

# EG2104S Datasheet

MOS driver chip with  
SD function

# EG2104S DataSheet

Чип драйвера МО  
S с функцией SD

## Version Change record

| Version № | Date              | Description                          |
|-----------|-------------------|--------------------------------------|
| V1.0      | October 10, 2017. | First draft of the EG2104S Datasheet |
|           |                   |                                      |
|           |                   |                                      |

## Запись об изменении версии

| Version № | Date              | Description                          |
|-----------|-------------------|--------------------------------------|
| V1.0      | October 10, 2017. | First draft of the EG2104S Datasheet |
|           |                   |                                      |
|           |                   |                                      |

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# EG2104S Datasheet V1.0

## 1. Features

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- High-end suspension bootstrap power supply design, withstand voltage up to 600V
- Adapts to 5V, 3.3 V input voltages
- Maximum frequency support 500KHZ
- VCC and VB side supplies with undervoltage protection
- Low-side VCC voltage range 10V-20V
- Output current capability IO+/- 1.0 A/1.5 A
- Built-in dead zone control circuit
- SD input channel is active low, turning off the HO and LO outputs.
- Fewer peripheral devices
- Package form: SOP-8

## 2. Description

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EG2104S is a cost-effective MOS transistor with SD function, IGBT transistor Gate Drive dedicated chip, integrated logic signal input processing circuit, dead zone control circuit, level displacement circuit, pulse filter circuit and output drive circuit, dedicated to brushless motor controller, power supply DC-DC drive circuit.

The high-end operating voltage of the EG2104S can reach 600V, and the low-end Vcc has a wide supply voltage range of 10V~20V. The chip input channel is built-in a 200k pull-down resistor, SD built-in a 200k pull-down resistor, when the input is floating so that the upper and lower power MOS transistor is turned off, the output current capability IO+/- 1.0/1.5 A, using SOP8 package.

## ■ Application areas

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- Mobile power supply high voltage fast charge switching power supply
- Wireless charging drive variable frequency pump controller
- DC-DC power supply
- Brushless motor driver
- High voltage Class-D power amplifier

# EG2104S Datasheet v1.0

## 1. Особенности

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■ High-end suspension bootstrap power supply design, withstand voltage up to 600V ■ Adapts to 5V, 3.3V input voltages ■ Maximum frequency support 500KHZ ■ VCC and VB side supplies with undervoltage protection ■ Low-side VCC voltage range 10V-20V ■ Output current capability  $I_o$  +/- 1.0A/1.5A ■ встроенная схема управления мертвой зоной ■ SD входной канал активен, отключение выхода в HO и LO. ■ меньше периферийных устройств ■ форма пакета : Sop-8

## 2. Описание

---

EG2104S является экономически эффективным транзистором MOS с функцией SD, выделенным чипом транзистора IGBT, схемой обработки ввода логического сигнала, цепью управления мертвой зоной, схемой смещения уровня, цепью импульсного фильтра и выходным приводом, посвященной контроллеру без килограмма, цепью привода DC-DC питания.

Высокое рабочее напряжение EG2104S может достигать 600V, а низкочастотный VCC имеет широкий диапазон напряжений питания 10V ~ 20V. Входной канал чипа встроенный резистор 200K, встроенный резистор 200K, когда входной ток 1.0/1.5A, используя пакет SOP8.

## ■ Области применения

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■ Мобильный источник питания  
высокий напряжение питания быс  
трого переключения заряда

## 3. Pin

### 3.1 Pin definition

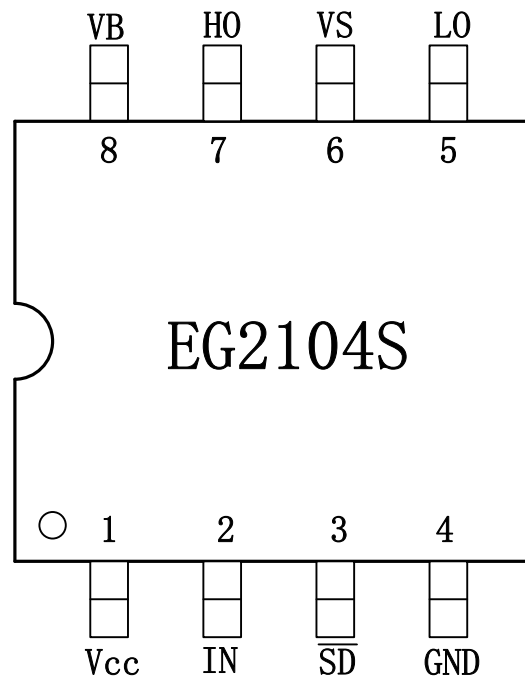


Figure 4-1. EG2104S pin definition

### 3.2 Pin description

| Pin serial № | Pin name        | I/O   | Description                                                                                                                                                                   |
|--------------|-----------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | Vcc             | Power | Chip power input, voltage range 9V-20V,an external high-frequency 0.1 uF bypass capacitor can reduce the high-frequency noise at the input of the chip                        |
| 2            | IN              | I     | Logic input control signal to control the output MOS transistor is turned on and off<br>"0" corresponds to LO High,HO low.<br>"1" corresponds to HO high,LO low.              |
| 3            | $\overline{SD}$ | I     | Logic input control signal is active low, forcing the LO,HO output low.<br>"1 " allows LO and HO to be controlled with the IN input.<br>"0" forces the LO and HO outputs low. |
| 4            | GND             | GND   | The ground end of the chip.                                                                                                                                                   |
| 5            | LO              | O     | The output controls the conduction and shutdown of the low-side MOS transistor                                                                                                |
| 6            | VS              | O     | High-end suspended Ground end                                                                                                                                                 |
| 7            | HO              | O     | The output controls the on and off of the high-side MOS transistor                                                                                                            |
| 8            | VB              | Power | High-end suspended power supply                                                                                                                                               |

### 3. Pin

#### 3.1 Определение штифта

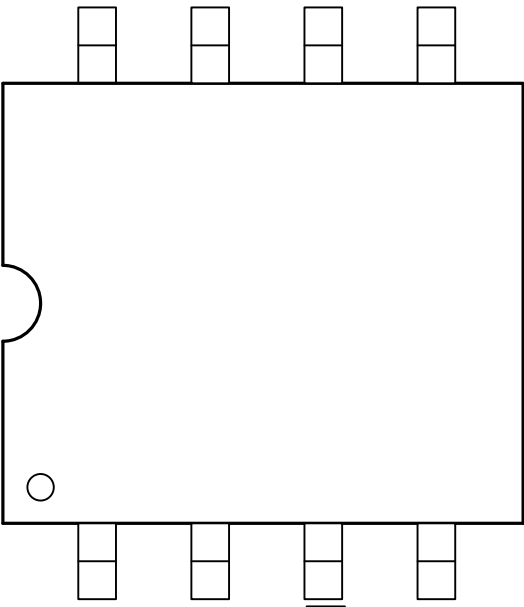


Рисунок 4-1. EG2104S Определение штифта

#### 3.2 Описание PIN

| Pin serial № | Pin name        | I/O   | Description                                                                                                                                                                   |
|--------------|-----------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | Vcc             | Power | Chip power input, voltage range 9V-20V,an external high-frequency 0.1 uF bypass capacitor can reduce the high-frequency noise at the input of the chip                        |
| 2            | IN              | I     | Logic input control signal to control the output MOS transistor is turned on and off<br>"0" corresponds to LO High,HO low.<br>"1" corresponds to HO high,LO low.              |
| 3            | $\overline{SD}$ | I     | Logic input control signal is active low, forcing the LO,HO output low.<br>"1 " allows LO and HO to be controlled with the IN input.<br>"0" forces the LO and HO outputs low. |
| 4            | GND             | GND   | The ground end of the chip.                                                                                                                                                   |
| 5            | LO              | O     | The output controls the conduction and shutdown of the low-side MOS transistor                                                                                                |
| 6            | VS              | O     | High-end suspended Ground end                                                                                                                                                 |
| 7            | HO              | O     | The output controls the on and off of the high-side MOS transistor                                                                                                            |
| 8            | VB              | Power | High-end suspended power supply                                                                                                                                               |

## 4. Block diagram

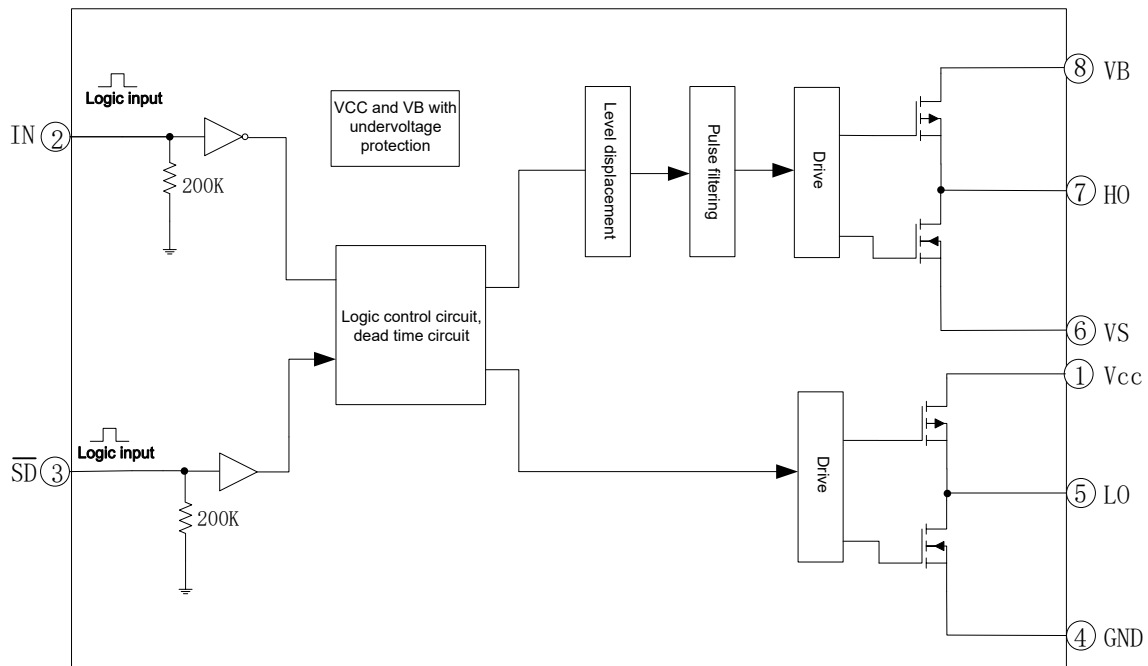


Figure 5-1. EG2104S internal circuit diagram

## 5. Typical application circuit

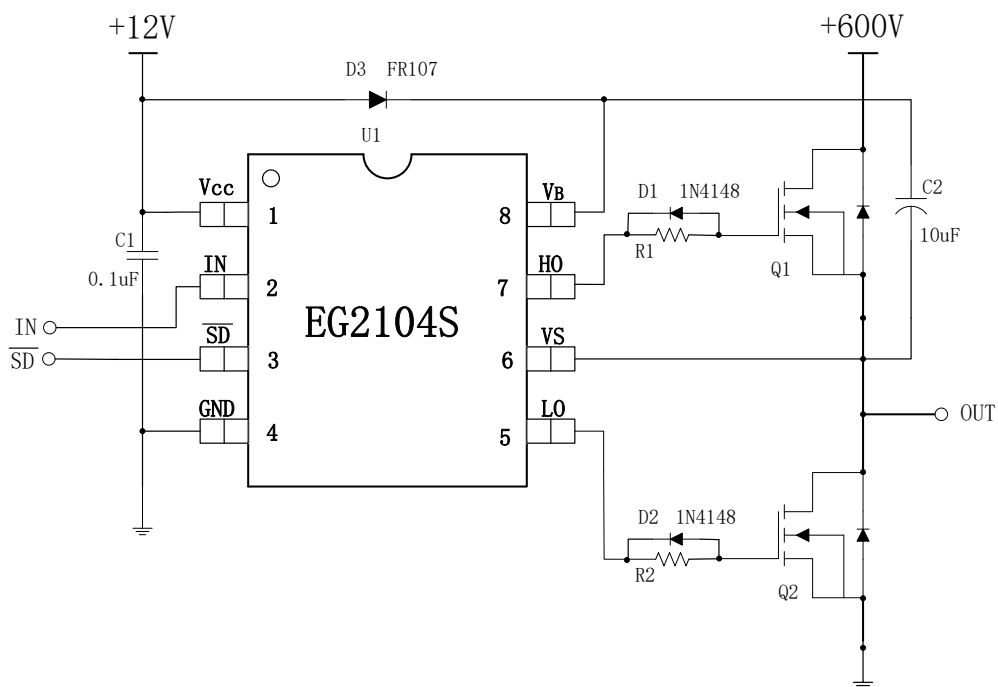


Figure 6-1. EG2104S typical application circuit diagram

## 4. Блок -схема

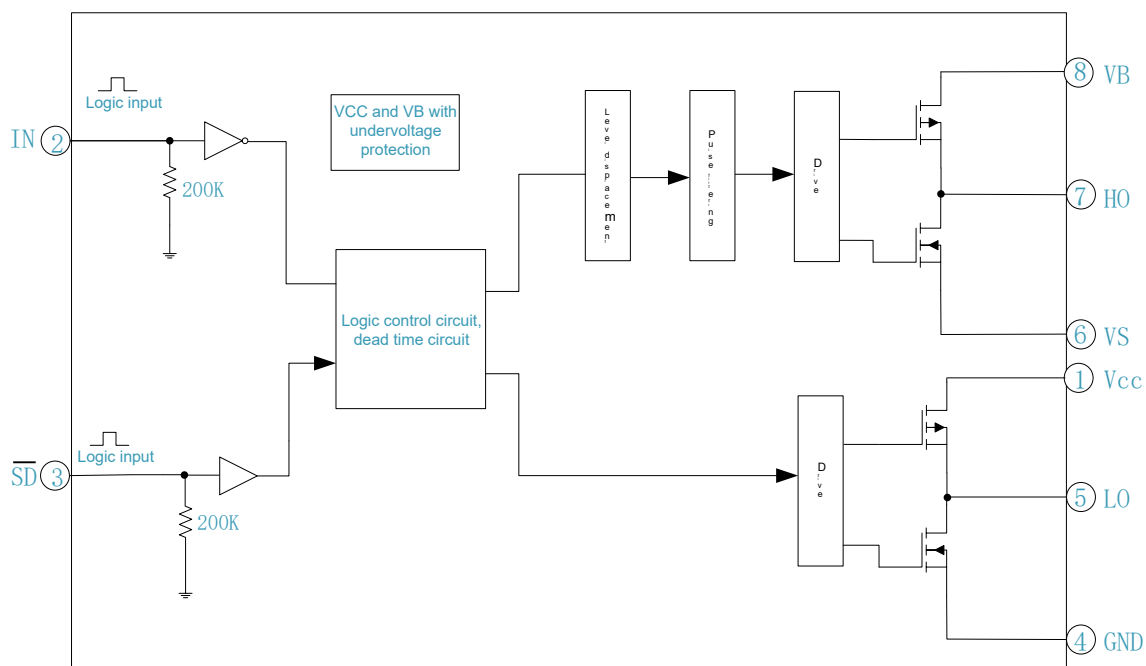


Рисунок 5-1. EG2104S Внутренняя схема

## 5. Типичная схема применения

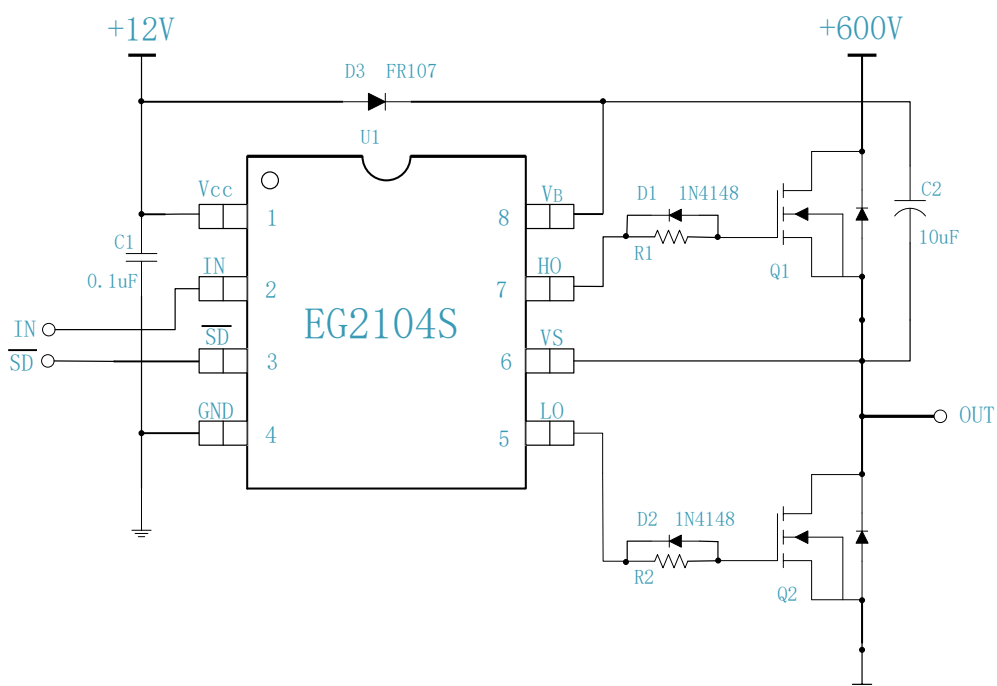


Рисунок 6-1. EG2104S Типичная схема прикладной схемы

## 6. Electrical characteristics

### 6.1 Limit parameters

Without further explanation, at TA=25℃ conditions

| Symbols                                  | Parameter name        | Test conditions | Min.   | Max.    | Units |
|------------------------------------------|-----------------------|-----------------|--------|---------|-------|
| High side floating absolute voltage      | VB                    | -               | -0.3   | 600     | V     |
| High side floating supply offset voltage | VS                    | -               | VB-20  | VB+0.3  | V     |
| High side floating supply offset voltage | HO                    | -               | VS-0.3 | VB+0.3  | V     |
| Low side output voltage                  | LO                    | -               | -0.3   | VCC+0.3 | V     |
| Low side and logic fixed supply voltage  | VCC                   | -               | -0.3   | 20      | V     |
| Logic input voltage (HIN & LIN)          | IN                    | -               | -0.3   | VCC+0.3 | V     |
| Low channel logic signal input level     | $\overline{SD}$       | -               | -0.3   | 6       | V     |
| TA                                       | Ambient temperature   | -               | -45    | 125     | ℃     |
| Tstr                                     | Storage temperature   | -               | -55    | 150     | ℃     |
| TL                                       | Soldering temperature | T=10S           | -      | 300     | ℃     |

Note: exceeding the listed limit parameters may cause permanent damage to the chip, operating in extreme conditions for a long time will affect the reliability of the chip.

## 6. Электрические характеристики

### 6.1 Ограниченные параметры

Без дальнейшего объяснения, в TA = 25 °C Условия

| Symbols                                  | Parameter name        | Test conditions | Min.   | Max.    | Units |
|------------------------------------------|-----------------------|-----------------|--------|---------|-------|
| High side floating absolute voltage      | VB                    | -               | -0.3   | 600     | V     |
| High side floating supply offset voltage | VS                    | -               | VB-20  | VB+0.3  | V     |
| High side floating supply offset voltage | HO                    | -               | VS-0.3 | VB+0.3  | V     |
| Low side output voltage                  | LO                    | -               | -0.3   | VCC+0.3 | V     |
| Low side and logic fixed supply voltage  | VCC                   | -               | -0.3   | 20      | V     |
| Logic input voltage (HIN & LIN)          | IN                    | -               | -0.3   | VCC+0.3 | V     |
| Low channel logic signal input level     | $\overline{SD}$       | -               | -0.3   | 6       | V     |
| TA                                       | Ambient temperature   | -               | -45    | 125     | °C    |
| Tstr                                     | Storage temperature   | -               | -55    | 150     | °C    |
| TL                                       | Soldering temperature | T=10S           | -      | 300     | °C    |

ПРИМЕЧАНИЕ. Превышение перечисленных параметров предела может привести к постоянно му повреждению чипа, работая в экстремальных условиях в течение длительного времени, пов лияет на надежность чипа.

## 6.2 Typical parameters

Without further explanation, at TA=25°C, Vcc=15V, load capacitance CL=1nF conditions

| Parameter name                                            | Symbols   | Test conditions                             | Min. | Typical | Max. | Units |
|-----------------------------------------------------------|-----------|---------------------------------------------|------|---------|------|-------|
| Power supply                                              | Vcc       | -                                           | 10   | 15      | 20   | V     |
| Quiescent current                                         | Icc       | Input dangling, Vcc=15V                     | -    | 100     | 200  | uA    |
| Input logic signal high potential                         | Vin(H)    | All input control signals                   | 2.5  | -       | -    | V     |
| Input logic signal low potential                          | Vin(L)    | All input control signals                   | -0.3 | 0       | 1.0  | V     |
| Current at the high level of the input logic signal       | Iin(H)    | Vin=5V                                      | -    | -       | 30   | uA    |
| Input logic signal low current                            | Iin(L)    | Vin=0V                                      | -10  | -       | -    | uA    |
| <b>VCC supply undervoltage shutdown feature</b>           |           |                                             |      |         |      |       |
| VCC turn-on voltage                                       | Vcc(on)   | -                                           | 7.6  | 8.6     | 9.6  | V     |
| VCC shutdown voltage                                      | Vcc (off) | -                                           | 7.1  | 8.1     | 9.1  | V     |
| <b>VB supply undervoltage shutdown feature</b>            |           |                                             |      |         |      |       |
| VB turn-on voltage                                        | VB(on)    | -                                           | 6.8  | 7.8     | 8.8  | V     |
| VB shutdown voltage                                       | VB (off)  | -                                           | 6.6  | 7.6     | 8.6  | V     |
| <b>Low-side output LO switching time characteristics</b>  |           |                                             |      |         |      |       |
| On delay                                                  | Ton       | See Figure 7-1                              | -    | 800     | 940  | ns    |
| Off delay                                                 | Toff      | See Figure 7-1                              | -    | 160     | 240  | ns    |
| Rise Time                                                 | Tr        | See Figure 7-1                              | -    | 150     | 250  | ns    |
| Descent time                                              | Tf        | See Figure 7-1                              | -    | 75      | 175  | ns    |
| <b>High-side output HO switching time characteristics</b> |           |                                             |      |         |      |       |
| On delay                                                  | Ton       | See Figure 7-2                              | -    | 800     | 940  | ns    |
| Off delay                                                 | Toff      | See Figure 7-2                              | -    | 160     | 240  | ns    |
| Rise Time                                                 | Tr        | See Figure 7-2                              | -    | 150     | 250  | ns    |
| Descent time                                              | Tf        | See Figure 7-2                              | -    | 75      | 175  | ns    |
| <b>Dead time characteristics</b>                          |           |                                             |      |         |      |       |
| Dead time                                                 | DT        | See Figure 7-3,<br>No load capacitance CL=0 | 500  | 640     | 800  | ns    |
| <b>IO output maximum drive capability</b>                 |           |                                             |      |         |      |       |
| IO output pull current                                    | IO+       | Vo=0V, VIN=VIH<br>PW≤10uS                   | -    | 1.0     | -    | A     |

## 6.2 Типичные параметры

Без дальнейшего объяснения, в  $T_A = 25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = 15\text{V}$ , емкость нагрузки  $c_l = 1\text{nF}$  Условия

| Parameter name                                            | Symbols                | Test conditions                                           | Min. | Typical | Max. | Units         |
|-----------------------------------------------------------|------------------------|-----------------------------------------------------------|------|---------|------|---------------|
| Power supply                                              | $V_{CC}$               | -                                                         | 10   | 15      | 20   | V             |
| Quiescent current                                         | $I_{CC}$               | Input dangling, $V_{CC}=15\text{V}$                       | -    | 100     | 200  | $\mu\text{A}$ |
| Input logic signal high potential                         | $V_{in(H)}$            | All input control signals                                 | 2.5  | -       | -    | V             |
| Input logic signal low potential                          | $V_{in(L)}$            | All input control signals                                 | -0.3 | 0       | 1.0  | V             |
| Current at the high level of the input logic signal       | $I_{in(H)}$            | $V_{in}=5\text{V}$                                        | -    | -       | 30   | $\mu\text{A}$ |
| Input logic signal low current                            | $I_{in(L)}$            | $V_{in}=0\text{V}$                                        | -10  | -       | -    | $\mu\text{A}$ |
| <b>VCC supply undervoltage shutdown feature</b>           |                        |                                                           |      |         |      |               |
| VCC turn-on voltage                                       | $V_{CC(on)}$           | -                                                         | 7.6  | 8.6     | 9.6  | V             |
| VCC shutdown voltage                                      | $V_{CC} \text{ (off)}$ | -                                                         | 7.1  | 8.1     | 9.1  | V             |
| <b>VB supply undervoltage shutdown feature</b>            |                        |                                                           |      |         |      |               |
| VB turn-on voltage                                        | $V_B(on)$              | -                                                         | 6.8  | 7.8     | 8.8  | V             |
| VB shutdown voltage                                       | $V_B \text{ (off)}$    | -                                                         | 6.6  | 7.6     | 8.6  | V             |
| <b>Low-side output LO switching time characteristics</b>  |                        |                                                           |      |         |      |               |
| On delay                                                  | $T_{on}$               | See Figure 7-1                                            | -    | 800     | 940  | ns            |
| Off delay                                                 | $T_{off}$              | See Figure 7-1                                            | -    | 160     | 240  | ns            |
| Rise Time                                                 | $T_r$                  | See Figure 7-1                                            | -    | 150     | 250  | ns            |
| Descent time                                              | $T_f$                  | See Figure 7-1                                            | -    | 75      | 175  | ns            |
| <b>High-side output HO switching time characteristics</b> |                        |                                                           |      |         |      |               |
| On delay                                                  | $T_{on}$               | See Figure 7-2                                            | -    | 800     | 940  | ns            |
| Off delay                                                 | $T_{off}$              | See Figure 7-2                                            | -    | 160     | 240  | ns            |
| Rise Time                                                 | $T_r$                  | See Figure 7-2                                            | -    | 150     | 250  | ns            |
| Descent time                                              | $T_f$                  | See Figure 7-2                                            | -    | 75      | 175  | ns            |
| <b>Dead time characteristics</b>                          |                        |                                                           |      |         |      |               |
| Dead time                                                 | DT                     | See Figure 7-3,<br>No load capacitance $C_L=0$            | 500  | 640     | 800  | ns            |
| <b>IO output maximum drive capability</b>                 |                        |                                                           |      |         |      |               |
| IO output pull current                                    | $I_{O+}$               | $V_o=0\text{V}, V_{in}=V_{IH}$<br>$PW \leq 10\mu\text{S}$ | -    | 1.0     | -    | A             |

|                        |     |                           |   |     |   |   |
|------------------------|-----|---------------------------|---|-----|---|---|
| IO output sink current | IO- | Vo=12V,VIN=VIL<br>PW≤10uS | - | 1.5 | - | A |
|------------------------|-----|---------------------------|---|-----|---|---|

### 6.3 Switching time characteristics and dead time waveform diagram

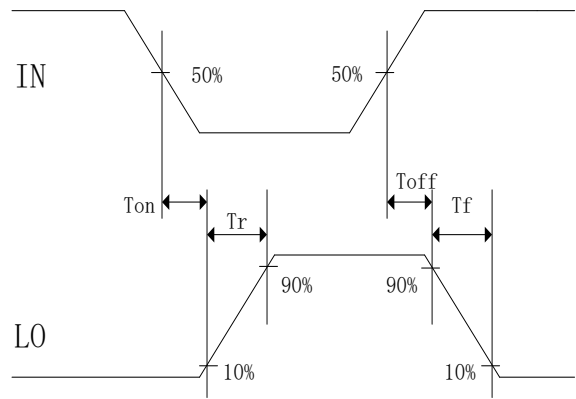


Figure 7-1. Low-side output LO switching time waveform diagram

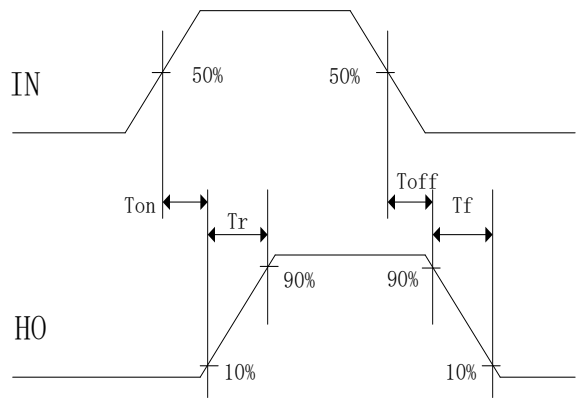


Figure 7-2. High-side output HO switching time waveform diagram

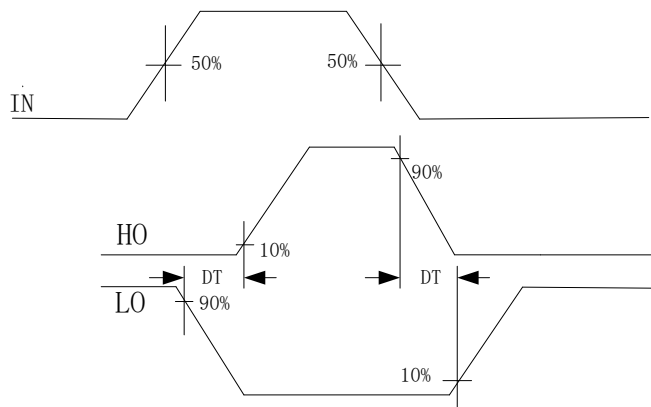


Figure 7-3. Dead time waveform diagram

|                        |     |                                               |   |     |   |   |
|------------------------|-----|-----------------------------------------------|---|-----|---|---|
| IO output sink current | IO- | $V_0=12V, V_{IN}=V_{IL}$<br>$PW \leq 10\mu S$ | - | 1.5 | - | A |
|------------------------|-----|-----------------------------------------------|---|-----|---|---|

### 6.3 Характеристики времени переключения и диаграмма сигнала мертвого времени

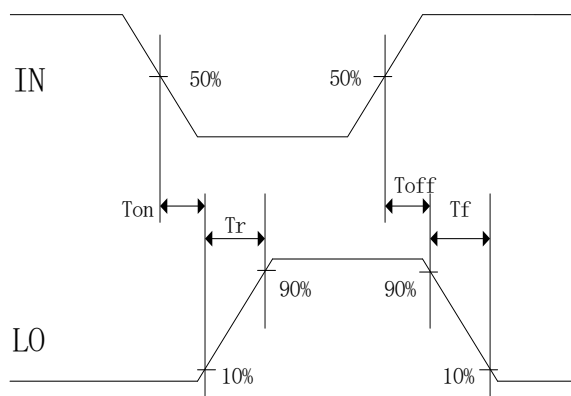


Рисунок 7-1. Диаграмма формы переключения с низким уровнем

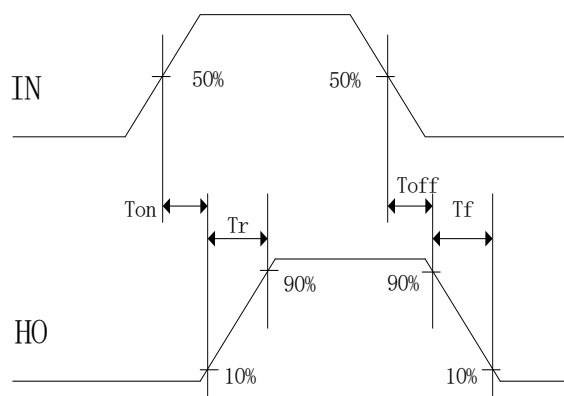


Рисунок 7-2. Выходная выходная диаграмма Thercing Thercing Diagram

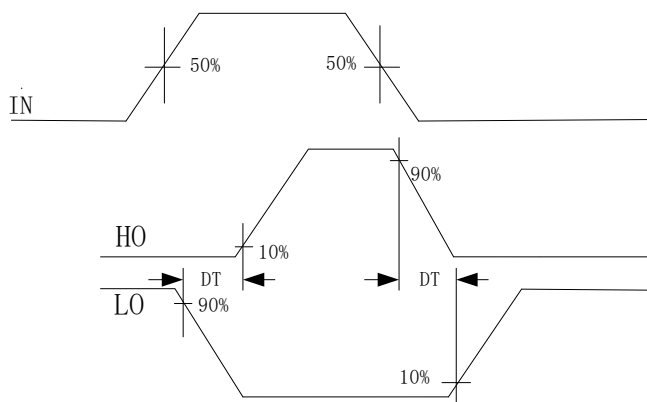


Рисунок 7-3. Диаграмма формы волны мертвого времени

## 7. Application design

### 7.1 VCC terminal supply voltage

For different MOS transistor, select a different drive voltage, chip supply voltage range of 10V-20V.

### 7.2 Input logic signal requirements and output driver characteristics

The main functions of the EG2104S are logic signal input processing, dead time control, level translation function, floating bootstrap power structure and upper and Lower Bridge totem pole output. Logic signal input high threshold of 2.5 V or more, low threshold of 1.0 V or less, the requirements of the output current of the logic signal is small, you can make the MCU output logic signal is directly connected to the EG2104S input channel.

Up to 1.0 A and the maximum output current up to 0.6 A, the high-end arm channel can withstand 600V voltage, the input logic signal and the output control signal conduction delay between small, low-end output opening conduction delay of 800ns, turn-off conduction delay of 160ns, high-end output opening conduction delay of 800ns, turn-off conduction delay of 160ns. The rise time of the low-side output is 150ns, the fall time of the shutdown is 75ns, the rise time of the high-side output is 150ns, the fall time of the shutdown is 75ns.

Input signal and output signal logic function diagram shown in Figure 8-2 :

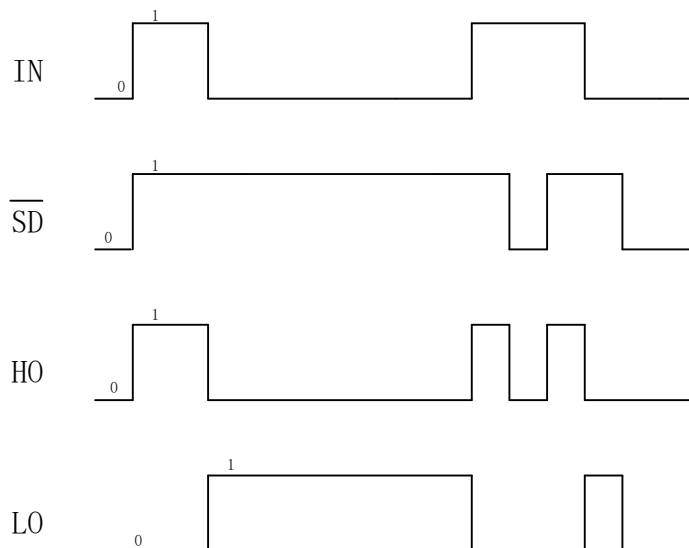


Figure 8-2. Input signal and output signal logic function diagram

## 7. Дизайн приложения

### 7.1 напряжение питания терминала VCC

Для различного транзистора MOS выберите другое напряжение привода, диапазон напряжения пода

### 7.2 Требования к входному логическому сигналу и характеристики выходного

Основными функциями EG2104S являются обработка ввода логического сигнала, управлен  
ие мертвым временем, функция трансляции уровня, структура мощности плавающей начальной з  
агрузки и выходной и нижний и нижний тотемный полюс.

До 1,0 а и максимальный выходной ток до 0,6 А, канал высококачественного рычага может в  
ыдерживать напряжение 600 В, сигнал ввода логического сигнала и задержка проводимости управ  
ления выходным управлением между небольшим, низкочастотным выходным проводящим пров  
одя закрытие составляет 75 нс, время роста выхода на высоком уровне составляет 150 нс, время па  
дения отключения составляет 75 нс.

Диаграмма функции входного сигнала и выходного сигнала, показанная на рисунке 8-2:

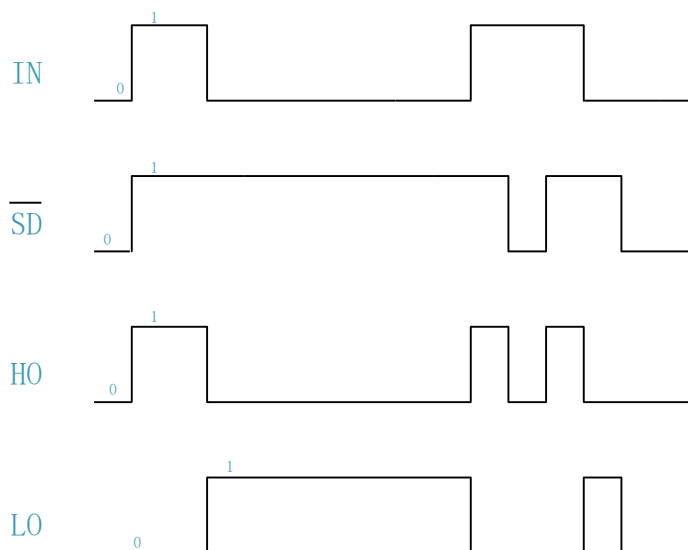


Рисунок 8-2. Диаграмма функции входного сигнала и выходного сигнала

Logic truth table for input and output signals:

| Input                  |             | Output     |            |
|------------------------|-------------|------------|------------|
| Input and output logic |             |            |            |
| IN (pin 2)             | SD (pin 3 ) | HO (Pin 7) | LO (pin 5) |
| 0                      | 0           | 0          | 0          |
| 1                      | 0           | 0          | 0          |
| 0                      | 1           | 0          | 1          |
| 1                      | 1           | 1          | 0          |

From the truth table, the input logic signal SD is“0“, regardless of IN is”1“or”0“, The Drive control output HO, LO while”0“, the upper and lower power tube is turned off simultaneously; when the input logic signal SD is”1“, IN is”0“, HO output is”0“, LO output is”1“; when the input logic signal SD is”1“, IN is”1“, HO output is”1“, LO output is”0“.

7.3 Bootstrap circuit

EG2104S using Bootstrap suspension drive power supply structure greatly simplifies the drive power supply design, only one way to complete the power supply voltage VCC high-end N-channel MOS transistor and low-end N-channel MOS transistor driving two power switching devices, to the practical application of great convenience. EG2104S can use an external bootstrap diode as shown in Figure 8-3 and a bootstrap capacitor to automatically complete the bootstrap boost function, assuming that the lower tube is turned on, the upper tube is turned off during the VC bootstrap capacitor has been charged to a sufficient voltage( $V_c=V_{CC}$ ), when the HO output is high on the tube is turned on, the lower tube is turned off, the voltage on the VC bootstrap Capacitor will be equivalent to a voltage source as an internal driver VB and VS, complete the high-end N-channel MOS transistor.

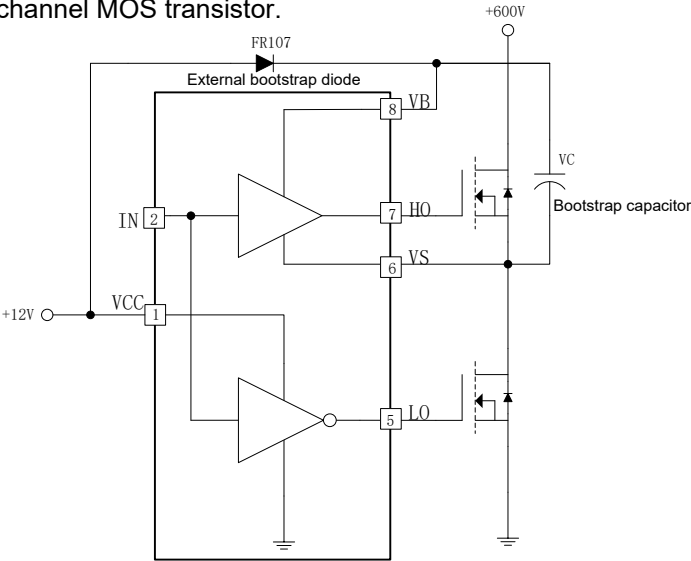


Figure 8-3. EG2104S bootstrap circuit structure

Логическая таблица правды для входных и выходных сигналов:

| Input                  |             | Output     |            |
|------------------------|-------------|------------|------------|
| Input and output logic |             |            |            |
| IN (pin 2)             | SD (pin 3 ) | HO (Pin 7) | LO (pin 5) |
| 0                      | 0           | 0          | 0          |
| 1                      | 0           | 0          | 0          |
| 0                      | 1           | 0          | 1          |
| 1                      | 1           | 1          | 0          |

Из таблицы истины входной логический сигнал SD составляет «0», независимо от IS is »1« или »0«, вывод управления привода Ho, lo while »0, верхняя и нижняя силовая трубка отключается одно временно; Когда входной логический сигнал SD - 1 «, in is» 0 «, вывод ho is» 0 «, выход LO» 1 «; Когда в ходной логический сигнал SD - 1 «, in is» 1 «, вывод ho» 1 «, выход LO is» 0 ».

7.3 Схема начальной загрузки

EG2104S Использование структуры питания привода подвески для начальной подвески значител ьно упрощает конструкцию источника питания привода, только один способ завершить напряжени е питания VCC High-Cannel N-канальное транзистор MOS и низкокачественный N-канальный транзис тор MOS, управляющий двумя устройствами переключения питания, к практическому применению большого удобства. EG2104S can use an external bootstrap diode as shown in Figure 8-3 and a bootstrap cap acitor to automatically complete the bootstrap boost function, assuming that the lower tube is turned on, the upper tube is turned off during the VC bootstrap capacitor has been charged to a sufficient voltage(Vc=VCC), when the HO output is high on the tube is turned on, the lower tube is turned off, Напряжение на конденсаторе Boots trap VC будет эквивалентно источнику напряжения в качестве внутреннего драйвера VB и VS, завер шите высококачественный N-канальный транзистор MOS.

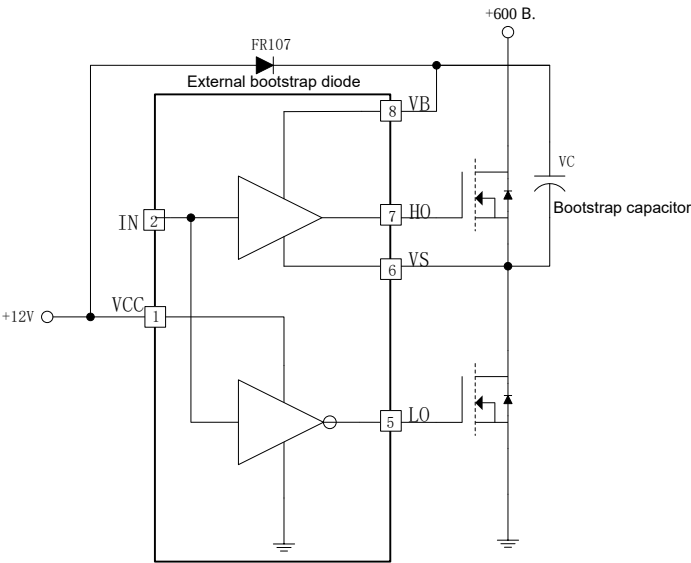
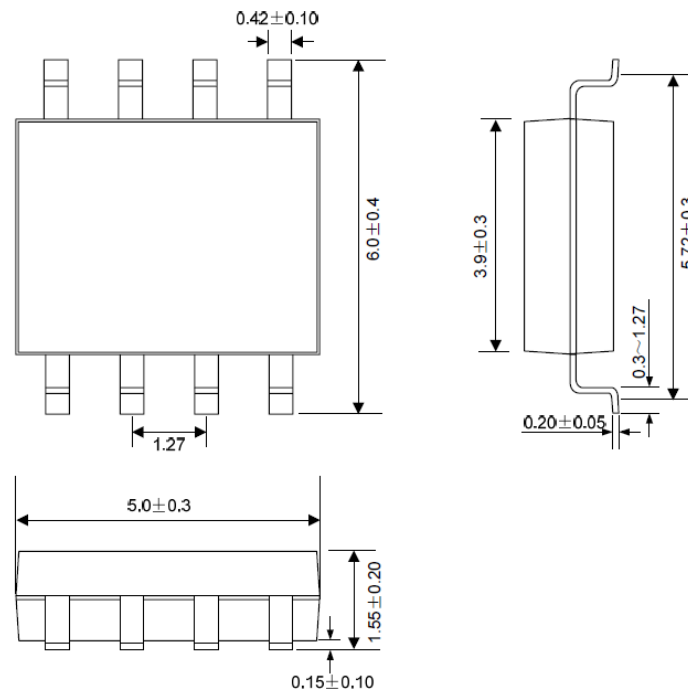


Рисунок 8-3. EG2104S Структура начальной загрузки

## 8. Package size

### 8.1 SOP8 Package size



## 8. Размер упаковки

### 8.1 SOP8 размер упаковки

