



**THE DATASHEET OF
HMA121R3V**



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

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

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

INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit |
|--|---|------------|----------------|-----|-------|-----|---------------|
| EMITTER 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 | μA |
| | | | HMA121 Series | | | | |
| | | | HMA124 | | | | |
| DETECTOR Breakdown Voltage 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 |

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| TRANSFER CHARACTERISTICS ($T_A = 25^\circ\text{C}$) | | | | | | | |
|--|---|---------------|----------|------|-------|-----|---------------|
| 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 | |
| | | | HMA121F | 100 | | 600 | |
| $(I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V})$ | HMA121F | 30 | | | | | |
| $(I_F = 1 \text{ mA}, V_{CE} = 0.5 \text{ V})$ | HMA124 | 100 | | 1200 | | | |
| $(I_F = 0.5 \text{ mA}, V_{CE} = 1.5 \text{ V})$ | HMA124 | 50 | | — | | | |
| CTR Symmetry | $(I_F = \pm 5 \text{ mA}, V_{CE} = 5 \text{ V})$ | — | HMAA2705 | 0.3 | | 3.0 | |
| Saturation Voltage | $(I_F = \pm 10 \text{ mA}, I_C = 2 \text{ mA})$ | $V_{CE(SAT)}$ | 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 | |
| | | | HMA121F | | | 0.4 | |
| $(I_F = 1 \text{ mA}, I_C = 0.2 \text{ mA})$ | HMA121F | | | 0.4 | | | |
| $(I_F = 1 \text{ mA}, I_C = 0.5 \text{ mA})$ | HMA124 | | | 0.4 | | | |
| Rise Time (Non-Saturated) | $(I_C = 2 \text{ mA}, V_{CE} = 5 \text{ V})$ $(R_L = 100\Omega)$ | t_r | | | 3 | | μs |
| Fall Time (Non-Saturated) | $(I_C = 2 \text{ mA}, V_{CE} = 5 \text{ V})$ $(R_L = 100\Omega)$ | 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

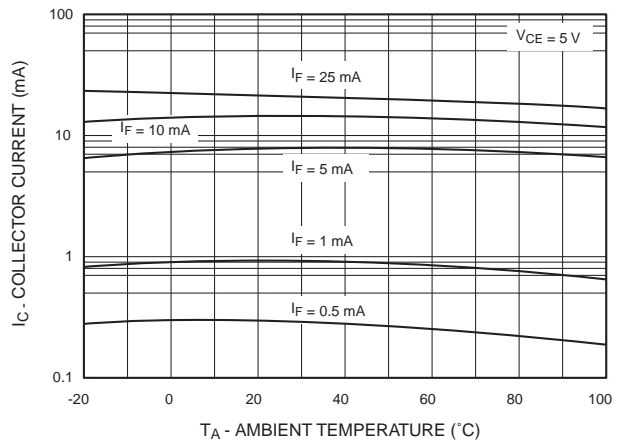
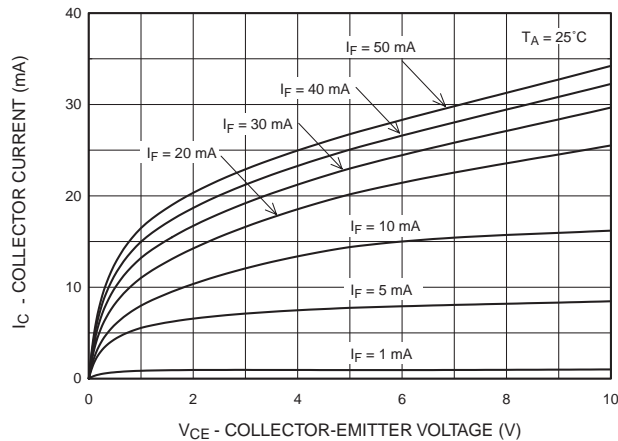


Fig. 5 Collector Current vs. Collector-Emitter Voltage



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Fig. 6 Collector Current vs. Collector-Emitter Voltage



Fig. 7 Collector Dark Current vs. Temperature

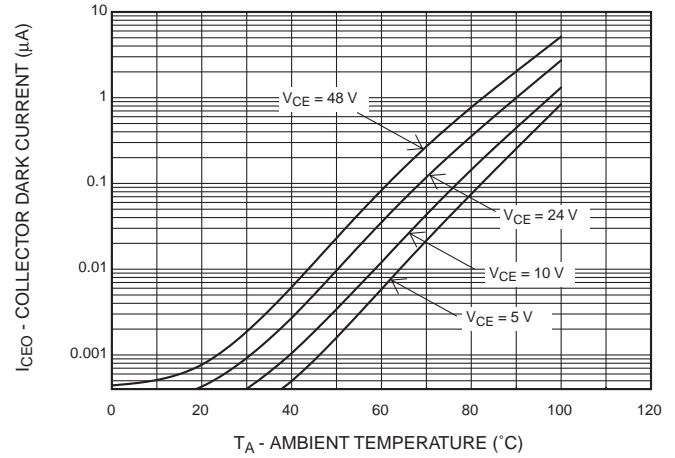


Fig. 8 Switching Time vs. Load Resistance

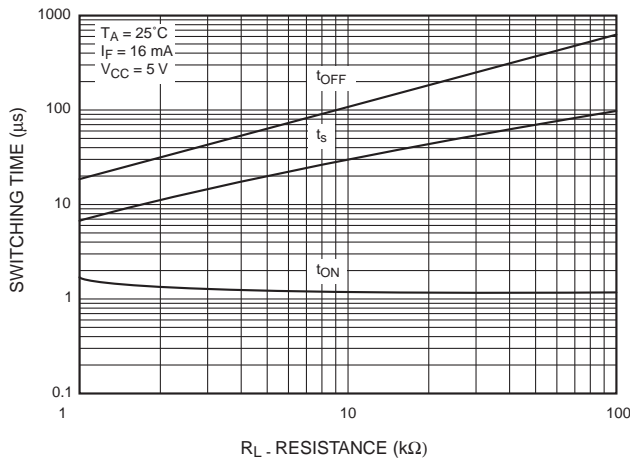
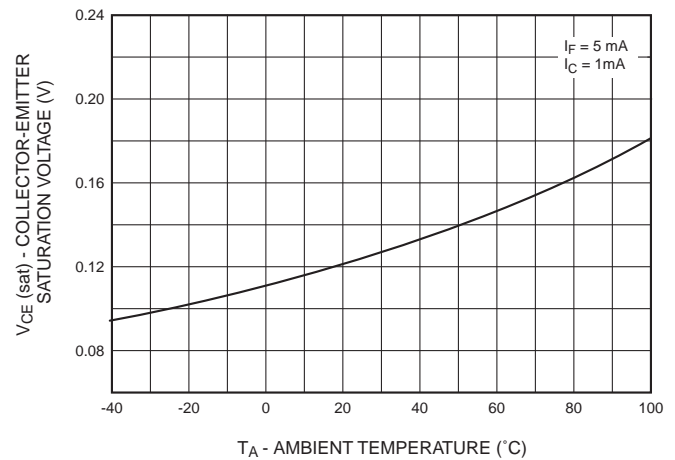


Fig. 9 Collector-Emitter Saturation Voltage vs. Temperature



HMA121 Series

HMA124

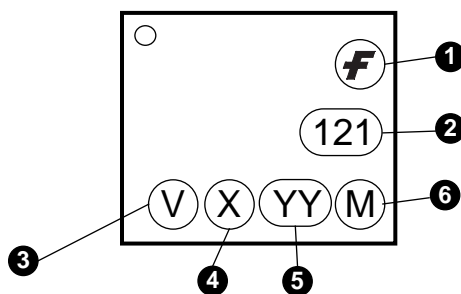
HMA2701 Series

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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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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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