

# TPMC700

**32/16 Digital Outputs (24 V, 0.5 A)**

Version 2.0

## **User Manual**

Issue 2.0.2

February 2026

**TPMC700-10R**

32 digital outputs front panel I/O

**TPMC700-11R**

16 digital outputs front panel I/O

**TPMC700-20R**

32 digital outputs P14 I/O

**TPMC700-21R**

16 digital outputs P14 I/O

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**Style Conventions**

Hexadecimal characters are specified with prefix 0x, i.e. 0x029E (that means hexadecimal value 029E).

For signals on hardware products, an ‚Active Low‘ is represented by the signal name with # following, i.e. IP\_RESET#.

Access terms are described as:

|     |            |
|-----|------------|
| W   | Write Only |
| R   | Read Only  |
| R/W | Read/Write |
| R/C | Read/Clear |
| R/S | Read/Set   |

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| 1.1.0        | New notation of HW Engineering Documentation Releases   | November 2011  |
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# 1 Product Description

The TPMC700 is a PMC compatible module which provide 32 (16) digital outputs with galvanic isolation via optocouplers. All outputs resist short-circuits and are protected against thermal overload. The output drivers are capable of driving 0.5 A continuous per channel as a high side switch. A hardware watchdog forces all outputs into safe state (disabled) in case of a trigger failure.

The TPMC700-1xR provides front panel I/O with a HD50 SCSI-2 type connector, the TPMC700-2xR provides P14 I/O.

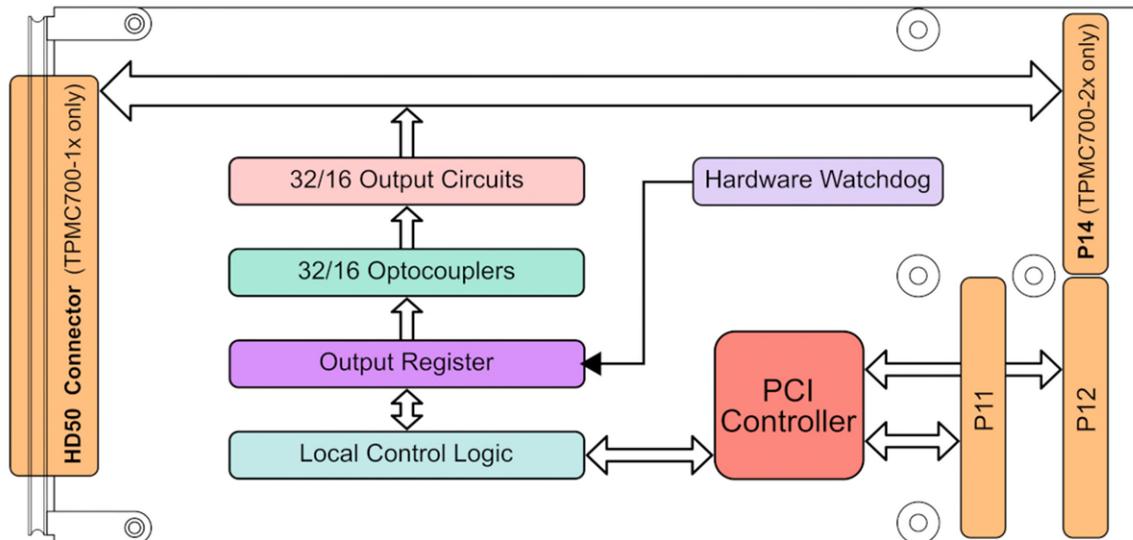


Figure 1-1 : Block Diagram

## 2 Technical Specification

| PMC Interface               |   |
|-----------------------------|---|
| <b>Mechanical Interface</b> | PCI Mezzanine Card (PMC) Interface<br>Single Size                                     |
| <b>Electrical Interface</b> | PCI Rev. 3.0 compatible<br>33 MHz / 32 bit PCI<br>3.3 V and 5 V PCI Signaling Voltage |

| I/O Interface                  |   |
|--------------------------------|---|
| <b>Number of Outputs</b>       | TPMC700-10R/-20R: 32 digital outputs<br>TPMC700-11R/-21R: 16 digital outputs  |
| <b>Output Isolation</b>        | Optocouplers for galvanic isolation between system and output lines   |
| <b>External Output Voltage</b> | 24 VDC typical, 6 VDC minimum, 48 VDC maximum   |
| <b>Output Current</b>          | 0.5 A typical (0.3 A for voltages over 32 V)  |
| <b>Short Circuit Current</b>   | 0.8 A typical   |
| <b>Output Voltage Drop</b>     | 1.1 V typical @ 0.5 A   |
| <b>Output Protection</b>       | Overload, short circuit, GND and Vs open wire protection, thermal shutdown  |
| <b>Watchdog</b>                | Maximum trigger distance = 120 ms   |
| <b>I/O Connector</b>           | TPMC700-10R/-11R: HD50 SCSI-2 type connector (AMP 787395-5) or compatible<br>TPMC700-20R/-21R: PMC P14 I/O (64 pin Mezzanine Connector) |

| Physical Data             |   |
|---------------------------|---|
| <b>Power Requirements</b> | 75 mA typical @ +5 VDC  |
| <b>Temperature Range</b>  | Operating    -25 °C to +85 °C<br>Storage       -40 °C to +125 °C  |
| <b>MTBF</b>               | TPMC700-10R: 711 000 h<br>TPMC700-11R: 858 000 h<br>TPMC700-20R: 711 000 h<br>TPMC700-21R: 858 000 h<br>MTBF values shown are based on calculation according to MIL-HDBK-217F and MIL-HDBK-217F Notice 2; Environment: G <sub>B</sub> 20°C.<br>The MTBF calculation is based on component FIT rates provided by the component suppliers. If FIT rates are not available, MIL-HDBK-217F and MIL-HDBK-217F Notice 2 formulas are used for FIT rate calculation. |
| <b>Humidity</b>           | 5 – 95 % non-condensing   |
| <b>Weight</b>             | 72 g  |

Table 2-1 : Technical Specification

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## 3 Handling and Operation Instructions

### 3.1 ESD Protection



This PMC module is sensitive to static electricity. Packing, unpacking and all other module handling has to be done with appropriate care.

### 3.2 Ground for Isolated I/O



I/O Connector's isolated ground signals must be connected to external ground.

## 4 Addressing

### 4.1 PCI Device Identification

The offset values relate to the PCI Header.

|                     | Offset |  |
|---------------------|--------|--|
| Vendor ID           | 0x00   | 0x1498 (TEWS Technologies)   |
| Device ID           | 0x02   | 0x02BC (TPMC700)   |
| Revision ID         | 0x08   | 0x00   |
| Class Code          | 0x09   | 0x118000 (Other Data Acquisition/Signal Processing Controllers)                              |
| Subsystem Vendor ID | 0x2C   | 0x1498 (TEWS Technologies)   |
| Subsystem ID        | 0x2E   | 0x000A (TPMC700-10R)<br>0x000B (TPMC700-11R)<br>0x0014 (TPMC700-20R)<br>0x0015 (TPMC700-21R) |

Table 4-1 : PCI Device Identification

### 4.2 PCI Address Space Overview

The local on board addressable regions are accessed from the PCI side by using the BAR2 Base Address.

| PCI BAR | PCI Base Address (Offset in PCI Configuration Space) | PCI Space Mapping | Size (Byte) | Port Width (Bit) | Endian Mode | Description                   |
|---------|--|-------------------|-------------|------------------|-------------|-------------------------------|
| 0       | 0x10   | MEM               | 128         | 32               | Little      | PCI Controller Register Space |
| 1       | 0x14   | I/O               | 128         | 32               | Little      |                               |
| 2       | 0x18   | MEM               | 16          | 32               | Big         | Local Register Space          |

Table 4-2 : PCI Address Space Overview

### 4.3 PCI Controller Register Space

The PCI Controller Register Spaces are factory reserved.

## 4.4 Local Register Space

The PCI base address for the Local Registers is PCI Base Address 2 (PCI Memory Space, Offset 0x18 in the PCI Configuration Space).

| Offset to BAR2 | Register Name        | Size (Bit) |
|----------------|----------------------|------------|
| 0x0000         | Data Output Register | 32         |
| 0x0004         | Control Register     | 32         |

Table 4-3 : Local Register Space

### 4.4.1 Data Output Register

The Data Output Register is a long word wide read/write register used to set or clear the outputs lines.

| Bit  | Symbol                       | Description   | Access | Reset Value |
|------|------------------------------|---|--------|-------------|
| 31:0 | OUTPUT 32<br>...<br>OUTPUT 1 | Set or clear the corresponding output line<br>1 = active<br>0 = inactive<br>Bit 0 represents OUT 1,<br>Bit 31 represents OUT 32 accordingly | R/W    | 0           |

Table 4-4 : Data Output Register

After power-on or reset the Data Output Register is cleared to '0', all outputs are inactive.

## 4.4.2 Control Register

The Control Register is a 32 bit read/write register.

| Bit  | Symbol    | Description  | Access | Reset Value |
|------|-----------|--|--------|-------------|
| 31:4 | -         | Reserved (0 for reads)   | -      | 0           |
| 3    | WDOG_STAT | Watchdog Status bit<br>1 = indicate that the watchdog has recognized a failure and has disabled all output channels. The Data Output Register is locked. Writing '1' to this bit unlocks the Data Output Register.<br>0 = signals normal operation | R/W    | 0           |
| 2    | -         | Reserved (0 for reads)   | -      | 0           |
| 1    | WDOG_EN   | Watchdog Enable bit for all 32 outputs<br>1 = enable watchdog function<br>0 = disable  | R/W    | 0           |
| 0    | -         | Reserved (0 for reads)   | -      | 0           |

Table 4-5 : Control Register

**The watchdog status is only active if the watchdog is enabled.**

## 5 Functional Description of Digital Outputs

### 5.1 Optical Isolation

The TPMC700 has 32 (TPMC700-10R/-20R) or 16 (TPMC700-11R/-21R) digital outputs. The standard signal level for these outputs is 24 VDC. All outputs are isolated by optocouplers from the system and in two ground groups (output OUT 1-16 and output OUT 17-32) against each other.

Within these two groups there are four subgroups for the VS power supply which allow different supply voltages in groups of four, but referenced to the same GND.

| Group | Supply | Ground | Output                               |
|-------|--------|--------|--------------------------------------|
| O1    | VS_O1  | GND_OA | OUT 1<br>OUT 2<br>OUT 3<br>OUT 4     |
| O2    | VS_O2  |        | OUT 5<br>OUT 6<br>OUT 7<br>OUT 8     |
| O3    | VS_O3  |        | OUT 9<br>OUT 10<br>OUT 11<br>OUT 12  |
| O4    | VS_O4  |        | OUT 13<br>OUT 14<br>OUT 15<br>OUT 16 |
| O5    | VS_O5  | GND_OB | OUT 17<br>OUT 18<br>OUT 19<br>OUT 20 |
| O6    | VS_O6  |        | OUT 21<br>OUT 22<br>OUT 23<br>OUT 24 |
| O7    | VS_O7  |        | OUT 25<br>OUT 26<br>OUT 27<br>OUT 28 |
| O8    | VS_O8  |        | OUT 29<br>OUT 30<br>OUT 31<br>OUT 32 |

Table 5-1 : Isolated Digital Outputs summary

### 5.2 Output Polarity

Each output can be individually switched to the according power supply VS\_Ox (high side switch).

---

## 5.3 Overload Protection

The output drivers used on the TPMC700 are 'smart drivers' TDE1707. The maximum continuous output current is 0.5 A. The output circuits are protected against overload, short circuit and over temperature. In case of such failure the corresponding output is switched off until the error condition is removed. The output returns automatically to normal operation, i.e. the state programmed in the Data Output Register.

## 5.4 Output Watchdog

Writing '1' into bit 1 of the Control Register the hardware watchdog function is enabled. The status of the watchdog is indicated at bit 3 of the Control Register.

Any software accesses (read or write) to the Data Output Register will retrigger the watchdog. The maximum time between two accesses is set to 120ms. If the time expires without a software access all outputs go into "OFF" state. At the same time the watchdog status will change from '0' to '1' and locks the Data Output Register. This prevents a write access to the Data Output Register. The output register content is not affected by that.

Writing '1' to the watchdog status (bit 3 Control Register) clears this bit and also unlocks the Data Output Register. After unlocking the Data Output Register the output stays in the "OFF" state till the next write access to this register.

**The watchdog is disabled after power-on or reset.**

---

## 6 Programming Hints

### 6.1 Local Read/Write

The local register set supports long word (32 bit) read/write access only. A byte or word access has undefined result.

**Use only 32 bit read/write accesses to the TPMC700.**

## 7 Installation

### 7.1 Output Wiring

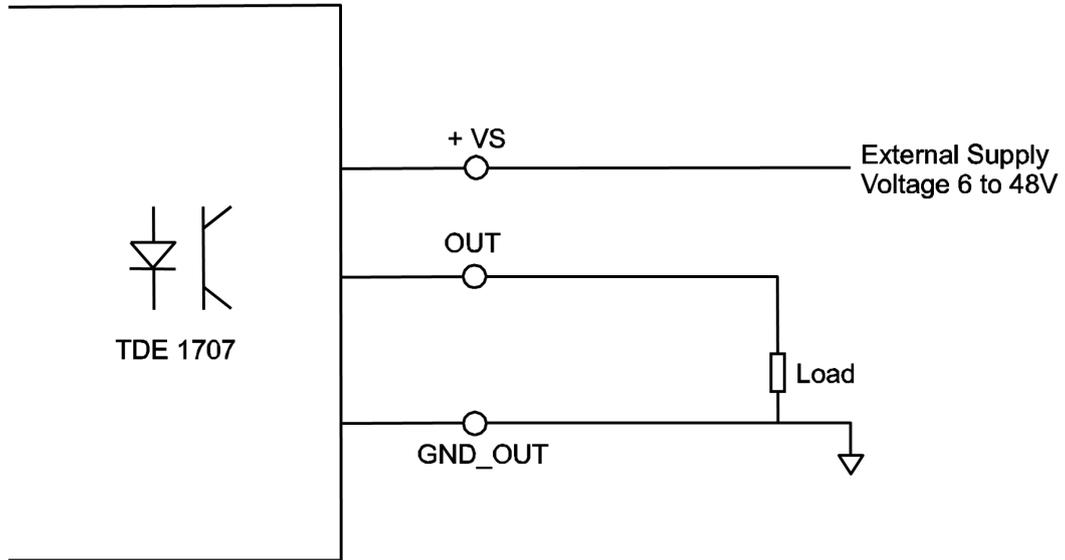


Figure 7-1 : Output Wiring

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## 8 Pin Assignment – I/O Connector

### 8.1 Front Panel I/O

#### 8.1.1 HD50 Connector

AMP 787395-5 or compatible.

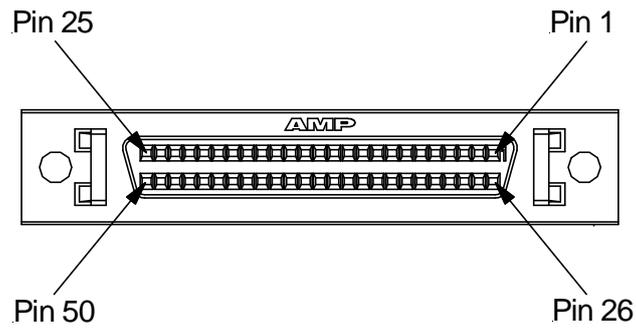


Figure 8-1 : Front Panel I/O Connector Numbering

## 8.1.2 Front Panel I/O Assignment TPMC700-1xR

The subsequent table shows the complete assembled pin front panel I/O connector. Bear in mind that variant -11R does not provide the channels 16 up to 32. Consequently, these are unconnected.

| Pin | Signal | Description                           | Pin | Signal | Description                  |
|-----|--------|---------------------------------------|-----|--------|------------------------------|
| 1   | VS_O1  | Power Supply for<br>OUT 1 ... OUT 4   | 26  | OUT 10 | Output 10                    |
| 2   |        |                                       | 27  | OUT 11 | Output 11                    |
| 3   | VS_O2  | Power Supply for<br>OUT 5 ... OUT 8   | 28  | OUT 12 | Output 12                    |
| 4   |        |                                       | 29  | OUT 13 | Output 13                    |
| 5   | VS_O3  | Power Supply for<br>OUT 9 ... OUT 12  | 30  | OUT 14 | Output 14                    |
| 6   |        |                                       | 31  | OUT 15 | Output 15                    |
| 7   | VS_O4  | Power Supply for<br>OUT 13 ... OUT 16 | 32  | OUT 16 | Output 16                    |
| 8   |        |                                       | 33  | OUT 17 | Output 17                    |
| 9   | VS_O5  | Power Supply for<br>OUT 17 ... OUT 20 | 34  | OUT 18 | Output 18                    |
| 10  |        |                                       | 35  | OUT 19 | Output 19                    |
| 11  | VS_O6  | Power Supply for<br>OUT 21 ... OUT 24 | 36  | OUT 20 | Output 20                    |
| 12  |        |                                       | 37  | OUT 21 | Output 21                    |
| 13  | VS_O7  | Power Supply for<br>OUT 25 ... OUT 28 | 38  | OUT 22 | Output 22                    |
| 14  |        |                                       | 39  | OUT 23 | Output 23                    |
| 15  | VS_O8  | Power Supply for<br>OUT 29 ... OUT 32 | 40  | OUT 24 | Output 24                    |
| 16  |        |                                       | 41  | OUT 25 | Output 25                    |
| 17  | OUT 1  | Output 1                              | 42  | OUT 26 | Output 26                    |
| 18  | OUT 2  | Output 2                              | 43  | OUT 27 | Output 27                    |
| 19  | OUT 3  | Output 3                              | 44  | OUT 28 | Output 28                    |
| 20  | OUT 4  | Output 4                              | 45  | OUT 29 | Output 29                    |
| 21  | OUT 5  | Output 5                              | 46  | OUT 30 | Output 30                    |
| 22  | OUT 6  | Output 6                              | 47  | OUT 31 | Output 31                    |
| 23  | OUT 7  | Output 7                              | 48  | OUT 32 | Output 32                    |
| 24  | OUT 8  | Output 8                              | 49  | GND_OA | Ground for OUT 1 ... OUT 16  |
| 25  | OUT 9  | Output 9                              | 50  | GND_OB | Ground for OUT 17 ... OUT 32 |

Table 8-1 : Pin Assignment Front I/O Connector TPMC700-1xR

**Please check the maximum current of the used connection cable. Some standard cables (AWG28 50 pol.) are limited to 0.75 A per lead.**

---

## **8.2 Back panel I/O**

### **8.2.1 Mezzanine Card Connector P14**

MOLEX 71436-216 or compatible.

## 8.2.2 Rear I/O Assignment TPMC700-2xR

The subsequent table shows the complete Rear I/O connector. Bear in mind that variant -21R does not provide the channels 16 up to 32. Consequently, these are unconnected.

| Pin | Signal | Description                           | Pin | Signal        | Description                  |
|-----|--------|---------------------------------------|-----|---------------|------------------------------|
| 1   | VS_O1  | Power Supply for<br>OUT 1 ... OUT 4   | 33  | OUT 17        | Output 17                    |
| 2   |        |                                       | 34  | OUT 18        | Output 18                    |
| 3   | VS_O2  | Power Supply for<br>OUT 5 ... OUT 8   | 35  | OUT 19        | Output 19                    |
| 4   |        |                                       | 36  | OUT 20        | Output 20                    |
| 5   | VS_O3  | Power Supply for<br>OUT 9 ... OUT 12  | 37  | OUT 21        | Output 21                    |
| 6   |        |                                       | 38  | OUT 22        | Output 22                    |
| 7   | VS_O4  | Power Supply for<br>OUT 13 ... OUT 16 | 39  | OUT 23        | Output 23                    |
| 8   |        |                                       | 40  | OUT 24        | Output 24                    |
| 9   | VS_O5  | Power Supply for<br>OUT 17 ... OUT 20 | 41  | OUT 25        | Output 25                    |
| 10  |        |                                       | 42  | OUT 26        | Output 26                    |
| 11  | VS_O6  | Power Supply for<br>OUT 21 ... OUT 24 | 43  | OUT 27        | Output 27                    |
| 12  |        |                                       | 44  | OUT 28        | Output 28                    |
| 13  | VS_O7  | Power Supply for<br>OUT 25 ... OUT 28 | 45  | OUT 29        | Output 29                    |
| 14  |        |                                       | 46  | OUT 30        | Output 30                    |
| 15  | VS_O8  | Power Supply for<br>OUT 29 ... OUT 32 | 47  | OUT 31        | Output 31                    |
| 16  |        |                                       | 48  | OUT 32        | Output 32                    |
| 17  | OUT 1  | Output 1                              | 49  | GND_OA        | Ground for OUT 1 ... OUT 16  |
| 18  | OUT 2  | Output 2                              | 50  | GND_OB        | Ground for OUT 17 ... OUT 32 |
| 19  | OUT 3  | Output 3                              | 51  | Not connected |                              |
| 20  | OUT 4  | Output 4                              | 52  |               |                              |
| 21  | OUT 5  | Output 5                              | 53  |               |                              |
| 22  | OUT 6  | Output 6                              | 54  |               |                              |
| 23  | OUT 7  | Output 7                              | 55  |               |                              |
| 24  | OUT 8  | Output 8                              | 56  |               |                              |
| 25  | OUT 9  | Output 9                              | 57  |               |                              |
| 26  | OUT 10 | Output 10                             | 58  |               |                              |
| 27  | OUT 11 | Output 11                             | 59  |               |                              |
| 28  | OUT 12 | Output 12                             | 60  |               |                              |
| 29  | OUT 13 | Output 13                             | 61  |               |                              |
| 30  | OUT 14 | Output 14                             | 62  |               |                              |
| 31  | OUT 15 | Output 15                             | 63  |               |                              |
| 32  | OUT 16 | Output 16                             | 64  |               |                              |

Table 8-2 : Pin Assignment Rear I/O Connector TPMC700-2xR