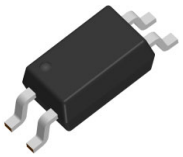
Single Channel, AC/DC Sensing Input, Phototransistor Optocoupler In Half-Pitch Mini-Flat 4-Pin Package

FODM214, FODM217 Series



MFP4 2.5x4.4, 1.27P
CASE 100AL

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.

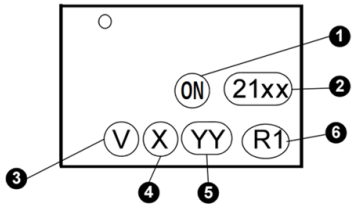
Features

- Current Transfer Ratio Ranges from 20 to 600%
  at I_F = ±1 mA, V_{CE} = 5 V, T_A = 25°C
  - FODM214 − 20 to 400%
  - FODM214A − 50 to 250%
  at I_F = 5 mA, V_{CE} = 5 V, T_A = 25°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

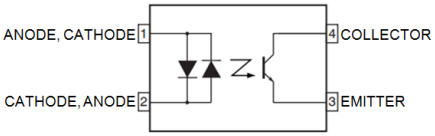
- Primarily Suited for DC−DC Converters
- For Ground Loop Isolation, Signal to Noise Isolation
- Communications − Adapters, Chargers
- Consumer − Appliances, Set Top Boxes
- Industrial − Power Supplies, Motor Control, Programmable Logic Control

MARKING DIAGRAM

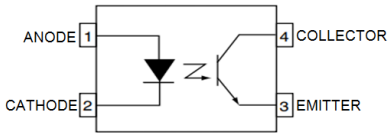


1. ON = Corporate Logo
2. 21xx = Device Number
3. V = DIN EN/IEC60747−5−5 Option
4. X = One−Digit Year Code
5. YY = Digit Work Week
6. R1 = Assembly Package Code

PIN CONNECTIONS



FODM214



FODM217

ORDERING INFORMATION

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

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	Vpeak
	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	Vpeak
V_{IORM}	Maximum Working Insulation Voltage	565	Vpeak
V_{IOTM}	Highest Allowable Over−Voltage	4,000	Vpeak
	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
$IF_{(peak)}$	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.

ELECTRICAL CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Device	Conditions	Min.	Typ.	Max.	Units
EMITTER							
V_F	Forward Voltage	FODM214	I_F = ±20 mA		1.2	1.4	V
		FODM217	I_F = 20 mA				
I_R	Reverse Current	FODM217	V_R = 4 V			10	μA
C_T	Terminal Capacitance	All	V = 0 V, f = 1 kHz		30	250	pF
DETECTOR							
BV_{CEO}	Collector−Emitter Breakdown Voltage	All	I_C = 0.1 mA, IF = 0 mA	80			V
BV_{ECO}	Emitter−Collector Breakdown Voltage	All	I_E = 10 μA, IF = 0 mA	7			V
I_{CEO}	Collector Dark Current	All	V_{CE} = 50 V, IF = 0 mA			100	nA

TRANSFER CHARACTERISTICS T_A=25°C unless otherwise specified

Symbol	Parameter	Device	Conditions	Min.	Typ.	Max.	Units
CTR_{CE}	Current Transfer Ratio (collector−emitter)	FODM214	I_F = ±1 mA, V_{CE} = 5 V	20		400	%
		FODM214A		50		250	
		FODM217A	I_F = 5 mA, V_{CE} = 5 V	80		160	
		FODM217B		130		260	
		FODM217C		200		400	
		FODM217D		300		600	
I_C	Collector Current	FODM214	I_F = ±1 mA, V_{CE} = 5 V	0.2		2.5	mA
		FODM217	I_F = 5 mA, V_{CE} = 5 V	4		30	
$CTR_{(SAT)}$	Saturated Current Transfer Ratio	FODM214	I_F = ±8 mA, V_{CE} = 0.4 V		60		%
		FODM217	I_F = 8 mA, V_{CE} = 0.4 V				
$I_{C(SAT)}$	Collector Current	FODM214	I_F = ±8 mA, V_{CE} = 0.4 V		4.8		mA
		FODM217	I_F = 8 mA, V_{CE} = 0.4 V				
$V_{CE(SAT)}$	Collector−Emitter Saturation Voltage	FODM214	I_F = ±8 mA, I_C = 2.4 mA			0.4	V
		FODM217	I_F = 8 mA, I_C = 2.4 mA				

SWITCHING CHARACTERISTICS T_A = 25°C 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		3		μs
t_F	Output Fall Time (90%−10%)	IC = 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, $I_{I-O} \leq$ 10 μA (Note 3, 4)	3,750			VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V (Note 3)	5 x 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 VAC_{RMS} for 1 minute duration is equivalent to 4,500 VAC_{RMS} for 1 second duration.

TYPICAL CHARACTERISTICS

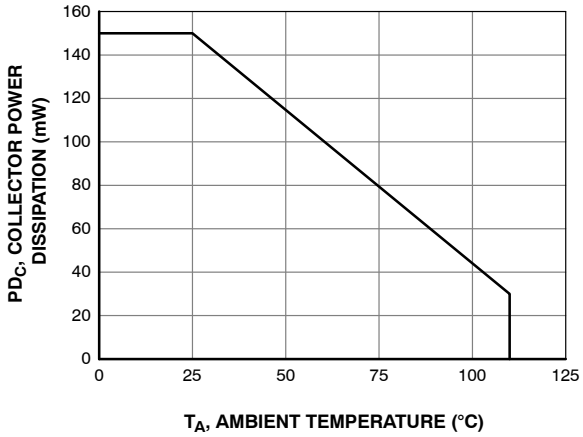


Figure 1. Collector Power Dissipation vs. Ambient Temperature

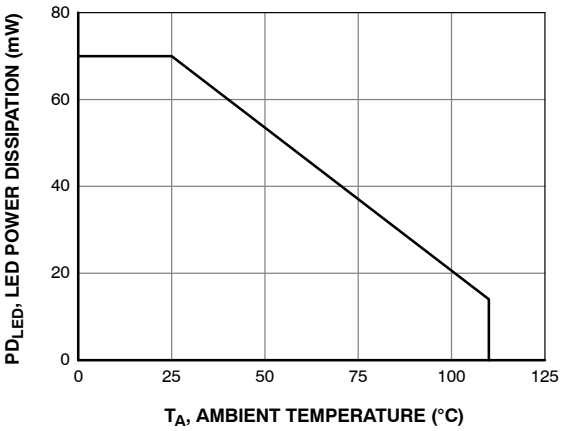


Figure 2. LED Power Dissipation vs. Ambient Temperature

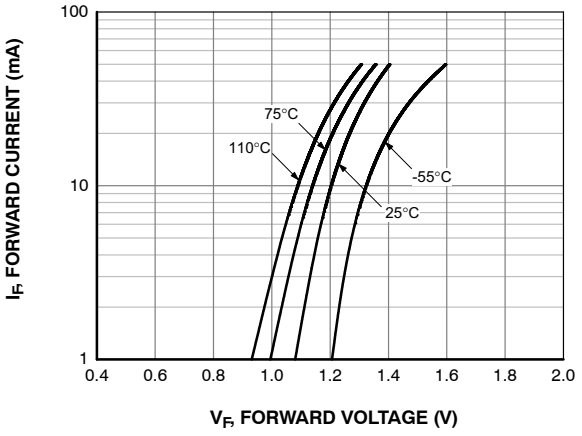


Figure 3. Forward Current vs. Forward Voltage

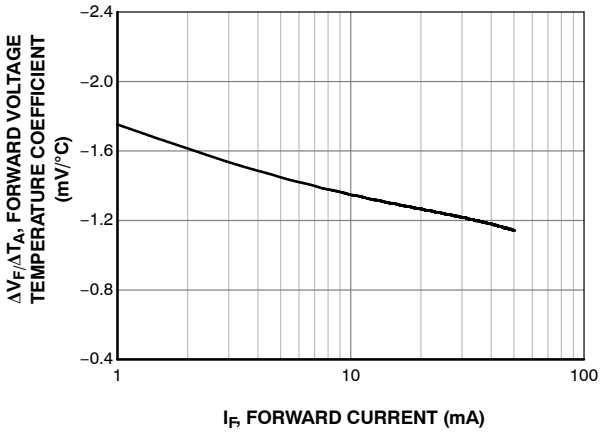


Figure 4. Forward Voltage Temperature Coefficient vs. Forward Current

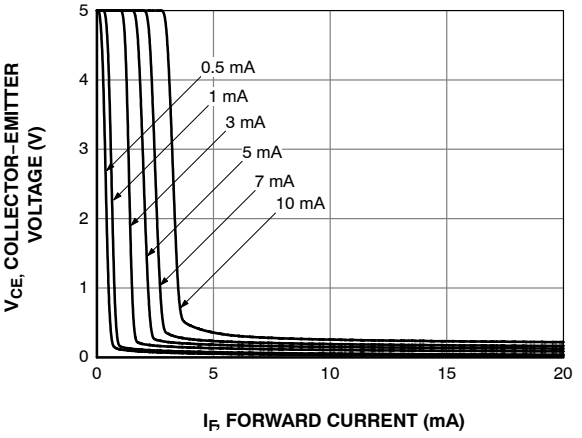


Figure 5. Collector Emitter Voltage vs. Forward Current

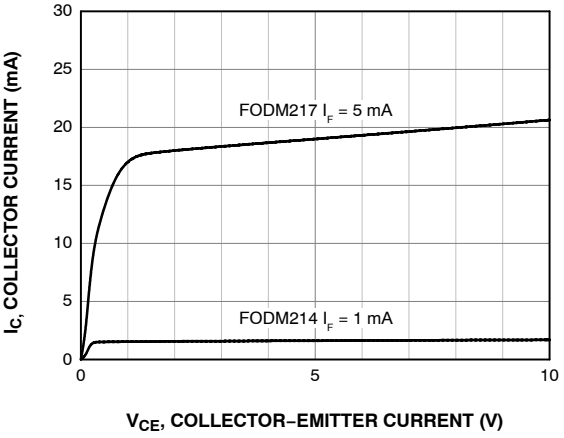


Figure 6. Collector Current vs. Collector−Emitter Voltage

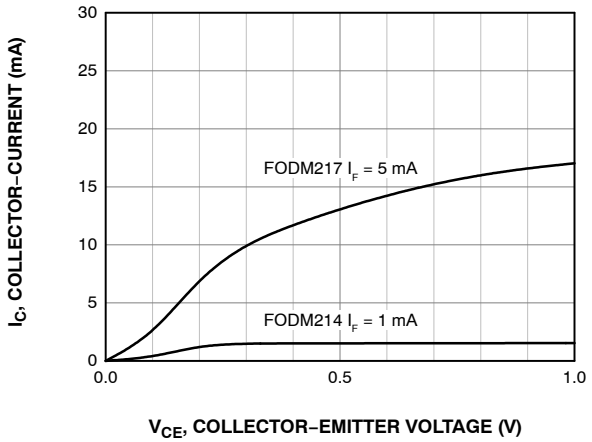


Figure 7. Collector Current vs. Small Collector−Emitter Voltage

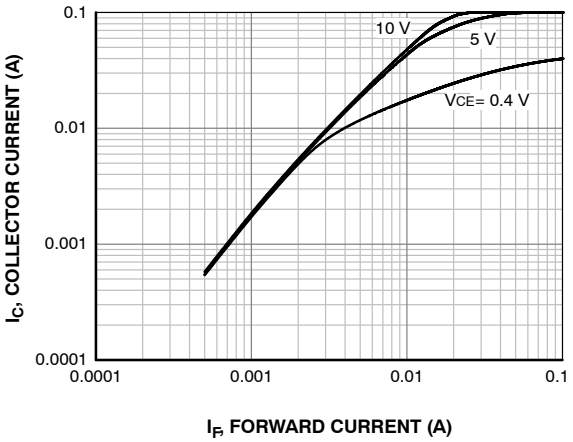


Figure 8. Collector Current vs. Forward Current

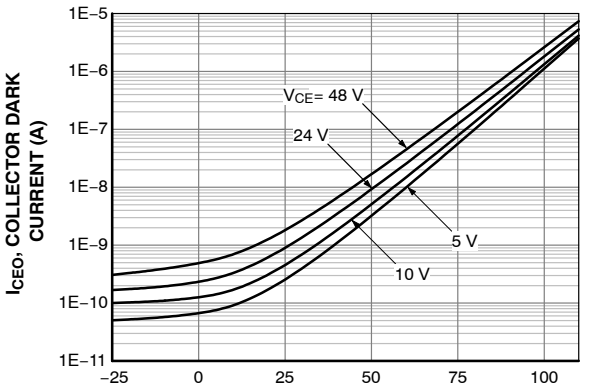


Figure 9. Collector Dark Current vs. Ambient Temperature

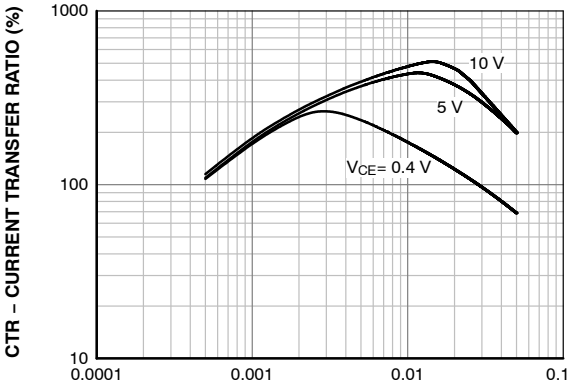


Figure 10. Current Transfer Ratio vs. Forward Current

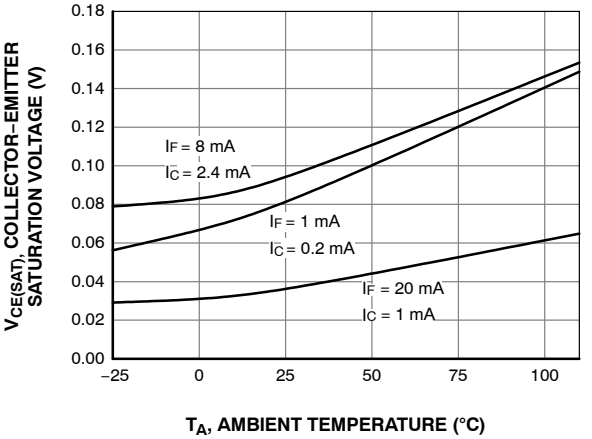


Figure 11. Collector−Emitter Saturation vs. Ambient Temperature

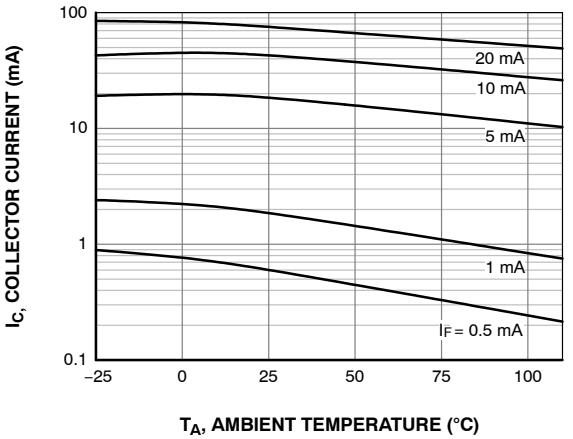


Figure 12. Collector Current vs. Ambient Temperature

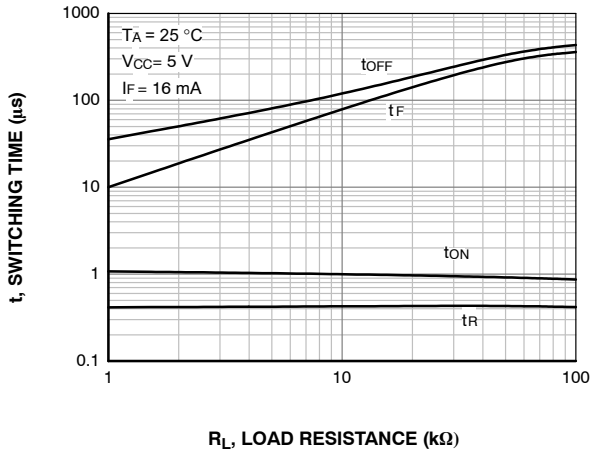


Figure 13. Switching Time vs. Load Resistance

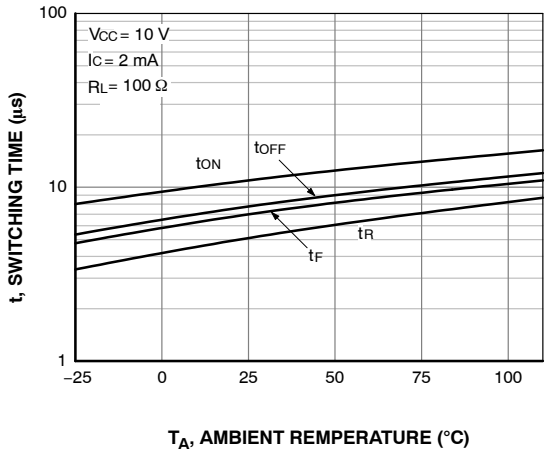
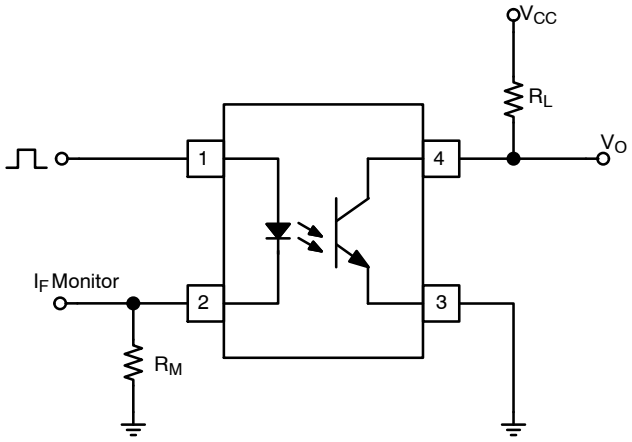


Figure 14. Switching Time vs. Ambient Temperature

TEST CIRCUIT



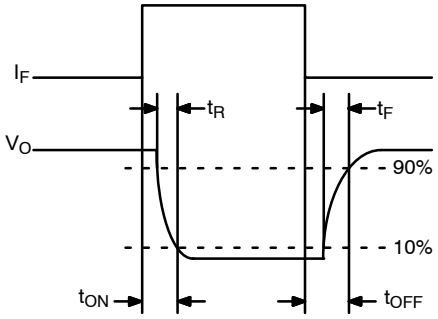


Figure 15. Test Circuit for Switching Time

REFLOW PROFILE

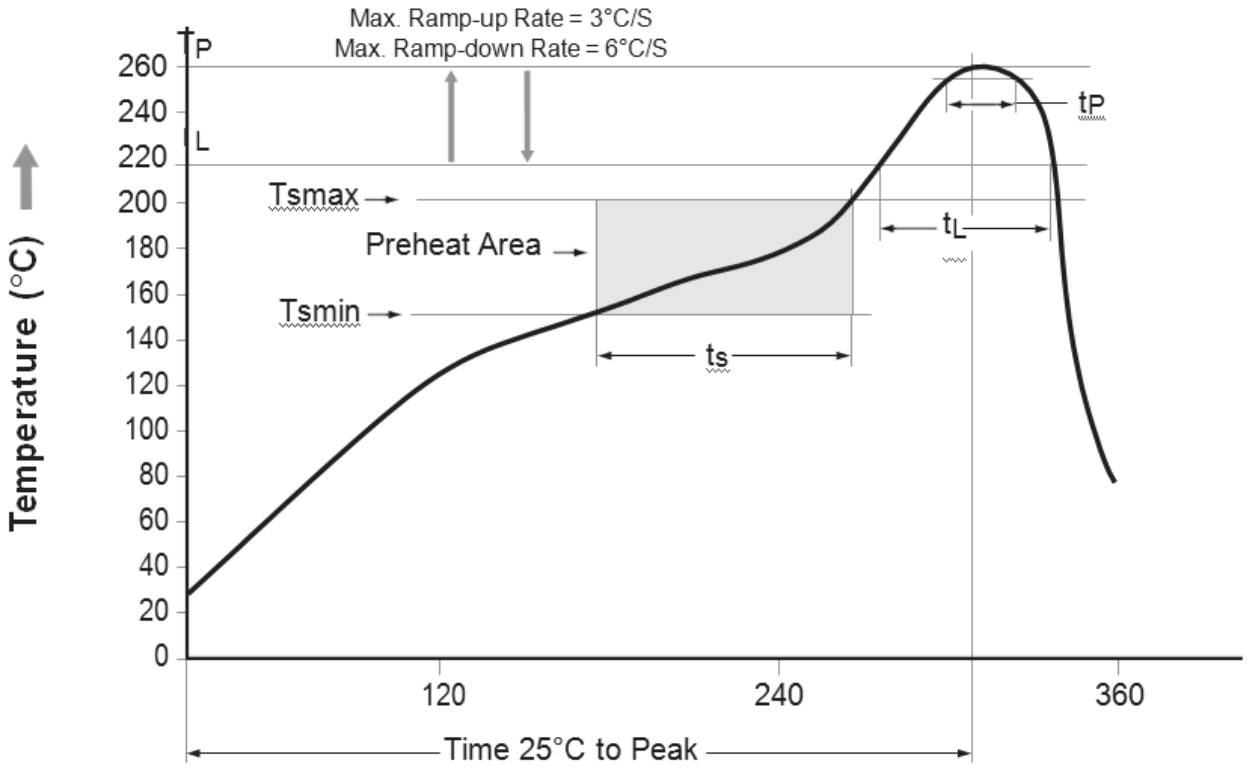


Figure 16. Reflow Profile

Profile Feature	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.

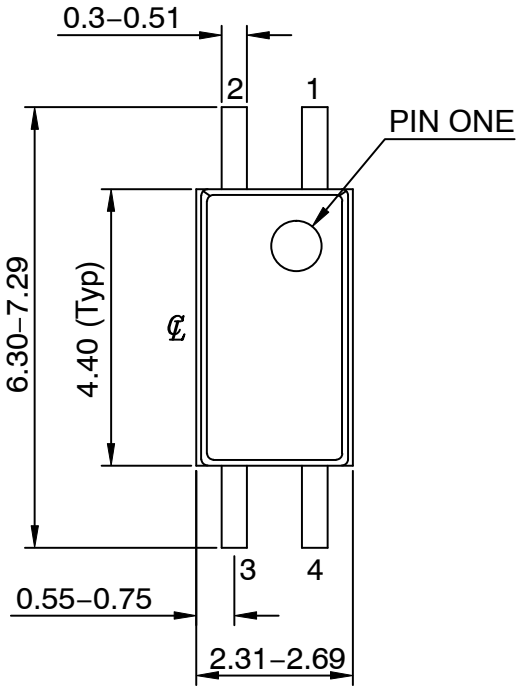
ORDERING INFORMATION (Note 5)

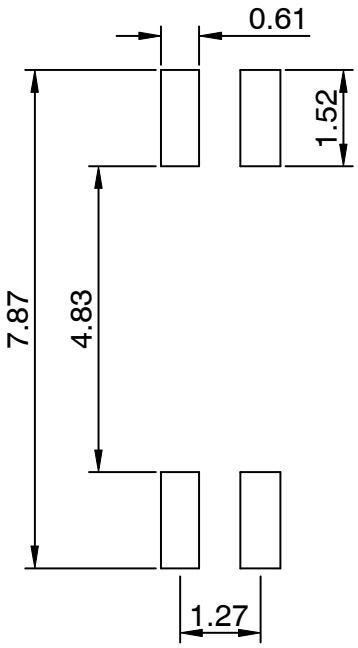
Part Number	Package	Packing Method
FODM214A	SOP 4−Pin	Tube (100 units)
FODM214AR2	SOP 4−Pin	Tape and Reel (3000 units)
FODM214AV	SOP 4−Pin, DIN EN/IEC60747−5−5 Option	Tube (100 units)
FODM214AR2V	SOP 4−Pin, DIN EN/IEC60747−5−5 Option	Tape and Reel (3000 units)

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

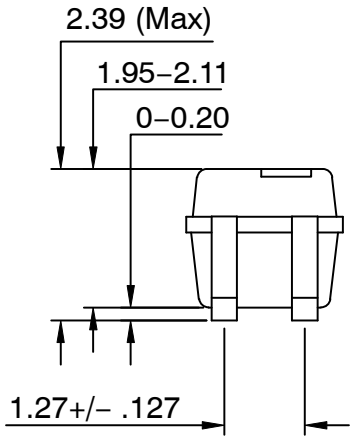
PACKAGE DIMENSIONS

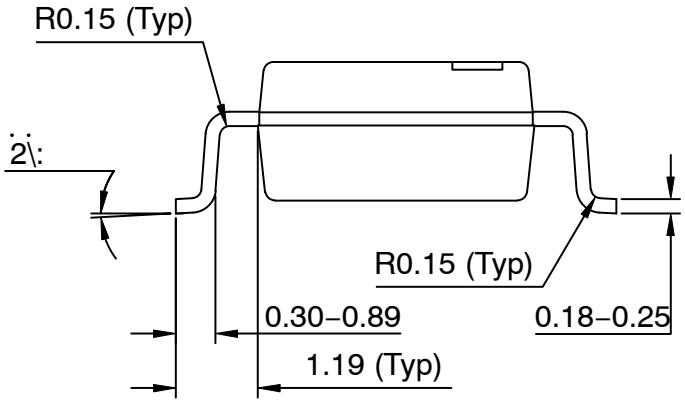
MFP4 2.5x4.4, 1.27P
CASE 100AL
ISSUE O





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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
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Phone: 011 421 33 790 2910

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FODM217D FODM217C FODM217A FODM217AR2 FODM217BR2 FODM217CR2 FODM217DR2 FODM217B FODM217CR2V FODM217CV FODM217DR2V FODM217DV FODM217AR2V FODM217AV FODM217BR2V FODM217BV FODM214A FODM214 FODM214R2 FODM214AR2 FODM217CR4