



T-1 3/4 (5mm) RESISTOR LAMPS

LTL-4203-R1/R2 RED

LTL-4238-R1/R2 GREEN

LTL-4213-R1/R2 BRIGHT RED

LTL-4253-R1/R2 YELLOW

LTL-4223-R1/R2 HI.EFF.RED

LTL-4293-R1/R2 ORANGE

LTL-4233-R1/R2 GREEN

T-41-21

FEATURES

- INTEGRAL CURRENT LIMITING RESISTOR.
- COST EFFECTIVE.
Saves Spaces and Resistor Cost.
- EXTERNAL RESISTOR REQUIRED WITH
5 VOLT/12 VOLT SUPPLY.
- AVAILABLE IN ALL COLORS.
Red, High Efficiency Red, Yellow and Green in
T-1 3/4 Packages.

DESCRIPTION

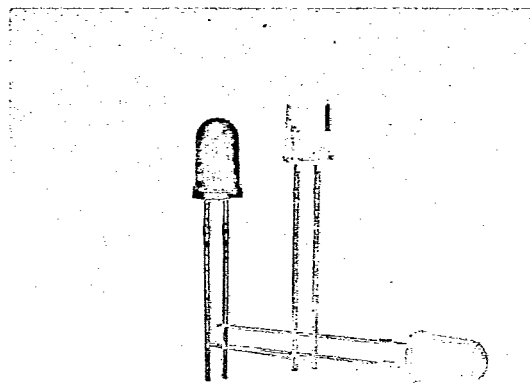
The RESISTOR LAMP contains an integral current limiting resistor in series with the LED. This allows the lamp to be driven from a high volt source without an external current limiter. The Red source color devices are made with Gallium Arsenide Phosphide on Gallium Arsenide Red Light Emitting Diode. The 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.

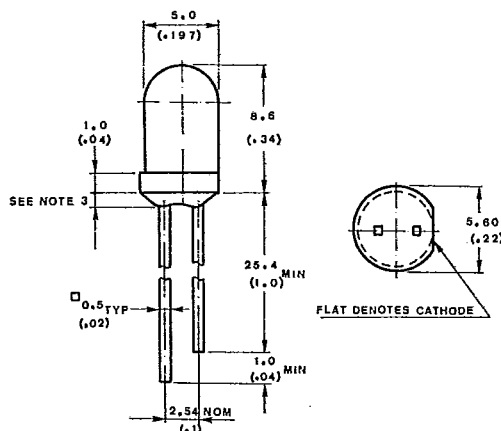
The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode.

DEVICES

PART NO. LTL--	LENS		SOURCE COLOR
	COLOR	DIFFUSION	
4203-R1/R2	Red	Diffused	Red
4213-R1/R2	Red	Diffused	Bright Red
4223-R1/R2	Red	Diffused	Hi.Eff.Red
4233-R1/R2	Green	Diffused	Green
4238-R1/R2	Water Clear	Non-Diffused	Green
4253-R1/R2	Yellow	Diffused	Yellow
4293-R1/R2	Orange	Diffused	Orange



PACKAGE DIMENSION



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

T-41-21

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

PARAMETER	RED/BRIGHT RED/HI.EFF.RED GREEN/YELLOW/ORANGE 5V LAMPS	RED/BRIGHT RED/HI.EFF.RED GREEN/YELLOW/ORANGE 12V LAMPS	UNIT
DC Forward Voltage ($T_A = 25^\circ\text{C}$)	7.5	15	volts
Reverse Voltage	5	5	volts
Operating Temperature Range	-40°C to $+85^\circ\text{C}$		
Storage Temperature Range	-55°C to $+100^\circ\text{C}$		
Lead Soldering Temperature [1.6mm (0.063in) From Body]	260°C for 5 Seconds		

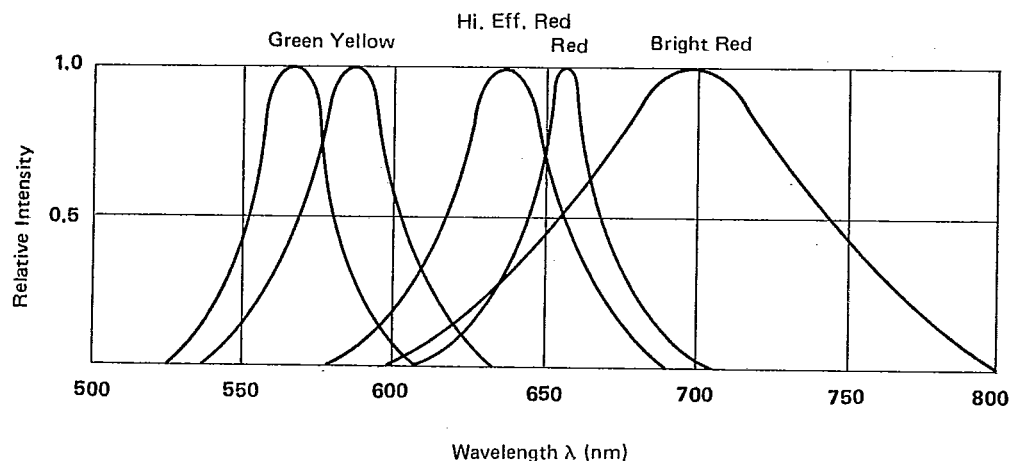
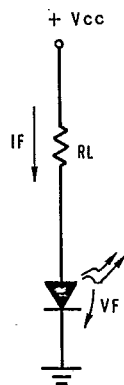


FIG. 1 RELATIVE INTENSITY VS. WAVELENGTH

EQUIVALENT CIRCUIT:



$V_{CC} = 5$ volts
($R_L = 250$ ohms $\pm 20\%$)

$V_{CC} = 12$ volts
($R_L = 800$ ohms $\pm 20\%$)

$$I_F = \frac{V_{CC} - V_F}{R_L}$$



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	4203-R1	0.3	0.8		mcd	VF=5V
		4203-R2	0.3	1.0			VF=12V
Viewing Angle	$2\theta_{1/2}$	4203-R1/R2		36		deg	Note 2 (Fig. 6)
Peak Emission Wavelength	λ_{PEAK}	4203-R1/R2		655		nm	Measurement @Peak (Fig. 1)
Spectral Line Half - Width	$\Delta\lambda$	4203-R1/R2		24		nm	
Forward Current 5V Devices	IF	4203-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	IF	4203-R2		12	20	mA	VF = 12V
Reverse Current	IR	4203-R1/R2			100	μA	VR = 5V

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.

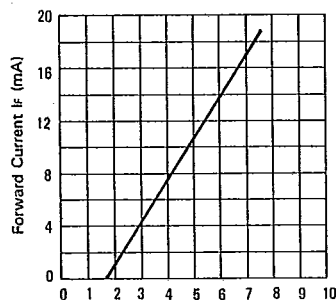


FIG. 2 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

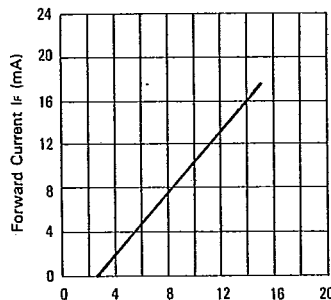


FIG. 3 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 12 VOLT DEVICES

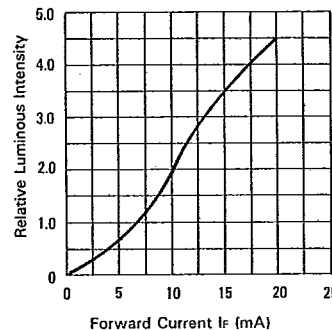


FIG. 4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

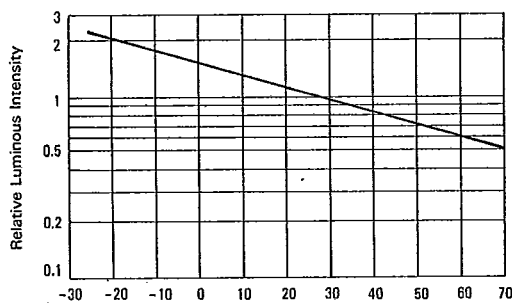


FIG. 5 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

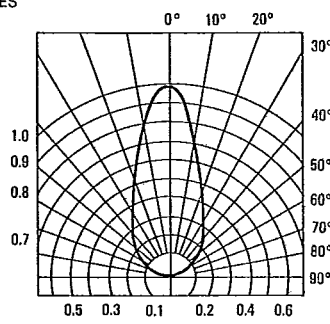


FIG. 6 SPATIAL DISTRIBUTION

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	Iv	4213-R1	1.1	3.8		mcd	VF=5V
		4213-R2	1.1	4.0			VF=12V
Viewing Angle	$2\theta_{1/2}$	4213-R1/R2		36		deg	Note 2 (Fig. 11)
Peak Emission Wavelength	λ_{PEAK}	4213-R1/R2		697		nm	Measurement @Peak (Fig. 1)
Spectral Line Half - Width	$\Delta\lambda$	4213-R1/R2		90		nm	
Forward Current 5V Devices	IF	4213-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	IF	4213-R2		12	20	mA	VF = 12V
Reverse Current	IR	4213-R1/R2			100	μA	VR = 5V

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.

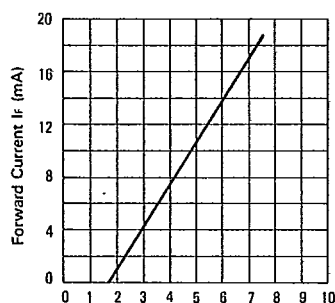


FIG. 7 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

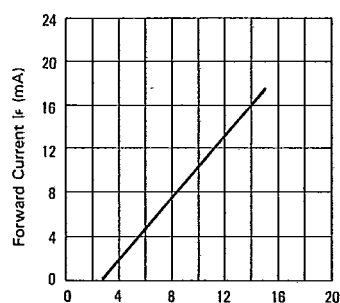


FIG. 8 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 12 VOLT DEVICES

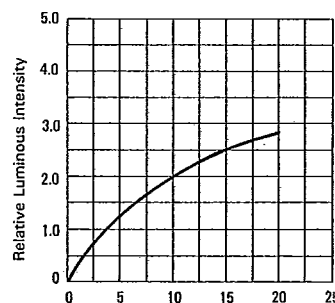


FIG. 9 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

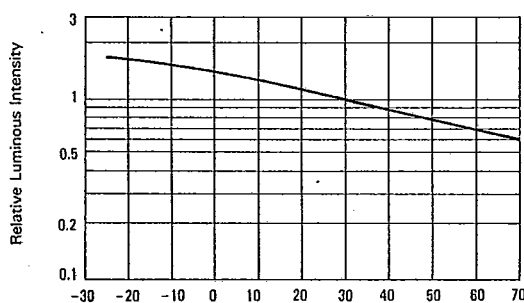


FIG. 10 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

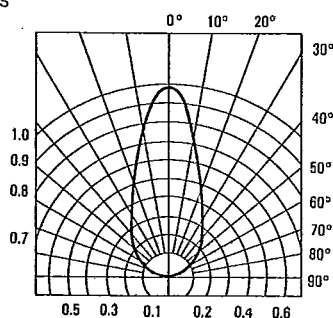


FIG. 11 SPATIAL DISTRIBUTION



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	Iv	4223-R1	2.5	8.7		mcd	VF=5V
		4223-R2	2.5	8.9			VF=12V
Viewing Angle	$2\theta_{1/2}$	4223-R1/R2		36		deg	Note 2 (Fig. 16)
Peak Emission Wavelength	λ_{PEAK}	4223-R1/R2		635		nm	Measurement @Peak (Fig. 1)
Spectral Line Half - Width	$\Delta\lambda$	4223-R1/R2		40		nm	
Forward Current 5V Devices	IF	4223-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	IF	4223-R2		12	20	mA	VF = 12V
Reverse Current	IR	4223-R1/R2			100	μA	VR = 5V

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.

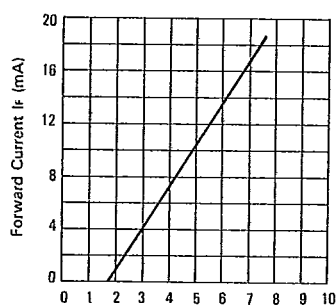


FIG. 12 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE, 5 VOLT DEVICES

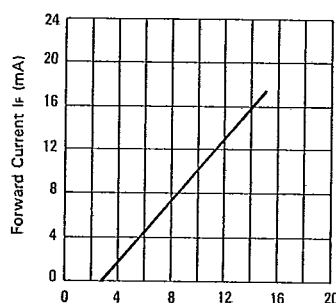


FIG. 13 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE, 12 VOLT DEVICES

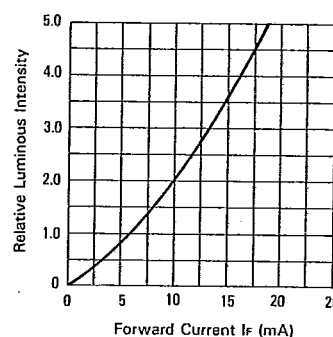


FIG. 14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

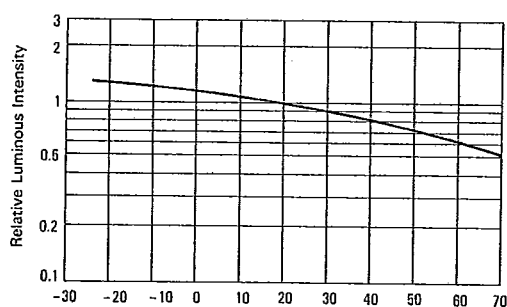


FIG. 15 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

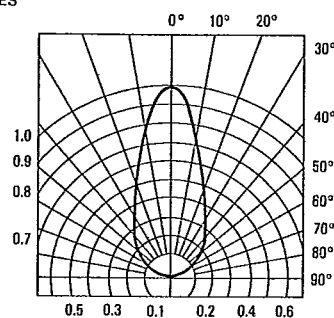


FIG. 16 SPATIAL DISTRIBUTION

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	4233-R1 4238-R1	2.5 35	8.7 70		mcd	VF=5V
		4233-R2 4238-R2	2.5 40	8.9 85			VF=12V
Viewing Angle	$2\theta_{1/2}$	4233-R1/R2 4238-R1/R2		36 16		deg	Note 2 (Fig. 21)
Peak Emission Wavelength	λ_{PEAK}	4233-R1/R2 4238-R1/R2		565		nm	Measurement @Peak (Fig. 1)
Spectral Line Half - Width	$\Delta\lambda$	4233-R1/R2 4238-R1/R2		30		nm	
Forward Current 5V Devices	IF	4233-R1 4238-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	IF	4233-R2 4238-R2		12	20	mA	VF = 12V
Reverse Current	IR	4233-R1/R2 4238-R1/R2			100	μA	VR = 5V

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.

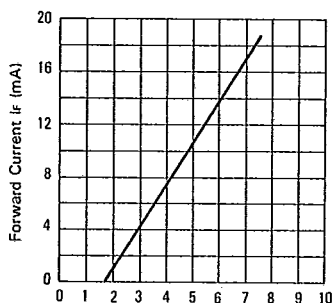


FIG. 17 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 5 VOLT DEVICES

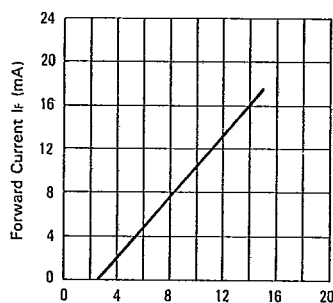


FIG. 18 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE. 12 VOLT DEVICES

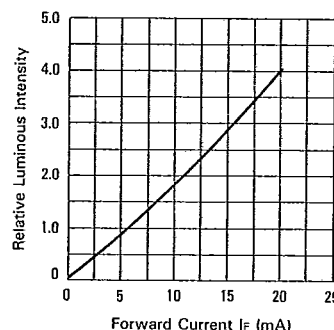


FIG. 19 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

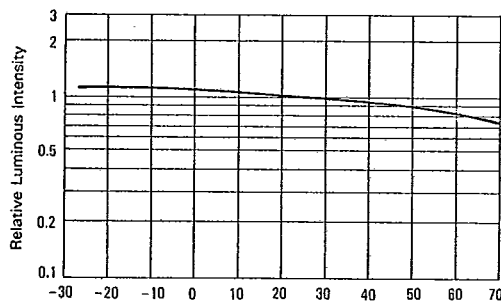


FIG. 20 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

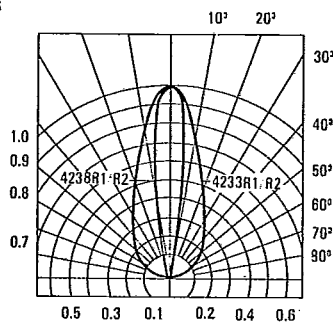


FIG. 21 SPATIAL DISTRIBUTION



2-48

327

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	Iv	4253-R1	2.5	8.7		mcd	VF=5V
		4253-R2	2.5	8.9			VF=12V
Viewing Angle	$2\theta_{1/2}$	4253-R1/R2		36		deg	Note 2 (Fig. 26)
Peak Emission Wavelength	λ_{PEAK}	4253-R1/R2		585		nm	Measurement @Peak (Fig. 1)
Spectral Line Half — Width	$\Delta\lambda$	4253-R1/R2		35		nm	
Forward Current 5V Devices	IF	4253-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	IF	4253-R2		12	20	mA	VF = 12V
Reverse Current	IR	4253-R1/R2			100	μA	VR = 5V

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.

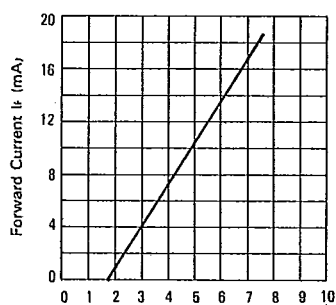


FIG. 22 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE, 5 VOLT DEVICES

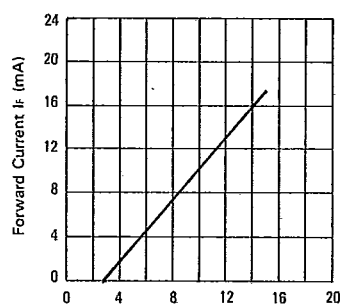


FIG. 23 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE, 12 VOLT DEVICES

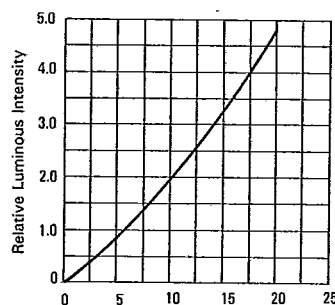


FIG. 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

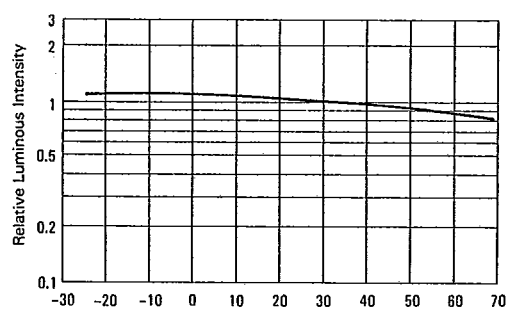


FIG. 25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

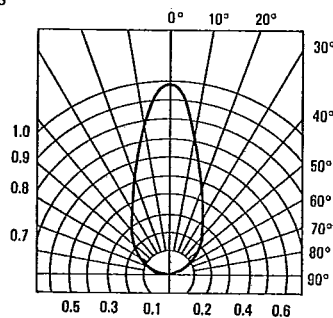


FIG. 26 SPATIAL DISTRIBUTION

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	4293-R1	2.5	8.7		mcd	VF=5V
		4293-R2	2.5	8.9			VF=12V
Viewing Angle	$2\theta_{1/2}$	4293-R1/R2		36		deg	Note 2 (Fig. 31)
Peak Emission Wavelength	λ_{PEAK}	4293-R1/R2		630		nm	Measurement @Peak (Fig. 1)
Spectral Line Half - Width	$\Delta\lambda$	4293-R1/R2		40		nm	
Forward Current 5V Devices	I_F	4293-R1		10	20	mA	VF = 5V
Forward Current 12V Devices	I_F	4293-R2		12	20	mA	VF 12V
Reverse Current	I_R	4293-R1/R2			100	μA	VR = 5V

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.

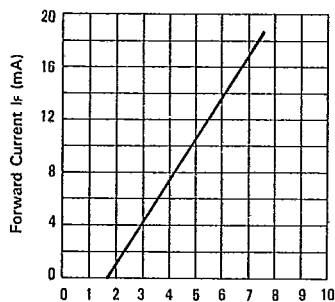


FIG. 22 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE, 5 VOLT DEVICES

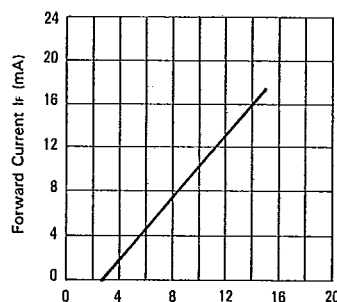


FIG. 23 FORWARD CURRENT VS. APPLIED FORWARD VOLTAGE, 12 VOLT DEVICES

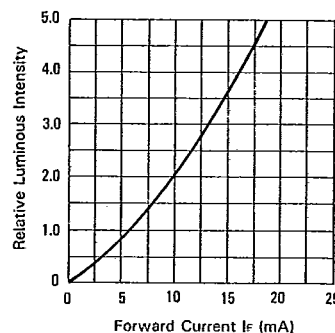


FIG. 24 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

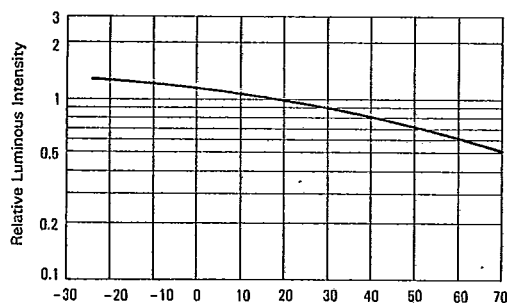


FIG. 25 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

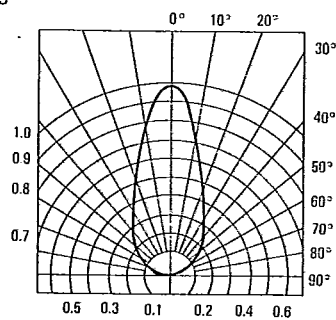


FIG. 31 SPATIAL DISTRIBUTION



T-41-21

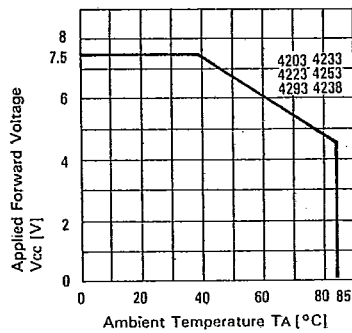


FIG. 32 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [5 VOLT DEVICES]

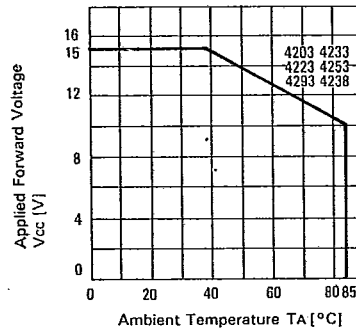


FIG. 33 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [12 VOLT DEVICES]

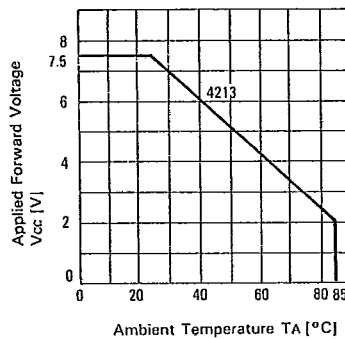


FIG. 34 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [5 VOLT DEVICES]

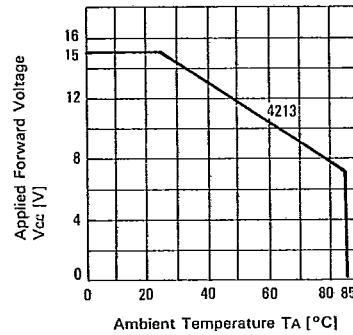


FIG. 35 MAXIMUM ALLOWED APPLIED FORWARD VOLTAGE VS. AMBIENT TEMPERATURE [12 VOLT DEVICES]