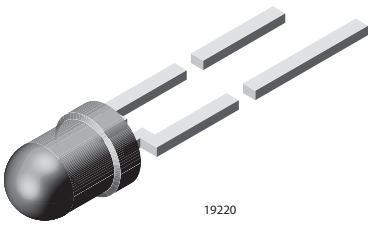
High Efficiency LED in Ø 3 mm Tinted Diffused Package



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

Pb-free

e8

RoHS COMPLIANT

GREEN (5-2008)**

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°

PARTS TABLE

PART	COLOR, LUMINOUS FLUX	TECHNOLOGY
TLHP4401	Pure green, I_V > 1 mcd	GaP on GaP
TLHP4401-AS12Z	Pure green, I_V > 1 mcd	GaP on GaP
TLHG4400	Green, I_V > 2.5 mcd	GaP on GaP
TLHG4400-MS12	Green, I_V > 2.5 mcd	GaP on GaP
TLHG4401	Green, I_V > 4 mcd	GaP on GaP
TLHG4405	Green, I_V > 6.3 mcd	GaP on GaP
TLHY4400	Yellow, I_V > 1.6 mcd	GaAsP on GaP
TLHY4400-AS12Z	Yellow, I_V > 1.6 mcd	GaAsP on GaP
TLHY4400-AS21	Yellow, I_V > 1.6 mcd	GaAsP on GaP
TLHY4400-AS21Z	Yellow, I_V > 1.6 mcd	GaAsP on GaP
TLHY4400-BT12	Yellow, I_V > 1.6 mcd	GaAsP on GaP
TLHY4400-CS12	Yellow, I_V > 1.6 mcd	GaAsP on GaP
TLHY4401	Yellow, I_V > 2.5 mcd	GaAsP on GaP
TLHY4401-AS12	Yellow, I_V > 2.5 mcd	GaAsP on GaP
TLHY4401-AS12Z	Yellow, I_V > 2.5 mcd	GaAsP on GaP
TLHY4401-AS21	Yellow, I_V > 2.5 mcd	GaAsP on GaP
TLHY4405	Yellow, I_V > 6.3 mcd	GaAsP on GaP
TLHY4405-AS12	Yellow, I_V > 6.3 mcd	GaAsP on GaP
TLHY4405-AS12Z	Yellow, I_V > 6.3 mcd	GaAsP on GaP
TLHY4405-BT12Z	Yellow, I_V > 6.3 mcd	GaAsP on GaP
TLHY4405-MS12	Yellow, I_V > 6.3 mcd	GaAsP on GaP

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

PARTS TABLE

PART	COLOR, LUMINOUS FLUX	TECHNOLOGY
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 to 12.5) mcd	GaAsP on GaP
TLHR4407-MS12Z	Red, I_V = (4 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	$t_p \leq 10$ µs	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 ≤ 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	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		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, f = 1 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 °C, unless otherwise specified)
TLHO440, SOFT ORANGE

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity [1]	I_F = 10 mA	TLHO4400	I_V	1.6	4		mcd
Dominant wavelength	I_F = 10 mA		λ_d	598		611	nm
Peak wavelength	I_F = 10 mA		λ_p		605		nm
Angle of half intensity	I_F = 10 mA		φ		± 30		deg
Forward voltage	I_F = 20 mA		V_F		2.4	3	V
Reverse voltage	I_R = 10 µA		V_R	6	15		V
Junction capacitance	V_R = 0, f = 1 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 °C, unless otherwise specified)
TLHY440., YELLOW

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity [1]	I_F = 10 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 mA		λ_d	581		594	nm
Peak wavelength	I_F = 10 mA		λ_p		585		nm
Angle of half intensity	I_F = 10 mA		φ		± 30		deg
Forward voltage	I_F = 20 mA		V_F		2.4	3	V
Reverse voltage	I_R = 10 µA		V_R	6	15		V
Junction capacitance	V_R = 0, f = 1 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 °C, unless otherwise specified)
TLHG440., GREEN

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity [1]	I_F = 10 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 mA		λ_d	562		575	nm
Peak wavelength	I_F = 10 mA		λ_p		565		nm
Angle of half intensity	I_F = 10 mA		φ		± 30		deg
Forward voltage	I_F = 20 mA		V_F		2.4	3	V
Reverse voltage	I_R = 10 µA		V_R	6	15		V
Junction capacitance	V_R = 0, f = 1 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 °C, unless otherwise specified)
TLHP440., PURE GREEN

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity [1]	I_F = 10 mA	TLHP4401	I_V	1	3		mcd
Dominant wavelength	I_F = 10 mA		λ_d	555		565	nm
Peak wavelength	I_F = 10 mA		λ_p		555		nm
Angle of half intensity	I_F = 10 mA		φ		± 30		deg
Forward voltage	I_F = 20 mA		V_F		2.4	3	V
Reverse voltage	I_R = 10 µA		V_R	6	15		V
Junction capacitance	V_R = 0, f = 1 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 °C, unless otherwise specified)

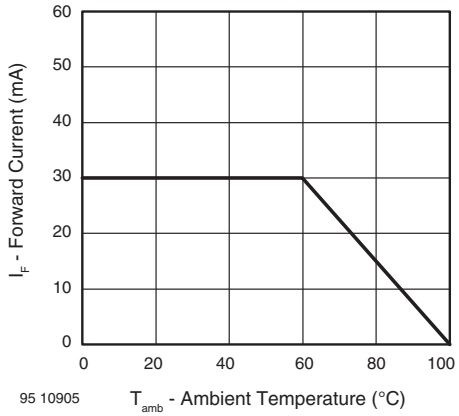


Figure 1. Forward Current vs. Ambient Temperature for InGaN

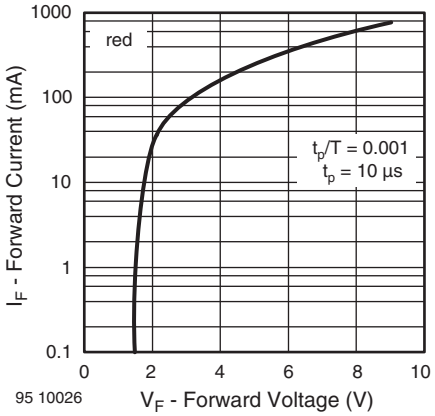


Figure 4. Forward Current vs. Forward Voltage

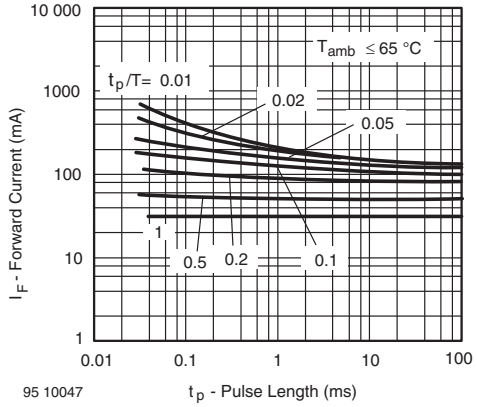


Figure 2. Forward Current vs. Pulse Length

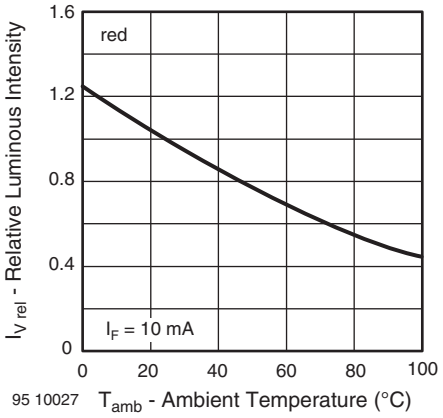


Figure 5. Rel. Luminous Intensity vs. Ambient Temperature

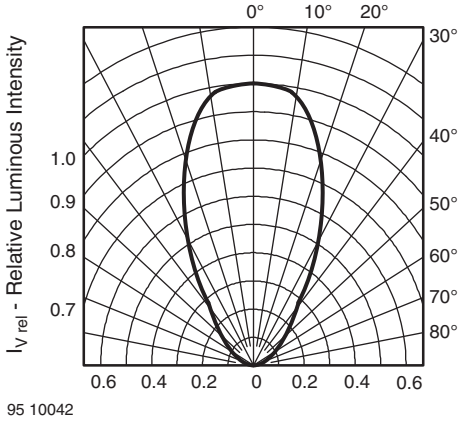


Figure 3. Rel. Luminous Intensity vs. Angular Displacement

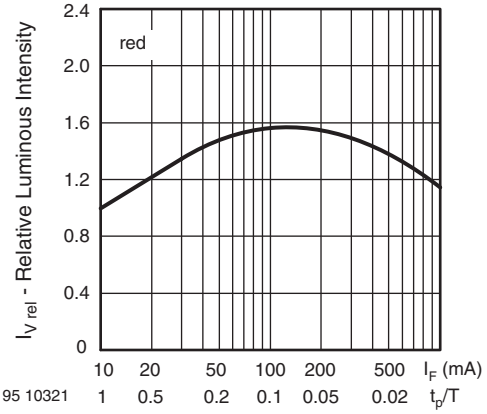


Figure 6. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

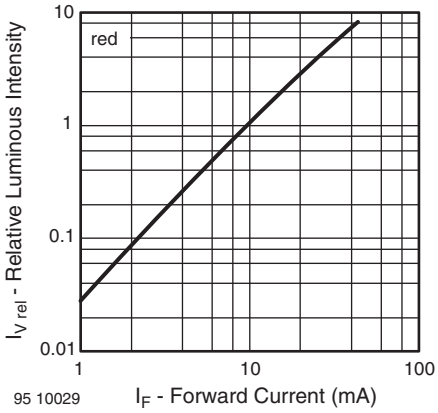


Figure 7. Relative Luminous Intensity vs. Forward Current

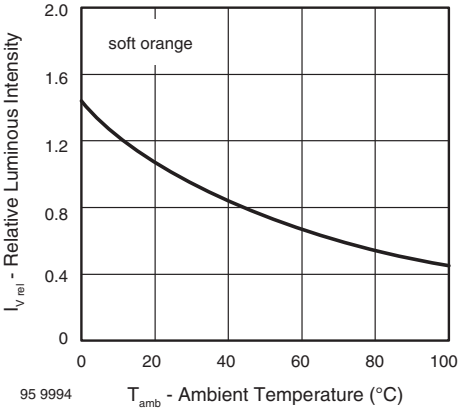


Figure 10. Rel. Luminous Intensity vs. Ambient Temperature

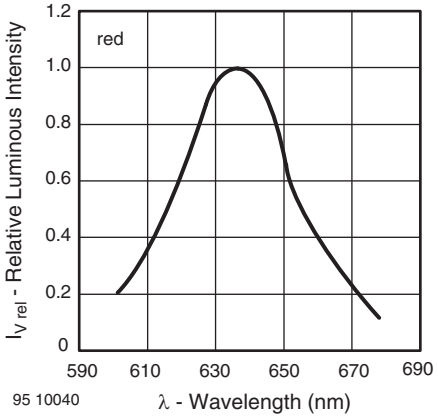


Figure 8. Relative Intensity vs. Wavelength

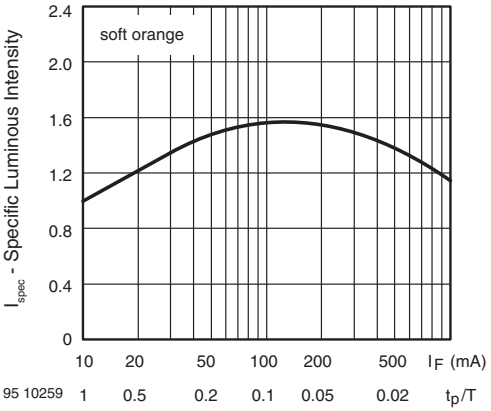


Figure 11. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

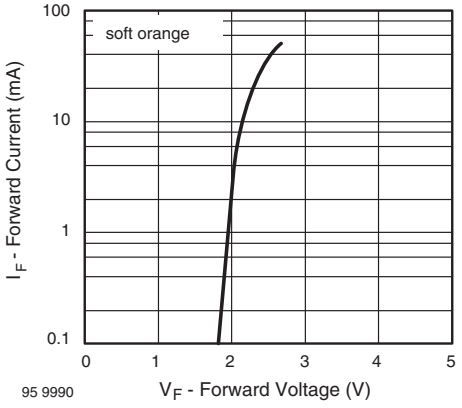


Figure 9. Forward Current vs. Forward Voltage

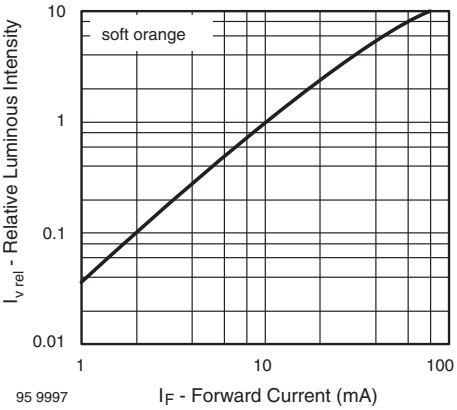


Figure 12. Relative Luminous Intensity vs. Forward Current

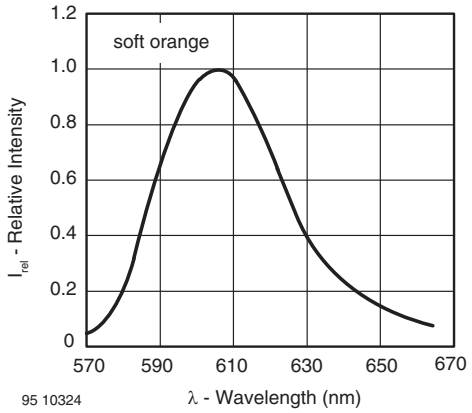


Figure 13. Relative Intensity vs. Wavelength

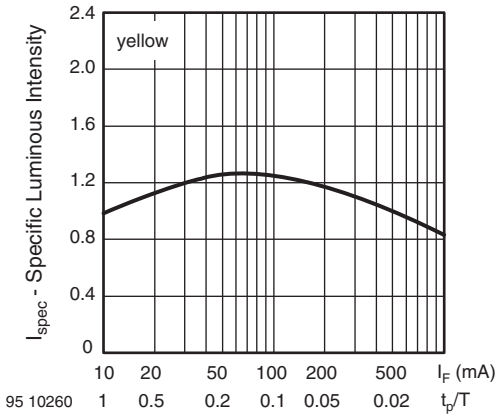


Figure 16. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

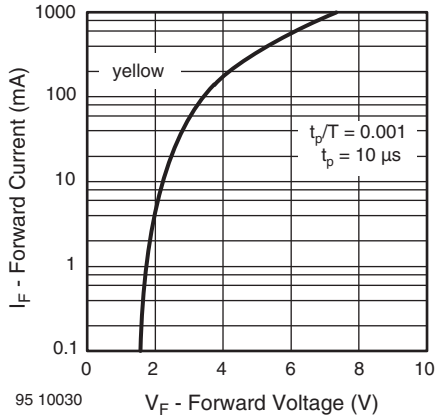


Figure 14. Forward Current vs. Forward Voltage

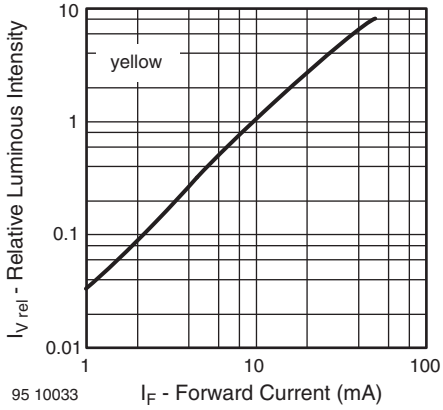


Figure 17. Relative Luminous Intensity vs. Forward Current

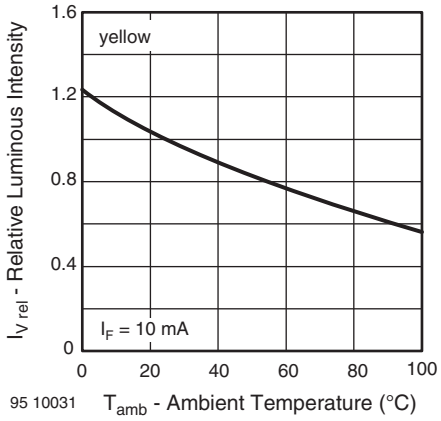


Figure 15. Rel. Luminous Intensity vs. Ambient Temperature

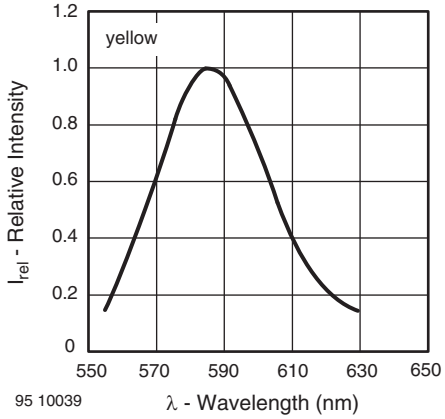


Figure 18. Relative Intensity vs. Wavelength

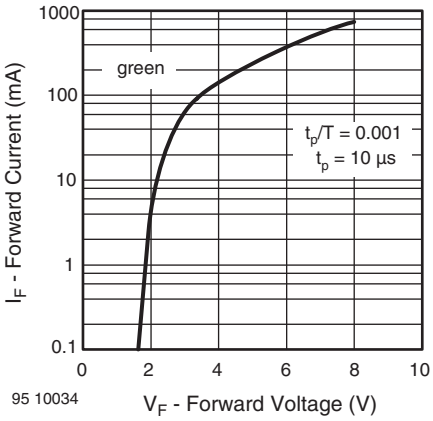


Figure 19. Forward Current vs. Forward Voltage

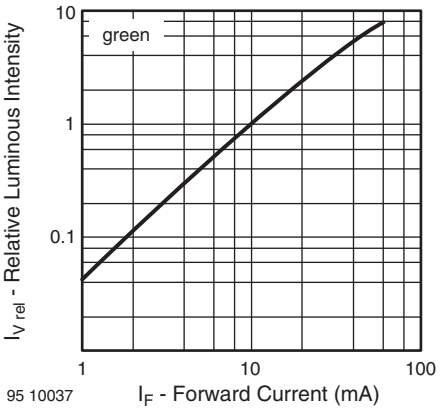


Figure 22. Relative Luminous Intensity vs. Forward Current

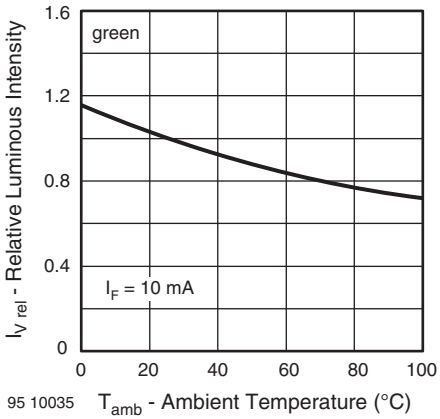


Figure 20. Rel. Luminous Intensity vs. Ambient Temperature

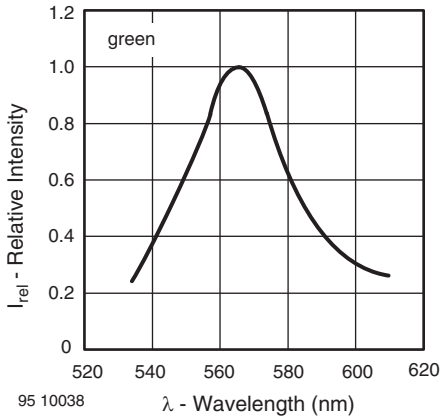


Figure 23. Relative Intensity vs. Wavelength

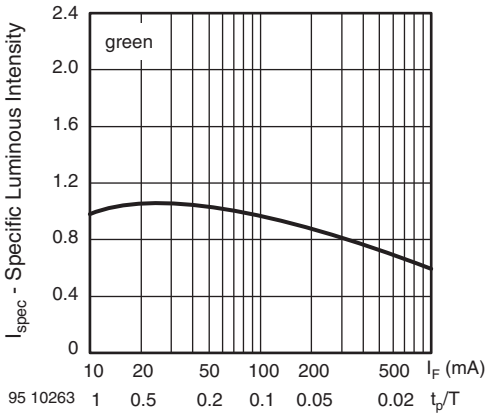


Figure 21. Specific Luminous Intensity vs. Forward Current

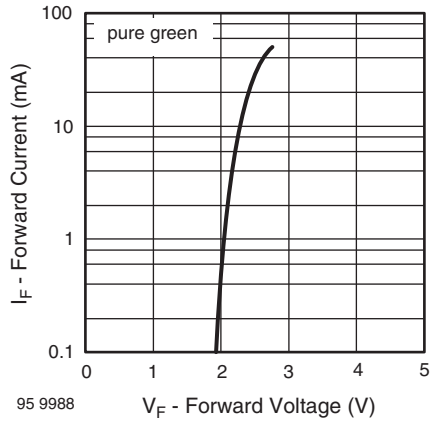


Figure 24. Forward Current vs. Forward Voltage

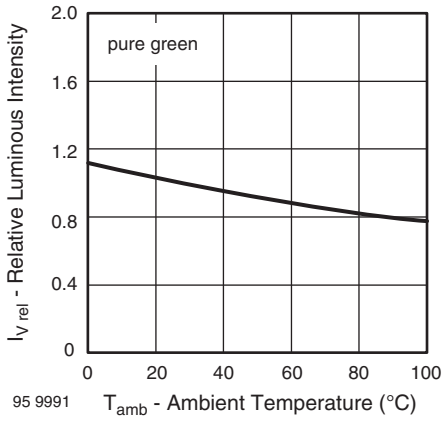


Figure 25. Rel. Luminous Intensity vs. Ambient Temperature

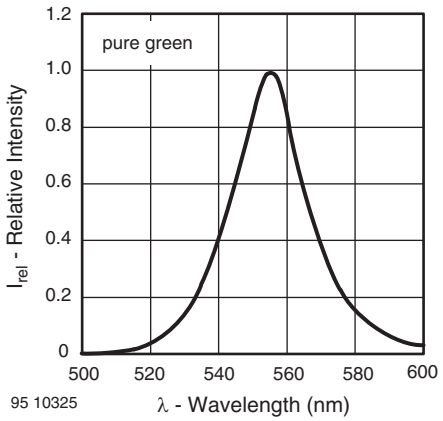


Figure 28. Relative Intensity vs. Wavelength

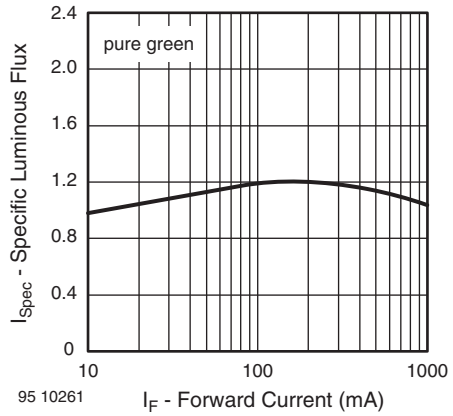


Figure 26. Specific Luminous Intensity vs. Forward Current

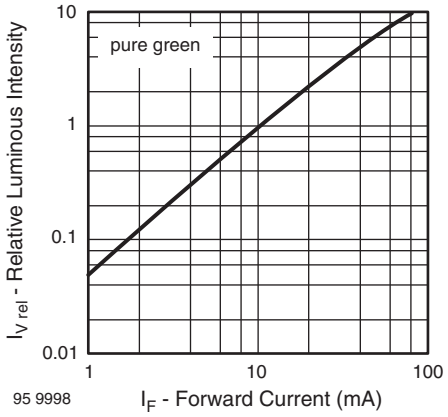
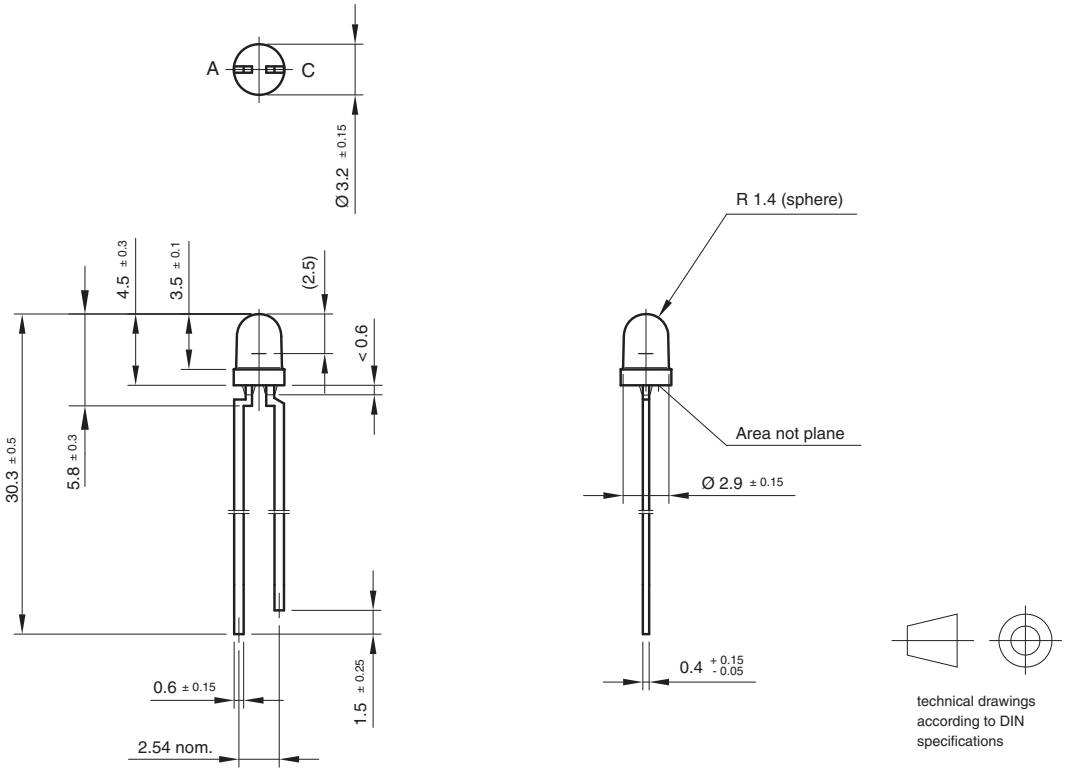


Figure 27. Relative Luminous Intensity vs. Forward Current

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5255.01-4
Issue: 7; 25.09.08
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REEL DIMENSIONS in millimeters

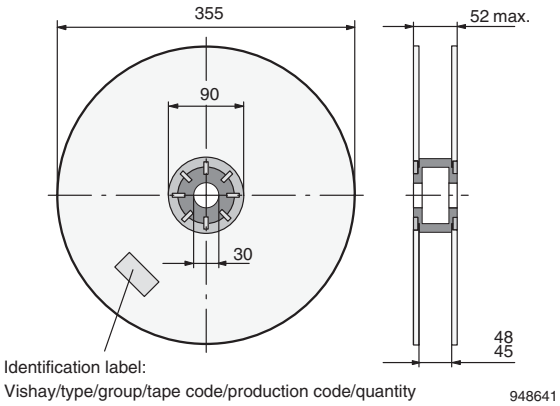


Figure 29. Reel

TAPE

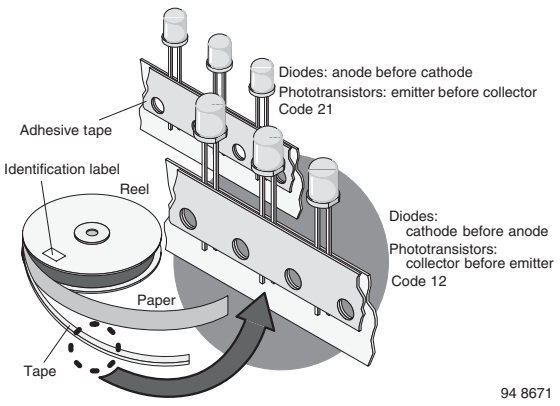


Figure 30. LED in Tape

For technical support, please contact: LED@vishay.com

AMMOPACK

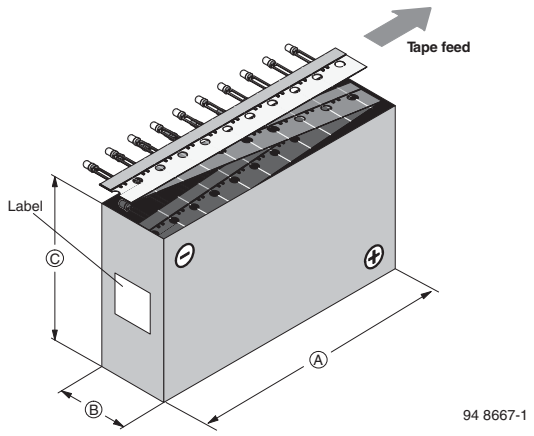
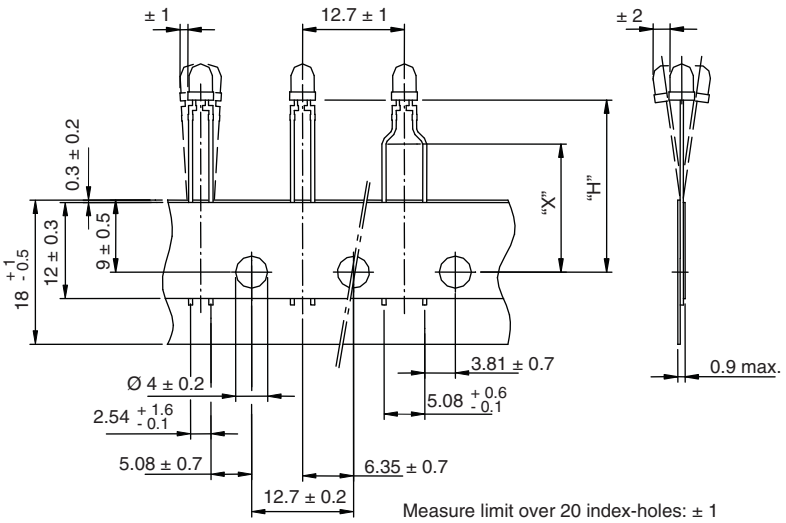


Figure 31. Tape Direction

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

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