

# 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<sub>RMS</sub>
- 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

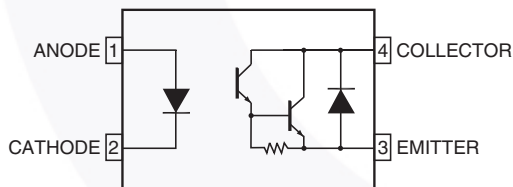


Figure 1. Schematic

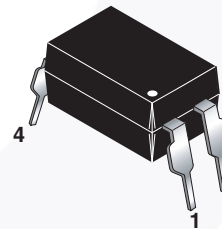


Figure 2. Package Outlines

## 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
<b>Total Device</b>			
$T_{STG}$	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
<b>Input</b>			
$I_F$	Continuous Forward Current	50	mA
$V_R$	Reverse Voltage	6	V
$P_D$	LED Power Dissipation	70	mW
<b>Output</b>			
$V_{CEO}$	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
<b>Input</b>						
$V_F$	Forward Voltage	$I_F = 10\text{ mA}$		1.2	1.4	V
$I_R$	Reverse Current	$V_R = 4\text{ V}$			10	$\mu\text{A}$
$C_t$	Terminal Capacitance	$V = 0, f = 1\text{ kHz}$		30	250	pF
<b>Output</b>						
$I_{CEO}$	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 <sup>(1)</sup>		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	$5 \times 10^{10}$	$1 \times 10^{11}$		$\Omega$
$C_F$	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	$\mu\text{s}$
$t_F$	Response Time (Fall)			20	100	$\mu\text{s}$

### Isolation Characteristics

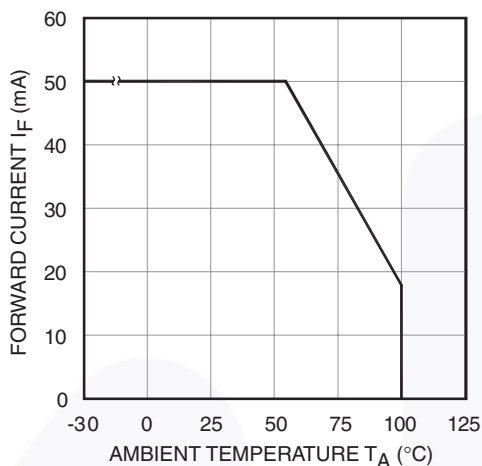
Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
$V_{ISO}$	Input-Output Isolation Voltage	$f = 60\text{ Hz}, t = 1\text{ minute}, I_{I-O} \leq 2\text{ }\mu\text{A}$	5000			$V_{AC(RMS)}$
$R_{ISO}$	Isolation Resistance	$V_{I-O} = 500\text{ V}_{DC}$	$5 \times 10^{10}$	$10^{11}$		$\Omega$
$C_{ISO}$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

#### Note:

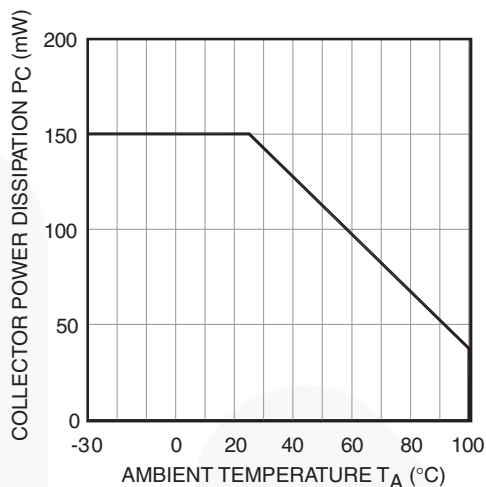
1. Current Transfer Ratio (CTR) =  $I_C / I_F \times 100\%$ .

## Typical Electrical/Optical Characteristic Curves

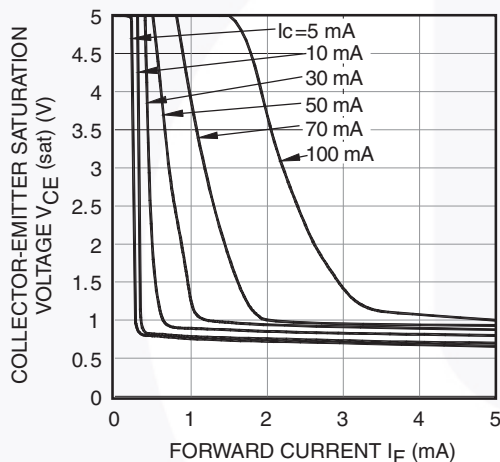
$T_A = 25^\circ\text{C}$  unless otherwise specified.



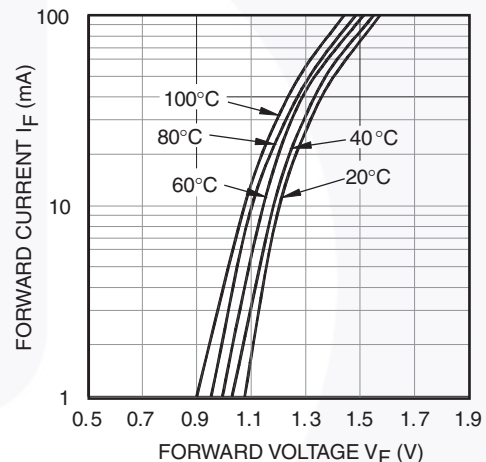
**Figure 3. Forward Current vs. Ambient Temperature**



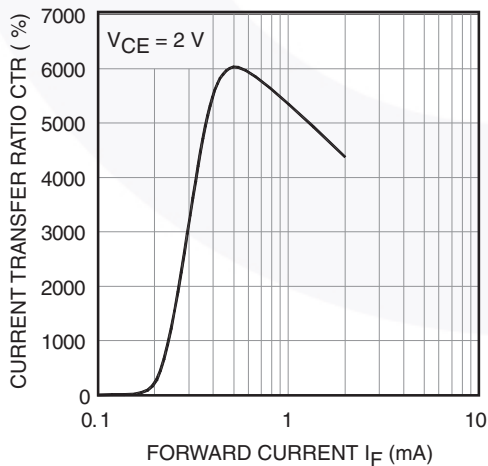
**Figure 4. Collector Power Dissipation vs. Ambient Temperature**



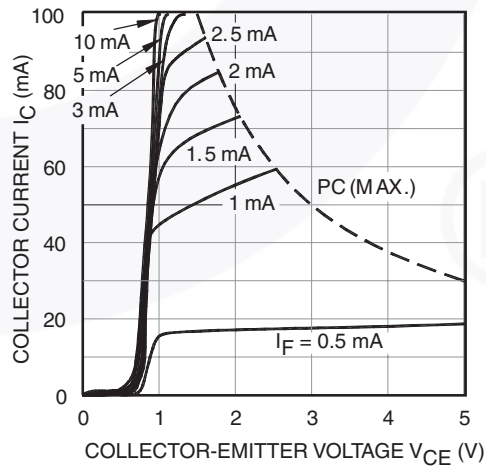
**Figure 5. Collector-Emitter Saturation Voltage vs. Forward Current**



**Figure 6. Forward Current vs. Forward Voltage**



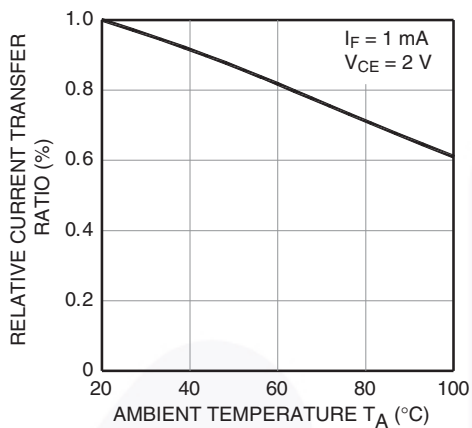
**Figure 7. Current Transfer Ratio vs. Forward Current**



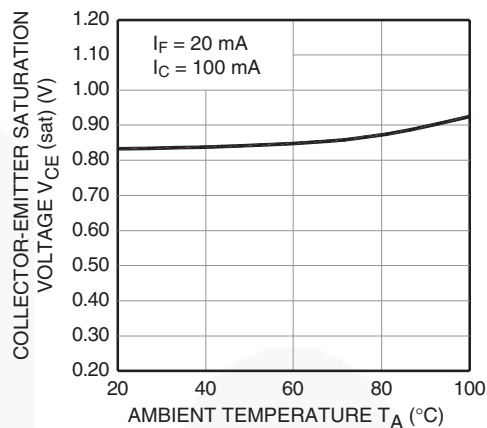
**Figure 8. Collector Current vs. Collector-Emitter Voltage**

### Typical Electrical/Optical Characteristic Curves (Continued)

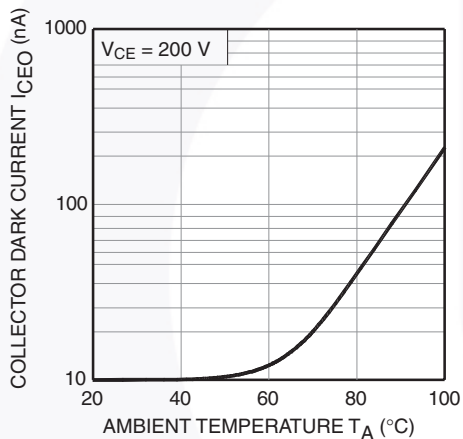
$T_A = 25^\circ\text{C}$  unless otherwise specified.



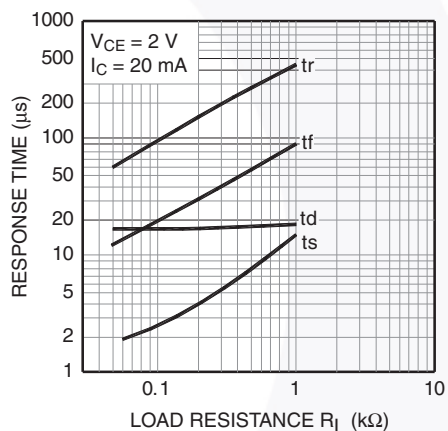
**Figure 9. Relative Current Transfer Ratio vs. Ambient Temperature**



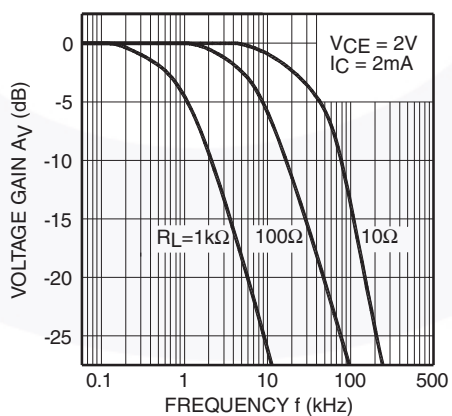
**Figure 10. Collector-Emitter Saturation Voltage vs. Ambient Temperature**



**Figure 11. Collector Dark Current vs. Ambient Temperature**

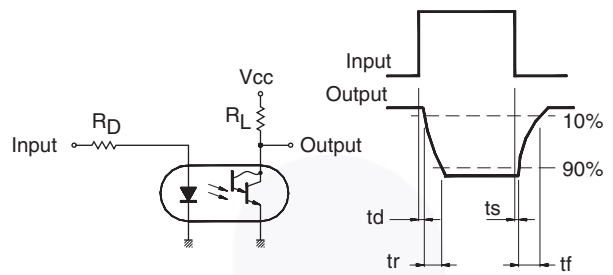


**Figure 12. Response Time vs. Load Resistance**

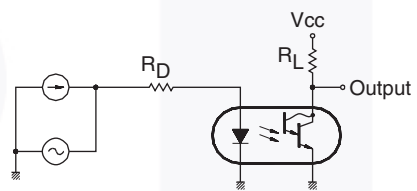


**Figure 13. Frequency Response**

**Test Circuits**



**Figure 14. Test Circuit for Response Time**



**Figure 15. Test Circuit for Frequency Response**



### Lead Free Recommended IR Reflow Condition

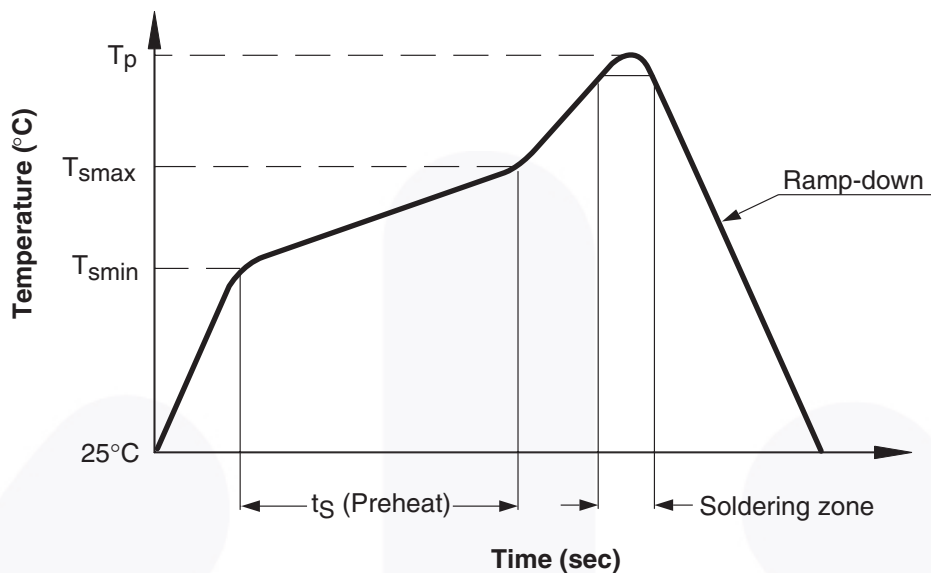


Figure 16. Reflow Profile

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

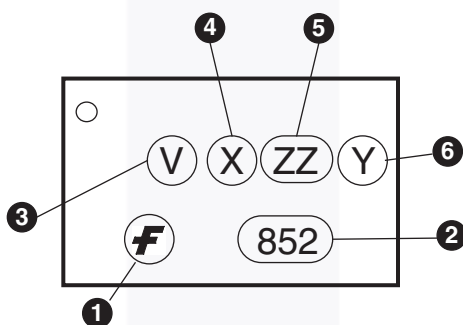
### Recommended Wave Soldering Condition

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



### Carrier Tape Specifications

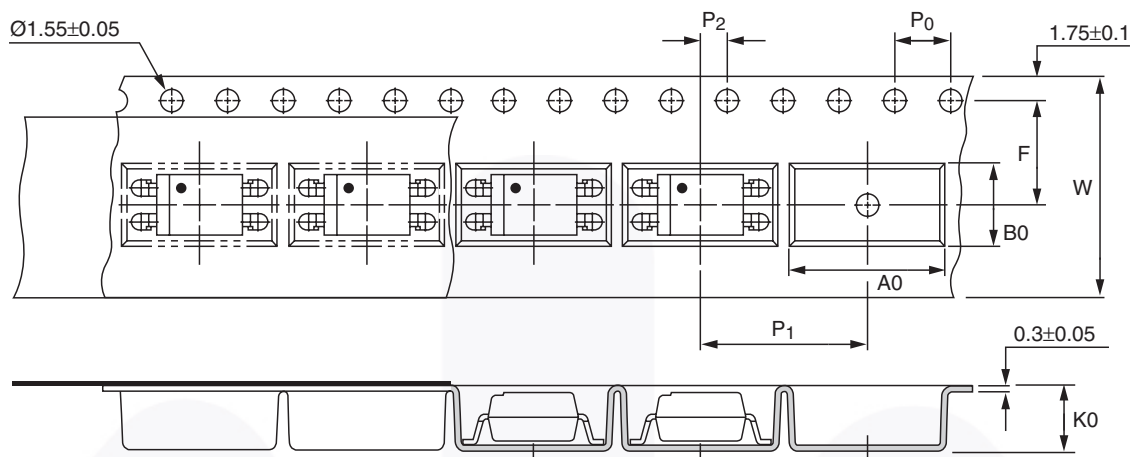
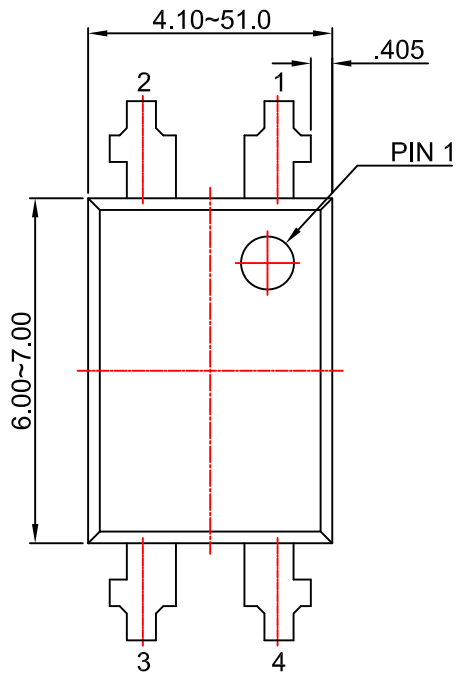


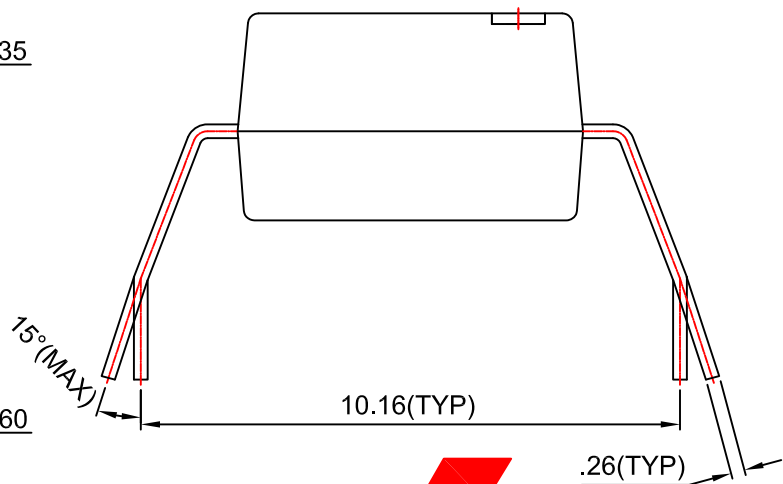
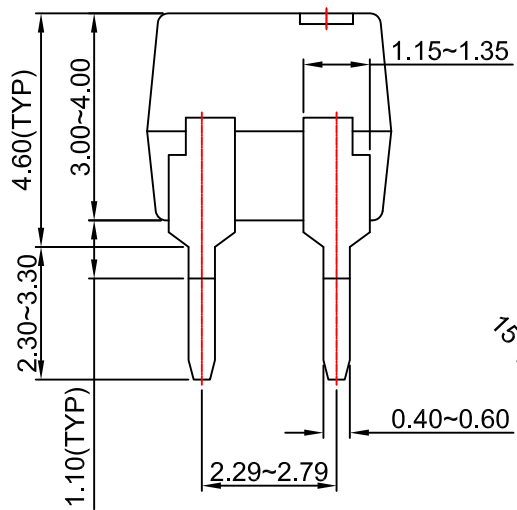
Figure 20. Carrier Tape Specification

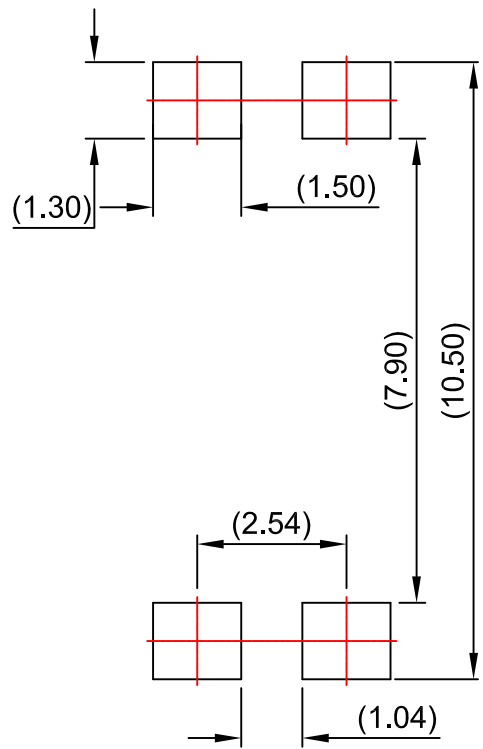
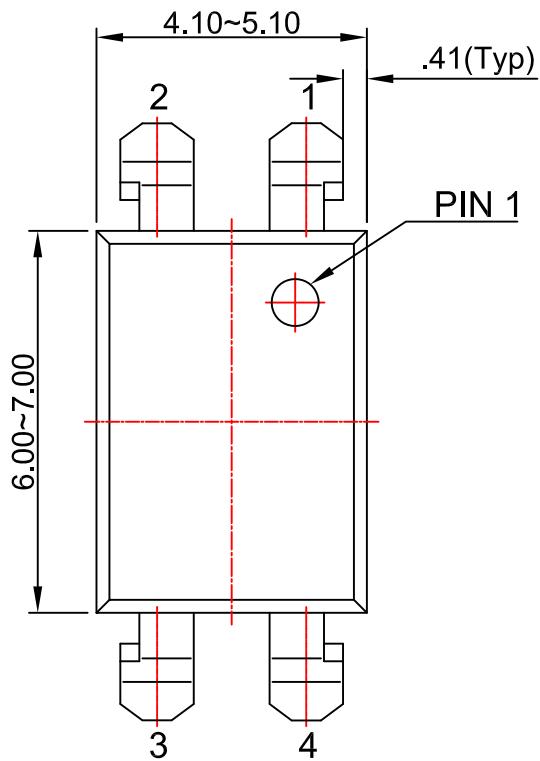
Symbol	Description	Dimensions in mm (inches)
W	Tape wide	$16 \pm 0.3$ (0.63)
$P_0$	Pitch of sprocket holes	$4 \pm 0.1$ (0.15)
F	Distance of compartment	$7.5 \pm 0.1$ (0.295)
$P_2$		$2 \pm 0.1$ (0.079)
$P_1$	Distance of compartment to compartment	$12 \pm 0.1$ (0.472)
$A_0$	Compartment	$10.45 \pm 0.1$ (0.411)
$B_0$		$5.30 \pm 0.1$ (0.209)
$K_0$		$4.25 \pm 0.1$ (0.167)



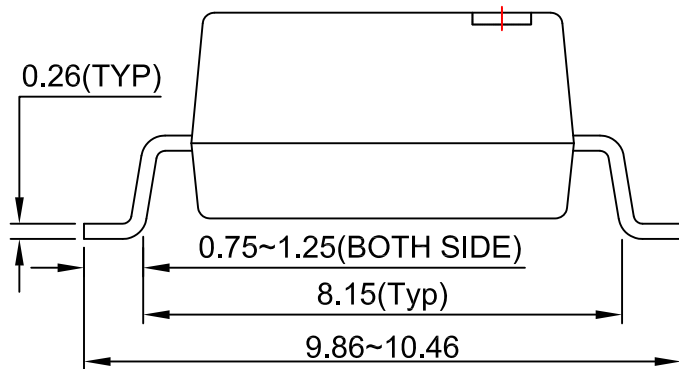
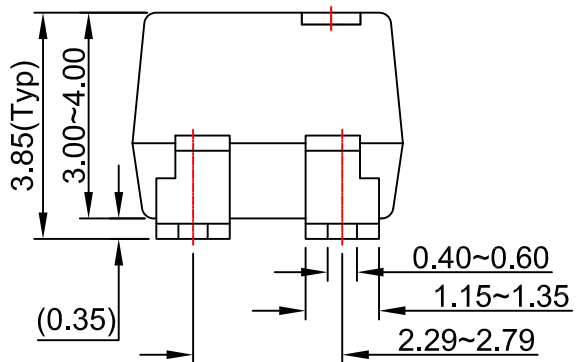
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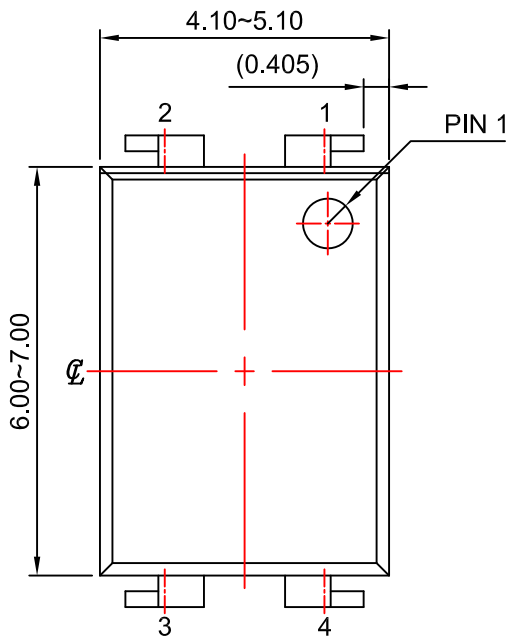
LAND PATTERN RECOMMENDATION



NOTES:

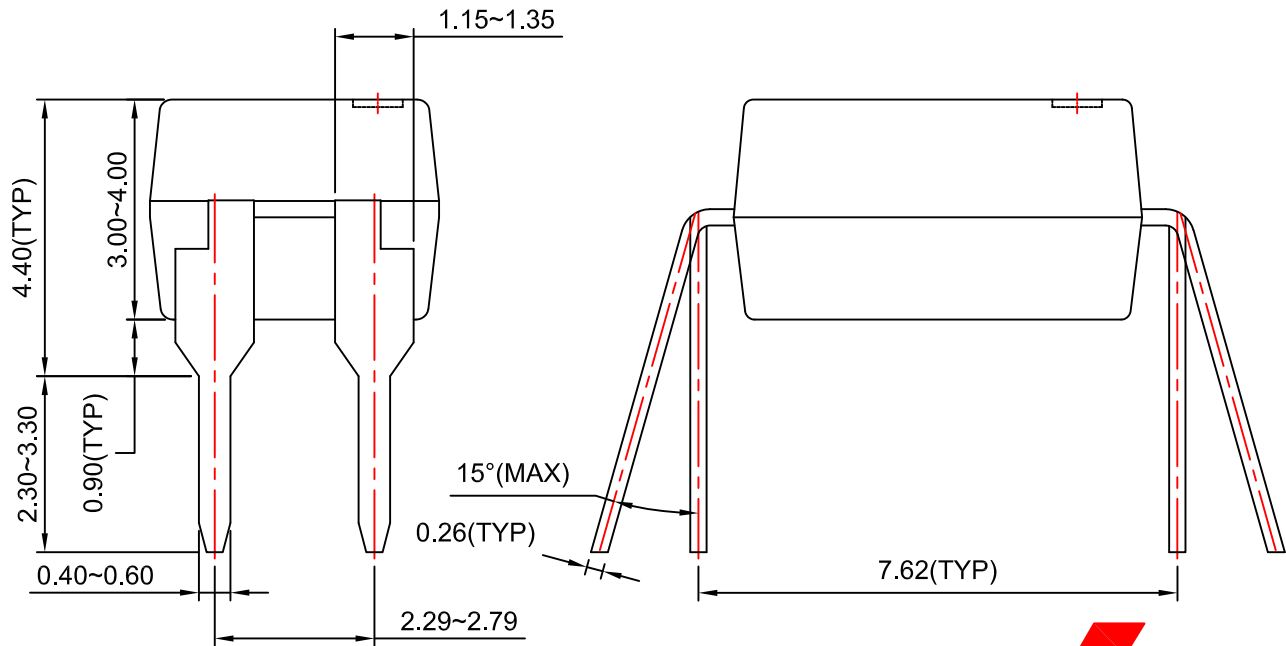
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	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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