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June 2015

HMHA281, HMHA2801 Series
4-Pin Half-Pitch Mini-Flat Phototransistor Optocouplers

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: 130% to 260%
  - HMHA2801C: 200% to 400%
- Safety and Regulatory Approvals:
  - UL1577, 3,750 VAC_{RMS} for 1 Minute
  - DIN-EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage

Applications

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

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.

Schematic

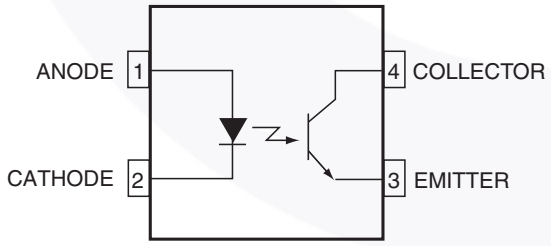


Figure 1. Schematic

Package Outline

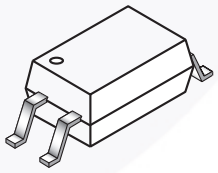


Figure 2. Package Outlines

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(1)	150	°C
$I_{S,INPUT}$	Input Current(1)	200	mA
$P_{S,OUTPUT}$	Output Power(1)	300	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V(1)	> 10^9	Ω

Note:

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

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Units
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

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	130		260	
			HMHA2801C	200		400	
$V_{CE\ (SAT)}$	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}

Typical Performance Characteristics

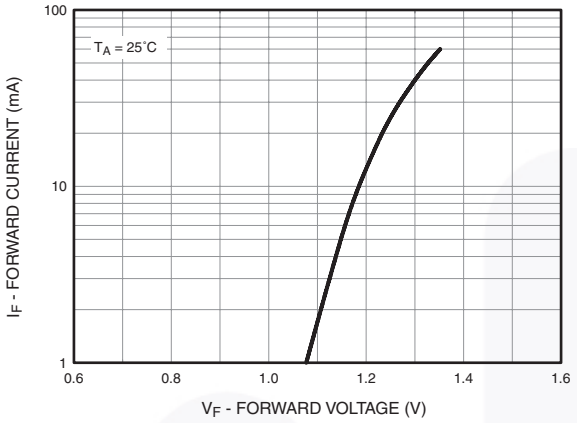


Figure 3. Forward Current vs. Forward Voltage

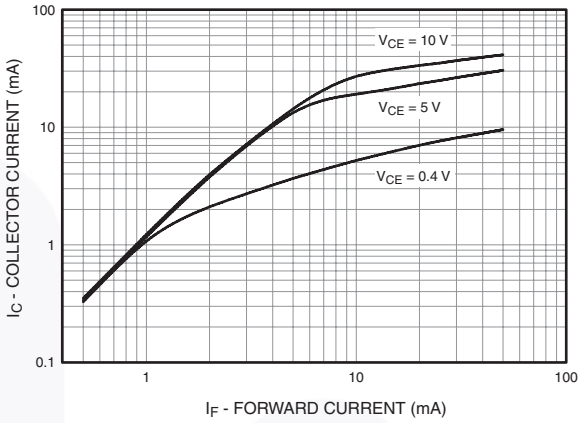


Figure 4. Collector Current vs. Forward Current

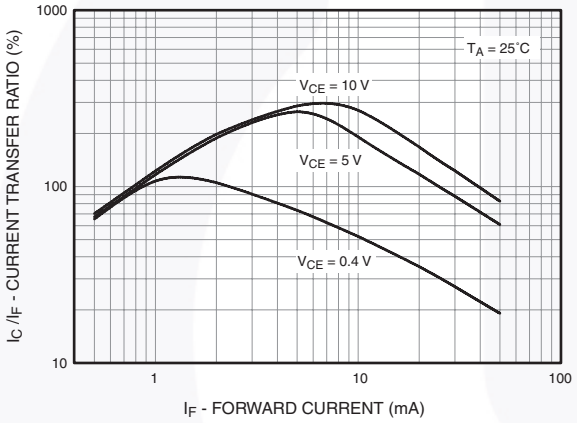


Figure 5. Current Transfer Ratio vs. Forward Current

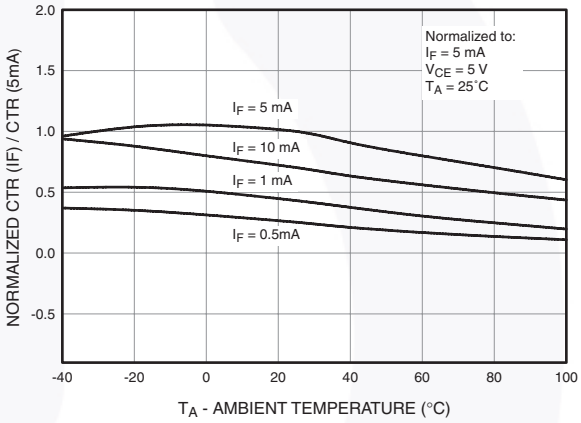


Figure 6. Normalized CTR vs. Temperature

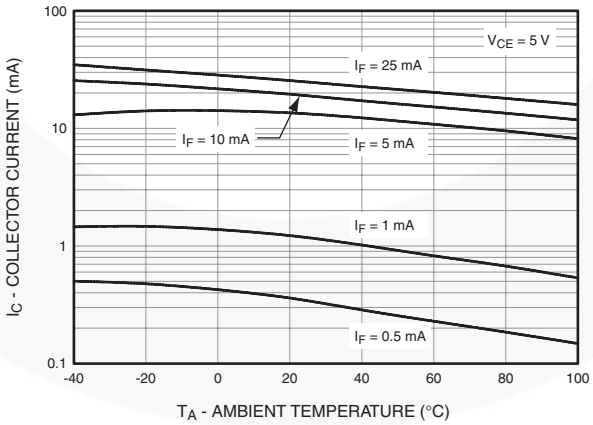


Figure 7. Collector Current vs. Temperature

Typical Performance Characteristics (Continued)

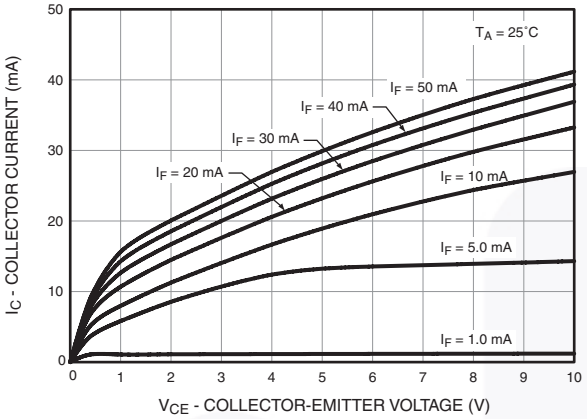


Figure 8. Collector Current vs. Collector-Emitter Voltage

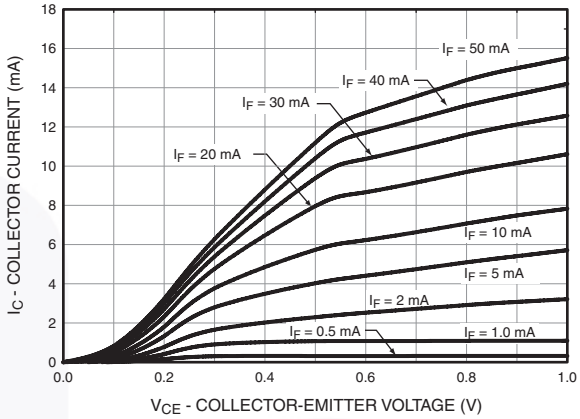


Figure 9. Collector Current vs. Collector-Emitter Voltage

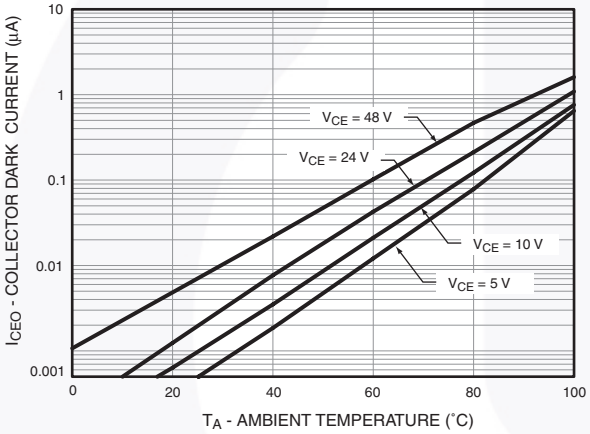


Figure 10. Collector Dark Current vs. Temperature

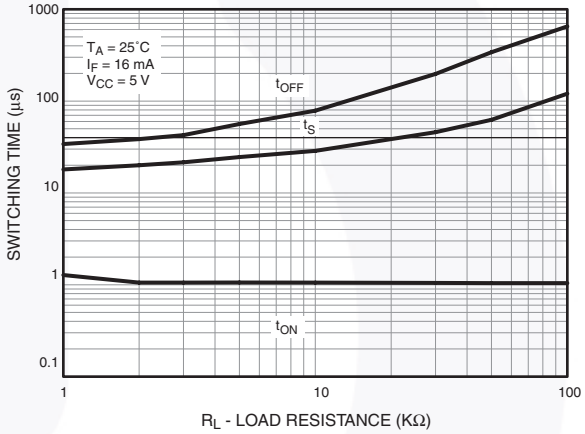


Figure 11. Switching Time vs. Load Resistance

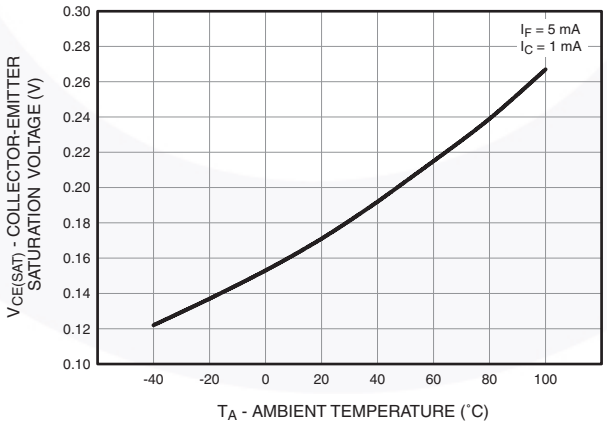


Figure 12. Collector-Emitter Saturation Voltage vs. Temperature

Reflow Profile

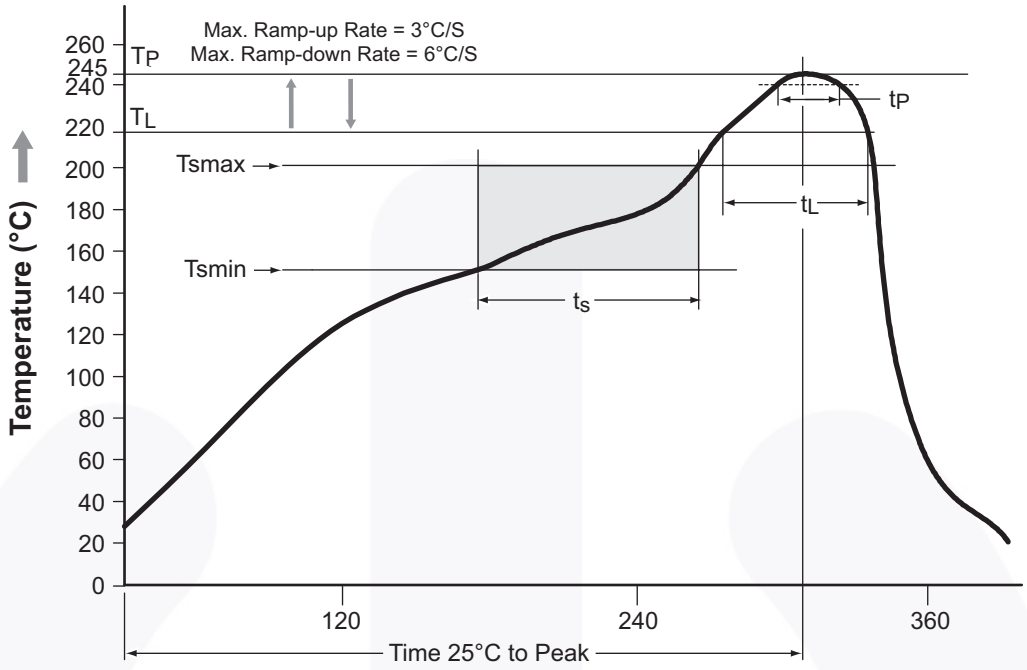


Figure 13. Reflow Profile

Profile Freature	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	Packing Method
HMHA2801	Half Pitch Mini-Flat 4-Pin	Tube (100 units)
HMHA2801R2	Half Pitch Mini-Flat 4-Pin	Tape and Reel (2500 Units)
HMHA2801V	Half Pitch Mini-Flat 4-Pin, DIN EN/IEC60747-5-5 Option	Tube (100 Units)
HMHA2801R2V	Half Pitch Mini-Flat 4-Pin, DIN EN/IEC60747-5-5 Option	Tape and Reel (2500 Units)

Note:

2. The product orderable part number system listed in this table also applies to the HMHA281, HMHA2801A, HMHA2801B, and HMHA2801C products.

Marking Information

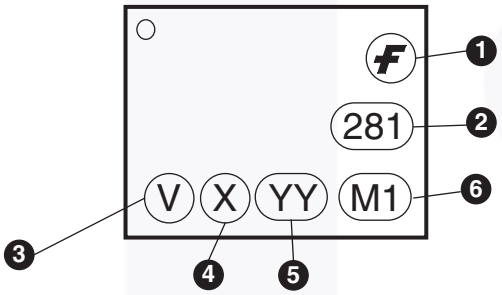
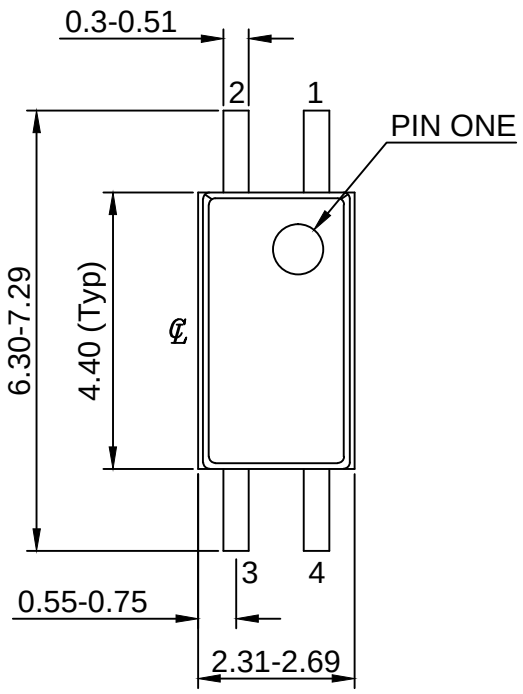
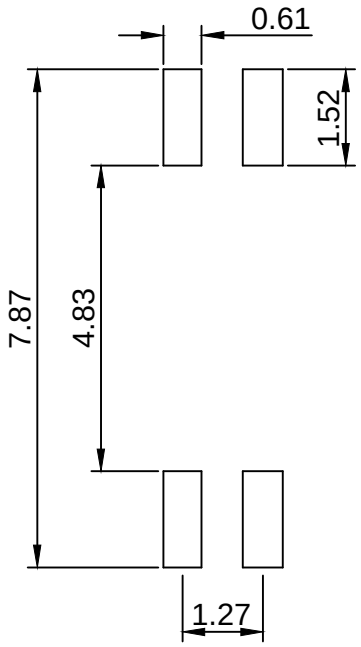


Figure 14. Top Mark

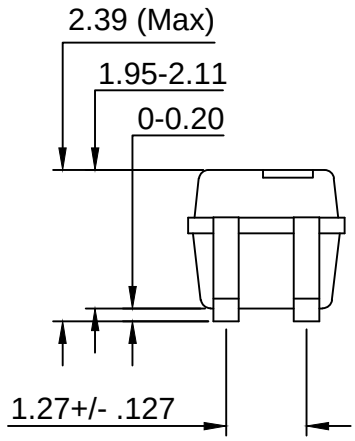
Table 1. Top Mark Definitions

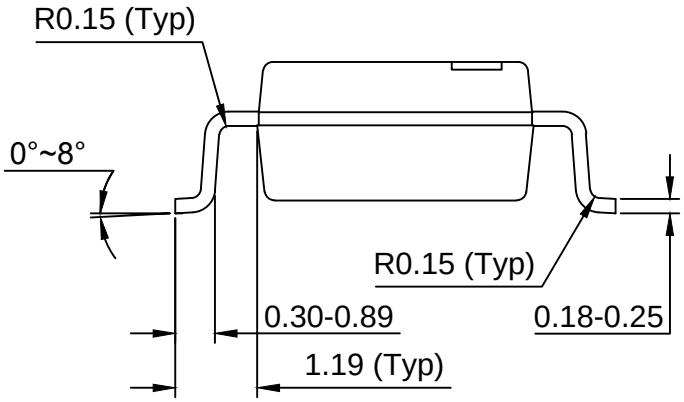
1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
4	One-Digit Year Code, e.g., “5”
5	Digit Work Week, Ranging from “01” to “53”
6	Assembly Package Code





LAND PATTERN RECOMMENDATION





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