*EVM User's Guide: TPS61372LEVM-110*

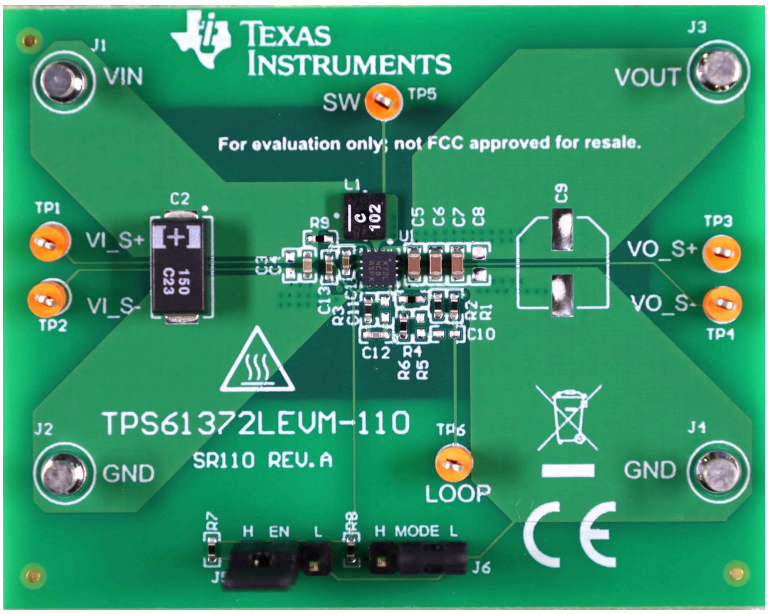
# *TPS61372LEVM-110 Evaluation Module*

## Description

The TPS61372LEVM-110 Evaluation Module describes the setup, schematic and layout of the evaluation module (EVM) for the TPS61372L. The EVM helps to evaluate the behavior and performance of the TPS61372L at different input voltage, output voltage, and load conditions. The input voltage is from 2.5V to 5.5V, and the output voltage is set to 11V. The input and output voltages can be changed through external feedback resistors. Two jumpers are placed to test the EN and MODE pin function.

## Features

- Output current 0.6A ($V_{IN}$ >= 3.3V to $V_{OUT}$ = 11V)
- Up to 92% efficiency at $V_{IN}$ = 5V to $V_{OUT}$ = 11V, and $I_{OUT}$ = 0.5A
- Typical 3.8A peak switching current limit
- Typical 74µA quiescent current
- Switching frequency: typical 1.5MHz
- Pin selectable PFM/FPWM mode
- External compensation
- Typical 0.9ms soft start time
- Thermal shutdown protection



# 1 Evaluation Module Overview

## 1.1 Introduction

This EVM is designed for 2.5V to 5.5V input voltage and 11V output voltage applications. The EN jumper (J5) controls the ON and OFF of the device. The MODE jumper (J6) controls PFM or FPWM mode at light load. This EVM has test points of TP5 and TP6 for SW voltage and loop measurement, respectively. The feedback divider can be modified for other application conditions as per the data sheet.

| CAUTION | | |
|---|---|---|
|  | **Caution** | **Hot surface. Contact can cause burns. Do not touch!** |

## 1.2 Kit Contents

**Table 1-1. Kit List**

| Designator | Quantity | Description | Material Type | Packaging |
|---|---|---|---|---|
| PCB1 | 1 | TPS61372LEVM, Circuit Board | EEE | Bag, ESD |
| BOX1 | 1 | Box, Cardboard | Cardboard | Box |
| FM1 | 2 | Foam, Antistatic | Plastic | Foam |
| LBL1 | 2 | Label, Small & Large standard labels | Paper/card stock | Paper |
| LIT1 | 1 | Literature, EVM Disclaimer Read Me | Paper/card stock | Paper |

## 1.3 Specification

Table 1-2 provides the summary of the TPS61372LEVM performance specifications. All the specifications are given for an ambient temperature of 25°C.

**Table 1-2. Performance Specification**

| Parameter | Value | Unit |
|---|---|---|
| Input voltage | 2.5 - 5.5 | V |
| Output voltage | 11 | V |
| Typical peak current limit | 3.8 | A |
| Default switching frequency | 1.5 | MHz |
| Output current | 0 - 500 (When Vin < 3.3V)<br>0 - 600 (When Vin >= 3.3V) | mA |

## 1.4 Device Information

The TPS61372L is a full-integrated synchronous boost converter with the load disconnect built-in. The device supports output voltage up to 16V with a 3.8A current limit. The input voltage ranges from 2.5V to 5.5V supporting applications powered by a single-cell Lithiumion battery or 3.3V or 5V bus.

# 2 Hardware

## 2.1 Test Setup

| Jumper | Description |
|---|---|
| J1 | Input voltage positive connection |
| J2 | Input voltage return connection |
| J3 | Output voltage positive connection |
| J4 | Output voltage return connection |
| J5 | EN pin input jumper. Place a jumper across EN and On to turn on the IC. Place a jumper across EN and Off to turn off the IC. |
| TP1 | Input voltage positive sensing node for measuring efficiency |
| TP2 | Input voltage negative sensing node for measuring efficiency |
| TP3 | Output voltage positive sensing node for measuring efficiency |
| TP4 | Output voltage negative sensing node for measuring efficiency |
| TP5 (SW) | Test point to measure SW pin waveform |
| TP6 | Test point to measure bode plot |

## 2.2 Modification

The external components of the TPS61372L device can be modified to adjust the output voltage of real applications.

## 2.3 Input Capacitor C1

The 150µF, 16V tantalum capacitor C2 is added as the input capacitor in the EVM. The capacitor is not necessary and can be removed in a real application.

# 3 Hardware Design Files

## 3.1 Schematic

Figure 3-1 shows the TPS61372LEVM schematic.

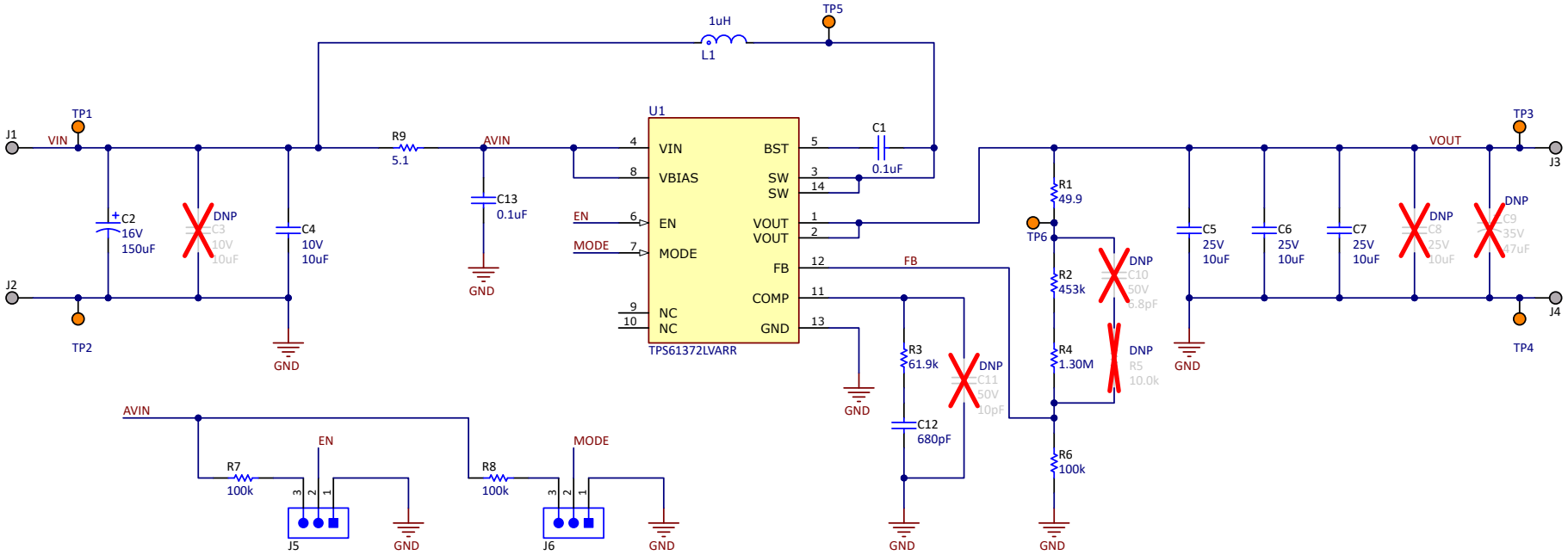



**Figure 3-1. Schematic**

## 3.2 PCB Layout

The TPS61372LEVM board is a 4-layer, 2/1/1/2oz copper thick PCB. All the components are placed on the top layer. Figure 3-2, Figure 3-3, Figure 3-4and Figure 3-5 show the top view, signal layer 1, signal layer 2 and bottom view, respectively.

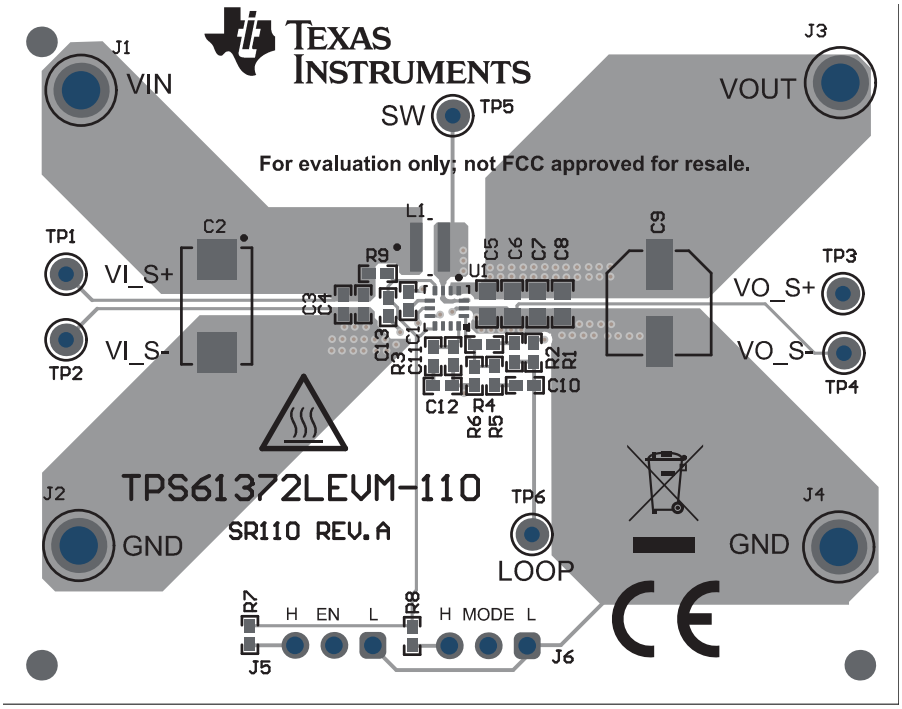



**Figure 3-2. Top Layer Layout**

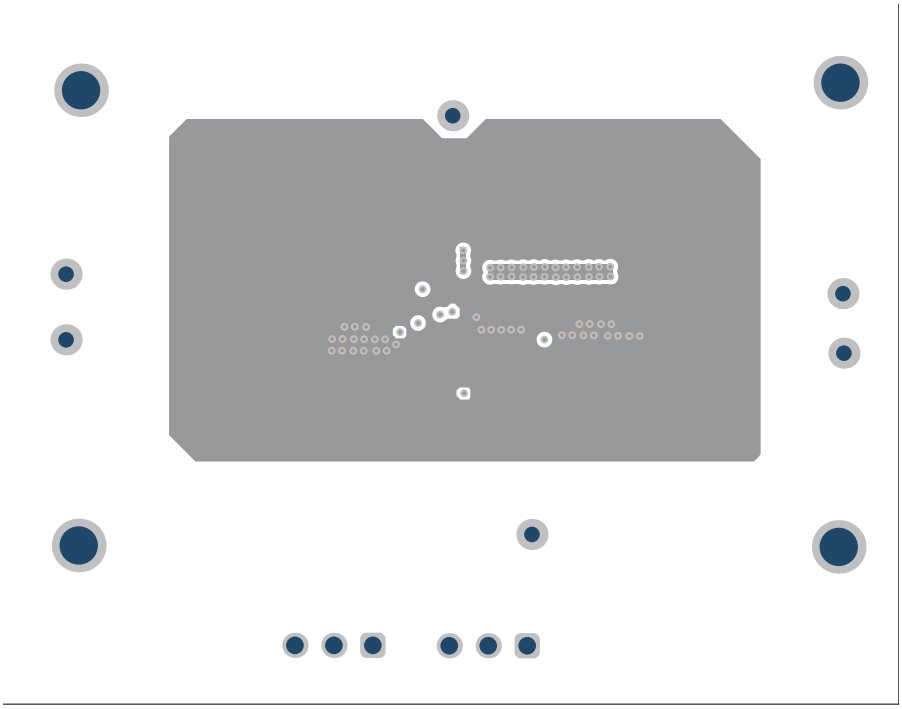


**Figure 3-3. Signal Layer 1 Layout**

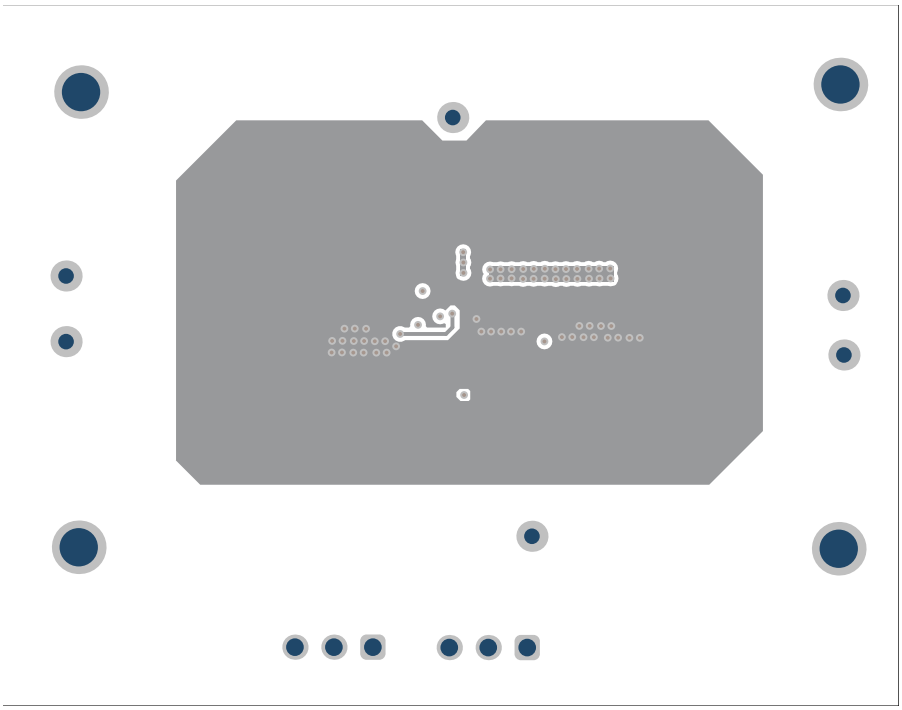


**Figure 3-4. Signal Layer 2 Layout**

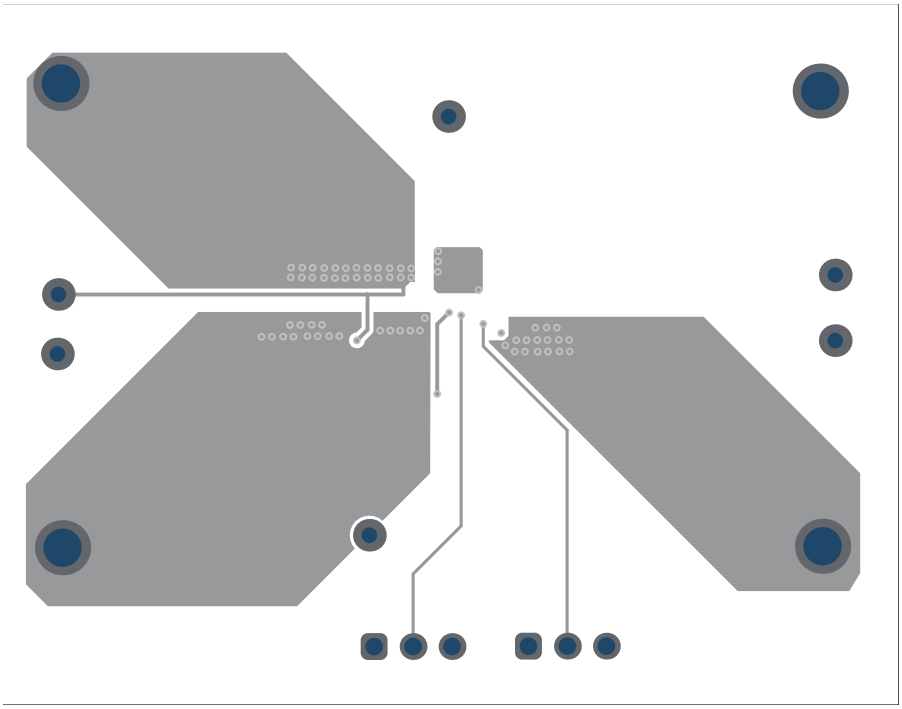


**Figure 3-5. Bottom Layer Layout (Mirrored)**

## 3.3 Bill of Materials

Table 3-1 lists the BOM of the TPS61372LEVM.

**Table 3-1. TPS61372LEVM Bill of Materials**

| Designator | Qty | Value | Description | PackageReference | PartNumber | Manufacturer |
|---|---|---|---|---|---|---|
| C1, C13 | 2 | 0.1µF | CAP, CERM, 0.1uF, 16V, +/- 10%, X5R, 0402 | 0402 | GRM155R61C104KA88D | MuRata |
| C2 | 1 | 150µF | CAP, Tantalum Polymer, 150uF, 16V, +/- 20%, 0.05ohm, 7343-31 SMD | 7343-31 | 16TQC150MYF | Panasonic |
| C4 | 1 | 10µF | CAP, CERM, 10uF, 10V, +/- 20%, X5R, 0402 | 0402 | GRM155R61A106ME11D | MuRata |
| C5, C6, C7 | 3 | 10µF | CAP, CERM, 10uF, 25V, +/- 20%, X5R, 0603 | 0603 | GRM188R61E106MA73D | MuRata |
| C12 | 1 | 680pF | CAP, CERM, 680pF, 25V, +/- 5%, C0G/NP0, 0402 | 0402 | GRM1555C1E681JA01D | MuRata |
| J1, J2, J3, J4 | 4 | | Terminal, Turret, TH, Double | Keystone1502-2 | 1502-2 | Keystone |
| J5, J6 | 2 | | Header, 2.54mm, 3x1, Gold, TH | Header, 2.54mm, 3x1, TH | 61300311121 | Wurth Elektronik |
| L1 | 1 | 1µH | 1µH Shielded Molded Inductor 4.9A 32.2mOhm Max Nonstandard | SMD2 | XGL3512-102MEC | Coilcraft |
| R1 | 1 | 49.9 | RES, 49.9, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW040249R9FKED | Vishay-Dale |
| R2 | 1 | 453k | RES, 453 k, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW0402453KFKED | Vishay-Dale |
| R3 | 1 | 61.9k | RES, 61.9k, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW040261K9FKED | Vishay-Dale |
| R4 | 1 | 1.3Meg | RES, 1.30M, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW04021M30FKED | Vishay-Dale |
| R6, R7, R8 | 3 | 100k | RES, 100k, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW0402100KFKED | Vishay-Dale |
| R9 | 1 | 5.1 | RES, 5.1, 5%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW04025R10JNED | Vishay-Dale |
| TP1, TP2, TP3, TP4, TP5, TP6 | 6 | | Test Point, Miniature, Orange, TH | Orange Miniature Testpoint | 5003 | Keystone Electronics |
| U1 | 1 | | 16V, 3.8A Synchronous Boost With Load Disconnect | WQFN-HR14 | TPS61372LVARR | Texas Instruments |
| C3 | 0 | 10uF | CAP, CERM, 10uF, 10V, +/- 20%, X5R, 0402 | 0402 | GRM155R61A106ME11D | MuRata |
| C8 | 0 | 10uF | CAP, CERM, 10uF, 25V, +/- 20%, X5R, 0603 | 0603 | GRM188R61E106MA73D | MuRata |
| C9 | 0 | 47µF | CAP, AL, 47µF, 35V, +/- 20%, 0.36ohm, AEC-Q200 Grade 2, SMD | SMT Radial D | EEE-FK1V470P | Panasonic |
| C10 | 0 | 6.8pF | CAP, CERM, 6.8pF, 50V, +/- 5%, C0G/NP0, 0402 | 0402 | GRM1555C1H6R8CA01D | MuRata |
| C11 | 0 | 10pF | CAP, CERM, 10pF, 50V, +/- 5%, C0G/NP0, 0402 | 0402 | GRM1555C1H100JA01D | MuRata |
| FID1, FID2, FID3 | 0 | | Fiducial mark. There is nothing to buy or mount. | N/A | N/A | N/A |
| R4 | 0 | 10.0k | RES, 10.0k, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW040210K0FKED | Vishay-Dale |

# 4 Additional Information

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**CAUTION**

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*NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

**FCC Interference Statement for Class B EVM devices**

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

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3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

**Concerning EVMs Including Radio Transmitters:**

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(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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   8.1 *General Limitations*. IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

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