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November 2015

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

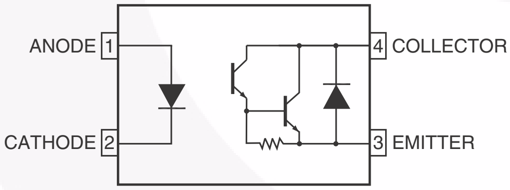


Figure 1. Schematic

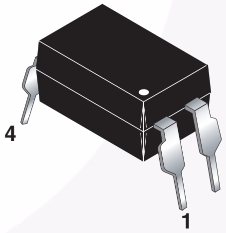


Figure 2. Package Outlines

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} x 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} x 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°C Unless otherwise specified.

Symbol	Parameter	Value	Units
Total Device			
T_{STG}	Storage Temperature	-55 to +125	°C
T_{OPR}	Operating Temperature	-30 to +100	°C
T_J	Junction Temperature	-55 to +100	°C
T_{SOL}	Lead Solder Temperature	260 for 10 seconds	°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°C unless otherwise specified.

Individual Component Characteristics

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

Transfer Characteristics

Symbol	DC Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
I_C	Collector Current	I_F = 1 mA, V_{CE} = 2 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 mA, I_C = 100 mA			1.2	V
f_C	Cut-Off Frequency	V_{CE} = 2 V, I_C = 20 mA, R_L = 100 Ω, -3 dB	1	7		kHz
t_R	Response Time (Rise)	V_{CE} = 2 V, I_C = 20 mA, R_L = 100 Ω		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 Hz, t = 1 minute, $I_{I-O} \leq 2$ µA	5000			VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V_{DC}		10^{12}		Ω
C_{ISO}	Isolation Capacitance	V_{I-O} = 0, f = 1 MHz		0.6	1.0	pf

Note:

2. Current Transfer Ratio (CTR) = I_C / I_F x 100%.

Typical Electrical/Optical Characteristic Curves

T_A = 25°C unless otherwise specified.

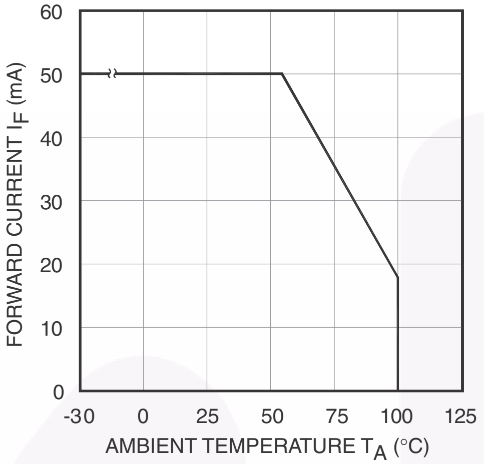


Figure 3. Forward Current vs. Ambient Temperature

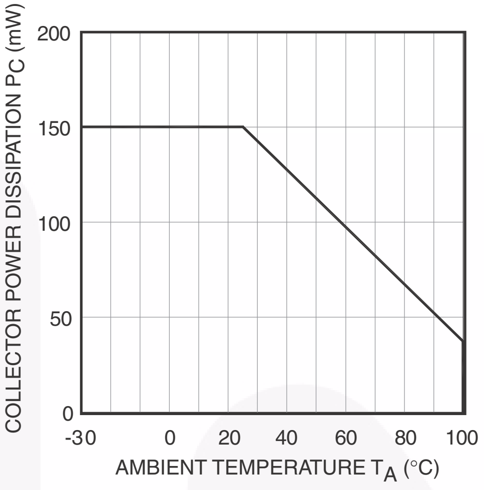


Figure 4. Collector Power Dissipation vs. Ambient Temperature

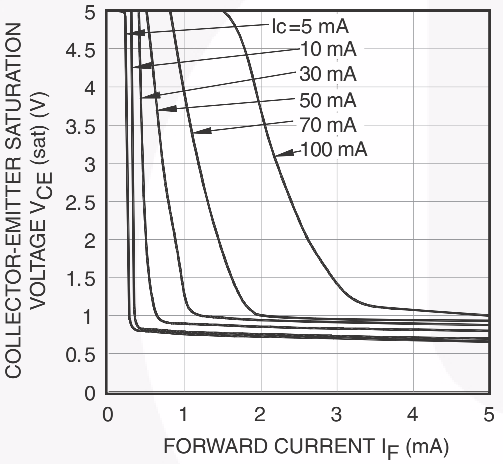


Figure 5. Collector-Emitted Saturation Voltage vs. Forward Current

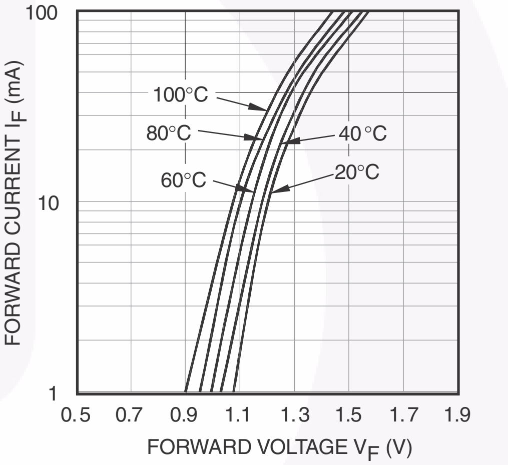


Figure 6. Forward Current vs. Forward Voltage

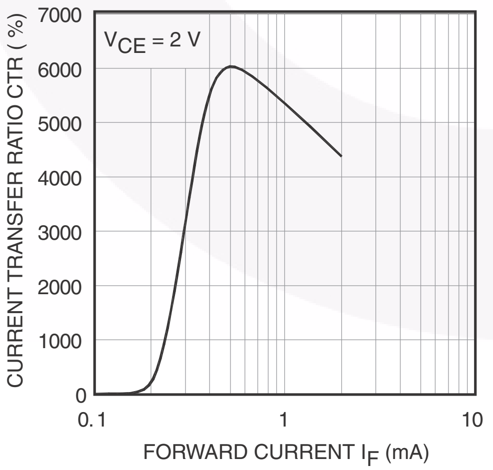


Figure 7. Current Transfer Ratio vs. Forward Current

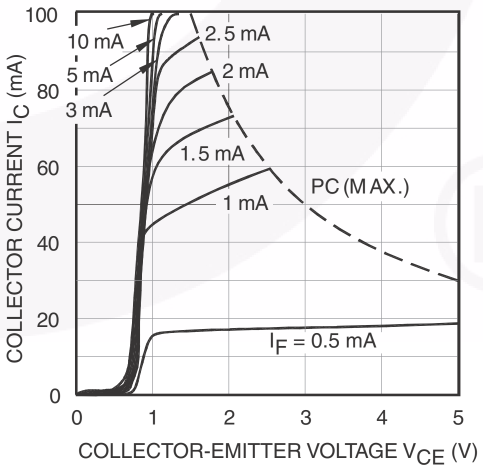


Figure 8. Collector Current vs. Collector-Emitter Voltage

Typical Electrical/Optical Characteristic Curves (Continued)

T_A = 25°C unless otherwise specified.

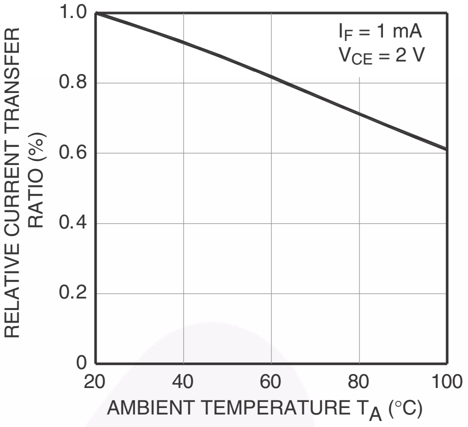


Figure 9. Relative Current Transfer Ratio vs. Ambient Temperature

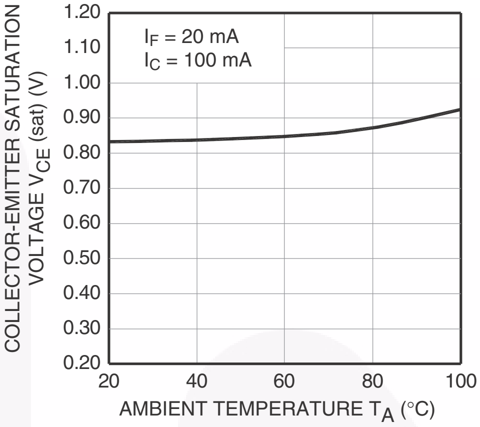


Figure 10. Collector-Emitter Saturation Voltage vs. Ambient Temperature

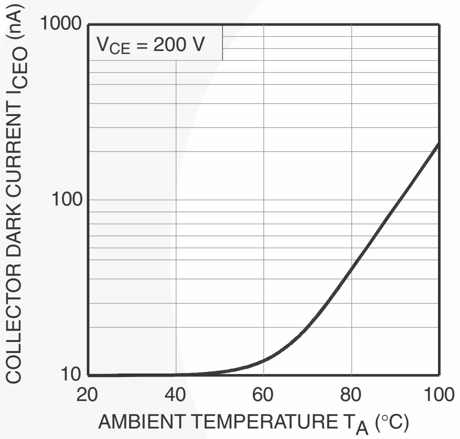


Figure 11. Collector Dark Current vs. Ambient Temperature

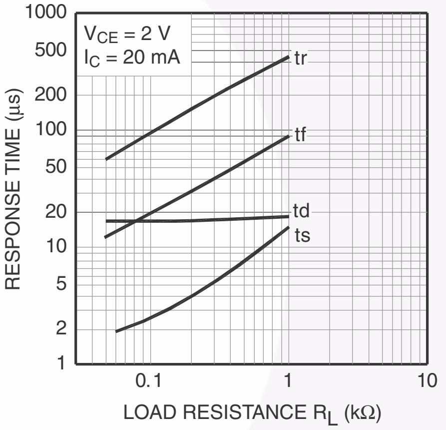


Figure 12. Response Time vs. Load Resistance

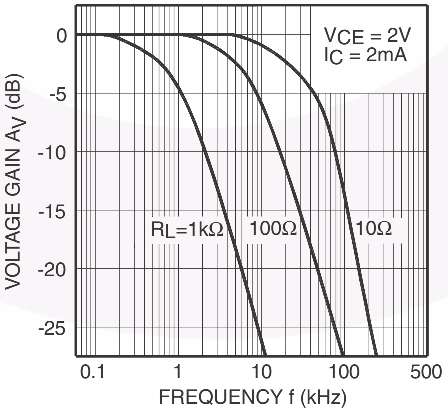


Figure 13. Frequency Response

Test Circuits

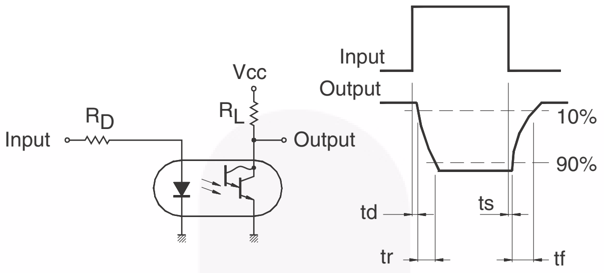


Figure 14. Test Circuit for Response Time

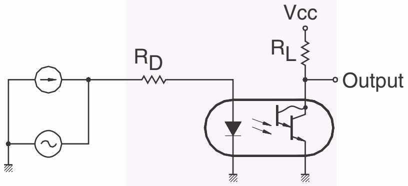
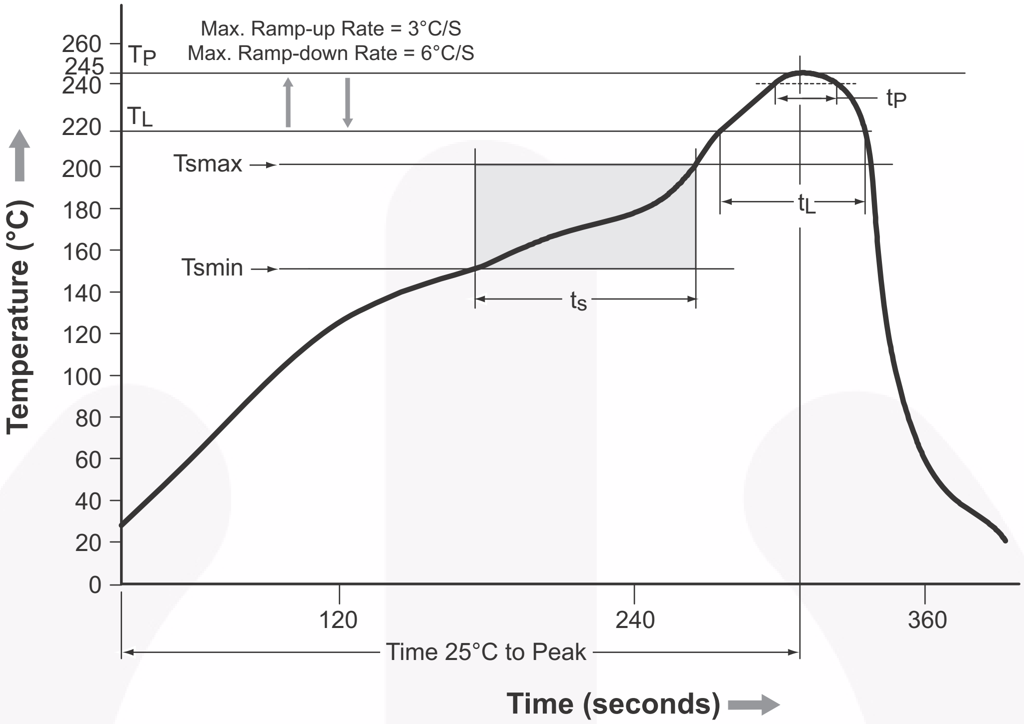


Figure 15. Test Circuit for Frequency Response

Reflow Profile



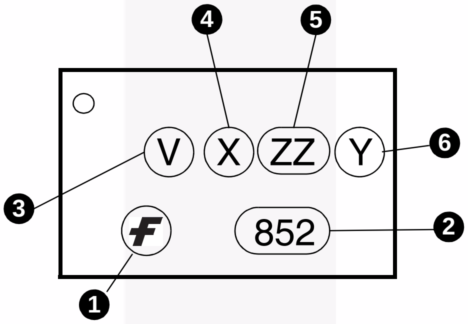
Profile Freature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60–120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	245°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

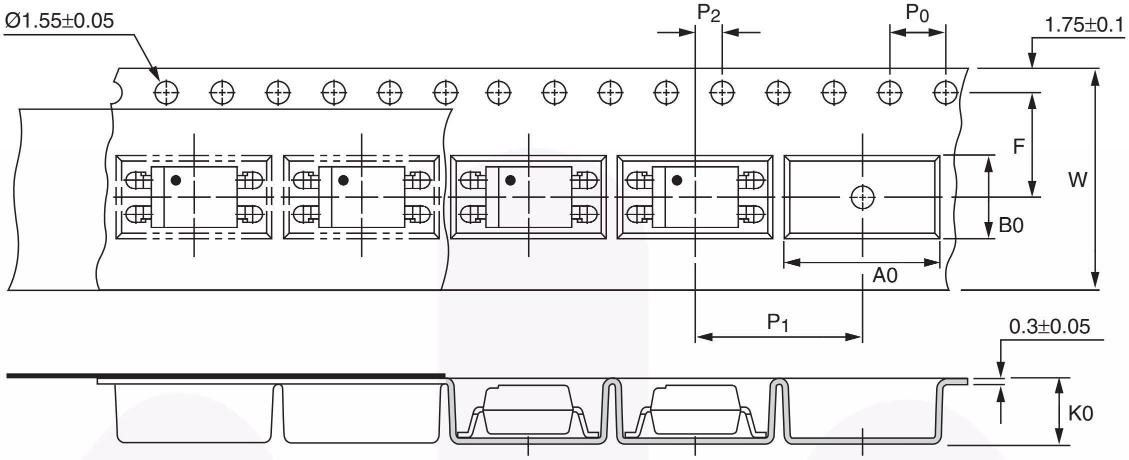
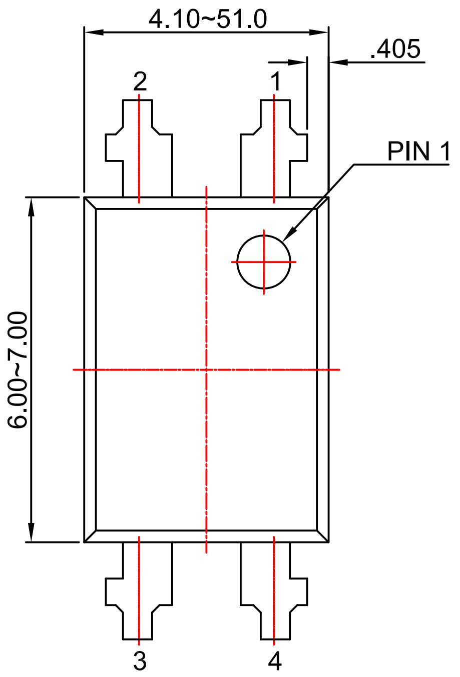


Figure 17. Carrier Tape Specification

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 P_2	Distance of compartment	7.5 ± 0.1 (0.295) 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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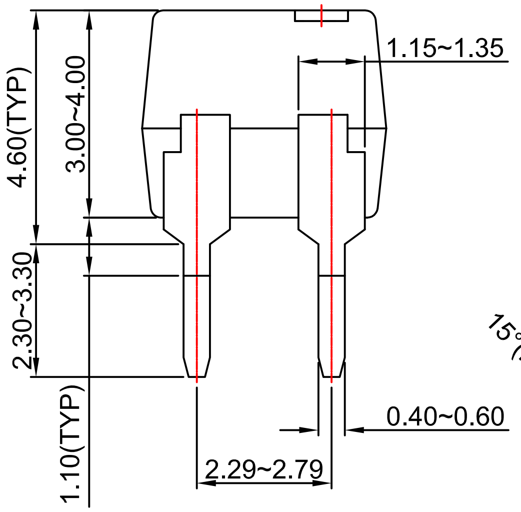

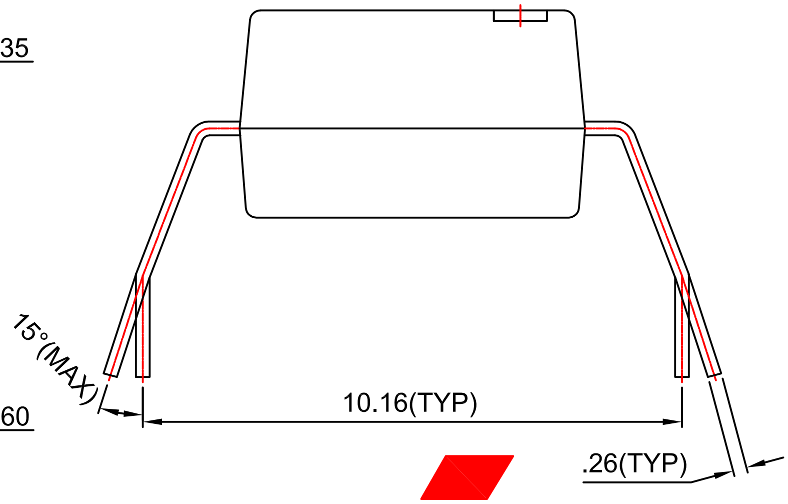

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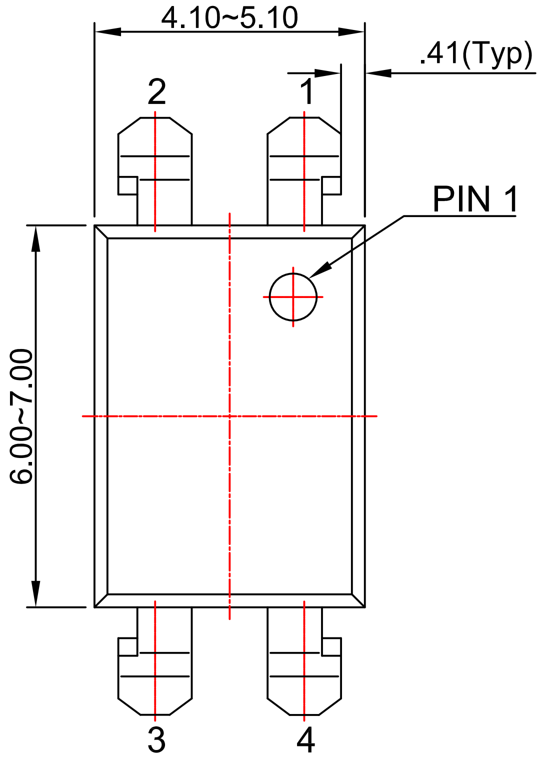

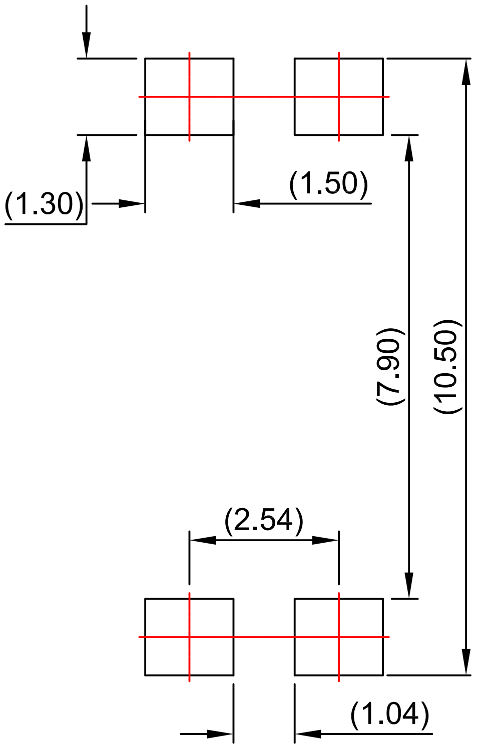

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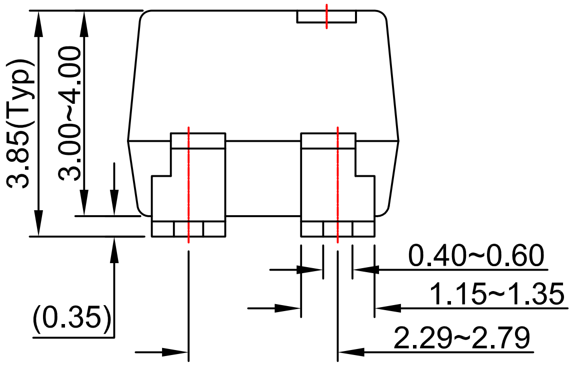

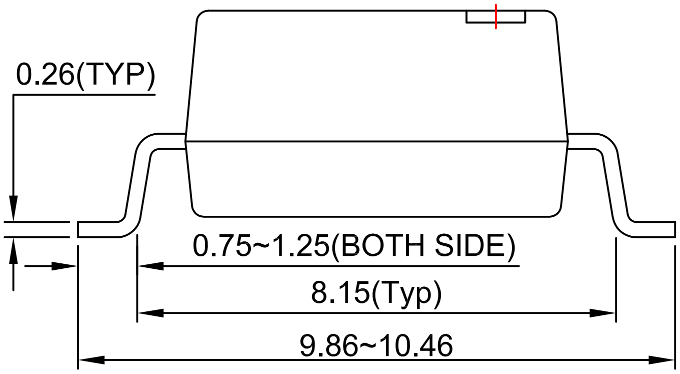

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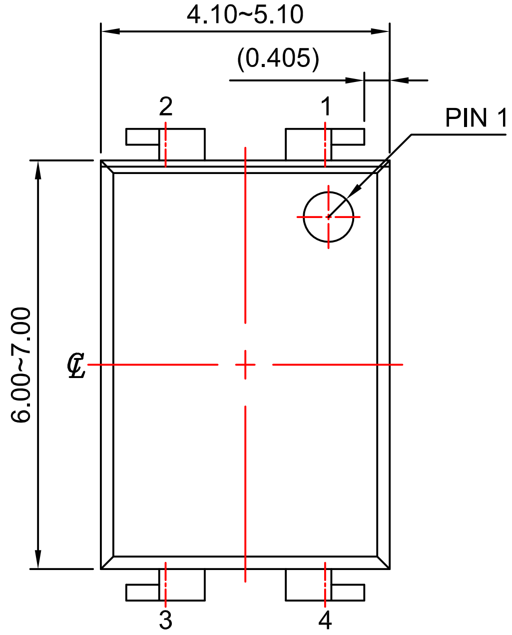

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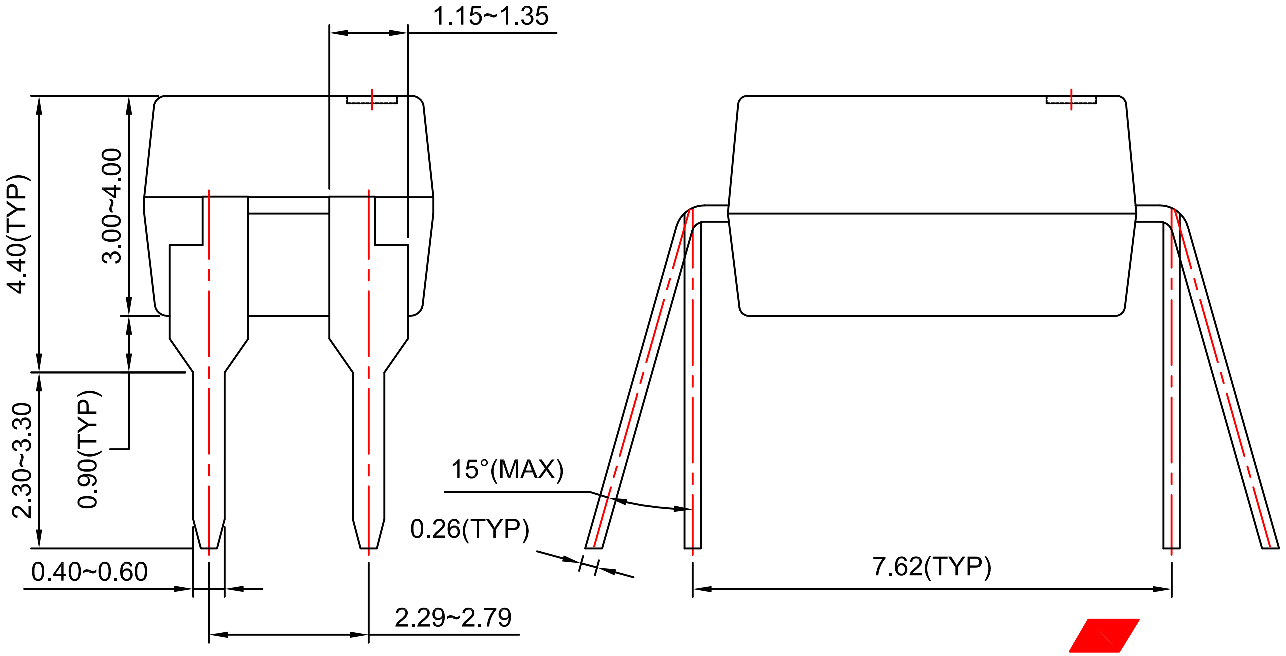

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