

CLR2169 CLR2170 CLR2180

Silicon NPN Planar Epitaxial Darlington Phototransistors

GENERAL DESCRIPTION — The Clairex CLR2169, CLR2170, and CLR2180 are three-lead, silicon planar epitaxial Darlington phototransistors in a lensed-window, hermetic TO-18 package. The initial stage base lead is provided for those applications where circuitry biasing permits additional gain and switching control. The series is characterized for controlled, high sensitivity at very low irradiance levels. The lensed window unit reduces optical cross-talk from stray light.

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature - 65°C to + 200°C

Operating Junction Temperature + 150°C

Maximum Power Dissipation

Total Dissipation

at 25°C Ambient Temperature $P_T = 250\text{mW}$
derate 2mW/°C

at 100°C Ambient Temperature $P_T = 100\text{mW}$

Maximum Voltages

| | CLR2169 | CLR2170 | CLR2180 |
|--|----------|----------|----------|
| V_{CB0} Collector to Base Voltage | 60 volts | 60 volts | 60 volts |
| V_{CE0} Collector to Emitter Voltage | 40 volts | 40 volts | 40 volts |
| V_{EB0} Emitter to Base Voltage | 10 volts | 10 volts | 10 volts |

Maximum Current: Note 3

I_C Collector Current 200ma

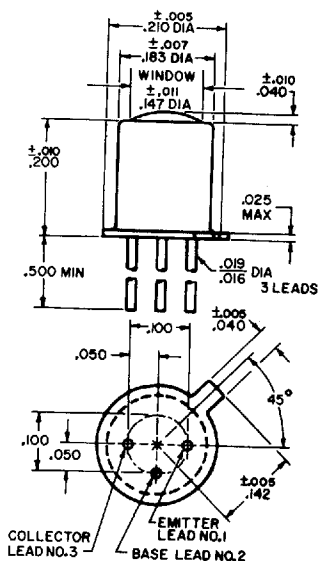
ELECTRICAL CHARACTERISTICS (25°C Free Air unless otherwise designated.)

| Symbol | Characteristics | Test Conditions | CLR2169 | | CLR2170 | | CLR2180 | | Unit |
|-----------------|---|--|-------------|------|-------------|------|-------------|------|-----------------|
| | | | Min. | Max. | Min. | Max. | Min. | Max. | |
| $I_L (I_{CE0})$ | Light Current | $V_{CE} = 5\text{v}$, $H = 0.02\text{mW/cm}^2$, Note 1 | | | 0.2 | 0.8 | 0.6 | | ma |
| $I_L (I_{CE0})$ | Light Current | $V_{CE} = 5\text{v}$, $H = 0.2\text{mW/cm}^2$, Note 1 | 0.5 | | 2.0 | | 4.0 | | ma |
| $I_D (I_{CE0})$ | Dark Current | $V_{CE} = 10\text{ volts}$, $H = 0$ | | 50 | | 100 | | 100 | na |
| BV_{CE0} | Collector to Emitter Breakdown Voltage | $I_C = 0.1\text{ma}$ | 40 | | 40 | | 40 | | volts |
| BV_{CB0} | Collector to Base Breakdown Voltage | $I_C = 0.1\text{ma}$ | 60 | | 60 | | 60 | | volts |
| BV_{EB0} | Emitter to Base Breakdown Voltage | $I_E = 0.1\text{ma}$ | 10 | | 10 | | 10 | | volts |
| t_r | Light Current Rise Time (unsaturated) | $R_L = 100 \Omega$, $I_C = 0.5\text{ma}$ $V_{CC} = 5.0\text{ volts}$ Note 2 | 100 Typical | | 100 Typical | | 100 Typical | | μsec |
| t_f | Light Current Fall Time (unsaturated) | | 150 Typical | | 150 Typical | | 150 Typical | | μsec |
| $V_{CE (SAT)}$ | Collector to Emitter Saturation Voltage | $I_C = 10\text{ma}$, $I_B = 0.05\text{ma}$ $H = 0$ | | 1.2 | | 1.2 | | 1.2 | volts |

Note 1: The light source is a frosted tungsten incandescent lamp at 2854°K.

Note 2: The light source is a gallium arsenide LED pulsed with a rise and fall time of $< 0.3 \mu\text{sec}$.

Note 3: Pulsed conditions: 300 μ sec., 2% duty cycle.

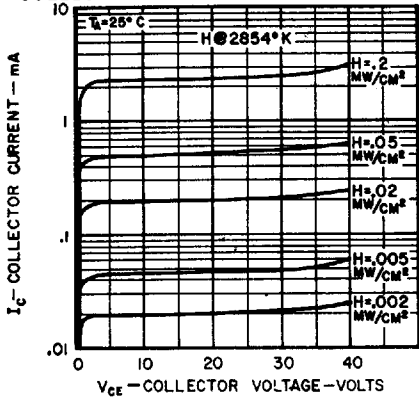


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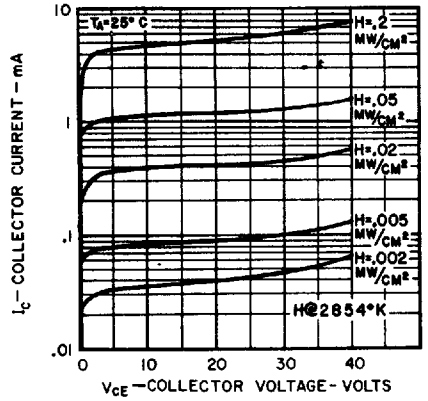
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Typical Electrical Characteristics

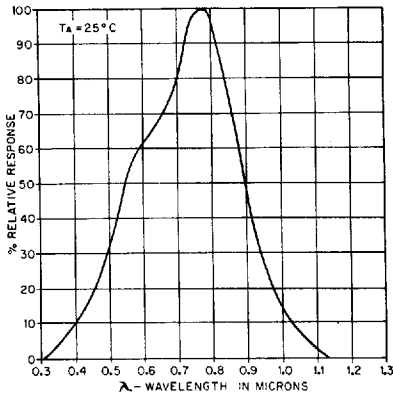
COLLECTOR CHARACTERISTICS CLR 2170



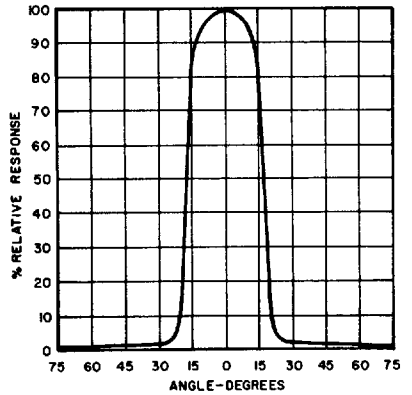
COLLECTOR CHARACTERISTICS CLR 2180



SPECTRAL RESPONSE



ANGULAR RESPONSE



LIGHT CURRENT vs. IRRADIATION

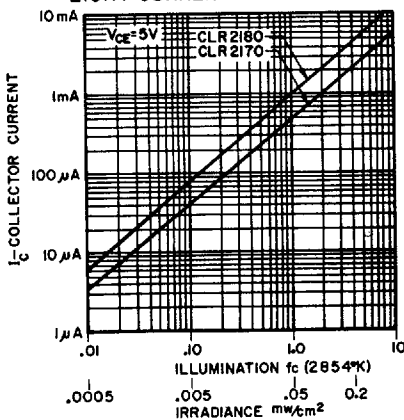
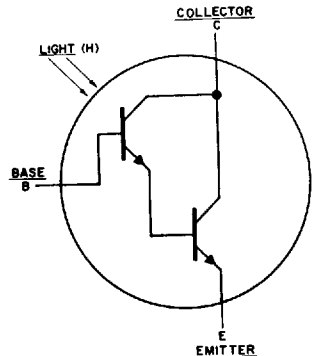


PHOTO-DARLINGTON CIRCUIT



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