

Single Channel, DC Sensing Input, Phototransistor Optocoupler In Half-Pitch Mini-Flat 4-Pin Package

FODM291 Series

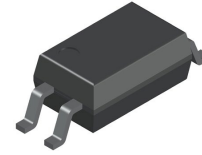
The FODM291 series consist of a gallium arsenide infrared emitting diode driving a phototransistor. It built in a compact, half-pitch, mini-flat, 4-pin package. The lead pitch is 1.27 mm.

Features

- Current Transfer Ratio Ranges from 80 to 600% at $I_F = 5 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$
 - FODM291A – 80 to 160%
 - FODM291B – 130 to 260%
 - FODM291C – 200 to 400%
 - FODM291D – 300 to 600%
- Safety and Regulatory Approvals:
 - UL1577, 3750 VAC_{RMS} for 1 min
 - DIN EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage (Pending)
- Applicable to Infrared Ray Reflow, 260°C

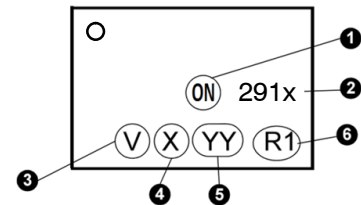
Typical Applications

- 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



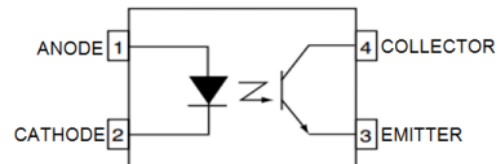
MFP4 2.7x4.4, 1.27P
CASE 100EB

MARKING DIAGRAM



- ON = Corporate Logo
- 291x = Device Number
- V = DIN EN/IEC60747-5-5 Option
- X = One-Digit Year Code
- YY = Digit Work Week
- R1 = Assembly Package Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

FODM291 Series

SAFETY AND INSULATIONS RATING

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		55/110/21
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	904	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	1060	V _{peak}
V _{IORM}	Maximum Working Insulation Voltage	565	V _{peak}
V _{IOTM}	Highest Allowable Over-Voltage	4,000	V _{peak}
	External Creepage	≥ 5	mm
	External Clearance	≥ 5	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T _S	Case Temperature (Note 1)	150	°C
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 specified.)

Symbol	Parameter	Value	Units
T _{STG}	Storage Temperature	–55 to +125	°C
T _{OPR}	Operating Temperature	–55 to +110	°C
T _J	Junction Temperature	–55 to +125	°C
T _{SOL}	Lead Solder Temperature (Refer to Reflow Temperature Profile)	260 for 10 sec	°C

EMITTER

I _{F(average)}	Continuous Forward Current	50	mA
I _{F(peak)}	Peak Forward Current (1 s pulse, 300 pps)	1	A
V _R	Reverse Input Voltage	6	V
PD _{LED}	Power Dissipation (Note 2)	70	mW

DETECTOR

I _{C(average)}	Continuous Collector Current	50	mA
V _{CEO}	Collector–Emitter Voltage	80	V
V _{ECO}	Emitter–Collector Voltage	7	V
PD _C	Collector Power Dissipation (Note 2)	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.

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

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

Symbol	Parameter	Device	Conditions	Min.	Typ.	Max.	Units
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EMITTER

I_F	Forward Current	FODM291	$I_F = 20\text{ mA}$		1.2	1.4	V
I_R	Reverse Current	FODM291	$V_R = 4\text{ V}$			10	μA
C_{in}	Input Capacitance	All	$V = 0\text{ V}, f = 1\text{ kHz}$		30	250	pF

DETECTOR

BV_{CEO}	Collector–Emitter Breakdown Voltage	All	$I_C = 0.1\text{ mA}, I_F = 0\text{ mA}$	80			V
BV_{ECO}	Emitter–Collector Breakdown Voltage	All	$I_E = 0.1\text{ mA}, I_F = 0\text{ mA}$	7			V
I_{CEO}	Collector Dark Current	All	$V_{CE} = 20\text{ V}, I_F = 0\text{ mA}$			100	nA

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

Symbol	Parameter	Device	Conditions	Min.	Typ.	Max.	Units
CTR_{CE}	Current Transfer Ratio (collector–emitter)	FODM291A	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$	80		160	%
		FODM291B		130		260	
		FODM291C		200		400	
		FODM291D		300		600	
$V_{CE(SAT)}$	Collector–Emitter Saturation Voltage	FODM291 series	$I_F = 10\text{ mA}, I_C = 1.0\text{ mA}$	–	0.1	0.2	V

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_R	Output Rise Time (10%–90%)	$I_C = 2\text{ mA}, V_{CE} = 2\text{ V}, R_L = 100\ \Omega$		5	18	μs
t_F	Output Fall Time (90%–10%)	$I_C = 2\text{ mA}, V_{CE} = 2\text{ V}, R_L = 100\ \Omega$		5	18	μs

ISOLATION CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input–Output Isolation Voltage	Frequency = 60 Hz, $t = 1.0\text{ min}$,	3,750			$V_{AC_{RMS}}$
R_{ISO}	Isolation Resistance	$V_{I-O} = 500\text{ V}$ (Note 3)	5×10^{10}			Ω
C_{ISO}	Isolation Capacitance	Frequency = 1 MHz		0.3	1.0	pF

3. Device is considered a two terminal device: Pin 1 and 2 are shorted together and Pins 3 and 4 are shorted together.

4. 3,750 $V_{AC_{RMS}}$ for 1 minute duration is equivalent to 4,500 $V_{AC_{RMS}}$ for 1 second duration.

TYPICAL CHARACTERISTICS

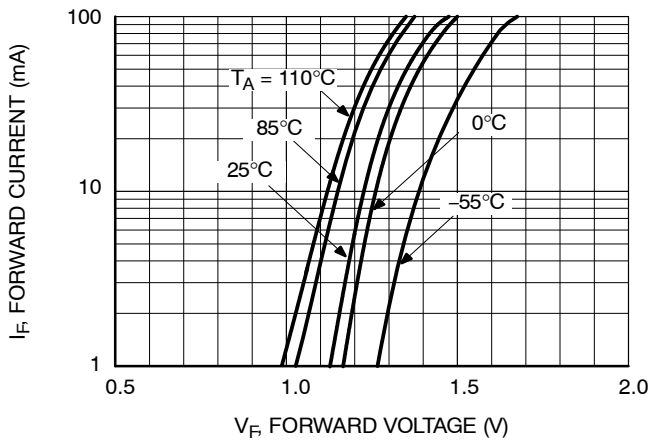


Figure 1. Forward Current vs. Forward Voltage

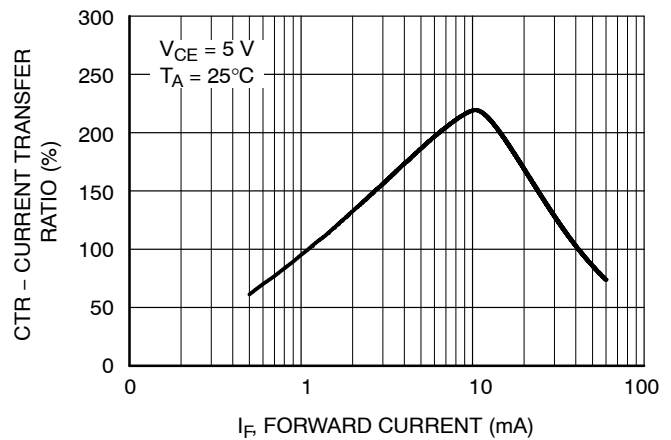


Figure 2. Current Transfer Ratio vs. Forward Current

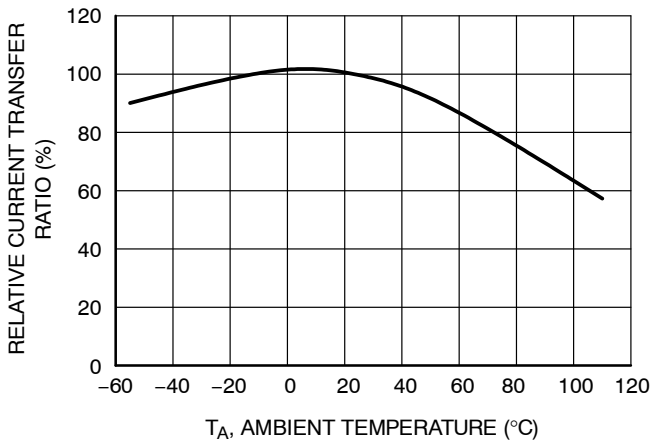


Figure 3. Relative Current Ratio vs. Ambient Temperature

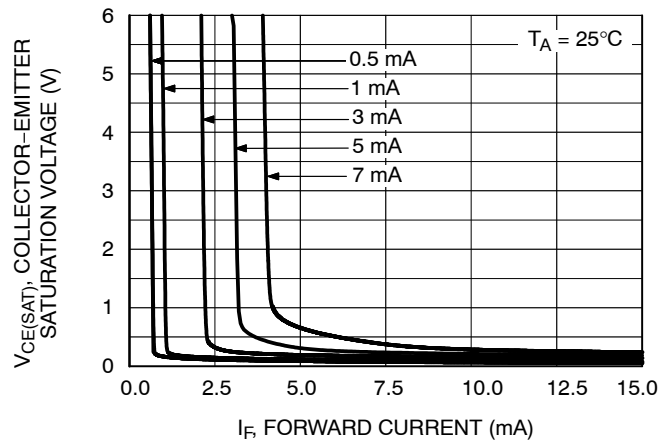


Figure 4. Collector-Emitter Saturation Voltage vs. Forward Current

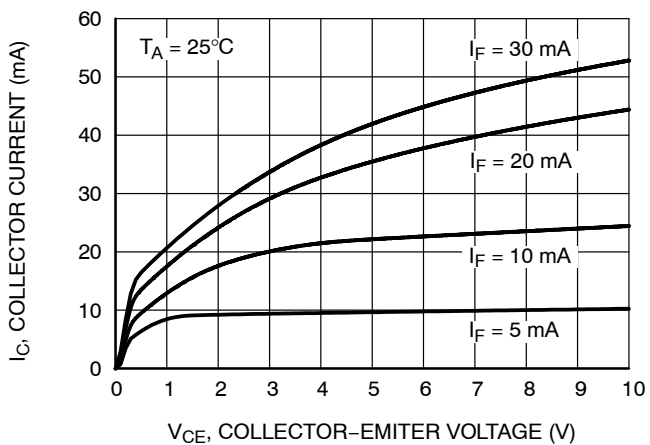


Figure 5. Collector Current vs. Collector-Emitter Voltage

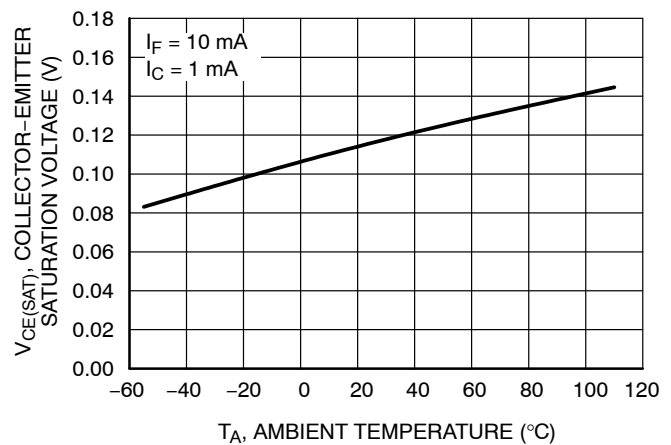


Figure 6. Collector-Emitter Saturation Voltage vs. Ambient Temperature

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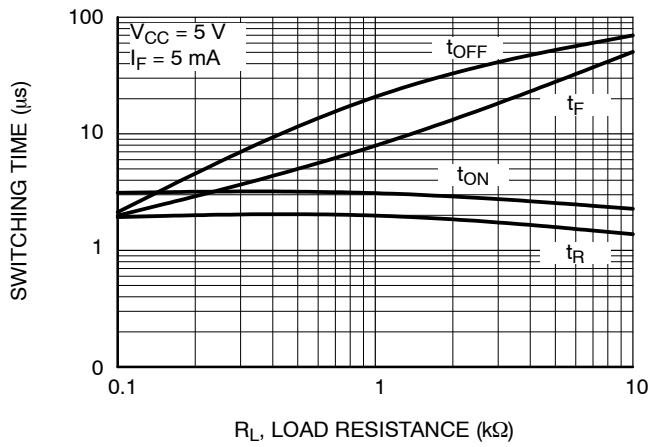


Figure 7. Switching Time vs. Load Resistance

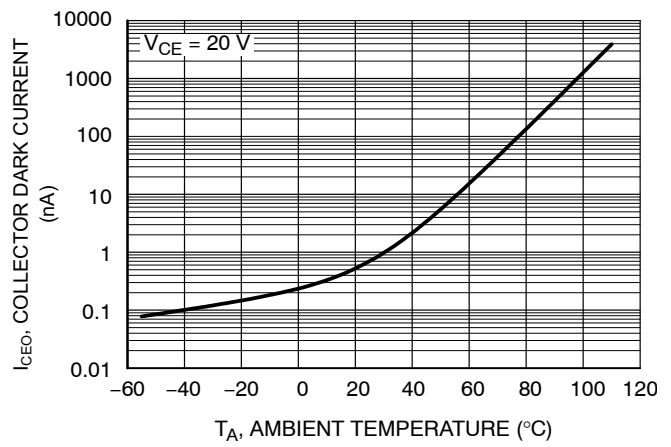


Figure 8. Collector Dark Current vs. Ambient Temperature

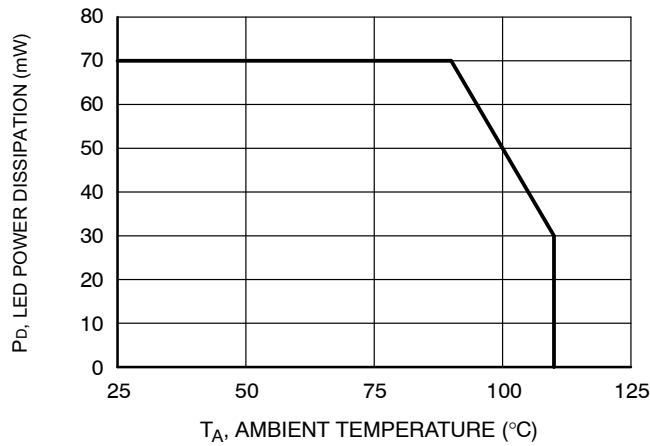


Figure 9. Max Allowable Power Dissipation (LED) vs. Ambient Temperature

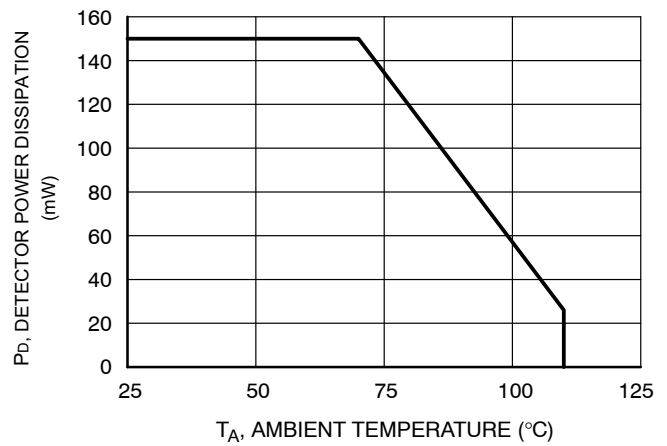


Figure 10. Max Allowable Power Dissipation (Detector) vs. Ambient Temperature

TEST CIRCUIT

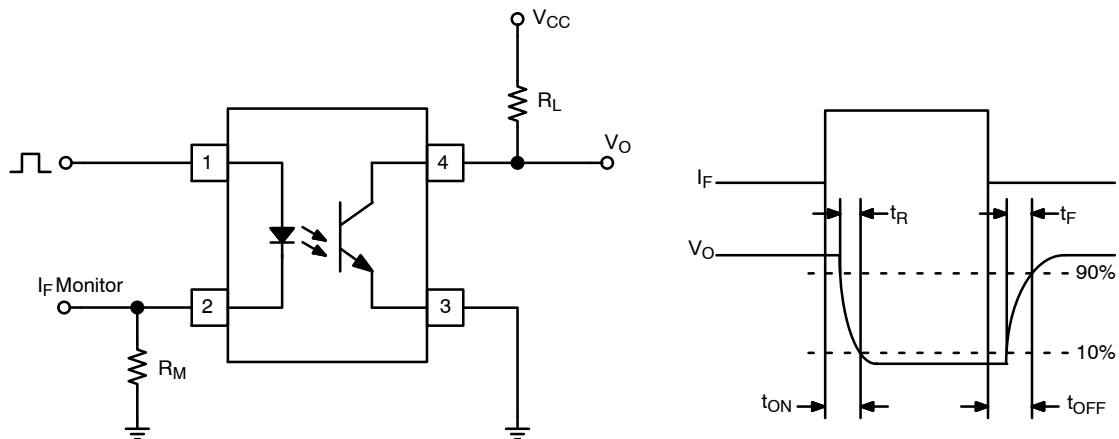


Figure 11. Test Circuit for Switching Time

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REFLOW PROFILE

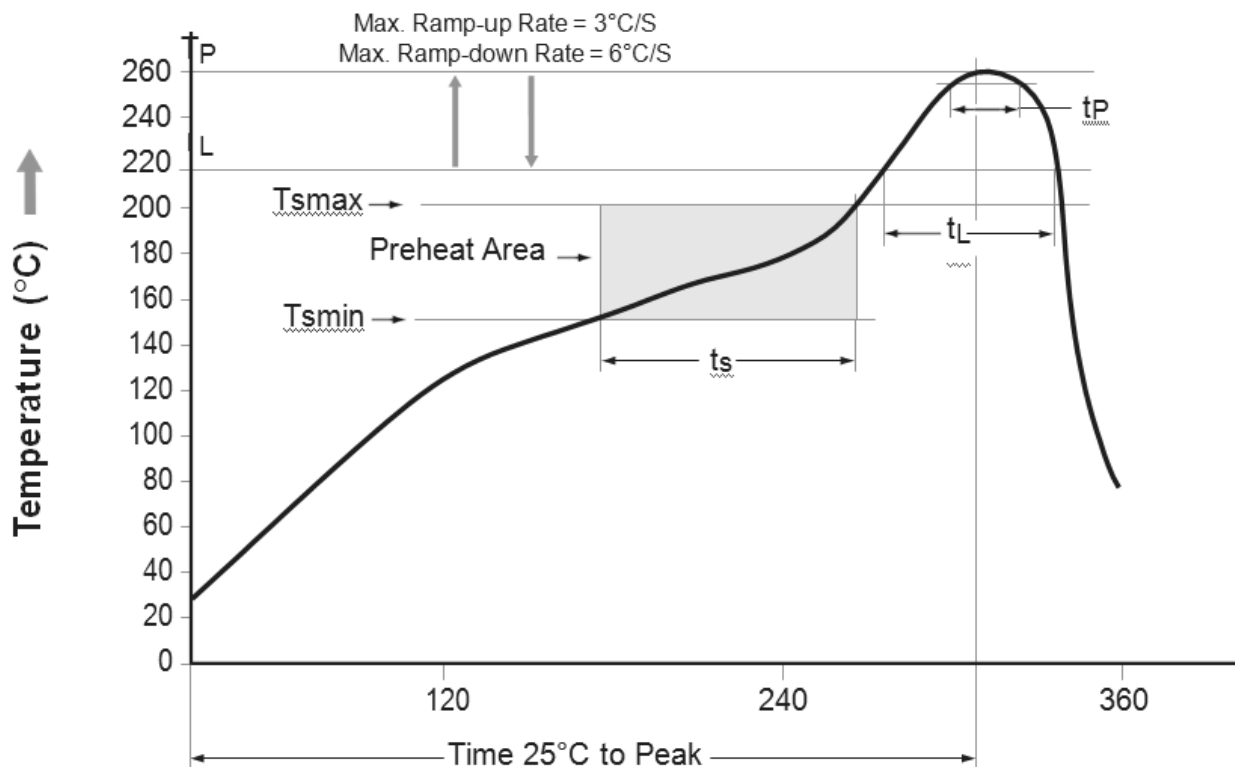


Figure 12. Reflow Profile

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)	291°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.

ORDERING INFORMATION (Note 5)

Part Number	Package	Packing Method
FODM291A	SOP 4-Pin	Tube (100 units)
FODM291AR2	SOP 4-Pin	Tape and Reel (5000 units)
FODM291AV	SOP 4-Pin, DIN EN/IEC60747-5-5 Option	Tube (100 units)
FODM291AR2V	SOP 4-Pin, DIN EN/IEC60747-5-5 Option	Tape and Reel (5000 units)

5. The product orderable part number system listed in this table also applies to the FODM291, FODM291B, FODM291C, and FODM291D products.

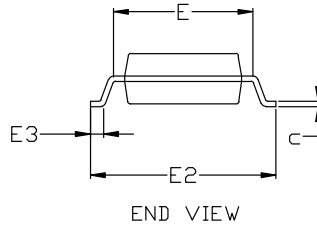
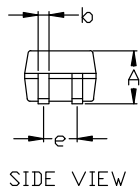
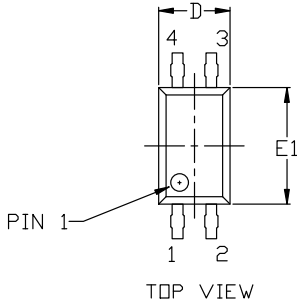
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PACKAGE DIMENSIONS



MFP4 2.7x4.4, 1.27P
CASE 100EB
ISSUE O

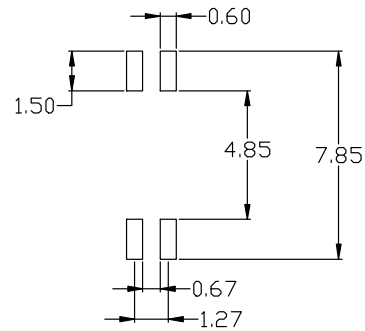
DATE 08 SEP 2022



NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

DIM	MILLIMETERS		
	MIN.	NDM.	MAX.
A	---	---	2.00
b	0.30	0.40	0.50
c	0.20 REF		
D	2.50	2.70	2.90
E	5.2 TYP		
E1	4.20	4.40	4.60
E2	6.70	7.00	7.30
E3	0.50	---	---
e	1.27 TYP		



RECOMMENDED MOUNTING FOOTPRINT*

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

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