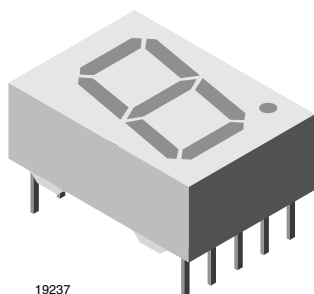




## Standard 7-Segment Display 13 mm



19237

### DESCRIPTION

The TDS.51.. series are 13 mm character seven segment LED displays in a very compact package.

The displays are designed for a viewing distance up to 7 m and available in four bright colors. The grey package surface and the evenly lighted untinted segments provide an optimum on-off contrast.

All displays are categorized in luminous intensity groups. That allows users to assemble displays with uniform appearance. Typical applications include instruments, panel meters, point-of-sale terminals and household equipment.

### FEATURES

- Evenly lighted segments
- Grey package surface
- Untinted segments
- Luminous intensity categorized
- Yellow and green categorized for color
- Wide viewing angle
- Suitable for DC and high peak current
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### APPLICATIONS

- Panel meters
- Test- and measure-equipment
- Point-of-sale terminals
- Control units
- TV sets

### PRODUCT GROUP AND PACKAGE DATA

- Product group: Display
- Package: 13 mm
- Product series: Standard
- Angle of half intensity:  $\pm 50^\circ$

### PARTS TABLE

| PART        | COLOR      | LUMINOUS INTENSITY ( $\mu\text{cd}$ ) |      |        | at $I_F$ (mA) | WAVELENGTH (nm) |      |      | at $I_F$ (mA) | FORWARD VOLTAGE (V) |      |      | at $I_F$ (mA) | CIRCUITRY      |
|-------------|------------|---------------------------------------|------|--------|---------------|-----------------|------|------|---------------|---------------------|------|------|---------------|----------------|
|             |            | MIN.                                  | TYP. | MAX.   |               | MIN.            | TYP. | MAX. |               | MIN.                | TYP. | MAX. |               |                |
| TDSO5150    | Orange red | 700                                   | 5000 | -      | 10            | 612             | -    | 625  | 10            | -                   | 2    | 3    | 20            | Common anode   |
| TDSO5150-LM | Orange red | 2800                                  | -    | 9000   | 10            | 612             | -    | 625  | 10            | -                   | 2    | 3    | 20            | Common anode   |
| TDSO5150-M  | Orange red | 4500                                  | -    | 9000   | 10            | 612             | -    | 625  | 10            | -                   | 2    | 3    | 20            | Common anode   |
| TDSO5160    | Orange red | 700                                   | 5000 | -      | 10            | 612             | -    | 625  | 10            | -                   | 2    | 3    | 20            | Common cathode |
| TDSO5160-LM | Orange red | 2800                                  | -    | 9000   | 10            | 612             | -    | 625  | 10            | -                   | 2    | 3    | 20            | Common cathode |
| TDSY5150    | Yellow     | 700                                   | 4200 | -      | 10            | 581             | -    | 594  | 10            | -                   | 2.4  | 3    | 20            | Common anode   |
| TDSY5160    | Yellow     | 700                                   | 4200 | -      | 10            | 581             | -    | 594  | 10            | -                   | 2.4  | 3    | 20            | Common cathode |
| TDSG5150    | Green      | 700                                   | 9500 | -      | 10            | 562             | -    | 575  | 10            | -                   | 2.4  | 3    | 20            | Common anode   |
| TDSG5150-MN | Green      | 4500                                  | -    | 14 000 | 10            | 562             | -    | 575  | 10            | -                   | 2.4  | 3    | 20            | Common anode   |
| TDSG5150-N  | Green      | 7000                                  | -    | 14 000 | 10            | 562             | -    | 575  | 10            | -                   | 2.4  | 3    | 20            | Common anode   |
| TDSG5160    | Green      | 700                                   | 9500 | -      | 10            | 562             | -    | 575  | 10            | -                   | 2.4  | 3    | 20            | Common cathode |
| TDSG5160-MN | Green      | 4500                                  | -    | 14 000 | 10            | 562             | -    | 575  | 10            | -                   | 2.4  | 3    | 20            | Common cathode |
| TDSG5160-N  | Green      | 7000                                  | -    | 14 000 | 10            | 562             | -    | 575  | 10            | -                   | 2.4  | 3    | 20            | Common cathode |



**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TDSO5150, TDSO5160, TDSY5150, TDSY5160, TDSG5150, TDSG5160**

| PARAMETER                               | TEST CONDITION                                    | SYMBOL     | VALUE      | UNIT               |
|-----------------------------------------|---------------------------------------------------|------------|------------|--------------------|
| Reverse voltage per segment or DP       |                                                   | $V_R$      | 6          | V                  |
| DC forward current per segment or DP    |                                                   | $I_F$      | 25         | mA                 |
| Surge forward current per segment or DP | $t_p \leq 10\text{ }\mu\text{s}$ (non repetitive) | $I_{FSM}$  | 0.15       | A                  |
| Power dissipation                       | $T_{amb} \leq 45\text{ }^{\circ}\text{C}$         | $P_V$      | 550        | mW                 |
| Junction temperature                    |                                                   | $T_j$      | 100        | $^{\circ}\text{C}$ |
| Operating temperature range             |                                                   | $T_{amb}$  | -40 to +85 | $^{\circ}\text{C}$ |
| Storage temperature range               |                                                   | $T_{stg}$  | -40 to +85 | $^{\circ}\text{C}$ |
| Soldering temperature                   | $t \leq 3\text{ s}$ , 2 mm below seating plane    | $T_{sd}$   | 260        | $^{\circ}\text{C}$ |
| Thermal resistance LED junction/ambient |                                                   | $R_{thJA}$ | 100        | K/W                |

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TDSO5150, TDSO5150-LM, TDSO5150-M, TDSO5160, TDSO5160-LM, ORANGE RED**

| PARAMETER                                                     | TEST CONDITION                | PART                                                     | SYMBOL      | MIN. | TYP.     | MAX. | UNIT           |
|---------------------------------------------------------------|-------------------------------|----------------------------------------------------------|-------------|------|----------|------|----------------|
| Luminous intensity per segment (digit average) <sup>(1)</sup> | $I_F = 10\text{ mA}$          | TDSO5150                                                 | $I_V$       | 700  | 5000     | -    | $\mu\text{cd}$ |
|                                                               |                               | TDSO5150-LM                                              |             | 2800 | -        | 9000 |                |
|                                                               |                               | TDSO5150-M                                               |             | 4500 | -        | 9000 |                |
|                                                               |                               | TDSO5160                                                 |             | 700  | 5000     | -    |                |
|                                                               |                               | TDSO5160-LM                                              |             | 2800 | -        | 9000 |                |
| Dominant wavelength                                           | $I_F = 10\text{ mA}$          | TDSO5150, TDSO5150-LM, TDSO5150-M, TDSO5160, TDSO5160-LM | $\lambda_d$ | 612  | -        | 625  | nm             |
| Peak wavelength                                               | $I_F = 10\text{ mA}$          |                                                          | $\lambda_p$ | -    | 630      | -    | nm             |
| Angle of half intensity                                       | $I_F = 10\text{ mA}$          |                                                          | $j$         | -    | $\pm 50$ | -    | deg            |
| Forward voltage per segment or DP                             | $I_F = 20\text{ mA}$          |                                                          | $V_F$       | -    | 2        | 3    | V              |
| Reverse voltage per segment or DP                             | $I_R = 10\text{ }\mu\text{A}$ |                                                          | $V_R$       | 6    | 15       | -    | V              |

**Note**

<sup>(1)</sup>  $I_{Vmin.}$  and  $I_V$  groups are mean values of all segments (a to g, D1 to D4), matching factor within segments is  $\geq 0.5$ , excluding decimal points and colon.

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TDSY5150, TDSY5160, YELLOW**

| PARAMETER                                                     | TEST CONDITION                | PART               | SYMBOL      | MIN. | TYP.     | MAX. | UNIT           |
|---------------------------------------------------------------|-------------------------------|--------------------|-------------|------|----------|------|----------------|
| Luminous intensity per segment (digit average) <sup>(1)</sup> | $I_F = 10\text{ mA}$          | TDSY5150           | $I_V$       | 700  | 4200     | -    | $\mu\text{cd}$ |
|                                                               |                               | TDSY5160           |             | 700  | 4200     | -    |                |
| Dominant wavelength                                           | $I_F = 10\text{ mA}$          | TDSY5150, TDSY5160 | $\lambda_d$ | 581  | -        | 594  | nm             |
| Peak wavelength                                               | $I_F = 10\text{ mA}$          |                    | $\lambda_p$ | -    | 585      | -    | nm             |
| Angle of half intensity                                       | $I_F = 10\text{ mA}$          |                    | $j$         | -    | $\pm 50$ | -    | deg            |
| Forward voltage per segment or DP                             | $I_F = 20\text{ mA}$          |                    | $V_F$       | -    | 2.4      | 3    | V              |
| Reverse voltage per segment or DP                             | $I_R = 10\text{ }\mu\text{A}$ |                    | $V_R$       | 6    | 15       | -    | V              |

**Note**

<sup>(1)</sup>  $I_{Vmin.}$  and  $I_V$  groups are mean values of all segments (a to g, D1 to D4), matching factor within segments is  $\geq 0.5$ , excluding decimal points and colon.



**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**TDSG5150, TDSG5150-MN, TDSG5150-N, TDSG5160, TDSG5160-MN, TDSG5160-N, GREEN**

| PARAMETER                                                     | TEST CONDITION                | PART                                                                 | SYMBOL      | MIN. | TYP.     | MAX.   | UNIT           |
|---------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------|-------------|------|----------|--------|----------------|
| Luminous intensity per segment (digit average) <sup>(1)</sup> | $I_F = 10\text{ mA}$          | TDSG5150                                                             | $I_V$       | 700  | 9500     | -      | $\mu\text{cd}$ |
|                                                               |                               | TDSG5150-MN                                                          |             | 4500 | -        | 14 000 |                |
|                                                               |                               | TDSG5150-N                                                           |             | 7000 | -        | 14 000 |                |
|                                                               |                               | TDSG5160                                                             |             | 700  | 9500     | -      |                |
|                                                               |                               | TDSG5160-MN                                                          |             | 4500 | -        | 14 000 |                |
|                                                               |                               | TDSG5160-N                                                           |             | 7000 | -        | 14 000 |                |
| Dominant wavelength                                           | $I_F = 10\text{ mA}$          | TDSG5150, TDSG5150-MN, TDSG5150-N, TDSG5160, TDSG5160-MN, TDSG5160-N | $\lambda_d$ | 562  | -        | 575    | nm             |
| Peak wavelength                                               | $I_F = 10\text{ mA}$          |                                                                      | $\lambda_p$ | -    | 565      | -      | nm             |
| Angle of half intensity                                       | $I_F = 10\text{ mA}$          |                                                                      | $j$         | -    | $\pm 50$ | -      | deg            |
| Forward voltage per segment or DP                             | $I_F = 20\text{ mA}$          |                                                                      | $V_F$       | -    | 2.4      | 3      | V              |
| Reverse voltage per segment or DP                             | $I_R = 10\text{ }\mu\text{A}$ |                                                                      | $V_R$       | 6    | 15       | -      | V              |

**Note**

- <sup>(1)</sup>  $I_{Vmin.}$  and  $I_V$  groups are mean values of all segments (a to g, D1 to D4), matching factor within segments is  $\geq 0.5$ , excluding decimal points and colon.

**LUMINOUS INTENSITY CLASSIFICATION**

| GROUP | LIGHT INTENSITY ( $\mu\text{cd}$ ) |        |
|-------|------------------------------------|--------|
|       | MIN.                               | MAX.   |
| E     | 180                                | 360    |
| F     | 280                                | 560    |
| G     | 450                                | 900    |
| H     | 700                                | 1400   |
| I     | 1100                               | 2200   |
| K     | 1800                               | 3600   |
| L     | 2800                               | 5600   |
| M     | 4500                               | 9000   |
| N     | 7000                               | 14 000 |

**Note**

- The above type numbers represent the order groups which include only a few brightness groups. Only one group will be shipped in one tube (there will be no mixing of two groups in one tube). In order to ensure availability, single brightness groups will not be orderable.

**COLOR CLASSIFICATION**

| GROUP | ORANGE RED |      | YELLOW |      | GREEN |      |
|-------|------------|------|--------|------|-------|------|
|       | MIN.       | MAX. | MIN.   | MAX. | MIN.  | MAX. |
| 1     | 612        | 617  | 581    | 584  |       |      |
| 2     | 616        | 621  | 583    | 586  |       |      |
| 3     | 620        | 625  | 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 and an accuracy of  $\pm 1\text{ nm}$ .



**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

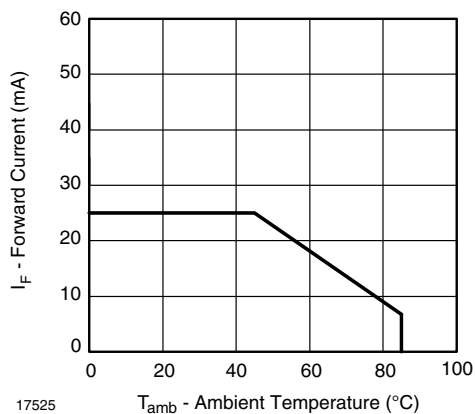


Fig. 1 - Forward Current vs. Ambient Temperature

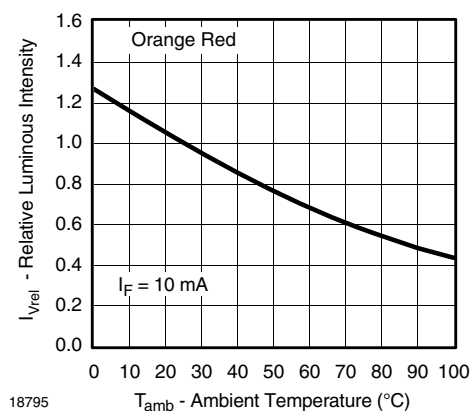


Fig. 4 - Relative Luminous Intensity vs. Ambient Temperature

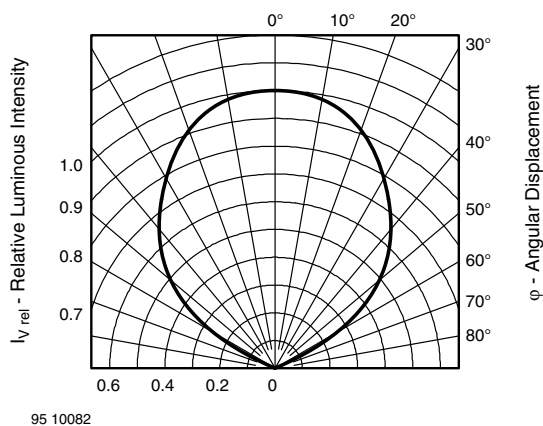


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

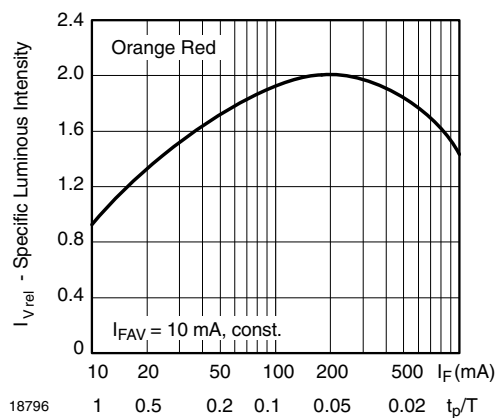


Fig. 5 - Relative Luminous Intensity vs. Forward Current/Duty Cycle

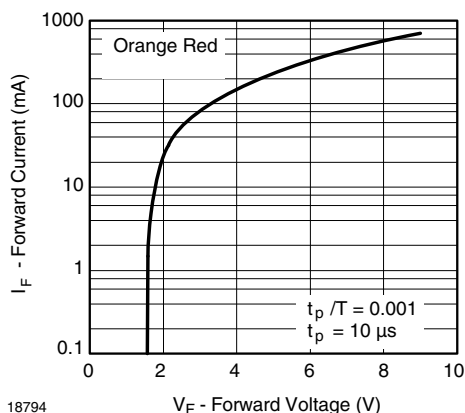


Fig. 3 - Forward Current vs. Forward Voltage

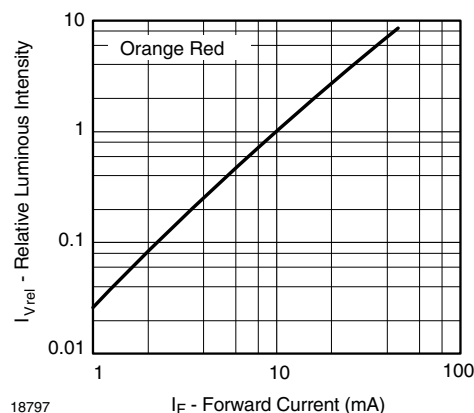


Fig. 6 - Relative Luminous Intensity vs. Forward Current

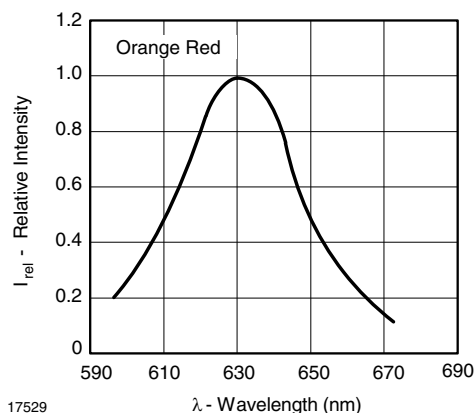


Fig. 7 - Relative Intensity vs. Wavelength

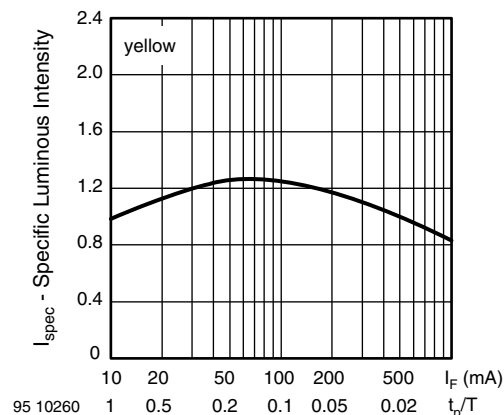


Fig. 10 - Relative Luminous Intensity vs. Forward Current/Duty Cycle

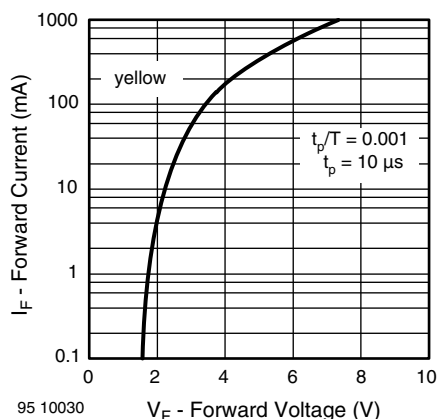


Fig. 8 - Forward Current vs. Forward Voltage

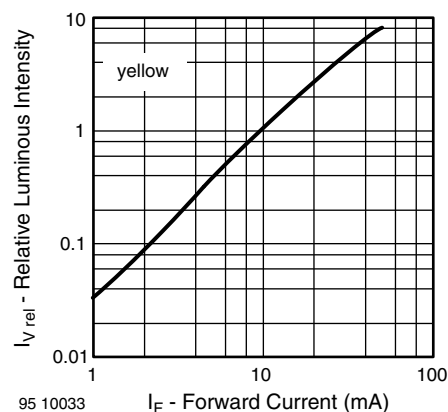


Fig. 11 - Relative Luminous Intensity vs. Forward Current

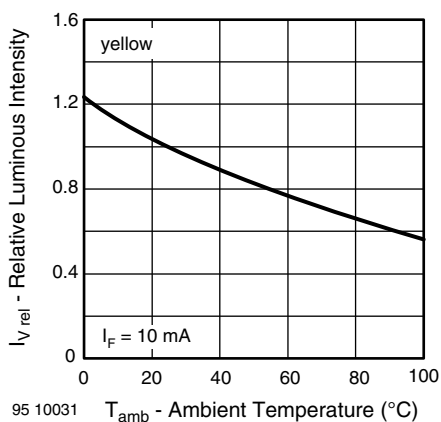


Fig. 9 - Relative Luminous Intensity vs. Ambient Temperature

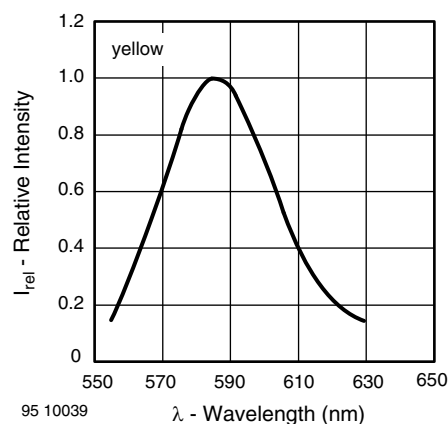


Fig. 12 - Relative Intensity vs. Wavelength

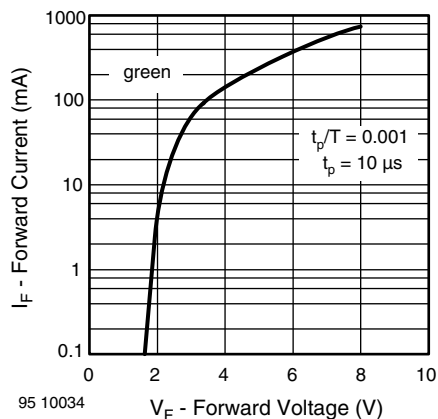


Fig. 13 - Forward Current vs. Forward Voltage

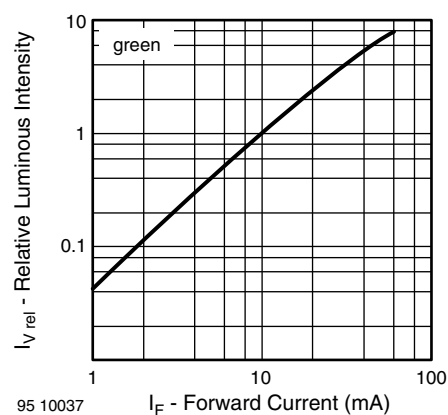


Fig. 16 - Relative Luminous Intensity vs. Forward Current

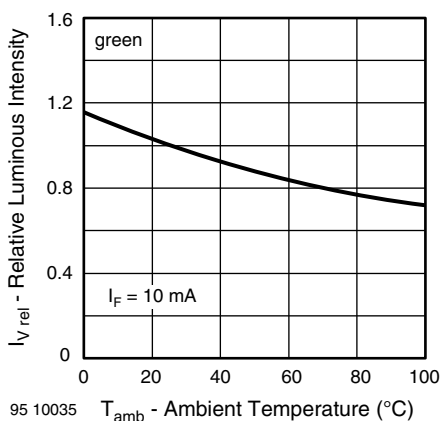


Fig. 14 - Relative Luminous Intensity vs. Ambient Temperature

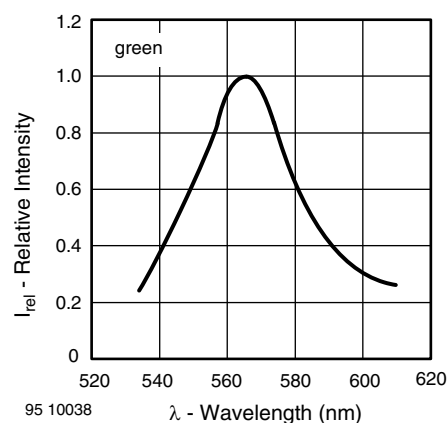


Fig. 17 - Relative Intensity vs. Wavelength

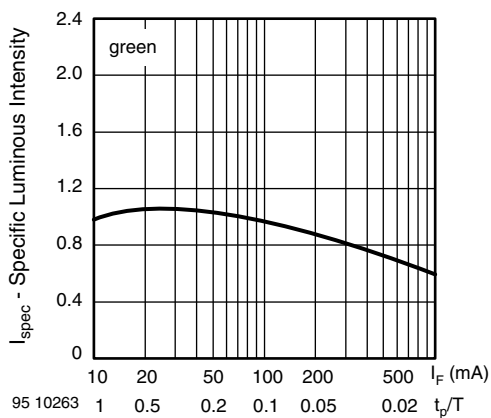


Fig. 15 - Specific Luminous Intensity vs. Forward Current

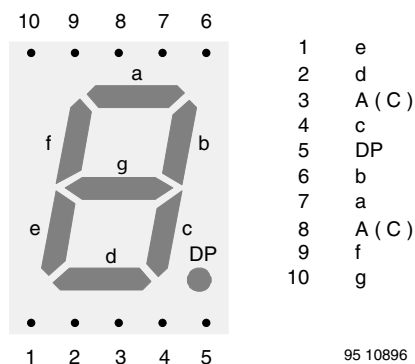
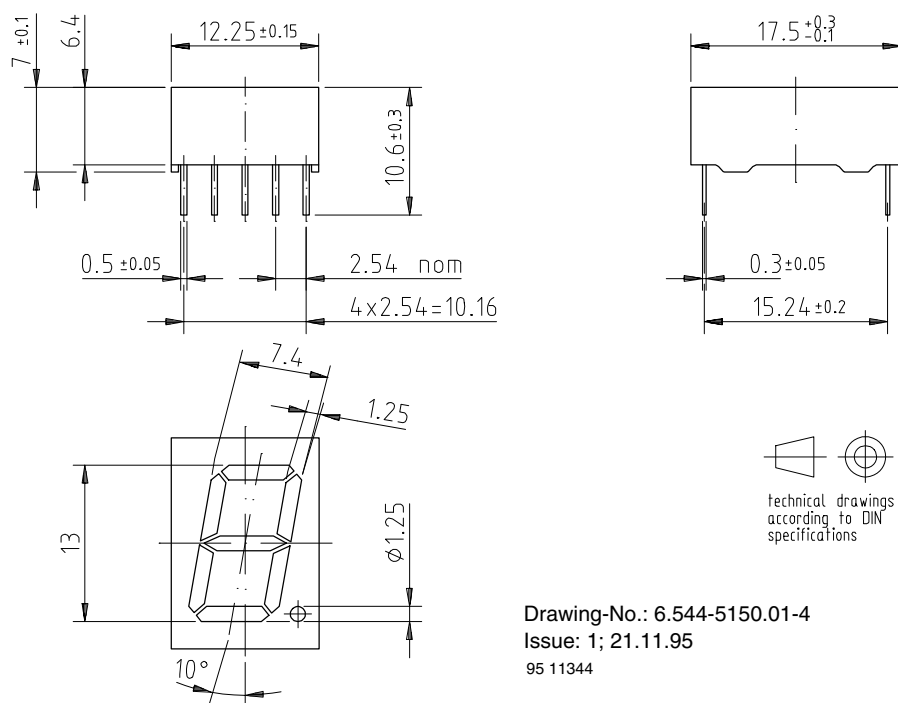


Fig. 18 - TDS.51..



**PACKAGE DIMENSIONS FOR TDS.51.. in millimeters**



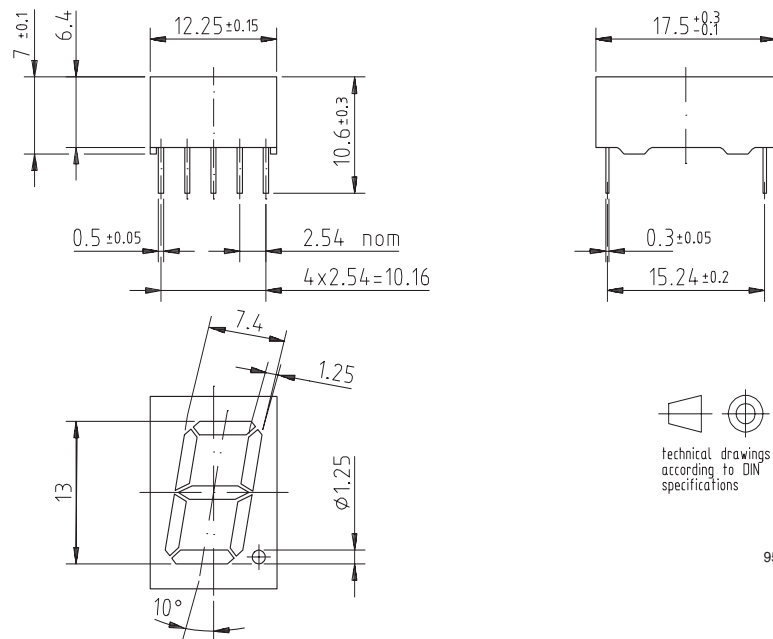
Drawing-No.: 6.544-5150.01-4

Issue: 1; 21.11.95

95 11344

## Display-13 mm

### Package Dimensions in mm



95 11344

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1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

**Vishay Semiconductor GmbH** has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

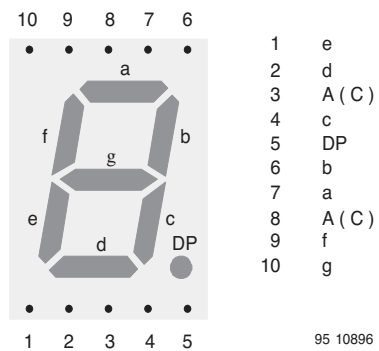
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**We reserve the right to make changes to improve technical design  
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Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany  
Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423

## Pin Connections 13 mm





## Ozone Depleting Substances Policy Statement

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Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423



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**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**