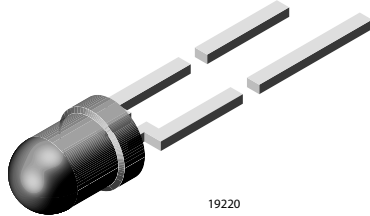




High Efficiency LED in Ø 3 mm Tinted Diffused Package



FEATURES

- Standard Ø 3 (T-1) package
Small mechanical tolerances
Suitable for DC and high peak current
Wide viewing angle
Luminous intensity categorized
Yellow and green color categorized
Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



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.

APPLICATIONS

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

PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
Package: 3 mm
Product series: standard
Angle of half intensity: ± 30°

Table with 3 columns: PART, COLOR, LUMINOUS INTENSITY, TECHNOLOGY. Lists various LED models and their specifications.

\*\* Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

PARTS TABLE		
TLHO4400	Soft orange, $I_V > 1.6$ mcd	GaAsP on GaP
TLHO4400-AS12Z	Soft orange, $I_V > 1.6$ mcd	GaAsP on GaP
TLHO4400-MS12Z	Soft orange, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4400	Red, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4400-AS12	Red, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4400-AS21	Red, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4400-AS12Z	Red, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4400-AS21Z	Red, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4400-MS12Z	Red, $I_V > 1.6$ mcd	GaAsP on GaP
TLHR4401	Red, $I_V > 2.5$ mcd	GaAsP on GaP
TLHR4401-AS12Z	Red, $I_V > 2.5$ mcd	GaAsP on GaP
TLHR4401-LS12Z	Red, $I_V > 2.5$ mcd	GaAsP on GaP
TLHR4405	Red, $I_V > 6.3$ mcd	GaAsP on GaP
TLHR4405-AS12	Red, $I_V > 6.3$ mcd	GaAsP on GaP
TLHR4405-AS21	Red, $I_V > 6.3$ mcd	GaAsP on GaP
TLHR4407	Red, $I_V = (4 \text{ to } 12.5)$ mcd	GaAsP on GaP
TLHR4407-MS12Z	Red, $I_V = (4 \text{ to } 12.5)$ mcd	GaAsP on GaP

ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25$ °C, unless otherwise specified) TLHG440. , TLHO440. , TLHP440. , TLHR440. , TLHY440.				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		$V_R$	6	V
DC Forward current		$I_F$	30	mA
Surge forward current	$t_p \leq 10$ $\mu$ s	$I_{FSM}$	1	A
Power dissipation	$T_{amb} \leq 60$ °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	$t \leq 5$ 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 <sup>1)</sup>	$I_F = 10$ mA	TLHR4400	$I_V$	1.6	3		mcd
		TLHR4401	$I_V$	2.5	5		mcd
		TLHR4405	$I_V$	6.3	10		mcd
		TLHR4407	$I_V$	4		12.5	mcd
Dominant wavelength	$I_F = 10$ mA		$\lambda_d$	612		625	nm
Peak wavelength	$I_F = 10$ mA		$\lambda_p$		635		nm
Angle of half intensity	$I_F = 10$ mA		$\varphi$		$\pm 30$		deg
Forward voltage	$I_F = 20$ mA		$V_F$		2	3	V
Reverse voltage	$I_R = 10$ $\mu$ A		$V_R$	6	15		V
Junction capacitance	$V_R = 0$ , $f = 1$ MHz		$C_j$		50		pF

Note:

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



<b>OPTICAL AND ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) <b>TLHO440, SOFT ORANGE</b>							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHO4400	$I_V$	1.6	4		mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	598		611	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$		605		nm
Angle of half intensity	$I_F = 10\text{ mA}$		$\phi$		$\pm 30$		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	$V_R = 0, f = 1\text{ MHz}$		$C_j$		15		pF

Note:

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

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) <b>TLHY440., YELLOW</b>							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHY4400	$I_V$	1.6	3		mcd
		TLHY4401	$I_V$	2.5	5		mcd
		TLHY4405	$I_V$	6.3	10		mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	581		594	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$		585		nm
Angle of half intensity	$I_F = 10\text{ mA}$		$\phi$		$\pm 30$		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	$V_R = 0, f = 1\text{ MHz}$		$C_j$		50		pF

Note:

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

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) <b>TLHG440., GREEN</b>							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHG4400	$I_V$	2.5	4		mcd
		TLHG4401	$I_V$	4	6		mcd
		TLHG4405	$I_V$	6.3	12		mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	562		575	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$		565		nm
Angle of half intensity	$I_F = 10\text{ mA}$		$\phi$		$\pm 30$		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	$V_R = 0, f = 1\text{ MHz}$		$C_j$		50		pF

Note:

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

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
<b>TLHP440., PURE GREEN</b>							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHP4401	$I_V$	1	3		mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	555		565	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$		555		nm
Angle of half intensity	$I_F = 10\text{ mA}$		$\varphi$		$\pm 30$		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	$V_R = 0, f = 1\text{ MHz}$		$C_j$		50		pF

Note:

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

<b>LUMINOUS INTENSITY CLASSIFICATION</b>		
GROUP	LIGHT INTENSITY (mcd)	
	MIN.	MAX.
STANDARD		
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 and an accuracy of  $\pm 11\%$ .

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.

<b>COLOR CLASSIFICATION</b>						
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)

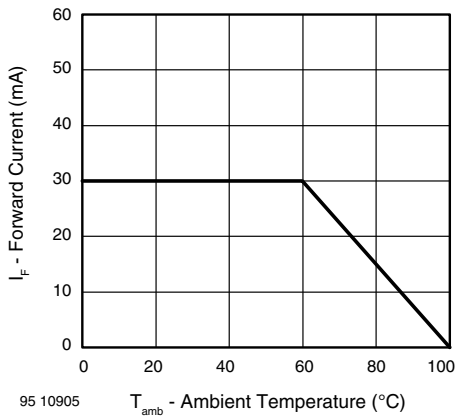


Figure 1. Forward Current vs. Ambient Temperature for InGaN

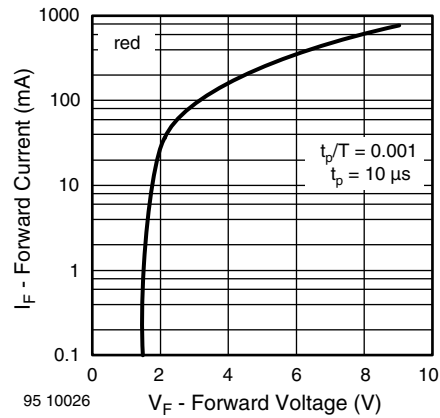


Figure 4. Forward Current vs. Forward Voltage

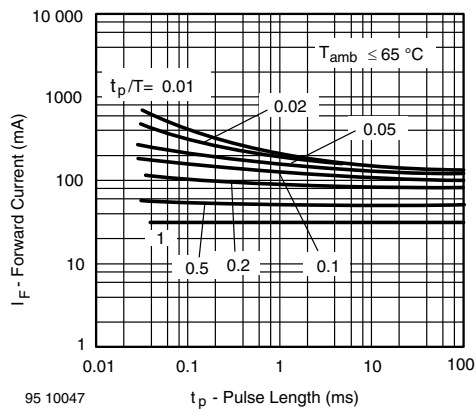


Figure 2. Forward Current vs. Pulse Length

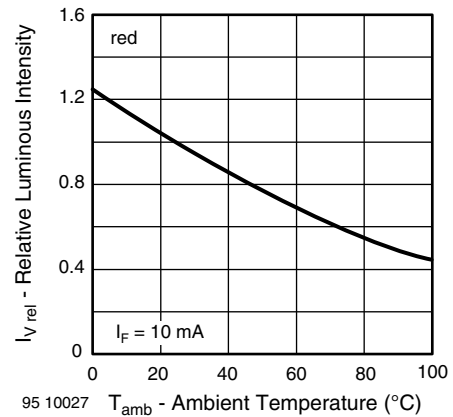


Figure 5. Rel. Luminous Intensity vs. Ambient Temperature

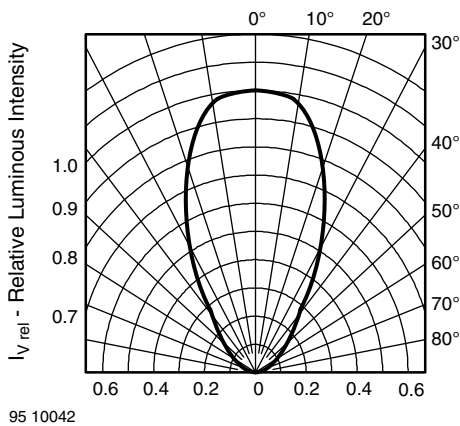


Figure 3. Rel. Luminous Intensity vs. Angular Displacement

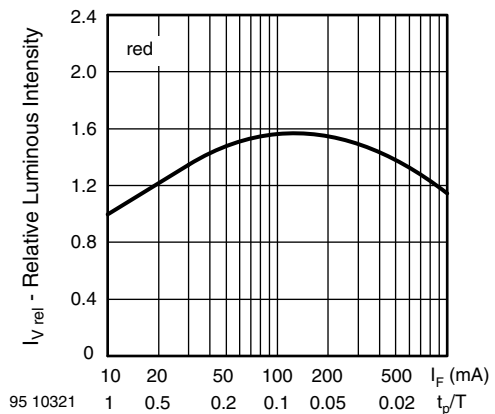


Figure 6. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

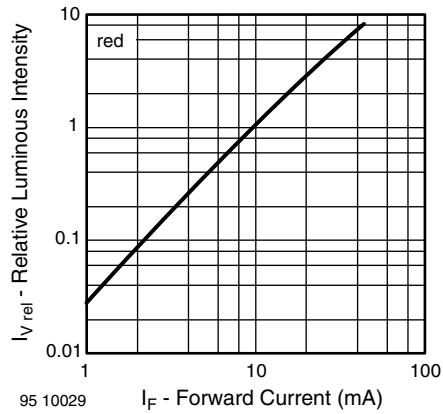


Figure 7. Relative Luminous Intensity vs. Forward Current

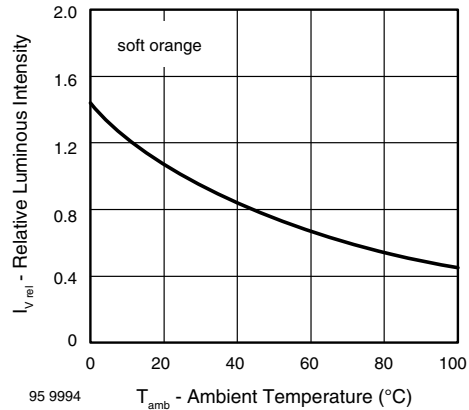


Figure 10. Rel. Luminous Intensity vs. Ambient Temperature

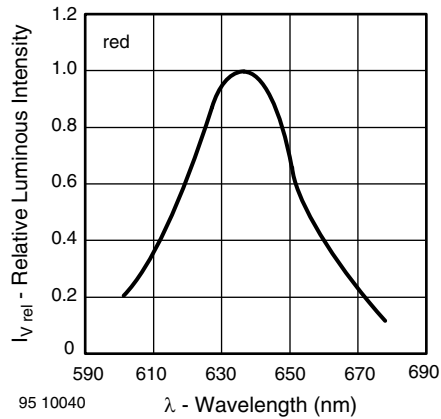


Figure 8. Relative Intensity vs. Wavelength

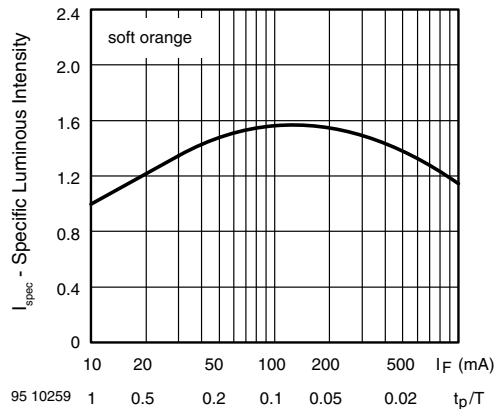


Figure 11. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

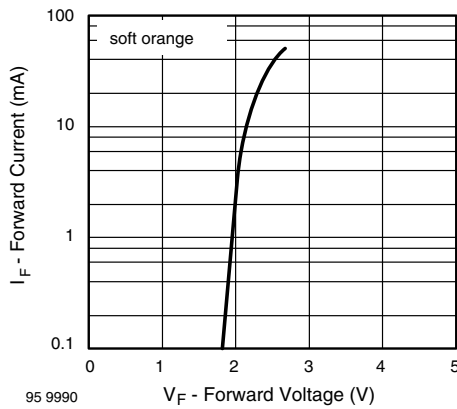


Figure 9. Forward Current vs. Forward Voltage

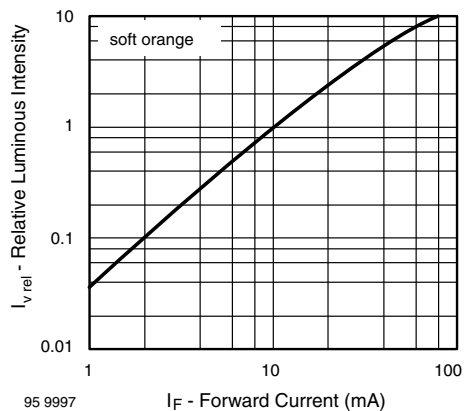


Figure 12. Relative Luminous Intensity vs. Forward Current

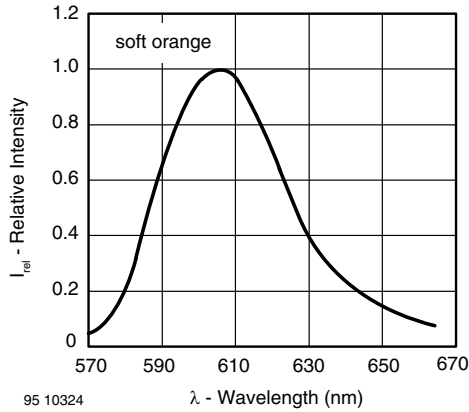


Figure 13. Relative Intensity vs. Wavelength

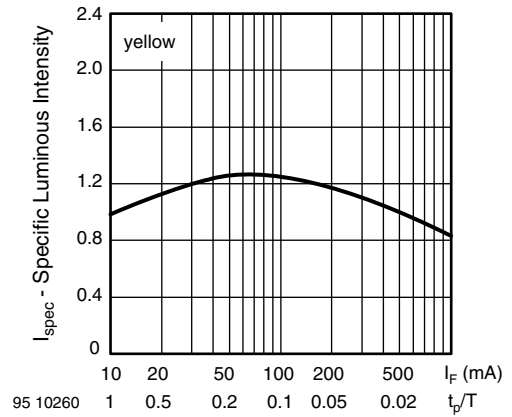


Figure 16. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

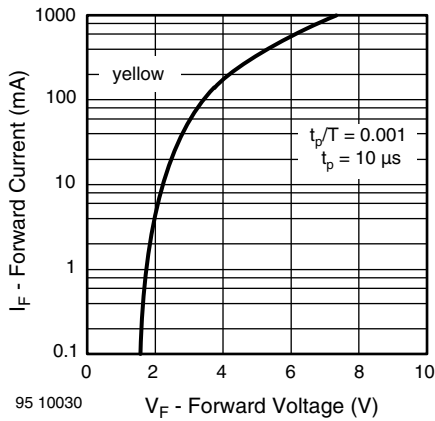


Figure 14. Forward Current vs. Forward Voltage

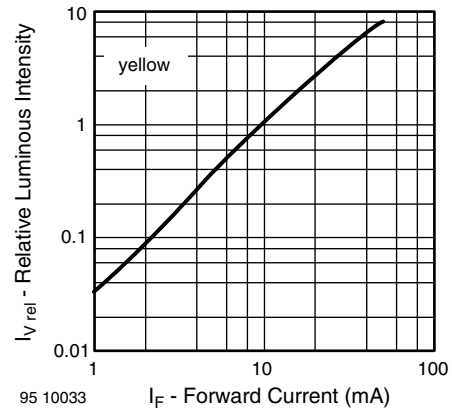


Figure 17. Relative Luminous Intensity vs. Forward Current

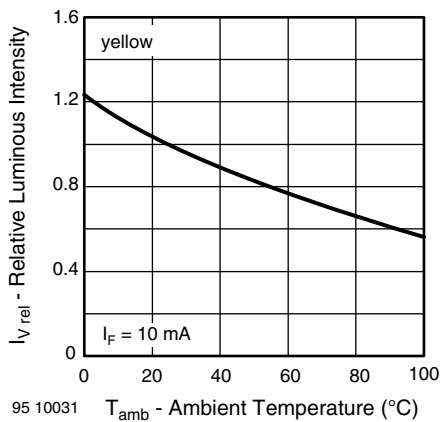


Figure 15. Rel. Luminous Intensity vs. Ambient Temperature

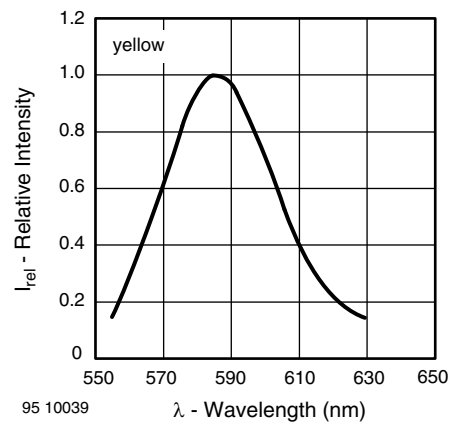


Figure 18. Relative Intensity vs. Wavelength

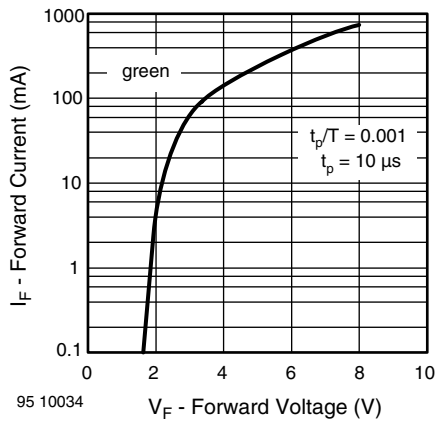


Figure 19. Forward Current vs. Forward Voltage

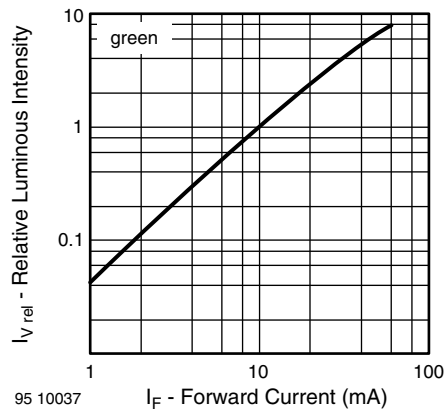


Figure 22. Relative Luminous Intensity vs. Forward Current

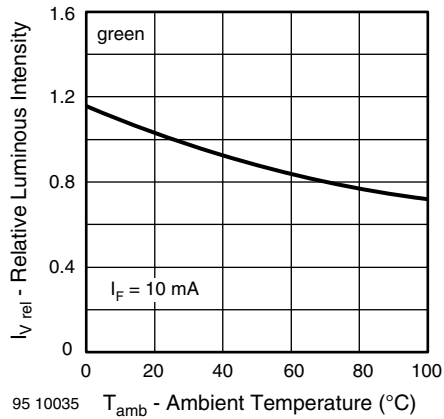


Figure 20. Rel. Luminous Intensity vs. Ambient Temperature

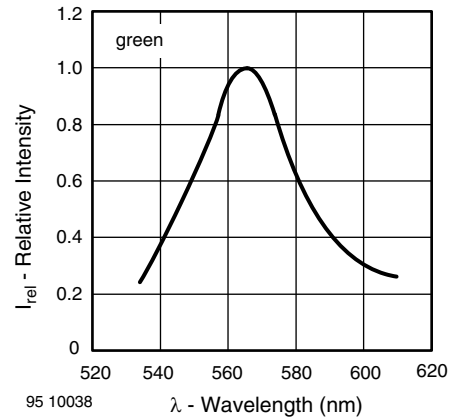


Figure 23. Relative Intensity vs. Wavelength

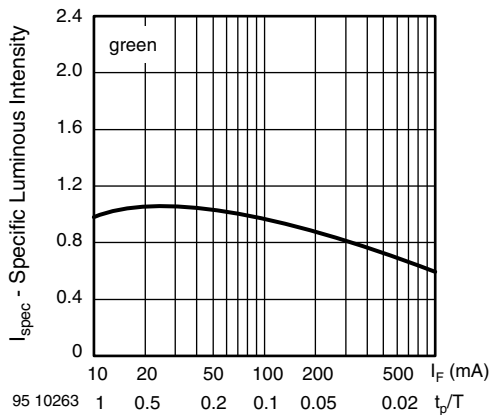


Figure 21. Specific Luminous Intensity vs. Forward Current

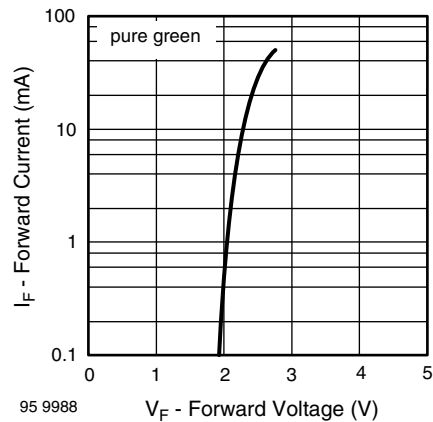


Figure 24. Forward Current vs. Forward Voltage



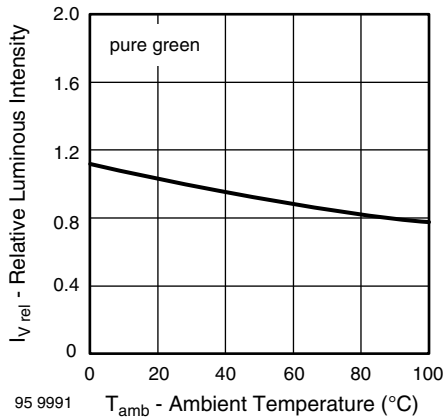


Figure 25. Rel. Luminous Intensity vs. Ambient Temperature

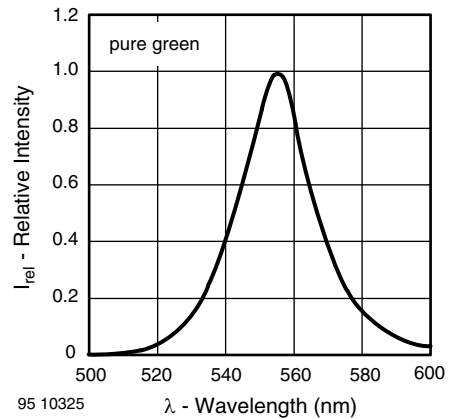


Figure 28. Relative Intensity vs. Wavelength

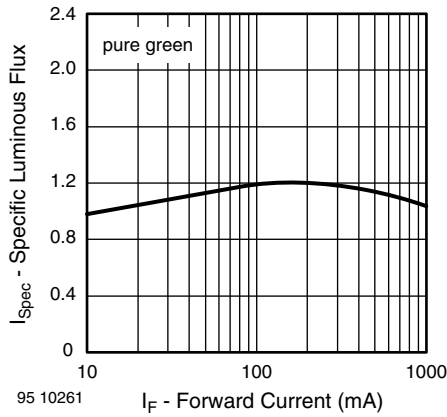


Figure 26. Specific Luminous Intensity vs. Forward Current

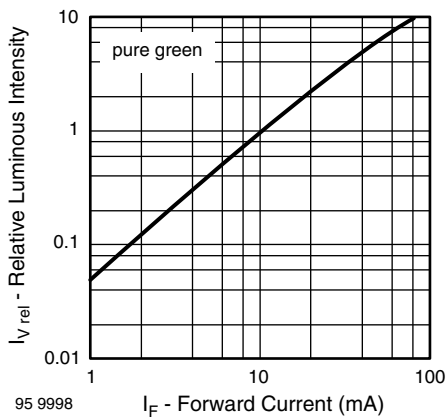
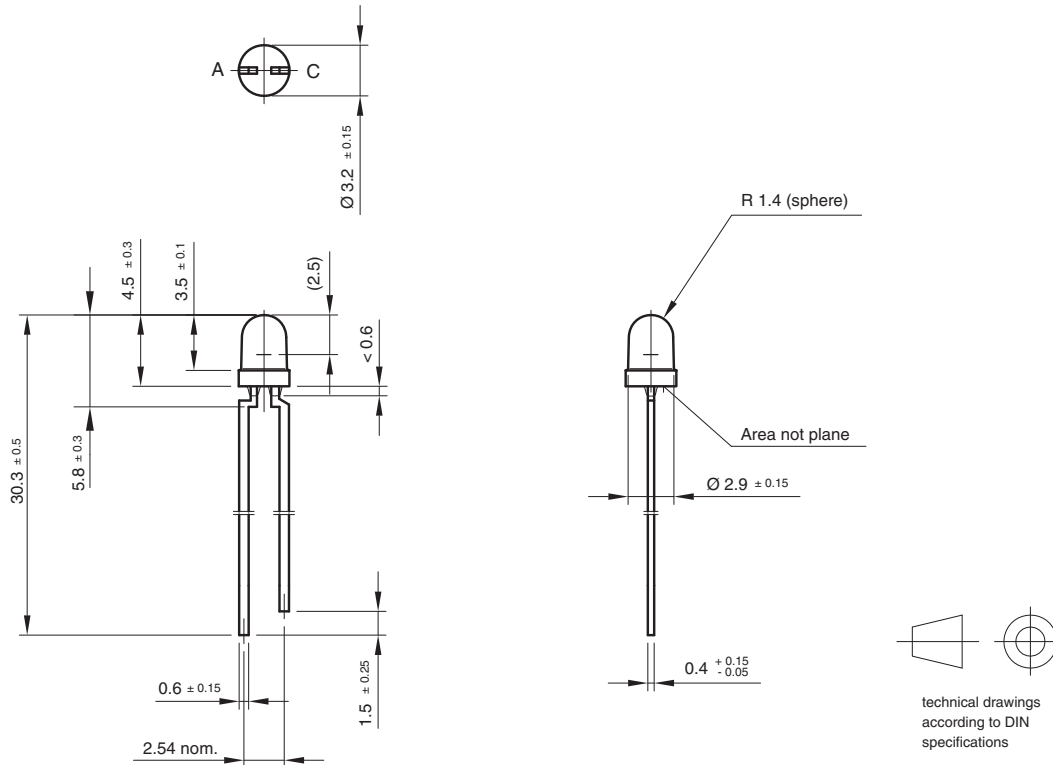


Figure 27. Relative Luminous Intensity vs. Forward Current

**PACKAGE DIMENSIONS** in millimeters



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

**REEL DIMENSIONS** in millimeters

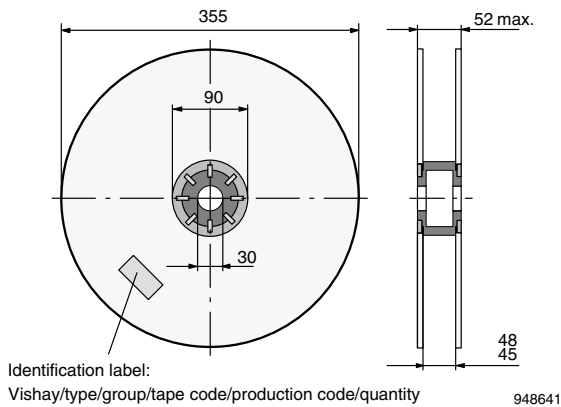


Figure 29. Reel

**TAPE**

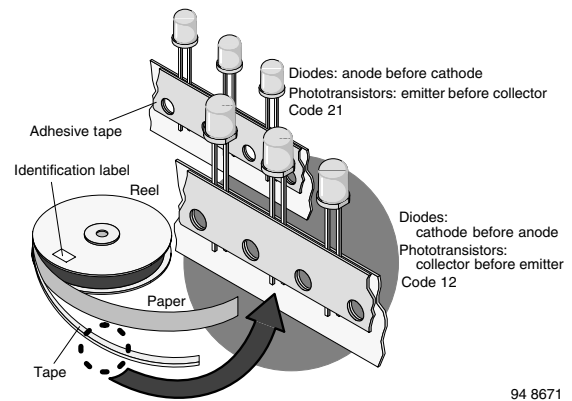
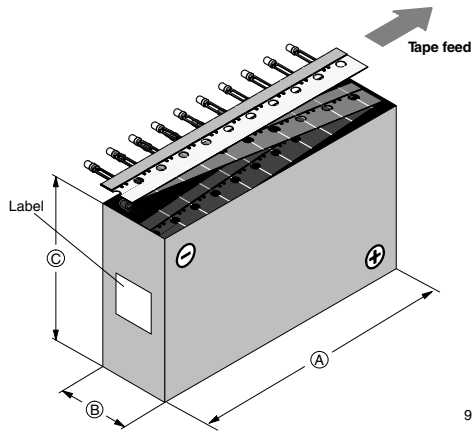


Figure 30. LED in Tape

**AMMOPACK**

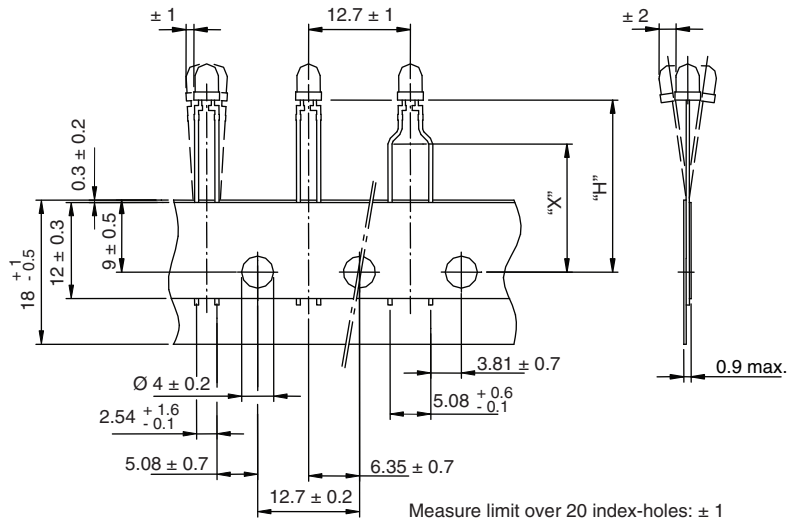


94 8667-1

Figure 31. Tape Direction

Note:  
AS12Z and AS21Z still valid for already existing types BUT NOT  
FOR NEW DESIGN

**TAPE DIMENSIONS** in millimeters



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

21885

Option	Dim. "H" ± 0.5 mm	Dim. "X" ± 0.5 mm
AS	17.3	
MS	25.5	
CS	22.0	
LS	21.0	
BT	20.0	16.0



## Disclaimer

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