

## HMA121 Series

## HMA124

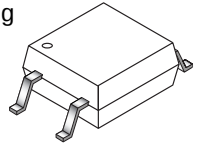
## HMA2701 Series

## HMAA2705

### DESCRIPTION

The HMA124, HMA121 series and HMA2701 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 2.54 mm.

The HMAA2705 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 2.54mm.



### FEATURES

- Compact 4-pin package (2.4 mm maximum standoff height)
- Current Transfer Ratio in selected groups
 

|                   |                    |
|-------------------|--------------------|
| HMA121: 50–600%   | HMA2701: 50–300%   |
| HMA121A: 100–300% | HMA2701A: 150–300% |
| HMA121B: 50–150%  | HMA2701B: 80–160%  |
| HMA121C: 100–200% | HMA124: 100% MIN   |
| HMA121D: 50–100%  | HMAA2705: 50–300%  |
| HMA121E: 150–300% |                    |
| HMA121F: 100–600% |                    |
- 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 #1162301), UL (File #E90700) and VDE (File #136480) certified
- Creepage ≥ 5 mm, typical 5.2 mm
- Clearance ≥ 5 mm, typical 5.2 mm

### APPLICATIONS

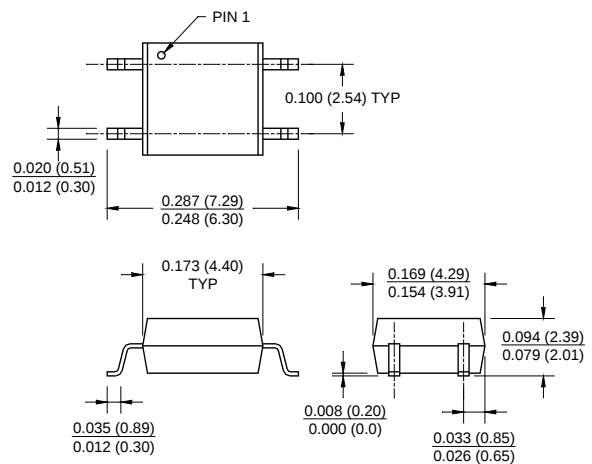
#### HMAA2705

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

#### HMA121 series, HMA2701 series, HMA124

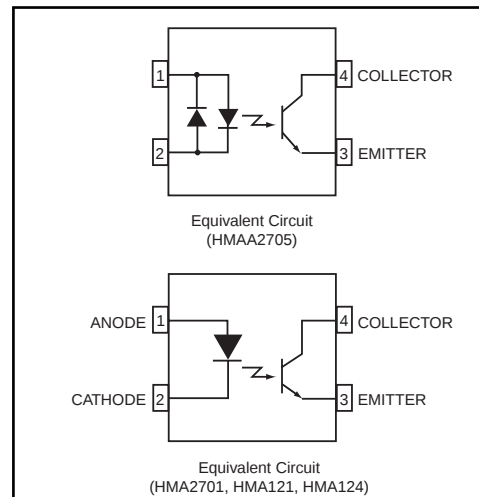
- Digital logic inputs
- Microprocessor inputs
- Power supply monitor
- Twisted pair line receiver
- Telephone line receiver

### PACKAGE DIMENSIONS



#### NOTE

All dimensions are in inches (millimeters)



**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25°C unless otherwise specified) |                      |             |       |
|-----------------------------------------------------------------------------|----------------------|-------------|-------|
| Parameter                                                                   | Symbol               | Value       | Units |
| TOTAL PACKAGE                                                               |                      |             |       |
| Storage Temperature                                                         | T <sub>STG</sub>     | -40 to +125 | °C    |
| Operating Temperature                                                       | T <sub>OPR</sub>     | -40 to +100 | °C    |
| EMITTER                                                                     |                      |             |       |
| Continuous Forward Current                                                  | I <sub>F</sub> (avg) | 50          | mA    |
| Peak Forward Current (1 μs pulse, 300 pps.)                                 | I <sub>F</sub> (pk)  | 1           | A     |
| Reverse Input Voltage (HMA)                                                 | V <sub>R</sub>       | 6           | V     |
| Power Dissipation                                                           | P <sub>D</sub>       | 70          | mW    |
| Derate linearly (above 25°C)                                                |                      | 0.65        | mW/°C |
| DETECTOR                                                                    |                      |             |       |
| Continuous Collector Current                                                |                      | 80          | mA    |
| Power Dissipation                                                           | P <sub>D</sub>       | 150         | mW    |
| Derate linearly (above 25°C)                                                |                      | 2.0         | mW/°C |
| Collector-Emitter Voltage                                                   | V <sub>CEO</sub>     | 40          | V     |
| HMA2701 Series, HMAA2705<br>HMA121 Series, HMA124                           |                      | 80          |       |
| Emitter-Collector Voltage                                                   | V <sub>ECO</sub>     | 7           | V     |

**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**

| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C)    |                                               |                   |                |     |       |     |      |  |
|-------------------------------------------------------|-----------------------------------------------|-------------------|----------------|-----|-------|-----|------|--|
| INDIVIDUAL COMPONENT CHARACTERISTICS                  |                                               |                   |                |     |       |     |      |  |
| Parameter                                             | Test Conditions                               | Symbol            | Device         | Min | Typ** | Max | Unit |  |
| EMITTER<br>Forward Voltage                            | (I <sub>F</sub> = 10 mA)                      | V <sub>F</sub>    | HMA121 Series  | 1.0 |       | 1.3 | V    |  |
|                                                       |                                               |                   | HMA124         |     |       |     |      |  |
|                                                       | (I <sub>F</sub> = 5 mA)                       |                   | HMA2701 Series |     |       | 1.4 |      |  |
|                                                       | (I <sub>F</sub> = ± 5 mA)                     |                   | HMAA2705       |     |       |     |      |  |
| Reverse Current                                       | (V <sub>R</sub> = 5 V)                        | I <sub>R</sub>    | HMA2701 Series |     |       | 5   | µA   |  |
|                                                       |                                               |                   | HMA121 Series  |     |       |     |      |  |
|                                                       |                                               |                   | HMA124         |     |       |     |      |  |
| DETECTOR<br>Breakdown Voltage<br>Collector to Emitter | (I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0)   | BV <sub>CEO</sub> | HMA121 Series  | 80  |       |     | V    |  |
|                                                       |                                               |                   | HMA124         |     |       |     |      |  |
|                                                       |                                               |                   | HMA2701 Series | 40  |       |     |      |  |
|                                                       |                                               |                   | HMAA2705       |     |       |     |      |  |
| Emitter to Collector                                  | (I <sub>E</sub> = 100 µA, I <sub>F</sub> = 0) | BV <sub>ECO</sub> | All            | 7   |       |     |      |  |
| Collector Dark Current                                | (V <sub>CE</sub> = 40 V, I <sub>F</sub> = 0)  | I <sub>CEO</sub>  | All            |     |       | 100 | nA   |  |
| Capacitance                                           | (V <sub>CE</sub> = 0 V, f = 1 MHz)            | C <sub>CE</sub>   | All            |     | 10    |     | pF   |  |

**HMA121 Series**

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**HMAA2705**

| TRANSFER CHARACTERISTICS (T <sub>A</sub> = 25°C) |                                                                           |                       |          |     |       |      |      |
|--------------------------------------------------|---------------------------------------------------------------------------|-----------------------|----------|-----|-------|------|------|
| Characteristic                                   | Test Conditions                                                           | Symbol                | Device   | Min | Typ** | Max  | Unit |
| DC Current Transfer Ratio                        | (I <sub>F</sub> = ± 5 mA, V <sub>CE</sub> = 5 V)                          | CTR                   | HMAA2705 | 50  |       | 300  | %    |
|                                                  | (I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V)                            |                       | HMA2701  | 50  |       | 300  |      |
|                                                  |                                                                           |                       | HMA2701A | 150 |       | 300  |      |
|                                                  |                                                                           |                       | HMA2701B | 80  |       | 160  |      |
|                                                  |                                                                           |                       | HMA121   | 50  |       | 600  |      |
|                                                  |                                                                           |                       | HMA121A  | 100 |       | 300  |      |
|                                                  |                                                                           |                       | HMA121B  | 50  |       | 150  |      |
|                                                  |                                                                           |                       | HMA121C  | 100 |       | 200  |      |
|                                                  |                                                                           |                       | HMA121D  | 50  |       | 100  |      |
|                                                  |                                                                           |                       | HMA121E  | 150 |       | 300  |      |
|                                                  |                                                                           |                       | HMA121F  | 100 |       | 600  |      |
|                                                  | (I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 0.4 V)                          |                       | HMA121F  | 30  |       |      |      |
|                                                  | (I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 0.5 V)                          |                       | HMA124   | 100 |       | 1200 |      |
|                                                  | (I <sub>F</sub> = 0.5 mA, V <sub>CE</sub> = 1.5 V)                        |                       | HMA124   | 50  |       | —    |      |
| CTR Symmetry                                     | (I <sub>F</sub> = ± 5 mA, V <sub>CE</sub> = 5 V)                          | —                     | HMAA2705 | 0.3 |       | 3.0  |      |
| Saturation Voltage                               | (I <sub>F</sub> = ± 10 mA, I <sub>C</sub> = 2 mA)                         | V <sub>CE (SAT)</sub> | HMAA2705 |     |       | 0.3  | V    |
|                                                  | (I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2 mA)                           |                       | HMA2701  |     |       | 0.3  |      |
|                                                  |                                                                           |                       | HMA2701A |     |       | 0.3  |      |
|                                                  |                                                                           |                       | HMA2701B |     |       | 0.3  |      |
|                                                  |                                                                           |                       | HMA121   |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA121A  |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA121B  |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA121C  |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA121D  |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA121E  |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA121F  |     |       | 0.4  |      |
|                                                  |                                                                           |                       | HMA124   |     |       | 0.4  |      |
| Rise Time (Non-Saturated)                        | (I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V)<br>(R <sub>L</sub> = 100Ω) | t <sub>r</sub>        |          |     | 3     |      | μs   |
| Fall Time (Non-Saturated)                        | (I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V)<br>(R <sub>L</sub> = 100Ω) | t <sub>f</sub>        |          |     | 3     |      |      |

| ISOLATION CHARACTERISTICS      |                 |                  |        |      |       |     |      |
|--------------------------------|-----------------|------------------|--------|------|-------|-----|------|
| Characteristic                 | Test Conditions | Symbol           | Device | Min  | Typ** | Max | Unit |
| Steady State Isolation Voltage | (1 Minute)      | V <sub>ISO</sub> | All    | 3750 |       |     | VRMS |

\*\* All typicals at T<sub>A</sub> = 25°C

**HMA121 Series**

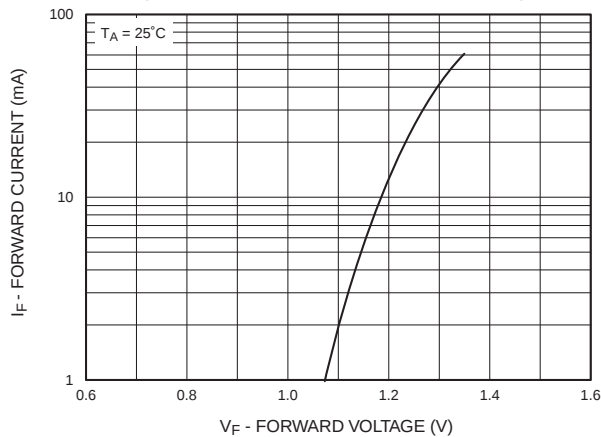
**HMA124**

**HMA2701 Series**

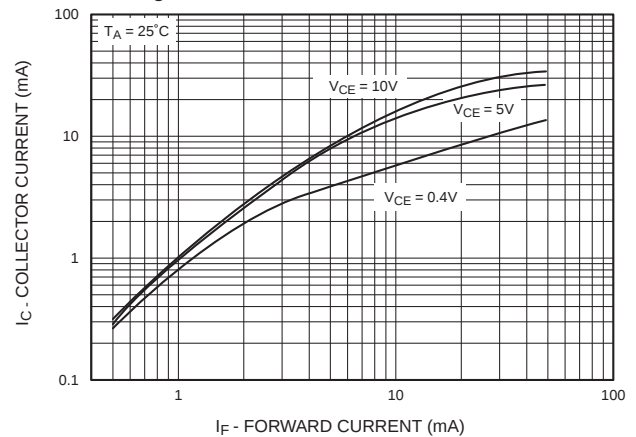
**HMAA2705**

**TYPICAL PERFORMANCE CURVES**

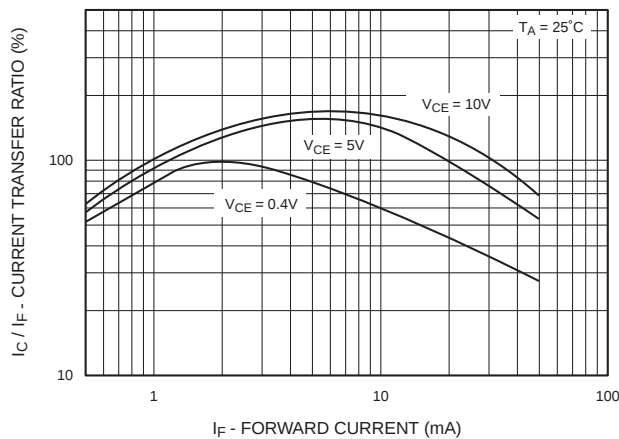
**Fig. 1 Forward Current vs. Forward Voltage**



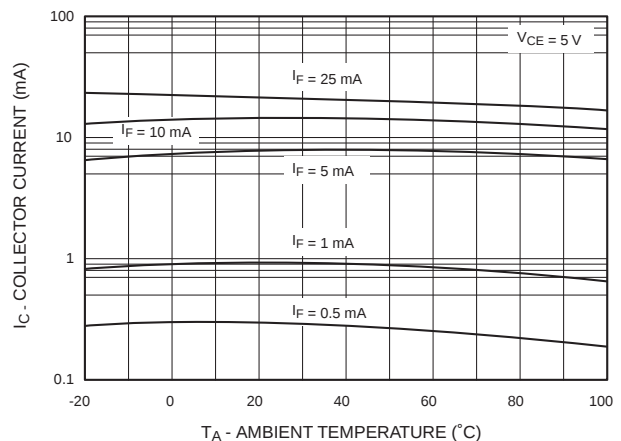
**Fig. 2 Collector Current vs. Forward Current**



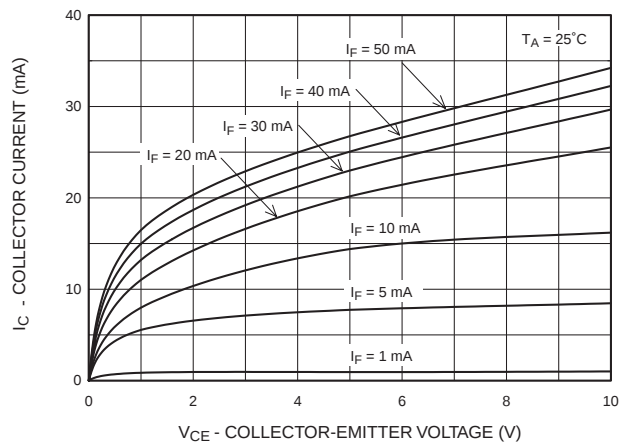
**Fig. 3 Current Transfer Ratio vs. Forward Current**



**Fig. 4 Collector Current vs. Temperature**



**Fig. 5 Collector Current vs. Collector-Emitter Voltage**



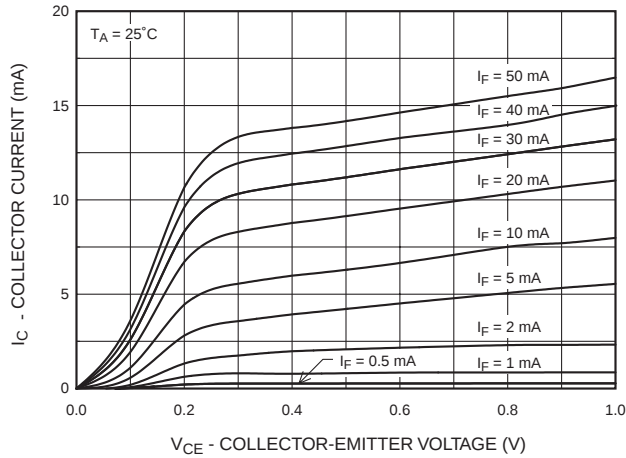
**HMA121 Series**

**HMA124**

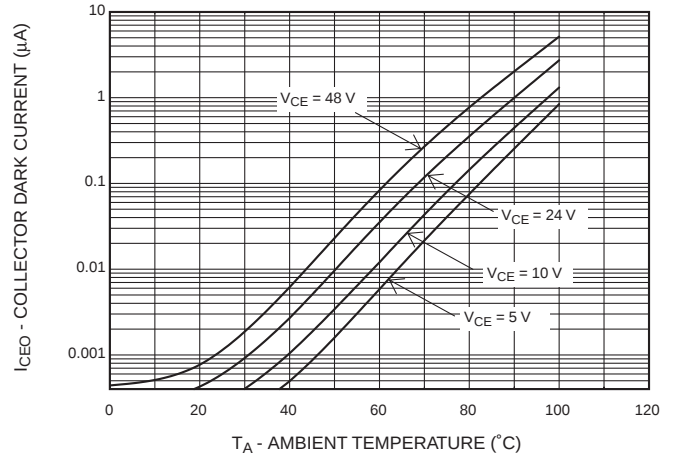
**HMA2701 Series**

**HMAA2705**

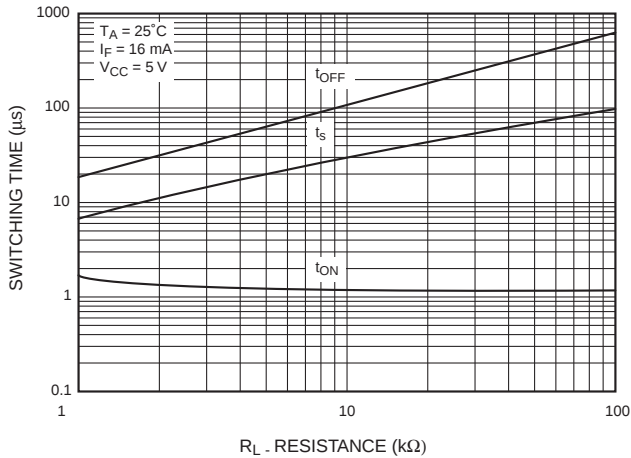
**Fig. 6 Collector Current vs. Collector-Emitter Voltage**



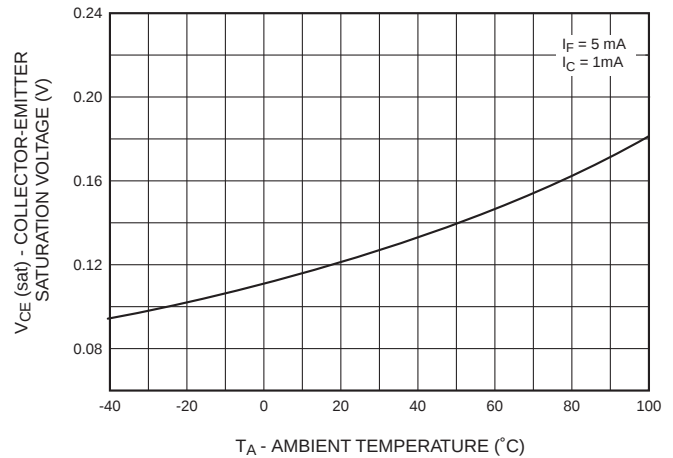
**Fig. 7 Collector Dark Current vs. Temperature**



**Fig. 8 Switching Time vs. Load Resistance**



**Fig. 9 Collector-Emitter Saturation Voltage vs. Temperature**



**HMA121 Series**

**HMA124**

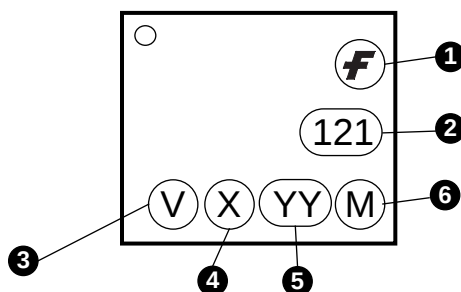
**HMA2701 Series**

**HMAA2705**

**ORDERING INFORMATION**

| Option | Description                                                    |
|--------|----------------------------------------------------------------|
| V      | VDE Approved                                                   |
| R1     | Tape and Reel (500 units)                                      |
| R2     | Tape and Reel (2500 units)                                     |
| R3     | Tape and Reel (500 units; unit 180° rotated)                   |
| R4     | Tape and Reel (2500 units; unit 180° rotated)                  |
| R1V    | Tape and Reel (500 units) and VDE Approved                     |
| R2V    | Tape and Reel (2500 units) and VDE Approved                    |
| R3V    | Tape and Reel (500 units; unit 180° rotated) and VDE Approved  |
| R4V    | Tape and Reel (2500 units; unit 180° rotated) and VDE Approved |

**MARKING INFORMATION**



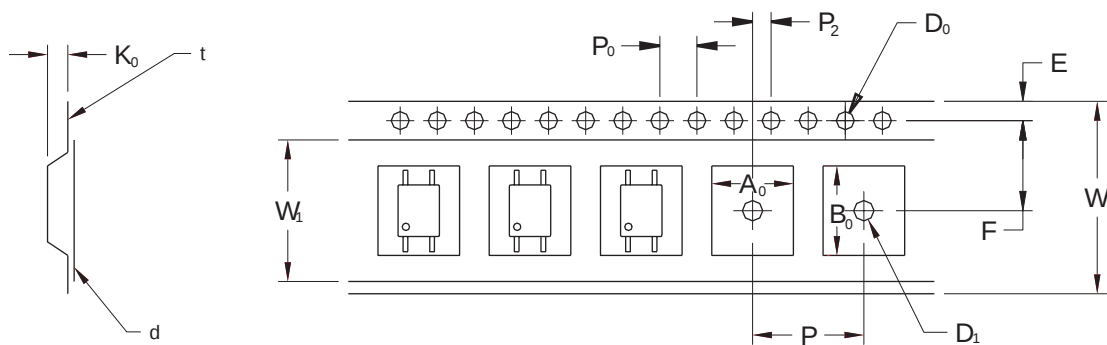
| Definitions |                                                                                        |
|-------------|----------------------------------------------------------------------------------------|
| 1           | Fairchild logo                                                                         |
| 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                                                                  |

**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**



|                                 |    | 2.54 Pitch     |              |
|---------------------------------|----|----------------|--------------|
| Description                     |    | Symbol         |              |
| Dimensions (mm)                 |    |                |              |
| Tape Width                      |    | W              | 12.00±0.4    |
| Tape Thickness                  |    | t              | 0.30±0.20    |
| Sprocket Hole Pitch             |    | P <sub>0</sub> | 4.00±0.20    |
| Sprocket Hole Dia.              |    | D <sub>0</sub> | 1.55±0.20    |
| Sprocket Hole Location          |    | E              | 1.75±0.20    |
| Pocket Location                 |    | F              | 5.50±0.20    |
|                                 |    | P <sub>2</sub> | 2.00±0.20    |
| Pocket Pitch                    |    | P              | 8.00±0.20    |
| Pocket Dimension                |    | A <sub>0</sub> | 4.40±0.20    |
|                                 |    | B <sub>0</sub> | 7.30±0.20    |
|                                 |    | K <sub>0</sub> | 2.30±0.20    |
| Pocket Hole Dia.                |    | D <sub>1</sub> | 1.55±0.20    |
| Cover Tape Width                |    | W <sub>1</sub> | 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") |

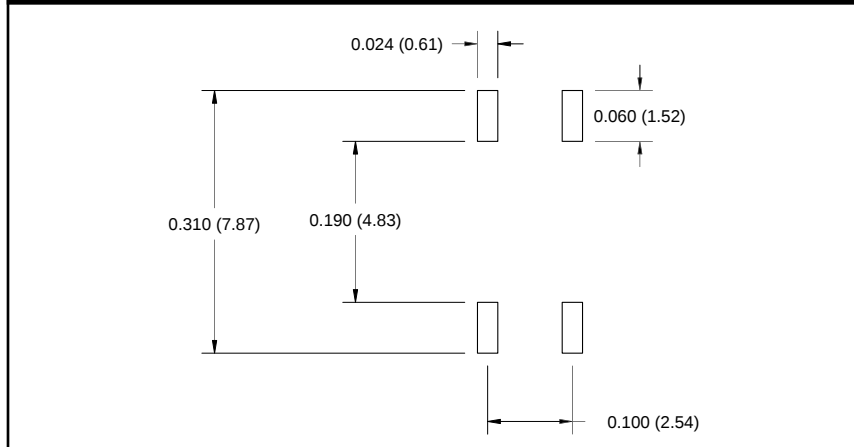
**HMA121 Series**

**HMA124**

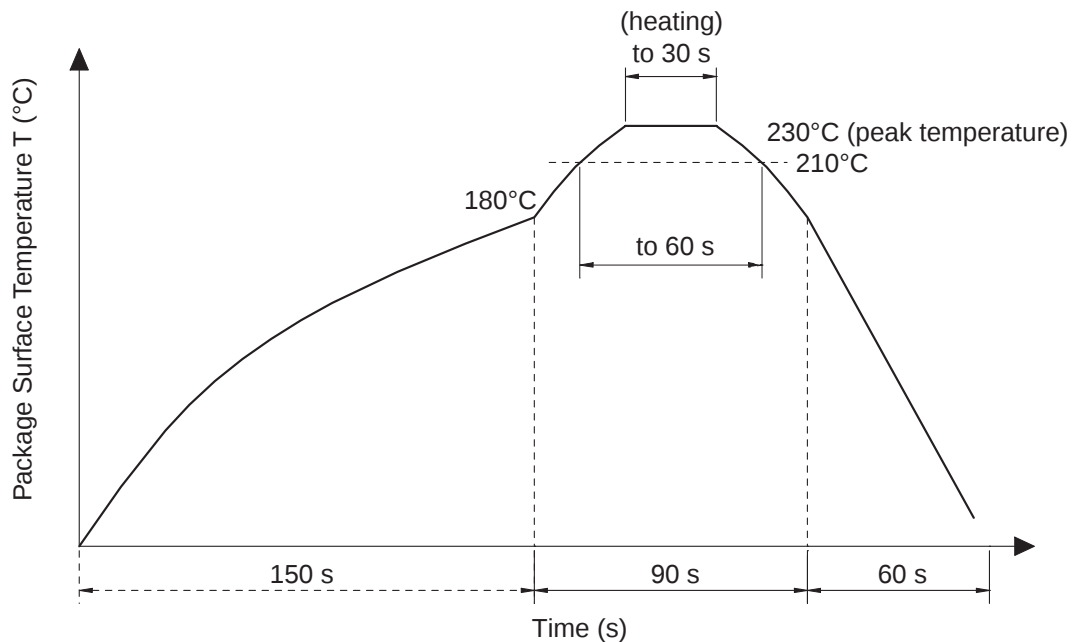
**HMA2701 Series**

**HMAA2705**

**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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**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.