



T-1(3mm) SOLID STATE LAMPS

LTL-201 RED
LTL-211 BRIGHT RED
LTL-221 HIGH EFFICIENCY RED

LTL-231 GREEN
LTL-251 YELLOW
LTL-291 ORANGE

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- CMOS/MOS AND TTL COMPATIBLE.
- LONG LIFE-SOLID STATE RELIABILITY.
- WIDE VIEWING ANGLE.
- LOW COST.

DESCRIPTION

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

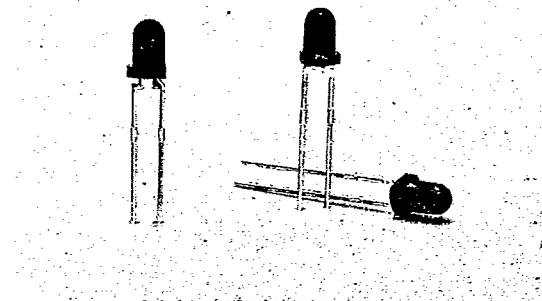
The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode.

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.

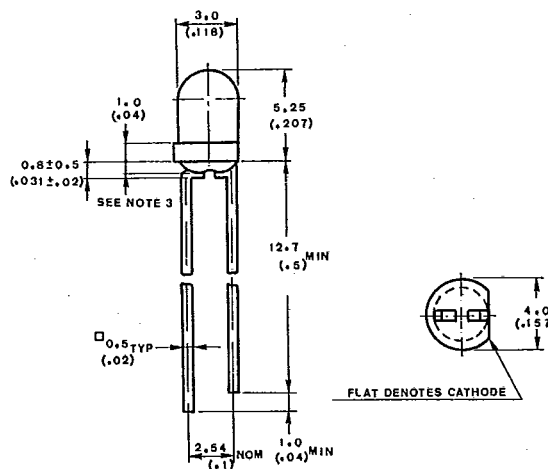
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
201 202 205	Red Red White	Diffused Transparent Diffused	Red
211	Red	Diffused	Bright Red
221	Red	Diffused	Hi. Eff. Red
231 232	Green	Diffused Transparent	Green
251 252	Yellow	Diffused Transparent	Yellow
291	Orange	Diffused	Orange



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 1.5mm (.059") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS AT $T_A = 25^\circ\text{C}$

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 25°C	0.5	0.2	0.4	0.25	0.4	mA/ $^\circ\text{C}$
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	-55°C to $+100^\circ\text{C}$					
Storage Temperature Range	-55°C to $+100^\circ\text{C}$					
Lead Soldering Temperature [1.6mm (0.063 in) From Body]	260°C for 5 Seconds					

LED LAMPS

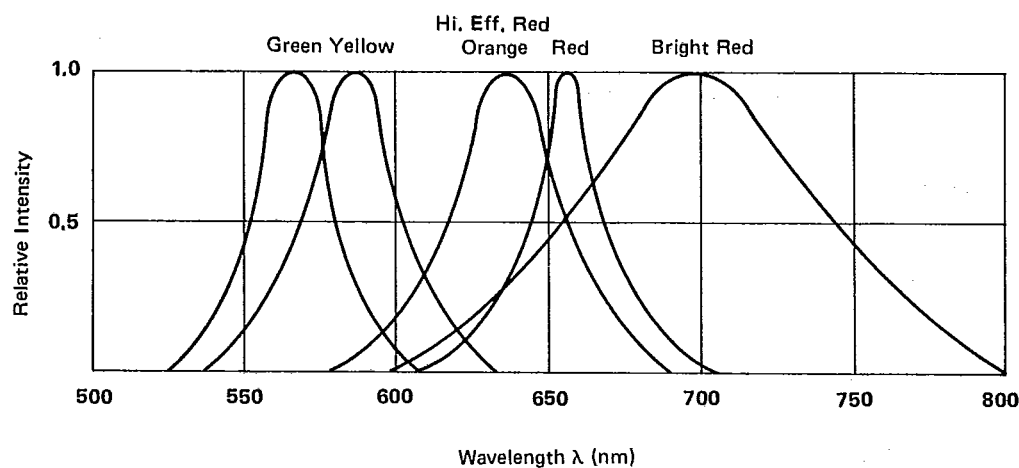


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	PART NO. LTL-	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	201 202 205	0.3 0.7 0.3	0.8 2.0 0.8		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	201 202 205		76 30 76		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}			655		nm	Measurement @Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			24		nm	
Forward Voltage	V_F			1.7	2.0	V	$I_F = 20\text{ mA}$
Reverse Current	I_R				100	μA	$V_R = 5\text{ V}$
Capactance	C			30		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 (Commission Internationale De L'Eclairage) eye-response curve.

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

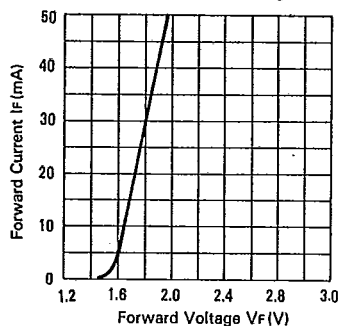


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

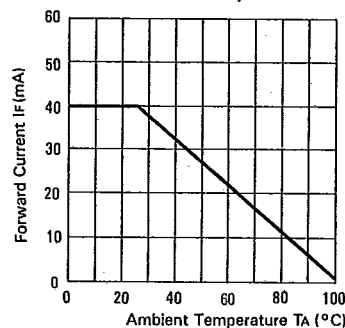


FIG. 3 FORWARD CURRENT DERATING CURVE.

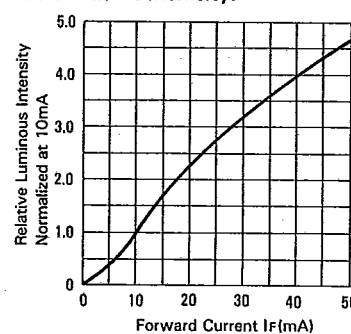


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

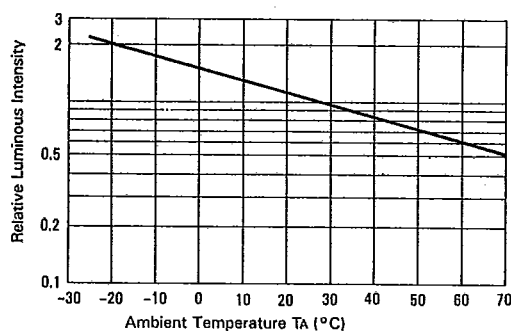


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

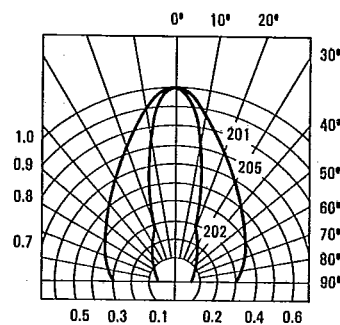


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	PART NO. LTL—	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_V	211 221	0.4 1.1	1.1 3.8		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	211 221		76 76		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	211 221		697 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	211 221		90 40		nm	
Forward Voltage	V_F	211 221		2.1 2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	211 221			100	μA	$V_R = 5\text{ V}$
Capactance	C	211 221		55 20		PF	$V_F = 0$ $f = 1\text{ MHz}$

LED LAMPS

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

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

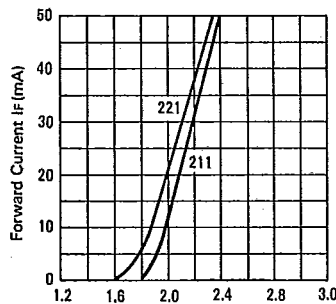


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

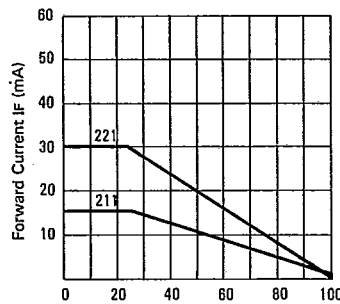


FIG. 8 FORWARD CURRENT DERATING CURVE

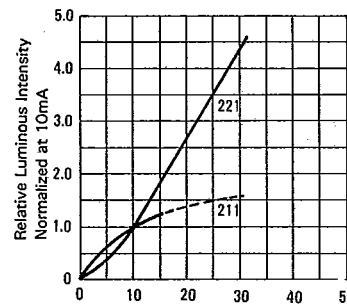


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

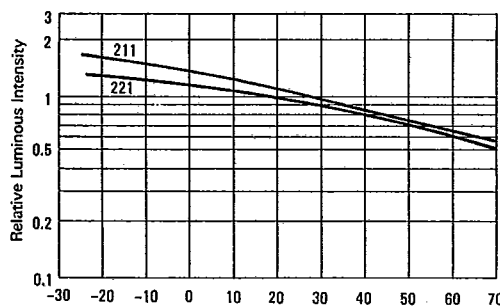


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

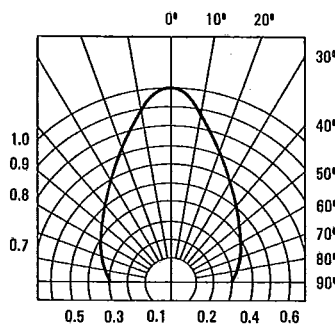


FIG. 11 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	PART NO. LTL-	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_v	231 232 251 252	1.1 2.5 1.1 2.5	3.8 8.0 3.8 8.0		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	231 232 251 252		76 30 76 30		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	231 232 251 252		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	231 232 251 252		30 30 35 35		nm	
Forward Voltage	V_F	231 232 251 252		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	231 232 251 252			100	μA	$V_R = 5\text{ V}$
Capacitance	C	231 232 251 252		35 35 15 15		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 (Commission Internationale De L'Eclairage) eye-response curve.

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

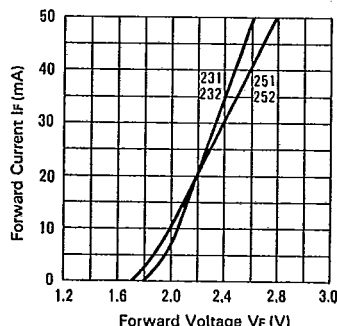


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE

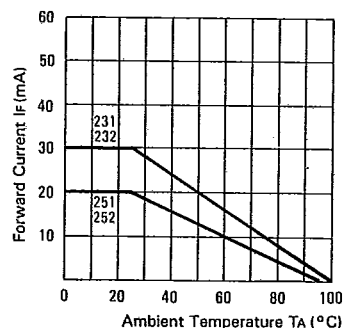


FIG. 13 FORWARD CURRENT DERATING CURVE

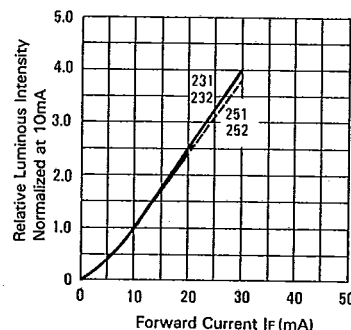


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

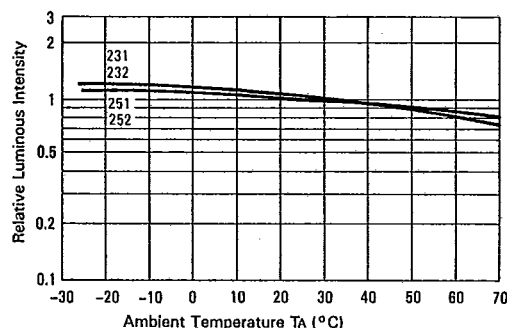


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

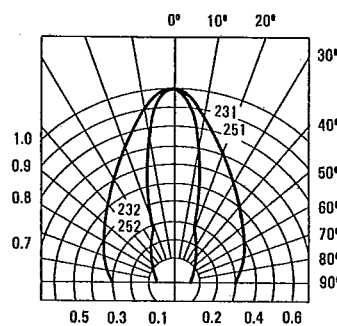


FIG. 6 SPATIAL DISTRIBUTION

ELECTRICAL/OPTICAL CHARACTERISTICS AND CURVES AT $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	PART NO. LTL-	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous Intensity	I_v	291	1.1	3.8		mod	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	291		76		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λ_{PEAK}	291		630		nm	Measurement @Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	291		40		nm	
Forward Voltage	V_F	291		2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	291			100	μA	$V_R = 5\text{ V}$
Capacitance	C	291		20		PF	$V_F = 0$ $f = 1\text{ MHz}$

LED LAMPS

NOTES: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

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

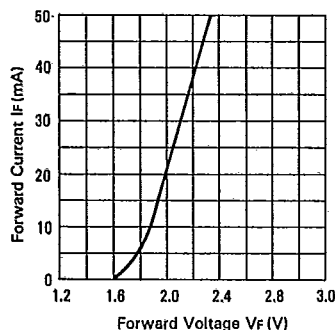


FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE.

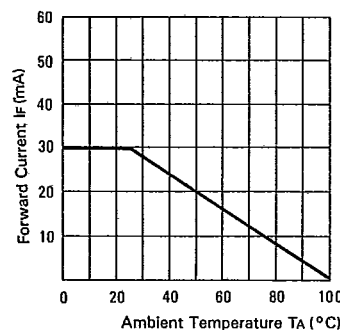


FIG. 18 FORWARD CURRENT DERATING CURVE

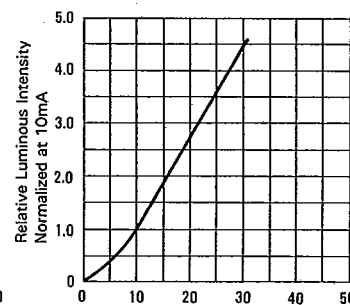


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

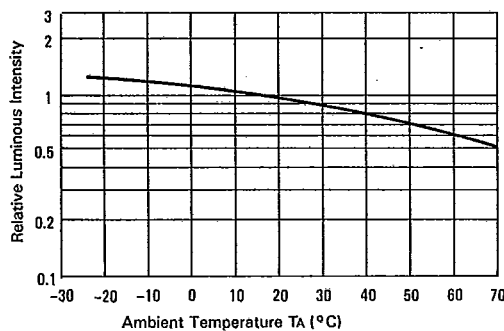


FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

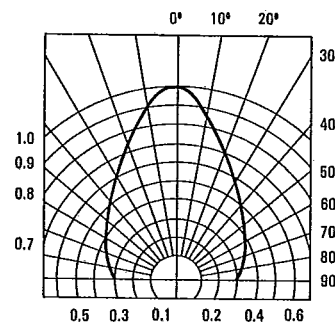


FIG. 21 SPATIAL DISTRIBUTION