



# THE DATASHEET OF HMA121FR2



**HMA121 Series**

**HMA124**

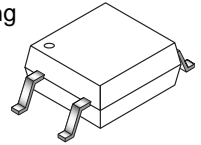
**HMA2701 Series**

**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

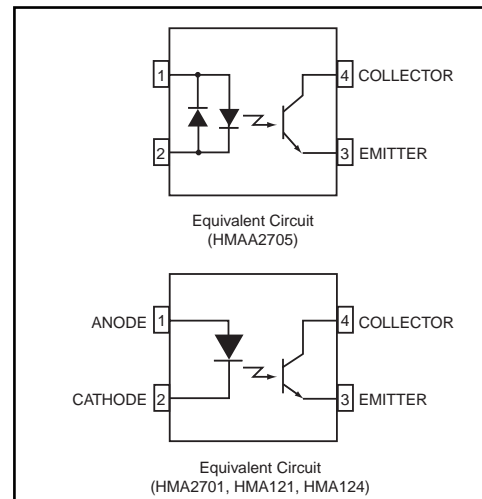
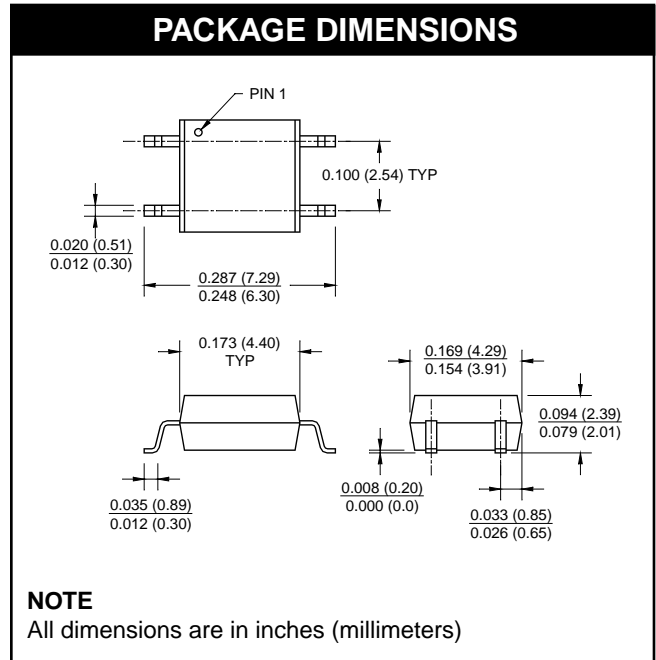
**APPLICATIONS**

**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 40	V
		HMA121 Series, HMA124 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> 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> 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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<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	
			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	$(I_F = \pm 10 \text{ mA}, I_C = 2 \text{ mA})$	$V_{CE} \text{ (SAT)}$	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	
			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		$\mu\text{s}$
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**



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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 <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")

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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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