FODM217 Series

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

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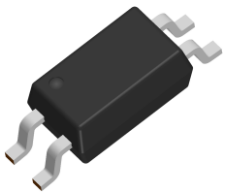
The FODM217 Series single channel, DC sensing input, optocoupler consists of one gallium arsenide (GaAs) infrared light emitting diode optically coupled to one phototransistor, in a compact, half-pitch, mini-flat, 4-pin package. The input-output isolation voltage, V_{ISO}, is rated at 3,750 VAC_{RMS}.



SOP 4 PINS

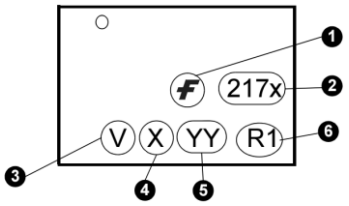
Features

- 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

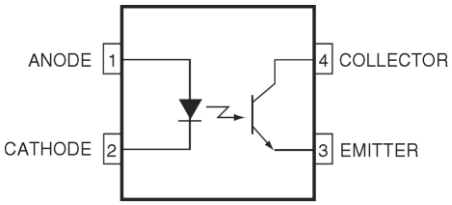
- Primarily Suited for DC-DC Converters
- For Ground Loop Isolation, Signal to Noise Isolation
- Communications – Adapters, Chargers
- Consumer – Appliances, Set Top Boxes
- Industrial – Power Supplies, Motor Control, Programmable Logic Control

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 (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)	5×10^{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

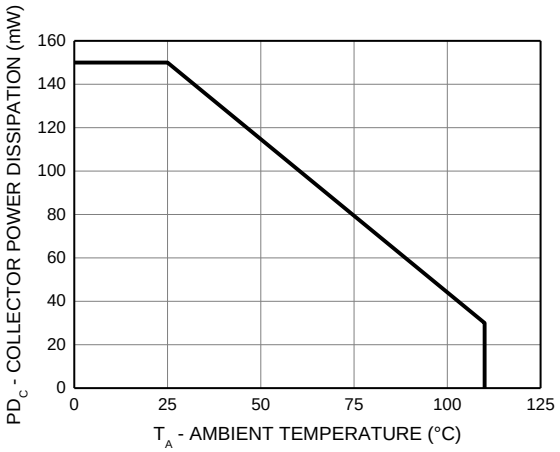


Figure 1. Collector Power Dissipation vs. Ambient Temperature

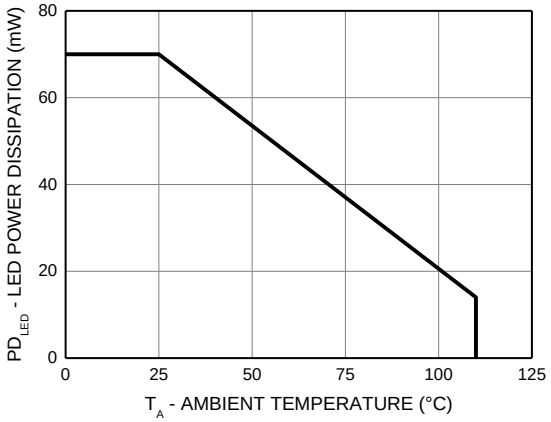


Figure 2. LED Power Dissipation vs. Ambient Temperature

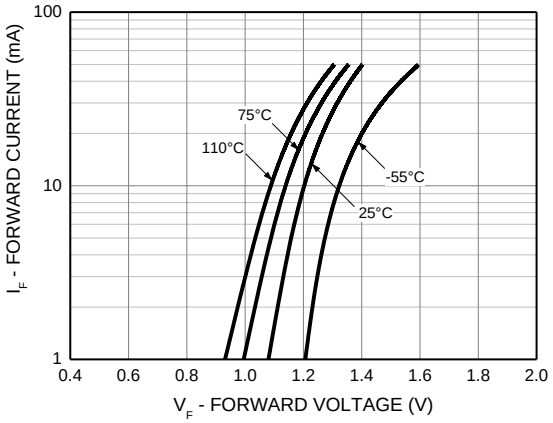


Figure 3. Forward Current vs. Forward Voltage

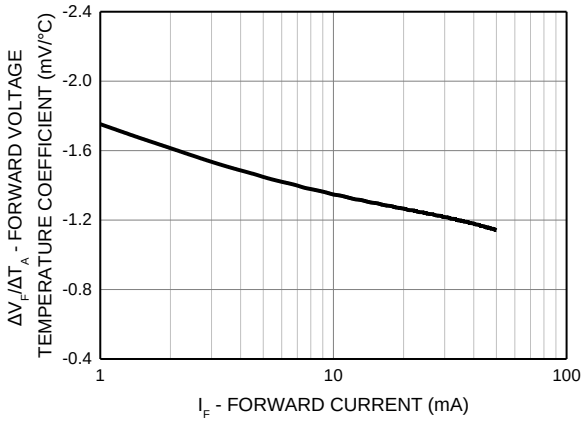


Figure 4. Forward Voltage Temperature Coefficient vs. Forward Current

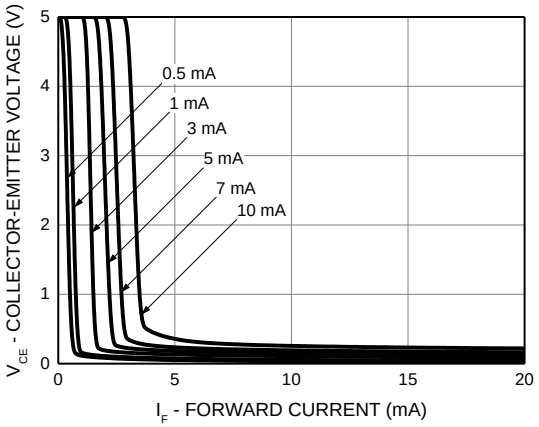


Figure 5. Collector Emitter Voltage vs. Forward Current

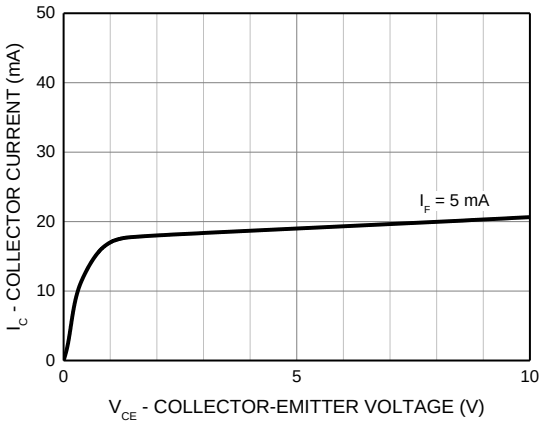


Figure 6. Collector Current vs. Collector-Emitter Voltage

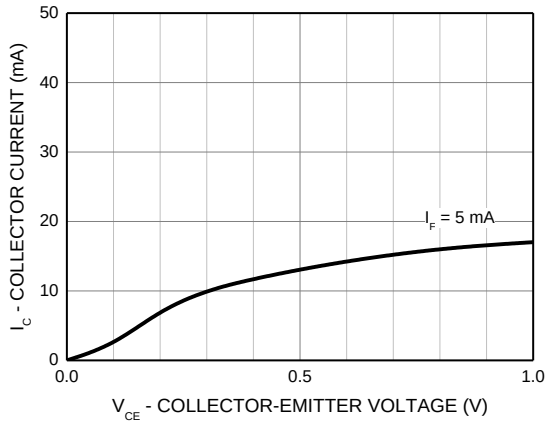


Figure 7. Collector Current vs. Small Collector-Emittter Voltage

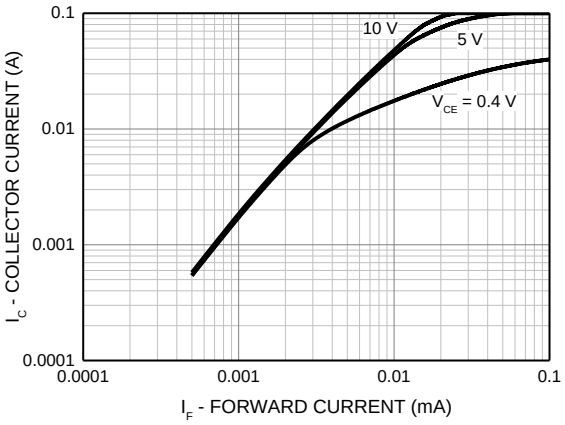


Figure 8. Collector Current vs. Forward Current

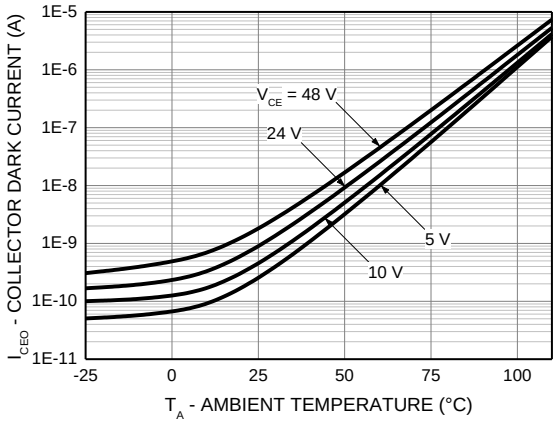


Figure 9. Collector Dark Current vs. Ambient Temperature

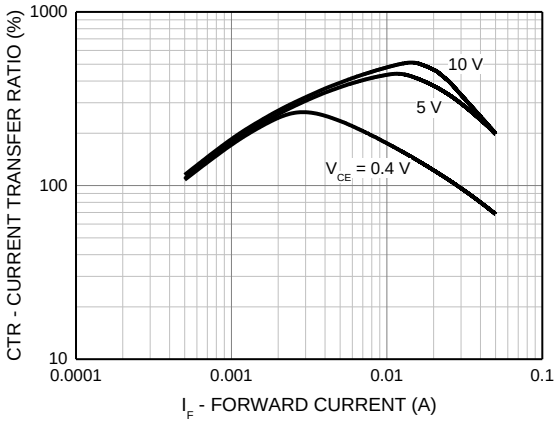


Figure 10. Current Transfer Ratio vs. Forward Current

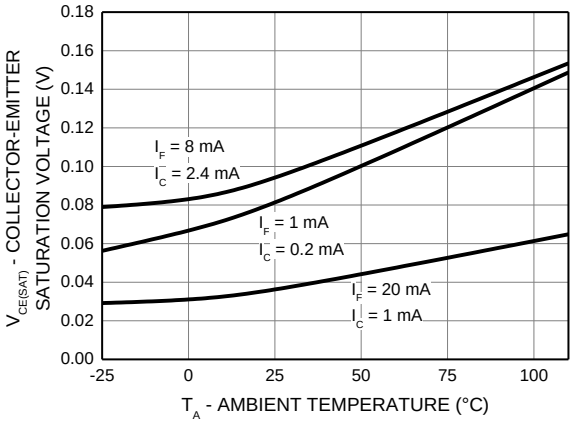


Figure 11. Collector-Emitter Saturation vs. Ambient Temperature

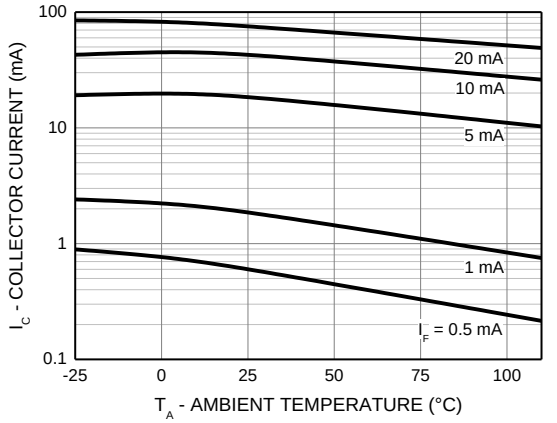


Figure 12. Collector Current vs. Ambient Temperature

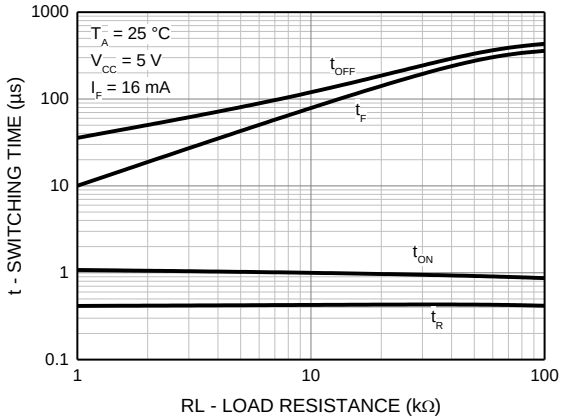


Figure 13. Switching Time vs. Load Resistance

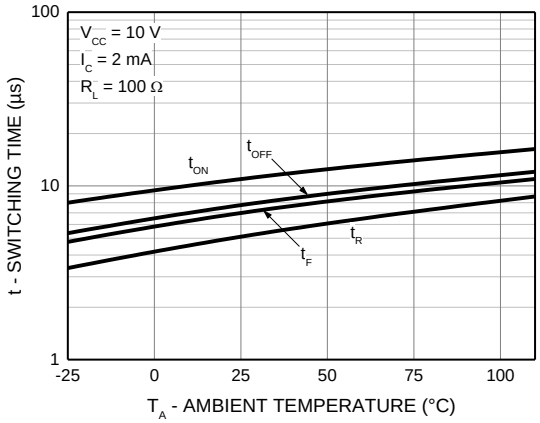


Figure 14. Switching Time vs. Ambient Temperature

TEST CIRCUIT

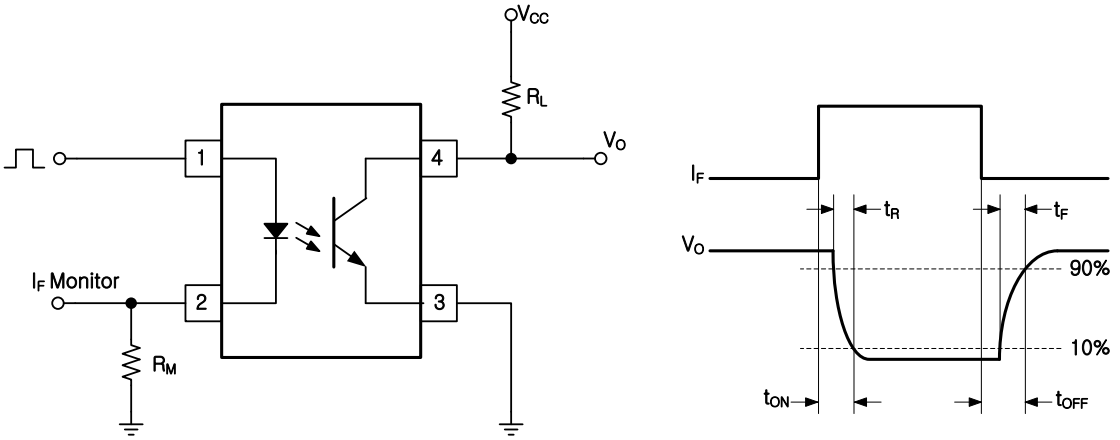
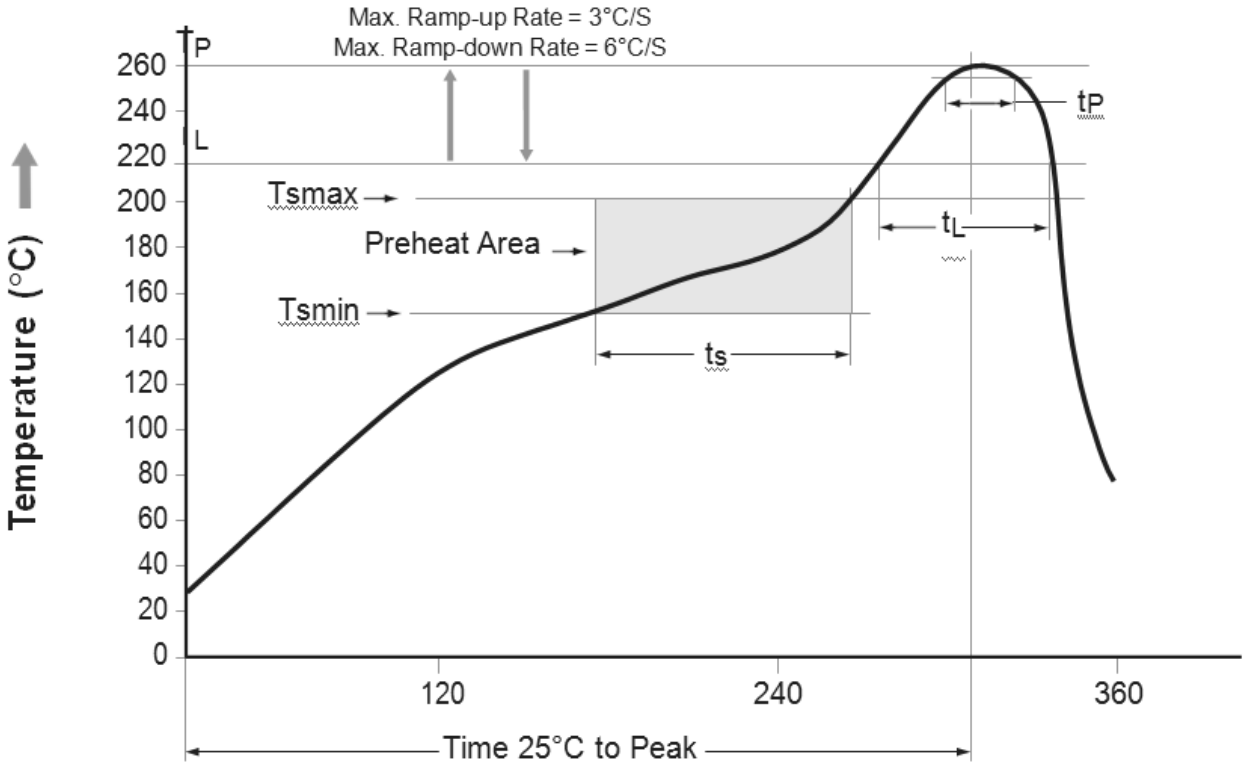


Figure 15. Test Circuit for Switching Time

REFLOW PROFILE



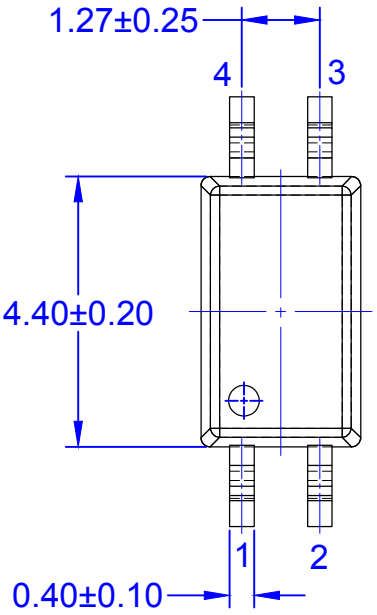
Profile Freature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60–120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature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

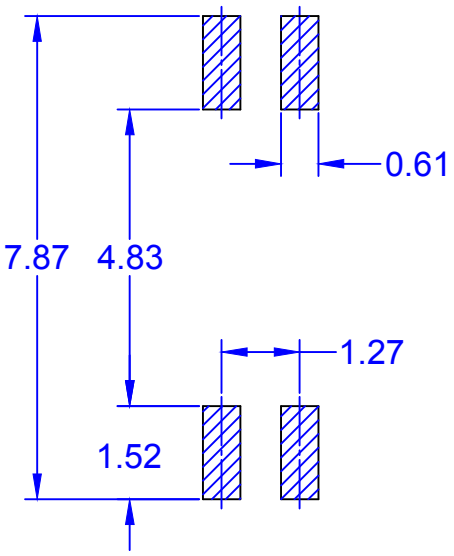
ORDERING INFORMATION (Note 6)

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)

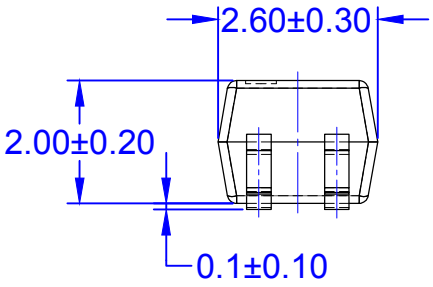
6. The product orderable part number system listed in this table also applies to the FODM217B, FODM217C, and FODM217D products.



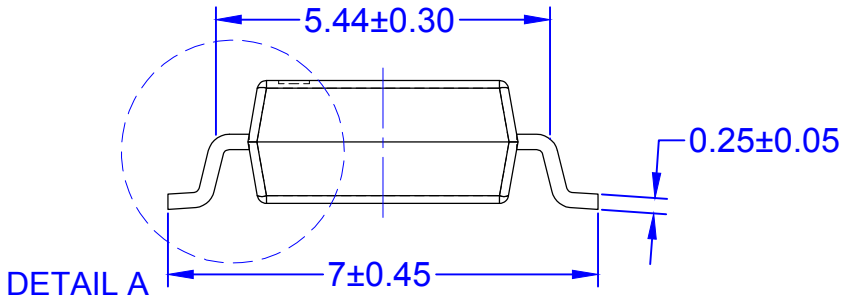
TOP VIEW



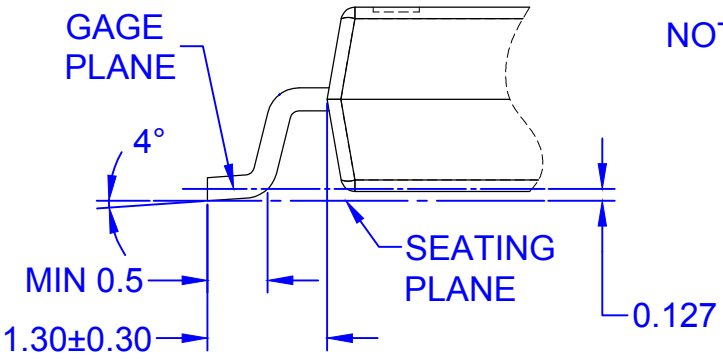
LAND PATTERN RECOMMENDATION



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

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