



**SiGma Micro**  
IC Solution Designing

# **SPECIFICATION**

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**SG8F080P**

**8-BIT MCU With Embedded Touch Sensor**

**Version 1.1**

**Sigma reserves the right to change this documentation without prior notice.**

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## 1. GENERAL DESCRIPTION

The SG8F080P is 8 bit MCU with 8 channels of touch sensor and 10 I/O ports. It develops from the mcu-SG8000B, which includes 8-bit CPU core, program OTP ROM, SRAM, TIMER, GPIO and touch sensor. It can also provide the interrupt function and the wakeup function from stand-by mode.

## 2. FEATURES

### Microcontroller Features:

- Operating voltage range: 2.4V~5.5V.
- Operating frequency up to 20MHz
- 8-bit MCU core
- 4Kx14 bits OTP ROM for program.
  - 6 level stacks for subroutine nesting
- 144x8 bits SRAM, and 128 bytes split to 4 banks.
- 2 bi-directional I/O ports (10 I/O pins)
  - P07-P00 has wake-up function, Pullup function and external interrupt function.
  - P21-P20 has wake-up function, Pullup function and external interrupt function.
- Clock Sources
  - HRC(32KHz~8MHz)
  - Crystal oscillator (32768Hz~20MHz)
  - LRC(200KHz)
- 6 interrupt sources:
  - TCC Timer overflow interrupt.
  - 2 external interrupt
  - RTC Timer overflow interrupt.
  - 2 touch pad interrupt
- 8-bit RTC Timer with overflow interrupt.
- 8-bit TCC Timer with overflow interrupt.
- 8-bit prescaler for WDT or TCC
- Touch sensor

- 8 channels.
- own RC oscillator.
- 16-bit Timer with overflow interrupt.
- touch pad interrupt and also have wake-up function.
- Built-in power on reset (POR)
- Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Watchdog Timer (WDT) with its own on-chip RC oscillator to prevent system stand still
- Built-in low power voltage reset (LVR)
- CMOS technology for low power consumption

**System mode :**

- SG8F080P supports four work modes
  - ✧ Normal: MCU turn on, XTAL(or HRC) and LRC turn on.
  - ✧ Slow: MCU turn on, XTAL(or HRC) turn off and LRC oscillator turn on.
  - ✧ Idle: MCU turn off, XTAL(or HRC) turn off and LRC oscillator turn on.
  - ✧ Sleep: MCU, XTAL(or HRC) and LRC oscillator turn off.

### 3. PIN ASSIGNMENT

| Pin Name     | Direction | Function description  |
|--------------|-----------|---|
| GND          | POWER     | Negative power supply pin.  |
| VDD          | POWER     | Positive power supply pin.  |
| RST_EXTb/VPP | I         | External reset signal.  |
| P21 ~ P20    | I/O       | I/O port. These ports have Wake-up function, external interrupt function and pullup function. |
| OSCI         | I         | High frequency crystal oscillator input.<br>High frequency RC oscillator input.               |
| P07 ~ P00    | I/O       | I/O port. These ports have Wake-up function, external interrupt function and pullup function. |
| TS7 ~ TS0    | I         | Touch sensor signal input.  |
| VC2          | I         | Comparator input.   |
| VC1          | I         | Comparator input.   |

Note1: The list is counterclockwise .

Note2: In OTP ROM programming mode, the shared pins are as follow,

RST\_EXTb/VPP, high voltage program port.

P21 – DOUT, program data serial output port.

P20 – VPP\_ACT, program active port.

TS4 – OEB, OTP ROM output enable port.

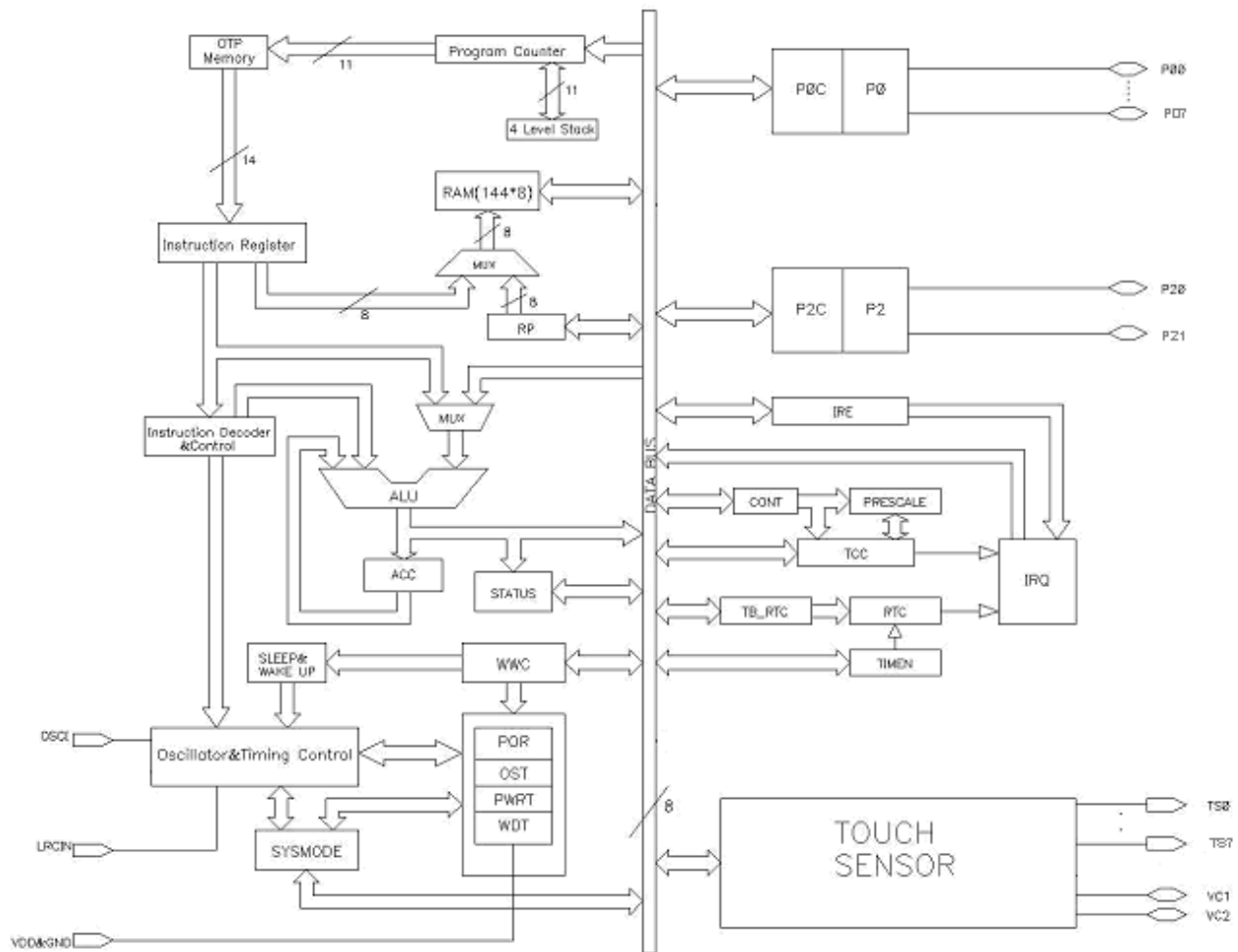
TS3 – PGMB, program enable port.

TS2 – DIN, program data input port.

TS1 – DCLK, program clock input port.

TS0 – CEB, chip enable port.

## 4. BLOCK DIAGRAM



## 5. ABSOLUTE MAXIMUM RATING

| Symbol                                       | Rating              | Unit |
|--|---------------------|------|
| Supply Voltage to Ground potential (VDD~GND) | -0.5~+6.0           | V    |
| Input Voltage (Vin)                          | GND-0.3<Vin<VDD+0.3 | V    |
| Output Voltage (Vout)                        | GND<Vout<VDD        | V    |
| Operating Temperature (Top)                  | -40~+85             | °C   |
| Storage Temperature (Tst)                    | -50~+100            | °C   |
| Operating Frequency (Fop)                    | 32K~20M             | Hz   |
| ESD-HBM(Human Body Mode)                     | 4000(min.)          | V    |

## 6. ELECTRICAL CHARACTERISTICS

### 6.1 DC CHARACTERISTICS

(VDD= 3.0V, No load, Main clock = 4MHz, subclock = 32768HZ with crystal mode. Ta = 25°C,)

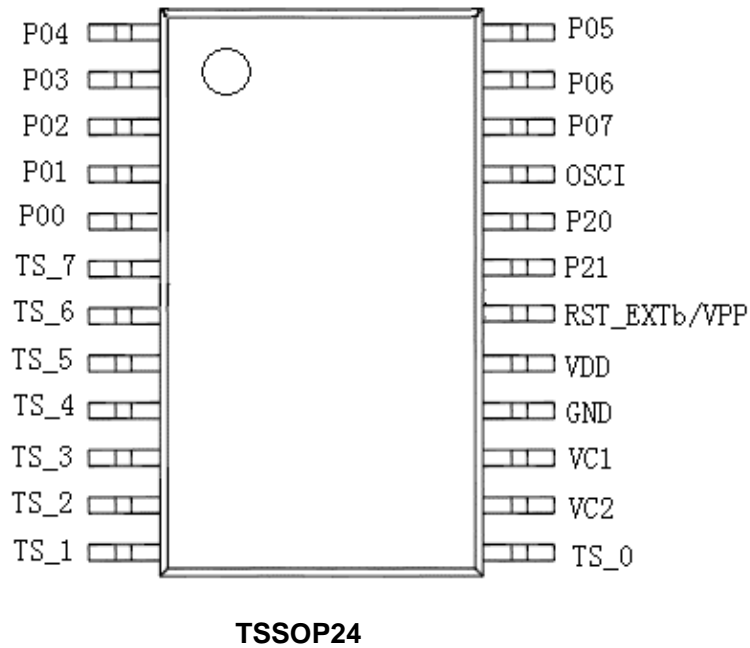
| Symbol                 | Parameter               |        | Min. | Type | Max. | Unit | Test condition   |
|------------------------|-------------------------|--------|------|------|------|------|--|
| <b>VDD</b>             | Operating voltage       |        | 2.4  |      | 5.5  | V    | -  |
| <b>I<sub>sb</sub></b>  | Operating current       | Sleep  | -    | 1    | 3    | uA   | MCU, XTAL(or HRC) and LRC oscillator turn off                  |
| <b>I<sub>op1</sub></b> |                         | IDLE   | -    | 4    | 6    | uA   | MCU turn off, XTAL(or HRC) turn off and LRC oscillator turn on |
| <b>I<sub>op2</sub></b> |                         | Slow   | -    | 25   | 30   | uA   | MCU turn on, XTAL(or HRC) turn off and LRC oscillator turn on  |
| <b>I<sub>op3</sub></b> |                         | Normal | -    | 0.55 | 0.7  | mA   | MCU turn on, XTAL(or HRC) and LRC turn on                      |
| <b>V<sub>ih1</sub></b> | Input high voltage      |        | -    | 2    | -    | V    | Vdd=5V   |
| <b>V<sub>il1</sub></b> | Input low voltage       |        | -    | 1    | -    | V    | Vdd=5V   |
| <b>V<sub>oh1</sub></b> | Output high voltage     |        | 4.5  | -    | -    | V    | Vdd=5V, I <sub>oh</sub> =4mA                                   |
| <b>V<sub>ol1</sub></b> | Output low voltage      |        | -    | -    | 0.5  | V    | Vdd=5V, I <sub>ol</sub> =10mA                                  |
| <b>I<sub>oh1</sub></b> | I/O output high current |        | 3    | 4    |      | mA   | Vdd=5V, V <sub>oh</sub> =4.5V                                  |
| <b>I<sub>ol1</sub></b> | I/O output low current  |        | 9    | 10   |      | mA   | Vdd=5V, V <sub>ol</sub> =0.5V                                  |
| <b>R<sub>up</sub></b>  | Pull-up resistor        |        |      | 75   |      | KΩ   | Vdd=5V   |

## 6.2 AC CHARACTERISTICS

| Symbol     | Parameter                        | Min.  | Typ.   | Max. | Unit | Test condition                                      |
|------------|----------------------------------|-------|--------|------|------|---|
| $F_{LRC}$  | Internal RC Oscillator Frequency | -     | 200K   | -    | Hz   | VDD=3V  |
| $F_{HRC}$  | External RC Oscillator Frequency | 32K   | -      | 8M   | Hz   | -   |
| $F_{XTAL}$ | Crystal Oscillator Frequency     | 32768 | -      | 20M  | Hz   | -   |
| $T_{CYC}$  | Instruction Cycle Time           | -     | 2/Fosc | -    | S    | -   |
| $T_{POR}$  | POR Timer Period                 | -     | 33     | -    | ms   | VDD=3V<br>FOSC = 2MHz                               |
| $T_{RST}$  | Reset Active Width               | 1     | 500    |      | us   | VDD=3V<br>FOSC = 2MHz                               |
| $T_{WDT}$  | Watch Dog Timer Period           | -     | 20     | -    | ms   | VDD = 3V  |
| $DF/F$     | RC OSC Frequency Stability       | -     | -      | 10   | %    | $\frac{F_{osc(3V)} - F_{osc(2.4V)}}{F_{osc(2.4V)}}$ |

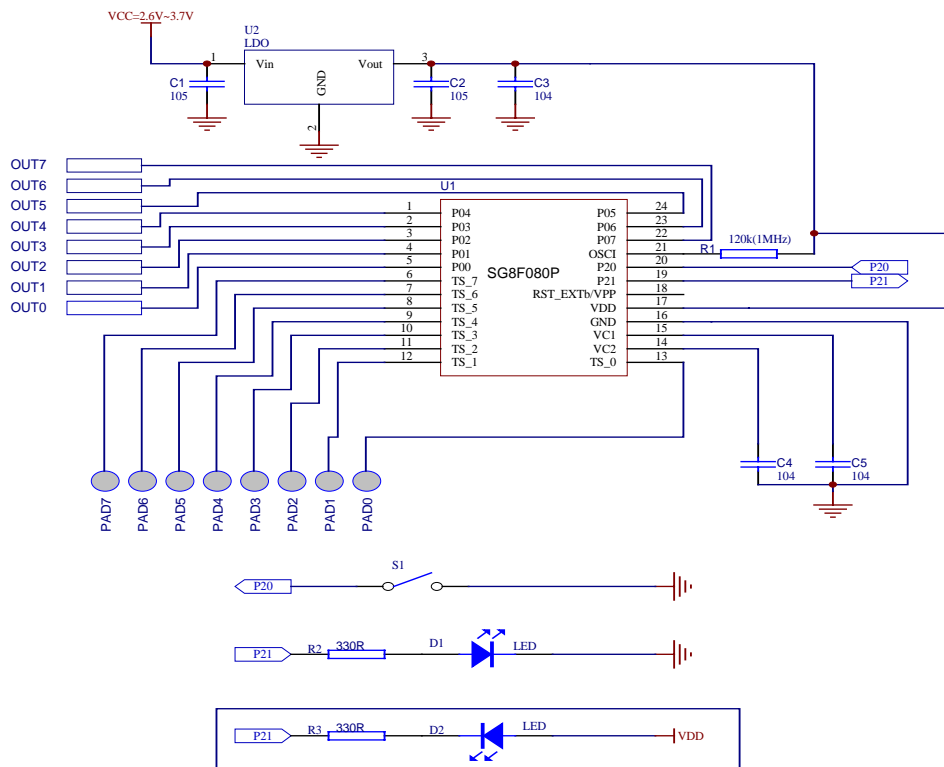


## 7. PACKAGE

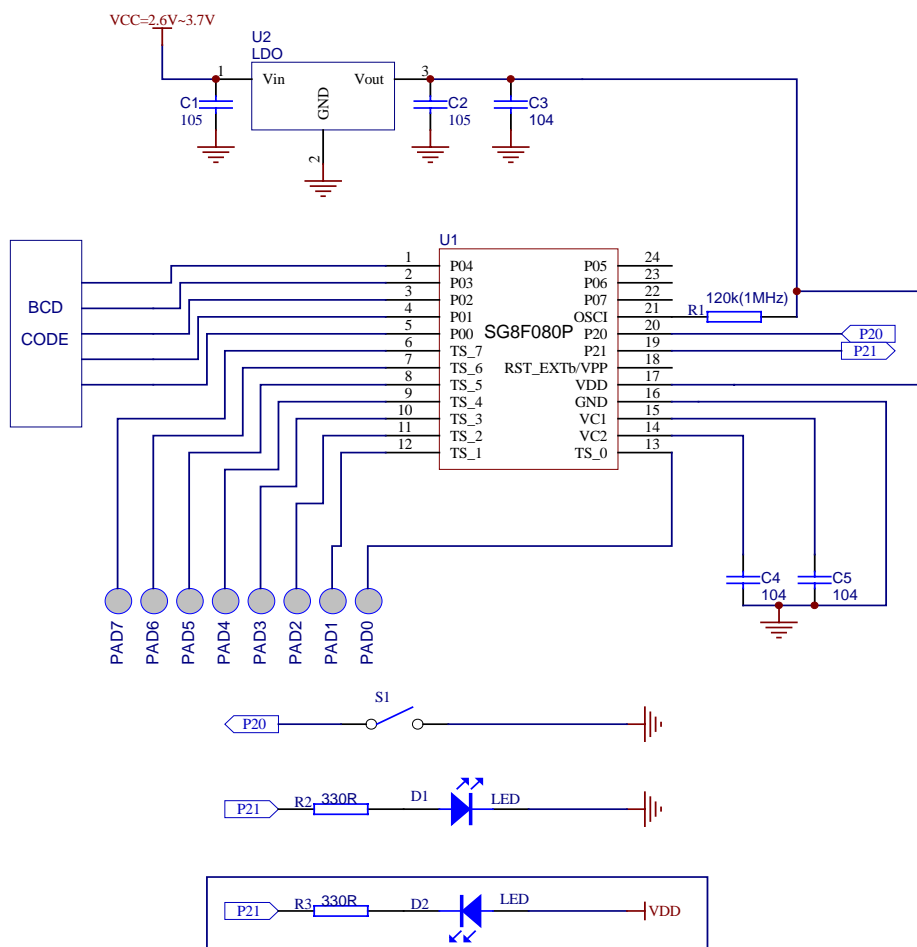


## 8. APPLICATION CIRCUIT

TYPE 1 — OCOO (One Channel One Out)



### Type 2 — BCD Code Output



### The relation of RC oscillator frequency and resistor (HZ)

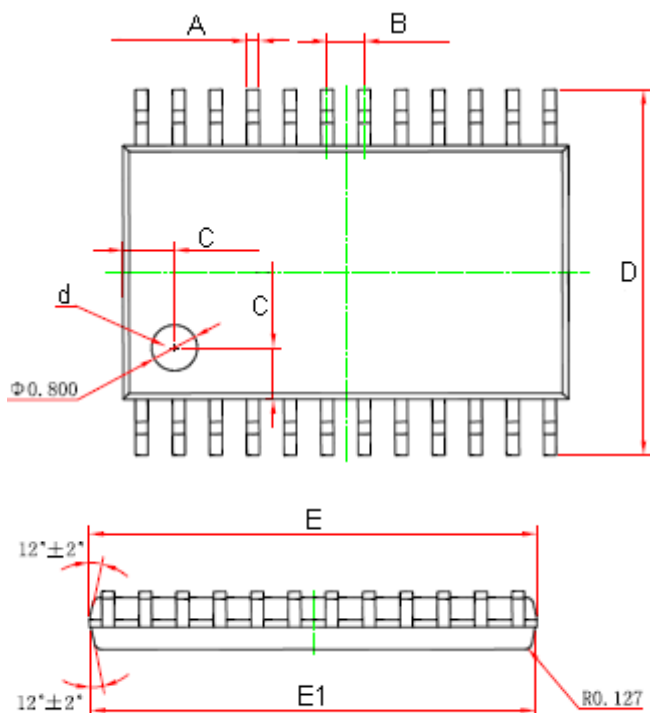
1. VDD=5.0V

|                        |     |      |      |     |     |      |      |      |
|------------------------|-----|------|------|-----|-----|------|------|------|
| R <sub>OSC</sub> (OHM) | 1K  | 3.9K | 9.1K | 20K | 56K | 120K | 300K | 4.7M |
| F <sub>REQ</sub> (HZ)  | 10M | 8M   | 6M   | 4M  | 2M  | 1M   | 455K | 32K  |

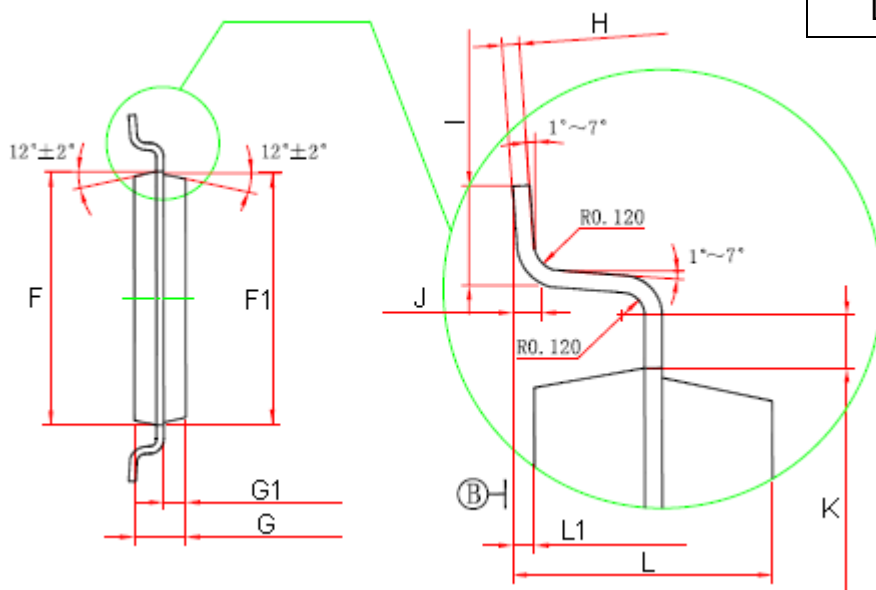
2. VDD=3.3V

|                        |      |     |     |      |      |      |
|------------------------|------|-----|-----|------|------|------|
| R <sub>OSC</sub> (OHM) | 3.6K | 15K | 47K | 120K | 300K | 4.7M |
| F <sub>REQ</sub> (HZ)  | 6M   | 4M  | 2M  | 1M   | 455K | 32K  |

## 9. PACKAGE DISCRIPTION



| SYMBOL | SIZE(mm)        |
|--------|-----------------|
| A      | 0.19~0.30       |
| B      | 0.650           |
| C      | 0.900           |
| D      | 6.400±0.150     |
| E      | 7.800±0.100     |
| E1     | 7.740±0.100     |
| F      | 4.400±0.100     |
| F1     | 4.340±0.100     |
| G      | 0.900±0.100     |
| G1     | 0.387±0.030     |
| H      | 0.09~0.20       |
| I      | 0.600±0.100     |
| J      | 0.250           |
| K      | 0.250(0.200min) |
| L      | 1.100max        |
| L1     | 0.02~0.150      |



## 10. REVISION HISTORY

| Version | Update date | Revised Content  | Revised By | Confirmed By |
|---------|-------------|--|------------|--------------|
| V1.0    | 2007-8-6    | Original version   | Joan       | Alan         |
| V1.1    | 2007-9-25   | 1.Modify the Block Diagram<br>2.Modify the Application Circuit<br>3.Modify the Absolute Maximum Rating<br>4.Add the Electrical Characteristics | Kate       | Alan         |