

# 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

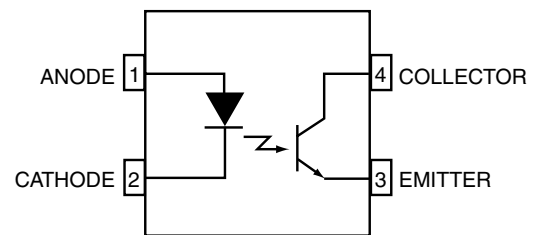
## Applications

- 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

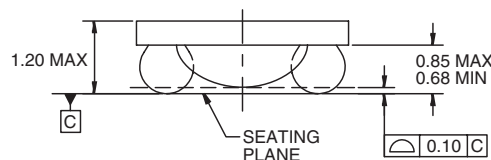
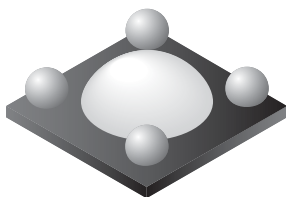
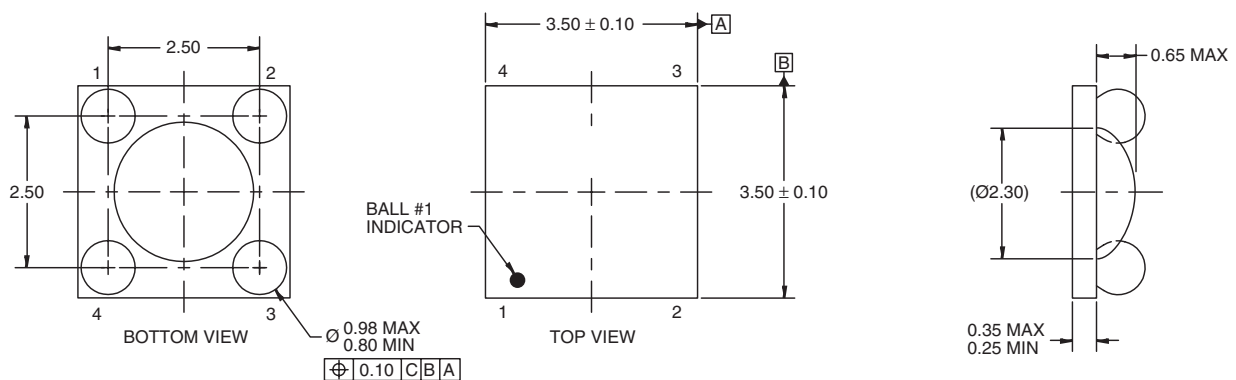
## Description

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** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified)**Individual Component Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>EMITTER</b>						
$V_F$	Forward Voltage	$I_F = 2\text{mA}$	1.0		1.5	V
$I_R$	Reverse Current	$V_R = 6\text{V}$			10	$\mu\text{A}$
<b>DETECTOR</b>						
$BV_{CEO}$	Breakdown Voltage Collector to Emitter	$I_C = 100\mu\text{A}, I_F = 0$	75			V
$BV_{ECO}$	Emitter to Collector	$I_E = 100\mu\text{A}, I_F = 0$	7			V
$I_{CEO}$	Collector Dark Current <sup>(1)</sup>	$V_{CE} = 75\text{V}, I_F = 0$			100	nA
$C_{CE}$	Capacitance	$V_{CE} = 0\text{V}, f = 1\text{MHz}$		8		pF

**Transfer Characteristics**

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
CTR	Current Transfer Ratio <sup>(2)</sup>	$I_F = 1\text{mA}, V_{CE} = 5\text{V}$	100			%
$CTR_{CE(SAT)}$	Saturated Current Transfer Ratio (Collector to Emitter)	$I_F = 1.6\text{mA}, V_{CE} = 0.4\text{V}$	100			%
		$I_F = 1.0\text{mA}, V_{CE} = 0.4\text{V}$	75			
$V_{CE(SAT)}$	Saturation Voltage	$I_F = 3.0\text{mA}, I_C = 1.8\text{mA}$			0.4	V
		$I_F = 1.6\text{mA}, I_C = 1.6\text{mA}$				
$t_r$	Rise Time (Non-Saturated)	$I_C = 2\text{mA}, V_{CE} = 5\text{V}, R_L = 1\text{k}\Omega$		1		$\mu\text{s}$
$t_f$	Fall Time (Non-Saturated)	$I_C = 2\text{mA}, V_{CE} = 5\text{V}, R_L = 1\text{k}\Omega$		5		
$T_{PHL}$	Propagation Delay High to Low	$I_F = 1.6\text{mA}, V_{CC} = 5.0\text{V}, R_L = 750\Omega$		3		$\mu\text{s}$
		$I_F = 1.6\text{mA}, V_{CC} = 5.0\text{V}, R_L = 4.7\text{k}\Omega$		12		
$T_{PLH}$	Propagation Delay Low to High	$I_F = 1.6\text{mA}, V_{CC} = 5.0\text{V}, R_L = 750\Omega$		5		$\mu\text{s}$
		$I_F = 1.6\text{mA}, V_{CC} = 5.0\text{V}, R_L = 4.7\text{k}\Omega$		19		

**Isolation Characteristics**

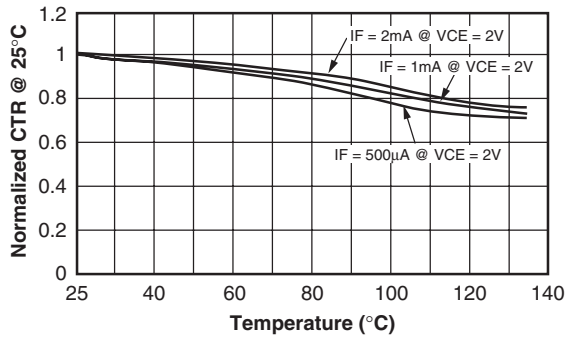
Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$V_{ISO}$	Steady State Isolation Voltage <sup>(3)</sup>	$RH \leq 50\%, T_A = 25^\circ\text{C}, t = 1\text{ sec}$	2500			V(rms)
$R_{ISO}$	Resistance (input to output) <sup>(3)</sup>	$V_{I-O} = 500\text{VDC}$	$10^{12}$			$\Omega$
$C_{ISO}$	Capacitance (input to output) <sup>(3)</sup>	$f = 1\text{MHz}$		0.3	0.5	pF

**Notes:**

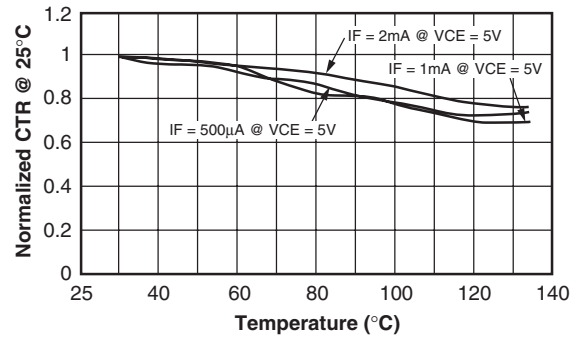
- The white dome area is sensitive to high intensity ambient light or any light source in the 500nm to 1200nm wavelength range. If such a light source is present, the part should be covered or protected. If the white dome is exposed to such a light source, the output leakage parameter of the phototransistor will increase.
- CTR bin (FODB100 only)  
FODB101: 100% – 200%  
FODB102: 150% – 300%
- Pin 1 and Pin 2 are shorted as input and Pin 3 and Pin 4 are shorted as output.

## Typical Performance Characteristics

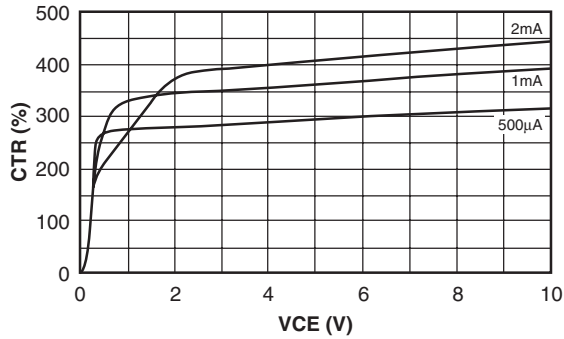
**Fig. 1 Normalized CTR vs. Temperature (VCE = 2V)**



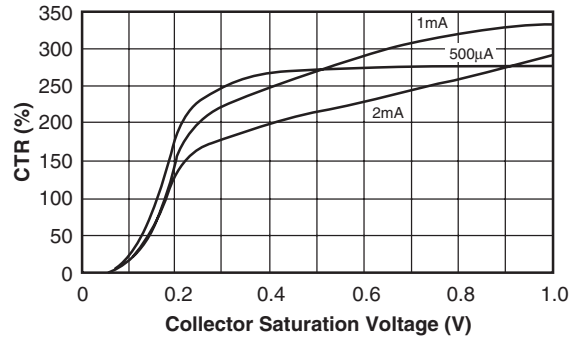
**Fig. 2 Normalized CTR vs. Temperature (VCE = 5V)**



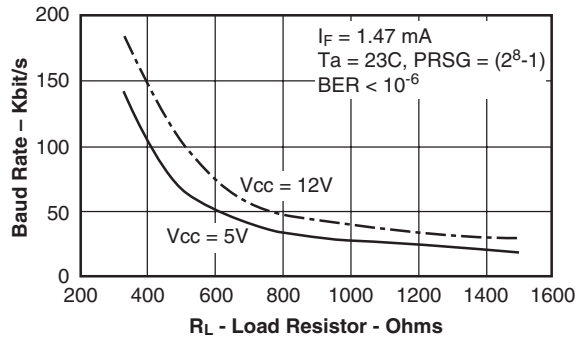
**Fig. 3 Current Transfer Ratio vs. Collector to Emitter Voltage**



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

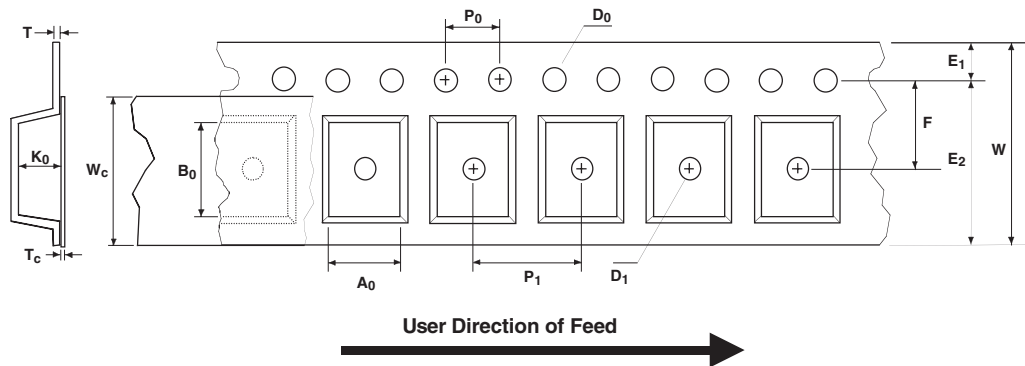


**Fig. 5 Baud Rate vs. Load Resistor**



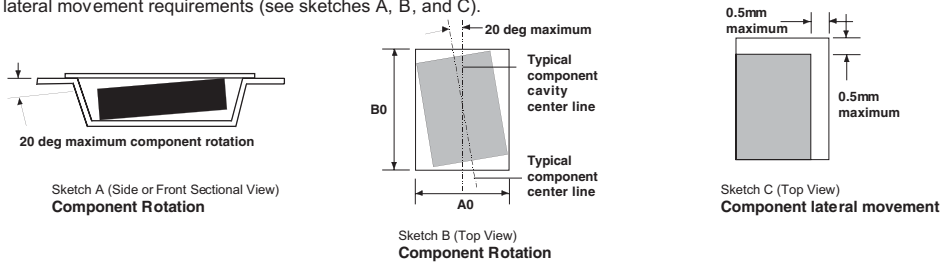
## Tape and Reel Specifications

### Embossed Carrier Tape Configuration

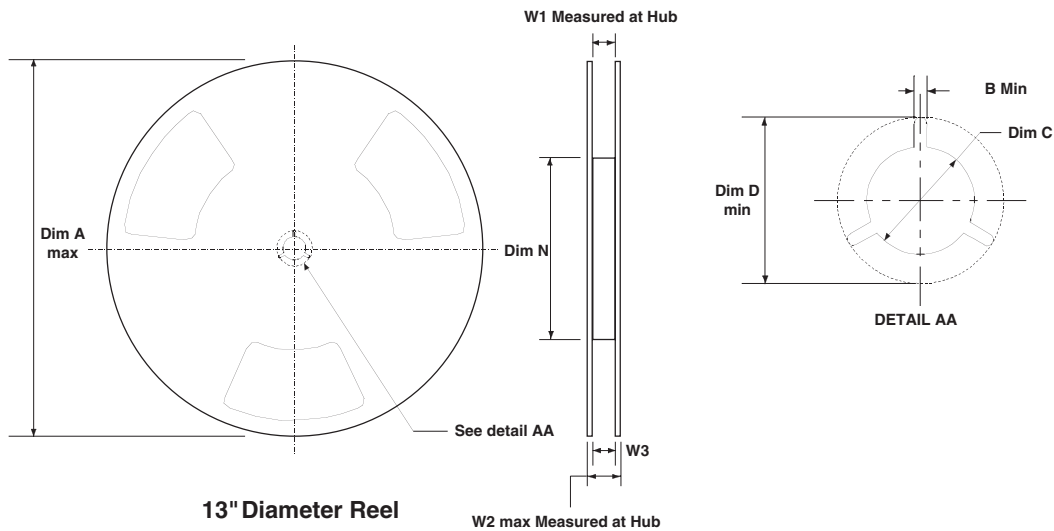


Dimensions are in millimeter														
Pkg type	$A_0$	$B_0$	$W$	$D_0$	$D_1$	$E_1$	$E_2$	$F$	$P_1$	$P_0$	$K_0$	$T$	$W_c$	$T_c$
Optocoupler (12mm)	3.80 ±0.10	3.80 ±0.10	12.0 +0.3/-0.1	1.50 +0.25/-0.00	1.50 +0.25/-0.00	1.75 ±0.10	10.25 min	5.50 ±0.05	8.0 ±0.1	4.0 ±0.1	1.40 ±0.10	0.279 ±0.02	9.2 ±0.3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

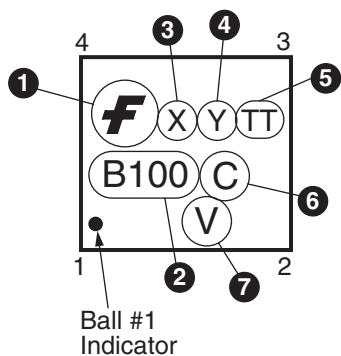


### Optocoupler Reel Configuration



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

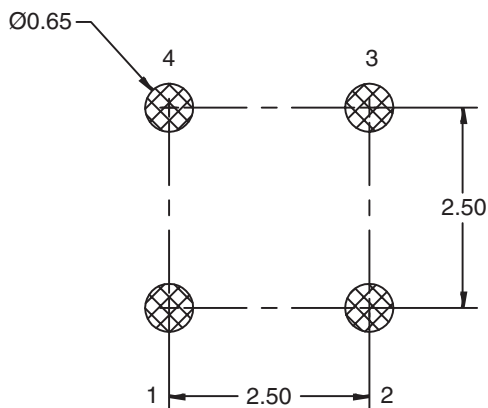
## Marking Information



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)

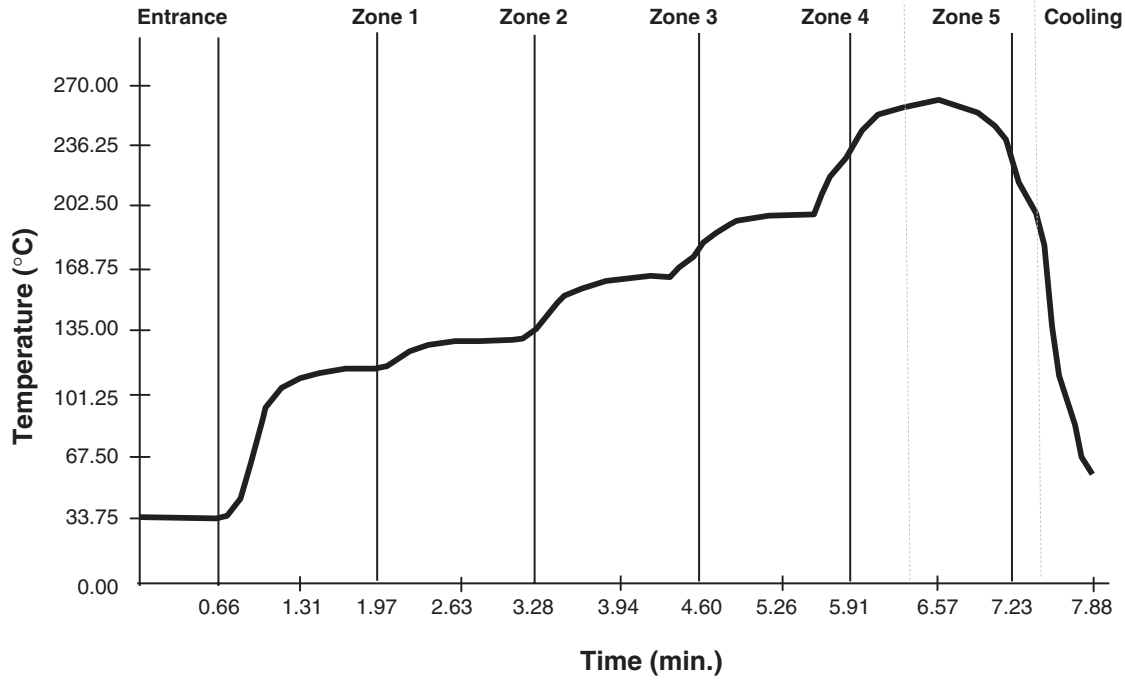
**Note:** The device number prefix of "FOD" will be omitted in the part number

## 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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Rev. I20