

# High-Sensitivity Silicon Phototransistors

Optoelectronic Products

## FPT120/A/B/C FPT130/A/B

### General Description

The FPT120/A/B/C and FPT130/A/B are silicon nitride protected npn Planar phototransistors with exceptionally stable characteristics and high illumination-sensitivity. The case is made of a special plastic compound with transparent resin encapsulation. The controlled sensitivities offered in the A, B and C versions give the circuit designer increased flexibility.

### High Illumination Sensitivity

### Availability Of Base Pins For Flexible Circuit Design

### Absolute Maximum Ratings

#### Maximum Temperature and Humidity

|                                  |                 |
|----------------------------------|-----------------|
| Storage Temperature              | -55°C to +100°C |
| Operating Temperature            | -55°C to +85°C  |
| Pin Temperature (Soldering, 5 s) | 260°C           |
| Relative Humidity at 65°C        | 85%             |

#### Maximum Power Dissipation (Note 1)

|                                               |            |
|-----------------------------------------------|------------|
| Total Dissipation at $T_C = 25^\circ\text{C}$ | 200 mW     |
| Derate Linearly from 25°C                     | 3.33 mW/°C |
| Total Dissipation at $T_A = 25^\circ\text{C}$ | 100 mW     |
| Derate Linearly from 25°C                     | 1.67 mW/°C |

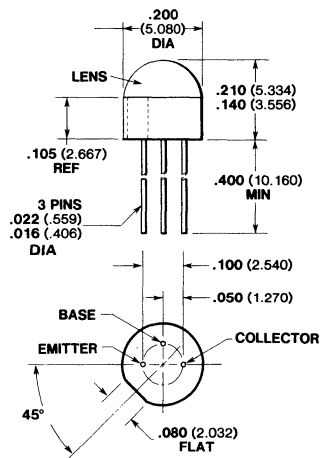
#### Maximum Voltage and Currents

|               |                                                        |       |
|---------------|--------------------------------------------------------|-------|
| $V_{CE(sus)}$ | Collector-to-Emitter<br>Sustaining Voltage<br>(Note 4) | 20 V  |
| $I_C$         | Collector Current                                      | 25 mA |

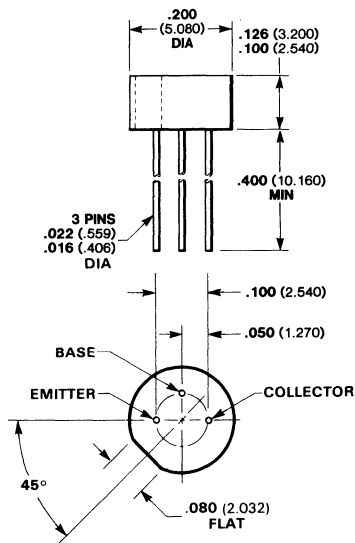
### Package Outlines

#### FPT120/A/B/C

#### PHYSICAL DIMENSIONS



#### FPT130/A/B



### Notes

All dimensions in inches **bold** and millimeters (parentheses)  
Tolerance unless specified =  $\pm .015$  ( $\pm .381$ )

# Typical Electrical Characteristics

# FPT120/A/B/C FPT130/A/B

## Electrical Characteristics $T_A = 25^\circ\text{C}$

| Symbol         | Characteristic                                                    | Min | Typ  | Max  | Units         | Test Conditions                                     |
|----------------|-------------------------------------------------------------------|-----|------|------|---------------|-----------------------------------------------------|
| $V_{CEO(sus)}$ | Collector-to-Emitter Sustaining Voltage (Note 4)                  | 20  | 50   |      | V             | $I_C = 1\text{ mA}$<br>(Pulsed)                     |
| $BV_{ECO}$     | Emitter-to-Collector Breakdown Voltage (Note 4)                   |     | 5.0  |      | V             | $I_{EC} = 100\text{ }\mu\text{A}$                   |
| $V_{CE(sat)}$  | Collector-to-Emitter Saturation Voltage, Tungsten Source (Note 2) |     | 0.25 | 0.55 | V             | $I_C = 1\text{ mA}$ ,<br>$H = 20\text{ mW/cm}^2$    |
| $I_{CEO}$      | Collector Dark Current (Note 4)                                   |     | 10   | 100  | nA            | $V_{CE} = 5.0\text{ V}$                             |
| $I_{CE(It)}$   | Photo Current, Tungsten Source (Note 2)                           |     |      |      | mA            | $V_{CE} = 5.0\text{ V}$ ,<br>$H = 5\text{ mW/cm}^2$ |
|                | FPT120                                                            | 2.0 | 7.5  |      |               |                                                     |
|                | FPT120A (Note 6)                                                  | 7.5 |      | 22.5 |               |                                                     |
|                | FPT120B (Note 6)                                                  | 10  |      | 20   |               |                                                     |
|                | FPT120C (Note 6)                                                  | 16  |      | 25   |               |                                                     |
|                | FPT130                                                            | 2.0 | 4.5  |      |               |                                                     |
|                | FPT130A (Note 7)                                                  | 4.5 |      | 13.5 |               |                                                     |
|                | FPT130B (Note 7)                                                  | 6.0 |      | 12   |               |                                                     |
| $I_{CE(It)}$   | Photo Current, GaAs Source (Note 3)                               |     |      |      | mA            | $V_{CE} = 5.0\text{ V}$ ,<br>$H = 1\text{ mW/cm}^2$ |
|                | FPT120                                                            | 0.7 | 4.5  |      |               |                                                     |
|                | FPT130                                                            | 0.7 | 2.7  |      |               |                                                     |
| $t_r$          | Light Current Rise Time (Note 5)                                  |     | 18   |      | $\mu\text{s}$ |                                                     |
| $t_f$          | Light Current Fall Time (Note 5)                                  |     | 18   |      | $\mu\text{s}$ |                                                     |

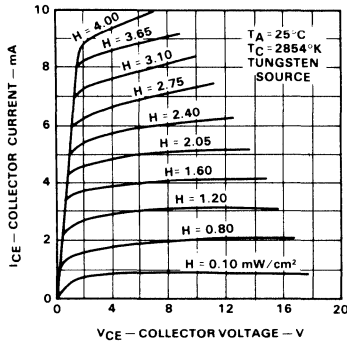
### Notes

- These are steady-state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- Measured at noted irradiance as emitted from a tungsten filament lamp at a color temperature of  $2854^\circ\text{K}$ . The effective photosensitive area is typically  $1.25\text{ mm}^2$  (FPT120A/B) and  $0.78\text{ mm}^2$  (FPT130A/B).
- These are values obtained at noted irradiance as emitted from a GaAs source at  $900\text{ nm}$ .
- Measured with radiation flux intensity of less than  $0.1\text{ }\mu\text{W/cm}^2$  over the spectrum from  $100\text{--}1500\text{ nm}$ .
- Rise time is defined as the time required for  $I_{CE}$  to rise from 10% to 90% of peak value. Fall time is defined as the time required for  $I_{CE}$  to decrease from 90% to 10% of peak value. Test conditions are:  $V_{CE} = 5.0\text{ V}$ ,  $I_{CC} = 4.0\text{ mA}$ ,  $R_L = 100\text{ }\Omega$ , GaAs source.
- Same electrical characteristics as FPT120 except for  $I_{CE(It)}$ .
- Same electrical characteristics as FPT130 except for  $I_{CE(It)}$ .

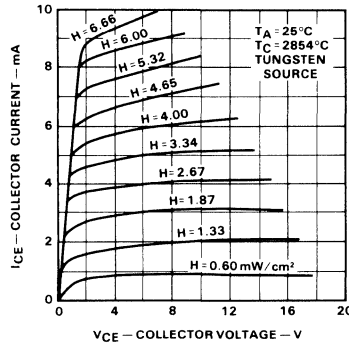
# Typical Electrical Characteristic Curves

# FPT120/A/B/C FPT130/A/B

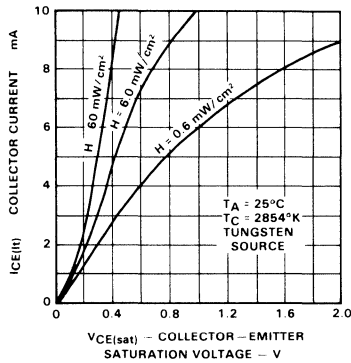
**FPT120/A/B/C Collector Current vs  
Collector Voltage**



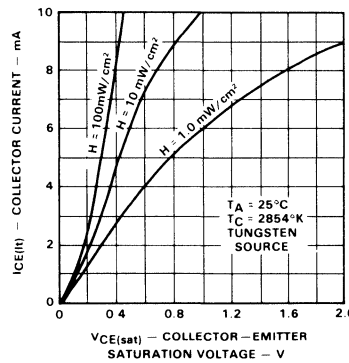
**FPT130/A/B/C Collector Current vs  
Collector Voltage**



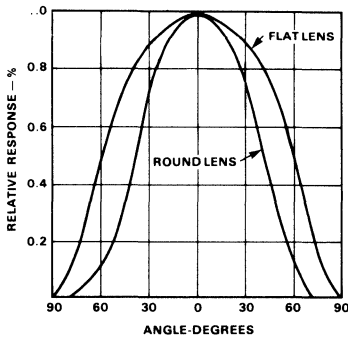
**Collector-Emitter Saturation  
Voltage vs Collector Current**



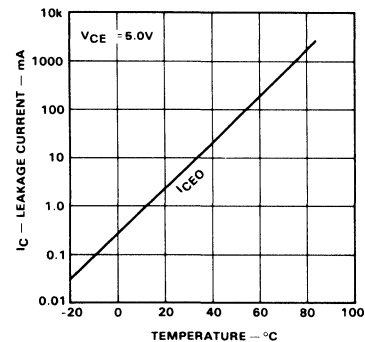
**Collector-Emitter Saturation  
Voltage vs Collector Current**



**Angular Response**



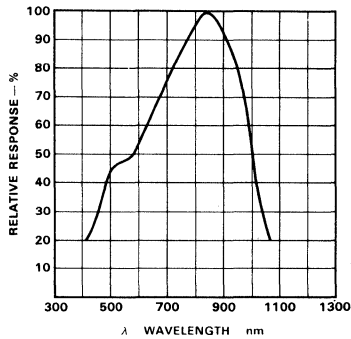
**Collector Dark Current vs Temperature**



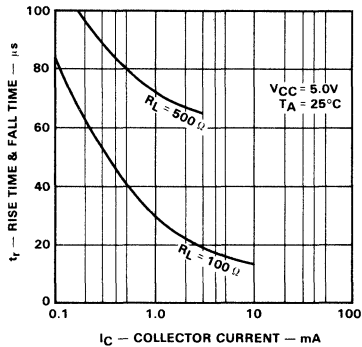
# Typical Electrical Characteristic Curves (Cont'd)

FPT120/A/B/C  
FPT130/A/B

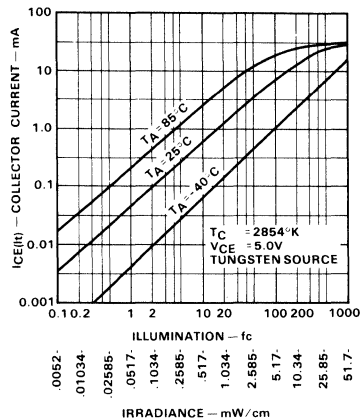
### Relative Spectral Response



### Rise And Fall Time vs Collector Current



### Photo Current Characteristics



### Switching Time Measurement Circuit

