
**Is Now Part of**


**ON Semiconductor®**

**To learn more about ON Semiconductor, please visit our website at**
**www.onsemi.com**

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

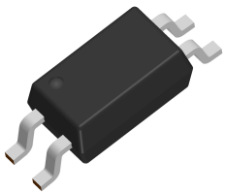
# FODM217 Series

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

ON Semiconductor®

www.onsemi.com

The FODM217 Series single channel, DC sensing input, optocoupler consists of one gallium arsenide (GaAs) infrared light emitting diode optically coupled to one phototransistor, in a compact, half-pitch, mini-flat, 4-pin package. The input-output isolation voltage, $V_{ISO}$, is rated at 3,750 $VAC_{RMS}$.



**SOP 4 PINS**

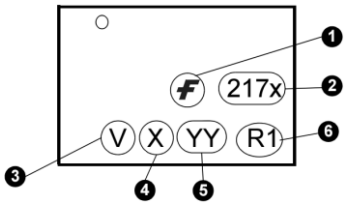
### Features

- Current Transfer Ratio Ranges from 80 to 600% at $I_F$ = 5 mA, $V_{CE}$ = 5 V, $T_A$ = 25ºC
  - 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, 260ºC

### Typical Applications

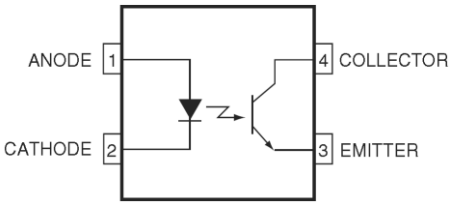
- Primarily Suited for DC-DC Converters
- For Ground Loop Isolation, Signal to Noise Isolation
- Communications – Adapters, Chargers
- Consumer – Appliances, Set Top Boxes
- Industrial – Power Supplies, Motor Control, Programmable Logic Control

### MARKING DIAGRAM




1. F = Corporate Logo
2. 217x = 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




### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

## 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, $V_{IORM}$ x 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, $V_{IORM}$ x 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 (Note 2)

$T_A$ = 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<br>(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 3) | 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 3) | 150 | mW |

2. 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.
3. 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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Emitter** | | | | | | |
| $V_F$ | Forward Voltage | $I_F$ = 20 mA | | 1.2 | 1.4 | V |
| $I_R$ | Reverse Current | $V_R$ = 4 V | | | 10 | μA |
| $C_T$ | Terminal Capacitance | V = 0 V, f = 1 kHz | | 30 | 250 | pF |
| **Detector** | | | | | | |
| $BV_{CEO}$ | Collector-Emitter Breakdown Voltage | $I_C$ = 0.1 mA, $I_F$ = 0 mA | 80 | | | V |
| $BV_{ECO}$ | Emitter-Collector Breakdown Voltage | $I_E$ = 10 μA, $I_F$ = 0 mA | 7 | | | V |
| $I_{CEO}$ | Collector Dark Current | $V_{CE}$ = 50 V, $I_F$ = 0 mA | | | 100 | nA |

## TRANSFER CHARACTERISTICS

$T_A$=25ºC unless otherwise specified

| Symbol | Parameter | Device | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $CTR_{CE}$ | Current Transfer Ratio (collector-emitter) | FODM217A | $I_F$ = 5 mA, $V_{CE}$ = 5 V | 80 | | 160 | % |
| | | FODM217B | | 130 | | 260 | |
| | | FODM217C | | 200 | | 400 | |
| | | FODM217D | | 300 | | 600 | |
| $I_C$ | Collector Current | All | $I_F$ = 5 mA, $V_{CE}$ = 5 V | 4 | | 30 | mA |
| $CTR_{(SAT)}$ | Saturated Current Transfer Ratio | All | $I_F$ = 8 mA, $V_{CE}$ = 0.4 V | | 60 | | % |
| $I_{C(SAT)}$ | Collector Current | All | $I_F$ = 8 mA, $V_{CE}$ = 0.4 V | | 4.8 | | mA |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage | All | $I_F$ = 8 mA, $I_C$ = 2.4 mA | | | 0.4 | V |

## SWITCHING CHARACTERISTICS

$T_A$=25ºC unless otherwise specified

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

## ISOLATION CHARACTERISTICS

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{ISO}$ | Input-Output Isolation Voltage | Freq = 60 Hz, t = 1.0 min, $I_{I-O}$ ≤ 10 μA (Note 4,5) | 3,750 | | | $VAC_{RMS}$ |
| $R_{ISO}$ | Isolation Resistance | $V_{I-O}$ = 500 V (Note 4) | $5 \times 10^{10}$ | | | Ω |
| $C_{ISO}$ | Isolation Capacitance | Frequency = 1 MHz | | 0.6 | 1.0 | pF |

4. Device is considered a two terminal device: Pin 1 and 2 are shorted together and Pins 3 and 4 are shorted together.
5. 3,750 $VAC_{RMS}$ for 1 minute duration is equivalent to 4,500 $VAC_{RMS}$ for 1 second duration.

## TYPICAL CHARACTERISTICS

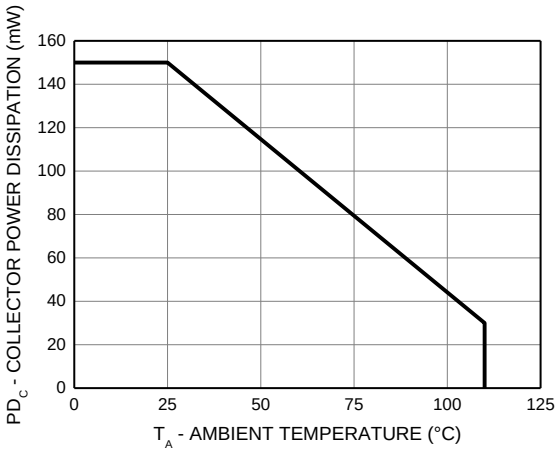



**Figure 1. Collector Power Dissipation vs. Ambient Temperature**

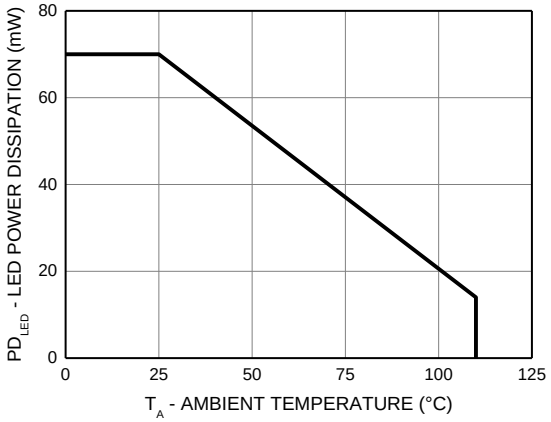



**Figure 2. LED Power Dissipation vs. Ambient Temperature**

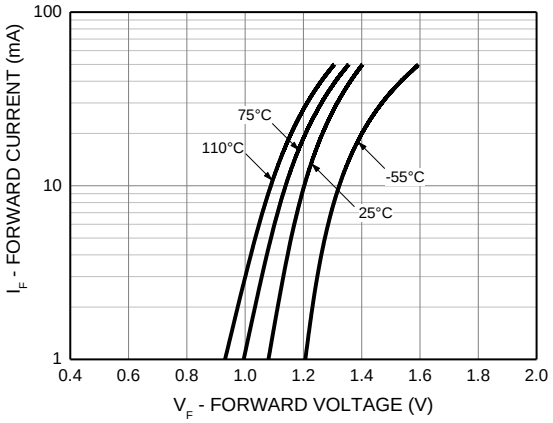



**Figure 3. Forward Current vs. Forward Voltage**

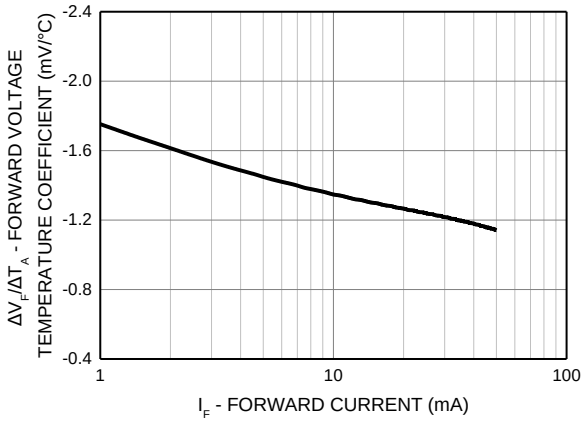



**Figure 4. Forward Voltage Temperature Coefficient vs. Forward Current**

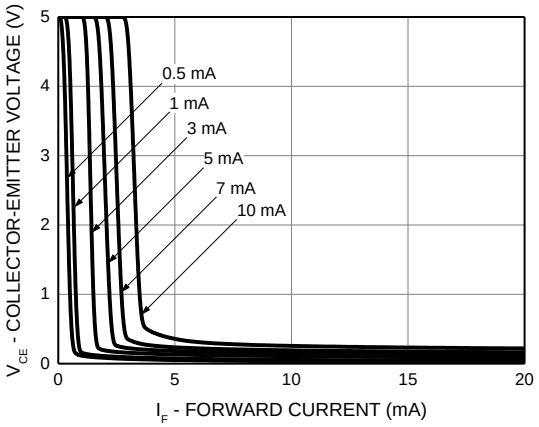



**Figure 5. Collector Emitter Voltage vs. Forward Current**

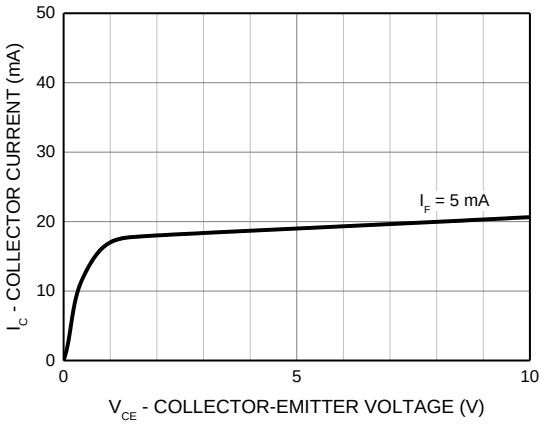



**Figure 6. Collector Current vs. Collector-Emitter Voltage**

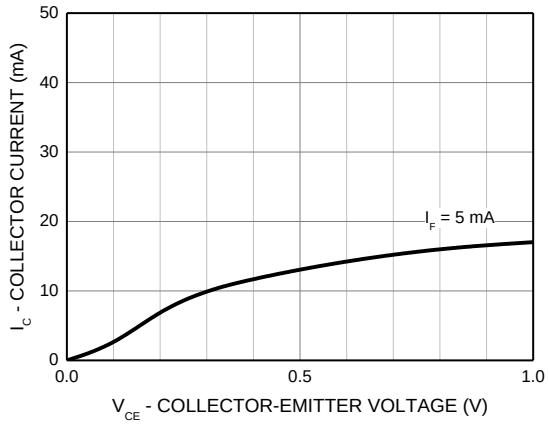



**Figure 7. Collector Current vs. Small Collector-Emittter Voltage**

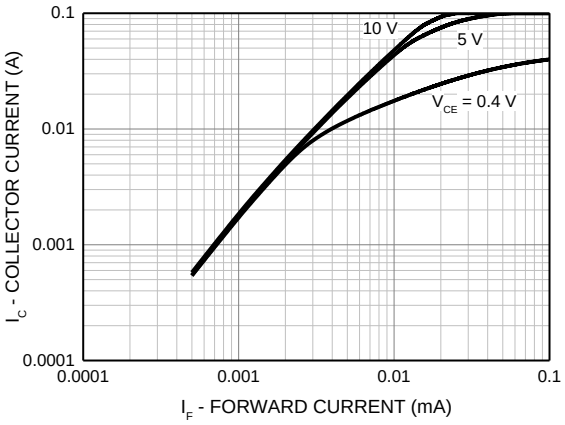



**Figure 8. Collector Current vs. Forward Current**

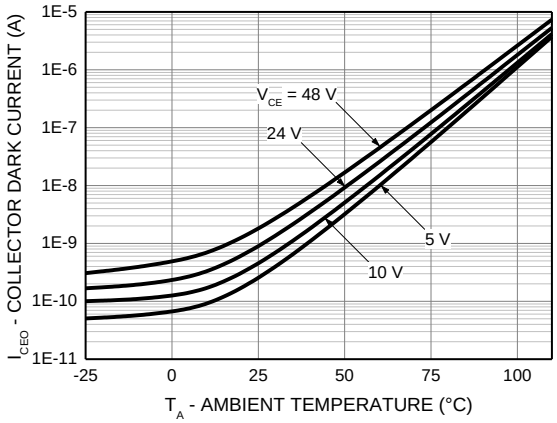



**Figure 9. Collector Dark Current vs. Ambient Temperature**

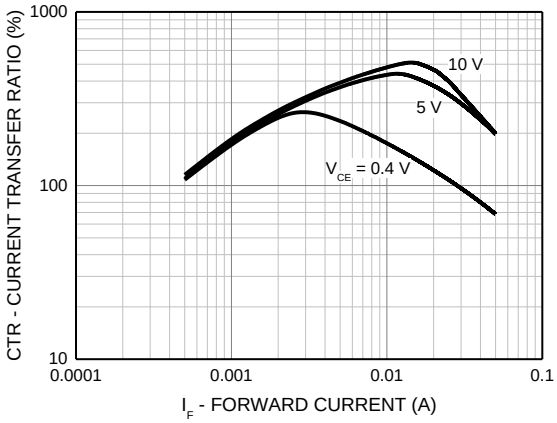



**Figure 10. Current Transfer Ratio vs. Forward Current**

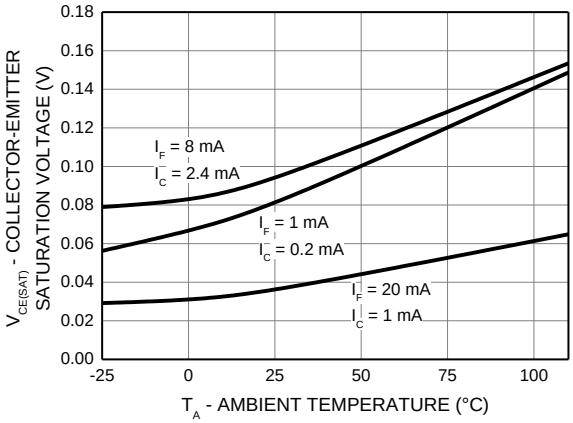



**Figure 11. Collector-Emitter Saturation vs. Ambient Temperature**

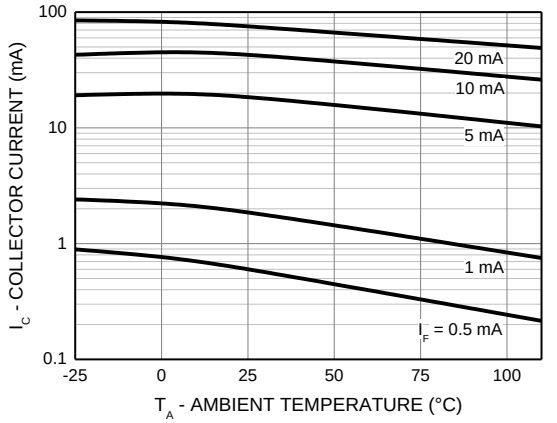



**Figure 12. Collector Current vs. Ambient Temperature**

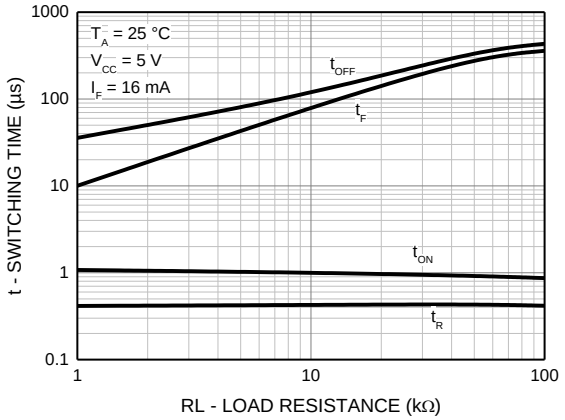



**Figure 13. Switching Time vs. Load Resistance**

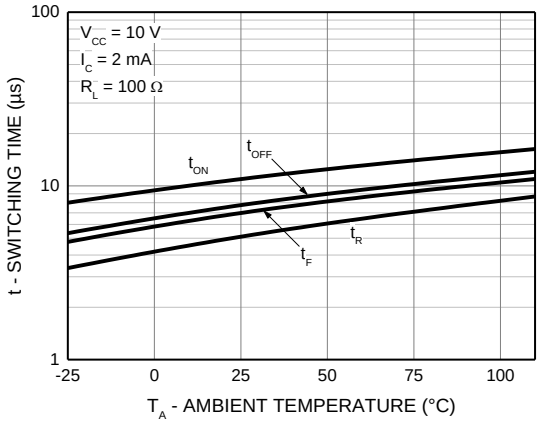



**Figure 14. Switching Time vs. Ambient Temperature**

## TEST CIRCUIT

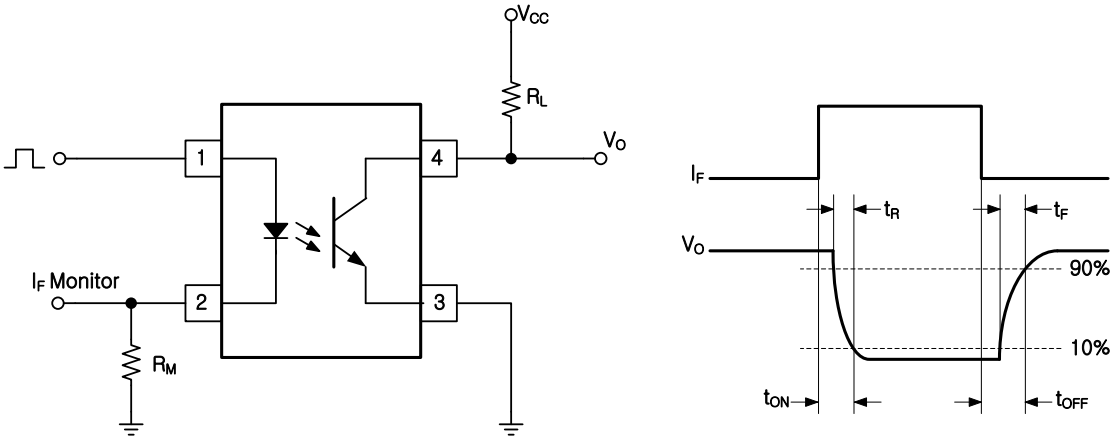
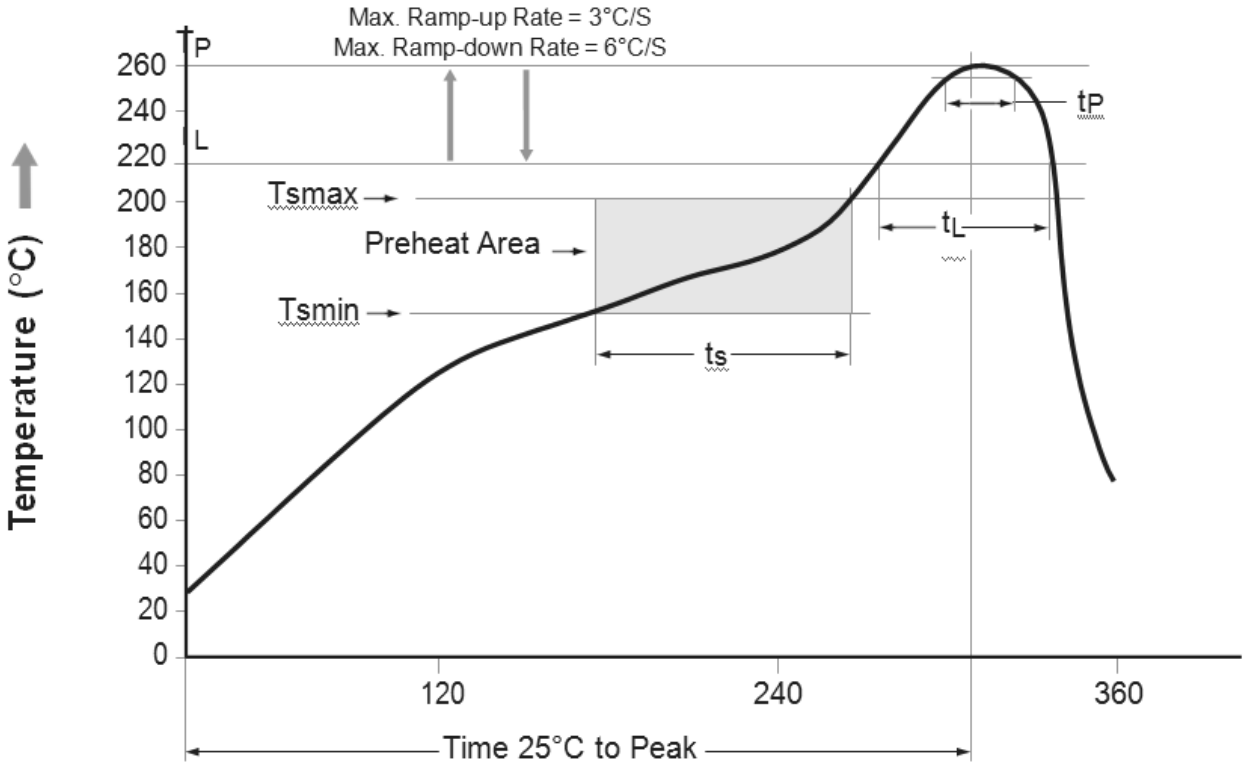



**Figure 15. Test Circuit for Switching Time**

## REFLOW PROFILE



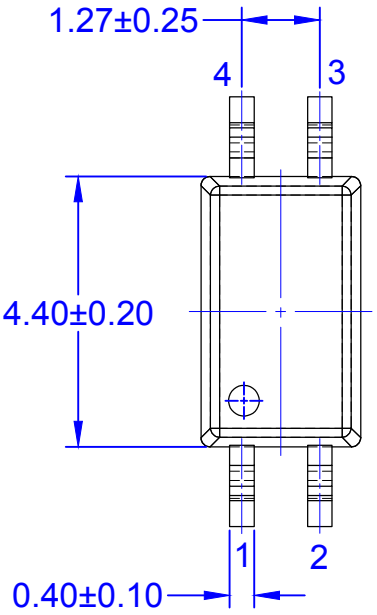

| Profile Freature | Pb-Free Assembly Profile |
|---|---|
| Temperature Min. (Tsmin) | 150°C |
| Temperature Max. (Tsmax) | 200°C |
| Time ($t_S$) from (Tsmin to Tsmax) | 60–120 seconds |
| Ramp-up Rate ($t_L$ to $t_P$) | 3°C/second max. |
| Liquidous Temperature ($T_L$) | 217°C |
| Time ($t_L$) Maintained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

**Figure 36. Reflow Profile**

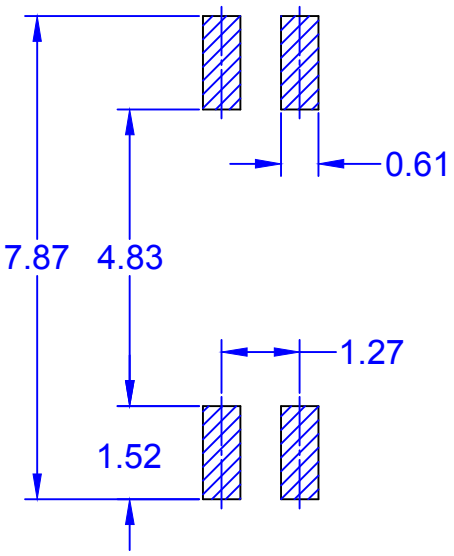
## ORDERING INFORMATION (Note 6)

| Part Number | Package | Packing Method |
|---|---|---|
| FODM217A | SOP 4-Pin | Tube (100 units) |
| FODM217AR2 | SOP 4-Pin | Tape and Reel (3000 units) |
| FODM217AV | SOP 4-Pin, DIN EN/IEC60747-5-5 Option | Tube (100 units) |
| FODM217AR2V | SOP 4-Pin, DIN EN/IEC60747-5-5 Option | Tape and Reel (3000 units) |

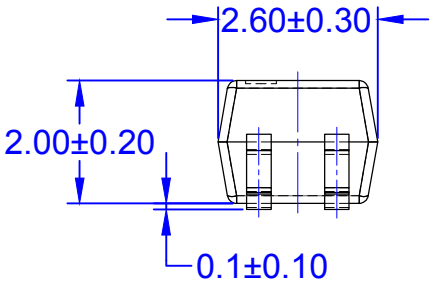
6. The product orderable part number system listed in this table also applies to the FODM217B, FODM217C, and FODM217D products.



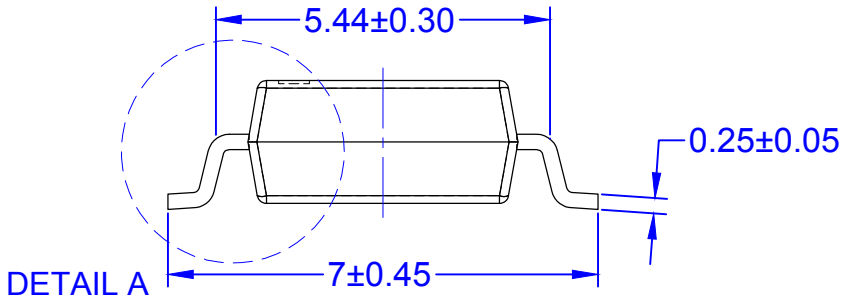

TOP VIEW



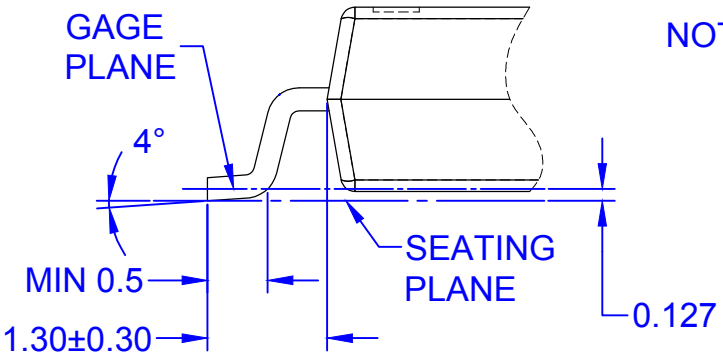

LAND PATTERN RECOMMENDATION




FRONT VIEW




SIDE VIEW




DETAIL A

NOTES:

A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE
B. ALL DIMENSIONS ARE IN MILLIMETERS
C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
D. DRAWING FILENAME: MKT-MFP04DrevA

**ON Semiconductor**

## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5817−1050

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative