

4-Pin DIP Photodarlington Output Optocoupler

FOD852

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.

Features

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

Applications

- Power Supply Regulators
- Digital Logic Inputs
- Microprocessor Inputs

Functional Block Diagram

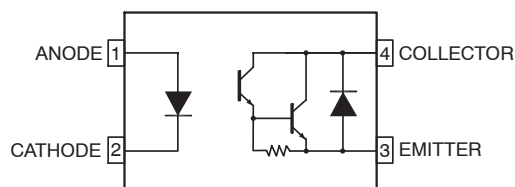
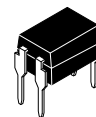
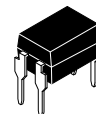


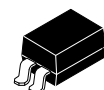
Figure 1. Schematic



PDIP4 4.6x6.5, 2.54P
CASE 646CA

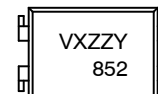


PDIP4 4.6x6.5, 2.54P
CASE 646CD



PDIP4 4.60x6.50x3.85, 2.54P
CASE 709AH

MARKING DIAGRAM



- V = DIN EN/IEC60747-5-5 Option (only appears on parts ordered with this option)
 X = One Digit Year Code
 ZZ = Two Digit Work Week
 Y = Assembly Package Code
 852 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

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 (Note 1)	175	°C
I _{S, INPUT}	Input Current (Note 1)	400	mA
P _{S, OUTPUT}	Output Power (Note 1)	700	mW
R _{IO}	Insulation Resistance at T _S , V _{IO} = 500 V (Note 1)	>10 ¹¹	Ω

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

MAXIMUM RATINGS (T_A = 25 °C unless otherwise noted)

Symbol	Rating	Value	Unit
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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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS(T_A = 25 °C unless otherwise noted)**INDIVIDUAL COMPONENT CHARACTERISTICS**

Symbol	Parameter	Test Condition	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, 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 Characteristics	Test Condition	Min	Typ	Max	Unit
I _C	Collector Current	I _F = 1 mA, V _{CE} = 2 V	10	40	150	mA
CTR	Current Transfer Ratio (Note 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

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

Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
V _{ISO}	Input-Output Isolation Voltage	f = 60 Hz, t = 1 minute, I _{I-O} ≤ 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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

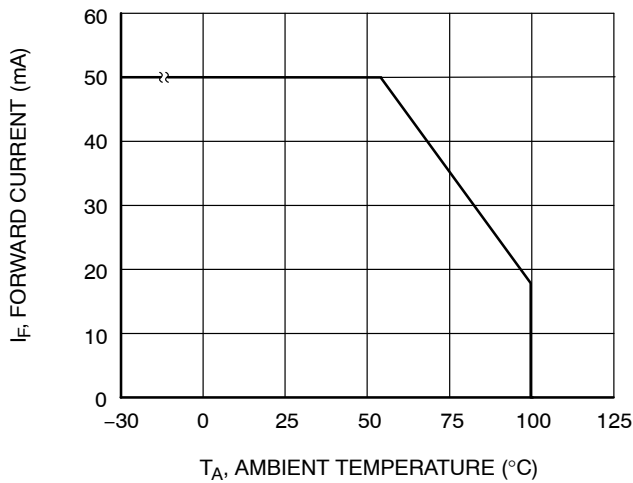
TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Figure 2. Forward Current vs. Ambient Temperature

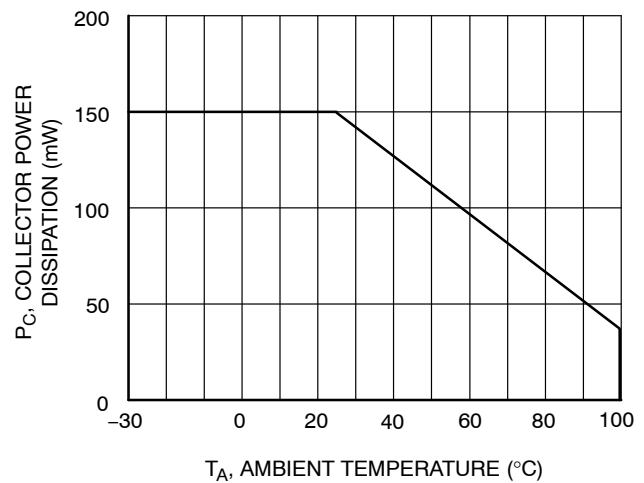


Figure 3. Collector Power Dissipation vs. Ambient Temperature

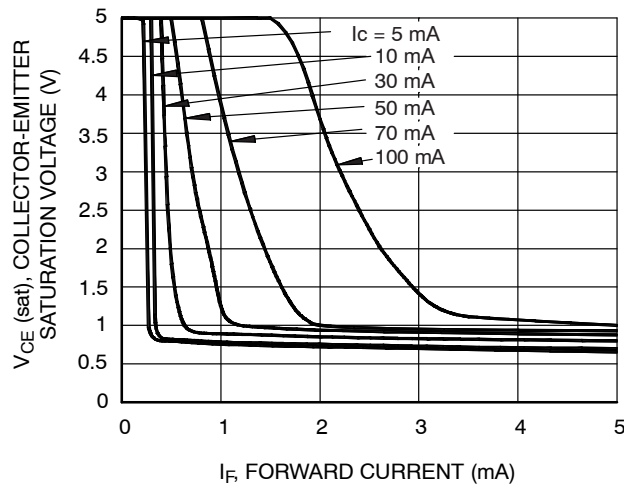


Figure 4. Collector-Emitter Saturation Voltage vs. Forward Current

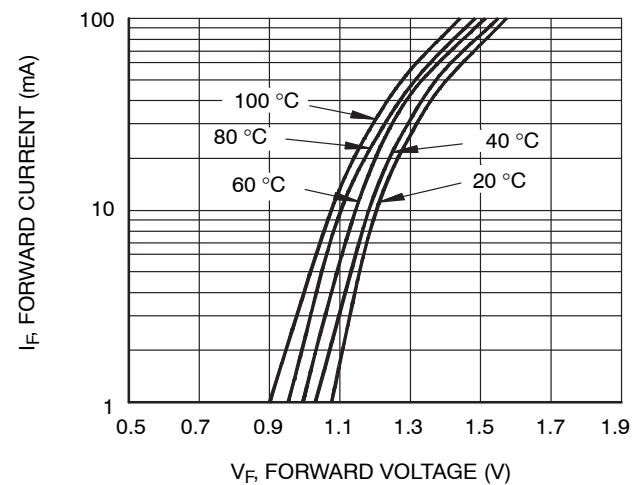


Figure 5. Forward Current vs. Forward Voltage

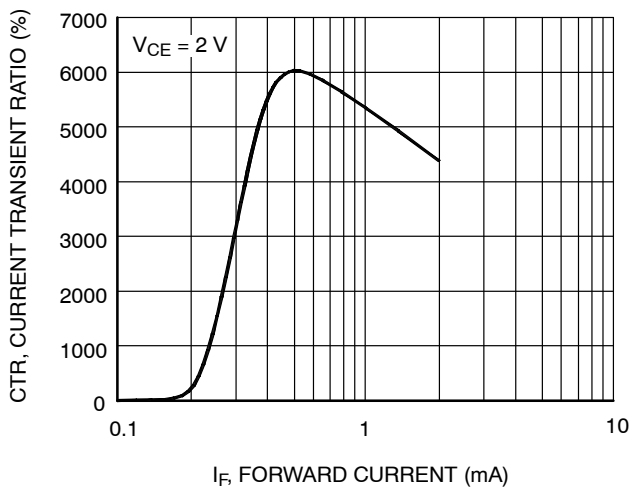


Figure 6. Current Transfer Ratio vs. Forward Current

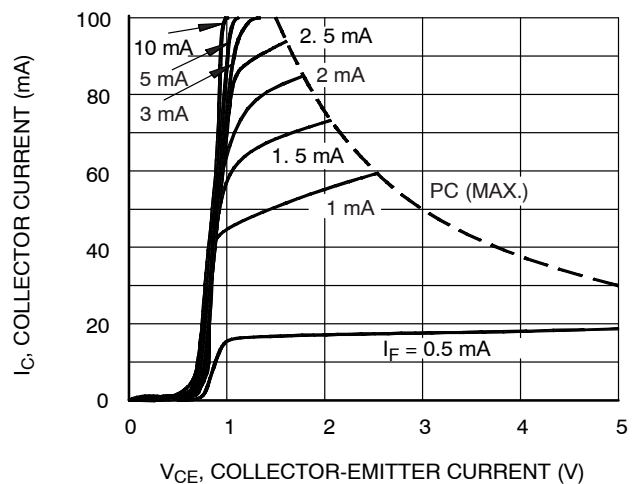


Figure 7. Collector Current vs. Collector-Emitter Voltage

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES ($T_A = 25^\circ\text{C}$ unless otherwise noted) (continued)

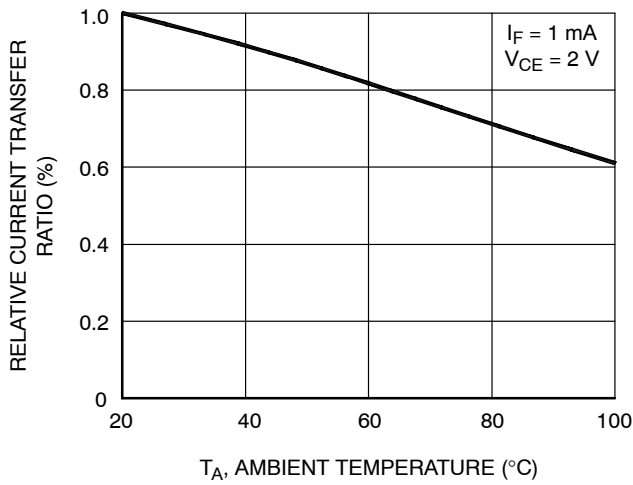


Figure 8. Relative Current Transfer Ratio vs. Ambient Temperature

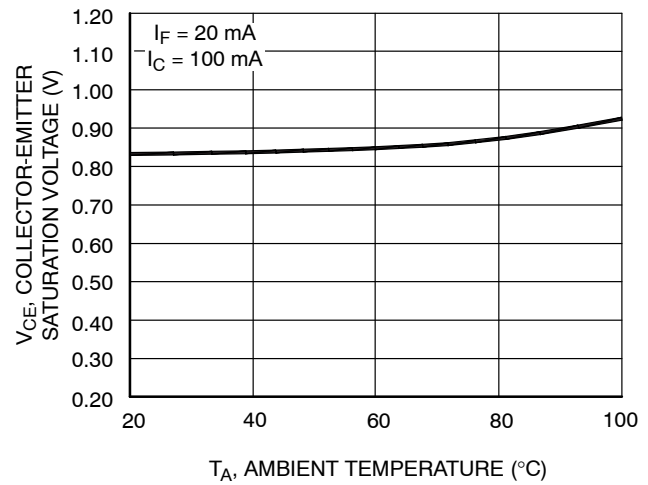


Figure 9. Collector-Emitter Saturation Voltage vs. Ambient Temperature

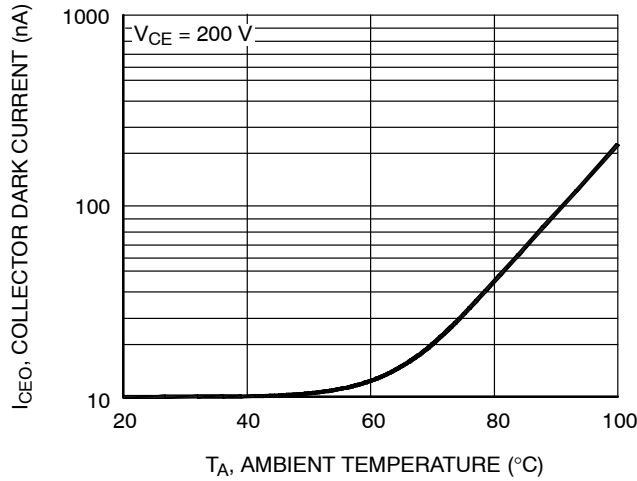


Figure 10. Collector Dark Current vs. Ambient Temperature

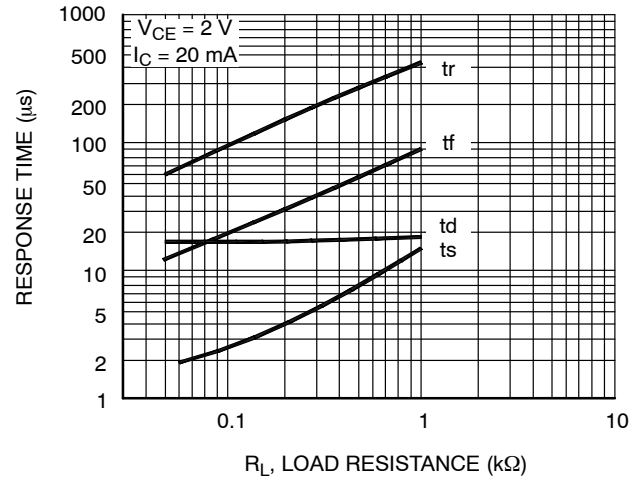


Figure 11. Response Time vs. Load Resistance

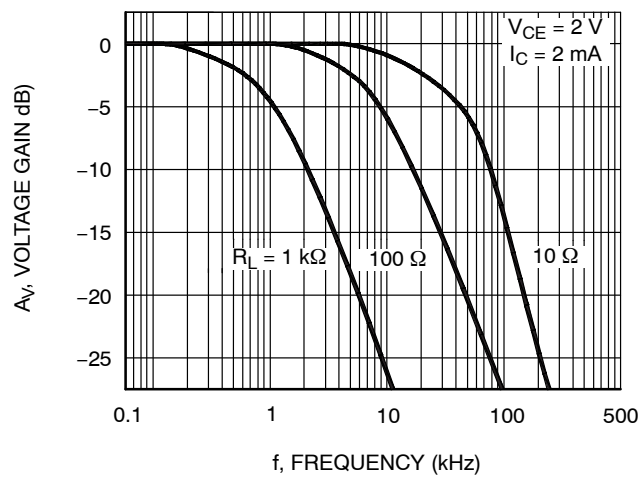


Figure 12. Frequency Response

TEST CIRCUITS

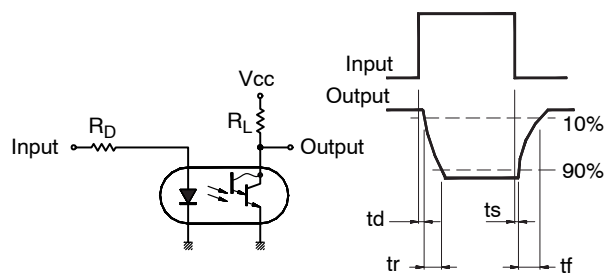


Figure 13. Test Circuit for Response Time

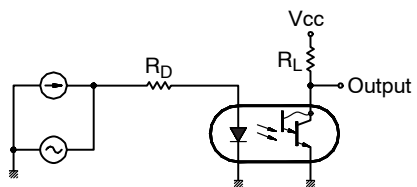
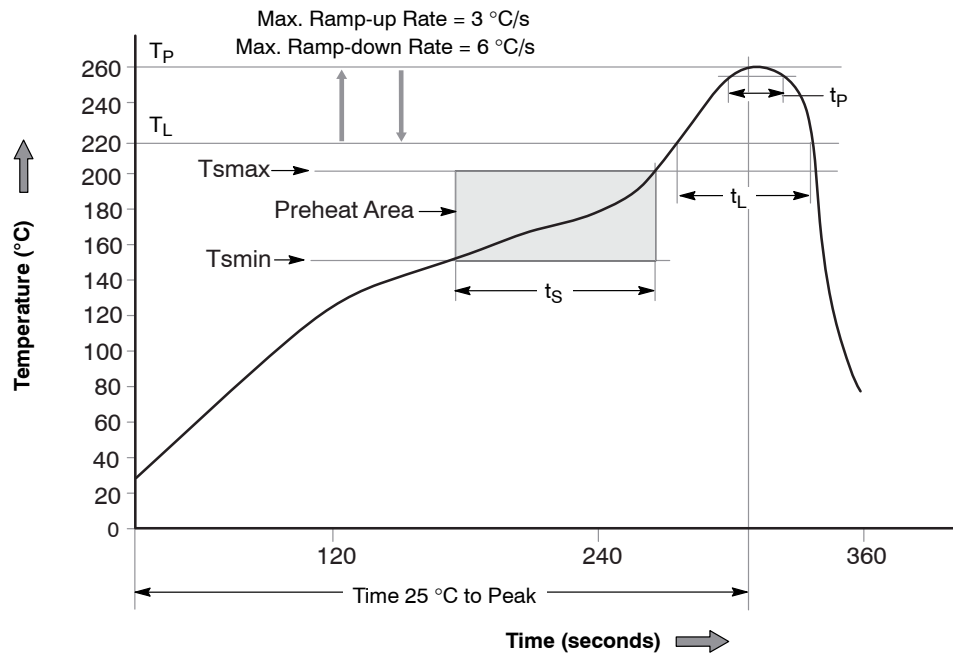


Figure 14. Test Circuit for Frequency Response

REFLOW PROFILE



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T_{smin})	150 °C
Temperature Max. (T_{smin})	200 °C
Time (t_S) from T_{smin} to T_{smax}	60–120 seconds
Ramp-up Rate (t_L to t_P)	3 °C/seconds 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 / seconds max.
Time 25 °C to Peak Temperature	8 minutes max.

Figure 15. Reflow Profile

FOD852

ORDERING INFORMATION

Part Number	Package Type	Shipping†
FOD852	DIP 4-Pin (Case 646CD)	2000 / Unit Box
FOD852S	SMT 4-Pin (Lead Bend) (Case 709AH)	2000 / Unit Box
FOD852SD	SMT 4-Pin (Lead Bend) (Case 709AH)	1000 / Tape & Reel
FOD852300	DIP 4-Pin, DIN EN/IEC60747-5-5 option (Case 646CD)	2000 / Unit Box
FOD8523S	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-5 option (Case 709AH)	2000 / Unit Box
FOD8523SD	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-5 option (Case 709AH)	1000 / Tape & Reel
FOD852300W	DIP 4-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 option (Case 646CA)	2000 / Unit Box

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

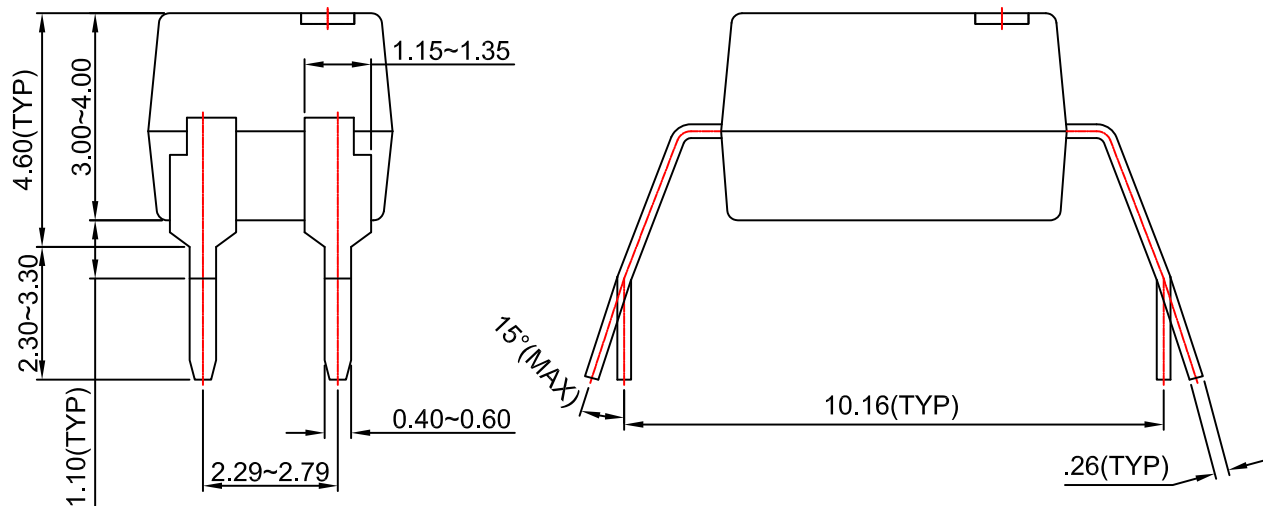
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CASE 646CA
ISSUE O

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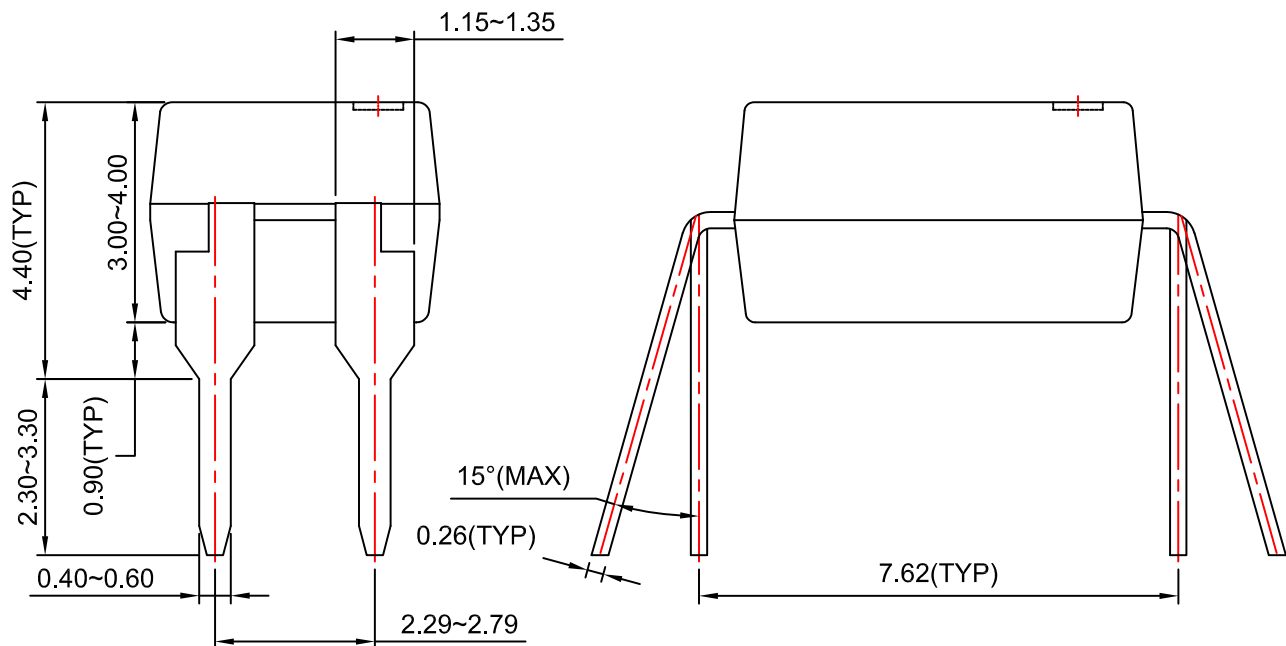
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PDIP4 4.60x6.50x3.85, 2.54P
CASE 709AH
ISSUE B

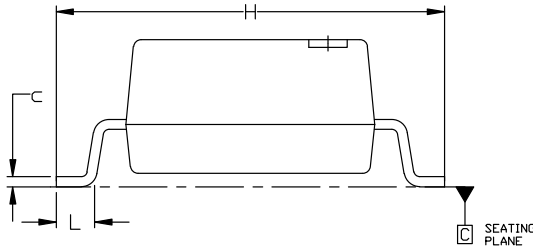
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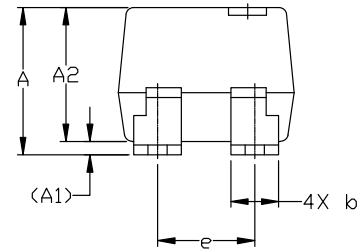
TOP VIEW

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END VIEW



SIDE VIEW



LAND PATTERN RECOMMENDATION

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	3.85 (TYP)		
A1	0.35 (REF)		
A2	3.00	3.50	4.00
b	1.15	1.25	1.35
c	0.26 (REF)		
D	4.10	4.60	5.10
E	6.00	6.50	7.00
e	2.29	2.54	2.79
H	9.86	10.16	10.46
L	0.75	---	1.25

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

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