

## High Efficiency LED, Ø 3 mm Tinted Total Diffused Package



### FEATURES

- Choice of three bright colors
- Standard Ø 3 (T-1) package
- Small mechanical tolerances
- Suitable for DC and high peak current
- Very 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.46.. series was developed for applications which need a very wide radiation angle like backlighting, general indicating and lighting purposes. It is housed in a 3 mm tinted total 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:  $\pm 60^\circ$

PARTS TABLE		
PART	COLOR, LUMINOUS INTENSITY	TECHNOLOGY
TLHR4600	Red, $I_V > 1$ mcd	GaAsP on GaP
TLHR4605	Red, $I_V > 2.5$ mcd	GaAsP on GaP
TLHR4605-MS12Z	Red, $I_V > 2.5$ mcd	GaAsP on GaP
TLHY4600	Yellow, $I_V > 0.63$ mcd	GaAsP on GaP
TLHY4600-AS12	Yellow, $I_V > 0.63$ mcd	GaAsP on GaP
TLHY4601	Yellow, $I_V > 1$ mcd	GaAsP on GaP
TLHY4605	Yellow, $I_V > 2.5$ mcd	GaAsP on GaP
TLHY4605-AS12Z	Yellow, $I_V > 2.5$ mcd	GaAsP on GaP
TLHY4605-CS12Z	Yellow, $I_V > 2.5$ mcd	GaAsP on GaP
TLHY4605-MS12Z	Yellow, $I_V > 2.5$ mcd	GaAsP on GaP
TLHG4600	Green, $I_V > 1$ mcd	GaP on GaP
TLHG4601-AS21	Green, $I_V > 1.6$ mcd	GaP on GaP
TLHG4605	Green, $I_V > 4$ mcd	GaP on GaP
TLHG4605-AS12Z	Green, $I_V > 4$ mcd	GaP on GaP
TLHG4605-MS21Z	Green, $I_V > 4$ mcd	GaP on GaP

\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHR460., TLHY460., TLHG460.**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage		$V_R$	6	V
DC Forward current	$T_{amb} \leq 60\text{ }^{\circ}\text{C}$	$I_F$	30	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	1	A
Power dissipation	$T_{amb} \leq 60\text{ }^{\circ}\text{C}$	$P_V$	100	mW
Junction temperature		$T_j$	100	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	- 20 to + 100	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 55 to + 100	$^{\circ}\text{C}$
Soldering temperature	$t \leq 5\text{ s}$ , 2 mm from body	$T_{sd}$	260	$^{\circ}\text{C}$
Thermal resistance junction/ambient		$R_{thJA}$	400	K/W

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHR460., RED**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHR4600	$I_V$	1	4		mcd
		TLHR4605	$I_V$	2.5	6		mcd
Dominant wavelength	$I_F = 10\text{ mA}$		$\lambda_d$	612		625	nm
Peak wavelength	$I_F = 10\text{ mA}$		$\lambda_p$		635		nm
Angle of half intensity	$I_F = 10\text{ mA}$		$\varphi$		$\pm 60$		deg
Forward voltage	$I_F = 20\text{ mA}$		$V_F$		2	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  $I_{Vmin.}/I_{Vmax.} \leq 0.5$

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TLHY460., YELLOW**

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHY4600	$I_V$	0.63	3.5		mcd
		TLHY4601	$I_V$	1	4		mcd
		TLHY4605	$I_V$	2.5	5		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	$I_F = 10\text{ mA}$		$\varphi$		$\pm 60$		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  $I_{Vmin.}/I_{Vmax.} \leq 0.5$



OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
TLHG460., GREEN							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity <sup>1)</sup>	$I_F = 10\text{ mA}$	TLHG4600	$I_V$	1	4		mcd
		TLHG4601	$I_V$	1.6	3.5		mcd
		TLHG4605	$I_V$	4	6		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	$I_F = 10\text{ mA}$		$\phi$		$\pm 60$		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  $I_{Vmin}/I_{Vmax} \leq 0.5$

LUMINOUS INTENSITY CLASSIFICATION			
GROUP	LIGHT INTENSITY (mcd)		
	STANDARD	MIN.	MAX.
K	0.63	1.25	
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  $\pm 11\%$ .

These 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	
	MIN.	MAX.	MIN.	MAX.
0				
1	581	584		
2	583	586		
3	585	588	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)

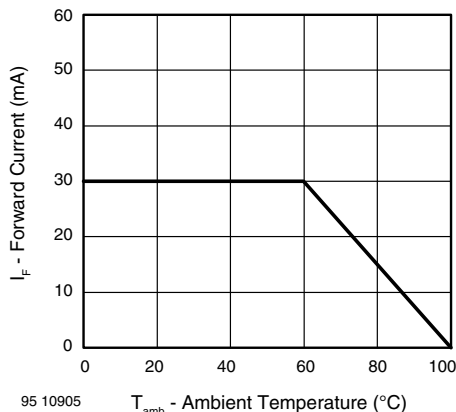


Figure 1. Forward Current vs. Ambient Temperature

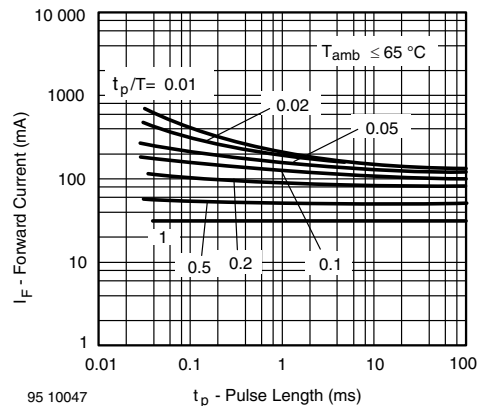


Figure 2. Forward Current vs. Pulse Length



Figure 3. Rel. Luminous Intensity vs. Angular Displacement



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



Figure 4. Forward Current vs. Forward Voltage



Figure 7. Relative Luminous Intensity vs. Forward Current

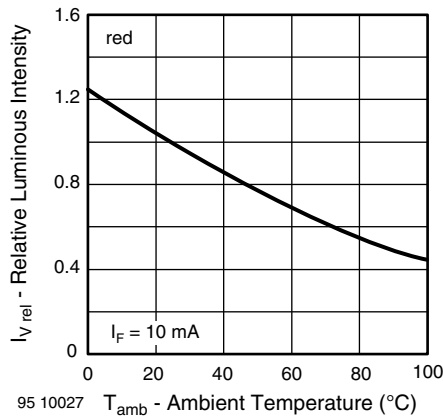


Figure 5. Rel. Luminous Intensity vs. Ambient Temperature



Figure 8. Relative Intensity vs. Wavelength

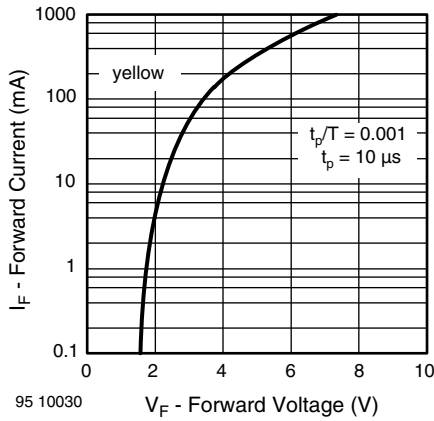


Figure 9. Forward Current vs. Forward Voltage

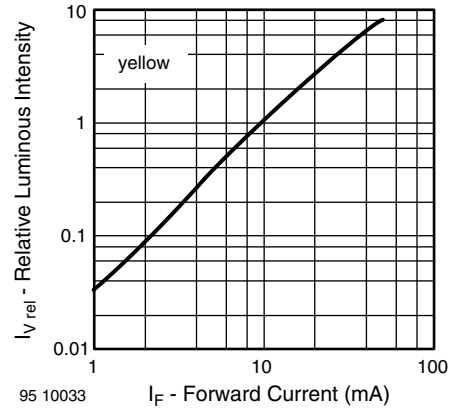


Figure 12. Relative Luminous Intensity vs. Forward Current



Figure 10. Rel. Luminous Intensity vs. Ambient Temperature

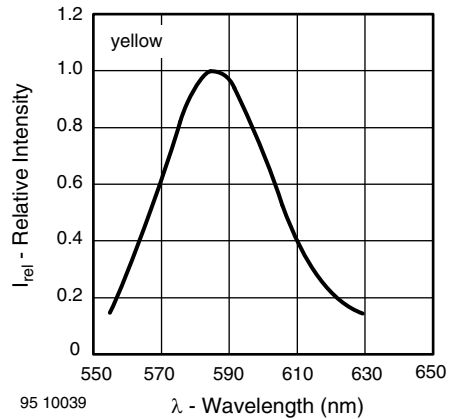


Figure 13. Relative Intensity vs. Wavelength

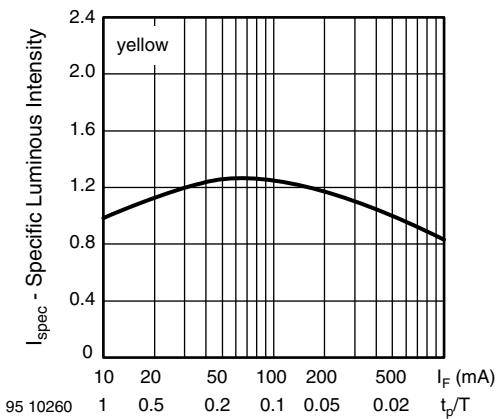


Figure 11. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle

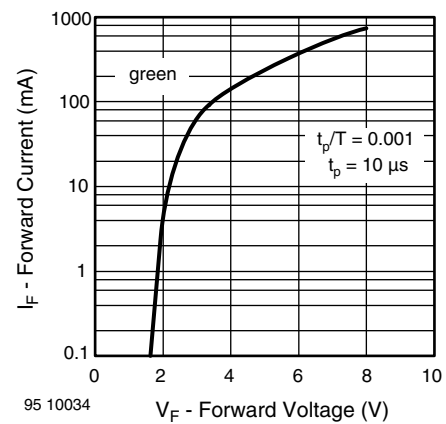


Figure 14. Forward Current vs. Forward Voltage



Figure 15. Rel. Luminous Intensity vs. Ambient Temperature



Figure 18. Relative Intensity vs. Wavelength

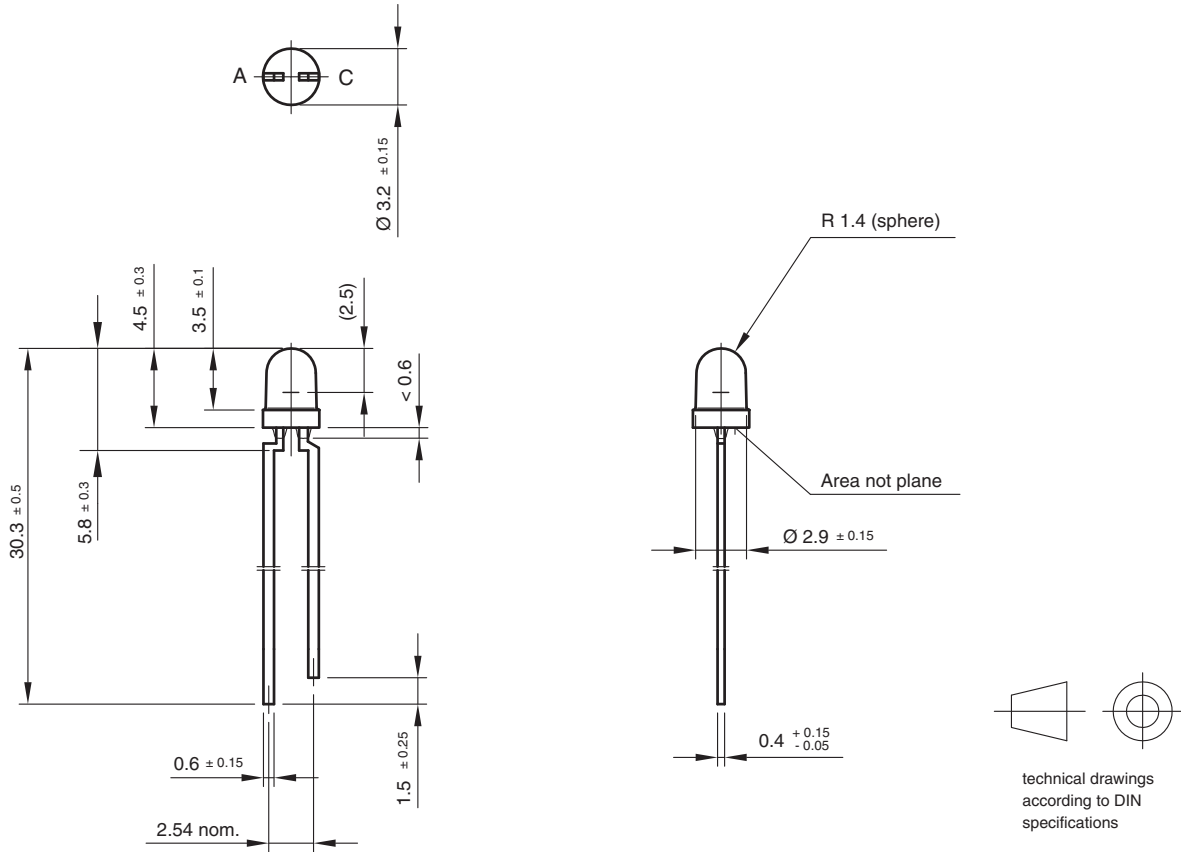


Figure 16. Rel. Lumin. Intensity vs. Forw. Current/Duty Cycle



Figure 17. Relative Luminous Intensity vs. Forward Current

**PACKAGE DIMENSIONS** in millimeters



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

## TAPE

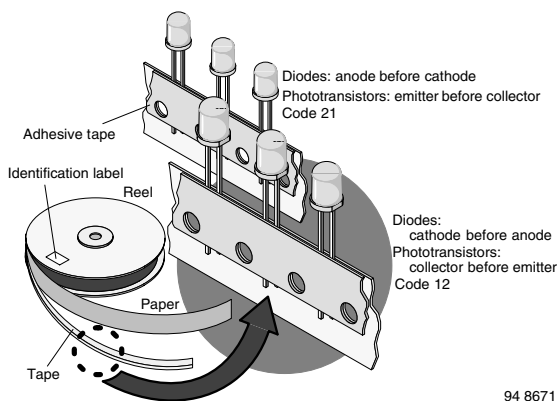


Figure 19. LED in Tape

94 8671

## AMMOPACK

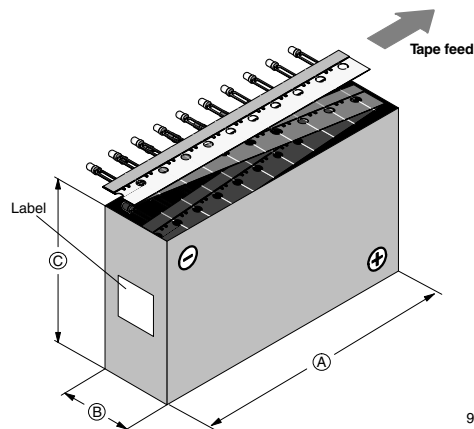


Figure 20. Tape Direction

94 8667-1

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

94 8171

Option	Dim. "H" ± 0.5 mm
AS	17.3
MS	25.5
CS	22.0





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