



# 3mm Cylindrical LED Lamps

LTL-2211AT Bright Red

LTL-2231AT Green

LTL-2251AT Yellow

LTL-2291AT Red Orange

## Features

- Cylindrical shape.
- I.C. compatible.
- Low power consumption.
- Long life solid state reliability.
- Low cost.

## Description

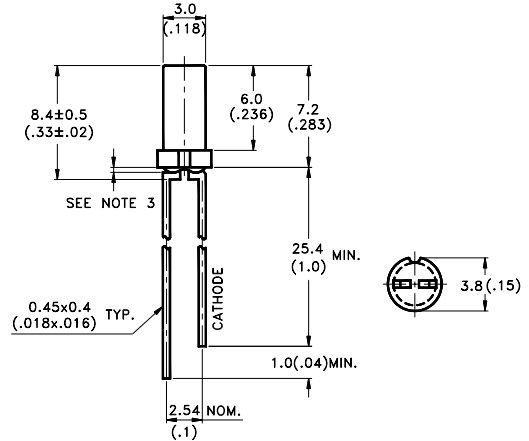
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.

The Red Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode.

The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.

The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

## Package Dimensions



### Notes:

1. All dimensions are in millimeters (inches).
2. Tolerance is  $\pm 0.25\text{mm}$  (.010") unless otherwise noted.
3. Protruded resin under flange is 1.0mm (.04") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

## Devices

Part No. LTL-	Lens	Source Color
2211AT	Red Diffused	Bright Red
2231AT	Green Diffused	Green
2251AT	Yellow Diffused	Yellow
2291AT	Orange Diffused	Red Orange

## Absolute Maximum Ratings at Ta=25°C

Parameter	Bright Red	Green	Yellow	Red Orange	Unit
Power Dissipation	40	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	60	120	80	120	mA
Continuous Forward Current	15	30	20	30	mA
Derating Linear From 25°C	0.2	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	5	V
Operating Temperature Range	-55°C to +100°C				
Storage Temperature Range	-55°C to +100°C				
Lead Soldering Temperature [1.6mm (0.063 in.) from body]	260°C for 5 Seconds				

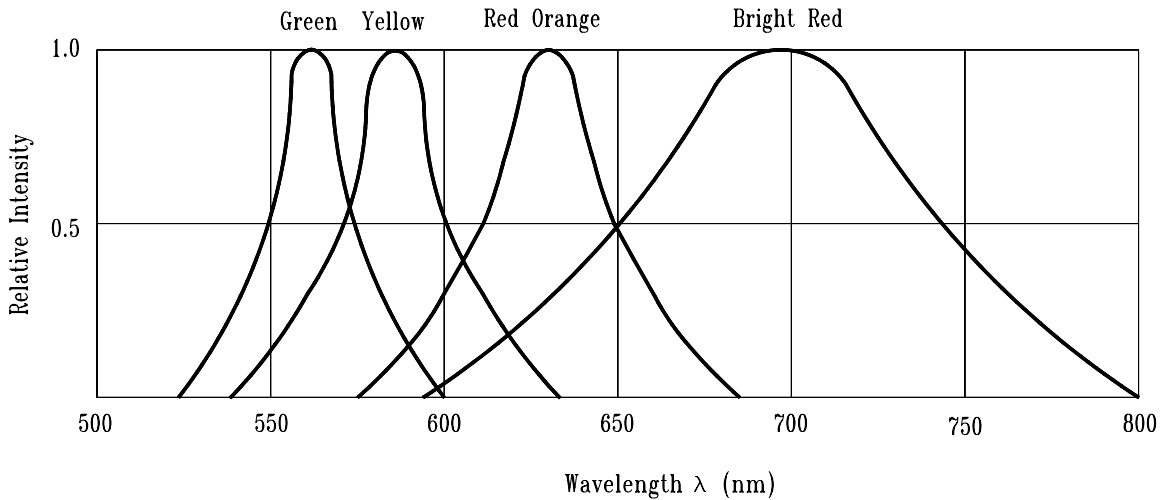


Fig.1 Relative Intensity vs. Wavelength

**Electrical/Optical Characteristics at Ta=25°C**

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit.	Test Condition.
Luminous Intensity	$I_v$	2211AT 2231AT 2251AT 2291AT	0.4 0.7 1.1 0.7	1.1 3.7 2.5 2.5		mcd	$I_F=10\text{ mA}$ Note 1,4
Viewing Angle	$2\theta_{1/2}$	22x1AT		180		deg	Note 2 (Fig.6)
Peak Emission Wavelength	$\lambda_P$	2211AT 2231AT 2251AT 2291AT		697 565 585 630		nm	Measurement @Peak (Fig.1)
Dominant Wavelength	$\lambda_d$	2211AT 2231AT 2251AT 2291AT		657 569 588 621		nm	Note 3
Spectral Line Half Width	$\Delta\lambda$	2211AT 2231AT 2251AT 2291AT		90 30 35 40		nm	
Forward Voltage	$V_F$	2211AT 2231AT 2251AT 2291AT		2.1 2.1 2.1 2.0	2.6 2.6 2.6 2.6	V	$I_F=20\text{ mA}$
Reverse Current	$I_R$	22x1AT			100	$\mu\text{ A}$	$V_R=5\text{ V}$
Capacitance	C	2211AT 2231AT 2251AT 2291AT		55 35 15 20		pF	$V_F=0, f=1\text{ MHz}$

Notes:1.Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.

2.  $\theta_{1/2}$  is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

3.The dominant wavelength,  $\lambda_d$  is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.

4. $I_v$  needs  $\pm 15\%$  additionaly for guaranteed limits.

# Typical Electrical/Optical Characteristic Curves (25°C Ambient Temperature Unless Otherwise Noted)

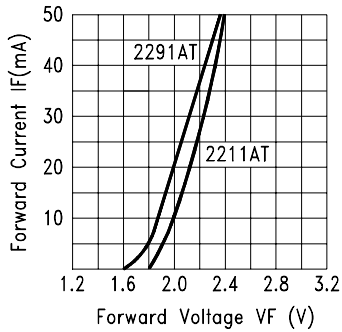


Fig.2 FORWARD CURRENT VS. FORWARD VOLTAGE

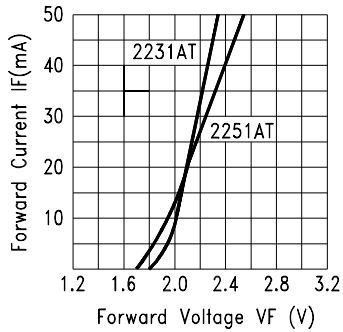


Fig.2 FORWARD CURRENT VS. FORWARD VOLTAGE

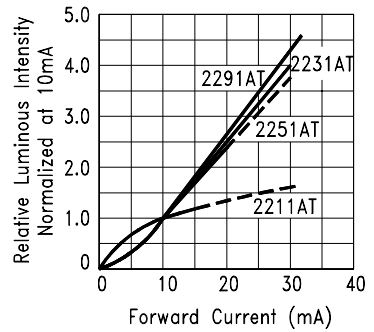


Fig.4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

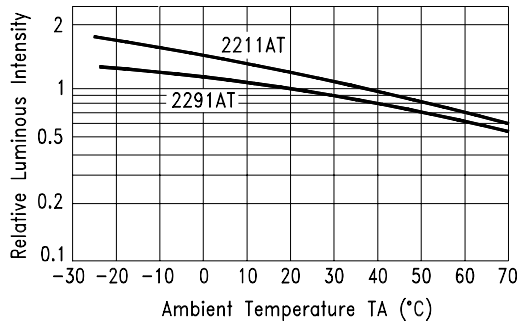


Fig.5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

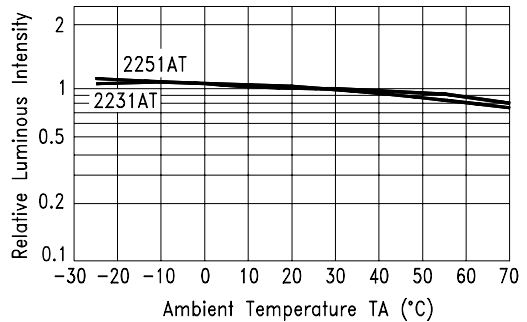


Fig.6 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

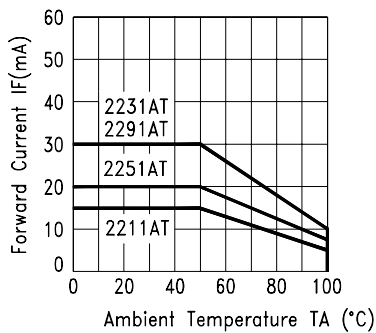


Fig.7 FORWARD CURRENT DERATING CURVE

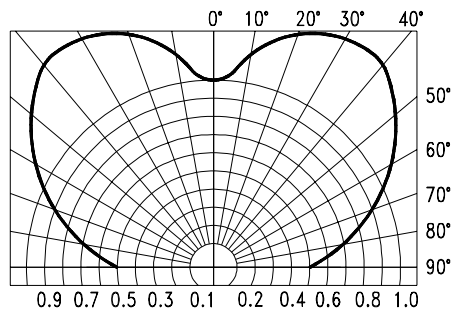


Fig.8 SPATIAL DISTRIBUTION