General Information

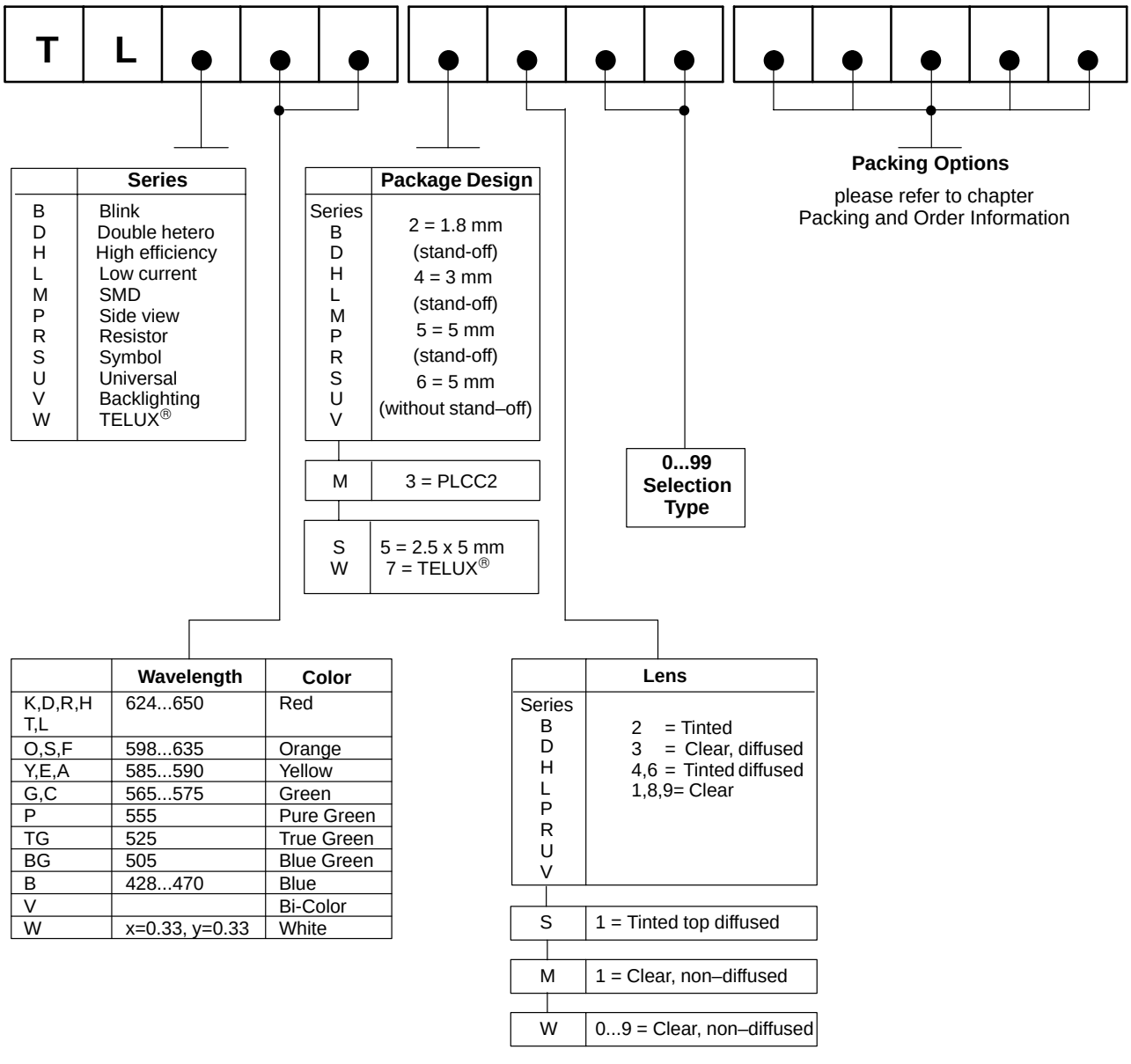
Explanation of Technical Data

Vishay light emitting diodes and displays are generally designated in accordance with the Vishay designation system:

TL... = Light emitting diode
TD... = Display

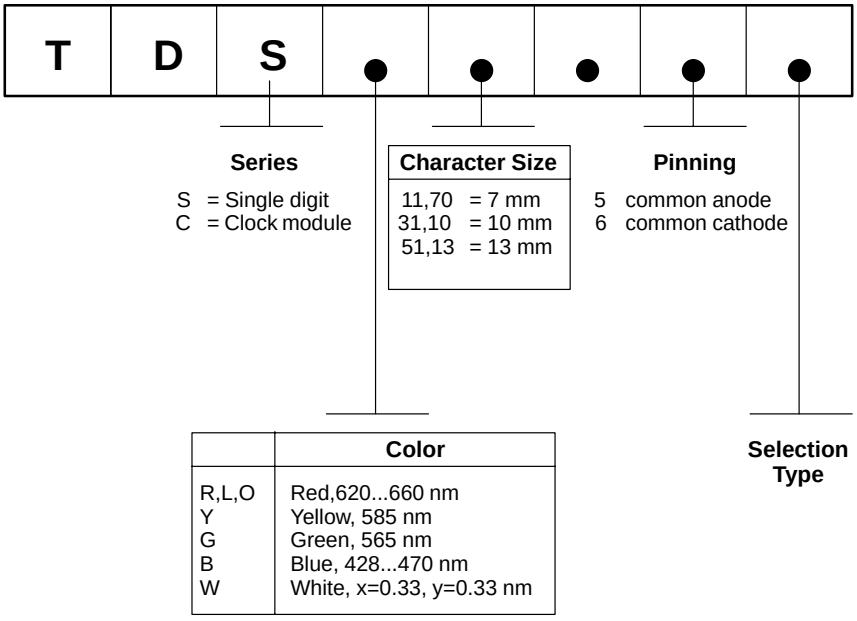
The following figures show how the components can be identified.

Type Designation Code for LEDs



Example: TLME3100 GS08 = SMD, yellow, 8 mm Blister tape, 1500 pcs

Telefunken Type Designation Code for Displays



Example: TDSG5160 = Display single digit green, 13 mm

Symbols and Terminology – Alphabetically

A Anode, anode terminal

A Radiant sensitive area
That area which is radiant sensitive for a specified range.

AQL Acceptable Quality Level

C Capacitance

C Cathode, cathode terminal

°C Celsius
Unit of the Celsius temperature scale;
Symbols: T
T (°C) = T (K) – 273

cd Candela
SI unit of luminous intensity I_v

C_j Junction capacitance
Capacitance due to a PN-junction of a diode. It decreases with increasing reverse voltage.

E_v Illuminance, illumination (at a specific point on a surface) .Quotient of the luminous flux incident on an element of the surface containing the point, divided by the area of that element.

$$E_v = \frac{d\Phi_v}{dA}$$

Unit: lx (Lux)

f Frequency
Unit: Hz (Hertz)

I_F Continuous forward current
The current flowing through a diode in the direction of lower resistance.

I_{FAV} Average (mean) forward current

I_{FM} Peak forward current

I_{FSM} Surge forward current

I_R Reverse current, leakage current
Current which flows when reverse bias is applied to a semiconductor junction.

I_v Luminous intensity (of a source in a given direction). Quotient of the luminous flux leaving the source propagated in an element of solid angle containing the given direction by the element of solid angle.

$$I_v = \frac{d\Phi_v}{d\Omega}$$

Unit: cd (candela), lm/sr

I_{vav} Luminous intensity, average

K Kelvin
The unit of absolute temperature T (also called the Kelvin temperature); can also be used for temperature changes (formerly °K).

lm Lumen
SI-unit of luminous flux, Φ_V

L_V Luminance (in a given direction, at a point on the surface of a source or a receptor, or at a point on the path of a beam).

Quotient of the luminous flux leaving, arriving at, or passing through an element of surface at this point. It is propagated in directions defined by an element of the solid angle containing the given direction, divided by the product of the solid angle of the cone and the area of the orthogonal projection of the element of surface on a plane perpendicular to the given direction.

$$L_v = \frac{d^2\Phi_v}{d\Omega \times dA \times \cos\theta}$$

Unit: cd/m^2

lx Lux
SI-unit of illumination, E_v

M_v Luminous exitance (at a specific point on a surface). Quotient of the luminous flux leaving an element of the surface containing the point, divided by the area of that element.

$$M_v = \frac{d\Phi_v}{dA}$$

Unit: lm/m^2

P_{tot} Total power dissipation

P_v Power dissipation, general

Q_v Quantity of light
Product of luminous flux and its duration
$Q_v = \int \Phi_v \times dt$ Unit: lm s (lumen-second)

R_{thJA} Thermal resistance, junction-ambient

R_{thJC} Thermal resistance, junction case

sr Steradian
SI-unit of a solid angle Ω

T Period (duration)

T Temperature
0 K = –273.16°C
Unit: K (Kelvin), °C (Celsius)

t Time

T_{amb} Ambient temperature
If self-heating is significant:
Temperature of the surrounding air below the device, under conditions of thermal equilibrium.
If self-heating is insignificant: Air temperature in the intermediate surroundings of the device.

T_{amb} Ambient temperature range
As an absolute maximum rating:
The maximum permissible ambient temperature range.

TC Temperature coefficient
The ratio of the relative change of an electrical quantity to the change in temperature (ΔT) which causes it, under otherwise constant operating conditions.

T_{case} Case temperature
The temperature measured at a specified point on the case of a semiconductor device.
Unless otherwise stated, this temperature is given as the temperature of the mounting base for devices with metal can.

t_d Delay time

t_f Fall time

T_j Junction temperature
The spatial mean value of temperature during operation.

t_{off} Turn-off time

t_{on} Turn-on time

t_p Pulse duration

t_r Rise time

t_s Storage time

T_{sd} Soldering temperature
Maximum temperature allowed for soldering at a specified distance from case and its duration.

T_{stg} Storage temperature range
The temperature range at which the device may be stored or transported without any applied voltage.

$V_{(BR)}$ Breakdown voltage
Reverse voltage at which a small increase in voltage results in a sharp rise of reverse current. It is given in the technical data sheet for a specified current.

V_F The voltage across the diode terminals which results from the flow of current in the forward direction.

V_R Reverse voltage
Voltage drop which results from the flow of reverse current.

V_S, V_{CC}
Supply voltage

φ The plane angle through which an emitter can be rotated in both directions away from the optical axis, before the electrical output of a linear detector facing the emitter falls to half the maximum value.

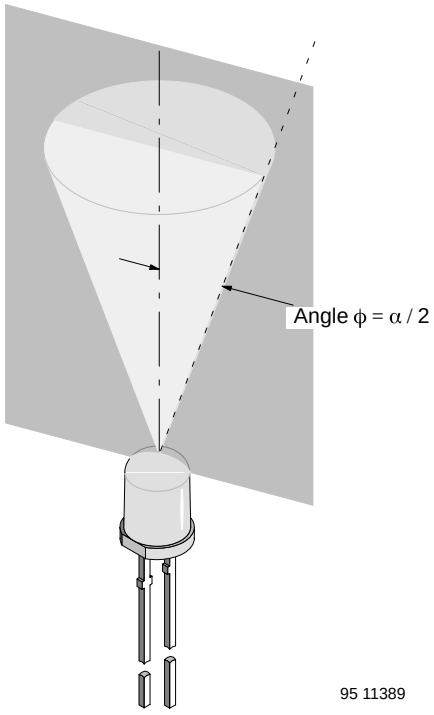


Figure 1. Angle of half intensity

λ Wavelength
The wavelength of an electromagnetic radiation

$\lambda_{0.5}$ Range of spectral bandwidth (50%)
The range of wavelengths where the spectral sensitivity or spectral emission remains within 50% of the maximum value.

λ_d Dominant wavelength
The dominant wavelength of a color stimulus is the wavelength of the monochromatic stimulus that, when additively mixed in suitable proportions with an achromatic stimulus, yields a color which matches the color stimulus in question.

λ_p Peak wavelength
Wavelength of peak sensitivity or emission

$\Delta\lambda$ Spectral half bandwidth
The wavelength interval within which the spectral sensitivity or spectral emission falls to half peak value.

Φ_v Luminous flux
Quantity derived from radiant power by evaluating the radiation according to its effect upon a selective receptor, the spectral sensitivity of which is defined by the standard spectral luminous efficiencies.

$$\Phi_v = \frac{dQ_v}{dt}$$

Unit: lm (lumen)

Ω Solid angle
The space enclosed by rays which emerge from a single point and lead to all the points of a closed curve. If it is assumed that the apex of the cone formed in this way is the center of a sphere with radius r and that the cone intersects with the surface of the sphere, then the size of the surface area (A) of the sphere subtending the cone is a measure of the solid angle

$$\Omega = \frac{A}{r^2} \quad [sr]$$

There are 4π sr in a complete sphere. A cone with an angle of half sensitivity α forms a solid angle of

$\Omega = 2\pi\,(1 - \cos\alpha/2) = 4\pi \sin^2 \alpha/4$
Unit: sr (Steradian)

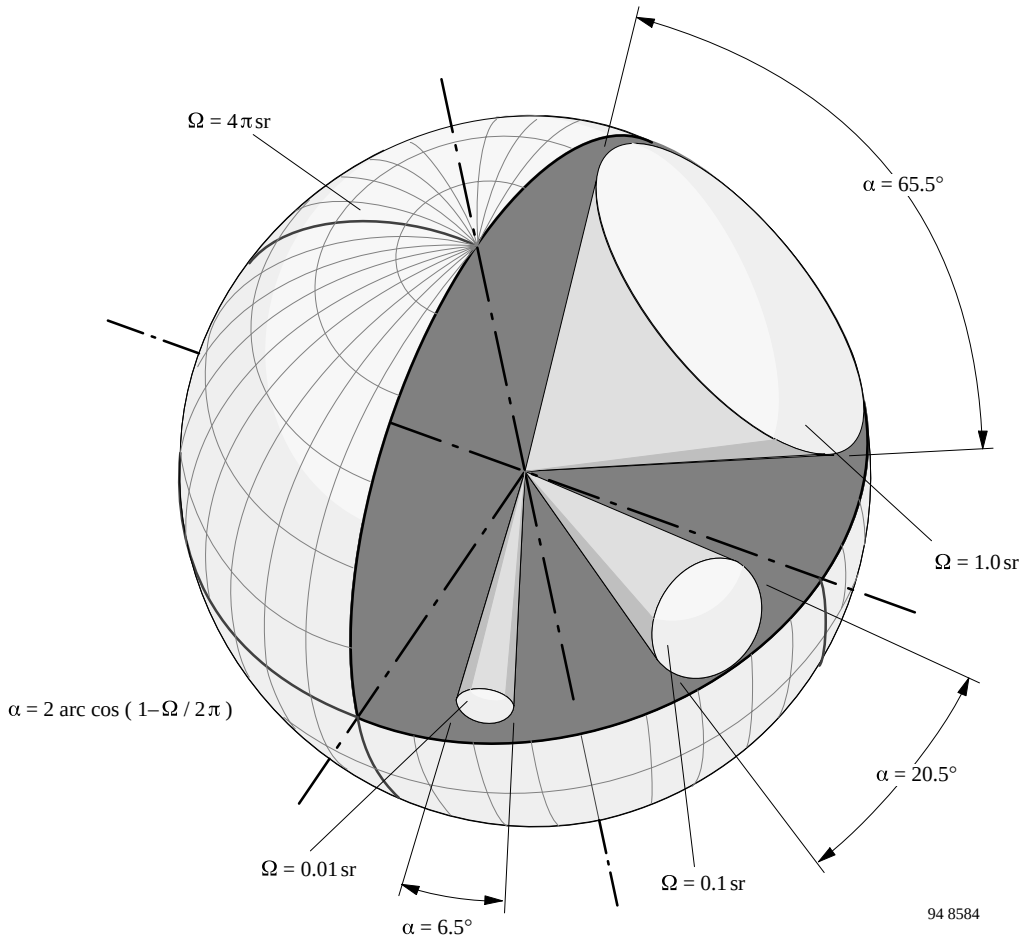


Figure 2. Solid angle

Data Sheet Construction

Data sheet information is generally presented in the following sequence:

- Description
- Features
- Applications
- Absolute maximum ratings
- Optical and electrical characteristics
- Typical characteristics (diagrams)
- Dimensions (mechanical data)

Additional information on device performance is provided if necessary.

Description

The following information is provided: Type number, semiconductor materials used, sequence of zones, technology used, device type and, if necessary, construction.

Also, short-form information on the typical applications and special features is given.

Absolute Maximum Ratings

These define maximum permissible operational and environmental conditions. If any one of these conditions is exceeded, this could result in the destruction of the device. Unless otherwise specified, an ambient temperature of $25 \pm 3°C$ is assumed for all absolute maximum ratings. Most absolute ratings are static characteristics; if they are measured by a pulse method, the associated measurement conditions are stated. Maximum ratings are absolute (i.e., interdependent).

Any equipment incorporating semiconductor devices must be designed so that even under the most unfavorable operating conditions, the specified maximum ratings of the devices used are never exceeded. These ratings could be exceeded because of changes in supply voltage, the properties of other components used in this equipment, control settings, load conditions, drive level, environmental conditions and the properties of the devices themselves (i.e., ageing).

Some thermal data is given under the heading ‘Absolute Maximum Ratings’ (e.g., junction temperature, storage temperature range, total power dissipation). This is because it imposes a limit on the application range of the device.

The thermal resistance junction ambient (R_{thJA}) quoted is that which would be measured without artificial cooling, i.e., under worst-case conditions.

Temperature coefficients, on the other hand, are listed together with the associated parameters under ‘Optical and Electrical Characteristics’.

Optical and Electrical Characteristics

The most important operational optical and electrical characteristics (minimum, typical and maximum values) are grouped under this heading, together with associated test conditions supplemented with graphs.

Typical Characteristics (Diagrams)

Besides the static (DC) and dynamic (AC) characteristics, a family of curves is given for specified operating conditions. Here, the typical independence of individual characteristics is shown.

Dimensions (Mechanical Data)

In this section, important dimensions and connection sequences are given, supplemented by a circuit diagram. Case outline drawings carry DIN-, JEDEC or commercial designations. Information on angle of sensitivity or intensity and weight completes the list of mechanical data.

Note:

If the dimensional information does not include any tolerances, then the following applies:

Lead length and mounting hole dimensions are minimum values. Radiant sensitive or emitting area respectively are typical, all other dimensions are maximum.

Any device accessories must be ordered separately and the order number must be quoted.

Additional Information

Preliminary specifications

This heading indicates that some information given here may be subject to slight changes.

Not for new developments

This heading indicates that the device concerned should not be used in equipment under development. The device is, however, available for present production.