HMHA281, HMHA2801 Series

4-Pin Half-Pitch Mini-Flat Phototransistor Optocouplers

DEVICE NOT RECOMMENDED FOR NEW DESIGN

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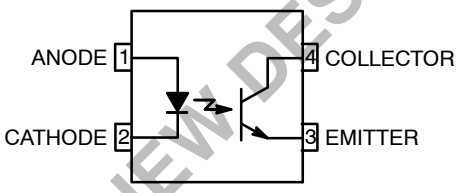
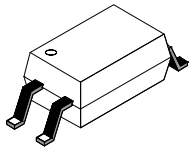


Phototransistor Optocoupler



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Description

The HMHA281 and HMHA2801 series devices consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a compact 4−pin mini−flat package. The lead pitch is 1.27 mm.

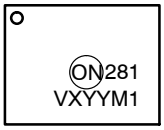
Features

- Compact 4−Pin Package
  - 2.4 mm Maximum Standoff Height
  - Half−Pitch Leads for Optimum Board Space Savings
- Current Transfer Ratio:
  - HMHA281: 50% to 600%
  - HMHA2801: 80% to 600%
  - HMHA2801A: 80% to 160%
  - HMHA2801B: 50% to 150%
  - HMHA2801C: 50% to 100%
- Safety and Regulatory Approvals:
  - UL1577, 3.750 VAC_{RMS} for 1 Minute
  - DIN−EN/IEC60747−5−5, 565 V Peak Working Insulation Voltage
- These Devices are Pb−Free and are RoHS Compliant

Applications

- Digital Logic Inputs
- Microprocessor Inputs
- Power Supply Monitor
- Twisted Pair Line Receiver
- Telephone Line Receiver

MARKING DIAGRAM



ON	= **onsemi** Logo
281	= Device Number
V	= DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X	= One−Digit Year Code, e.g., ”5”
YY	= Digit Work Week, Ranging from ”01” to ”53”
M1	= Assembly Package Code

ORDERING INFORMATION

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

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Table 1. SAFETY AND INSULATION RATINGS (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		55/100/21
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	4000	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 (T_C = 25°C, Unless otherwise specified)

Symbol	Parameter	Value	Unit
TOTAL PACKAGE			
T_{STG}	Storage Temperature	−55 to +125	°C
T_{OPR}	Operating Temperature	−55 to +100	°C
T_J	Junction Temperature	−40 to +125	°C
P_D	Total Device Power Dissipation @ T_A = 25°C	210	mW
	Derate Above 25°C	2.1	mW/°C
EMITTER			
$I_{F\ (avg)}$	Continuous Forward Current	50	mA
$I_{F\ (pk)}$	Peak Forward Current (1 μs pulse, 300 pps)	1	A
V_R	Reverse Input Voltage	6	V
P_D	LED Power Dissipation @ T_A = 25°C	60	mW
	Derate Above 25°C	0.6	mW/°C
DETECTOR			
I_C	Continuous Collector Current	50	mA
V_{CEO}	Collector−Emitter Voltage	80	V
V_{ECO}	Emitter−Collector Voltage	7	V
P_D	Detector Power Dissipation @ T_A = 25°C	150	mW
	Derate Above 25°C	1.5	mW/°C

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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Symbol	Parameter	Test Conditions	Device	Min	Typ	Max	Unit
INDIVIDUAL COMPONENT CHARACTERISTICS							
Emitter							
V_F	Forward Voltage	I_F = 10 mA	All	1.0	–	1.3	V
I_R	Reverse Current	V_R = 5 V	All	–	–	5	μA
Detector							
BV_{CEO}	Breakdown Voltage Collector to Emitter	I_C = 0.5 mA, I_F = 0	All	80	–	–	V
BV_{ECO}	Emitter to Collector	I_E = 100 μA, I_F = 0	All	7	–	–	
I_{CEO}	Collector Dark Current	V_{CE} = 80 V, I_F = 0	All	–	–	100	nA
C_{CE}	Capacitance	V_{CE} = 0 V, f = 1 MHz	All	–	10	–	pF
TRANSFER CHARACTERISTICS							
CTR	DC Current Transfer Ratio	I_F = 5 mA, V_{CE} = 5 V	HMHA281	50	–	600	%
			HMHA2801	80	–	600	
			HMHA2801A	80	–	160	
			HMHA2801B	50	–	150	
		I_F = 1 mA, V_{CE} = 5 V	HMHA2801C	50	–	100	
$V_{CE\ (SAT)}$	Saturation Voltage	I_F = 8 mA, I_C = 2.4 mA	HMHA281	–	–	0.4	V
		I_F = 10 mA, I_C = 2 mA	HMHA2801, HMHA2801A, HMHA2801B, HMHA2801C	–	–	0.3	
t_r	Rise Time (Non−Saturated)	I_C = 2 mA, V_{CE} = 5 V, R_L = 100 Ω	All	–	3	–	μs
t_f	Fall Time (Non−Saturated)	I_C = 2 mA, V_{CE} = 5 V, R_L = 100 Ω	All	–	3	–	
ISOLATION CHARACTERISTICS							
V_{ISO}	Steady State Isolation Voltage	1 Minute	All	3750	–	–	VAC_{RMS}

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE CHARACTERISTICS

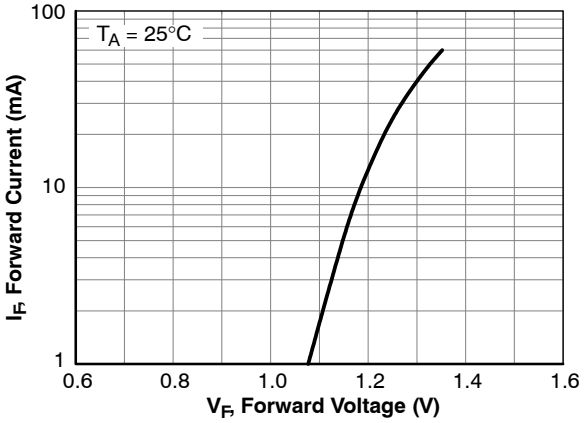

Figure 1. Forward Current vs. Forward Voltage

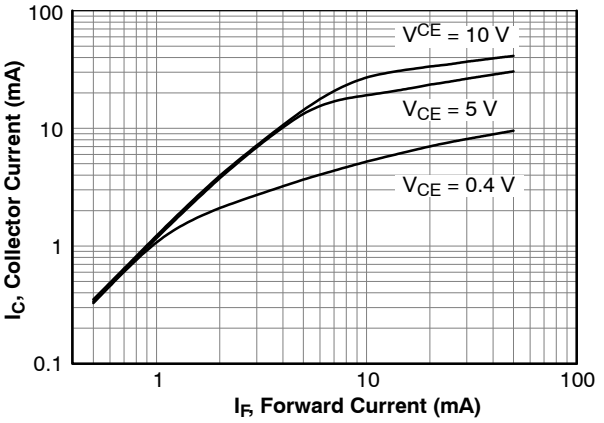

Figure 2. Collector Current vs. Forward Current

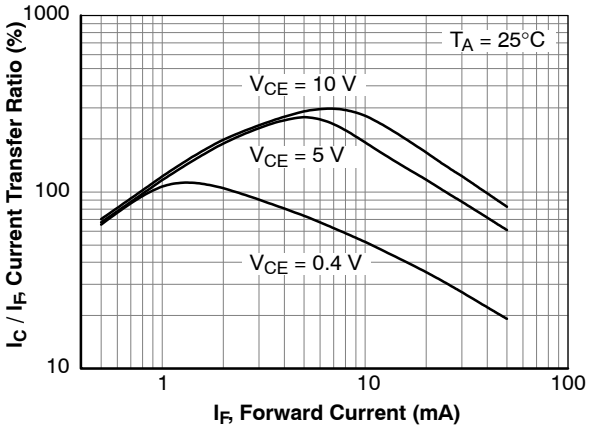

Figure 3. Current Transfer Ratio vs. Forward Current

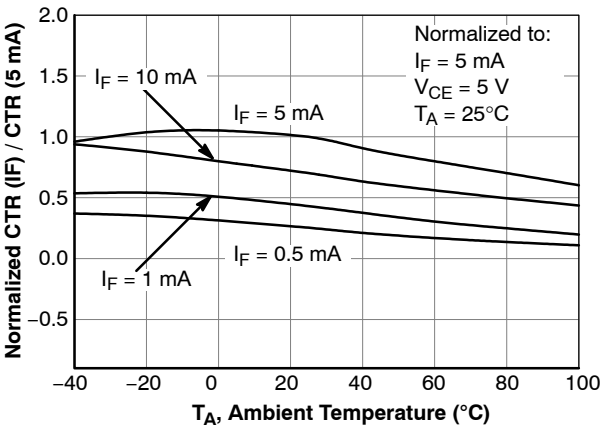

Figure 4. Normalized CTR vs. Temperature

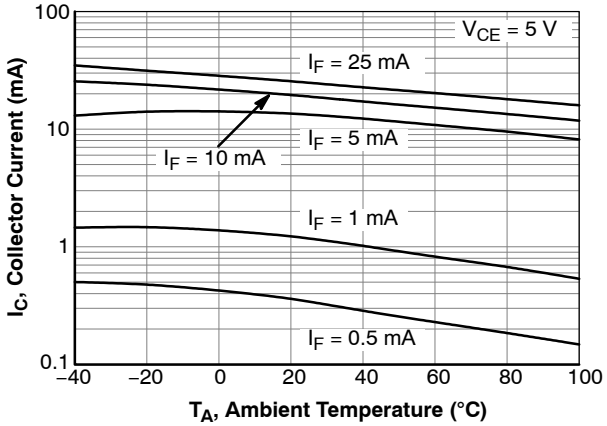

Figure 5. Collector Current vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

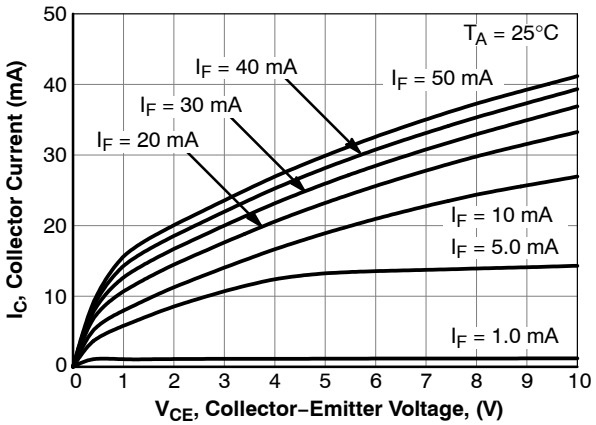

Figure 6. Collector Current vs. Collector−Emiter Voltage

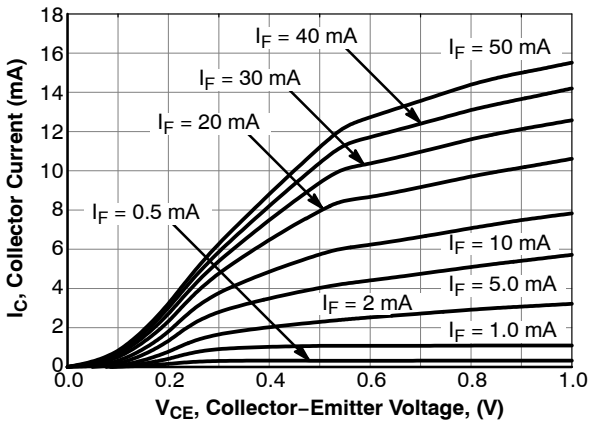

Figure 7. Collector Current vs. Collector−Emiter Voltage

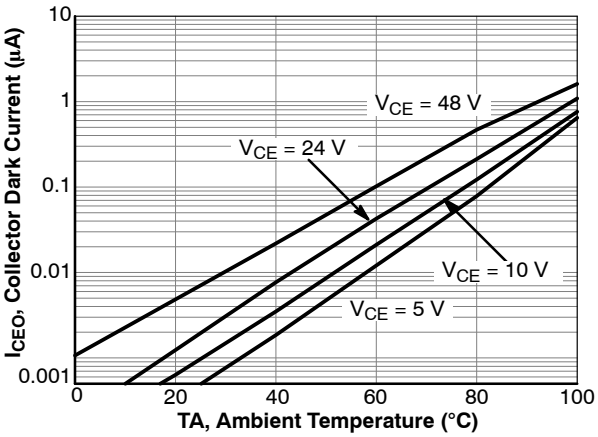

Figure 8. Collector Dark Current vs. Temperature

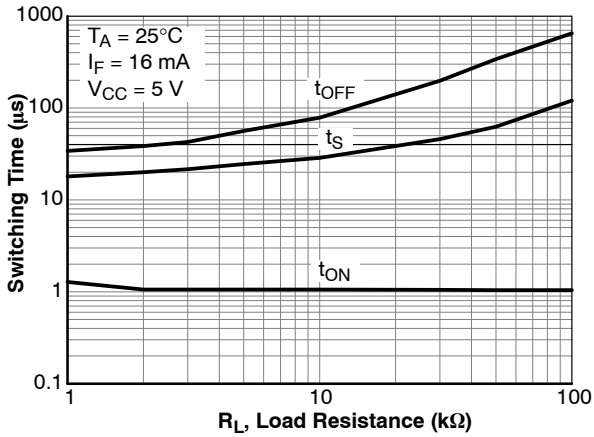

Figure 9. Switching Time vs. Load Resistance

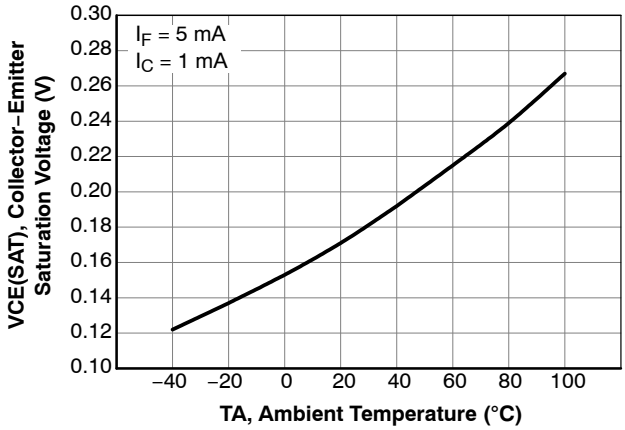

Figure 10. Collector−Emitter Saturation Voltage vs Temperature

REFLOW PROFILE

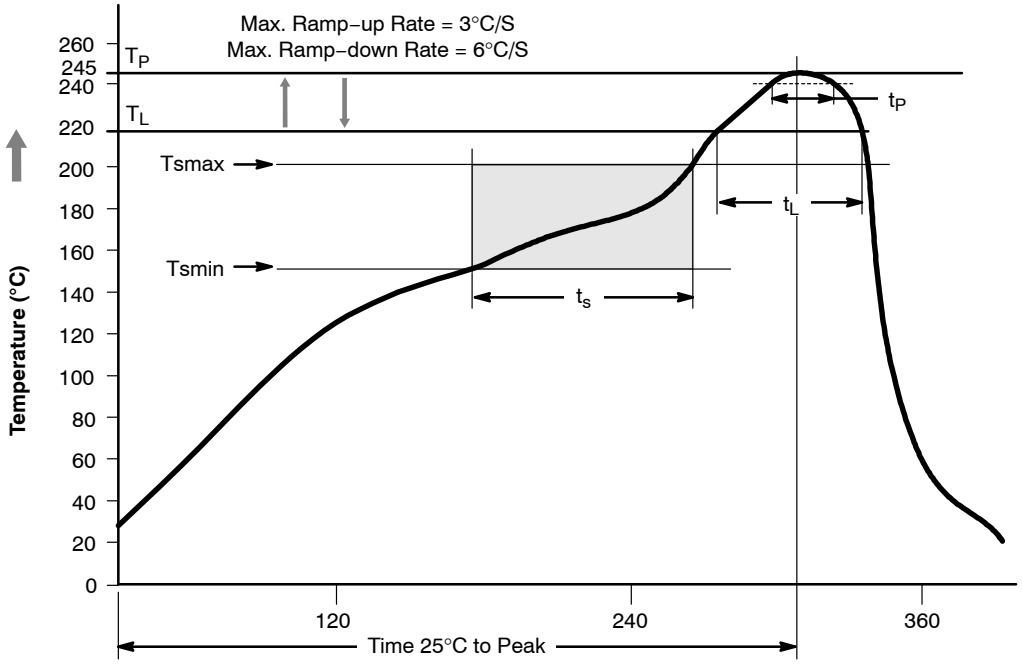

Figure 11. Reflow Profile

*For applications requiring 260C peak reflow performance, please order FODM217 series.

Profile Feature	Pb−Free Assembly Profile
Temperature Minimum (Tsmin)	150°C
Temperature Maximum (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60 – 120 seconds
Ramp−up Rate (t_L to t_P)	3°C / second maximum
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds
Peak Body Package Temperature	245°C +0°C / −5°C
Time (t_P) within 5°C of 245°C	30 seconds
Ramp−down Rate (T_P to T_L)	6°C / second maximum
Time 25°C to Peak Temperature	8 minutes maximum

ORDERING INFORMATION

Part Number	Package	Shipping†
HMHA2801	Half Pitch Mini−Flat 4−Pin	150 Units / Tube
HMHA2801R2	Half Pitch Mini−Flat 4−Pin	2500 / Tape & Reel
HMHA2801V	Half Pitch Mini−Flat 4−Pin, DIN EN/IEC60747−5−5 Option	150 Units / Tube
HMHA2801R2V	Half Pitch Mini−Flat 4−Pin, DIN EN/IEC60747−5−5 Option	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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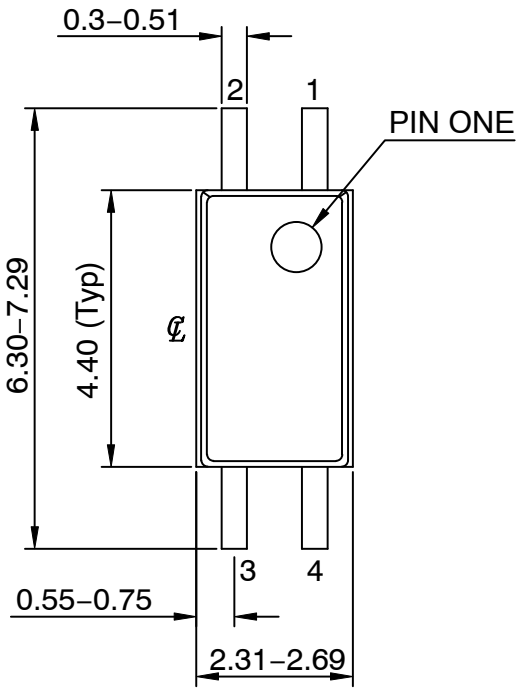
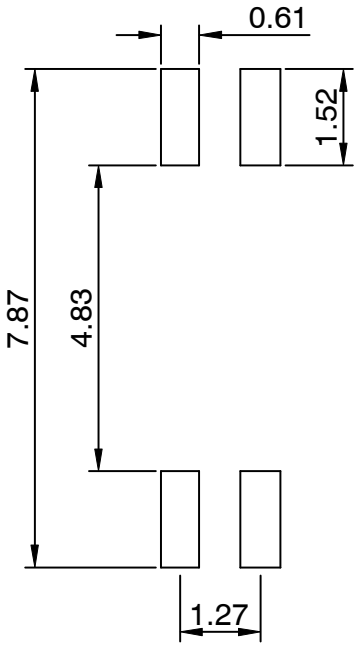
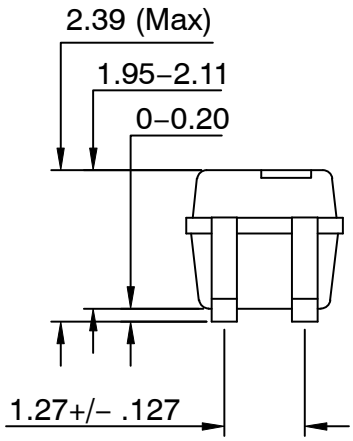
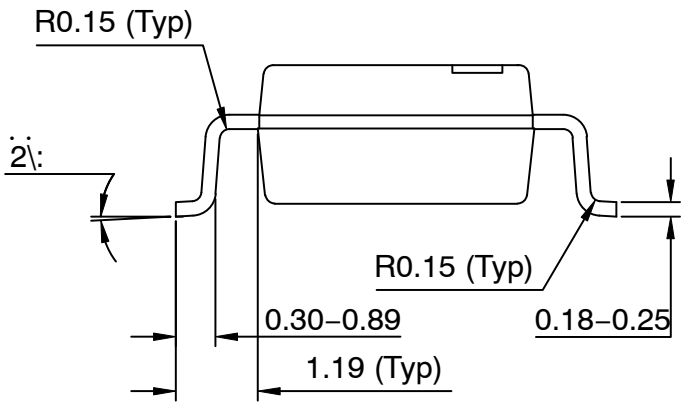




LAND PATTERN RECOMMENDATION





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