

# 1 Characteristics

**Table 2. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

| Symbol             | Parameter                                             |                                   |                            | Value       | Unit |
|--------------------|-------------------------------------------------------|-----------------------------------|----------------------------|-------------|------|
| V <sub>RRM</sub>   | Repetitive peak reverse voltage                       |                                   |                            | 400         | V    |
| I <sub>F(AV)</sub> | Average forward current, δ = 0.5                      | DO-41                             | T <sub>lead</sub> = 100 °C | 1.0         | A    |
|                    |                                                       | DO-15                             | T <sub>lead</sub> = 105 °C |             |      |
|                    |                                                       | SMA                               | T <sub>lead</sub> = 125 °C |             |      |
|                    |                                                       | SMB                               | T <sub>lead</sub> = 140 °C |             |      |
| I <sub>FSM</sub>   | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms Sinusoidal |                            | 30          | A    |
| T <sub>stg</sub>   | Storage temperature range                             |                                   |                            | -65 to +175 | °C   |
| T <sub>j</sub>     | Maximum operating junction temperature <sup>(1)</sup> |                                   |                            | 175         | °C   |

1. On infinite heatsink with 10 mm lead length

**Table 3. Thermal parameters**

| Symbol        | Parameter        |                                             |       | Value | Unit |
|---------------|------------------|---------------------------------------------|-------|-------|------|
| $R_{th(j-l)}$ | Junction to lead | Lead length = 10 mm<br>on infinite heatsink | DO-41 | 55    | °C/W |
|               |                  |                                             | DO-15 | 50    |      |
| $R_{th(j-l)}$ | Junction to lead |                                             | SMA   | 35    |      |
|               |                  |                                             | SMB   | 25    |      |

**Table 4. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions       |                      | Min | Typ | Max  | Unit          |
|-------------|-------------------------|-----------------------|----------------------|-----|-----|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$      |     |     | 5    | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                      |     | 5   | 50   |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 1.0\text{ A}$ |     |     | 1.5  | V             |
|             |                         | $T_j = 100\text{ °C}$ |                      |     | 1.0 | 1.25 |               |
|             |                         | $T_j = 150\text{ °C}$ |                      |     | 0.9 | 1.15 |               |

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.9 \times I_{F(AV)} + 0.250 \times I_F^2_{(RMS)}$$

Table 5. Dynamic characteristics ( $T_j = 25^\circ\text{C}$  unless otherwise stated)

| Symbol   | Parameter                | Test conditions                                                                                                      | Min | Typ | Max | Unit |
|----------|--------------------------|----------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $t_{rr}$ | Reverse recovery time    | $I_F = 1\text{ A}$ , $dI_F/dt = -50\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$        |     |     | 30  | ns   |
|          |                          | $I_F = 1\text{ A}$ , $dI_F/dt = -100\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$       |     | 14  | 20  |      |
| $I_{RM}$ | Reverse recovery current | $I_F = 1\text{ A}$ , $dI_F/dt = -200\text{ A}/\mu\text{s}$ ,<br>$V_R = 320\text{ V}$ , $T_j = 125^\circ\text{C}$     |     | 2.5 | 3.5 | A    |
| $t_{fr}$ | Forward recovery time    | $I_F = 1\text{ A}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$<br>$V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25^\circ\text{C}$ |     |     | 50  | ns   |
| $V_{FP}$ | Forward recovery voltage | $I_F = 1\text{ A}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$                                                              |     | 3.5 |     | V    |

Figure 1. Conduction losses versus average forward current

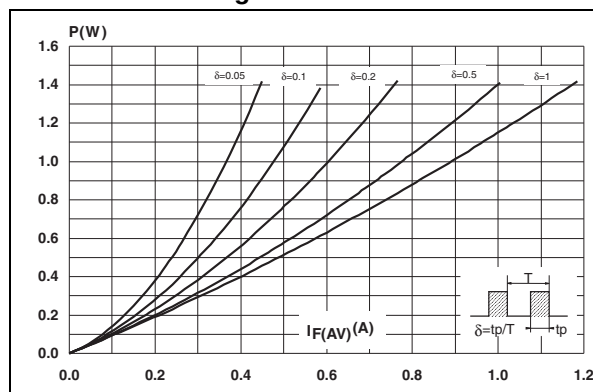


Figure 2. Forward voltage drop versus forward current

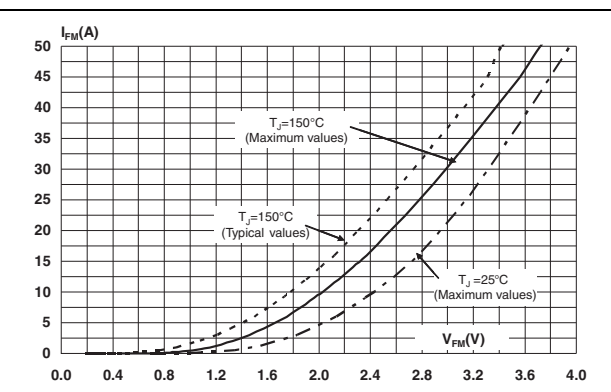


Figure 3. Relative variation of thermal impedance junction to lead versus pulse duration (DO-41)

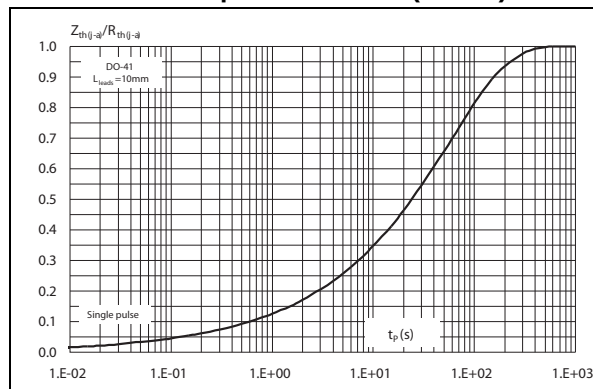
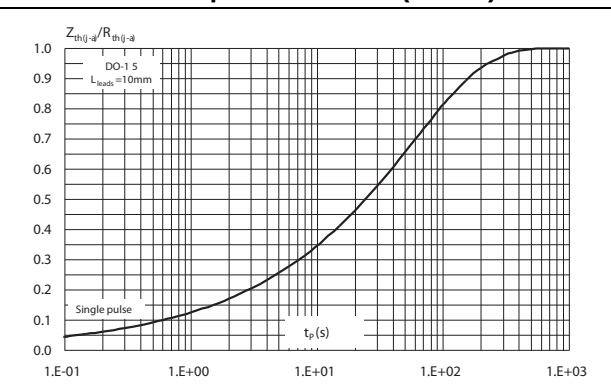
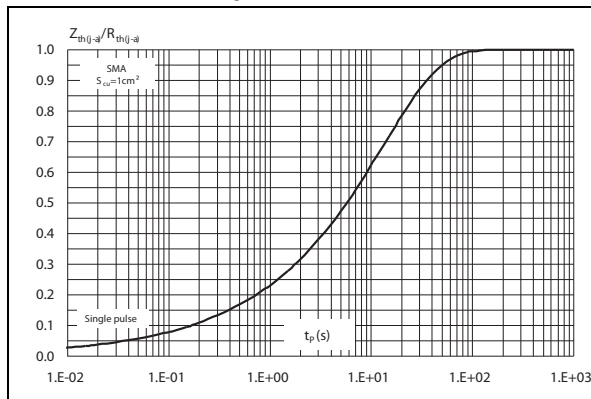


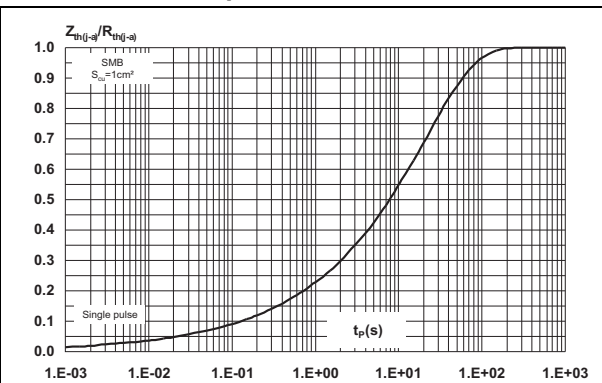
Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (DO-15)



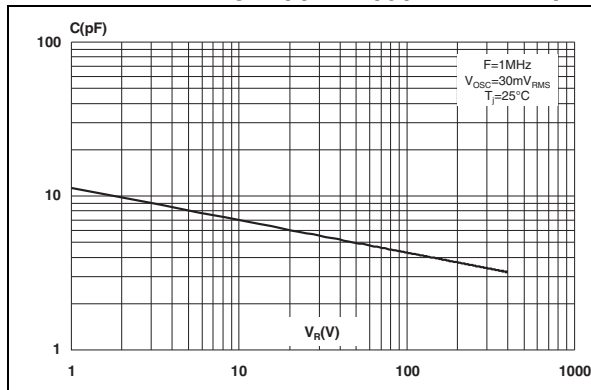
**Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration, SMA**



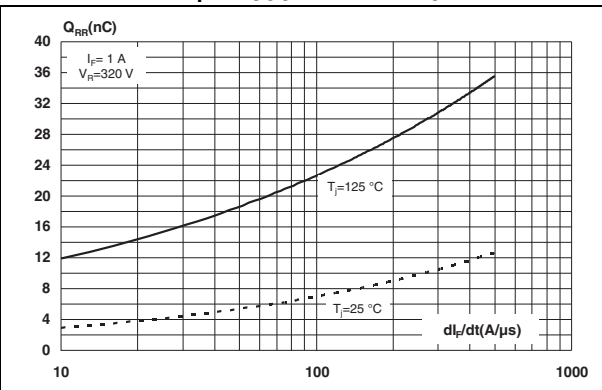
**Figure 6. Relative variation of thermal impedance junction to lead versus pulse duration, SMB**



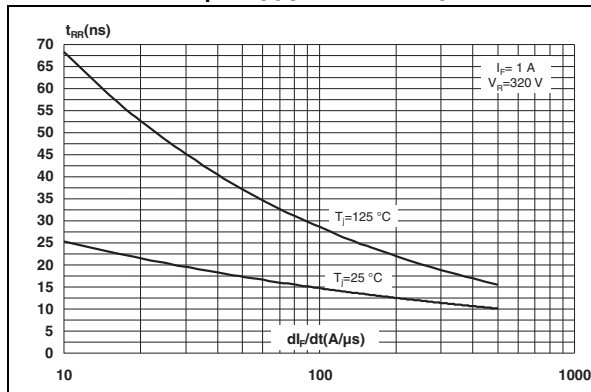
**Figure 7. Junction capacitance versus reverse voltage applied (typical values)**



**Figure 8. Reverse recovery charges versus  $di_F/dt$  (typical values)**



**Figure 9. Reverse recovery time versus  $di_F/dt$  (typical values)**



**Figure 10. Peak reverse recovery current versus  $di_F/dt$  (typical values)**

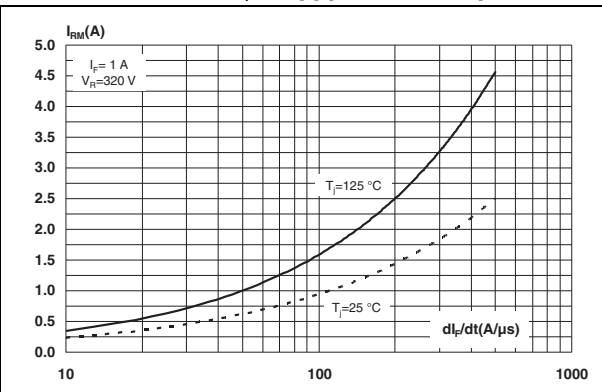


Figure 11. Relative variations of dynamic parameters versus junction temperature

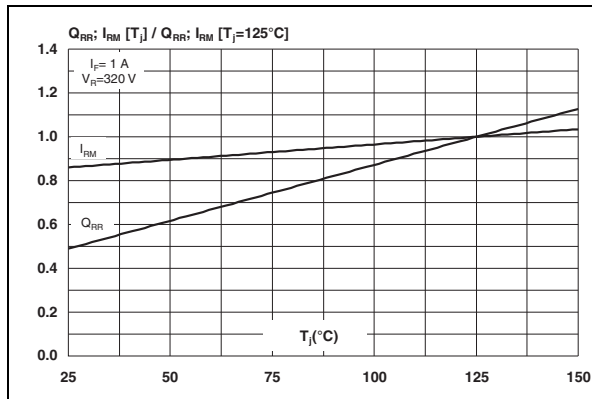
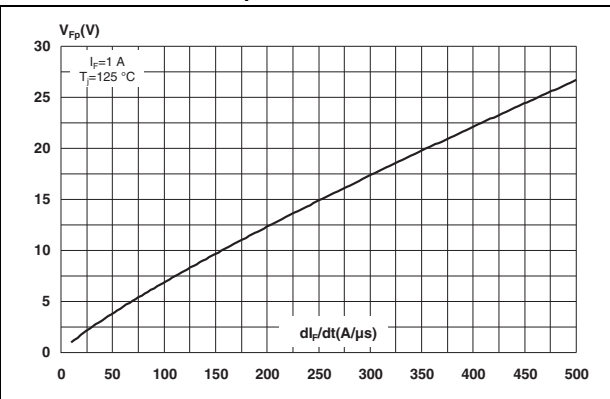
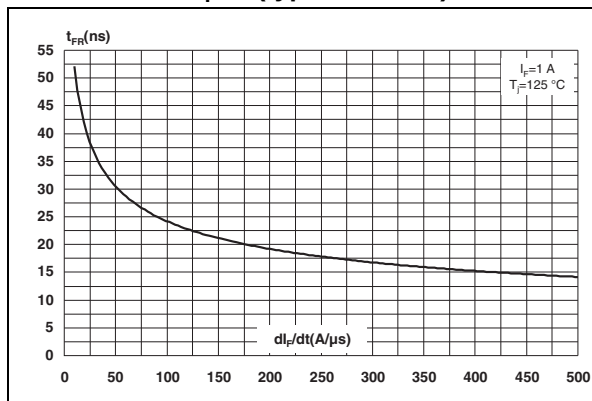
Figure 12. Transient peak forward voltage versus  $di_F/dt$  (typical values)Figure 13. Forward recovery time versus  $di_F/dt$  (typical values)

Figure 14. Thermal resistance versus lead length (DO-41)

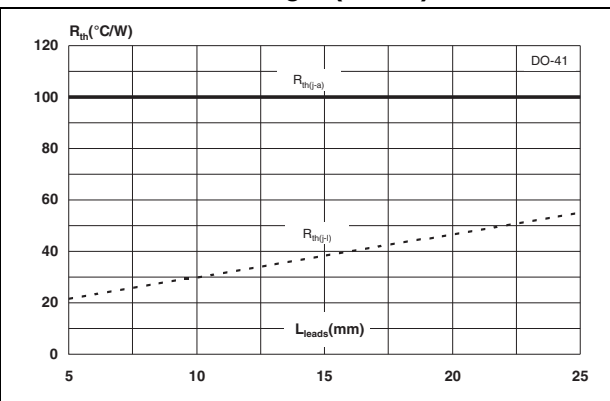


Figure 15. Thermal resistance junction to ambient versus lead length, DO-15

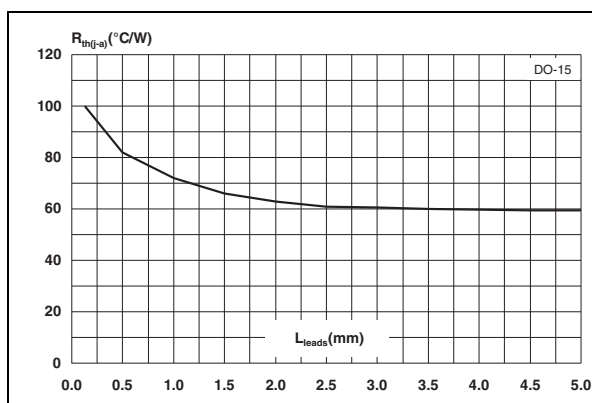
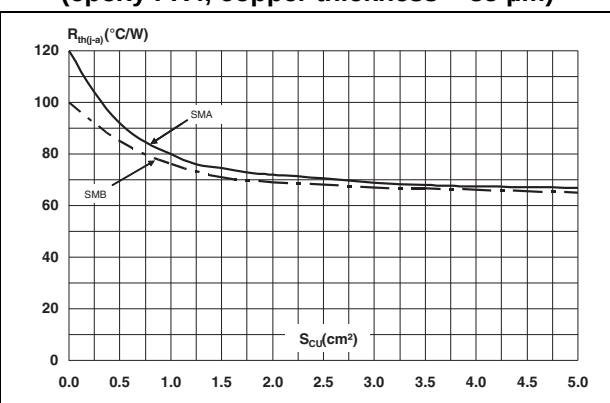


Figure 16. Thermal resistance junction to ambient versus copper surface under each lead, SMA, SMB, (epoxy FR4, copper thickness = 35 μm)



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

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 DO-14 (plastic) package information

Table 6. DO-41 (plastic) dimensions

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.1         | 5.20  | 0.160  | 0.205 |
| B    | 2           | 2.71  | 0.080  | 0.107 |
| C    | 25.4        |       | 1      |       |
| D    | 0.712       | 0.863 | 0.028  | 0.034 |

### 2.2 DO-15 package information

Table 7. DO-15 dimensions

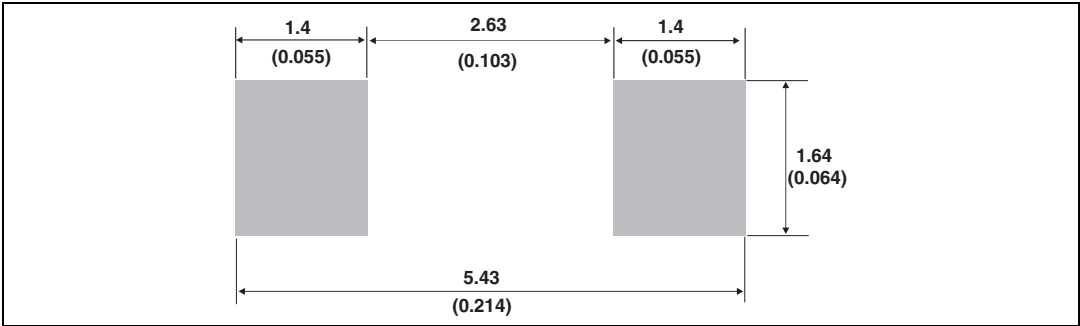
| Ref. | Dimensions  |      |        |       |
|------|-------------|------|--------|-------|
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A    | 6.05        | 6.75 | 0.238  | 0.266 |
| B    | 2.95        | 3.53 | 0.116  | 0.139 |
| C    | 26          | 31   | 1.024  | 1.220 |
| D    | 0.71        | 0.88 | 0.028  | 0.035 |

## 2.3 SMA package information

Table 8. SMA dimensions

| Ref. | Dimensions  |      |        |       |
|------|-------------|------|--------|-------|
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A1   | 1.90        | 2.45 | 0.075  | 0.094 |
| A2   | 0.05        | 0.20 | 0.002  | 0.008 |
| b    | 1.25        | 1.65 | 0.049  | 0.065 |
| c    | 0.15        | 0.40 | 0.006  | 0.016 |
| D    | 2.25        | 2.90 | 0.089  | 0.114 |
| E    | 4.80        | 5.35 | 0.189  | 0.211 |
| E1   | 3.95        | 4.60 | 0.156  | 0.181 |
| L    | 0.75        | 1.50 | 0.030  | 0.059 |

Figure 17. Footprint, dimensions in mm (inches)

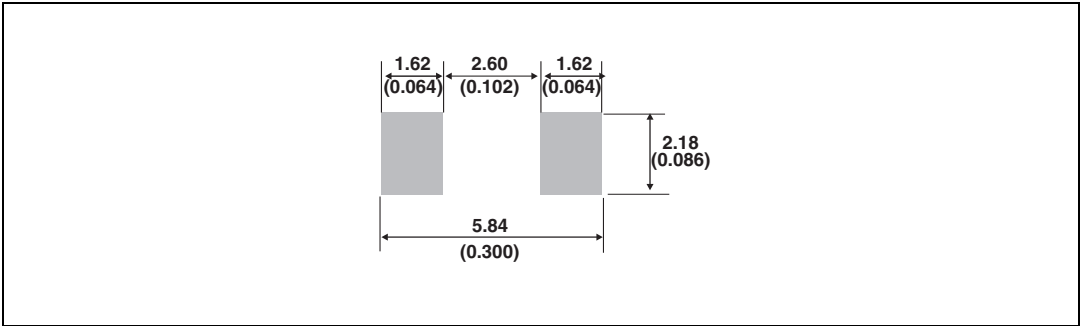


2.4 SMB package information

Table 9. SMB dimensions

| Ref. | Dimensions  |      |        |       |
|------|-------------|------|--------|-------|
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A1   | 1.90        | 2.45 | 0.075  | 0.096 |
| A2   | 0.05        | 0.20 | 0.002  | 0.008 |
| b    | 1.95        | 2.20 | 0.077  | 0.087 |
| c    | 0.15        | 0.40 | 0.006  | 0.016 |
| D    | 3.30        | 3.95 | 0.130  | 0.156 |
| E    | 5.10        | 5.60 | 0.201  | 0.220 |
| E1   | 4.05        | 4.60 | 0.159  | 0.181 |
| L    | 0.75        | 1.50 | 0.030  | 0.059 |

Figure 18. Footprint, dimensions in mm (inches)



### 3 Ordering information

Table 10. Ordering information

| Order code  | Marking   | Package | Weight  | Base qty | Delivery mode |
|-------------|-----------|---------|---------|----------|---------------|
| STTH1R04    | STTH1R04  | DO-41   | 0.34 g  | 1000     | Ammopack      |
| STTH1R04RL  | STTH1R04  | DO-41   | 0.34 g  | 5000     | Tape and reel |
| STTH1R04Q   | STTH1R04Q | DO-15   | 0.4 g   | 1000     | Ammopack      |
| STTH1R04QRL | STTH1R04Q | DO-15   | 0.4 g   | 6000     | Tape and reel |
| STTH1R04A   | HR4       | SMA     | 0.068 g | 5000     | Tape and reel |
| STTH1R04U   | BR4       | SMB     | 0.12 g  | 2500     | Tape and reel |

### 4 Revision history

Table 11. Document revision history

| Date        | Revision | Description of changes                                                                                                                       |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 30-May-2008 | 1        | First issue                                                                                                                                  |
| 12-Nov-2015 | 2        | Updated <a href="#">Figure 3</a> , <a href="#">Figure 4</a> , <a href="#">Figure 5</a> and <a href="#">Figure 6</a> .<br>Minor text changes. |

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