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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

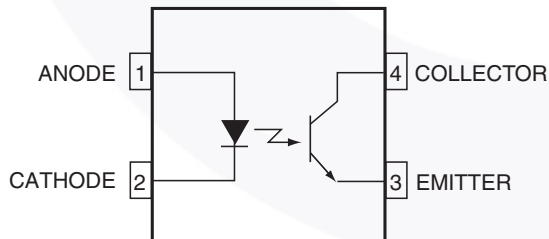


Figure 1. Schematic

Package Outline

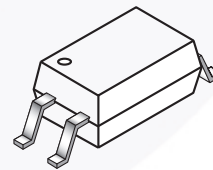


Figure 2. Package Outlines

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} × 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} × 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 @ $T_A = 25^\circ\text{C}$ | 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 @ $T_A = 25^\circ\text{C}$ | 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 @ $T_A = 25^\circ\text{C}$ | 150 | mW |
| | Derate Above 25°C | 1.5 | mW/°C |

Electrical Characteristics $T_A = 25^\circ\text{C}$

| Symbol | Parameter | Test Conditions | Device | Min. | Typ. | Max. | Unit |
|---|---|--|--|------|------|------|----------------|
| INDIVIDUAL COMPONENT CHARACTERISTICS | | | | | | | |
| Emitter | | | | | | | |
| V_F | Forward Voltage | $I_F = 10\text{ mA}$ | All | 1.0 | | 1.3 | V |
| I_R | Reverse Current | $V_R = 5\text{ V}$ | All | | | 5 | μA |
| Detector | | | | | | | |
| BV_{CEO} | Breakdown Voltage Collector to Emitter | $I_C = 0.5\text{ mA}, I_F = 0$ | All | 80 | | | V |
| BV_{ECO} | Emitter to Collector | $I_E = 100\text{ }\mu\text{A}, I_F = 0$ | All | 7 | | | |
| I_{CEO} | Collector Dark Current | $V_{CE} = 80\text{ V}, I_F = 0$ | All | | | 100 | nA |
| C_{CE} | Capacitance | $V_{CE} = 0\text{ V}, f = 1\text{ MHz}$ | All | | 10 | | pF |
| TRANSFER CHARACTERISTICS | | | | | | | |
| CTR | DC Current Transfer Ratio | $I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$ | HMHA281 | 50 | | 600 | % |
| | | | HMHA2801 | 80 | | 600 | |
| | | | HMHA2801A | 80 | | 160 | |
| | | | HMHA2801B | 130 | | 260 | |
| | | | HMHA2801C | 200 | | 400 | |
| $V_{CE(SAT)}$ | Saturation Voltage | $I_F = 8\text{ mA}, I_C = 2.4\text{ mA}$ | HMHA281 | | | 0.4 | V |
| | | $I_F = 10\text{ mA}, I_C = 2\text{ mA}$ | HMHA2801, HMHA2801A, HMHA2801B, HMHA2801C | | | 0.3 | |
| t_r | Rise Time (Non-Saturated) | $I_C = 2\text{ mA}, V_{CE} = 5\text{ V},$ $R_L = 100\text{ }\Omega$ | All | | 3 | | μs |
| t_f | Fall Time (Non-Saturated) | $I_C = 2\text{ mA}, V_{CE} = 5\text{ V},$ $R_L = 100\text{ }\Omega$ | All | | 3 | | |
| ISOLATION CHARACTERISTICS | | | | | | | |
| V_{ISO} | Steady State Isolation Voltage | 1 Minute | All | 3750 | | | $V_{AC_{RMS}}$ |

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 Feature | Pb-Free Assembly Profile |
|---|--------------------------|
| Temperature Minimum (T _{smin}) | 150°C |
| Temperature Maximum (T _{smax}) | 200°C |
| Time (t _s) from (T _{smin} to T _{smax}) | 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

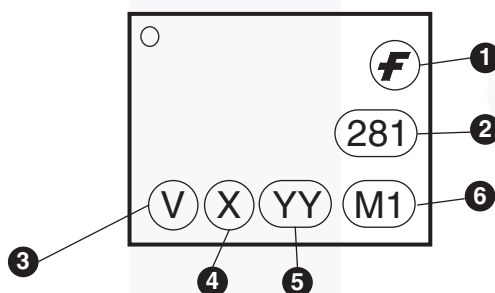


Figure 14. Top Mark

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 |

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