Single Channel, DC Sensing Input, Phototransistor Optocoupler In Stretched Body SOP 4-Pin

FODM100x Series

Description

The FODM100x Series, single channel, DC sensing input, optocoupler consists of one gallium arsenide (GaAs) infrared light emitting diode optically coupled to one phototransistor, in a stretched body SOP 4−pin package. The input−output isolation voltage, V_{ISO}, is rated at 5,000 VAC_{RMS}.

Features

- ≥ 8 mm Creepage and Clearance Distance, and ≥ 0.4 mm Insulation Distance to Achieve Reliable and High Voltage Insulation
- Safety and Regulatory Approvals
- UL1577, 5,000 VAC_{RMS} for 1 min
- DIN_EN/IEC60747−5−5, 890 V_Peak Working Voltage
- High Breakdown Collector to Emitter Voltage, BV_{CEO} = 70 V Minimum
- Extended Industrial Temperate Range, −40 to 110°C
- Current Transfer Ratio at I_F = 5 mA, V_{CE} = 5 V, T_A = 25°C
- FODM1007: 80 to 160%
- FODM1008: 130 to 260%
- FODM1009: 200 to 400%
- These are Pb−Free Devices

Applications

- Primarily Suited for DC−DC Converters
- For Ground Loop Isolation, Signal to Noise Isolation
- Communications – Adapters, Chargers
- Consumer – Appliances, Set−Top Boxes
- Industrial – Power Supplies, Motor Control, Programmable Logic Control

Related Resources

- https://www.onsemi.com/products/optoelectronics/
- www.onsemi.com/datsheets/HM/HMHA2801.pdf

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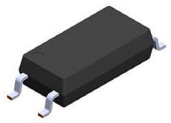

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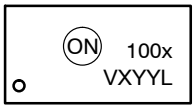
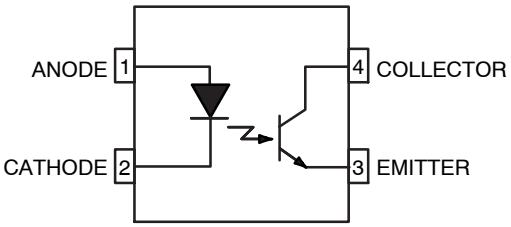
MARKING DIAGRAM



100x	= Specific Device Code (x = 7, 8, 9)
V	= DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X	= Last Digit Year Code
YY	= Two Digit Work Week
L	= Assembly Package Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 7 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		40/110/21
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	1,426	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	1,671	V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	890	V_{peak}
V_{IOTM}	Highest Allowable Over−Voltage	6.000	V_{peak}
	External Creepage	≥8.0	mm
	External Clearance	≥8.0	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥0.4	mm
T_S	Case Temperature (Note 1)	150	°C
$I_{S,INPUT}$	Input Current (Note 1)	200	mA
$P_{S,OUTPUT}$	Output Power (Note 1)	300	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V (Note 1)	$>10^9$	Ω

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

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

Symbol	Parameter	Value	Unit
TOTAL PACKAGE			
T_{STG}	Storage Temperature	−55 to +150	°C
T_{OPR}	Operating Temperature	−40 to +110	°C
T_J	Junction Temperature	−40 to +125	°C
EMITTER			
$I_{F(avg)}$	Continuous Forward Current	50	mA
$I_{F(pk)}$	Continuous Forward Current (1 μs Pulse, 300 pps)	1	A
V_R	Reverse Input Voltage	6	V
PD_{LED}	LED Power Dissipation @ T_A = 25°C (Note 2)	100	mW
	Derate Above 25°C	0.9	mW/°C
DETECTOR			
I_C	Continuous Collector Current	50	mA
V_{CEO}	Collector−Emitter Voltage	70	V
V_{ECO}	Emitter−Collector Voltage	7	V
PD_C	Detector Power Dissipation @ T_A = 25°C (Note 2)	150	mW
	Derate Above 25°C	1.47	mW/°C

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.

2. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

ELECTRICAL CHARACTERISTICS

T_A = 25°C unless otherwise specified.

INDIVIDUAL COMPONENT CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
EMITTER							
V_F	Forward Voltage	All	I_F = 50 mA	–	1.4	1.6	V
I_R	Reverse Current	All	V_R = 4 V	–	–	10	μA
DETECTOR							
BV_{CEO}	Breakdown Voltage Collector to Emitter	All	I_C = 1 mA, I_F = 0	70	–	–	V
BV_{ECO}	Emitter to Collector	All	I_E = 0.1 mA, I_F = 0	7	–	–	V
I_{CEO}	Collector Dark Current	All	V_{CE} = 70 V, I_F = 0	–	–	100	nA
C_{CE}	Capacitance	All	V_{CE} = 0 V, f = 1 MHz	–	5	–	pF

DC TRANSFER CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
CTR	DC Current Transfer Ratio	FODM1007	I_F = 5 mA, V_{CE} = 5 V	80	–	160	%
		FODM1008		130	–	260	
		FODM1009		200	–	400	
$V_{CE(SAT)}$	Saturation Voltage	All	I_F = 10 mA, I_C = 1 mA	–	–	0.3	V

AC TRANSFER CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
t_r	Rise Time (Non−Saturated)	All	I_C = 2 mA, V_{CE} = 5 V, R_L = 100 Ω	–	5.7	18.0	μs
t_f	Fall Time (Non−Saturated)	All	I_C = 2 mA, V_{CE} = 5 V, R_L = 100 Ω	–	8.5	18.0	

ISOLATION CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
V_{ISO}	Steady State Isolation Voltage	All	T_A = 25°C, R.H. < 50%, t =1.0 min., $I_{I-O} \leq$ 20 μA	5,000	–	–	VAC_{RMS}

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 PERFORMANCE CHARACTERISTICS

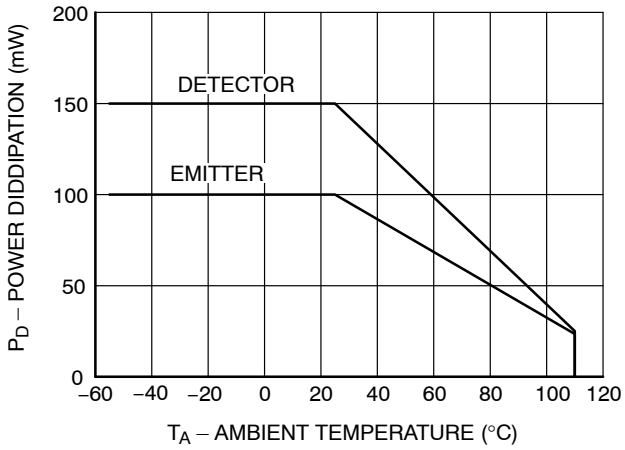


Figure 1. Power Dissipation vs. Ambient Temperature

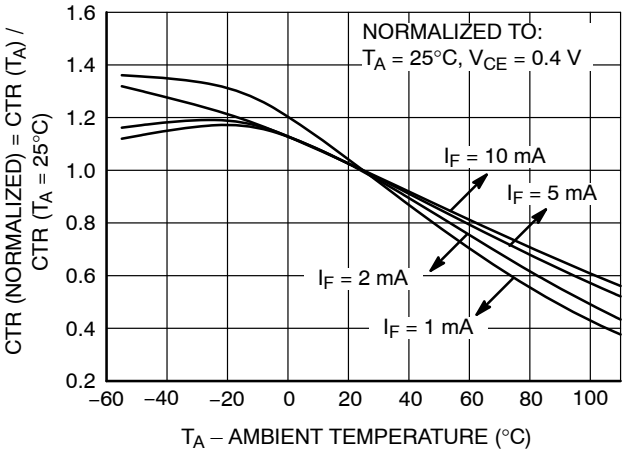


Figure 2. Saturated Normalized Current Transfer Ratio vs. Ambient temperature

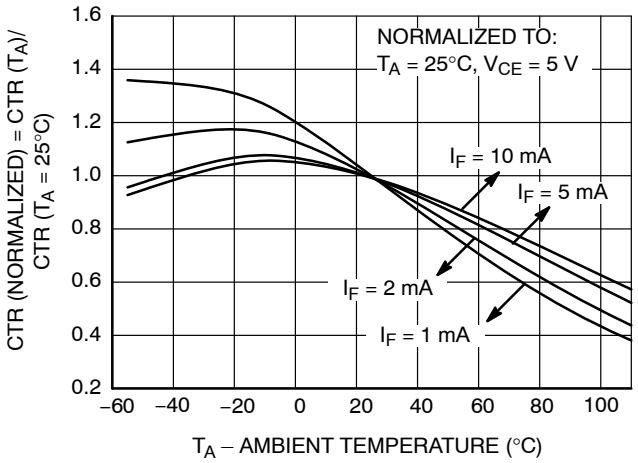


Figure 3. Non−Saturated Normalized Current Transfer Ratio vs. Ambient temperature

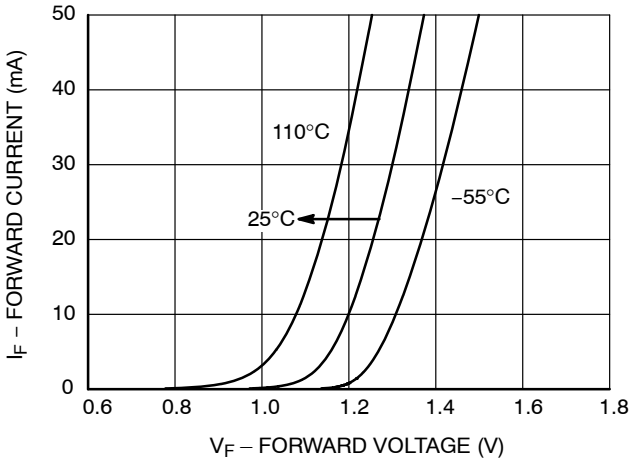


Figure 4. Forward Current vs. Forward Voltage

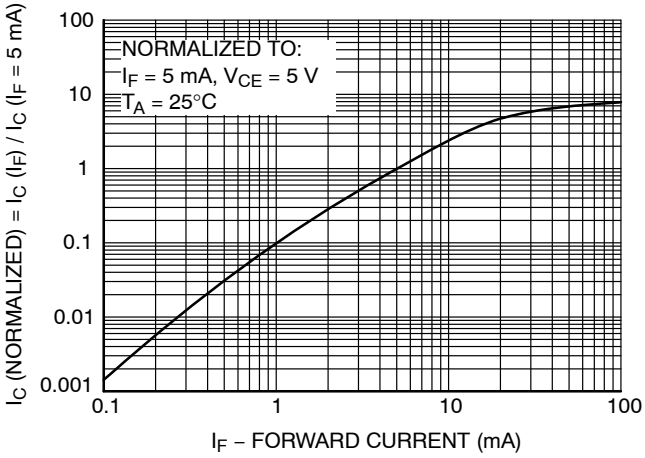


Figure 5. Normalized Current Collector vs. Forward Current

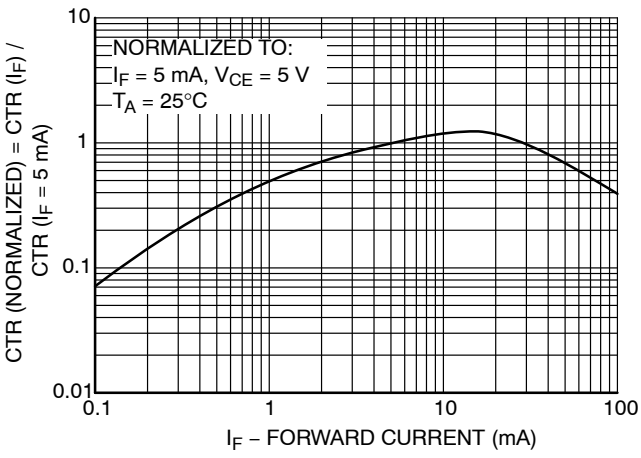


Figure 6. Normalized Current Transfer Ratio vs. Forward Current

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

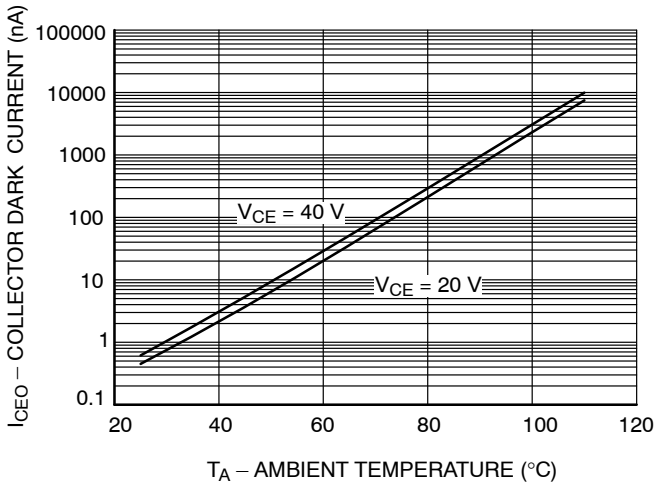


Figure 7. Collector Dark Current vs. Ambient Temperature

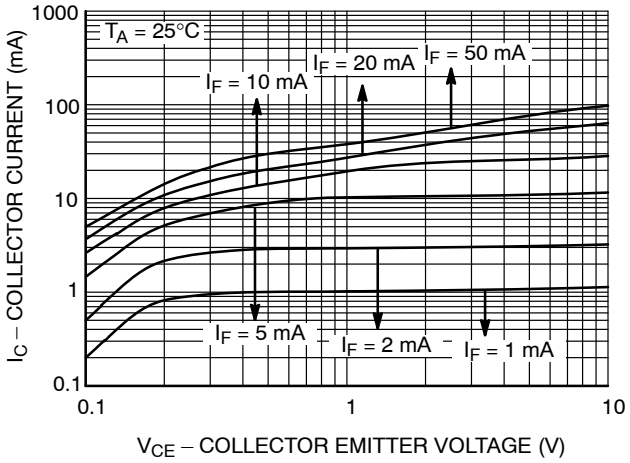


Figure 8. Collector Current vs. Collector Emitter Voltage

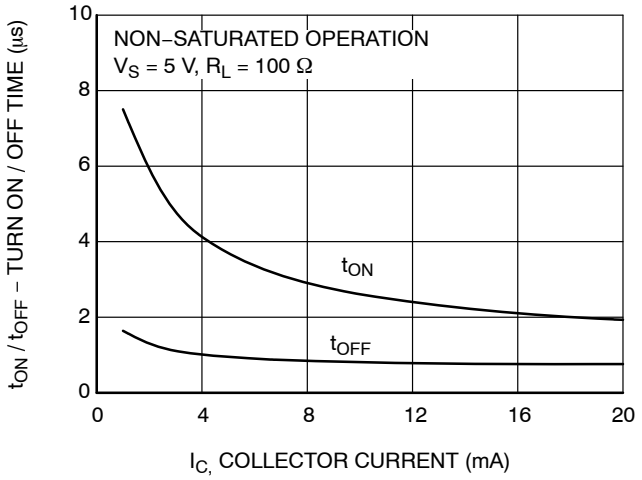


Figure 9. Turn On / Turn Off Time vs. Collector Current

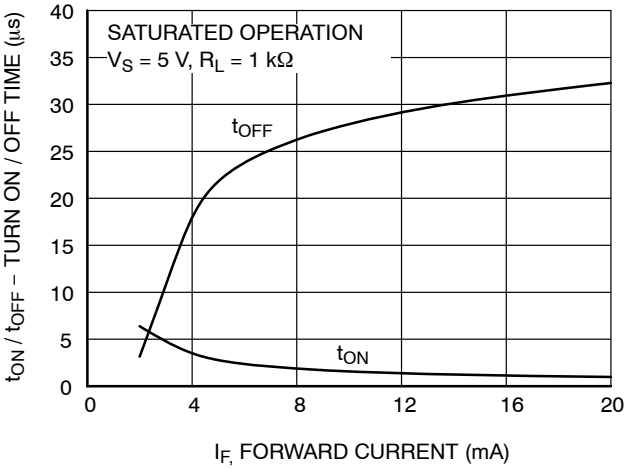


Figure 10. Turn On / Turn Off Time vs. Forward Current

REFLOW PROFILE

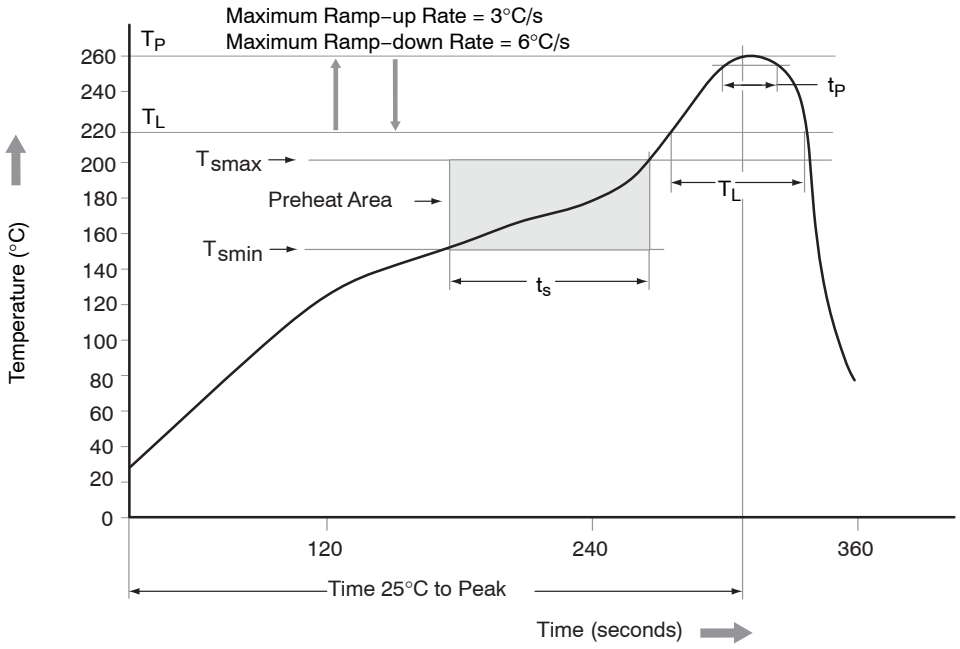


Figure 11. Reflow Profile

Table 1. REFLOW PROFILE

Profile Feature	Pb−Free Assembly Profile
Temperature Minimum (T_{smin})	150°C
Temperature Maximum (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 maximum
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 maximum
Time 25°C to Peak Temperature	8 minutes maximum

ORDERING INFORMATION

Part Number	Package	Shipping†
FODM1007	Stretched Body SOP 4−Pin	100 Units / Tube
FODM1007R2	Stretched Body SOP 4−Pin	3000 / Tape & Reel
FODM1007V	Stretched Body SOP 4−Pin, DIN EN/IEC60747−5−5 Option	100 Units / Tube
FODM1007R2V	Stretched Body SOP 4−Pin, DIN EN/IEC60747−5−5 Option	3000 / Tape & Reel

†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.

NOTE: The product orderable part number system listed in this table also applies to the FODM1008, FODM1009 products.

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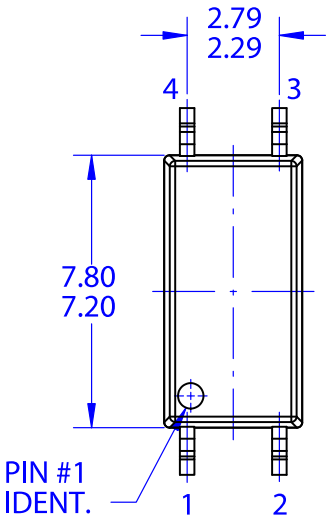
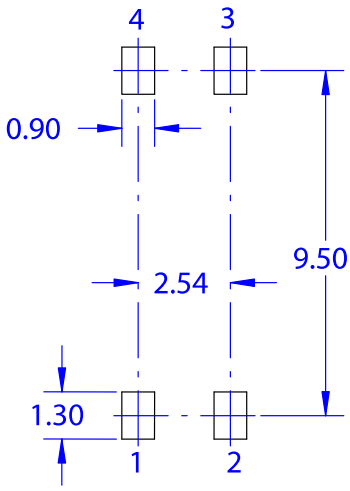
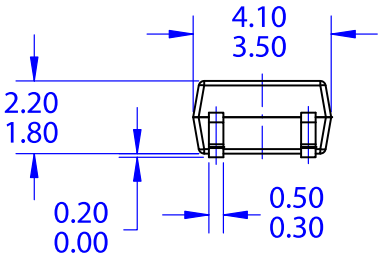


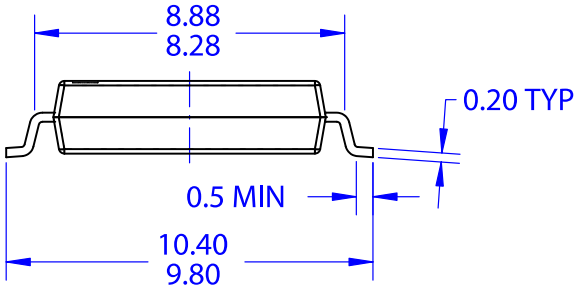
TOP VIEW



LAND PATTERN RECOMMENDATION



FRONT VIEW



SIDE VIEW

NOTES:

A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE
B. ALL DIMENSIONS ARE IN MILLIMETERS
C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS

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