ST9 FAMILY

ST92163 DEMO BOARD

USER MANUAL

Release 1.0

June 1999

DOC- ST92163 DEMO BOARD

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ST92163

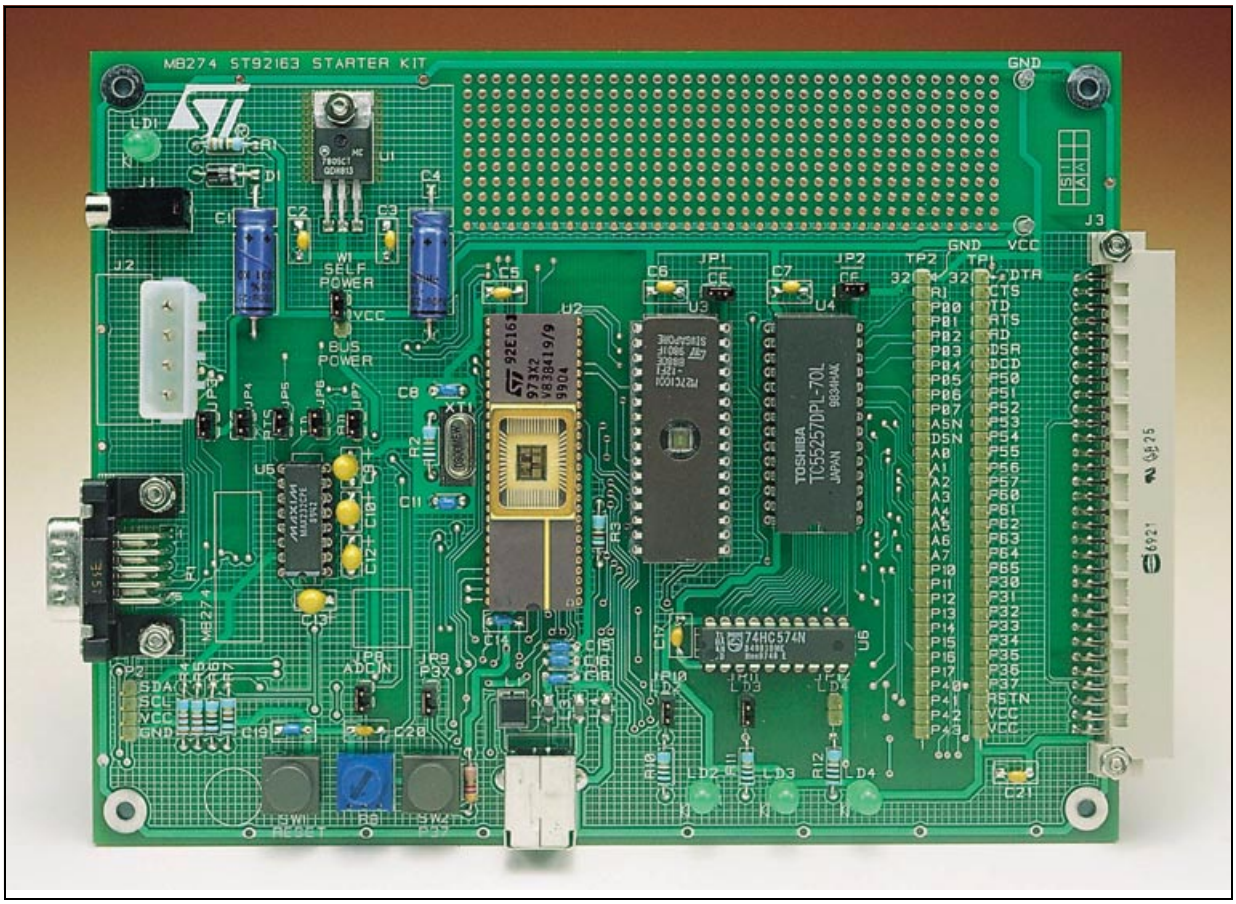
DEMO BOARD

1 INTRODUCTION

The objective of this Demo Board is to provide the user with a hardware platform for rapid development of an USB application with the ST92163 microcontroller. Starting from this ST92163 Demo Board, the developer can add his own application by using the wrapping area or with a daughter board connected via the 64 pin connector.

To help developers get familiar with USB applications, an example is provided and programmed in the ST92E163. After setting some jumpers, as described in chapter 3, the user can plug the ST92163 Demo Board to the PC with the USB cable and dialogue with the ST Demo Board software via different HID transfers.

Figure 1. ST92163 DEMO BOARD



Rev. 1.0

Table of Contents

The following items are supplied in this package:

– ST92163 Demo Board.

– ST92E163 programmed with a HID transfer demonstration.

– User manual (this document).

– Floppy disk with the ST Demo Board software need to use the HID transfer demonstration.

– ST92163 Datasheet.

– ”ST9 8/16-BIT MCU FAMILY” CD ROM.

– USB cable.

2 ST92163 DEMO BOARD CHARACTERISTICS

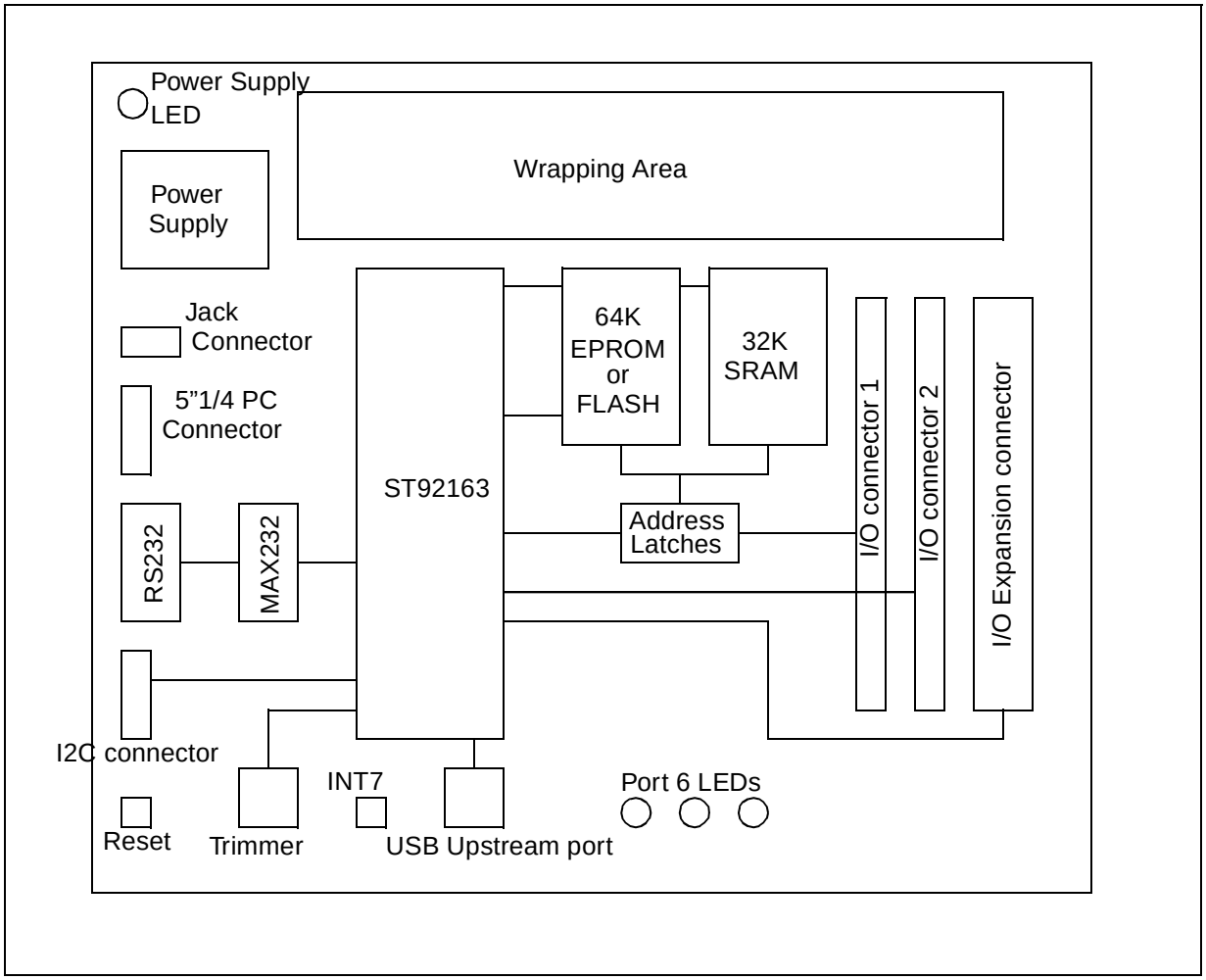
This ST92163 Demo Board has been designed to offer to developer a wide range of possibilities for developing his specific application as fast as possible.

The following chapters describe all the characteristics of the ST92163 Demo Board.

2.1 HARDWARE FEATURES

The figure 2 shows the ST92163 Demo Board block diagram with all the components usable on this board.

Figure 2. ST92163 Demo Board synoptic



2.2 FEATURES AND FUNCTIONS DESCRIPTION

2.2.1 RESET BUTTON

A reset button is provided for resetting the ST92163 microcontroller. The inverted reset signal is available to the user via pin 30 of the I/O expansion connector.

2.2.2 RS232 CONNECTOR

The ST92163 Demo Board has one DB9 male connector and uses a standard RS232 cable for communication between the ST92163 microcontroller and an external peripheral or a PC.

The following jumper configuration allows the developer to connect RS232 signals directly to the ST92163 microcontroller . Note that all DB9 connector (P1) signals are available via the I/O expansion connector (pins 1 to 7 and pin 34) and via the I/O connectors TP1 (pins 26 to 32) and TP2 (pin 31).

Furthermore the ST92163 Demo Board allows the use of special peripherals (RS232 mouse for example) by connecting the pin 7 of the DB9 connector to the VCC through a jumper (JP3).

Table 1. RS232 signal jumper configurations

jumper on	RS232 signal
JP3	RTS/VCC
JP4	CTS/P3.4
JP5	RTS/P3.1
JP6	TD/P3.0
JP7	RD/P3.5

2.2.3 I2C CONNECTOR

The ST92163 Demo Board has one connector (P2) for I2C communication.

The following table shows the correspondence between I2C connector pins and ST92163 microcontroller pins.

Table 2. I2C connector and ST92163 pin correspondence

I2C connector pin	ST92163 pin
1	SDA/P6.0
2	SCL/P6.1
3	VCC (5V)
4	GND

2.2.4 TRIMMER

A trimmer (R8) let you exercise the Analog to Digital Converter. You only need to put a jumper on JP8 to connect the ADC IN pin (P6.2) to the trimmer.

2.2.5 LEDS

Three LEDs can be directly driven from microcontroller Port 6. They can be used to test the ST92163 I/Os. You only need to put jumpers on JP10, JP11 and JP12 to use the LEDs

The following table shows the correspondence between the LEDs and the Port 6 pins.

Table 3. Correspondence between LEDs and Port 6 pins

Port 6 pin	LED number
P6.3	LD2
P6.4	LD3
P6.5	LD4

2.2.6 I/O CONNECTOR

The two I/O connectors TP1 and TP2 allow you to probe or to connect all the microcontroller pins, the address latch outputs, the RS232 DB9 connector pins, VCC and GND.

The following table shows the correspondence between I/O connector pins and signals.

Table 4. I/O connectors TP1 and TP2 signals

Pins number	TP1 signals	TP2 signals
1	V_{CC}	P43
2	V_{CC}	P42
3	$\overline{RESET}$	P41
4	P37	P40
5	P36	P17
6	P35	P16
7	P34	P15
8	P33	P14
9	P32	P13
10	P31	P12
11	P30	P11
12	P65	P10
13	P64	A7
14	P63	A6
15	P62	A5
16	P61	A4
17	P60	A3
18	P57	A2
19	P56	A1
20	P55	A0
21	P54	DSN
22	P53	ASN
23	P52	P07
24	P51	P06
25	P50	P05
26	DCD	P04
27	DSR	P03
28	RD	P02
29	RTS	P01
30	TD	P00
31	CTS	RI
32	DTR	GND

2.2.7 I/O EXPANSION CONNECTOR

On the I/O expander (J3) it is possible to connect a daughter board to develop specific application. On this connector all the microcontroller's pins are available but the developer will find too the address latch outputs (pin 45 to 52), the RS232 DB9 connector pins (pin 1 to 7 and pin 34), VCC (pin 31 and 32) and GND (pin 33).

The table 5 shows the correspondence between I/O connector pins and signals.

Table 5. I/O expansion Connector signals

Pin number	Signal	Pin number	Signal
1A	DTR	1B	GND
2A	CTS	2B	RI
3A	TD	3B	P00
4A	RTS	4B	P01
5A	RD	5B	P02
6A	DSR	6B	P03
7A	DCD	7B	P04
8A	P50	8B	P05
9A	P51	9B	P06
10A	P52	10B	P07
11A	P53	11B	ASN
12A	P54	12B	DSN
13A	P55	13B	A0
14A	P56	14B	A1
15A	P57	15B	A2
16A	P60	16B	A3
17A	P61	17B	A4
18A	P62	18B	A5
19A	P63	19B	A6
20A	P64	20B	A7
21A	P65	21B	P10
22A	P30	22B	P11
23A	P31	23B	P12
24A	P32	24B	P13
25A	P33	25B	P14
26A	P34	26B	P15
27A	P35	27B	P16
28A	P36	28B	P17
29A	P37	29B	P40
30A	$\overline{\text{RESET}}$	30B	P41
31A	V_{CC}	31B	P42
32A	V_{CC}	32B	P43

2.2.8 EXTERNAL MEMORIES

To offer you more flexibility , two external memories can be used directly with the ST92163 DEMO BOARD. To use the 32K of RAM or the 64K EPROM or FLASH ROM you just have to put a jumper on the corresponding chip enable slot (JP2 for RAM and JP1 for EPROM/ FLASH).

The latch buffer (U4) is mandatory because the P0 port is multiplexed when you address external memory.

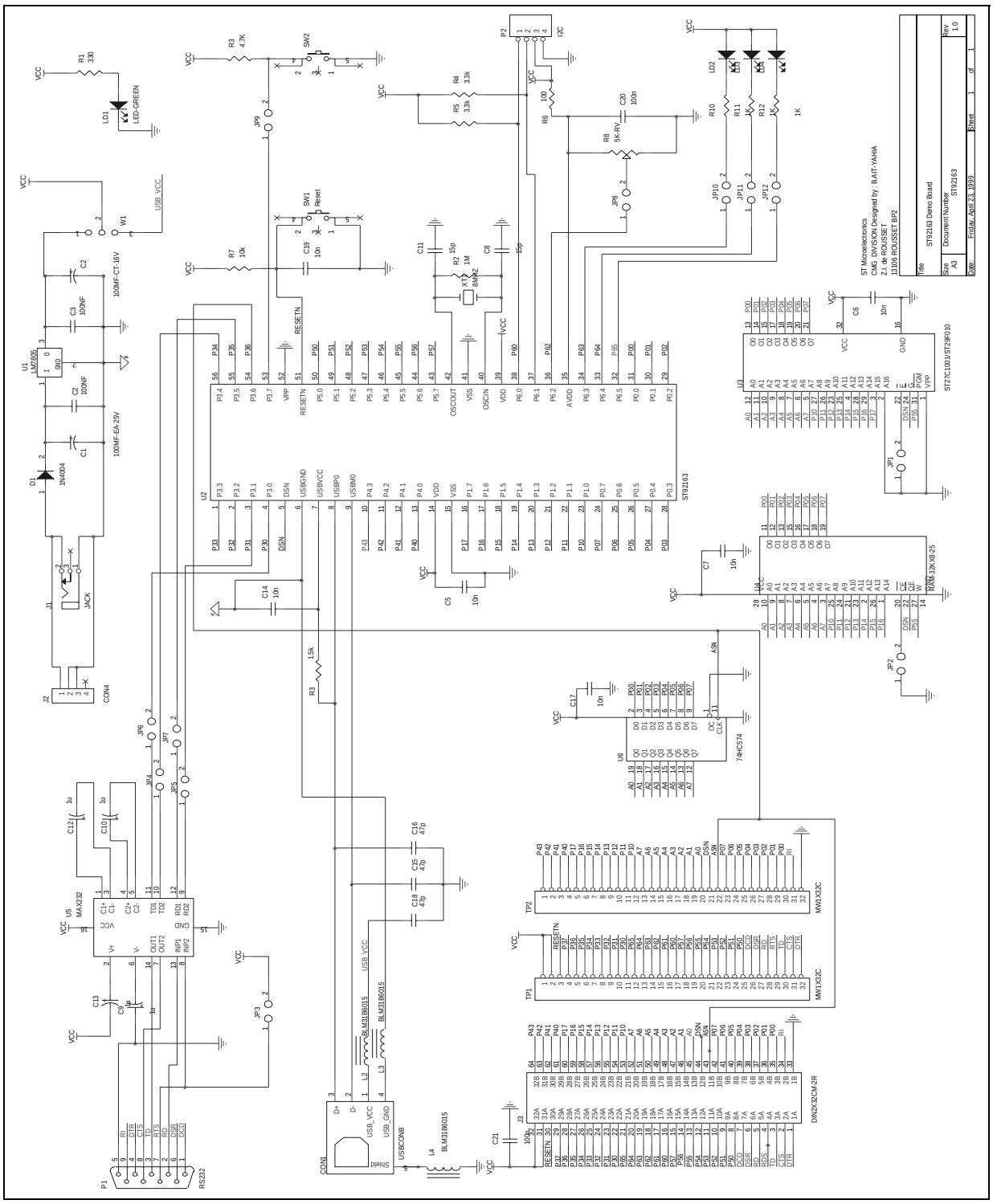
2.2.9 POWER SUPPLY CONNECTOR

The ST92163 Demo Board can be powered either through a jack allowing the use of an external AC/DC transformer or through the J2 connector allowing the power to be supplied from an internal PC 5”1/4 power supply connector.

Note that by using jumper W1, you can choose to power your board from the VCC supplied by on the on-board power supply (self power) or from the VCC supplied by the USB cable (bus power).

2.3 ST92163 DEMO BOARD SCHEMATIC

The following diagram shows the connection between the components of the ST92163 Demo Board .



2.4 BILL OF MATERIALS

The following table describes all components installed on the ST92163 Demo Board.

Table 6. Bill of Materials

Reference	Part	Usage
C1	100m (25V)	
C2	100n	
C3	100n	
C4	100m (25V)	
C5	1u	
C6	1u	
C7	1u	
C8	15p	
C9	1u pol	
C10	1u pol	
C11	15p	
C12	1u pol	
C13	1u pol	
C14	47p	
C15	47p	
C16	47p	
C17	1u	
C18	47p	
C19	10n	
C20	100n	
C21	100n	
JP1	Jumper	EPROM/FLASH CE
JP2	jumper	RAM CE
JP3	Jumper	DB9 pin7/ VDD
JP4	Jumper	CTS/P34
JP5	Jumper	RTS/P31
JP6	Jumper	TD/P30
JP7	jumper	RD/P35
JP8	Jumper	Trimmer/ADC IN
JP9	Jumper	SW2/P37
JP10	Jumper	LED 2
JP11	Jumper	LED 3
JP12	Jumper	LED 4
LD1	LED GREEN 5mm	LED power supply
LD2	LED GREEN 5mm	LED I/O Driven
LD3	LED GREEN 5mm	LED I/O Driven

Reference	Part	Usage
LD4	LED GREEN 5mm	LED I/O Driven
J1	Jack	AC/DC transformer
J2	5”1/4 power supply	PC power supply
J3	DIN2X32DM-2R	I/O expander
CON1	USB connector (B)	USB Upstream
P1	DB9 male	RS232
P2	Connector	I2C
W1	Jumper	USB or external power supply
D1	Zener Diode	
R1	330	
R2	1M	
R3	1.5K	
R4	3.3K	
R5	3.3K	
R6	100	
R7	3.3K	
R8	5K-RV	Trimmer
R9	4.7K	
R10	1K	
R11	1K	
R12	1K	
SW1	KSA Switch	Reset
SW2	KSA Switch	INT7
TP1	Connector	32-pin Header
TP2	Connector	32-pin Header
XT1	8 MHz	8 MHz Crystal
U1	LM7805	Power supply regulator
U2	ST92163	Microcontroller
U3	ST27C1001/ST29F010	External 1Mb EPROM/ FLASH
U4	TC55257-DPL	SRAM 552Kb
U5	MAX 232	Level shift
U6	74HC574	Address latch
L2	BLM31B6015	Iron inductor
L3	BLM31B6015	Iron inductor
L4	BLM31B6015	Iron inductor
L5	BLM31B6015	Iron inductor

3 ST92163 DEMO BOARD EXAMPLE

3.1 INTRODUCTION

In this package, a user friendly example for the ST92163 Demo board is programmed in the ST92E163 microcontroller. This example uses the ST92163 Demo Board as an Human Interface Device (HID) that dialogues with the dedicated “ST Demo Board” PC software.

The ST Demo Board Interface, shown figure 3, allows to display the following information :

– Available USB HID Device : All HID devices connected to the PC are shown in this window.

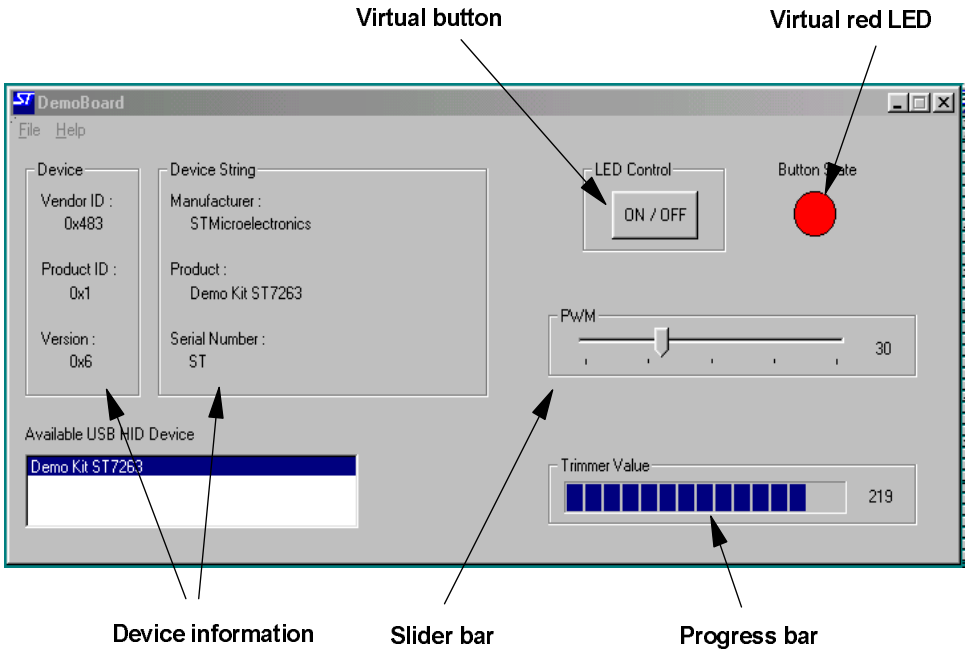
– Device information : This information, obtained during the enumeration phase, refers to the highlighted device in the “Available USB HID Device” window.

– Button State : This virtual red LED changes its state when the SW2 push-button of the ST92163 Demo Board is pressed.

– Trimmer Value :This value is the re sult of the Analog to Digital Conversion of the R8 trimmer output.

Furthermore, the ST Demo Board Interface allows to control the LD2 LED by clicking the “LED Control” virtual button and to change the PWM output value by moving the virtual slider bar.

Figure 3. ST DemoBoard User interface



3.2 INSTALLATION

The first step is to install the “ST Demo Board” software in your PC by using the setup.exe command on the floppy disk provided with this package.

After that, put jumpers on the following connectors:

– W1: Put the jumper between “VCC” and “BUS POWER” to enable the power supplied through the USB cable.

JP8: To connect the R8 trimmer to the ADCIN pin.

JP9: To connect the SW2 push-button to the P37 pin.

JP10: To command the LD2 led

. JP6 and JP7: To transmit TD and RD signals to the ST92E163 microcontroller.

To see the result of the “Slider bar” control, the PWM output pin (P53) has to be connected to the connector of the LD4 LED.

Note: When you plug the ST92163 DEMO BOARD with the programmed ST92E163 for the first time on your PC, “WINDOWS 98” requires some files. Insert your “WINDOWS 98” CD-ROM to provide these new drivers and click on the CD-ROM drive as shown below.

3.3 HID TRANSFER

When you plug in the ST92163 Demo Board, you obtain the information that the host retrieved after the device enumeration. It will be the VendorID, ProductID and Version Number (see USB 1.1 specification or later). Additionally as string information is supported, you can see the Manufacturer, Product and Serial Number displayed.

The Control Endpoint (endpoint 0) is used for the LED control and to change the PWM value.

An Interrupt Endpoint (endpoint 1), addressed each 20 ms, is used for the Trimmer Value and for the Button state.

3.4 USING THE EXAMPLE

3.4.1 START

Launch the “ST Demo Board” software. Plug the ST92163 Demo Board to the PC USB connector with the provided USB cable.

If the ST92163 Demo Board is plugged in for the first time see the note in chapter 3.2.

Afterthat, all the information concerning the device will be displayed in the “ST Demo Board” window.

3.4.2 Button State

If you push the button SW2 on the ST92163 Demo Board, it will toggle the virtual LED called Button State in the “ST Demo Board” window.

3.4.3 Trimmer Value

The trimmer (R8) position modification will transmit the new ADC value via the USB bus, and display it on the progress bar.

3.4.4 LED Control

On “ST Demo Board” software window click the virtual button and it will switch on the green led LD2 on the board. Clicking again will switch off.

3.4.5 PWM

The slider bar controls the brightness of the led LD4. Each slider bar value will be converted to a pulse width modulation (PWM) from microcontroller.

Notes: