

# FODM217 Series

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

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 VACRMS.

### Features

- Current Transfer Ratio Ranges from 80 to 600% at  $I_F = 5$  mA,  $V_{CE} = 5$  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 VACRMS for 1 min
  - DIN EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage
- Applicable to Infrared Ray Reflow,  $260^\circ\text{C}$

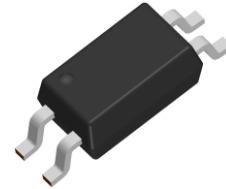
### Typical Applications

- 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



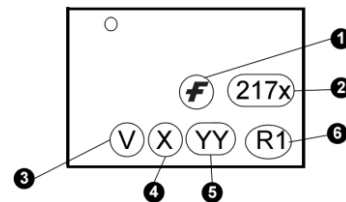
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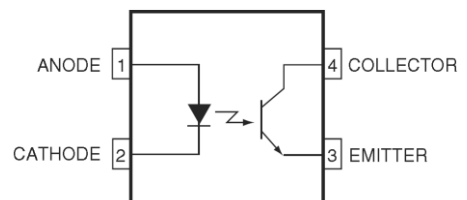
SOP 4 PINS

### 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 <sub>RMS</sub>	I–IV
	< 300 V <sub>RMS</sub>	I–III
Climatic Classification		55/110/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V <sub>PR</sub>	Input-to-Output Test Voltage, Method A, V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC	904	V <sub>peak</sub>
	Input-to-Output Test Voltage, Method B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test with t <sub>m</sub> = 1 s, Partial Discharge < 5 pC	1060	V <sub>peak</sub>
V <sub>IORM</sub>	Maximum Working Insulation Voltage	565	V <sub>peak</sub>
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	4,000	V <sub>peak</sub>
	External Creepage	≥ 5	mm
	External Clearance	≥ 5	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T <sub>S</sub>	Case Temperature (Note 1)	150	°C
I <sub>S,INPUT</sub>	Input Current (Note 1)	200	mA
P <sub>S,OUTPUT</sub>	Output Power (Note 1)	300	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V (Note 1)	> 10 <sup>9</sup>	Ω

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

**ABSOLUTE MAXIMUM RATINGS** (Note 2)T<sub>A</sub> = 25°C unless otherwise specified.

Symbol	Parameter	Value	Units
T <sub>STG</sub>	Storage Temperature	-55 to +150	°C
T <sub>OPR</sub>	Operating Temperature	-55 to +110	°C
T <sub>J</sub>	Junction Temperature	-55 to +125	°C
T <sub>SOL</sub>	Lead Solder Temperature (Refer to Reflow Temperature Profile)	260 for 10 sec	°C
<b>Emitter</b>			
I <sub>F(average)</sub>	Continuous Forward Current	50	mA
I <sub>F(peak)</sub>	Peak Forward Current (1 μs pulse, 300 pps)	1	A
V <sub>R</sub>	Reverse Input Voltage	6	V
PD <sub>LED</sub>	Power Dissipation (Note 3)	70	mW
<b>Detector</b>			
I <sub>C(average)</sub>	Continuous Collector Current	50	mA
V <sub>CEO</sub>	Collector-Emitter Voltage	80	V
V <sub>ECO</sub>	Emitter-Collector Voltage	7	V
PD <sub>C</sub>	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** $T_A = 25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>Emitter</b>						
$V_F$	Forward Voltage	$I_F = 20\text{ mA}$		1.2	1.4	V
$I_R$	Reverse Current	$V_R = 4\text{ V}$			10	$\mu\text{A}$
$C_T$	Terminal Capacitance	$V = 0\text{ V}, f = 1\text{ kHz}$		30	250	pF
<b>Detector</b>						
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 0.1\text{ mA}, I_F = 0\text{ mA}$	80			V
$BV_{ECO}$	Emitter-Collector Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_F = 0\text{ mA}$	7			V
$I_{CEO}$	Collector Dark Current	$V_{CE} = 50\text{ V}, I_F = 0\text{ mA}$			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)	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	All	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$	4		30	mA
$CTR_{(SAT)}$	Saturated Current Transfer Ratio	All	$I_F = 8\text{ mA}, V_{CE} = 0.4\text{ V}$		60		%
$I_{C(SAT)}$	Collector Current	All	$I_F = 8\text{ mA}, V_{CE} = 0.4\text{ V}$		4.8		mA
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	All	$I_F = 8\text{ mA}, I_C = 2.4\text{ mA}$			0.4	V

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

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

**ISOLATION CHARACTERISTICS**

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

TYPICAL CHARACTERISTICS

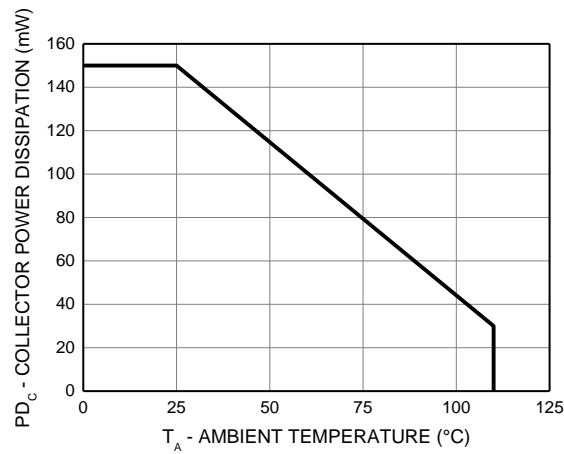


Figure 1. Collector Power Dissipation vs. Ambient Temperature

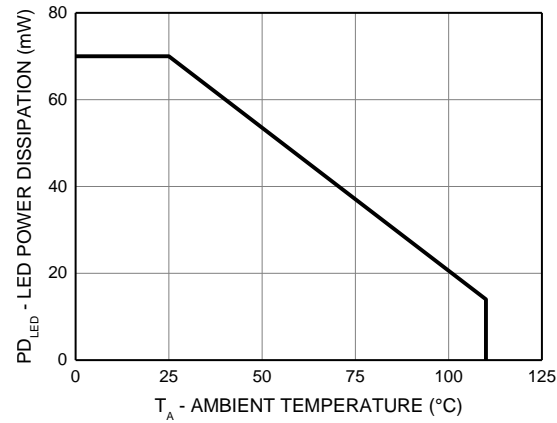


Figure 2. LED Power Dissipation vs. Ambient Temperature

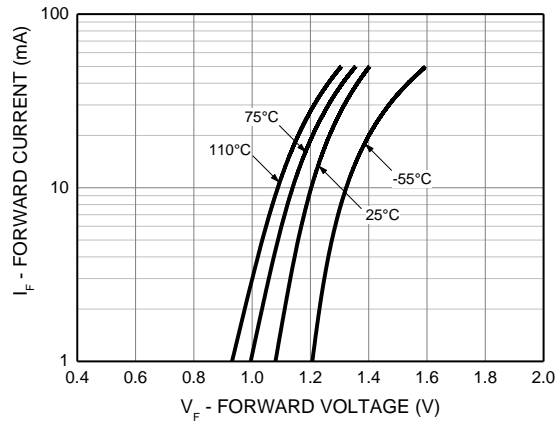


Figure 3. Forward Current vs. Forward Voltage

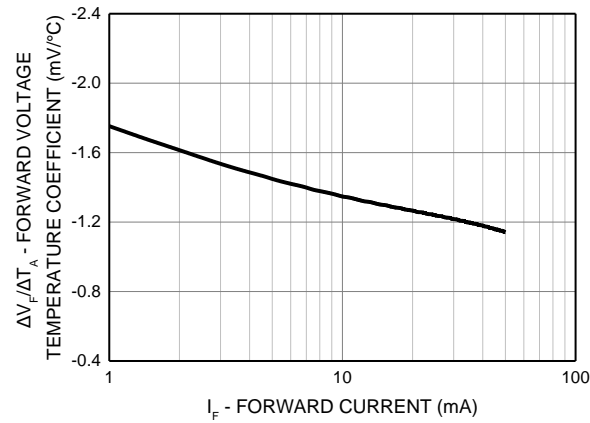


Figure 4. Forward Voltage Temperature Coefficient vs. Forward Current

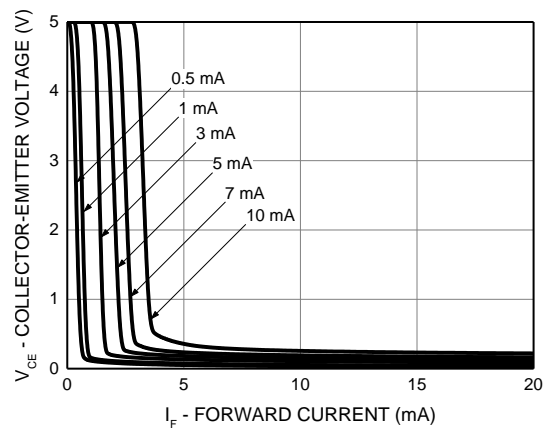


Figure 5. Collector-Emitter Voltage vs. Forward Current

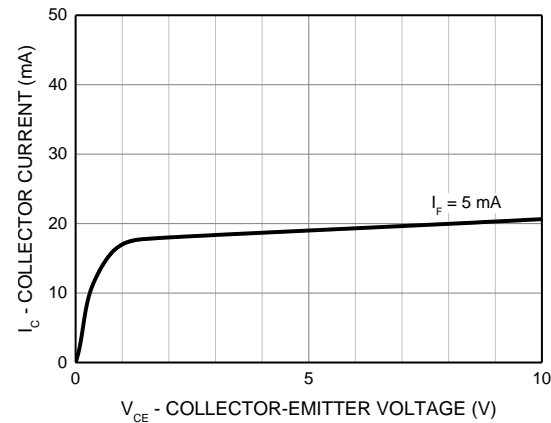
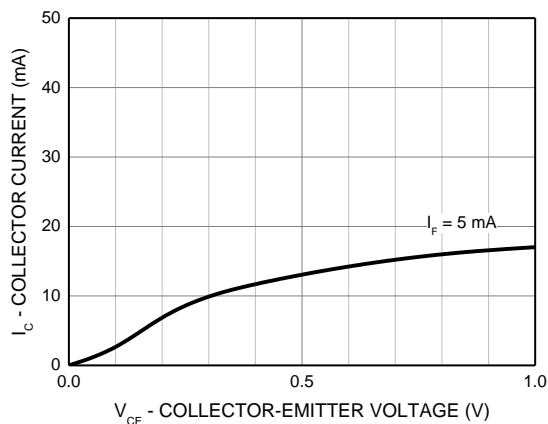
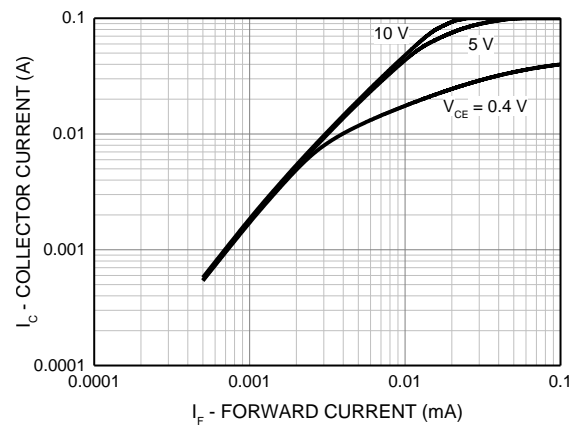


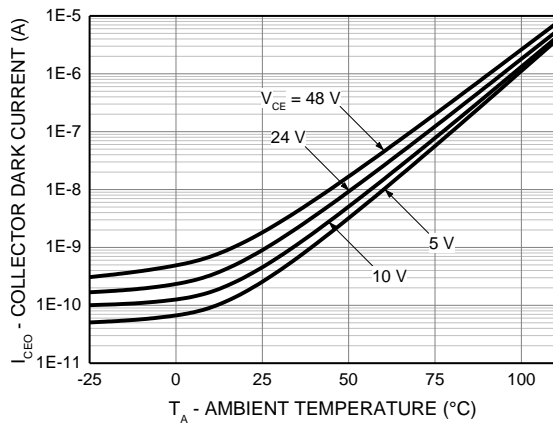
Figure 6. Collector Current vs. Collector-Emitter Voltage



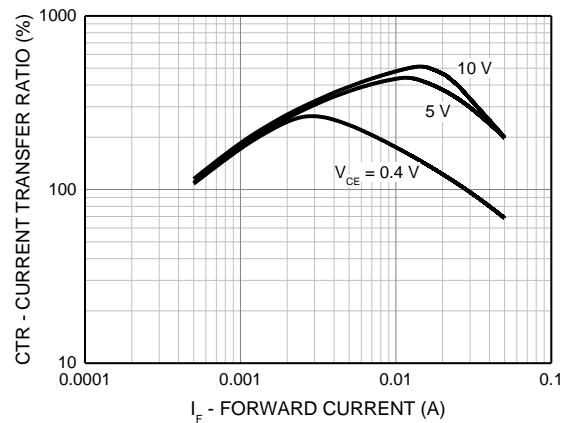
**Figure 7. Collector Current vs. Small Collector-Emitter Voltage**



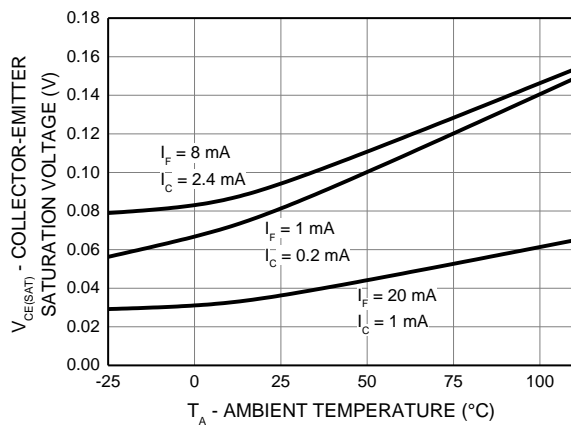
**Figure 8. Collector Current vs. Forward Current**



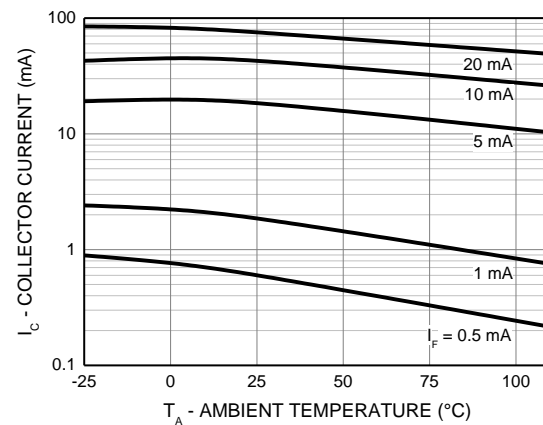
**Figure 9. Collector Dark Current vs. Ambient Temperature**



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



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



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

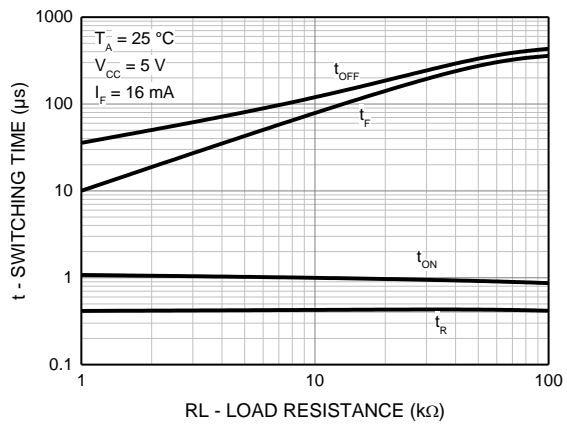


Figure 13. Switching Time vs. Load Resistance

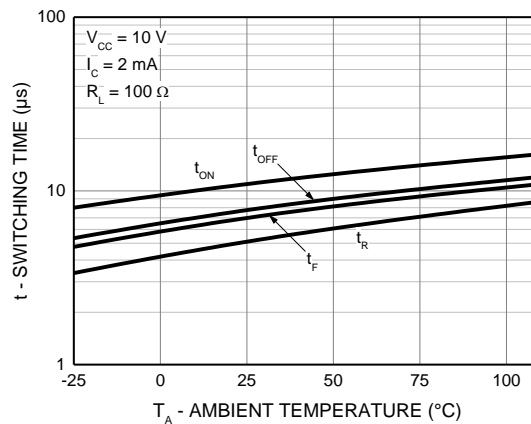


Figure 14. Switching Time vs. Ambient Temperature

## TEST CIRCUIT

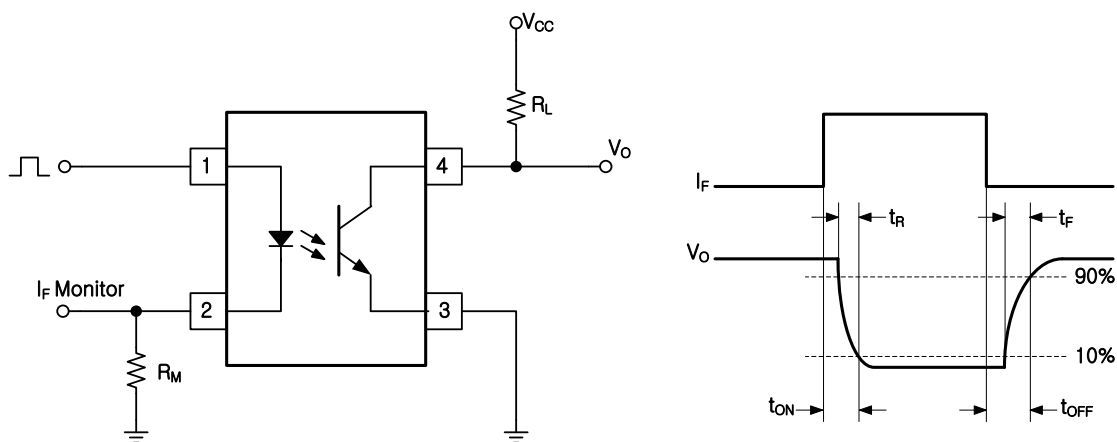
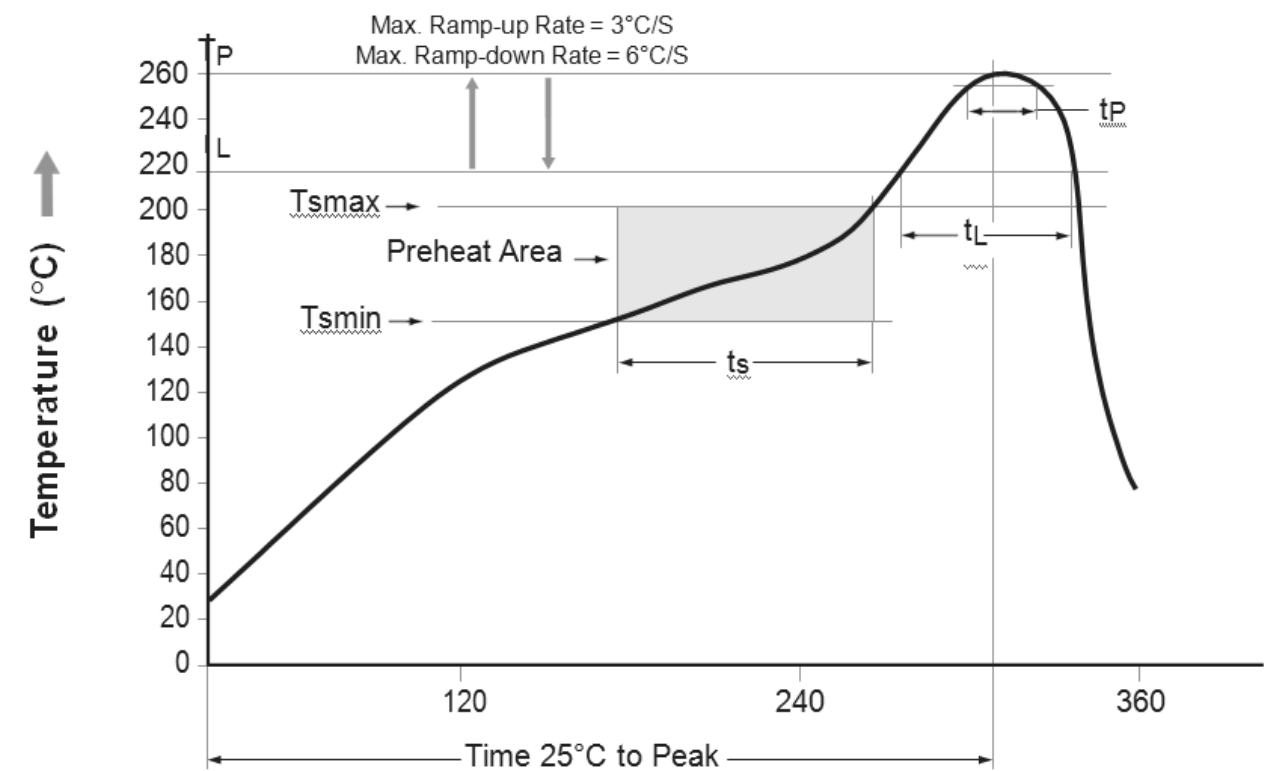


Figure 15. Test Circuit for Switching Time

REFLOW PROFILE



Profile 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 ( $T_L$ )	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.

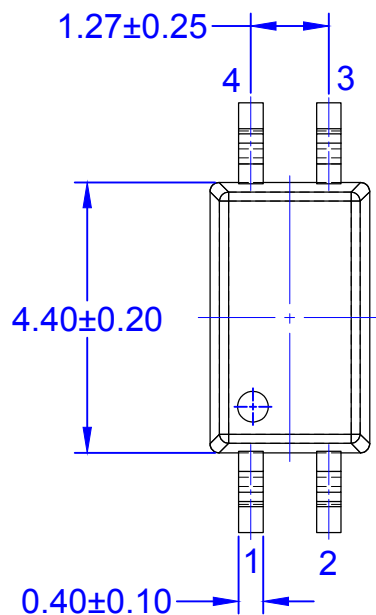
Figure 36. Reflow Profile



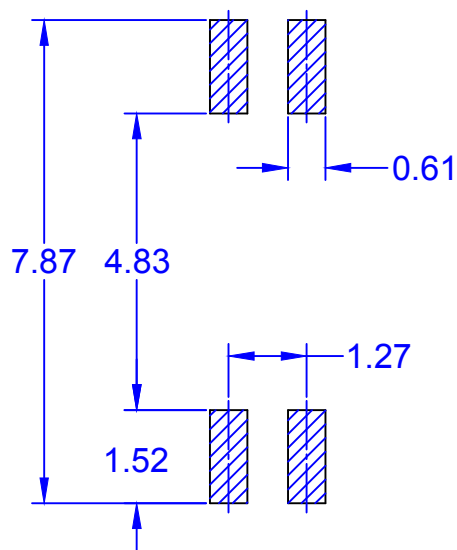
**ORDERING INFORMATION** (Note 6)

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)

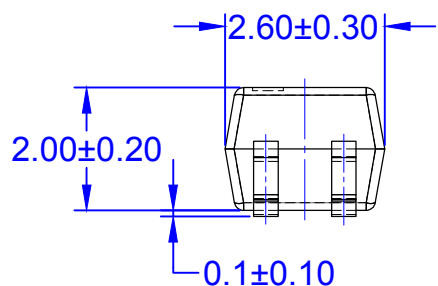
6. The product orderable part number system listed in this table also applies to the FODM217B, FODM217C, and FODM217D products.



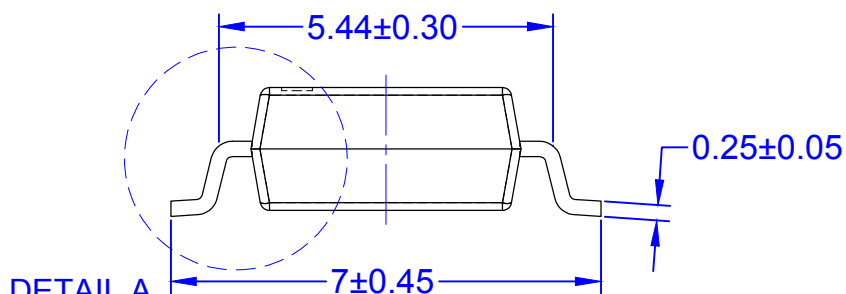
TOP VIEW



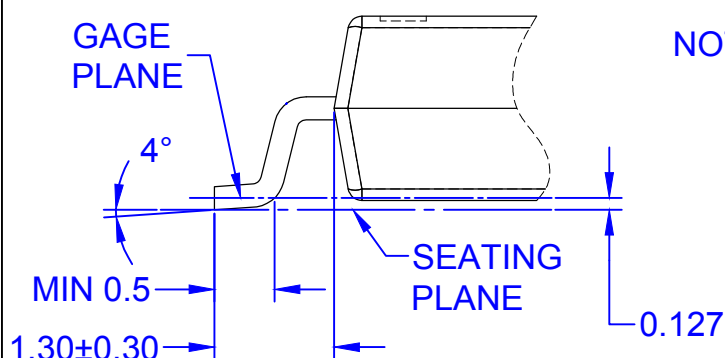
LAND PATTERN RECOMMENDATION



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

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