

LITE-ON**T-1(3mm) SOLID STATE LAMPS**

LTL-4201/4201N RED

LTL-4211/4211N BRIGHT RED

LTL-4221/4221N HIGH EFFICIENCY RED

LTL-4231/4231N GREEN

LTL-4251/4251N YELLOW

LTL-4291/4291N ORANGE

T-41-21

FEATURES

- LOW POWER CONSUMPTION.
- HIGH EFFICIENCY.
- VERSATILE MOUNTING ON P.C. BOARD OR PANEL.
- I.C. COMPATIBLE/LOW CURRENT REQUIREMENTS.
- POPULAR T-1 DIAMETER, 25mm (1") LENGTH OF LEADS PACKAGE.
- RELIABLE AND RUGGED.
- LOW COST.

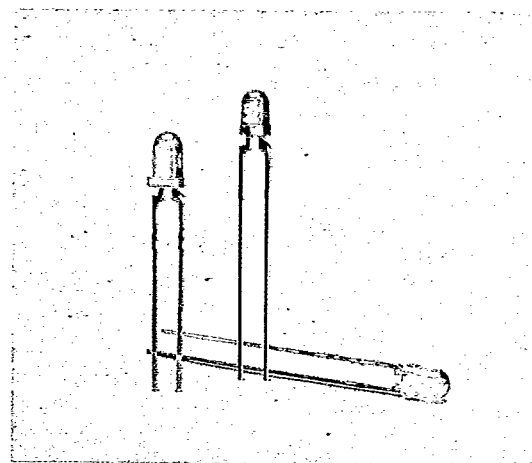
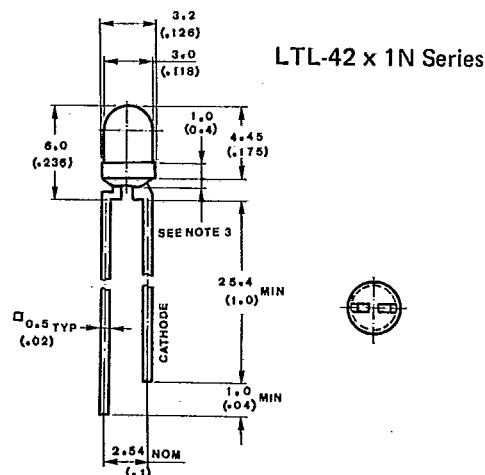
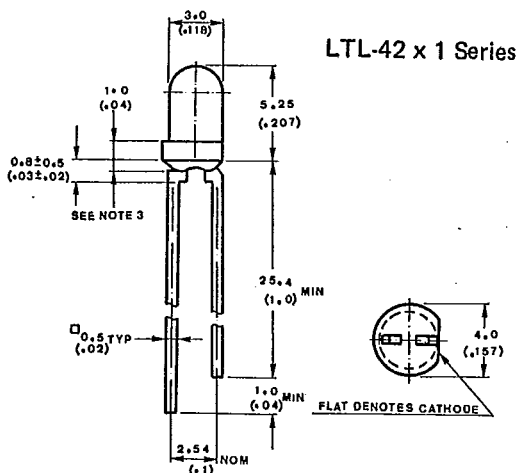
DESCRIPTION

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.

**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.

2-112

391

T-41-21

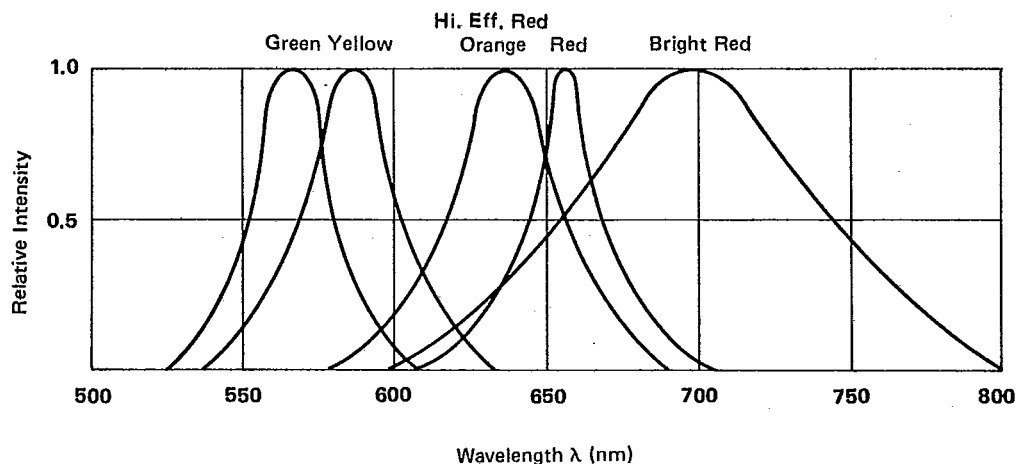
DEVICES

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4201	Red	Diffused	Red
4202	Red	Transparent	
4206	Water Clear	Non-diffused	
4211	Red	Diffused	Bright Red
4221	Red	Diffused	Hi. Eff. Red
4222	Red	Transparent	
4231	Green	Diffused	Green
4232	Green	Transparent	
4251	Yellow	Diffused	Yellow
4252	Yellow	Transparent	
4291	Orange	Diffused	Orange
4292	Orange	Transparent	
4296	Water Clear	Non-diffused	

PART NO. LTL-	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4201N	Red	Diffused	Red
4202N		Transparent	
4211N		Diffused	
4221N	Red	Diffused	Hi. Eff. Red
4222N		Transparent	
4231N	Green	Diffused	Green
4232N		Transparent	
4236N		Non-diffused	
4251N	Yellow	Diffused	Yellow
4252N		Transparent	
4256N		Non-diffused	
4291N	Orange	Diffused	Orange
4292N		Transparent	
4296N		Non-diffused	

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 (0.063in) From Body]	260°C for 5 Seconds					



Wavelength λ (nm)

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	4201 4202 4211	0.3 1.1 0.6	0.8 4.0 1.7		mcđ	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4201 4202 4211		40 20 40		deg.	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	4201 4202 4211		655 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4201 4202 4211		24 24 90		nm	
Forward Voltage	V_F	4201 4202 4211		1.7 1.7 2.1	2.0 2.0 2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4201 4202 4211			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4201 4202 4211		30 30 55		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.

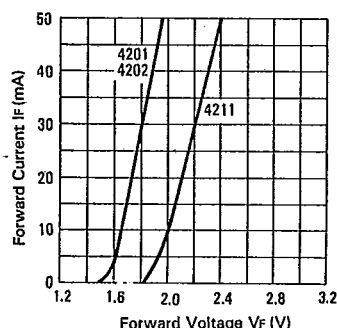


FIG. 2 FORWARD CURRENT VS FORWARD VOLTAGE.

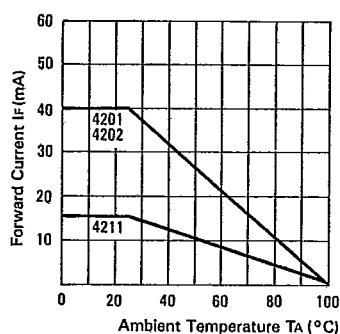


FIG. 3 FORWARD CURRENT DERATING CURVE

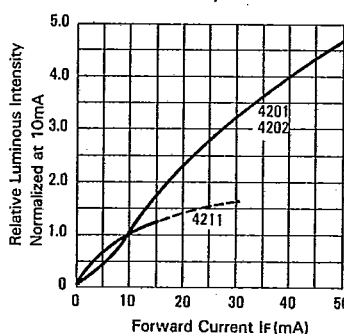


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

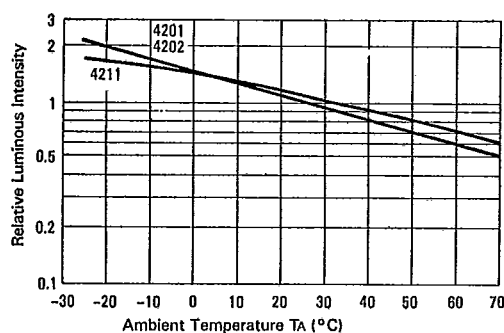


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

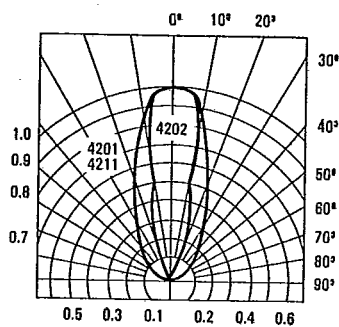


FIG. 6 SPATIAL DISTRIBUTION



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	4221 4222	1.1 4.0	3.8 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4221 4222		40 20		deg.	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	4221 4222		635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4221 4222		40 40		nm	
Forward Voltage	V_F	4221 4222		2.0 2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4221 4222			100	μA	$V_R = 5\text{ V}$
Capactance	C	4221 4222		20 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.

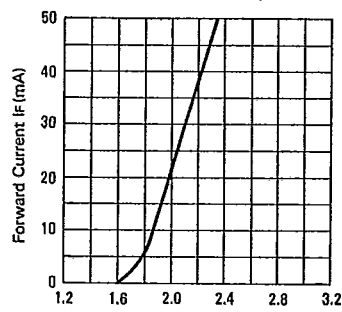


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

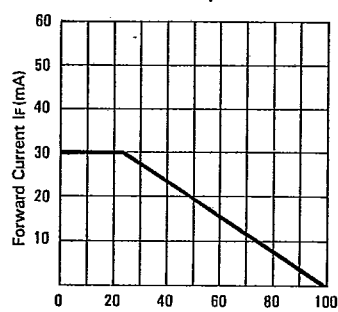


FIG. 8 FORWARD CURRENT DERATING CURVE

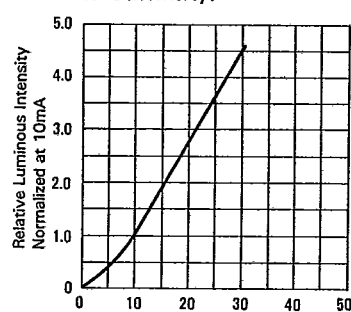


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

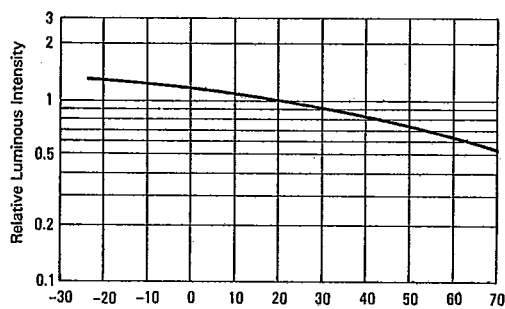


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

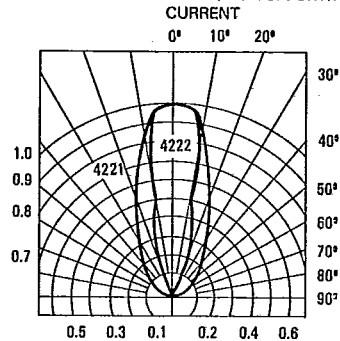


FIG. 11 SPATIAL DISTRIBUTION

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	4231 4232 4251 4252	1.7 4.0 1.7 4.0	5.6 12.6 5.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4231 4232 4251 4252		40 20 40 20		deg.	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	4231 4232 4251 4252		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4231 4232 4251 4252		30 30 35 35		nm	
Forward Voltage	V_F	4231 4232 4251 4252		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4231 4232 4251 4252			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4231 4232 4251 4252		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.

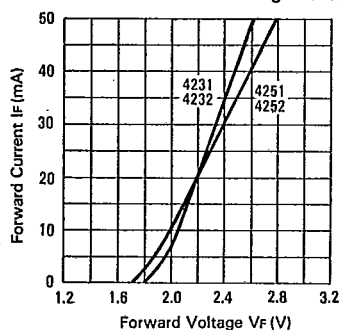


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE

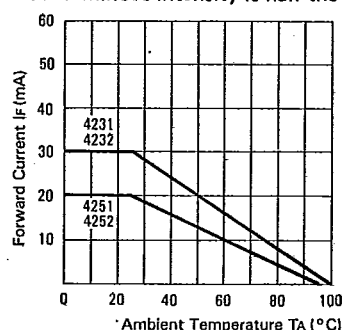


FIG. 13 FORWARD CURRENT DERATING CURVE

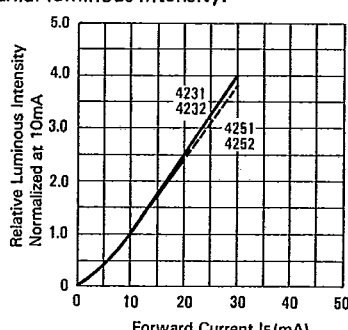


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

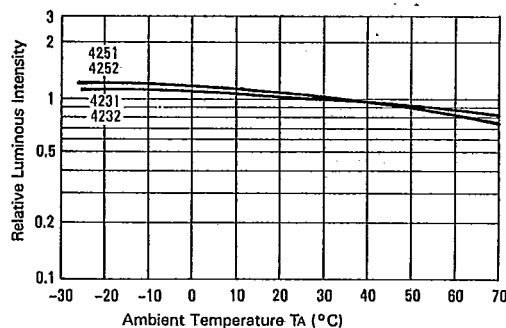


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

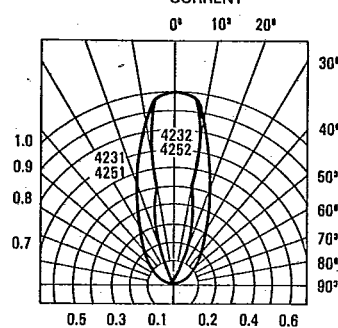


FIG. 16 SPATIAL DISTRIBUTION



T-41-21

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	4291 4292 4296	1.7 4.0 4.0	5.6 12.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4291 4292 4296		40 20 20		deg.	Note 2 (Fig. 21)
Peak Emission Wavelength	λ_{PEAK}			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R				100	μA	$V_R = 5\text{ V}$
Capacitance	C			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.

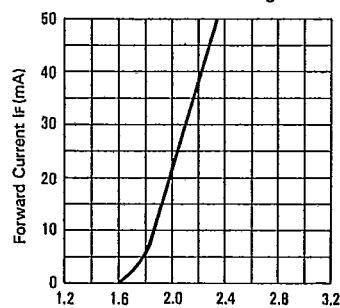


FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE

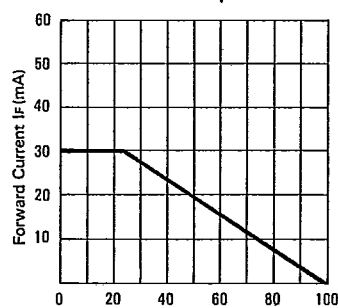


FIG. 18 FORWARD CURRENT DERATING CURVE

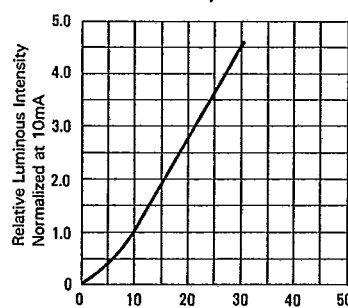


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

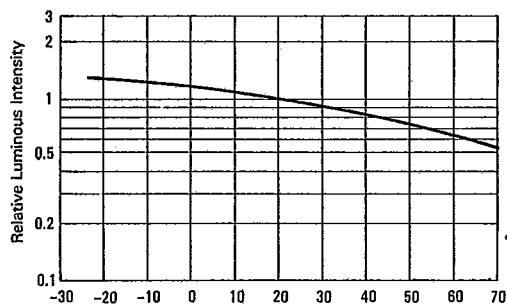


FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

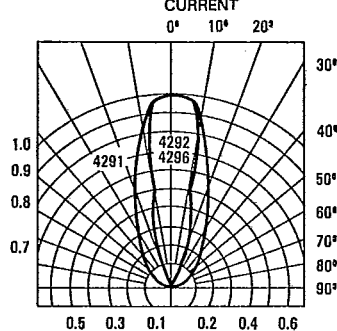


FIG. 21 SPATIAL DISTRIBUTION

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	4201N 4202N 4211N	0.3 0.8 0.8	0.8 2.5 2.5		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4201N 4202N 4211N		60 45 60		deg.	Note 2 (Fig. 26)
Peak Emission Wavelength	λ_{PEAK}	4201N 4202N 4211N		655 655 697		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4201N 4202N 4211N		24 24 90		nm	
Forward Voltage	V_F	4201N 4202N 4211N		1.7 1.7 2.0	2.0 2.0 2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4201N 4202N 4211N			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4201N 4202N 4211N		30 30 55		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.

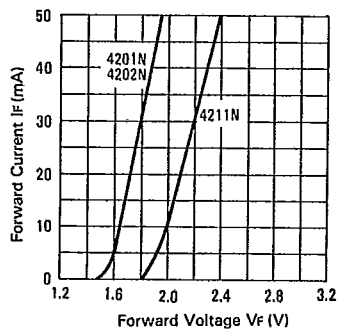


FIG. 22 FORWARD CURRENT VS. FORWARD VOLTAGE.

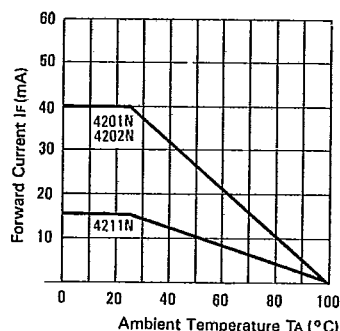


FIG. 23 FORWARD CURRENT DERATING CURVE

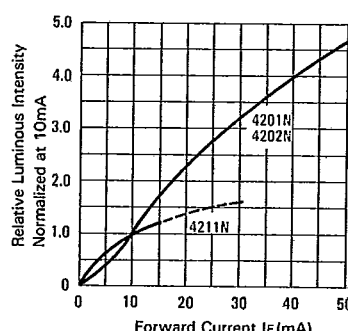


FIG. 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

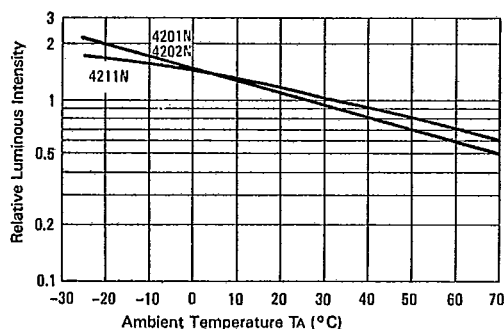


FIG. 25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

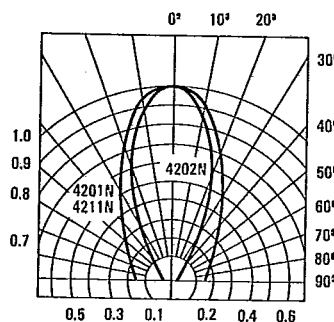


FIG. 26 SPATIAL DISTRIBUTION



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	4221N 4222N	1.7 4.0	5.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4221N 4222N		60 45		deg.	Note 2 (Fig. 31)
Peak Emission Wavelength	λ_{PEAK}	4221N 4222N		635 635		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4221N 4222N		40 40		nm	
Forward Voltage	V_F	4221N 4222N		2.0 2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4221N 4222N			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4221N 4222N		20 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.

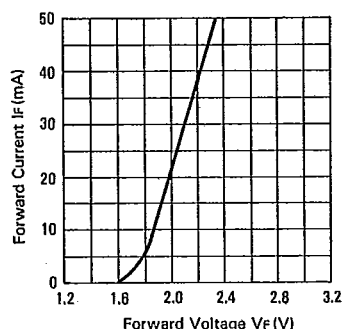


FIG. 27 FORWARD CURRENT VS. FORWARD VOLTAGE

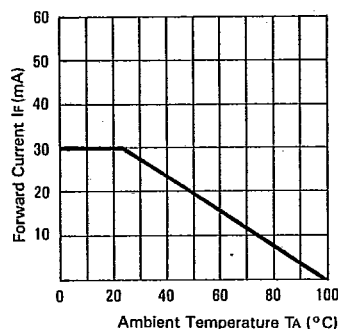


FIG. 28 FORWARD CURRENT DERATING CURVE

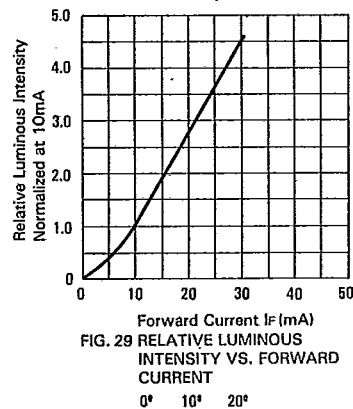


FIG. 29 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

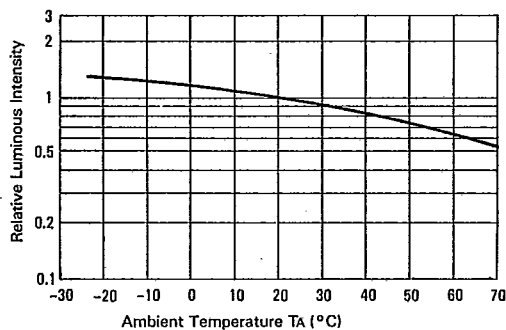


FIG. 30 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

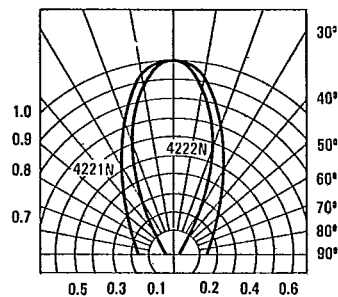


FIG. 31 SPATIAL DISTRIBUTION

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	4231N 4232N 4236N	1.7 4.0 4.0	5.6 12.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4231N 4232N 4236N		60 45 45		deg.	Note 2 (Fig. 36)
Peak Emission Wavelength	λ_{PEAK}	4231N 4232N 4236N		565		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4231N 4232N 4236N		30		nm	
Forward Voltage	V_F	4231N 4232N 4236N		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4231N 4232N 4236N			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4231N 4232N 4236N		35		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.

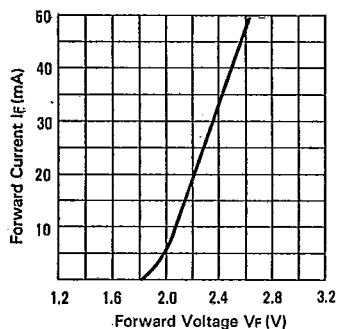


FIG. 32 FORWARD CURRENT VS. FORWARD VOLTAGE.

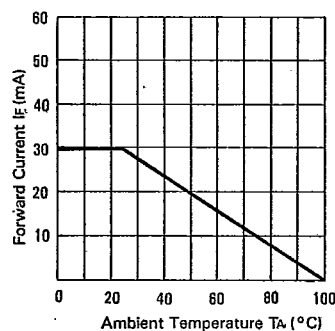


FIG. 33 FORWARD CURRENT DERATING CURVE.

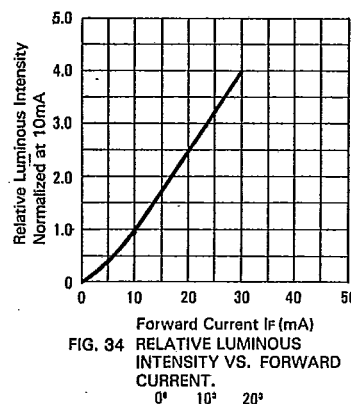


FIG. 34 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

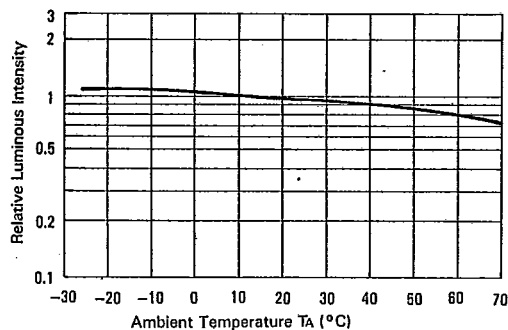


FIG. 35 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

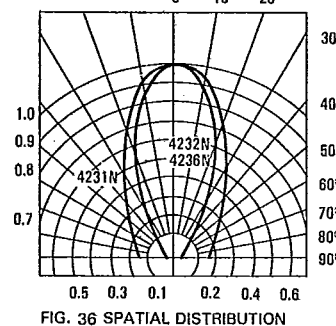


FIG. 36 SPATIAL DISTRIBUTION



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	4251N 4252N 4256N	1.7 4.0 4.0	5.6 12.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4251N 4252N 4256N		60 45 45		deg.	Note 2 (Fig. 41)
Peak Emission Wavelength	λ_{PEAK}	4251N 4252N 4256N		585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4251N 4252N 4256N		35		nm	
Forward Voltage	V_F	4251N 4252N 4256N		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4251N 4252N 4256N			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4251N 4252N 4256N		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.

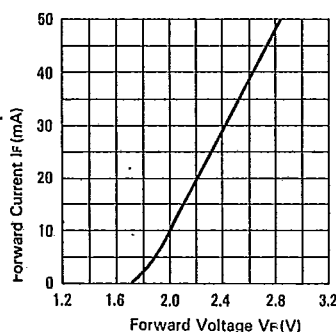


FIG. 37 FORWARD CURRENT VS. FORWARD VOLTAGE

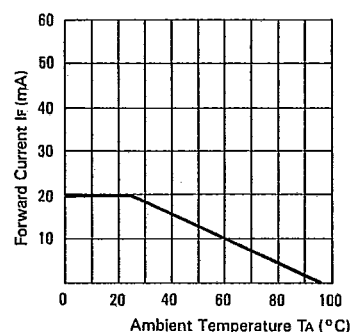


FIG. 38 FORWARD CURRENT DERATING CURVE

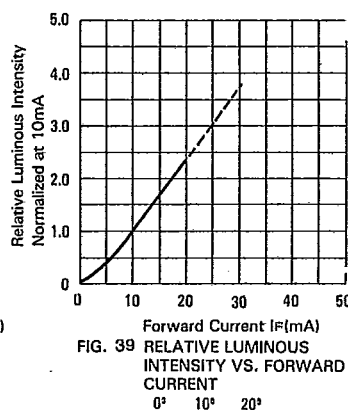


FIG. 39 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

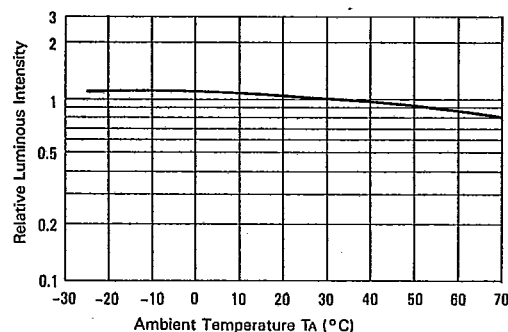


FIG. 40 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

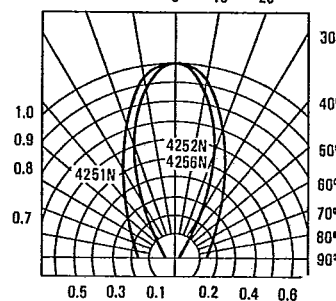


FIG. 41 SPATIAL DISTRIBUTION

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	4291N 4292N 4296N	1.7 4.0 4.0	5.6 12.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4291N 4292N 4296N		60 45 45		deg.	Note 2 (Fig. 46)
Peak Emission Wavelength	λ_{PEAK}			630		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$			40		nm	
Forward Voltage	V_F			2.0	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R				100	μA	$V_R = 5\text{ V}$
Capacitance	C			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.

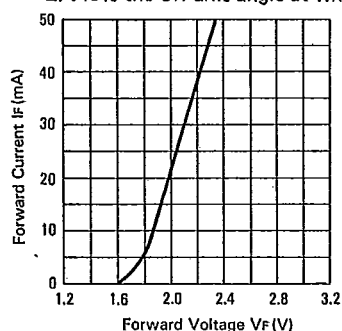


FIG. 42 FORWARD CURRENT VS. FORWARD VOLTAGE

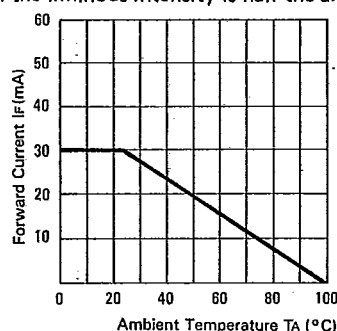


FIG. 43 FORWARD CURRENT DERATING CURVE

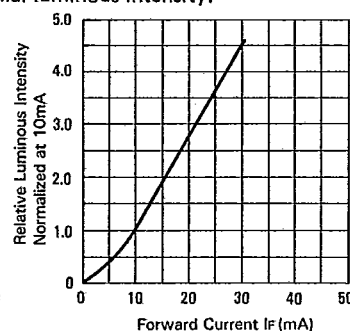


FIG. 44 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

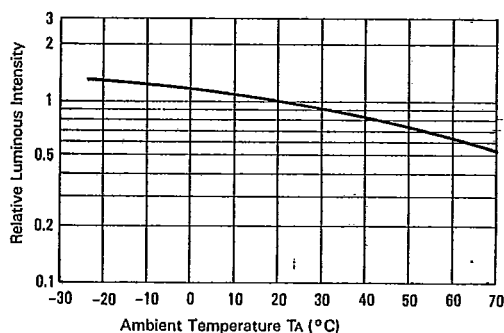


FIG. 45 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

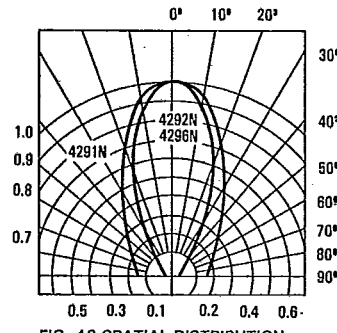


FIG. 46 SPATIAL DISTRIBUTION

