

# FODM121 Series, FODM124, FODM2701, FODM2705 4-Pin Full Pitch Mini-Flat Package Transistor Output Optocouplers

## Features

- 35mm creepage/clearance
- Compact 4-pin surface mount package (2.4mm maximum standoff height)
- Current Transfer Ratio in selected groups  
DC Input:
 

FODM121: 50–600%	FODM2701: 50–300%
FODM121A: 100–300%	FODM124: 100% MIN
FODM121B: 50–150%	
FODM121C: 100–200%	
- AC Input:  
FODM2705: 50–300%
- Available in tape and reel quantities of 2500
- Applicable to Infrared Ray reflow (260°C max, 10 sec.)
- C-UL, UL and VDE\* certifications

\*option 'V' required

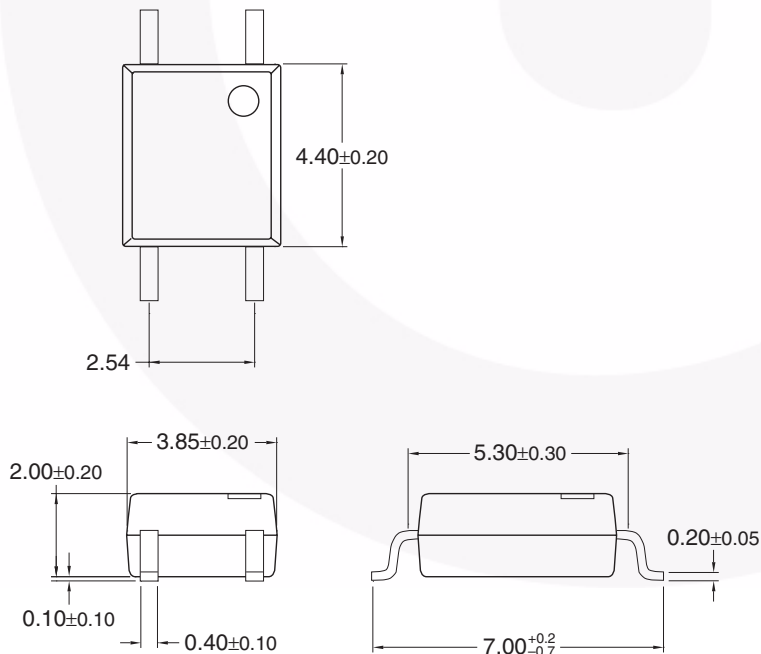
## Applications

- Digital logic inputs
- Microprocessor inputs
- Power supply monitor
- Twisted pair line receiver
- Telephone line receiver

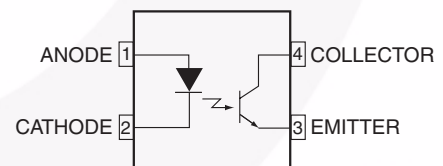
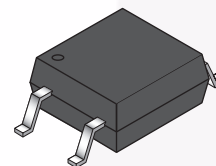
## Description

The FODM124, FODM121 series, and FODM2701 consists of a gallium arsenide infrared emitting diode driving a phototransistor in a compact 4-pin mini-flat package. The lead pitch is 2.54mm. The FODM2705 consists of two gallium arsenide infrared emitting diodes connected in inverse parallel for AC operation.

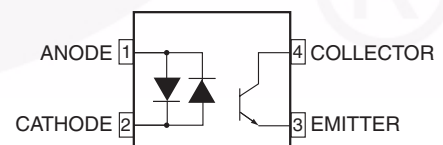
## Package Dimensions



**Note:**  
All dimensions are in millimeters.



**Equivalent Circuit**  
FODM121, FODM124, FODM2701



**Equivalent Circuit**  
FODM2705

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

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Units	
<b>TOTAL PACKAGE</b>				
$T_{STG}$	Storage Temperature	-40 to +125	$^\circ\text{C}$	
$T_{OPR}$	Operating Temperature	-40 to +110	$^\circ\text{C}$	
<b>EMITTER</b>				
$I_F$ (avg)	Continuous Forward Current	50	mA	
$I_F$ (pk)	Peak Forward Current (1 $\mu\text{s}$ pulse, 300 pps.)	1	A	
$V_R$	Reverse Input Voltage	6	V	
$P_D$	Power Dissipation Derate linearly (above $25^\circ\text{C}$ )	70	mW	
		0.65	mW/ $^\circ\text{C}$	
<b>DETECTOR</b>				
	Continuous Collector Current	80	mA	
$P_D$	Power Dissipation Derate linearly (above $25^\circ\text{C}$ )	150	mW	
		2.0	mW/ $^\circ\text{C}$	
$V_{CEO}$	Collector-Emitter Voltage	FODM2701, FODM2705	40	V
		FODM121 Series, FODM124	80	
$V_{ECO}$	Emitter-Collector Voltage	7	V	

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

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
<b>EMITTER</b>							
$V_F$	Forward Voltage	$I_F = 10\text{mA}$	FODM121 Series, FODM124	1.0		1.3	V
		$I_F = 5\text{mA}$	FODM2701			1.4	
		$I_F = \pm 5\text{mA}$	FODM2705				
$I_R$	Reverse Current	$V_R = 5\text{V}$	FODM2701			5	$\mu\text{A}$
			FODM121 Series				
			FODM124				
<b>DETECTOR</b>							
$BV_{CEO}$	Breakdown Voltage Collector to Emitter	$I_C = 1\text{mA}, I_F = 0$	FODM121 Series, FODM124	80			V
			FODM2701, FODM2705	40			
$BV_{ECO}$	Emitter to Collector	$I_E = 100\mu\text{A}, I_F = 0$	All	7			V
$I_{CEO}$	Collector Dark Current	$V_{CE} = 40\text{V}, I_F = 0$	All			100	nA
$C_{CE}$	Capacitance	$V_{CE} = 0\text{V}, f = 1\text{MHz}$	All		10		pF

**Electrical Characteristics** (Continued) ( $T_A = 25^\circ\text{C}$ )**Transfer Characteristics**

Symbol	Characteristic	Test Conditions	Device	Min.	Typ.*	Max.	Unit
CTR	DC Current Transfer Ratio	$I_F = \pm 5\text{mA}, V_{CE} = 5\text{V}$	FODM2705	50		300	%
		$I_F = 5\text{mA}, V_{CE} = 5\text{V}$	FODM2701	50		300	
		$I_F = 5\text{mA}, V_{CE} = 5\text{V}$	FODM121	50		600	
			FODM121A	100		300	
			FODM121B	50		150	
			FODM121C	100		200	
		$I_F = 1\text{mA}, V_{CE} = 0.5\text{V}$	FODM124	100		1200	
$I_F = 0.5\text{mA}, V_{CE} = 1.5\text{V}$	50						
	CTR Symmetry	$I_F = \pm 5\text{mA}, V_{CE} = 5\text{V}$	FODM2705	0.3		3.0	
$V_{CE(SAT)}$	Saturation Voltage	$I_F = \pm 10\text{mA}, I_C = 2\text{mA}$	FODM2705			0.3	V
		$I_F = 10\text{mA}, I_C = 2\text{mA}$	FODM2701			0.3	
		$I_F = 8\text{mA}, I_C = 2.4\text{mA}$	FODM121 Series			0.4	
		$I_F = 1\text{mA}, I_C = 0.5\text{mA}$	FODM124			0.4	
$t_r$	Rise Time (Non-Saturated)	$I_C = 2\text{mA}, V_{CE} = 5\text{V}, R_L = 100\Omega$	All		3		$\mu\text{s}$
$t_f$	Fall Time (Non-Saturated)	$I_C = 2\text{mA}, V_{CE} = 5\text{V}, R_L = 100\Omega$	All		3		$\mu\text{s}$

**Isolation Characteristics**

Characteristic	Test Conditions	Symbol	Device	Min.	Typ.*	Max.	Unit
Steady State Isolation Voltage <sup>(1)</sup>	1 Minute	$V_{ISO}$	All	3750			VRMS

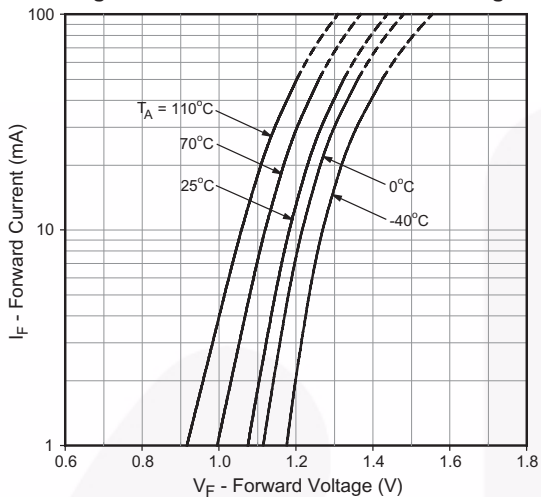
\*All typicals at  $T_A = 25^\circ\text{C}$

**Note:**

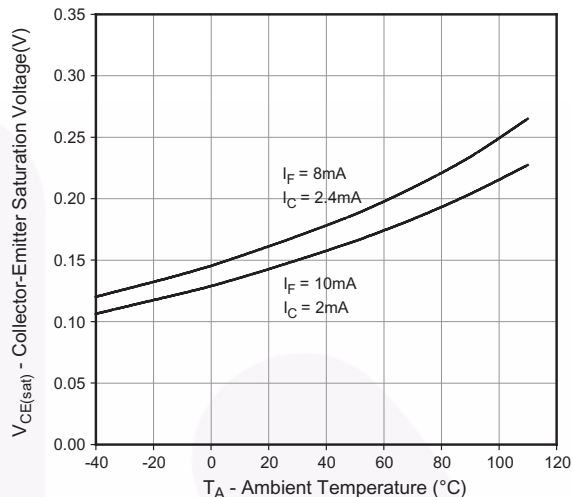
1. Steady state isolation voltage,  $V_{ISO}$ , is an internal device dielectric breakdown rating. For this test, pins 1 and 2 are common, and pins 3 and 4 are common.

## Typical Performance Curves

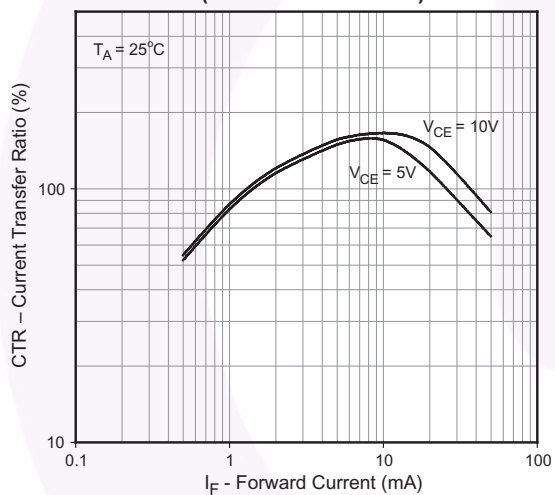
**Fig. 1 Forward Current vs. Forward Voltage**



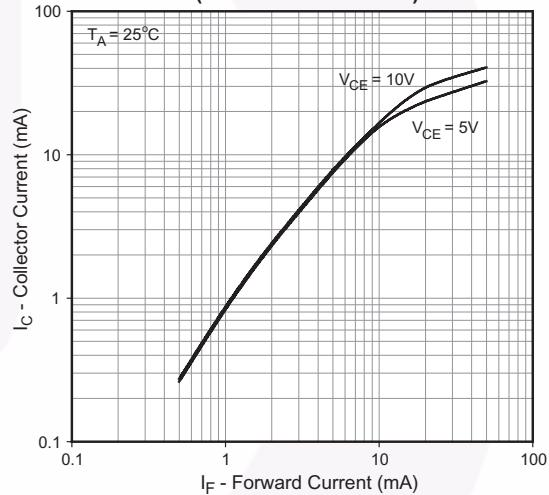
**Fig. 2 Collector-Emitter Saturation Voltage vs. Ambient Temperature (FODM121/2701/2705)**



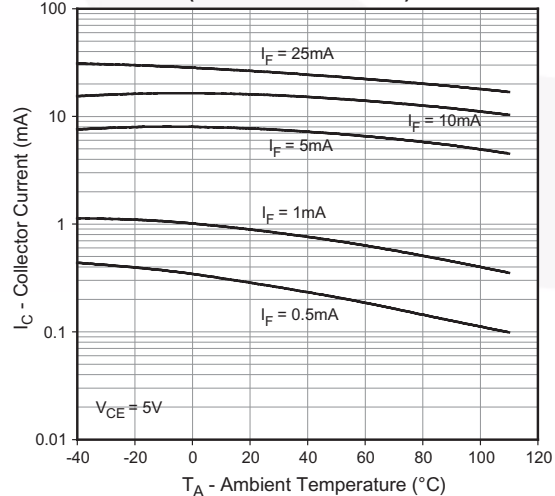
**Fig. 3 Current Transfer Ratio vs. Forward Current (FODM121/2701/2705)**



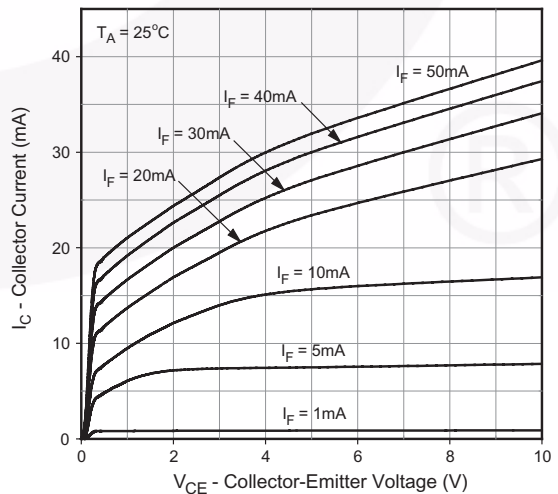
**Fig. 4 Collector Current vs. Forward Current (FODM121/2701/2705)**



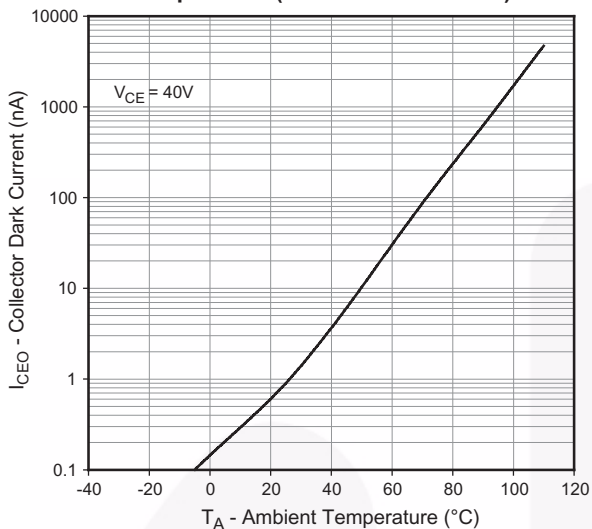
**Fig. 5 Collector Current vs. Ambient Temperature (FODM121/2701/2705)**



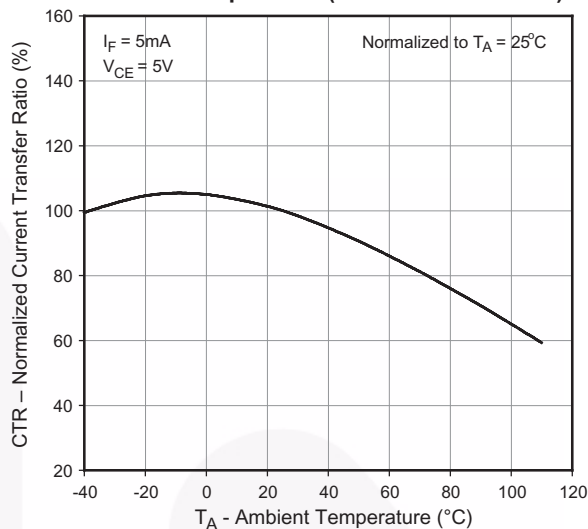
**Fig. 6 Collector Current vs. Collector-Emitter Voltage (FODM121/2701/2705)**



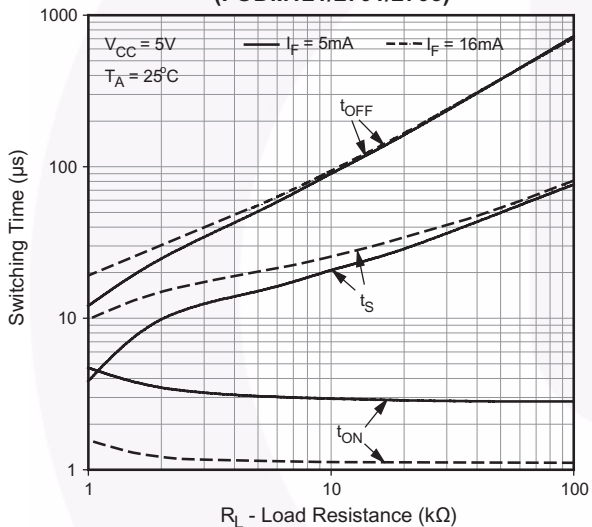
**Fig 7. Collector Dark Current vs. Ambient Temperature (FODM121/2701/2705)**



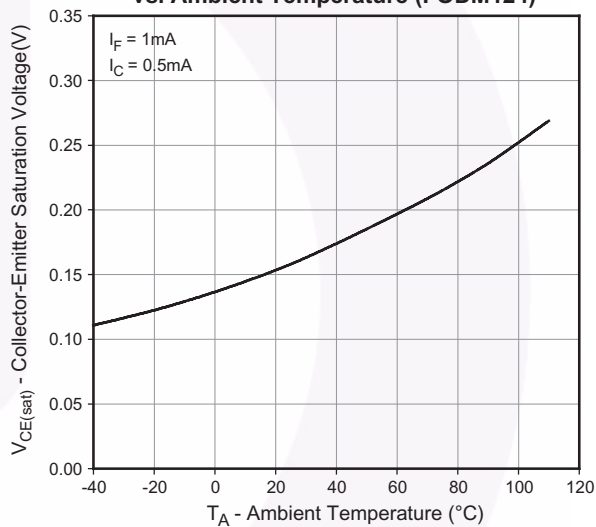
**Fig 8 Normalized Current Transfer Ratio vs. Ambient Temperature (FODM121/2701/2705)**



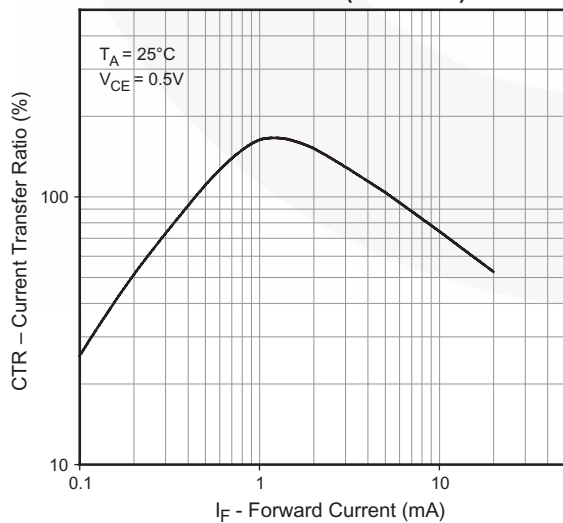
**Fig. 9 Switching Time vs. Load Resistance (FODM121/2701/2705)**



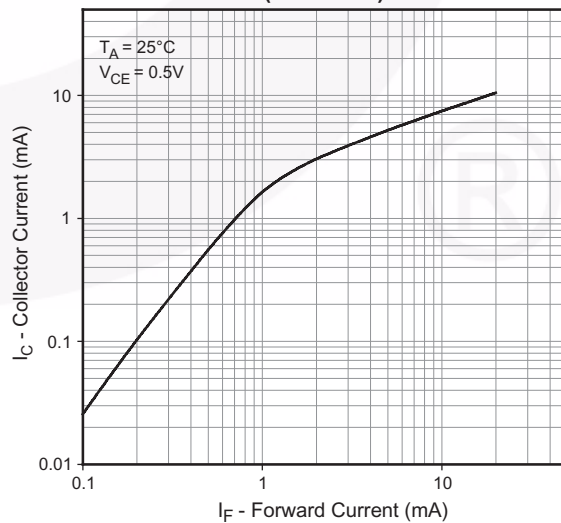
**Fig. 10 Collector-Emitter Saturation Voltage vs. Ambient Temperature (FODM124)**



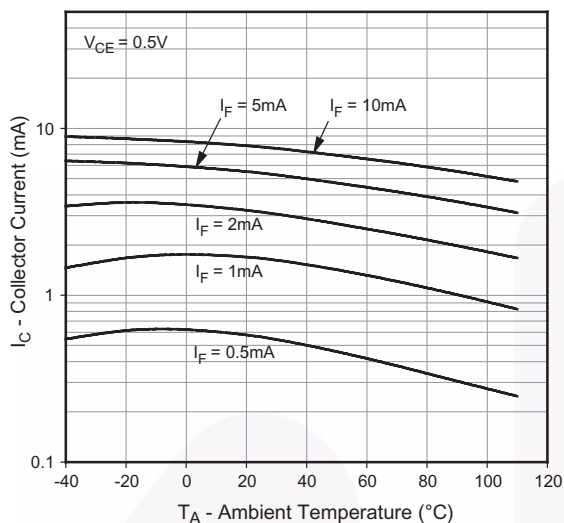
**Fig. 11 Current Transfer Ratio vs. Forward Current (FODM124)**



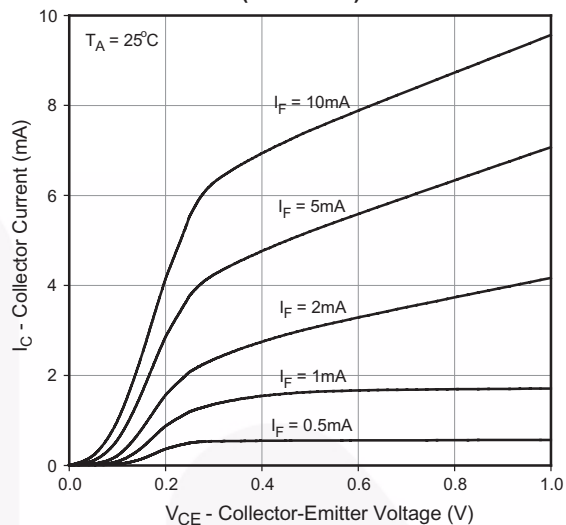
**Fig 12. Collector Current vs. Forward Current (FODM124)**



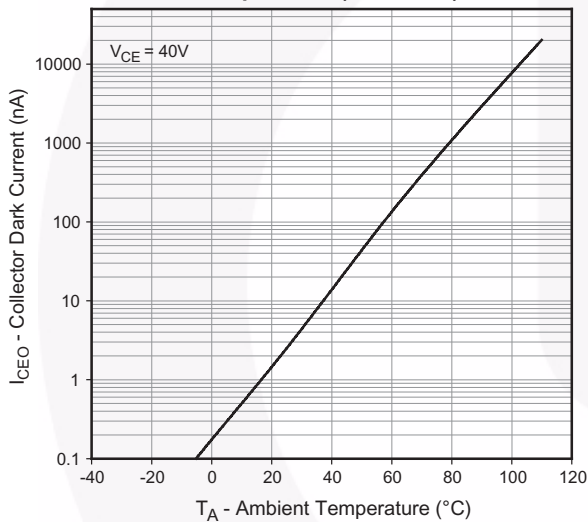
**Fig 13. Collector Current vs. Ambient Temperature (FODM124)**



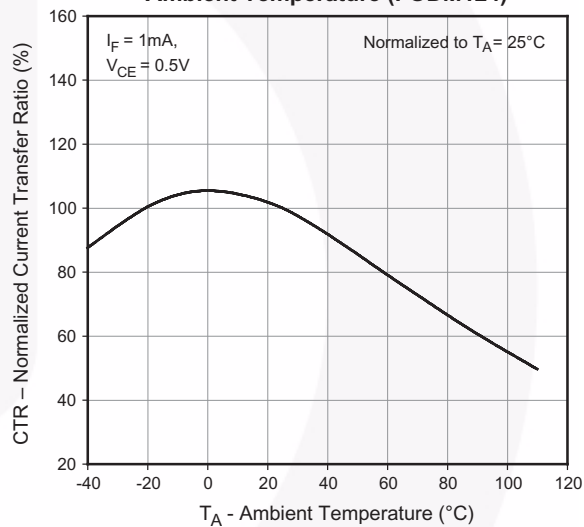
**Fig 14 Collector Current vs. Collector-Emitter Voltage (FODM124)**



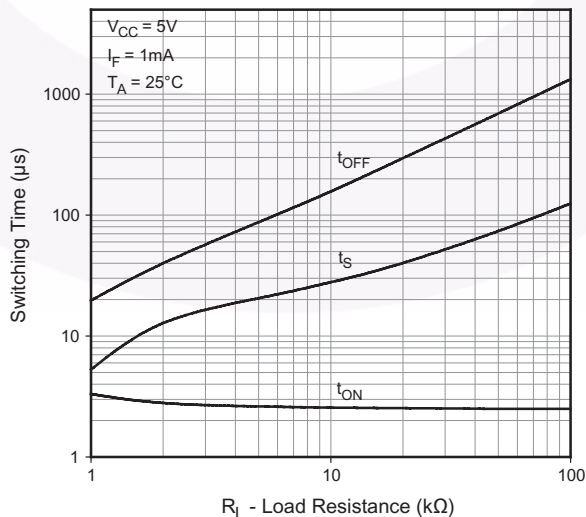
**Fig 15 Collector Dark Current vs. Ambient Temperature (FODM124)**



**Fig 16 Normalized Current Transfer Ratio vs. Ambient Temperature (FODM124)**



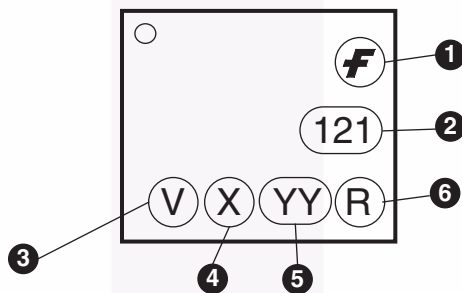
**Fig 17 Switching Time vs. Load Resistance (FODM124)**



## Ordering Information

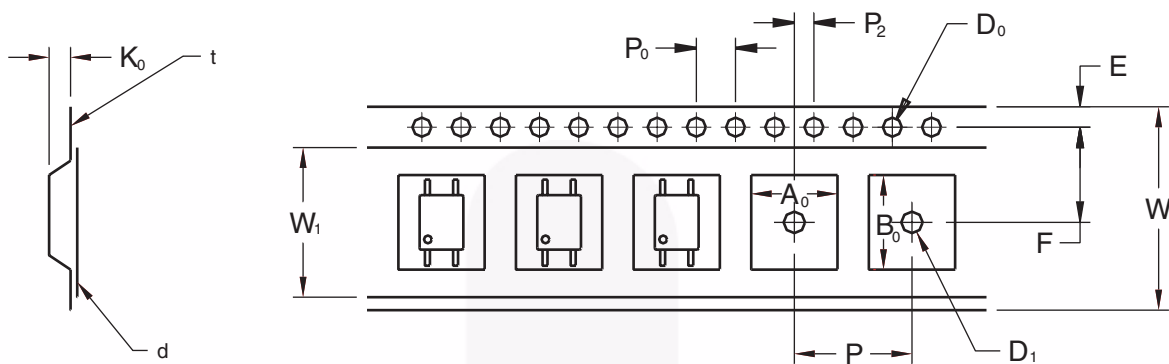
Option	Description
V	VDE Approved
R2	Tape and Reel (2500 units)
R2V	Tape and Reel (2500 units) and VDE Approved

## Marking Information



Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

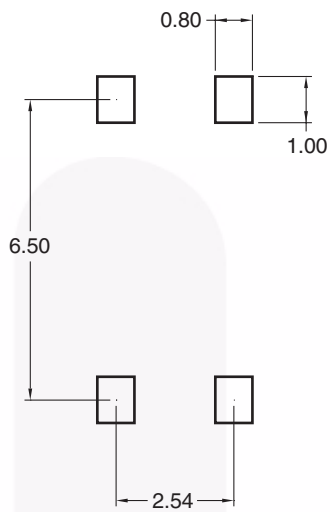
## Carrier Tape Specifications



		2.54 Pitch
Description	Symbol	Dimensions
Tape Width	W	12.00±0.4
Tape Thickness	t	0.35±0.02
Sprocket Hole Pitch	P <sub>0</sub>	4.00±0.20
Sprocket Hole Dia.	D <sub>0</sub>	1.55±0.20
Sprocket Hole Location	E	1.75±0.20
Pocket Location	F	5.50±0.20
	P <sub>2</sub>	2.00±0.20
Pocket Pitch	P	8.00±0.20
Pocket Dimension	A <sub>0</sub>	4.75±0.20
	B <sub>0</sub>	7.30±0.20
	K <sub>0</sub>	2.30±0.20
Pocket Hole Dia.	D <sub>1</sub>	1.55±0.20
Cover Tape Width	W <sub>1</sub>	9.20
Cover Tape Thickness	d	0.065±0.02
Max. Component Rotation or Tilt		20° max
Devices Per Reel		2500
Reel Diameter		330 mm (13")



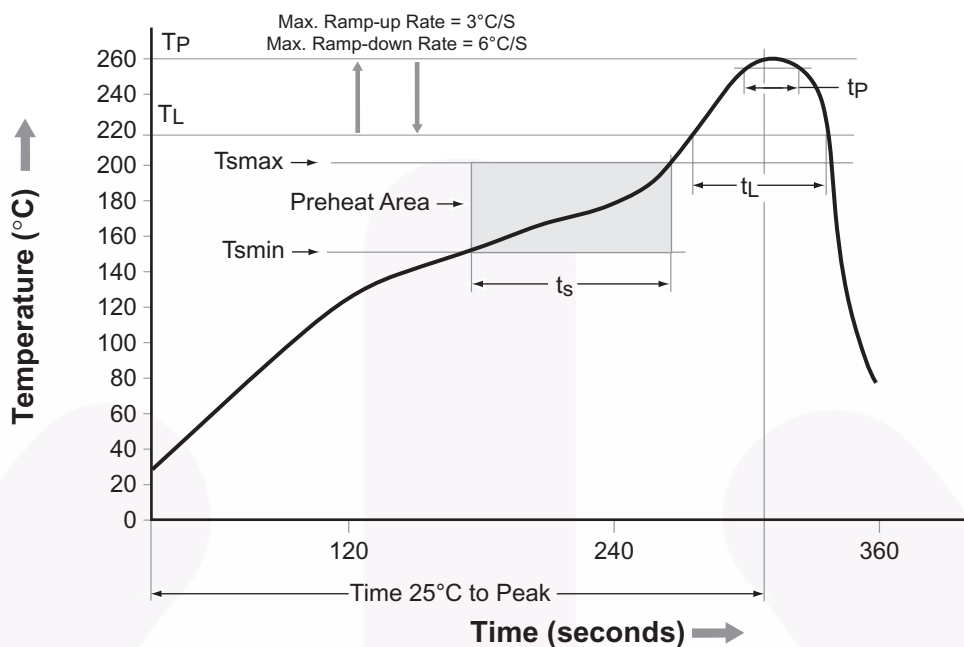
### Footprint Drawing for PCB Layout



**Note:**  
All dimensions are in mm.



## Reflow Profile








Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmin to Tsmax)	60–120 seconds
Ramp-up Rate (tL to tp)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tp) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.



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**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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