F81232

USB to UART Chip

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F81232 Datasheet Revision History

Version	Date	Page	Revision History
V0.10P	2008/8/25	-	Preliminary Version

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1. General Description

The F81232 is a highly-integrated USB to UART bridge controller providing a simple solution for updating RS-232 design to USB using a minimum of components. A programmable generator is provided to select baud rate from 1200 to 115.2kbps.

In USB interface function, The F81232 communications with host by full-speed USB interface (12Mb/s). It supports 4 suits endpoint, one control endpoint(endpoint zero) is for bus enumeration, one output endpoint is for UART transmit data and two input endpoint is transmit UART data and status to host.

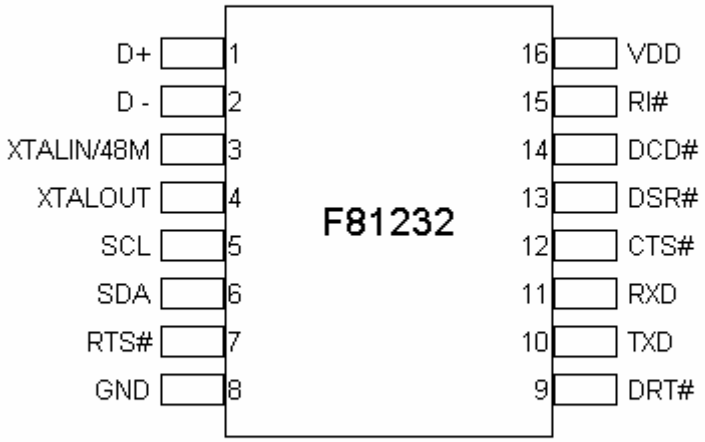
In I2C interface function, The F81232 builds 256 bytes SRAM to save from I2C flash/ROM information for USB bus enumeration. The I2C flash/ROM contains IdVendor/ IdProduct/ BcdDevice/ Manufacturer string / IProduct string / iSerialNumber string information.

In power function, The F81232 supports remote-wakeup function for USB interface, when PC system into S3 state. The F81232 receive UART data to asserted USB interface to wakeup PC system.

2. Feature List

- Full compliance with the USB specification Rev 1.1.
- Support RS-232 serial interface.
- Install as a standard COM port.
- Support baud rate from 1200 to 115.2kbps.
- Support remote-wakeup and power management
- Single chip USB to serial communication.
- Power by 3.3V and package in 16SSOP.

3. Pin Configuration



4. Pin Description

OD_{12_5v} - Open-drain output pin with 12 mA sink 5v tolerance capability.

IOD_{12st_5v} - TTL level bi-directional pin with schmitt trigger and with 12 mA sink 5v tolerance capability.

O_{12} - output pin with 12 mA driving/sink capability.

IN_{st_5v} - TTL level input pin with schmitt trigger 5v tolerance.

IN_t - TTL level input pin.

AIO - USB PAD compatible USB 1.1 spec(internal resistor 28ohm~44ohm)

$AIO_{1.5k}$ - USB PAD compatible USB 1.1 spec(internal resistor 28ohm~44ohm),and internal pull high 1.5kohm

P - Power.

Pin No	Pin Name	Type	PWR	Description
1	D+	$AIO_{1.5k}$	VDD	D+, different data bus conforming to USB standard. internal pull high 1.5k
2	D-	AIO	VDD	D-, different data bus conforming to USB standard.
3	XTALIN/48M	IN_t	VDD	12MHz/48Mhz clock input.
4	XTALOUT	O_{12}	VDD	12 MHz clock output.
5	SCL	$OD_{12_4.7k}$	VDD	I2C serial clock internal pull high 4.7k
6	SDA	$OD_{12_4.7k}$	VDD	I2C serial data internal pull high 4.7k
7	RTS#	O_{12}	VDD	Serial port (request to send)
8	GND	P	GND	GND
9	DTR#	I/O_{12st_5v}	VDD	Serial port(data terminal ready)
10	TXD	O_{12}	VDD	Serial port(transmitted data)
11	RXD	IN_{ts_5V}	VDD	Serial port(received data)
12	CTS#	IN_{ts_5V}	VDD	Serial port(clear to send)
13	DSR#	IN_{ts_5V}	VDD	Serial port(data set ready)
14	DCD#	IN_{ts_5V}	VDD	Serial port(data carrier detect)
15	RI#	IN_{ts_5V}	VDD	Serial port(ring indicator)
16	VDD	P	VDD	Power supply input 3.3v

5. Functional Description

5.1 USB function

The F81232 communications with host by full-speed USB interface (12Mb/s). It supports 4 suits endpoint, one control endpoint(endpoint zero) is for bus enumeration, one output endpoint is for UART transmit data and two input endpoint is transmit UART data and status to host.

Endpoint zero is special significance in USB system. It is a control endpoint, and is required by every device. Only control endpoint accept special setup token that the host transfer command to device.

During enumeration, host requests GET_DESCRIPTOR to device and device return information (over in endpoint zero) as what device driver top load. The F81232 get descriptor information from I2C flash/ROM, the F81232 returns default description to Host. If I2C flash/ROM does not connect with F81232, the below table is about F81232 default descriptor.

offset	Field	size	Value
0	BLength	1	0x12

1	bDescriptor Type	1	0x01
2	BcdUSB	2	0x0101
4	bDeviceClass	1	0x00
5	bDeviceSubClass	1	0x00
6	bDeviceProtocol	1	0x00
7	bMaxPacketSize	1	0x10
8	IdVendor	2	0x1934
10	IdProduct	2	0x0706
12	BcdDevice	2	0x0001
14	Manufacturer	1	0x01
15	IProduct	1	0x02
16	iSerialNumber	1	0x03
17	bNumConfiguration	1	0x01

Table 5-1 Device Descriptor

offset	Field	size	Value
0	BLength	1	0x09
1	bDescriptor Type	1	0x02
2	wTotalLength	2	0x0027
4	bNumInterface	1	0x01
5	bConfigurationValue	1	0x01
6	iConfiguration	1	0x00
7	BmAttributes	1	0xa0
8	MaxPower	1	0x32

Table 5-2 Configuration Descriptor

offset	Field	size	Value
0	BLength	1	0x09
1	bDescriptor Type	1	0x04
2	wInterfaceNumber	1	0x00
3	bAlternateSetting	1	0x00
4	bNumEndpoints	1	0x03
5	bInterfaceClass	1	0x00
6	bInterfaceSubClass	1	0x00
7	bInterfaceProtocol	1	0x00
8	IInterface	1	0x00

Table 5-3 Interface Descriptor

offset	Field	size	Value
0	BLength	1	0x07
1	bDescriptor Type	1	0x05
2	bEndpointAddress	1	0x81
3	BmAttributes	1	0x03
4	wMaxPacketSize	2	0x0010
6	BInterval	1	0x0a

Table 5-4 In Endpoint Descriptor

offset	Field	size	Value
0	BLength	1	0x07
1	bDescriptor Type	1	0x05

2	bEndpointAddress	1	0x82
3	BmAttributes	1	0x02
4	wMaxPacketSize	2	0x0010
6	BInterval	1	0x00

Table 5-5 In Endpoint Descriptor

offset	Field	size	Value
0	BLength	1	0x07
1	bDescriptor Type	1	0x05
2	bEndpointAddress	1	0x01
3	BmAttributes	1	0x02
4	wMaxPacketSize	2	0x0010
6	BInterval	1	0x00

Table 5-6 Out Endpoint Descriptor

The string table 1 is about manufacturer information, its contents are “FINTEK”, the string table 2 is about Product information, its contents is “USB to UART Bridge. The string table 3 is about serial number information, its contents is “88635600168801”.

In power function, The F81232 supports remote-wakeup function for USB interface, when PC system into S3 state. The F81232 receive any UART data and ring. The F81232 is asserted USB interface to wakeup PC system.

5.2 UART function

The F81232 provides 1 suit UART through USB interface. UART includes 16-bytes send/ 64 bytes receive FIFO, a programmable baud rate generator, complete modem control capability and an interrupt system.

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5.3 Wakeup function

The F81232 Supports wakeup system function, The F81232 detect idle state on USB bus for more than 3.0ms, it is into suspend state. In Suspend state, the F81232 receive any UART data and ring. It asserted USB interface.

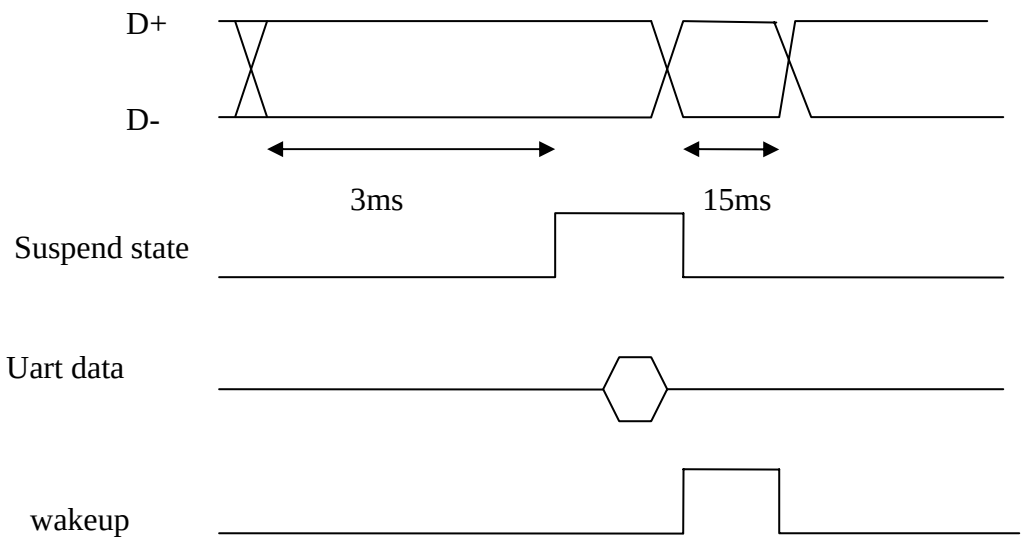


Figure 5-1 USB remote wakeup

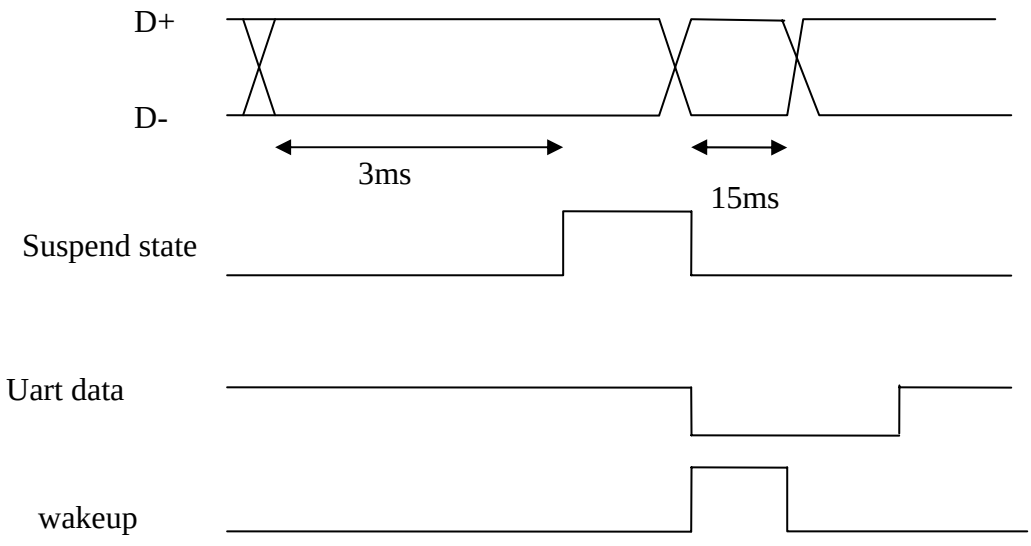


Figure 5-2 USB remote wakeup

5.4 I2C interface function

The F81232 Supports 1 suit I2C interface to get USB description information and builds 256 bytes RAM to save vendor USB description information. When power is ready, I2C function start to load USB description into 256 bytes RAM, and expect host requests GET_DESCRIPTOR to F81232 which returns vendor USB description, if i2c flash/ROM connect with F81232. The contents of I2C flash /ROM format is below table.

0x0	Security code	0x55
0x1	Security code	0xaa
0x2	IdVendor length	0x02
0x3	IdVendor low byte	IdVendor low byte
0x4	IdVendor low byte	IdVendor high byte
0x5	IdProduct length	0x02
0x6	IdProduct low byte	IdProduct low byte
0x7	IdProduct low byte	IdProduct high byte
0x8	Endpoint 1 polling time	Define by vendor content
0x9	BcdDevice length	0x02
0xa	BcdDevice low byte	BcdDevice low byte
0xb	BcdDevice high byte	BcdDevice high byte
0xc	Manufacturer string length	Define by vendor content
0xd+ Manufacturer string length	Manufacturer string content	Define by vendor content
0xd+ Manufacturer string length + 1	IProduct string length	Define by vendor content
0xd+ Manufacturer string length + IProduct string length +1	IProduct string content	Define by vendor content
0xd+ Manufacturer string length + IProduct string length +2	ISerialNumber string length	Define by vendor content
0xd+ Manufacturer string length + IProduct string length +2	IProduct string length	Define by vendor content

Table 5-7 I2C flash/ROM USB description format

6. Electrical Characteristics Request

Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Power Supply Voltage	-0.3 to 3	V
Input Voltage	-0.3 to VDD+0.3	V
Operating Temperature	0 to 70	° C
Storage Temperature	-55 to 150	° C

Table 6-1: Electrical characteristics table

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

DC Characteristics

(T_A = 0° C to 70° C, VDD = 3.3V ± 10%, VSS = 0V)

Parameter	Conditions	MIN	TYP	MAX	Unit
Supply Voltage range	VDD	3.0	3.3	3.6	V

Table 6-2: Operating Voltage table

PARAMETER	SYM.	MIN	TYP	MAX.	UNIT	CONDITIONS
I/O_{12st_5v} - TTL level and schmitt trigger bi-directional pin with 12 mA source-sink 5v tolerance capability(3.3V)						
Input Low Voltage	VIL			0.8	V	
Input High Voltage	VIH	2.0			V	
Hysteresis			0.5		V	
Output Low Current	IOL		12		mA	0.4V
Output high Current	IOL		12		mA	2.4V
Input High Leakage	ILIH	-1		1	μA	
Input Low Leakage	ILIL	-1		1	μA	
$OD_{12_4.7k}$ – Open-drain output pin with12mA source-sink capability(3.3V), pull high 4.7k						
Output Low Current	IOL		12		mA	0.4V
O_{12} – Output pin with12mA source-sink capability(3.3V)						
Output Low Current	IOL		12		mA	0.4V
Output HIGH Current	IOH		12		mA	2.4V
IN_t – TTL level input pin						
Input Low Threshold Voltage	VIL			0.8	V	
Input Hign Threshold Voltage	VIH	2.0			V	

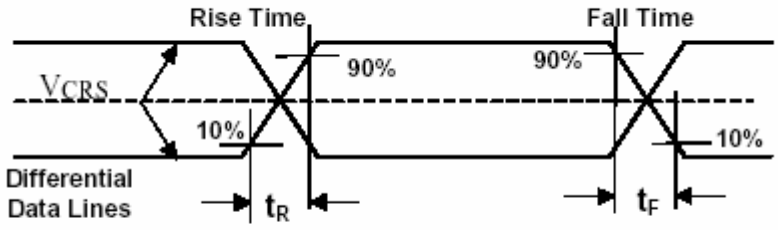
Input High Leakage	ILIH			+1	μA	
Input Low Leakage	ILIL	-1			μA	
IN_{ts_5v} – TTL level input pin and schmitt trigger, 5 tolerance						
Input Low Threshold Voltage	VIL			0.8	V	
Input Hign Threshold Voltage	VIH	2.0			V	
Hysteresis			0.5		V	
Input High Leakage	ILIH			+1	μA	
Input Low Leakage	ILIL	-1			μA	

Table 6-3: PAD DC table

USB Interface

Parameter	Symbol	Min.	Max.	Units
Rise Time	T_{FR}	4	20	Ns
Fall Time	T_{FF}	4	20	Ns
Differential Rise and Fall Time Matching	T_{FRFM}	90	111.11	%
Driver Output Resistance	Z_{DRV}	28	44	Ω

USB AC table



USB timing

Jitter Source	Full-speed			
	Next Transition		Paired Transition	
	Each (ns)	Total (ns)	Each (ns)	Total (ns)
Source Driver Jitter	2.0	2.0	1.0	1.0
Source Frequency Tolerance (worst-case)	0.21/bit	1.5	0.21/bit	3.0
Source Jitter Total		**3.5**		**4.0**
Hub Jitter	3.0	15.0	1.0	5.0
Jitter Specification		**18.5**		**9.0**
Destination Frequency Tolerance	0.21/bit	1.5	0.21/bit	3.0
Receiver Jitter Budget		**20.0**		**12.0**

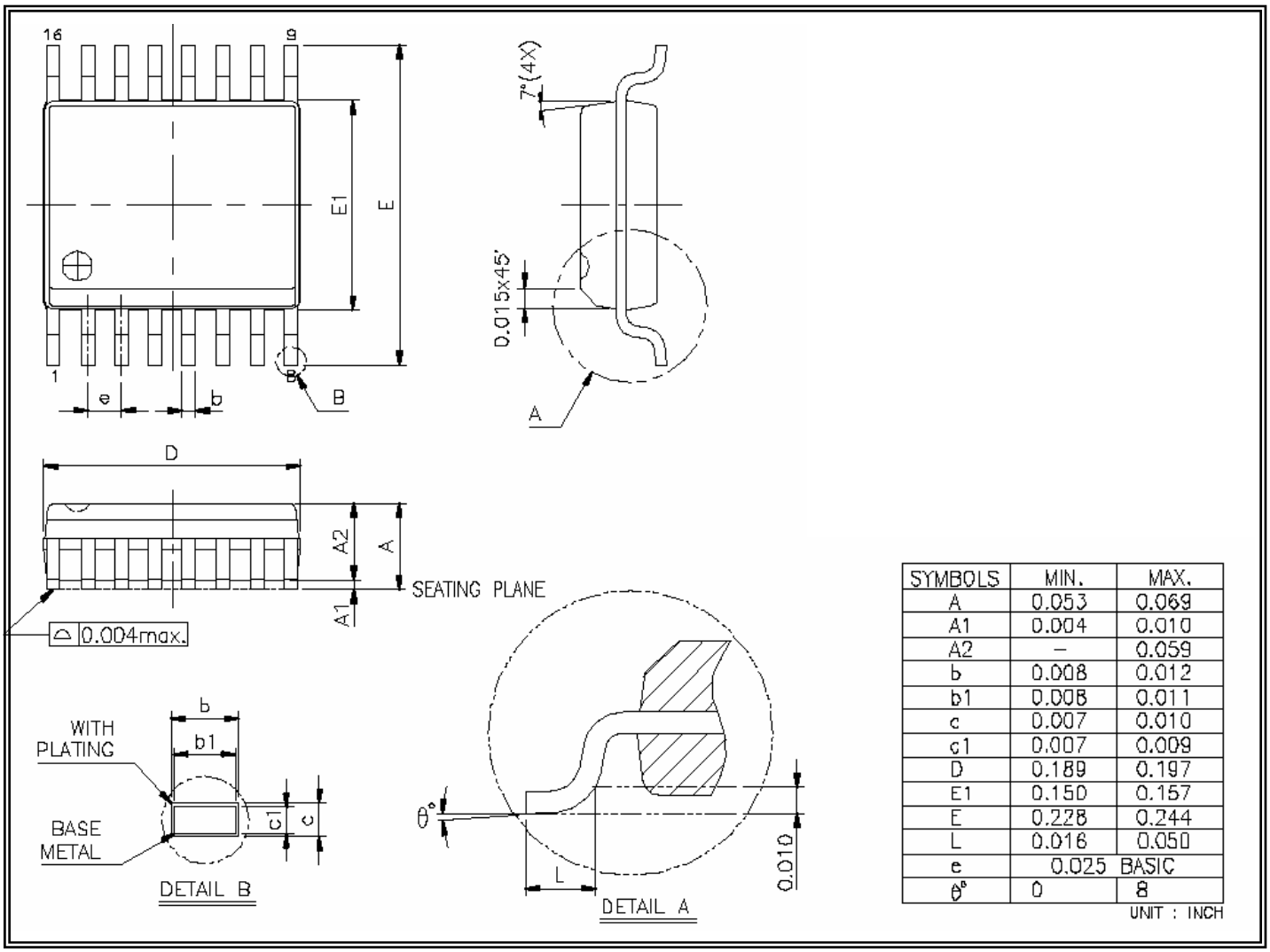
USB Jitter

7. Ordering Information

Part Number	Package Type	Production Flow
F81232R	16 pin SSOP (Green Package)	Commercial, 0°C to +70°C

8. Package Dimensions

16pin-SSOP (150mil)



SYMBOLS	MIN.	MAX.
A	0.053	0.069
A1	0.004	0.010
A2	–	0.059
b	0.008	0.012
b1	0.008	0.011
c	0.007	0.010
c1	0.007	0.009
D	0.189	0.197
E1	0.150	0.157
E	0.228	0.244
L	0.016	0.050
e	0.025 BASIC	
θ°	0	8

UNIT : INCH

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