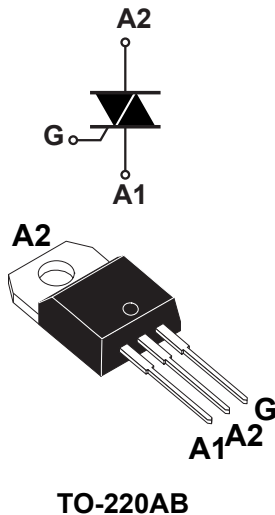


## 12 A 800 V Snubberless Triac in TO-220AB package



### Features

- Medium current Triac
- High static and dynamic commutation
- Three quadrants
- **ECOPACK2** compliant

### Applications

- General purpose AC line load switching
- Motor control circuits
- Small home appliances
- Lighting
- Inrush current limiting circuits
- Overvoltage crowbar protection

### Description

Available in through-hole package, the **T1235T-8T** Triac can be used for the on/off or phase angle control function in general purpose AC switching where high commutation capability is required.

This device can be used without a snubber circuit when the limits defined in this datasheet are respected.

#### Product status link

[T1235T-8T](#)

#### Product summary

|                                     |           |
|-------------------------------------|-----------|
| <b>Order code</b>                   | T1235T-8T |
| <b>Package</b>                      | TO-220AB  |
| <b><math>I_{T(RMS)}</math></b>      | 12 A      |
| <b><math>V_{DRM}/V_{RRM}</math></b> | 800 V     |
| <b><math>V_{DSM}/V_{RSM}</math></b> | 900 V     |
| <b><math>I_{GT}</math></b>          | 35 mA     |

# 1 Characteristics

**Table 1. Absolute maximum ratings (limiting values)**

| Symbol            | Parameter                                                                          |                       | Value                 | Unit        |                  |
|-------------------|------------------------------------------------------------------------------------|-----------------------|-----------------------|-------------|------------------|
| $I_{T(RMS)}$      | On-state RMS current (full sine wave)                                              |                       | $T_c = 131\text{ °C}$ | 12          | A                |
| $I_{TSM}$         | Non repetitive surge peak on-state current ( $T_j$ initial = 25 °C)                | F = 50 Hz t = 20 ms   | 90                    | A           |                  |
|                   |                                                                                    | F = 60 Hz t = 16.7 ms | 95                    |             |                  |
| $I^2t$            | $I^2t$ value for fusing, ( $T_j$ initial = 25 °C)                                  |                       | $t_p = 10\text{ ms}$  | 54          | A <sup>2</sup> s |
| $V_{DRM}/V_{RRM}$ | Repetitive surge peak off-state voltage                                            |                       | $T_j = 150\text{ °C}$ | 600         | V                |
|                   |                                                                                    |                       | $T_j = 125\text{ °C}$ | 800         |                  |
| $V_{DSM}/V_{RSM}$ | Non repetitive surge peak off-state voltage                                        |                       | $t_p = 10\text{ ms}$  | 900         | V                |
| di/dt             | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , tr ≤ 100 ns |                       | F = 100 Hz            | 100         | A/μs             |
| $I_{GM}$          | Peak gate current                                                                  | $t_p = 20\text{ μs}$  | $T_j = 150\text{ °C}$ | 4           | A                |
| $P_{G(AV)}$       | Average gate power dissipation                                                     |                       | $T_j = 150\text{ °C}$ | 1           | W                |
| $T_{stg}$         | Storage junction temperature range                                                 |                       |                       | -40 to +150 | °C               |
| $T_j$             | Operating junction temperature range                                               |                       |                       | -40 to +150 | °C               |
| $T_L$             | Maximum lead temperature soldering during 10 s                                     |                       |                       | 260         | °C               |

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

| Symbol                 | Test conditions                                                 |                       | Value | Unit                  |      |      |
|------------------------|-----------------------------------------------------------------|-----------------------|-------|-----------------------|------|------|
| $I_{GT}^{(1)}$         | $V_D = 12\text{ V}$ , $R_L = 30\text{ Ω}$                       | I - II - III          | Min.  | 1.75                  | mA   |      |
|                        |                                                                 |                       | Max.  | 35                    |      |      |
| $V_{GT}$               | $V_D = 12\text{ V}$ , $R_L = 30\text{ Ω}$                       | I - II - III          | Max.  | 1.3                   | V    |      |
| $V_{GD}$               | $V_D = V_{DRM}$ , $R_L = 3.3\text{ kΩ}$ , $T_j = 150\text{ °C}$ | I - II - III          | Min.  | 0.2                   | V    |      |
| $I_H$                  | $I_T = 500\text{ mA}$                                           |                       | Max.  | 40                    | mA   |      |
| $I_L$                  | $I_G = 1.2 \times I_{GT}$                                       | I - III               | Max.  | 60                    | mA   |      |
|                        |                                                                 | II                    |       | 65                    |      |      |
| dV/dt <sup>(2)</sup>   | $V_D = 536\text{ V}$ , gate open                                | $T_j = 125\text{ °C}$ | Min.  | 2000                  | V/μs |      |
|                        | $V_D = 402\text{ V}$ , gate open                                | $T_j = 150\text{ °C}$ |       | 1000                  |      |      |
| (di/dt) <sup>(2)</sup> | Without snubber (dV/dt) <sub>c</sub> > 20 V/μs                  |                       | Min.  | $T_j = 125\text{ °C}$ | 12   | A/ms |
|                        |                                                                 |                       |       | $T_j = 150\text{ °C}$ | 6    |      |

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

2. For both polarities of A2 referenced to A1

**Table 3. Static characteristics**

| Symbol                | Test conditions                                   |                                    |      | Value | Unit          |
|-----------------------|---------------------------------------------------|------------------------------------|------|-------|---------------|
| $V_T^{(1)}$           | $I_{TM} = 17 \text{ A}$ , $t_p = 380 \mu\text{s}$ | $T_j = 25 \text{ }^\circ\text{C}$  | Max. | 1.55  | V             |
| $V_{TO}^{(1)}$        | Threshold voltage                                 | $T_j = 150 \text{ }^\circ\text{C}$ | Max. | 0.85  |               |
| $R_d^{(1)}$           | Dynamic resistance                                | $T_j = 150 \text{ }^\circ\text{C}$ | Max. | 37    | m $\Omega$    |
| $I_{DRM}$ , $I_{RRM}$ | $V_D = V_R = 800 \text{ V}$                       | $T_j = 25 \text{ }^\circ\text{C}$  | Max. | 7.5   | $\mu\text{A}$ |
|                       |                                                   | $T_j = 125 \text{ }^\circ\text{C}$ |      | 1.0   | mA            |
|                       | $V_D = V_R = 600 \text{ V}$                       | $T_j = 150 \text{ }^\circ\text{C}$ | Max. | 2.7   |               |

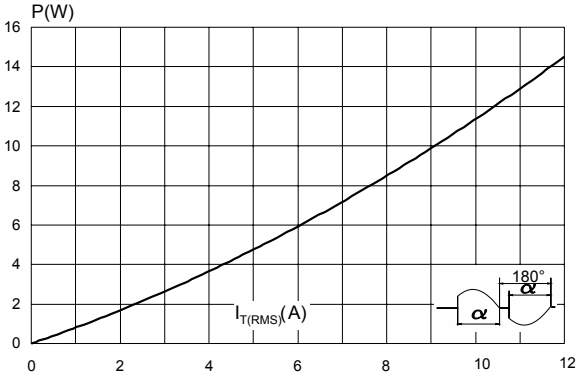
1. For both polarities of A2 referenced to A1

**Table 4. Thermal parameters**

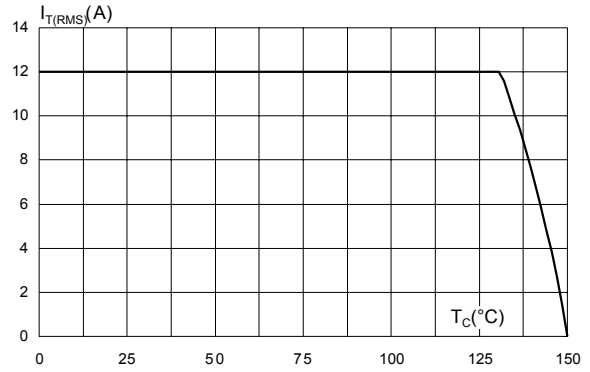
| Symbol        | Parameter             | Value | Unit               |
|---------------|-----------------------|-------|--------------------|
| $R_{th(j-c)}$ | Junction to case (AC) | 1.3   | $^\circ\text{C/W}$ |
| $R_{th(j-a)}$ | Junction to ambient   | 60    | $^\circ\text{C/W}$ |

### 1.1 Characteristics curves

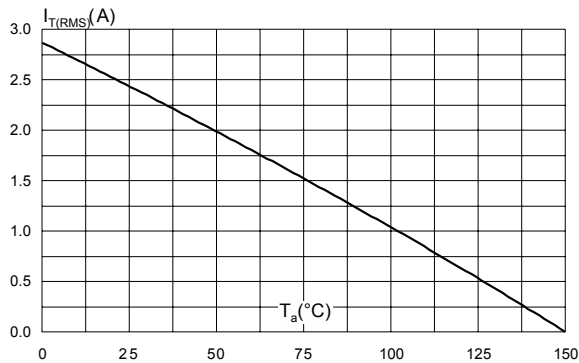
**Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)**



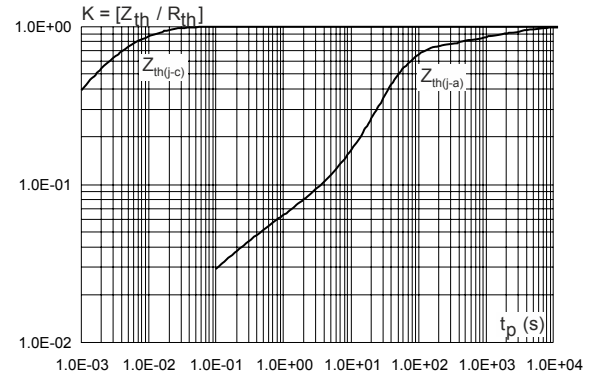
**Figure 2. On-state RMS current versus case temperature (full cycle)**



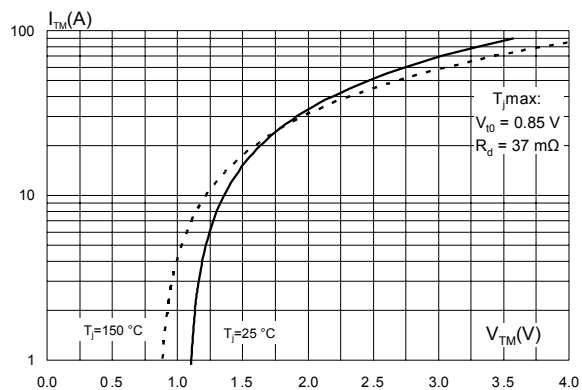
**Figure 3. On-state RMS current versus ambient temperature (free air convection)**



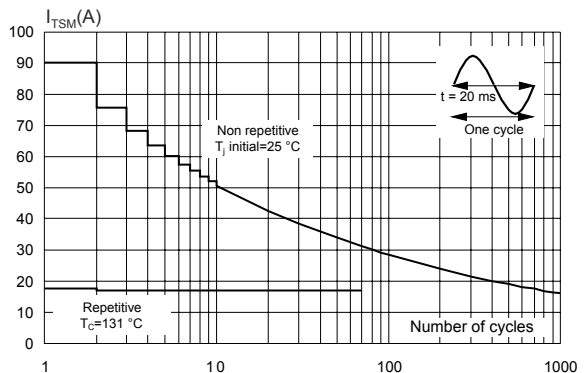
**Figure 4. Relative variation of thermal impedance versus pulse duration**



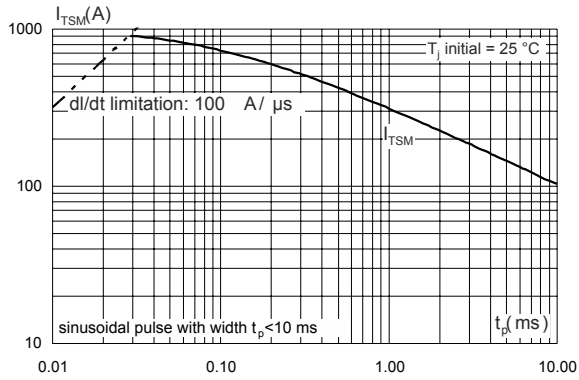
**Figure 5. On-state characteristics (maximum values)**



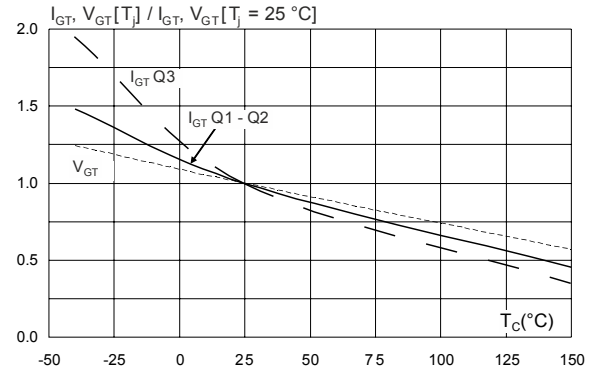
**Figure 6. Surge peak on-state current versus number of cycles**



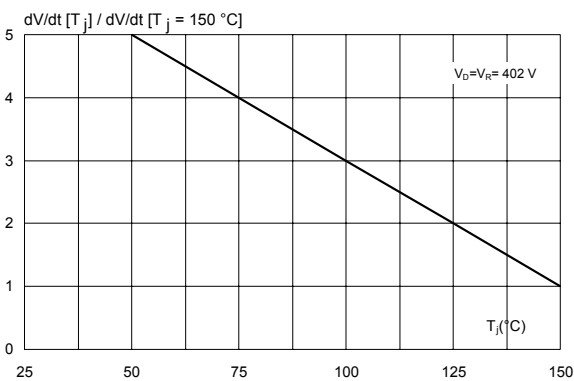
**Figure 7. Non repetitive surge peak on-state current**



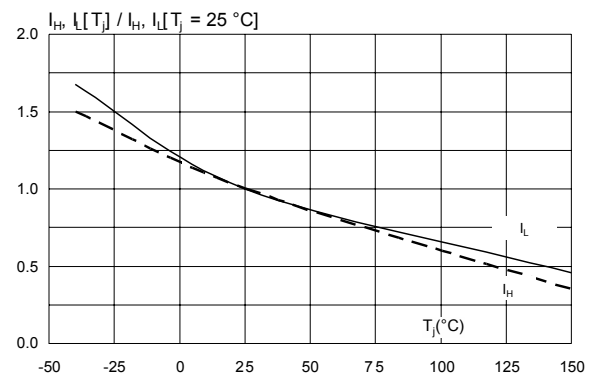
**Figure 8. Relative variation of gate trigger current and gate voltage versus junction temperature (typical values)**



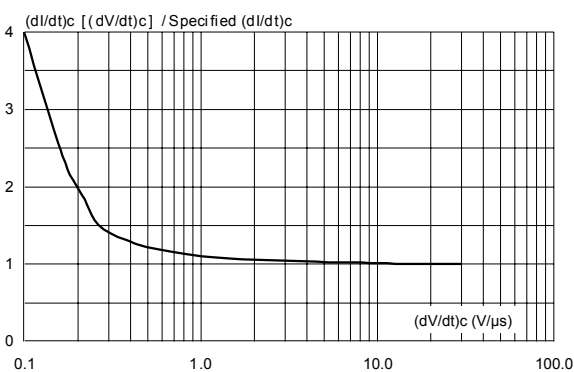
**Figure 9. Relative variation of static dV/dt immunity versus junction temperature (typical values)**



**Figure 10. Relative variation of holding current and latching current versus junction temperature (typical values)**



**Figure 11. Relative variation of critical rate of decrease of main current (di/dt)c versus reapplied (dV/dt)c (typical values)**



**Figure 12. Relative variation of critical rate of decrease of main current (di/dt)c versus junction temperature (typical values)**

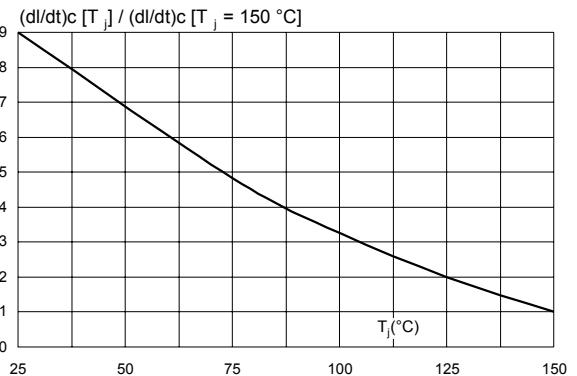
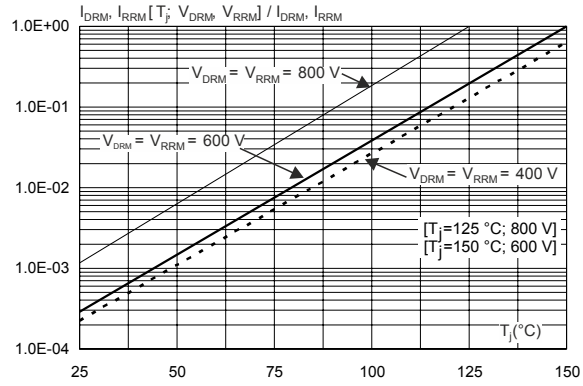


Figure 13. Relative variation of leakage current versus junction temperature for  $V_D = V_{DRM} / V_R = V_{RRM}$  blocking voltage (typical values)



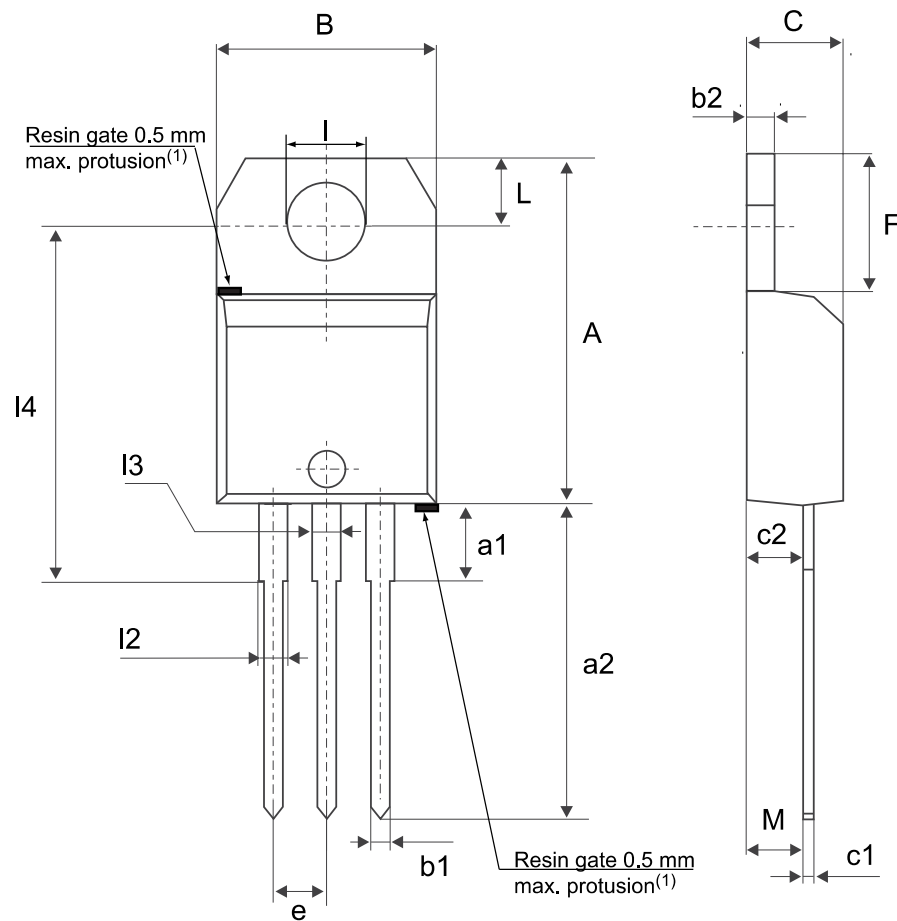
## 2 Package information

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 TO-220AB package information

- Epoxy resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free plating package leads
- Recommended torque: 0.4 to 0.6 N·m

Figure 14. TO-220AB package outline



(1)Resin gate position accepted in one of the two positions or in the symmetrical opposites.

**Table 5. TO-220AB package mechanical data**

| Ref. | Dimensions  |       |       |        |        |        |
|------|-------------|-------|-------|--------|--------|--------|
|      | Millimeters |       |       | Inches |        |        |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.   | Max.   |
| A    | 15.20       |       | 15.90 | 0.5984 |        | 0.6260 |
| a1   |             | 3.75  |       |        | 0.1476 |        |
| a2   | 13.00       |       | 14.00 | 0.5118 |        | 0.5512 |
| B    | 10.00       |       | 10.40 | 0.3937 |        | 0.4094 |
| b1   | 0.61        |       | 0.88  | 0.0240 |        | 0.0346 |
| b2   | 1.23        |       | 1.32  | 0.0484 |        | 0.0520 |
| C    | 4.40        |       | 4.60  | 0.1732 |        | 0.1811 |
| c1   | 0.49        |       | 0.70  | 0.0193 |        | 0.0276 |
| c2   | 2.40        |       | 2.72  | 0.0945 |        | 0.1071 |
| e    | 2.40        |       | 2.70  | 0.0945 |        | 0.1063 |
| F    | 6.20        |       | 6.60  | 0.2441 |        | 0.2598 |
| I    | 3.73        |       | 3.88  | 0.1469 |        | 0.1528 |
| L    | 2.65        |       | 2.95  | 0.1043 |        | 0.1161 |
| I2   | 1.14        |       | 1.70  | 0.0449 |        | 0.0669 |
| I3   | 1.14        |       | 1.70  | 0.0449 |        | 0.0669 |
| I4   | 15.80       | 16.40 | 16.80 | 0.6220 | 0.6457 | 0.6614 |
| M    |             | 2.6   |       |        | 0.1024 |        |

1. Inch dimensions are for reference only.



### 3 Ordering information

Figure 15. Ordering information scheme

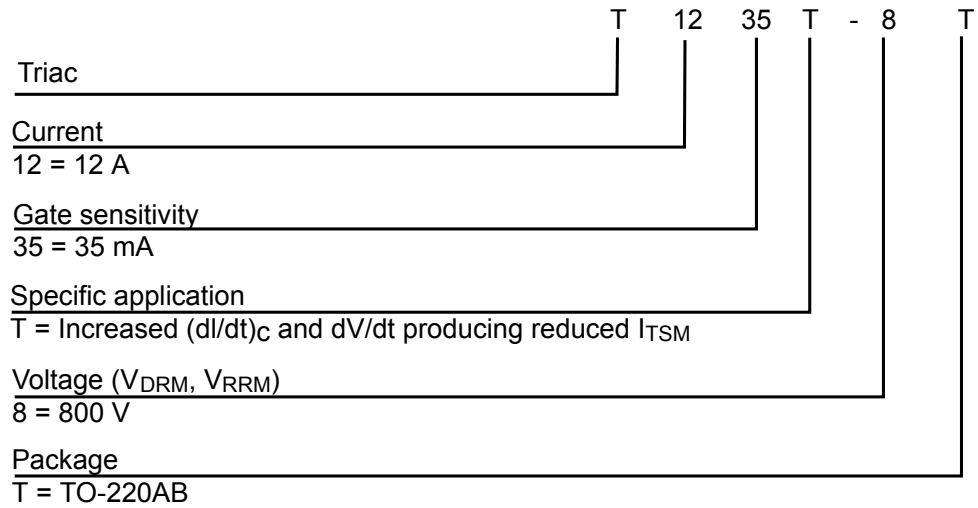


Table 6. Ordering information

| Order code | Marking   | Package  | Weight | Base qty. | Delivery mode |
|------------|-----------|----------|--------|-----------|---------------|
| T1235T-8T  | T1235T-8T | TO-220AB | 2.0 g  | 50        | Tube          |

## Revision history

**Table 7. Document revision history**

| Date        | Revision | Changes                                                         |
|-------------|----------|-----------------------------------------------------------------|
| 05-Aug-2013 | 1        | Initial release.                                                |
| 01-Jul-2014 | 2        | Updated Table 2.                                                |
| 28-Jul-2014 | 3        | Updated Table 5.                                                |
| 13-Sep-2019 | 4        | Updated <a href="#">Figure 14</a> and <a href="#">Table 5</a> . |

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