

## HMA121 Series

## HMA124

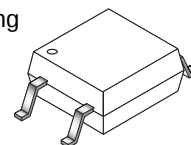
## HMA2701 Series

## 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

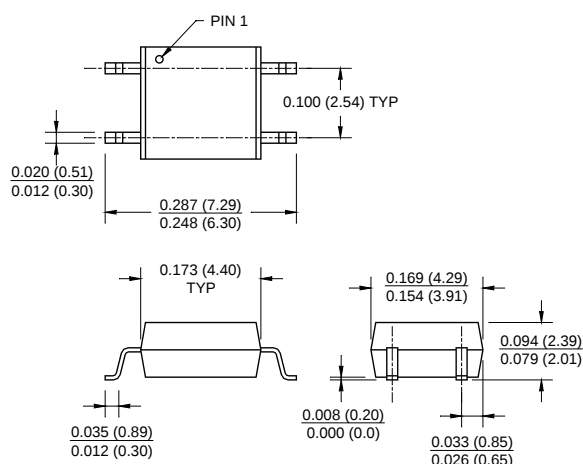
#### HMAA2705

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

#### HMA121 series, HMA2701 series, HMA124

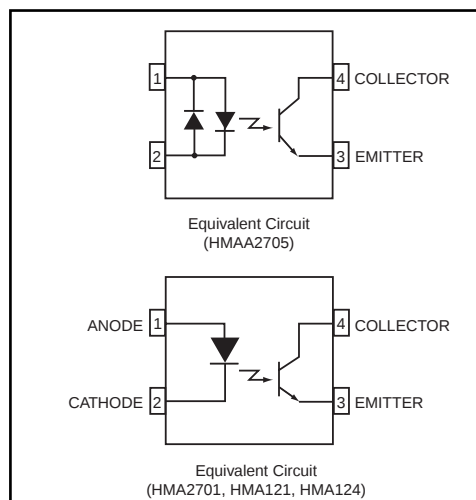
- Digital logic inputs
- Microprocessor inputs
- Power supply monitor
- Twisted pair line receiver
- Telephone line receiver

### 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**

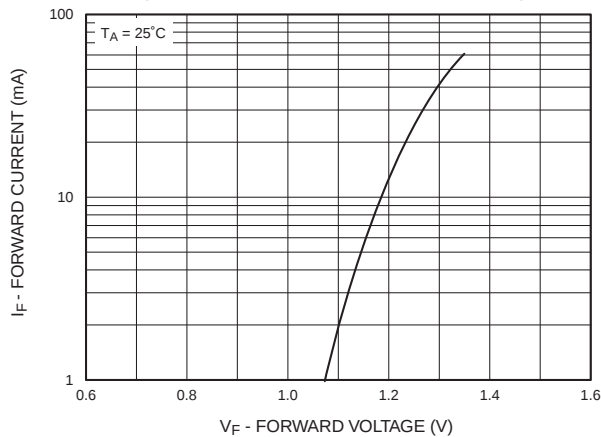
**HMA124**

**HMA2701 Series**

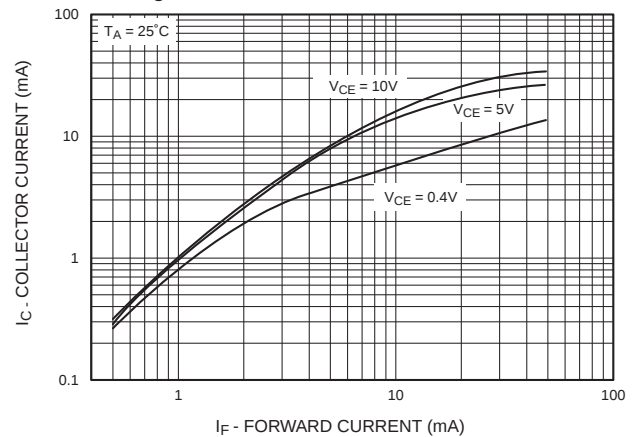
**HMAA2705**

**TYPICAL PERFORMANCE CURVES**

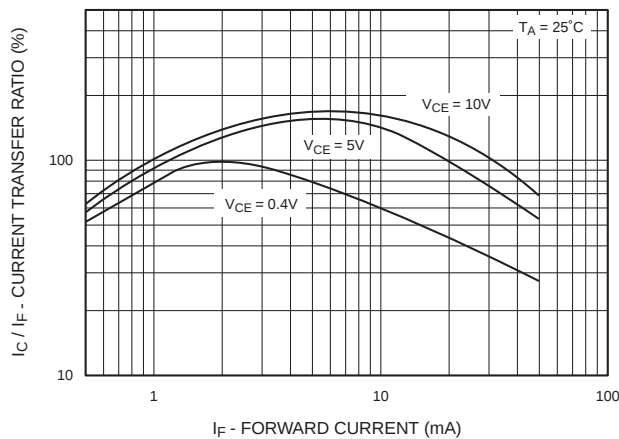
**Fig. 1 Forward Current vs. Forward Voltage**



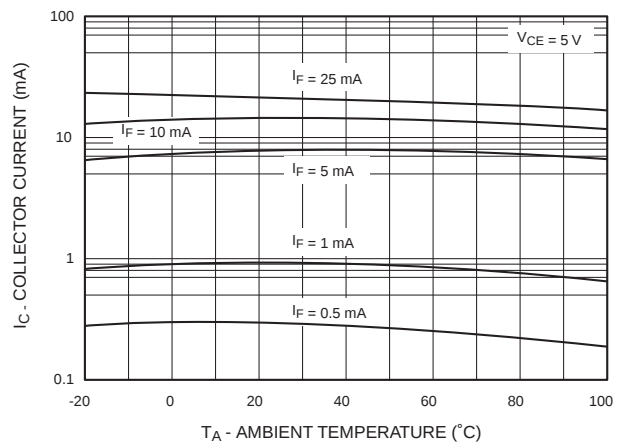
**Fig. 2 Collector Current vs. Forward Current**



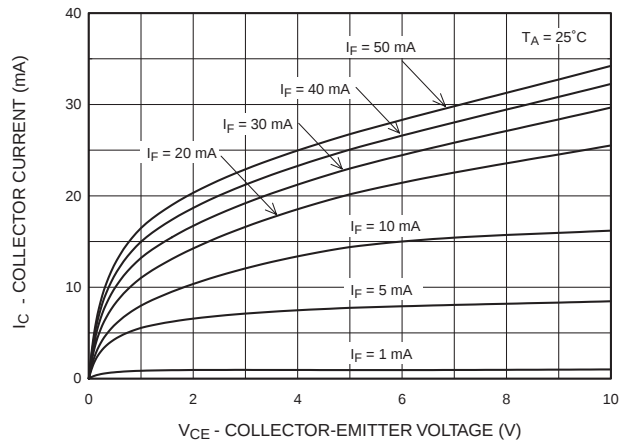
**Fig. 3 Current Transfer Ratio vs. Forward Current**



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



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



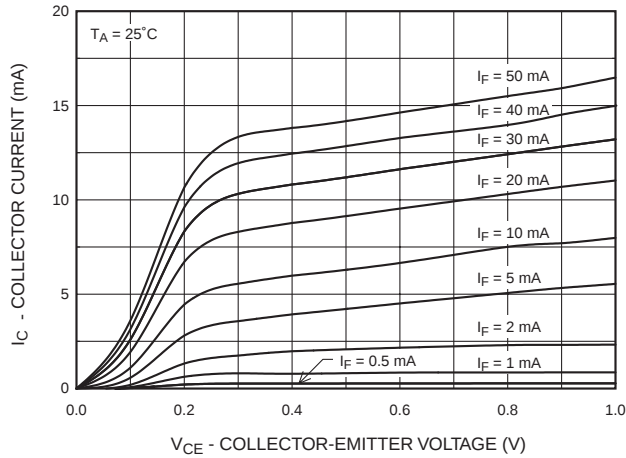
**HMA121 Series**

**HMA124**

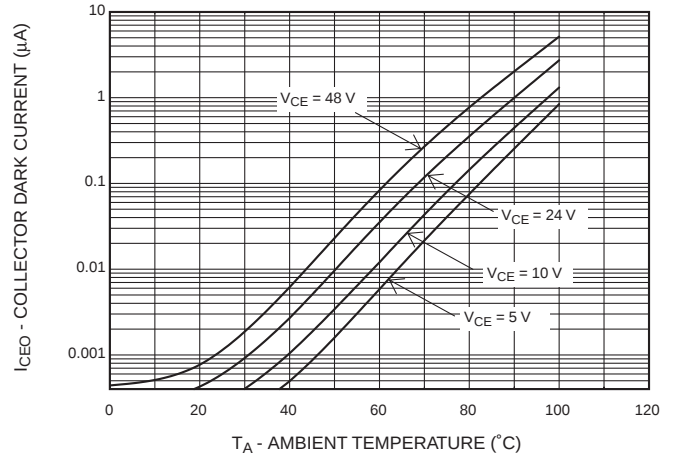
**HMA2701 Series**

**HMAA2705**

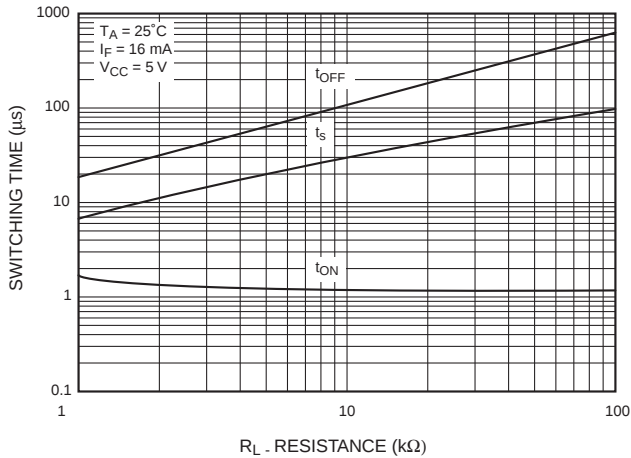
**Fig. 6 Collector Current vs. Collector-Emitter Voltage**



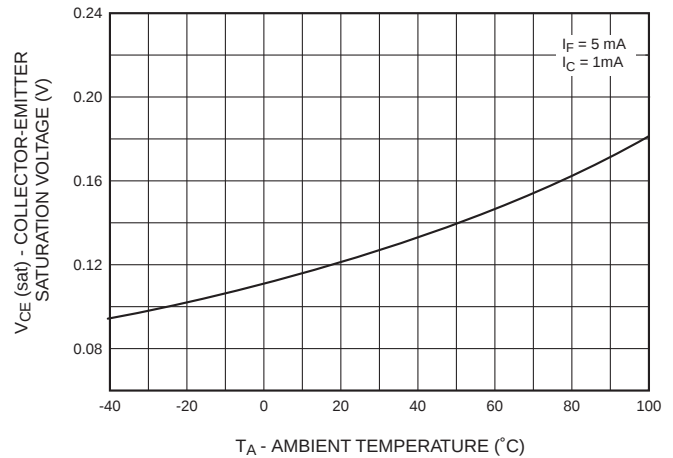
**Fig. 7 Collector Dark Current vs. Temperature**



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



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



**HMA121 Series**

**HMA124**

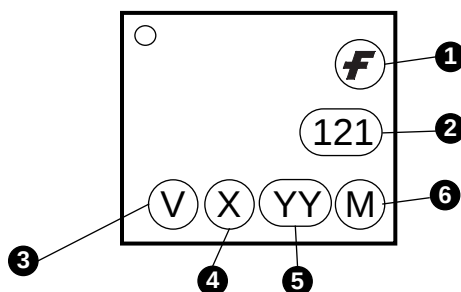
**HMA2701 Series**

**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**



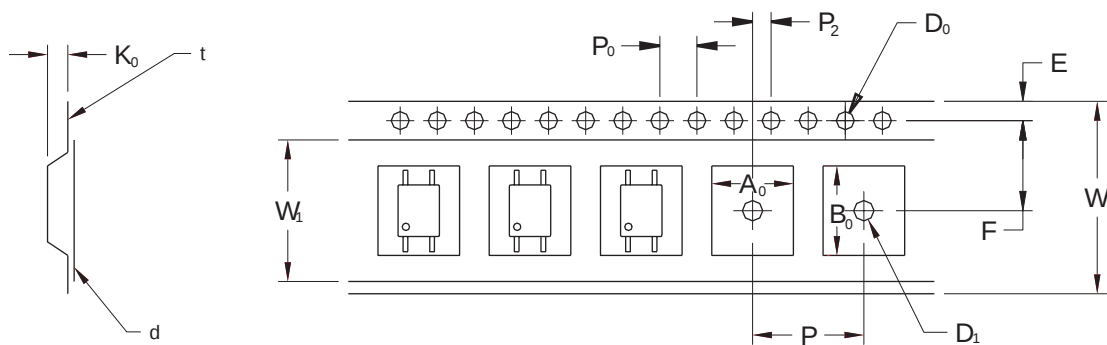
| Definitions |                                                                                        |
|-------------|----------------------------------------------------------------------------------------|
| 1           | Fairchild logo                                                            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



| Description                     |  | Symbol | 2.54 Pitch<br>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")                  |

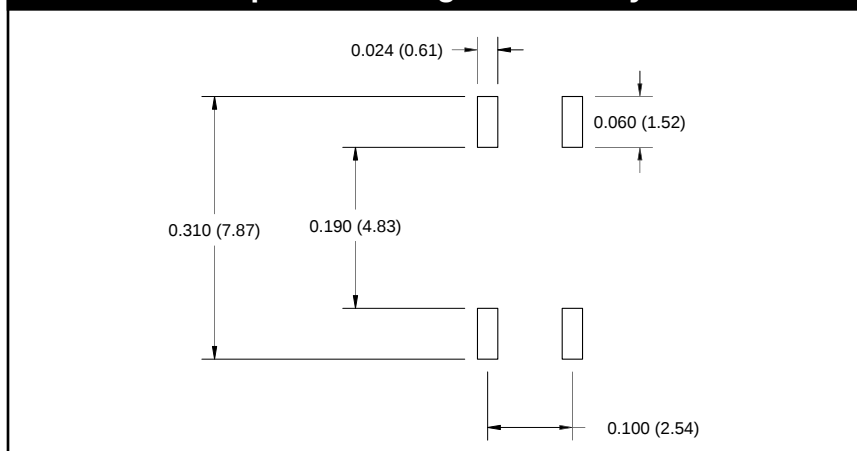
**HMA121 Series**

**HMA124**

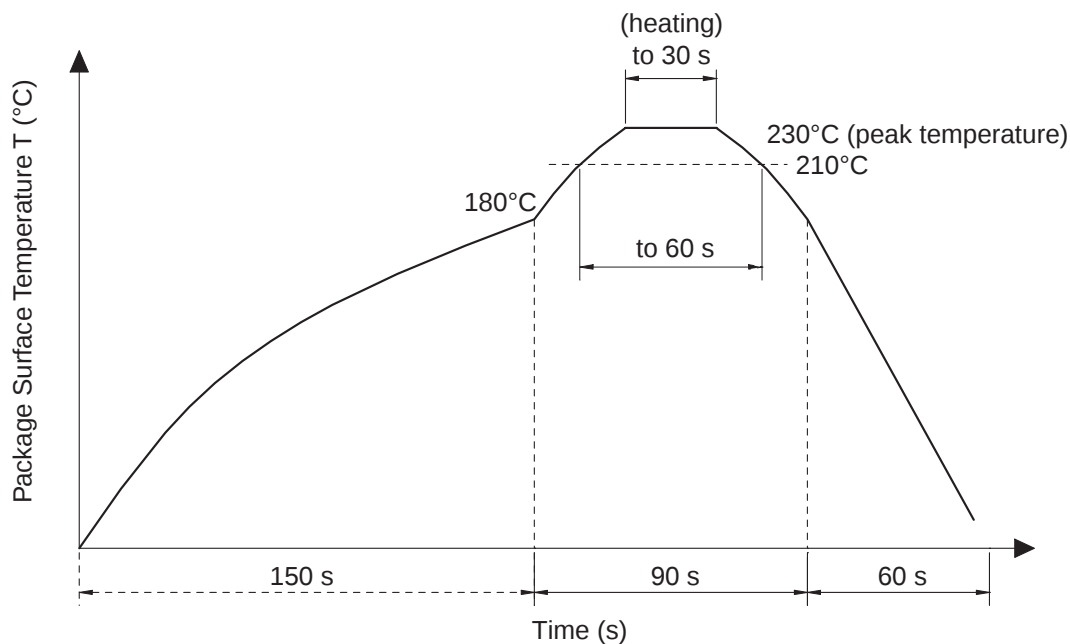
**HMA2701 Series**

**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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