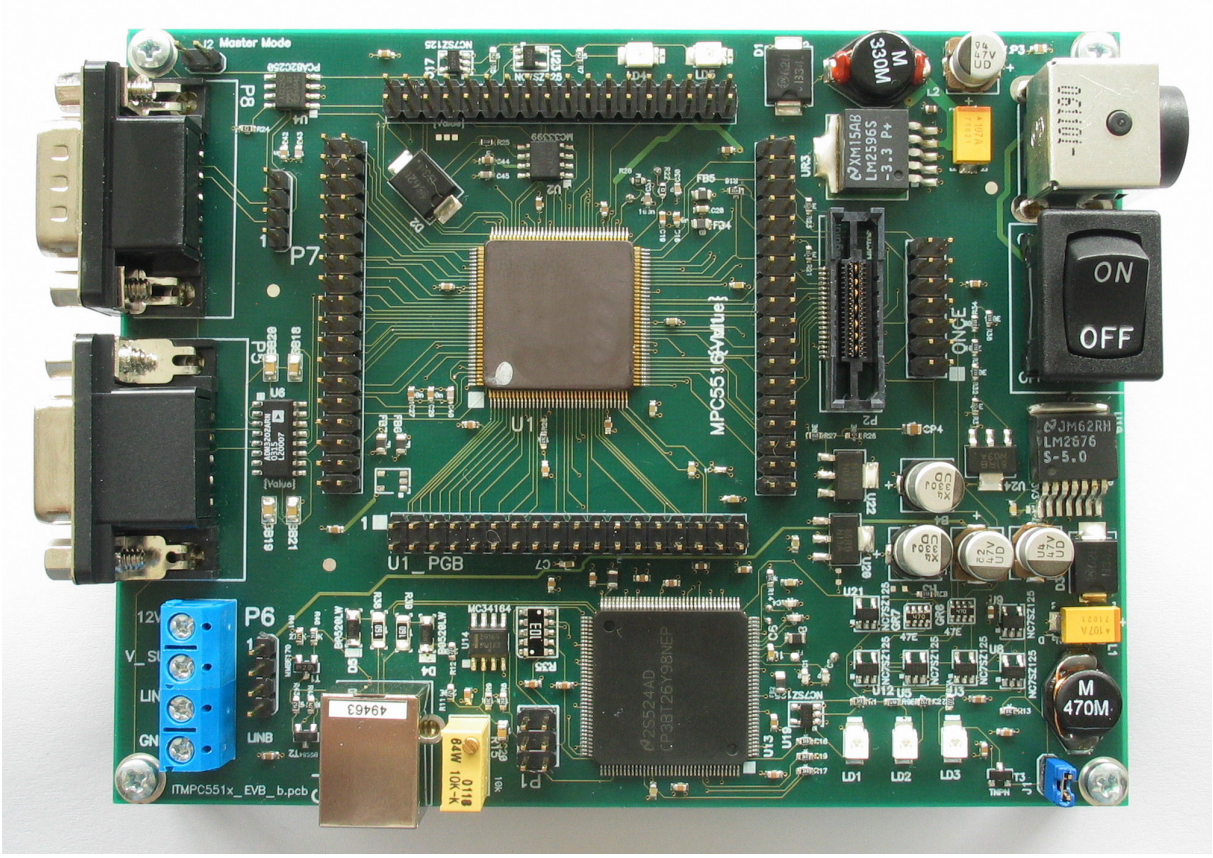
User's Manual

Evaluation & Development Kit for Freescale PowerPC MPC5517 Microcontroller

Ordering code
ITMPC5517



Solutions for Embedded Systems Development
www.isystem.com

Contents

Features

The ITMPC5517 Target Board is an evaluation and a development system for the Freescale MPC5517 microcontroller. The ITMPC5517 package consists of a USB cable, a power supply and a target board populated with the Freescale MPC5517 CPU, JTAG debug and Nexus debug connectors and an on-board integrated iSYSTEM JTAG debugger. The application under the development or test runs from the internal CPU flash.

Specifications

Clock Speed – up to 80 MHz
Power requirement: 15 - 24V DC, + in the center @ 500 mA (if the 12V power output is not used, also a 9-15V power supply can be used)
Power output: 12V, 5V, 3.3V, 2.5V and 1.5V regulated supplies
Board Size: 131 mm x 101 mm

ITMPC5517 Features

- MPC5517, QFP144
- 8MHz clock (ext. crystal)
- Power Indicators – Supply voltage indications for 5V, 3.3V, and 2.5V supplies
- User Indicator – two user indicators to provide user conceived visual response during testing
- Configuration jumper: Jumper J1 enables/disables the iSYSTEM on-board integrated USB-JTAG debugger
- Two debug options available – JTAG, Nexus
- Low cost and user friendly support manual and software

Software Development

The board has been tested and does run at speeds up to 80 MHz, which you can set by engaging the PLL module in your software. Software development on the ITMPC5517 can be performed using the iSYSTEM on-board integrated USB-JTAG debugger. Alternatively, external development tools can be connected to the ONCE (JTAG) or P2 (Nexus) connector. This provides real-time access to all hardware, peripherals and memory on the board. Software is usually uploaded to the external SRAM where it's executed during the development. Then it can be programmed into the CPU Flash in order to execute in standalone when the power is applied.

Getting Started - Setting up the ITMPC5517

Power Supply

Permissible input voltage: 15-24 V DC**.** The required current load capacity of the power supply depends on the specific configuration of the ITMPC5517. A power supply with a minimum of 500mA is recommended and delivered in the package. Please use the power supply that was shipped with the evaluation board.

Switch-on the target board after the AC adapter is plugged into the wall and connected to the target board. Check that power indicators (LD1, LD2, LD3) lit, indicating that 5V, 3.3V and 2.5V voltage is present.

Note: When connecting an external debugger, make sure that the emulator is powered on first, then the target board and vice versa when switching off the system. First, switch off the target and then the emulator.

Use of On-Board Integrated Debugger

Follow below instructions, in order to get a sample application running with "out of the box" experience.
If winIDEA 2008 CD is not part of the package, please obtain winIDEA 2008 setup from your local iSYSTEM office or from www.isystem.com.

- Install winIDEA 2008 full setup on a PC.
- Set jumper J1, which enables on-board integrated debugger.
- Make sure that power switch on the ITMPC5517 is in off position.
- Connect the power supply to the ITMPC5517.
- Switch on the ITMPC5517.
- Run winIDEA by selecting Start>Programs>… and open ITMPC5517 sample workspace (.xjrf) in c:\winIDEA\2008\Examples\Targets\ITMPC5517\IntFLASH or obtain it from iSYSTEM if it's not available in the Examples directory.
- Connect USB cable between the PC and the ITMPC5517.
- Windows should auto-detect a new USB device and install belonging USB driver. In case of any problems, the driver is located under winIDEA install directory (e.g. c:\winIDEA\2008\USBDrv).
- Execute Debug/Download. This should program and run the application until main function.
- The application is now ready for debugging. If you run the application, a successful operation is indicated with blinking LED LD4 and LD5.

The on-board integrated USB-JTAG debugger runs without restrictions for 90 days after using it for the first time. After the 90 day period expires, the debugger falls back to a restriction of a 32k byte download limit.

The debugger can be upgraded to a regular debugger (no limits) by purchasing the debug enable license. Additionally, you need to purchase a regular winIDEA license. Please contact your local iSYSTEM distributor for more details on upgrading your development tool.

What To Do Now?

winIDEA allows you to run code step by step, set execution and access breakpoints, examine and modify the source code, rebuild the project using GNU compiler, which is optionally installed during winIDEA installation, and much more. For more information refer to the winIDEA documentation. Software in the combination with the development board can be used as a basis for developing future applications also on your hardware. This project illustrates various programming issues, which are essential to all winIDEA projects:

- Initialization of bus interface unit
- Initialization of configuration registers
- Implementation of dispatch table
- Format of linker definition file
- Correct project settings (Project>Settings), which ensure that the compiler is invoked successfully

More interesting examples are also included on the support CD.

Troubleshooting

ITMPC5517 doesn't show signs of life by first start

a) Check the power supplied to the EVB board – Diodes LD1, LD2 and LD3.

b) When using the on-board integrated JTAG debugger, make sure that Jumper J1 is enabled. When Jumper J1 is not enabled, a connection to the JTAG or Nexus port must be made.

c) Try "slow" JTAG Scan Speed if the debugger cannot connect to the CPU.

d) Execute debug Reset instead of debug Download.

Unable to download the code to the board

a) Check the power supplied to the EVB board.

b) Ensure that the correct workspace was loaded into winIDEA.

c) Check the hardware configuration:

- Tools>Hardware Plug-In
- Hardware>Hardware …
- Hardware>Emulation Options

d) Reset the board and try to connect again.

Checksum failed error

a) When performing any kind of checksum, remove all software breakpoints

Default Memory Map

The MPC5517 of the MPC5500 family has up to 80-Kbyte of internal SRAM and internal 1.5MB Flash memory. Both the internal SRAM and the Flash memory can hold instructions and data. The SRAM block is powered for standby operation. The provided software uses the default memory map. If you modify the memory map make sure that all memory banks and chip select configuration settings are adjusted accordingly.

Downloading the code into the memory

winIDEA allows you to load the code directly into the internal Flash memory through the standard debug download. winIDEA identifies, which code from the download file fits in the internal FLASH, and loads it to the Flash through the flash programming procedure hidden to the user. All other code propagates to the target through standard memory writes.

Demo software has the example configured for the internal Flash. Load the project into winIDEA and execute debug download (Debug->Download), which will download the code directly to the Flash memory. For more information see the winIDEA user's manual.

Settings and Options

Jumpers

Jumper J1 selects whether iSYSTEM on-board integrated USB-JTAG debugger is used or an external debug tool.

Jumper pin 1 is marked with a white square on the ITMPC5517 PCB. If pin 1 cannot be located directly from the ITMPC5517, please use Figure 1 for assistance.

Note: Don't change jumper settings while the ITMPC5517 Target Board is supplied with power!

Status Indicators

Three LED diodes show the presence of supply voltages. LD1 (+5V), LD2 (+3.3V) and LD3 (+2.5V) must light when the power is applied to the evaluation board. LD4 and LD5 are available for the user as a status indicator.

Component List

Name	Description
U1	Freescale MPC5517 CPU
P1(bottom)	Connector for manufacturing purpose
P2	Nexus debug connector
P3	USB connector (integrated debugger)
P5	RS232 connector
P6	LIN connector (small and big)
P8	CAN connector
ONCE	JTAG debug connector
J1	Debug mode
J2	LIN master mode pull-up enable
LD1	Power LED 5V
LD2	Power LED 3,3V
LD3	Power LED 2,5V
LD4	User LED
LD5	User LED
SW1	Power switch

Connectors

14-pin JTAG debug connector (ONCE)

CPU_TDI	**1**	**2**	GND
CPU_TDO	**3**	**4**	GND
CPU_TCK	**5**	**6**	GND
N.C.	**7**	**8**	N.C.
CPU_RESET	**9**	**10**	CPU_TMS
3V3	**11**	**12**	N.C.
N.C.	**13**	**14**	CPU_TRST

External JTAG debug tool connects to a 14-pin JTAG debug connector. **Jumper J1 must be open when using external debugger.**

P6: LIN connector

There are two LIN connectors that provide connection to the LIN interface. The bigger one allows easier connection of larger cables and they both connect to the same interface.

Pin	Signal
1	12V
2	V_SUP
3	LIN
4	GND

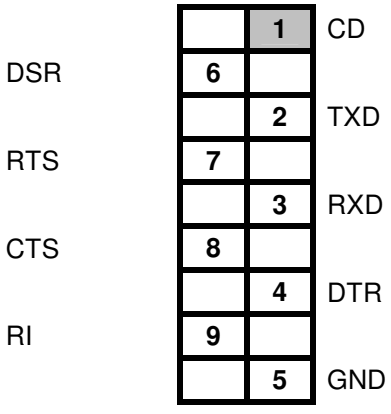
P2: Nexus 38-pin Mictor debug connector

Signal	Pin	Pin	Signal
Not used	1	2	Not used
Not used	3	4	Not used
Not used	5	6	CLKOUT
Not used	7	8	Not used
RSTIN	9	10	EVTIN
TDO	11	12	VTREF
Not used	13	14	Not used
TCK	15	16	MDO7
TMS	17	18	MDO6
TDI	19	20	MDO5
NTRST	21	22	MDO4
Not used	23	24	MDO3
Not used	25	26	MDO2
Not used	27	28	MDO1
Not used	29	30	MDO0
Not used	31	32	EVTO
Not used	33	34	MCKO
Not used	35	36	Not used
Not used	37	38	MSEO0

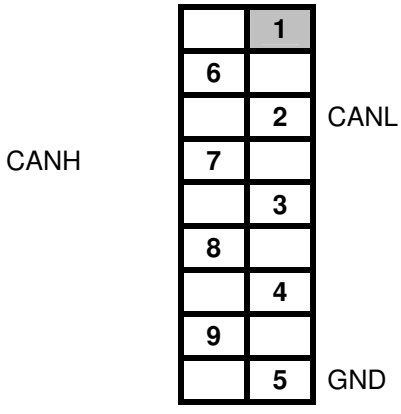
External Nexus debug tool connects to a Nexus 38-pin Mictor debug connector. **Jumper J1 must be open when using external debugger.**

P5: RS232 connector and P8: CAN connector

There are two connectors on the side of the evaluation board. The P5 connector is a standard RS232 connector and the P8 is a CAN-BUS connector.



P5: RS232 connector



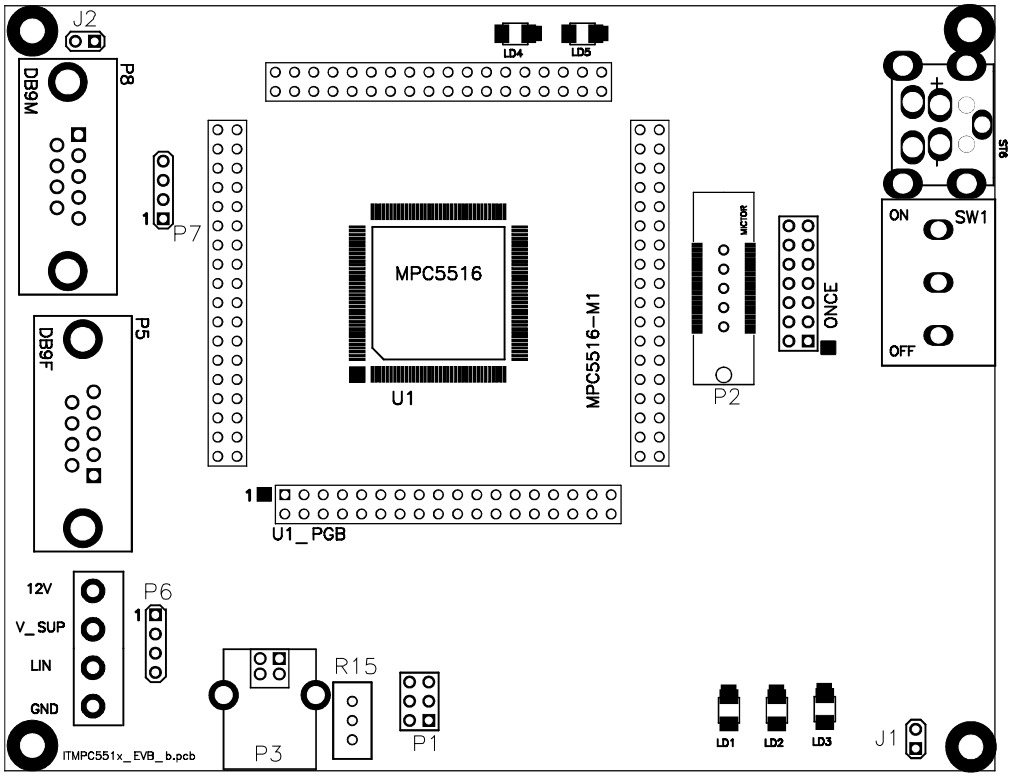
P8: CAN-BUS connector

CPU expansion connector

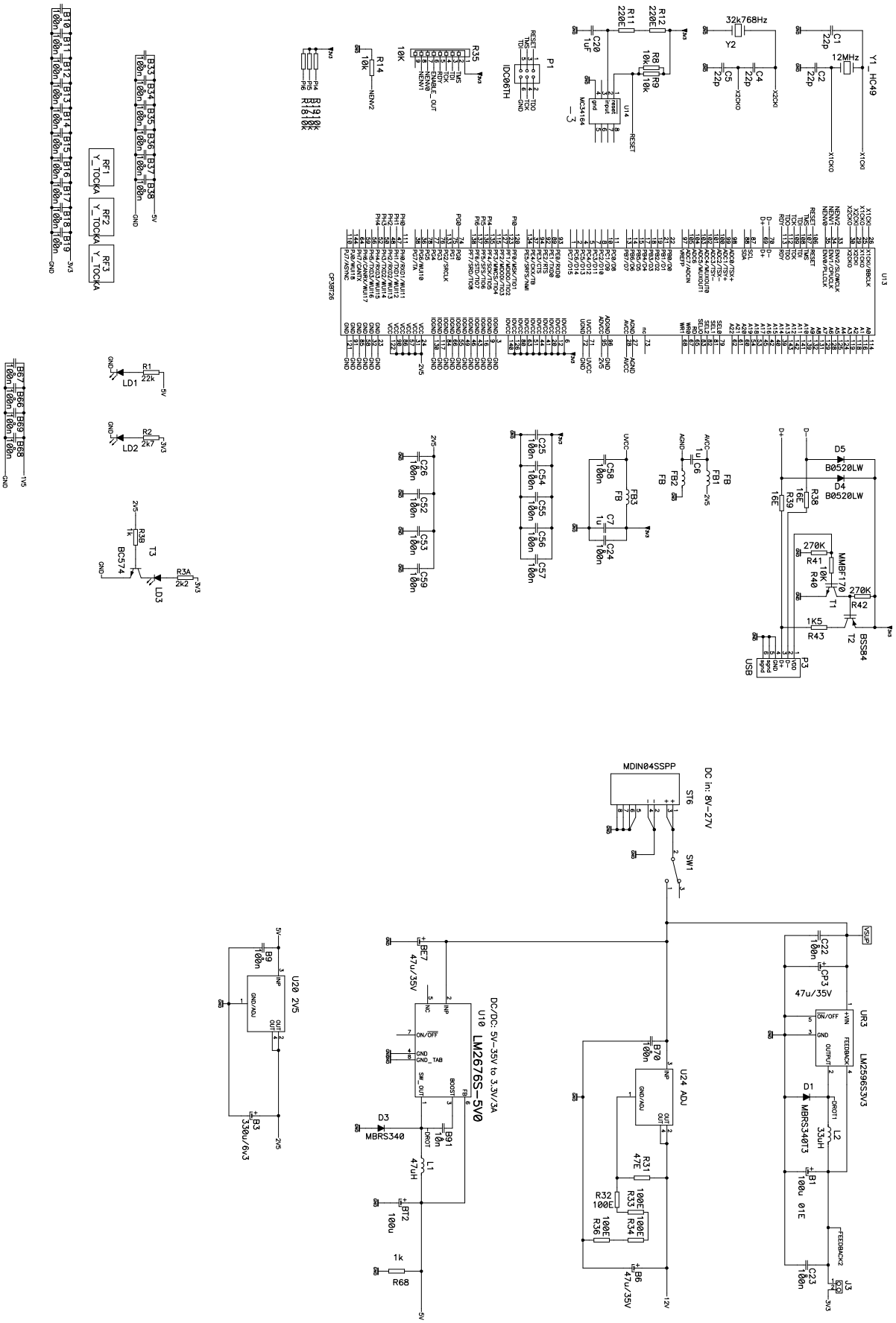
The CPU expansion connector makes all the CPU signals accessible and can be used in order to expand the development system by connecting the ITMPC5517 to another module. Please see the schematic for the pinout.

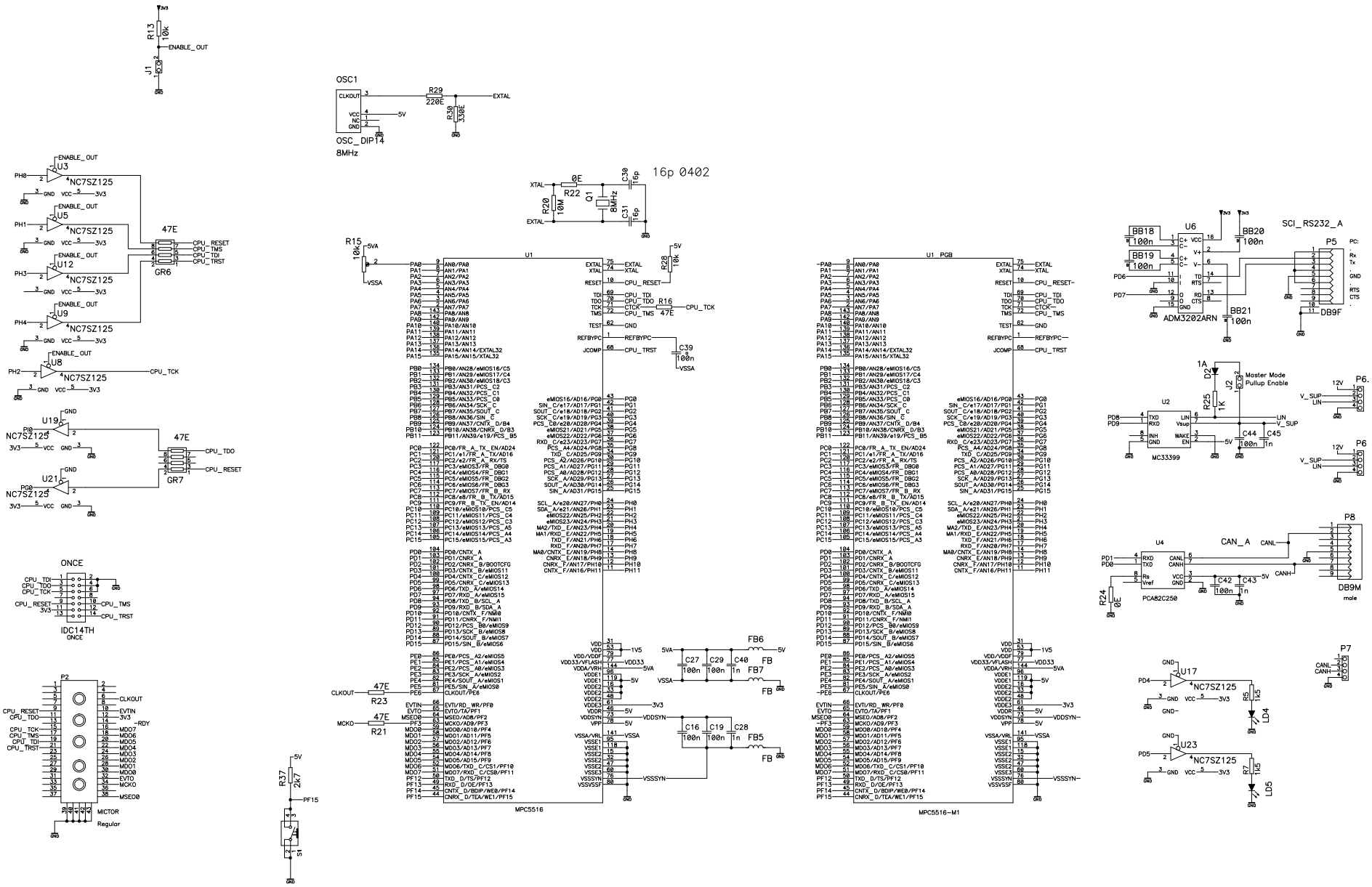
Appendix A

View of the ITMPC5517



Schematic





CPU Expansion Connector

The CPU Expansion Connector is used for easier connection to the CPU pins.

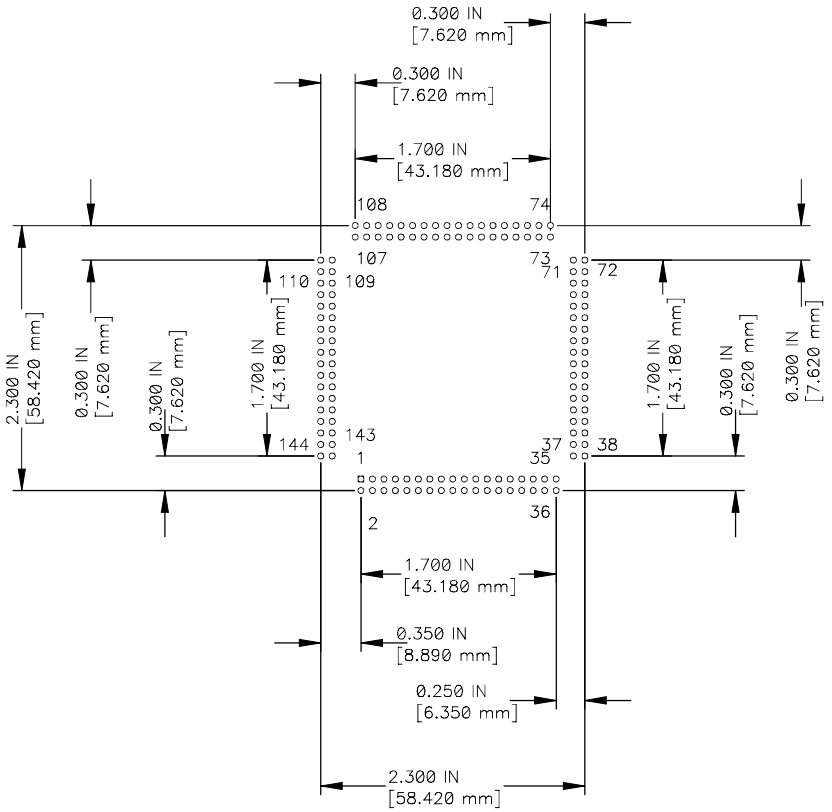
144	142	140	138	136	134	132	130	128	126	124	122	120	118	116	114	112	110
143	141	139	137	135	133	131	129	127	125	123	121	119	117	115	113	111	109

2	1
4	3
6	5
8	7
10	9
12	11
14	13
16	15
18	17
20	19
22	21
24	23
26	25
28	27
30	29
32	31
34	33
36	35

107	108
105	106
103	104
101	102
99	100
97	98
95	96
93	94
91	92
89	90
87	88
85	86
83	84
81	82
79	80
77	78
75	76
73	74

37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71
38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72

CPU Expansion Connector – Top view



CPU Expansion Connector - Dimensions