CNZ1111,CNZ1112

Photo Interrupters

For contactless SW, object detection

■ Overview

CNZ1111 and CNZ1112 are a photocoupler in which a high efficiency GaAs infrared light emitting diode is used as the light emitting element, and a high sensitivity phototransistor is used as the light detecting element. The two elements are arranged so as to face each other, and objects passing between them are detected.

■ Features

- Highly precise position detection : 0.3 mm
- Wide gap between emitting and detecting elements, suitable for thick plate detection
- Fast response : t_r, t_f = 6 μs (typ.)
- Small output current variation against change in temperature

■ Absolute Maximum Ratings (Ta = 25°C)

Parameter		Symbol	Ratings	Unit
Input (Light emitting diode)	Reverse voltage (DC)	V_R	3	V
	Forward current (DC)	I_F	50	mA
	Power dissipation	P_D[*1]	75	mW
Output (Photo transistor)	Collector current	I_C	20	mA
	Collector to emitter voltage	V_{CEO}	30	V
	Emitter to collector voltage	V_{ECO}	5	V
	Collector power dissipation	P_C[*2]	100	mW
Temperature	Operating ambient temperature	T_{opr}	–25 to +85	°C
	Storage temperature	T_{stg}	–30 to +100	°C

[*1] Input power derating ratio is 1.0 mW/°C at Ta ≥ 25°C.

[*2] Output power derating ratio is 1.33 mW/°C at Ta ≥ 25°C.

CNZ1111 — Unit : mm

CNZ1112 — Unit : mm
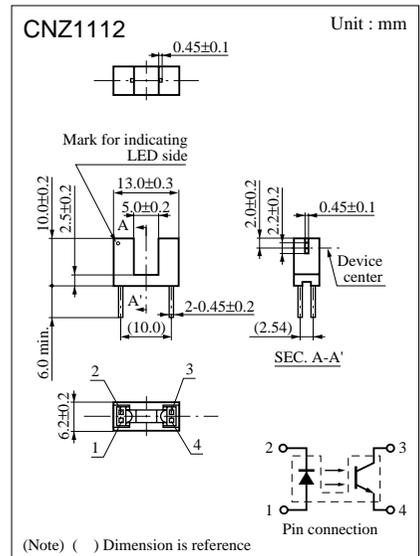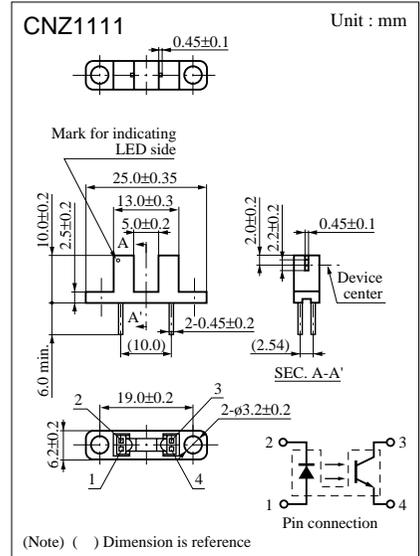
■ Electrical Characteristics (Ta = 25°C)

	Parameter	Symbol	Conditions	min	typ	max	Unit
Input characteristics	Forward voltage (DC)	V_F	$I_F = 50mA$		1.2	1.5	V
	Reverse current (DC)	I_R	$V_R = 3V$			10	μA
Output characteristics	Collector cutoff current	I_{CEO}	$V_{CE} = 10V$			200	nA
	Collector to emitter capacitance	C_C	$V_{CE} = 10V, f = 1MHz$		5		pF
Transfer characteristics	Collector current	I_C	$V_{CE} = 10V, I_F = 20mA$	0.3			mA
	Response time	t_r , t_f *	$V_{CC} = 10V, I_C = 1mA, R_L = 100Ω$		6		μs
	Collector to emitter saturation voltage	$V_{CE(sat)}$	$I_F = 50mA, I_C = 0.1mA$			0.3	V

* Switching time measurement circuit

Sig.IN V_{CC}

(Input pulse)

Sig.OUT   (Output pulse)

50Ω R_L

90%
10%
t_d
t_r t_f
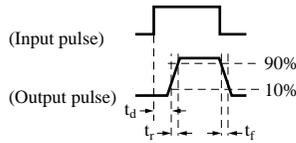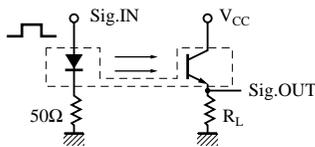
t_d : Delay time

t_r : Rise time (Time required for the collector current to increase from 10% to 90% of its final value)

t_f : Fall time (Time required for the collector current to decrease from 90% to 10% of its initial value)

I_F , I_C — Ta

I_F — V_F

I_C — I_F

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V_F — Ta

Forward voltage V_F (V)

1.6
1.2
0.8
0.4
0

$I_F = 50mA$
10mA

Ambient temperature　Ta (°C)
− 40　− 20　0　20　40　60　80　100

I_C — V_{CE}

Collector current I_C (mA)

10^2
10
1
10^{-1}
10^{-2}

Ta = 25°C

$I_F = 30mA$
20mA
10mA

Collector to emitter voltage　V_{CE} (V)
10^{-1}　1　10　10^2

I_C — Ta

Relative output current I_C (%)

160
120
80
40
0

$V_{CE} = 10V$
$I_F = 20mA$

Ambient temperature　Ta (°C)
− 40　− 20　0　20　40　60　80　100

I_{CEO} — Ta

Dark current I_{CEO} (µA)

10
1
10^{-1}
10^{-2}
10^{-3}
10^{-4}

$V_{CE} = 24V$　10V

Ambient temperature　Ta (°C)
− 40　− 20　0　20　40　60　80　100

t_r — I_C

Rise time t_r (µs)

10^3
10^2
10
1
10^{-1}

$V_{CC} = 10V$
Ta = 25°C

$R_L = 1kΩ$
500Ω
100Ω

Sig.IN　　V_{CC}
Sig.
OUT
V_1
50Ω　R_L　V_2

V_1
V_2　90%
10%
t_r　t_d　t_f

Collector current　I_C (mA)
10^{-2}　10^{-1}　1　10

I_C — d

Relative output current I_C (%)

100
80
60
40
20
0

$V_{CE} = 10V$
Ta = 25°C
$I_F = 20mA$

Criterion
0
d

Distance　d (mm)
0　1　2　3　4　5　6