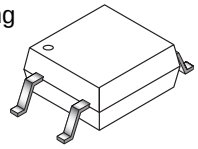
# FULL PITCH MINI-FLAT PACKAGE 4-PIN OPTOCOUPLERS

## 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

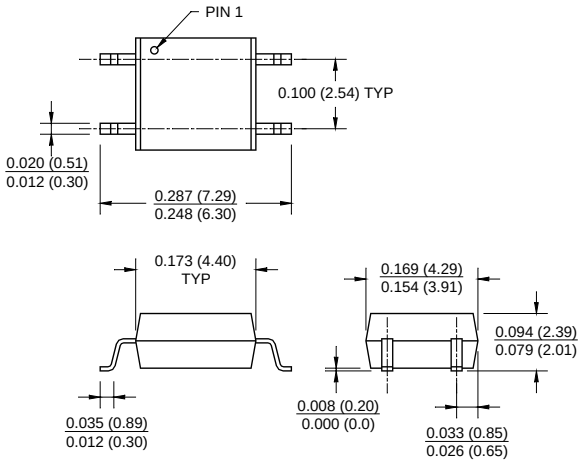
HMAA2705

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

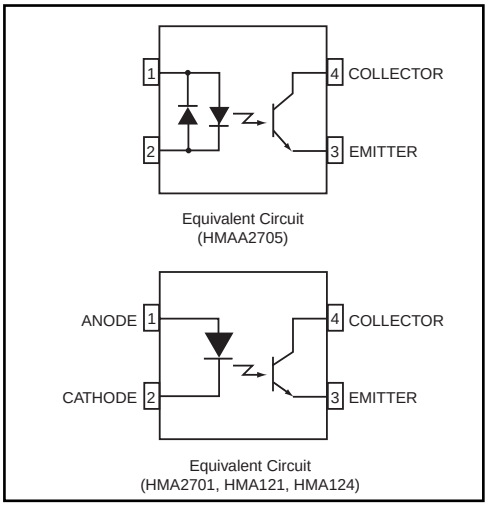
HMA121 series, HMA2701 series, HMA124

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

## PACKAGE DIMENSIONS




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




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| **ABSOLUTE MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise specified) | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Value** | **Units** |
| **TOTAL PACKAGE** | | | | |
| Storage Temperature | | $T_{STG}$ | -40 to +125 | °C |
| Operating Temperature | | $T_{OPR}$ | -40 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 | | $P_D$ | 70 | mW |
| Derate linearly (above 25°C) | | | 0.65 | mW/°C |
| **DETECTOR** | | | | |
| Continuous Collector Current | | | 80 | mA |
| Power Dissipation | | $P_D$ | 150 | mW |
| Derate linearly (above 25°C) | | | 2.0 | mW/°C |
| Collector-Emitter Voltage | HMA2701 Series, HMAA2705 | $V_{CEO}$ | 40 | V |
| | HMA121 Series, HMA124 | | 80 | |
| Emitter-Collector Voltage | | $V_{ECO}$ | 7 | V |

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## 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) | $V_F$ | HMA121 Series | 1.0 | | 1.3 | V |
| | | | HMA124 | | | | |
| | ($I_F$ = 5 mA) | | HMA2701 Series | | | 1.4 | |
| | ($I_F$ = ± 5 mA) | | HMAA2705 | | | | |
| Reverse Current | ($V_R$ = 5 V) | $I_R$ | HMA2701 Series | | | 5 | µA |
| | | | HMA121 Series | | | | |
| | | | HMA124 | | | | |
| **DETECTOR** Breakdown Voltage Collector to Emitter | ($I_C$ = 1 mA, $I_F$ = 0) | $BV_{CEO}$ | HMA121 Series | 80 | | | V |
| | | | HMA124 | | | | |
| | | | HMA2701 Series | 40 | | | |
| | | | HMAA2705 | | | | |
| Emitter to Collector | ($I_E$ = 100 µA, $I_F$ = 0) | $BV_{ECO}$ | All | 7 | | | |
| Collector Dark Current | ($V_{CE}$ = 40 V, $I_F$ = 0) | $I_{CEO}$ | All | | | 100 | nA |
| Capacitance | ($V_{CE}$ = 0 V, f = 1 MHz) | $C_{CE}$ | All | | 10 | | pF |

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### 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 | HMAA2705 | 50 | | 300 | % |
| | ($I_F$ = 5 mA, $V_{CE}$ = 5 V) | | HMA2701 | 50 | | 300 | |
| | | | HMA2701A | 150 | | 300 | |
| | | | HMA2701B | 80 | | 160 | |
| | ($I_F$ = 5 mA, $V_{CE}$ = 5 V) | | HMA121 | 50 | | 600 | |
| | | | HMA121A | 100 | | 300 | |
| | | | HMA121B | 50 | | 150 | |
| | | | HMA121C | 100 | | 200 | |
| | | | HMA121D | 50 | | 100 | |
| | | | HMA121E | 150 | | 300 | |
| | | | HMA121F | 100 | | 600 | |
| | ($I_F$ = 1 mA, $V_{CE}$ = 0.4 V) | | HMA121F | 30 | | | |
| | ($I_F$ = 1 mA, $V_{CE}$ = 0.5 V) | | HMA124 | 100 | | 1200 | |
| | ($I_F$ = 0.5 mA, $V_{CE}$ = 1.5 V) | | HMA124 | 50 | | — | |
| CTR Symmetry | ($I_F$ = ± 5 mA, $V_{CE}$ = 5 V) | — | HMAA2705 | 0.3 | | 3.0 | |
| Saturation Voltage | ($I_F$ = ± 10 mA, $I_C$ = 2 mA) | $V_{CE\ (SAT)}$ | HMAA2705 | | | 0.3 | V |
| | ($I_F$ = 10 mA, $I_C$ = 2 mA) | | HMA2701 | | | 0.3 | |
| | | | HMA2701A | | | 0.3 | |
| | | | HMA2701B | | | 0.3 | |
| | ($I_F$ = 8 mA, $I_C$ = 2.4 mA) | | HMA121 | | | 0.4 | |
| | | | HMA121A | | | 0.4 | |
| | | | HMA121B | | | 0.4 | |
| | | | HMA121C | | | 0.4 | |
| | | | HMA121D | | | 0.4 | |
| | | | HMA121E | | | 0.4 | |
| | | | HMA121F | | | 0.4 | |
| | ($I_F$ = 1 mA, $I_C$ = 0.2 mA) | | HMA121F | | | 0.4 | |
| | ($I_F$ = 1 mA, $I_C$ = 0.5 mA) | | HMA124 | | | 0.4 | |
| Rise Time (Non-Saturated) | ($I_C$ = 2 mA, $V_{CE}$ = 5 V) ($R_L$ = 100Ω) | $t_r$ | | | 3 | | µs |
| Fall Time (Non-Saturated) | ($I_C$ = 2 mA, $V_{CE}$ = 5 V) ($R_L$ = 100Ω) | $t_f$ | | | 3 | | µs |

### 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 TA = 25°C

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## TYPICAL PERFORMANCE CURVES

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

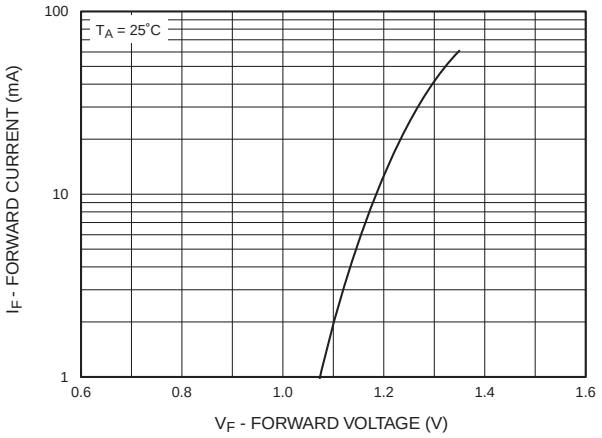



**Fig. 2 Collector Current vs. Forward Current**

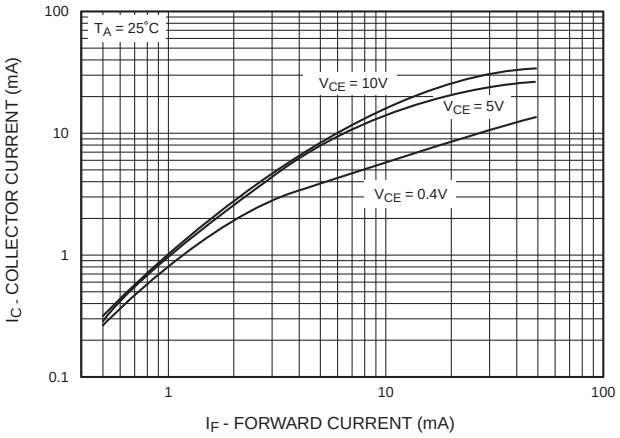



**Fig. 3 Current Transfer Ratio vs. Forward Current**

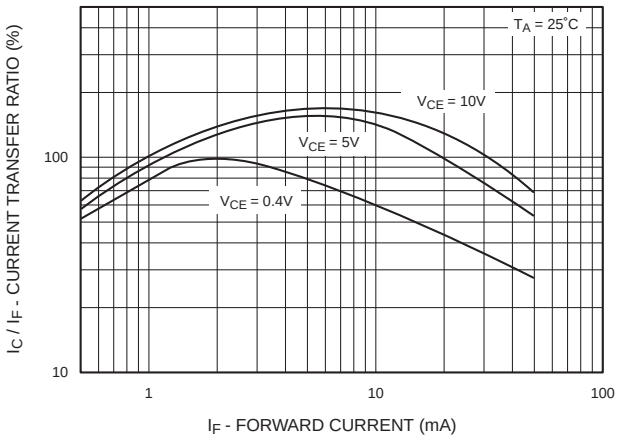



**Fig. 4 Collector Current vs. Temperature**

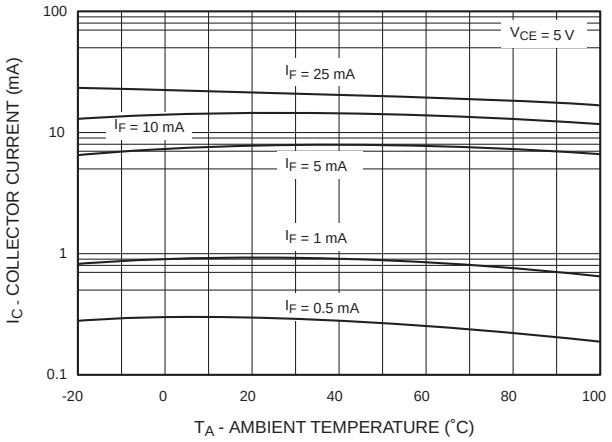
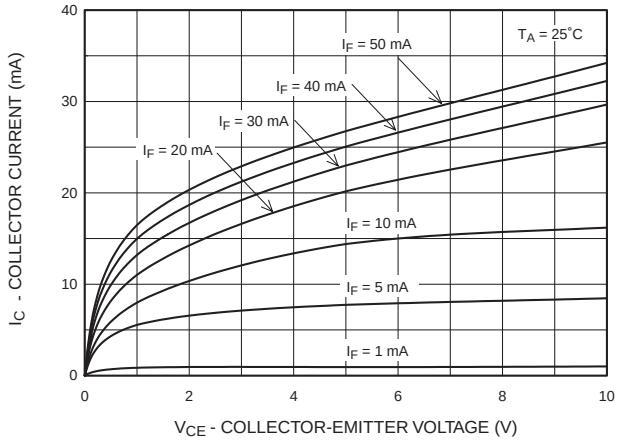



**Fig. 5 Collector Current vs. Collector-Emitter Voltage**




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

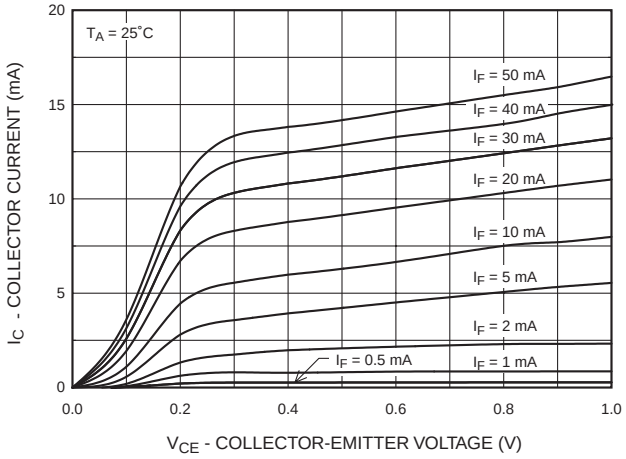



**Fig. 7 Collector Dark Current vs. Temperature**

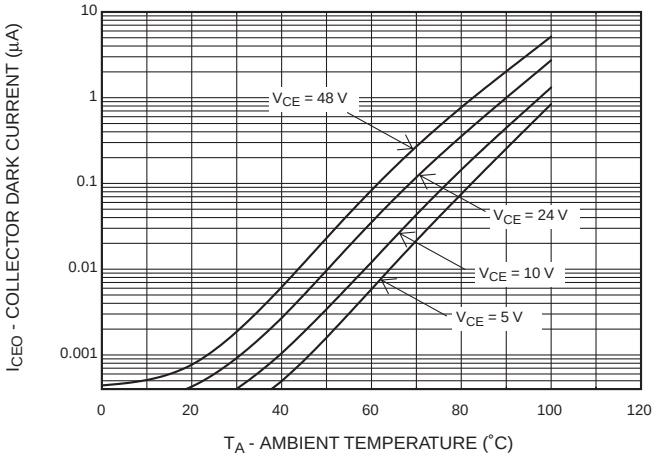



**Fig. 8 Switching Time vs. Load Resistance**

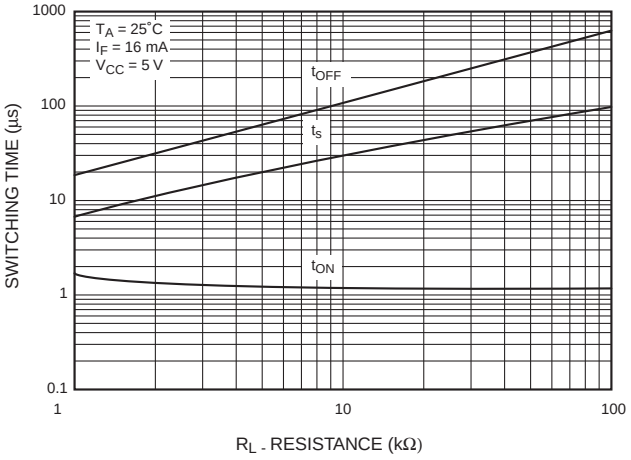
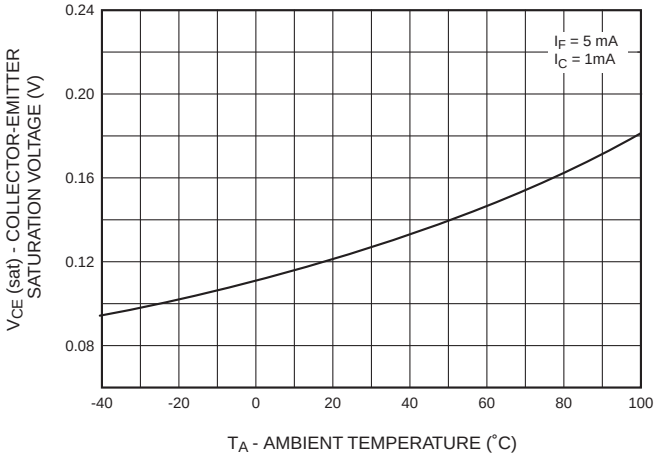



**Fig. 9 Collector-Emitter Saturation Voltage vs. Temperature**

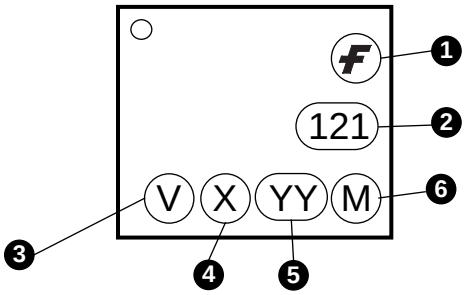



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## ORDERING INFORMATION

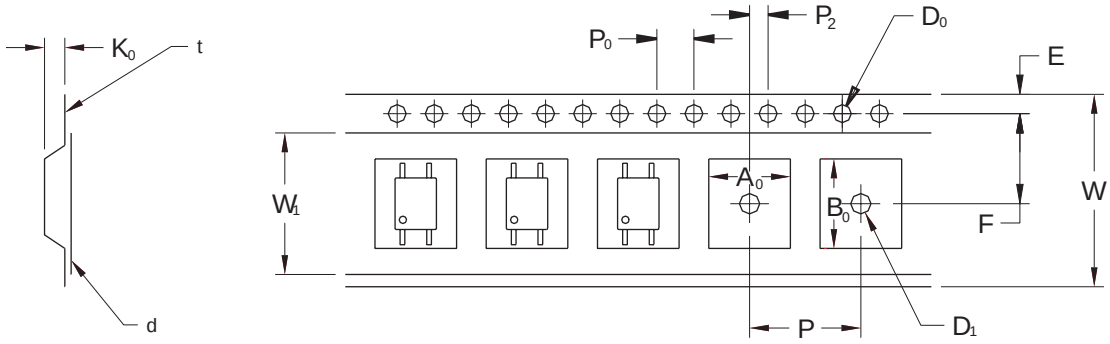
| Option | Description |
|---|---|
| V | VDE Approved |
| R1 | Tape and Reel (500 units) |
| R2 | Tape and Reel (2500 units) |
| R3 | Tape and Reel (500 units; unit 180° rotated) |
| R4 | Tape and Reel (2500 units; unit 180° rotated) |
| R1V | Tape and Reel (500 units) and VDE Approved |
| R2V | Tape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

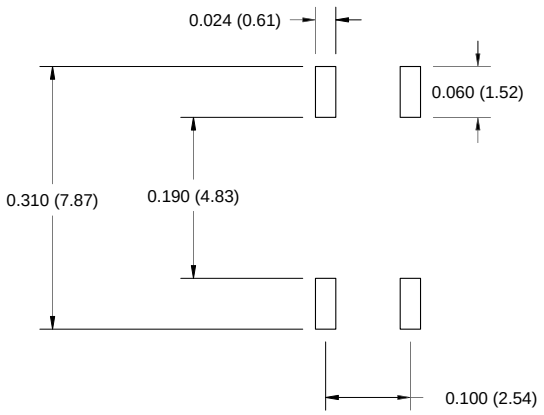
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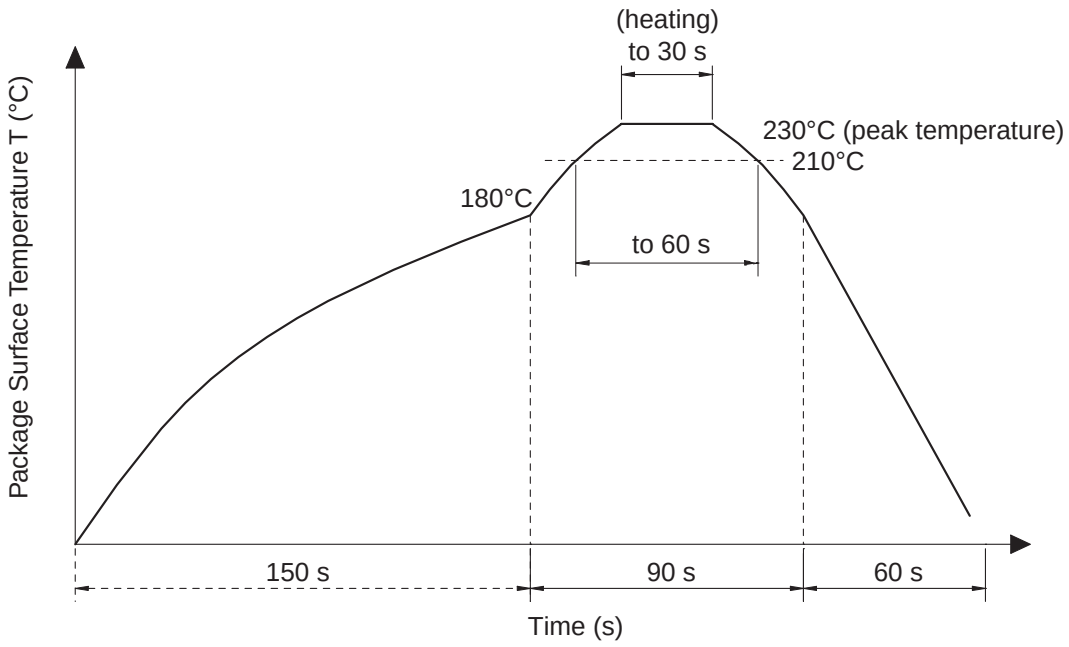

| Description | | Symbol | 2.54 Pitch Dimensions (mm) |
|---|---|---|---|
| Tape Width | | W | 12.00±0.4 |
| Tape Thickness | | t | 0.30±0.20 |
| Sprocket Hole Pitch | | $P_0$ | 4.00±0.20 |
| Sprocket Hole Dia. | | $D_0$ | 1.55±0.20 |
| Sprocket Hole Location | | E | 1.75±0.20 |
| Pocket Location | | 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") |

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## 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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