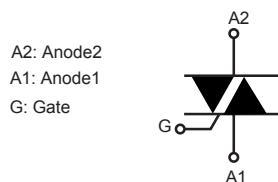
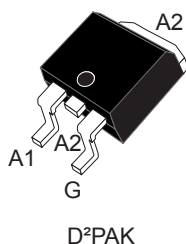


## 16 A - 800 V logic level T-series Triac in D<sup>2</sup>PAK



### Product status link

[T1610T-8G](#)

### Product summary

|                   |       |
|-------------------|-------|
| $I_{T(RMS)}$      | 16 A  |
| $V_{DRM}/V_{RRM}$ | 800 V |
| $V_{DSM}/V_{RSM}$ | 900 V |
| $I_{GT}$          | 10 mA |

### Features

- 150 °C maximum junction temperature
- Three quadrants
- High commutation on resistive loads
- Surge capability  $V_{DSM}$ ,  $V_{RSM}$  = 900 V
- Benefits:
  - Easy direct control by MCU thanks to low 10 mA  $I_{GT}$
  - Increase of thermal margin due to extended working  $T_j$  up to 150 °C

### Applications

- General purpose AC line load switching
- Small home appliances with resistive loads
- Hybrid relays
- Inrush current limiting circuits
- Overvoltage crowbar protection

### Description

The SMD T1610T-8G Triac can be used for the on/off or phase angle control function in general purpose AC switching with resistive loads. A Logic level T-series Triac, the T1610T-8G can be controlled directly from an MCU with a simplified circuit. T-series triacs are optimized for high EMI constraints.

The surface mount D<sup>2</sup>PAK package enables compact SMT designs for automated manufacturing.

D<sup>2</sup>PAK package's molding compound resin is halogen-free and meets UL94 flammability standard level V0.

Package environmentally friendly [Ecopack2](#) graded (RoHS and Halogen Free compliance).

# 1 Characteristics

**Table 1. Absolute maximum ratings (limiting values),  $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified**

| Symbol                          | Parameter                                                                                              |                                                                     | Value       | Unit                   |
|---------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|------------------------|
| $V_{\text{DRM}}/V_{\text{RRM}}$ | Repetitive peak off-state voltage (50-60 Hz)                                                           | $T_j = 125\text{ }^{\circ}\text{C}$                                 | 800         | V                      |
|                                 |                                                                                                        | $T_j = 150\text{ }^{\circ}\text{C}$                                 | 600         | V                      |
| $V_{\text{DSM}}/V_{\text{RSM}}$ | Non Repetitive peak off-state voltage                                                                  | $t_p = 10\text{ ms}$ , $T_j = 25\text{ }^{\circ}\text{C}$           | 900         | V                      |
| $I_{\text{T(RMS)}}$             | RMS on-state current (full sine wave)                                                                  | $T_c = 126\text{ }^{\circ}\text{C}$                                 | 16          | A                      |
| $I_{\text{TSM}}$                | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = $25\text{ }^{\circ}\text{C}$ ) | $t = 16.7\text{ ms}$                                                | 126         | A                      |
|                                 |                                                                                                        | $t = 20\text{ ms}$                                                  | 120         |                        |
| $I^2t$                          | $I^2t$ value for fusing                                                                                | $t_p = 10\text{ ms}$                                                | 95          | $\text{A}^2\text{s}$   |
| $di/dt$                         | Critical rate of rise of on-state current, $I_G = 2 \times I_{\text{GT}}$ , $t_r \leq 100\text{ ns}$   | $f = 100\text{ Hz}$                                                 | 100         | $\text{A}/\mu\text{s}$ |
| $I_{\text{GM}}$                 | Peak gate current                                                                                      | $t_p = 20\text{ }\mu\text{s}$ , $T_j = 150\text{ }^{\circ}\text{C}$ | 4           | A                      |
| $V_{\text{GM}}$                 | Peak Gate Voltage                                                                                      |                                                                     | 5           | V                      |
| $P_{\text{G(AV)}}$              | Average gate power dissipation                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$                                 | 1           | W                      |
| $T_{\text{stg}}$                | Storage junction temperature range                                                                     |                                                                     | -40 to +150 | $^{\circ}\text{C}$     |
| $T_j$                           | Operating junction temperature range                                                                   |                                                                     | -40 to +150 | $^{\circ}\text{C}$     |

**Table 2. Electrical characteristics ( $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**

| Symbol                | Test conditions                                                                         | Quadrants; $T_j$                    |      | Value | Unit                   |
|-----------------------|-----------------------------------------------------------------------------------------|-------------------------------------|------|-------|------------------------|
| $I_{\text{GT}}^{(1)}$ | $V_D = 12\text{ V}$ , $R_L = 30\text{ }\Omega$                                          | I - II - III                        | Max. | 10    | mA                     |
| $V_{\text{GT}}$       | $V_D = 12\text{ V}$ , $R_L = 30\text{ }\Omega$                                          | I - II - III                        | Max. | 1.3   | V                      |
| $V_{\text{GD}}$       | $V_D = 800\text{ V}$ , $R_L = 3.3\text{ k}\Omega$ , $T_j = 125\text{ }^{\circ}\text{C}$ | I - II - III                        | Min. | 0.2   | V                      |
| $I_L$                 | $I_G = 1.2 \times I_{\text{GT}}$                                                        | I - III                             | Max. | 20    | mA                     |
|                       | $I_G = 1.2 \times I_{\text{GT}}$                                                        | II                                  | Max. | 30    | mA                     |
| $I_H^{(2)}$           | $I_T = 500\text{ mA}$ , gate open                                                       |                                     | Max. | 25    | mA                     |
| $dV/dt^{(2)}$         | $V_D = 536\text{ V}$ , gate open                                                        | $T_j = 125\text{ }^{\circ}\text{C}$ | Min. | 100   | $\text{V}/\mu\text{s}$ |
|                       | $V_D = 402\text{ V}$ , gate open                                                        | $T_j = 150\text{ }^{\circ}\text{C}$ | Min. | 50    | $\text{V}/\mu\text{s}$ |
| $(di/dt)_c^{(2)}$     | $(dV/dt)_c = 0.1\text{ V}/\mu\text{s}$                                                  | $T_j = 125\text{ }^{\circ}\text{C}$ | Min. | 9     | A/ms                   |
|                       |                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ |      | 5.4   |                        |
|                       | $(dV/dt)_c = 10\text{ V}/\mu\text{s}$                                                   | $T_j = 125\text{ }^{\circ}\text{C}$ | Min. | 3     | A/ms                   |
|                       |                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ |      | 1.8   |                        |

1. Minimum  $I_{\text{GT}}$  is guaranteed at 5% of  $I_{\text{GT max}}$

2. For both polarities of A2 referenced to A1.

**Table 3. Static characteristics**

| Symbol            | Test conditions                                        | $T_j$  |      | Value | Unit |
|-------------------|--------------------------------------------------------|--------|------|-------|------|
| $V_{TM}^{(1)}$    | $I_T = 22.6\text{ A}$ , $t_p = 380\text{ }\mu\text{s}$ | 25 °C  | Max. | 1.55  | V    |
| $V_{TO}^{(1)}$    | Threshold on-state voltage                             | 150 °C | Max. | 0.85  | V    |
| $R_D^{(1)}$       | Dynamic resistance                                     | 150 °C | Max. | 34    | mΩ   |
| $I_{DRM}/I_{RRM}$ | $V_{DRM} = V_{RRM} = 800\text{ V}$                     | 25 °C  | Max. | 5     | μA   |
|                   |                                                        | 125 °C |      | 1.0   | mA   |
|                   | $V_{DRM} = V_{RRM} = 600\text{ V}$                     | 150 °C | Max. | 3.6   | mA   |

1. For both polarities of A2 referenced to A1.

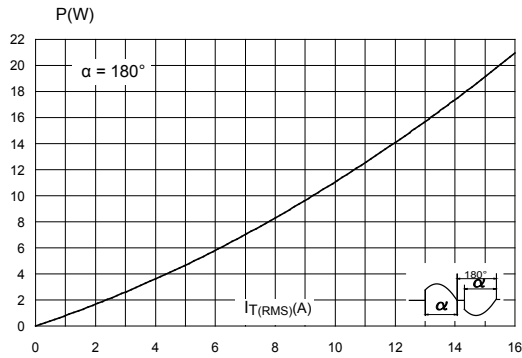
**Table 4. Thermal resistance**

| Symbol        | Parameter                                              |                    |      | Value | Unit |
|---------------|--------------------------------------------------------|--------------------|------|-------|------|
| $R_{th(j-c)}$ | Junction to case (AC)                                  | D <sup>2</sup> PAK | Max. | 1.15  | °C/W |
| $R_{th(j-a)}$ | Junction to ambient ( $S_{CU}^{(1)} = 2\text{ cm}^2$ ) |                    | Typ. | 45    | °C/W |

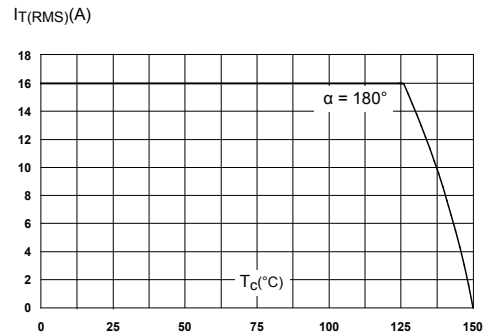
1.  $S_{CU}$  : copper pad surface under tab, 35 μm copper thickness on FR4 PCB.

## 1.1 Characteristics (curves)

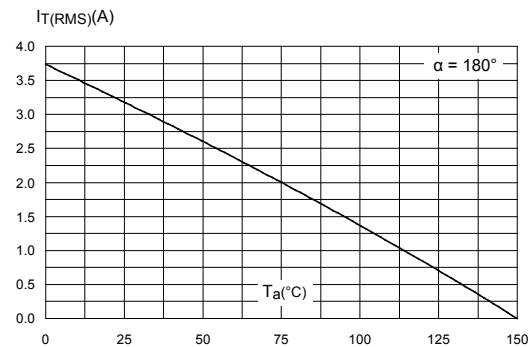
**Figure 1. Maximum power dissipation versus on-state RMS current**



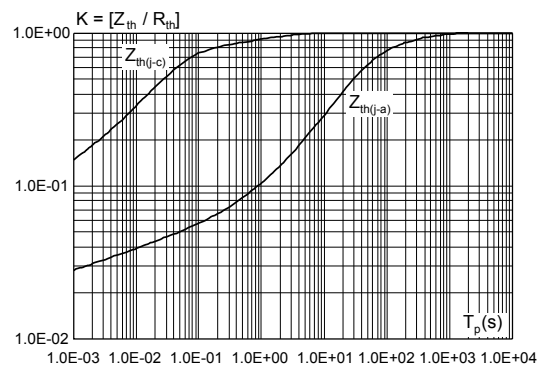
**Figure 2. On-state RMS current versus case temperature**



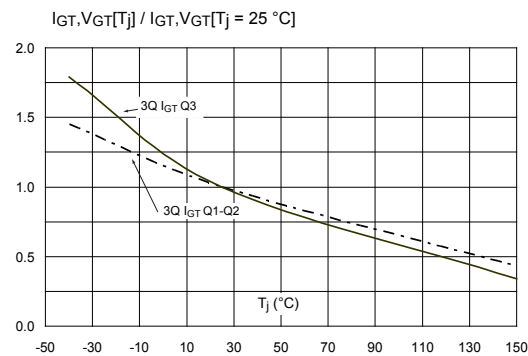
**Figure 3. On-state RMS current versus ambient temperature (free air convection)**



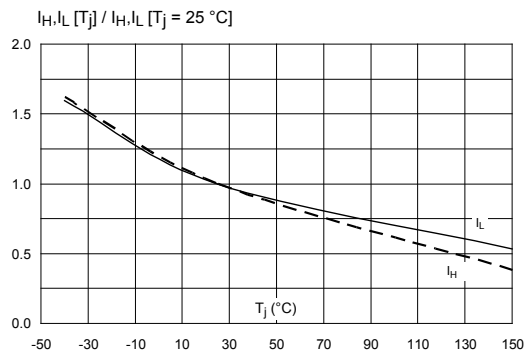
**Figure 4. Relative variation of thermal impedance versus pulse duration**



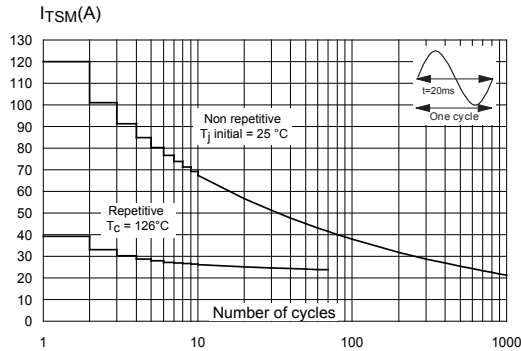
**Figure 5. Relative variation of gate trigger voltage and current versus junction temperature (typical values)**



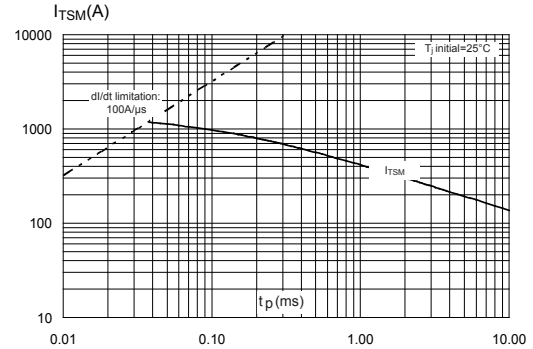
**Figure 6. Relative variation of holding current and latching current versus junction temperature (typical values)**



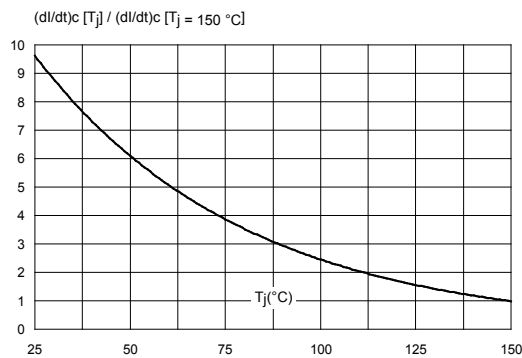
**Figure 7. Surge peak on-state current versus number of cycles**



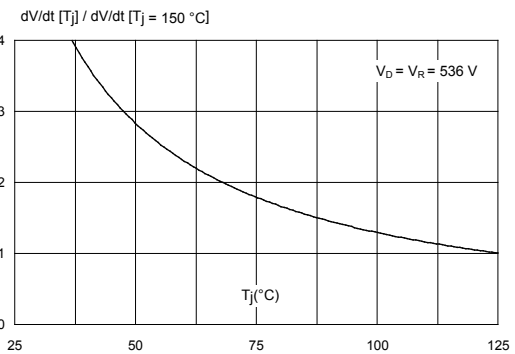
**Figure 8. Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms**



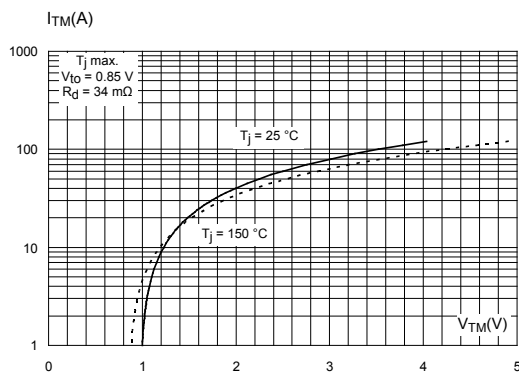
**Figure 9. Relative variation of critical rate of decrease of main current versus junction temperature (typical values)**



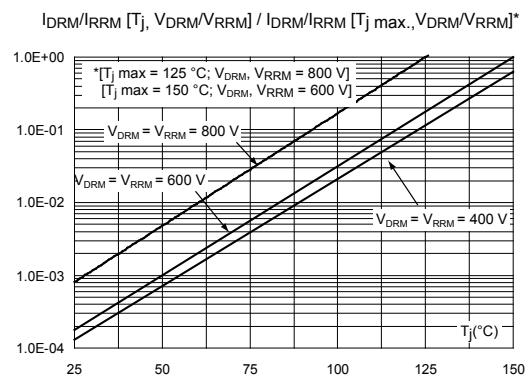
**Figure 10. Relative variation of critical rate of decrease of main voltage versus junction temperature**



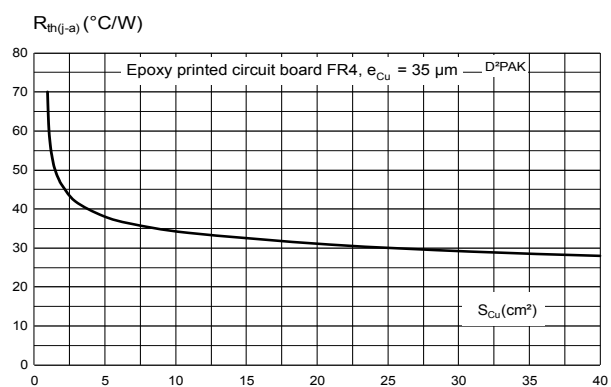
**Figure 11. On-state characteristics (maximum values)**



**Figure 12. Relative variation of leakage current versus junction temperature for different values of blocking voltage**



**Figure 13. Thermal resistance junction to ambient versus copper surface under tab**



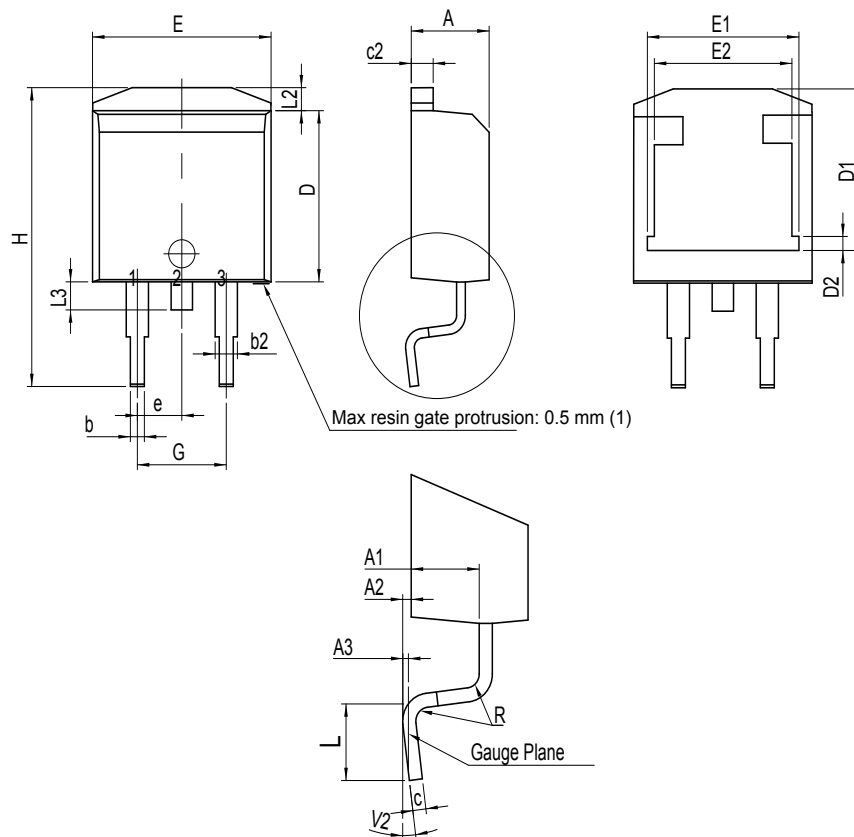
## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 D<sup>2</sup>PAK package information

- **ECOPACK2** compliant
- Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL standard level V0

**Figure 14. D<sup>2</sup>PAK package outline**



(1) Resin gate is accepted in each of position shown on the drawing, or their symmetrical.

**Table 5. D<sup>2</sup>PAK package mechanical data**

| Ref.              | Dimensions  |      |       |                       |        |        |
|-------------------|-------------|------|-------|-----------------------|--------|--------|
|                   | Millimeters |      |       | Inches <sup>(1)</sup> |        |        |
|                   | Min.        | Typ. | Max.  | Min.                  | Typ.   | Max.   |
| A                 | 4.30        |      | 4.60  | 0.1693                |        | 0.1811 |
| A1                | 2.49        |      | 2.69  | 0.0980                |        | 0.1059 |
| A2                | 0.03        |      | 0.23  | 0.0012                |        | 0.0091 |
| A3                |             | 0.25 |       |                       | 0.0098 |        |
| b                 | 0.70        |      | 0.93  | 0.0276                |        | 0.0366 |
| b2                | 1.25        |      | 1.7   | 0.0492                |        | 0.0669 |
| c                 | 0.45        |      | 0.60  | 0.0177                |        | 0.0236 |
| c2                | 1.21        |      | 1.36  | 0.0476                |        | 0.0535 |
| D                 | 8.95        |      | 9.35  | 0.3524                |        | 0.3681 |
| D1                | 7.50        |      | 8.00  | 0.2953                |        | 0.3150 |
| D2                | 1.30        |      | 1.70  | 0.0512                |        | 0.0669 |
| e                 |             | 2.54 |       |                       | 0.1    |        |
| E                 | 10.00       |      | 10.28 | 0.3937                |        | 0.4047 |
| E1                | 8.30        |      | 8.70  | 0.3268                |        | 0.3425 |
| E2                | 6.85        |      | 7.25  | 0.2697                |        | 0.2854 |
| G                 | 4.88        |      | 5.28  | 0.1921                |        | 0.2079 |
| H                 | 15          |      | 15.85 | 0.5906                |        | 0.6240 |
| L                 | 1.78        |      | 2.28  | 0.0701                |        | 0.0898 |
| L2                | 1.19        |      | 1.40  | 0.0468                |        | 0.0551 |
| L3                | 1.40        |      | 1.75  | 0.0551                |        | 0.0689 |
| R                 |             | 0.40 |       |                       | 0.0157 |        |
| V2 <sup>(2)</sup> | 0°          |      | 8°    | 0°                    |        | 8°     |

1. Dimensions in inches are given for reference only

2. Degrees

Technical drawing of a stepped profile with the following dimensions:

- Overall width: 16.90
- Overall height: 10.30
- Width of the leftmost section: 8.90
- Width of the middle section: 3.70
- Height of the middle section: 5.08
- Height of the rightmost section: 1.30

Technical drawing of a rectangular plate with a grid of holes. The drawing shows a top view and a side view.

**Top View Dimensions:**

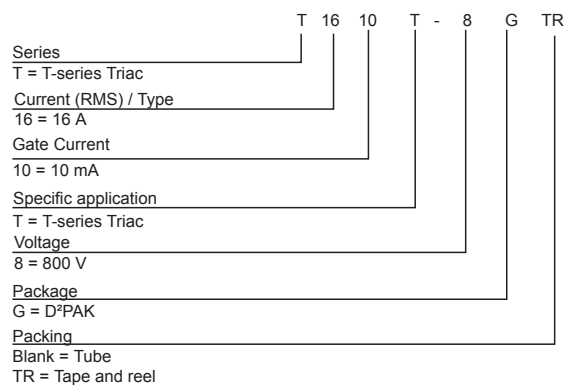
- Overall width: 8,90
- Overall height: 10,30 (10,20)
- Grid of holes: 4 rows by 3 columns.
- Horizontal spacing between hole centers: 2,10
- Vertical spacing between hole centers: 2,60
- Hole diameter: 2,54
- Distance from left edge to first hole center: 0,05
- Distance from right edge to last hole center: 0,05
- Distance from top edge to first hole center: 0,05
- Distance from bottom edge to last hole center: 0,05
- Distance from left edge to first hole center: 0,05
- Distance from right edge to last hole center: 0,05
- Distance from top edge to first hole center: 0,05
- Distance from bottom edge to last hole center: 0,05

**Side View Dimensions:**

- Overall width: 4,30
- Overall height: 3,70
- Distance from left edge to hole center: 4,39
- Distance from right edge to hole center: 3,60
- Distance from top edge to hole center: 1,20
- Distance from bottom edge to hole center: 1,30

### 3 Ordering information

**Figure 17. Ordering information scheme**



**Table 6. Ordering information**

| Order code   | Marking   | Package            | Weight | Base qty. | Delivery mode |
|--------------|-----------|--------------------|--------|-----------|---------------|
| T1610T-8G-TR | T1610T-8G | D <sup>2</sup> PAK | 1.6 g  | 1000      | Tape and reel |
| T1610T-8G    |           |                    |        | 50        | Tube          |

## Revision history

**Table 7. Document revision history**

| Date        | Version | Changes                                                                                                                             |
|-------------|---------|-------------------------------------------------------------------------------------------------------------------------------------|
| 03-Apr-2018 | 1       | Initial release.                                                                                                                    |
| 17-Jul-2018 | 2       | Updated Table 2. Electrical characteristics ( $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified).                     |
| 29-Oct-2020 | 3       | Updated Table 5 and added Figure 13. Thermal resistance junction to ambient versus copper surface under tab.<br>Minor text changes. |

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