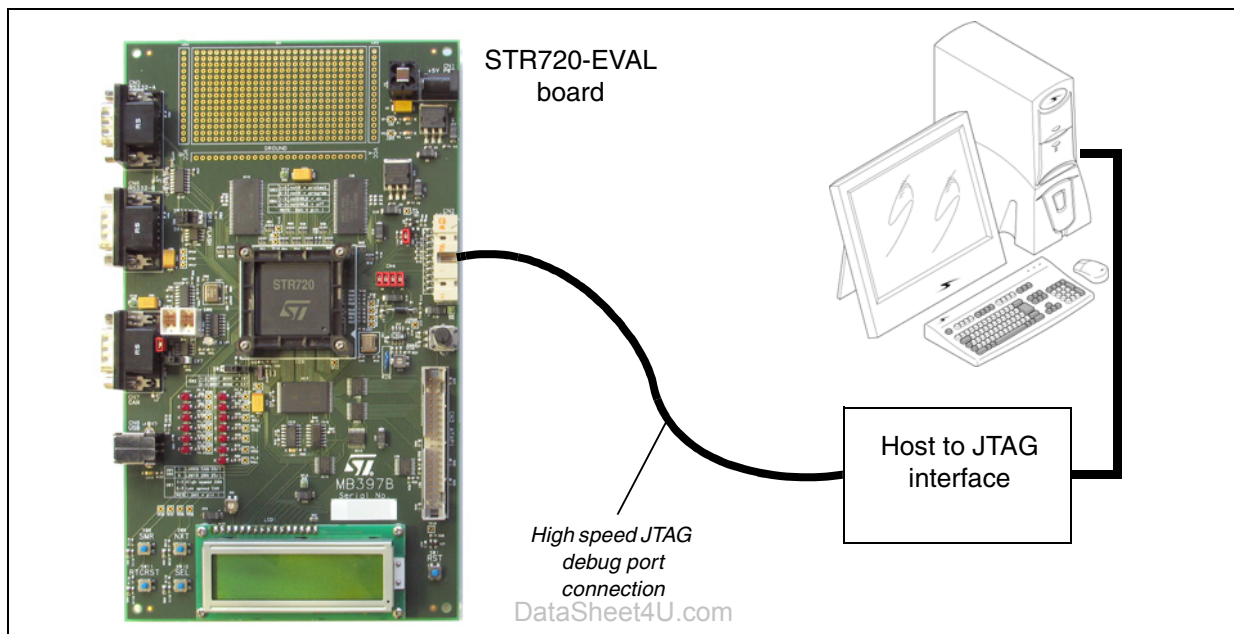




# STR720-EVAL

## Evaluation Board for STR72xF



### Main components

- STR720 processor running at 66 MHz
- EMI flash 4 Mbytes (2M x 16)
- SMI SDRAM 16 Mbytes (2 x (4M x 16))
- SPI serial flash
- LCD display

### Features

- Support for the following interfaces:
  - ATAPI
  - USB
  - CAN
  - RS232
- LED displays
- Test buttons
- JTAG connector

### Description

The STR720-EVAL board is a complete development platform for the STR720 series. It is a cost effective, flexible and open design to demonstrate the capability of the STR720 series of microcontrollers and enable rapid evaluation of the STR720 devices and peripherals. It uses the high performance STR720 ARM720T™ device that embeds 8 Kbytes unified cache, has a memory management unit (MMU), 16K program RAM and numerous peripheral interfaces, including USB and CAN.

The STR720-EVAL board includes shared memory interface (SMI) SDRAM and flash memory on the external memory interface (EMI) to enable freedom in development of large programs before custom hardware is designed. It integrates a 2 x 16 LCD, LEDs, UART, CAN, USB interfaces and test buttons to create a versatile stand-alone test platform. A wide choice of third party development tools are available in addition to those available from STMicroelectronics.

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**STR720-EVAL**

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# 1 Introduction

STMicroelectronics is a global independent semiconductor company that designs, develops, manufactures and markets a broad range of semiconductor integrated circuits and discrete devices used in a wide variety of applications.

The STR720-EVAL board is based on the STR720, a highly integrated microcontroller, running at 66 MHz. It combines the popular ARM720T™ 32-bit RISC CPU that embeds 8 Kbytes of unified cache and a memory management unit (MMU) with 16 Kbytes of program RAM, external SDRAM interface for up to 128 Mbytes of SDRAM, an EMI for up to 8 Mbytes of SRAM, flash or ROM and numerous on-chip peripherals.

This board is intended as a low cost development platform to demonstrate the capability of the STR720 series of micro-controllers and to enable rapid evaluation of the STR720 devices and available peripherals.

The STR720-EVAL board has 4 Mbytes of flash on EMI, 1-Mbit SPI serial flash and 16 Mbytes of SDRAM. It supports ATAPI, USB, CAN and RS232 interfaces. The on-board chip STR720RBQ6 is an ARM720T™ 32-bit RISC micro-controller with cache and MMU.

This board includes a 2x16 programmable LCD display supported by reset, RTC reset, next, select and previous push buttons.

The hardware platform of the STR720 series is supported by an extensive software support package, including device drivers in ANSI C source form and demonstration software. It is flashed with a demonstration application that shows the basic features of the device. Development tools are readily available. This is complemented by a range of third party real-time OS and middleware.

Design schematics can also be supplied in electronic format to those customers with compatible design environments.

*Note:* ARM® and ARM7TDMI™ are registered trademarks of ARM Limited in the EU and other countries.

## 1.1 Processor and memory devices on this board

- STR720 ARM720T™ processor running at 66 MHz, IC9:
  - 208-pin PQFP version,
  - 8 Kbytes cache,
  - 16 Kbytes program RAM,
  - memory management unit (MMU),
  - dual voltage, 1.8 V for core supply and 3.3 V for inputs/outputs,
  - nested interrupt controller.
- External memory interface:
  - flash (bank 0) 4 Mbytes arranged as 2M x 16: IC17,
  - LCD (bank 0), see [Section 1.4 on page 4](#): LCD1,
  - ATAPI interface: CN3
- SMI (bank 0) 16 Mbytes SDRAM arranged as (2 x (4M x 16)): IC8, IC15,

- Clocking:
  - +3.3 V surface mounted 16 MHz oscillator provides the main clock source,
  - RTC real-time clock with embedded 32 KHz oscillator.
- Serial ROM. A 1-Mbit SPI serial flash connected to the buffered serial peripheral interface (BSPi): IC20.

## 1.2 Board interface connections

Diagrams and wiring descriptions for these connectors are provided in [Section 4 on page 18](#). The following connections are supported by the board:

- USB support USB device using a type B connector: CN8,
- CAN uses a single 9 D-type connector with microswitch selectable low or high speed transceiver: CN7,
- UART1 (Rx and Tx only) connected to a 9-way male D-type RS232 connector: CN5,
- UART2 (Rx and Tx only) connected to a 9-way male D-type RS232 connector: CN6,
- JTAG, 20 pin IDC connector: CN2,
- variable resistor voltage range 0 to 2.5 V: VR1,
- LM35 temperature sensor: IC4,
- prototype area: GD1,
- test points various test points are located throughout the board, for details see [Section 4.1 on page 18](#),
- main power supply: CN1.

## 1.3 Push buttons

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The following push buttons are provided, they are described further in [Section 2.13 on page 10](#):

- reset (RST), board reset: SW1,
- previous (PRV), programmable switch: SW8,
- next (NXT), programmable switch: SW9,
- select (SEL), programmable switch: SW10,
- RTC reset (RTCRST): SW11.

## 1.4 Displays

The following LCD and LEDs are provided:

- LCD write-only display, 2x16 LCD display connected to the EMI using a buffer and address decode logic, green back light display: LCD1,
- surface mount red +5 V and +3.3 V power indicators: LD1, LD2,
- surface mount yellow, IDE ATAPI +3.3 V power indicator: LD3,
- surface mount yellow, USB connection indicator: LD18,
- bi-color red/green, reset indicator: LD4,
- low consumption LEDs red: LD5, LD6, LD7, LD8, LD9, LD10, LD11, LD12, LD13, LD14, LD15, LD16, LD17.



# 2 Hardware

Figure 1. STR720-EVAL board layout block diagram

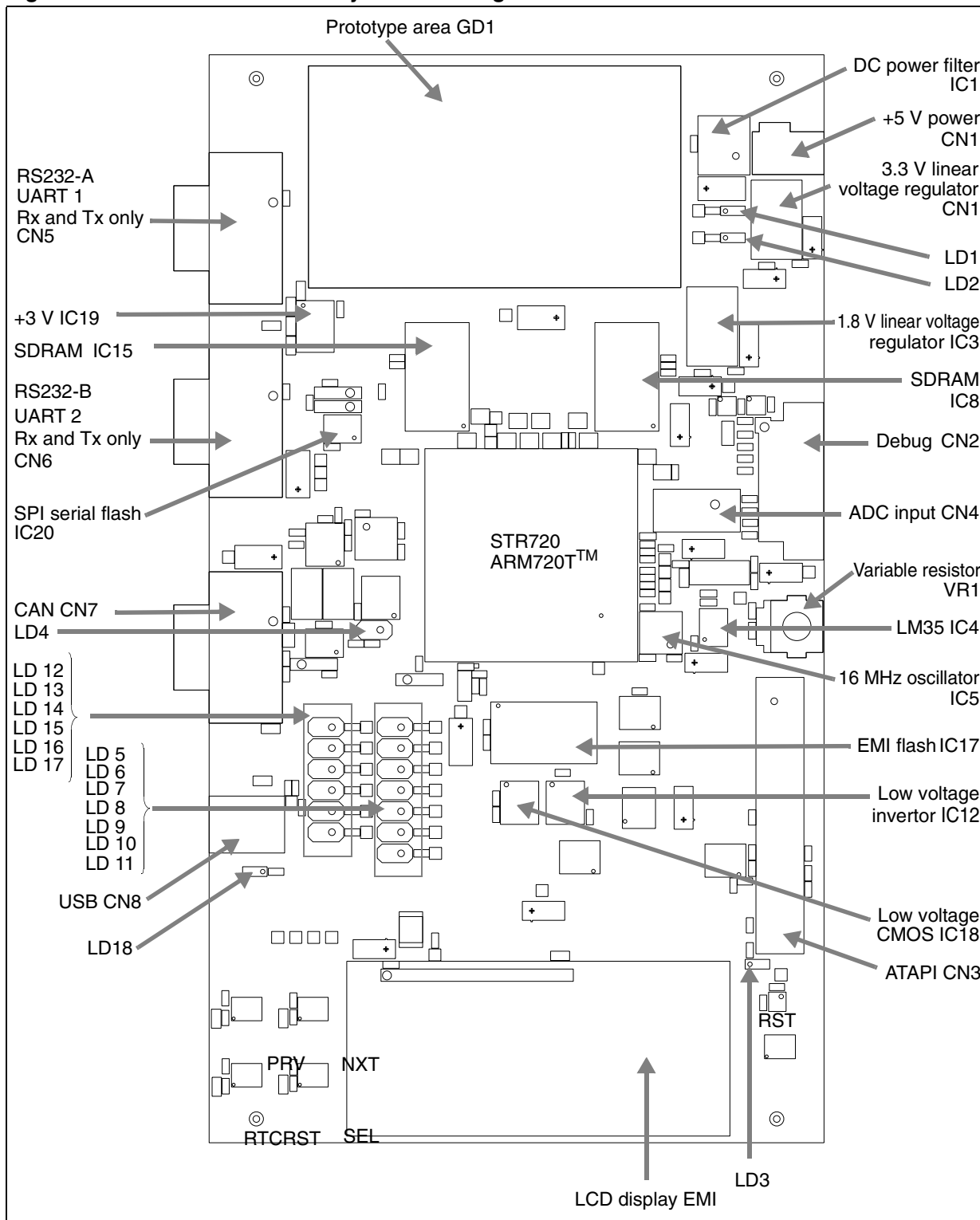
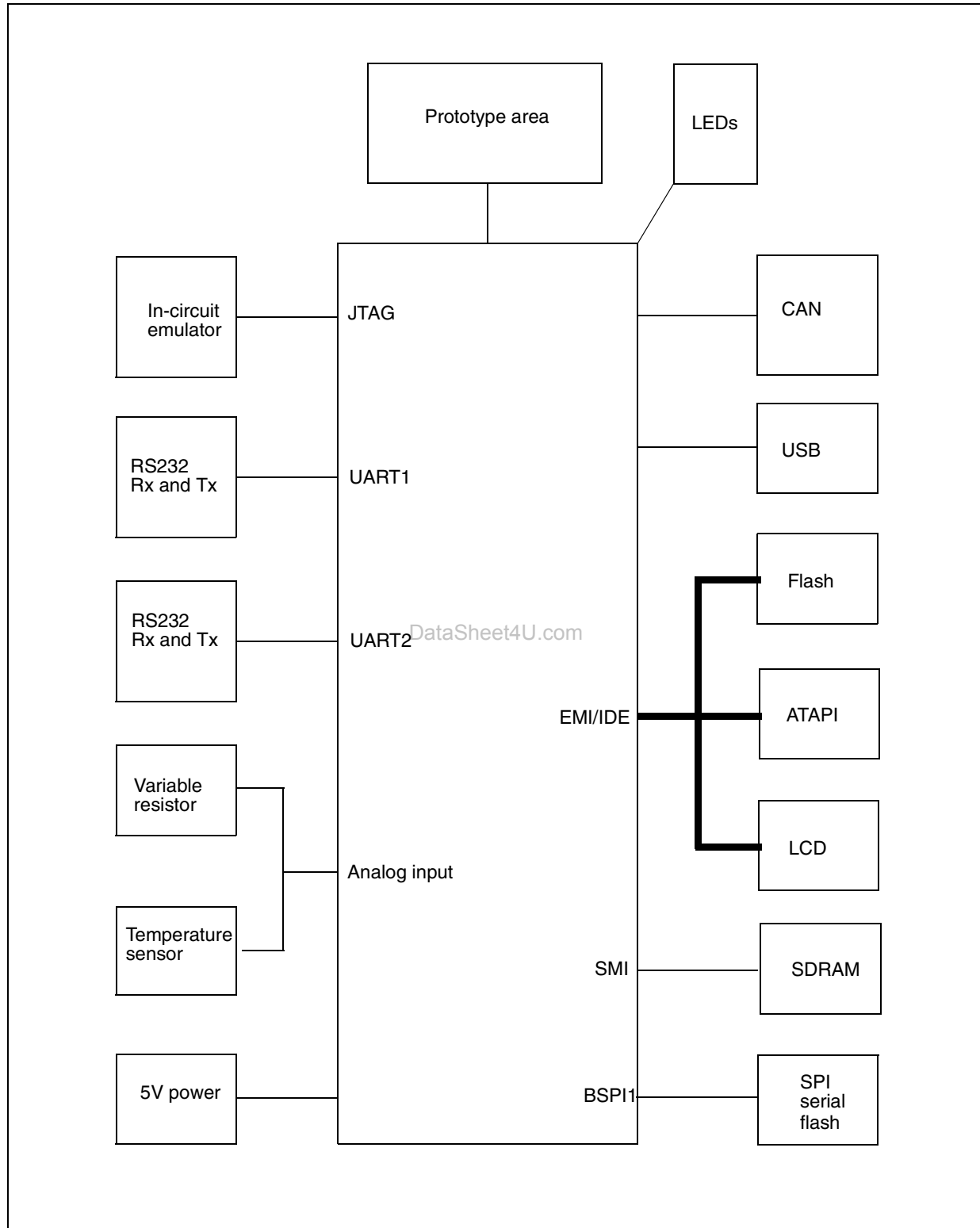


Figure 2. STR720-EVAL board system block diagram



## 2.1 Overview

The STR720-EVAL board is a general purpose evaluation platform with ATAPI, USB, CAN (controller area network) and RS232 interfaces.

## 2.2 Processor

The board supports the STR720 ARM720T™ silicon - 208-pin PQFP version. This chip runs at a frequency of 66 MHz.

Boot modes and configuration options are set using microswitches, see [Section 2.15: Option switch settings on page 12](#)

## 2.3 Debug

Software debug is performed using a standard 20-pin JTAG connection. This may connect to a JTAG in-circuit emulator.

## 2.4 Prototype area

A 2.54x2.54mm gridded area of 1mm holes is available for prototyping using wire wrap or similar prototyping techniques.

## 2.5 Reset

The reset sources are:

- power on reset,
- push button reset,
- JTAG reset from an in-circuit emulator.

## 2.6 Memory

**Table 1. STR720-EVAL board SDRAM memory map**

Region	Usage	Memory map used
-	SDRAM	0xA000 0000 - 0xA0FF FFFF

**Table 2. STR720-EVAL board EMI memory map**

Region	Usage	Memory map used
3	EMI	0x4000 0000 - 0x5FFF FFFF
2	flash	0x4000 0000 - 0x403F FFFF
1	LCD	0x4040 0000 - 0x407F FFFF



## 2.7 Power supplies

Power to the board is supplied using a lump in cord power supply providing 5 V to the board. All other required voltages are provided on-board by voltage regulators or voltage convertors.

## 2.8 USB full speed interface

USB full speed interface device supported by a type B connector. The USB clock uses a separate 48 MHz oscillator. See [Section 3.1: USB on page 14](#).

## 2.9 CAN interface

A general purpose, asynchronous serial I/O data port connected through a 9-pin D-type male connector with microswitch selectable low speed fault tolerant transceiver (L9669) or low or high speed selectable transceiver (L9616). See [Section 3.2: CAN bus connector on page 14](#).

The L9669 transceiver only works in normal mode, the wake-up functionality is not implemented.

**Caution:** The board schematic for the CAN interface detailed in [Section 4.10: STR720-Eval board - CAN interface](#), is not a reference design and should not be copied. To design a CAN interface with the STR720 please refer to the “STR720 Hardware Development Getting Started Guide AN1907”.

## 2.10 RS232 serial interfaces

Two general purpose, asynchronous serial I/O data ports are connected through 9-pin D-type male connectors. Refer to [Section 3.3: RS232 serial data connector on page 15](#).

RS232-A connects directly to UART1, transmit and receive only. RS232-B connects to UART2, transmit and receive only.

RTS is shorted to CTS and DTR is shorted to DSR at the connector for both interfaces.

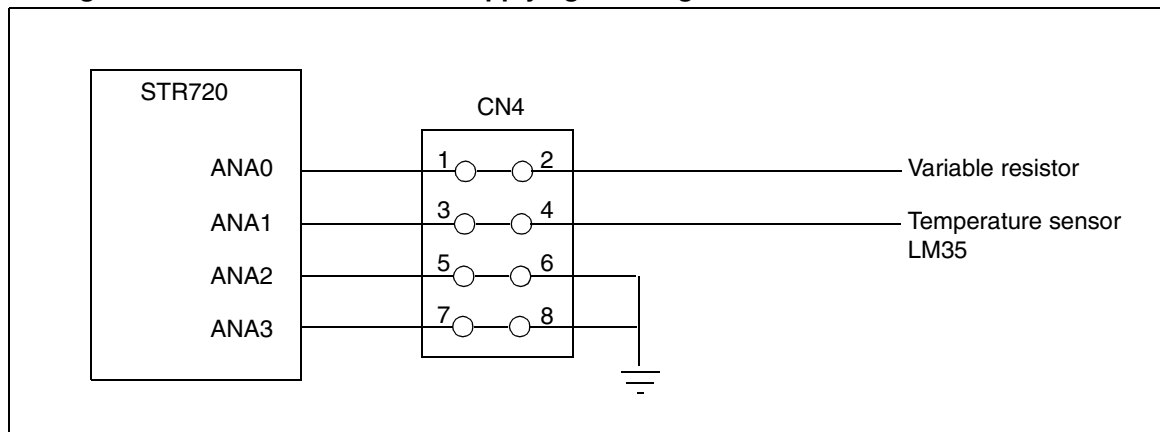
## 2.11 Analog input

The following analog inputs are provided, see the schematics [Section 4.1 on page 18](#):

- ADC connector: CN4,
- LM35 temperature sensor IC4 is connected to pin 4 of the ADC connector CN4 (pins 3 and 4 must be shorted to enable temperature sensing,)
- variable resistor VR1 is connected to pin 2 of the ADC connector CN4 (pins 1 and 2 must be shorted to enable the variable resistor.)

If pins 5 and 7 are not used they should be shorted to pins 6 and 8 respectively. Alternatively the analog inputs can be used directly by removing the shorting and connecting the signal to be sampled to links 1, 3, 5 or 7, see [Figure 3](#).

**Figure 3. ADC connector CN4: applying shorting**



## 2.12 LEDs

### Software controlled LEDs

The (red) LEDs in [Table 3](#) are software controlled by PIO pins. See the schematic in [Section 4.1 on page 18](#).

**Table 3. Software controlled LEDs**

LED	Signal name
LD5	LED_P3_7
LD6	LED_P3_11
LD7	LED_P3_12
LD8	LED_P4_1
LD9	LED_P4_2
LD10	LED_P4_3
LD11	LED_P4_4
LD12	LED_P3_0
LD13	LED_P3_1
LD14	LED_P3_2
LD15	LED_P3_3
LD16	LED_P3_4
LD17	LED_P3_5

## Status LEDs

**Table 4. Status LEDs**

LED	Description	Schematic	Color
LD1	+5 V	<a href="#">Section 4.2 on page 19</a>	Red
LD2	+3.3 V	<a href="#">Section 4.2 on page 19</a>	Red
LD3	ATAPI HDD	<a href="#">Section 4.5 on page 22</a>	Yellow
LD4	reset indicator	<a href="#">Section 4.1 on page 18</a>	Red/green
LD18	USB indicator	<a href="#">Section 4.9 on page 26</a>	Yellow

## 2.13 Push buttons

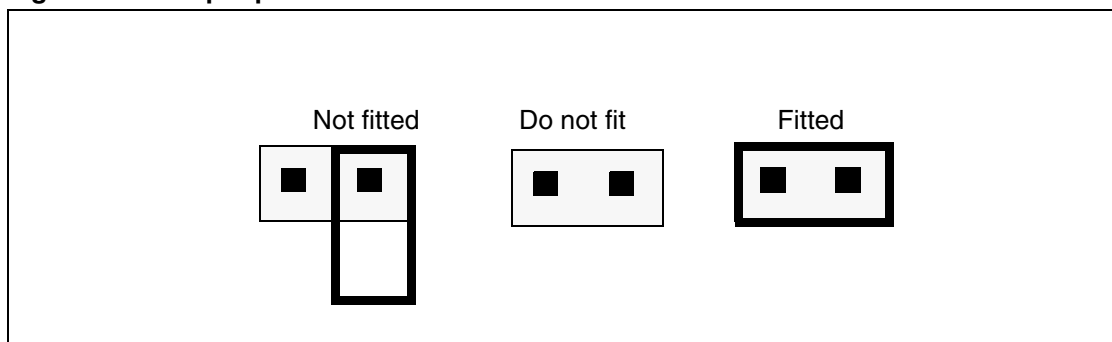
**Table 5. Status push buttons**

Button	Connected to	Schematic
Board reset SW1	power on reset	<a href="#">Section 4.8 on page 25</a>
Previous SW8	P3.10_EINT2	<a href="#">Section 4.1 on page 18</a>
Next SW9	P3.8_EINT0	<a href="#">Section 4.1 on page 18</a>
Select SW10	P3.9_EINT1	<a href="#">Section 4.1 on page 18</a>
RTC reset SW11	not RTC_reset	<a href="#">Section 4.1 on page 18</a>

## 2.14 Option jumper placement

Jumpers are fitted as shown in [Figure 4](#), the position of the jumpers on the board are shown in [Figure 5 on page 11](#).

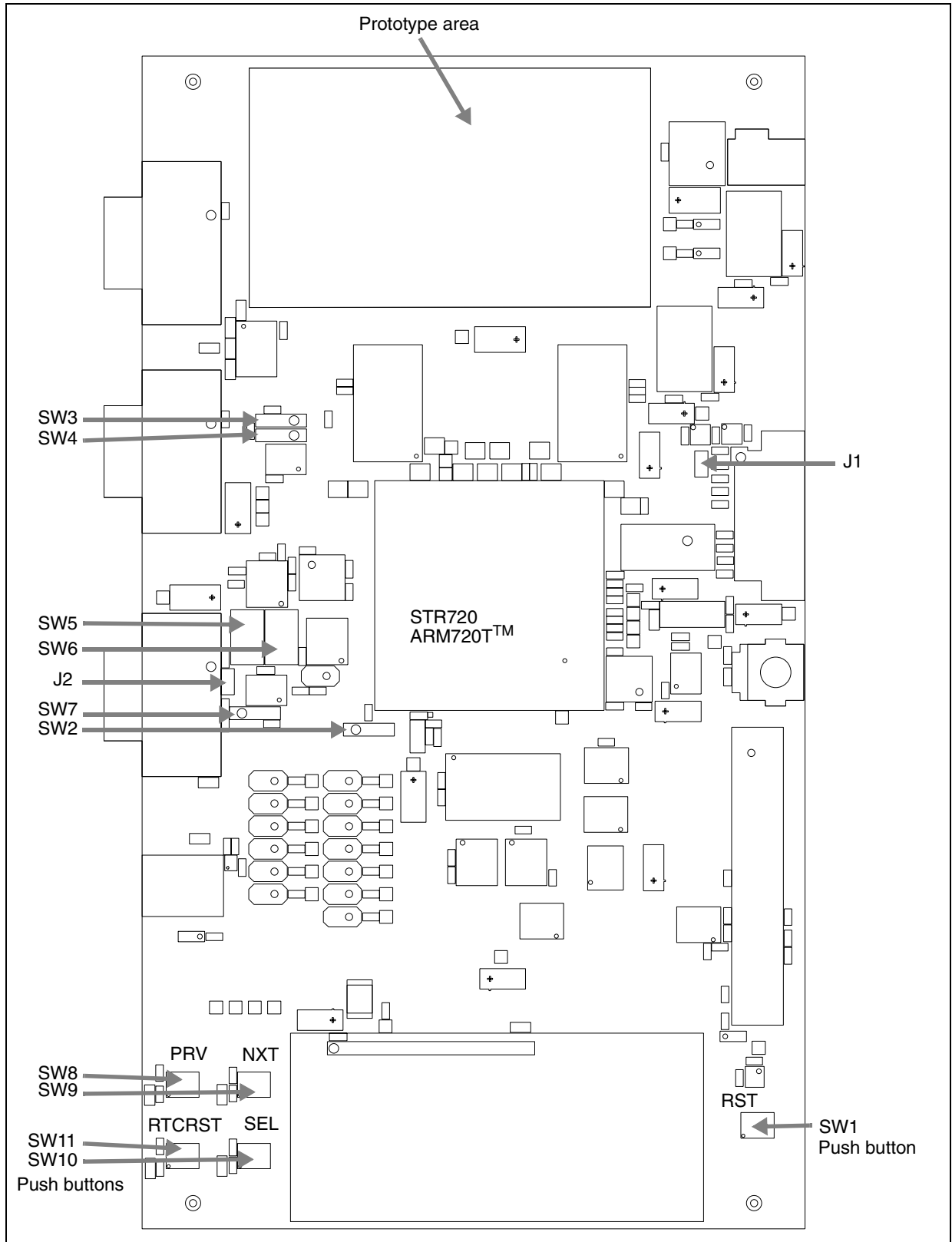
**Figure 4. Jumper positions**



**Table 6. Option jumpers**

Jumper	Figure	Description	Default
J1	<a href="#">Section 4.8 on page 25</a>	notRST to notJTRST connect: fitted = enabled, not fitted = disabled	Fitted
J2	<a href="#">Section 4.10 on page 27</a>	CAN loopback link: not fitted / fitted (default)	Not fitted

Figure 5. Option jumpers resistors and switches



## 2.15 Option switch settings

For switch position details, see [Figure 6](#).

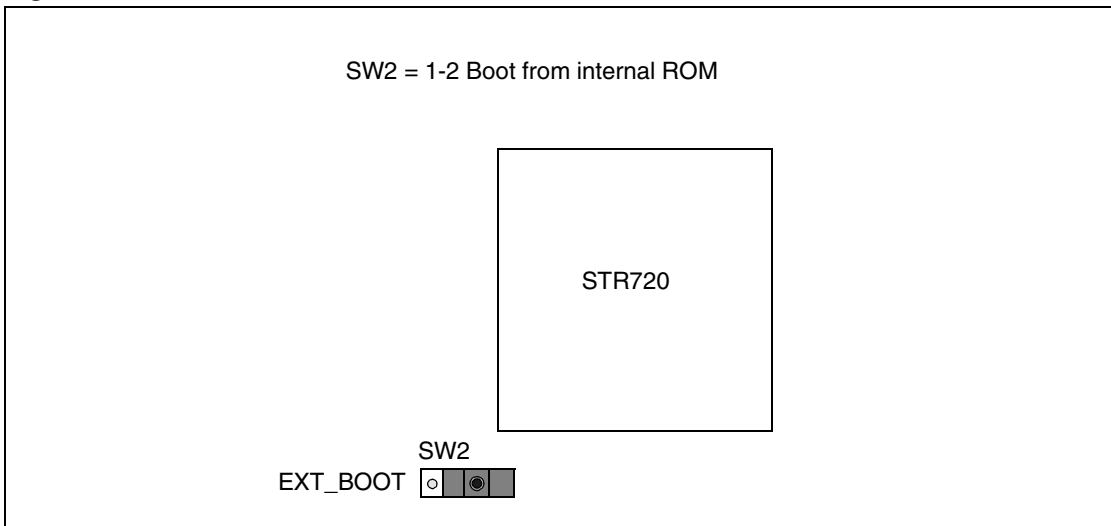
**Figure 6. Switch positions**



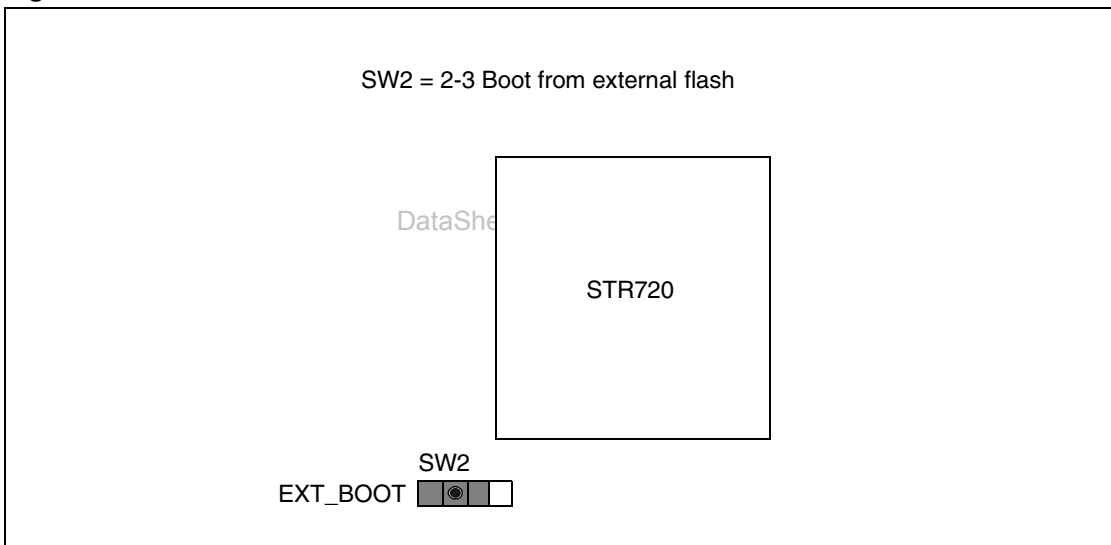
**Table 7. Option switch settings**

Switch	Schematic	Description	Default
SW1	<a href="#">Section 4.1 on page 18</a>	Reset	Push to make
SW2	<a href="#">Section 4.1 on page 18</a>	Boot mode: 1-2 = Boot from internal ROM 2-3 = Boot from external flash See <a href="#">Figure 7</a> and <a href="#">Figure 8 on page 13</a> .	2-3
SW3	<a href="#">Section 4.11 on page 28</a>	SPI flash notW: 1-2 = Active 2-3 = Inactive	2-3
SW4	<a href="#">Section 4.11 on page 28</a>	SPI flash notHOLD: 1-2 = Active 2-3 = Inactive	2-3
SW5	<a href="#">Section 4.10 on page 27</a>	CAN transceiver select: L9669 / L9616 (default) Note SW5 and SW6 must be changed together. 1 = L9669 A = L9616	1
SW6			1
SW7	<a href="#">Section 4.10 on page 27</a>	L9616 ASC speed: 1-2 = pull down = high speed 2-3 = pull up = low speed	2-3
SW8	<a href="#">Section 4.1 on page 18</a>	Previous	Push to make
SW9	<a href="#">Section 4.1 on page 18</a>	Next	Push to make
SW10	<a href="#">Section 4.1 on page 18</a>	Select	Push to make
SW11	<a href="#">Section 4.1 on page 18</a>	RTC reset	Push to make

**Figure 7. SW2 boot from internal ROM**



**Figure 8. SW2 boot from external flash**



## 3 Connectors

### 3.1 USB

Figure 9. USB-B connector: CN3

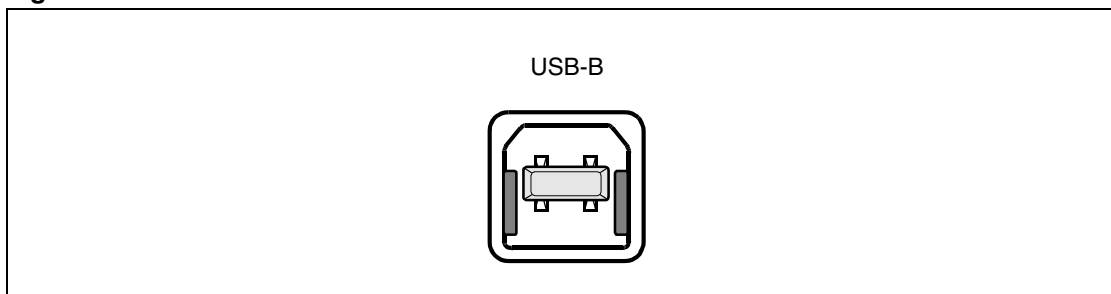


Table 8. USB-B connector pinout: CN3

Pin	Description
1	VBUS
2	DM
3	DP
4	GND

### 3.2 CAN bus connector

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Figure 10. CAN connector 9 pin male D-type: CN4

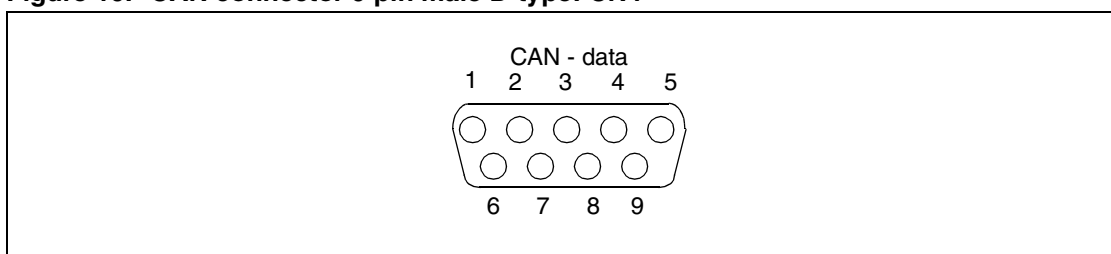


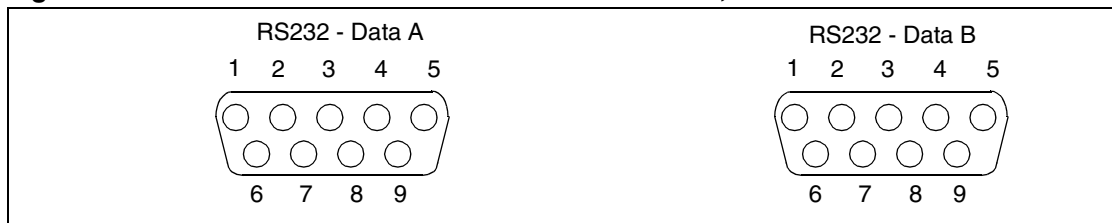
Table 9. CAN connector pinout: CN4

Pin	Description	Pin	Description	Pin	Description
1	Not connected	4	Not connected	7	CAN H, high side bus output
2	CAN L, low side bus output	5	Not connected	8	Pull down to GROUND
3	Ground	6	GROUND	9	Pull up to +3V3

### 3.3 RS232 serial data connector

9-pin general purpose D-type male connectors

**Figure 11. RS232 transmit and receive connectors: CN7, CN8**

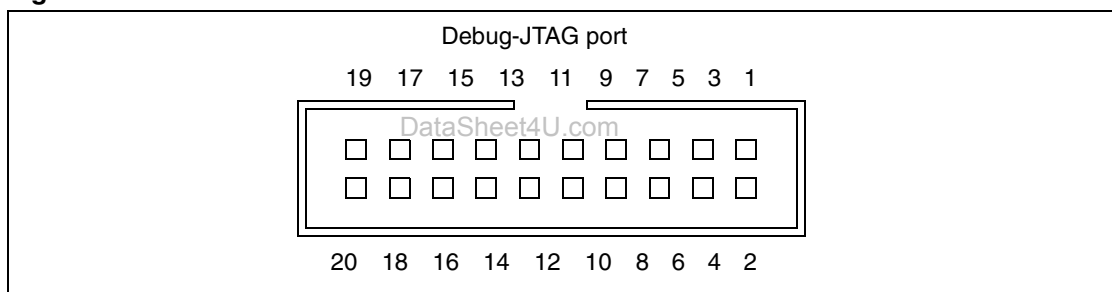


**Table 10. RS232 connector pinout: CN7, CN8**

Pin	Description	Pin	Description	Pin	Description
1	Shorted to pin 4 and 6	4	Shorted to pin 1 and 6	7	Shorted to pin 8
2	R1IN (port A), R2IN (port B)	5	GROUND	8	Shorted to pin 7
3	T1OUT (port A), T2OUT (port B)	6	Shorted to pin 1 and 4	9	Not connected

### 3.4 Debug

**Figure 12. JTAG standard interface: CN9**



**Table 11. JTAG interface pinout: CN9**

Pin	Description	Pin	Description
4, 6, 8, 10, 12, 14, 16, 18, 20	GROUND	9	TCK
1	VTref+3.3 V	11	RTCK (GROUND)
2	Vsupply +3.3 V	13	TD0
3	notTRST	15	notReset
5	TDI	17	DBGQRS pulled low
7	TMS	19	DBGACK pulled low



### 3.5 ATAPI interface

Figure 13. ATAPI interface: CN3

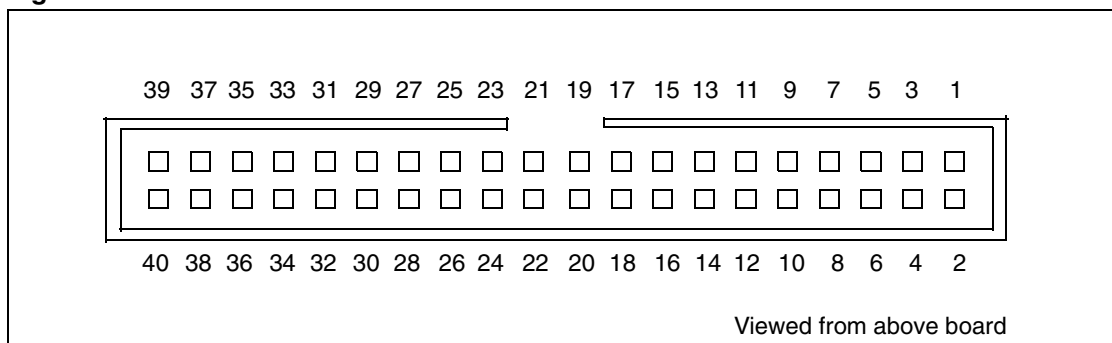


Table 12: ATAPI interface connector: CN3

Pin	Assignment	Pin	Assignment
1	notRESET	2	ground
3	ddata7	4	ddata8
5	ddata6	6	ddata9
7	ddata5	8	ddata10
9	ddata4	10	ddata11
11	ddata3	12	ddata12
13	ddata2	14	ddata13
15	ddata1	16	ddata14
17	ddata0	18	ddata15
19	ground	20	reserved
21	dmarq	22	ground
23	notDIOW	24	ground
25	not_DIOR	26	ground
27	iordy	28	spsync_csel
29	not_DMACK	30	ground
31	intrq	32	not_IOCS16
33	DA1	34	pdiag
35	DA0	36	DA2
37	notCS0	38	notCS1
39	notDASP	40	ground

### 3.6 ADC input

Figure 14. ADC input connector: CN4

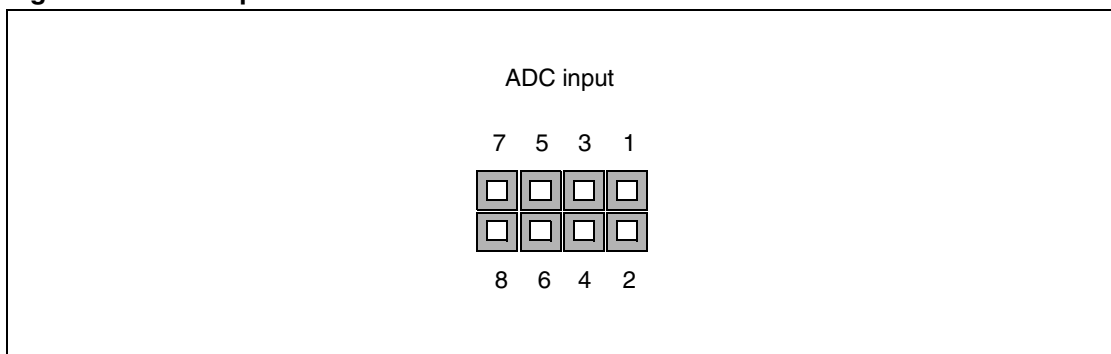
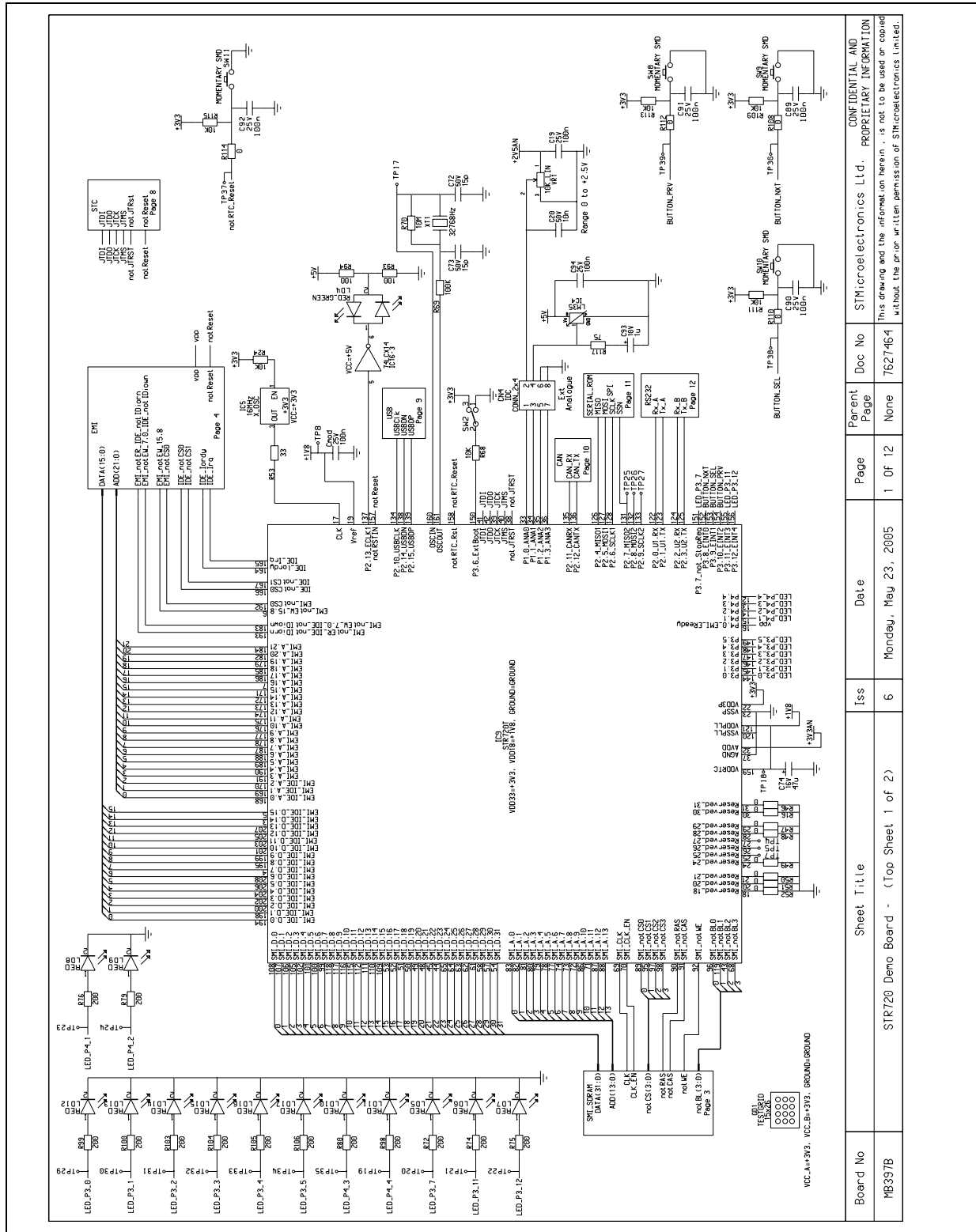


Table 13. ADC interface pinout: CN4

Pin	Description	Pin	Description
1	ANA0	5	ANA2
2	Variable resistor output	6	GROUND
3	ANA1	7	ANA3
4	Temperature sensor output	8	GROUND

# 4 Schematics

## 4.1 STR720-EVAL board top sheet 1 of 2

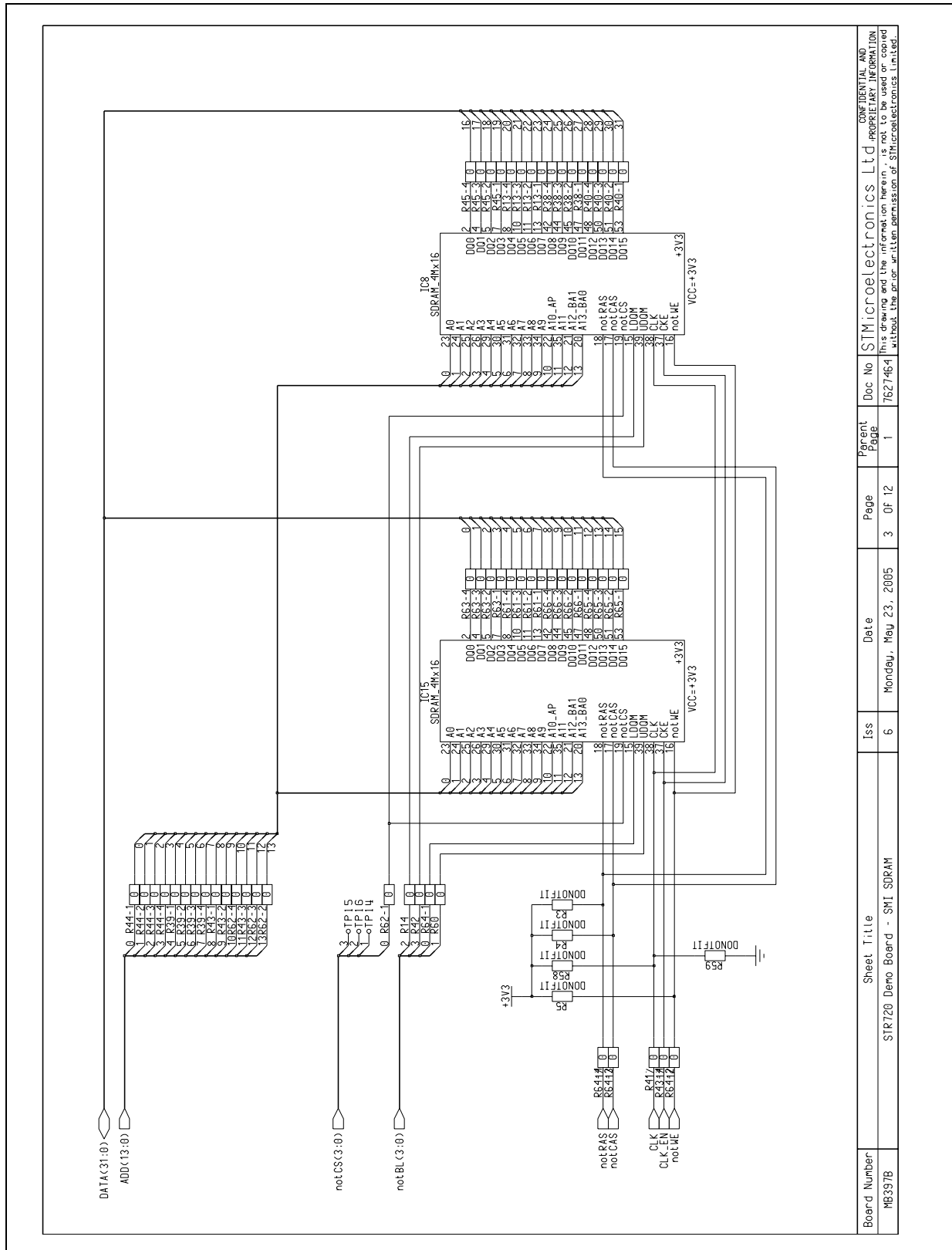


Board No	Sheet Title	Iss	Date	Page	Parent Page	Doc No	CONFIDENTIAL AND PROPRIETARY INFORMATION
MB397B	STR720 Demo Board - (Top Sheet 1 of 2)	6	Monday, May 23, 2005	1 of 12	None	7627464	This drawing and the information herein is not to be used or copied without the prior written permission of STMicroelectronics limited.



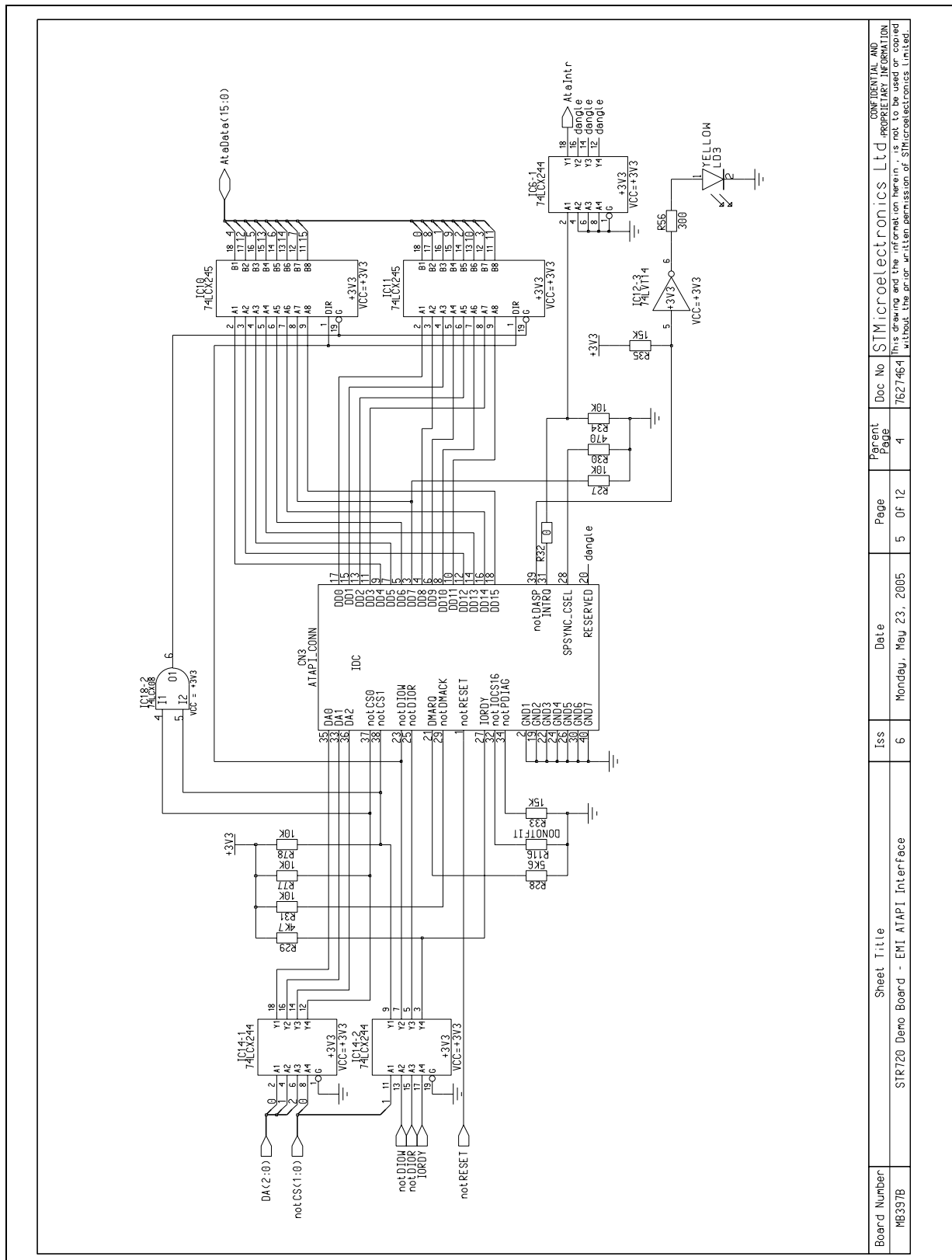


### 4.3 STR720-Eval board - SMI SDRAM





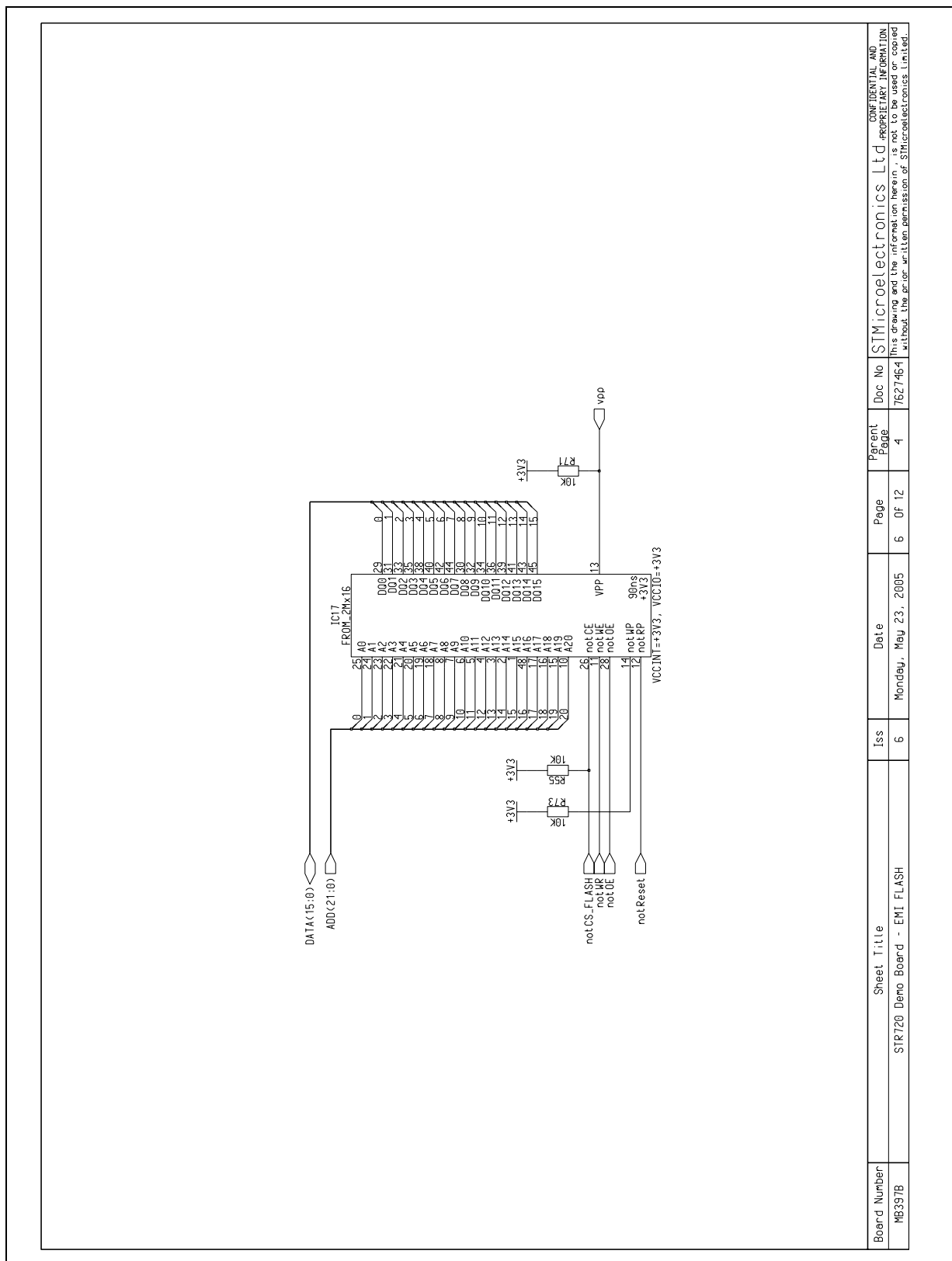
### 4.5 STR720-Eval board - EMI ATAPI interface



Board Number	MB337B	Sheet Title	STR720 Demo Board - EMI ATAPI Interface	Iss	6	Date	Monday, May 23, 2005	Page	5 of 12	Parent Page	4	Doc No	7627461	CONFIDENTIAL AND PROPRIETARY INFORMATION
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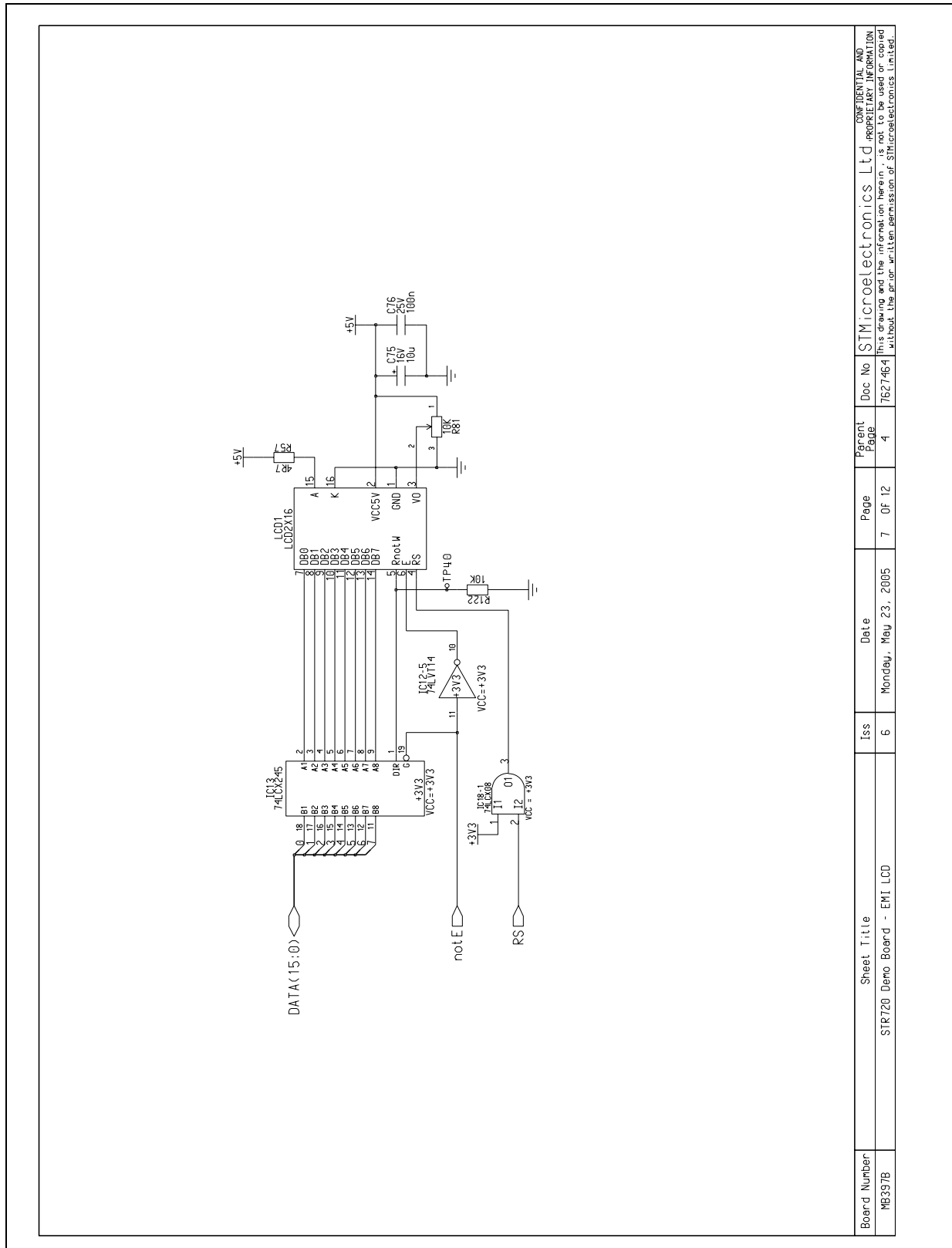


### 4.6 STR720-Eval board - EMI flash





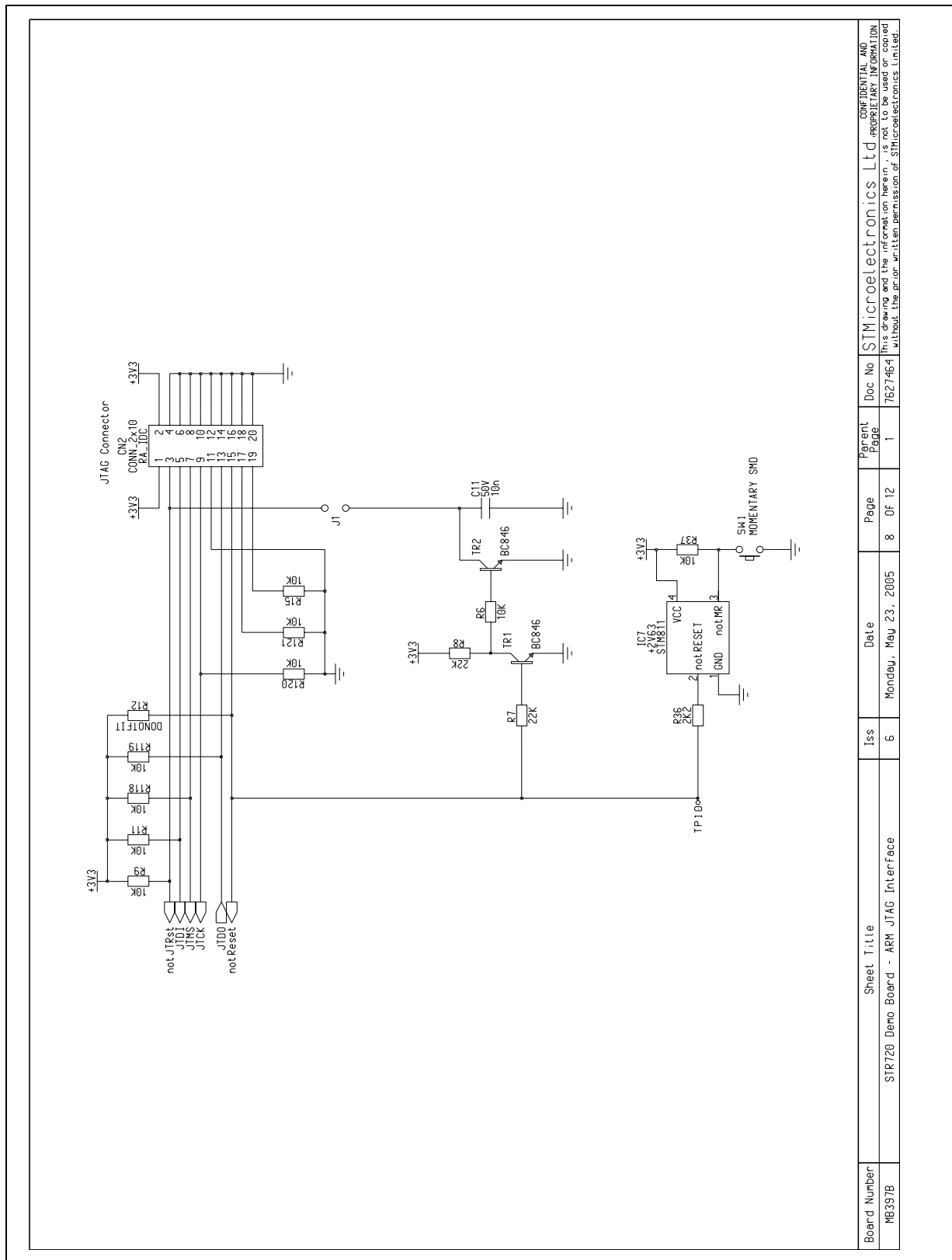
### 4.7 STR720-Eval board - EMI LCD



Board Number	MB337B	Sheet Title	STR720 Demo Board - EMI LCD	Iss	6	Date	Monday, May 23, 2005	Page	7 of 12	Percent Page	4	Doc No	7627464	Doc No	7627464	STMicroelectronics Ltd	CONFIDENTIAL AND PROPRIETARY INFORMATION
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### 4.8 STR720-Eval board - ARM JTAG interface

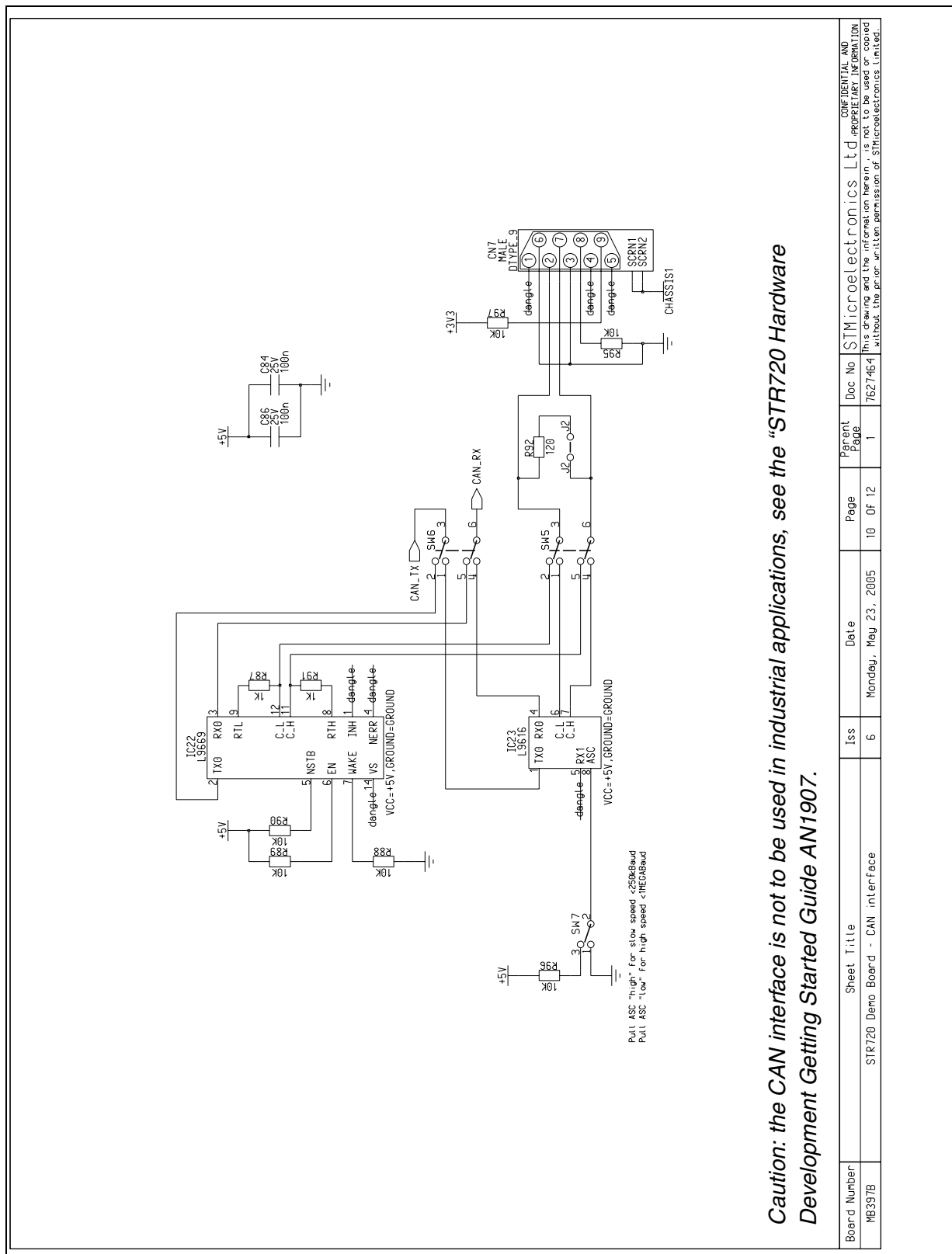


Board Number	MB397B	Sheet Title	STR720 Demo Board - ARM JTAG Interface	Iss	6	Date	Monday, May 23, 2005	Page	8 OF 12	Parent Page	1	Doc No	7527454	CONFIDENTIAL AND PROPRIETARY INFORMATION. This drawing and the information herein is not to be used or copied without the prior written permission of STMicroelectronics Limited.
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### 4.10 STR720-Eval board - CAN interface



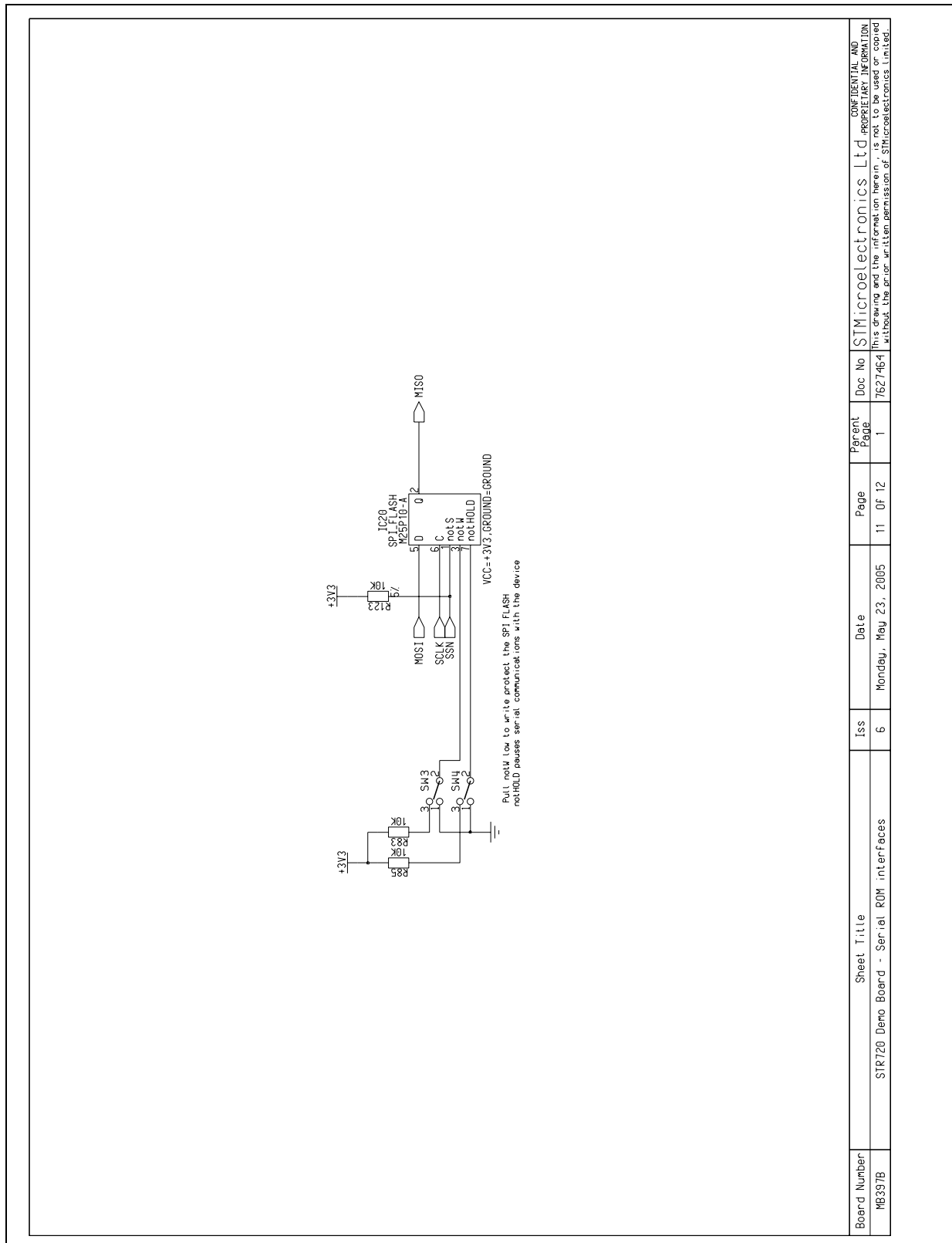
**Caution: the CAN interface is not to be used in industrial applications, see the "STR720 Hardware Development Getting Started Guide AN1907."**

Board Number	MB337B	Sheet Title	STR720 Demo Board - CAN interface	Iss	6	Date	Monday, May 23, 2005	Page	10 Of 12	Parent Page	7627464	Doc No	7627464	Doc No	7627464	Doc No	7627464	Doc No	7627464
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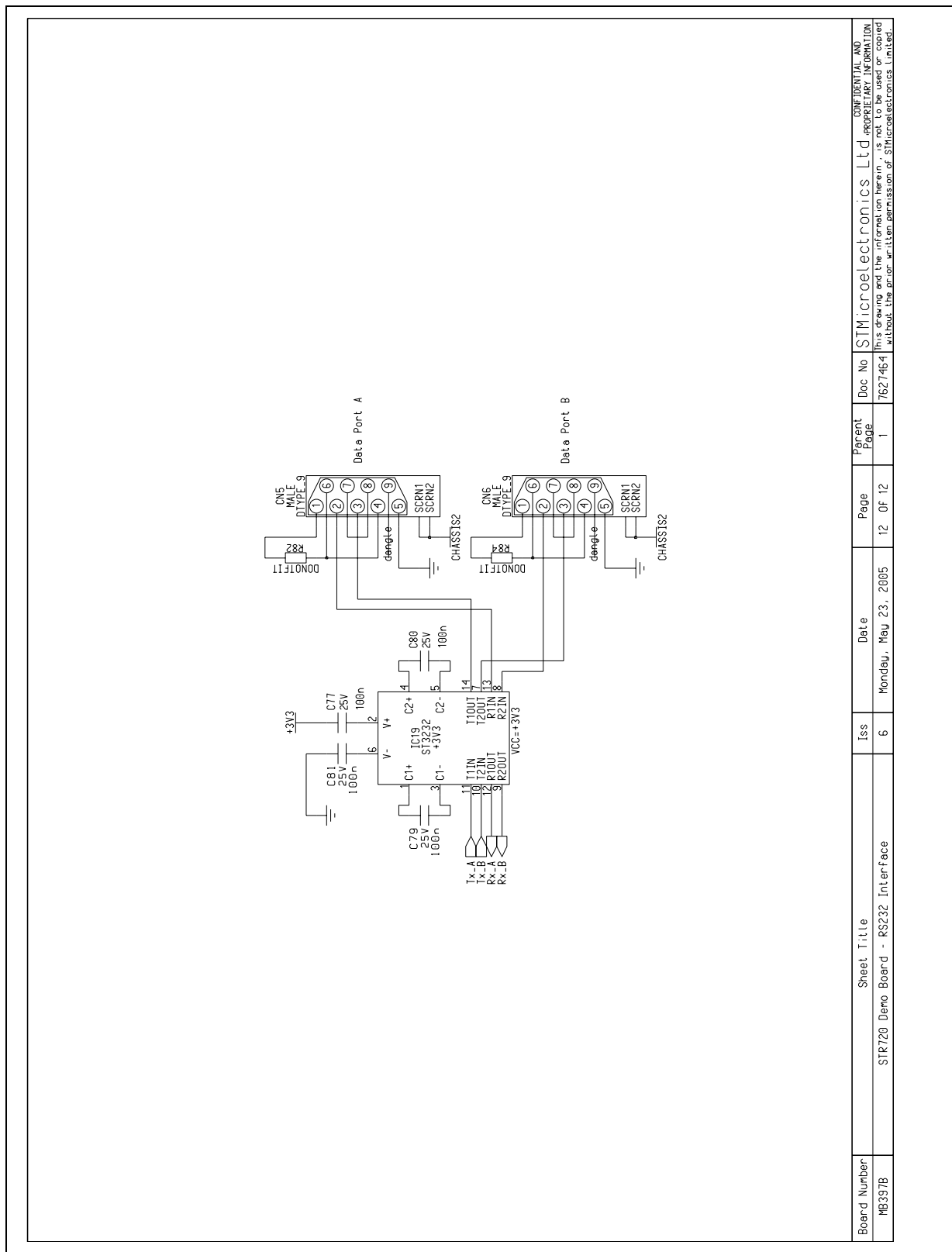
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### 4.11 STR720-Eval board - serial flash interfaces



### 4.12 STR720-Eval board - RS232 interface



## 5 Revision history

Date	Revision	Changes
26-September-2005	1	Initial external release.
4-October-2005	2	<p>Page 1 - Updated image.</p> <p><i>Figure 2: STR720-EVAL board system block diagram on page 6</i> - correction.</p> <p><i>Section 2.3: Debug on page 7</i> - correction.</p> <p><i>Section 2.8: USB full speed interface on page 8</i> - correction to SDRAM and LCD.</p> <p><i>Section 2.8: USB full speed interface on page 8</i> - rephrased.</p> <p><i>Section 2.9: CAN interface on page 8</i> - expanded and added caution.</p> <p><i>Section 2.15: Option switch settings on page 12</i> - correction to SW2.</p> <p><i>Section 3.4: Debug on page 15</i> - clarification for even pins.</p> <p><i>Chapter 4: Schematics</i> updated revision and <i>Section 4.9: STR720-Eval board - USB interface on page 26</i> and <i>Section 4.10: STR720-Eval board - CAN interface on page 27</i> detail design changes.</p> <p><i>Section 4.1: STR720-EVAL board top sheet 1 of 2 on page 18</i> is updated with ClkVref pin19 connected to +1.8 V including decoupling cap.</p> <p>Removed list of third party vendors from the description.</p>

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