Connectors for Debug and Trace

H.1 Overview

A number of commonly used debug connectors are shown here. Most of the ARM® development tools use one of these pin out. When developing your ARM circuit board, it is recommended to use a standard debug signal arrangement to make connection to debugger easier.

H.1.1 20-pin Cortex® Debug + ETM connector

Some newer ARM® microcontroller board use a 0.05" 20-pin header (Samtec FTSH-110) for both debug and trace. (The signals greyed out are not available on the Cortex®-M3 or Cortex-M4.)

The 20-pin Cortex Debug + ETM connector support both JTAG and Serial Wire debug protocols. When the Serial debug protocol is used, the TDO signal can be used for Serial Wire Viewer output for trace capture. The connector also provides a 4-bit wide trace port for capturing of trace that require a higher trace bandwidth (e.g., when ETM trace is enabled).
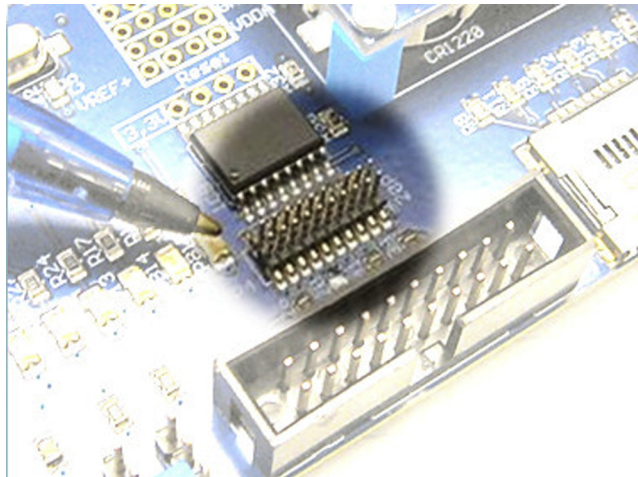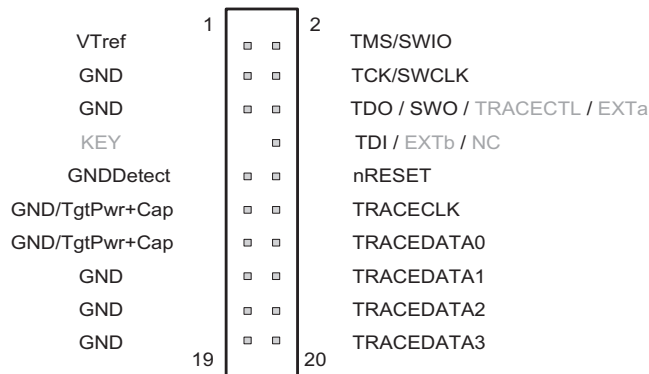

FIGURE H.1

20-pin Cortex Debug + ETM connector

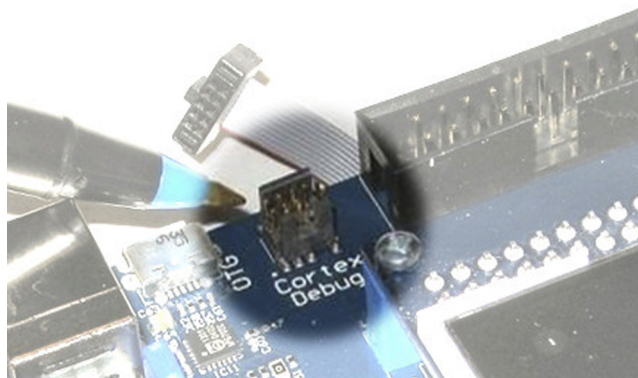|			
VTref	1	▫ ▫	2	TMS/SWIO
GND		▫ ▫		TCK/SWCLK
GND		▫ ▫		TDO / SWO / TRACECTL / EXTa
KEY		▫		TDI / EXTb / NC
GNDDetect		▫ ▫		nRESET
GND/TgtPwr+Cap		▫ ▫		TRACECLK
GND/TgtPwr+Cap		▫ ▫		TRACEDATA0
GND		▫ ▫		TRACEDATA1
GND		▫ ▫		TRACEDATA2
GND	19	▫ ▫	20	TRACEDATA3

FIGURE H.2

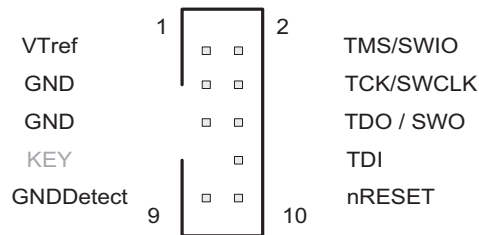20-pin Cortex Debug + ETM connector pin layout

The FTSH-110 connector is smaller than the traditional IDC connector and is recommended for new designs. An example development board that use this new connector is the KEIL™ MCBSTM32E evaluation board.

H.1.2 **10-pin Cortex® Debug connector**

For device without ETM, you can use an even smaller 0.05" 10-pin connector (Samtec FTSH-105) for debug. Similar to the 20-pin Cortex® Debug + ETM connector, both JTAG and Serial-Wire debug protocols are supported in the 10 pin version.
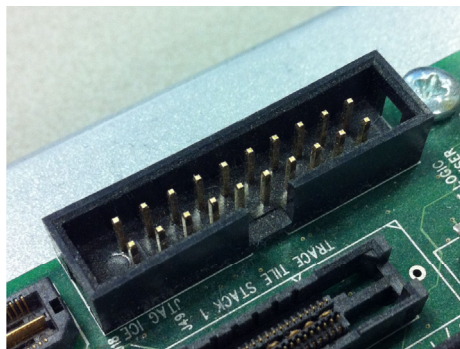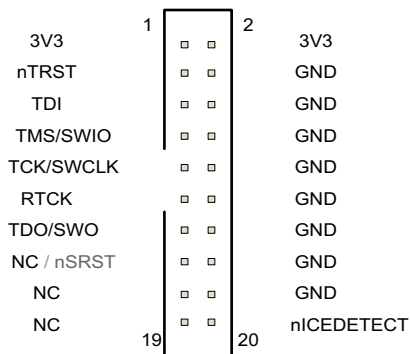

FIGURE H.3

10-pin Cortex Debug connector

VTref	1	▫ ▫	2	TMS/SWIO
GND		▫ ▫		TCK/SWCLK
GND		▫ ▫		TDO / SWO
KEY		▫		TDI
GNDDetect	9	▫ ▫	10	nRESET

FIGURE H.4

10-pin Cortex Debug connector pin layout

H.1.3 **Legacy 20-pin IDC connector**

A common debug connector used in ARM® development boards is the 20 pins IDC connector. The 20-pin IDC connector arrange support JTAG debug, Serial Wire debug (SWIO and SWCLK), Serial Wire Output (SWO). The nICEDETECT pin allows the target system to detect if a debugger is connected. When no debugger is attached, this pin is pulled high. A debugger connection connects this pin to ground. This is used in some development boards that support multiple JTAG configurations. The nSRST connection is optional; debugger can reset a Cortex®-M system via the System Control Block (SCB) so this connection is often omitted from the top level of microcontroller designs.

3V3	1	▫ ▫	2	3V3
nTRST		▫ ▫		GND
TDI		▫ ▫		GND
TMS/SWIO		▫ ▫		GND
TCK/SWCLK		▫ ▫		GND
RTCK		▫ ▫		GND
TDO/SWO		▫ ▫		GND
NC / nSRST		▫ ▫		GND
NC		▫ ▫		GND
NC	19	▫ ▫	20	nICEDETECT

FIGURE H.5

20-pin IDC connector

H.1.4 **38-pin Mictor connector**

In some ARM® system designs, Mictor connector is used when trace port is required (e.g., for instruction trace with ETM). It can also be used for JTAG/SWD connection. The 20-pin IDC connector can be connected in parallel with the Mictor connector (only one is use at a time).
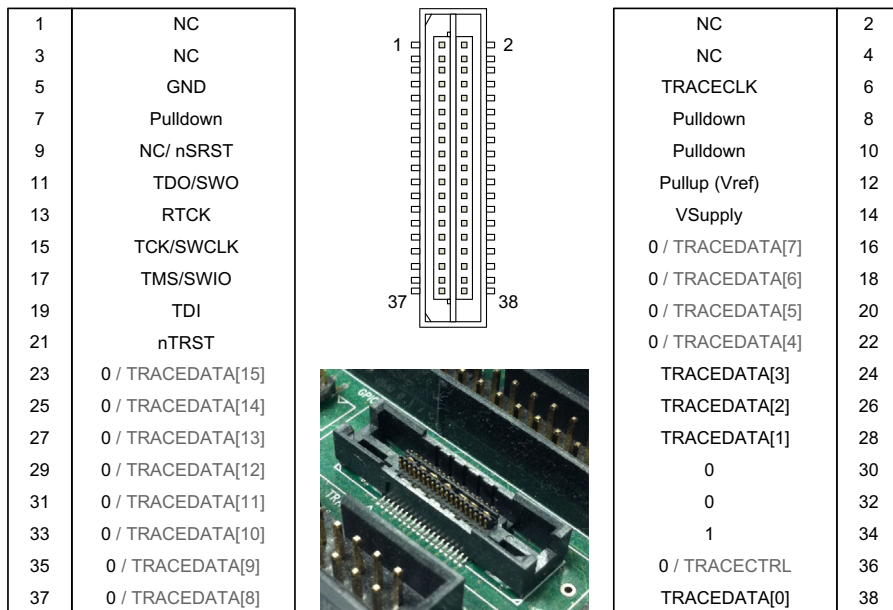
1	NC			NC	2
3	NC			NC	4
5	GND			TRACECLK	6
7	Pulldown			Pulldown	8
9	NC/ nSRST			Pulldown	10
11	TDO/SWO			Pullup (Vref)	12
13	RTCK			VSupply	14
15	TCK/SWCLK			0 / TRACEDATA[7]	16
17	TMS/SWIO			0 / TRACEDATA[6]	18
19	TDI			0 / TRACEDATA[5]	20
21	nTRST			0 / TRACEDATA[4]	22
23	0 / TRACEDATA[15]			TRACEDATA[3]	24
25	0 / TRACEDATA[14]			TRACEDATA[2]	26
27	0 / TRACEDATA[13]			TRACEDATA[1]	28
29	0 / TRACEDATA[12]			0	30
31	0 / TRACEDATA[11]			0	32
33	0 / TRACEDATA[10]			1	34
35	0 / TRACEDATA[9]			0 / TRACECTRL	36
37	0 / TRACEDATA[8]			TRACEDATA[0]	38

FIGURE H.6

38-pin Mictor connector

Typically a Cortex®-M3 or Cortex-M4 microcontroller only has 4 bits of trace data signals, so most of the trace data pins on the Mictor connectors are not used. The Mictor connector is used mostly in other ARM Cortex processors (Cortex-A8/A9, Cortex-R4) or in some multiprocessor systems the trace system might require a wider trace port. In such cases, some of the other unused pins on the connector will also be used. For a typical Cortex-M3 or Cortex-M4 system, the Cortex Debug + ETM connector is recommended.