



# T-1(3mm) Solid State Lamps

LTL-1CHA / 1CHAE	Amber
LTL-1CHE / 1CHEE	High Efficiency Red
LTL-1CHG / 1CHGE	Green
LTL-1CHP / 1CHPE	Bright Red
LTL-1CHR / 1CHRE	Red
LTL-1CHY / 1CHYE	Yellow

## Features

- Low power consumption.
- High efficiency.
- Versatile mounting on P.C. Board or panel.
- I.C. compatible/low current requirements.
- 3.1mm diameter package.

## Description

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

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

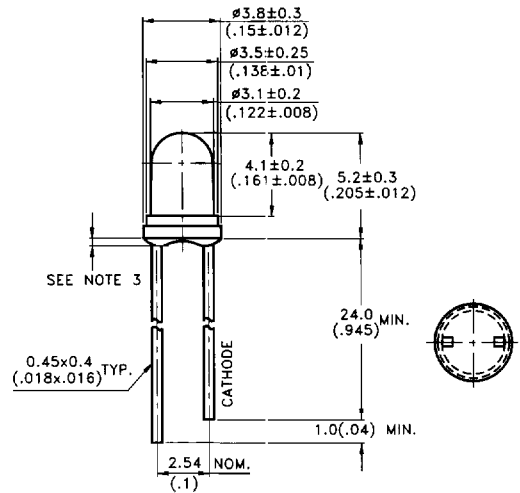
The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode.

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

The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red 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.

## Devices

Part No. LTL-	Lens		Source Color
	Color	Diffusion	
1CHA 1CHAE	Amber	Diffused Transparent	Amber
1CHE 1CHEE	Red	Diffused Transparent	Hi.Eff.Red
1CHG 1CHGE	Green	Diffused Transparent	Green
1CHP 1CHPE	Red	Diffused Transparent	Bright Red
1CHR 1CHRE	Red	Diffused Transparent	Red
1CHY 1CHYE	Yellow	Diffused Transparent	Yellow

## Absolute Maximum Ratings at Ta=25 °C

Parameter	Amber	Hi.Eff. Red	Green	Bright Red	Red	Yellow	Unit
Power Dissipation	60	100	100	40	80	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	80	120	120	60	200	80	mA
Continuous Forward Current	20	30	30	15	40	20	mA
Derating Linear From 50 °C	0.25	0.4	0.4	0.2	0.5	0.25	mA/ °C
Reverse Voltage	5	5	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(.063") From Body]	260 °C for 5 seconds						

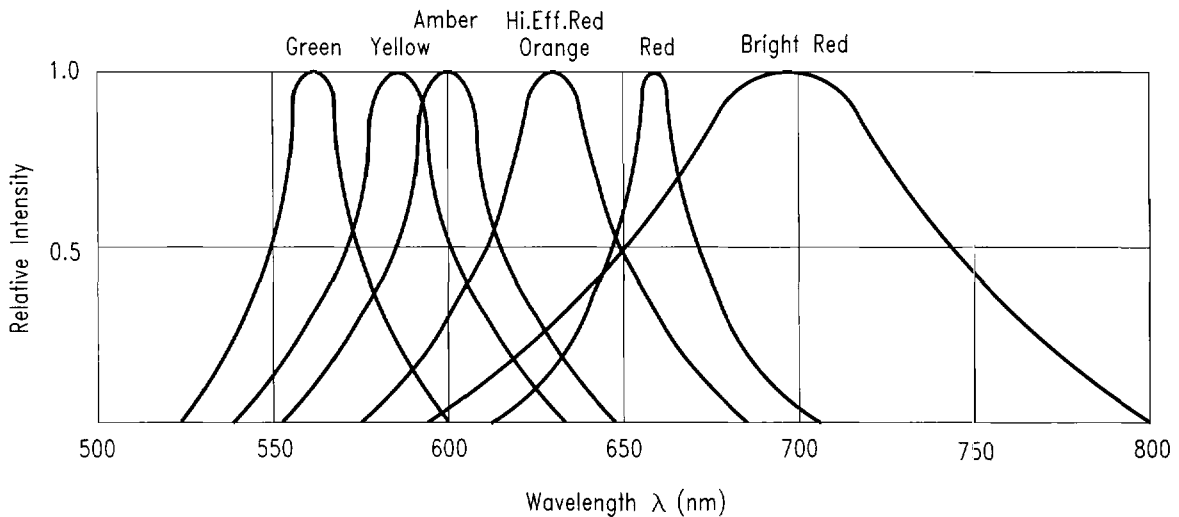


Fig.1 RELATIVE INTENSITY VS. WAVELENGTH

## Electrical / Optical Characteristics and Curves at Ta = 25 °C

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	Iv	1CHA	3.7	12.6		mcd	If=10mA Note 1
		1CHE	2.5	7.8			
		1CHG	3.7	12.6			
		1CHP	1.3	4.4			
		1CHR	0.4	1.1			
		1CHY	2.5	8.7			
Viewing Angle	$2\theta_{1/2}$	1CHA		60		deg	Note 2 (Fig.6)
		1CHE		60			
		1CHG		60			
		1CHP		60			
		1CHR		60			
		1CHY		60			
Peak Emission Wavelength	$\lambda_P$	1CHA		610		nm	Measurement @ peak (Fig.1)
		1CHE		630			
		1CHG		565			
		1CHP		697			
		1CHR		655			
		1CHY		585			
Dominant Wavelength	$\lambda_d$	1CHA		602		nm	Note 3
		1CHE		621			
		1CHG		569			
		1CHP		657			
		1CHR		651			
		1CHY		588			
Spectral Line Half-Width	$\Delta\lambda$	1CHA		35		nm	
		1CHE		40			
		1CHG		30			
		1CHP		90			
		1CHR		24			
		1CHY		35			
Forward Voltage	VF	1CHA		2.1	2.8	V	If=20mA
		1CHE		2.0	2.8		
		1CHG		2.1	2.8		
		1CHP		2.1	2.8		
		1CHR		1.7	2.0		
		1CHY		2.1	2.8		
Reverse	IR	1CHA			100	$\mu A$	VR=5V
		1CHE			100		
		1CHG			100		
		1CHP			100		
		1CHR			100		
		1CHY			100		
Capacitance	C	1CHA		15		PF	VF=0 f=1MHZ
		1CHE		20			
		1CHG		35			
		1CHP		55			
		1CHR		30			
		1CHY		15			

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.

## Electrical / Optical Characteristics and Curves at Ta = 25 °C

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	Iv	1CHAE	8.7	29		mcd	If=10mA Note 1
		1CHEE	5.6	19			
		1CHGE	12.6	40			
		1CHPE	2.5	8.7			
		1CHRE	1.1	3.7			
		1CHYE	12.6	40			
Viewing Angle	2 θ 1/2	1CHAE		45		deg	Note 2 (Fig.6)
		1CHEE		45			
		1CHGE		45			
		1CHPE		45			
		1CHRE		45			
		1CHYE		45			
Peak Emission Wavelength	λ P	1CHAE		610		nm	Measurement @ peak (Fig.1)
		1CHEE		635			
		1CHGE		565			
		1CHPE		697			
		1CHRE		655			
		1CHYE		585			
Dominant Wavelength	λ d	1CHAE		602		nm	Note 3
		1CHEE		621			
		1CHGE		569			
		1CHPE		657			
		1CHRE		651			
		1CHYE		588			
Spectral Line Half-Width	Δ λ	1CHAE		35		nm	
		1CHEE		40			
		1CHGE		30			
		1CHPE		90			
		1CHRE		24			
		1CHYE		35			
Forward Voltage	VF	1CHAE		2.1	2.8	V	If= 20mA
		1CHEE		2.0	2.8		
		1CHGE		2.1	2.8		
		1CHPE		2.1	2.8		
		1CHRE		1.7	2.0		
		1CHYE		2.1	2.8		
Reverse	IR	1CHAE			100	μ A	VR=5V
		1CHEE			100		
		1CHGE			100		
		1CHPE			100		
		1CHRE			100		
		1CHYE			100		
Capacitance	C	1CHAE		15		PF	VF=0 f=1MHZ
		1CHEE		20			
		1CHGE		35			
		1CHPE		55			
		1CHRE		30			
		1CHYE		15			

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

2. θ1/2 is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

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

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

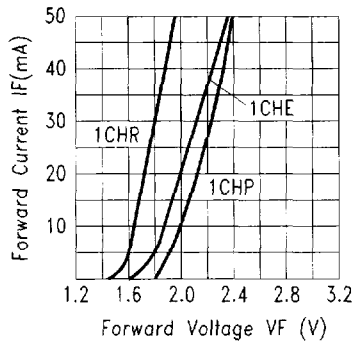


Fig.18 FORWARD CURRENT VS. FORWARD VOLTAGE

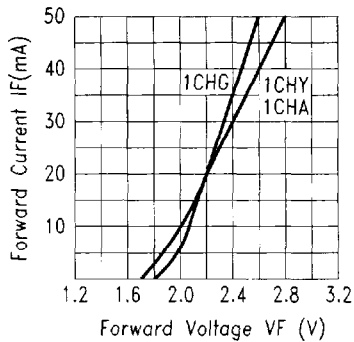


Fig.19 FORWARD CURRENT VS. FORWARD VOLTAGE

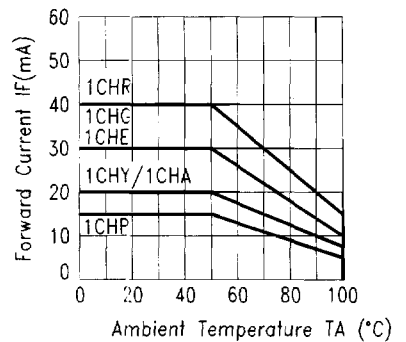


Fig.20 FORWARD CURRENT DERATING CURVE

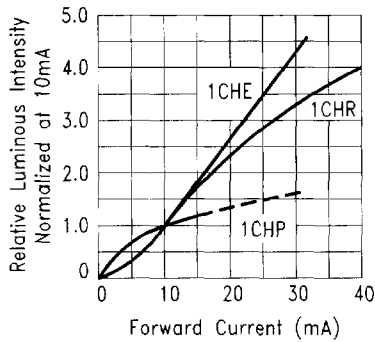


Fig.21 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

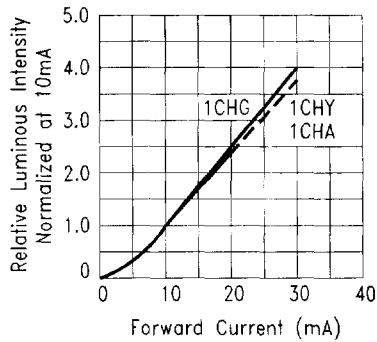


Fig.22 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

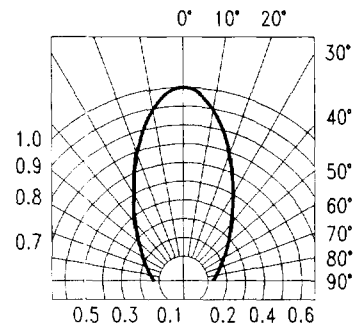


Fig.23 SPATIAL DISTRIBUTION

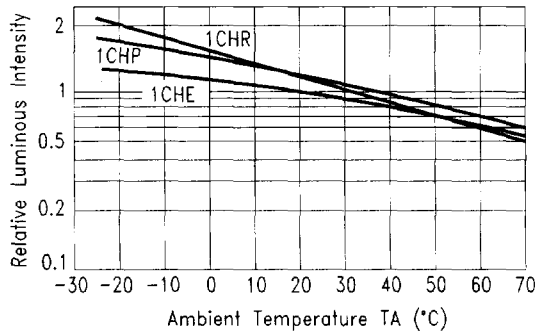


Fig.24 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

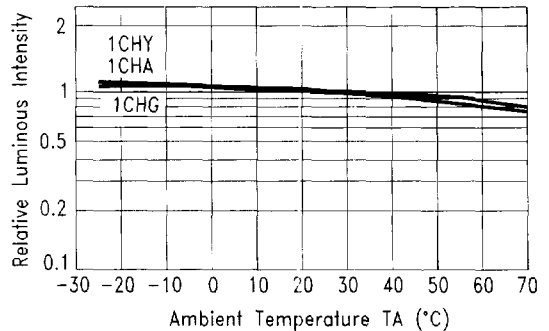


Fig.25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

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

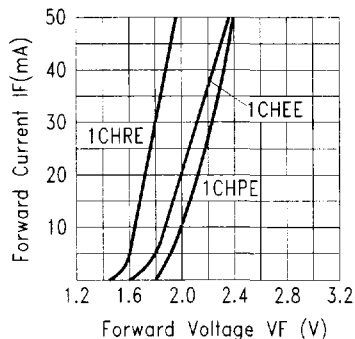


Fig.18 FORWARD CURRENT VS. FORWARD VOLTAGE

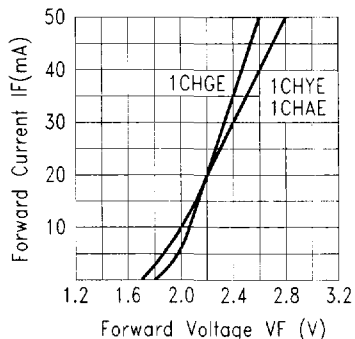


Fig.19 FORWARD CURRENT VS. FORWARD VOLTAGE

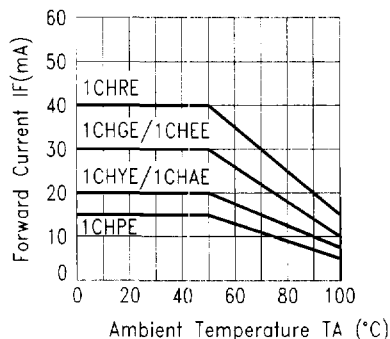


Fig.20 FORWARD CURRENT DERATING CURVE

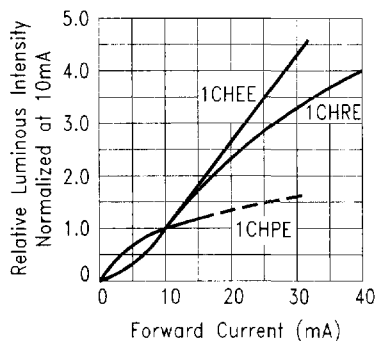


Fig.21 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

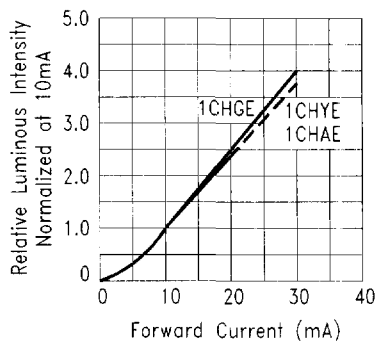


Fig.22 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

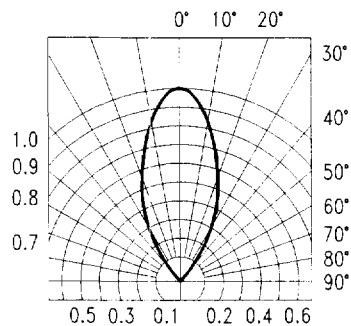


Fig.23 SPATIAL DISTRIBUTION

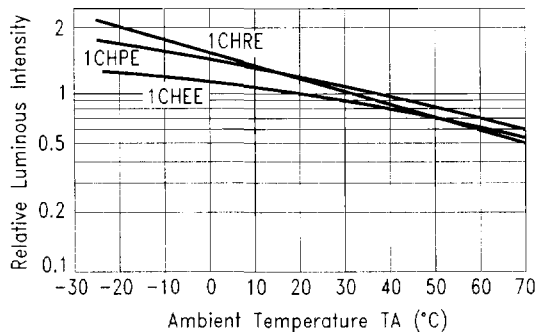


Fig.24 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

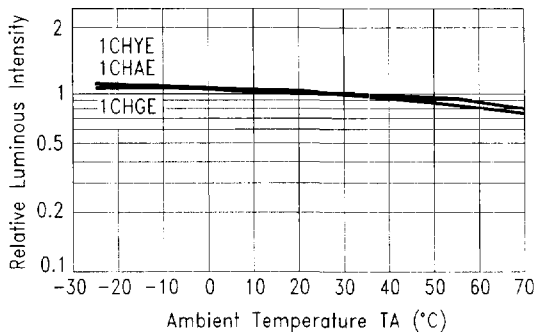


Fig.25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

LED LAMPS