

# TLD5190 VOLT DEMO evaluation board

## User Manual

### About this document

#### Product description

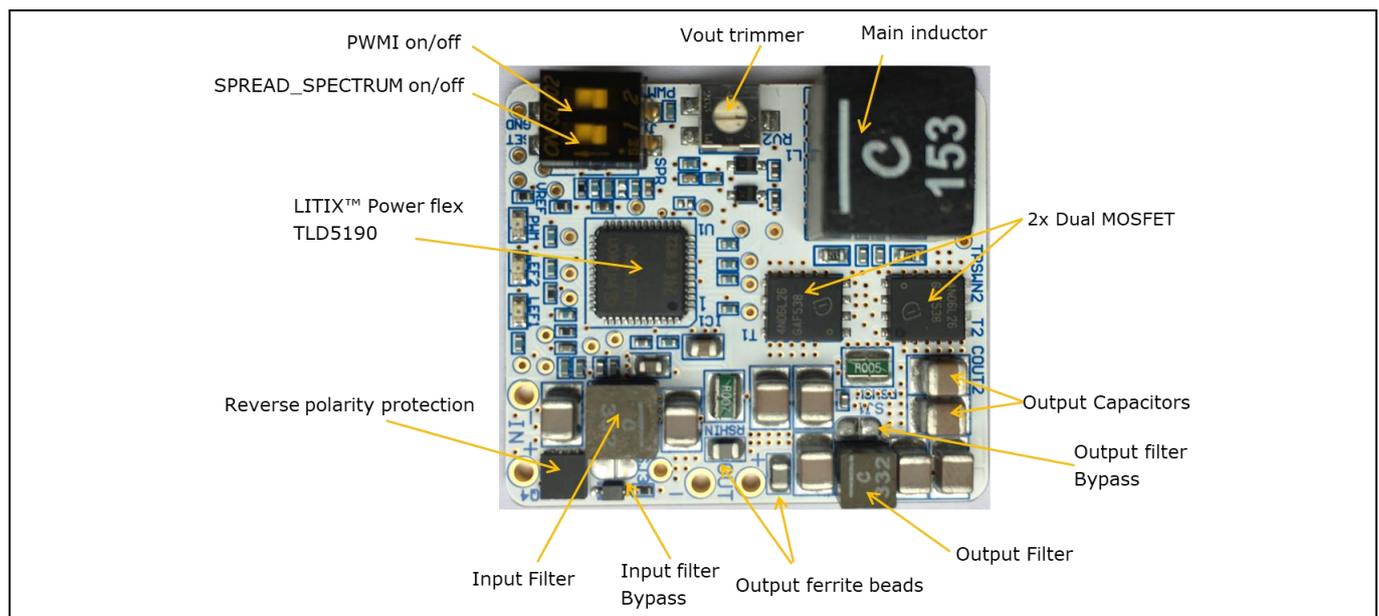
TLD5190: H-Bridge buck-boost DC-DC controller designed for high power, high efficiency automotive applications

- Constant current (LED driver) and constant voltage regulation
- EMC optimized device: Spread spectrum

#### Scope and purpose

Scope of this user manual is to provide to the audience instructions on usage of the TLD5190 VOLT DEMO evaluation board schematic version V3.1, PCB version R2.

The TLD5190 VOLT DEMO is an evaluation platform for the TLD5190 set as compact voltage regulator.



**Figure 1** TLD5190 VOLT DEMO evaluation board

#### Intended audience

Hardware engineers, system architects



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### Description

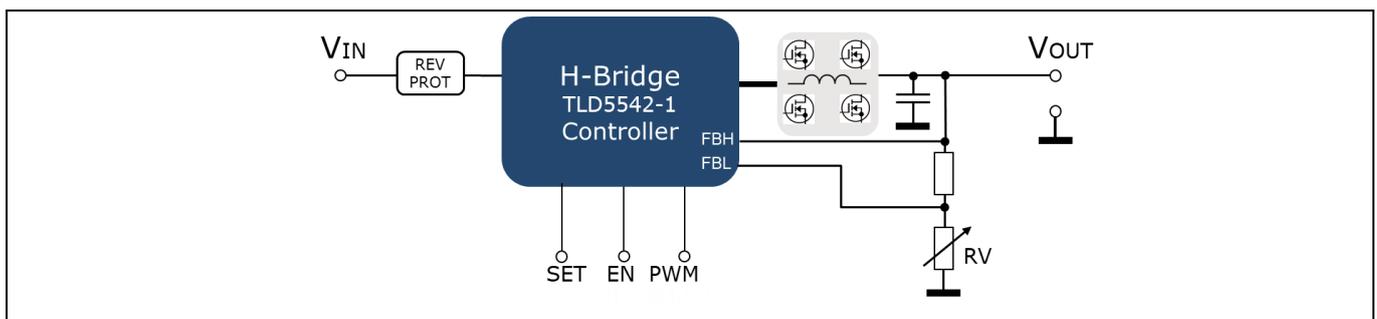
## 2 Description

The H-Bridge architecture is among the most efficient buck-boost topologies for high current applications. The TLD5190 can be configured as voltage regulator or LED driver.

The TLD5190 VOLT DEMO is an evaluation platform for the TLD5190 as voltage regulator. The PCB is extremely compact and can fit in to small applications enclosures for fast prototyping.

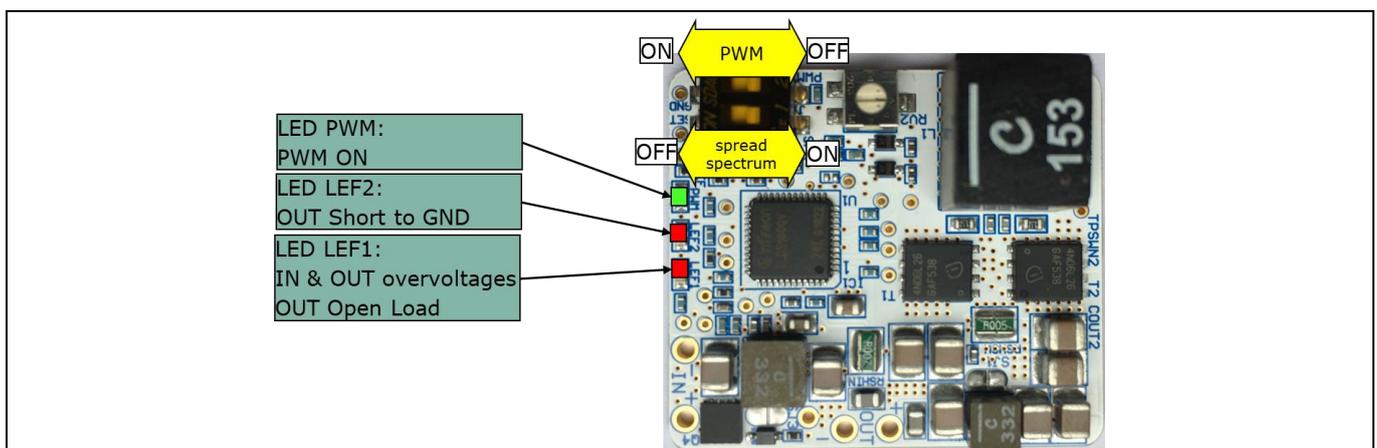
**Note:** *The board has been designed as voltage pre-regulator for rear lighting applications, so it will startup correctly only with output current > 100 mA. In case of startup with no load the soft-start capacitor has to be dimensioned accordingly with the application conditions (input and output voltage).*

The soft start enables DCM (Discontinuous Conduction Mode), this may prevent exact regulation at startup with no load. In case of startup without load the output voltage may rise above the target and the Comp capacitor to be discharged. After the soft start expires, the TLD5190 applies CCM, and the output voltage would be discharged producing a short circuit detection.



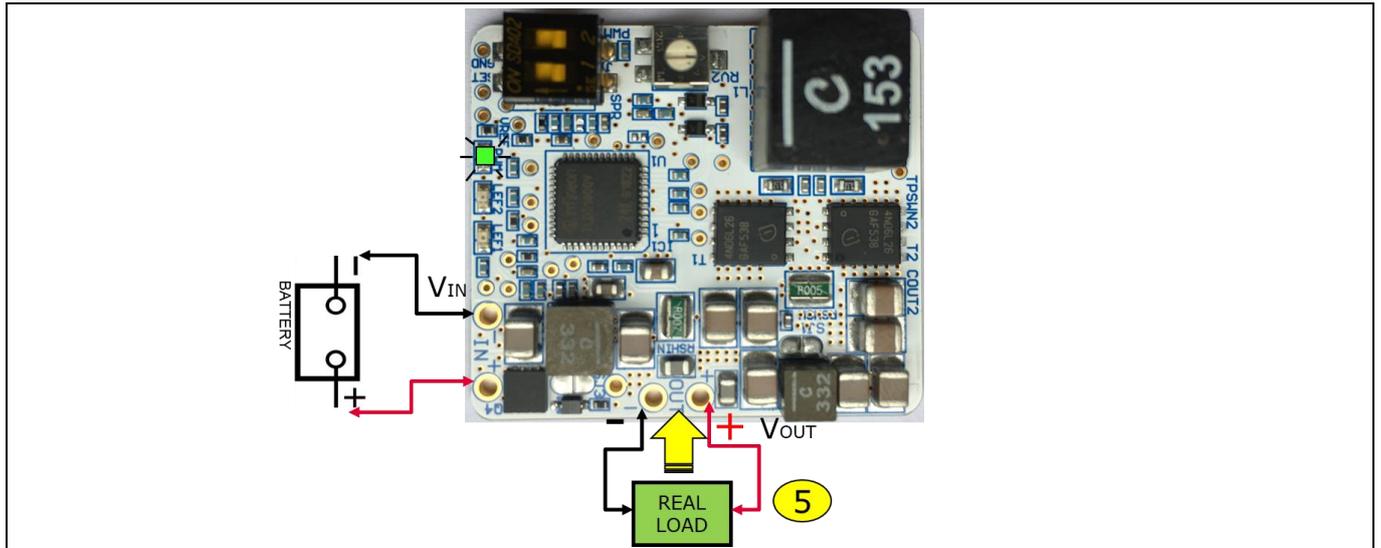
**Figure 2 TLD5190 as voltage regulator**

On the board, in addition there are 3 LEDs to indicate PWMI and error flags status, and 2 switches to activate spread spectrum and PWMI.



**Figure 3 TLD5190 VOLT DEMO LEDs signals**





**Figure 6** Connect the real load

## 4 Operating range and power derating

The TLD5190 VOLT DEMO has very high efficiency, so it can deliver up to 40 W at the output without a heat sink at  $T_A = 25^\circ\text{C}$ ,  $V_{IN} = 12\text{ V}$   $I_{OUT} < 3\text{ A}$  (see Figure 7 for power-derating curve).

**Note:** *The module does not implement thermal protection, so ensure proper cooling when output power exceeds the power-derating curve. The heat sink has to be positioned below the switching MOSFETs.*

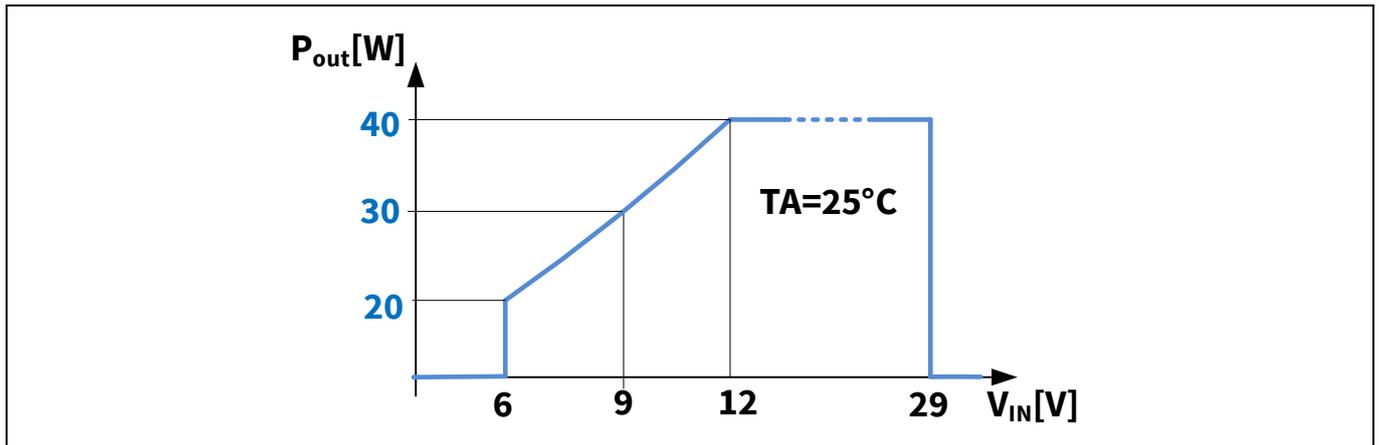


Figure 7 Output power derating curve ( $T_A = 25^\circ\text{C}$ ,  $I_{OUT} < 3\text{ A}$ )

## 5 Electrical characteristics

Table 1 TLD5190 VOLT DEMO schematic version V3.1 – Electrical characteristics

| Parameter           | Symbol              | Value |      |      | Unit | Note/Test Condition   |
|---------------------|---------------------|-------|------|------|------|---|
|                     |                     | Min.  | Typ. | Max. |      |   |
| Input voltage       | $V_{IN}$            | 5     | -    | 29   | V    | -   |
| Output voltage      | $V_{OUT}$           | 3     | -    | 21   | V    | RV2 trimmer could set $V_{OUT}$ as low as 1.5 V , but short to GND would be detected                      |
| Output current      | $I_{OUT}$           | 0     | -    | 3    | A    | -   |
| Input current limit | $I_{IN\_MAX}$       | -     | 7    | -    | A    | -   |
| Output power        | $P_{OUT}$           | -     | 40   | -    | W    | $V_{IN}$ 12 V to 28 V, $I_{OUT} < 3$ A, $T_A = 25^\circ\text{C}$<br>see Figure 7 for power derating curve |
| Switching frequency | Switching frequency | -     | 290  | -    | kHz  | Spread spectrum deviation is present  |
| System efficiency   | Eff                 | -     | 94   | -    | %    | -   |

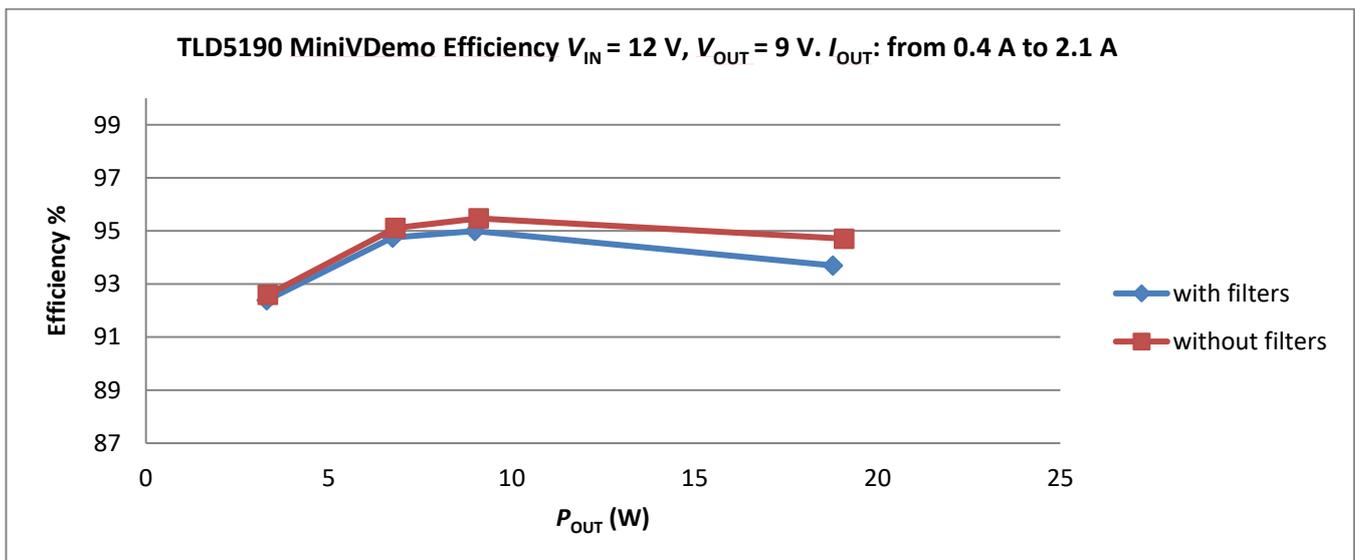


Figure 8 TLD5190 VOLT DEMO Efficiency

## 6 PCB - component placement

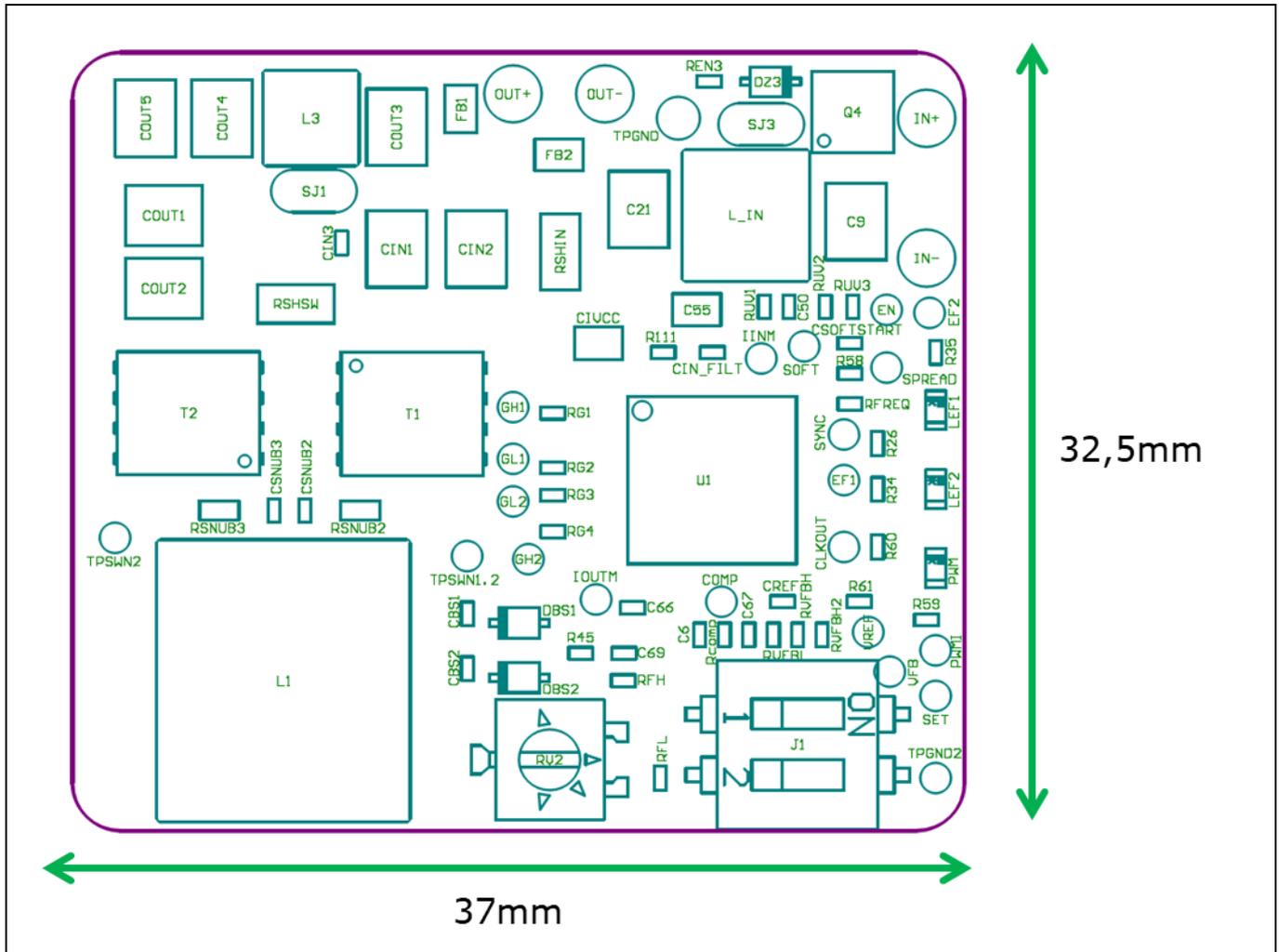


Figure 9 PCB dimensions and component placement - top view



## 8 BoM

Table 2 BoM TLD5190 microVBoard

| BoM: TLD5190 - microVBoard R2                  |                    |                         |
|--|--------------------|-------------------------|
| Configuration: Voltage mode                    |                    |                         |
| Designator                                     | Comment            | Footprint               |
| C6   | 15nF 16V X7R       | C0402                   |
| C9,C21,CIN1,CIN2,COUT1,COUT2,COUT3,COUT4,COUT5 | 10uF 50V 1210      | C1210                   |
| C50  | 100n 0402          | C0402                   |
| C55  | 1uF 50V X7R 0603   | C0805                   |
| C66  | nm                 | C0402                   |
| C67  | nm                 | C0402                   |
| C69  | 10n 50V 0402       | C0402                   |
| CBS1,CBS2,CIN3,CREF                            | 100nF 50V          | C0402                   |
| CIN_FILTER                                     | 220nF 6.3V 0402    | C0402                   |
| CIVCC  | 10uF 6.3V 0805     | C0805                   |
| CSNUB2,CSNUB3                                  | 680pF              | C0402                   |
| CSOFTSTART                                     | 22nF 16V           | C0402                   |
| DBS1,DBS2                                      | NXP_BAT46WJ        | SOD323F                 |
| DZ3  | ZENER 10V          | SOD323                  |
| FB1, FB2                                       | IND 220R/100MHz    | IND SMD 0805            |
| J1   | A6S-2104-H         | DIP SW 2 SMD SDA02H0SB  |
| L1   | XAL1010-153        | IND SMD XAL1010+XAL8080 |
| L3   | XAL4030-332        | IND SMD XAL4030         |
| LEF1,LEF2                                      | RED LED            | LED 0603 RED            |
| L_IN   | XAL5030-332        | IND SMD XAL5030         |
| PWM  | GREEN LED          | LED 0603 GREEN          |
| Q4   | BSZ08P03NS3        | PG-TSDSON-8 SGD         |
| R26  | 10k 1% 0402        | R0402                   |
| R34,R35,R45                                    | 1k5                | R0402                   |
| R58,R59,R61                                    | 10kΩ1%             | R0402                   |
| R60  | 1k5                | R0402                   |
| R111   | 50Ω                | R0402                   |
| Rcomp  | 1k 1% 0402         | R0402                   |
| REN3   | 10kΩ 0402          | R0402                   |
| RFH  | 150                | R0402                   |
| RFL  | 1k5                | R0402                   |
| RFREQ  | 39kΩ 0402          | R0402                   |
| RG1,RG2,RG3,RG4                                | 10 Ω               | R0402                   |
| RSHIN  | 7mΩ 0612           | R0612                   |
| RSHSW  | 5mΩ 0612           | R0612                   |
| RSNUB2,RSNUB3                                  | 5.1Ω               | R0603                   |
| RUV1   | 14.3k 1% 0402      | R0402                   |
| RUV2   | 6.2k 1% 0402       | R0402                   |
| RUV3   | 1k5 1% 0402        | R0402                   |
| RV2  | 20k TRIM           | TRIMMER SMD 23B         |
| RVFBH  | 33k 1%             | R0402                   |
| RVFBH2   | 14.3k 1%           | R0402                   |
| RVFBL  | 1k5                | R0402                   |
| SJ1,SJ2  | SOLDER JUMP        |                         |
| T1,T2  | IFX_IPG20N06S4L-26 | PG-TDSON-8-4            |
| U1   | TLD5190QV          | VQFN48 7X7 P05          |



**Revision history**

| <b>Document version</b> | <b>Date of release</b> | <b>Description of changes</b> |
|-------------------------|------------------------|-------------------------------|
| Rev. 1.00               | 2020-06-05             | Initial User Manual           |
|                         |                        |                               |
|                         |                        |                               |
|                         |                        |                               |

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**Document reference**

**UM TLD5190 VOLT DEMO**

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