

DEVICES

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

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

LED LAMPS

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					

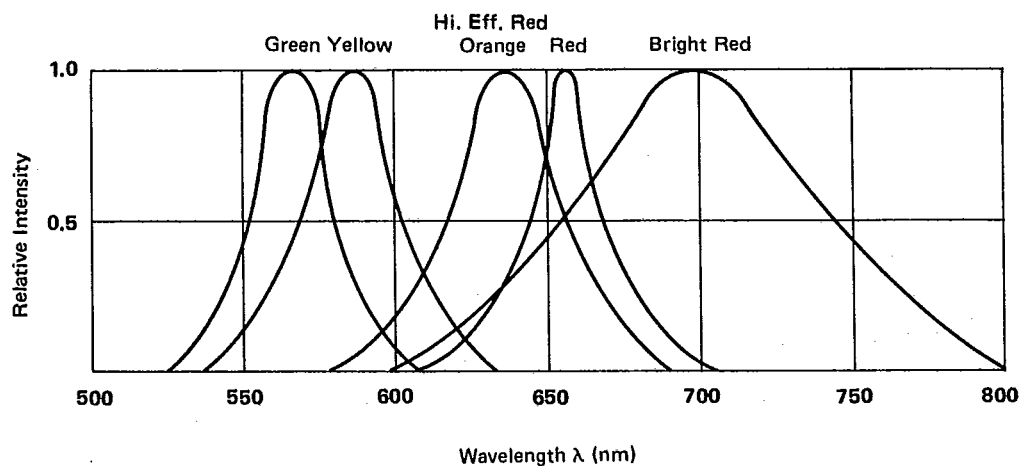


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

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		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4201 4202 4211		40 20 40		deg.	Note (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	$V_F = 0$ $f = 1\text{ MHz}$

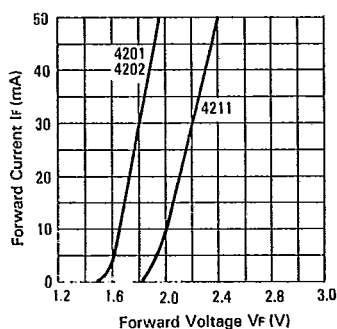


FIG. 2 FORWARD CURRENT VS. FORWARD VOLTAGE.

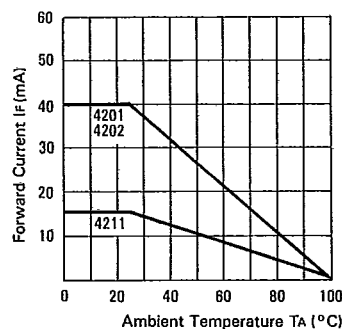


FIG. 3 FORWARD CURRENT DERATING CURVE

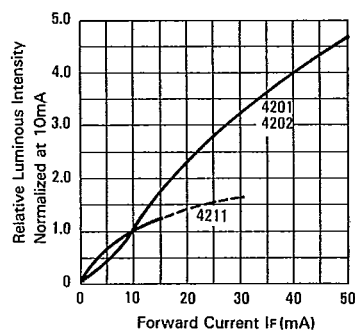


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

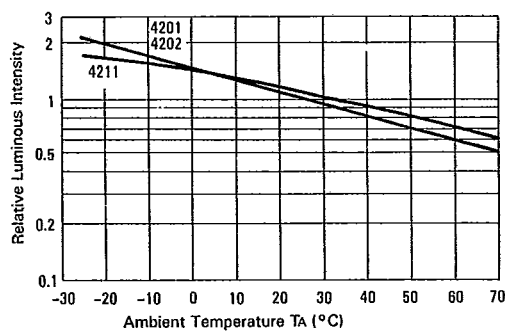


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

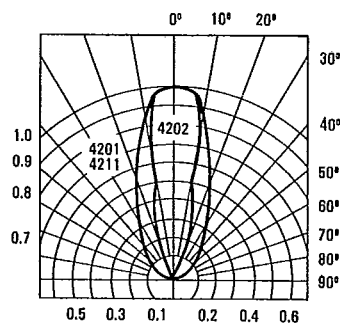


FIG. 6 SPATIAL DISTRIBUTION

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	1.7 4.0	5.6 12.6		cd	$I_F = 10\text{ mA}$ 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	$V_R = 5\text{ V}$
Capacitance	C	4221 4222		20 20		PF	$V_F = 0$ $f = 1\text{ MHz}$

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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.

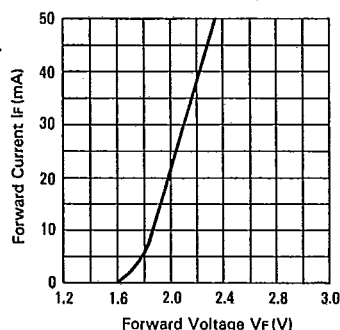


FIG. 7 FORWARD CURRENT VS. FORWARD VOLTAGE

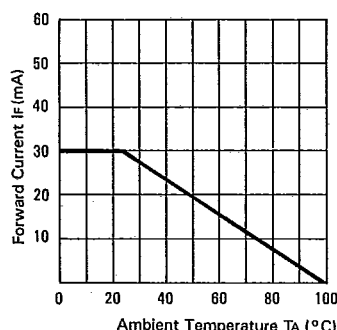


FIG. 8 FORWARD CURRENT DERATING CURVE

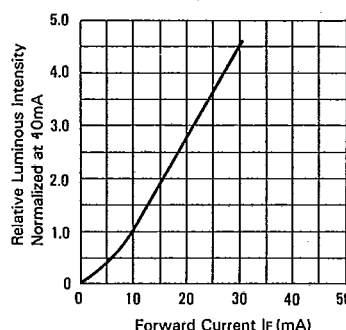


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

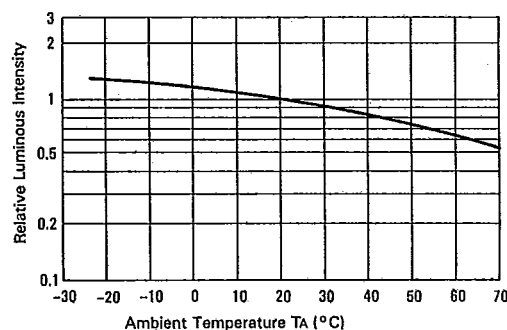


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

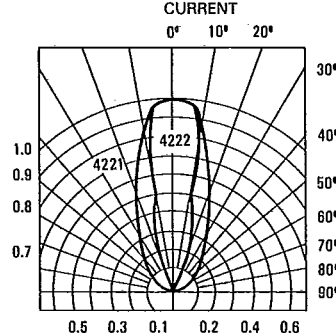


FIG. 11 SPATIAL DISTRIBUTION

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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.

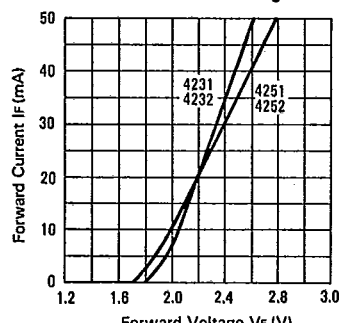


FIG. 12 FORWARD CURRENT VS. FORWARD VOLTAGE

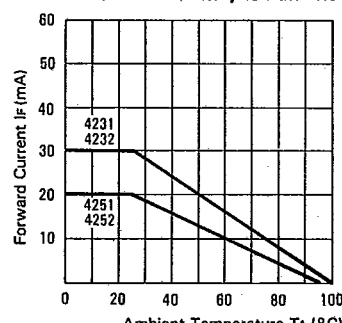


FIG. 13 FORWARD CURRENT DERATING CURVE

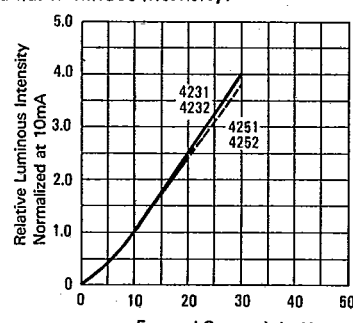


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

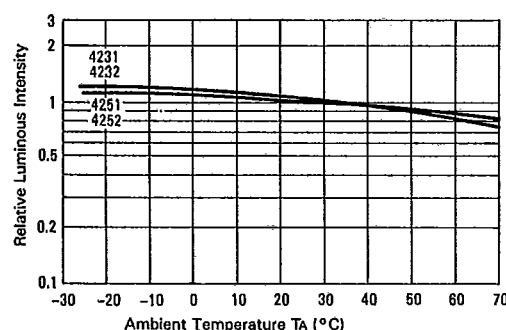


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

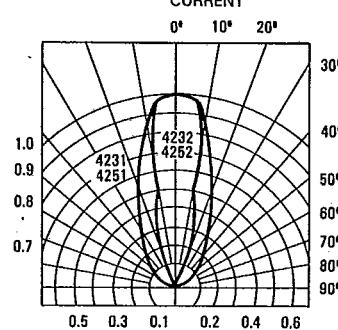


FIG. 16 SPATIAL DISTRIBUTION

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	$V_F = 0$ $f = 1\text{ MHz}$

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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.

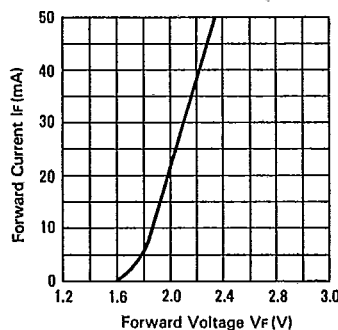


FIG. 17 FORWARD CURRENT VS. FORWARD VOLTAGE

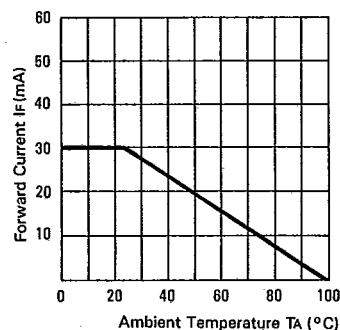


FIG. 18 FORWARD CURRENT DERATING CURVE

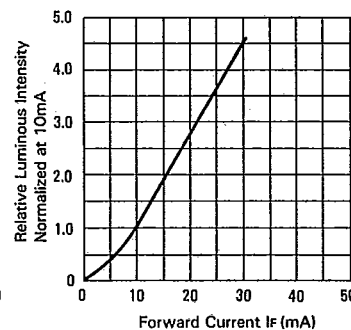


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

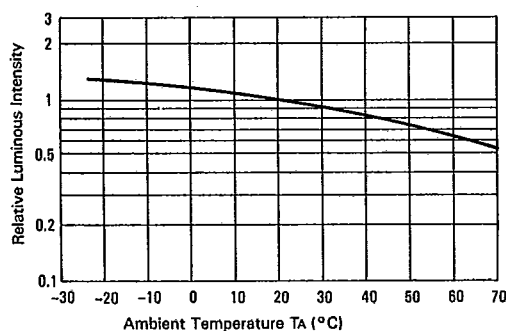


FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

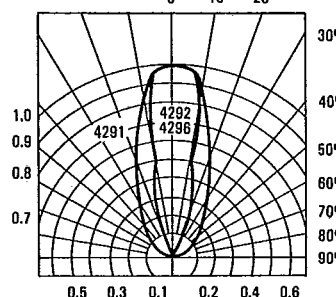


FIG. 21 SPATIAL DISTRIBUTION

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 1.1 0.8	0.8 4.0 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 65		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.

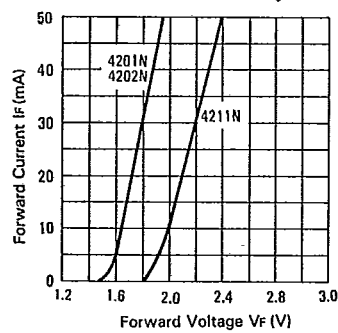


FIG. 22 FORWARD CURRENT VS. FORWARD VOLTAGE.

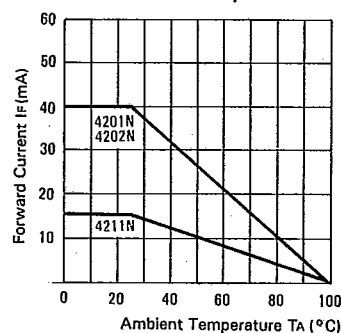


FIG. 23 FORWARD CURRENT DERATING CURVE

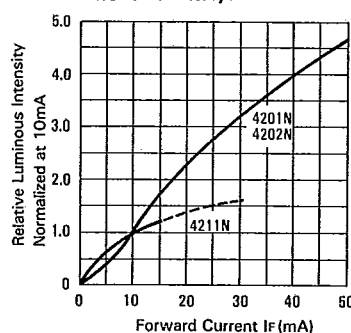


FIG. 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT.

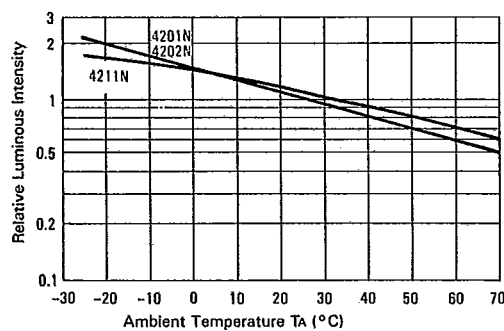


FIG. 25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

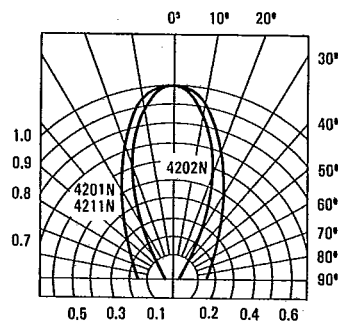


FIG. 26 SPATIAL DISTRIBUTION

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	$V_F = 0$ $f = 1\text{ MHz}$

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.

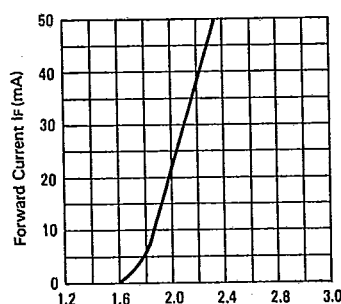


FIG. 27 FORWARD CURRENT VS. FORWARD VOLTAGE

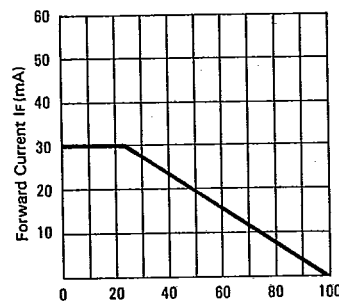


FIG. 28 FORWARD CURRENT DERATING CURVE

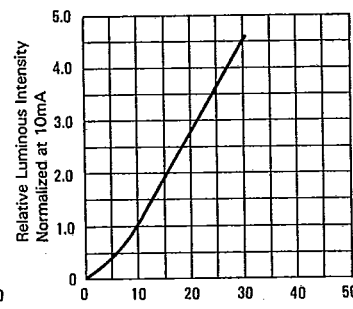


FIG. 29 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

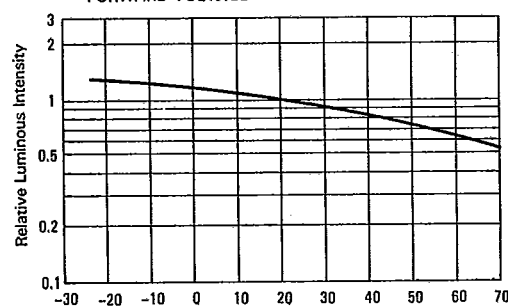


FIG. 30 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

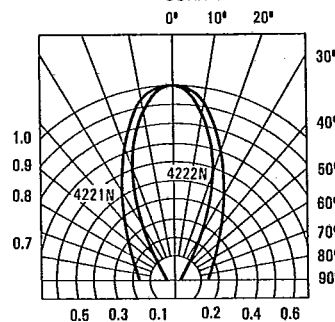


FIG. 31 SPATIAL DISTRIBUTION

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 4251N 4252N	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	$2\theta_{1/2}$	4231N 4232N 4251N 4252N		60 45 60 45		deg.	Note (Fig. 36)
Peak Emission Wavelength	λ_{PEAK}	4231N 4232N 4251N 4252N		565 565 585 585		nm	Measurement @ Peak (Fig. 1)
Spectral Line Half Width	$\Delta\lambda$	4231N 4232N 4251N 4252N		30 30 35 35		nm	
Forward Voltage	V_F	4231N 4232N 4251N 4252N		2.1	2.8	V	$I_F = 20\text{ mA}$
Reverse Current	I_R	4231N 4232N 4251N 4252N			100	μA	$V_R = 5\text{ V}$
Capacitance	C	4231N 4232N 4251N 4252N		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.

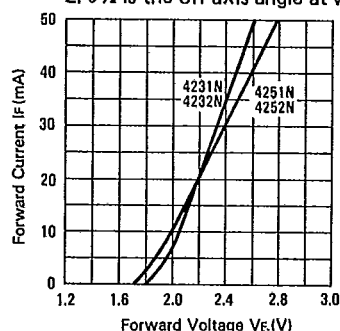


FIG. 32 FORWARD CURRENT VS. FORWARD VOLTAGE

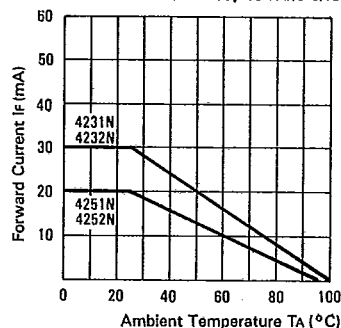


FIG. 33 FORWARD CURRENT DERATING CURVE

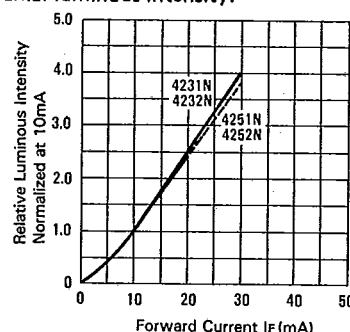


FIG. 34 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

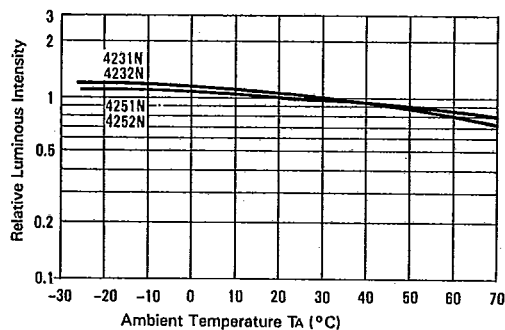


FIG. 35 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

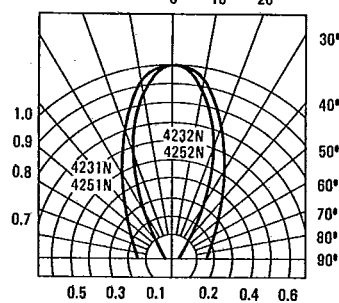


FIG. 36 SPATIAL DISTRIBUTION

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	4291N 4292N	1.7 4.0	5.6 12.6		mcd	$I_F = 10\text{ mA}$ Note 1
Viewing Angle	$2\theta_{1/2}$	4291N 4292N		60 45		deg.	Note 2 (Fig. 41)
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	$V_F = 0$ $f = 1\text{ MHz}$

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.

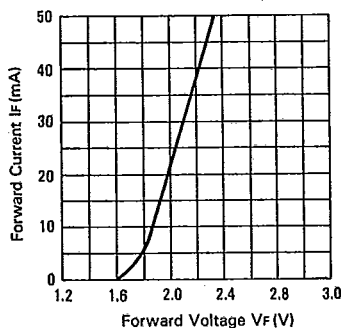


FIG. 37 FORWARD CURRENT VS. FORWARD VOLTAGE

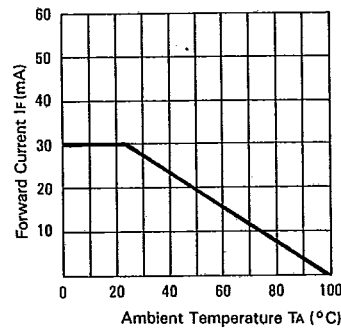


FIG. 38 FORWARD CURRENT DERATING CURVE

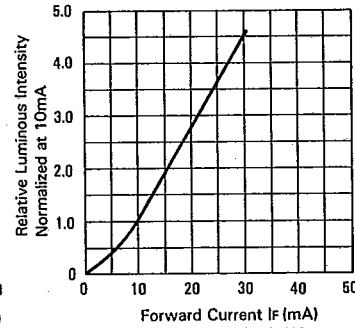


FIG. 39 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

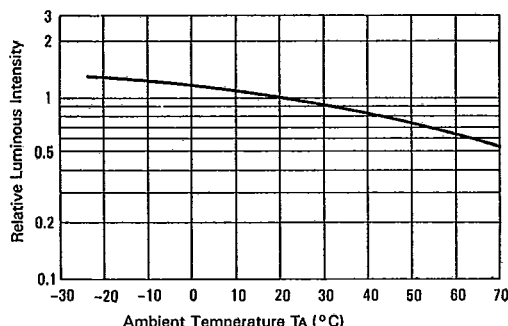


FIG. 40 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

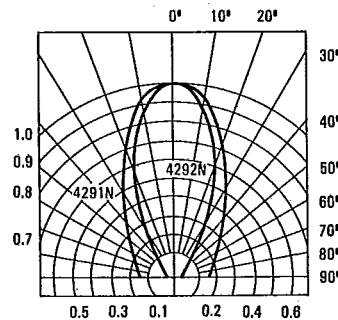


FIG. 41 SPATIAL DISTRIBUTION