CF1216

Capacitive Touch Screen Controller

Datasheet

Version 1.0

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1   INTRODUCTION

The CF1216 is a capacitive sensing controller for small size projected capacitive touch screen. It is a RISC microcontroller with capacitor charge, capacitor sensing, slave I2C interface, general purpose I/O and embedded non-volatile memory.

Internal program and cooperating digital circuit convert finger / capacitor stylus physical touching into button pressing message or multiple coordination information for application. The maximum fingers identification ability is up to ten.

The CF1216 uses low profile QFN package and support ITO electrode on glass or film substrate. Hence, slim and small touch panel module is realizable.

And more, low electromagnetic interference of CF1216 makes it suitable for modern touch screen application such as mobile phone, industrial equipment and automotive vehicle.

FEATURES

- **MCU based touch controller**
- **Operation voltage**
  - VDD = 2.8V ~ 3.6V
  - IOVDD = 1.65V ~ 3.6V
- **Operation Temperature: -40℃ ~ 85℃**
- **Storage Temperature: -40℃ ~ 125℃**
- **Interface**
  - I2C (slave)
- **Sensor**
  - 16 TX, 32 RX
- **Ten fingers detection and tracking**
- **Support zero external component (0C0R)**
- **Support TX voltage up to 5.5V**
- **Capacitive Sensor**
  - Mutual-capacitance sensing
  - Self-capacitance sensing
  - Report rate : 100Hz
  - Hardware noise reduction
  - Waterproof circuit
  - LCD synchronisation

- **Package**
- QFN56

APPLICATIONS

- **Mobile phone**
- **Appliance**
- **Medical**
- **Industrial automation**
- **Home automation**
- **Point of Sales**
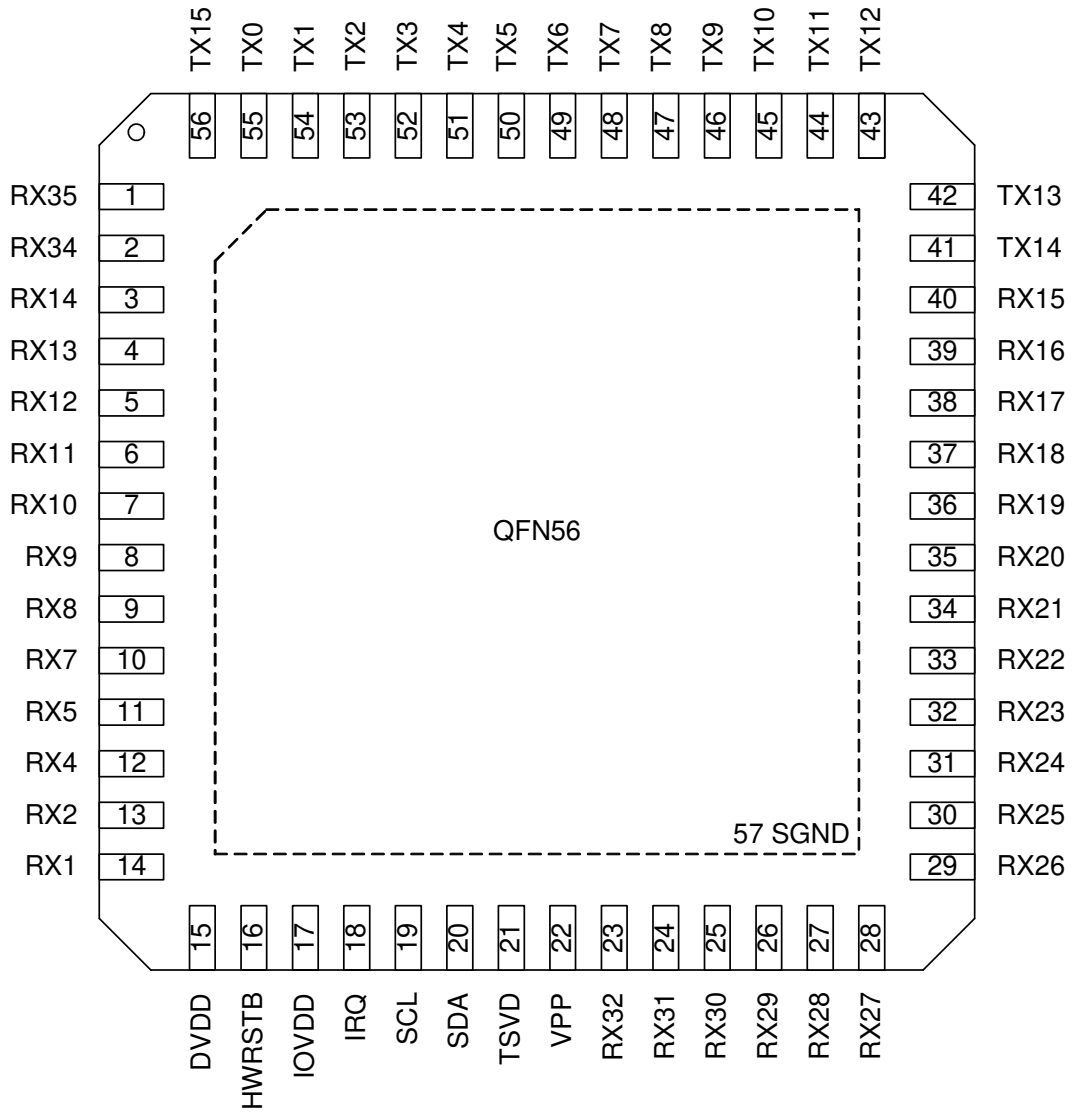- **Automotive**
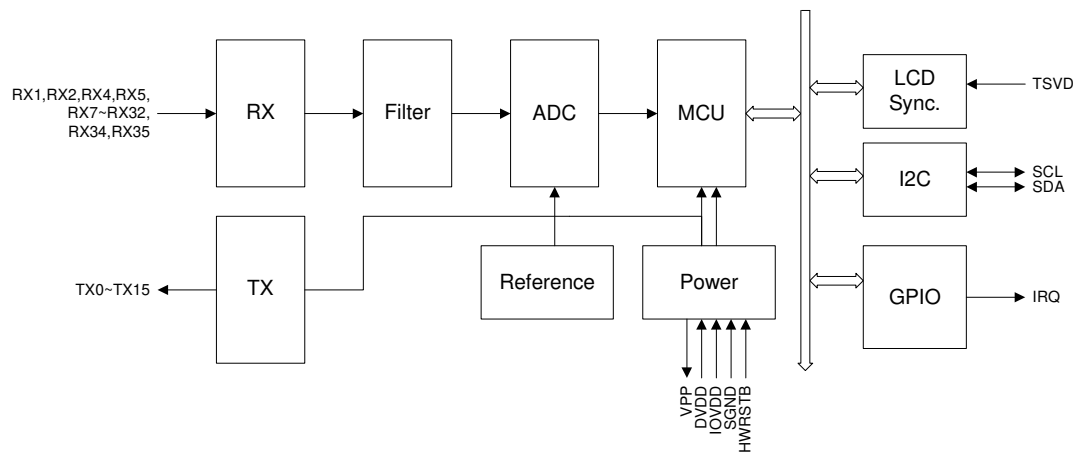
2   PACKAGE INFORMATION

Figure 2-1   CF1216 Package Pin Configuration

Table 2-1   CF1216 Package Signal Descriptions

Pin #	Pin Name	I/O	Description
1~2	RX35~RX34	I	Receiver channel
3~10	RX14~RX7	I	Receiver channel
11~12	RX5~RX4	I	Receiver channel
13~14	RX2~RX1	I	Receiver channel
15	DVDD	P	Power supply
16	HWRSTB	I	System reset signal input, active low
17	IOVDD	P	I/O power supply
18	IRQ	I/O	Indicate coordinate data ready
19	SCL	I/O	I2C serial clock
20	SDA	I/O	I2C serial data
21	TSVD	I	LCD synchronisatin input
22	VPP	P	Power for program
23~40	RX32~RX15	I	Receiver channel
41~55	TX14~TX0	O	Transmitter channel
56	TX15	O	Transmitter channel
57	SGND	P	Ground

Note: I/O type: P=Power pin, I=Input pin, O=Output pin

3   SYSTEM MANAGEMENT

3.1   Power Down

Host can pull low HWRSTB pin to force CF1216 in power down mode which consumes only little current. The way to exit power down mode is by pulling high HWRSTB pin.
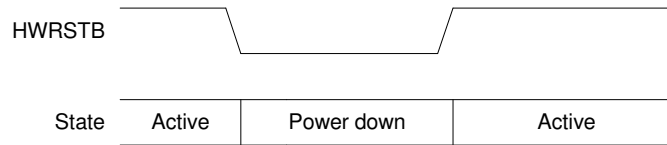

	Active	Power down	Active
State			

Figure 3-1   Power Down Sequence

3.2   Power On/Off Sequence

HWRSTB pin should be held low before power on and power off. During power on, after both DVDD and IOVDD reach normal voltage, HWRSTB pin needs to be held low for 5ms to ensure internal block stable.
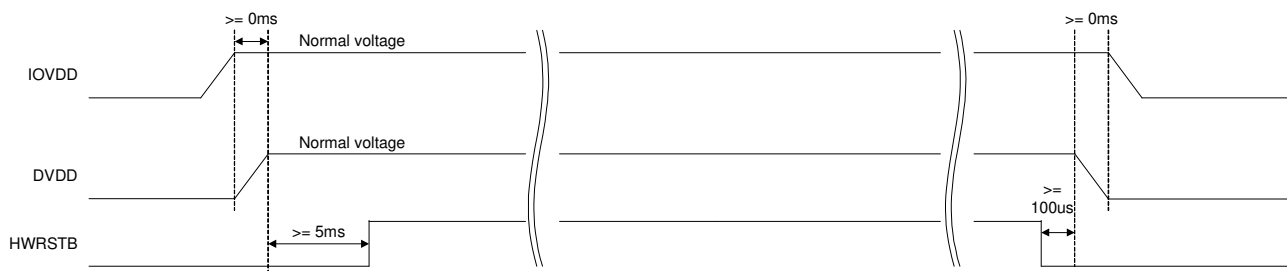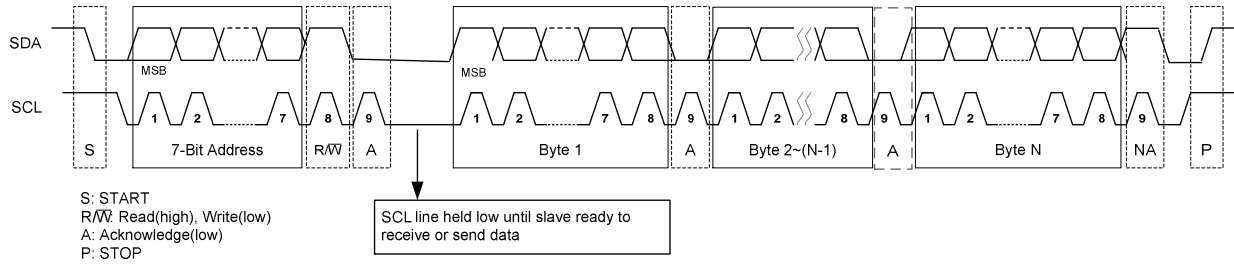

Figure 3-2   Power On/Off Sequence

4   DIGITAL INTERFACE

4.1   I2C Slave Interface

CF1216 equipped with I2C provides two wires, serial data (SDA) and serial clock (SCL), to carry transferring information at up to 400 kbit/s(Fast mode). CF1216 plays the slave role in I2C transfer. Both SDA and SCL are bidirectional lines, connected to IOVDD via pull-up resistors. All transactions begin with a START (S) and can be terminated by a STOP (P). 7-bits address follows START to recognize device. Each bye is 8-bits length and followed by an acknowledge bit. A HIGH to LOW transition on the SDA line while SCL is HIGH defines a START condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a STOP condition. The data on the SDA line must be stable during the HIGH period of the clock. The HIGH or LOW state of the data line can only change when the clock signal on the SCL line is LOW.

Read

S: START
R/W: Read(high), Write(low)
A: Acknowledge(low)
P: STOP

SCL line held low until slave ready to receive or send data

Write

S: START
R/W: Read(high), Write(low)
A: Acknowledge(low)
P: STOP

SCL line held low until slave ready to receive or send data
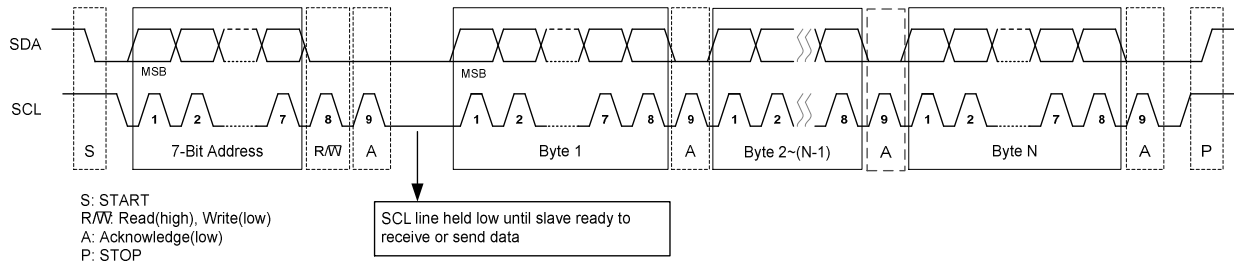
Figure 4-1   I2C Waveform

5   ELECTRICAL CHARACTERISTIC

5.1   Absolute Maximum Ratings

Table 5-1   Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
DVDD	V_{DVDD}	-0.3	TBD	V
IOVDD	V_{IOVDD}	-0.3	TBD	V
Operating Ambient Temperature	T_A	-40	+85	°C
Storage Temperature	T_S	-40	+125	°C

*Note: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. All the ranges are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied or intended. Exposed to the absolute maximum rating conditions for extended periods may affect device reliability.

5.2   DC Electrical Characteristics

Table 5-2   System DC Electrical Characteristics

Condition: DVDD = IOVDD = 3.3V, T_A = 25°C, unless be specified individually.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
VDD	V_{VDD}	2.8	-	3.6	V	
IOVDD	V_{IOVDD}	1.65	-	3.6	V	
Operating Current	I_{NML}	-	15.7	-	mA	16TX, 32RX, scan rate=101.9Hz, 1 Finger touch
	I_{NML}	-	16.6	-	mA	16TX, 32RX, scan rate=101.9Hz, 5 Finger touch
	I_{NML}	-	18.1	-	mA	16TX, 32RX, scan rate=101.9Hz, 10 Finger touch
Idle Current	I_{IDLE}	-	1.3	-	mA	scan rate=29.7Hz
Power Down Current	I_{PD}	-	1.5	-	uA	
Input High Voltage	V_{IH}	0.8*IOVDD	-	-	V	IOVDD=1.65V IOVDD=1.8V
Input High Voltage	V_{IH}	0.85*IOVDD	-	-	V	IOVDD=3.6V
Input Low Voltage	V_{IL}	-	-	0.2*IOVDD	V	IOVDD=1.65V IOVDD=1.8V
Input Low Voltage	V_{IL}	-	-	0.15*IOVDD	V	IOVDD=3.6V
Output Driving Current	I_{DRV}	4	-	-	mA	V_{OH} = IOVDD x 0.8, IOVDD=1.65V
Output Driving Current	I_{DRV}	5	-	-	mA	V_{OH} = IOVDD x 0.8, IOVDD=1.8V
Output Driving Current	I_{DRV}	21	-	-	mA	V_{OH} = IOVDD x 0.8, IOVDD=3.6V
Output Sinking Current	I_{SINK}	4	-	-	mA	V_{OL} = IOVDD x 0.2, IOVDD=1.65V

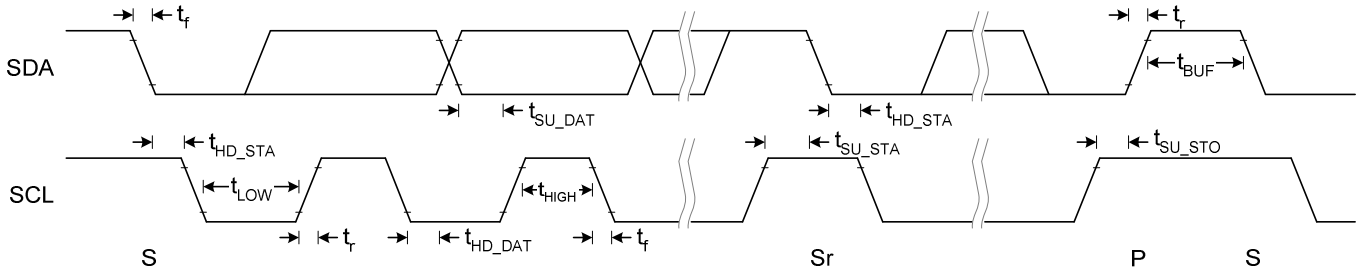| Output Sinking Current	I$_{SINK}$	5	-	-	mA	V$_{OL}$ = IOVDD x 0.2, IOVDD=1.8V
Output Sinking Current	I$_{SINK}$	21	-	-	mA	V$_{OL}$ = IOVDD x 0.2, IOVDD=3.6V

5.3　AC Electrical Characteristics

Figure 5-1　I2C Fast Mode Timing

Table 5-3　I2C Fast Mode Timing Characteristic

Conditions: IOVDD = 3.3V, GND = 0V, T$_A$ = 25°C

Symbol	Parameter	Rating			Unit
		Min.	Typ.	Max.	
f$_{SCL}$	SCL clock frequency	0	-	400	kHz
t$_{LOW}$	Low period of the SCL clock	1.3	-	-	us
t$_{HIGH}$	High period of the SCL clock	0.6	-	-	us
t$_f$	Signal falling time	-	-	300	ns
t$_r$	Signal rising time	-	-	300	ns
t$_{SU\_STA}$	Set up time for a repeated START condition	0.6	-	-	us
t$_{HD\_STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	0.6	-	-	us
t$_{SU\_DAT}$	Data set up time	100	-	-	ns
t$_{HD\_DAT}$	Data hold time	0	-	0.9	us
t$_{SU\_STO}$	Set up time for STOP condition	0.6	-	-	us
t$_{BUF}$	Bus free time between a STOP and START condition	1.3	-	-	us
C$_b$	Capacitive load for each bus line	-	-	400	pF

6   APPLICATION CIRCUITS
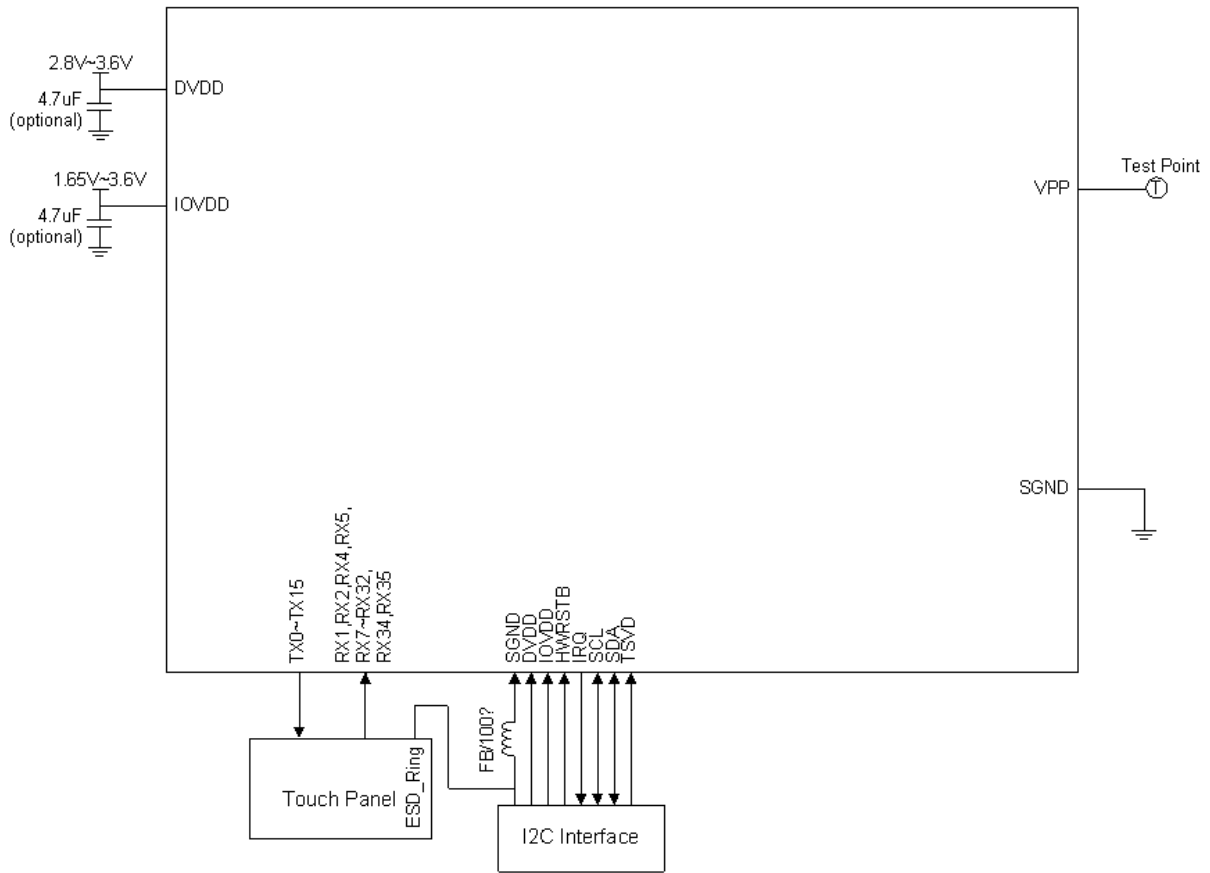
Figure 6-1   CF1216 Application Circuit

7　PACKAGE DIMENSION
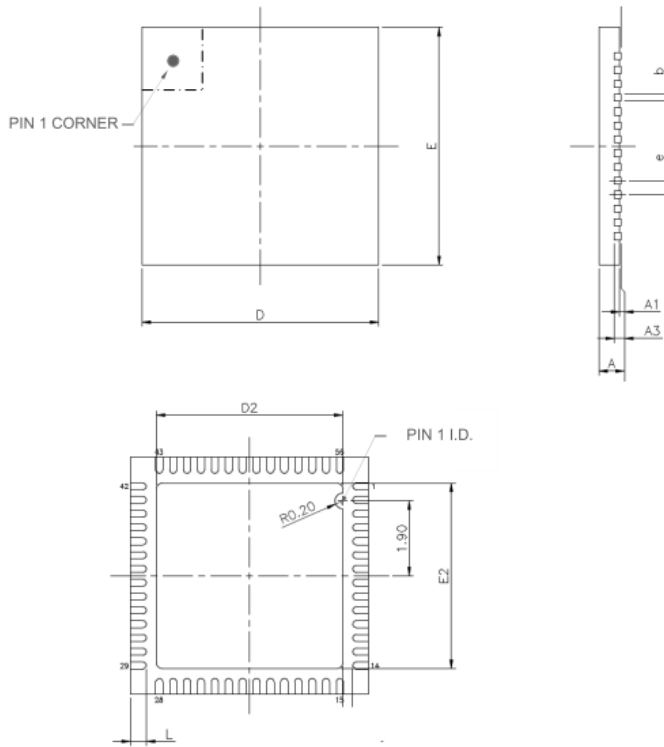
SYMBOL	MIN.	MAX.
A	0.5	0.6
A1	0.0	0.05
A3	0.152 REF.	
b	0.13	0.23
D	6.00 (BSC)	
D2	4.6	4.8
E	6.00 (BSC)	
E2	4.6	4.8
L	0.35	0.45
e	0.35 (BSC)	

UNIT : mm

Figure 7-1　CF1216 Package Dimension

8   REVISION

REVISION	DESCRIPTION	PAGE	DATE
1.0	■ First release		2019/04/08