# GP8403 Datasheet

Translated and rearranged by StanStrong

## 12-bit DAC dual I2C to 0-5V/0-10V

### DAC (Digital to Analog Convertor)

**Datasheet**

- GP8403 linearity conversion into two analog voltage outputs of 0-5V or 0-10V through I2C interface.
- One I2C interface supports 8 GP8202 parallel connections, selected through three-digit hardware addresses A2/A1/A0.
- Input signal range 12Bit, 0x000-0xFFF
- 0-5V/0-10V output voltage is controlled by internal data
- Input I2C signal high level: 2.7V-5.5V
- Output voltage error: < 0.5% (0.2% version please contact Keyi Electronics).%
- Output voltage linearity error: 0.1%.
- Output short-circuit protection, when the output pin is short-circuited with ground, the chip enters the protection mode to stop the output.
- Vltage: 10V – 13.2 V consumption: <4mA
- Start time: <2ms
- Working temperature: -40°C to 85°C

**Described**

GP8403 is an I2C signal to analog signal converter, i.e. DAC, this chip can carry 12 Bit digital quantity 0x000-0xFFF is linearly converted into two independent – 0-5V Or 0-10 V analog voltage with an output voltage error of 0 5%。

NOTE: PLEASE MAKE SURE THAT THE CURRENT DATASHEET IS THE OFFICIAL WEBSITE TO DOWNLOAD THE LATEST VERSION.

**Application**

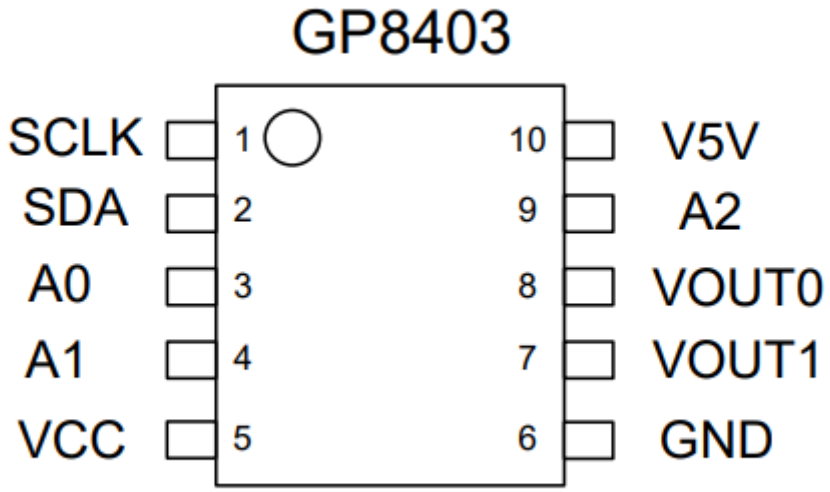
- Universal signal conversion
- Motor speed regulation, LED dimming
- power supply
- Industrial analog signal isolation

# 1. Pin definition

Table-A Pin Distribution

| Pin name | Pin function |
|---|---|

| | |
|---|---|
| SCLK | I2C protocol clock signal |
| SDA | I2C protocol data signals |
| VCC | power supply |
| GND | Ground |
| V5V | Internal LDO, 5V output, must be externally larger than 1uF capacitor. |
| A0 | The 0th bit hardware address |
| A1 | 1st bit hardware address |
| A2 | 2nd bit hardware address |
| VOUT0 | For the first analog voltage output, an external 10uF capacitor must be connected |
| VOUT1 | For the second analog voltage output, an external 10uF capacitor must be connected |



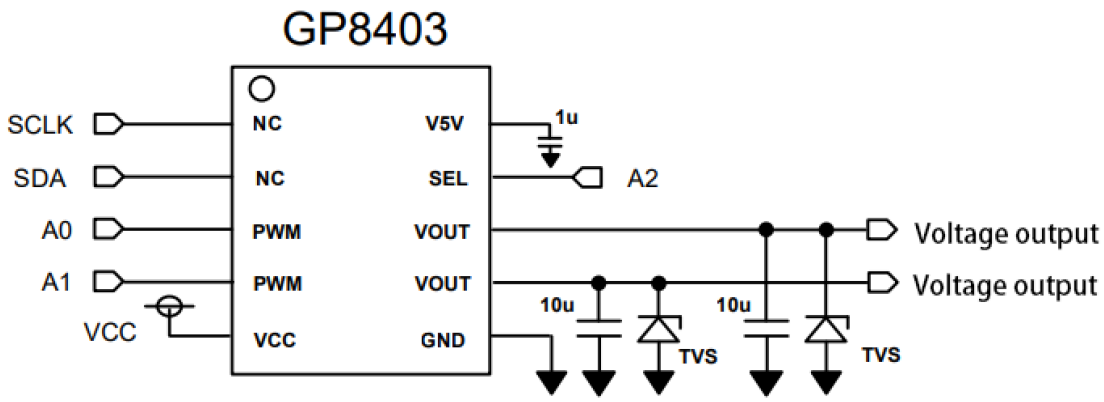

## 2. Absolute maximum rated parameters

Industrial operating temperature: -40°C to 85°C
Storage temperature: -50°C to 125°C
Input voltage: -0.3 V VCC + 0.3 V
Maximum voltage: 40 V
ESD protection: > 2000 v
*Exceeding the parameter values listed in the Absolute Maximum Rating may cause permanent damage to the equipment. There is no guarantee that the device will operate under conditions other than those listed in the specification. Prolonged exposure to extreme conditions can affect equipment reliability or functionality.

# 3. Typical applications

## 3.1 Basic functions (typical circuit).

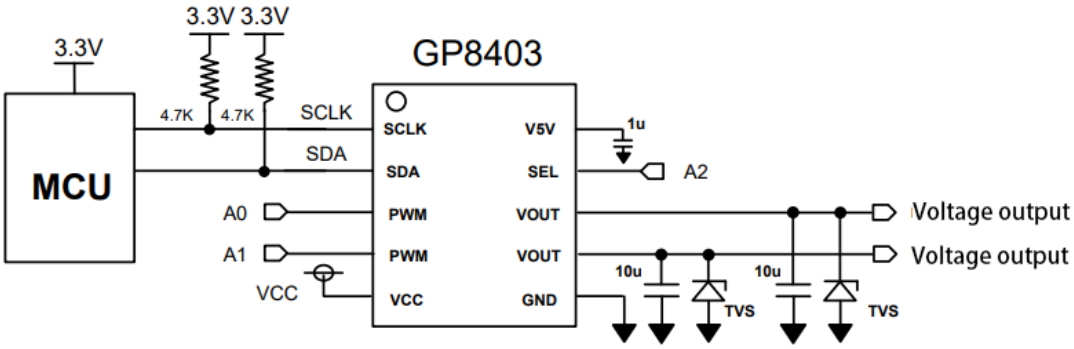
When the chip is used in the circuit of the board, the capacitance and TVS can be appropriately added to stabilize and protect the circuit.




Note:

1. A capacitor greater than 1uF on V5V is required
2. When VOUT is used as a board-level interface,
   add 12V unidirectional TVS, reverse connection, surge protection.

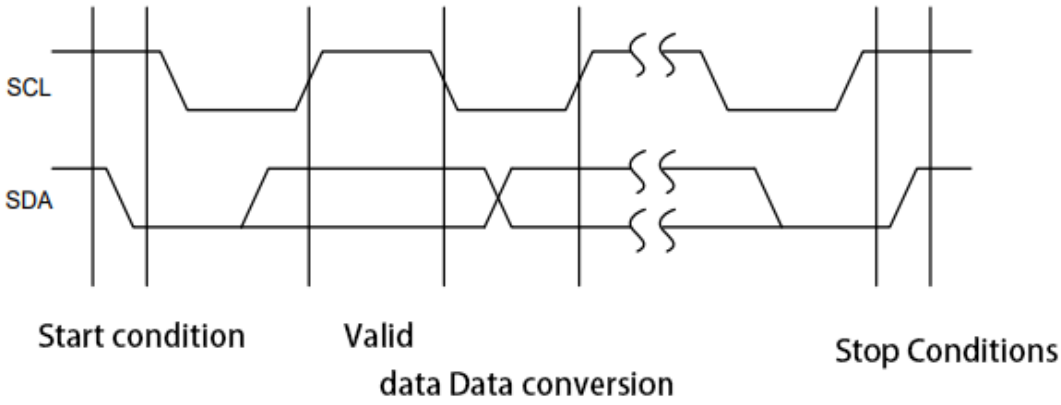
## 3.2 Interface with 3.3V MCU



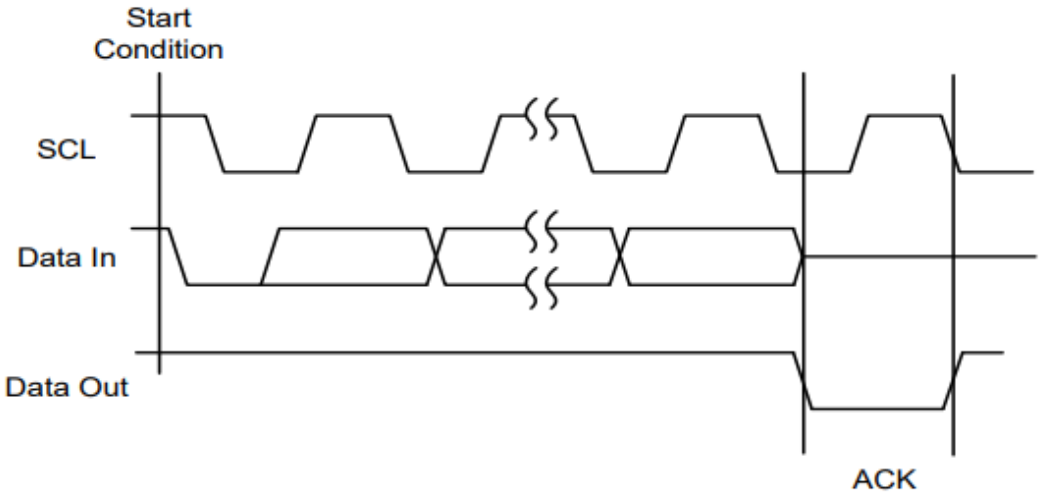

The MCU outputs 3.3V I2C interface to the GP8403.

## 3.3 Method of operation

3.3.1 Start, Stop condition, valid data, data transformation format

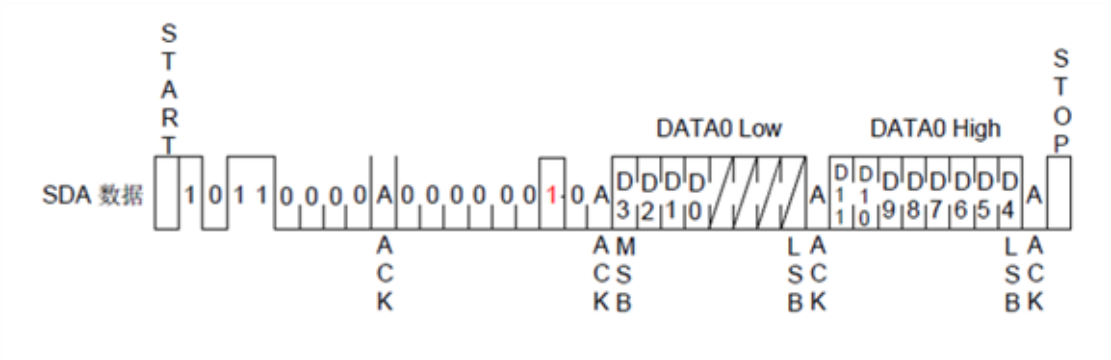



3.3.2 ACK format

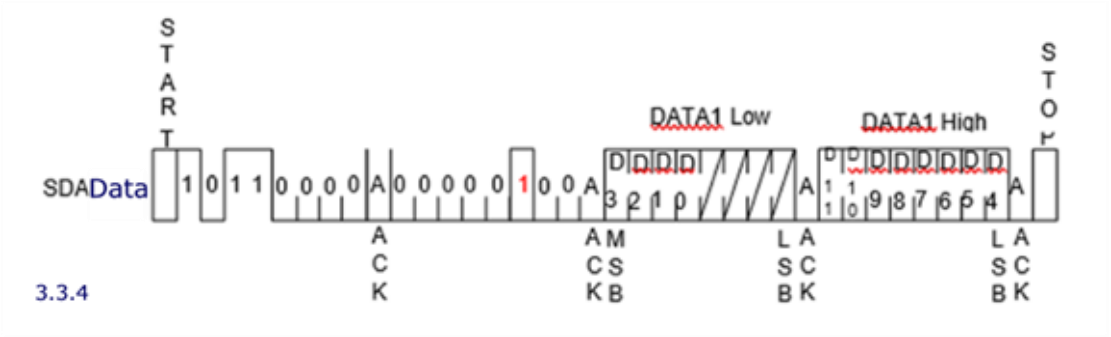



3.3.3 Set the red configuration bit in the figure below:

Set the address to 02 to operate VOUT0 12 Bit DATA into DATA0 Low and DATA0 High, Write, DATA0 Low is low Byte, DATA0 High is high Byte, and ignore DATA0 Low lower 4 bits. If it is 0-10V mode, the corresponding voltage of the output is: VOUT=DATA0/0xFFF*10V – if it is 0-5V mode, the corresponding voltage of the output is: VOUT=DATA0/0xFFF*5V .

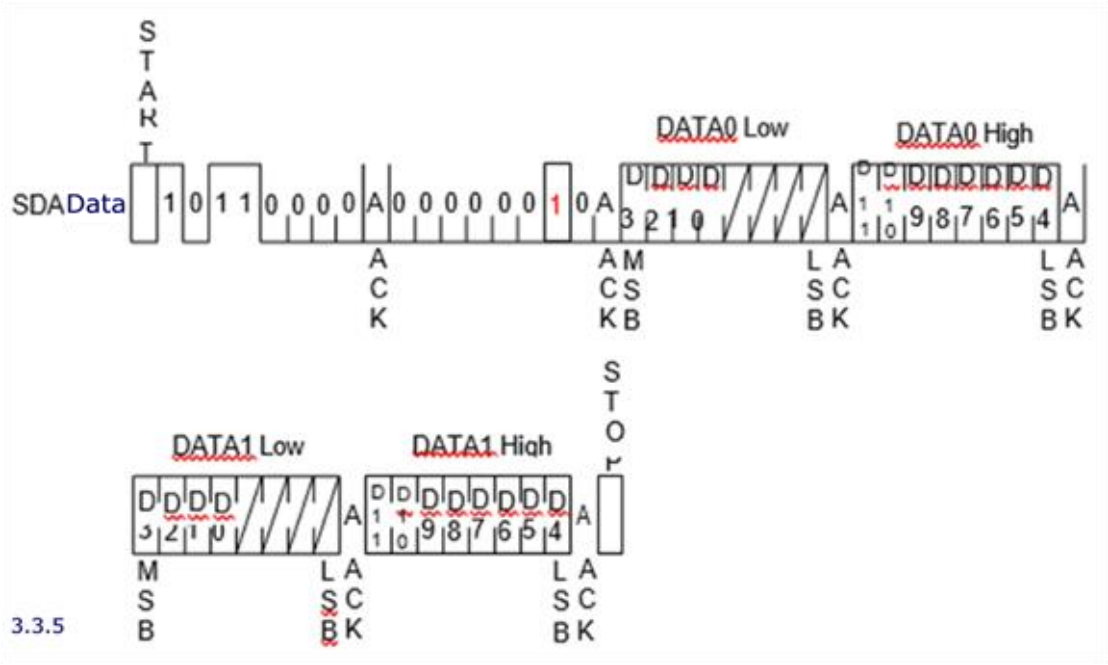



3.3.4 Set the red configuration bit in the figure below and set the address to 04 to operate VOUT1.Divide 12-bit DATA data into DATA Low and DATA High Write, DATA Low is low Byte, DATA High is high /b121>Byte, and ignores the lower 4 bits of DATA Low. it is 0-10V mode, the corresponding voltage of the output is: VOUT=DATA/0xFFF*10V . is t is: VOUT=DATA/0xFFF*5V .

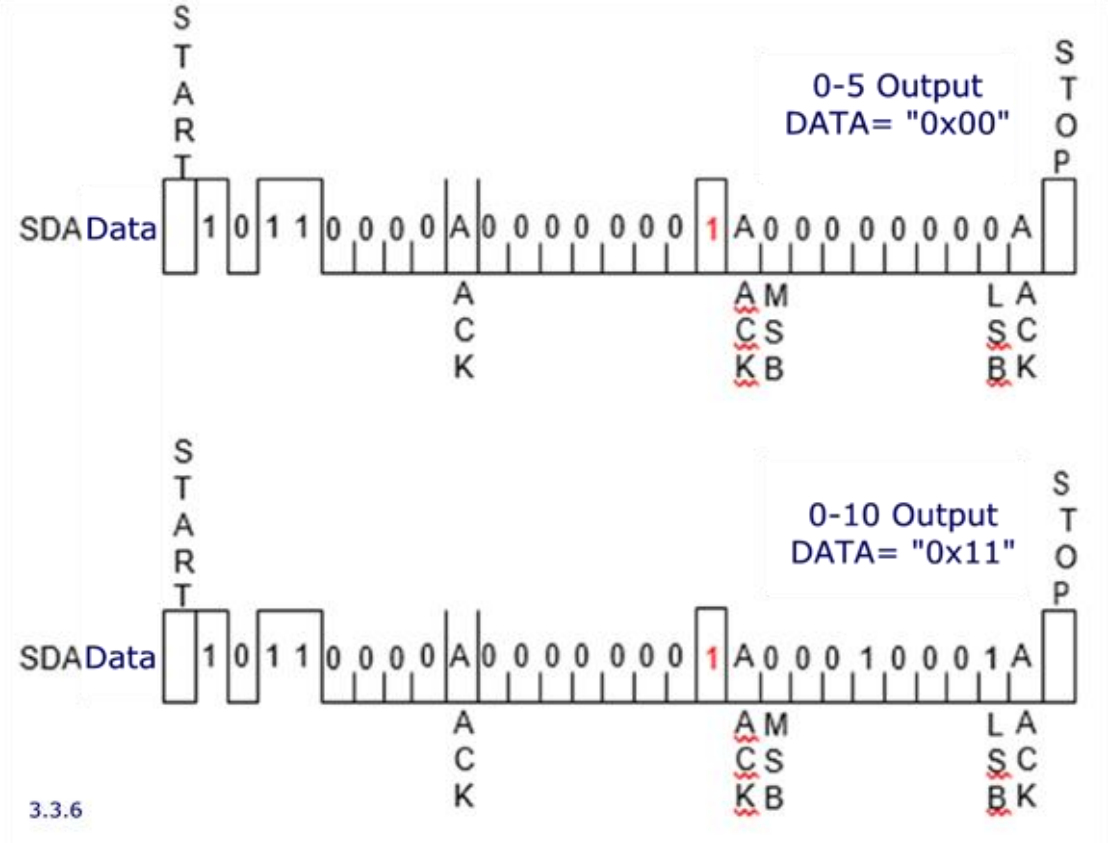



3.3.5 Set the red configuration bit in the figure below, set the address to 0 2 , and operate on VOUT0 and VOUT1 at the same time.
Divide the 12-bit DATA0 data into DATA0 Low and DATA0 High bytes, DATA0 Low is low Byte, DATA0 High is high Byte ignore the lower 4 bits of DATA0 Low. If it is 0-10V mode, the corresponding voltage of the output is: VOUT0= DATA0/0xFFF*10V, if it is 0-5V mode,the corresponding voltage of the output is: VOUT0= DATA0/0xFFF*5V.
Similarly, 12-bit DATA1 data is divided into DATA1 Low and DATA1 High bytes, DATA1 Low is low Byte, DATA1 High is high Byte, and ignores the lower 4 bits of DATA1 Low. If it is 0-10V mode, the corresponding voltage of the output is: VOUT0= DATA1/0xFFF*10V,

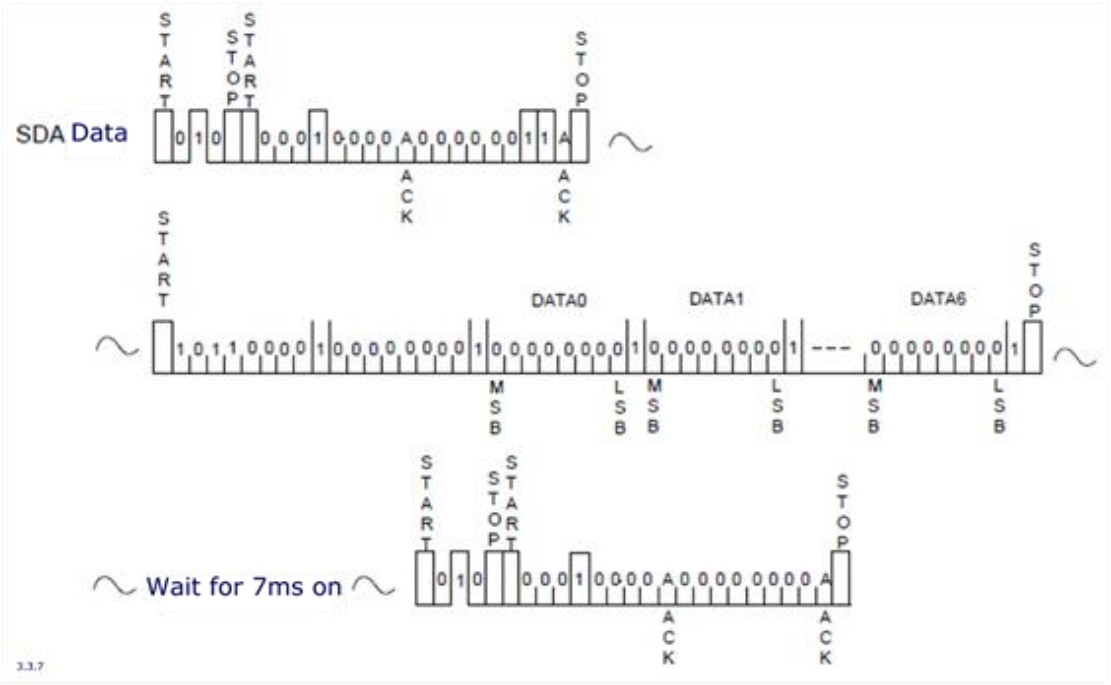
if it is 0-5V mode,the corresponding voltage of the output is: VOUT1= DATA1/0xFFF*5V .




3.3.6 Set the red configuration bit in the figure below, the address is set to 01, if the data is written to 0x00, the chip output voltage is selected 0-5V; If the write data is 0x11, the voltage at the chip output is selected from 0-10V.



3.3.7 GP8403 supports saving voltage data in the chip to ensure that it can still be in the corresponding voltage output state after power-down start-up.
By sending the data shown in the figure below, the written data can be solidified into the inside of the chip.

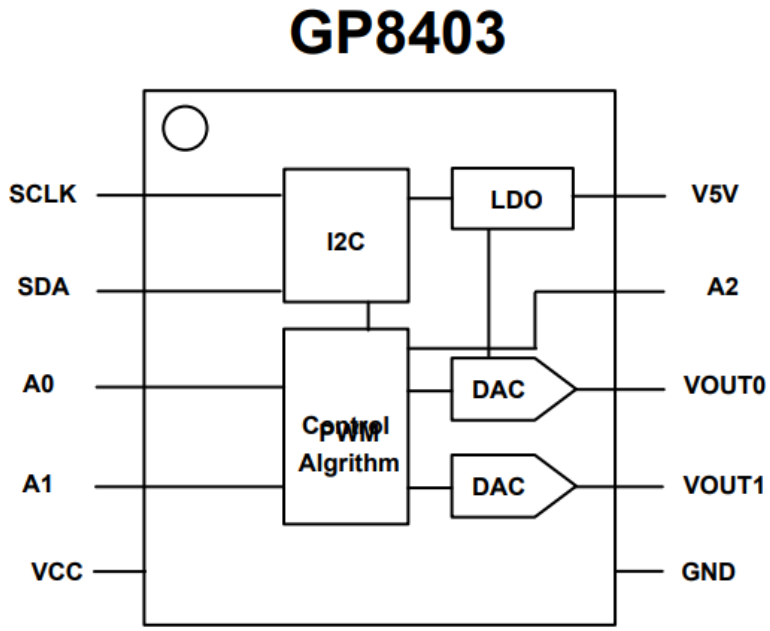



# 4. Device function

The GP8403 is a high-performance dual DAC chip (I2C to analog voltage converter) that converts 12BIT data to analog voltage via I2C with an output voltage range of 0-5V or 0-10V, selected by internal configuration of the chip. Refer to Section 3.3.6 for details. The chip has hardware address A0A1A2 to support single I2C control 8-channel GP8403.

The default output voltage accuracy of the GP8402 is 0.5%.

When the GP8402 chip is used as an interface chip for the system, a 10uF capacitor and a 12V unidirectional TVS need to be connected to ground on the VOUT output pin, to ensure the chip hot plugging, static electricity, reverse connection and other protection.




## 5. Table-B AC characteristics

| symbol | description | min | nom | max | unit |
|---|---|---|---|---|---|
| $f_{pwm}$ *1 | PWM signal frequency | 50 | | 50K | Hz |
| $D_{pwm}$ | The duty cycle of the PWM signal | 0 | | 100 | % |
| $K_{CYCLE}$ | PWM recognizes the number of cycles | | 1 | | PWM cycle |
| $T_{ACT}$ *2 | Output voltage response time | | 100 | 200 | uS |

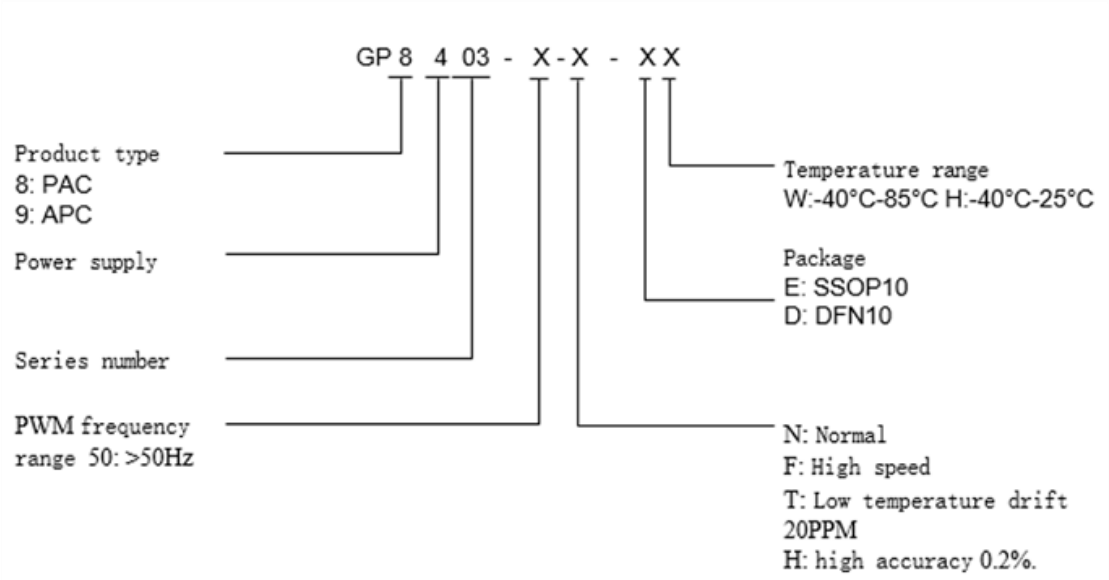
*1: The default frequency range of the input PWM signal is 50Hz-50KHz, if the input PWM signal frequency exceeds 50KHz, the output voltage accuracy is reduced if the input is input /b19>PWM signal frequency below 50Hz, output voltage error. If you need to be lower than 50Hz, you need to ask Keyi Electronics to customize the parameters.

*2: The time from when the input PWM is recognized to when the output voltage stabilizes.

## 6. Table-C DC characteristics

| symbol | description | Test conditions | least | typical | utmost | unit |
|---|---|---|---|---|---|---|
| VCC | Supply voltage*1 | | 10 | 12 | 40 | V |
| ICC | Power consumption | VCC @24V No load | | 5 | 10 | mA |
| VOUT | Output voltage | SEL ground | 0 | | 5 | V |
| | | SEL connected to V5V | 0 | | 10 | V |
| ΔVOUT | Output voltage error | Example of the ratio to the VOUT output range | | | 0.5 | % |
| IOUT *2 | VOUT output current | VOUT>0.5V VCC@24V | 20 | | | mA |
| TC | Temperature coefficient | | | 50 | | PPM/℃ |

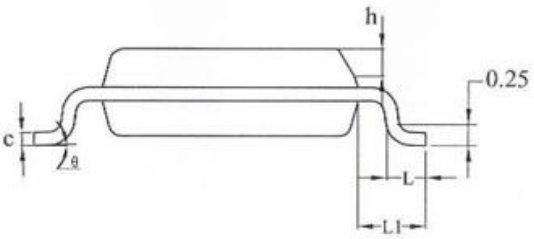
*3: External load on V5V may slightly affect chip accuracy.

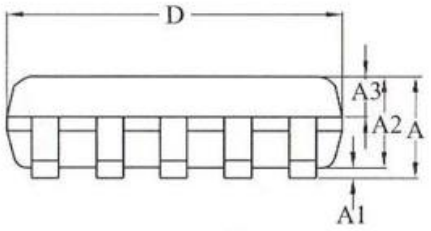


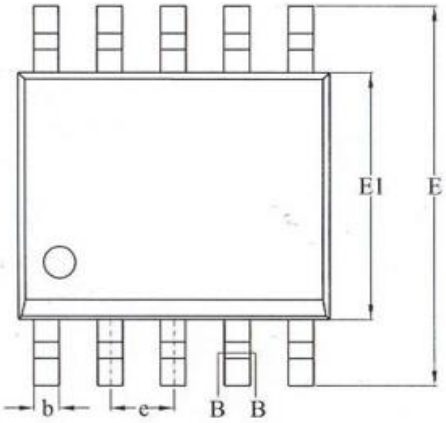

# 7.4 Ordering Instructions

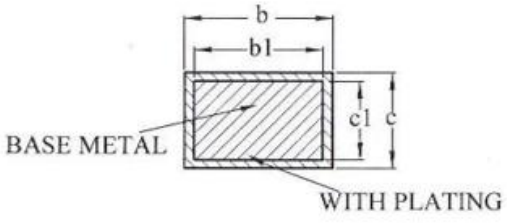
| High frequency modulation | Temperature coefficient | Precision | Encapsulation | Operating temperature | Order code |
|---|---|---|---|---|---|
| NO | 50PPM/℃ | 0.5% | ESSOP10 | -40℃-85℃ | GP8403-F50-NF-EW |

# 7. Encapsulation Information




SECTION B-B

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | — | — | 1.75 |
| A1 | 0.10 | — | 0.225 |
| A2 | 1.30 | 1.40 | 1.50 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.39 | — | 0.47 |
| b1 | 0.38 | 0.41 | 0.44 |
| c | 0.20 | — | 0.24 |
| c1 | 0.19 | 0.20 | 0.21 |
| D | 4.80 | 4.90 | 5.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.00BSC | | |
| h | 0.25 | — | 0.50 |
| L | 0.50 | — | 0.80 |
| L1 | 1.05REF | | |
| θ | 0 | — | 8° |