

# High-Performance T-1<sup>3</sup>/<sub>4</sub> (5 mm) TS AlGaAs Infrared (875 nm) Lamp

## Technical Data

**HSDL-4200 Series**  
**HSDL-4220 30°**  
**HSDL-4230 17°**

### Features

- Very High Power TS AlGaAs Technology
- 875 nm Wavelength
- T-1<sup>3</sup>/<sub>4</sub> Package
- Low Cost
- Very High Intensity:  
HSDL-4220 - 38 mW/sr  
HSDL-4230 - 75 mW/sr
- Choice of Viewing Angle:  
HSDL-4220 - 30°  
HSDL-4230 - 17°
- Low Forward Voltage for Series Operation
- High Speed: 40 ns Rise Times

- Copper Leadframe for Improved Thermal and Optical Characteristics

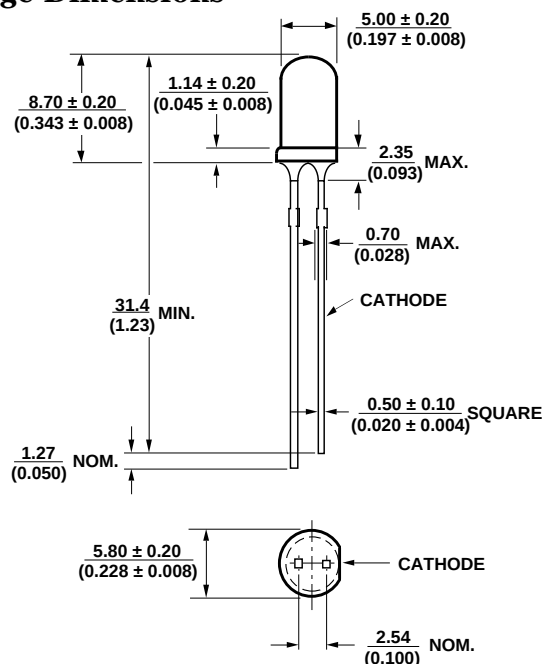
### Applications

- IR Audio
- IR Telephones
- High Speed IR Communications  
IR LANs  
IR Modems  
IR Dongles
- Industrial IR Equipment
- IR Portable Instruments



- Interfaces with Crystal Semiconductor CS8130 Infrared Transceiver

### Package Dimensions



### Description

The HSDL-4200 series of emitters are the first in a sequence of emitters that are aimed at high power, low forward voltage, and high speed. These emitters utilize the Transparent Substrate, double heterojunction, Aluminum Gallium Arsenide (TS AlGaAs) LED technology. These devices are optimized for speed and efficiency at emission wavelengths of 875 nm. This material produces high radiant efficiency over a wide range of currents up to 500 mA peak current. The HSDL-4200 series of emitters are available in a choice of viewing angles, the HSDL-4230 at 17° and the HSDL-4220 at 30°. Both lamps are packaged in clear T-1<sup>3</sup>/<sub>4</sub> (5 mm) packages.

The package design of these emitters is optimized for efficient power dissipation. Copper leadframes are used to obtain better thermal performance than the traditional steel leadframes.

The wide angle emitter, HSDL-4220, is compatible with the IrDA SIR standard and can be used with the HSDL-1000 integrated SIR transceiver.

### Absolute Maximum Ratings

| Parameter                                                    | Symbol            | Min. | Max.                 | Unit               | Reference                                                            |
|--------------------------------------------------------------|-------------------|------|----------------------|--------------------|----------------------------------------------------------------------|
| Peak Forward Current                                         | $I_{\text{FPK}}$  |      | 500                  | mA                 | [2], Fig. 2b<br>Duty Factor = 20%<br>Pulse Width = 100 $\mu\text{s}$ |
| Average Forward Current                                      | $I_{\text{FAVG}}$ |      | 100                  | mA                 | [2]                                                                  |
| DC Forward Current                                           | $I_{\text{FDC}}$  |      | 100                  | mA                 | [1], Fig. 2a                                                         |
| Power Dissipation                                            | $P_{\text{DISS}}$ |      | 260                  | mW                 |                                                                      |
| Reverse Voltage ( $I_{\text{R}} = 100 \mu\text{A}$ )         | $V_{\text{R}}$    | 5    |                      | V                  |                                                                      |
| Transient Forward Current (10 $\mu\text{s}$ Pulse)           | $I_{\text{FTR}}$  |      | 1.0                  | A                  | [3]                                                                  |
| Operating Temperature                                        | $T_{\text{O}}$    | 0    | 70                   | $^{\circ}\text{C}$ |                                                                      |
| Storage Temperature                                          | $T_{\text{S}}$    | -20  | 85                   | $^{\circ}\text{C}$ |                                                                      |
| LED Junction Temperature                                     | $T_{\text{J}}$    |      | 110                  | $^{\circ}\text{C}$ |                                                                      |
| Lead Soldering Temperature<br>[1.6 mm (0.063 in.) from body] |                   |      | 260 for<br>5 seconds | $^{\circ}\text{C}$ |                                                                      |

#### Notes:

1. Derate linearly as shown in Figure 4.
2. Any pulsed operation cannot exceed the Absolute Max Peak Forward Current as specified in Figure 5.
3. The transient peak current is the maximum non-recurring peak current the device can withstand without damaging the LED die and the wire bonds.

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

| Parameter                                  | Symbol                | Min. | Typ.         | Max. | Unit                        | Condition                                                             | Reference          |
|--------------------------------------------|-----------------------|------|--------------|------|-----------------------------|-----------------------------------------------------------------------|--------------------|
| Forward Voltage                            | $V_{\text{F}}$        | 1.30 | 1.50<br>2.15 | 1.70 | V                           | $I_{\text{FDC}} = 50 \text{ mA}$<br>$I_{\text{FPK}} = 250 \text{ mA}$ | Fig. 2a<br>Fig. 2b |
| Forward Voltage<br>Temperature Coefficient | $\Delta V/\Delta T$   |      | -2.1<br>-2.1 |      | mV/ $^{\circ}\text{C}$      | $I_{\text{FDC}} = 50 \text{ mA}$<br>$I_{\text{FDC}} = 100 \text{ mA}$ | Fig. 2c            |
| Series Resistance                          | $R_{\text{S}}$        |      | 2.8          |      | ohms                        | $I_{\text{FDC}} = 100 \text{ mA}$                                     |                    |
| Diode Capacitance                          | $C_{\text{O}}$        |      | 40           |      | pF                          | 0 V, 1 MHz                                                            |                    |
| Reverse Voltage                            | $V_{\text{R}}$        | 2    | 20           |      | V                           | $I_{\text{R}} = 100 \mu\text{A}$                                      |                    |
| Thermal Resistance,<br>Junction to Pin     | $R\theta_{\text{jp}}$ |      | 110          |      | $^{\circ}\text{C}/\text{W}$ |                                                                       |                    |

### Optical Characteristics at 25°C

| Parameter                                            | Symbol                      | Min. | Typ.             | Max. | Unit  | Condition                                                                             | Reference          |
|------------------------------------------------------|-----------------------------|------|------------------|------|-------|---------------------------------------------------------------------------------------|--------------------|
| Radiant Optical Power<br>HSDL-4220                   | $P_O$                       |      | 19<br>38         |      | mW    | $I_{FDC} = 50 \text{ mA}$<br>$I_{FDC} = 100 \text{ mA}$                               |                    |
| HSDL-4230                                            | $P_O$                       |      | 16<br>32         |      | mW    | $I_{FDC} = 50 \text{ mA}$<br>$I_{FDC} = 100 \text{ mA}$                               |                    |
| Radiant On-Axis Intensity<br>HSDL-4220               | $I_E$                       | 22   | 38<br>76<br>190  | 60   | mW/sr | $I_{FDC} = 50 \text{ mA}$<br>$I_{FDC} = 100 \text{ mA}$<br>$I_{FPK} = 250 \text{ mA}$ | Fig. 3a<br>Fig. 3b |
| HSDL-4230                                            | $I_E$                       | 39   | 75<br>150<br>375 | 131  | mW/sr | $I_{FDC} = 50 \text{ mA}$<br>$I_{FDC} = 100 \text{ mA}$<br>$I_{FPK} = 250 \text{ mA}$ | Fig. 3a<br>Fig. 3b |
| Radiant On-Axis Intensity<br>Temperature Coefficient | $\Delta I_E / \Delta T$     |      | -0.35<br>-0.35   |      | %/°C  | $I_{FDC} = 50 \text{ mA}$<br>$I_{FDC} = 100 \text{ mA}$                               |                    |
| Viewing Angle<br>HSDL-4220                           | $2\theta_{1/2}$             |      | 30               |      | deg   | $I_{FDC} = 50 \text{ mA}$                                                             | Fig. 6             |
| HSDL-4230                                            | $2\theta_{1/2}$             |      | 17               |      | deg   | $I_{FDC} = 50 \text{ mA}$                                                             | Fig. 7             |
| Peak Wavelength                                      | $\lambda_{PK}$              | 860  | 875              | 895  | nm    | $I_{FDC} = 50 \text{ mA}$                                                             | Fig. 1             |
| Peak Wavelength<br>Temperature Coefficient           | $\Delta \lambda / \Delta T$ |      | 0.25             |      | nm/°C | $I_{FDC} = 50 \text{ mA}$                                                             |                    |
| Spectral Width—at FWHM                               | $\Delta \lambda$            |      | 37               |      | nm    | $I_{FDC} = 50 \text{ mA}$                                                             | Fig. 1             |
| Optical Rise and Fall<br>Times, 10%-90%              | $t_r / t_f$                 |      | 40               |      | ns    | $I_{FDC} = 50 \text{ mA}$                                                             |                    |
| Bandwidth                                            | $f_c$                       |      | 9                |      | MHz   | $I_F = 50 \text{ mA}$<br>$\pm 10 \text{ mA}$                                          | Fig. 8             |

### Ordering Information

| Part Number | Lead Form | Shipping Option |
|-------------|-----------|-----------------|
| HSDL-4220   | Straight  | Bulk            |
| HSDL-4230   | Straight  | Bulk            |

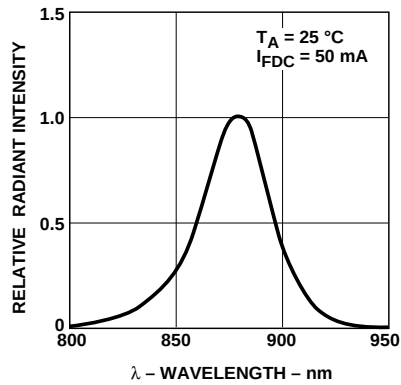


Figure 1. Relative Radiant Intensity vs. Wavelength.

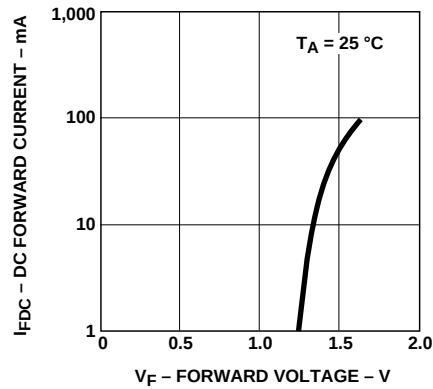


Figure 2a. DC Forward Current vs. Forward Voltage.

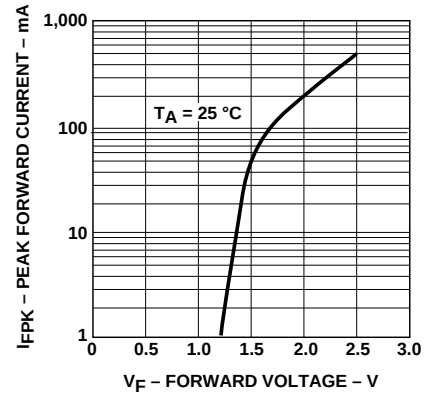


Figure 2b. Peak Forward Current vs. Forward Voltage.

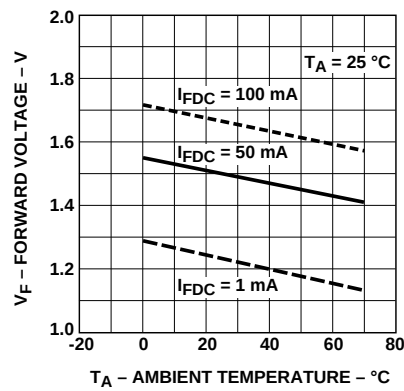


Figure 2c. Forward Voltage vs. Ambient Temperature.

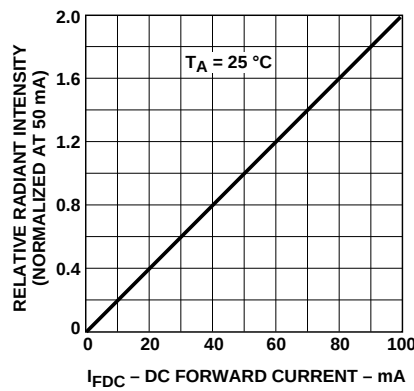


Figure 3a. Relative Radiant Intensity vs. DC Forward Current.

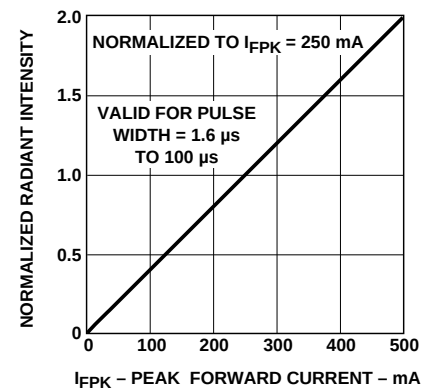


Figure 3b. Normalized Radiant Intensity vs. Peak Forward Current.

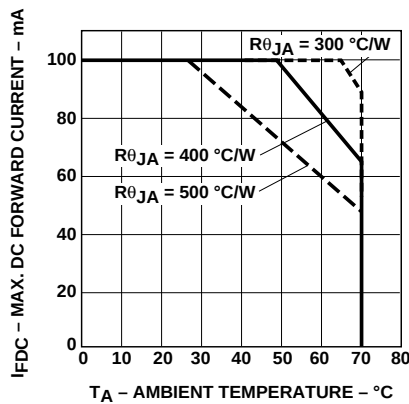


Figure 4. Maximum DC Forward Current vs. Ambient Temperature. Derated Based on  $T_{JMAX} = 110^{\circ}\text{C}$ .

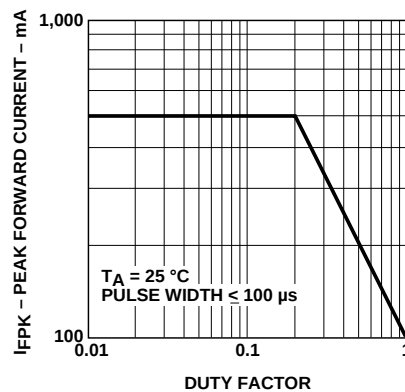
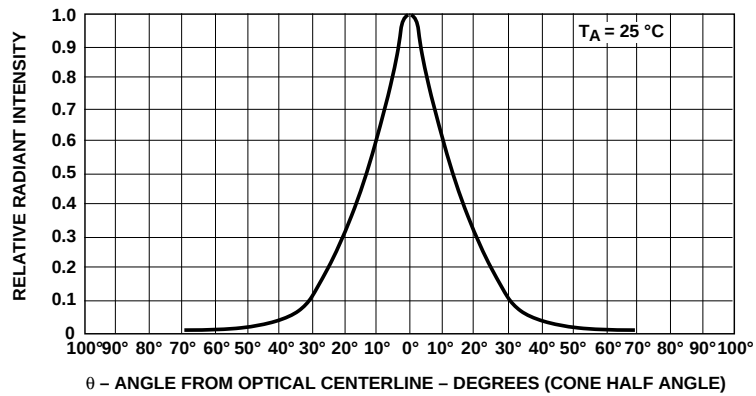
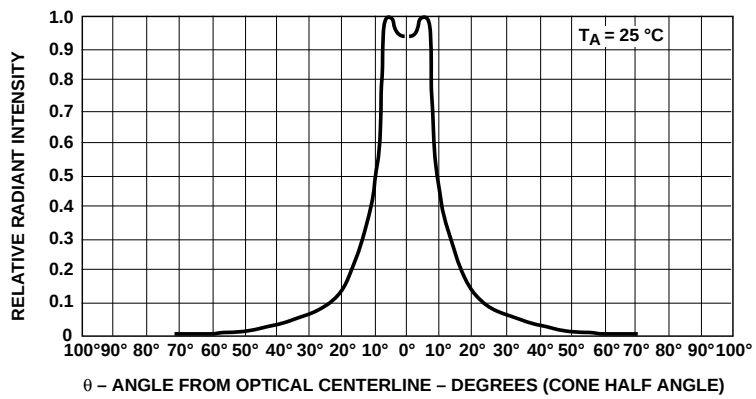


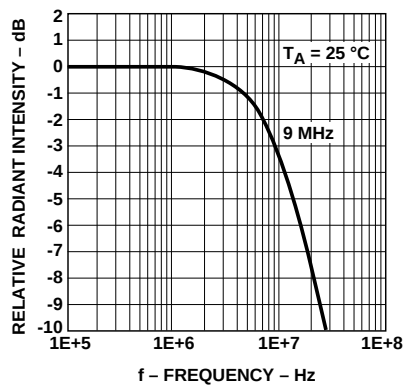
Figure 5. Maximum Peak Forward Current vs. Duty Factor.



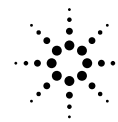
**Figure 6. Relative Radiant Intensity vs. Angular Displacement HSDL-4220.**



**Figure 7. Relative Radiant Intensity vs. Angular Displacement HSDL-4230.**



**Figure 8. Relative Radiant Intensity vs. Frequency.**



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Obsoletes 5968-0956E (8/98)

5968-5912E (11/99)