Synnix™

Chip Card Interface Device
STD200

Feature:

- **Both USB and UART Interface**
  - Full speed bulk, control and interrupt transfer types compliant with USB specification
  - USB Suspend/Resume operations
  - On-Chip 3.3V USB voltage regulator
  - Software emulated UART
- **Smartcard interface specification compliant with ISO7816, GSM, EMV, and PC/SC (WHQL)**
- **Communication protocols compliant with CCID specification**
- **Built-in Step-up/down Converter**
  - Automatic recognize and access 5V/3V/1.8V (Class A, B, C) Smartcard
  - Current overload protection
- **Built-in ISO7816 UART**
  - Direct Connection to Smartcard Terminals
  - Automatic retry on parity error
  - Automatic character repetition on parity error
  - Card Clock Stop High or Low for Card Power-down Mode
  - Card Detection and Automatic De-activation Sequence
  - 4 KV ESD protection for all Smartcard Interface I/Os
- **Multi-protocols with smartcard:**
  - Access ISO 7816 asynchronous Smartcard T=0 /T=1 protocols
  - PTS management
  - Direct/Inverse conversion
  - Wide range communication baud rate up to 11.625 clock pulses (D=32/F=372)
  - IFSD adjustable
  - Full function of S-block: WTX, Abort, IFS
- **LED indication**
- **Package: 24 pin SO**

Application:

- Security & Identification
  - Smart card reader
  - Fingerprint Identifier
- Access control & E-Commerce
  - PC/ Notebook PC & PDA
- Banking & Payment system
  - ATM & EFT POS terminal
  - KIOSK & Vending machine
- Telecommunication & I.A
  - Set-top box &, Thin-Client
  - Pay-phone

The STD200 was developed to provide the designer with a single chip and low cost solution for smart card reader device offering a simple and easy way to connect to the smart cards. By using the STD200, the designer eliminates the task of assuring ISO 7816, GSM, EMV, PC/SC, and CCID specification compliance and the necessity of understanding smart card timing requirements when interfacing a smart card application.

Preliminary Product Information
Specifications are subject to change without prior notice
V1.03//2002/3/12

Figure 1. STD200 Block Diagram

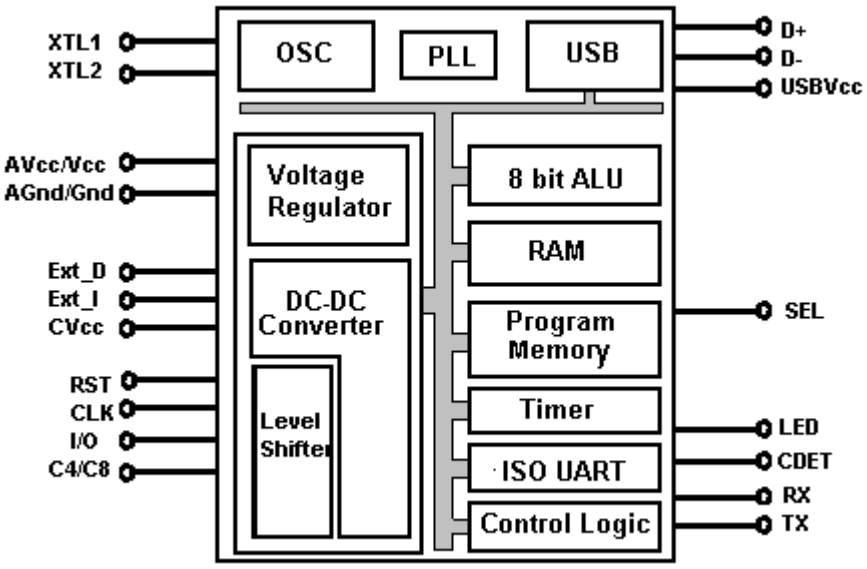
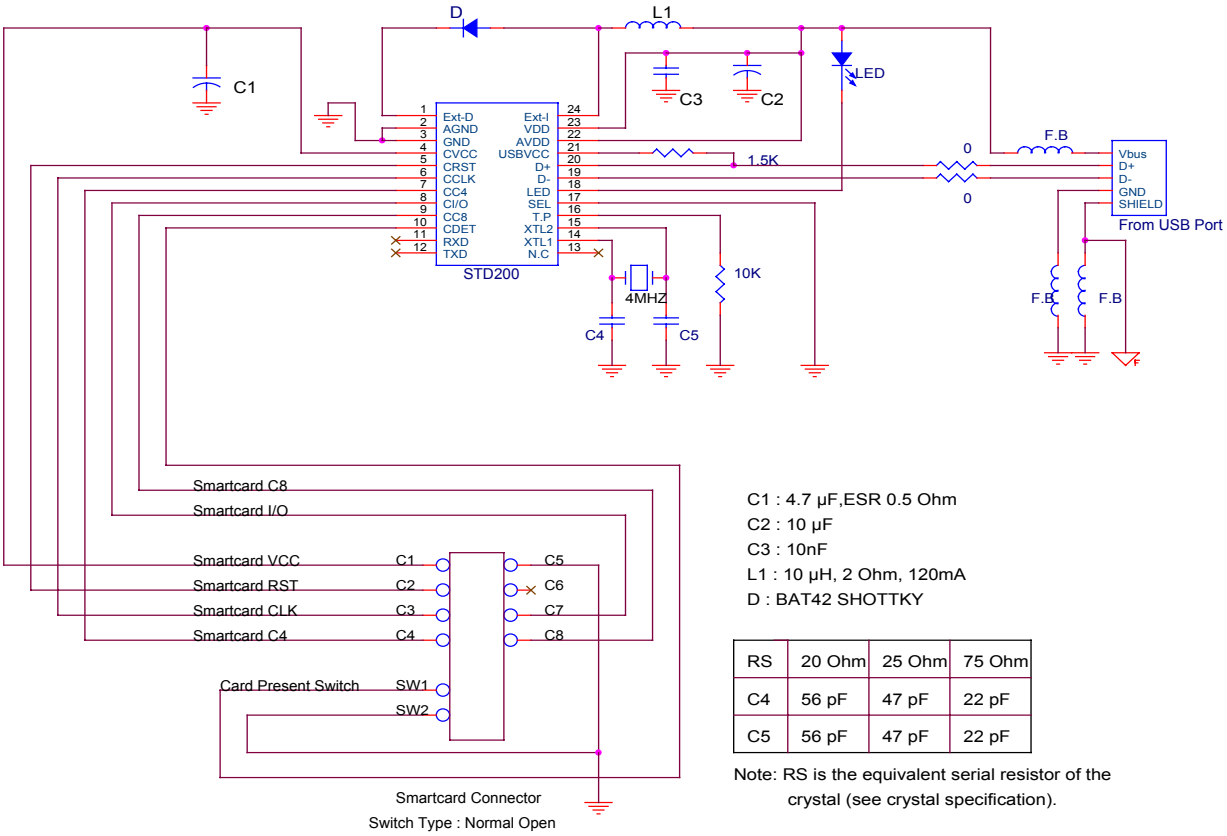


Figure 2. Reference Application: USB Interface Smartcard Reader

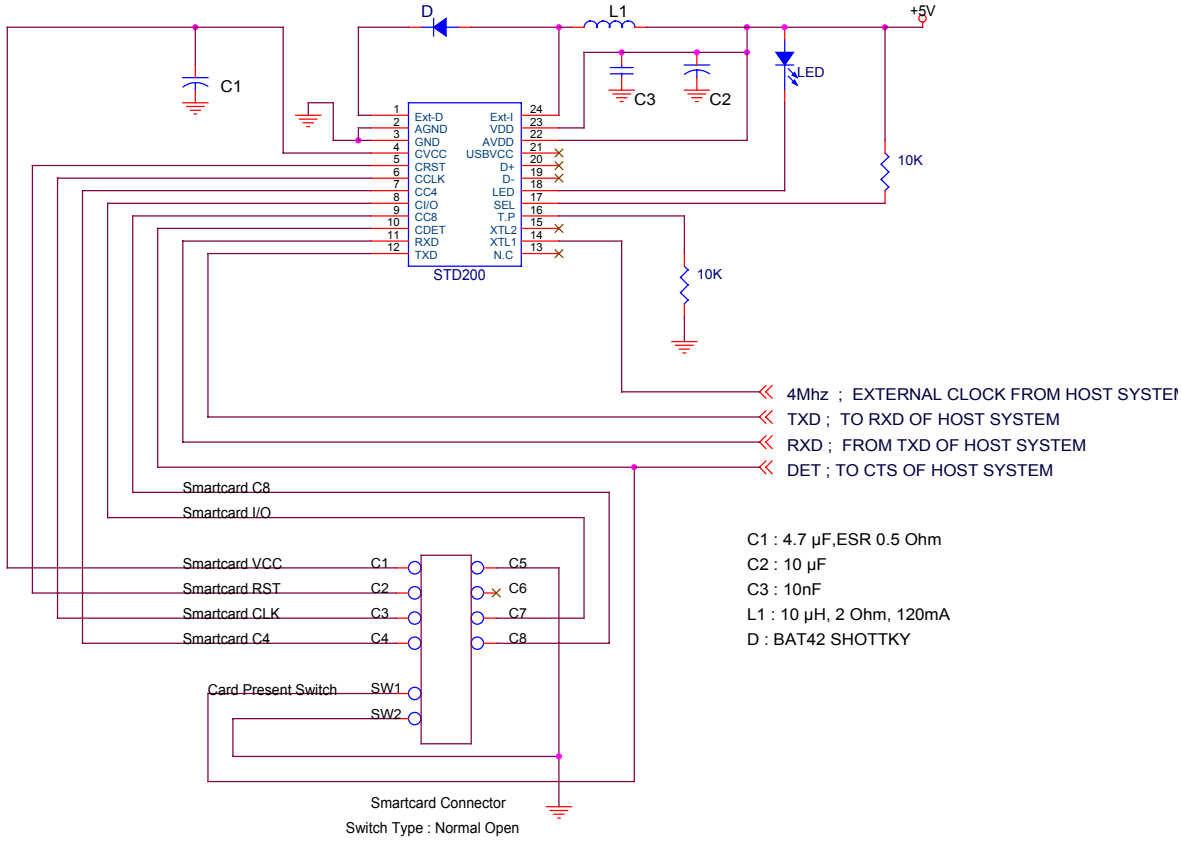


C1 : 4.7 µF,ESR 0.5 Ohm
C2 : 10 µF
C3 : 10nF
L1 : 10 µH, 2 Ohm, 120mA
D : BAT42 SHOTTKY

RS	20 Ohm	25 Ohm	75 Ohm
C4	56 pF	47 pF	22 pF
C5	56 pF	47 pF	22 pF

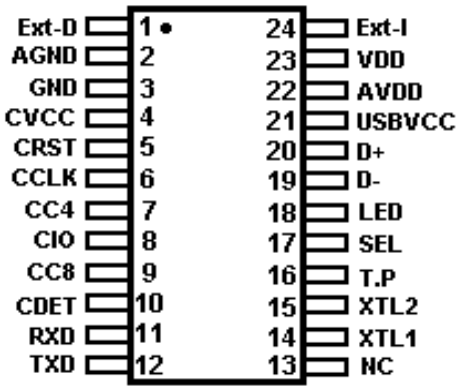
Note: RS is the equivalent serial resistor of the crystal (see crystal specification).

Figure 3. Reference Application: UART Interface Smartcard Reader



STD200 Pin Description

Figure 4 STD200 Pinout



STD200 Pin Description			
Pin No	**Signal**	**Type**	**Descriptions**
23	VDD	P	Supply voltage.
22	AVDD	P	Analog power supply.
21	USB VCC	P	3.3V output for USB.
3	GND	P	Circuit ground.
2	AGND	P	Analog ground.
20	D+	I/O	USB data plus line.
19	D-	I/O	USB data minus line.
1	Ext-D	P	An External Diode must be connected to this pin for the step-up converter.
24	Ext-I	P	An External Inductance must be connected to this pin for the step-up converter.
18	LED	O	LED indication. This pin is used to indicate the device operation.
14	XTL1	I	Input to the oscillator amplifier and the internal clock generate circuits. To drive the device from the external clock source, XTL1 should be driven, while XTL2 is left unconnected. This pin connects a 4MHz parallel-resonant crystal, or an external source to the on-chip oscillator.
15	XTL2	O	
11	RX	I	Receiver data input.
12	TX	O	Transmitter data output.

17	SEL/ V_{SEN}	I	Interface bus selection, when USB bus mode is selected, this pin must be tied to low before power on. When standard serial bus mode is selected, this pin must be tied to high via external resistor. In the standard serial bus mode, this pin always detect the signal that is sent form the voltage detector, once the system power is failure, the STD200 will execute the deactivate action.
16	T.P	I	Test pin. This pin must be tied to low state when normal operation is doing. For factory use only.
10	CDET	I	Smartcard insert/withdraw detection.
4	CVCC	P	Smartcard power pin.
5	CRST	O	Smartcard reset pin. The voltage is supplied by CVCC.
6	CCLK	O	Smartcard clock pin. The voltage is supplied by CVCC.
8	CIO	I/O	Smartcard I/O pin. The voltage is supplied by CVCC.
7,9	CC4/CC8	O	Smartcard pin C4/C8. The voltage is supplied by CVCC.
13	NC	-	Not connected.

Electrical Characteristics

➢ Absolute Maximum Ratings

Symbol	Ratings	Value	Unit
V_{DD} - V_{SS}	Supply voltage	6.5	V
V_{IN}	Input voltage	V_{SS} - 0.3 to V_{DD} + 0.3	V
V_{OUT}	Output voltage	V_{SS} - 0.3 to V_{DD} + 0.3	V
ESD	ESD susceptibility	2000	V
ESDCard	ESD susceptibility for card pads	4000	V
I_{VDD_i}	Total current into V_{DD_i} (source)	250	mA
I_{VSS_i}	Total current out of V_{SS_i} (sink)	250	mA

➢ Thermal Characteristics

Symbol	Ratings	Value	Unit
R_{thJA}	Package thermal resistance	80	°C/W
T_{Jmax}	Max. junction temperature	V_{SS} - 0.3 to V_{DD} + 0.3	V
T_{STG}	Storage temperature range	V_{SS} - 0.3 to V_{DD} + 0.3	V
P_D	Power dissipation	500	mW

➢ DC Characteristics

GENERAL						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
V_{DD}	Supply voltage		4.0		5.5	V
f_{OSC}	External clock source			4		MHz
T_A	Ambient temperature range		0		70	°C
I_{DD}	Supply current in RUN mode	f_{OSC} = 4MHz		10	15	mA
	Supply current in WAIT mode	f_{OSC} = 4MHz		3		mA
	Supply current in HALT mode (suspend mode for USB)	External I_{LOAD} = 0mA			500	μA

LED PINS						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
ILsink	Low current	V_{pad} > V_{CARD}-2.4	2		4	mA
ILsink	High current	V_{pad} > V_{CARD}-2.4	5.6		8.4	mA

RX/TX PINS						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
V_{IL}	Input low level voltage	$V_{pad} > V_{CARD}-2.4$			$0.3xV_{DD}$	mA
V_{IH}	Input high level voltage	$V_{pad} > V_{CARD}-2.4$	$0.7xV_{DD}$			mA
V_{HYS}	Schmidt trigger voltage hysterics			400		mV
V_{OL}	Output low level voltage for Standard I/O port pins	I=-5mA			1.3	V
		I=-2mA			0.4	
V_{OH}	Output high level voltage V_{DD}-0.8	I=3mA	V_{DD}-0.8			V
I_L	Input leakage current	$V_{SS}<V_{PIN}<V_{DD}$			1	µA
I_{SV}	Static current consumption	Floating input mode			200	µA
R_{PU}	Pull-up equivalent resistor		50	90	170	KΩ
R_{PD}	Pull-down equivalent resistor		20	40	100	KΩ
t_{OHL}	Output high to low level fall time for pins	Cl=50pF	18		23	ns
t_{OLH}	Output L-H rise time for pins		19		28	ns

➢ SMARTCARD SUPPLY SUPERVISOR ELECTRICAL CHARACTERISTICS

(T_A = 0 ~+70° C, 4.0 < V_{DD} - V_{SS} < 5.5V unless otherwise specified)

SUPERVISOR						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
5V regulator output (for IEC7816-3 Class A Cards)						
V_{CARD}	Smartcard Power Supply Voltage		4.6	5.00	5.4	V
I_{SC}	Smartcard Supply Current		55			mA
I_{OVDET}	Current Overload Detection				120	mA
t_{IDET}	Detection time on Current Overload		170		1400	µs
t_{OFF}	V_{CARD} Turn off Time	$C_{LOADmax}$ ≤4.7uF			750	µs
t_{ON}	V_{CARD} Turn on Time	$C_{LOADmax}$ ≤4.7uF		150	500	µs
V_{CARD_OK}	V_{CARD} above minimum supply voltage		4.52		4.76	V
I_{VDD}	VDD supply current				100	mA
3V regulator output (for IEC7816-3 Class B Cards)						
V_{CARD}	Smartcard Power Supply Voltage		2.7		3.3	V
I_{SC}	Smartcard Supply Current		50			mA
I_{OVDET}	Current Overload Detection				100	mA
t_{IDET}	Detection time on Current Overload		170		1400	µs
t_{OFF}	V_{CARD} Turn off Time	$C_{LOADmax}$ ≤4.7uF			750	µs

tON	VCARD Turn on Time	CLOADmax ≤4.7uF		150	500	µs
VCARD_OK	VCARD above minimum supply voltage		2.50		2.75	V
1.8V regulator output (for IEC7816-3 Class C Cards)						
VCARD	Smartcard Power Supply Voltage		1.65		1.95	V
ISC	Smartcard Supply Current		20			mA
IOVDET	Current Overload Detection				100	mA
tIDET	Detection time on Current Overload		170		1400	µs
tOFF	VCARD Turn off Time	CLOADmax ≤4.7uF			750	µs
tON	VCARD Turn on Time	CLOADmax ≤4.7uF		150	500	µs
VCARD_OK	VCARD above minimum supply voltage		2.50		2.75	V
IVDD	VDD supply current		1.58		1.68	mA
Smartcard CLKPin						
VOL	Output Low Level Voltage	I=-50uA			0.4	V
VOH	Output High Level Voltage	I=50uA	VCARD-0.5			V
IL	Input Leakage Current	VSS<VIN<VSC_PWR	-10		-10	µA
TOHL	Output H-L Fall Time	Cl=30pF			20	ns
TOLH	Output L-H Rise Time	Cl=30pF			20	ns
FVAR	Frequency variation				1	%
FDUTY	Duty cycle		45		55	%
POL	Signal low perturbation		-0.25		0.4	V
POH	Signal high perturbation		VCARD-0.5		VCARD+0.25	V
ISGND	Short-circuit to Ground				15	mA
Smartcard I/O Pin						
VIL	Input Low Level Voltage				0.5	V
VIH	Input High Level Voltage		0.6VCARD			V
VOL	Output Low Level Voltage	I=-0.5mA			0.4	V
VOH -	Output High Level Voltage	I=20uA	0.8VCARD		VCARD	V
IL	Input Leakage Current	VSS<VIN<VSC_PWR	-10		10	A
IRPU	Pull-up Equivalent Resistance	VIN=VSS		11	18	KΩ
TOHL	Output H-L Fall Time	Cl=30pF			0.8	us
TOLH	Output L-H Rise Time	Cl=30pF			0.8	us
POL	Signal low perturbation		-0.25		0.4	V
POH	Signal high perturbation		0.8VCARD		VCARD+0.25	V
ISGND	Short-circuit to Ground				15	mA
Smartcard RST C4 and C8 Pin						
VOL	Output Low LeveL Voltage	VSS<VIN<VSC_PWR	-	-	0.4	V
VOH	Output High Level Voltage	I=20uA	VCARD-0.5		VCARD	V
IL	Input Leakage Current		-10	-	10	µA
TOHL	Output H-L Fall Time	Cl=30pF	-		0.8	us
TOLH	Output L-H Rise Time	Cl=30pF	-		0.8	us

V_{OL}	Signal low perturbation		-0.25		0.4	V
V_{OH}	Signal high perturbation		0.8V_{CARD}		V_{CARD}+0.25	V
I_{SGND}	Short-circuit to Ground				15	mA

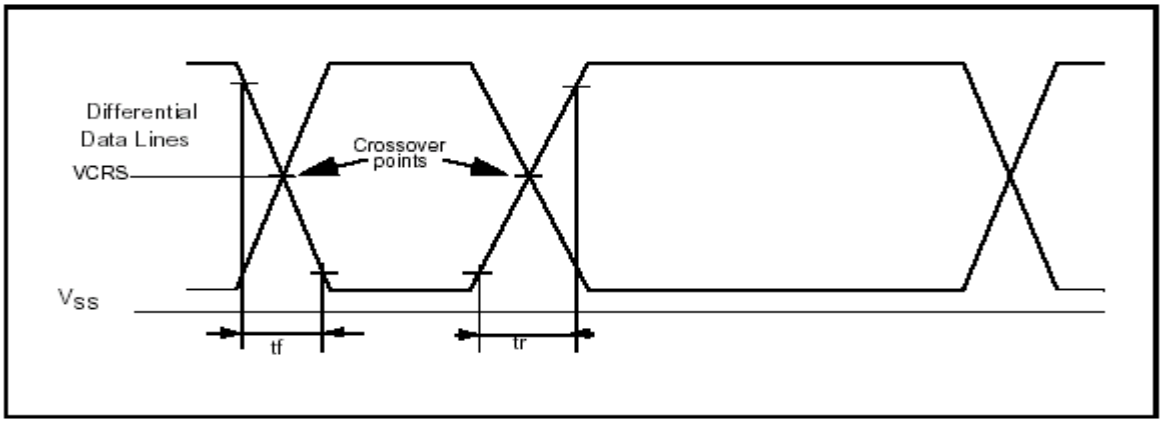
➢ COMMUNICATION INTERFACE CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Max.	Unit
Input Levels:					
V_{DI}	Differential Input Sensitivity	I (D+, D-)	0.2		V
V_{CM}	Differential common Mode Range	Includes V_{DI} range	0.8	2.5	V
V_{SE}	Single Ended Receiver Threshold		1.3	2.0	V
Output Levels:					
V_{OL}	Static Output Low	R_L of 1.5K ohms to 3.6V		0.3	V
V_{OH}	Static Output High	R_L of 15K ohm to V_{SS}	2.8	3.6	V
USBV_{CC}	USBV_{CC}: voltage level	V_{DD}=5v	3.00	3.60	V

Note 1: R_L is the load connected on the USB drivers.

Note 2: All the voltages are measured from the local ground potential.

Figure.5: USB: Data Signal Rise and Fall Time



USB: Full speed electrical characteristics					
Symbol	**Parameter**	**Conditions**	**Min.**	**Max.**	**Unit**
Driver characteristics:					
tr	Rise time	Note 1,C_L=50 pF	4	20	ns
tf	Fall Tim	Note 1, C_L=50 pF	4	20	ns
trfm	Rise/ Fall Time matching		90	110	%
V_{CRS}	Output signal Crossover Voltage		1.3	2.0	V

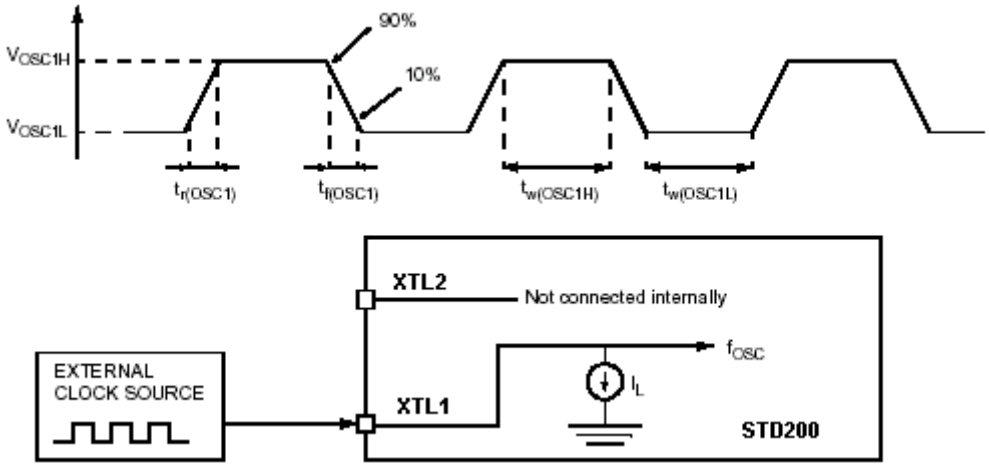
Note1: Measured from 10% to 90% of the data signal. For more detailed information, please refer to Chapter 7 (Electrical) of the USB specification (version 1.1).

➢ CLOCK AND TIMING CHARACTERISTICS

(Operating conditions TA = 0 to +70°C unless otherwise specified)

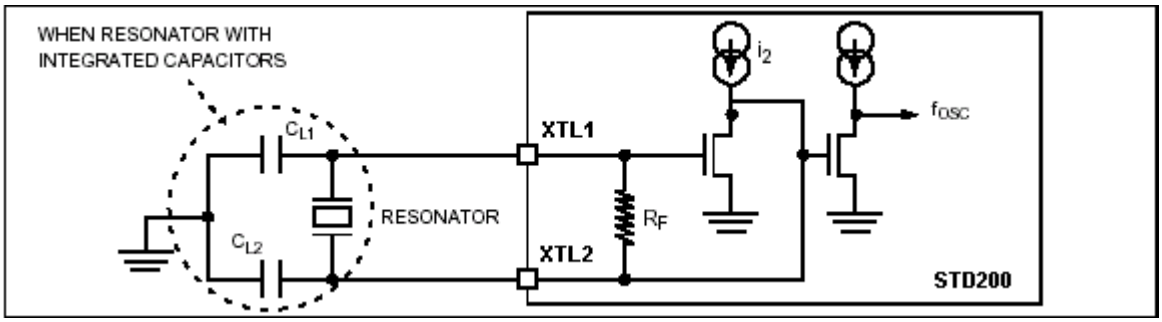
General Timings						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
External Clock Source						
V_{OSC1H}	OSC1 input pin high level voltage	See following Figure6	0.7xV_{DD}		V_{DD}	V
V_{OSC1L}	OSC1 input pin Low level voltage		Vss		0.3xV_{DD}	V
tw(OSC1H) tw(OSC1L)	see Figure OSC1 high or low time		15			ns
					15	
tr(OSC1) tf(OSC1)	OSC1 rise or fall time		15			ns
					15	
IL	OSCx Input leakage current	$V_{SS} \le V_{IN} \le V_{DD}$			±1	µA

Figure 6: Typical Application with an External Clock Source



The ST200 internal clock is supplied with one Crystal resonator oscillator. All the information given in these paragraphs are based on characterization results with specified typical external components. In the application, the resonator and the load capacitors have to be placed as close as possible to the oscillator pins in order to minimize output distortion and start-up stabilization time. Refer to the crystal resonator manufacturer for more details (frequency, package, accuracy...).

General Timings						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
f_{OSC}	Oscillator Frequency	MP: Medium power oscillator		4		MHz
R_F	Feedback resistor	f=4MHz	20		40	KΩ
C_{L1} C_{L2}	Recommended load capacitances versus equivalent serial resistance of the crystal resonator (R_S)	R_S=200Ω MP oscillator	32		46	pF
i_2	OSC2 driving current	V_{DD}=5V MP oscillator V_{IN}=V_{SS}	110		190	μA

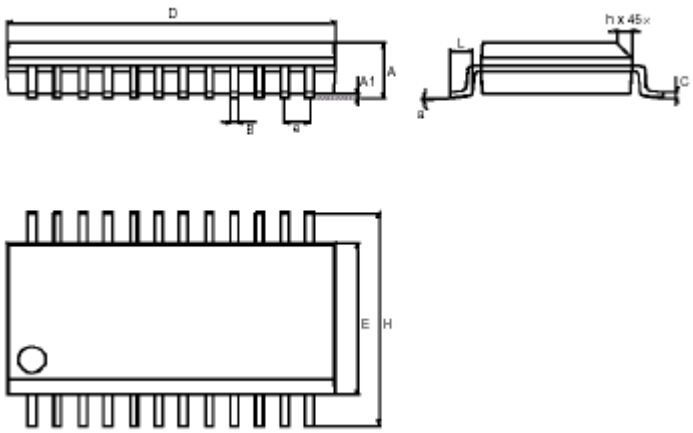


Notes:

1. Resonator characteristics given by the crystal resonator manufacturer.
2. $t_{SU(OSC)}$ is the typical oscillator start-up time measured between V_{DD}=2.8V and the fetch of the first instruction (with a quick VDD ramp-up from 0 to 5V (<50 μs).
3. The oscillator selection can be optimized in terms of supply current using an high quality resonator with small RS value. Refer to crystal resonator manufacturer for more details.

Package Information:

SO-24 pin



Dim.	mm			inches		
	Min	Typ	Max	Min	Typ	Max
A	2.35		2.65	0.093		0.104
A1	0.10		0.30	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	15.20		15.60	0.599		0.614
E	7.40		7.60	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
α	0°		8°	0°		8°
L	0.40		1.27	0.016		0.050
	Number of Pins					
N	24					

Dim.	mm			inches		
	Min	Typ	Max	Min	Typ	Max