FAIRCHILD
SEMICONDUCTOR®

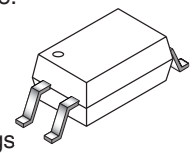
# HALF PITCH MINI-FLAT PACKAGE 4-PIN OPTOCOUPLERS

## HMHAA280 HMHA2801 HMHA281

## DESCRIPTION

The HMHA series consists 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.

The HMHAA series consists of two gallium arsenide infrared emitting diodes, connected in inverse parallel, driving a single silicon phototransistor in a compact 4-pin mini-flat package.



## FEATURES

- Compact 4-pin package (2.4 mm maximum standoff height)
- Half pitch leads for optimum board space savings
- Current Transfer Ratio in selected groups
  HMHAA280: 50-600% HMHA2801: 80-600%
  HMHA281: 50-600%
- Available in tape and reel quantities of 500 and 2500
- Applicable to Infrared Ray reflow (230°C Max, 30 seconds)
- BSI (File #8611/8612), CSA (File #1201524), UL (File #E90700) and VDE (File #136480) certified

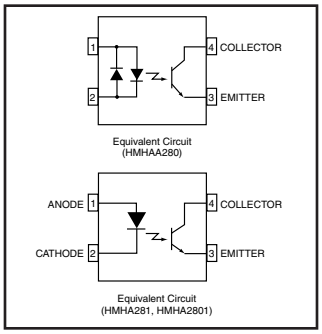
## APPLICATIONS

HMHAA series

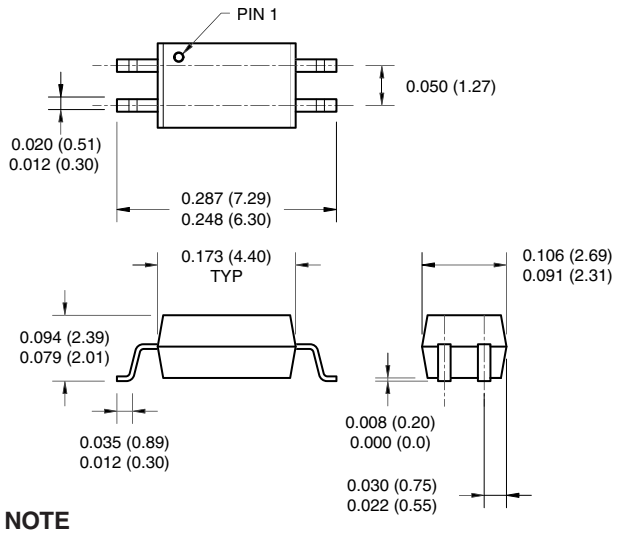
- AC line monitor
- Unknown polarity DC sensor
- Telephone line receiver

HMHA series

- Digital logic inputs
- Microprocessor inputs
- Power supply monitor
- Twisted pair line receiver
- Telephone line receiver




## PACKAGE DIMENSIONS




**NOTE**
All dimensions are in inches (millimeters)

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise specified)

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| **TOTAL PACKAGE** | | | |
| Storage Temperature | $T_{STG}$ | -55 to +150 | °C |
| Operating Temperature | $T_{OPR}$ | -55 to +100 | °C |
| **EMITTER** | | | |
| Continuous Forward Current | $I_{F\ (avg)}$ | 50 | mA |
| Peak Forward Current (1 µs pulse, 300 pps.) | $I_{F\ (pk)}$ | 1 | A |
| Reverse Input Voltage (HMA) | $V_R$ | 6 | V |
| Power Dissipation | $P_D$ | 60 | mW |
| Derate linearly (above 25°C) | | 0.6 | mW/°C |
| **DETECTOR** | | | |
| Continuous Collector Current | | 50 | mA |
| Power Dissipation | $P_D$ | 150 | mW |
| Derate linearly (above 25°C) | | 1.5 | mW/°C |
| Collector-Emitter Voltage | $V_{CEO}$ | 80 | V |
| Emitter-Collector Voltage | $V_{ECO}$ | 7 | V |

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit |
|---|---|---|---|---|---|---|---|
| **EMITTER** Forward Voltage | ($I_F$ = 10 mA) | $V_F$ | HMHA281 | 1.0 | | 1.3 | V |
| | | | HMHA2801 | | | | |
| | ($I_F$ = ± 5 mA) | | HMHAA280 | | | 1.4 | |
| Reverse Current | ($V_R$ = 5 V) | $I_R$ | All | | | 5 | µA |
| **DETECTOR** Breakdown Voltage Collector to Emitter | ($I_C$ = 0.5 mA, $I_F$ = 0) | $BV_{CEO}$ | All | 80 | | | V |
| Emitter to Collector | ($I_E$ = 100 µA, $I_F$ = 0) | $BV_{ECO}$ | All | 7 | | | |
| Collector Dark Current | ($V_{CE}$ = 80 V, $I_F$ = 0) | $I_{CEO}$ | All | | | 100 | nA |
| Capacitance | ($V_{CE}$ = 0 V, f = 1 MHz) | $C_{CE}$ | All | | 10 | | pF |

## TRANSFER CHARACTERISTICS ($T_A$ = 25°C)

| Characteristic | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit |
|---|---|---|---|---|---|---|---|
| DC Current Transfer Ratio | ($I_F$ = ± 5 mA, $V_{CE}$ = 5 V) | CTR | HMHAA280 | 50 | | 600 | % |
| | ($I_F$ = 5 mA, $V_{CE}$ = 5 V) | | HMHA2801 | 80 | | 600 | |
| | ($I_F$ = 5 mA, $V_{CE}$ = 5 V) | | HMHA281 | 50 | | 600 | |
| CTR Symmetry | ($I_F$ = ± 5 mA, $V_{CE}$ = 5 V) | — | HMHAA280 | 0.33 | | 3.0 | |
| Saturation Voltage | ($I_F$ = ± 8 mA, $I_C$ = 2.4 mA) | $V_{CE\ (SAT)}$ | HMHAA280 | | | 0.4 | V |
| | ($I_F$ = 10 mA, $I_C$ = 2 mA) | | HMHA2801 | | | 0.3 | |
| | ($I_F$ = 8 mA, $I_C$ = 2.4 mA) | | HMHA281 | | | 0.4 | |
| Rise Time (Non-Saturated) | ($I_C$ = 2 mA, $V_{CE}$ = 5 V) ($R_L$ = 100V) | $t_r$ | | | 3 | | µs |
| Fall Time (Non-Saturated) | ($I_C$ = 2 mA, $V_{CE}$ = 5 V) ($R_L$ = 100V) | $t_f$ | | | 3 | | |

## ISOLATION CHARACTERISTICS

| Characteristic | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit |
|---|---|---|---|---|---|---|---|
| Steady State Isolation Voltage | (1 Minute) | $V_{ISO}$ | All | 2500 | | | VRMS |

** All typicals at TA = 25°C

## TYPICAL PERFORMANCE CURVES

**Fig. 1 Forward Current vs. Forward Voltage**

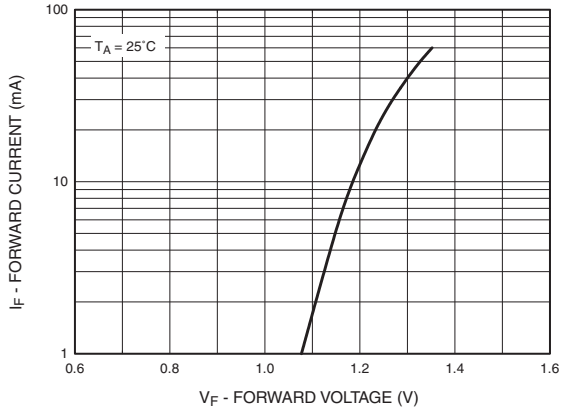



**Fig. 2 Collector Current vs. Forward Current**

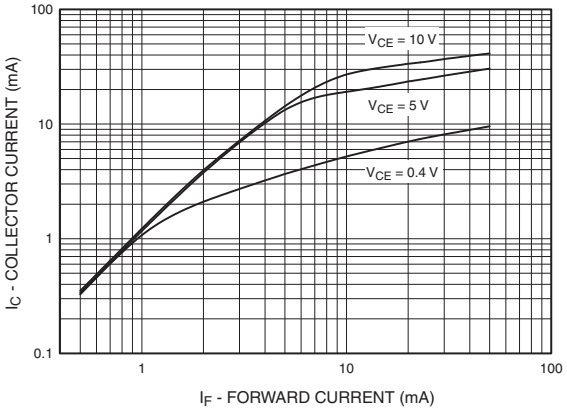



**Fig. 3 Current Transfer Ratio vs. Forward Current**

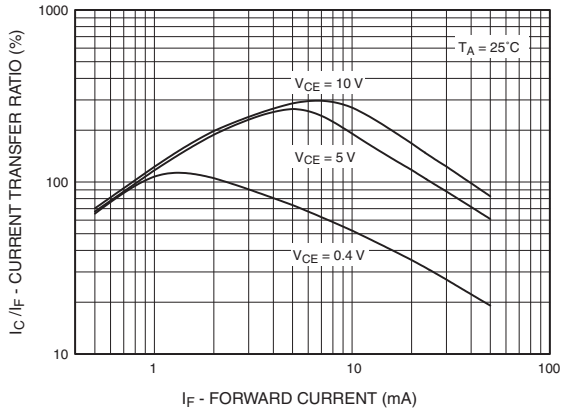



**Fig. 4 Normalized CTR vs. Temperature**

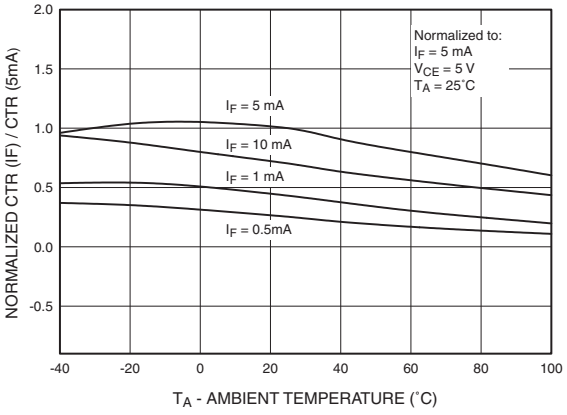



**Fig. 5 Collector Current vs. Temperature**

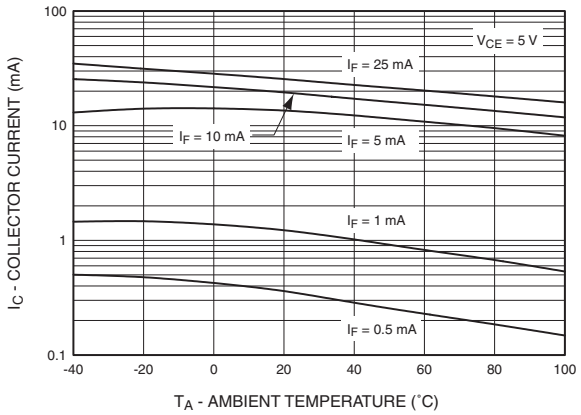


**Fig. 6 Collector Current vs. Collector-Emitter Voltage**

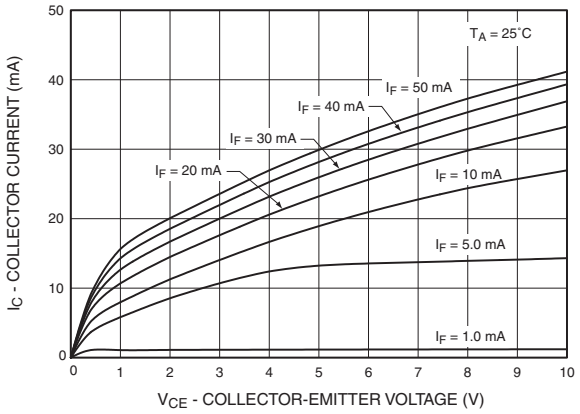



**Fig. 7 Collector Current vs. Collector-Emitter Voltage**

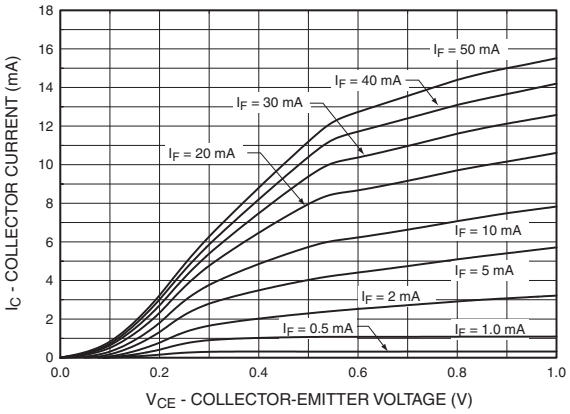



**Fig. 8 Collector Dark Current vs. Temperature**

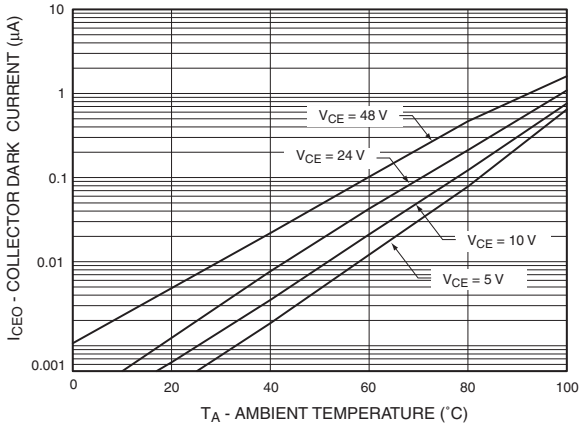



**Fig. 9 Switching Time vs. Load Resistance**

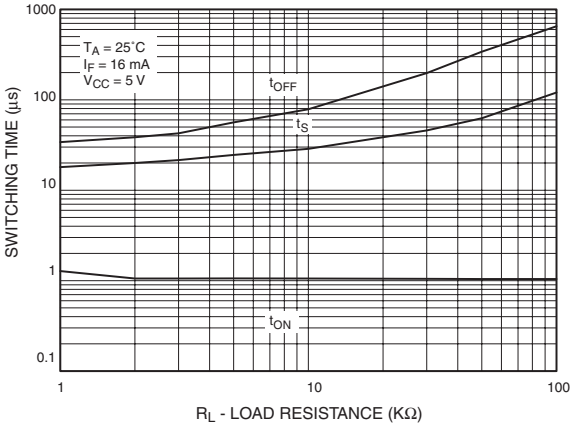
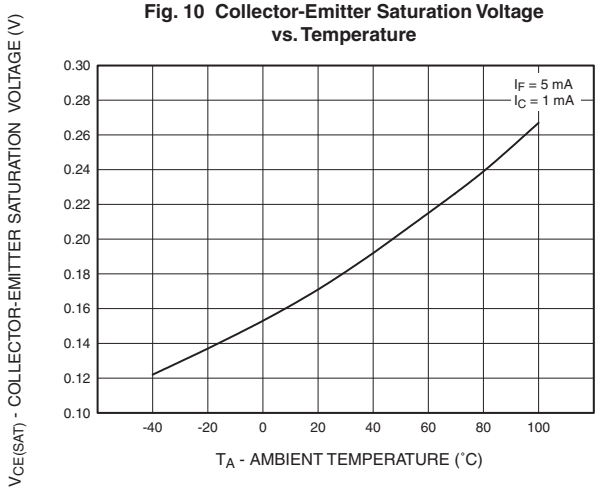
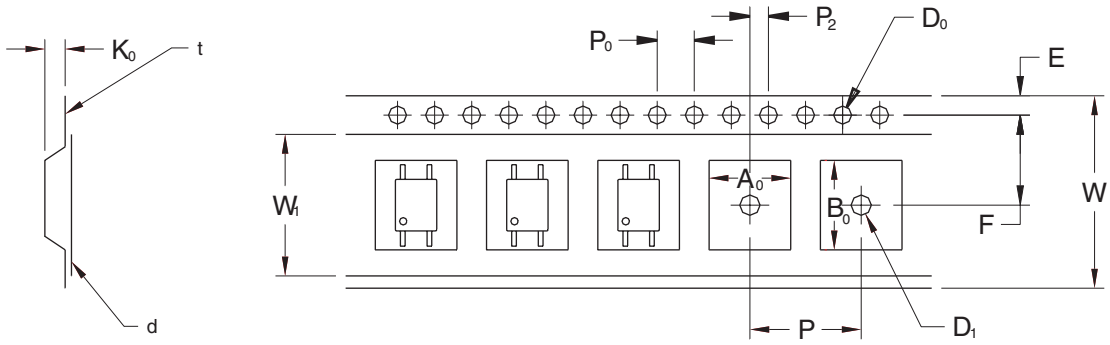



**Fig. 10 Collector-Emitter Saturation Voltage vs. Temperature**



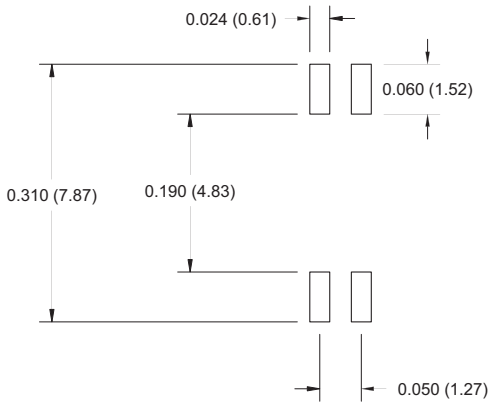
## ORDERING INFORMATION

| Option | Description |
|---|---|
| V | VDE Approved |
| R1 | Tape and Reel (500 units) |
| R2 | Tape and Reel (2500 units) |
| R1V | Tape and Reel (500 units) and VDE Approved |
| R2V | Tape and Reel (2500 units) and VDE Approved |

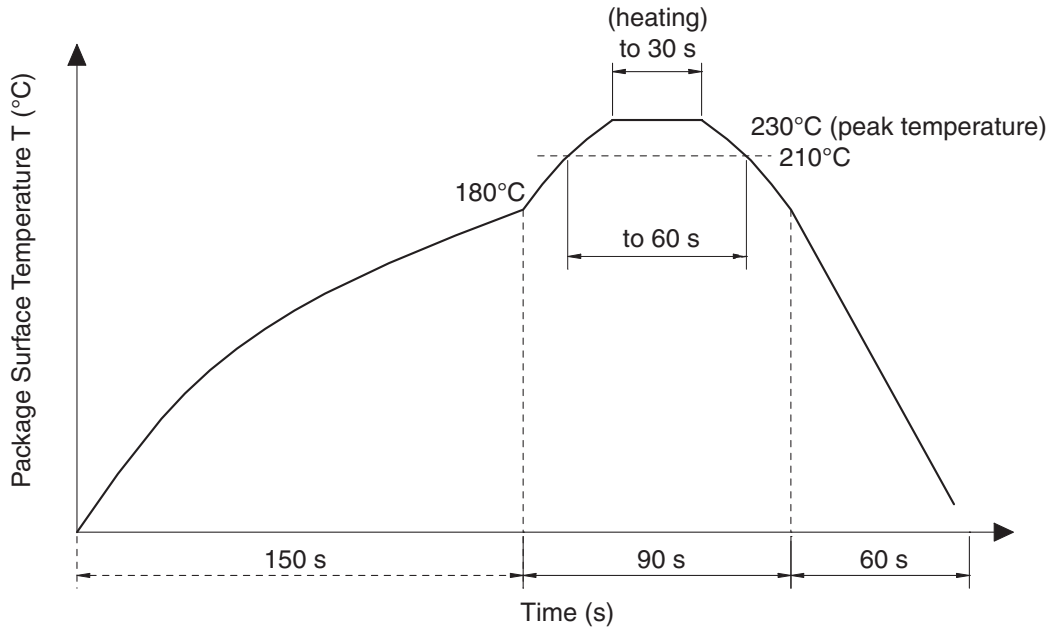



| Description | | Symbol | 1.27 Pitch Dimensions (mm) |
|---|---|---|---|
| Tape Width | | W | 12.00±0.4 |
| Tape Thickness | | t | 0.30±0.20 |
| Sprocket Hole Pitch | | $P_0$ | 4.00±0.20 |
| Sprocket Hole Dia. | | $D_0$ | 1.55±0.20 |
| Sprocket Hole Location | | E | 1.75±0.20 |
| Pocket Location | | F | 5.50±0.20 |
| | | $P_2$ | 2.00±0.20 |
| Pocket Pitch | | P | 8.00±0.20 |
| Pocket Dimension | | $A_0$ | 4.40±0.20 |
| | | $B_0$ | 7.30±0.20 |
| | | $K_0$ | 2.30±0.20 |
| Pocket Hole Dia. | | $D_1$ | 1.55±0.20 |
| Cover Tape Width | | $W_1$ | 9.20 |
| Cover Tape Thickness | | d | 0.065±0.02 |
| Max. Component Rotation or Tilt | | | 20˚ max |
| | | | |
| Devices Per Reel | R1 | | 500 |
| | R2 | | 2500 |
| Reel Diameter | R1 | | 178 mm (7") |
| | R2 | | 330 mm (13") |

## Footprint Drawing for PCB Layout




## Recommended Infrared Reflow Soldering Profile




- Peak reflow temperature: 230°C (package surface temperature) for 30 seconds
- Time of temperature higher than 210°C: 60 seconds or less
- One time soldering reflow is recommended

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# HALF PITCH MINI-FLAT PACKAGE 4-PIN OPTOCOUPLERS

## HMHAA280 HMHA2801 HMHA281

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