DESCRIPTION

The L14F1/L14F2 are silicon photodarlingtons mounted in a narrow angle, TO-18 package.

FEATURES

• Hermetically sealed package
• Narrow reception angle
ABSOLUTE MAXIMUM RATINGS \( (T_A = 25^\circ C \text{ unless otherwise specified}) \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>T_{OPR}</td>
<td>-65 to +125</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>T_{STG}</td>
<td>-65 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature (Iron)(^{(3,4,5 \text{ and } 6)})</td>
<td>T_{SOL-I}</td>
<td>240 for 5 sec</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature (Flow)(^{(3,4 \text{ and } 6)})</td>
<td>T_{SOL-F}</td>
<td>260 for 10 sec</td>
<td>°C</td>
</tr>
<tr>
<td>Collector to Emitter Breakdown Voltage</td>
<td>V_{CEO}</td>
<td>25</td>
<td>V</td>
</tr>
<tr>
<td>Collector to Base Breakdown Voltage</td>
<td>V_{CBO}</td>
<td>25</td>
<td>V</td>
</tr>
<tr>
<td>Emitter to Base Breakdown Voltage</td>
<td>V_{EBO}</td>
<td>12</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation ( (T_A = 25^\circ C)^{(1)} )</td>
<td>P_D</td>
<td>300</td>
<td>mW</td>
</tr>
<tr>
<td>Power Dissipation ( (T_C = 25^\circ C)^{(2)} )</td>
<td>P_D</td>
<td>600</td>
<td>mW</td>
</tr>
</tbody>
</table>

**NOTE:**
1. Derate power dissipation linearly 3.00 mW/°C above 25°C ambient.
2. Derate power dissipation linearly 6.00 mW/°C above 25°C case.
3. RMA flux is recommended.
4. Methanol or isopropyl alcohols are recommended as cleaning agents.
5. Soldering iron tip 1/16” (1.6mm) minimum from housing.
6. As long as leads are not under any stress or spring tension.
7. Light source is a GaAs LED emitting light at a peak wavelength of 940 nm.
8. Figure 1 and figure 2 use light source of tungsten lamp at 2870°K color temperature. A GaAs source of 0.05 mW/cm\(^2\) is approximately equivalent to a tungsten source, at 2870°K, of 0.2 mW/cm\(^2\).

**ELECTRICAL / OPTICAL CHARACTERISTICS \( (T_A = 25^\circ C) \) (All measurements made under pulse conditions)**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>SYMBOL</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-Emitter Breakdown</td>
<td>( I_C = 10 \text{ mA}, E_e = 0 )</td>
<td>BV_{CEO}</td>
<td>25</td>
<td>—</td>
<td>—</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-Base Breakdown</td>
<td>( I_E = 100 \mu\text{A}, E_e = 0 )</td>
<td>BV_{EBO}</td>
<td>12</td>
<td>—</td>
<td>—</td>
<td>V</td>
</tr>
<tr>
<td>Collector-Base Breakdown</td>
<td>( I_C = 100 \mu\text{A}, E_e = 0 )</td>
<td>BV_{CBO}</td>
<td>25</td>
<td>—</td>
<td>—</td>
<td>V</td>
</tr>
<tr>
<td>Collector-Emitter Leakage</td>
<td>( V_{CE} = 12 \text{ V}, E_e = 0 )</td>
<td>I_{CEO}</td>
<td>—</td>
<td>100</td>
<td>—</td>
<td>nA</td>
</tr>
<tr>
<td>Reception Angle at 1/2 Sensitivity</td>
<td>( \theta )</td>
<td>±8</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Degrees</td>
</tr>
<tr>
<td>On-State Collector Current L14F1</td>
<td>( E_e = .125 \text{ mW/cm}^2, V_{CE} = 5 \text{ V} )</td>
<td>I_{C(ON)}</td>
<td>7.5</td>
<td>—</td>
<td>—</td>
<td>mA</td>
</tr>
<tr>
<td>On-State Collector Current L14F2</td>
<td>( E_e = .125 \text{ mW/cm}^2, V_{CE} = 5 \text{ V} )</td>
<td>I_{C(ON)}</td>
<td>2.5</td>
<td>—</td>
<td>—</td>
<td>mA</td>
</tr>
<tr>
<td>Rise Time</td>
<td>( I_C = 10 \text{ mA}, V_{CC} = 5 \text{ V}, R_l = 100 \Omega )</td>
<td>( t_r )</td>
<td>300</td>
<td>—</td>
<td>—</td>
<td>( \mu\text{s} )</td>
</tr>
<tr>
<td>Fall Time</td>
<td>( I_C = 10 \text{ mA}, V_{CC} = 5 \text{ V}, R_l = 100 \Omega )</td>
<td>( t_f )</td>
<td>250</td>
<td>—</td>
<td>—</td>
<td>( \mu\text{s} )</td>
</tr>
</tbody>
</table>
**Figure 1. Light Current vs. Collector to Emitter Voltage**

- **Graph Details:**
  - **X-axis:** Collector to Emitter Voltage (V)
  - **Y-axis:** Normalized Light Current
  - **Data Points:** Various voltage levels (0.1, 1.0, 5, 2, 1, 0.5, 0.1)
  - **Note:** Normalized to $V_{CE} = 5\, V$, $E_d = 2\, mW/cm^2$

**Figure 2. Relative Light Current vs. Ambient Temperature**

- **Graph Details:**
  - **X-axis:** Temperature (°C)
  - **Y-axis:** Relative Light Current
  - **Data Points:** Various temperature levels (-50, -25, 0, 25, 50, 75, 100, 125)
  - **Note:** Relative to $I_L@25^\circ C$

**Figure 3. Spectral Response**

- **Graph Details:**
  - **X-axis:** Wave Length (Nanometers)
  - **Y-axis:** Relative Spectral Response
  - **Data Points:** Various wave lengths (400, 500, 600, 700, 800, 900, 1000, 1100, 1200)

**Figure 4. Angular Response**

- **Graph Details:**
  - **X-axis:** Degrees
  - **Y-axis:** Relative Amplitude
  - **Data Points:** Degrees range from -90° to 90°

**Figure 5. Test Circuit and Voltage Waveforms**

- **Test Circuit Diagram:**
  - **Components:** L14F, VCC, Load Resistance
  - **Waveforms:**
    - Input pulse durations: $t_{d}$, $t_{r}$, $t_{s}$, $t_{f}$
    - Output pulse durations: $t_{ON} = t_{d} + t_{r}$, $t_{OFF} = t_{s} + t_{f}$

**Figure 6. Light Current vs. Relative Switching Speed**

- **Graph Details:**
  - **X-axis:** Relative Switching Speed
  - **Y-axis:** Light Current (mA)
  - **Data Points:** Various load resistances (10 Ω, 100 Ω, 1kΩ)
  - **Note:** Normalized to $V_{CC} = 10\, V$, $I_L = 10\, mA$, $V_{CE} = 5\, V$
DISCLAIMER
FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY
FAIRCHILD’S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in labeling, can be reasonably expected to result in a significant injury of the user.

2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.