

F1DQ8675

Datasheet

Confidential / Preliminary Documentation

Revision 1.1



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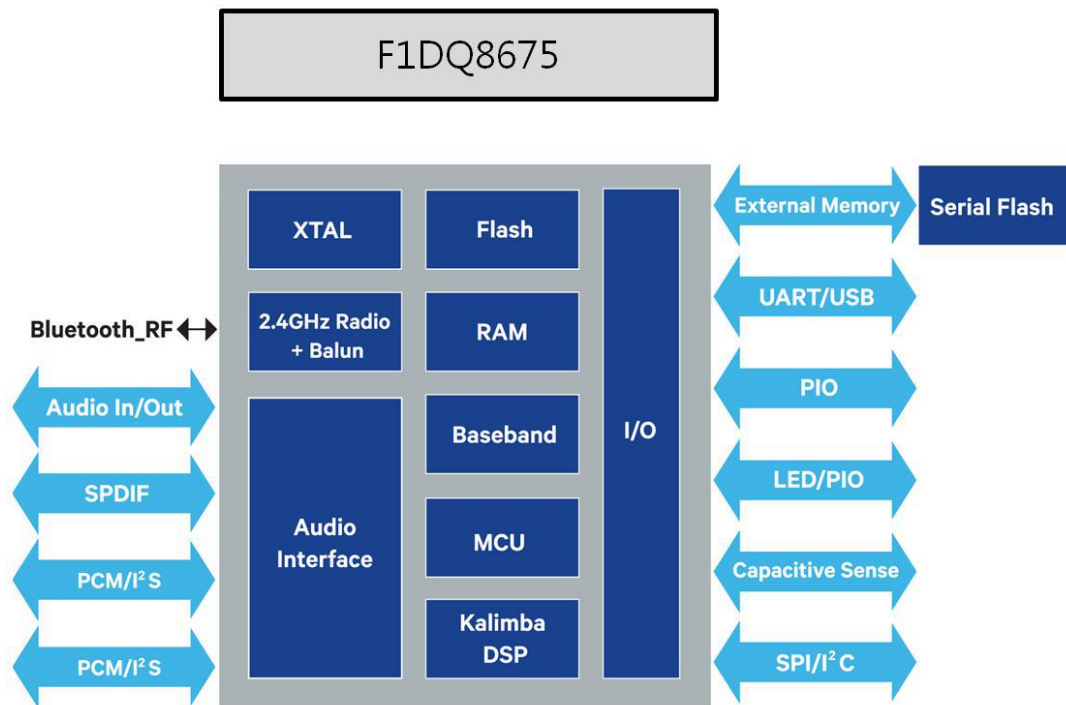
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1. General

1.1 Overview

This specification covers Bluetooth module (class-2) which complies with Bluetooth specification version 4.1 and integrates RF & Baseband controller in small package. This Module has deployed CSR's CSR8675 WLCSP chipset.



1.2 Features

- Bluetooth supports
 - . Bluetooth 4.1 specification compliant
 - . Support for Bluetooth basic rate/EDR
- Kalimba DSP
 - . Enhanced Kalimba DSP (120MIPS)
- Audio Interface
 - . analog/digital support
 - . 2/6 microphone input (analog/digital:MEMS)
 - . Supported sample rates of 8, 11.025, 16, 22.05, 32, 44.1, 48, 96kHz and 192kHz (DAC only)

- Physical interfaces
 - . UART/USB(2.0)
 - . 1-bit SPI flash memory interface
 - . 29 general PIO
 - . 2 x PCM/I2S
 - . 1 SPSID interfaces
 - . 3 LED drivers
- Memory
 - . 16Mb internal flash
 - . Up to 64Mb external flash
 - . 56kB system MCU ram
- Battery Charger
 - . Lithium ion/Lithium polymer battery charger
 - . Support USB charger detection
- It supports following profiles:
 - . HFP,PBAP,A2DP,AVRCP,SPP,OTP,HID,BLE.....
- Improved Audio Quality
 - . CVC noise cancel support
 - . aptX, aptX HD Music quality enhancement
 - . Multipoint support for HPF/A2DP

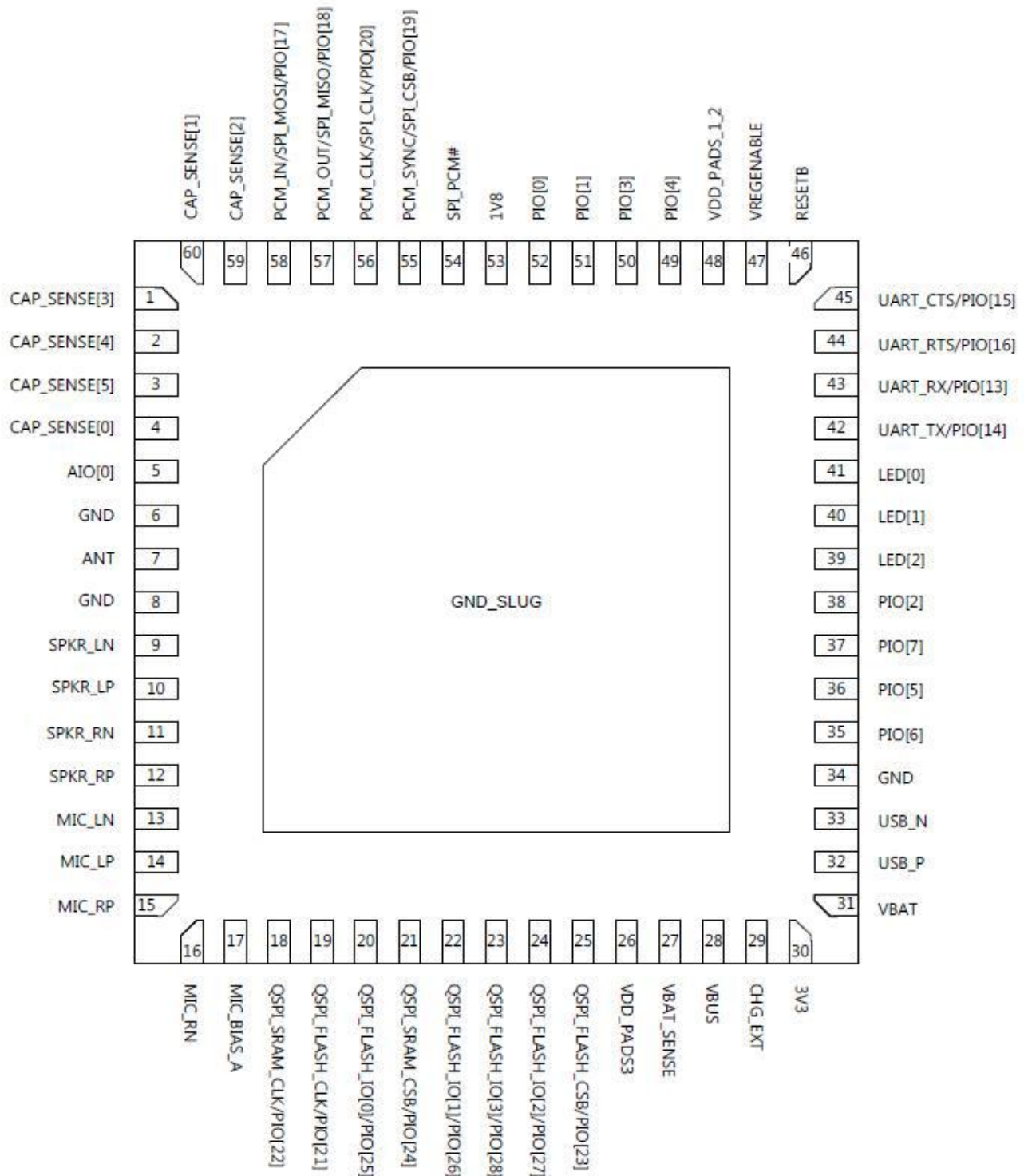
1.3 Application

- High-end wired/wireless stereo headphones/headset
- High-end wired/wireless active headsets
- Wireless stereo speakers



1.4 Pinout Diagram

Top view



1.5 Device Terminal Functions

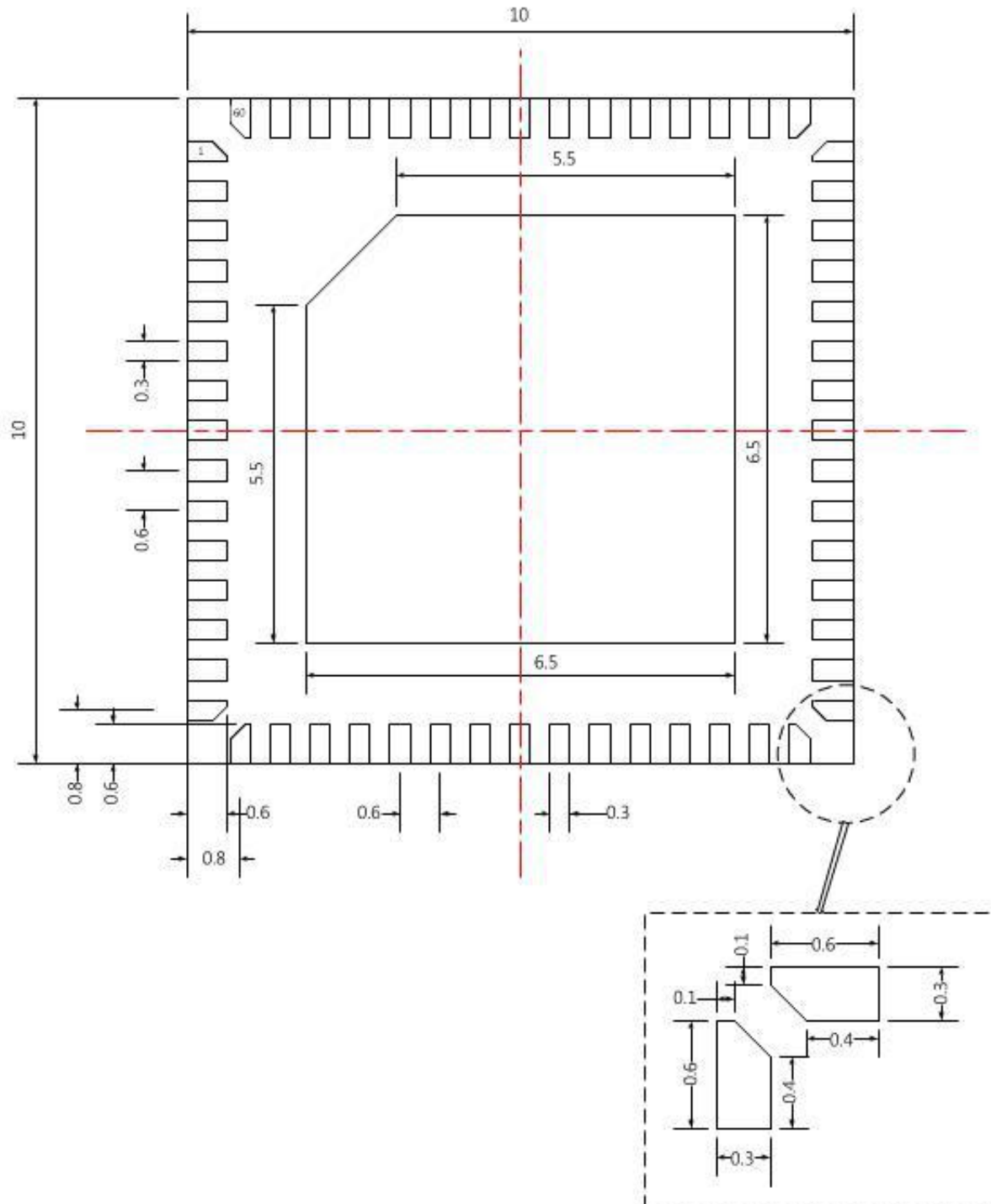
Pad	Pin Name	Pin Description
1	CAP_SENSE[3]	Touch sensor 3
2	CAP_SENSE[4]	Touch sensor 4
3	CAP_SENSE[5]	Touch sensor 5
4	CAP_SENSE[0]	Touch sensor 0
5	AIO[0]	AIO
6	GND	ground
7	ANT	RF antenna
8	GND	ground
9	SPKR_LN	Speaker output negative, left
10	SPKR_LP	Speaker output positive, left
11	SPKR_RN	Speaker output negative, right
12	SPKR_RP	Speaker output positive , right
13	MIC_LN	MIC input negative, channel A
14	MIC_LP	MIC input positive, channel A
15	MIC_RP	MIC input positive, channel B
16	MIC_RN	MIC input negative, channel B
17	MIC_BIAS_A	MIC bias
18	QSPI_SRAM_CLK/PIO[22]	SPI ram clk/pio[22]
19	QSPI_FLASH_CLK/PO[21]	SPI flash clk/pio[21]
20	QSPI_FLASH_IO/PO[25]	SPI flash data bit/pio[25]
21	QSPI_SRAM_CSB/PO[24]	SPI ram chip enable/pio[24]
22	QSPI_FLASH_IO[1]/PO[26]	SPI flash data bit 1/pio[26]
23	QSPI_FLASH_IO[3]/PO[28]	SPI flash data bit 3/pio[28]
24	QSPI_FLASH_IO[2]/PO[27]	SPI flash data bit 2/pio[27]
25	QSPI_FLASH_CSB/PO[23]	SPI flash chip enable/pio[23]
26	VDD_PADS3	1.7V to 3.6V positive supply input for serial quad I/O flash port
27	VBAT_SENSE	Battery charger sense input
28	VBUS	Charger input
29	CHG_EXT	External charger control
30	3V3	3.3V voltage in/out



31	VBAT	Battery voltage input
32	USB_P	USB data plus
33	USB_M	USB data minus
34	GND	ground
35	PIO[6]	Pio 6 / PCM2_SYNC
36	PIO[5]	Pio 5 / PCM2_OUT
37	PIO[7]	Pio 7 / PCM2_CLK
38	PIO[2]	Pio 2
39	LED[2]	LED[2] drive output
40	LED[1]	LED[1] drive output
41	LED[0]	LED[1] drive output
42	UART_TX/PIO[14]	UART TX/ Pio 14
43	UART_RX/PIO[13]	UART RX/ Pio 13
44	UART_RTS/PIO[16]	UART RTS/ Pio 16
45	UART_CTS/PIO[15]	UART CTS/ Pio 15
46	VDD_PADS1_2	.7V to 3.6V positive supply input for input/output ports: RST#, UART, PCM, SPI, PIO[3:0], PIO[7:4]
47	RESETB	Reset, active low
48	VREG_EN	Regulator enable input
49	PIO[4]	Pio 4 / PCM2_IN
50	PIO[3]	Pio 3
51	PIO[1]	Pio 1
52	PIO[0]	Pio 0
53	1V8	1V8
54	SPI_PCM#	SPI/PCM select input. (Low:PCM/, High:SPI)
55	PCM_SYNC/SPI_CSB/PIO[19]	SPI chip select/PCM SYNC/pio[19]
56	PCM_CLK/SPICLK/PIO[20]	SPI data clock/PCM CLOCK/pio[20]
57	PCM_OUT/SPI_MISO/PIO[18]	SPI data output/PCM OUT/pio[18]
58	PCM_IN/SPI_IN/SPI_MOSI/PIO[17]	SPI data input/PCM IN/pio[17]
59	CAP_SENSE[2]	Touch sensor 2
60	CAP_SENSE[1]	Touch sensor 1
61	GND_SLUG	Ground slug

1.6 Module Dimension

1. TOP VIEW(Unit : mm)



2. Characteristics

2.1 Electrical Characteristics

Absolute Maximum Ratings		
Rating	MIN	MAX
Storage temperature	-40°C	85°C
Charger (VBUS)		5.75V
PIO VDD_PADS1_2		3.6V
PIO VDD_PADS3		3.6V

Recommended Operating Conditions		
Operating Condition	MIN	MAX
Operating temperature range	-30°C	85°C
Charger (VBUS)	4.56V	5.75V
PIO VDD_PADS1_2	1.7V	3.6V
PIO VDD_PADS3	1.7V	3.6V

2.2 RF Characteristics

Transmitter

Specification	Condition	MIN	TYP	MAX	UNIT
Output transmit power	Normal	-6	1	4	dBm
Transmit power density	Normal			4	dBm
Transmit power control	Normal	2		8	dBm
Frequency Range	Normal	2400		2483.5	MHz
20dB bandwidth for modulated carrier	Normal		850	1000	KHz
Adjacent channel transmit power	±2MHz ±3MHz ±4MHz			-20 -40 -40	dBm



Modulation Characteristics	f1avg	140		175	KHz
	f2max	115			KHz
	f2avg / f1avg			80	%
Initial carrier frequency tolerance	Normal	-20		20	KHz
Carrier frequency Drift	One slot packet(DH1)	-25		25	KHz
	Three slot packet(DH3)	-40		40	
	Five slot packet(DH5)	-40		40	

Transceiver

Specification	Condition	MIN	TYP	MAX	UNIT
Adjacent channel transmit power	30MHz ~ 1GHz			-36	dBm
	1GHz ~12.75GHz			-30	
	1.8GHz ~5.1GHz			-47	
	5.1GHz ~5.3GHz			-47	

Receiver

Specification	Condition	MIN	TYP	MAX	UNIT
Sensitivity level (0.1% BER)	Single slot packets	-70	-78		dBm
Transmit power density	Multi slot packet	-70	-78		dBm
C/I performance	co-channel 1MHz (Adjacent channel)			11 0	dB
	2MHz (2nd Adjacent channel)			-30	
	3MHz (3rd Adjacent channel)			-40	
Blocking performance	30MHz ~ 2000MHz	-10			dBm
	2000MHz ~ 2400MHz	-27			
	2500MHz ~ 3000MHz	-27			
	3000MHz ~ 12.75GHz	-10			
Intermodulation performance	n=5	-39			dBm
Maximum input level		-20	-10		dBm

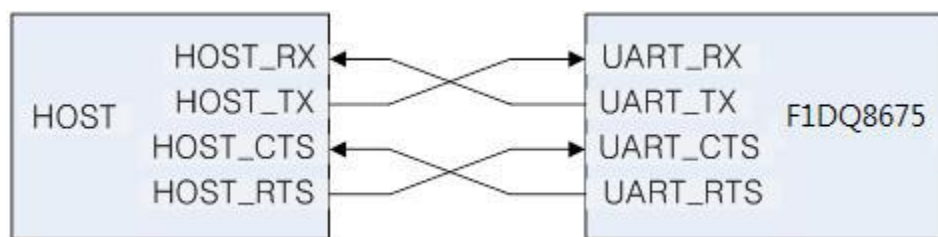


3. Interface

3.1 UART interface

Four signals are used to implement the UART function.

This is only for test and debug. UART_TX and UART_RX transfer data between the two devices. The remaining two signals, UART_CTS and UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators.



3.1.1 UART Setting

User can change data format the following selection using PSKEY.

However, host shall communicate with default setting UART connection initiated at first time.

$$\text{Baud Rate} = (\text{PSKEY_UART_BAUD_RATE}) / 0.004096$$

Parameter	Possible value
Baud Rate	9600 ~ 4M Baud
Flow Control	None
Parity	None, Odd or Even
Number of Stop Bits	1 or 2
Bits per channel	8

3.2 USB interface

F1DQ8675 has a full speed(12Mbps) USB interface for communicating with other compatible digital devices.

F1DQ8675 contains internal USB termination resistors and requires no external resistor matching.

F1DQ8675 supports the Universal serial bus specification, battery charging specification together.

The below describes USB basics and architecture.

- Power distribution for high and low bus-powered configurations
- Power distribution for self-powered configuration, which includes USB VBUS monitoring
- USB enumeration
- USB suspend modes and Bluetooth low-power modes :
 - . Global suspend
 - . Selective suspend, includes remote wake
 - . Wake on Bluetooth, includes permitted devices and set-up prior to selective suspend
 - . Suspend mode current draw
 - . PIO status in suspend mode
 - . Resume, detach and wake PIOs
- Battery charging from USB, which describes dead battery provision, charge currents, charging in suspend modes and USB VBUS voltage consideration

3.3 Serial Memory interface

CSR8675 WLCSP supports external serial flash and SRAM ICs. (this enables additional data storage areas for device)specific data. CSR8675 WLCSP supports serial single, dual or quad I/O devices with a 1-bit, 2-bit or 4-bit multiplexed I/O flash-memory interface.

3.4 Programming and Debug interface

F1DQ8675 provides a debug SPI interface for programming

3.5 I2C EEPROM interface

F1DQ8675 supports optional I2C eeprom for storage of setting value and voice prompt data

3.6 LED drivers

F1DQ8675 includes a 3-pad synchronized PWM LED driver for driving RGB LEDs for producing a wide range of colors. All LEDs are controlled by firmware. The terminals are open-drain outputs, so the LED must be connected from a positive supply rail to the pad in series with a current-limiting resistor.

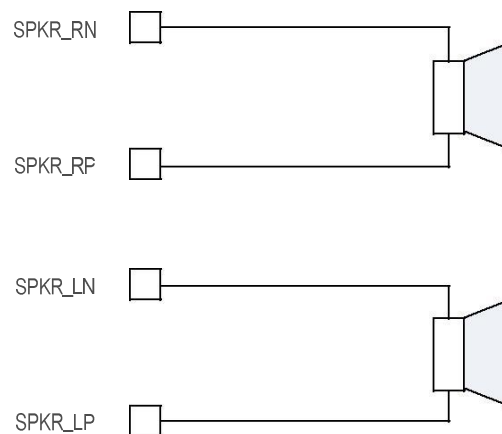
3.7 Audio Interfaces

F1DQ8675's audio interface consists below.

- Stereo/dual-mono audio codec
- Dual analogue audio inputs
- Dual analogue audio outputs
- 6 digital microphone inputs(MEMS)
- Configurable PCM and I2S interface

3.7.1 Audio Output

F1DQ8675 have a buffer with gain-setting, a low-pass filter and a class AB output stage amplifier



Mono operation is a single-channel operation of the stereo codec. The left channel represents the single mono channel for audio in and audio out. In mono operation, the right channel is the auxiliary mono channel for dual-mono channel operation

3.7.2 Analog Input

F1DQ8675 contains an independent low-noise microphone bias generator. In using Line input, F1DQ8675 supports a differential input and a single-ended input.

3.7.3 PCM interface

F1DQ8675 supports 2 x PCM interface.

- Continuous transmission and reception of PCM encoded audio data over Bluetooth
- Processor overhead reduction through hardware support for continual transmission and reception of PCM data
- PCM interface master, generating PCM_SYNC and PCM_CLK
- PCM interface slave, accepting externally generated PCM_SYNC and PCM_CLK
- Various clock formats including :
 - . Long Frame Sync
 - . Short Frame Sync
 - . GCI timing environments
- 13-bit or 16-bit linear, 8-bit u-law or A-law companded sample formats
- Receives and transmits on any selection of 3 of the first 4 slots following PCM_SYNC

3.7.4 I2S Interface

The digital audio interface supports the industry standard formats for I2S, left-justified or right-justified. The interface shares the same pins as the PCM interface, which means each audio bus is mutually exclusive in its usage.

3.8 Battery Charger

3.8.1 Battery Charger Hardware Operating Modes

The battery charger has 5 modes.

- Disabled
- Trickle charge
- Fast charge
- Standby : fully charged or float charge
- Error : charging input voltage.

The battery charger operating mode is determined by the battery voltage and current. The internal charger circuit can provide up to 200mA. For currents higher than this, external pass transistor is needed.

3.8.1.1 Disable mode

In this mode, the battery charger is fully disabled and draws no active current on any of its terminals.

3.8.1.2 Trickle Charge mode

In this mode, a current of approximately 10% of the fast charge current.

3.8.1.3 Fast Charge mode

In this mode, a current of approximately is between 10mA and 200mA.

3.8.1.4 Standby mode

When the battery is fully charged, the charger enters standby mode, and battery charging stops.

3.8.1.5 Error mode

The charger enters the error mode if the voltage on the VBUS pin is too low to operate the charger correctly. In this mode, charging is stopped. The battery charger does not require a reset to resume normal operation.

3.8.1 Battery Charger External Mode

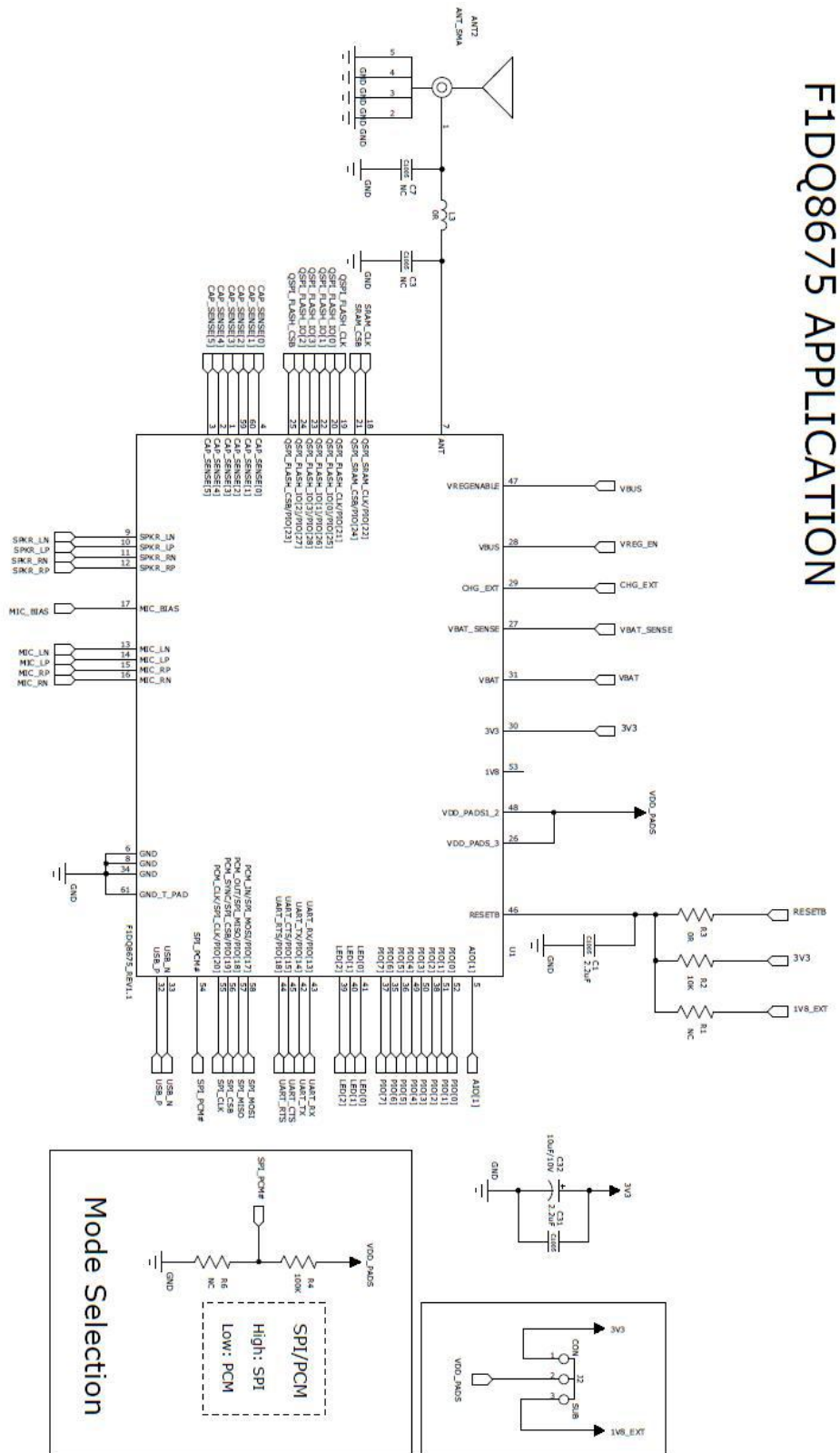
The external mode is for charging higher capacity batteries using an external pass device. The current is controlled by sinking a varying current into the CHG_EXT pin, and the current is determined by measuring the voltage drop across a resistor.

3.9 Capacitive Touch Sensor

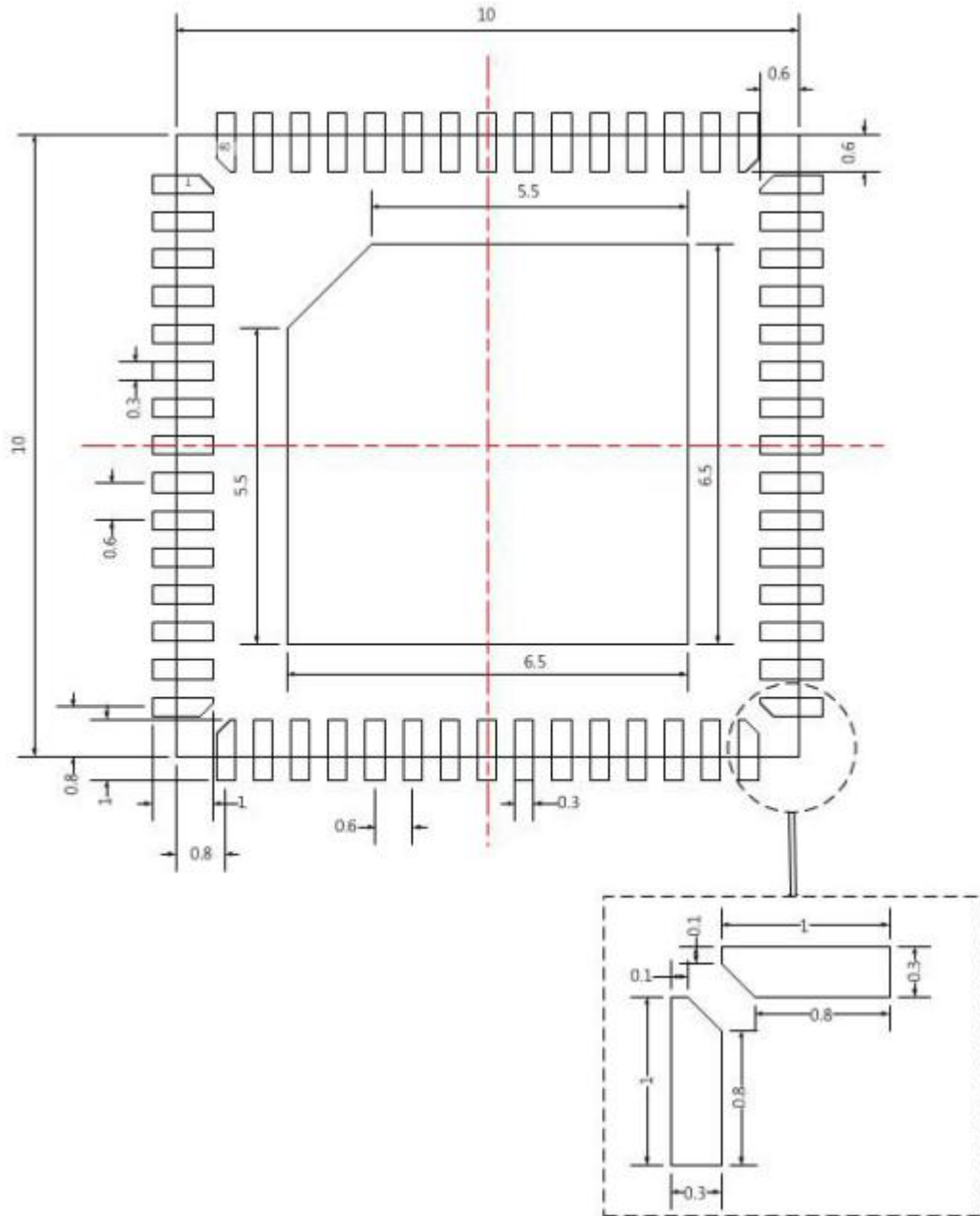
F1DQ8675 capacitive touch sensor interface features

- Support for up to 6 capacitive touch sensing electrodes
 - . Printed on the PCB
 - . Made from flex PCB
- Configuration for individual buttons
- Configuration for a wipe-type arrangement where 2 or more pads sense taps at each end or a wipe from one side to the other
- Operates in deep sleep and is a programmable source for wake-up

4. Application Schematic



5. PCB Layout



6. 联系方式

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