

## HMA121 Series

## HMA124

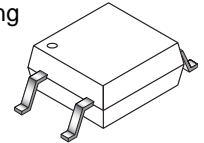
## HMA2701 Series

## 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

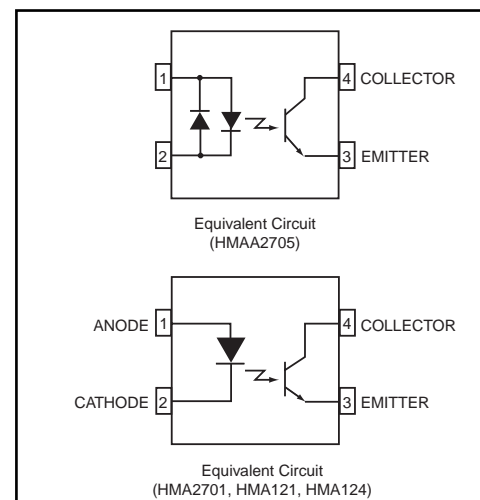
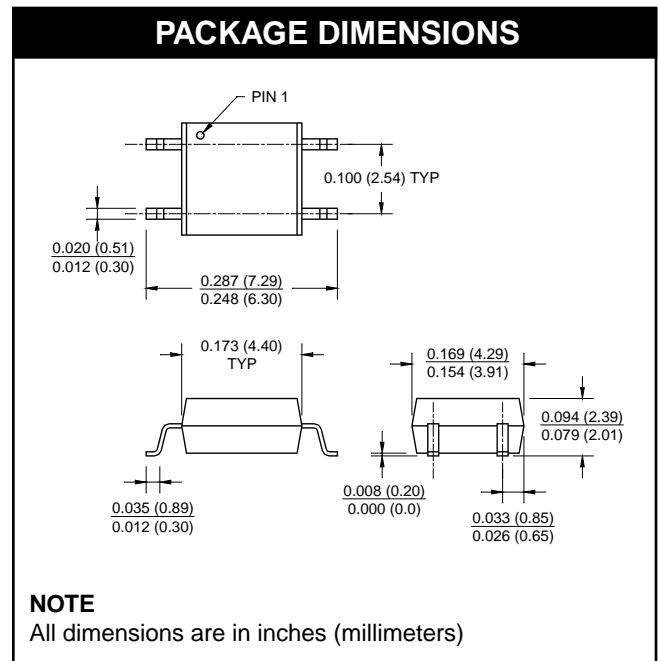
### APPLICATIONS

#### 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



**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**

| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise specified) |                      |                                |                      |
|--|----------------------|--------------------------------|----------------------|
| <b>Parameter</b>   | <b>Symbol</b>        | <b>Value</b>                   | <b>Units</b>         |
| <b>TOTAL PACKAGE</b>   |                      |                                |                      |
| Storage Temperature  | $T_{\text{STG}}$     | -40 to +125                    | $^\circ\text{C}$     |
| Operating Temperature  | $T_{\text{OPR}}$     | -40 to +100                    | $^\circ\text{C}$     |
| <b>EMITTER</b>   |                      |                                |                      |
| Continuous Forward Current   | $I_{\text{F (avg)}}$ | 50                             | mA                   |
| Peak Forward Current (1 $\mu\text{s}$ pulse, 300 pps.)                                 | $I_{\text{F (pk)}}$  | 1                              | A                    |
| Reverse Input Voltage (HMA)  | $V_{\text{R}}$       | 6                              | V                    |
| Power Dissipation  | $P_{\text{D}}$       | 70                             | mW                   |
| Derate linearly (above $25^\circ\text{C}$ )  |                      | 0.65                           | mW/ $^\circ\text{C}$ |
| <b>DETECTOR</b>  |                      |                                |                      |
| Continuous Collector Current   |                      | 80                             | mA                   |
| Power Dissipation  | $P_{\text{D}}$       | 150                            | mW                   |
| Derate linearly (above $25^\circ\text{C}$ )  |                      | 2.0                            | mW/ $^\circ\text{C}$ |
| Collector-Emitter Voltage  | $V_{\text{CEO}}$     | HMA2701 Series, HMAA2705<br>40 | V                    |
|  |                      | HMA121 Series, HMA124<br>80    |                      |
| Emitter-Collector Voltage  | $V_{\text{ECO}}$     | 7                              | V                    |

**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ )

**INDIVIDUAL COMPONENT CHARACTERISTICS**

| Parameter  | Test Conditions                             | Symbol     | Device         | Min | Typ** | Max | Unit          |
|--|---|------------|----------------|-----|-------|-----|---------------|
| <b>EMITTER</b><br>Forward Voltage                            | $(I_F = 10 \text{ mA})$                     | $V_F$      | HMA121 Series  | 1.0 |       | 1.3 | V             |
|  |   |            | HMA124         |     |       |     |               |
|  | $(I_F = 5 \text{ mA})$                      |            | HMA2701 Series |     |       | 1.4 |               |
|  |   |            | HMAA2705       |     |       |     |               |
| Reverse Current  | $(V_R = 5 \text{ V})$                       | $I_R$      | HMA2701 Series |     |       | 5   | $\mu\text{A}$ |
|  |   |            | HMA121 Series  |     |       |     |               |
|  |   |            | HMA124         |     |       |     |               |
| <b>DETECTOR</b><br>Breakdown Voltage<br>Collector to Emitter | $(I_C = 1 \text{ mA}, I_F = 0)$             | $BV_{CEO}$ | HMA121 Series  | 80  |       |     | V             |
|  |   |            | HMA124         |     |       |     |               |
|  |   |            | HMA2701 Series | 40  |       |     |               |
|  |   |            | HMAA2705       |     |       |     |               |
| Emitter to Collector   | $(I_E = 100 \mu\text{A}, I_F = 0)$          | $BV_{ECO}$ | All            | 7   |       |     |               |
| Collector Dark Current                                       | $(V_{CE} = 40 \text{ V}, I_F = 0)$          | $I_{CEO}$  | All            |     |       | 100 | nA            |
| Capacitance  | $(V_{CE} = 0 \text{ V}, f = 1 \text{ MHz})$ | $C_{CE}$   | All            |     | 10    |     | pF            |

**HMA121 Series**

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| <b>TRANSFER CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ )   |   |                        |          |      |       |     |               |
|--|---|------------------------|----------|------|-------|-----|---------------|
| Characteristic   | Test Conditions   | Symbol                 | Device   | Min  | Typ** | Max | Unit          |
| DC Current Transfer Ratio  | $(I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V})$                    | CTR                    | HMAA2705 | 50   |       | 300 | %             |
|  |   |                        | HMA2701  | 50   |       | 300 |               |
|  | $(I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V})$                        |                        | HMA2701A | 150  |       | 300 |               |
|  |   |                        | HMA2701B | 80   |       | 160 |               |
|  | $(I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V})$                        |                        | HMA121   | 50   |       | 600 |               |
|  |   |                        | HMA121A  | 100  |       | 300 |               |
|  |   |                        | HMA121B  | 50   |       | 150 |               |
|  |   |                        | HMA121C  | 100  |       | 200 |               |
|  |   |                        | HMA121D  | 50   |       | 100 |               |
|  |   |                        | HMA121E  | 150  |       | 300 |               |
| $(I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V})$<br>$(I_F = 1 \text{ mA}, V_{CE} = 0.5 \text{ V})$<br>$(I_F = 0.5 \text{ mA}, V_{CE} = 1.5 \text{ V})$ | HMA121F   | 100                    |          | 600  |       |     |               |
|  | HMA121F   | 30                     |          |      |       |     |               |
|  | HMA124  | 100                    |          | 1200 |       |     |               |
|  | HMA124  | 50                     |          | —    |       |     |               |
| CTR Symmetry   | $(I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V})$                    | —                      | HMAA2705 | 0.3  |       | 3.0 |               |
| Saturation Voltage   | $(I_F = \pm 10 \text{ mA}, I_C = 2 \text{ mA})$                     | $V_{CE} \text{ (SAT)}$ | HMAA2705 |      |       | 0.3 | V             |
|  |   |                        | HMA2701  |      |       | 0.3 |               |
|  | $(I_F = 10 \text{ mA}, I_C = 2 \text{ mA})$                         |                        | HMA2701A |      |       | 0.3 |               |
|  |   |                        | HMA2701B |      |       | 0.3 |               |
|  | $(I_F = 8 \text{ mA}, I_C = 2.4 \text{ mA})$                        |                        | HMA121   |      |       | 0.4 |               |
|  |   |                        | HMA121A  |      |       | 0.4 |               |
|  |   |                        | HMA121B  |      |       | 0.4 |               |
|  |   |                        | HMA121C  |      |       | 0.4 |               |
|  |   |                        | HMA121D  |      |       | 0.4 |               |
|  |   |                        | HMA121E  |      |       | 0.4 |               |
| $(I_F = 1 \text{ mA}, I_C = 0.2 \text{ mA})$<br>$(I_F = 1 \text{ mA}, I_C = 0.5 \text{ mA})$   | HMA121F   |                        |          | 0.4  |       |     |               |
|  | HMA121F   |                        |          | 0.4  |       |     |               |
| Rise Time (Non-Saturated)  | $(I_C = 2 \text{ mA}, V_{CE} = 5 \text{ V})$<br>$(R_L = 100\Omega)$ | $t_r$                  |          |      | 3     |     | $\mu\text{s}$ |
|  |   |                        |          |      | 3     |     |               |
| Fall Time (Non-Saturated)  | $(I_C = 2 \text{ mA}, V_{CE} = 5 \text{ V})$<br>$(R_L = 100\Omega)$ | $t_f$                  |          |      | 3     |     |               |

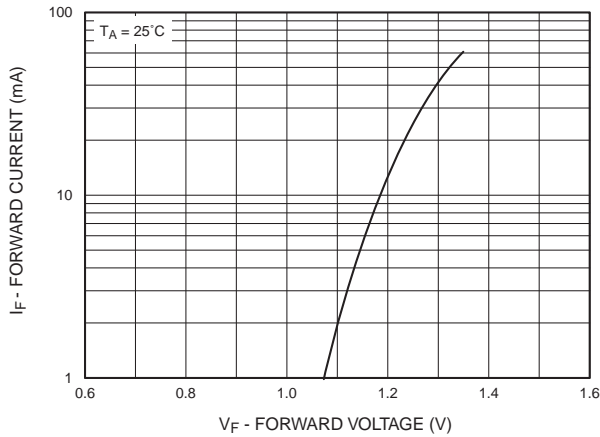
**ISOLATION CHARACTERISTICS**

| Characteristic                 | Test Conditions | Symbol    | Device | Min  | Typ** | Max | Unit |
|--------------------------------|-----------------|-----------|--------|------|-------|-----|------|
| Steady State Isolation Voltage | (1 Minute)      | $V_{ISO}$ | All    | 3750 |       |     | VRMS |

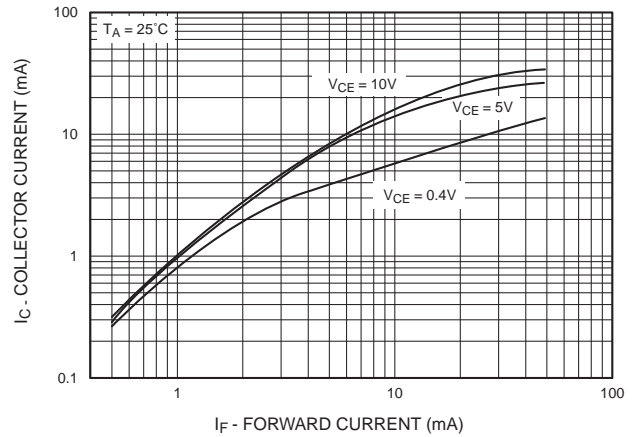
\*\* All typicals at  $T_A = 25^\circ\text{C}$

**TYPICAL PERFORMANCE CURVES**

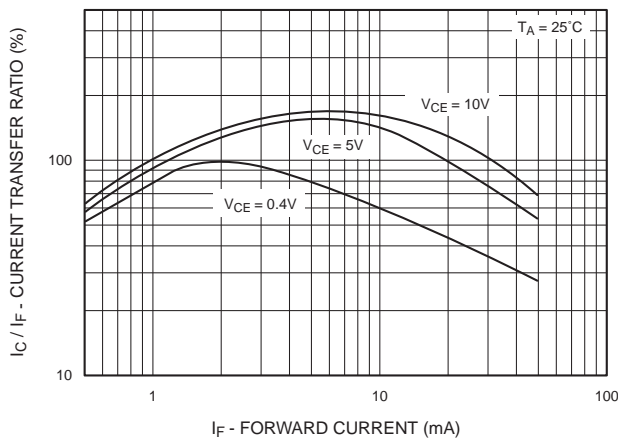
**Fig. 1 Forward Current vs. Forward Voltage**



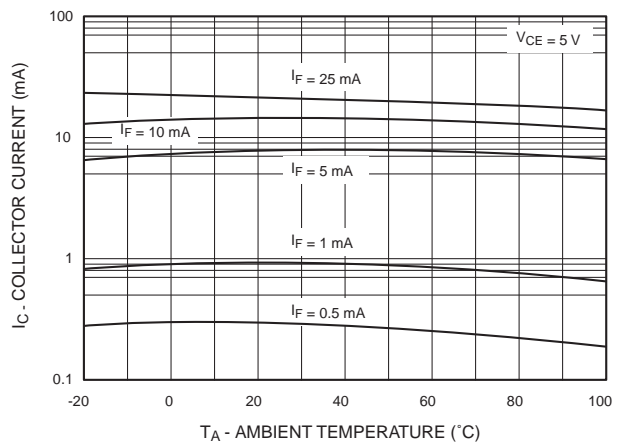
**Fig. 2 Collector Current vs. Forward Current**



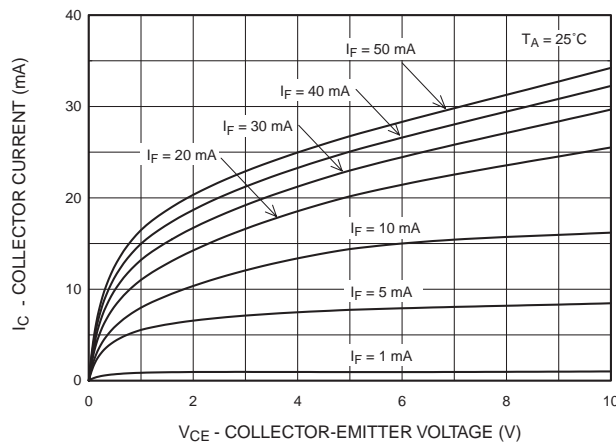
**Fig. 3 Current Transfer Ratio vs. Forward Current**



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



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



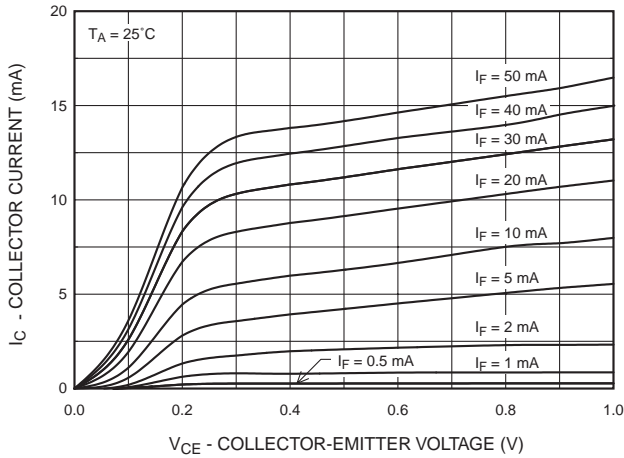
**HMA121 Series**

**HMA124**

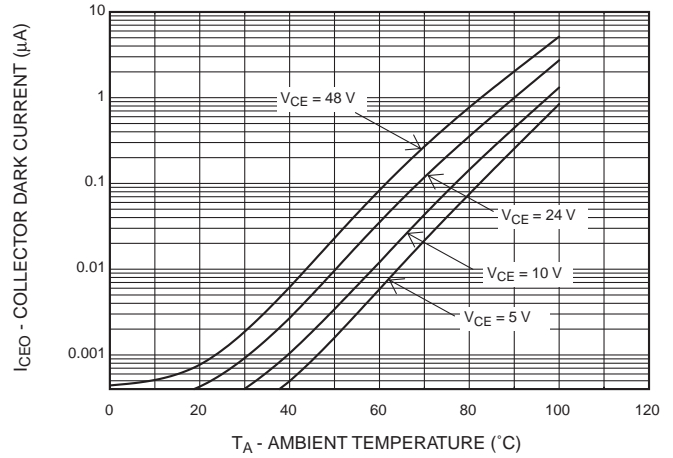
**HMA2701 Series**

**HMAA2705**

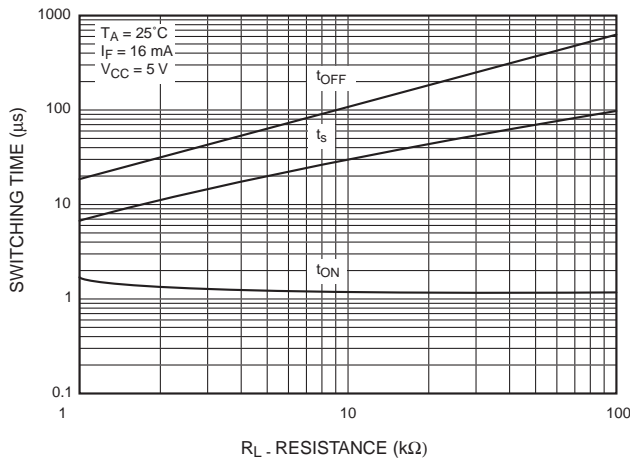
**Fig. 6 Collector Current vs. Collector-Emitter Voltage**



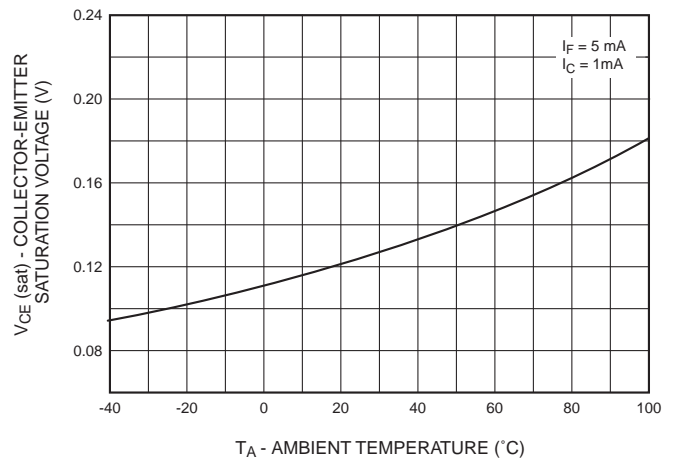
**Fig. 7 Collector Dark Current vs. Temperature**



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



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



**HMA121 Series**

**HMA124**

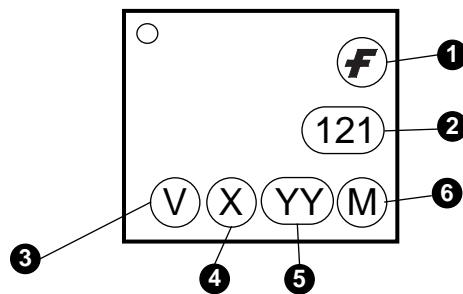
**HMA2701 Series**

**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**



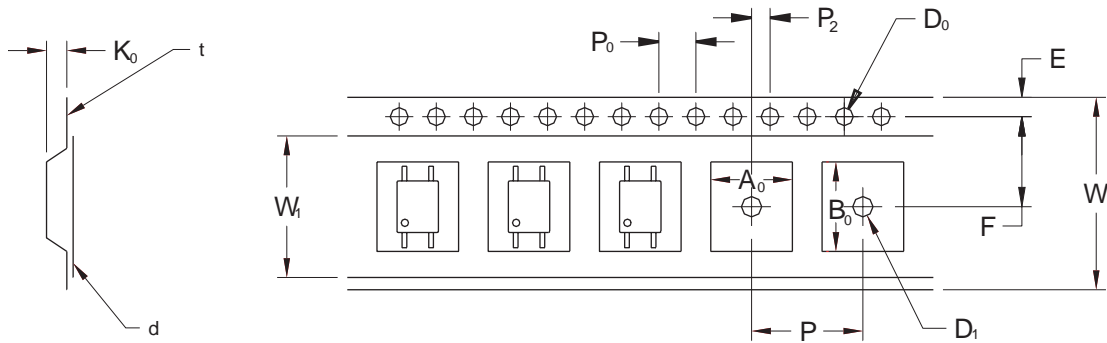
| Definitions |  |
|-------------|--|
| 1           | Fairchild logo   |
| 2           | Device number  |
| 3           | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4           | One digit year code  |
| 5           | Two digit work week ranging from '01'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

**HMA121 Series**

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**HMAA2705**



| Description                     |    | Symbol | 2.54 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")    |

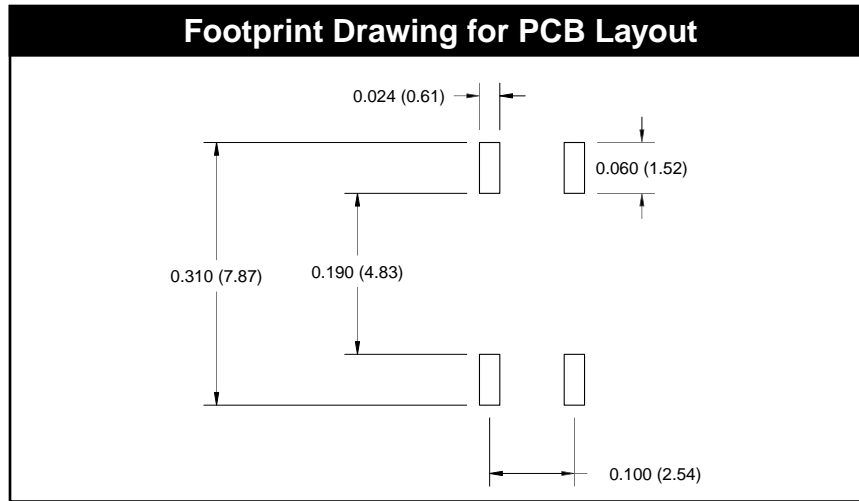


**HMA121 Series**

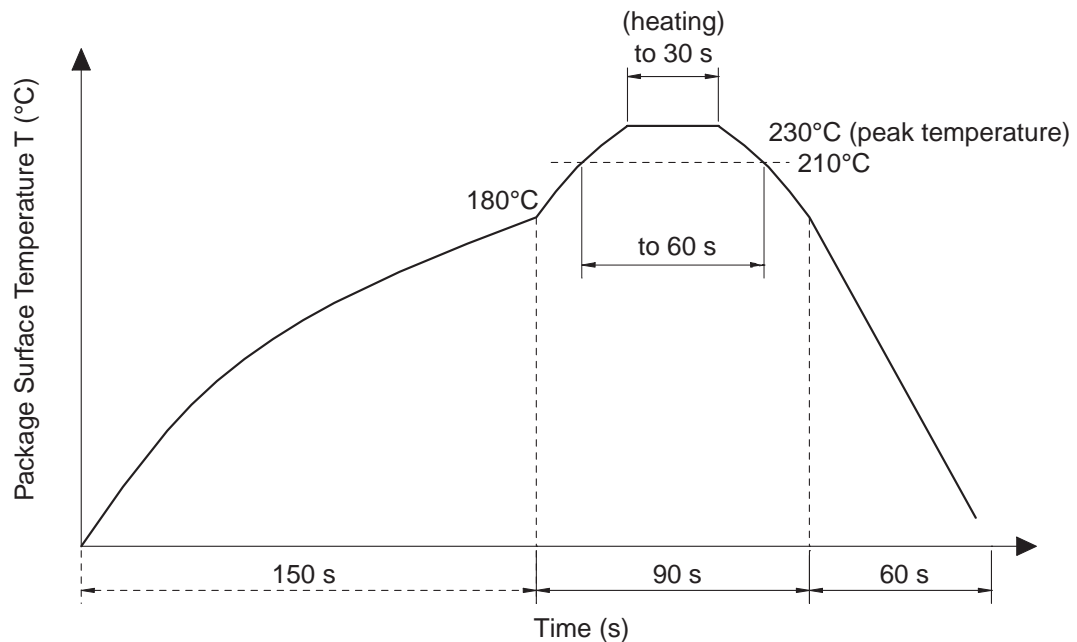
**HMA124**

**HMA2701 Series**

**HMAA2705**



**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

**HMA121 Series**

**HMA124**

**HMA2701 Series**

**HMAA2705**

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