

Vishay Semiconductors

### High Efficiency LED in Ø 3 mm Tinted Diffused Package



#### **FEATURES**

- Standard T-1 package
- · Small mechanical tolerances
- · Suitable for DC and high peak current
- Wide viewing angle
- · Luminous intensity categorized
- Yellow and green color categorized
- · Lead (Pb)-free device





#### **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: LEDPackage: 3 mm

Product series: standard
Angle of half intensity: ± 40°

PARTS TABLE		
PART	COLOR, LUMINOUS INTENSITY	TECHNOLOGY
TLHR4400	Red, I <sub>V</sub> > 1.6 mcd	GaAsP on GaP
TLHR4401	Red, I <sub>V</sub> > 2.5 mcd	GaAsP on GaP
TLHR4405	Red, I <sub>V</sub> > 6.3 mcd	GaAsP on GaP
TLHO4400	Soft orange, I <sub>V</sub> > 1.6 mcd	GaAsP on GaP
TLHY4400	Yellow, I <sub>V</sub> > 1.6 mcd	GaAsP on GaP
TLHY4401	Yellow, I <sub>V</sub> > 2.5 mcd	GaAsP on GaP
TLHY4405	Yellow, I <sub>V</sub> > 6.3 mcd	GaAsP on GaP
TLHG4400	Green, I <sub>V</sub> > 2.5 mcd	GaP on GaP
TLHG4401	Green, I <sub>V</sub> > 4 mcd	GaP on GaP
TLHG4405	Green, I <sub>V</sub> > 6.3 mcd	GaP on GaP
TLHP4401	Pure green, I <sub>V</sub> > 1 mcd	GaP on GaP

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ABSOLUTE MAXIMUM	ABSOLUTE MAXIMUM RATINGS 1) TLHR440., TLHO440., TLHY440., TLHG440., TLHP440.,								
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT					
Reverse voltage		$V_{R}$	6	V					
DC Forward current		I <sub>F</sub>	30	mA					
Surge forward current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1	A					
Power dissipation	T <sub>amb</sub> ≤ 60 °C	P <sub>V</sub>	100	mW					
Junction temperature		Tj	100	°C					
Operating temperature range		T <sub>amb</sub>	- 40 to + 100	°C					
Storage temperature range		T <sub>stg</sub>	- 55 to + 100	°C					
Soldering temperature	$t \le 5$ s, 2 mm from body	T <sub>sd</sub>	260	°C					
Thermal resistance junction/ ambient		R <sub>thJA</sub>	400	K/W					

Note:

<sup>1)</sup> T<sub>amb</sub> = 25 °C, unless otherwise specified

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
		TLHR4400	I <sub>V</sub>	1.6	3		mcd
Luminous intensity 2)	I <sub>F</sub> = 10 mA	TLHR4401	I <sub>V</sub>	2.5	5		mcd
		TLHR4405	I <sub>V</sub>	6.3	10		mcd
Dominant wavelength	I <sub>F</sub> = 10 mA		$\lambda_{d}$	612		625	nm
Peak wavelength	I <sub>F</sub> = 10 mA		$\lambda_{p}$		635		nm
Angle of half intensity	I <sub>F</sub> = 10 mA		φ		± 30		deg
Forward voltage	I <sub>F</sub> = 20 mA		$V_{F}$		2	3	V
Reverse voltage	I <sub>R</sub> = 10 μA		$V_{R}$	6	15		V
Junction capacitance	V <sub>R</sub> = 0, f = 1 MHz		C <sub>j</sub>		50		pF

OPTICAL AND ELECTRICAL CHARACTERISTICS 1) TLHO440, SOFT ORANGE							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity 2)	I <sub>F</sub> = 10 mA	TLHO4400	I <sub>V</sub>	1.6	4		mcd
Dominant wavelength	I <sub>F</sub> = 10 mA		$\lambda_{d}$	598		611	nm
Peak wavelength	I <sub>F</sub> = 10 mA		$\lambda_{p}$		605		nm
Angle of half intensity	I <sub>F</sub> = 10 mA		φ		± 30		deg
Forward voltage	I <sub>F</sub> = 20 mA		V <sub>F</sub>		2.4	3	V
Reverse voltage	I <sub>R</sub> = 10 μA		$V_R$	6	15		V
Junction capacitance	V <sub>R</sub> = 0, f = 1 MHz		C <sub>j</sub>		15		pF

<sup>&</sup>lt;sup>1)</sup>  $T_{amb}$  = 25 °C, unless otherwise specified <sup>2)</sup> In one packing unit  $I_{Vmin.}/I_{Vmax.} \le 0.5$ 

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OPTICAL AND ELECTRICAL CHARACTERISTICS 1) TLHY440., YELLOW								
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT	
		TLHY4400	I <sub>V</sub>	1.6	3		mcd	
Luminous intensity 2)	I <sub>F</sub> = 10 mA	TLHY4401	I <sub>V</sub>	2.5	5		mcd	
		TLHY4405	I <sub>V</sub>	6.3	10		mcd	
Dominant wavelength	I <sub>F</sub> = 10 mA		$\lambda_{d}$	581		594	nm	
Peak wavelength	I <sub>F</sub> = 10 mA		$\lambda_{p}$		585		nm	
Angle of half intensity	I <sub>F</sub> = 10 mA		φ		± 30		deg	
Forward voltage	I <sub>F</sub> = 20 mA		V <sub>F</sub>		2.4	3	V	
Reverse voltage	I <sub>R</sub> = 10 μA		V <sub>R</sub>	6	15		V	
Junction capacitance	V <sub>R</sub> = 0, f = 1 MHz		C <sub>j</sub>		50		pF	

OPTICAL AND ELECTRICAL CHARACTERISTICS 1) TLHG440., GREEN							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
		TLHG4400	Ι <sub>V</sub>	2.5	4		mcd
Luminous intensity 2)	I <sub>F</sub> = 10 mA	TLHG4401	I <sub>V</sub>	4	6		mcd
		TLHG4405	I <sub>V</sub>	6.3	12		mcd
Dominant wavelength	I <sub>F</sub> = 10 mA		$\lambda_{d}$	562		575	nm
Peak wavelength	I <sub>F</sub> = 10 mA		$\lambda_{p}$		565		nm
Angle of half intensity	I <sub>F</sub> = 10 mA		φ		± 30		deg
Forward voltage	I <sub>F</sub> = 20 mA		$V_{F}$		2.4	3	V
Reverse voltage	I <sub>R</sub> = 10 μA		$V_R$	6	15		V
Junction capacitance	V <sub>R</sub> = 0, f = 1 MHz		C <sub>j</sub>		50		pF

Note:

OPTICAL AND ELECTRICAL CHARACTERISTICS 1) TLHP440., PURE GREEN							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity 2)	I <sub>F</sub> = 10 mA	TLHP4401	I <sub>V</sub>	1	3		mcd
Dominant wavelength	I <sub>F</sub> = 10 mA		$\lambda_{d}$	555		565	nm
Peak wavelength	I <sub>F</sub> = 10 mA		$\lambda_{p}$		555		nm
Angle of half intensity	I <sub>F</sub> = 10 mA		φ		± 30		deg
Forward voltage	I <sub>F</sub> = 20 mA		$V_{F}$		2.4	3	V
Reverse voltage	I <sub>R</sub> = 10 μA		$V_R$	6	15		V
Junction capacitance	V <sub>R</sub> = 0, f = 1 MHz		C <sub>j</sub>		50		pF

<sup>&</sup>lt;sup>1)</sup>  $T_{amb}$  = 25 °C, unless otherwise specified <sup>2)</sup> In one packing unit  $I_{Vmin.}/I_{Vmax.} \le 0.5$ 

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 $<sup>^{(1)}</sup>$  T<sub>amb</sub> = 25 °C, unless otherwise specified  $^{(2)}$  In one packing unit  $I_{Vmin.}/I_{Vmax.} \le 0.5$ 

## Vishay Semiconductors



#### **TYPICAL CHARACTERISTICS**

T<sub>amb</sub> = 25 °C, unless otherwise specified

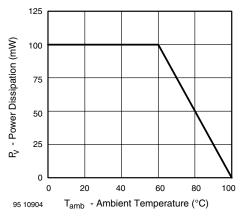


Figure 1. Power Dissipation vs. Ambient Temperature

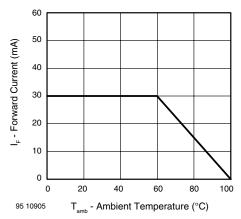


Figure 2. Forward Current vs. Ambient Temperature for InGaN

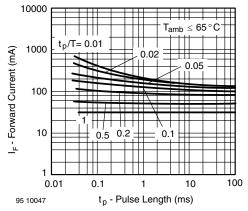


Figure 3. Forward Current vs. Pulse Length

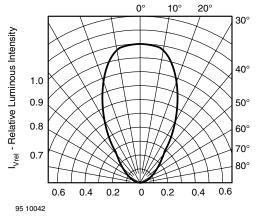


Figure 4. Rel. Luminous Intensity vs. Angular Displacement

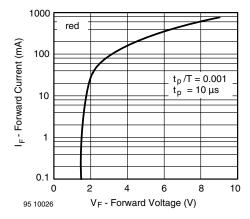


Figure 5. Forward Current vs. Forward Voltage

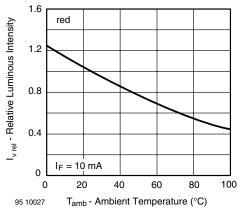


Figure 6. Rel. Luminous Intensity vs. Ambient Temperature



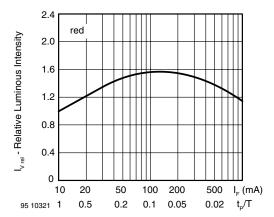


Figure 7. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

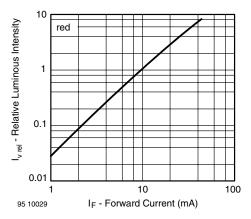


Figure 8. Relative Luminous Intensity vs. Forward Current

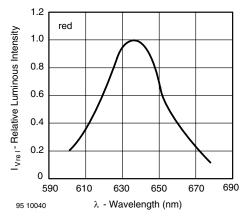


Figure 9. Relative Intensity vs. Wavelength

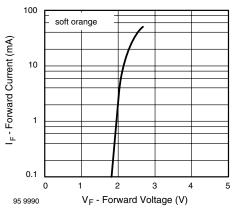


Figure 10. Forward Current vs. Forward Voltage

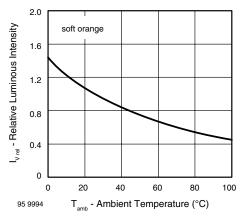


Figure 11. Rel. Luminous Intensity vs. Ambient Temperature

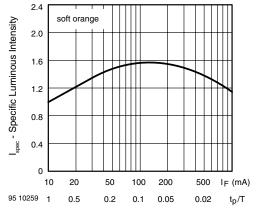


Figure 12. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle



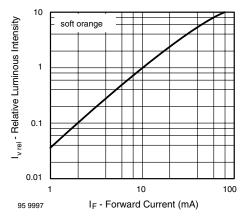


Figure 13. Relative Luminous Intensity vs. Forward Current

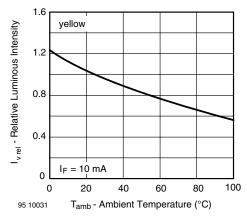


Figure 16. Rel. Luminous Intensity vs. Ambient Temperature

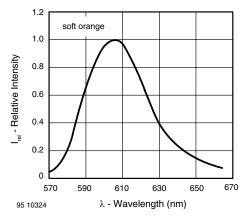


Figure 14. Relative Intensity vs. Wavelength

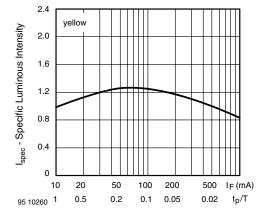


Figure 17. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

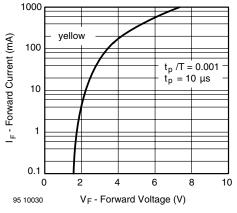


Figure 15. Forward Current vs. Forward Voltage

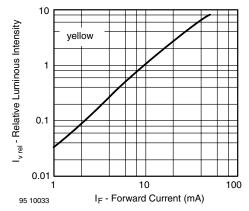


Figure 18. Relative Luminous Intensity vs. Forward Current

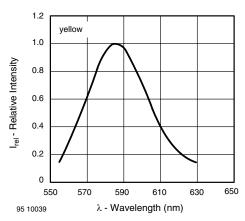


Figure 19. Relative Intensity vs. Wavelength

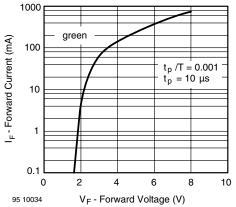


Figure 20. Forward Current vs. Forward Voltage

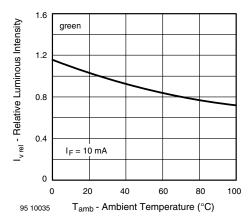


Figure 21. Rel. Luminous Intensity vs. Ambient Temperature

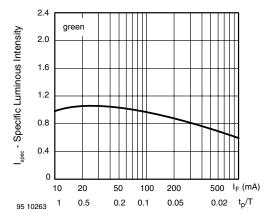


Figure 22. Specific Luminous Intensity vs. Forward Current

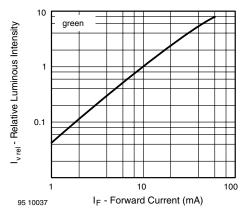


Figure 23. Relative Luminous Intensity vs. Forward Current

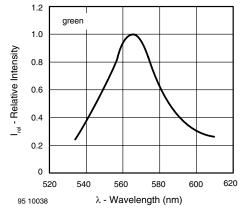


Figure 24. Relative Intensity vs. Wavelength



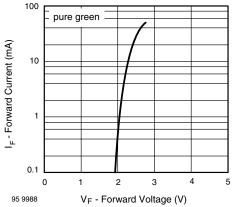


Figure 25. Forward Current vs. Forward Voltage

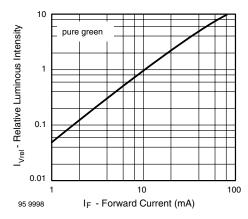


Figure 28. Relative Luminous Intensity vs. Forward Current

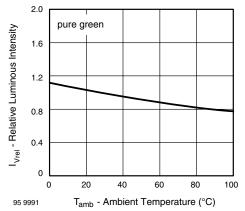


Figure 26. Rel. Luminous Intensity vs. Ambient Temperature

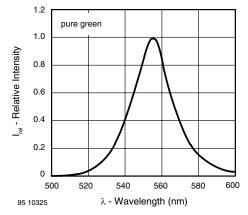


Figure 29. Relative Intensity vs. Wavelength

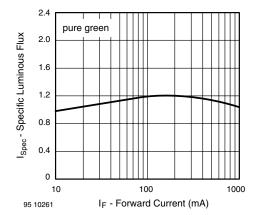
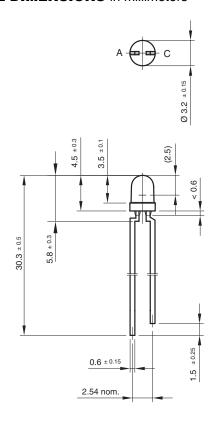


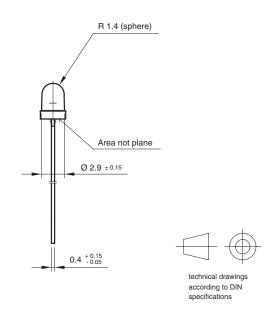
Figure 27. Specific Luminous Intensity vs. Forward Current



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#### **PACKAGE DIMENSIONS** in millimeters





Drawing-No.: 6.544-5255.01-4

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