

TEG2000 TRM

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Overview

1 Overview

The Trenez Electronic TEG 2000 is a FPGA module integrating a CologneChip GateMate FPGA, a QSPI Flash, level shifter, LEDs and several clocking and power components necessary for all on-board voltages. Numerous configurable I/Os are provided via rugged high-speed strips. All this on a tiny footprint, smaller than a credit card size at a very competitive price. All Trenez Electronic SoMs in 4 x 5 cm form factor are mechanically compatible.

Refer to <http://trenz-ord.ted2000-info> for the current online version of this manual and other available documentation.

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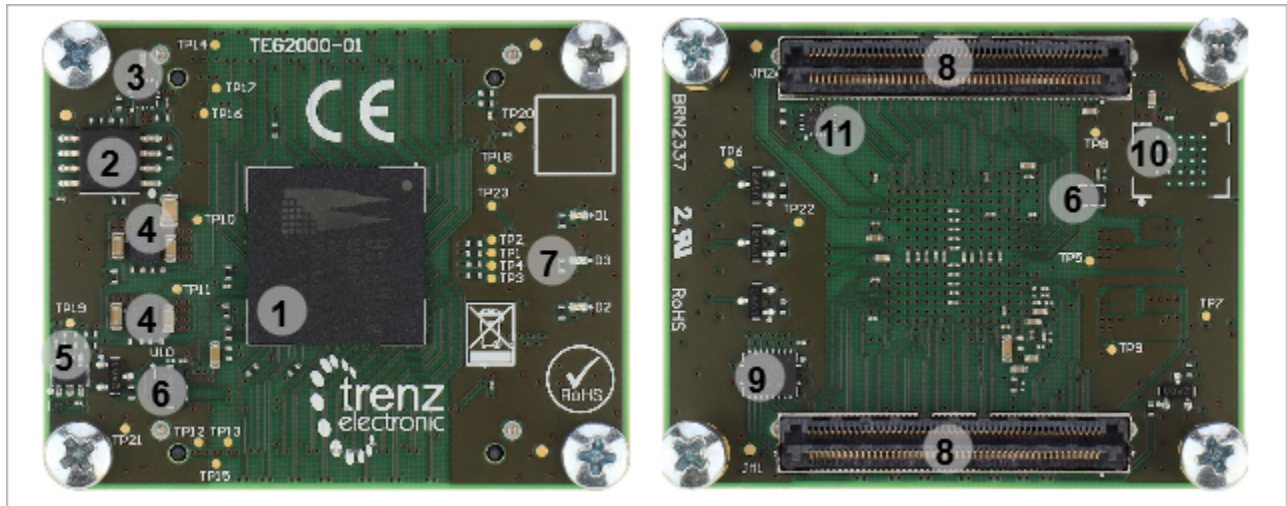
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 - 2) Up to 16 MByte are possible.

Block Diagram



TEG2000 main components

1. CologneChip GateMate FPGA, U1
2. QSPI Flash, U5
3. Power Switch, Q1
4. DCDC, U7, U8
5. Power Monitor, U9
6. Oscillator, U10, U3
7. LEDs, D1, D2, D3
8. B2B connector, JM2, JM1
9. Level shifter, U2
10. Optional additional Flash, U4
11. BUS-Transceiver, U6

Initial Delivery State

Storage device name	Content	Notes
Quad SPI Flash	Blinky Demo Design	U5

Initial delivery state of programmable devices on the module

Signals, Interfaces and Pins

Connectors

Connector Type	Designator	Interface	IO CNT	Notes
B2B	JM1	SerDes	8	
B2B	JM1	GPIO	48	Bank NB/EB/EA, powered by VCCIOA
B2B	JM1	GPIO	6	up to 3.3V due to level shifter, connected to Bank SB

B2B	JM1	GPIO	6	up to 1.8V, also connected to Bank SB
B2B	JM1	configuration Signals	3	EN1, PGOOD , MODE
B2B	JM2	GPIO	50	Bank NA/WB /WC, powered by VCCIOD
B2B	JM2	GPIO	18	Bank SA, powered by VCCIOC
B2B	JM2	JTAG	4	0..3.3VIN
B2B	JM2	MR	1	low active Reset
B2B	JM1	CLK	DIFF CLK	

Board Connectors

Test Points

Test Point	Signal	Side	Notes ¹⁾
TP1	NA_6_N TP1	top	FPGA IO
TP2	NA_6_P	top	FPGA IO
TP3	NB_B3	top	FPGA IO
TP4	NB_A3	top	FPGA IO
TP5	1V	bottom	1V power rail
TP6	DONE	bottom	FPGA CFG_DONE pin
TP7	PROG_B	bottom	FPGA RST_N pin
TP8	GND	bottom	
TP9	GND	bottom	
TP10	1V	top	1V power rail
TP11	1.8V	top	OUT, 1.8V power rail
TP12	VIN	top	VIN (3.3 - 5.0V)
TP13	3.3VIN	top	
TP14	3.3V	top	OUT, 3.3V power rail
TP15	VCCIOA	top	IN 1.1V ... 2.7V, powers IO Banks NB/EB/EA
TP16	VCCIOC	top	IN 1.1V ... 2.7V, powers IO Bank SA
TP17	VCCIOD	top	IN 1.1V ... 2.7V, powers IO Banks NA/WB/WC
TP18	DONE	top	FPGA CFG_DONE pin
TP19	PROG_B	top	FPGA RST_N pin
TP20	GND	top	
TP21	GND	top	
TP22	FAILED_n	bottom	FPGA CFG_FAILED pin

TP23	FAILED_n	top	FPGA CFG_FAILED pin
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1) Direction:

- IN: Input from the point of view of this board.
- OUT: Output from the point of view of this board.

Test Points Information

On-board Peripherals

Chip/Interface	Designator	Connected To	Notes
QSPI Flash	U5	FPGA Bank CFG WA	SP1x4 Interface for FPGA configuration
Oscillator	U3	FPGA Bank SB, Pin IO_SB_A8	25 MHz
Oscillator	U10	JM1.16, JM1.18	differential 100 MHz Clock for Gigabit-Transceiver

On board peripherals

Configuration and System Control Signals

Connector+Pin	Signal Name	Direction ¹⁾	Description
JM1.28	EN1	IN	activates DC-DCs
JM1.30	PGOOD	OUT	Output from power monitor
JM1.32	MODE	IN	configuration mode - 0 JTAG or 1 SPI active Mode
JM2.18	MR	IN	low active Reset connected to the Power Monitor that triggers PROG_B (FPGA RST_N)
JM2.93 / JM2.95 / JM2.97 / JM2.99	TMS / TDI / TDO / TCK	Signal-dependent	JTAG configuration and debugging interface. JTAG reference voltage: 3.3V

1) Direction:

- IN: Input from the point of view of this board.
- OUT: Output from the point of view of this board.

Power and Power-On Sequence

Power Rails

Power Rail Name/ Schematic Name	Connector + Pin	Direction ¹⁾	Notes
VIN	JM1.1 / JM1.3 / JM1.5 / JM2.2 / JM2.4 / JM2.6 / JM1.8	IN	3.3 V - 5.0V, Micromodule Power
3.3VIN	JM1.13 / JM1.15	IN	Micromodule Power
VCCIOA	JM1.9 / JM1.11	IN	
VCCIOC	JM2.5	IN	
VCCIOD	JM2.7 / JM2.9	IN	
3.3V	JM2.10 / JM2.12 / JM2.91	OUT	Power for Carrier, powers on module the level shifter, LEDs and control Pins
1.8V	JM1.39	OUT	Power for Carrier, On module it powers the Flash, FPGA VDD and Banks SB,WA
1V	--	--	Powers the FPGA core, PLLs and SerDes interface

¹⁾ Direction:

- IN: Input from the point of view of this board.
- OUT: Output from the point of view of this board.

Module power rails.

Recommended Power up Sequencing

Sequence	Net name	Recommended Voltage Range	Power-up/down	Description	Notes
0	-	-	-	Configuration signal setup.	See Configuration and System Control Signals .
1	VIN	3.3 V - 5.0 V (\pm 5 %)	-	Main power supply	
1	EN1	-	PU ¹⁾ , 3.3VIN	power enable	
1	PGOOD	-	PU ¹⁾ , 3.3V	power good status.	
2	3.3VIN	3.3 V (\pm 5 %)	-	Main power supply	Main module power supply. 0.5 A minimum. Power consumption depends mainly on design and cooling solution.
3	VCCIOA, VCCIOC, VCCIOD	1.1 V - 2.7 V	-	Bank Voltages	1.8 V on TE0703 Carrier

¹⁾ (on module)

Baseboard Design Hints

Board to Board Connectors



These connectors are hermaphroditic. Odd pin numbers on the module are connected to even pin numbers on the baseboard and vice versa.

4 x 5 modules use two or three [Samtec Razor Beam LSHM connectors](#) on the bottom side.

- 2 x REF-189016-02 (compatible to LSHM-150-04.0-L-DV-A-S-K-TR), (100 pins, "50" per row)
- 1 x REF-189017-02 (compatible to LSHM-130-04.0-L-DV-A-S-K-TR), (60 pins, "30" per row) (depending on module)

Connector Mating height

When using the same type on baseboard, the mating height is 8mm. Other mating heights are possible by using connectors with a different height

Order number	Connector on baseboard	compatible to	Mating height
23836	REF-189016-01	LSHM-150-02.5-L-DV-A-S-K-TR	6.5 mm
	LSHM-150-03.0-L-DV-A-S-K-TR	LSHM-150-03.0-L-DV-A-S-K-TR	7.0 mm
23838	REF-189016-02	LSHM-150-04.0-L-DV-A-S-K-TR	8.0 mm
	LSHM-150-06.0-L-DV-A-S-K-TR	LSHM-150-06.0-L-DV-A-S-K-TR	10.0mm
26125	REF-189017-01	LSHM-130-02.5-L-DV-A-S-K-TR	6.5 mm
	LSHM-130-03.0-L-DV-A-S-K-TR	LSHM-130-03.0-L-DV-A-S-K-TR	7.0 mm
24903	REF-189017-02	LSHM-130-04.0-L-DV-A-S-K-TR	8.0 mm
	LSHM-130-06.0-L-DV-A-S-K-TR	LSHM-130-06.0-L-DV-A-S-K-TR	10.0mm

Connectors.

The module can be manufactured using other connectors upon request.

Connector Speed Ratings

The LSHM connector speed rating depends on the stacking height; please see the following table:

Stacking height	Speed rating
12 mm, Single-Ended	7.5 GHz / 15 Gbps
12 mm, Differential	6.5 GHz / 13 Gbps
5 mm, Single-Ended	11.5 GHz / 23 Gbps
5 mm, Differential	7.0 GHz / 14 Gbps

Speed rating.

Current Rating

Current rating of Samtec Razor Beam™ LSHM B2B connectors is 2.0A per pin (2 adjacent pins powered).

Connector Mechanical Ratings

- Shock: 100G, 6 ms Sine
- Vibration: 7.5G random, 2 hours per axis, 3 axes total

Manufacturer Documentation

File	Modified
PDF File hsc-report_lshm-lshm-05mm_web.pdf High speed test report	07 04, 2016 by Thorsten Trenz
PDF File lshm_dv.pdf LSHM catalog page	07 04, 2016 by Thorsten Trenz
PDF File LSHM-1XX-XX.X-X-DV-A-X-X-TR-FOOTPRINT(1).pdf Recommended layout and stencil drawing	07 04, 2016 by Thorsten Trenz
PDF File LSHM-1XX-XX.X-XX-DV-A-X-X-TR-MKT.pdf Technical drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189016-01.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189016-02.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189017-01.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189017-02.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File TC0923--2523_report_Rev_2_qua.pdf Design qualification test report	07 04, 2016 by Thorsten Trenz
PDF File tc0929--2611_qua(1).pdf Shock and vibration report	07 04, 2016 by Thorsten Trenz

[Download All](#)

Technical Specifications

Absolute Maximum Ratings ^{*)}

Power Rail Name/ Schematic Name	Description	Min	Max	Unit
VIN	Micromodule Power	-0.3	6.5	V
3.3VIN	Micromodule Power	-0.3	6.5	V
VCCIOA	Bank NB/EB/EA voltage	-	2.75	V
VCCIOC	Bank SA voltage	-	2.75	V
VCCIOD	Bank NA/WB/WC voltage	-	2.75	V

Absolute maximum ratings

*) Stresses beyond those listed under [Absolute Maximum Ratings](#) may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under [Recommended Operating Condition](#). Exposure to absolute-maximum rated conditions for extended periods may affect device reliability.

Recommended Operating Conditions

This TRM is generic for all variants. Temperature range can be differ depending on the assembly version. Voltage range is mostly the same during variants (exceptions are possible, depending on custom request)

Operating temperature range depends also on customer design and cooling solution. Please contact us for options.

- Variants of modules are described here: [Article Number Information](#)
- Modules with commercial temperature grade are equipped with components that cover at least the range of 0°C to 75°C
- Modules with extended temperature grade are equipped with components that cover at least the range of 0°C to 85°C
- Modules with industrial temperature grade are equipped with components that cover at least the range of -40°C to 85°C
- The actual operating temperature range will depend on the FPGA / SoC design / usage and cooling and other variables.

Parameter	Min	Max	Units	Reference Document
VIN	3,135	5,25	V	
3.3VIN	3,135	3,465	V	
VCCIOA	1.1	2.75	V	
VCCIOC	1.1	2.75	V	
VCCIOD	1.1	2.75	V	

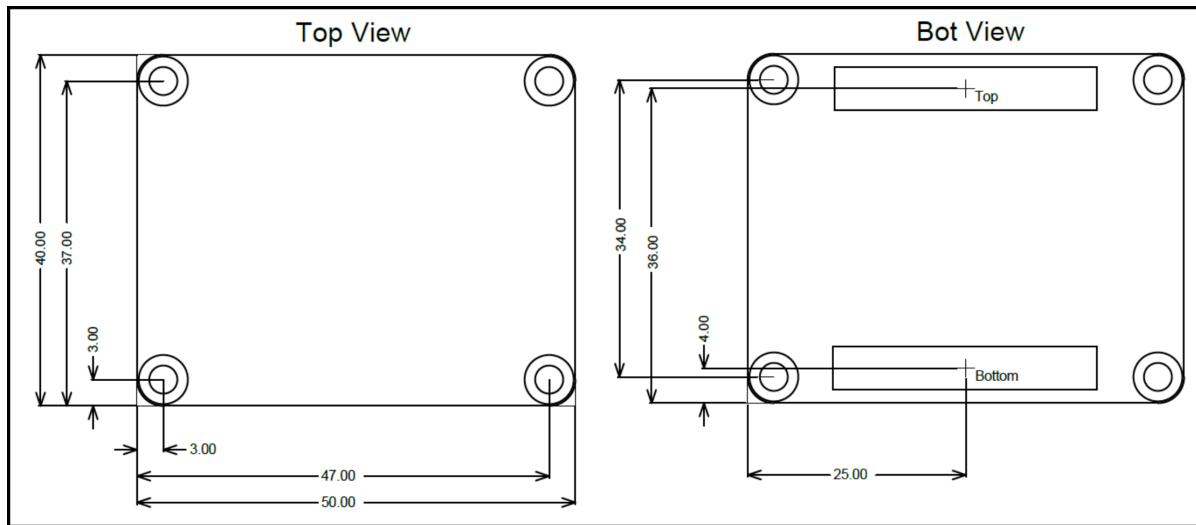
Recommended operating conditions.

Physical Dimensions

- Module size: 40 mm x 50 mm. Please download the assembly diagram for exact numbers.
- Mating height with standard connectors: 8 mm.

PCB thickness: 1.4 mm.

All dimensions are shown in millimeters.



Physical Dimension

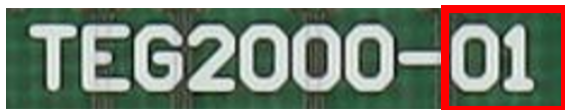
Currently Offered Variants

Trenz shop TEG2000 overview page	
English page	German page

Trenz Electronic Shop Overview

Revision History

Hardware Revision History



Board hardware revision number.

Date	Revision	Changes	Documentation Link
-	REV01	First Production Release	REV01

Hardware Revision History

Hardware revision number can be found on the PCB board together with the module model number separated by the dash.

Document Change History

Date	Revision	Contributor	Description
<div>Error rendering macro 'page-info'</div> <div>Ambiguous method overloading for method jdk. proxy27 9.\$Proxy 4022#hasContentLevelPermission . Cannot resolve which method to invoke for [null, class java. lang. String, class com. atlassian .</div>	<div>Error rendering macro 'page-info'</div> <div>Ambiguous method overloading for method jdk. proxy27 9.\$Proxy 4022#hasContentLevelPermission . Cannot resolve which method to invoke for [null, class java. lang. String, class com. atlassian .</div>	<div>Error rendering macro 'page-info'</div> <div>Ambiguous method overloading for method jdk. proxy27 9.\$Proxy 4022#hasContentLevelPermission . Cannot resolve which method to invoke for [null, class java. lang. String, class com. atlassian .</div>	<div><ul style="list-style-type: none">initial revision</div>

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Document change history.

Disclaimer

Data Privacy

Please also note our data protection declaration at <https://www.trenz-electronic.de/en/Data-protection-Privacy>

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To confront directly with the responsibility toward the environment, the global community and eventually also oneself. Such a resolution should be integral part not only of everybody's life. Also enterprises shall be conscious of their social responsibility and contribute to the preservation of our common living space. That is why Trenz Electronic invests in the protection of our Environment.

REACH, RoHS and WEEE

REACH

Trenz Electronic is a manufacturer and a distributor of electronic products. It is therefore a so called downstream user in the sense of [REACH](#). The products we supply to you are solely non-chemical products (goods). Moreover and under normal and reasonably foreseeable circumstances of application, the goods supplied to you shall not release any substance. For that, Trenz Electronic is obliged to neither register nor to provide safety data sheet. According to present knowledge and to best of our knowledge, no [SVHC \(Substances of Very High Concern\) on the Candidate List](#) are contained in our products. Furthermore, we will immediately and unsolicited inform our customers in compliance with REACH - Article 33 if any substance present in our goods (above a concentration of 0,1 % weight by weight) will be classified as SVHC by the [European Chemicals Agency \(ECHA\)](#).

RoHS

Trenz Electronic GmbH herewith declares that all its products are developed, manufactured and distributed RoHS compliant.

WEEE

Information for users within the European Union in accordance with Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

Users of electrical and electronic equipment in private households are required not to dispose of waste electrical and electronic equipment as unsorted municipal waste and to collect such waste electrical and electronic equipment separately. By the 13 August 2005, Member States shall have ensured that systems are set up allowing final holders and distributors to return waste electrical and electronic equipment at least free of charge. Member States shall ensure the availability and accessibility of the necessary collection facilities. Separate collection is the precondition to ensure specific treatment and recycling of waste electrical and electronic equipment and is necessary to achieve the chosen level of protection of human health and the environment in the European Union. Consumers have to actively contribute to the success of such collection and the return of waste electrical and electronic equipment. Presence of hazardous substances in electrical and electronic equipment results in potential effects on the environment and human health. The symbol consisting of the crossed-out wheeled bin indicates separate collection for waste electrical and electronic equipment.

Trenz Electronic is registered under WEEE-Reg.-Nr. DE97922676.

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