



十速科技股份有限公司
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**Advance
Information**

TP6823

USB Full Speed Game Pad Controller Data Sheet

**Tenx reserves the right to change or
discontinue this product without notice.**

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1. GENERAL DESCRIPTION

The TP6823 is an 8051 embedded device tailored to the USB full speed Game Pad controller application. TP6823 was designed for connecting PC or operating at stand-alone (non-PC) mode. It also supports powerful functions and interfaces, such as USB Keyboard, USB Mouse, USB Joystick, USB HID, 10-bit A/D converter for data acquisition and 20 channels input analog or digital control all in one unit for Game Pad control, speech PWM output, PWM 2 channels of Pulse Width Modulation for Voice Vibration feedback, master/slave SPI and external parallel bus (NOR, NAND interface), RF 2.4G and Bluetooth control interface, G-sensor control interface.

2. FEATURES

(1). Dual Power System

- USB 5V and/or battery-in dual power systems

(2). Operation Frequency

- FAST mode
- 6MHz crystal oscillator for PLL clock source, PLL generate 48MHz for USB data transaction and 24MHz/6MHz for CPU clock
- SLOW mode
- External resistor, RC oscillator at 2.0V~3.6V for battery system (optional)
- 32KHz crystal oscillator for CPU clock and accuracy timing in low power mode (optional)
- STOP mode

(3). On-Chip Memory

- 32k x 8 internal program OTP-ROM
- Internal RAM 256 bytes and external XRAM up to 320 bytes

(4). USB interface

- Compliance with the Universal Serial Bus specification v2.0 Full Speed
- Built-in USB Transceiver, 3.3V regulator
- Software Control USB pull-up resistor
- Support USB Suspend /Resume and Remote Wakeup function
- Endpoint 0: Control SETUP transfer (8 bytes)
- Endpoint 0: Control IN/OUT transfer (64 bytes)
- Endpoint 1: BULK-IN transfer with Pin-Pong feature (2*64 bytes)

- Endpoint 2: BULK-OUT transfer with Pin-Pong feature (2*64 bytes)
- Endpoint 3: INTERRUPT IN transfer (8 bytes)

(5). ADC (Analog to Digital Converter)

- 20 input channels analog or digital control all in one unit for Game Pad control
- 10-bit SAR A/D converter

(6). Speech PWM Out

- 8-bit unsigned PCM format
- 8KHz sampling rate for Audio Playback
- Class-D Amplify for Speaker Out

(7). NOR Interface

- Data transfer for all of External XRAMs
- H/W handle NOR command procedure
- Read DMA (up to 64 bytes per time)
- Write DMA (up to 64 bytes per time)

(8). NAND Interface

- Data transfer for all of External XRAMs
- Write DMA (up to 64 bytes per time)
- Read DMA (up to 64 bytes per time)
- Compatible with 8-bit parallel interface

(9). SPI Interface

- Mode0, 1, 2, 3
- Master or Slave mode
- Clock Rate up to 12Mbps
- Read DMA (up to 64 bytes per time)
- Write DMA (up to 64 bytes per time)

(11). PWM

- Support 2 channels of Pulse Width Modulation (PWM) function with 8-bit resolution
- Voice Vibration feedback for Game Pad

(12). Reset Controller

- Power On Reset
- Low Voltage Reset
- Watch-Dog Timer

- USB Plug-in Reset
- Plug-out Reset

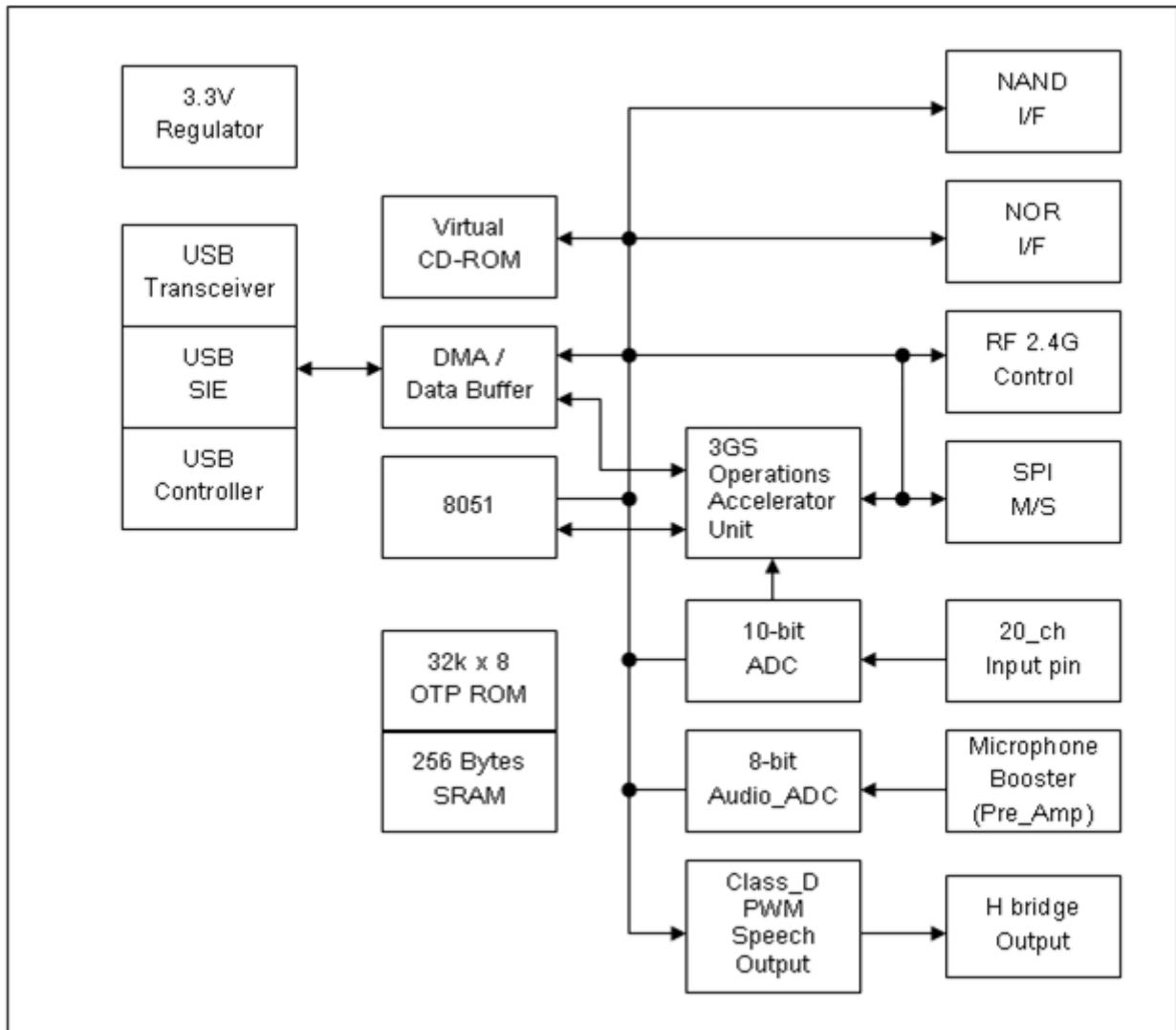
(13). Keep SRAM data when USB un-plug (need battery)

(14). LQFP80 / Die Form / Customer Request

(15). Application

- USB full speed Game Pad for PS3 peripheral application
- USB full speed Game Pad for G-sensor application
- USB full speed Game Pad for RF 2.4G wireless application
- USB full speed Game Pad for Bluetooth wireless application
- USB full speed Game Pad with Built-in Games application

3. Functional Block Diagram



4. Pin Description

Name	I/O	Description		
DVDD	P	5V Power from USB cable		
DGND	P	Ground		
PC5VDET	I	USB 5V detection pin, should connect to USB power		
VBAT	P	Battery power in		
V33	O	3.3V regulator output		
DP	I/O	USB positive data signal		
DM	I/O	USB negative data signal		
VPP/RESETn	I	OTP programming power/Chip reset pin (internal pull-up)		
TESTn[1:0]	I	Test Mode control (internal pull-up)		
FX1	I	Crystal in (6MHz)		
FX2	O	Crystal out		
VDDX	P	PLL power		
FLTC	I	PLL filter		
VSSX	P	PLL ground		
LX1	I	Crystal in (32KHz)		
LX2	O	Crystal out		
VR	I	RCLK clock, external resistor		
RF_RST	O	RF Reset (Bluetooth, RF 2.4G)		
CSA	O	Serial flash Chip enable		
CSB	O	Chip enable pin		
CLE	O	NAND Flash Command Latch Enable		
CSM	O	NAND Flash Chip Enable		
CSR	O	RF Chip Enable		
ALE	O	NAND Flash Address Latch Enable		
RDY	I	NAND Flash ready output		
WP	I	NAND Flash Write Protect		
Key1	I/O	Function Key and 8051's UART (RXD)		
Key2	I/O	Function Key and 8051's UART (TXD)		
T0	I/O	8051's Timer 0 and USB Power enable		
T1	I/O	8051's Timer 1 and System Power enable		
ADC[4:0]	I/O	ADC_CH[4:0]	NOR_FA[4:0] (o)	wake-up interrupt
ADC5	I/O	G-Sensor AXOUT	ADC_CH[5]	NOR_FA[5] (o)
ADC6	I/O	G-Sensor AYOUT	ADC_CH[6]	NOR_FA[6] (o)
ADC7	I/O	G-Sensor AZOUT	ADC_CH[7]	NOR_FA[7] (o)
D[3:0]	I/O	NAND_DIO[3:0] (b)	NOR_FD[3:0] (b)	
D[7:4]	I/O	NAND_DIO[7:4] (b)	NOR_FD[7:4] (b)	ADC_CH[19:16]
WRN	I/O	NAND_WRN (o)	NOR_WRN (o)	wake-up interrupt
RDN	I/O	NAND_RDN (o)	NOR_RDN (o)	wake-up interrupt
Key0	I	Function Key with wake-up interrupt (b)		
RF_PKT	I	RF Packet flag		
LED	O	LED Output with PWM		
RF_FIFO	I	RF FIFO		

RF_CLK	O	RF SPI CLK Output
RF_DO	O	RF SPI Data Output
RF_DI	I	RF SPI Data Input
ADC[15:8]		ADC Channel[15:8]
CSG	O	G-Sensor Chip select
FS0	I	G-Sensor Function select 0
FS1	I	G-Sensor Function select 1
FS2	I	G-Sensor Function select 2
ADC:		
AVDD	P	Analog Power
AGND	P	Analog Ground
MICP	I	Micro-phone MIC IN+ input
MICN	I	Micro-phone MIC IN- input
VREF	I	External reference voltage
ANAI	I	AC couple in
ANAO	O	AC couple out
Speech PWM:		
VDDW	P	PWM Power
PWMP	O	Speech PWMP output
PWMN	O	Speech PWMN output
VSSW	P	PWM Ground

All I/O Pin are pseudo-open drain type, unless otherwise specified function.

5. CPU Operation Mode V.S. Peripheral Clock

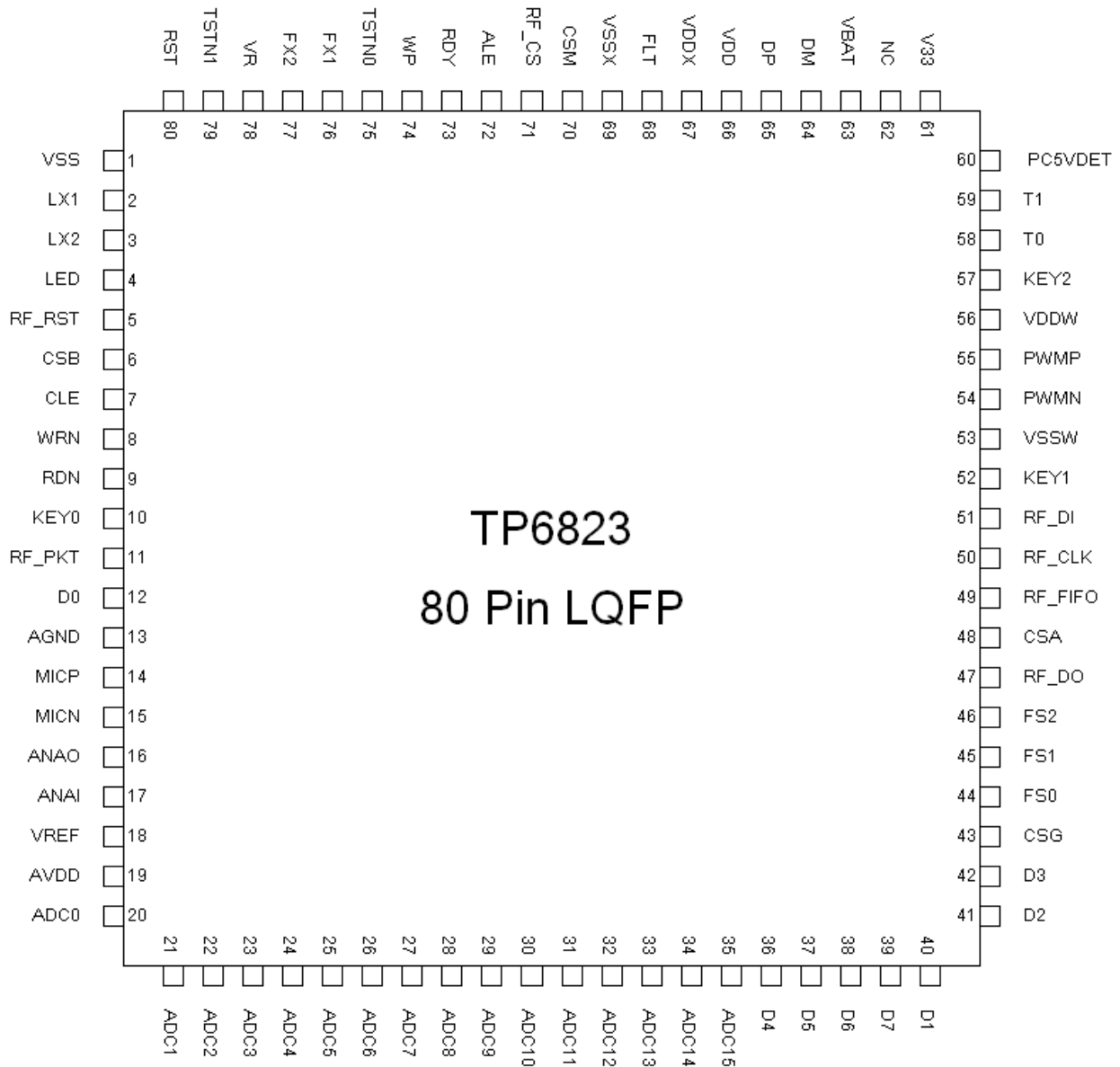
	DUAL MODE ⁽¹⁾		SIGNLE MODE ⁽¹⁾	NOTE
	SLOW ⁽²⁾	FAST ⁽²⁾		
CPUCLK(CPU51)	RCLK/32KHz	6M/24MHz	6M/24MHz	
USB function	N/A	48MHz	48MHz	
NAND DMA	N/A	6MHz	6MHz	XTAL_EN = 1
NOR DMA	N/A	6MHz	6MHz	
A/D converter	N/A	6MHz	6MHz	
Recording	N/A	6MHz	6MHz	
Speech PWM	N/A	6MHz	6MHz	
SPI	CPUCLK	CPUCLK	CPUCLK	
WDT	CPUCLK	CPUCLK	CPUCLK	
PWMA/B	CPUCLK	CPUCLK	CPUCLK	
0.5sec timer wakeup Interrupt	0.5sec	0.5sec	0.5sec	If 32KHz Xtal ⁽³⁾ is available

Notes:

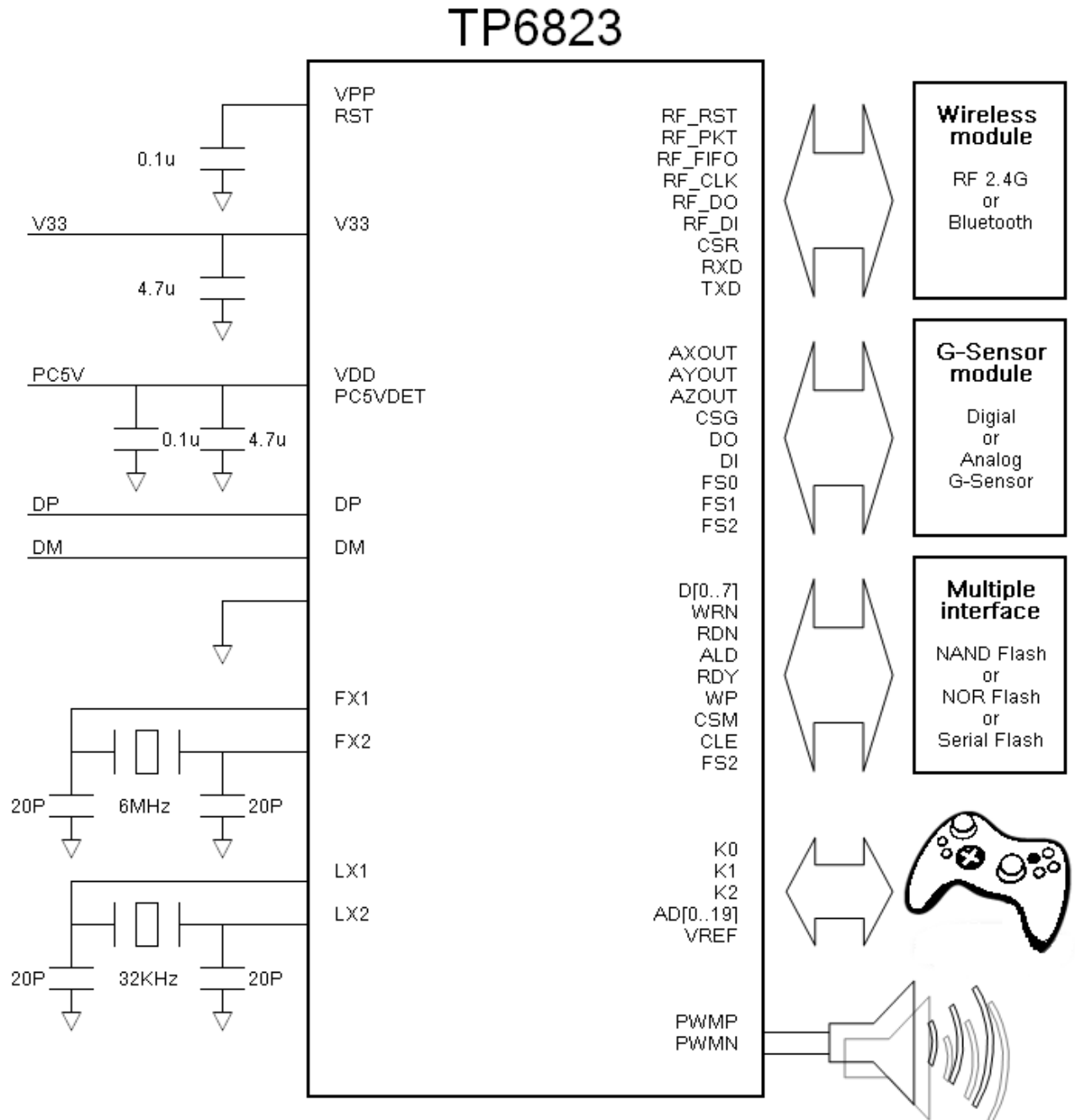
(1) & (3) Function enable/disable control by FUSE option.

(2) CPU clock mode switching control by firmware.

6. Package



7. Application Circuit



8. Electrical Characteristics

(1). ABSOLUTE MAXIMUM RATINGS (GND = 0V)

Name	Symbol	Range	Unit
Maximum Supply Voltage	VDD	-0.3 to 5.5	V
Maximum Input Voltage	Vin	-0.3 to VDD +0.3	V
Maximum output Voltage	Vout	-0.3 to VDD +0.3	V
Maximum Operating Temperature	Topg	-10 to +70	°C
Maximum Storage Temperature	Tstg	-25 to +125	°C

(2). RECOMMEND OPERATING CONDITION (at Ta = -10°C to 70°C, GND = 0V)

Name	Symb.	Min.	Max.	Unit
Supply Voltage	VDD	2.2	5.5	V
Battery Voltage, if apply	Vbat	2.2	4.2	V
Input "H" Voltage	Vih	0.9 x VDD	VDD	V
Input "L" Voltage	Vil	0	0.1 x VDD	V

(3). DC CHARACTERISTICS

(at Ta = 25°C, VDD = 5.0V, VSS = 0V, unless otherwise specify)

Name	Symb.	Min.	Typ.	Max.	Unit	Condition	Note
FAST clock	fclk1		24		MHz	XT6MHz On, PLL enable	
	fclk2		6		MHz	XT6MHz On	
SLOW clock	sclk1	0.1		10	MHz	VBAT = 3.0V, VDD = N.C.	
	sclk2		32		KHz	XT32KHz On	
Operating current	lcc1		10		mA	fclk1 = 24MHz, XT6MHz On	No load
	lcc2		0.8		mA	XT6MHz Off, RCLK = 3MHz VBAT = 3.0V, VDD = N.C.	No load
Suspend current	lsus		360	500	uA	USB mode	No load
Power down current	lpd1		3	5	uA	VDD = 3.0v, XT32KHz Off	No load
Output high current	loh1	2.5	3.8	-	mA	Voh = 3.0v, Vbat = 3.3v, VDD = N.C.	One clk time
	loh2	4	6	-	uA		
	loh3	2.5	3.8	-	mA		PWMA/B
	loh4	60	70	-	mA	VDD = 3.3V, Voh = VDD/2	Sph. PWM
Output low current	lol1	10	15	-	mA	Vol = VSS + 0.4v,	GPIO
	lol2	20	25	-	mA	Vol = VSS + 0.4v	PWMA/B
Input high voltage	Vih1	1.6		VDD	V	VDD = 3.2V, Vio = V33 = 3.2V PC5V = 0, Schmitt trigger	GPIO
	Vih2	1.7		VDD	V	VDD = 5.0V, Vio = V33 = 3.3V, PC5V > Vih3, Schmitt trigger	GPIO
	Vih3	2.8		VDD	V	Schmitt trigger	PC5V
Pull up resistance	Rup1	5	10	15	KΩ	VDD = 3.3 or 5V	VPP/RSTn
	Rup2	40	50	60	KΩ	VDD = 5V	TEST pin
Pull down resistance	Rdn1	50	100	150	KΩ	PC5V	
V33 pin voltage	V33	3.0	3.3	3.6	V	PC5V > Vih3	
V33 output current	IV33		130		mA	PC5V > Vih3	

(4). A/D conversion

(at Ta = 25°C, VDD = AVDD = 5.0V, VSS = AGND = 0V, unless otherwise specify)

Name	Symb.	Min.	Typ.	Max.	Unit	Condition	Note
Resolution		-	10	-	Bits		
Conversion time	Tadc		24		us	Fadc=1.5MHz	
Differential linearity	DL		±2.5	±4	LSB		
Linearity	IL		±3.2	±5	LSB		
Total error	ERR		±4	±6	LSB		

(5). USB AC CHARACTERISTICS

(at Ta = 25°C, VDD = AVDD = 5.0V, VSS = AGND = 0V)

Name	Symb.	Min.	Typ.	Max.	Unit	Note
DP/DM rising time	Trise	4		20	ns	
DP/DM falling time	Tfall	4		20	ns	
DP,DM cross point	Vx	1.3		2.0	V	
V33 output voltage	Vreg	3.2	3.3	3.4	V	

Note: All USB transceiver characteristics can meet USB1.1 spec.