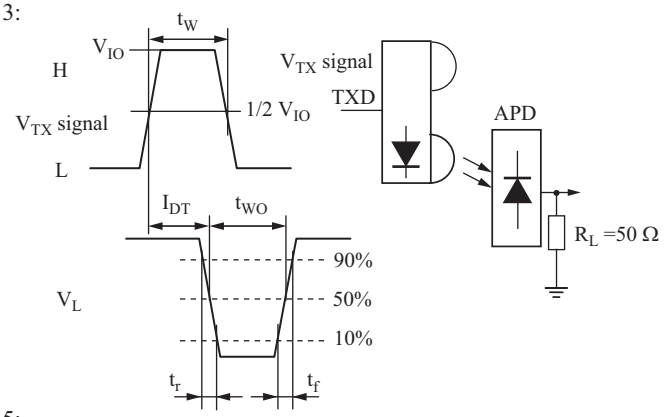
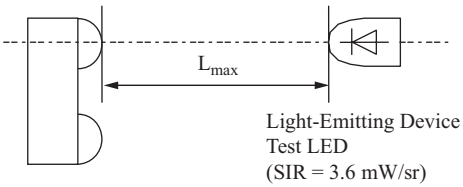


*Fig. 4:



Light-Emitting Device
Test LED
(SIR = 3.6 mW/sr)
(FIR = 9.0 mW/sr)
$\theta_T = 0° \pm 15°$

*Fig. 5:

TX Wake up time

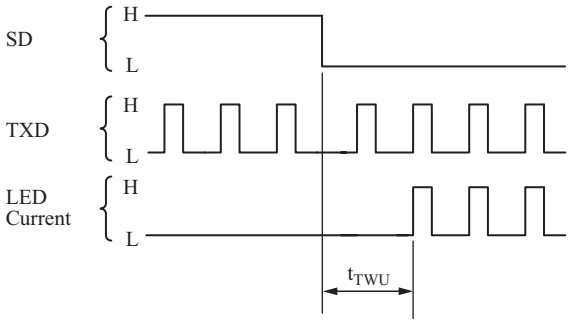
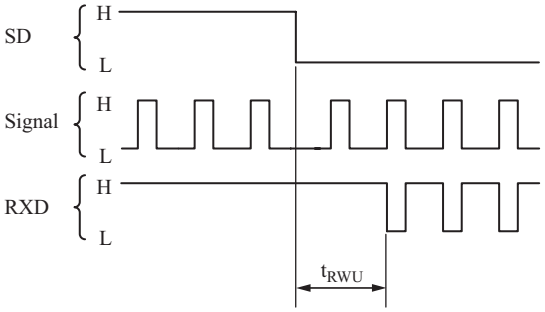


*Fig. 6:

RX Wake up time



RXD state is uncertainty while receiver wakeup time.
(RXD dose assert for an instant after SD negate.)

*Fig. 7:

Receiver latency time

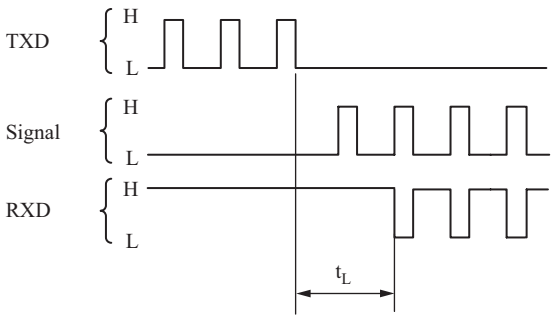
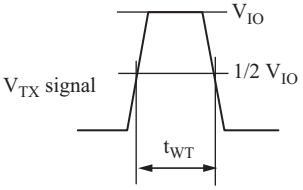


*Fig. 8:



■ Electrical-Optical Characteristics (continued)

Note) Measurement circuit (continued)

*Fig. 9:

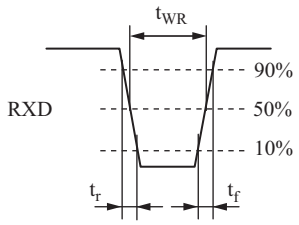
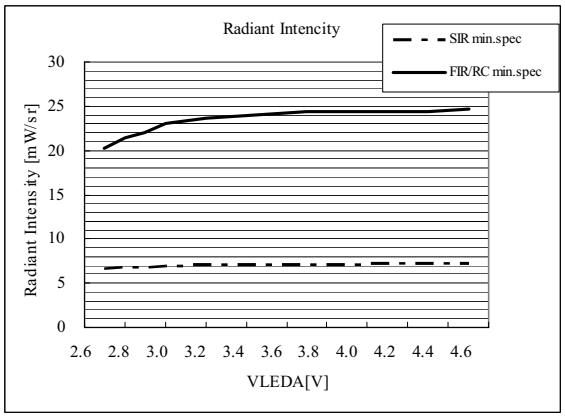
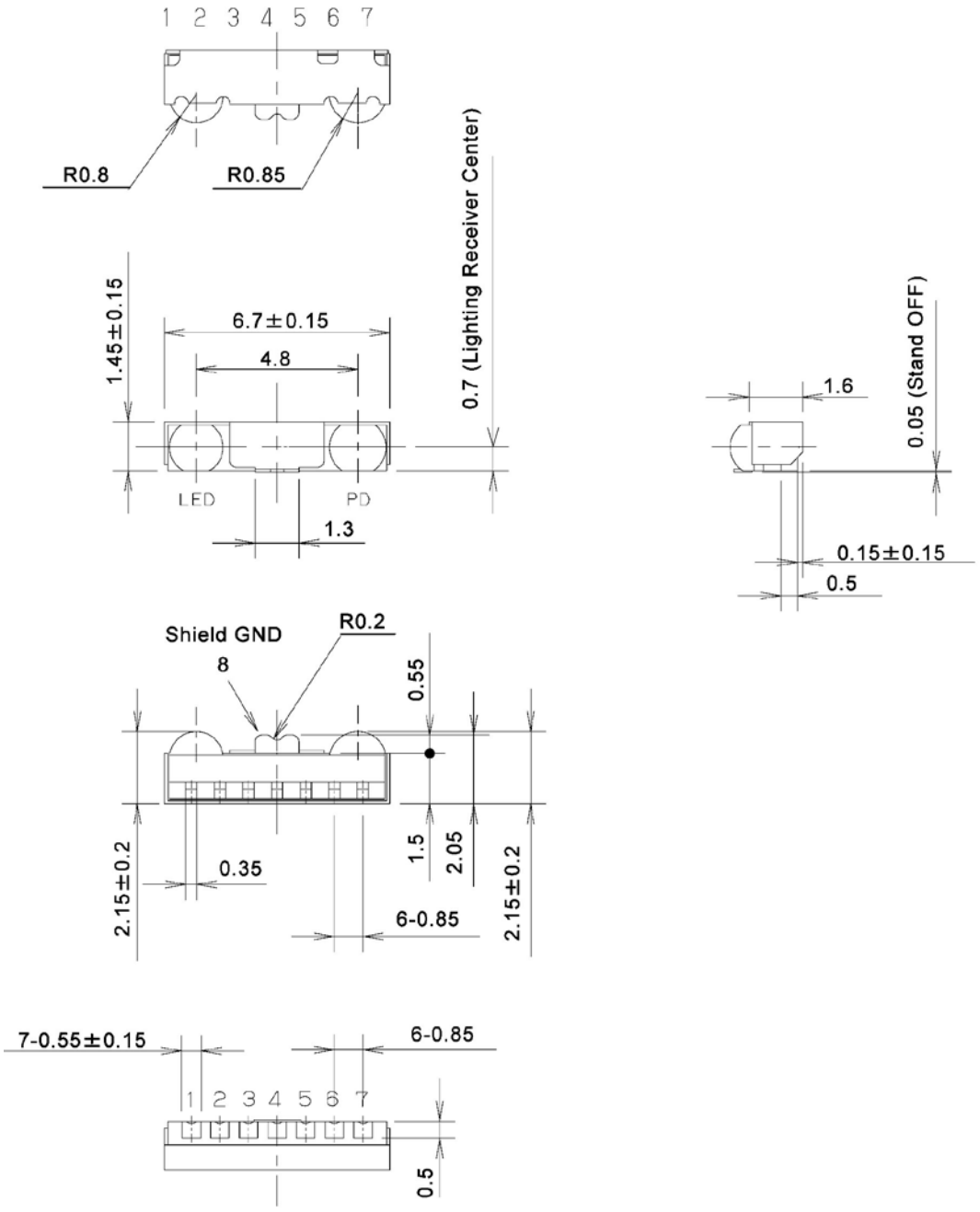


*Fig. 10:



■ 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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