

## T-1 (3mm) Solid State Lamps

LTL-4201N	Red	LTL-4231N	Green
LTL-4211N	Bright Red	LTL-4251N	Yellow
LTL-4221N	Hi. Eff. Red	LTL-4291N	Orange

### Feature

- High Intensity.
- Popular T-1 diameter package.
- Selected minimum intensities.
- Wide viewing angle.
- General purpose leads.
- Reliable and rugged.

### Description

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

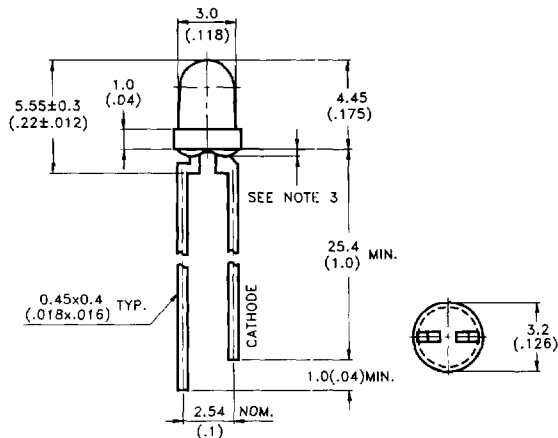
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.

The High Efficiency Red and 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  $\pm 0.25\text{mm}$  (0.10") 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
	Color	Diffusion	
4201N 4206N	Red Water Clear	Diffused Non-diffused	Red
4211N 4212N	Red Red	Diffused Transparent	Bright Red
4221N 4222N	Red Red	Diffused Transparent	Hi. Eff. Red
4231N 4232N 4236N	Green Green Water Clear	Diffused Transparent Non-diffused	Green
4251N 4252N 4256N	Yellow Yellow Water Clear	Diffused Transparent Non-diffused	Yellow
4291N 4292N 4296N	Orange Orange Water Clear	Diffused Transparent Non-diffused	Orange

## Absolute Maximum Ratings at Ta=25 °C

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

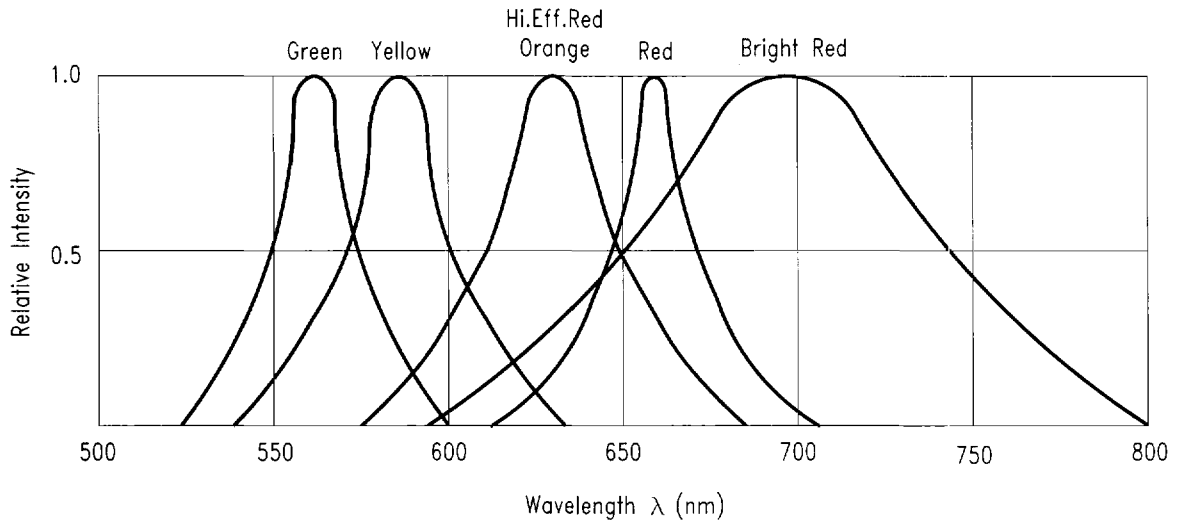


Fig.1 RELATIVE INTENSITY VS. WAVELENGTH

LED LAMPS

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

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	$I_v$	4201N 4211N 4221N 4231N 4251N 4291N	0.4 1.3 2.5 3.7 1.7 2.5	1.1 4.4 8.7 12.6 5.6 8.7		mcd	$I_F = 10\text{mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4201N 4211N 4221N 4231N 4251N 4291N		60		deg	Note 2 (Fig.7)
Peak Emission Wavelength	$\lambda_P$	4201N 4211N 4221N 4231N 4251N 4291N		655 697 635 565 585 630		nm	Measurement @ Peak (Fig.1)
Dominant Wavelength	$\lambda_d$	4201N 4211N 4221N 4231N 4251N 4291N		651 657 621 569 588 621		nm	Note 3
Spectral Line Half Width	$\Delta\lambda$	4201N 4211N 4221N 4231N 4251N 4291N		24 90 40 30 35 40		nm	
Forward Voltage	$V_F$	4201N 4211N 4221N 4231N 4251N 4291N		1.7 2.1 2.0 2.1 2.1 2.0	2.0 2.8 2.8 2.8 2.8 2.8	V	$I_F = 20\text{mA}$
Reverse Current	$I_R$	4201N 4211N 4221N 4231N 4251N 4291N			100	$\mu\text{A}$	$V_R = 5\text{V}$
Capacitance	C	4201N 4211N 4221N 4231N 4251N 4291N		30 55 20 35 15 20		PF	$V_F=0$ $f=1\text{MHZ}$

### Notes:

- Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
- $\theta_{1/2}$  is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
- 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	4206N	1.1	3.7		mcd	If = 10mA Note 1
		4212N	1.7	5.6			
		4222N	8.7	29			
		4232N	12.6	40			
		4236N	19	60			
		4252N	5.6	19			
		4256N	12.6	40			
		4292N	5.6	19			
4296N	19	60					
Viewing Angle	2 θ 1/2	4206N				deg	Note 2 (Fig.15)
		4212N					
		4222N					
		4232N		45			
		4236N					
		4252N					
		4256N					
		4292N					
4296N							
Peak Emission Wavelength	λP	4206N		655		nm	Measurement @ Peak (Fig.1)
		4212N		697			
		4222N		635			
		4232N		565			
		4236N		565			
		4252N		585			
		4256N		585			
		4292N		630			
4296N		630					
Dominant Wavelength	λd	4206N		651		nm	Note 3
		4212N		657			
		4222N		621			
		4232N		569			
		4236N		569			
		4252N		588			
		4256N		588			
		4292N		621			
4296N		621					
Spectral Line Half Width	Δ λ	4206N		24		nm	
		4212N		90			
		4222N		40			
		4232N		30			
		4236N		30			
		4252N		35			
		4256N		35			
		4292N		40			
4296N		40					
Forward Voltage	VF	4206N		1.7	2.0	V	If = 20mA
		4212N		2.1	2.8		
		4222N		2.0	2.8		
		4232N		2.1	2.8		
		4236N		2.1	2.8		
		4252N		2.1	2.8		
		4256N		2.1	2.8		
		4292N		2.0	2.8		
4296N		2.0	2.8				
Reverse Current	IR	4206N				100	μA
		4212N					
		4222N					
		4232N					
		4236N					
		4252N					
		4256N					
		4292N					
4296N							
Capacitance	C	4206N		30		PF	VF=0 f=1MHZ
		4212N		55			
		4222N		20			
		4232N		35			
		4236N		35			
		4252N		15			
		4256N		15			
		4292N		20			
4296N		20					

### Notes:

- Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
- θ 1/2 is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
- 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)

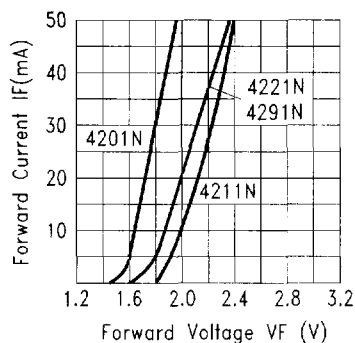


Fig.2 FORWARD CURRENT VS. FORWARD VOLTAGE

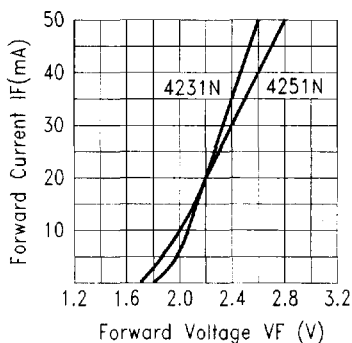


Fig.3 FORWARD CURRENT VS. FORWARD VOLTAGE

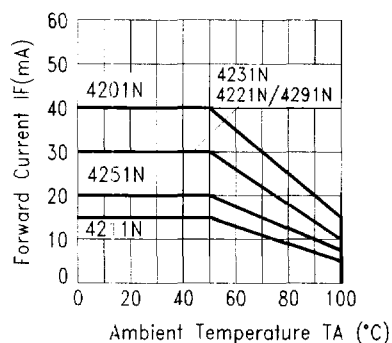


Fig.4 FORWARD CURRENT DERATING CURVE

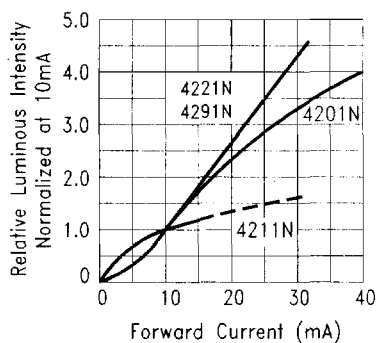


Fig.5 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

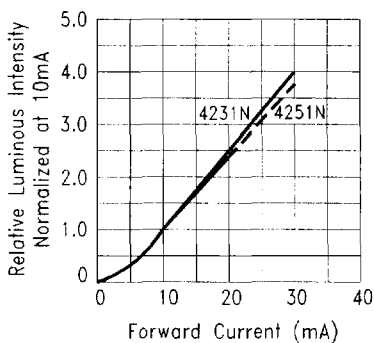


Fig.6 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

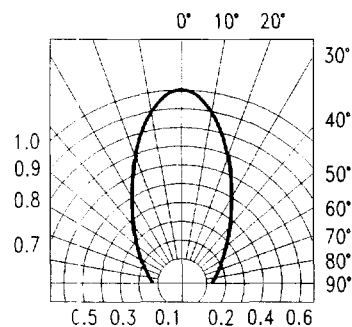


Fig.7 SPATIAL DISTRIBUTION

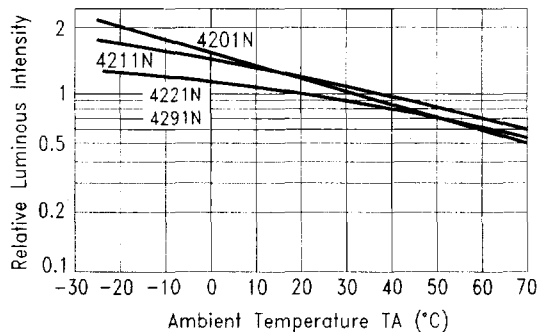


Fig.8 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

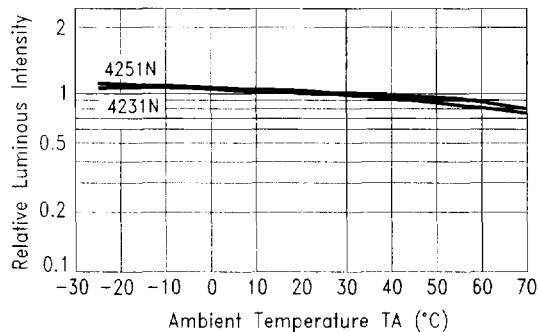


Fig.9 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

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

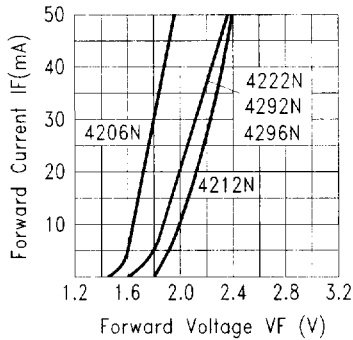


Fig.10 FORWARD CURRENT VS. FORWARD VOLTAGE

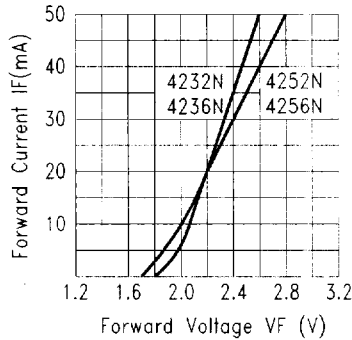


Fig.11 FORWARD CURRENT VS. FORWARD VOLTAGE

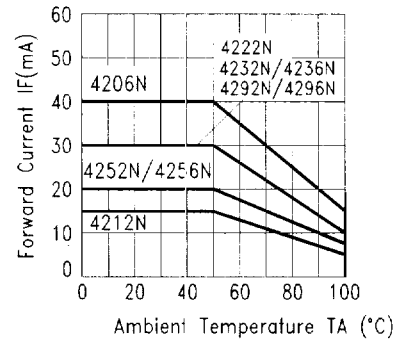


Fig.12 FORWARD CURRENT DERATING CURVE

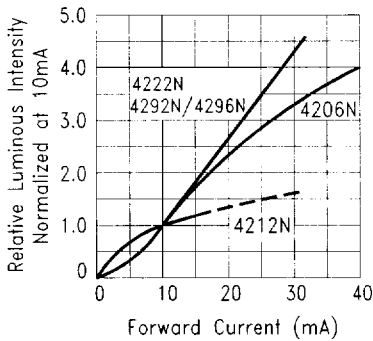


Fig.13 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

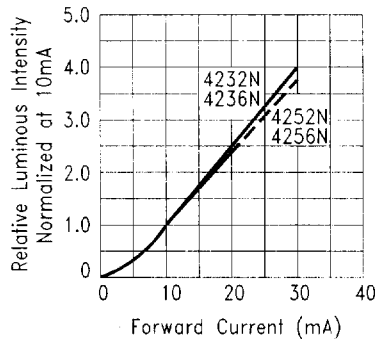


Fig.14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

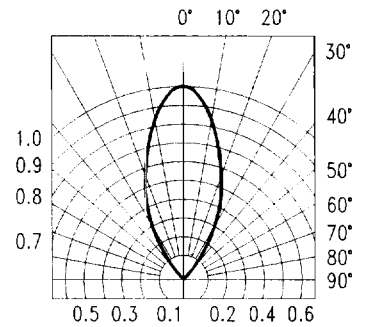


Fig.15 SPATIAL DISTRIBUTION

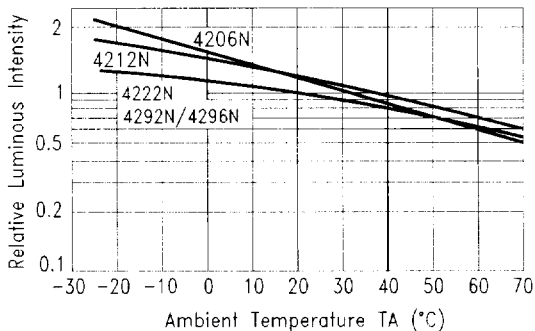


Fig.16 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

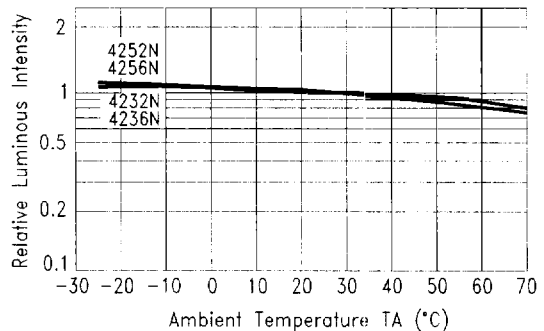


Fig.17 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE