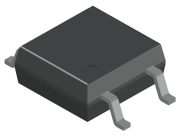
Single Channel, DC Sensing Input, Phototransistor Optocoupler In Full-Pitch Mini-Flat 4-Pin Package



MFP4 4.10 x 4.4, 2.54P
100EC

Product Preview

FODM181 Series

The FODM181 series consist of a gallium arsenide infrared emitting diode driving a phototransistor. It built in a compact, half−pitch, mini−flat, 4−pin package. The lead pitch is 2.54 mm.

Features

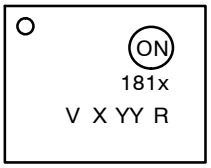
- Current Transfer Ratio Ranges from 20 to 600%
- at I_F = 5 mA, V_{CE} = 5 V, T_A = 25°C
  - FODM181A − 80 to 160%
  - FODM181B − 130 to 260%
  - FODM181C − 200 to 400%
  - FODM181D − 300 to 600%
- Safety and Regulatory Approvals:
  - UL1577, 3750 VAC_{RMS} for 1 min
  - DIN EN/IEC60747−5−5, 565 V Peak Working Insulation Voltage (Pending)
- 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

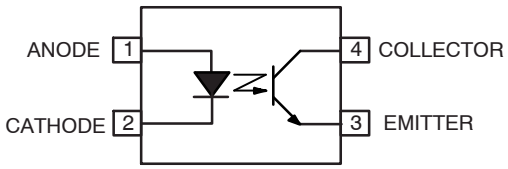
This document contains information on a product under development. **onsemi** reserves the right to change or discontinue this product without notice.

MARKING DIAGRAM



ON	= onsemi Logo
181x	= Device Number
V	= DIN EN/IEC60747−5−5 Option
X	= One−Digit Year Code
YY	= Digit Work Week
R	= Assembly Package Code

PIN CONNECTIONS



FODM181

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 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
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 s 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							
I_F	Forward Current	FODM181	I_F = 20 mA	–	1.2	1.4	V
I_R	Reverse Current	FODM181	V_R = 4 V	–	–	10	A
C_{in}	Input 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 = 0.01 mA, IF = 0 mA	7	–	–	V
I_{CEO}	Collector Dark Current	All	V_{CE} = 20 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)	FODM181A	I_F = 5 mA, V_{CE} = 5 V	80	–	160	
		FODM181B		130	–	260	
		FODM181C		200	–	400	
		FODM181D		300	–	600	
$V_{CE(SAT)}$	Collector−Emitter Saturation Voltage	FODM181 series	I_F = 20 mA, I_C = 1.0 mA	–	0.1	0.2	V

SWITCHING CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_R	Rise Time	I_C = 2 mA, V_{CE} = 2 V, R_L = 100 Ω	–	3	18	μs
t_F	Fall Time	I_C = 2 mA, V_{CE} = 2 V, R_L = 100 Ω	–	4	18	μs

ISOLATION CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input−Output Isolation Voltage	Freq = 60 Hz, t = 1.0 min	3,750	–	–	VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V (Note 3)	5×10^{10}	–	–	
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 PERFORMANCE CURVES

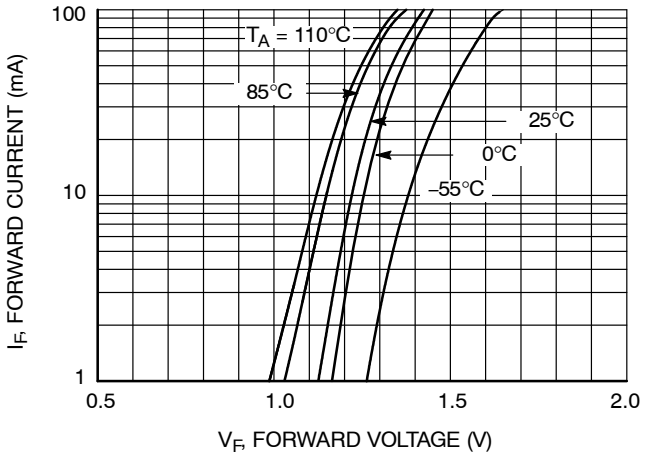


Figure 1. Forward Current vs. Forward Voltage

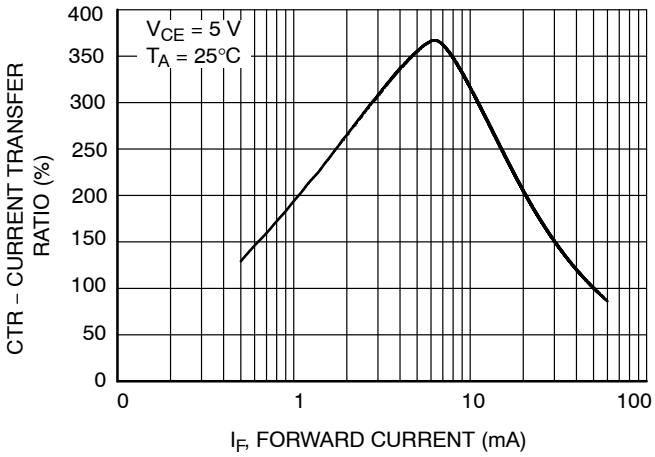


Figure 2. Current Transfer Ratio vs. Forward Current

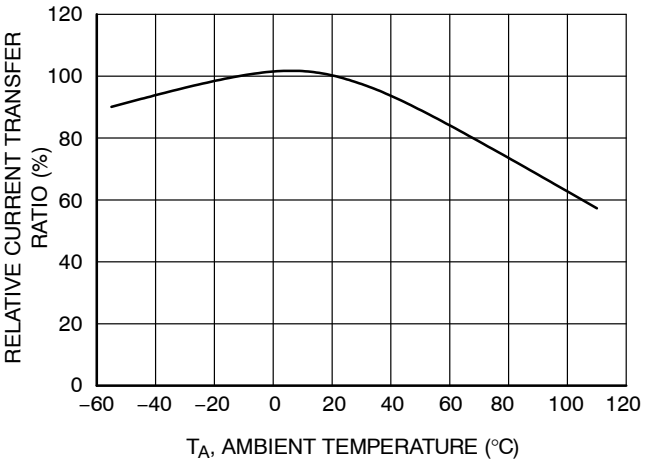


Figure 3. Relative Current Ratio vs. Ambient Temperature

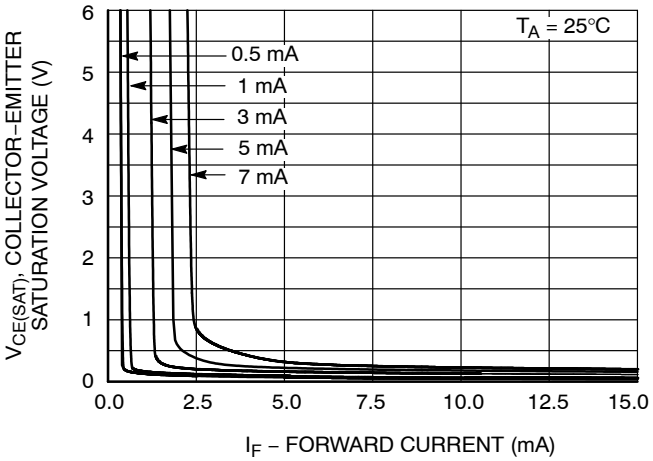


Figure 4. Collector–Emitter Saturation Voltage vs. Forward Current

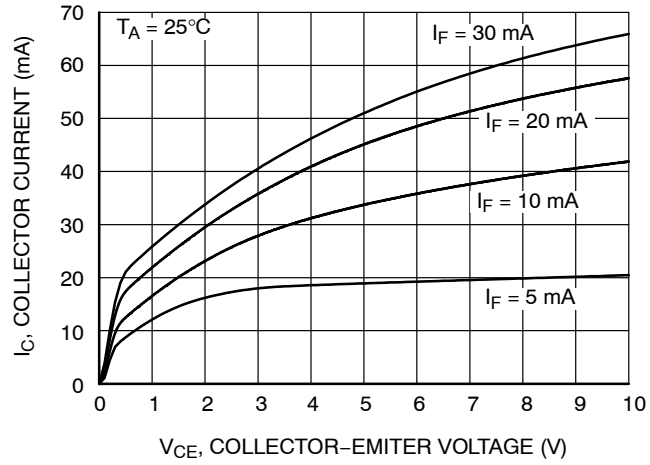


Figure 5. Collector Current vs. Collector–Emitter Voltage

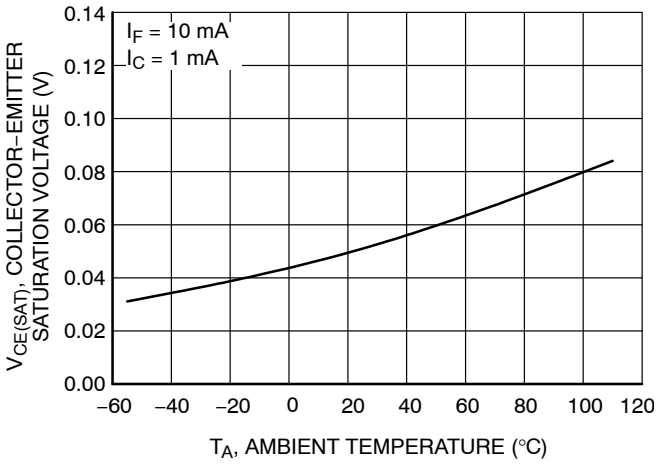


Figure 6. Collector–Emitter Saturation Voltage vs. Ambient Temperature

TYPICAL PERFORMANCE CURVES (CONTINUE)

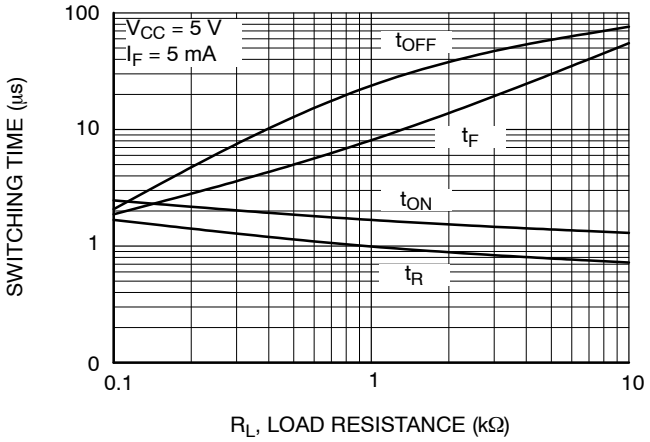


Figure 7. Switching Time vs. Load Resistance

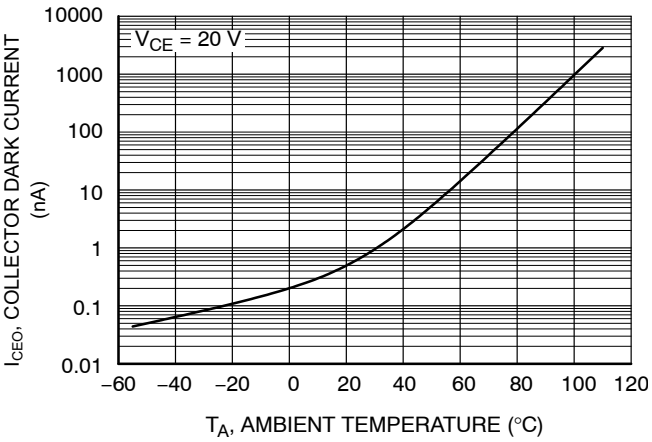


Figure 8. Collector Dark Current vs. Ambient Temperature

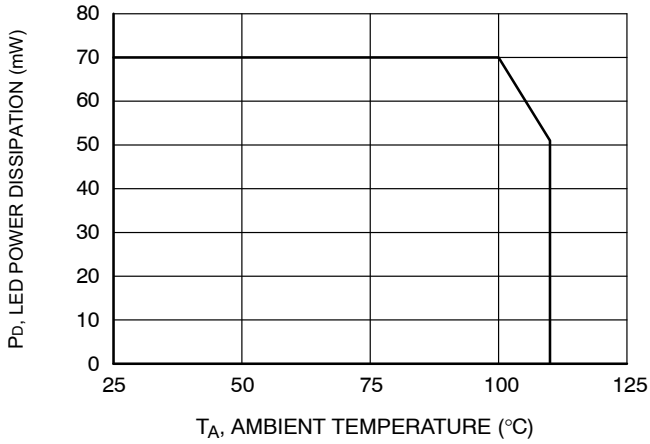


Figure 9. Max Allowable Power Dissipation (LED) vs. Ambient Temperature

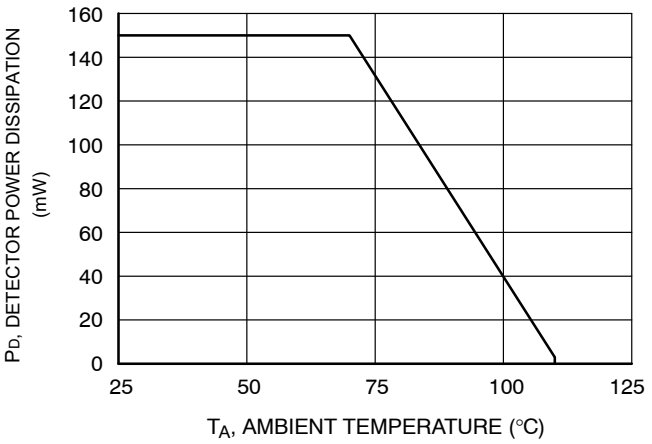


Figure 10. Max Allowable Power Dissipation (Detector) vs. Ambient Temperature

TEST CIRCUIT

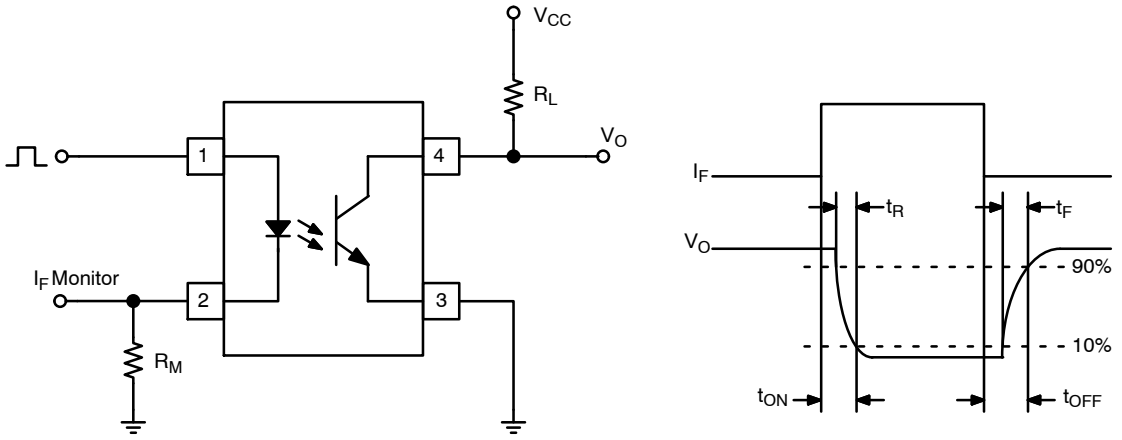
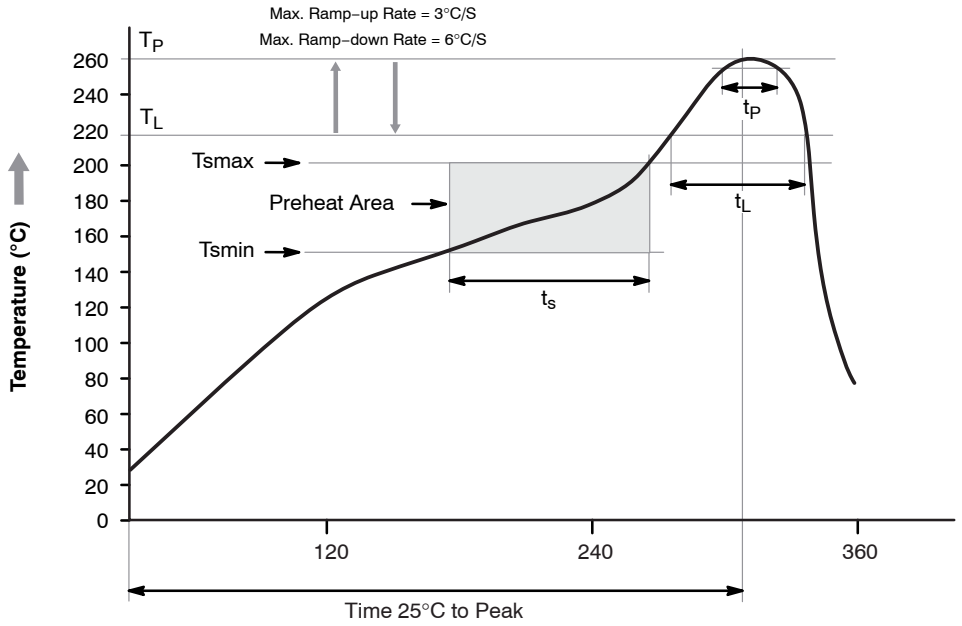


Figure 11. Test Circuit for Switching Time

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)	181°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.

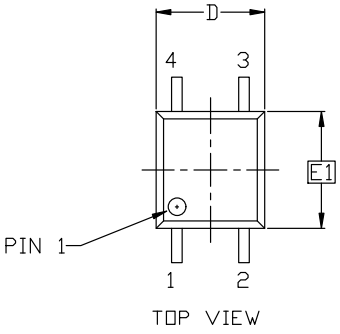
ORDERING INFORMATION (Note 5)

Part Number	Package	Packing Method
FODM181A	SOP 4−Pin	Tube (100 units)
FODM181AR2	SOP 4−Pin	Tape and Reel (3000 units)
FODM181AV	SOP 4−Pin, DIN EN/IEC60747−5−5 Option	Tube (100 units)
FODM181AR2V	SOP 4−Pin, DIN EN/IEC60747−5−5 Option	Tape and Reel (3000 units)

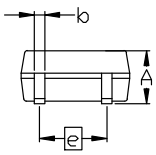
5. The product orderable part number system listed in this table also applies to the FODM181, FODM181A, FODM181B, FODM181C, and FODM181D products.

PACKAGE DIMENSIONS

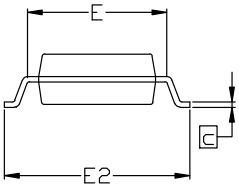
MFP4 4.1x4.4, 2.54P
CASE 100EC
ISSUE O



TOP VIEW



SIDE VIEW

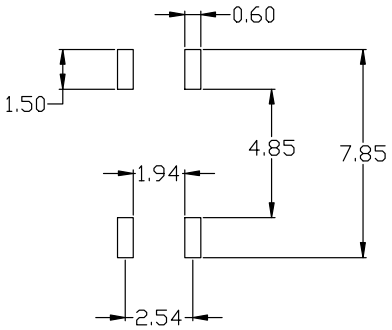


END VIEW

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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	2.00
b	0.30	0.40	0.50
c	0.20 REF		
D	3.90	4.10	4.30
E	5.00	5.20	5.40
E1	4.40 TYP		
E2	6.70	7.00	7.30
e	2.54 TYP		



RECOMMENDED
MOUNTING
FOOTPRINT*

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

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