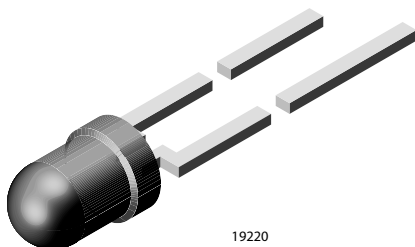




High Efficiency LED in Ø 3 mm Tinted Diffused Package



DESCRIPTION

The TLH.44.. series was developed for standard applications like general indicating and lighting purposes.

It is housed in a 3 mm tinted diffused plastic package. The wide viewing angle of these devices provides a high on-off contrast.

Several selection types with different luminous intensities are offered. All LEDs are categorized in luminous intensity groups. The green and yellow LEDs are categorized additionally in wavelength groups.

That allows users to assemble LEDs with uniform appearance.

PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: 3 mm
- Product series: standard
- Angle of half intensity: $\pm 30^\circ$

FEATURES

- Standard Ø 3 mm (T-1) package
- Small mechanical tolerances
- Suitable for DC and high peak current
- Wide viewing angle
- Luminous intensity categorized
- Yellow and green color categorized
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

APPLICATIONS

- Status lights
- Off/on indicator
- Background illumination
- Readout lights
- Maintenance lights
- Legend light

PARTS TABLE

PART	COLOR	LUMINOUS INTENSITY (mcd)			at I _F (mA)	WAVELENGTH (nm)			at I _F (mA)	FORWARD VOLTAGE (V)			at I _F (mA)	TECHNOLOGY
		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		
TLHR4400	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4400-AS12	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4400-AS21	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4400-AS12Z	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4400-AS21Z	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4400-MS12	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4400-MS12Z	Red	1.6	13	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4401	Red	2.5	14	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4401-AS12Z	Red	2.5	14	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4401-LS12Z	Red	2.5	14	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4405	Red	6.3	15	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4405-AS12	Red	6.3	15	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4405-AS21	Red	6.3	15	-	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4407	Red	4	-	12.5	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHR4407-MS12Z	Red	4	-	12.5	10	612	-	625	10	-	2	3	20	GaAsP on GaP
TLHO4400	Soft orange	1.6	13	-	10	598	-	611	10	-	2.4	3	20	GaAsP on GaP
TLHO4400-AS12Z	Soft orange	1.6	13	-	10	598	-	611	10	-	2.4	3	20	GaAsP on GaP
TLHO4400-MS12Z	Soft orange	1.6	13	-	10	598	-	611	10	-	2.4	3	20	GaAsP on GaP
TLHY4400	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4400-AS12Z	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP



PARTS TABLE

PART	COLOR	LUMINOUS INTENSITY (mcd)			at I _F (mA)	WAVELENGTH (nm)			at I _F (mA)	FORWARD VOLTAGE (V)			at I _F (mA)	TECHNOLOGY
		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		
TLHY4400-AS21	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4400-AS21Z	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4400-BT12	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4400-CS12	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4400-MS12	Yellow	1.6	10	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4401	Yellow	2.5	10.5	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4401-AS12	Yellow	2.5	10.5	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4401-AS12Z	Yellow	2.5	10.5	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4401-AS21	Yellow	2.5	10.5	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4405	Yellow	6.3	11	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4405-AS12	Yellow	6.3	11	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4405-AS12Z	Yellow	6.3	11	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4405-BT12Z	Yellow	6.3	11	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4405-MS12	Yellow	6.3	11	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4405-MSZ	Yellow	6.3	11	-	10	581	-	594	10	-	2.4	3	20	GaAsP on GaP
TLHY4438	Yellow	6.3	-	20	10	583	-	586	10	-	2.4	3	20	GaAsP on GaP
TLHG4400	Green	2.5	13	-	10	562	-	575	10	-	2.4	3	20	GaP on GaP
TLHG4400-MS12	Green	2.5	13	-	10	562	-	575	10	-	2.4	3	20	GaP on GaP
TLHG4401	Green	4	14	-	10	562	-	575	10	-	2.4	3	20	GaP on GaP
TLHG4405	Green	6.3	15	-	10	562	-	575	10	-	2.4	3	20	GaP on GaP
TLHP4401	Pure green	1	4	-	10	555	-	565	10	-	2.4	3	20	GaP on GaP
TLHP4401-AS12Z	Pure green	1	4	-	10	555	-	565	10	-	2.4	3	20	GaP on GaP

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified) TLHR440., TLHO440., TLHY440., TLHG440., TLHP440.

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		V _R	6	V
DC forward current		I _F	30	mA
Surge forward current	t _p ≤ 10 μs	I _{FSM}	1	A
Power dissipation	T _{amb} ≤ 60 °C	P _V	100	mW
Junction temperature		T _j	100	°C
Operating temperature range		T _{amb}	-40 to +100	°C
Storage temperature range		T _{stg}	-55 to +100	°C
Soldering temperature	t ≤ 5 s, 2 mm from body	T _{sd}	260	°C
Thermal resistance junction/ambient		R _{thJA}	400	K/W

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified) TLHR440., RED

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity ⁽¹⁾	I _F = 10 mA	TLHR4400	I _V	1.6	13	-	mcd
		TLHR4401	I _V	2.5	14	-	mcd
		TLHR4405	I _V	6.3	15	-	mcd
		TLHR4407	I _V	4	-	12.5	mcd
Dominant wavelength	I _F = 10 mA		λ _d	612	-	625	nm
Peak wavelength	I _F = 10 mA		λ _p	-	635	-	nm
Angle of half intensity	I _F = 10 mA		φ	-	± 30	-	deg
Forward voltage	I _F = 20 mA		V _F	-	2	3	V
Reverse voltage	I _R = 10 μA		V _R	6	15	-	V
Junction capacitance	V _R = 0 V, f = 1 MHz		C _j	-	50	-	pF

Note

⁽¹⁾ In one packing unit I_{Vmin}/I_{Vmax} ≤ 0.5



OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^\circ\text{C}$, unless otherwise specified)
TLHO440., SOFT ORANGE

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity ⁽¹⁾	$I_F = 10\text{ mA}$	TLHO4400	I_V	1.6	13	-	mcd
Dominant wavelength	$I_F = 10\text{ mA}$		λ_d	598	-	611	nm
Peak wavelength	$I_F = 10\text{ mA}$		λ_p	-	605	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		ϕ	-	± 30	-	deg
Forward voltage	$I_F = 20\text{ mA}$		V_F	-	2.4	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		V_R	6	15	-	V
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$		C_j	-	15	-	pF

Note

⁽¹⁾ In one packing unit $I_{Vmin.}/I_{Vmax.} \leq 0.5$

OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^\circ\text{C}$, unless otherwise specified)
TLHY440., YELLOW

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity ⁽¹⁾	$I_F = 10\text{ mA}$	TLHY4400	I_V	1.6	10	-	mcd
		TLHY4401	I_V	2.5	10.5	-	mcd
		TLHY4405	I_V	6.3	11	-	mcd
		TLHY4438	I_V	6.3	-	20	mcd
Dominant wavelength	$I_F = 10\text{ mA}$	TLHY4400	λ_d	581	-	594	nm
		TLHY4401	λ_d	581	-	594	nm
		TLHY4405	λ_d	581	-	594	nm
		TLHY4438	λ_d	583	-	590	nm
		TLHY4442	λ_d	585	-	592	nm
Peak wavelength	$I_F = 10\text{ mA}$		λ_p	-	585	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		ϕ	-	± 30	-	deg
Forward voltage	$I_F = 20\text{ mA}$		V_F	-	2.4	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		V_R	6	15	-	V
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$		C_j	-	50	-	pF

Note

⁽¹⁾ In one packing unit $I_{Vmin.}/I_{Vmax.} \leq 0.5$

OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^\circ\text{C}$, unless otherwise specified)
TLHG440., GREEN

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity ⁽¹⁾	$I_F = 10\text{ mA}$	TLHG4400	I_V	2.5	13	-	mcd
		TLHG4401	I_V	4	14	-	mcd
		TLHG4405	I_V	6.3	15	-	mcd
Dominant wavelength	$I_F = 10\text{ mA}$		λ_d	562	-	575	nm
Peak wavelength	$I_F = 10\text{ mA}$		λ_p	-	565	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		ϕ	-	± 30	-	deg
Forward voltage	$I_F = 20\text{ mA}$		V_F	-	2.4	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		V_R	6	15	-	V
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$		C_j	-	50	-	pF

Note

⁽¹⁾ In one packing unit $I_{Vmin.}/I_{Vmax.} \leq 0.5$



OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, unless otherwise specified) TLHP440., PURE GREEN

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity ⁽¹⁾	$I_F = 10\text{ mA}$	TLHP4401	I_V	1	4	-	mcd
Dominant wavelength	$I_F = 10\text{ mA}$		λ_d	555	-	565	nm
Peak wavelength	$I_F = 10\text{ mA}$		λ_p	-	555	-	nm
Angle of half intensity	$I_F = 10\text{ mA}$		ϕ	-	± 30	-	deg
Forward voltage	$I_F = 20\text{ mA}$		V_F	-	2.4	3	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$		V_R	6	15	-	V
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$		C_j	-	50	-	pF

Note

⁽¹⁾ In one packing unit $I_{Vmin.}/I_{Vmax.} \leq 0.5$

LUMINOUS INTENSITY CLASSIFICATION

GROUP	LIGHT INTENSITY (mcd)	
STANDARD	MIN.	MAX.
L	1	2
M	1.6	3.2
N	2.5	5
P	4	8
Q	6.3	12.5
R	10	20
S	16	32
T	25	50
U	40	80

Note

- Luminous intensity is tested at a current pulse duration of 25 ms. The above type numbers represent the order groups which include only a few brightness groups. Only one group will be shipped on each bag (there will be no mixing of two groups on each bag). In order to ensure availability, single brightness groups will not be orderable. In a similar manner for colors where wavelength groups are measured and binned, single wavelength groups will be shipped on any one bag. In order to ensure availability, single wavelength groups will not be orderable.

COLOR CLASSIFICATION

GROUP	DOM. WAVELENGTH (nm)					
	YELLOW		GREEN		PURE GREEN	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0	-	-	-	-	555	559
1	581	584	-	-	558	561
2	583	586	-	-	560	563
3	585	588	562	565	562	565
4	587	590	564	567	-	-
5	589	592	566	569	-	-
6	591	594	568	571	-	-
7	-	-	570	573	-	-
8	-	-	572	575	-	-

Note

- Wavelengths are tested at a current pulse duration of 25 ms.



TYPICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

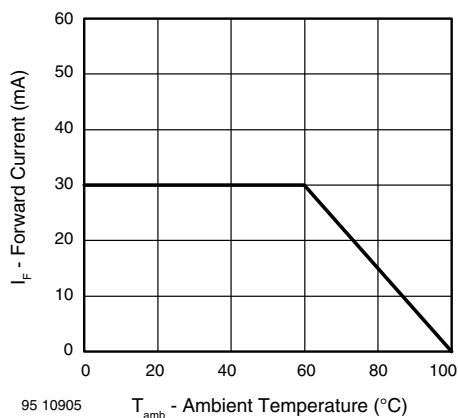


Fig. 1 - Forward Current vs. Ambient Temperature for InGaN

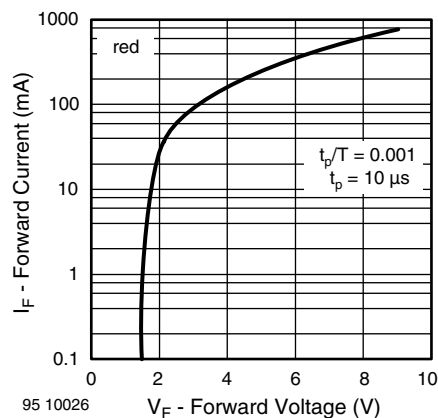


Fig. 4 - Forward Current vs. Forward Voltage

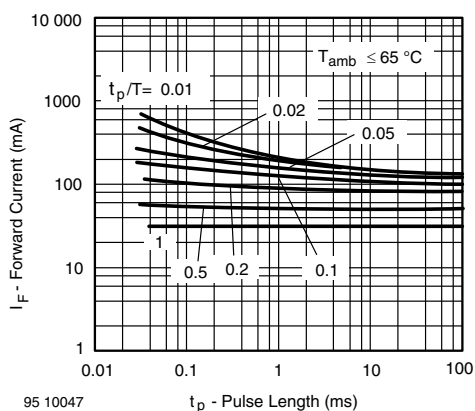


Fig. 2 - Forward Current vs. Pulse Length

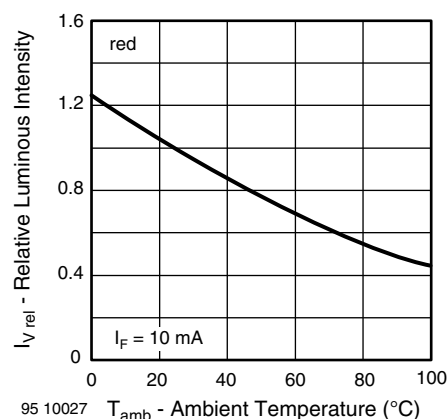


Fig. 5 - Relative Luminous Intensity vs. Ambient Temperature

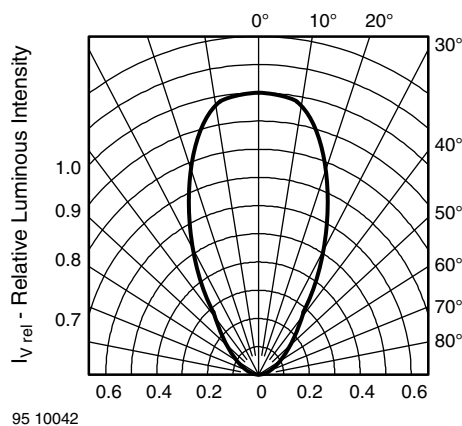


Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

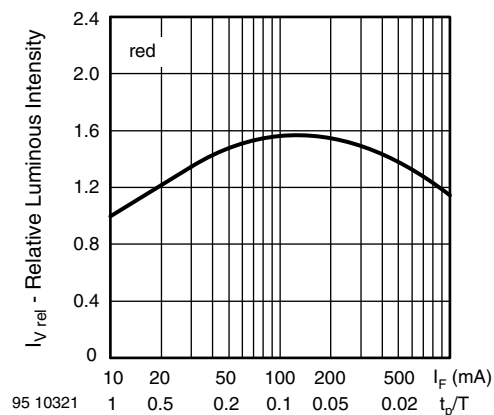
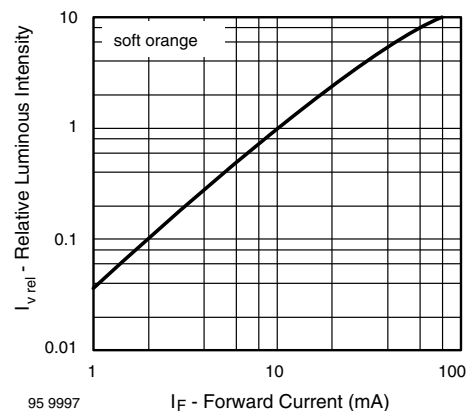
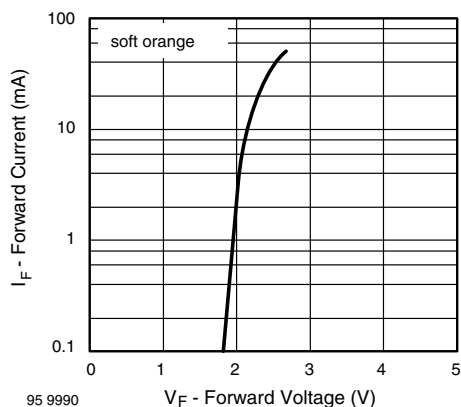
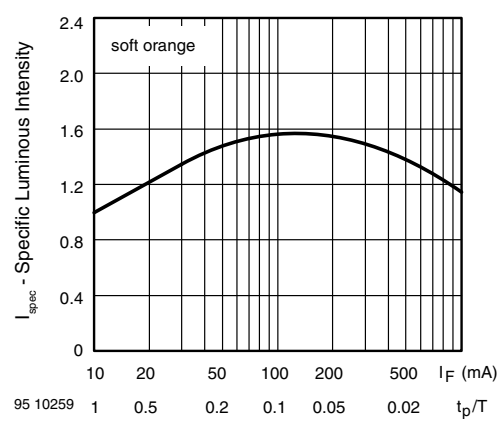
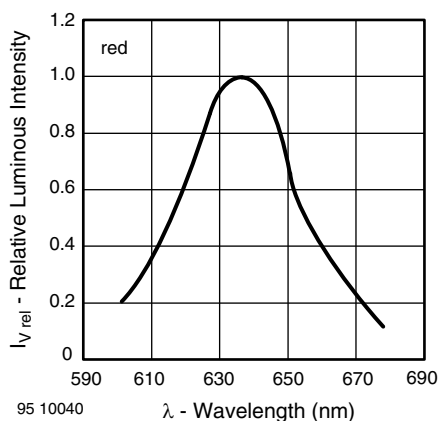
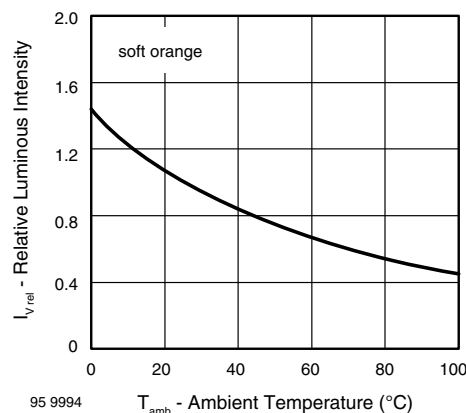
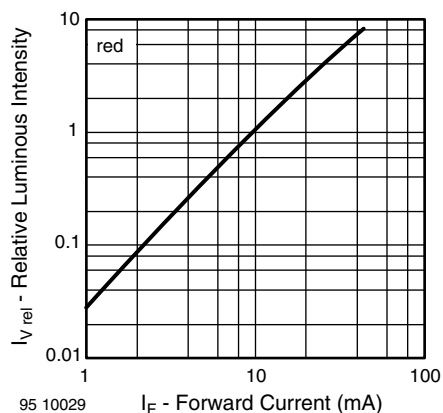


Fig. 6 - Relative Luminous Intensity vs. Forward Current/Duty Cycle



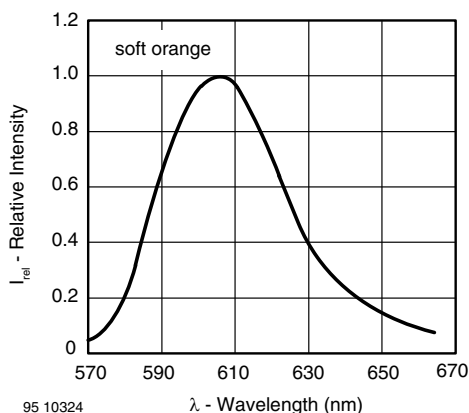


Fig. 13 - Relative Intensity vs. Wavelength

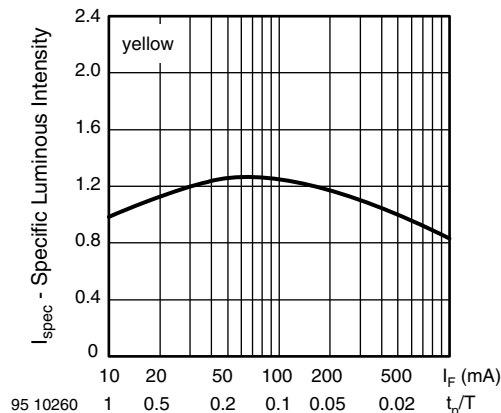


Fig. 16 - Relative Luminous Intensity vs. Forward Current/Duty Cycle

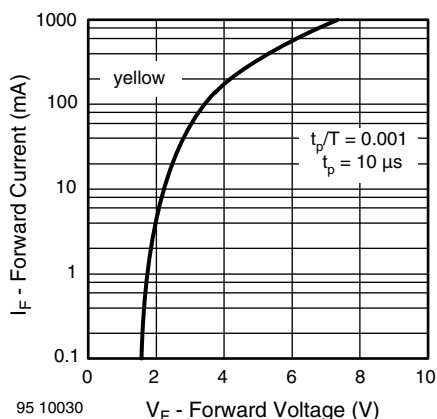


Fig. 14 - Forward Current vs. Forward Voltage

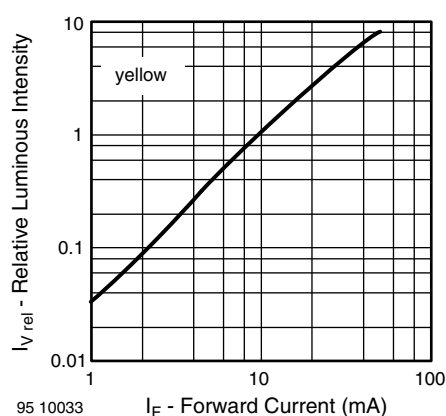


Fig. 17 - Relative Luminous Intensity vs. Forward Current

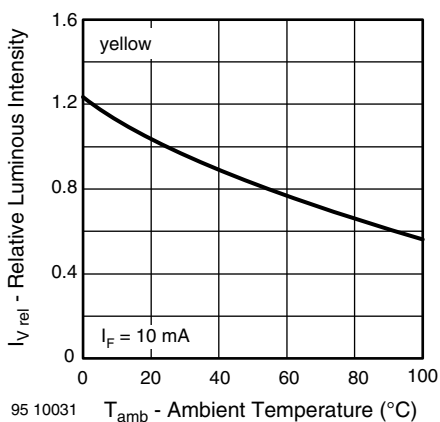


Fig. 15 - Relative Luminous Intensity vs. Ambient Temperature

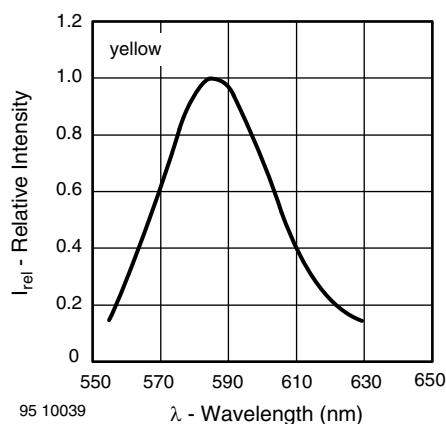


Fig. 18 - Relative Intensity vs. Wavelength

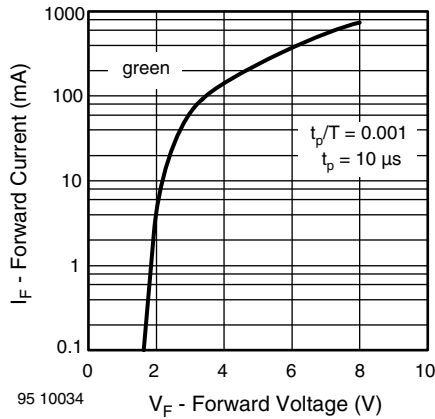


Fig. 19 - Forward Current vs. Forward Voltage

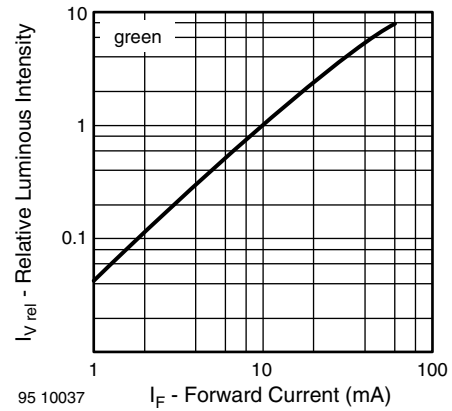


Fig. 22 - Relative Luminous Intensity vs. Forward Current

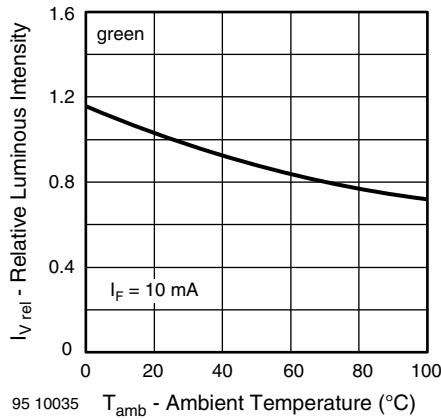


Fig. 20 - Relative Luminous Intensity vs. Ambient Temperature

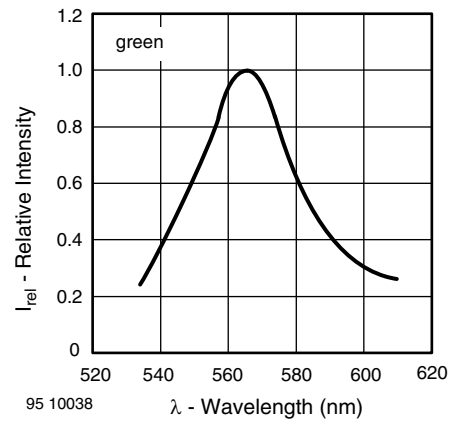


Fig. 23 - Relative Intensity vs. Wavelength

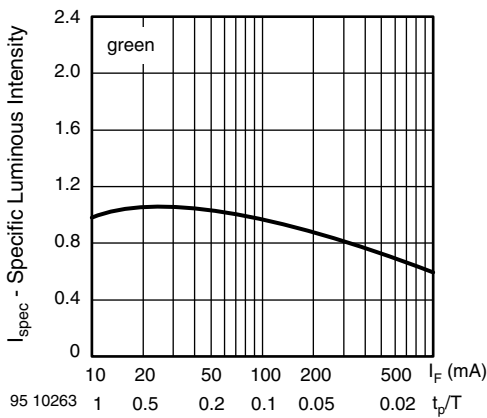


Fig. 21 - Specific Luminous Intensity vs. Forward Current

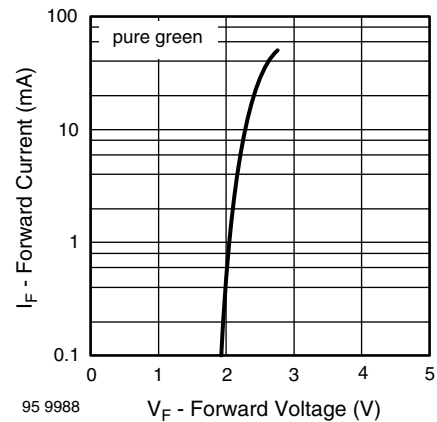


Fig. 24 - Forward Current vs. Forward Voltage

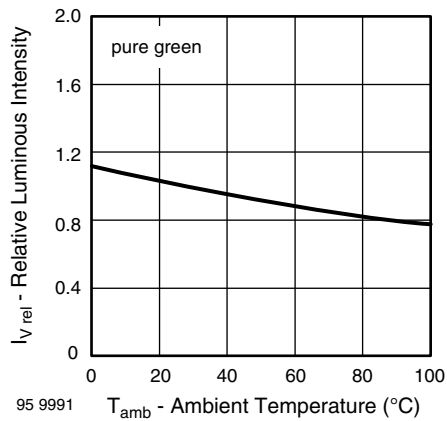


Fig. 25 - Relative Luminous Intensity vs. Ambient Temperature

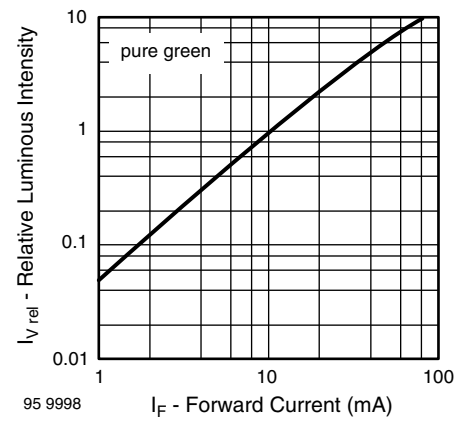


Fig. 27 - Relative Luminous Intensity vs. Forward Current

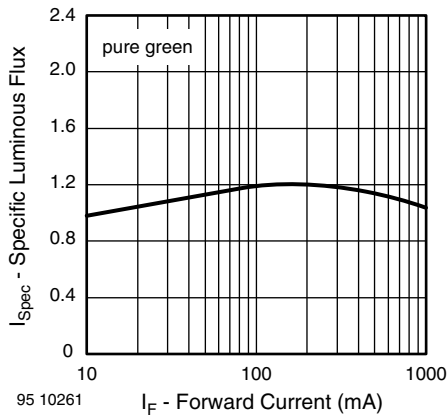


Fig. 26 - Specific Luminous Intensity vs. Forward Current

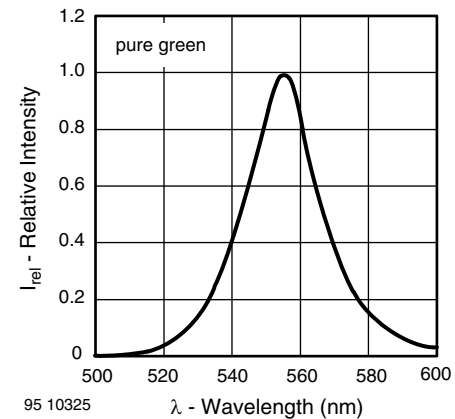
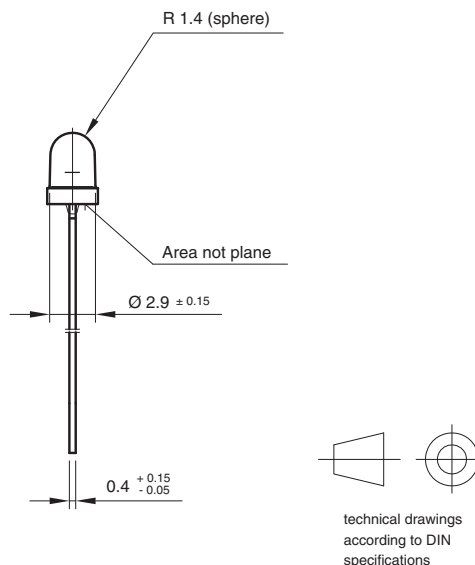
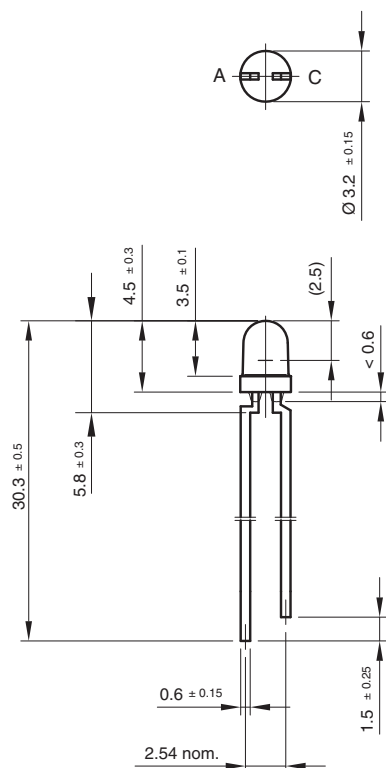


Fig. 28 - Relative Intensity vs. Wavelength



PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5255.01-4
Issue: 7; 25.09.08
95 10913

REEL DIMENSIONS in millimeters

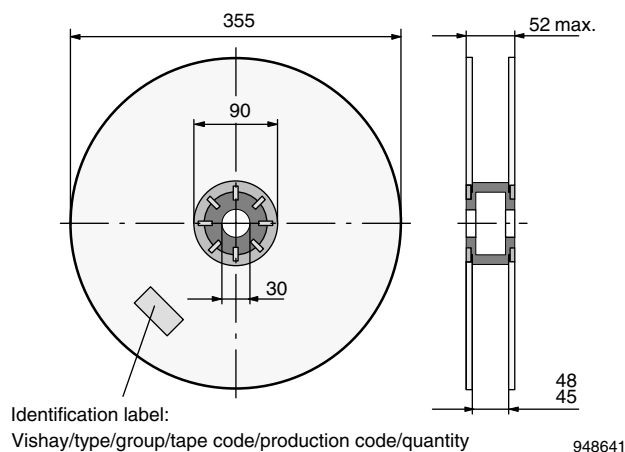


Fig. 29 - Reel

TAPE

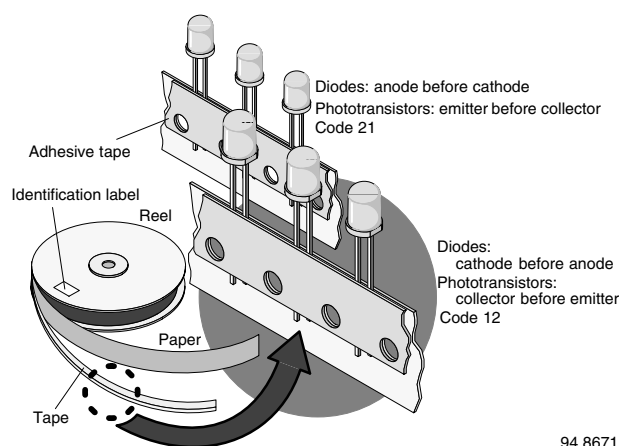


Fig. 30 - LED in Tape

The diagram illustrates a tape-mounted component carrier with two different pin configurations. The carrier is shown in a perspective view, with a label on the left side. The top surface features a series of pins, each with a diode or transistor symbol. The carrier is divided into two sections, each with its own 'Tape feed direction' arrow. The left section is labeled 'Diodes: cathode before anode' and 'Transistors: collector before emitter'. The right section is labeled 'Diodes: anode before cathode' and 'Transistors: emitter before collector'. The carrier is marked with a '+' sign on the left and a '-' sign on the right. The part number '94 8667-2' is printed at the bottom.

Tape feed direction
 Diodes: cathode before anode
 Transistors: collector before emitter

Tape feed direction
 Diodes: anode before cathode
 Transistors: emitter before collector

94 8667-2

[illegible]

Quantity per:	Reel (Mat.-no. 1764)
	2000

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