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ACT-IR8200D

IrDA Compliant Protocol Processor

Design Specification

Nov. 10, 2004 Rev.0.2

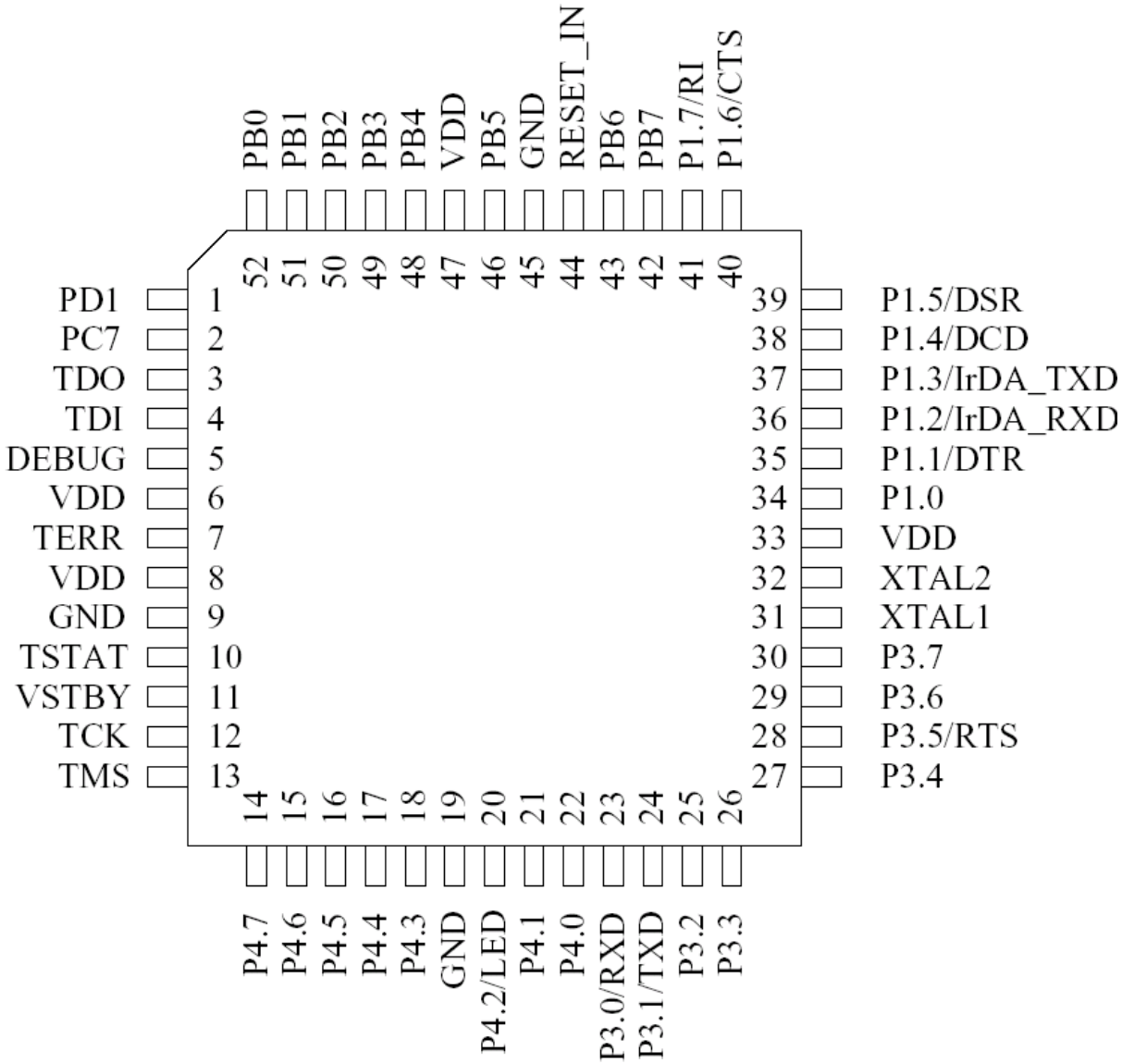
Revision History		
Revision	**Date**	**Comment**
Rev. 0.1	11/03/2004	Created
Rev. 0.2	11/10/2004	Add comset_IR100SD and others on chapter 6,7

Table of Contents

1. Features

- A complete IrDA Protocol stack in a single chip.
- No any driver program is needed.
- Includes IrPHY encoding/decoding and interfaces directly to Infrared transceivers for data rate up to 115.2kbit/s. Only an external Infrared transceiver is needed to complete an IrDA compliant infrared communication subsystem.
- Supports mandatory IrDA layer: IrPHY, IrLAP, IrLMP and IAS.
- Supports upper layers TinyTP, IrCOMM, IrLPT, and OBEX transport.
- Supports host baud rate from 1.2kbit/s to 115.2kbit/s, which is changed by PC utility or 8 pins on chip. IrDA baud rate from 9.6kbit/s to 115.2kbit/s, which is flexible, setting by IrDA devices.
- IR frame and Host buffer are 2048 bytes separately.
- Low supply voltage, 3.0 V to 3.6 V.
- Current consumption: 20mA standby, 30mA active.
- Small low profile plastic 52-pin QFP package.
- Available in programmed and tested chips, assembled & tested boards, or fully packaged devices.
- A ready IrDA-compatible evaluation board ACT-IR100SD is available. IR100SD is strongly recommended to test before purchase IR8200D chip.
- A very useful Evaluation Kit Full Set is ACT-IR100SDK, which is: IR100SD + IR4000US (notebook/desktop USB-IrDA adapter). This is to test IR100D (connected to your device), to exchange IrDA data with IR4000US (connected to PC USB port), running hyper-terminal on top of Windows IrDA driver. To avoid debugging multiple issues: e.g. PDA application IrDA SW activated and behaves properly, with the matching protocol layer? IR100SD to host interface issues (UART data rates, flow control, data bit/parity/stop bit, UART signal pins, power levels)? Or performance issues (throughput, distance, error rate/dropping bits)?

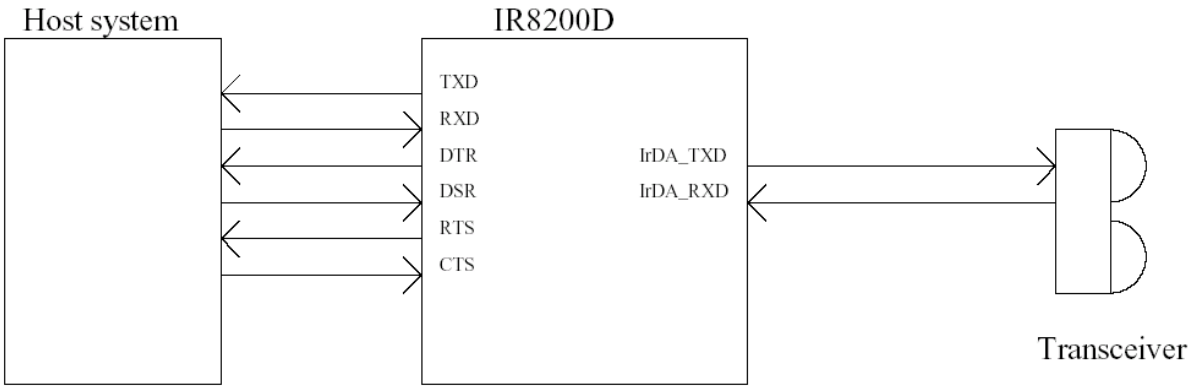
ACT-IR8200D


PB0
PB1
PB2
PB3
PB4
VDD
PB5
GND
RESET_IN
PB6
PB7
P1.7/RI
P1.6/CTS
52
51
50
49
48
47
46
45
44
43
42
41
40
PD1 1
PC7 2
TDO 3
TDI 4
DEBUG 5
VDD 6
TERR 7
VDD 8
GND 9
TSTAT 10
VSTBY 11
TCK 12
TMS 13
39 P1.5/DSR
38 P1.4/DCD
37 P1.3/IrDA_TXD
36 P1.2/IrDA_RXD
35 P1.1/DTR
34 P1.0
33 VDD
32 XTAL2
31 XTAL1
30 P3.7
29 P3.6
28 P3.5/RTS
27 P3.4
14
15
16
17
18
19
20
21
22
23
24
25
26
P4.7
P4.6
P4.5
P4.4
P4.3
GND
P4.2/LED
P4.1
P4.0
P3.0/RXD
P3.1/TXD
P3.2
P3.3

2. Overview

The ACT-IR8200D is a low cost, high performance and high-integration micro-controller, with on-chip IrDA protocol stack and on-chip Infrared physical encoder/decoder. It provides a serial interface (UART) to a host device that intends to have Infrared communication capability. The host device can be any equipment or devices that need to communicate with IrDA enabled portable or tablet PC, PDA, cellular phone and hand held data terminal, via IrDA beam and protocol but has only a wired serial interface. The ACT-IR8200D will handle all the detail regard IrDA protocols. It sends and receives only user data to/from the host device via the wired serial interface with hardware flow-control. IrDA has two modes; one is Primary, and the other is Secondary. The difference between these two modes is that a Primary mode device initiates the discovery, negotiation and connection sequence to Secondary mode device, and decides IrDA protocol parameters. Secondary mode device always waits for commands from Primary mode device. Both modes can run different protocols, and both may send or receive user data. ACT-IR8200D supports both Primary and Secondary modes. Fig.1 is system diagram.

Fig. 1



3. Pins Description

Symbol	Pin No.	I/O Type	Descriptions
VDD	6,8,33,47		Digital and Analog supply voltage, positive terminal.
GND	9,19,45		Ground.
PD1	1	I/O	General I/O pin, not used.
PC7	2	I/O	General I/O pin, not used.
TDO	3	O	JTAG signals, not used.
TDI	4	I	JTAG signals, not used.
DEBUG	5	O	JTAG signals, not used.
TERR	7	O	JTAG signals, not used.
TSTAT	10	O	JTAG signals, not used.
VSTBY	11	I	SRAM standby voltage input, not used.
TCK	12	I	JTAG signals, not used.
TMS	13	O	JTAG signals, not used.
P4.7	14	I/O	General I/O pin, not used.
P4.6	15	I/O	General I/O pin, not used.
P4.5	16	I/O	General I/O pin, not used.
P4.4	17	I/O	General I/O pin, not used.
P4.3	18	I/O	General I/O pin, not used.
P4.2/LED	20	O	Status LED output.
P4.1	21	I/O	General I/O pin, not used.
P4.0	22	I/O	General I/O pin, not used.
P3.0/RXD	23	I	Receive data signal from host, same as UART receiver.
P3.1/TXD	24	O	Transmit data signal to host, same as UART transmitter.
P3.2	25	I/O	General I/O pin, not used.
P3.3	26	I/O	General I/O pin, not used.
P3.4	27	I/O	General I/O pin, not used.
P3.5/RTS	28	O	Ready to send. If low then host can send data to 8200D.
P3.6	29	I/O	General I/O pin, not used.
P3.7	30	I/O	General I/O pin, not used.
XTAL1	31	I	Oscillator input pin for system clock. 22.1184MHz is required.
XTAL2	32	O	Oscillator output pin for system clock.
P1.0	34	I/O	General I/O pin, not used.
P1.1/DTR	35	O	Device terminal is ready. If low means IR8200D established IrDA link.
P1.2/IrDA_RXD	36	I	Infrared signal input pin from IrDA transceiver.
P1.3/IrDA_TXD	37	I	Infrared signal output pin to IrDA transceiver.
P1.4/DCD	38	I	Device carrier detect, not used.

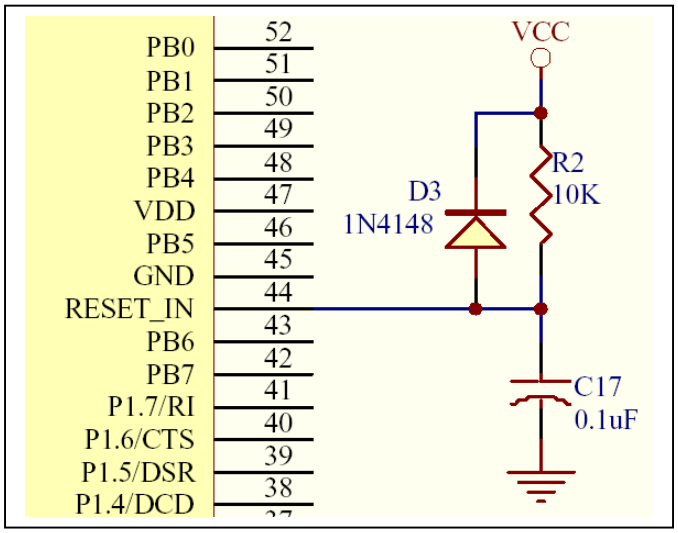
PIN Description (Continued)

Symbol	Pin No.	I/O Type	Descriptions
P1.5/DSR	39	I	Data Set Ready. If low means host is ready and IR8200D can start to establish IrDA link(If Primary mode) or ready to be link by other IrDA Primary device(if secondary mode) .
P1.6/CTS	40	I	Clear to send. If low then 8200D is allowed sending data to host.
P1.7/RI	41	I	Ring-in, not used.
PB7	42	I	Configuration selector. Hi means use default setting. Low means use the setting on PB4~PB0. Default setting means the configuration is setting by Comset_IR100SD program.
PB6	43	I	Not used.
RESET_IN	44	I	Reset IR8200D signal. Pull it low to reset.
PB5	46	I	Not used.
PB4	48	I	DSR selector. Hi means use the default setting. Low means ignore DSR and IR8200D will be ready no matter DSR signal (pin 39) is hi or low.
PB3	49	I	CTS selector. Hi means use the default setting. Low means ignore CTS and IR8200D will send data to host no matter CTS signal (pin 40) is hi or low.
PB2	50	I	Host interface baud rate selector pin 2. See PB0.
PB1	51	I	Host interface baud rate selector pin 1. See PB0
PB0	52	I	Host interface baud rate selector pin 0. PB2 PB1 PB0 host baud rate lo lo lo 1.2kbit/s lo lo hi 2.4kbit/s lo hi lo 4.8kbit/s lo hi hi 9.6kbit/s hi lo lo 19.2kbit/s hi lo hi 38.4kbit/s hi hi lo 57.6kbit/s hi hi hi 115.2kbit/s

4. Device Operation

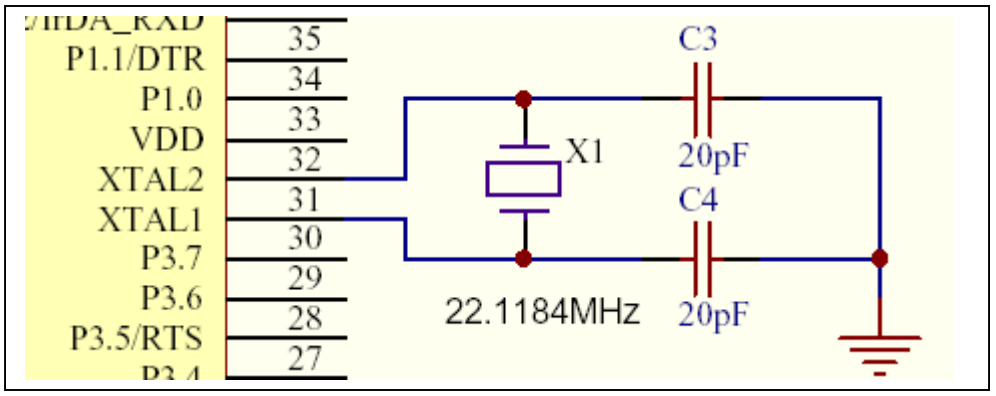
4.1 RESET circuit

IR8200D will be reset when RESET_IN is pulled low. It needs a 10K ohms resistor, 0.1uF capacitor and a diode to implement the reset circuit. Please refer to right figure.



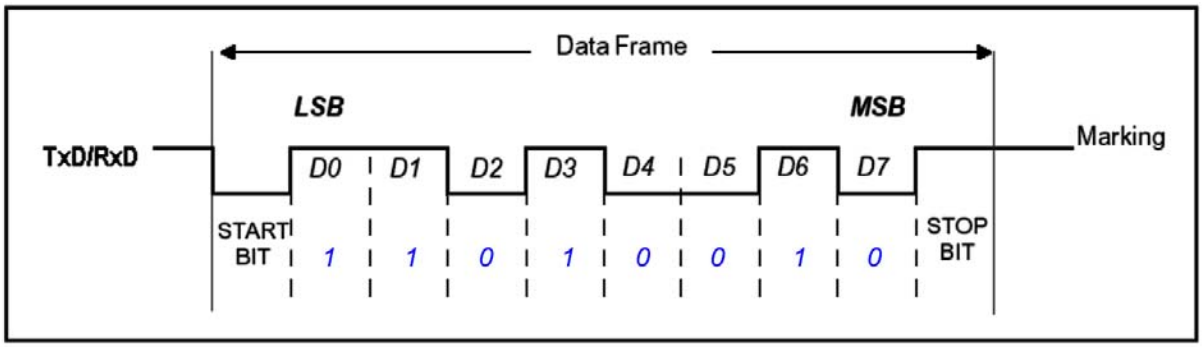
4.2 Crystal circuit

IR8200D needs a specific clock to operate, please refer to right figure.



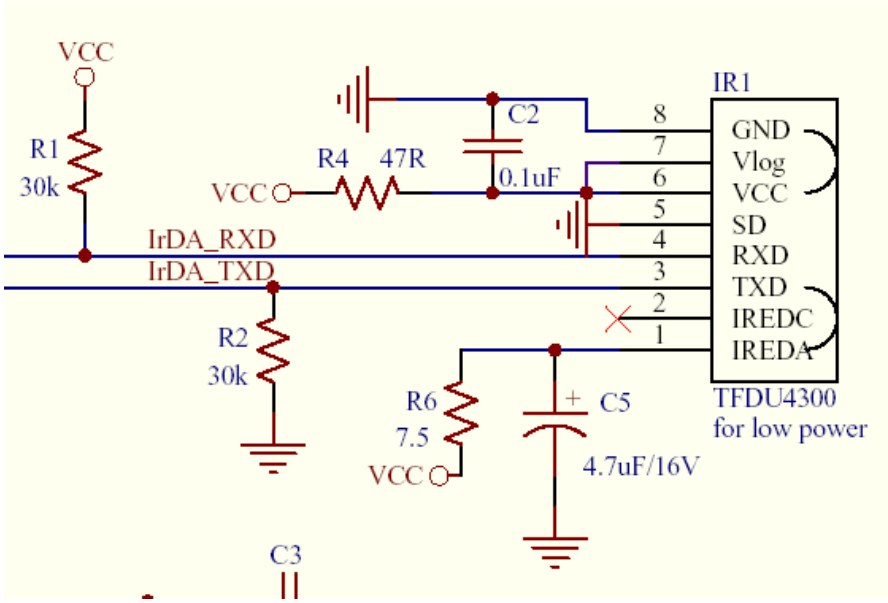
4.3 Host Interface

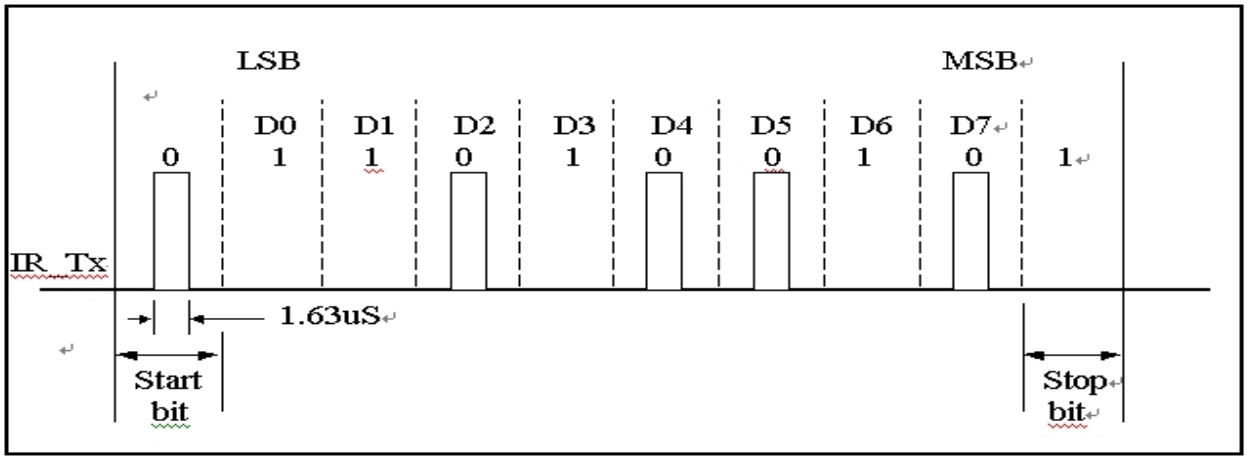
The host interface of IR8200D is a full-duplex asynchronous serial data interface. The data bytes are transmitted via TX and received via RX. Each data byte consists of one start bit (0), 8 data bits (LSB first, MSB last) and a stop bit (1).



4.4 IR port interface

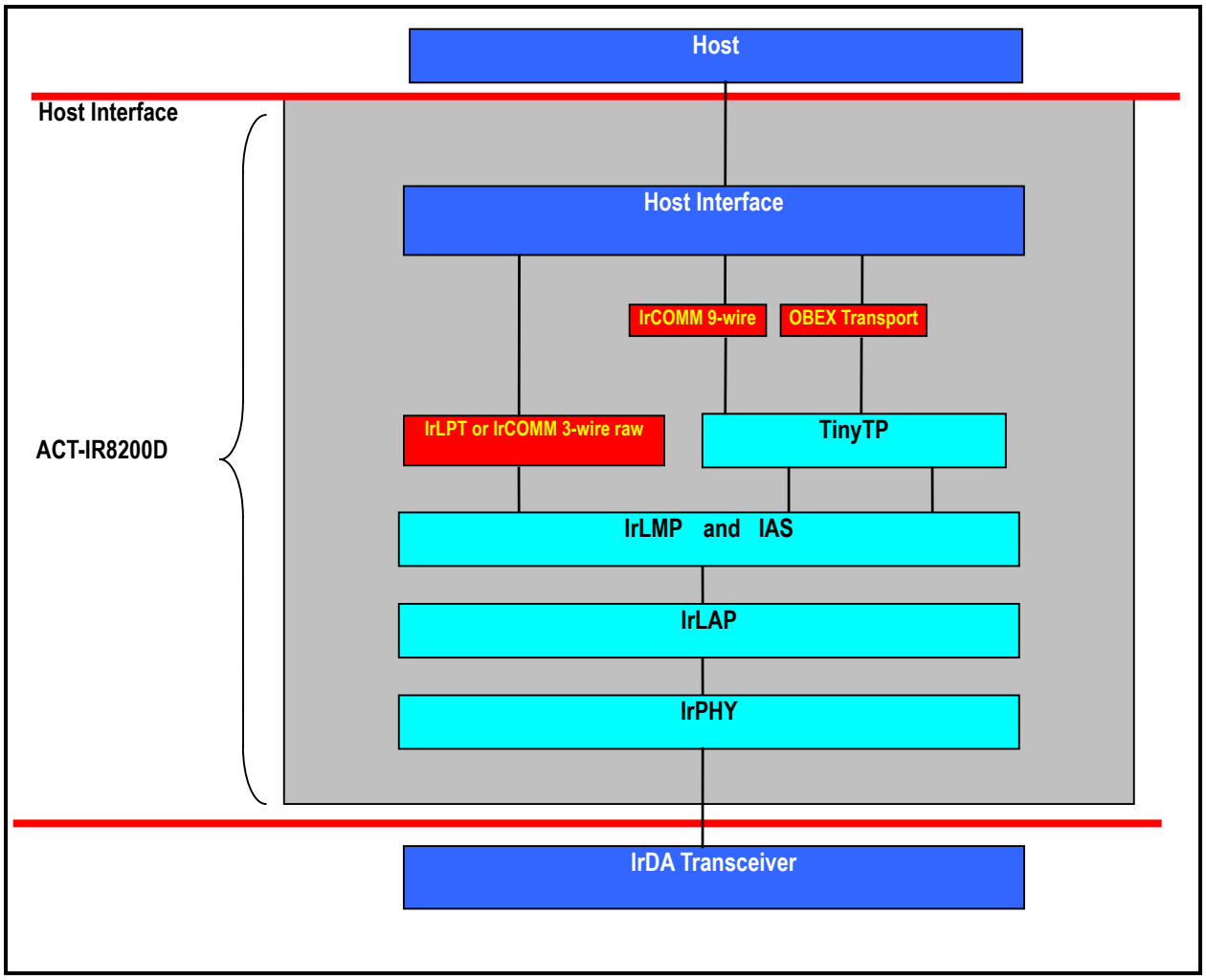
The IR port of IR8200D can be connected to most transceiver. The data is transmit by pin IrDA_TXD and data received from IrDA_RXD. The below figure is the signal specification of IrDA_TXD, it sends 1.63uS pulse infrared signal out.





5. Firmware architecture

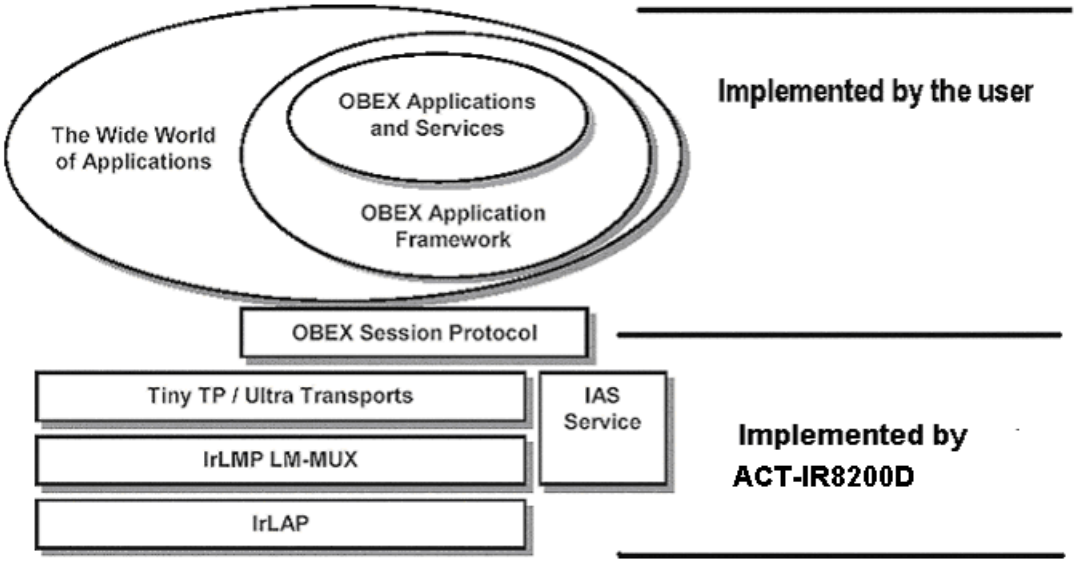
The following figure is the block diagram of ACT-IR8200D protocols architecture. The red colored blocks represent different upper layers. Only one of the red colored blocks can work at same time.



OBEX transport Description

The OBEX specification consists of two major parts: a protocol and an application framework. This is also illustrated graphically below. The "application framework" is represented in ellipses inside the "wide word of applications" at the upper half of this figure. The "protocol" part is presented in five rectangles at the lower half of this figure.

ACT-IR8200D doesn't and can't provide the "application framework" part of OBEX in the "wide world of applications" (the ellipses in Figure). The host system using IR8200D must **implement that part itself.**



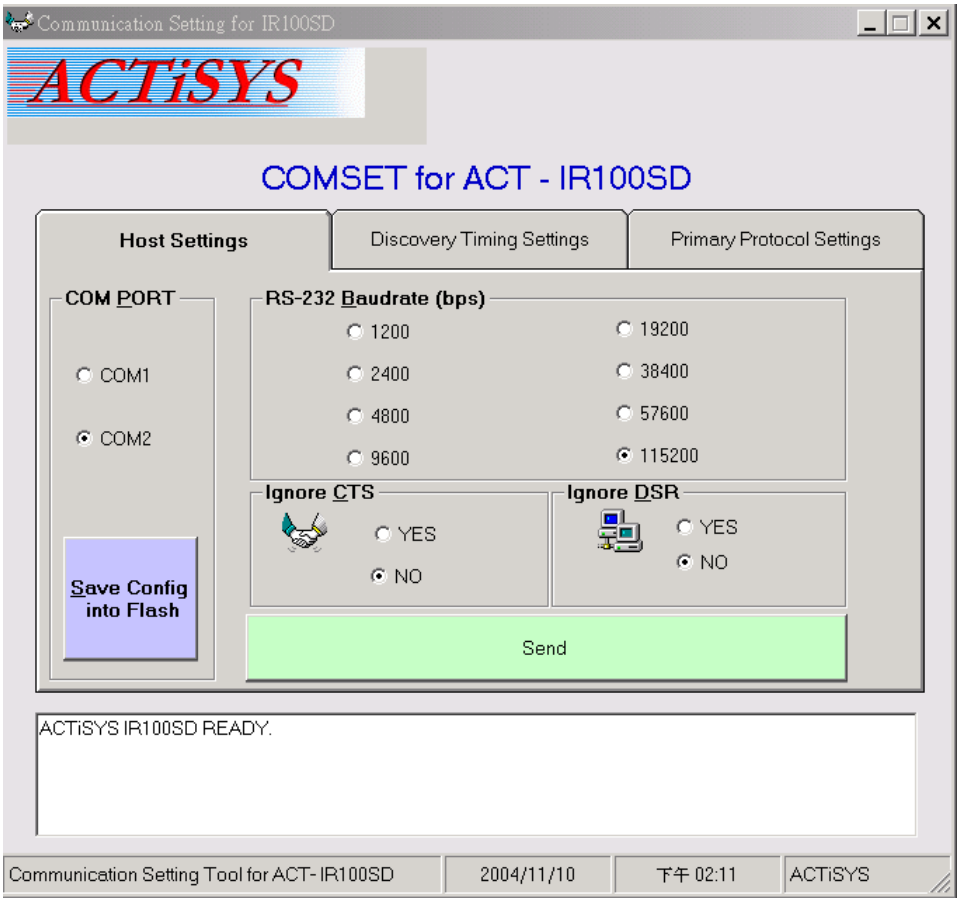
For example, Suppose that you have a Pocket PC, which is connecting to IR8200D by using OBEX protocol, Pocket PC (it called Client in OBEX) will send a "connect command" first and waits Server (IR8200D's host, your device) to reply "connect confirmed". The "connect command" is like "80 00 07 00 01 01 FF", since IR8200D supports OBEX transport, so IR8200D has received these 7 bytes, it will pass all these 7 bytes data to its host. When its host has received these 7 bytes data, it knows that there is a OBEX client tries to connect it, so it sends "A0 00 07 00 01 02 00" back to Client, which means that it confirms the connect command from Client. Then they can start to send an object by PUT/GET command.

6. How to configure IR8200D?

Since IR8200D support both Primary / Secondary modes and other parameters which provide flexibility for customer usage, the first thing needs to do is to make sure what host baud rate and which protocol you require before chip is implemented on PCB. Therefore, ACTiSYS developed a windows program named Comset_IR100SD.exe to let customer to configure IR8200D more easily. Note: Comset_IR100SD.exe program is running under windows system (98, 98SE, Me, 2K and XP) and work with com port, so if you want to configure IR8200D on PCB, you should wire all 6 host signals of IR8200D to a DB9F connector, those wires are TXD, RXD, DTR, DSR, RTS and CTS. After these done, you can change the configuration of IR8200D. Since customer may not want to wire those signals to a DB9, we recommend that customer can buy our IR8200D evaluation board (IR100SD) to test and configure before purchase. Please contact ACTiSYS to get the information of IR100SD. Please see the following page, which shows how to configure by Comset_IR100SD.exe,

After any parameter is changed, you have press “send” button on every page you changed first then press “Save Config into Flash”, then parameters are configured successfully.

The first page is to set the host baud rate and the hardware flow control,

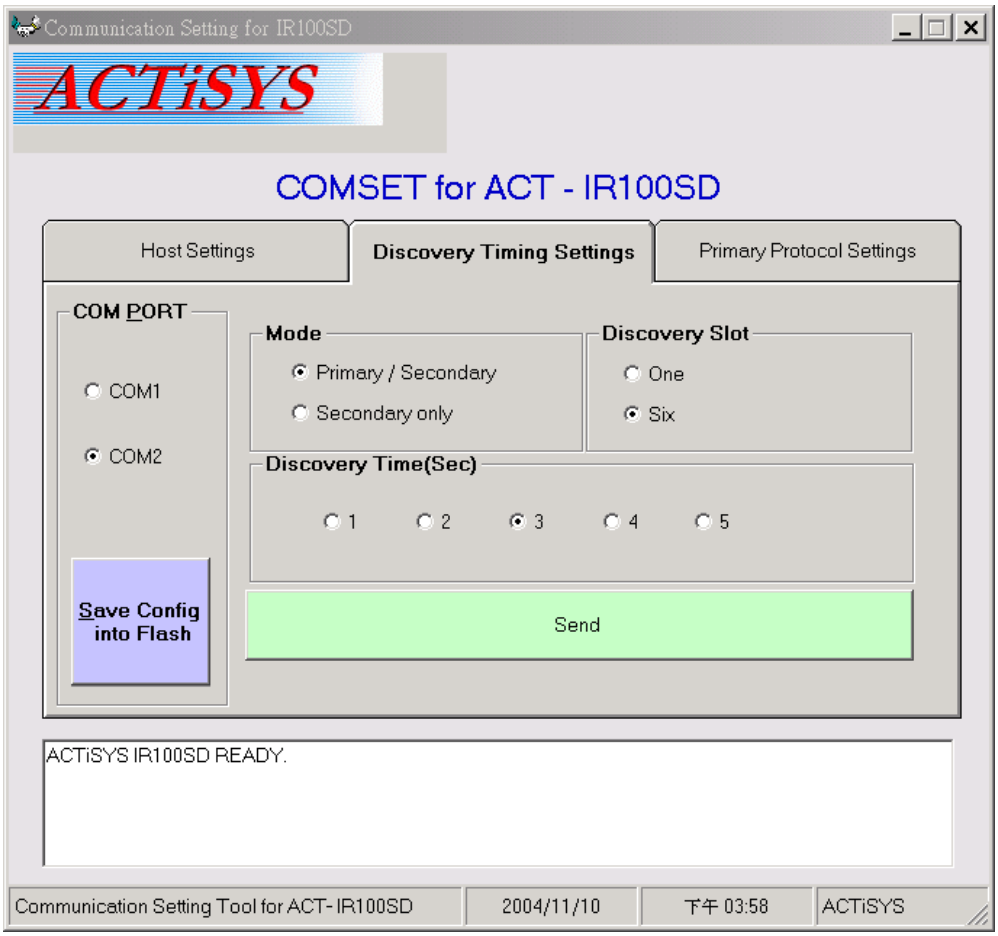


Please note:

Ignore CTS: If host device has no hardware flow control signals, only Tx, Rx and GND. Then you have to set this bit to 1, IR8200D will pass the coming data to host and doesn't care the status of CTS. Note: Since IR8200D is a buffer limited dongle (2K bytes for host and 2K bytes for IrDA), if this bit is set, then it will cause data lose (Because no flow control). Where data lose can be solved if user sends data by segment and every segment doesn't exceed 2K bytes.

Ignore DSR. If host system has no DSR signals, then this bit should be ignored. But since this signal triggers IR8200D in and out Primary mode, it will be no way to ask IR8200D disconnecting IrDA link and IR8200D will always be in Primary once power on. In another word, once it is set to 1, you are not able to control IR8200D at all until power it off and reset it to 0. This bit is recommended being set when host device is in Secondary mode.

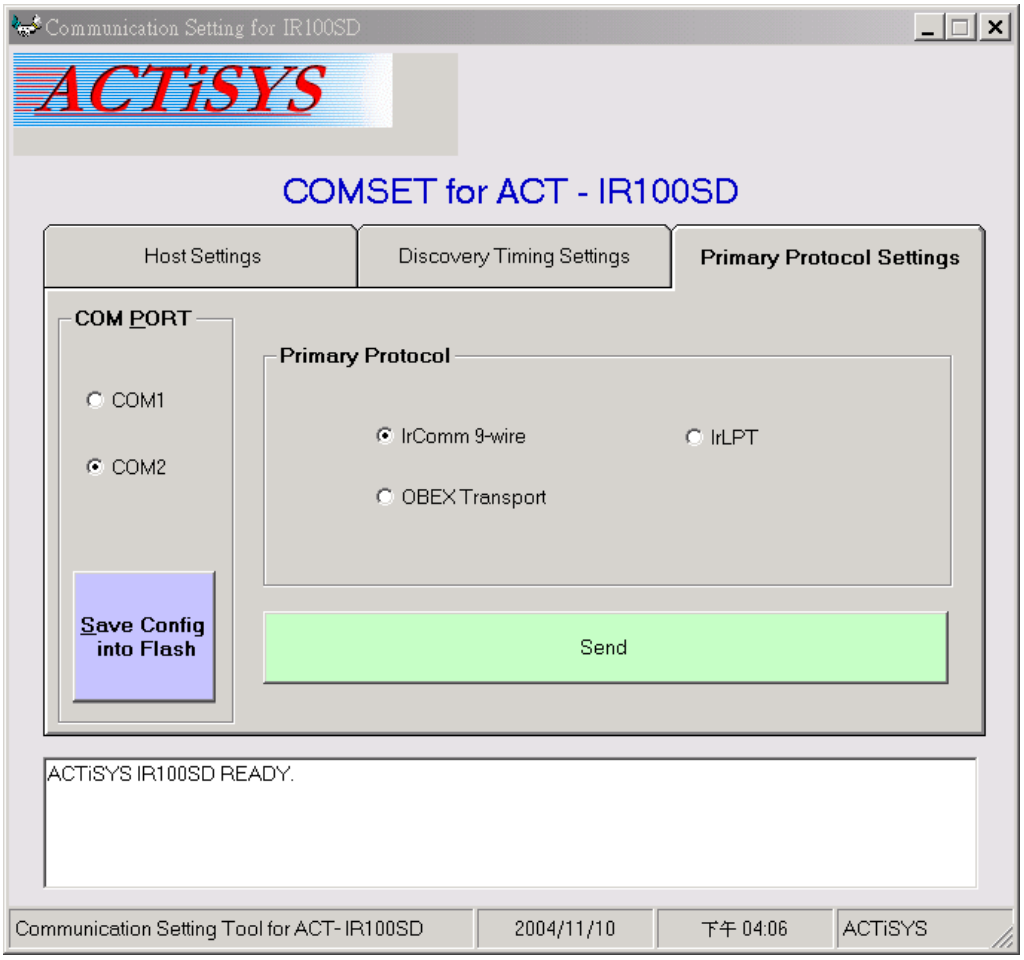
The second page is to set time interval of discovery, the slot number of discovery and the mode of IR8200D.



1) IR8200D supports both Primary and secondary, it allows customer to change it.

2) Discovery time should be 3 seconds in general, if you want the discovery process faster, you can change it.
3) Discovery slot also can make discovery process faster.

The third page is to set the IrDA protocols when IR8200D is in Primary.



There is another choice for customer if you don't want change the parameters by program but manual, or you already soldered IR8200D on PCB. The PB7~PB0 pins on IR8200D can be configured host baud rate and hardware flow control signals to fit your requirements, but you can change the Primary protocol or discovery time or slot here. Please see the pin description to get information.

7. How to make IR8200D work?

The behavior of IR8200D is according to the activity of several host signals before it works. The following description shows how to make IR8200D work,

1) When IR8200D is in Primary / Secondary
   Pull DSR to low then IR8200D will be triggered and start to discover others IrDA device, once it found IrDA device it will send discovery command, try to establish IR link and make the specific IrDA Primary protocols connection to this IrDA device (ex. IrCOMM, IrLPT or OBEX transport). If the connection is connected successfully, then IR8200D will pull DTR to low, then host device can send and receive data.
   Since there is one Primary and one Secondary device in IrDA protocols, even we configure IR8200D to Primary / Secondary, it probably enters Secondary mode when it accepts the discovery command from other Primary device. Suppose there is two Primary devices are discovering to each other, it always has one device to be Primary and another is to be Secondary after negotiation.

2) When IR8200D is in Secondary
   Pull DSR to low then IR8200D will be ready to accept the inquiry which comes from a Primary device. Once it found IrDA link is established, IR8200D will pull DTR to low, then host device can send and receive data.

If your host device can only provide 3 wires (TXD, RXD and Ground), then you can connect DSR and CTS of IR8200D to ground and keep DTR and RTS open. Note: Since IR8200D is a buffer limited dongle (2K bytes for host and 2K bytes for IrDA), if CTS is connected to ground, then it might cause data lose (Because no flow control). Where data lose can be solved if user sends data by segment and every segment doesn't exceed 2K bytes.

8. CHARACTERISTICS AND SPECIFICATION

Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit
T_{STG}	Storage Temperature	–65	125	°C
T_{LEAD}	Lead Temperature during Soldering (20 seconds max.)(1)		235	°C
V_{IO}	Input and Output Voltage (Q = V_{OH} or Hi-Z)	–0.5	6.5	V
V_{CC}	Supply Voltage	–0.5	6.5	V
V_{PP}	Device Programmer Supply Voltage	–0.5	14.0	V
V_{ESD}	Electrostatic Discharge Voltage (Human Body Model)(2)	–2000	2000	V

Note: 1. IPC/JEDEC J-STD-020A
2. JEDEC Std JESD22-A114A (C1=100pF, R1=1500 Ω, R2=500 Ω)

Operating Conditions

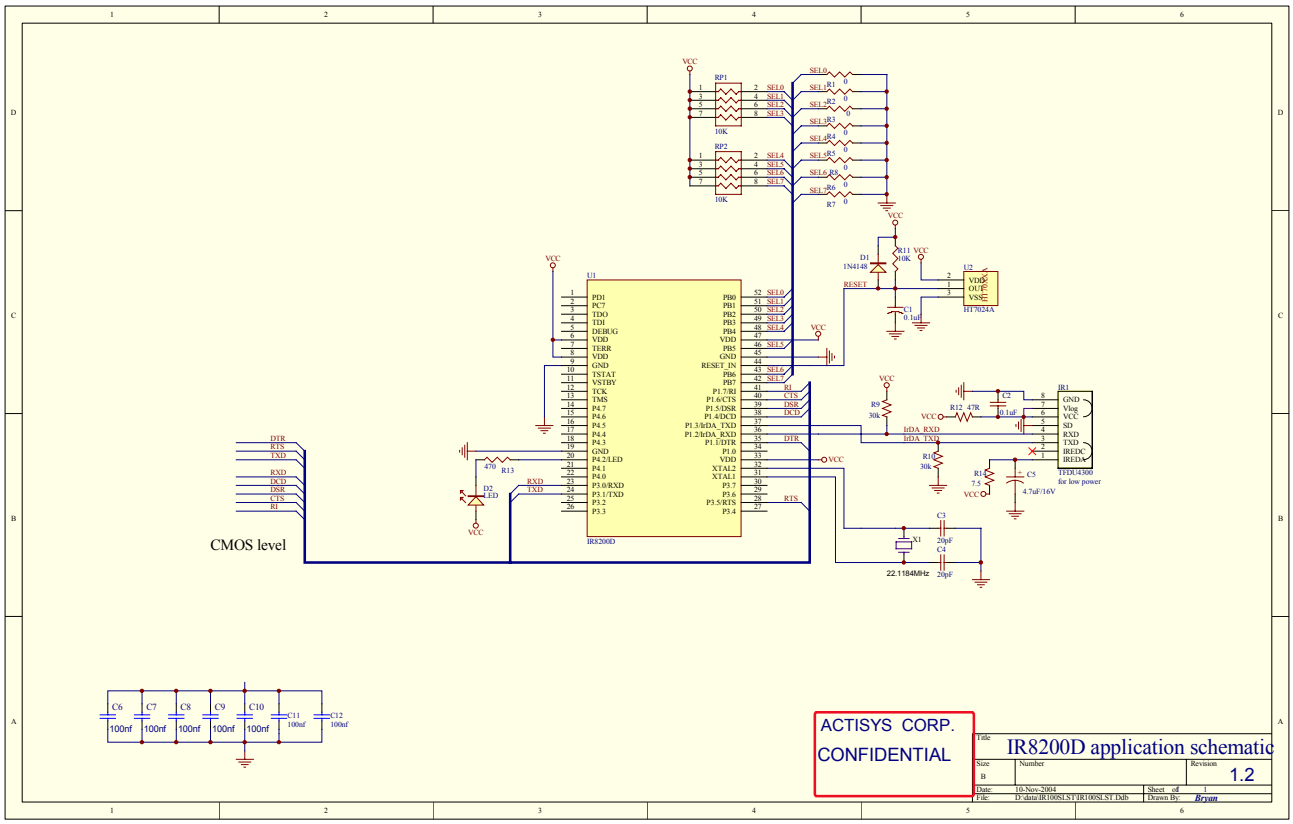
Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	3.0	3.6	V
T_A	Ambient Operating Temperature (industrial)	–40	85	°C
	Ambient Operating Temperature (commercial)	0	70	°C

DC Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage(1)		3.0		3.6	V
V_{IH}	High Level Input Voltage (Ports 0, 1, 2, 3, 4, XTAL1, RESET) 5V Tolerant - max voltage 5.5V	3.0V < V_{CC} < 3.6V	0.7V_{CC}		5.5	V
V_{IL}	Low Level Input Voltage (Ports 0, 1, 2, 3, 4, XTAL1, RESET)	3.0V < V_{CC} < 3.6V	V_{SS} – 0.5		0.3V_{CC}	V
V_{OL1}	Output Low Voltage (Port 4)	I_{OL} = 10mA			0.6	V
						V
V_{OL2}	Output Low Voltage (Other Ports)	I_{OL} =5mA			0.6	V
						V
V_{OH1}	Output High Voltage (Ports 4 push-pull)	I_{OH} = –10mA	2.4			V
						V
V_{OH2}	Output High Voltage (Other Ports push-pull)	I_{OH} = –5mA	2.4			V
						V

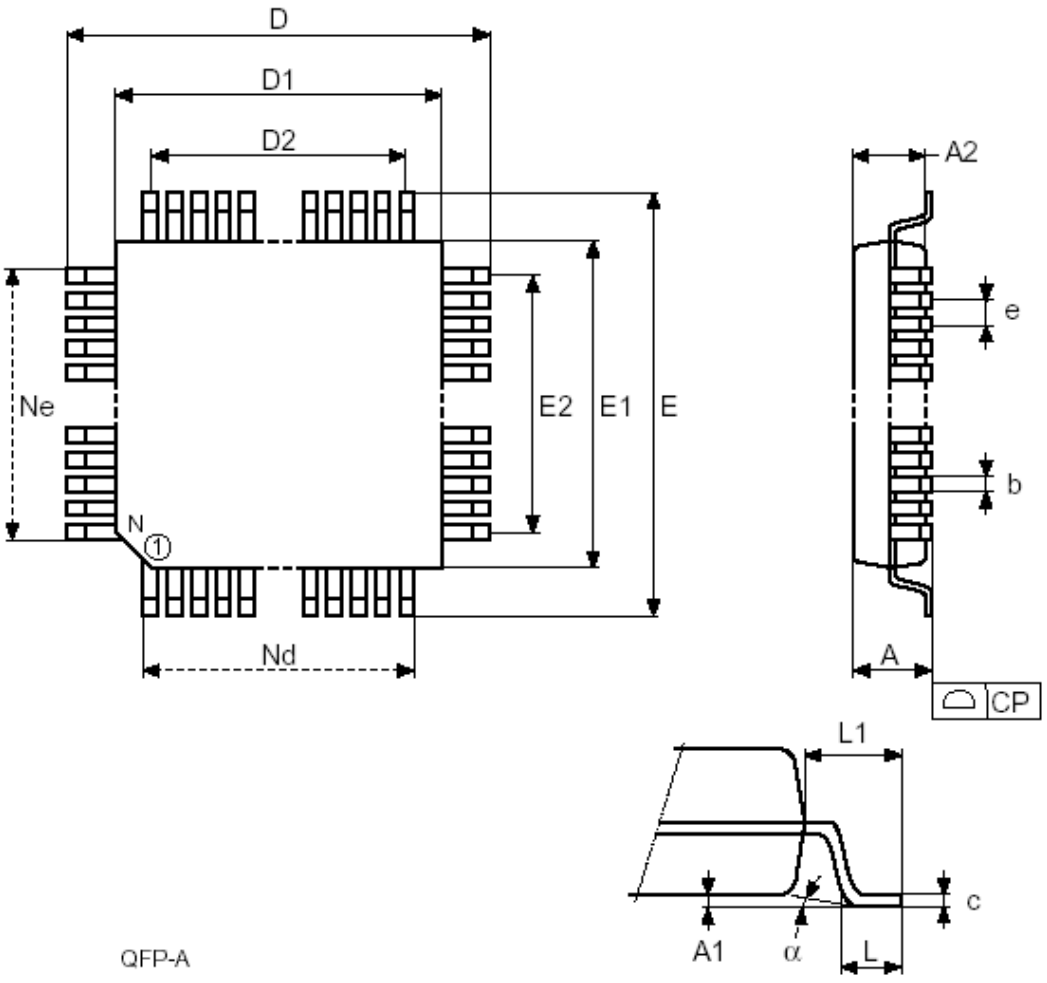
V_{OP}	XTAL Open Bias Voltage (XTAL1, XTAL2)	I_{OL} = 3.2mA	1.0		2.0	V
I_{RST}	RESET Pin Pull-up Current (RESET)	$V_{IN} = V_{SS}$	–10		–55	uA
I_{FR}	XTAL Feedback Resistor Current (XTAL1)	XTAL1 = V_{CC}; XTAL2 = V_{SS}	TBD (–20)		TBD (–50)	uA
I_{IHL1}	Input High Leakage Current (Port 0)	$V_{SS} < V_{IN} < 5.5V$	–10		10	uA
I_{IHL2}	Input High Leakage Current (Port 1, 2, 3, 4)	V_{IH} = 2.3V	–10		10	uA
I_{ILL}	Input Low Leakage Current (Port 1, 2, 3, 4)	$V_{IL} < 0.5V$	–10		10	uA

9. Application Circuit



10. Package Dimensions

52-PIN QFP



QFP-A

Symb	mm			inches		
	Typ	Min	Max	Typ	Min	Max
A	–	–	1.75	–	–	0.069
A1	–	0.05	0.20	–	0.002	0.008
A2	–	1.25	1.55	–	0.049	0.061
b	–	0.20	0.40	–	0.008	0.016
c	–	0.07	0.23	–	0.002	0.009
D	12.00	–	–	0.473	–	–
D1	10.00	–	–	0.394	–	–
D2						
E	12.00	–	–	0.473	–	–
E1	10.00	–	–	0.394	–	–
E2	7.80			0.307		
e	0.65	–	–	0.026	–	–
L	–	0.45	0.75	–	0.018	0.030
L1	1.00	–	–	0.039	–	–
α	–	0°	7°	–	0°	7°
n	52			52		
Nd	13			13		
Ne	13			13		
CP	–	–	0.10	–	–	0.004