

FOD852

4-Pin High Operating Temperature Photodarlington Optocoupler

Features

- Applicable to Pb-free IR Reflow Soldering
- Compact 4-pin Package
- High Current Transfer Ratio: 1000% Minimum
- C-UL, UL, and VDE Approved
- High Input-Output Isolation Voltage of 5000 V_{RMS}
- High Operating Temperature of 100°C

Applications

- Power Supply Regulators
- Digital Logic Inputs
- Microprocessor Inputs

Description

The FOD852 consists of gallium arsenide infrared emitting diode driving a silicon photodarlington output (with integral base-emitter resistor) in a 4-pin dual in-line package.

Functional Block Diagram

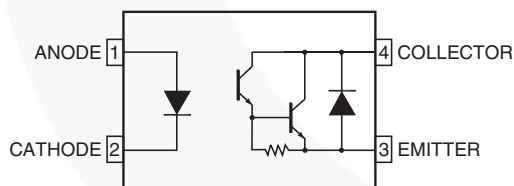


Figure 1. Schematic

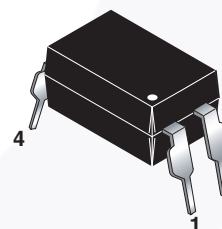


Figure 2. Package Outlines

Absolute Maximum Ratings

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. $T_A = 25^\circ\text{C}$ Unless otherwise specified.

Symbol	Parameter	Value	Units
Total Device			
T_{STG}	Storage Temperature	-55 to +125	$^\circ\text{C}$
T_{OPR}	Operating Temperature	-30 to +100	$^\circ\text{C}$
T_{SOL}	Lead Solder Temperature	260 for 10 seconds	$^\circ\text{C}$
P_{TOT}	Total Device Power Dissipation	200	mW
Input			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	6	V
P_D	LED Power Dissipation	70	mW
Output			
V_{CEO}	Collector-Emitter Voltage	300	V
V_{ECO}	Emitter-Collector Voltage	0.1	V
I_C	Continuous Collector Current	150	mA
P_C	Collector Power Dissipation	150	mW

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise specified.

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Input						
V_F	Forward Voltage	$I_F = 10\text{ mA}$		1.2	1.4	V
I_R	Reverse Current	$V_R = 4\text{ V}$			10	μA
C_t	Terminal Capacitance	$V = 0, f = 1\text{ kHz}$		30	250	pF
Output						
I_{CEO}	Collector Dark Current	$V_{CE} = 200\text{ V}, I_F = 0$			200	nA
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C = 0.1\text{ mA}, I_F = 0$	300			V
BV_{ECO}	Emitter-Collector Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_F = 0$	0.1			V

Transfer Characteristics

Symbol	DC Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
I_C	Collector Current	$I_F = 1\text{ mA}, V_{CE} = 2\text{ V}$	10	40	150	mA
CTR	Current Transfer Ratio ⁽¹⁾		1,000	4,000	15,000	%
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$I_F = 20\text{ mA}, I_C = 100\text{ mA}$			1.2	V
R_{ISO}	Isolation Resistance	DC = 5000 V, 40% to 60% Relative Humidity	5×10^{10}	1×10^{11}		Ω
C_F	Floating Capacitance	$V = 0, f = 1\text{ MHz}$		0.6	1	pF
f_C	Cut-Off Frequency	$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}, R_L = 100\text{ }\Omega, -3\text{ dB}$	1	7		kHz
t_R	Response Time (Rise)	$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}, R_L = 100\text{ }\Omega$		100	300	μs
t_F	Response Time (Fall)			20	100	μs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	$f = 60\text{ Hz}, t = 1\text{ minute}, I_{I-O} \leq 2\text{ }\mu\text{A}$	5000			$V_{AC(RMS)}$
R_{ISO}	Isolation Resistance	$V_{I-O} = 500\text{ V}_{DC}$	5×10^{10}	10^{11}		Ω
C_{ISO}	Isolation Capacitance	$V_{I-O} = 0, f = 1\text{ MHz}$		0.6	1.0	pf

Note:

1. Current Transfer Ratio (CTR) = $I_C / I_F \times 100\%$.

Typical Electrical/Optical Characteristic Curves

$T_A = 25^\circ\text{C}$ unless otherwise specified.

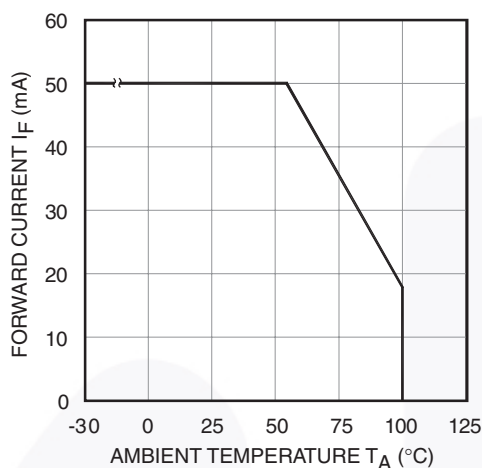


Figure 3. Forward Current vs. Ambient Temperature

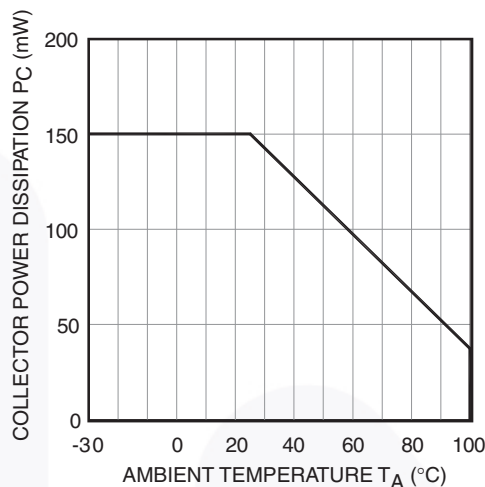


Figure 4. Collector Power Dissipation vs. Ambient Temperature

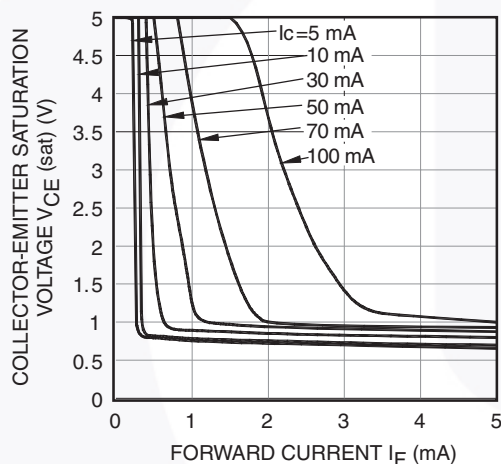


Figure 5. Collector-Emitter Saturation Voltage vs. Forward Current

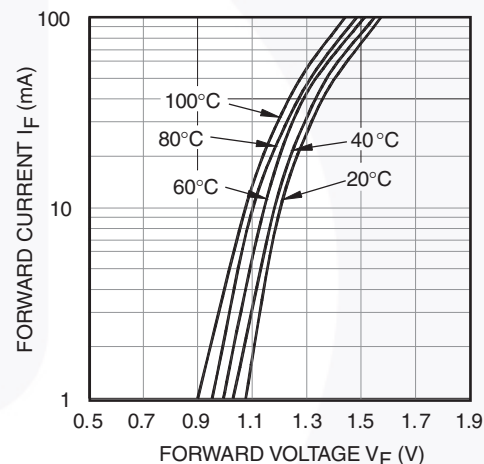


Figure 6. Forward Current vs. Forward Voltage

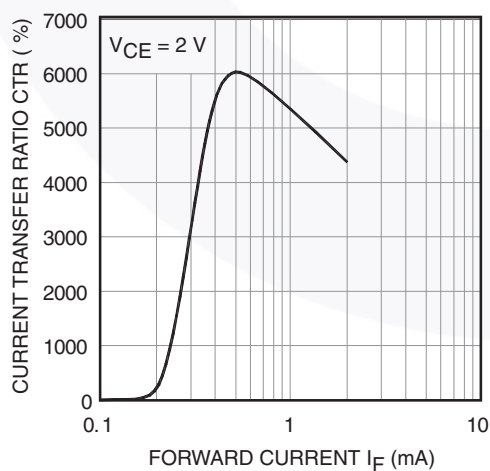


Figure 7. Current Transfer Ratio vs. Forward Current

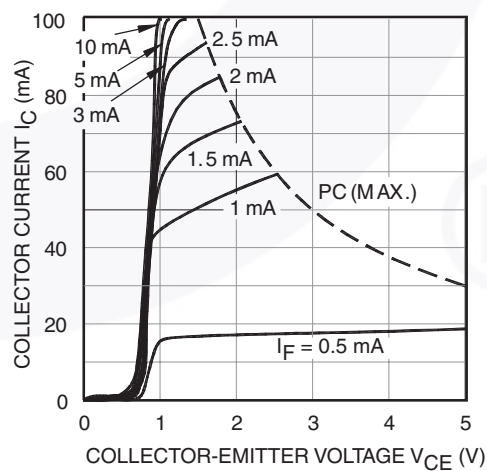


Figure 8. Collector Current vs. Collector-Emitter Voltage

Typical Electrical/Optical Characteristic Curves (Continued)

$T_A = 25^\circ\text{C}$ unless otherwise specified.

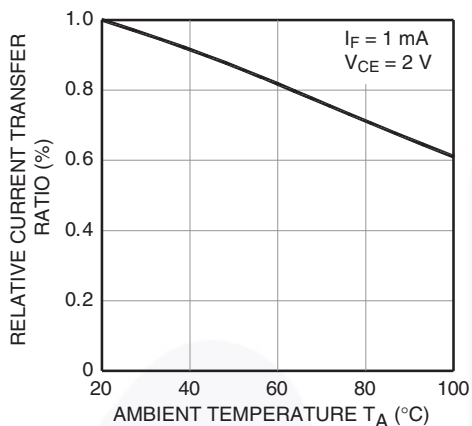


Figure 9. Relative Current Transfer Ratio vs. Ambient Temperature

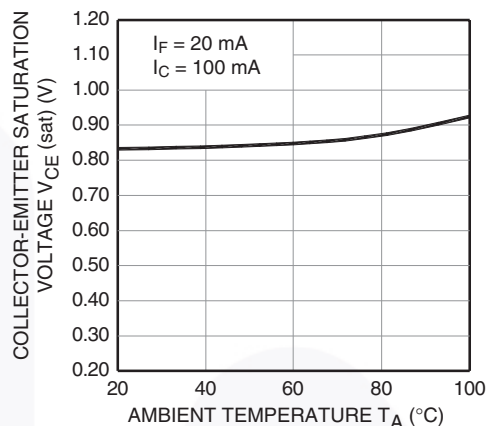


Figure 10. Collector-Emitter Saturation Voltage vs. Ambient Temperature

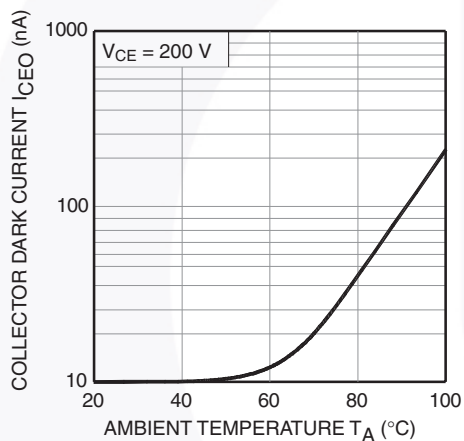


Figure 11. Collector Dark Current vs. Ambient Temperature

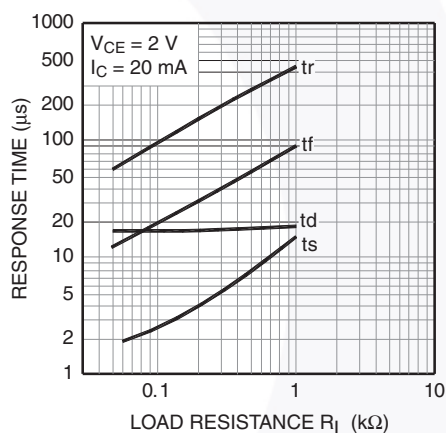


Figure 12. Response Time vs. Load Resistance

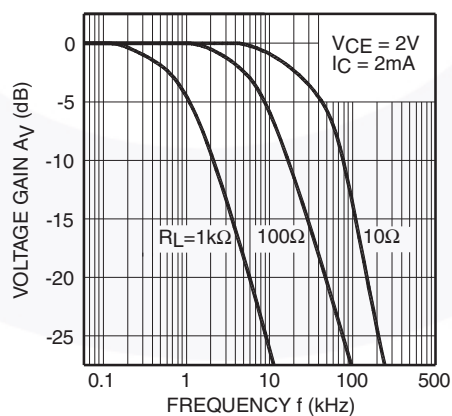


Figure 13. Frequency Response

Test Circuits

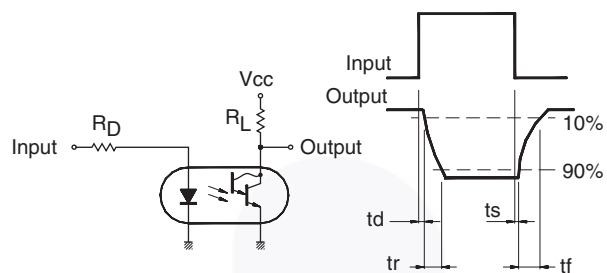


Figure 14. Test Circuit for Response Time

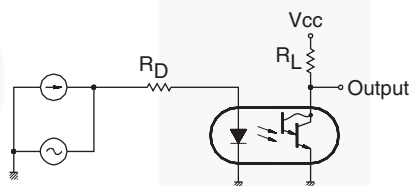


Figure 15. Test Circuit for Frequency Response

Lead Free Recommended IR Reflow Condition

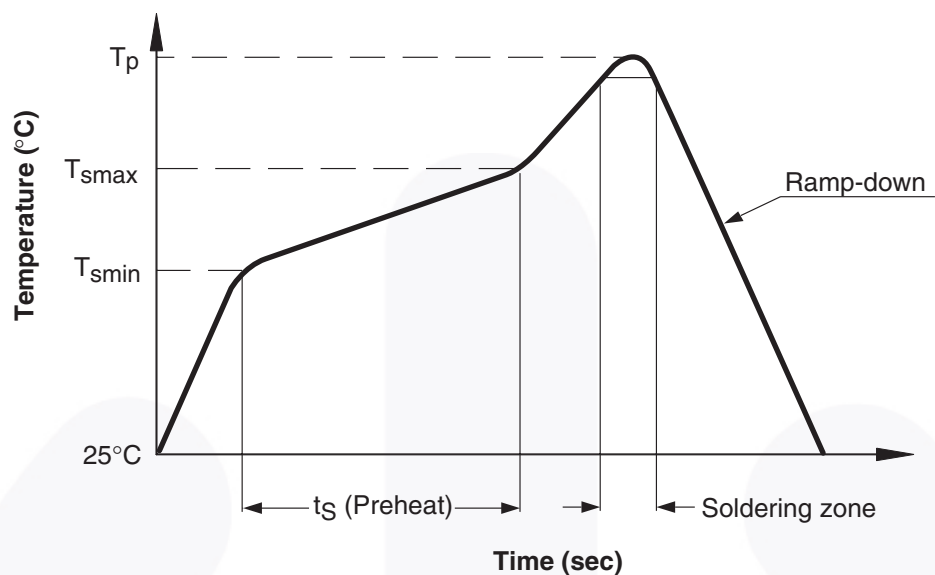


Figure 16. Reflow Profile

Profile Feature	Pb-Sn solder assembly	Lead Free assembly
Preheat Conditions Temperature: T_{smin} to T_{smax} Time: t_s	100°C to 150°C 60 to 120 seconds	150°C to 200°C 60 to 120 seconds
Melt Soldering Zone	183°C 60 to 120 seconds	217°C 30 to 90 seconds
Peak Temperature (T_p)	240 +0°C/-5°C	260 +0°C/-5°C
Ramp-down Rate	6°C/s maximum	6°C/s maximum

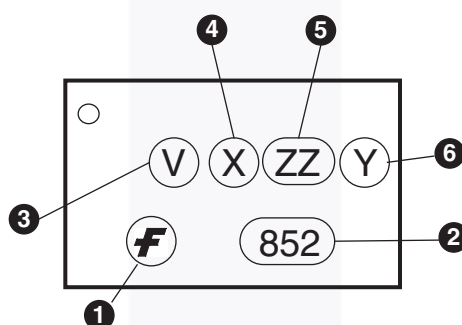
Recommended Wave Soldering Condition

Profile Feature	For all Solder Assembly
Peak Temperature (T_p)	Maximum 260°C for 10 seconds

Ordering Information

Part Number	Package	Packing Method
FOD852	DIP 4-Pin	Tube (50 units per tube)
FOD852S	SMT 4-Pin (Lead Bend)	Tube (50 units per tube)
FOD852SD	SMT 4-Pin (Lead Bend)	Tape and Reel (1,000 units per reel)
FOD852300	DIP 4-Pin, DIN EN/IEC60747-5-2 option	Tube (50 units per tube)
FOD8523S	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-2 option	Tube (50 units per tube)
FOD8523SD	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-2 option	Tape and Reel (1,000 units per reel)
FOD852300W	DIP 4-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-2 option	Tube (50 units per tube)

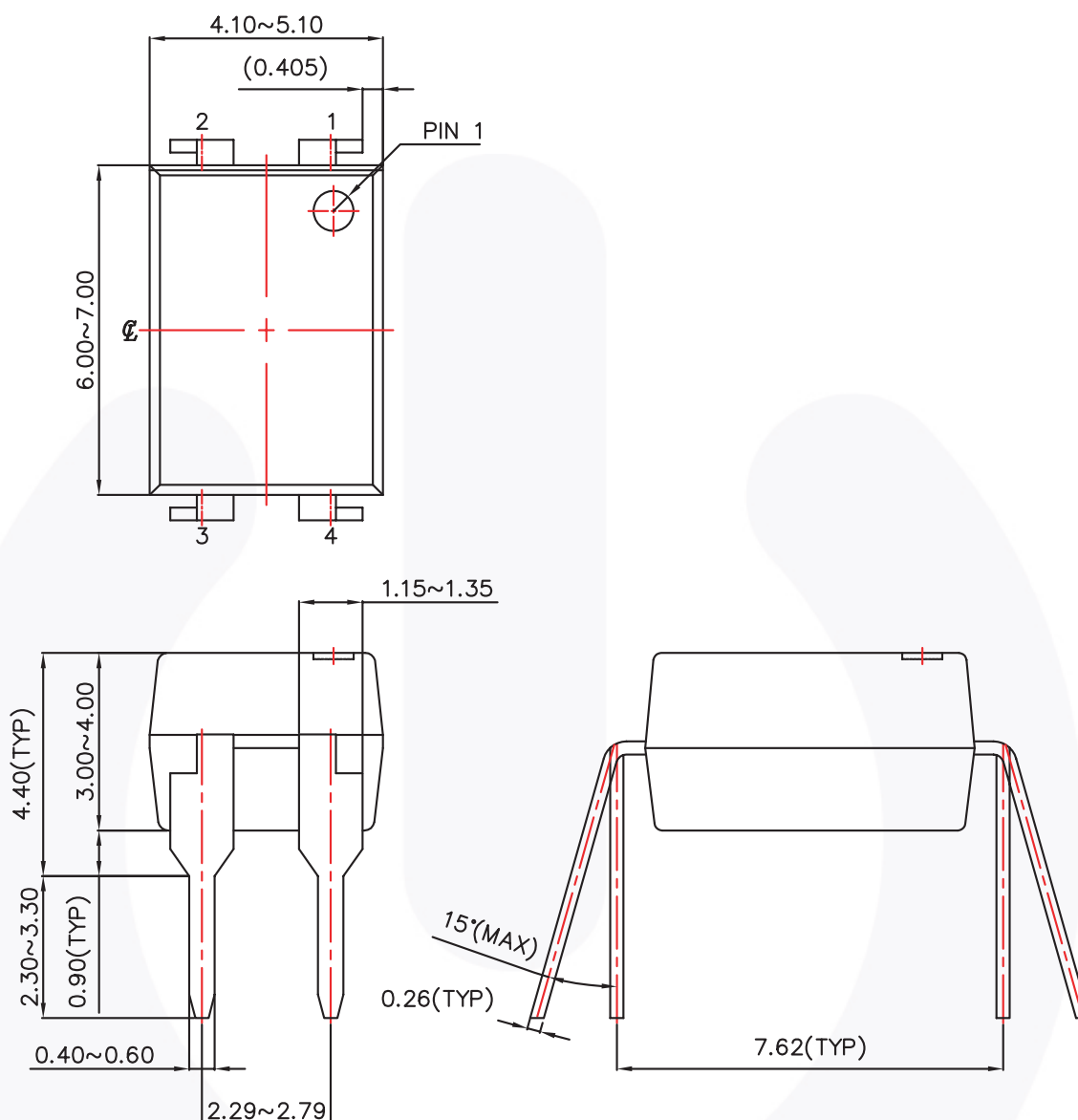
Marking Information



Definitions

1	Fairchild logo
2	Device number
3	DIN EN/IEC60747-5-2 Option (only appears on parts ordered with this option)
4	One-digit year code
5	Two-digit work week, ranging from '01' to '53'
6	Assembly package code Y = manufactured in Thailand YA = manufactured in China

Package Dimensions



NOTES:

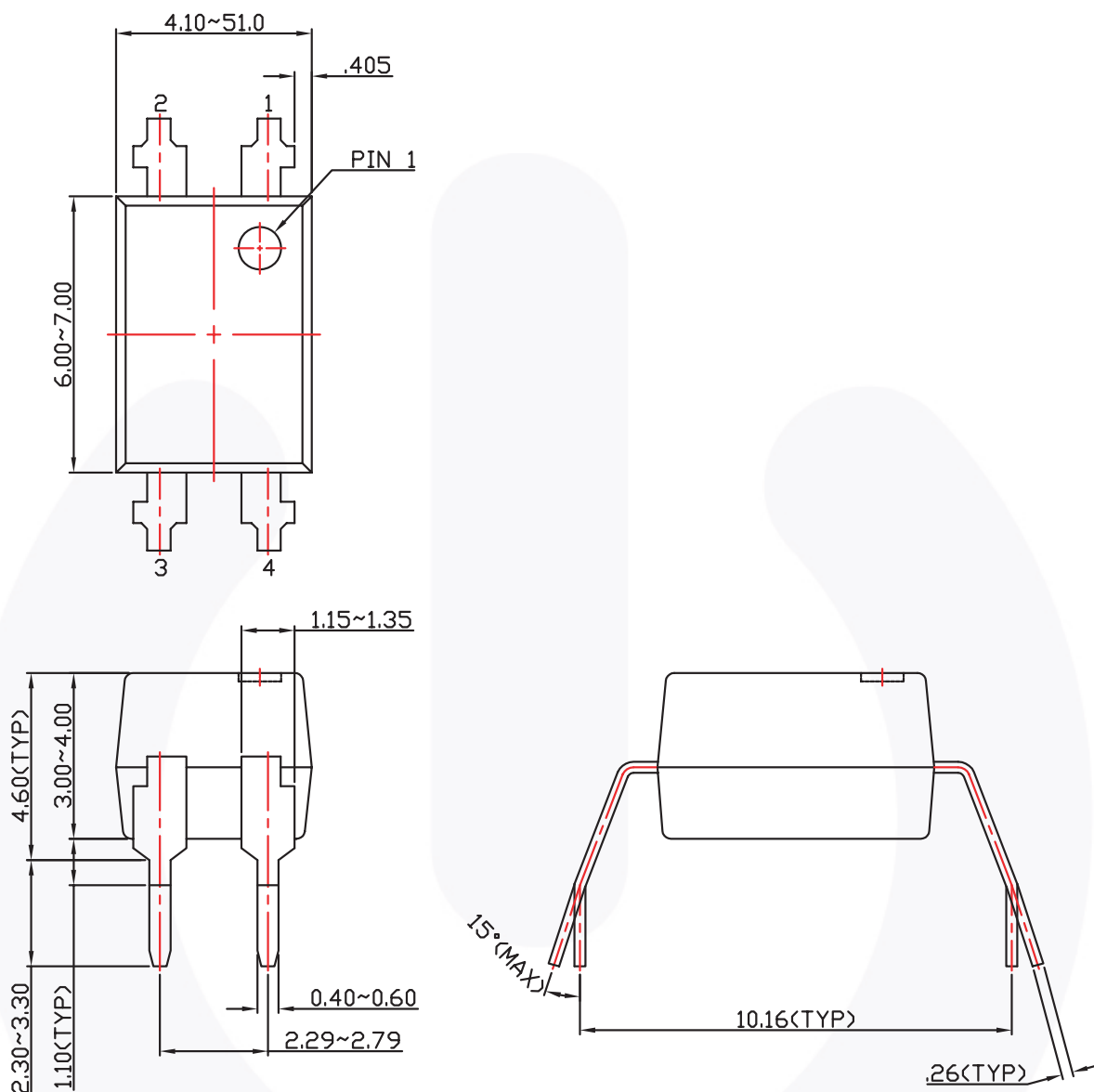
- A) NO STANDARD APPLIES TO THIS PACKAGE.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N04A.

Figure 17. 4-Pin DIP Through Hole

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Package Dimensions (Continued)



NOTES:

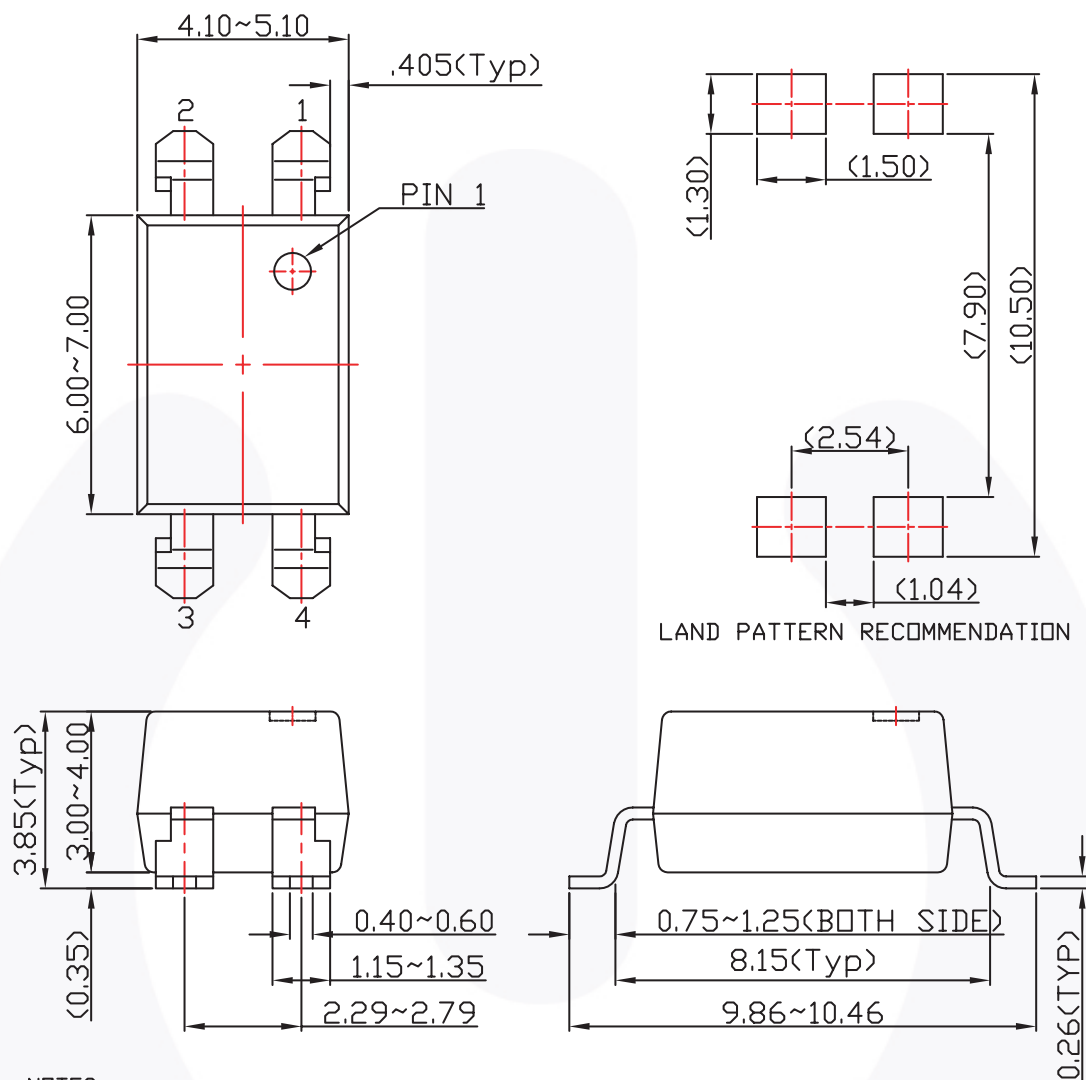
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Figure 18. 4-Pin DIP 0.4" Lead Spacing

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Figure 19. 4-Pin DIP Surface Mount

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Carrier Tape Specifications

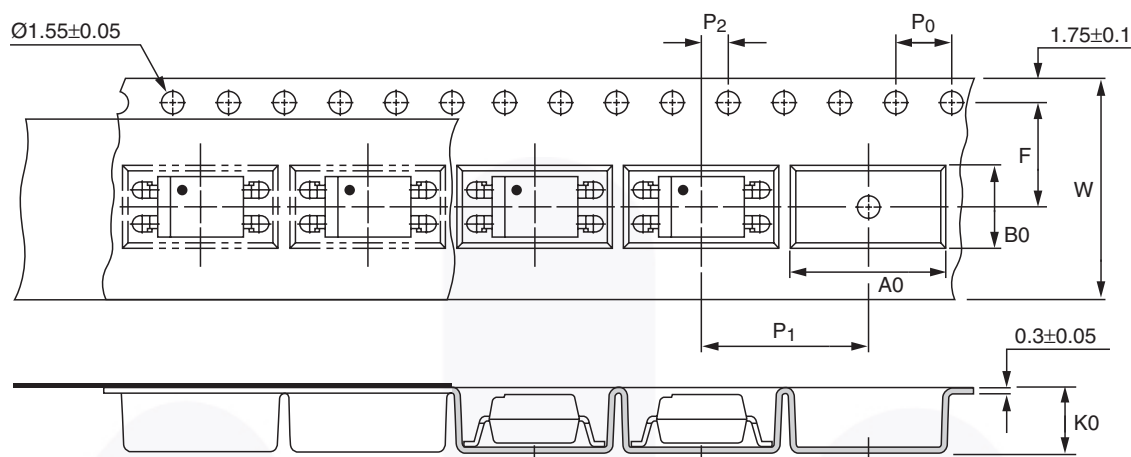


Figure 20. Carrier Tape Specification

Symbol	Description	Dimensions in mm (inches)
W	Tape wide	16 ± 0.3 (0.63)
P_0	Pitch of sprocket holes	4 ± 0.1 (0.15)
F	Distance of compartment	7.5 ± 0.1 (0.295)
P_2		2 ± 0.1 (0.079)
P_1	Distance of compartment to compartment	12 ± 0.1 (0.472)
A0	Compartment	10.45 ± 0.1 (0.411)
B0		5.30 ± 0.1 (0.209)
K0		4.25 ± 0.1 (0.167)



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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.

Rev. 164

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