Light Reflection Emitter / Sensor Array

Optoelectronic Products

FPA103, FPA104 FPA105, FPA106 FPA107, FPA108

General Description

The FPA103/104/105/106/107/108 consists of a GaAs infrared-emitting diode and a silicon npn phototransistor. The axial radiant intensity of the diode and the axial response of the phototransistor are perpendicular to the face of the device; therefore, the phototransistor responds to radiation emitted from the diode only when a reflective object or surface is in the field of view of the phototransistor.

The diode used in the FPA103/104/105/106/107/108 is similar to Fairchild's FPE104 GaAs infrared-emitting diode. It emits an intense, narrow band of radiation, peaking at approximately 900 nm (non-visible) when forward biased. The phototransistor used in this device is sensitive to radiation over the wavelength range of 400 to 1100 nm.

The FPA106/107/108 is electrically equivalent to the FPA103/104/105 respectively, with the addition of an infrared filter to prevent visible light from entering the phototransistor.

Reduces Mechanical Design and Packaging Problems
High Sensitivity
Excellent Stability
Low Temperature Coefficient

Absolute Maximum Ratings

Maximum Temperature and Humidity

Storage Temperature	−40°C to +100°C
Operating Temperature	−40°C to +100°C
Pin Temperature (Soldering, 10 s)	260°C
Relative Humidity at 65°C	85%

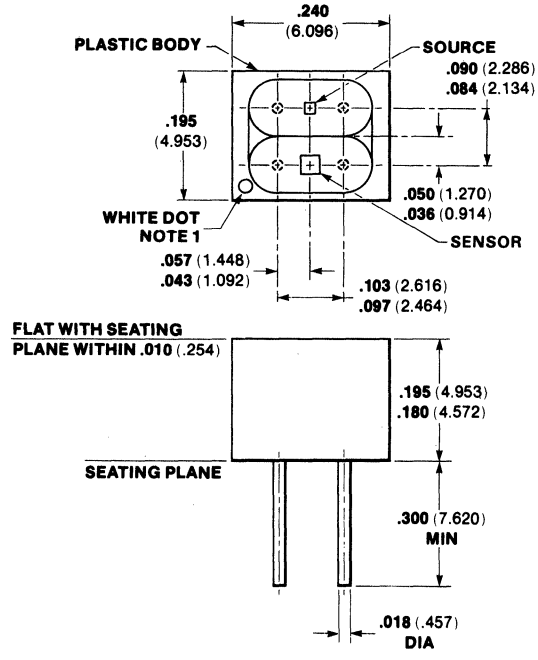
Input Diode

I_F	Forward dc Current	75 mA
V_R	Reverse Voltage	3.0 V
	Power Dissipation at $T_A = 25°C$	110 mW
	Derate Linearly from 25°C	1.47 mW/°C

Output Transistor

I_C	Collector dc Current	25 mA
V_{CE}	Collector-to-Emitter Voltage	12 V
	Power Dissipation at $T_A = 25°C$	167 mW
	Derate Linearly from 25°C	2.22 mW/°C

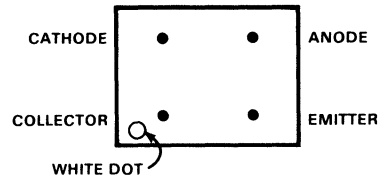
Package Outline



Notes

1. White dot defines collector of phototransistor. Read pinout clockwise, top view: collector, source cathode, source anode, emitter.
2. All dimensions in inches **bold** and millimeters (parentheses)
3. Tolerance unless specified = ±.015 (0.381)

Connection Diagram (Top View)



Typical Electrical Characteristics

FPA103, FPA104 FPA105, FPA106 FPA107, FPA108

Electrical Characteristics—Input Diode $T_A = 25°C$

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
V_F	Forward Voltage		1.25	1.5	V	I_F = 50 mA
BV_R	Reverse Breakdown Voltage	3.0	6.0		V	I_R = 100μA

Electrical Characteristics—Output Transistor $T_A = 25°C$

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
$V_{CEO(sus)}$	Sustaining Voltage (Note 2)	12	20		V	I_C = 1.0 mA, pulsed
BV_{ECO}	Emitter-to-Collector Breakdown Voltage (Note 2)		5.0		V	I_{EC} = 100 μA

Electrical Characteristics—Combination $T_A = 25°C$

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_C	Photo Current					I_F = 50 mA, V_{CE} = 5.0 V d = 0.40-inch
	(GaAs Source, Note 1)					
	103-106	20	80		μA	
	104-107	60		180	μA	
	105-108	80		160	μA	
I_{CEO}	Collector Dark Current (Note 2)		10	100	nA	I_F = 50 mA, V_{CE} = 5.0 V, Non-reflecting external surface
$V_{CE(sat)}$	Saturation Voltage (Note 1)		0.3	0.7	V	I_F = 50 mA, I_C = 5.0 μA, d = 0.40-inch
t_r & t_f	Rise & Fall Time (Note 3)		100		μs	I_C = 80 μA, V_{CC} = 5.0 V, R_L = 1 kΩ

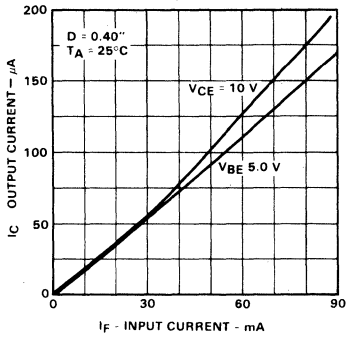
Notes

1. Photocurrent is that obtained from a 4.0-inch × 4.0-inch 90% white surface placed at a distance of 0.40-inch from the face of the device. For test purposes, an Eastman Kodak neutral white test card with 90% diffuse reflectance was employed.
2. Measured with radiation flux intensity of less than 0.1 μW/cm² over the spectrum from 0.1 micron to 1.5 microns.
3. Rise time is defined as the time required for I_{CE} to rise from 10% to 90% of the peak value. Fall time is defined as the time required for I_{CE} to decrease from 90% to 10% of the peak value.
4. White dot defines collector of phototransistor. Read pinout clockwise, top view: collector, source cathode, source anode, emitter.

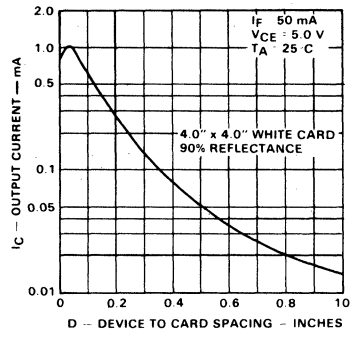
Typical Electrical Characteristic Curves

FPA103, FPA104 FPA105, FPA106 FPA107, FPA108

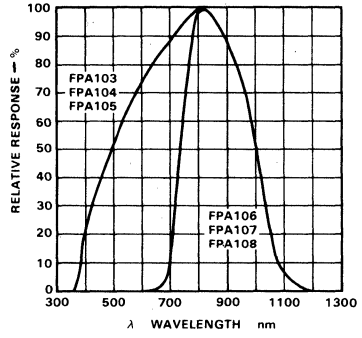
Output Current vs Input Current



Output Current vs Device To Card Spacing



Spectral Characteristics



Interfacing Circuit