



(3mm) CYLINDRICAL LED LAMPS

LTL-2201A / 2201AL RED

LTL-2211A / 2211AL BRIGHT RED

LTL-2221A / 2221AL HIGH EFFICIENCY RED

LTL-2231A / 2231AL GREEN

LTL-2251A / 2251AL YELLOW

LTL-2271A / 2271AL AMBER

LTL-2291A / 2291AL ORANGE

LED LAMPS

FEATURES

- CYLINDRICAL SHAPE.
- I.C. COMPATIBLE.
- LOW POWER CONSUMPTION.
- LONG LIFE-SOLID STATE RELIABILITY.
- LOW COST.

DESCRIPTION

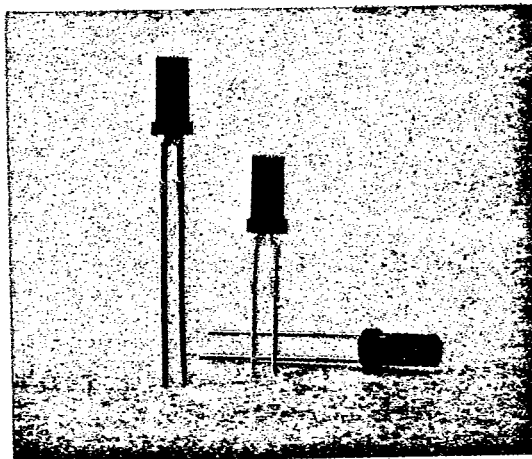
The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Red Light Emitting Diode.

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.

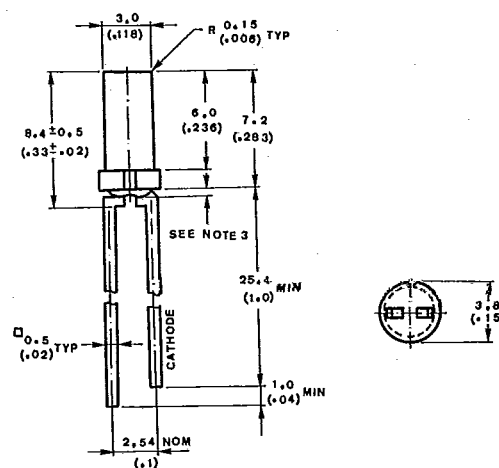
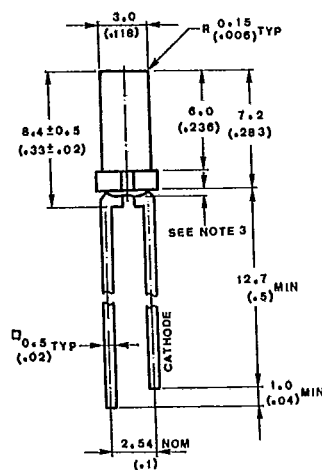
The Yellow and Amber source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.



PACKAGE DIMENSIONS

LTL-22 x 1AL Series

LTL-22 x 1A Series



NOTES:

1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25mm (.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.

2-138

213

DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
2201A	Red	Diffused	Red
2211A	Red	Diffused	Bright Red
2221A	Red	Diffused	Hi. Eff. Red
2231A	Green	Diffused	Green
2251A	Yellow	Diffused	Yellow
2271A	Amber	Diffused	Amber
2291A	Orange	Diffused	Orange

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
2201AL	Red	Diffused	Red
2211AL	Red	Diffused	Bright Red
2221AL	Red	Diffused	Hi. Eff. Red
2231AL	Green	Diffused	Green
2251AL	Yellow	Diffused	Yellow
2271AL	Amber	Diffused	Amber
2291AL	Orange	Diffused	Orange

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

PARAMETER	RED	BRIGHT RED	GREEN	YELLOW AMBER	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 (0.063in) From Body]	260°C for 5 Seconds					

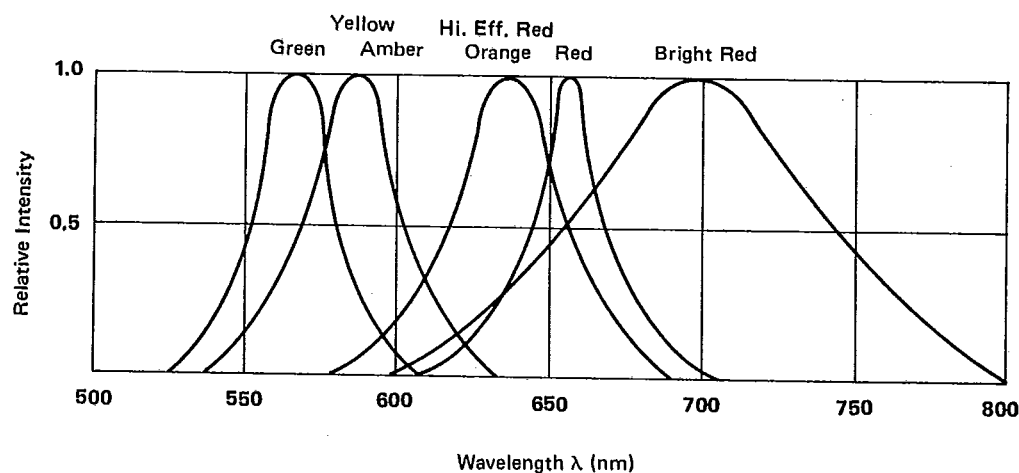


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

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	2201A 2211A 2201AL 2211AL	0.1 0.15 0.1 0.4	0.2 0.3 0.2 1.1		mcd	$I_F = 10\text{mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	2201A 2211A 2201AL 2211AL		180		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	2201A 2211A 2201AL 2211AL		655 697 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2201A 2211A 2201AL 2211AL		24 90 24 90		nm	
Forward Voltage	V_F	2201A 2211A 2201AL 2211AL		1.7 2.1 1.7 2.1	2.0 2.8 2.0 2.8	V	$I_F = 20\text{mA}$
Reverse Current	I_R	2201A 2211A 2201AL 2211AL			100	μA	$V_R = 5\text{V}$
Capacitance	C	2201A 2211A 2201AL 2211AL		30 55 30 55		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.

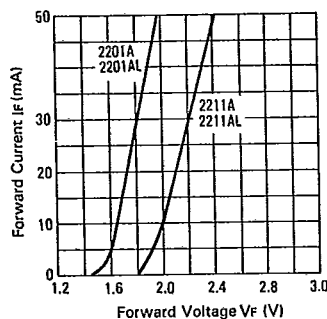


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

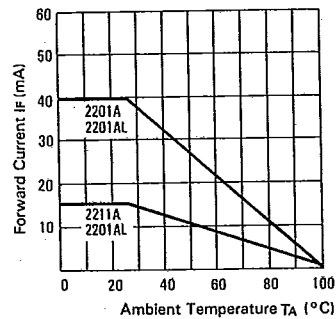


FIG. 3 FORWARD CURRENT DERATING CURVE

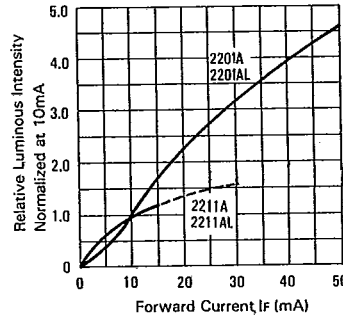


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

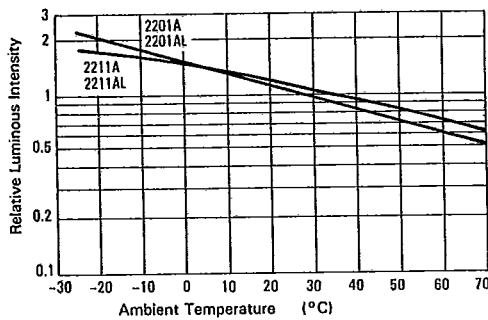


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

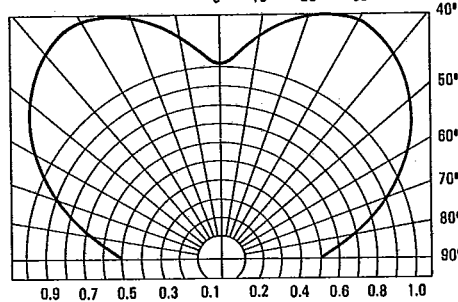


FIG. 6 SPATIAL DISTRIBUTION

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	2221A 2221AL	0.4 0.5	1.1 1.7		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	2221A 2221AL		180		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	2221A 2221AL		635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2221A 2221AL		40		nm	
Forward Voltage	V_F	2221A 2221AL		2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	2221A 2221AL			100	μA	$V_R = 5\text{ V}$
Capacitance	C	2221A 2221AL		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 (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.

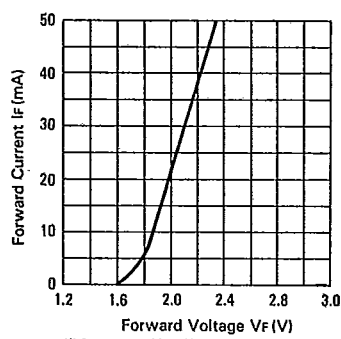


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

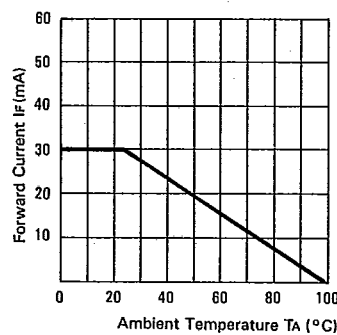


FIG. 8 FORWARD CURRENT DERATING CURVE

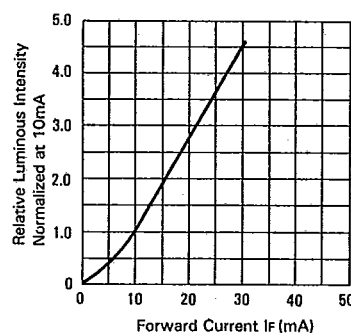


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

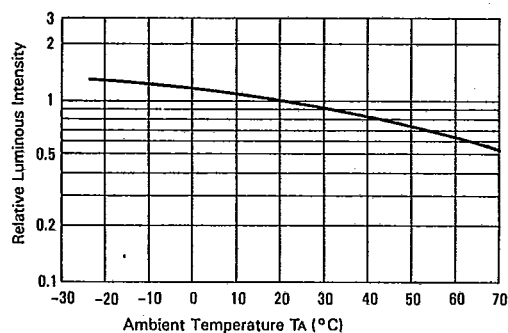


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

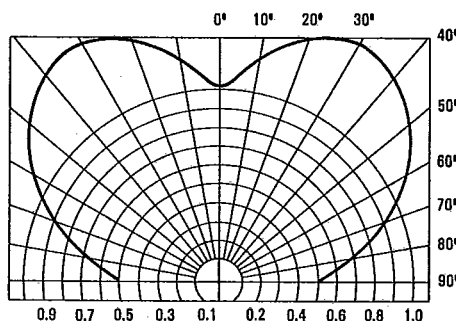


FIG. 11 SPATIAL DISTRIBUTION

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	2271A 2291A 2271AL 2291AL	0.3 0.3 0.7 0.5	1.1 1.1 2.5 1.7		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	2271A 2291A 2271AL 2291AL		180		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λ_{PEAK}	2271A 2291A 2271AL 2291AL		600 630 600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2271A 2291A 2271AL 2291AL		35 40 35 40		nm	
Forward Voltage	V_F	2271A 2291A 2271AL 2291AL		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	2271A 2291A 2271AL 2291AL			100	μA	$V_R = 5\text{ V}$
Capacitance	C	2271A 2291A 2271AL 2291AL		15 20 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 (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.

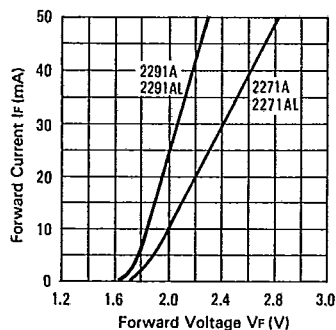


FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE

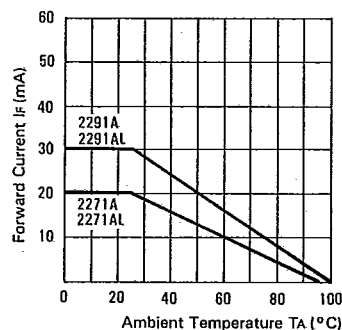


FIG. 18 FORWARD CURRENT DERATING CURVE

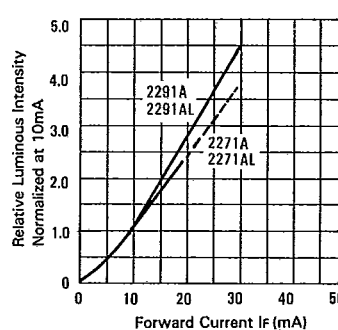


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

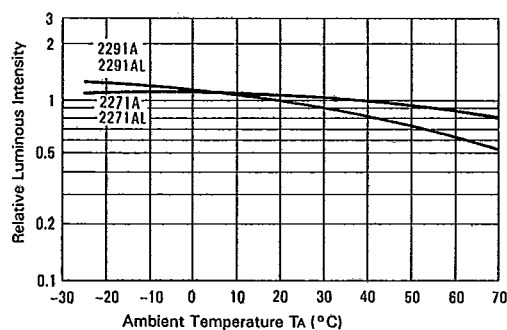


FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

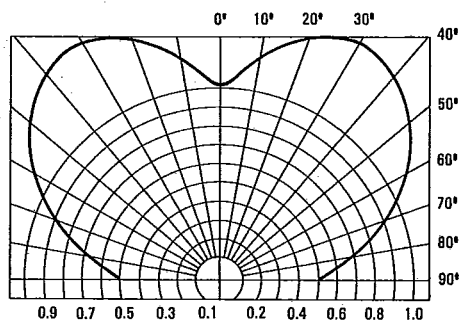


FIG. 21 SPATIAL DISTRIBUTION

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	2231A 2251A 2231AL 2251AL	0.3 0.3 0.7 0.7	1.1 1.1 2.6 2.6		mcd	$I_F = 10\text{mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	2231A 2251A 2231AL 2251AL		180		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	2231A 2251A 2231AL 2251AL		585 585 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2231A 2251A 2231AL 2251AL		30 30 35 35		nm	
Forward Voltage	V_F	2231A 2251A 2231AL 2251AL		2.1	2.8	V	$I_F = 20\text{mA}$
Reverse Current	I_R	2231A 2251A 2231AL 2251AL			100	μA	$V_R = 5\text{V}$
Capacitance	C	2231A 2251A 2231AL 2251AL		35 35 15 15		PF	$V_F = 0$ $f = 1\text{MHz}$

SMD
LED

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.

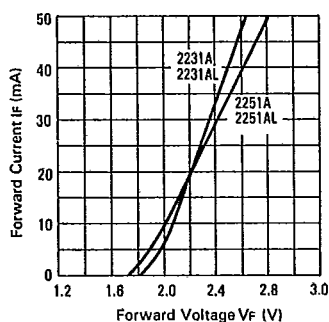


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE

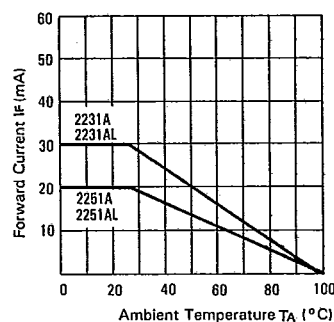


FIG. 13 FORWARD CURRENT DERATING CURVE

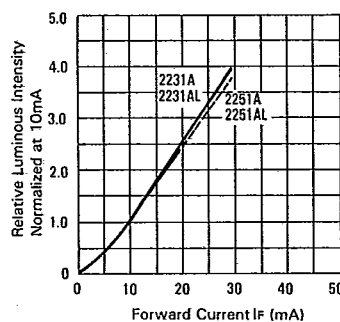


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

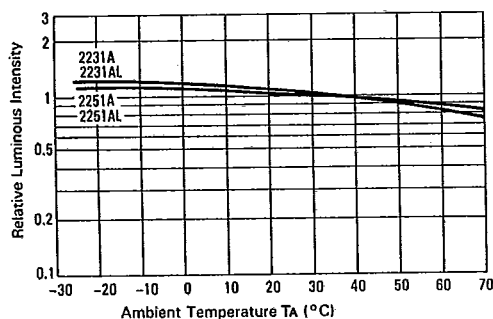


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

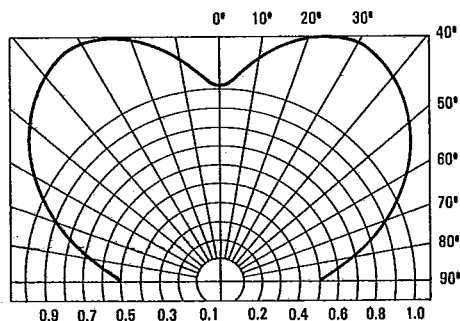


FIG. 16 SPATIAL DISTRIBUTION

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	2271A 2291A 2271AL 2291AL	0.3 0.3 0.7 0.6	1.1 1.1 2.5 1.7		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	2271A 2291A 2271AL 2291AL		180		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λ_{PEAK}	2271A 2291A 2271AL 2291AL		600 630 600 630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	2271A 2291A 2271AL 2291AL		35 40 35 40		nm	
Forward Voltage	V_F	2271A 2291A 2271AL 2291AL		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	2271A 2291A 2271AL 2291AL			100	μA	$V_R = 5\text{V}$
Capacitance	C	2271A 2291A 2271AL 2291AL		15 20 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 (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.

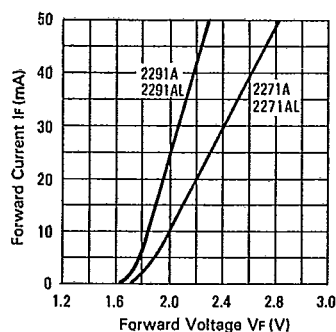


FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE

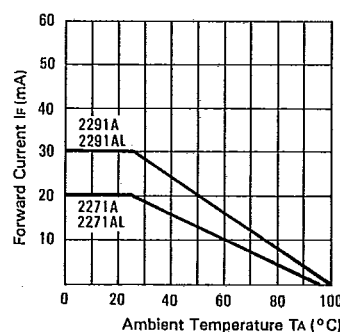


FIG. 18 FORWARD CURRENT DERATING CURVE

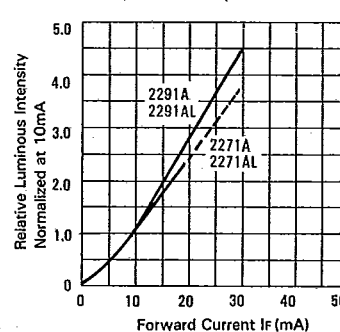


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

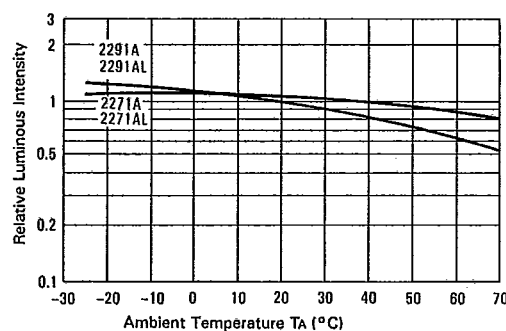


FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

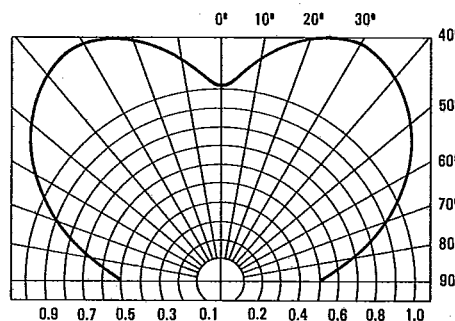


FIG. 21 SPATIAL DISTRIBUTION