

HMHAA280, HMHA2801 Series, HMHA281 Half Pitch Mini-Flat Package 4-Pin Optocouplers

Features

- Compact 4-pin package (2.4mm maximum standoff height)
- Half pitch leads for optimum board space savings
- Current Transfer Ratio in selected groups

| | |
|--------------------|--------------------|
| HMHA2801: 80–600% | HMHA2801A: 80–160% |
| HMHA2801B: 50–150% | HMHA2801C: 50–100% |
| HMHA281: 50–600% | HMHAA280: 50–600% |
- Available in tape and reel quantities of 2500
- CSA (File #1201524), UL (File #E90700) and VDE (File #136480) certified

Applications

HMHAA280

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

HMHA281, HMHA2801 Series

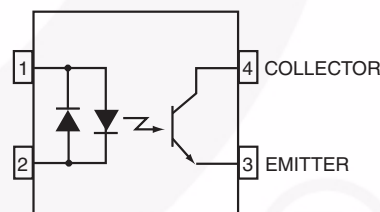
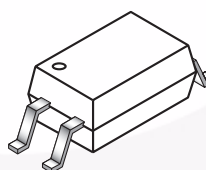
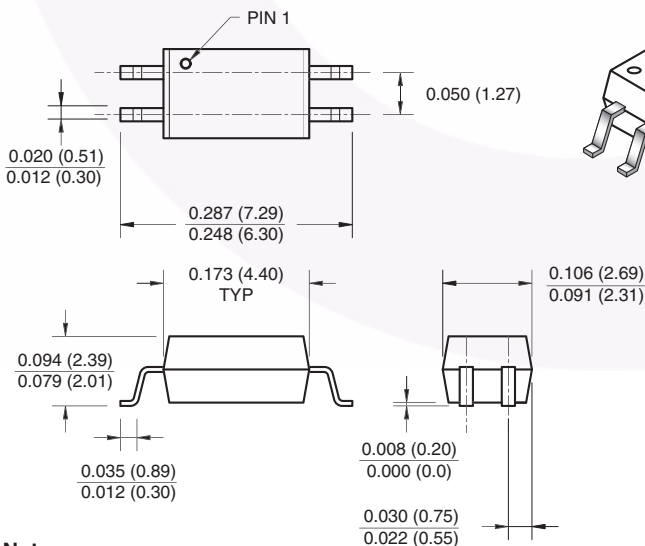
- Digital logic inputs
- Microprocessor inputs
- Power supply monitor
- Twisted pair line receiver
- Telephone line receiver

Description

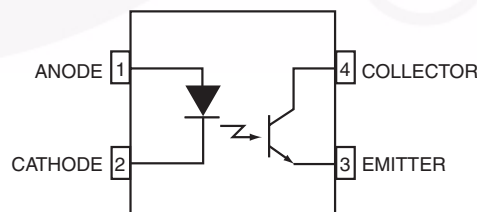
The HMHA281, HMHA2801 Series consists of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a compact 4-pin mini-flat package. The lead pitch is 1.27mm.

The HMHAA280 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. The lead pitch is 1.27mm.

Package Dimensions



Equivalent Circuit
(HMHAA280)



Equivalent Circuit
(HMHA281, HMHA2801)

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise specified)

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 | $^\circ\text{C}$ |
| T_{OPR} | Operating Temperature | -55 to +100 | $^\circ\text{C}$ |
| EMITTER | | | |
| I_F (avg) | Continuous Forward Current | 50 | mA |
| I_F (pk) | Peak Forward Current (1 μs pulse, 300pps.) | 1 | A |
| V_R | Reverse Input Voltage (HMHA) | 6 | V |
| P_D | Power Dissipation | 60 | mW |
| | Derate linearly (above 25°C) | 0.6 | mW/ $^\circ\text{C}$ |
| DETECTOR | | | |
| | Continuous Collector Current | 50 | mA |
| P_D | Power Dissipation | 150 | mW |
| | Derate linearly (above 25°C) | 1.5 | mW/ $^\circ\text{C}$ |
| V_{CEO} | Collector-Emitter Voltage | 80 | V |
| V_{ECO} | Emitter-Collector Voltage | 7 | V |

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 | $I_F = 10\text{mA}$ | HMHA281 | 1.0 | | 1.3 | V |
| | | | HMHA2801 | | | | |
| | | | HMHA2801A | 1.0 | | 1.3 | |
| | | | HMHA2801B | | | | |
| | | $I_F = 20\text{mA}$ | HMHA2801C | | | 1.4 | |
| | | $I_F = \pm 5\text{mA}$ | HMHAA280 | | | 1.4 | |
| 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 | $I_E = 100\mu\text{A}$, $I_F = 0$ | 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 |

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

| Symbol | Characteristic | Test Conditions | Device | Min. | Typ.* | Max. | Unit |
|---------------------------|--------------------------------|--|-----------------------------|------|-------|------|---------------|
| TRANSFER CHARACTERISTICS | | | | | | | |
| CTR | DC Current Transfer Ratio | $I_F = \pm 5\text{mA}$, $V_{CE} = 5\text{V}$ | HMHAA280 | 50 | | 600 | % |
| | | $I_F = 5\text{mA}$, $V_{CE} = 5\text{V}$ | HMHA281 | 50 | | 600 | |
| | | | HMHA2801 | 80 | | 600 | |
| | | | HMHA2801A | 80 | | 160 | |
| | | | HMHA2801B | 50 | | 150 | |
| | | $I_F = 1\text{mA}$, $V_{CE} = 5\text{V}$ | HMHA2801C | 50 | | 100 | |
| | CTR Symmetry | $I_F = \pm 5\text{mA}$, $V_{CE} = 5\text{V}$ | HMHAA280 | 0.33 | | 3.0 | |
| $V_{CE(SAT)}$ | Saturation Voltage | $I_F = \pm 8\text{mA}$, $I_C = 2.4\text{mA}$ | HMHAA280 | | | 0.4 | V |
| | | $I_F = 8\text{mA}$, $I_C = 2.4\text{mA}$ | HMHA281 | | | 0.4 | |
| | | $I_F = 10\text{mA}$, $I_C = 2\text{mA}$ | HMHA2801 | | | 0.3 | |
| | | | HMHA2801A | | | 0.3 | |
| | | | HMHA2801B | | | | |
| | | $I_F = 20\text{mA}$, $I_C = 1\text{mA}$) | HMHA2801C | | | 0.2 | |
| t_r | Rise Time (Non-Saturated) | $I_C = 2\text{mA}$, $V_{CE} = 5\text{V}$, $R_L = 100\Omega$ | All except for HMHA2801C | | 3 | | μs |
| | | $I_C = 2\text{mA}$, $V_{CE} = 2\text{V}$, $R_L = 1\text{K}\Omega$ | HMHA2801C | | | 9 | |
| t_f | Fall Time (Non-Saturated) | $I_C = 2\text{mA}$, $V_{CE} = 5\text{V}$, $R_L = 100\Omega$ | All except for HMHA2801C | | 3 | | |
| | | $I_C = 2\text{mA}$, $V_{CE} = 2\text{V}$, $R_L = 1\text{K}\Omega$ | HMHA2801C | | | 9 | |
| ISOLATION CHARACTERISTICS | | | | | | | |
| V_{ISO} | Steady State Isolation Voltage | 1 Minute | All | 2500 | | | VRMS |

*All typicals at $T_A = 25^\circ\text{C}$

Typical Performance Characteristics

Fig. 1 Forward Current vs. Forward Voltage

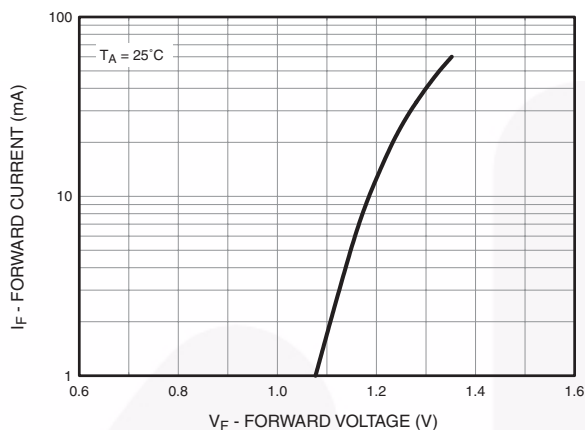


Fig. 2 Collector Current vs. Forward Current

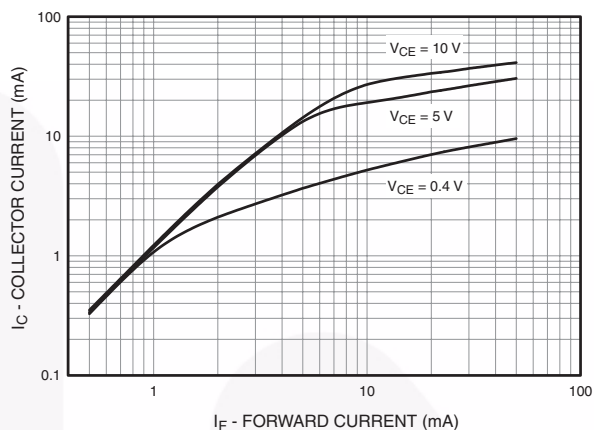


Fig. 3 Current Transfer Ratio vs. Forward Current

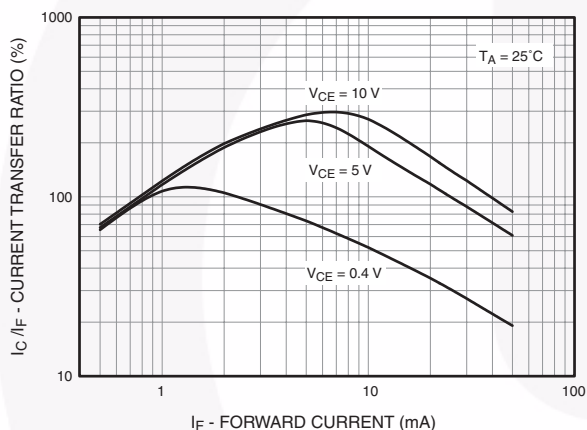


Fig. 4 Normalized CTR vs. Temperature

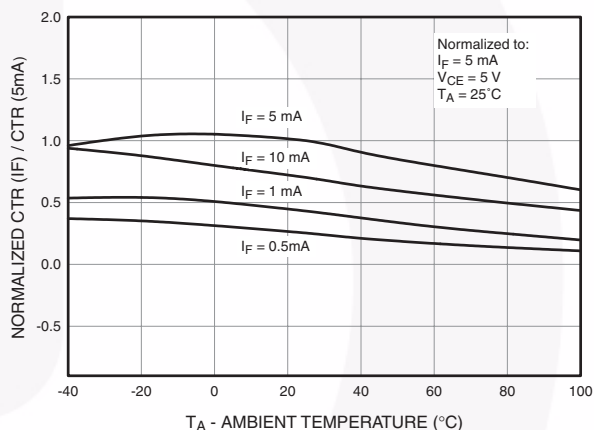
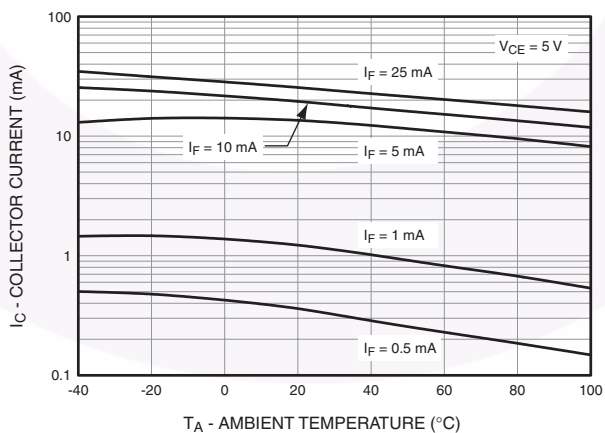


Fig. 5 Collector Current vs. Temperature



Typical Performance Characteristics (Continued)

Fig. 6 Collector Current vs. Collector-Emitter Voltage

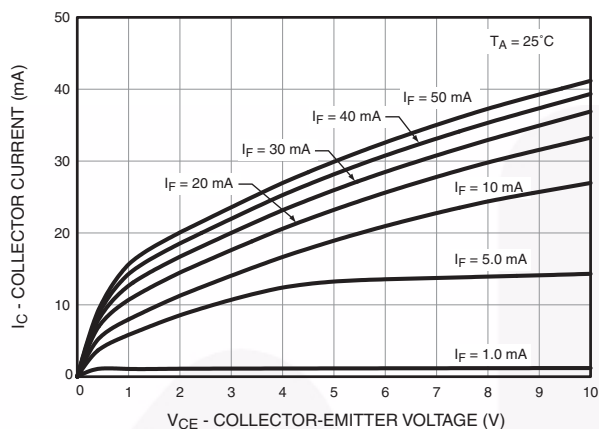


Fig. 7 Collector Current vs. Collector-Emitter Voltage

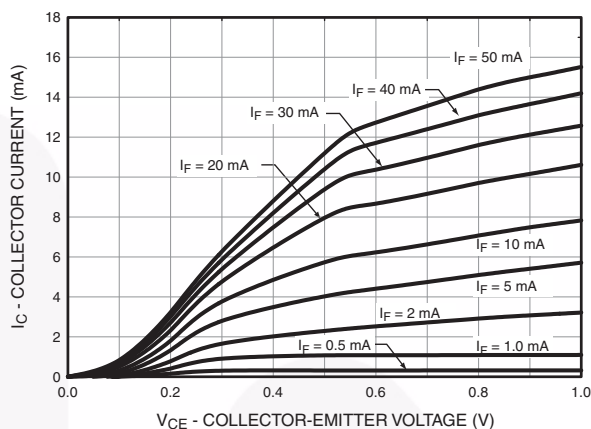


Fig. 8 Collector Dark Current vs. Temperature

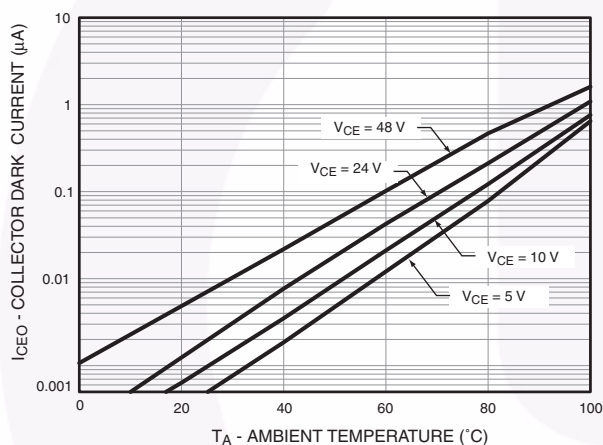


Fig. 9 Switching Time vs. Load Resistance

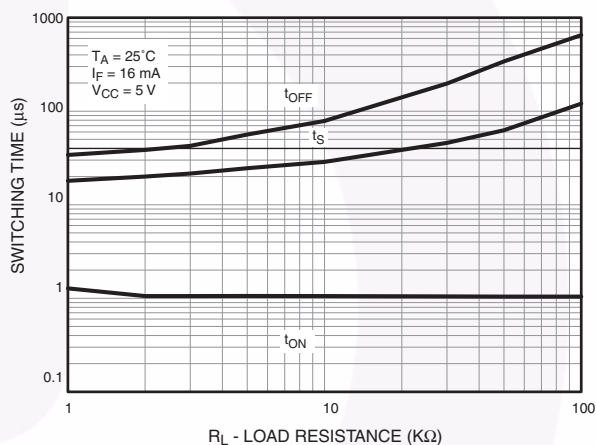
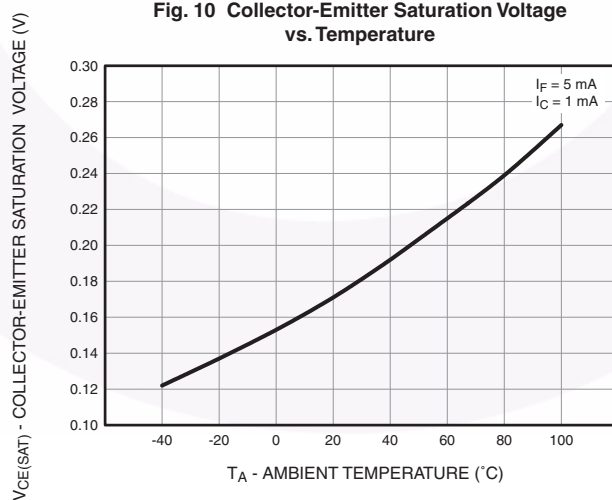


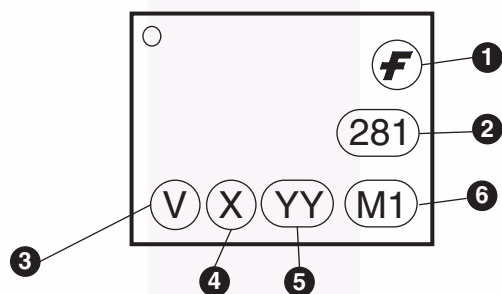
Fig. 10 Collector-Emitter Saturation Voltage vs. Temperature



Ordering Information

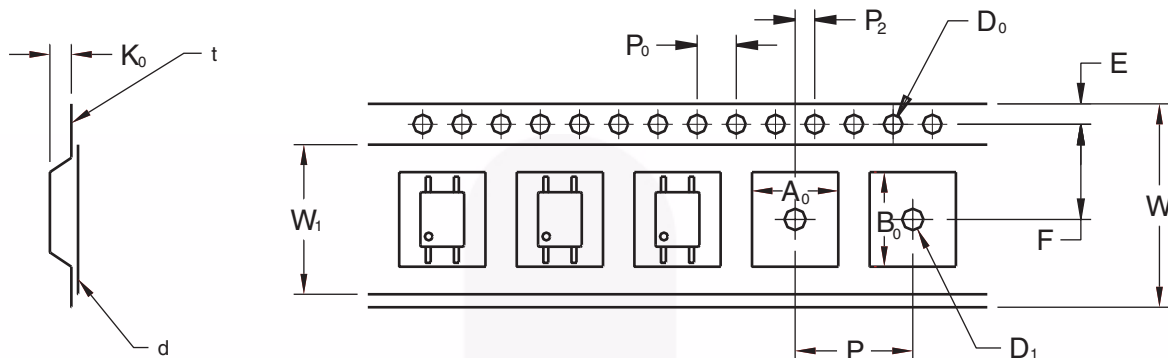
| Option | Description |
|--------|---|
| V | VDE Approved |
| R2 | Tape and Reel (2500 units) |
| R2V | Tape and Reel (2500 units) and VDE Approved |

Marking Information



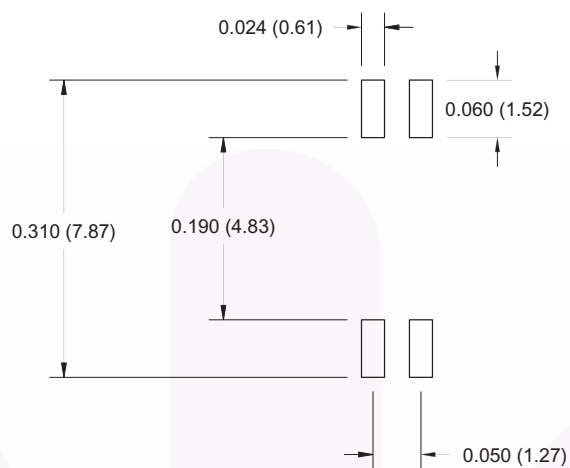
| Definitions | |
|-------------|--|
| 1 | Fairchild logo |
| 2 | Device number |
| 3 | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4 | One digit year code |
| 5 | Two digit work week ranging from '01' to '53' |
| 6 | Assembly package code |

Tape and Reel Dimensions

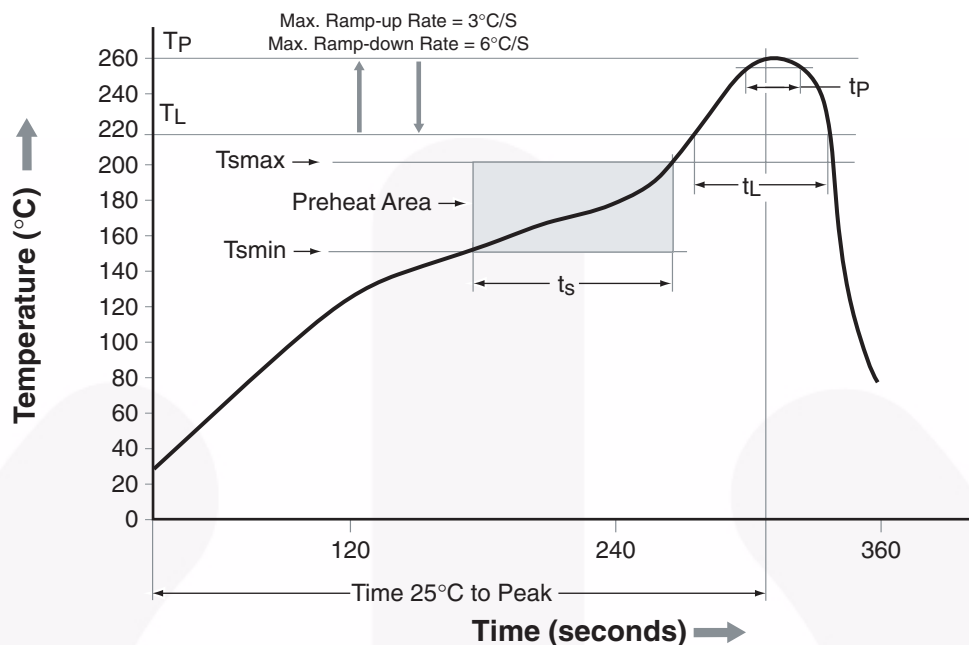


| | | 2.54 Pitch |
|---------------------------------|----------------|--------------|
| Description | Symbol | Dimensions |
| Tape Width | W | 12.00±0.4 |
| Tape Thickness | t | 0.35±0.02 |
| Sprocket Hole Pitch | P ₀ | 4.00±0.20 |
| Sprocket Hole Dia. | D ₀ | 1.55±0.20 |
| Sprocket Hole Location | 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 | 4.75±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 | | 2500 |
| Reel Diameter | | 330 mm (13") |

Footprint Drawing for PCB Layout



Reflow Profile



| Profile Feature | Pb-Free Assembly Profile |
|---|--------------------------|
| Temperature Min. (T _{smin}) | 150°C |
| Temperature Max. (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 max. |
| Liquidous Temperature (T _L) | 217°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. |

This reflow profile applies only to all HMHAXXXX devices with datecode marks starting from “0938” going forward. All preceding datecodes utilize a peak reflow temperature: 230°C (package surface temperature) for 30 seconds.



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|--------------------------|-----------------------|---|
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