

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



MFP4 2.5x4.4, 1.27P
CASE 100AL

FODM214, FODM217 Series

The FODM217 series consist of a gallium arsenide infrared emitting diode driving a phototransistor. The FODM214 series consist of two gallium arsenide infrared emitting diodes connected in inverse parallel for AC operation. Both were built in a compact, half-pitch, mini-flat, 4-pin package. The lead pitch is 1.27 mm.

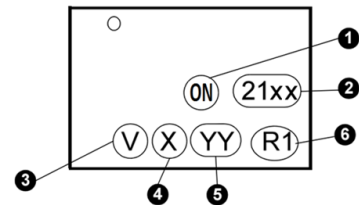
Features

- Current Transfer Ratio Ranges from 20 to 600%
 - at $I_F = \pm 1 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$
 - ◆ FODM214 – 20 to 400%
 - ◆ FODM214A – 50 to 250%
 - at $I_F = 5 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$
 - ◆ FODM217A – 80 to 160%
 - ◆ FODM217B – 130 to 260%
 - ◆ FODM217C – 200 to 400%
 - ◆ FODM217D – 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
- Applicable to Infrared Ray Reflow, 260°C

Typical Applications

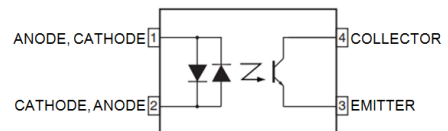
- Primarily Suited for DC-DC Converters
- For Ground Loop Isolation, Signal to Noise Isolation
- Communications – Adapters, Chargers
- Consumer – Appliances, Set Top Boxes
- Industrial – Power Supplies, Motor Control, Programmable Logic Control

MARKING DIAGRAM

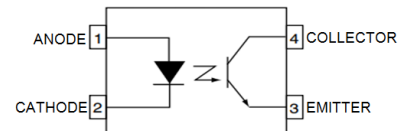


1. ON = Corporate Logo
2. 21xx = Device Number
3. V = DIN EN/IEC60747-5-5 Option
4. X = One-Digit Year Code
5. YY = Digit Work Week
6. R1 = Assembly Package Code

PIN CONNECTIONS



FODM214



FODM217

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

FODM214, FODM217 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 |
| 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 specified.)

| Symbol | Parameter | Value | Units |
|------------------|--|----------------|-------|
| T _{STG} | Storage Temperature | -55 to +150 | °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 μs 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.

FODM214, FODM217 Series

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

| Symbol | Parameter | Device | Conditions | Min. | Typ. | Max. | Units |
|----------------|----------------------|---------|--------------------------------------|------|------|------|---------------|
| EMITTER | | | | | | | |
| V_F | Forward Voltage | FODM214 | $I_F = \pm 20 \text{ mA}$ | | 1.2 | 1.4 | V |
| | | FODM217 | $I_F = 20 \text{ mA}$ | | | | |
| I_R | Reverse Current | FODM217 | $V_R = 4 \text{ V}$ | | | 10 | μA |
| C_T | Terminal 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 | $I_E = 10 \mu\text{A}, I_F = 0 \text{ mA}$ | 7 | | | V |
| I_{CEO} | Collector Dark Current | All | $V_{CE} = 50 \text{ V}, I_F = 0 \text{ mA}$ | | | 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) | FODM214 | $I_F = \pm 1 \text{ mA}, V_{CE} = 5 \text{ V}$ | 20 | | 400 | % |
| | | FODM214A | | 50 | | 250 | |
| | | FODM217A | $I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$ | 80 | | 160 | |
| | | FODM217B | | 130 | | 260 | |
| | | FODM217C | | 200 | | 400 | |
| | | FODM217D | | 300 | | 600 | |
| I_C | Collector Current | FODM214 | $I_F = \pm 1 \text{ mA}, V_{CE} = 5 \text{ V}$ | 0.2 | | 2.5 | mA |
| | | FODM217 | $I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$ | 4 | | 30 | |
| $CTR_{(SAT)}$ | Saturated Current Transfer Ratio | FODM214 | $I_F = \pm 8 \text{ mA}, V_{CE} = 0.4 \text{ V}$ | | 60 | | % |
| | | FODM217 | $I_F = 8 \text{ mA}, V_{CE} = 0.4 \text{ V}$ | | | | |
| $I_{C(SAT)}$ | Collector Current | FODM214 | $I_F = \pm 8 \text{ mA}, V_{CE} = 0.4 \text{ V}$ | | 4.8 | | mA |
| | | FODM217 | $I_F = 8 \text{ mA}, V_{CE} = 0.4 \text{ V}$ | | | | |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage | FODM214 | $I_F = \pm 8 \text{ mA}, I_C = 2.4 \text{ mA}$ | | | 0.4 | V |
| | | FODM217 | $I_F = 8 \text{ mA}, I_C = 2.4 \text{ mA}$ | | | | |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-----------|----------------------------|---|------|------|------|---------------|
| t_{ON} | Turn On Time | $I_C = 2 \text{ mA}, V_{CE} = 10 \text{ V}, R_L = 100 \Omega$ | | 3 | | μs |
| t_{OFF} | Turn Off Time | $I_C = 2 \text{ mA}, V_{CE} = 10 \text{ V}, R_L = 100 \Omega$ | | 3 | | μs |
| t_R | Output Rise Time (10%-90%) | $I_C = 2 \text{ mA}, V_{CE} = 10 \text{ V}, R_L = 100 \Omega$ | | 3 | | μs |
| t_F | Output Fall Time (90%-10%) | $I_C = 2 \text{ mA}, V_{CE} = 10 \text{ V}, R_L = 100 \Omega$ | | 3 | | μs |

ISOLATION CHARACTERISTICS

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-----------|--------------------------------|--|--------------------|------|------|-------------|
| V_{ISO} | Input-Output Isolation Voltage | Freq = 60 Hz, $t = 1.0 \text{ min}$, $I_{I-O} \leq 10 \mu\text{A}$ (Note 3, 4) | 3,750 | | | V_{ACRMS} |
| R_{ISO} | Isolation Resistance | $V_{I-O} = 500 \text{ V}$ (Note 3) | 5×10^{10} | | | Ω |
| C_{ISO} | Isolation Capacitance | Frequency = 1 MHz | | 0.6 | 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_{ACRMS} for 1 minute duration is equivalent to 4,500 V_{ACRMS} for 1 second duration.

FODM214, FODM217 Series

TYPICAL CHARACTERISTICS

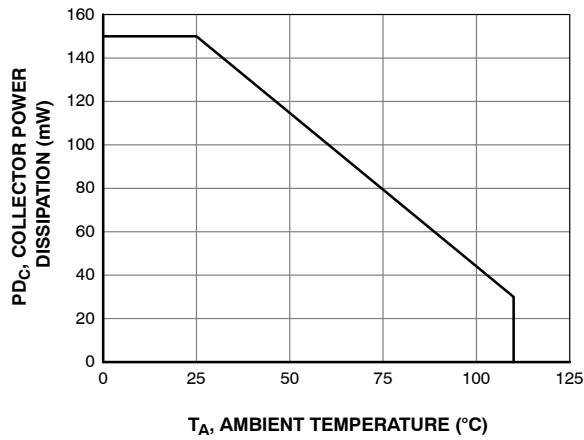


Figure 1. Collector Power Dissipation vs. Ambient Temperature

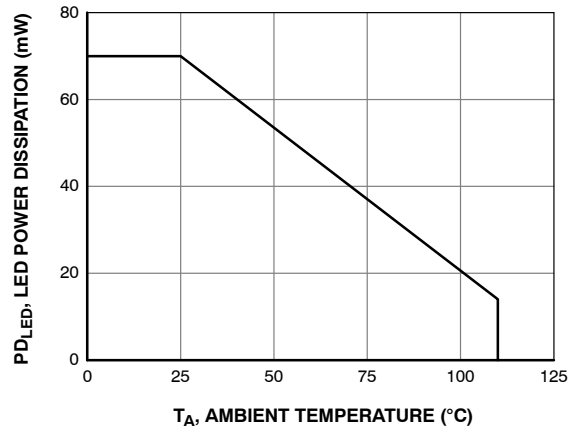


Figure 2. LED Power Dissipation vs. Ambient Temperature

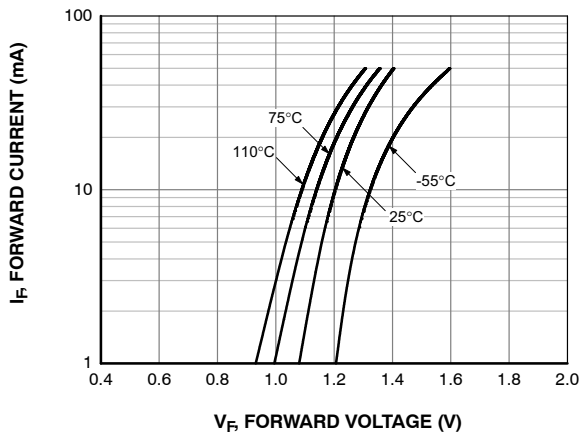


Figure 3. Forward Current vs. Forward Voltage

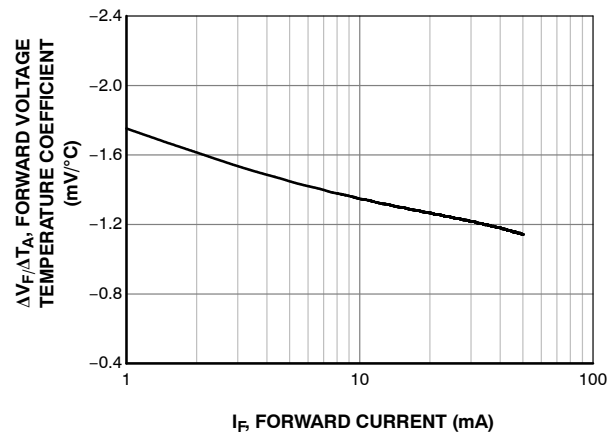


Figure 4. Forward Voltage Temperature Coefficient vs. Forward Current

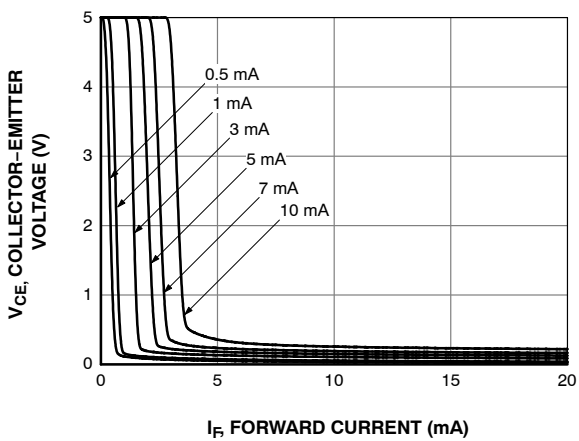


Figure 5. Collector Emitter Voltage vs. Forward Current

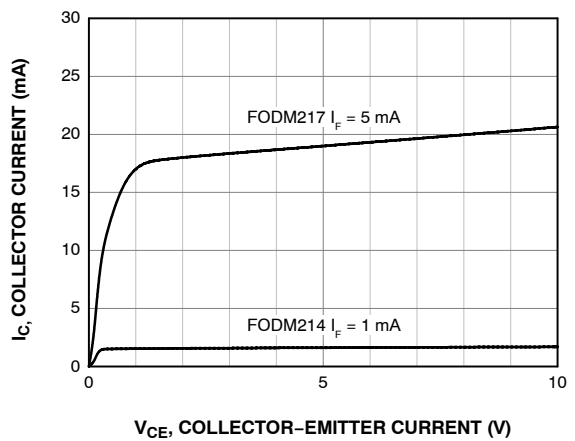


Figure 6. Collector Current vs. Collector-Emitter Voltage

FODM214, FODM217 Series

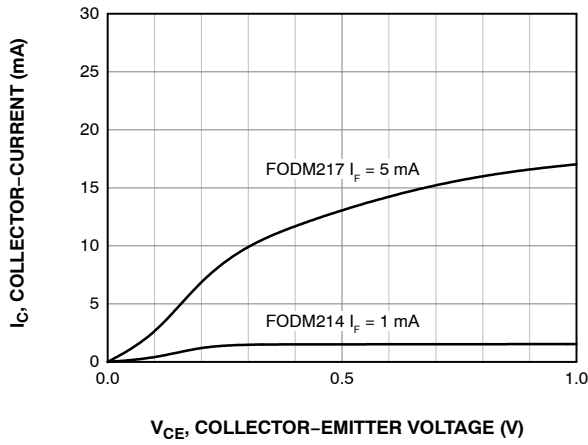


Figure 7. Collector Current vs. Small Collector-Emitter Voltage

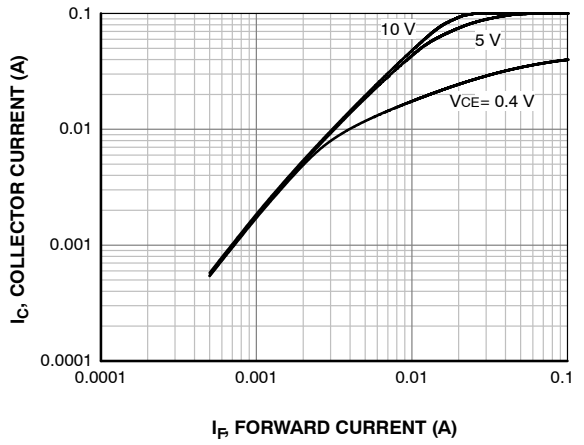


Figure 8. Collector Current vs. Forward Current

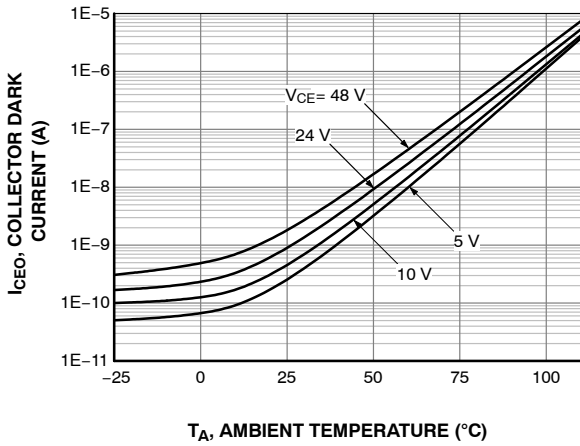


Figure 9. Collector Dark Current vs. Ambient Temperature

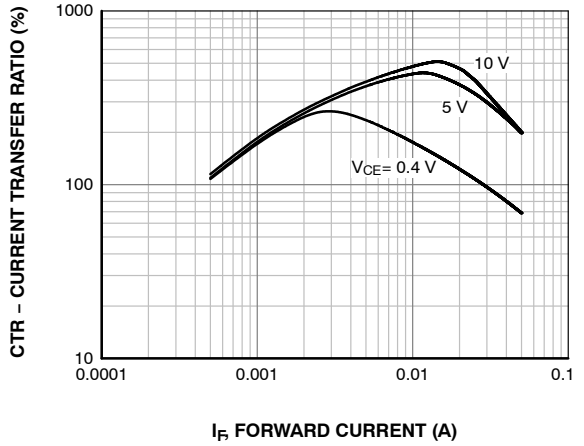


Figure 10. Current Transfer Ratio vs. Forward Current

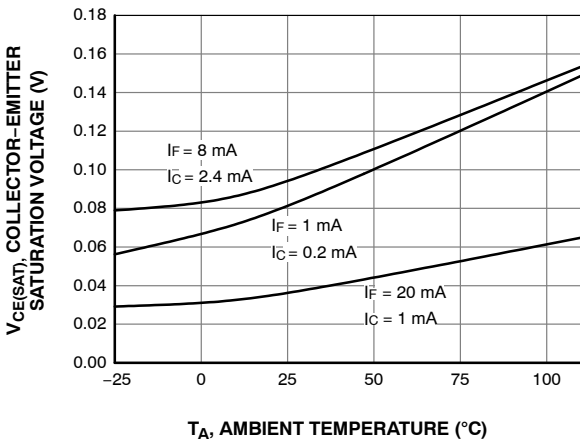


Figure 11. Collector-Emitter Saturation vs. Ambient Temperature

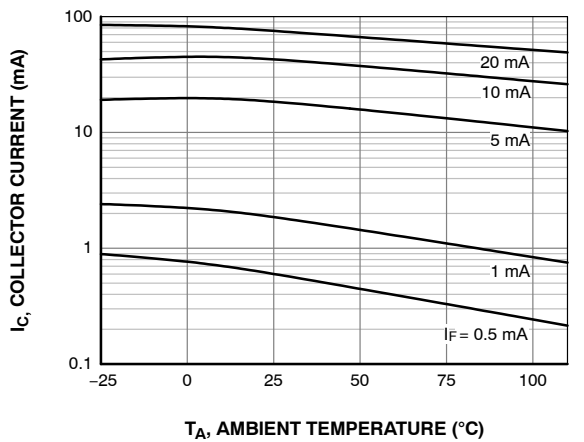


Figure 12. Collector Current vs. Ambient Temperature

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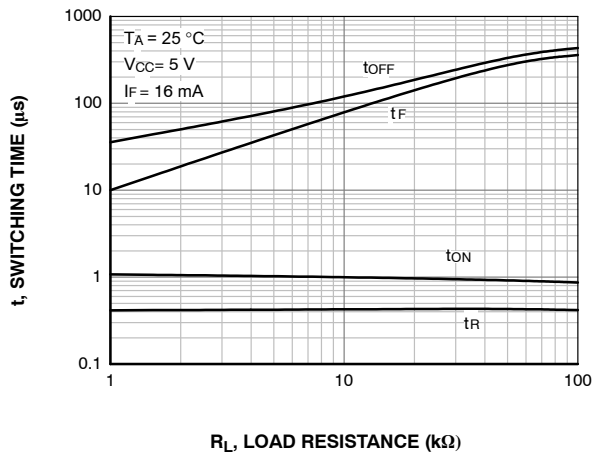


Figure 13. Switching Time vs. Load Resistance

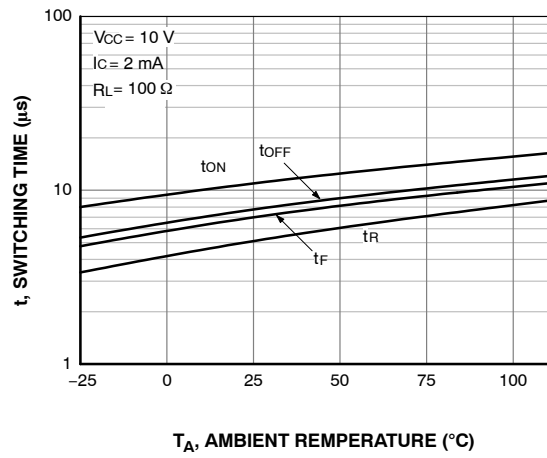


Figure 14. Switching Time vs. Ambient Temperature

TEST CIRCUIT

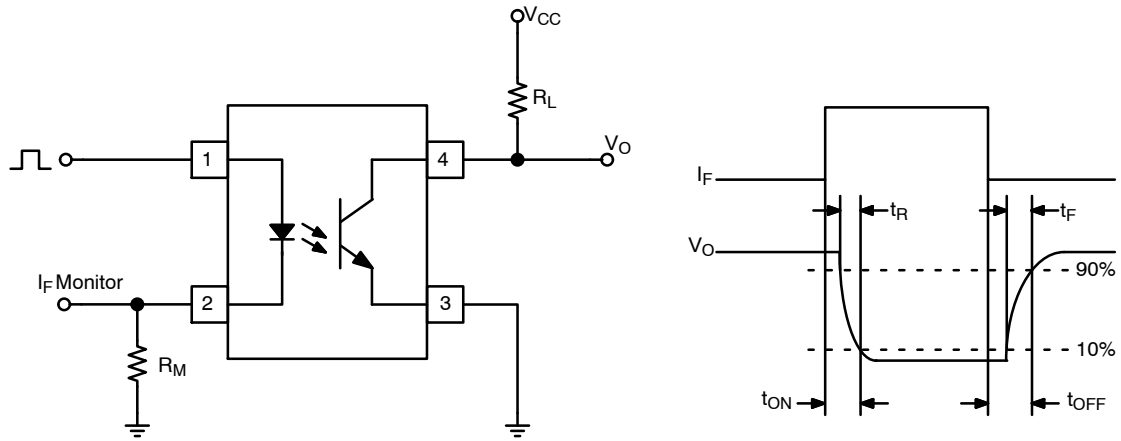


Figure 15. Test Circuit for Switching Time

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REFLOW PROFILE

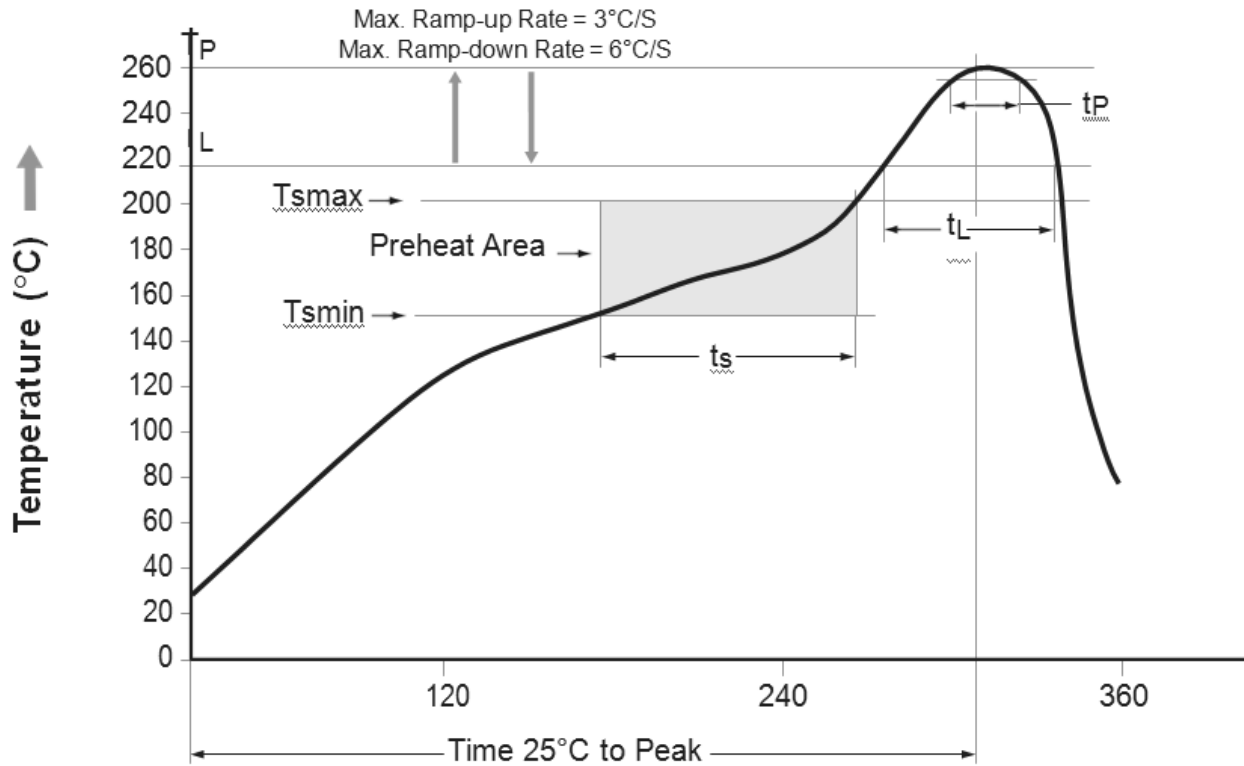


Figure 16. Reflow Profile

| Profile Feature | Pb-Free Assembly Profile |
|-----------------------------------|--------------------------|
| Temperature Min. (Tsmmin) | 150°C |
| Temperature Max. (Tsmmax) | 200°C |
| Time (ts) from (Tsmmin to Tsmmax) | 60–120 seconds |
| Ramp-up Rate (tL to tp) | 3°C/second max. |
| Liquidous Temperature (TL) | 217°C |
| Time (tL) Maintained Above (TL) | 60–150 seconds |
| Peak Body Package Temperature | 260°C +0°C / -5°C |
| Time (tp) within 5°C of 260°C | 30 seconds |
| Ramp-down Rate (TP to TL) | 6°C/second max. |
| Time 25°C to Peak Temperature | 8 minutes max. |

ORDERING INFORMATION (Note 5)

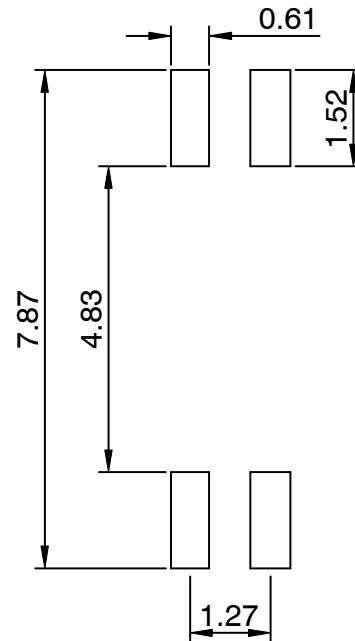
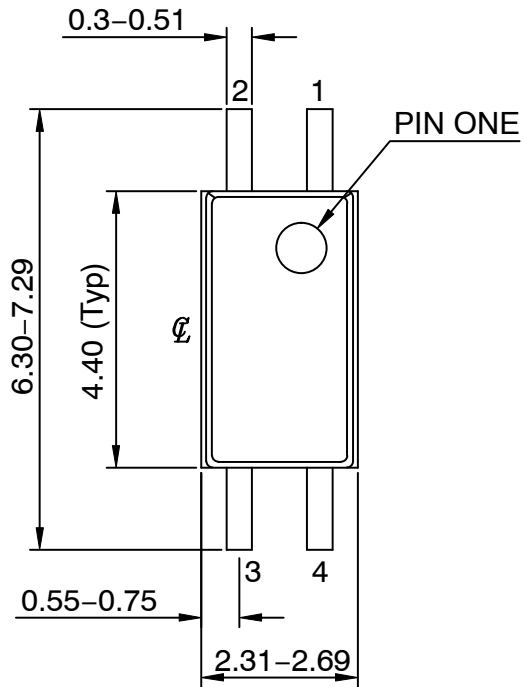
| Part Number | Package | Packing Method |
|-------------|---------------------------------------|----------------------------|
| FODM214A | SOP 4-Pin | Tube (100 units) |
| FODM214AR2 | SOP 4-Pin | Tape and Reel (3000 units) |
| FODM214AV | SOP 4-Pin, DIN EN/IEC60747-5-5 Option | Tube (100 units) |
| FODM214AR2V | SOP 4-Pin, DIN EN/IEC60747-5-5 Option | Tape and Reel (3000 units) |

5. The product orderable part number system listed in this table also applies to the FODM214, FODM217A, FODM217B, FODM217C, and FODM217D products.

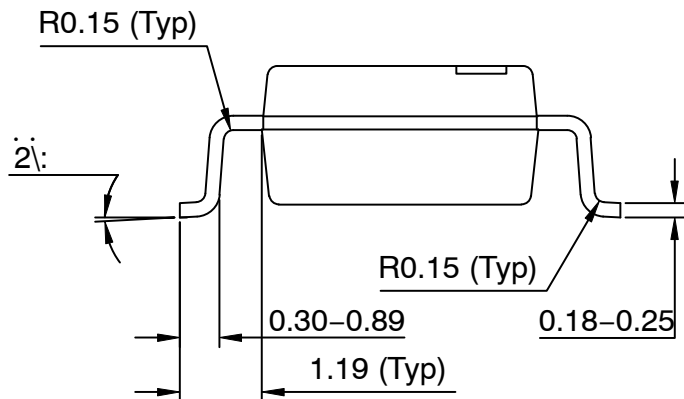
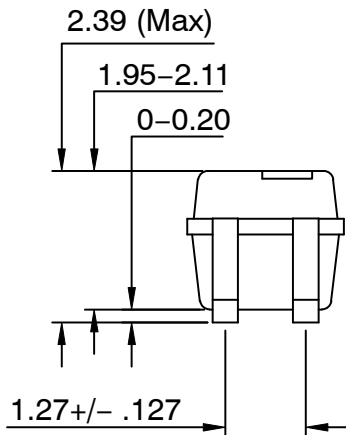
FODM214, FODM217 Series

PACKAGE DIMENSIONS

MFP4 2.5x4.4, 1.27P
CASE 100AL
ISSUE O



LAND PATTERN RECOMMENDATION



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

FODM214, FODM217 Series

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