



# CDG701\_702

SPST Switch

Version: Rev 1.0.0 Date: 2025-6-18

## Features ■■

- 1.8 V to 5.5 V single supply
- Low on resistance ( $2\ \Omega$  Typ)
- Low on resistance flatness ( $0.5\ \Omega$  Typ)
- $-3\ \text{dB}$  bandwidth  $> 200\ \text{MHz}$
- Rail-to-rail operation
- Fast switching times:  $t_{\text{ON}} = 18\ \text{ns}$   $t_{\text{OFF}} = 12\ \text{ns}$
- Typical power consumption: ( $< 0.01\ \mu\text{W}$ )
- TTL/CMOS compatible
- 1.8 V to 5.5 V single supply

## Application ■■

- Video switching
- Communication systems
- Audio signal routing
- Battery-powered systems
- Sample-and-hold systems
- Mechanical reed relay replacement

## Description ■■

The CDG701/CDG702 are monolithic CMOS SPST switches. These switches are designed on an advanced submicron process that provides low power dissipation yet high switching speed, low on resistance, and low leakage currents. In addition,  $-3\ \text{dB}$  bandwidths of greater than  $200\ \text{MHz}$  can be achieved.

The CDG701/CDG702 can operate from a single  $1.8\ \text{V}$  to  $5.5\ \text{V}$  supply, making it ideal for use in battery-powered instruments. Figure 1 shows that with a logic input of 1, the switch of the CDG701 is closed and that of the CDG702 is open. Each switch conducts equally well in both directions when on.

The CDG701/CDG702 are available in 5-lead SOT-23, 6-lead SOT-23, and 8-lead MSOP packages.

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## Product Highlights

1. 1.8 V to 5.5 V Single-Supply Operation. The ADG701/ADG702 offer high performance, including low on resistance and fast switching times, and are fully specified and guaranteed with 3 V and 5 V supply rails.
2. Very Low  $R_{ON}$  ( $2\ \Omega$  Maximum at 5 V,  $3\ \Omega$  Maximum at 3 V). At 1.8 V operation,  $R_{ON}$  is typically  $40\ \Omega$  over the temperature range.
3. On Resistance Flatness  $R_{FLAT(ON)}$  ( $1\ \Omega$  Maximum).
4.  $-3\ \text{dB}$  Bandwidth  $> 200\ \text{MHz}$ .
5. Low Power Dissipation. CMOS construction ensures low power dissipation.
6. Fast  $t_{ON}/t_{OFF}$ .

## Pin Configurations

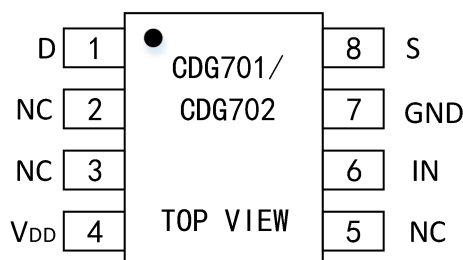


Figure 1. MSOP8 Pin Configuration

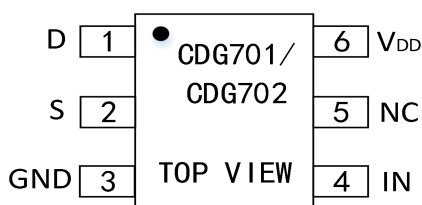


Figure 2. SOT23-6 Pin Configuration

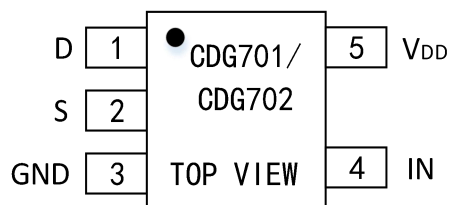
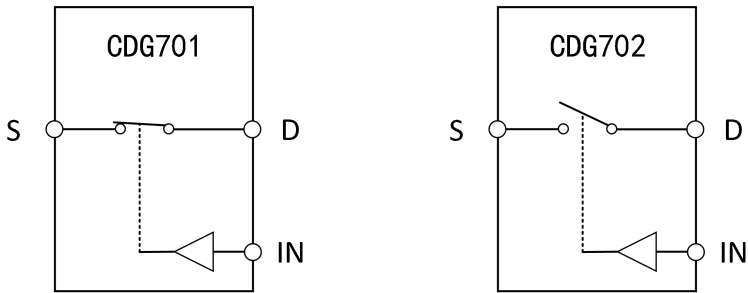


Figure 3. SOT23-5 Pin Configuration

Pin Description

| 引脚编号   |         |         | 引脚名称            | 描述                                          |
|--------|---------|---------|-----------------|---------------------------------------------|
| MSOP-8 | SOT23-6 | SOT23-5 |                 |                                             |
| 1      | 1       | 1       | D               | Drain Pin. Can be used as input or output.  |
| 2,3,5  | 5       |         | NC              | No Connect.                                 |
| 4      | 6       | 5       | V <sub>DD</sub> | Most Positive Power Supply Potential.       |
| 6      | 4       | 4       | IN              | Logic Control Input.                        |
| 7      | 3       | 3       | GND             | Ground (0 V) Reference.                     |
| 8      | 2       | 2       | S               | Source Pin. Can be used as input or output. |

Functional Block diagram



Switches shown for a logic "0" input

Truth Table

| CDG701 In | CDG702 In | Switch Condition |
|-----------|-----------|------------------|
| 0         | 1         | OFF              |
| 1         | 0         | ON               |

Absolute Maximum Ratings

| Parameter                           | Rating                                                             |
|-------------------------------------|--------------------------------------------------------------------|
| V <sub>DD</sub> to GND              | −0.3 V to +7 V                                                     |
| Analog, Digital Inputs <sup>1</sup> | −0.3 V to V <sub>DD</sub> + 0.3 V or 30 mA, whichever occurs first |
| Peak Current, S or D                | 100 mA                                                             |
| Continuous Current, S or D          | 30mA                                                               |
| Operating Temperature Range         | −40°C to +125°C                                                    |
| Storage Temperature Range           | −65°C to +150°C                                                    |
| Junction Temperature                | 150°C                                                              |

|                                                 |                  |
|-------------------------------------------------|------------------|
| MSOP Package, Power Dissipation                 | 315 mW           |
| $\theta_{JA}$ Thermal Impedance                 | 206°C/W          |
| $\theta_{JC}$ Thermal Impedance                 | 44°C/W           |
| SOT-23 Package, Power Dissipation               | 282 mW           |
| $\theta_{JA}$ Thermal Impedance                 | 229.6°C/W        |
| $\theta_{JC}$ Thermal Impedance                 | 91.99°C/W        |
| Lead Temperature, Soldering Vapor Phase(60 sec) | 215°C            |
| IR Reflow, Peak Temperature (<20sec)            | 220°C            |
| Soldering (Pb-Free) Reflow, Peak Temperature    | 260(+0/-5)°C     |
| Time at Peak Temperature                        | 20 sec to 40 sec |
| ESD                                             | 2 kV             |

## Electrical Characteristics

VDD = +5 V $\pm$ 10%, GND = 0 V. All specifications -40°C to +85°C, unless otherwise noted.

| PARAMETER                                               | +25°C |       |     | −40° C to +85° C      |     |      | Test Conditions                                                            | UNIT |
|---------------------------------------------------------|-------|-------|-----|-----------------------|-----|------|----------------------------------------------------------------------------|------|
|                                                         | Min   | Typ   | Max | Min                   | Typ | Max  |                                                                            |      |
| Analog Switch                                           |       |       |     |                       |     |      |                                                                            |      |
| Analog Signal Range                                     |       |       |     | 0V to V <sub>DD</sub> |     |      |                                                                            | V    |
| On Resistance (R <sub>ON</sub> )                        | --    | 2     | 3   | --                    | --  | 4    | V <sub>S</sub> =0V to V <sub>DD</sub> , I <sub>S</sub> =−10mA;See Figure 8 | Ω    |
| On Resistance Flatness (RFLAT(ON))                      | --    | 0.5   | --  | --                    | --  | 1.0  | V <sub>S</sub> =0 V to V <sub>DD</sub> , I <sub>S</sub> =−10mA             | Ω    |
| Leakage Currents                                        |       |       |     |                       |     |      |                                                                            |      |
| V <sub>DD</sub> =+5.5V                                  |       |       |     |                       |     |      |                                                                            |      |
| Source Off Leakage I <sub>S</sub> (Off)                 | --    | ±0.01 | --  | --                    | --  | --   | V <sub>S</sub> =4.5V/1V, V <sub>D</sub> =1V/4.5V;See Figure 10             | nA   |
| Drain Off Leakage I <sub>D</sub> (Off)                  | --    | ±0.01 | --  | --                    | --  | --   | V <sub>S</sub> =4.5V/1V, V <sub>D</sub> =1V/4.5V;See Figure 10             | nA   |
| Channel On Leakage I <sub>D</sub> , I <sub>S</sub> (On) | --    | ±0.01 | --  | --                    | --  | --   | V <sub>S</sub> =V <sub>D</sub> =1V, or 4.5V;See Figure 9                   | nA   |
| Digital Inputs                                          |       |       |     |                       |     |      |                                                                            |      |
| Input High Voltage, V <sub>INH</sub>                    |       |       |     | 2.4                   | --  | --   |                                                                            | V    |
| Input Low Voltage, V <sub>INL</sub>                     |       |       |     | --                    | --  | 0.8  |                                                                            | V    |
| Input Current I <sub>INL</sub> or I <sub>INH</sub>      | --    | 0.005 | --  | --                    | --  | ±0.1 | V <sub>IN</sub> =V <sub>INL</sub> or V <sub>INH</sub>                      | μA   |
| Dynamic Characteristics                                 |       |       |     |                       |     |      |                                                                            |      |

|                           |    |           |    |    |    |     |                                             |         |
|---------------------------|----|-----------|----|----|----|-----|---------------------------------------------|---------|
| $t_{ON}$                  | -- | 12        | -- | -- | -- | 18  | $R_L=300\Omega, C_L=35pF, V_S=3V$           | ns      |
| $t_{OFF}$                 | -- | 8         | -- | -- | -- | 12  | $R_L=300\Omega, C_L=35pF, V_S=3V$           | ns      |
| Charge Injection          | -- | 5         | -- |    |    |     | $V_S=2V; R_S=0\Omega, C_L=1nF;$             | pC      |
| Off Isolation             | -- | -55       | -- |    |    |     | $R_L=50\Omega, C_L=5pF,$<br>$f=10MHz$       | dB      |
|                           | -- | -75       | -- |    |    |     | $R_L=50\Omega, C_L=5pF, f=1MHz$             | dB      |
| Bandwidth -3 dB           | -- | 200       | -- |    |    |     | $R_L=50\Omega, C_L=5pF;$                    | MHz     |
| $C_S$                     | -- | 17        | -- |    |    |     |                                             | pF      |
| $C_D$                     | -- | 17        | -- |    |    |     |                                             | pF      |
| $C_D, C_S$ (On)           | -- | 38        | -- |    |    |     |                                             | pF      |
| <b>Power Requirements</b> |    |           |    |    |    |     |                                             |         |
| $I_{DD}$                  | -- | 0.00<br>1 | -- | -- | -- | 1.0 | $V_{DD}=+5.5V$ , Digital<br>inputs=0V or 5V | $\mu A$ |

$V_{DD} = +3V \pm 10\%$ ,  $GND = 0V$ . All specifications  $-40^\circ C$  to  $+85^\circ C$ , unless otherwise noted.

| PARAMETER                                                              | +25°C |       |     | −40° C to +85° C      |     |      | Test Conditions                                                            | UNIT |
|------------------------------------------------------------------------|-------|-------|-----|-----------------------|-----|------|----------------------------------------------------------------------------|------|
|                                                                        | Min   | Typ   | Max | Min                   | Typ | Max  |                                                                            |      |
| Analog Switch                                                          |       |       |     |                       |     |      |                                                                            |      |
| Analog Signal Range                                                    |       |       |     | 0V to V <sub>DD</sub> |     |      |                                                                            | V    |
| On Resistance (R <sub>ON</sub> )                                       | --    | 3.5   | 5   | --                    | --  | 6    | V <sub>S</sub> =0V to V <sub>DD</sub> , I <sub>S</sub> =−10mA;See Figure 8 | Ω    |
| On Resistance Flatness (R <sub>FLAT</sub> (ON))                        | --    | 1.5   | --  | --                    | --  | --   | V <sub>S</sub> =0 V to V <sub>DD</sub> , I <sub>S</sub> =−10mA             | Ω    |
| Leakage Currents <span style="float:right">V<sub>DD</sub>=+3.3V</span> |       |       |     |                       |     |      |                                                                            |      |
| Source Off Leakage I <sub>S</sub> (Off)                                | --    | ±0.01 | --  | --                    | --  | --   | V <sub>S</sub> =3V/1V, V <sub>D</sub> =1V/3V;See Figure 10                 | nA   |
| Drain Off Leakage I <sub>D</sub> (Off)                                 | --    | ±0.01 | --  | --                    | --  | --   | V <sub>S</sub> =3V/1V, V <sub>D</sub> =1V/3V;See Figure 10                 | nA   |
| Channel On Leakage I <sub>D</sub> , I <sub>S</sub> (On)                | --    | ±0.01 | --  | --                    | --  | --   | V <sub>S</sub> =V <sub>D</sub> =1V, or 3V;See Figure 9                     | nA   |
| Digital Inputs                                                         |       |       |     |                       |     |      |                                                                            |      |
| Input High Voltage, V <sub>INH</sub>                                   |       |       |     | 2.0                   | --  | --   |                                                                            | V    |
| Input Low Voltage, V <sub>INL</sub>                                    |       |       |     | --                    | --  | 0.4  |                                                                            | V    |
| Input Current I <sub>INL</sub> or I <sub>INH</sub>                     | --    | 0.005 | --  | --                    | --  | ±0.1 | V <sub>IN</sub> =V <sub>INL</sub> or V <sub>INH</sub>                      | μA   |
| Dynamic Characteristics                                                |       |       |     |                       |     |      |                                                                            |      |
| t <sub>ON</sub>                                                        | --    | 14    | --  | --                    | --  | 20   | R <sub>L</sub> =300Ω,C <sub>L</sub> =35pF,V <sub>S</sub> =2V               | ns   |
| t <sub>OFF</sub>                                                       | --    | 8     | --  | --                    | --  | 13   | R <sub>L</sub> =300Ω,C <sub>L</sub> =35pF,V <sub>S</sub> =2V               | ns   |
| Charge Injection                                                       | --    | 4     | --  |                       |     |      | V <sub>S</sub> =1.5V; R <sub>S</sub> =0Ω, C <sub>L</sub> =1nF;             | pC   |

|                    |    |           |    |    |    |     |                                             |         |
|--------------------|----|-----------|----|----|----|-----|---------------------------------------------|---------|
| Off Isolation      | -- | -55       | -- |    |    |     | $R_L=50\Omega$ , $C_L=5pF$ ,<br>$f=10MHz$   | dB      |
|                    | -- | -75       | -- |    |    |     | $R_L=50\Omega$ , $C_L=5pF$ , $f=1MHz$       | dB      |
| Bandwidth -3 dB    | -- | 200       | -- |    |    |     | $R_L=50\Omega$ , $C_L=5pF$ ;                | MHz     |
| $C_S$              | -- | 17        | -- |    |    |     |                                             | pF      |
| $C_D$              | -- | 17        | -- |    |    |     |                                             | pF      |
| $C_D$ , $C_S$ (On) | -- | 38        | -- |    |    |     |                                             | pF      |
| Power Requirements |    |           |    |    |    |     |                                             |         |
| $I_{DD}$           | -- | 0.00<br>1 | -- | -- | -- | 1.0 | $V_{DD}=+3.3V$ , Digital<br>inputs=0V or 3V | $\mu A$ |

Typical Characteristics

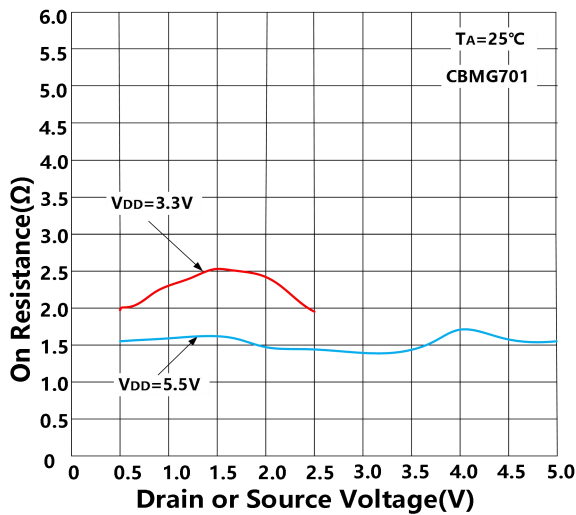


Figure 6.On Resistance vs.  $V_D$  ( $V_S$ )-(CDG701)

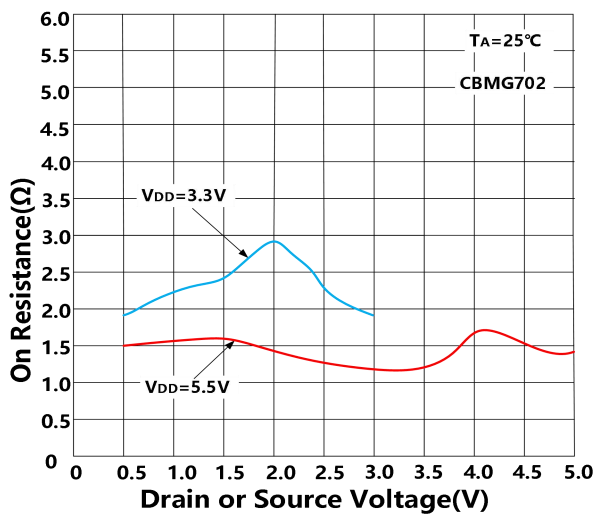


Figure 7.On Resistance vs.  $V_D$  ( $V_S$ )-(CDG702)

Test Circuit

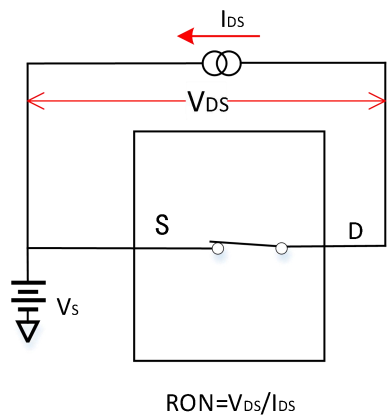


Figure 8. On Resistance

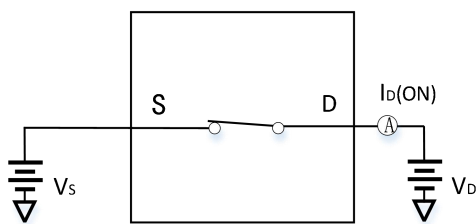


Figure 9. On Leakage

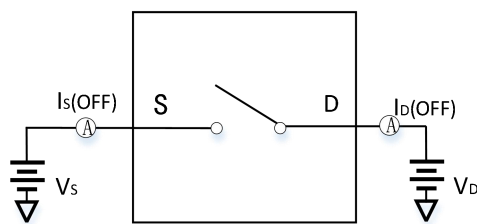


Figure 10. Off Leakage

Package Outline Dimensions

MSOP-8

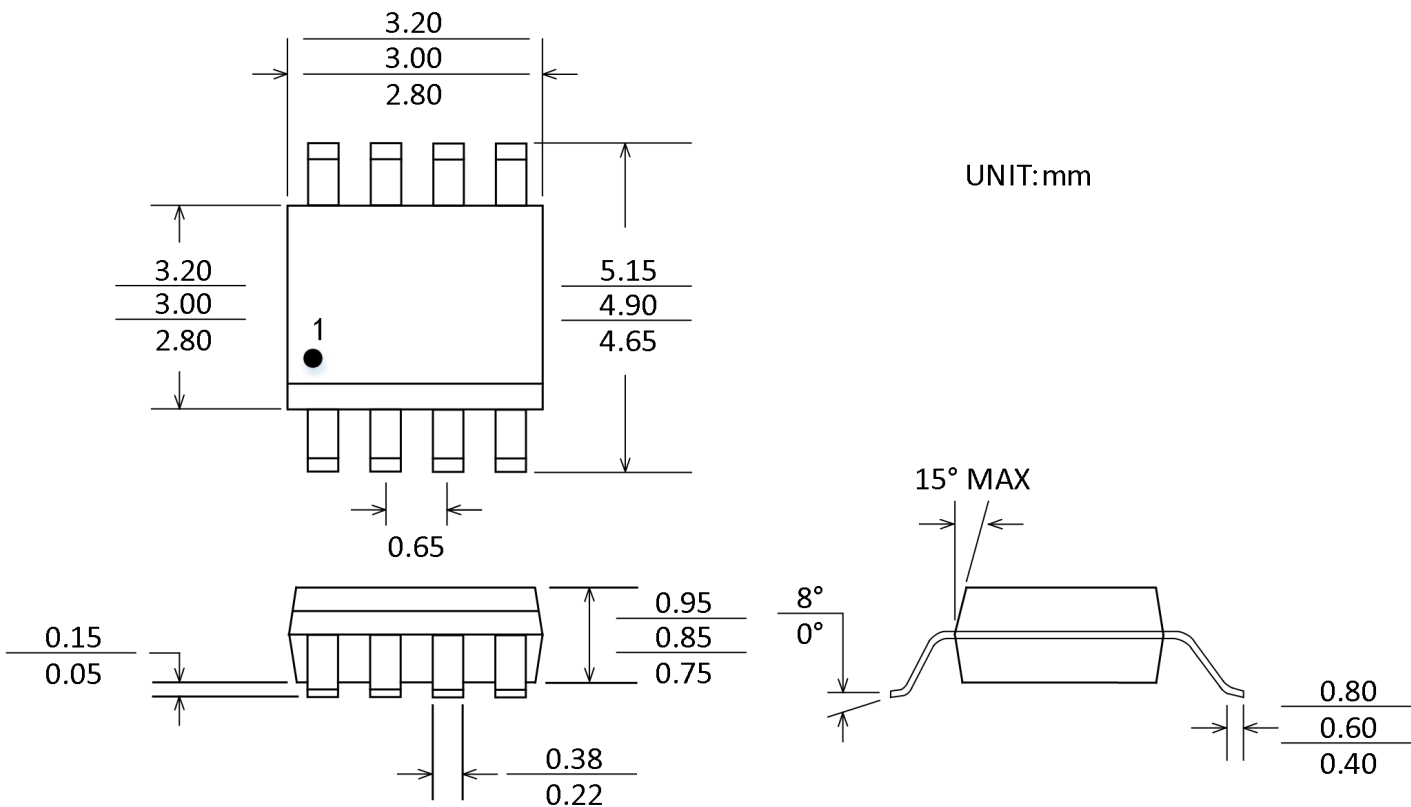


Figure 11. 8-Lead Mini Small Outline Package [MSOP]

SOT23-6

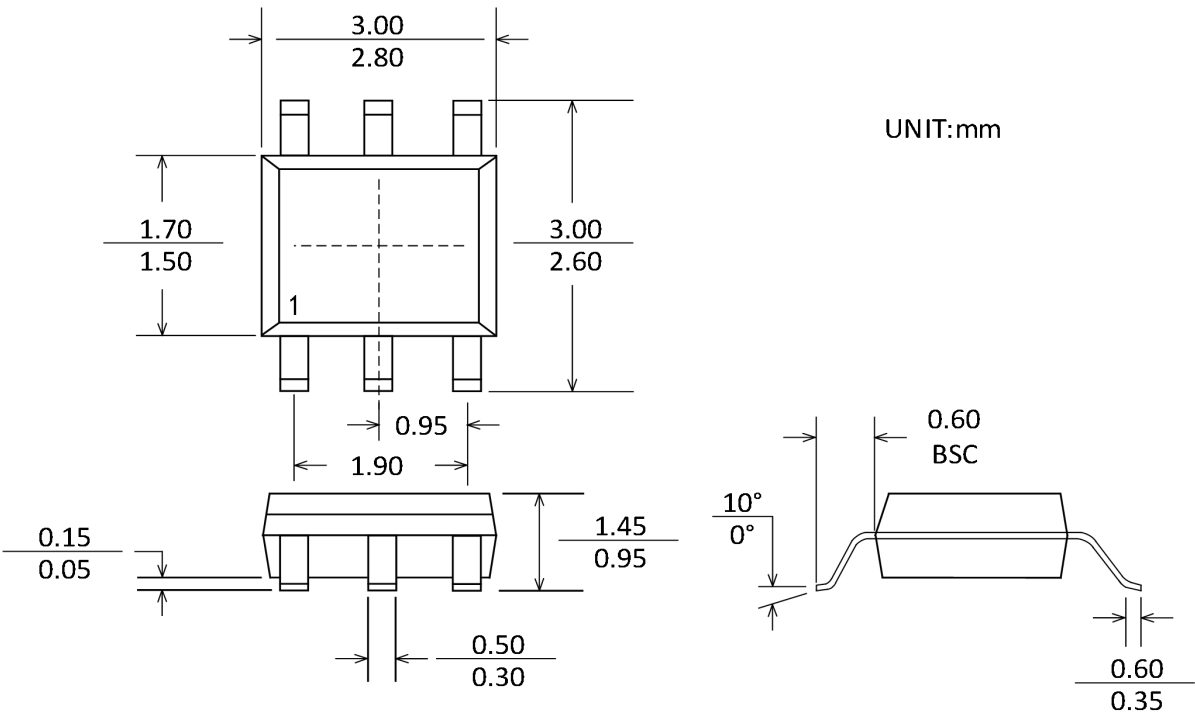


Figure 12. 6-Lead Small Outline Transistor Package [SOT-23]

SOT23-5

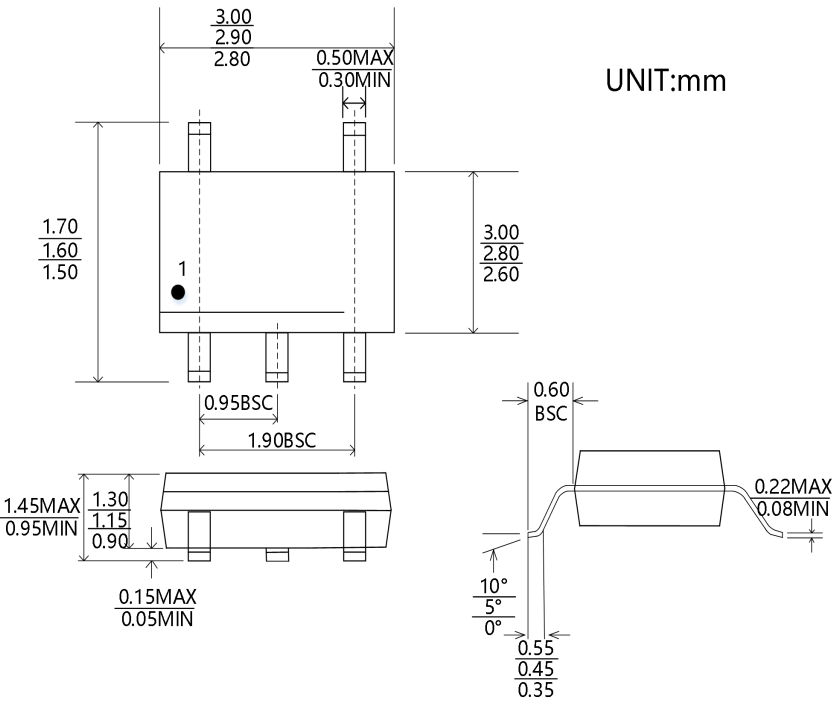


Figure 13. 5-Lead Small Outline Transistor Package [SOT-23]

Package/Ordering Information

| MODEL      | TEMPERATURE | PACKAGE DESCRIPTION | PACKAGE OPTION      |
|------------|-------------|---------------------|---------------------|
| CDG701AST5 | -40°C~85°C  | SOT23-5             | Tape and Reel, 3000 |
| CDG701AST6 | -40°C~85°C  | SOT23-6             | Tape and Reel, 3000 |
| CDG701AMS8 | -40°C~85°C  | MSOP-8              | Tape and Reel, 3000 |
| CDG702AST5 | -40°C~85°C  | SOT23-5             | Tape and Reel, 3000 |
| CDG702AST6 | -40°C~85°C  | SOT23-6             | Tape and Reel, 3000 |
| CDG702AMS8 | -40°C~85°C  | MSOP-8              | Tape and Reel, 3000 |

Revision Log

| Version | Revision date | Change content  | Reason for Change | Modified by | Reviewed By | Note |
|---------|---------------|-----------------|-------------------|-------------|-------------|------|
| V1.0    | 2025.6.18     | Initial version | Regular update    | WW          | LYL         |      |