

Infineon TC397XE Emulation Adapter Hardware User Manual

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isystem.com/start

General safety instructions

Please read the following safety precautions carefully before putting this device to use to avoid any personal injuries, damage to the instrument, or to the target system. Use this instrument only for its intended purpose as specified by this manual to prevent potential hazards.

Use included power cord and power supply

The enclosed power supply has been approved for use by iSYSTEM. Please contact iSYSTEM if you need to consider an alternative power.

Use grounding wire

Prior to applying power to either the BlueBox or the target, connect the device and the target system together with the included grounding wire. This is to avoid potential damage caused by any voltage difference between the device and the target system.

Use proper overvoltage protection

Ensure proper protection to avoid exposing the BlueBox device or the operator to overvoltage surges (e.g. caused by thunderstorm, mains power).

Do not operate without cover

Do not operate the device with cover removed.

Avoid circuit and wire exposure

Do not touch exposed components or wires when the device is powered.

Do not operate with suspected damage

If you suspect damage may have occurred, the BlueBox device must be inspected by qualified service personnel before further operation.

Do not operate the device outside its rated supply voltage or environmental range

Consult with iSYSTEM before using equipment outside of the parameters provided in this manual.



This symbol is used within the manual to highlight further safety notices.

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Introduction

Infineon TC397XE Emulation Adapter is based on the 292-pin TC397XE superset device and provides full trace capabilities for the:

- TC397Xx
- TC387QP
- TC3E7Qx

devices, where the trace port is not available or lacks the full trace capability.



The Emulation Adapter might differ in some peripherals from the target device; therefore, the device datasheet should be checked.

Infineon TC397XE Emulation Adapter supports the following debug and trace interfaces:

- DAP
- DAPE
- AGBT (Aurora Gigabit Trace)

The Emulation Adapter can also be used as a <u>standalone device</u> for microcontroller evaluation purposes or for development and testing of an embedded application ahead of target board availability.





Package content

Infineon TC397XE Emulation Adapter is delivered with all the components required for a <u>standalone operation</u>. <u>Target adaptation parts</u> for the Target board adaptation must be **ordered separately**.



Options

Target adaptation

The Emulation Adapter adaptation to a specific target microcontroller pincount and package is done via a Conversion board and a Solder part. Sometimes also an optional Extender is available. Conversion boards connect between the Emulation Adapter and the matching Solder part, which is being soldered on the embedded target side. Available Conversion boards, Solder parts and optional Extenders are listed in the table below.

Package (Pitch)	MCU	Conversion board (Ordering code)	Туре	Extender (optional) (Ordering code)	Solder part (Ordering code)
BGA292	TC397Xx TC387QP TC3E7Qx	IEA-TC397XE-TC397	BGA	IA292LFBGA-EXTENDER	IA292LFBGA-SOLDER

BGA Adaptation

Conversion board	Extender (optional)	Solder part

Measurement board (optional)

The Measurement board connects between the Emulation Adapter and the Conversion board. Embedded targets often do not have access to all the MCU pins / connected signals to connect with measurement equipment (oscilloscope, logic analyzer), its use provides easy access to all MCU pins. It is delivered together with an Layout board (chip signals are clearly marked), which is placed over the Measurement board.



 (\mathbf{i})

Not available in every Emulation Adapter or every MCU pin count.

Operation

How to connect?

- How to connect Emulation Adapter (video) short link: isystem.com/ea-intro
- How to connect TASKING Hardware (video) short link: isystem.com/connect-hardware

Configuration J1: Target reset configuration

Jumper J1 connects the Emulation Adapter reset line and the user target board reset line and is populated by default.

Emulation Adapter features a Reset push button (SW1).

If having problems establishing the initial debug session with the Emulation Adapter, remove J1 and try again.

J2 and J3: Clock source configuration



Jumpers J2 and J3 select clock source for the emulation device.

Position 1-2 (default position) selects the crystal circuit oscillator on the target.

Position 2-3 selects an external clock source (Q1 socket on the Emulation Adapter).



The Emulation Adapter may not operate when target board's crystal circuit is used as the clock source. TIP: The crystal should be as close as possible to the microcontroller. The crystal on the target board might not oscillate in conjunction with the Emulation Adapter when the clock lines (TP21_2, TP21_3) between the crystal and the emulation device on the Emulation Adapter become too long, thus affecting the impedance of the crystal circuit.



Separately packed 20 MHz crystal can be used as a 20 MHz external clock (XOSC) source to the emulation device. If a different clock frequency is required, insert appropriate crystal into the Q1 socket and replace C7 (default 10pF populated) and C8 (default 10pF populated) accordingly. Crystal socket Q1 is by default not populated (NP).

Crystal socket Q1 schematics below:



J4 and J5: GND connection points

In case a good ground connection is required, connection points bridge J4 and pin J5 provide easy access to the Emulation Adapter's GND potential.



J6 and J7: VFLEX and VAREF



VFLEX - If the target's VFLEX pin isn't exposed, bridge the jumper J6 to connect VEXT from the target to power VFLEX.

 $\underline{\land}$

Setting the jumper when emulating the BGA device may prevent establishing a debug connection or, in the worst case, can damage the Target board.

VAREF - If the target's VAREF2 pin isn't exposed, bridge the jumper J7 to connect VAREF1 from the target to power VAREF2



Setting the jumper if VAREF2 is present on the device may prevent establishing a debug connection or, in the worst case, can damage the Target board.

P2: Power supply configuration

Power supply of the Emulation Adapter is configured via the unshrouded 26-pin 2.54 mm header (P2).

Signal direction	Signal	Pin	Pin	Signal	Signal direction
Target board	TVEXT	1	2	VEXT	Emulation device
Target board	TVDDM	3	4	VDDM	Emulation device
Target board	TVAREF1	5	6	VAREF1	Emulation device
Target board	TVAREF2	7	8	VAREF2	Emulation device
Target board	TVEVRSB	9	10	VEVRSB	Emulation device
Target board	TVFLEX	11	12	VFLEX	Emulation device
Not connected	NC	13	14	NC	Not connected
Not connected	NC	15	16	NC	Not connected
Not connected	NC	17	18	NC	Not connected
Not connected	NC	19	20	NC	Not connected
Ground	GND	21	22	GND	Ground
Ground	GND	23	24	GND	Ground
Ground	GND	25	26	KEY	

P2 Signal description

By default, all jumpers are set to connect user target power supply to the microcontroller residing on the Emulation Adapter. Only pins 1-2, 3-4, 5-6, 7-8, 9-10 and 11-12 must be bridged, but for the convenience and ease of use, all jumpers are set, except for pins 25-26.

Pin 26 is the polarizer key preventing incorrect connection of the IEA-PS Power converter, when being plugged in.

If a different power source is used (e.g., a Standalone operation), remove all jumpers and apply 3V3 or 5V to:

- VEXT (pin 2),
- VAREF2 (pin 8),
- VDDM (pin 4),VAREF1 (pin 6),
- VEVRSB (pin 10),
 VFLEX (pin 12).
- Enclosed Power supply package (Power converter and Power adapter) simply plugs into the P2 header row, providing the necessary power supply for Emulation Adapter operation. LED1 indicates if power is supplied to the Emulation Adapter.

Refer to the microcontroller documentation for more details about power voltage designations.

Connectors



Be aware that debug and trace signals from the Emulation adapter superset device are not connected to the target board. They are exposed only to the connectors on the Emulation adapter.

P1: DAP

P1 connector exposes DAP debug interface.

Signal Direction	Signal Description	Signal	Pin	Pin	Signal	Signal Description	Signal Direction
I	Reference Voltage	Vref	1	2	DAP1	DAP Data pin	I/O
	Ground	GND	3	4	DAP0	DAP clock	0
	Ground	GND	5	6	DAP2	Optional 2d DAP Data pin	I/O

Signal Direction	Signal Description	Signal	Pin	Pin	Signal	Signal Description	Signal Direction
	Not Connected	NC	7	8	DAPEN	DAP Enable	0
	Ground	GND	9	10	nRESET	Reset	I/O

10-pin Infineon DAP pinout

Signal Direction is described from the BlueBox perspective.

BlueBox supporting Infineon DAP debug and trace interface connects to the P1 connector.

P8: DAPE

P8 connector exposes DAPE debug interface.

I Reference Voltage Vref 1 2 DAPE1 DAP Data I/O Ground GND 3 4 DAPE0 DAP Clock 0 Ground GND 5 6 DAPE2 Optional 2nd Data Pin I/O Not Connected NC 7 8 DAPEN/DAP 3 Optional 3rd Data Pin I/O Ground GND 9 10 NC Not Connected I/O	Signal Direction	Signal Description	Signal	Pin	Pin	Signal	Signal Description	Signal Direction
Ground GND 3 4 DAPE0 DAP Clock 0 Ground GND 5 6 DAPE2 Optional 2nd Data Pin I/O Not Connected NC 7 8 DAPEN/DAP 3 Optional 3rd Data Pin I/O Ground GND 9 10 NC Not Connected I/O	I	Reference Voltage	Vref	1	2	DAPE1	DAP Data	I/0
Ground GND 5 6 DAPE2 Optional 2nd Data Pin I/O Not Connected NC 7 8 DAPEN/DAP 3 Optional 3rd Data Pin I/O Ground GND 9 10 NC Not Connected NC		Ground	GND	3	4	DAPE0	DAP Clock	0
Not Connected NC 7 8 DAPEN/DAP 3 Optional 3rd Data Pin I/O Ground GND 9 10 NC Not Connected I/O		Ground	GND	5	6	DAPE2	Optional 2nd Data Pin	I/O
Ground GND 9 10 NC Not Connected		Not Connected	NC	7	8	DAPEN/DAP 3	Optional 3rd Data Pin	I/O
		Ground	GND	9	10	NC	Not Connected	

10-pin DAPE pinout

Signal Direction is described from the BlueBox perspective.

BlueBox supporting Infineon DAPE debug and trace interface connects to the **P8** connector.

P7: AGBT

P7 connector exposes AGBT interface.

Signal Direction	Signal Description	Signal	Pin	Pin	Signal	Signal Description	Signal Direction
I	AGBT TX0_P	TX0_P	1	2	Vref	Reference Voltage	I
I	AGBT TX0_N	TX0_N	3	4	DAP0	DAP clock	0
	Ground	GND	5	6	DAP1	DAP Data pin	I/O
	Not Connected	NC	7	8	NC	Not Connected	
	Not Connected	NC	9	10	DAP2	Optional 2nd Data pin	I/O
	Ground	GND	11	12	nTRST/DAPEN	JTAG/Output	0
	Not Connected	NC	13	14	CLK+	AGBT Clock	0
	Not Connected	NC	15	16	CLK-	AGBT Clock	0
	Ground	GND	17	18	TGO*	AGBT Trigger out	I
	Not Connected	NC	19	20	AGBT ERR	AGBT Error	
	Not Connected	NC	21	22	RESET	Reset	I/O

22-pin AGBT pinout (Revision C1)

Signal Direction is described from the BlueBox perspective.

Blue color marks the trace signals.

* Pin 18: TGO (AGBT Trigger out) is connected to the pin TP32.6. Before Revision C1 pin 18 was NC (Not Connected).

BlueBox solution supporting AGBT (Aurora GigaBit Trace) interface connects to the **P7** connector.

Standalone operation

Infineon TC397XE Emulation Adapter is delivered with all components required for a Standalone operation.



Power supply

Use the enclosed IEA-PS Emulation Adapter Power converter and adapter.

A Power supply package, which is delivered with the Emulation Adapter, is required when:

- The Emulation Adapter is used as a standalone device .
- The target board doesn't provide an accurate supply voltage.
- The target board doesn't provide sufficient current for the Emulation Adapter operation.

The Power converter can supply either 3.3 V or 5 V. The array of jumpers J0-J9 selects 3.3 V or 5 V voltage on the P3 connector, which connects to the Emulation Adapter.

Signal	Pin	Pin	Signal
NC	1	2	JO
NC	3	4	J1
NC	5	6	J2
NC	7	8	J3
NC	9	10	J4
NC	11	12	J5
NC	13	14	J6
NC	15	16	J7
NC	17	18	8L
NC	19	20	J9
GND	21	22	GND
GND	23	24	GND
GND	25	26	KEY

P3 connector and J0–J9 jumper correlation table

For example, when J2 is in the 3V3 position, it supplies 3.3 V to pin 6 of the P3 connector. When J2 is in the 5V position, it supplies 5 V to pin 6 of the P3 connector pin.



Be careful not to supply 5 V to the microcontroller power supply pin, which has declared a maximum voltage 3.3 V! Refer to the microcontroller documentation for detailed information on power supply.



P3 connector on the Power Supply board

External power supply requirements:

Min Voltage	Max Voltage	Min Power	
8 V	12 V	18 W	

Clock source

If the target's crystal circuit microcontroller oscillator (if available) is not an adequate clock source, insert appropriate crystal into the Q1 socket, replace the default 10pF C7 and C8 capacitors when necessary and place jumpers J2 and J3 in 2-3 position.

Mechanical information

Emulation Adapter



Side view of the Emulation Adapter, one Extender and Solder part (each Extender adds approx. 3,25mm)





Top view of the Conversion board

Top view of the Emulation Adapter

Oudenin a code	Unit (mm)							
Ordening code	Μ	N	Р	R				
IEA-TC397XE	70	70						
IEA-TC397XE-TC397			70	70				

Solder part



Top view of the Solder part

Ordening and	Unit (mm)				
Ordening code	К	L			
IA292LFBGA-SOLDER	17	17			

Extender



Side view of the Extender



Top view of the Extender

Ordering code	Unit (mm)	
	W	Z
IA292LFBGA-EXTENDER	17	3.25



To view Emulation Adapter schematics, visit isystem.com/schematics.

Assembly

- 1. Solder the Solder part **B** on the Target **A**.
- 2. (optional, recommended) Connect Extender C to the Solder part B.

The Extender protects from damaging the Solder part if the Emulation Adapter setup is frequently assembled and disassembled. Be careful and gentle during this procedure because all parts of the setup are extremely sensitive, and pins can easily bend or even break in the worst-case scenario.

More Extenders can be stacked to gain height between the Emulation Adapter and the Target, if surrounding components so high that they prevent connecting the Emulation Adapter. Keep the number of Extenders C at minimum since every Extender degrades the signal integrity of the electrical signals.

- 3. Assemble in order: Emulation Adapter F, optional Measurement board E, Conversion board D.
- 4. Connect Conversion board D to:
 - Solder part or
 - Extender



Accessories

To ease the development process, we recommend using the following iSYSTEM hardware tools.

Ordering Code	Description
IC5700	iC5700 BlueBox On-Chip Analyzer
IC5000	iC5000 BlueBox On-Chip Analyzer
IC57031	IOM6 Hub (3 x FNet & FBridge)
IC57040	IOM6 CAN/LIN
IC57041	IOM6 ADIO

Debug Adapters and Active Probes

Listed Debug Adapters and Active Probes provide tracing functionality.

Ordering Code	Description
IC57163-1	Infineon DAP/DAPE II Active Probe
IC57164	Infineon AGBT Active Probe
IC50163-2	10-pin 1.27 mm Infineon DAP2 Wide Debug Adapter

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More information about our products on <u>www.isystem.com</u> or via <u>sales@isystem.com</u>.

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