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May 2017

FOD852

4-Pin DIP Photodarlington Output Optocoupler

Features

- High Current Transfer Ratio: 1000% Minimum
- Safety and Regulatory Approvals
 - UL1577, 5,000 VAC_{RMS} for 1 Minute
 - DIN EN/IEC60747-5-5

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

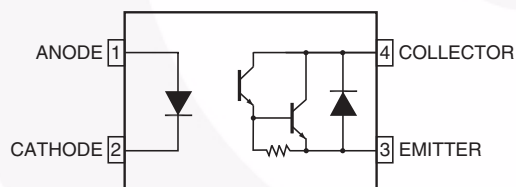


Figure 1. Schematic

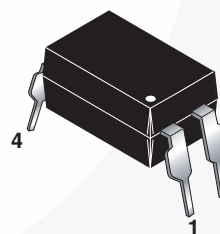


Figure 2. Package Outlines

Safety and Insulation Ratings

As per DIN EN/IEC 60747-5-5, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Parameter		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	< 150 V _{RMS}	I–IV
	< 300 V _{RMS}	I–III
Climatic Classification		30/110/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V _{PR}	Input-to-Output Test Voltage, Method A, V _{IORM} × 1.6 = V _{PR} , Type and Sample Test with t _m = 10 s, Partial Discharge < 5 pC	1360	V _{peak}
	Input-to-Output Test Voltage, Method B, V _{IORM} × 1.875 = V _{PR} , 100% Production Test with t _m = 1 s, Partial Discharge < 5 pC	1560	V _{peak}
V _{IORM}	Maximum Working Insulation Voltage	850	V _{peak}
V _{IOTM}	Highest Allowable Over-Voltage	6000	V _{peak}
	External Creepage	≥ 7	mm
	External Clearance	≥ 7	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T _S	Case Temperature ⁽¹⁾	175	°C
I _{S,INPUT}	Input Current ⁽¹⁾	400	mA
P _{S,OUTPUT}	Output Power ⁽¹⁾	700	mW
R _{IO}	Insulation Resistance at T _S , V _{IO} = 500 V ⁽¹⁾	> 10 ¹¹	Ω

Note:

1. Safety limit values – maximum values allowed in the event of a failure.

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_J	Junction Temperature	-55 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 ⁽²⁾		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
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	$V_{I-O} = 500\text{ V}_{DC}$		10^{12}		Ω
C_{ISO}	Isolation Capacitance	$V_{I-O} = 0, f = 1\text{ MHz}$		0.6	1.0	pf

Note:

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

Typical Electrical/Optical Characteristic Curves

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

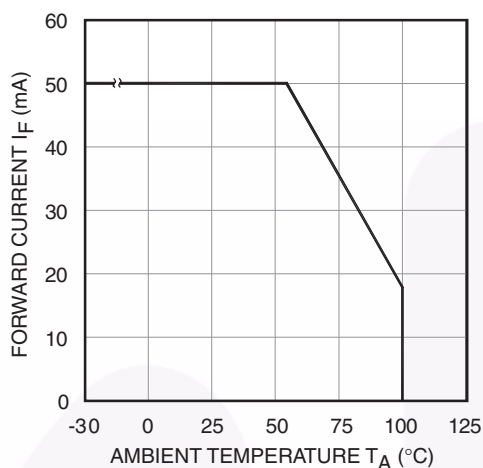


Figure 3. Forward Current vs. Ambient Temperature

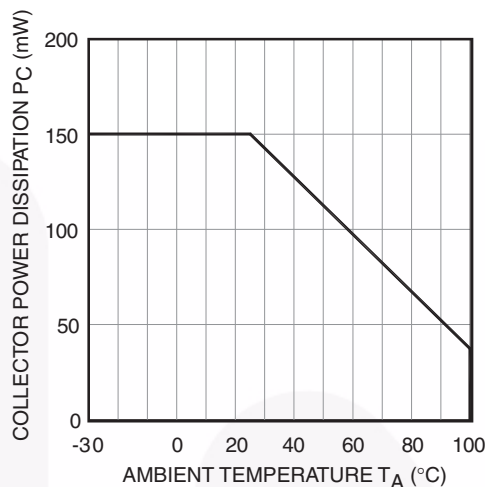


Figure 4. Collector Power Dissipation vs. Ambient Temperature

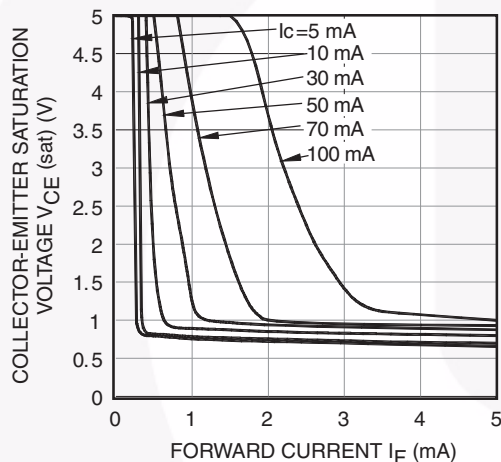


Figure 5. Collector-Emitter Saturation Voltage vs. Forward Current

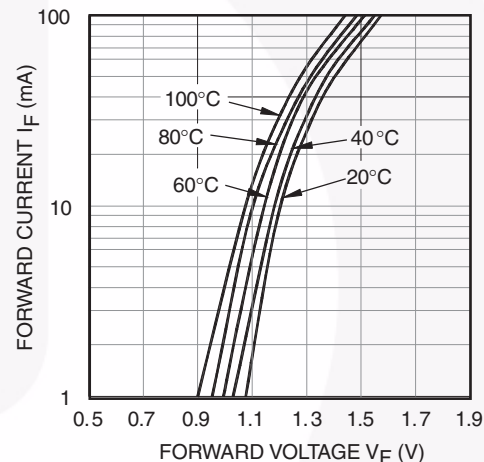


Figure 6. Forward Current vs. Forward Voltage

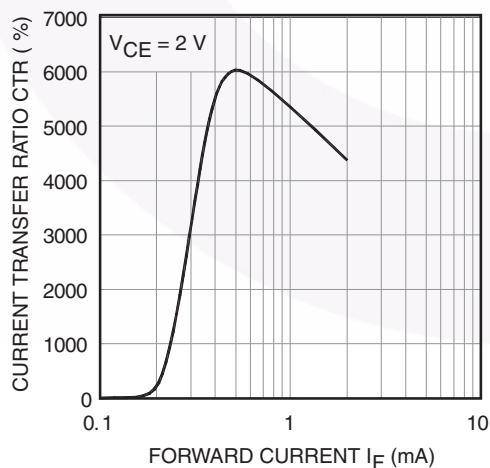


Figure 7. Current Transfer Ratio vs. Forward Current

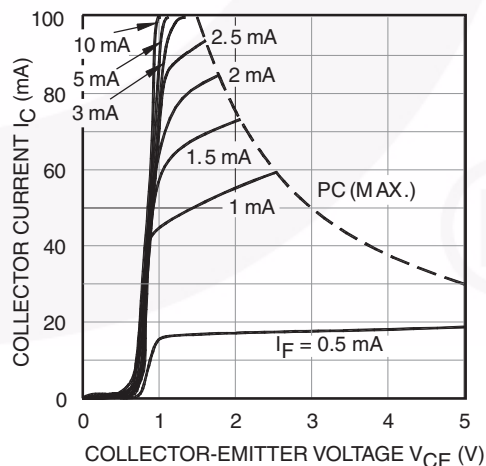
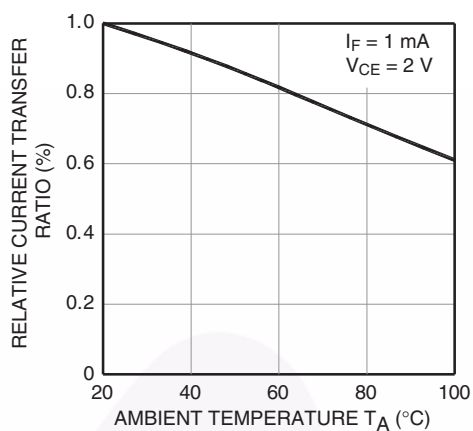
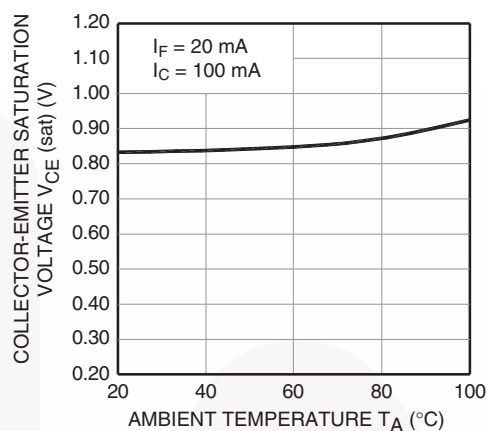
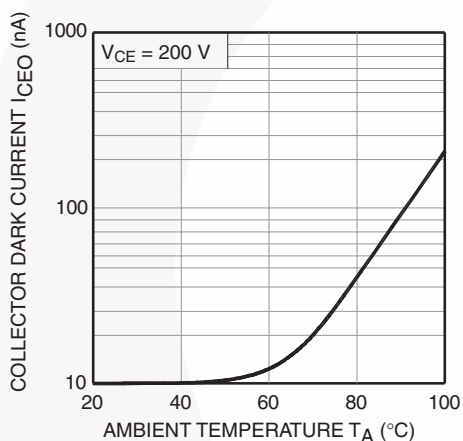
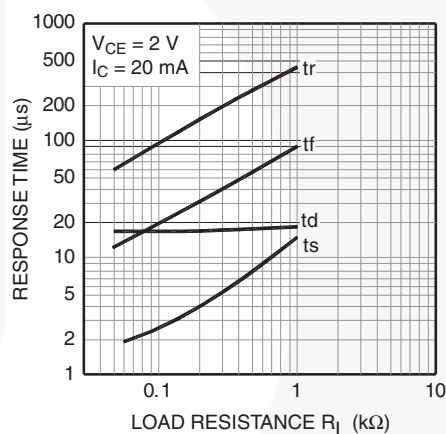
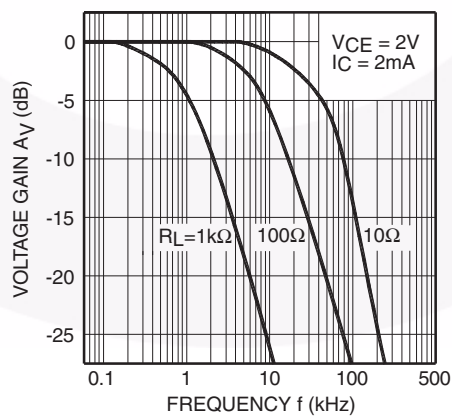


Figure 8. Collector Current vs. Collector-Emitter Voltage

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

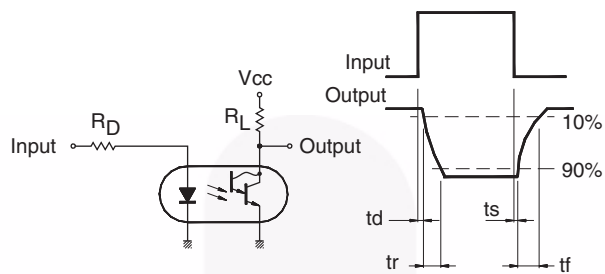


Figure 14. Test Circuit for Response Time

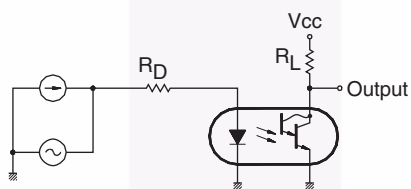
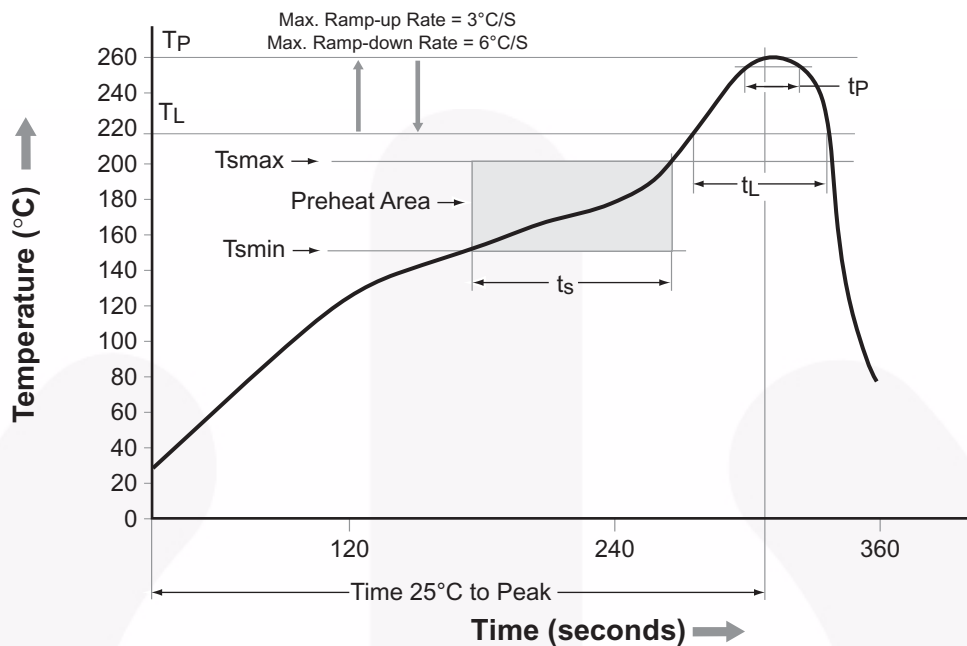


Figure 15. Test Circuit for Frequency Response

Reflow Profile



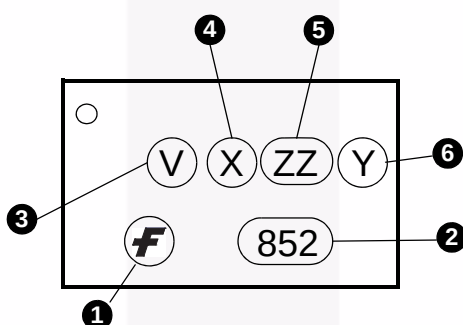
Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	150°C
Temperature Max. (T _{smax})	200°C
Time (t _s) from (T _{smin} to T _{smax})	60–120 seconds
Ramp-up Rate (t _L to t _P)	3°C/second max.
Liquidous Temperature (T _L)	217°C
Time (t _L) Maintained Above (T _L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t _P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T _P to T _L)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Figure 16. Reflow Profile

Ordering Information

Part Number	Package	Packing Method
FOD852	DIP 4-Pin	Tube (100 units per tube)
FOD852S	SMT 4-Pin (Lead Bend)	Tube (100 units per tube)
FOD852SD	SMT 4-Pin (Lead Bend)	Tape and Reel (1,000 units per reel)
FOD852300	DIP 4-Pin, DIN EN/IEC60747-5-5 option	Tube (100 units per tube)
FOD8523S	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-5 option	Tube (100 units per tube)
FOD8523SD	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-5 option	Tape and Reel (1,000 units per reel)
FOD852300W	DIP 4-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 option	Tube (100 units per tube)

Marking Information



Definitions

1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on parts ordered with this option)
4	One-Digit Year Code, e.g., '5'
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

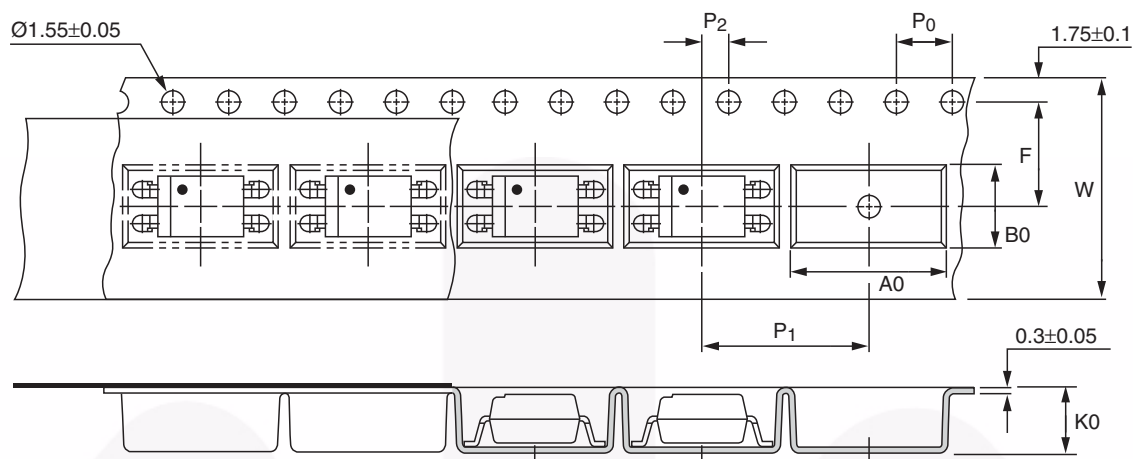
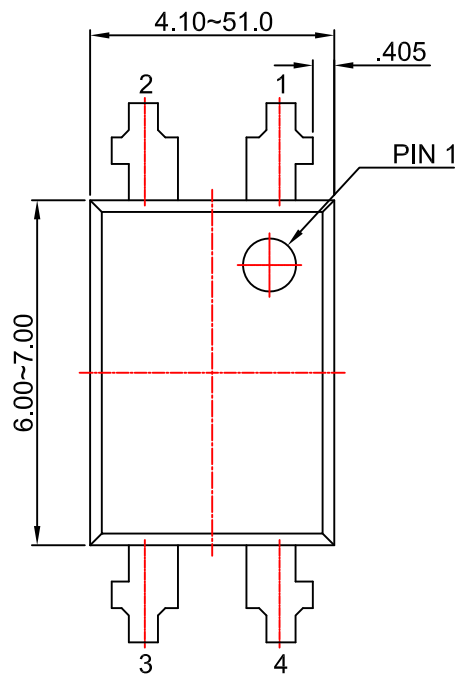


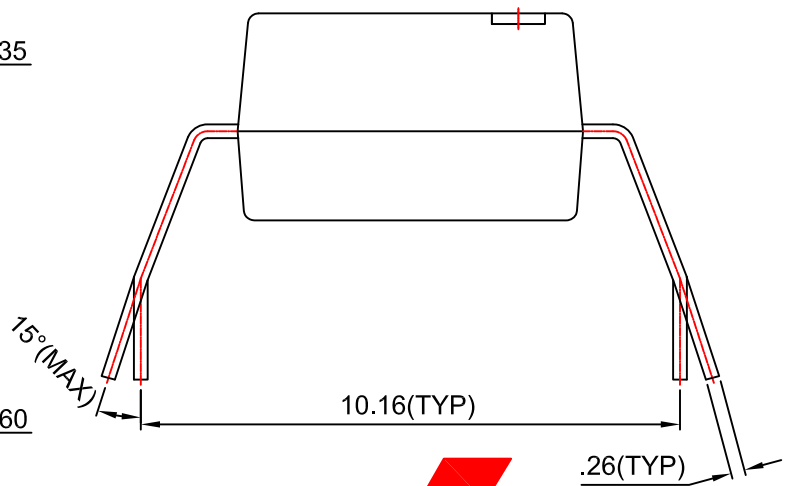
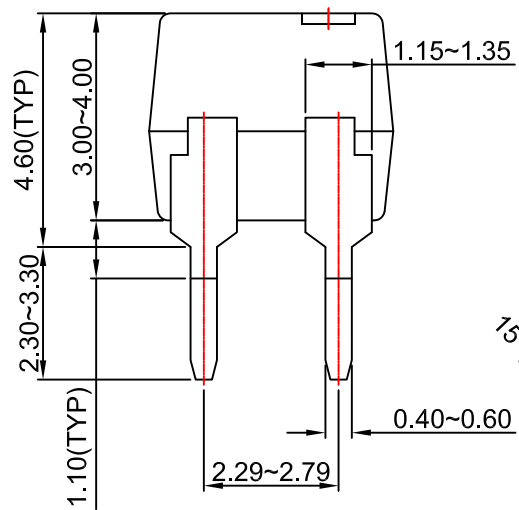
Figure 17. Carrier Tape Specification

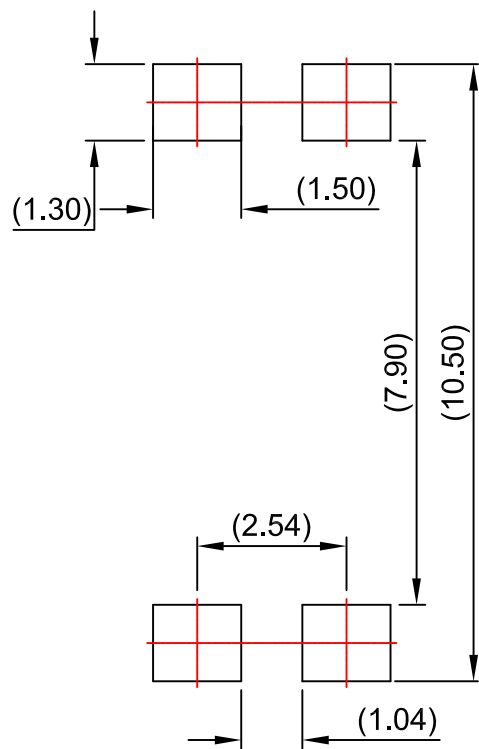
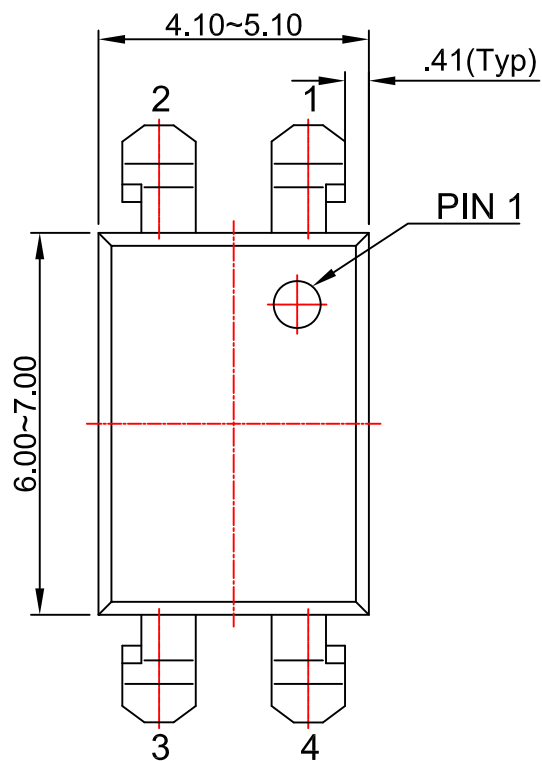
Symbol	Description	Dimensions in mm (inches)
W	Tape wide	16 ± 0.3 (0.63)
P ₀	Pitch of sprocket holes	4 ± 0.1 (0.15)
F	Distance of compartment	7.5 ± 0.1 (0.295)
P ₂		2 ± 0.1 (0.079)
P ₁	Distance of compartment to compartment	12 ± 0.1 (0.472)
A0	Compartment	10.45 ± 0.1 (0.411)
B0		5.30 ± 0.1 (0.209)
K0		4.25 ± 0.1 (0.167)



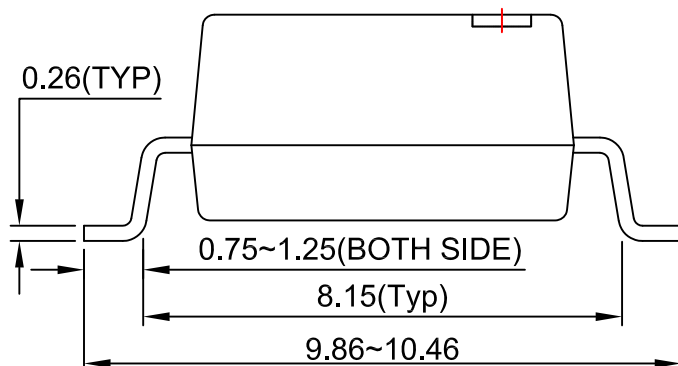
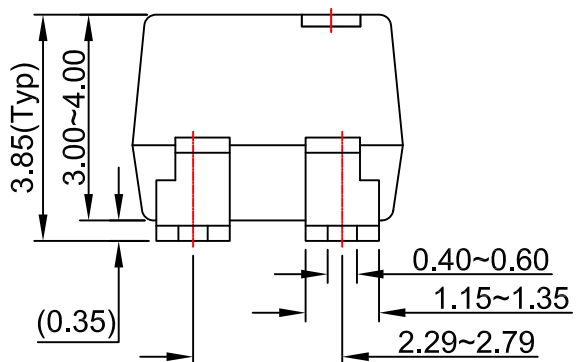
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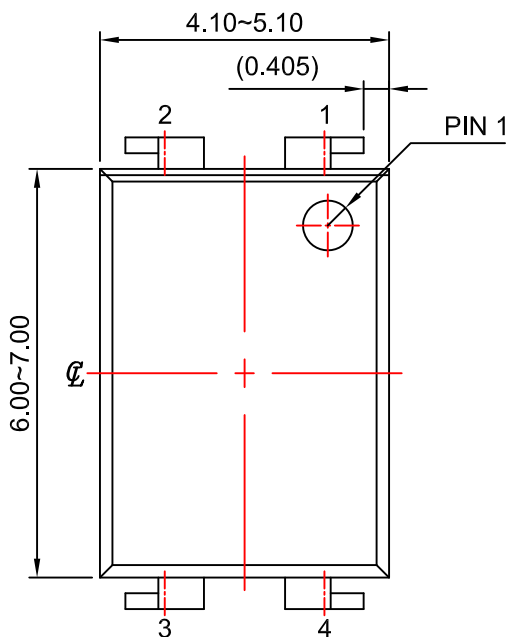
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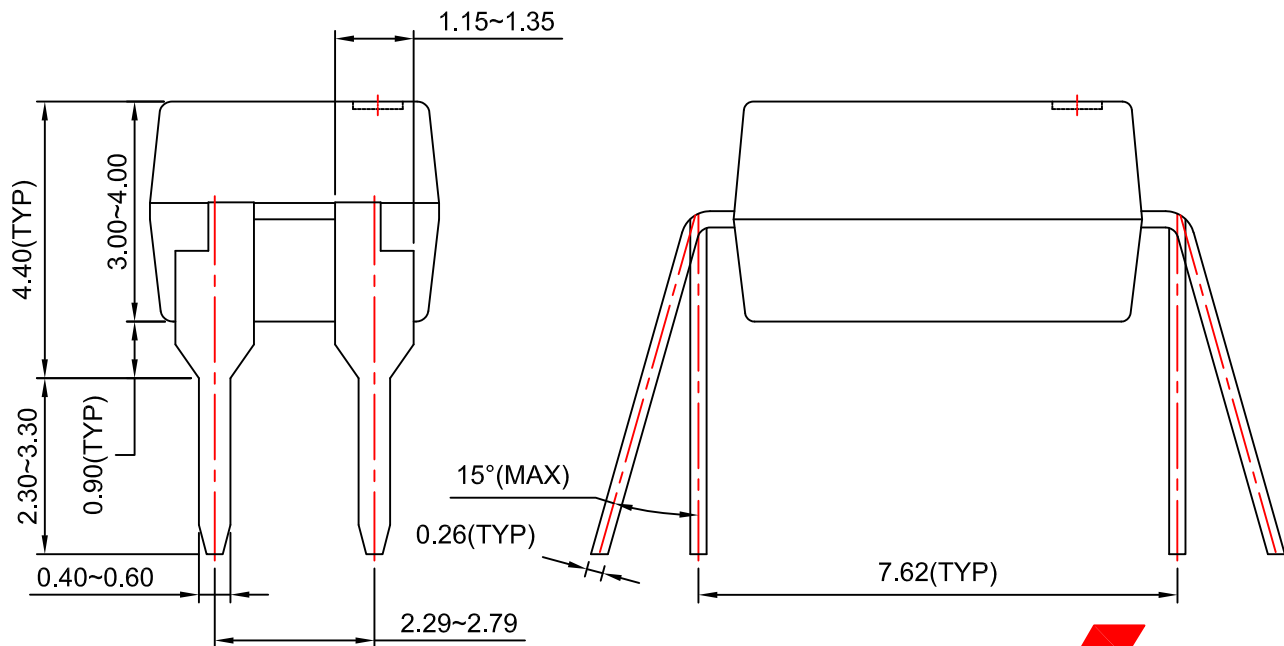
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