IAR Embedded Workbench

# IAR Debug Probes User Guide

## I-jet®

for

**RISC-V**

IARProbesRISCV-2

IAR SYSTEMS

## EDITION NOTICE
Second edition: November 2021

Part number: IARProbesRISCV-2

This guide applies to version 2.10.x of IAR Embedded Workbench® for RISC-V.

Internal reference: Mym8.3, tut2009.1, IJOA.

# Contents

# I-jet



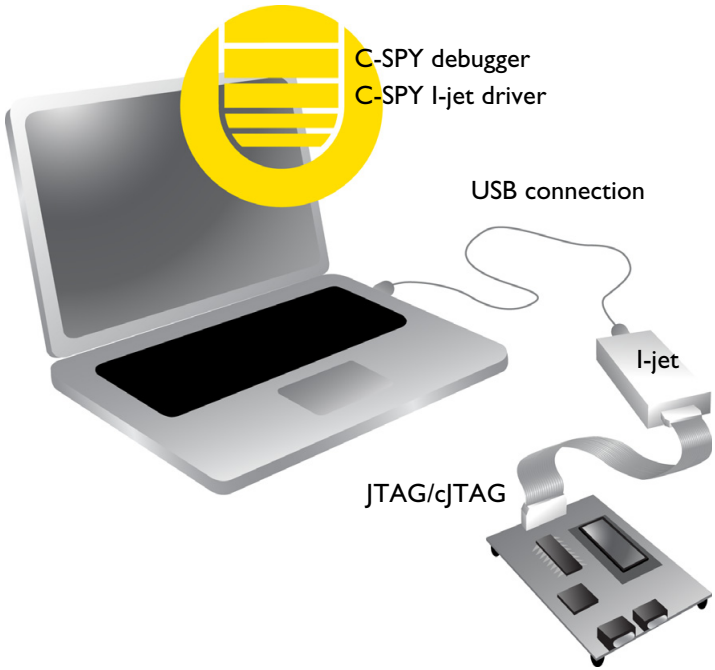
## Introduction

These topics are covered:

- The I-jet in-circuit debugging probe
- Requirements
- Target connections

## THE I-JET IN-CIRCUIT DEBUGGING PROBE

I-jet connects to the target board via a JTAG or cJTAG connection, and to the host computer via the USB port.




I-jet communicates using USB 2.0. (USB 1.0 is also supported but not advised.) The I-jet in-circuit debugging probe is also referred to as a debug probe, debug adapter, or JTAG in-circuit emulator by different tool vendors.

I-jet streams power measurement data to the host computer to provide a view into program execution in real time. Besides the typical JTAG debugging, I-jet is capable of providing power to the target board and measuring it with sufficient accuracy to provide a power profile during program execution in real time. This feature is referred to as *power debugging*.

### REQUIREMENTS

I-jet needs to be controlled by the IAR C-SPY® Debugger which comes with the IAR Embedded Workbench® IDE.

### TARGET CONNECTIONS

These interfaces are supported:

- MIPI-20 (part number SHF-110-01-L-D): JTAG, cJTAG
- MIPI-10 (part number SHF-105-01-L-D): JTAG, cJTAG
- ARM-20 (part number HTST-110-01-L-DV): JTAG, cJTAG

I-jet comes with a MIPI-20 connector on the front panel, with MIPI-20 and MIPI-10 cables, and a legacy ARM-20 adapter.

All other available I-jet adapters are also compatible with I-jet Trace.

## Working with I-jet

These tasks are covered:

- Setup and installation
- Connecting the target system
- Updating the probe firmware

For information about debugging using I-jet, see the *C-SPY® Debugging Guide for RISC-V*.

### SETUP AND INSTALLATION

#### Software

Before you can use I-jet, you need to install IAR Embedded Workbench for RISC-V. For information, see the *Installation and Licensing Quick Reference* booklet—available in the product box—and the *Licensing Guide*.

### Probe setup

I-jet does not require any special driver software installation. Normally, all drivers for I-jet are automatically installed as part of the IAR Embedded Workbench installation.

If you need to install the USB driver manually, navigate to `\Program Files\IAR Systems\Embedded Workbench x.x\riscv\drivers\jet\USB\32-bit` or `64-bit` (depending on your system). Start the `dpinst.exe` application. This will install the USB driver.

For information about using multiple I-jet probes on the same host computer, see the *C-SPY® Debugging Guide for RISC-V*.

## CONNECTING THE TARGET SYSTEM

### Power-up your I-jet probe

1. Connect I-jet to the target board using the cable that matches the target board connector (MIPI-20 or MIPI-10). If an ARM-20 JTAG connector is used, you must first plug the ADA-MIPI20-ARM20 adapter into the JTAG connector.
2. Connect I-jet to the host computer using the USB micro cable.

**Note:** No harm is done if the above order is reversed.

To prevent damage, the target GND and the USB host GND must be at the same level. When *hot-plugging*, make sure that the PC and the target board power supply are connected to the same grounded wall outlet or a common grounded desktop power strip.

### Power up your evaluation board

If you have an evaluation board that is prepared for it, you can power the board via I-jet through pin 19 on the ARM-20 connector, or pin 11/13 on the small MIPI-20 connector. Target power of up to 420 mA can be supplied from I-jet with overload protection. Most of the IAR Systems KickStart Kits contain an evaluation board that can be powered this way. Make sure that the power jumper found on most of these boards matches your setup.

**Note:** The target board will get power via I-jet once you choose the **Download and Debug** or **Debug without Downloading** command, but not before.

**Note:** The only way to use the power debugging feature is to power up your evaluation board via I-jet.

## UPDATING THE PROBE FIRMWARE

I-jet and I-jet Trace are designed so that firmware updates are not necessary unless new features added to IAR Embedded Workbench for RISC-V require extra hardware

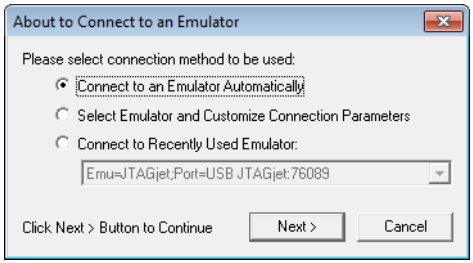
support. When a new version of IAR Embedded Workbench for RISC-V is released and a new feature that requires new firmware is used, C-SPY displays a message in the **Debug Log** window asking you to update the firmware.

**Note:** Support for new MCU devices is managed by software updates in IAR Embedded Workbench for RISC-V, and has nothing to do with I-jet or I-jet Trace firmware.

For more information about firmware versions, see the release notes.

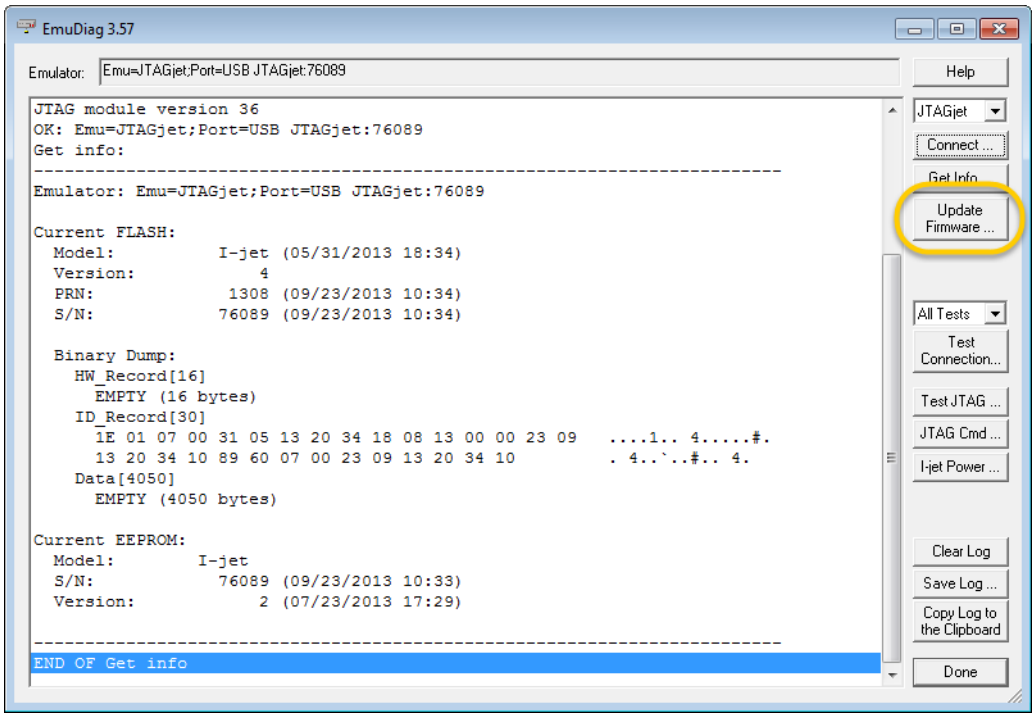
### To update the probe firmware:

1. In IAR Embedded Workbench, choose **I-jet>EmuDiag** to display the **About to Connect to an Emulator** dialog box.

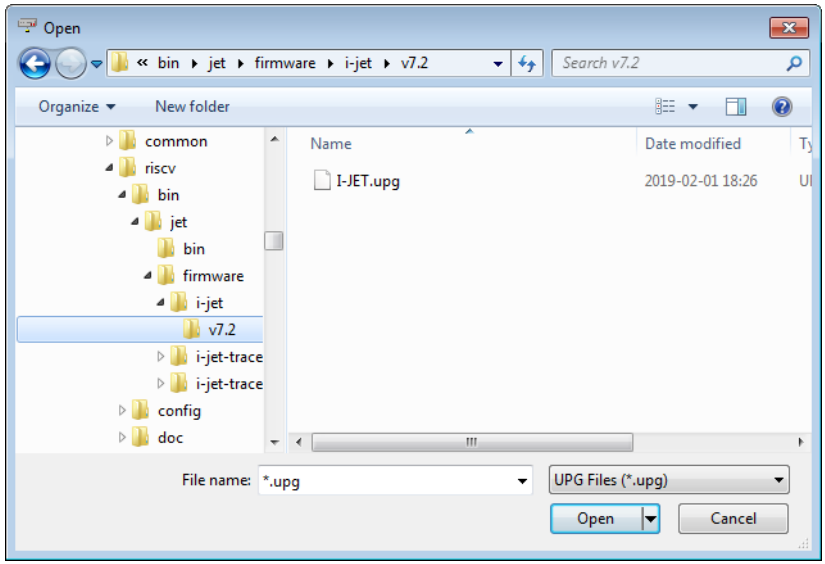



Select **Connect to an Emulator Automatically** and click **Next**.

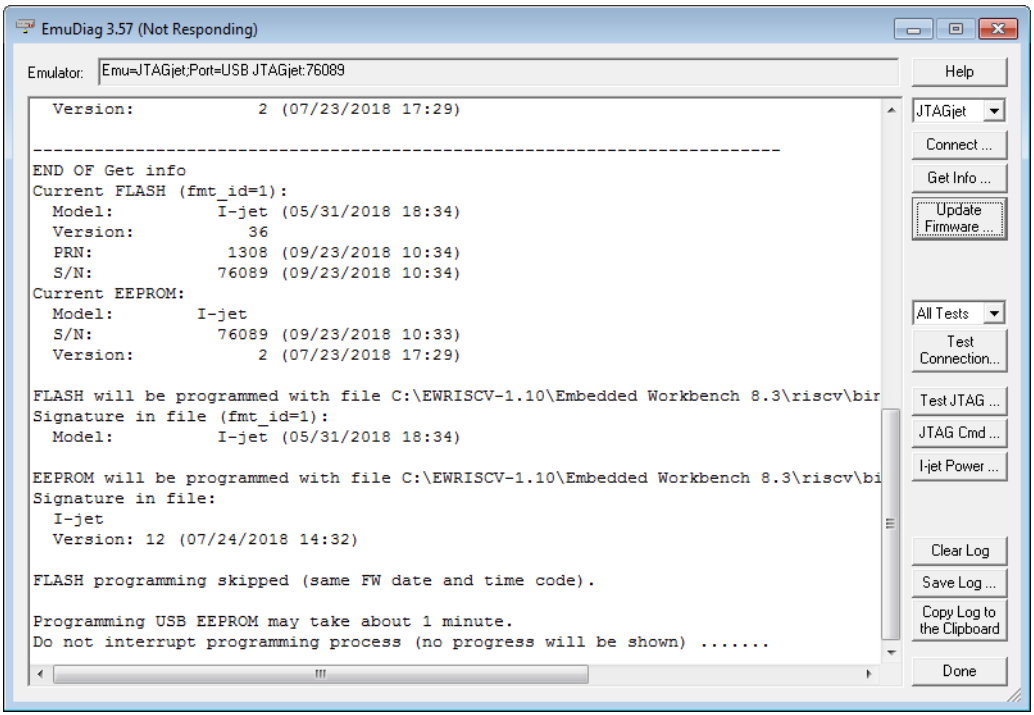
2 In the **EmuDiag** dialog box that is displayed, click the **Update Firmware** button.



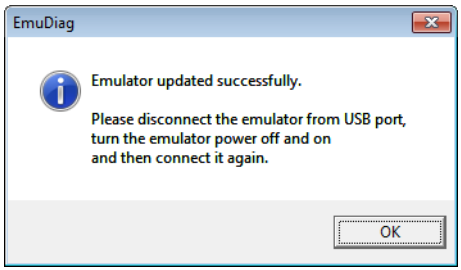
3 In the dialog box that is displayed, browse to the `riscv\bin\jet\firmware\i-jet` folder of your IAR Embedded Workbench installation. In one of the subfolders, select the firmware file that you want to use and click **Open**.



**4** The update log information is displayed in the **EmuDiag** dialog box.




**5** When the firmware update is complete, a message is displayed.



# Technical specifications

Reference information about:



## THE I-JET PACKAGE

The I-jet package contains:

- The I-jet in-circuit debugging probe
- MIPI-20 JTAG cable
- MIPI-10 JTAG cable
- USB 2.0 Micro B cable
- ADA-MIPI20-ARM20 adapter
- Welcome letter.

## MODEL SPECIFICATIONS

These are the specifications of I-jet:

| | |
|---|---|
| **USB speed** | 480 Mbps (USB 2.0) |
| **USB connection** | Micro-B |
| **Target connection** | MIPI-20, MIPI-10 |
| **Adapters included** | ADA-MIPI20-ARM20 |
| **I-jet debug interface** | JTAG and SWD |
| **JTAG/SWD maximum clock** | 32 MHz |
| **SWO protocols supported** | Manchester and UART |
| **SWO maximum speed** | 60 Mbps |
| **Power supplied to target** | 420 mA max at 4.4 V-5 V |
| **Over-current protection** | ~520 mA |

| | |
|---|---|
| **Target power measurement resolution** | ~160 uA |
| **Target power measurement speed** | up to 200 ksps (kilo samples per second) |
| **JTAG voltage range (auto-sensing)** | 1.65 V to 5.5 V |
| **JTAG VTref measurement resolution** | ~2 mV |
| **Current draw from VTref** | < 50 uA |
| **JTAG clock rise/fall time (TCK)** | <= 2 ns* |
| **Clock fall time** | <= 2 ns* |

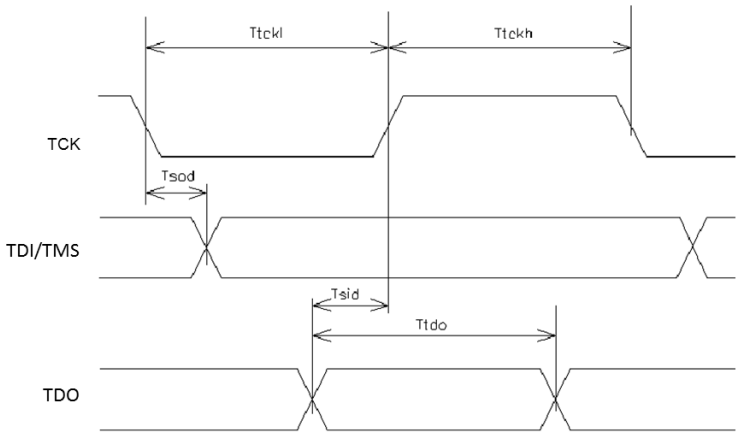
* <= 4 ns when the target board is connected

I-jet comes with a 20-pin MIPI connector—0.05 in × 0.05 (1.27 mm x 1.27 mm) pitch—on the front panel. It includes two cables:

- A 6-inch cable with 20-pin MIPI connectors on both ends for targets with 20-pin MIPI headers. Pin 7 on each end is keyed with a white plug.
- A 6-inch cable with a 20-pin MIPI connector on one side (to connect to I-jet), and a 10-pin MIPI connector on the other side for connection to targets with 10-pin headers. Pin 7 on the 20-pin end is keyed with a white plug. A red stripe on the cable indicates pin 1 (VTref).

## JTAG TIMING SPECIFICATION

This figure shows the JTAG timing and parameters:



In a JTAG device that fully complies to IEEE1149.1 standard, the TDI/TMS signals should be sampled on the rising edge of TCK, and TDO should be sent on the falling edge of TCK. I-jet takes advantage of these requirements and changes its TDI and TMS signals on the falling edge of TCK and samples the TDO on the rising edge of TCK. However, to accommodate target boards with long JTAG chains and fast JTAG clocks, I-jet allows TDO to be as late as 50 ns after the rising edge of TCK.

This table shows the timing specifications of the JTAG port measured at the end of its MIPI-20 cable without connection to target (VTref set to 3.3 V). The only load on the measured signals is the oscilloscope 3.9 pF probe.

| Parameter | Min | Max | Description |
|---|---|---|---|
| $T_{tckl}$ | 15.6 ns | 250 us | TCK LOW period |
| $T_{tckh}$ | 15.6 ns | 250 us | TCK HIGH period |
| $T_{sod}$ [1] | -- | 2.0 ns | TDI and TMS outputs valid from TCK falling |
| $T_{sid}$ [2] | 3 ns before TCK to 50 ns after TCK | -- | TDO setup to TCK rising |
| $T_{tdo}$ | $T_{tckl}$ | -- | TDO valid length |

*Table 1: I-jet JTAG port timing specifications*

1 $T_{sod}$ is the maximum delay from the falling edge of TCK and a valid level on the I-jet output signals, TDI and TMS. The target MCU will sample these signals on the following rising edge of TCK and so the minimum setup time for the target, relative to the rising edge of TCK, is $T_{bscl}$-$T_{bsod}$.

2 $T_{sid}$ is the minimum setup time for the TDO input signal, relative to the rising edge of TCK when I-jet samples this signal. Because the target MCU changes its TDO value on the previous falling edge of TCK, there might not be enough time at very-high JTAG speeds for the TDO to arrive before the positive edge of TCK. To compensate for any TDO delays, I-jet configures itself automatically to delays introduced to the TDO by the target board and will tolerate TDO delays of up to 50 ns after the positive edge of the TCK.

## HARDWARE REVISION HISTORY

These are the versions of I-jet:

| Version | Change specification | Date |
|---|---|---|
| Version A | The first version | April 2012 |

*Table 2: I-jet versions*

| Version | Change specification | Date |
|---|---|---|
| Version B | Added extra RAM to the SWO FIFO buffer to improve SWO performance on older, slower PCs.<br>Optional board current measurement resolution at 16.3 uA instead of 163 uA on I-jet Version A. | June 2017 |

*Table 2: I-jet versions (Continued)*

Version, production date, and serial number can be found on the backside of the probe.

**Note:** In IAR Embedded Workbench, choose **I-jet>EmuDiag** to open the **EmuDiag** dialog box where you can find both hardware and firmware versions of the plugged-in I-jet.

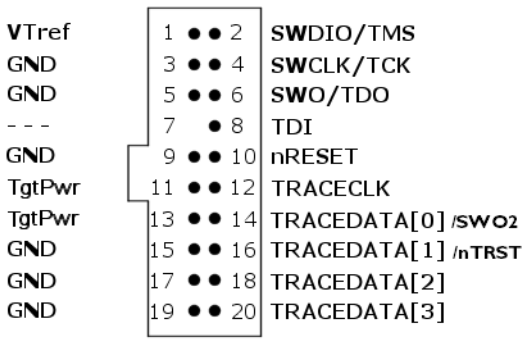
## TARGET INTERFACE

This section contains descriptions of pinout, signals, and connectors. The following cables are described in detail:

- The JTAG/SWD - MIPI-20 cable
- The JTAG/SWD - MIPI-10 cable

### The JTAG/SWD - MIPI-20 cable

I-jet comes with a 6-inch cable with 20-pin MIPI connectors on both ends for devices with 20-pin MIPI headers. Pin 7 on each end is keyed with a white plug:




The mating connector for a target board has the pitch size 0.05 in (1.27 mm). You can, for example, use part number SHF-110-01-L-D.

These are the MIPI-20 pin definitions:

| Pin | Signal | Type | Description |
|---|---|---|---|
| 1 | VTref | Input | The target reference voltage. Used by I-jet to check whether the target has power, to create the logic-level reference for the input comparators, and to control the output logic levels to the target. It is normally fed from JTAG I/O voltage. |
| 2 | SWDIO/TMS | I/O, output | JTAG mode set input of target CPU. This pin should be pulled up on the target. Typically connected to TMS of the target CPU. |
| 3 | | | This pin is a GND pin connected to GND in I-jet. It should also be connected to GND in the target system. |
| 4 | SWCLK/TCK | Output | JTAG clock signal to target CPU. It is recommended that this pin is pulled to a defined state of the target board. Typically connected to TCK of the target CPU. |
| 5 | | | This pin is a GND pin connected to GND in I-jet. It should also be connected to GND in the target system. |
| 6 | SWO/TDO | Input | JTAG data output from target CPU. Typically connected to TDO of the target CPU. When using SWD, this pin is used as Serial Wire Output (SWO) trace port. (Optional, but not required for SWD communication.) |
| -- | -- | -- | This pin (normally pin 7) does not exist. |
| 8 | TDI | Output | JTAG data input of target CPU. It is recommended that this pin is pulled to a defined state on the target board. Typically connected to TDI of the target CPU. For CPUs which do not provide TDI (SWD-only devices), this pin is not used (tri-stated). |
| 9 | | | This pin is a GND pin connected to GND in I-jet. It should also be connected to GND in the target system. |
| 10 | nRESET | I/O | Target CPU reset signal. Typically connected to the RESET pin of the target CPU, which is typically called nRST, nRESET, or RESET. |

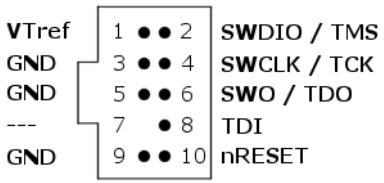
*Table 3: MIPI-20 pin definitions*

| Pin | Signal | Type | Description |
|---|---|---|---|
| 11 | TgtPwr | Output | This pin can be used for supplying 5 V power to the target hardware from I-jet. |
| 12 Not used | TRACECLK | Input | Input trace clock. |
| 13 | TgtPwr | Output | This pin can be used for supplying 5 V power to the target hardware from I-jet. |
| 14 Not used | TRACEDATA[0] / SWO2 | Input | Input Trace data pin 0. This pin can be used as secondary SWO. |
| 15 | | | This pin is a GND pin connected to GND in I-jet. It should also be connected to GND in the target system. |
| 16 Not used | TRACEDATA[1] / nTRST | Input | Input Trace data pin 1. This pin can be used as nTRST. |
| 17 | | | This pin is a GND pin connected to GND in I-jet. It should also be connected to GND in the target system. |
| 18 Not used | TRACEDATA[2] | Input | Input Trace data pin 2. |
| 19 | | | This pin is a GND pin connected to GND in I-jet. It should also be connected to GND in the target system. |
| 20 Not used | TRACEDATA[3] | Input | Input Trace data pin 3. |

*Table 3: MIPI-20 pin definitions (Continued)*

## The JTAG/SWD - MIPI-10 cable

I-jet also comes with a 6-inch cable with a 20-pin MIPI connector on one side (to connect to I-jet) and a 10-pin MIPI connector on the other side for connection to devices with 10-pin headers. Pin 7 on each end is keyed with a white plug:




The mating connector for a target board has the pitch size 0.05 in (1.27 mm). You can, for example, use part number SHF-105-01-L-D.

These are the MIPI-10 pin definitions:

| Pin | Signal | Type | Description |
|---|---|---|---|
| 1 | VTref | Input | The target reference voltage. Used by I-jet to check whether the target has power, to create the logic-level reference for the input comparators, and to control the output logic levels to the target. It is normally fed from JTAG I/O voltage. |
| 2 | SWDIO/TMS | I/O, output | JTAG mode set input of target CPU. This pin should be pulled up on the target. Typically connected to TMS of the target CPU. |
| 3 | GND | GND | Connected to logic GND on I-jet. |
| 4 | SWCLK/TCK | Output | JTAG clock signal to target CPU. It is recommended that this pin is pulled to a defined state of the target board. Typically connected to TCK of the target CPU. |
| 5 | GND | GND | Connected to logic GND on I-jet. |
| 6 | SWO/TDO | Input | JTAG data output from target CPU. Typically connected to TDO of the target CPU. When using SWD, this pin is used as Serial Wire Output (SWO) trace port. (Optional, not required for SWD communication.) |
| 7 | -- | KEY | KEY or GND. |
| 8 | TDI/NC | Output | JTAG data input of target CPU. It is recommended that this pin is pulled to a defined state on the target board. Typically connected to TDI of the target CPU. For CPUs that do not provide TDI (SWD-only devices), this pin is not used (tri-stated). |
| 9 | GND | GND | GND and target detect presence. |
| 10 | nRESET | Output | nRESET or TRST. |

*Table 4: MIPI-10 pin definitions*

## INDICATORS

I-jet has three LED indicators on the top, marked **TPWR**, **DBG**, and **USB**. The following indicators and their statuses are described in detail:

- The TPWR indicator (Target power)
- The DBG indicator (JTAG/SWD)
- The USB indicator

### The TPWR indicator (Target power)

| Indicator status | Description |
|---|---|
| Off | Power to target is not provided by I-jet. |
| Green | Power to target is provided by I-jet. |
| Yellow | Warning. Power to target is above 420 mA. |
| Red | Error. Overcurrent limit (520 mA) detected and power to target was switched off for protection. |

*Table 5: TPWR indicator statuses*

### The DBG indicator (JTAG/SWD)

| Indicator status | Description |
|---|---|
| Off | vTRef on JTAG header is too low. |
| Green | vTRef is at or above 1.8 V. |
| Green blinking | Indicates JTAG/SWD communication activity. |

*Table 6: DBG indicator statuses*

### The USB indicator

| Indicator status | Description |
|---|---|
| Off | No USB power. |
| Green steady | Initial state or no transfer. |
| Green blinking | USB transfers to or from I-jet. |
| Red blinking | USB enumeration. |
| Red steady | USB did not enumerate or broken hardware. |

*Table 7: USB indicator statuses*

## ADAPTERS

There are a number of useful adapters available. All of them are automatically recognized by I-jet. The following adapters are described in detail:

- The ADA-MIPI20-ISO isolation adapter
- The ADA-MIPI20-ARM20 adapter
- The ADA-MIPI20-TI14 adapter
- The ADA-MIPI20-cTI20 adapter.
- The ADA-MIPI20-RISCV12 adapter

- The ADA-MIPI20-RISCV24 adapter

Adapters not included in the I-jet package can be purchased from IAR Systems.

These are the mating target headers for the adapters

| TI-14 | cTI-20 |
|---|---|
| HTST-107-01-L-DV | TML-110-02-GD-SM-006 (shrouded)<br>FTR-110-51-S-D-06 (unshrouded) |

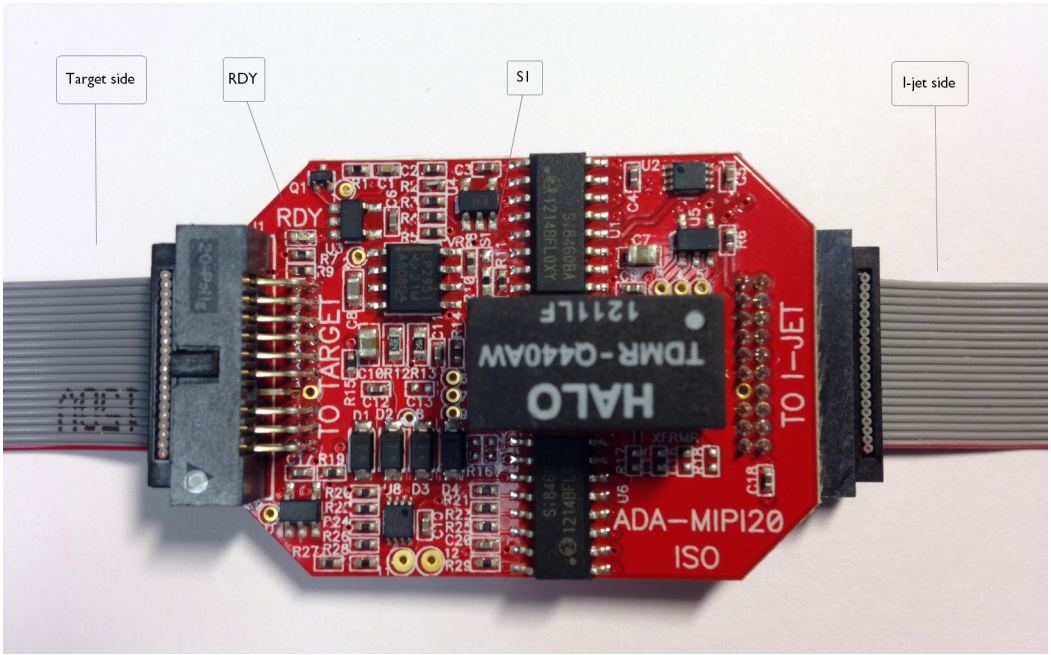
*Table 8: Mating target headers, part numbers*

## The ADA-MIPI20-ISO isolation adapter

The ADA-MIPI20-ISO isolation adapter galvanically isolates signals between the I-jet MIPI-20 connector and the target MIPI-20 connector. You can use it to reduce the risk of damage to the I-jet debug probe associated with power ground loops, voltage spikes, electrostatic discharge (ESD), and noisy power and ground lines generated by targets which drive high-current motors and other machinery.

The adapter has two MIPI-20 headers marked **TO I-JET** and **TO TARGET**. Make sure to connect the headers correctly because switching the sides will not work and might damage the adapter. The target side of the isolation adapter can be used with any passive IAR I-jet adapters, for example, the ADA-MIPI20-ARM20, ADA-MIPI20-TI14, and ADA-MIPI20-CTI20 adapters, and the MIPI20-MIPI10 cable.

The adapter is automatically recognized by the IAR C-SPY® Debugger, and the adapter powers up and the green **RDY** LED is turned on.



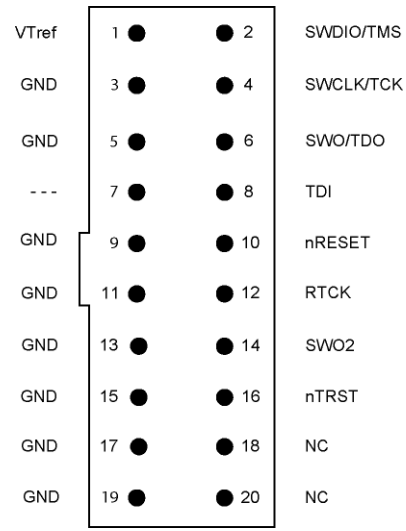

### *Specifications*

- Galvanic isolation up to 3000 V peak* (< 1 sec transients. See *Important safety and disclaimer note*, page 24) with continuous working voltage operation of up to 300 V.
- Compatible with I-jet
- Supports JTAG, SWD, and SWO debug modes
- Compatible with I-jet Trace in JTAG, SWD, and SWO modes only (ETM trace is not supported)
- Powered entirely by I-jet via pins 11 and 13 on the MIPI-20 header
- The **RDY** LED indicates that the unit is powered and ready to use
- Supports target voltages from 2.5 to 5 V
- JTAG clock speed up to 32 MHz

### *Compatibility notes*

- The adapter does not supply power to target and therefore does not resume the target power consumption.
- When used with the ADA-MIPI20-TI14 and ADA-MIPI20-CTI20 adapters, the EMU0 and EMU1 signals are not connected.
- Due to added JTAG signals propagation delays, some target boards might not work at the full 32 MHz JTAG clock speed, so reducing the JTAG speed in C-SPY might be needed.
- The adapter does not support 1.8 V JTAG signals from target. The target JTAG voltage range is limited to 2.5-5 V.
- The JTAG interface on the target side automatically adapts to the voltage given on the target VTREF pin (2.5 V-5 V). Because of the isolation barrier, the I-jet side uses its own voltage, independent of the target voltage. This is for information only and has no effect on the target JTAG operation.

### *MIPI20 connector pinout on target side*




For more information about the signal descriptions, see *The JTAG/SWD - MIPI-20 cable*, page 16.

### *Important safety and disclaimer note*

The continuous normal operation voltage across the isolation barrier should not exceed 300 V DC.

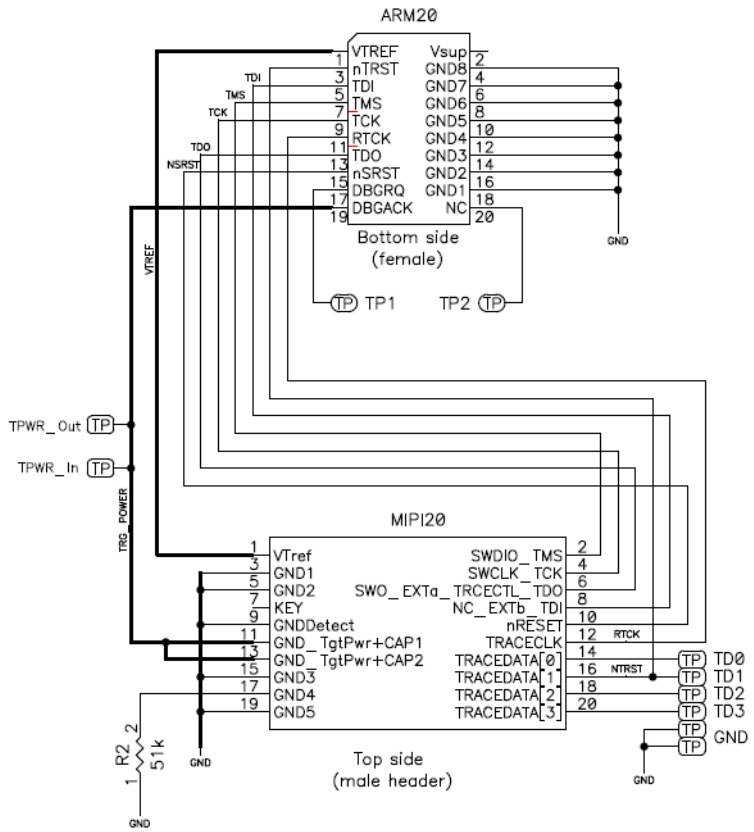
The isolation voltage only represents a measure of immunity to transient voltages—the probe should never be used as an element of a safety isolation system. For use with higher continuous voltages, additional isolation/insulation systems must be used in accordance with the safety standard requirements.

When handling equipment subjected to high voltages, use caution and follow all safety regulations. Touching any exposed circuitry on the target, the adapter, cables, or the I-jet probe can cause injury or death.

IAR Systems or the manufacturer shall not be liable for any damages related to the use of this probe.

## The ADA-MIPI20-ARM20 adapter

The ADA-MIPI20-ARM20 adapter is included with I-jet. It converts the MIPI-20 I-jet cable to the legacy ARM-20—0.1 in × 0.1 in (2.56 mm x 2.56 mm) pitch—JTAG headers. This is a diagram of the adapter:




These are the pin definitions of the ADA-MIPI20-ARM20 adapter:

| Pin | I-jet direction | Name | Description |
|---|---|---|---|
| nTRST | Output | Test Logic Reset | Test reset. Active LOW signal that resets the TAP controller's state machine. |

*Table 9: ADA-MIPI20-ARM20 adapter pin definitions*

| Pin | I-jet direction | Name | Description |
|---|---|---|---|
| TCK | Output | Test Clock | TCK synchronizes all JTAG transactions. TCK connects to all JTAG devices in the scan chain. TCK flows down the stack of modules and connects to each JTAG device. |
| TMS | Output | Test Mode Select | TMS controls transitions in the tap controller state machine. TMS connects to all JTAG devices in the scan chain as the signal flows down the module stack. |
| TDI | Output | Test Data Input | TDI is the test data input signal that is routed to the TDI input of the first device in the scan chain. |
| TDO | Input | Test Data Output | TDO is the return path of the test data input signal TDI. In a multi-device JTAG chain, the TDO of the first device connects to the TDI of the next device, etc. The last device's TDO is connected to the TDO on the JTAG header. |
| RTCK | Input | TCK Return | This pin is not used and is connected to ground on the target board. |
| VTref | Input | Voltage Target Reference | This is the target reference voltage. It indicates that the target has power. VTref is normally fed from Vdd on the target hardware and might have a series resistor (though this is not recommended). VTref is used by I-jet to detect if target power is active and to set JTAG signal voltage reference for level translators. |
| nSRST | I/O | System Reset | Active LOW open-collector signal that is driven by I-jet to reset the device and/or the target board. I-jet senses this line to determine when you have reset the device. |
| Vsupply | Output | -- | This pin is not connected to I-jet. |
| DBGRQ | Output | -- | This pin is not connected on I-jet. |
| DBGACK/TRGPWR | Output | Target Power | This pin is used under SW control to supply 5 V power to the target board. It should be routed through a jumper shunt to the 5 V DC board input to eliminate the power adapter during debugging. The maximum current supplied by I-jet on this pin is about 420 mA. When the current supplied reaches ~500 mA, the power will be shut down for protection. |

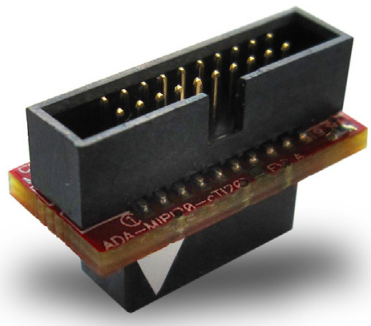
*Table 9: ADA-MIPI20-ARM20 adapter pin definitions (Continued)*

The R2 pull-down on pin 17 of the I-jet MIPI20 connector is a signal to I-jet that a legacy ADA-MIPI20-ARM20 adapter is being used. Other adapters will have different resistors so that I-jet can identify them if needed. A solid GND on this pin means that no adapter is being used, and that the MIPI cable is connected directly between the I-jet and the target board.

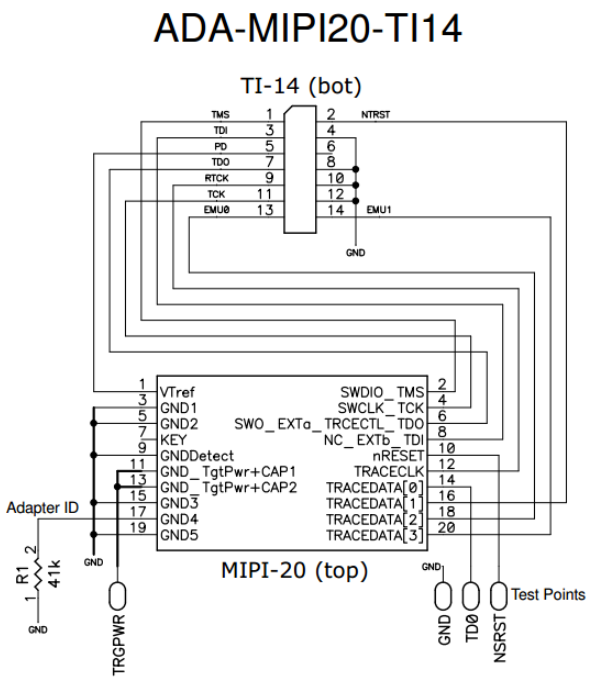
## The ADA-MIPI20-TI14 adapter

The ADA-MIPI20-TI14 adapter converts the I-jet standard MIPI-20 cable pinout to the Texas Instruments legacy 14-pin JTAG interface used on older OMAP and other TMS320, TMS470, and TMS570 target boards.

The adapter has the MIPI-20 male header on top for connecting the I-jet MIPI-20 cable and a TI-14-style female header (socket) on the bottom. The TI-14 JTAG header is a 14-pin, double-row, 0.1 in × 0.1 in (2.56 mm × 2.56 mm) pitch connector with a key (plug) in position 6 to prevent misconnections. In case the plug is missing, a white arrow on pin 1 of the TI-14 connector helps you ensure proper orientation.



This is a diagram of the ADA-MIPI20-TI14 adapter:




These are the pin definitions for the ADA-MIPI20-TI14 adapter:

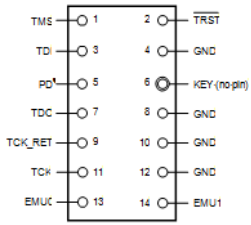
| Pin | I-jet direction | Name | Description |
|---|---|---|---|
| nTRST | Output | Test Logic Reset | Active LOW signal that causes all test and debug logic in the device to be reset along with the IEEE 1149.1 TAP. |
| TCK | Output | Test Clock | This is the test clock used for driving the IEEE 1149.1 TAP state machine and logic. |
| TMS | Output | Test Mode Select | Directs the next state of the IEEE 1149.1 TAP state machine. |
| TDI | Output | Test Data Input | IEEE 1149.1 scan data input to the device. |
| TDO | Input | Test Data Output | IEEE 1149.1 scan data output from the device. |

*Table 10: ADA-MIPI20-TI14 adapter pin definitions*

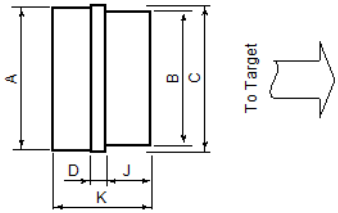
| Pin | I-jet direction | Name | Description |
|---|---|---|---|
| RTCK | Input | TCK Return | Not used; connected to ground on the target board. |
| PD | Input | Power Detect | Should be ties to the I/O voltage of the target device. Used by I-jet to detect whether target power is active and to set the JTAG signal voltage reference for level translators. |
| EMU0 | I/O | Emulation 0 | Depending on the device, EMU pins support boot modes and other features. I-jet does not use this pin but it is routed to the TRACEDATA[2] pin on the MIPI20 connector. For proper booting, this pin should be pulled up on the target. |
| EMU1 | I/O | Emulation 1 | Depending on the device, EMU pins support boot modes and other features. I-jet does not use this pin but it is routed to the TRACEDATA[3] pin on the MIPI20 connector. For proper booting, this pin should be pulled up on the target. |

*Table 10: ADA-MIPI20-TI14 adapter pin definitions (Continued)*

This is the pinout of the target cTI20 JTAG header. Pin 6 should be missing to indicate the proper orientation.



These are the top view dimensions of the ADA-MIPI20-TI14 adapter:




| | |
|---|---|
| A | 0.74 in (18.9 mm) |
| B | 1.0 in (25.4 mm) |
| C | 0.76 in (19.4 mm) |
| D | 0.062 in (1.6 mm) |
| J | 0.38 in (9.6 mm) |
| K | 0.80 in (20.3 mm) |

#### *TI14 header information (for target board)*

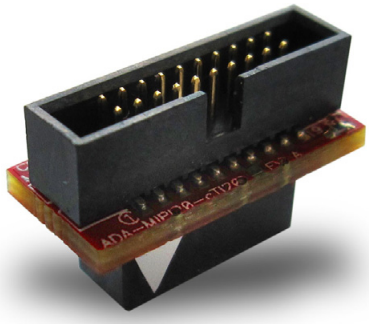
The TI14 header is manufactured by Samtec USA. The model number is TSM-107-01-F-DV. For more information, see the manufacturer's web page: **http://www.samtec.com/products/tsm**.

### The ADA-MIPI20-cTI20 adapter

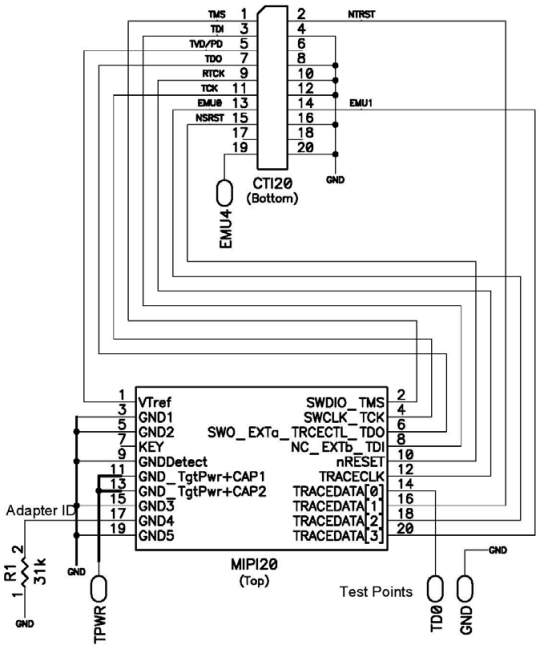
The ADA-MIPI20-cTI20 adapter adapts the I-jet standard MIPI-20 cable pinout to the Texas Instruments compact 20-pin JTAG interface used on some newer OMAP, DaVinci, and other TMS320, TMS470, and TMS570 target boards.

The adapter has the MIPI-20 male header on top for connecting the I-jet MIPI-20 cable, and a cTI-20 style female header (socket) on the bottom. The cTI-20 JTAG header is a 20-pin, double-row, high-density 0.05 in × 0.1 in (1.27 mm × 2.56 mm) pitch connector

with a key (plug) in position 6 to prevent misconnections. In case the plug is missing, a white arrow on pin 1 of the cTI-20 connector helps you ensure proper orientation.



This is a diagram of the ADA-MIPI20-cTI20 adapter:

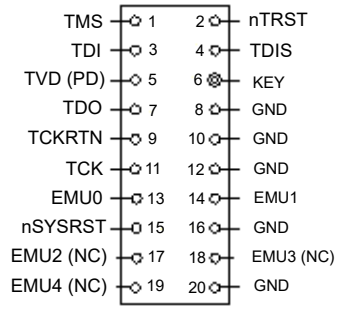


These are the pin definitions for the ADA-MIPI20-cTI20 adapter:

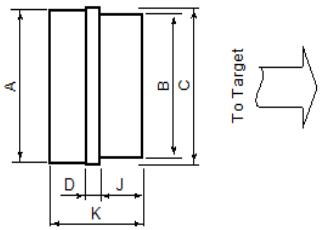
| Pin | I-jet direction | Name | Description |
|---|---|---|---|
| nTRST | Output | Test Logic Reset | Active LOW signal that causes all test and debug logic in the device to be reset along with the IEEE 1149.1 TAP. |
| TCK | Output | Test Clock | Test clock used to drive the IEEE 1149.1 TAP state machine and logic. |
| TMS | Output | Test Mode Select | Directs the next state of the IEEE 1149.1 TAP state machine. |
| TDI | Output | Test Data Input | IEEE 1149.1 scan data input to the device. |
| TDO | Input | Test Data Output | IEEE 1149.1 scan data output from the device. |
| RTCK | Input | TCK Return | Not used; connected to ground on the target board. |
| PD | Input | Power Detect | Should be tied to the I/O voltage of the target device. Used by I-jet to detect if target power is active and to set the JTAG signal voltage reference for level translators. |
| EMU0 | I/O | Emulation 0 | Depending on the device, EMU pins support boot modes and other features. I-jet does not use this pin but it is routed to the TRACEDATA[2] pin on the MIPI20 connector. For proper booting, this pin should be pulled-up on the target. |
| EMU1 | I/O | Emulation 1 | Depending on the device, EMU pins support boot modes and other features. I-jet does not use this pin but it is routed to the TRACEDATA[3] pin on the MIPI20 connector. For proper booting, this pin should be pulled-up on the target. |
| nRESET | I/O | System Reset | Active LOW open-collector signal that can be driven by I-jet to reset the device and/or the target board. I-jet senses this line to determine when a board has been reset by the user or by watchdog timer. |

*Table 11: ADA-MIPI20-cT120 adapter pin definitions*

This is the pinout of the target cTI20 JTAG header. Pin 6 should be missing to indicate the proper orientation.

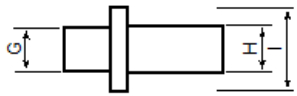



These are the top view dimensions of the ADA-MIPI20-cTI20 adapter:




| | |
|---|---|
| A | 0.74 in (18.9 mm) |
| B | 0.7 in (17.7 mm) |
| C | 0.76 in (19.4 mm) |
| D | 0.07 in (1.8 mm) |
| J | 0.24 in (6.0 mm) |
| K | 0.50 in (12.8 mm) |

These are the side view dimensions of the ADA-MIPI20-cTI20 adapter:



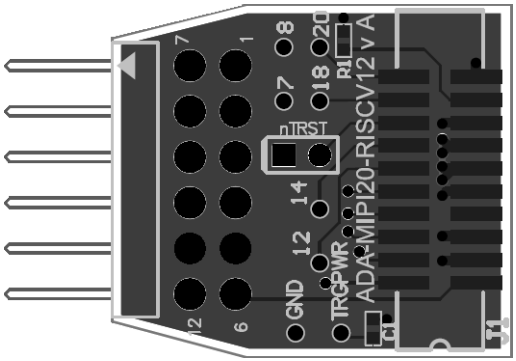
| | |
|---|---|
| G | 0.19 in (0.5 mm) |
| H | 0.2 in (5.1 mm) |
| I | 0.36 in (9.1 mm) |

#### *cTI20 header information (for target board)*

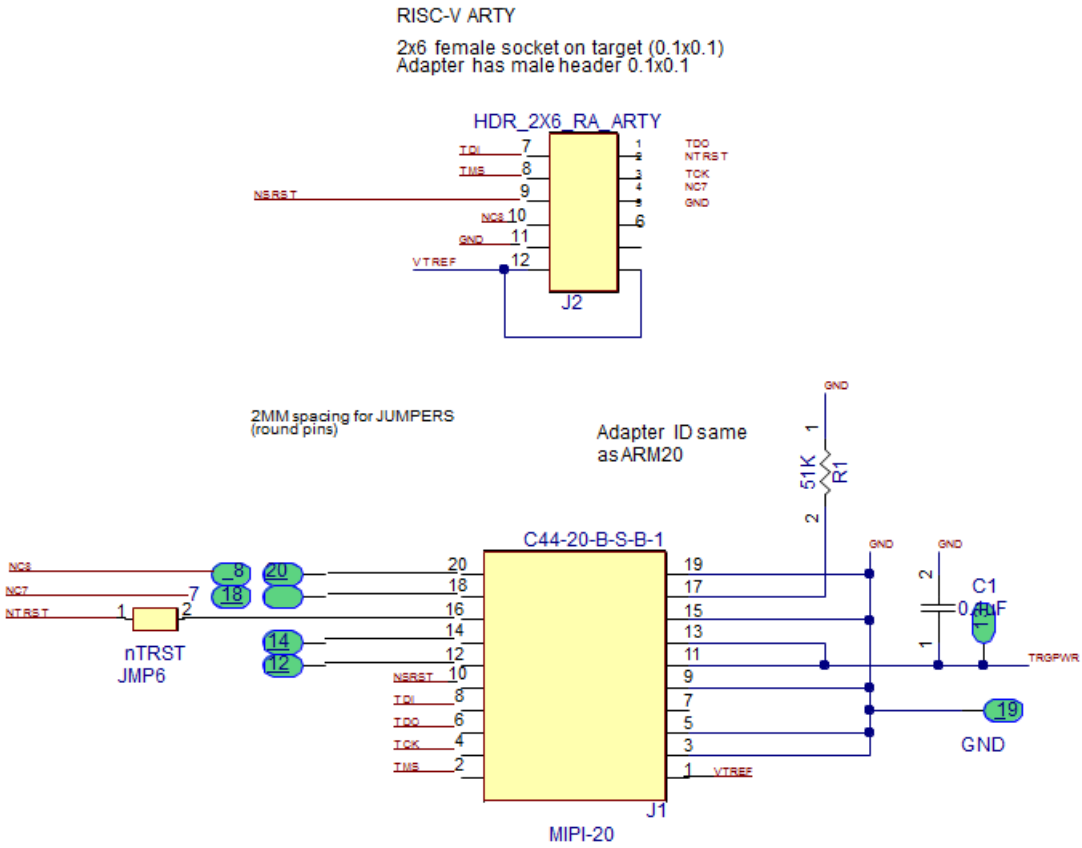
The cTI20 header is manufactured by Samtec USA. The model number is FTR-110-51-S-D-06. For more information, see the manufacturer's web page, **http://www.samtec.com/products/ftr**.

## The ADA-MIPI20-RISCV12 adapter

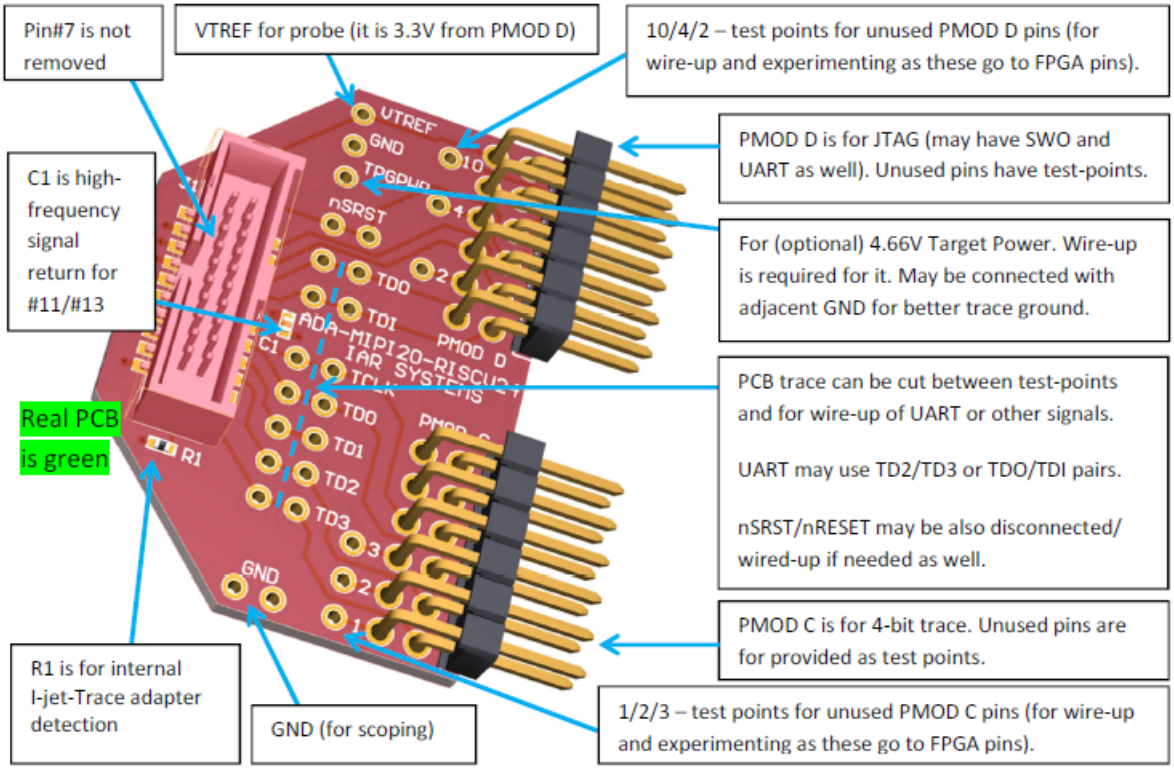
This is a pinout of the ADA-MIPI20-RISCV12 adapter:



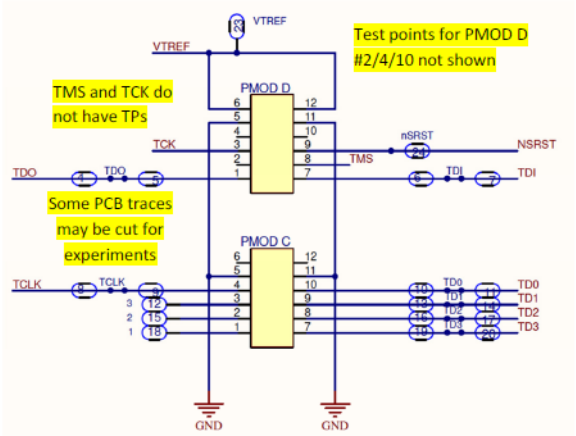
This is a diagram of the ADA-MIPI20-RISCV12 adapter:



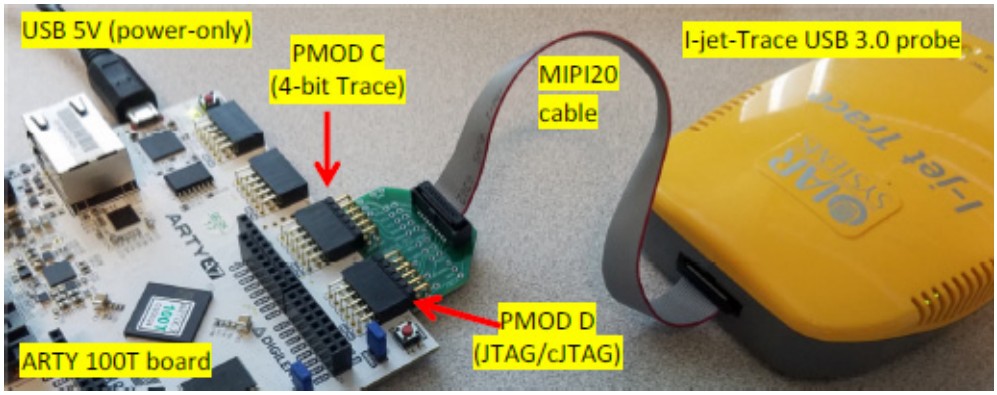
## The ADA-MIPI20-RISCV24 adapter

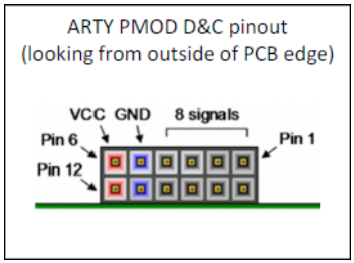


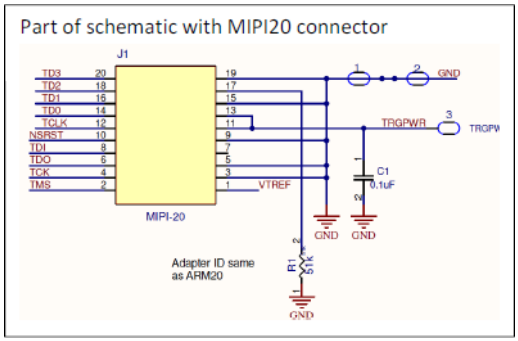
Part of schematic with PMOD D (JTAG) and PMOD C (Trace)




All signals (**VTREF/TCK/…**) go to corresponding MIPI20 pins




ARTY PMOD D&C pinout
(looking from outside of PCB edge)
VCC
GND
8 signals
Pin 6
Pin 12
Pin 1


Part of schematic with MIPI20 connector
J1
TD3
TD2
TD1
TD0
TCLK
NSRST
TDI
TDO
TCK
TMS
VTREF
GND
TRIGPWR
C1
0.1uF
MIPI-20
Adapter ID same
as ARM20
R1
5hk