



十速科技股份有限公司
tenx technology inc.

**Advance
Information**

TP6825

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 TP6825 is an 8051 embedded device tailored to the USB full speed Game Pad controller application. TP6825 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 control all in one unit for Game Pad control, PWM 2 channels of Pulse Width Modulation for Voice Vibration feedback, master/slave SPI for Serial Flash, RF 2.4G Module control interface, G-sensor control interface.

2. FEATURES

(1). Operation Frequency

- FAST mode: 24MHz crystal oscillation with internal 48MHz PLL at 5.0V for USB mode
- SLOW mode: Adjustable ext. R/C, RC oscillator at 2.0V~3.6V for battery system (optional)
- STOP mode

(2). On-Chip Memory

- 16k x 8 internal program OTP-ROM
- Internal RAM 256bytes and external XRAM up to 384bytes

(3). USB interface

- Compliance with the Universal Serial Bus specification v2.0 Full Speed
- Built-in USB Transceiver, 3.3V regulator
- Support USB Suspend /Resume and Remote Wakeup function
- Endpoint 0: Control SETUP/IN/OUT transfer (each 8 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: BULK-IN transfer (64 bytes)
- Endpoint 4: BULK-OUT transfer (64 bytes)
- Endpoint 5: INTERRUPT IN transfer (8 bytes)

(4). PWM

- Support 2 channels of Pulse Width Modulation (PWM) function with 8-bit resolution

(5). Reset Controller

- Power On Reset, Low Voltage Reset, Watch-Dog Timer, USB Plug-out Reset

(6). Full-Duplex UART interface

- Tx/Rx FIFO (each 8bytes, each 8 depth)
- Baud rate clock up to 3Mbps
- Break function

(7). SPI interface

- Support Mode0, 1, 2, 3
- 1x Master/Slave (Tx FIFO 8*8 bytes, Rx FIFO 8*8 bytes)
- Clock rate up to 6Mbps

(8). Support 32768Hz Crystal pin for Accuracy timing in low power mode (optional)

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

(10). I/O Ports

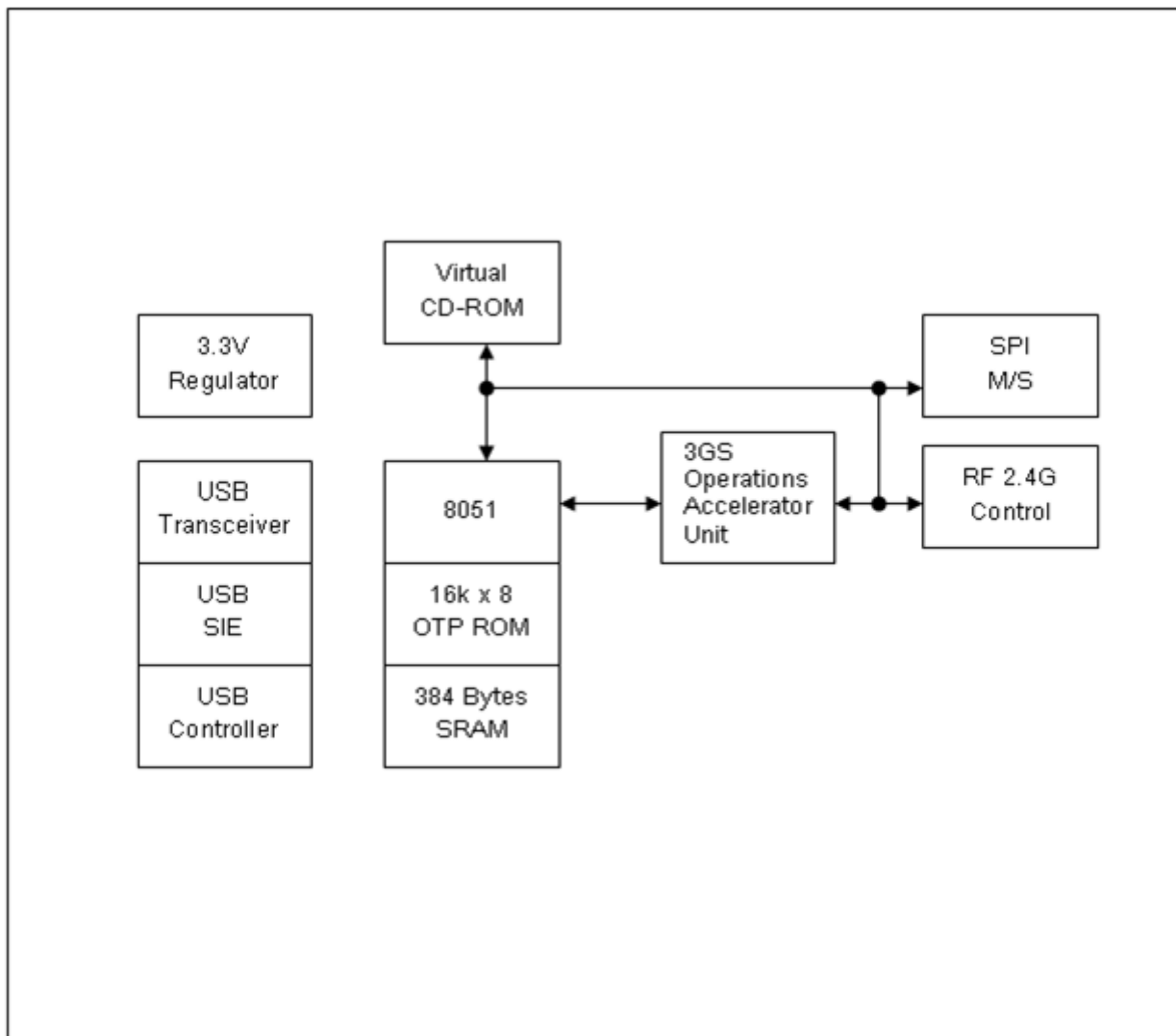
- 4 external Interrupts with wakeup function

(11). LQFP48/LQFT64/ Die Form

(12). 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 MAX. 20 Keys application
- USB full speed Game Pad with Built-in Games application

3. Functional Block Diagram



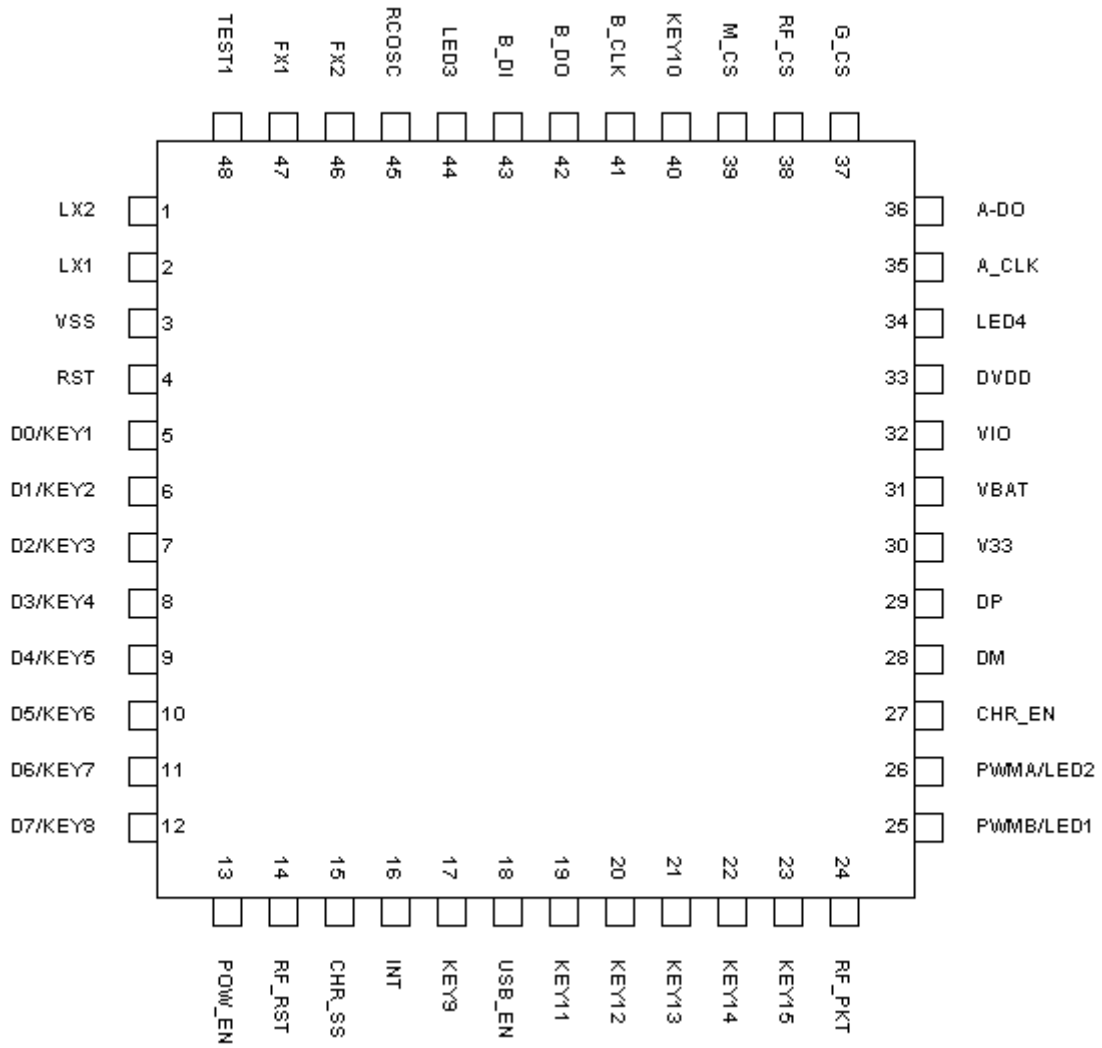
4. Pin Description

Name	I/O	Description
VDD	P	5V Power from USB cable
VSS	P	Ground
VBAT	P	Battery power
VIO	O	Chip I/O voltage, (1.8V/3.0V/3.3V/5V/VBAT by chip configuration)
FX1	I	Crystal in (24MHz)
FX2	O	Crystal out
LX1	I	Crystal in (32KHz)
LX2	O	Crystal out
OSCI	I	RC clock, external capacitor and resistor
VPP/RESETn	I	OTP programming power/Chip reset pin
TESTn[1:0]	I	Test Mode control
V33	O	3.3V regulator output
DP	I/O	USB positive data signal
DM	I/O	USB negative data signal
D[7:0]	I/O	8051's D[0..7]
	I/O	KEY[1..19] Keys
CHR_EN	O	Battery charge enable
CHR_SS		Battery charge state
USB_EN	O	USB enable
RF_PKT	I	RF Packet flag
RF_RST	O	RF Reset
RF_CS	O	RF Chip enable
B_CLK		SPI DATA Clock
B_DO		SPI DATA Output
B_DI		SPI DATA In
RF_CS	O	RF Chip enable
G_CS	O	G-Sensor enable
M_CS	O	Memory enable
POW_EN	O	Low power mode enable
PWMA	O	LED2 and PWMA Output
PWMB	O	LED1 and PWMB Output

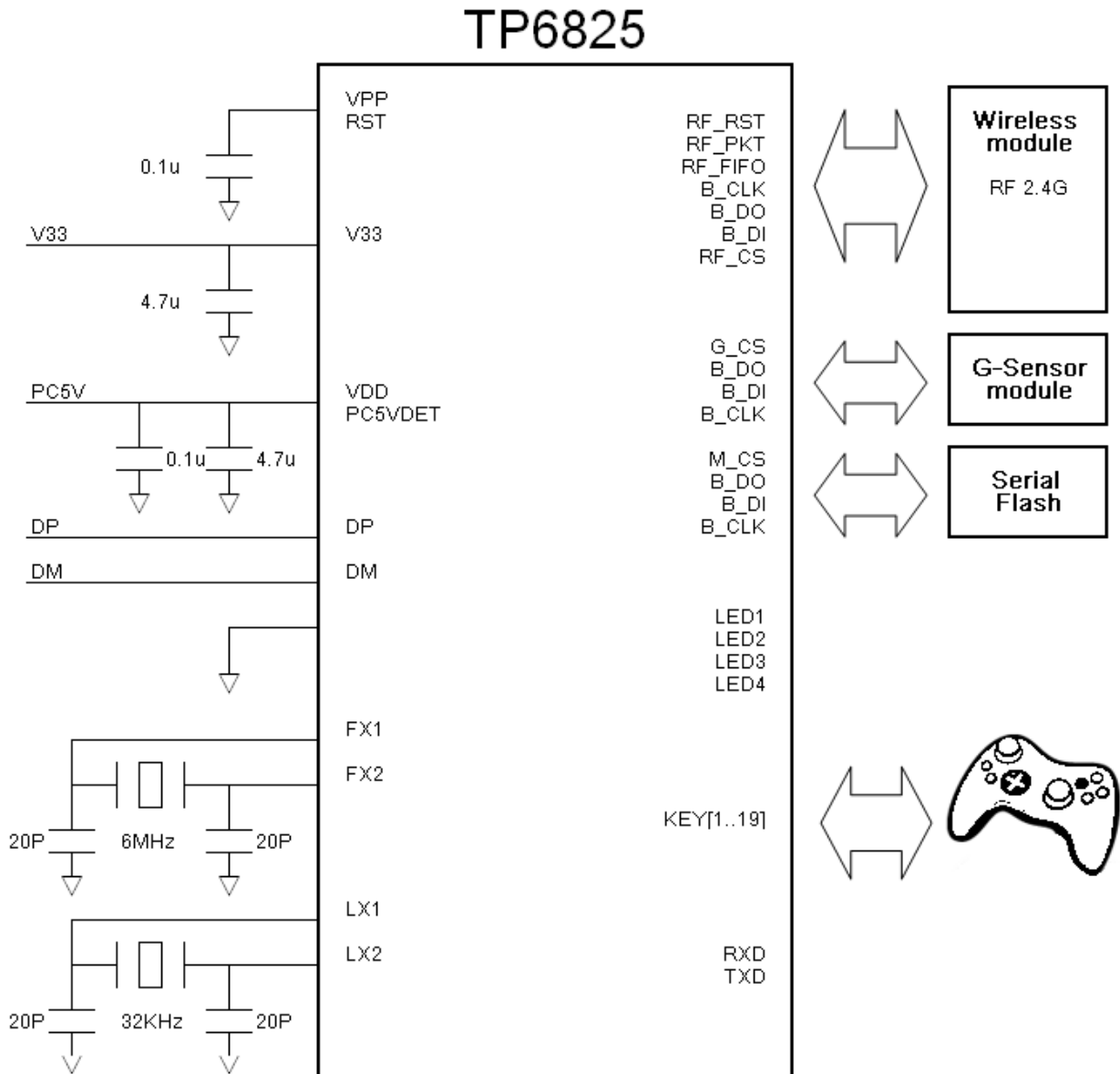
All I/O ports are pseudo-open drain type.

I/O voltage fixes 3.3V, unless otherwise specified.

5. Package



6. Application Circuit



7. 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	-5 to +70	°C
Maximum Storage Temperature	Tstg	-25 to +125	°C

(2). RECOMMEND OPERATING CONDITION (at Ta = -20°C to 70°C, GND = 0V)

Name	Symb.	Min.	Max.	Unit
Supply Voltage(USB mode)	VDD	4.5	5.5	V
Battery Voltage(battery mode)	Vbat	2.1	4.1	V
Chip I/O Voltage	Vio	1.8	5.5	V
Input "L" Voltage	Vil1	0	0.3xVio	V

(3). DC CHARACTERISTICS (at Ta = 25 °C, VDD = 5.0V, VSS = 0V, Fosc = 24MHz)

Name	Symb.	Min.	Typ.	Max.	Unit	Condition	Note
FAST clock	fclk		24		MHz		
SLOW clock	sclk	-30%	1	+30%	MHz	VBAT=3.0V, VDD=NC ExtC=750pF, ExtR=1K	
Threshold voltage of USB detection	Vdet		4.2		V		
Operating current	Icc1	-	16	-	mA	Fosc=24MHz	No load
	Icc2		1.4		mA	24MHz off, Fosc=1MHz VBAT=3.0V, VDD=N.C.	No load
Suspend current	Isus	-	340	500	uA	USB mode	No load
Power down current	Ipd1			1	uA	RC mode, no 32KHz	No load
	Ipd2		3	5	uA	RC mode with 0.5s wakeUp, disable Wakeup Int	No load
Port Output High Current	Ioh1	6			mA	Voh=Vio-0.4V, Vio>=3.0V	One clk time
	Ioh2	8			uA		
	Ioh3	2.6			mA	Voh=Vio-0.4V, Vio =1.8V	One clk time
	Ioh4	4			uA		
Port Output Low Current	Iol1	8			mA	Vol=VSS+0.2V, Vio >=3.0V	
	Iol2	4			mA	Vol=VSS+0.06V, Vio =1.8V	
VIO pin voltage	Vio1	1.7		1.9	V	I=40mA	Vio set 1.8V
	Vio2	2.9		3.1	V	I=80mA	Vio set 3V
	Vio3	3.2		3.4	V	I=120mA	Vio tie to V33
	Vio4	VDD-0.1		VDD	V		Vio set 5V
	Vio5	Vbat-0.1		Vbat	V	No PC5V, battery only	
Port Input High Voltage	Vih	0.55Vio			V	Schmitt trigger	

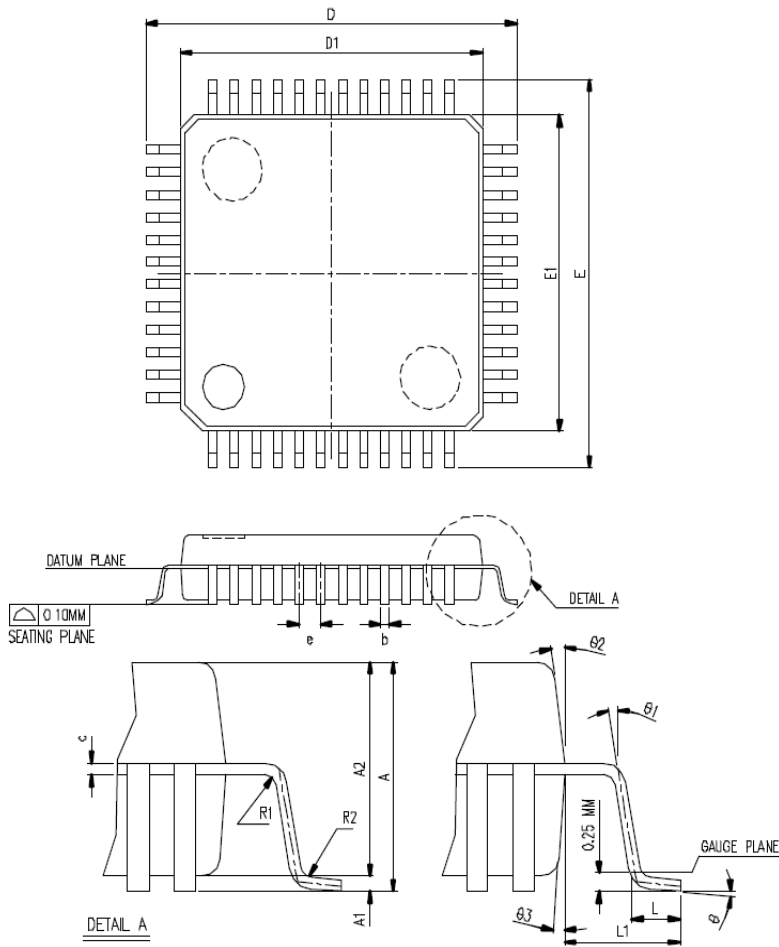
(4). AC CHARACTERISTICS (at $T_a = 25\text{ }^\circ\text{C}$, $V_{DD5V} = 5.0\text{V}$, $V_{SS} = 0\text{V}$, $F_{osc} = 24\text{MHz}$)

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	
V33 output current	IV33		20	30	mA	

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

8. Package Information

(1). LQFP48:



SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A			1.60			0.063
A1	0.05		0.15	0.001		0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.09		0.20	0.004		0.008
e	0.50 BASIC			0.020 BASIC		
D	9.00 BASIC			0.354 BASIC		
D1	7.00 BASIC			0.276 BASIC		
E	9.00 BASIC			0.354 BASIC		
E1	7.00 BASIC			0.276 BASIC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1.00 REF.			0.039 REF.		
R1	0.08			0.003		
R2	0.08		0.20	0.003		0.008
θ	0°	3.5°	7°	0°	3.5°	7°
θ1	0°			0°		
θ2	11°	12°	13°	11°	12°	13°
θ3	11°	12°	13°	11°	12°	13°
JEDEC	MS-026 (BBC)					

*NOTES: DIMENSIONS "D1" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 mm PER SIDE.
 "D1" AND "E1" ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.