

# FODB100, FODB101, FODB102 Single Channel Microcoupler™

## Features

- Low profile package (1.20mm maximum mounted height)
- Land pattern allows for optimum board space savings
- High Current Transfer Ratio (CTR) at low IF
- Minimum isolation distance of 0.45mm
- High steady state isolation voltage of 2500V<sub>rms</sub>
- Data rates up to 120Kbit/s (NRZ)
- Minimum creepage distance of 2mm
- Wide operating temperature range of -40°C to +125°C
- Available in tape and reel quantities of 3000 units
- Applicable to Pb-free Infrared Ray reflow (260°C max)
- UL and VDE approved

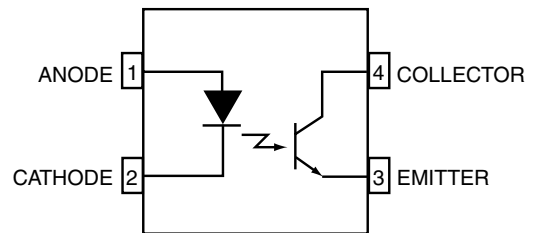
## Applications

- Primarily suited for DC-DC converters
- For ground loop isolation, signal to noise isolation
  - Communications – chargers, adapters
  - Consumer – appliances, set top boxes
  - Industrial – power supplies, motor control

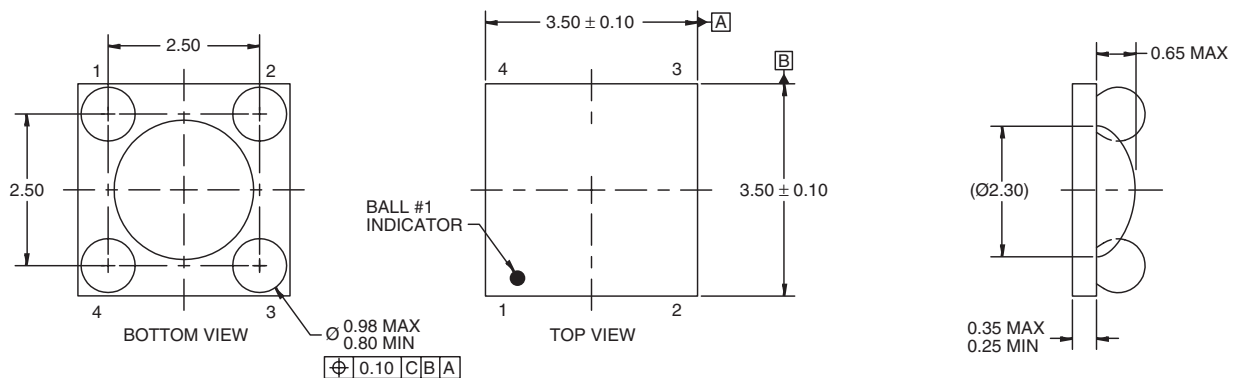
## Description

The FODB100, FODB101 and FODB102 single channel MICROCOUPLERS™ are all Pb-free, low profile miniature surface mount optocouplers in a Ball Grid Array (BGA) package. Each consists of an aluminum gallium arsenide (AlGaAs) infrared emitting diode driving a silicon phototransistor.

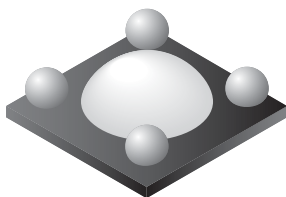
## Schematic



## Package Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED  
A) ALL DIMENSIONS ARE IN MILLIMETERS.  
B) NO JEDEC REGISTRATION REFERENCE AS OF NOVEMBER 2002.



**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified)

Symbol	Parameter	Value	Units
<b>TOTAL PACKAGE</b>			
$T_{\text{STG}}$	Storage Temperature	-55 to +150	$^\circ\text{C}$
$T_{\text{OPR}}$	Operating Temperature	-40 to +125	$^\circ\text{C}$
$T_j$	Junction Temperature	130	$^\circ\text{C}$
<b>EMITTER</b>			
$I_F$ (avg)	Continuous Forward Current	30	mA
$V_R$	Reverse Input Voltage	6	V
$P_D$	Power Dissipation	40	mW
	Derate linearly (above $25^\circ\text{C}$ )	0.39	mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
	Continuous Collector Current	50	mA
$P_D$	Power Dissipation	150	mW
	Derate linearly (above $25^\circ\text{C}$ )	1.42	mW/ $^\circ\text{C}$
$V_{\text{CEO}}$	Collector-Emitter Voltage	75	V
$V_{\text{ECO}}$	Emitter-Collector Voltage	7	V

## Electrical Characteristics (T<sub>A</sub> = 25°C Unless otherwise specified)

### Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>EMITTER</b>						
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 2mA	1.0		1.5	V
I <sub>R</sub>	Reverse Current	V <sub>R</sub> = 6V			10	μA
<b>DETECTOR</b>						
BV <sub>CEO</sub>	Breakdown Voltage Collector to Emitter	I <sub>C</sub> = 100μA, I <sub>F</sub> = 0	75			V
BV <sub>ECO</sub>	Emitter to Collector	I <sub>E</sub> = 100μA, I <sub>F</sub> = 0	7			V
I <sub>CEO</sub>	Collector Dark Current <sup>(1)</sup>	V <sub>CE</sub> = 75V, I <sub>F</sub> = 0			100	nA
C <sub>CE</sub>	Capacitance	V <sub>CE</sub> = 0V, f = 1MHz		8		pF

### Transfer Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
CTR	Current Transfer Ratio <sup>(2)</sup>	I <sub>F</sub> = 1mA, V <sub>CE</sub> = 5V	100			%
CTR <sub>CE(SAT)</sub>	Saturated Current Transfer Ratio (Collector to Emitter)	I <sub>F</sub> = 1.6mA, V <sub>CE</sub> = 0.4V	100			%
		I <sub>F</sub> = 1.0mA, V <sub>CE</sub> = 0.4V	75			
V <sub>CE(SAT)</sub>	Saturation Voltage	I <sub>F</sub> = 3.0mA, I <sub>C</sub> = 1.8mA			0.4	V
		I <sub>F</sub> = 1.6mA, I <sub>C</sub> = 1.6mA				
t <sub>r</sub>	Rise Time (Non-Saturated)	I <sub>C</sub> = 2mA, V <sub>CE</sub> = 5 V, R <sub>L</sub> = 1kΩ		1		μs
t <sub>f</sub>	Fall Time (Non-Saturated)	I <sub>C</sub> = 2mA, V <sub>CE</sub> = 5 V, R <sub>L</sub> = 1kΩ		5		
T <sub>PHL</sub>	Propagation Delay High to Low	I <sub>F</sub> = 1.6mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 750Ω		3		μs
		I <sub>F</sub> = 1.6mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 4.7kΩ		12		
T <sub>PLH</sub>	Propagation Delay Low to High	I <sub>F</sub> = 1.6mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 750Ω		5		μs
		I <sub>F</sub> = 1.6mA, V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 4.7kΩ		19		

### Isolation Characteristics

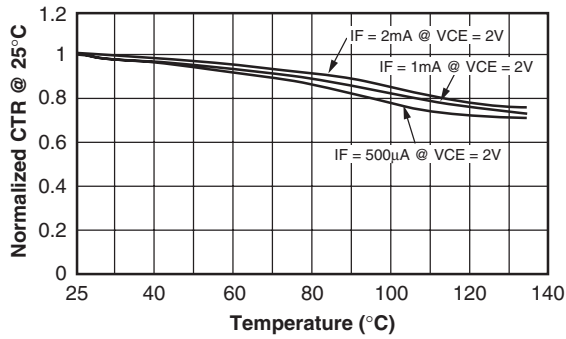
Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>ISO</sub>	Steady State Isolation Voltage <sup>(3)</sup>	RH ≤ 50%, T <sub>A</sub> = 25°C, t = 1 sec	2500			V(rms)
R <sub>ISO</sub>	Resistance (input to output) <sup>(3)</sup>	V <sub>I-O</sub> = 500VDC	10 <sup>12</sup>			Ω
C <sub>ISO</sub>	Capacitance (input to output) <sup>(3)</sup>	f = 1MHz		0.3	0.5	pF

#### Notes:

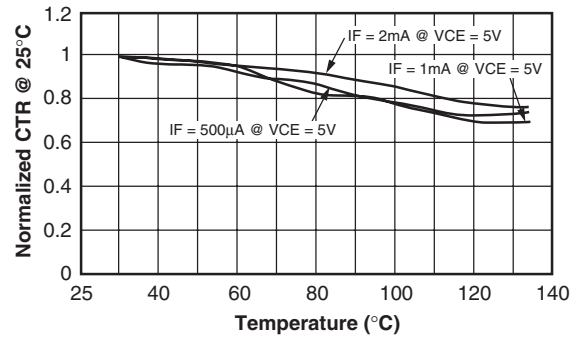
- The white dome area is sensitive to high intensity ambient light or any light source in the 500nm to 1200nm wavelength range. If such a light source is present, the part should be covered or protected. If the white dome is exposed to such a light source, the output leakage parameter of the phototransistor will increase.
- CTR bin (FODDB100 only)  
FODDB101: 100% – 200%  
FODDB102: 150% – 300%
- Pin 1 and Pin 2 are shorted as input and Pin 3 and Pin 4 are shorted as output.

## Typical Performance Characteristics

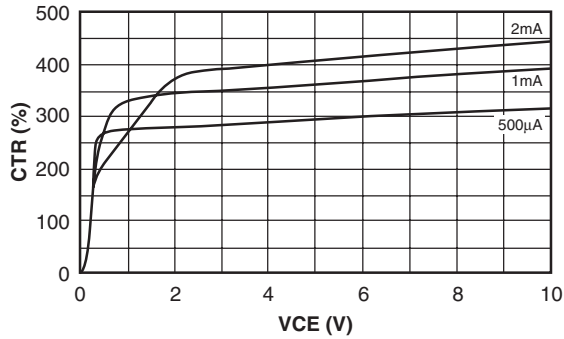
**Fig. 1 Normalized CTR vs. Temperature (VCE = 2V)**



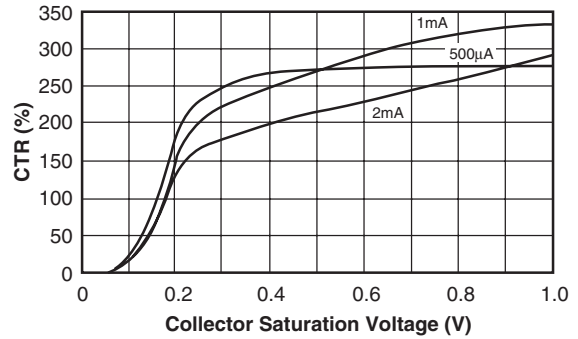
**Fig. 2 Normalized CTR vs. Temperature (VCE = 5V)**



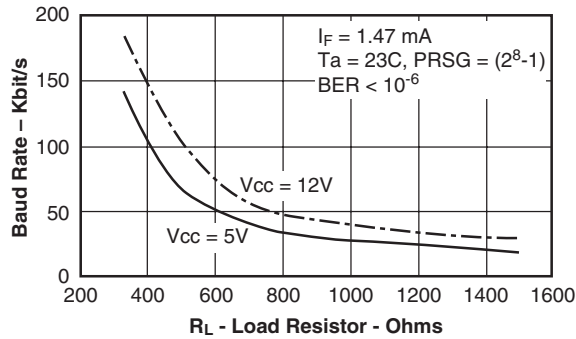
**Fig. 3 Current Transfer Ratio vs. Collector to Emitter Voltage**



**Fig. 4 Current Transfer Ratio vs. Collector Saturation Voltage**

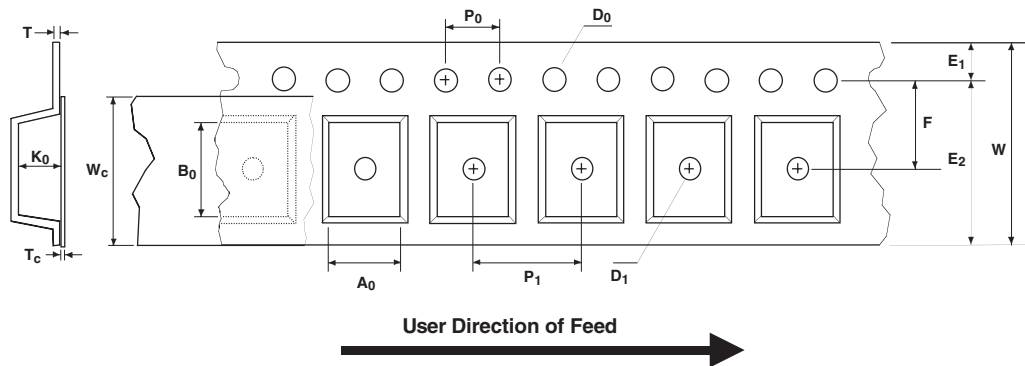


**Fig. 5 Baud Rate vs. Load Resistor**



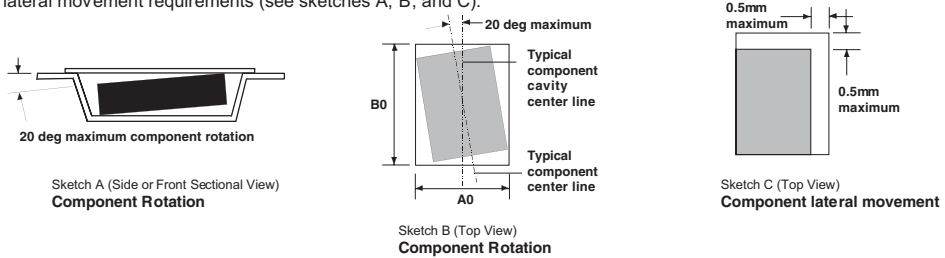
## Tape and Reel Specifications

### Embossed Carrier Tape Configuration

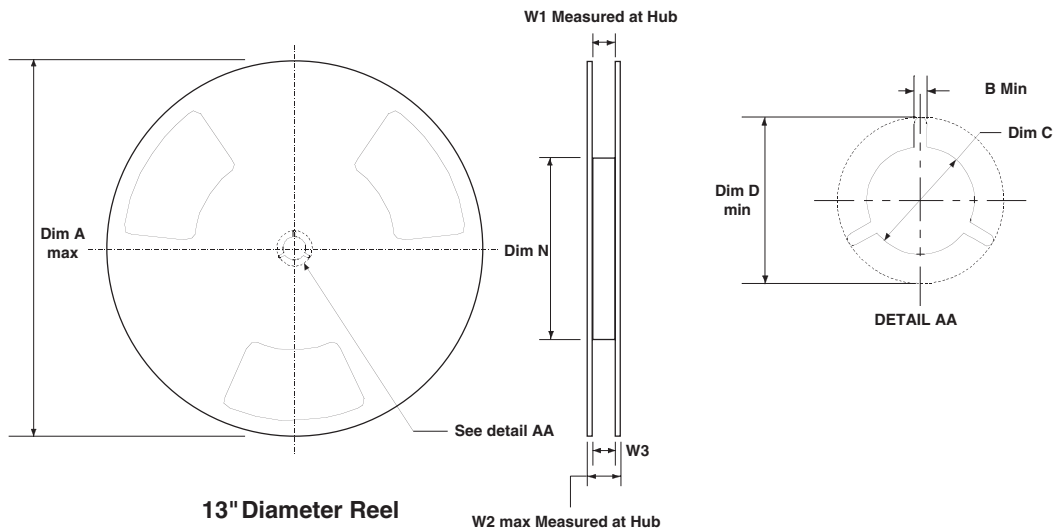


Dimensions are in millimeter														
Pkg type	$A_0$	$B_0$	$W$	$D_0$	$D_1$	$E_1$	$E_2$	$F$	$P_1$	$P_0$	$K_0$	$T$	$W_c$	$T_c$
Optocoupler (12mm)	3.80 $\pm 0.10$	3.80 $\pm 0.10$	12.0 $+0.3/-0.1$	1.50 $+0.25/-0.00$	1.50 $+0.25/-0.00$	1.75 $\pm 0.10$	10.25 min	5.50 $\pm 0.05$	8.0 $\pm 0.1$	4.0 $\pm 0.1$	1.40 $\pm 0.10$	0.279 $\pm 0.02$	9.2 $\pm 0.3$	0.06 $\pm 0.02$

Notes:  $A_0$ ,  $B_0$ , and  $K_0$  dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).

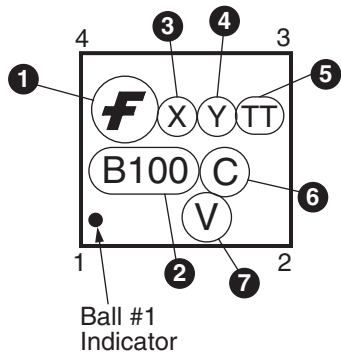


### Optocoupler Reel Configuration



Dimension are in inches and millimeters									
Tape Size	Reel Option	Dim A	Dim B	Dim C	Dim D	Dim N	Dim W1	Dim W2	Dim W3 (LSL-USL)
12mm	13" Dia	13.00 330	0.059 1.5	512 $+0.020/-0.008$ 13 $+0.5/-0.2$	0.795 20.2	7.00 178	0.488 $+0.078/-0.000$ 12.4 $+2/-0$	0.724 18.4	0.469 - 0.606 11.9 - 15.4

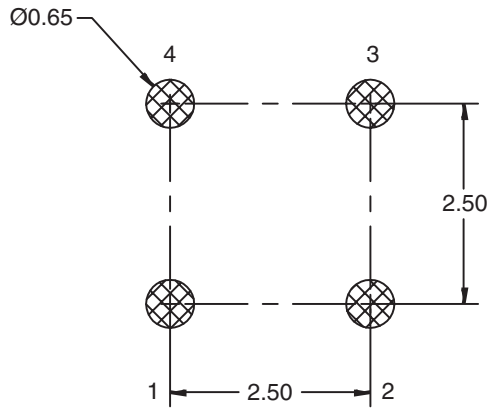
## Marking Information



Definitions	
1	Fairchild logo
2	Device number (FODB100)
3	One digit year code e.g. "E" for 2004
4	6-week date code character
5	Die Run Code
6	Assembly package code
7	VDE 0884 approved (Optional)

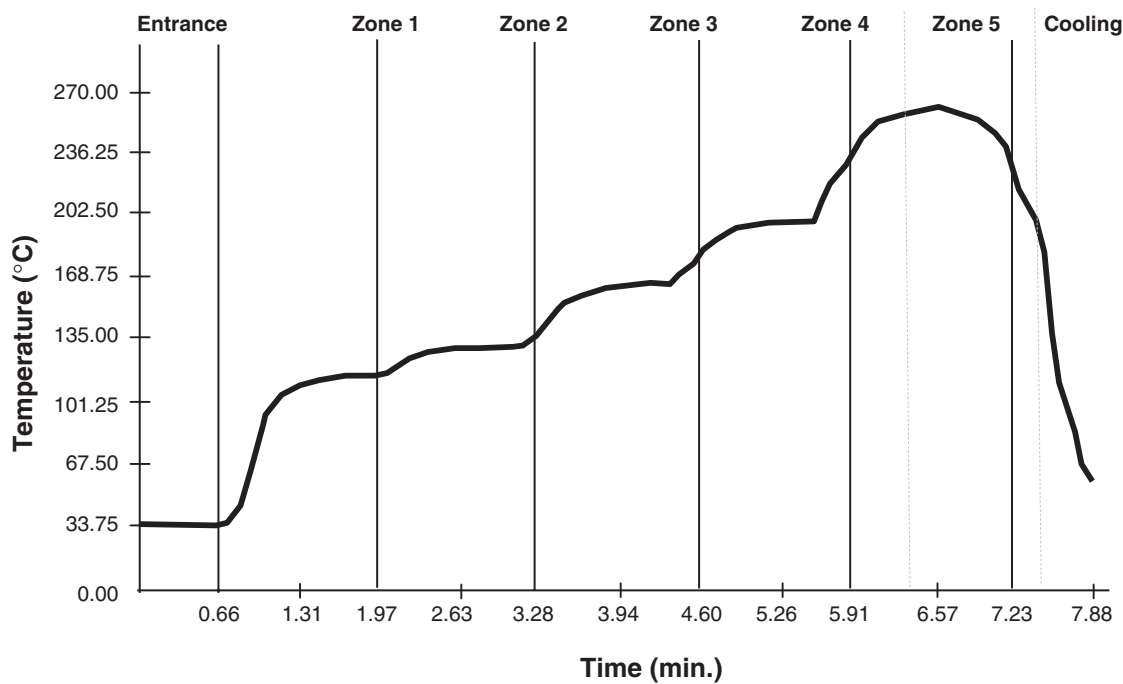
**Note:** The device number prefix of "FOD" will be omitted in the part number

## Recommended Footprint Drawing for PCB Layout



**Note:**  
 1. All dimensions in millimeters (mm)  
 2. It is recommended to use 6 mils of stencil thickness on PCB

### Recommended Infrared Reflow Soldering Profile



#### Reflow Profile for Pb Free

	Convection Reflow
Average ramp-up rate (183°C to peak)	3°C/sec max
Preheat Temperature 125(±25)°C to 200°C	60-180°C
Temperature maintained above 220°C	60-150 sec
Time within 5°C of actual peak temperature	20-40 sec
Peak temperature range	260 ±5°C
Ramp down rate	6°C/sec max
Time 25°C to peak temperature	8min max

**Note:** Surface Mount Adhesives (SMA) isn't recommended to be used on the dome area (white dome).

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Datasheet Identification	Product Status	Definition
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