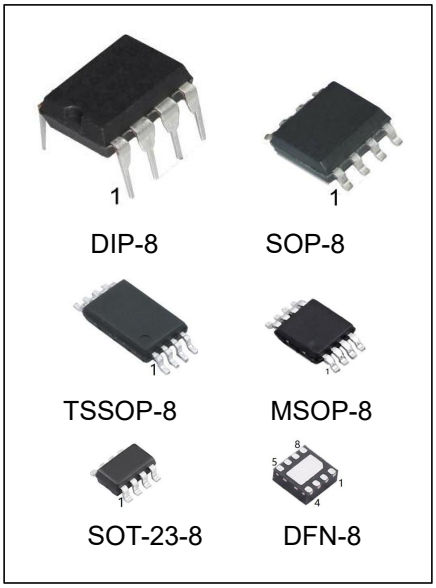
## Product Features

- Internal frequency compensation
- Short circuit protection
- Low consumption: typical value0.5mA @ VCC=5V
- Packaging Type：DIP-8、SOP-8、MSOP-8、TSSOP-8、SOT-23-8andDFN-8
- Single Power Supply Voltage Range：3V～36V
- Dual Power Supply Voltage Range：±18V
- Unit Gain Bandwidth : up to 1.2MHz




## Product Application

- Sensor signal amplifier
- DC gain
- Audio Amplifier
- Other Application Area

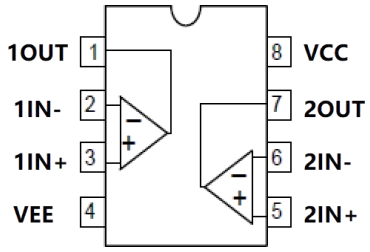
## Product Information

| Product Name | Packing Type | Silk Printing Name | Package | Packing Details |
|---|---|---|---|---|
| LM358N | DIP-8 | LM358 | tube | 2000 p c s /box |
| LM358M/TR | SOP-8 | LM358 | tape | 2500 pcs/reel |
| LM358MM/TR | MSOP-8 | LM358 | tape | 3000 pcs/reel |
| LM358DQ2/TR or LM358DQ/TR | DFN-8 2*2 | LM358 | tape | 4000 pcs/reel |
| LM358DQ3/TR | DFN-8 3*3 | LM358 | tape | 5000 pcs/reel |
| LM358MT/TR | TSSOP-8 | LM358 | tape | 2500 pcs/reel |
| LM358M8/TR | SOT-23-8 | LM358 | tape | 3000 pcs/reel |
| LM258N | DIP-8 | LM258 | tube | 2000 p c s /box |
| LM258M/TR | SOP-8 | LM258 | tape | 2500 pcs/reel |
| LM258MM/TR | MSOP-8 | LM258 | tape | 3000 pcs/reel |
| LM258DQ2/TR or LM258DQ/TR | DFN-8 2*2 | LM258 | tape | 4000 pcs/reel |
| LM258DQ3/TR | DFN-8 3*3 | LM258 | tape | 5000 pcs/reel |
| LM258MT/TR | TSSOP-8 | LM258 | tape | 2500 pcs/reel |
| LM258M8/TR | SOT-23-8 | LM258 | tape | 3000 pcs/reel |

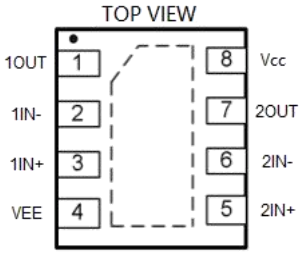
## Product Introduction

LM258/LM358 is a dual channel low-power differential operational amplifier that can be powered by a single or dual power supply. It has the characteristics of high open-loop gain, internal compensation, high common mode range, good temperature stability, and output short-circuit protection. Widely used in sensor amplification circuits, DC amplification modules, audio amplification circuits, and traditional operational amplification circuits.

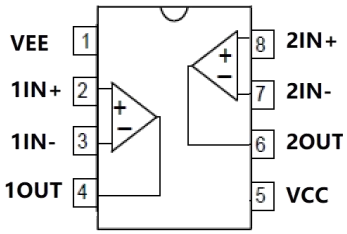
## Packaging Form And Pin Function Definition




DIP-8/SOP-8/MSOP-8/TSSOP-8




DFN-8 2*2/DFN-8 3*3




SOT-23-8

| Pin Number | | Pin Definition | Function Description |
|---|---|---|---|
| DIP8/SOP8/MSOP/TSSOP/DFN | SOT-23-8 | | |
| 1 | 4 | 1OUT | 1nd operational amplifier output |
| 2 | 3 | 1IN- | 1nd operational amplifier inverting input |
| 3 | 2 | 1IN+ | 1nd operational amplifier positive phase input |
| 4 | 1 | VEE | negative power supply |
| 5 | 8 | 2IN+ | 2nd operational amplifier positive phase input |
| 6 | 7 | 2IN- | 2nd operational amplifier inverting input |
| 7 | 6 | 2OUT | 2nd operational amplifier output |
| 8 | 5 | VCC | Positive power supply |

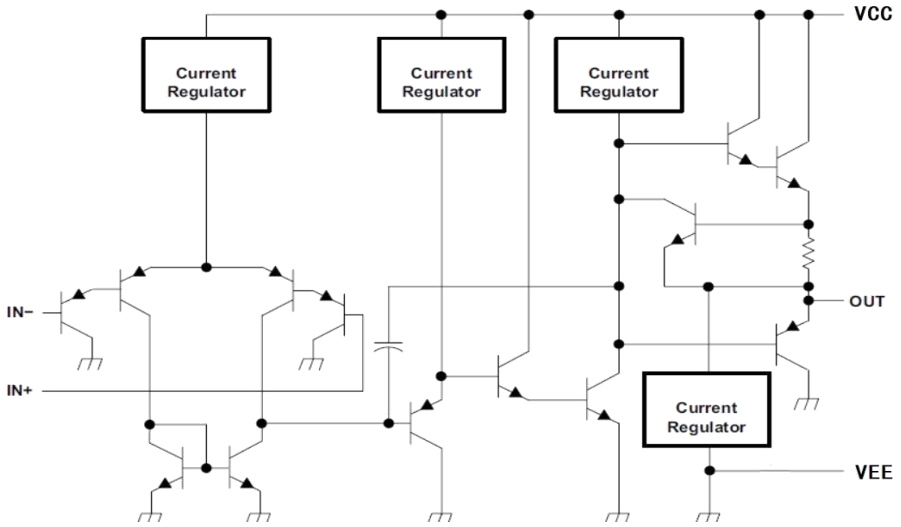
## Limit Parameter

| Item | Symbol | Limit Value(1) | Unit |
|---|---|---|---|
| Single power supply voltage | $V_{cc}$ | 36 | V |
| Dual power supply voltage | Vs | ±18 | V |
| Differential input voltage(2) | $V_{ID}$ | ±36 | V |
| Common mode input voltage | $V_{ICR}$ | -0.3 ~ 36V | V |
| Output short-circuit time | $t_{sc}$ | continuous | |
| Dissipated power | $P_D$ | 400 | mW |
| Operating Temperature LM358 | $T_A$ | 0-70 | ℃ |
| Operating Temperature LM258 | $T_A$ | -40~+85 | ℃ |
| Storage Temperature | $T_S$ | -65-150 | ℃ |
| welding temperature,10s | $T_W$ | 260 | ℃ |

Remark：（1）The limit value refers to the limit value that cannot be exceeded under any conditions. If this limit is reached, it may cause physical damage such as product degradation; At the same time, it cannot be guaranteed that the chip can work normally when approaching the limit parameters.

（2）The voltage difference between input terminal IN+and IN -.

## Equivalent schematic diagram

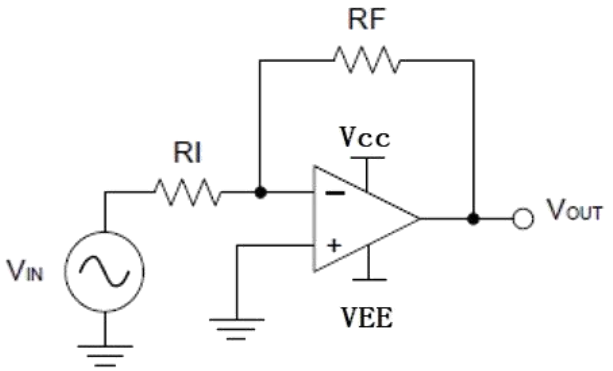



## DC electrical characteristics (TA=25℃, VCC=5V,VEE=GND Unless otherwise specified)

| Item | Symbol | Test Condition | | Min | TYP | Max | Uni |
|---|---|---|---|---|---|---|---|
| Input offset voltage | $V_{IO}$ | VCC=5V to MAX,$V_{IC}$=$V_{ICR}$(min),VO=1.4V | | - | ±3 | ±7 | mV |
| Input offset current | $I_{IO}$ | VO = 1.4 V | | - | 10 | 50 | nA |
| Bias Current | $I_{BIAS}$ | VO = 1.4 V | | - | 50 | 250 | nA |
| Common mode input voltage | $V_{ICR}$ | VCC=5V to 36V | | VEE | - | VCC-1.5V | V |
| Open-loop voltage gain | $A_{OL}$ | VCC=15V,VO=1V to 11V,RL≥2kΩ | | | 100 | - | V/mV |
| Common Mode Rejection Ratio | CMRR | VCC=5V to MAX,$V_{IC}$=$V_{ICR}$(min) | | - | 80 | - | dB |
| Unit Gain Bandwidth | GBWP | | | - | 1.2 | - | MHZ |
| 电源电压抑制比 $P_{SSR}$ | $\Delta V_{VDD}/\Delta V_{IO}$ | VCC=5V to MAX, f=20kHz | | - | 90 | - | dB |
| 串扰衰减抑制比 CS | $V_{O1}/V_{O2}$ | f=1kHz to 20kHz | | - | 120 | - | dB |
| Output high-level voltage | VOH | VCC=15V, $V_{ID}$=1V | Iout =-50uA | - | 13.6 | - | V |
| | | | Iout =-1mA | - | 13.5 | - | V |
| | | | Iout =-5mA | - | 13.4 | - | V |
| | | VCC=28V | RL=2k | | 26 | - | V |
| Output low-level voltage | VOL | VCC=15V, $V_{ID}$=-1V | Iout =50uA | - | 0.1 | - | V |
| | | | Iout =1mA | - | 0.7 | - | V |
| | | | Iout =5mA | - | 1.0 | - | V |
| | | VCC=28V | RL=2k | - | 0.85 | - | V |
| Output short-circuit current | $I_{OS}$ | VCC=5V,VEE=-5V,VO=0V | | - | ±24 | - | mA |
| Power Supply Operating Voltage | $I_{CC}$ | VCC=5V,VO=1/2VCC, No load | | - | 0.5 | - | mA |
| | | VCC=36,VO=1/2VCC,No load | | - | 0.8 | - | mA |
| Single power supply operating voltage | VCC | VEE=0V(GND) | | 3 | - | 36 | V |
| Dual power supply operating voltage | VS | VCC,VEE | | -18 | - | +18 | V |

## Typical Application

1.Diagram




2、Design Requirement

A power supply voltage greater than the input voltage range and output range must be selected.For example, amplifying the signal source VIN from ± 0.5V to ± 1.8V. Setting the power supply to ± 5V is sufficient to meet the requirements of this application.

3. **Design Process**

Calculate the amplification factor (gain) according to formula (1)AV

AV =-VO/VIN ----------(1)

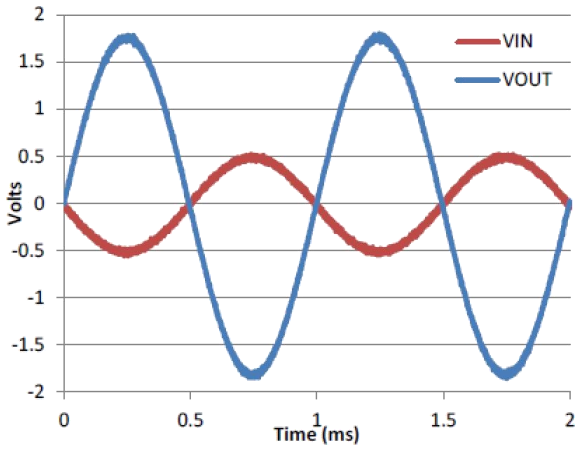
AV =-VO/VIN=-1.8/0.5=-3.6

Once the required gain AV is determined, a value should be selected for the RI or RF resistor. According to the electrical characteristics and power consumption requirements of the operational amplifier, values within the range of 1k Ω to 100k Ω can be selected. In this example, RI=10k Ω will be chosen, so RF=36k Ω. This is determined by Equation 2.

AV =-RF/RI ----------(2)

RF= AV * RI=3.6*10 = 36 kΩ

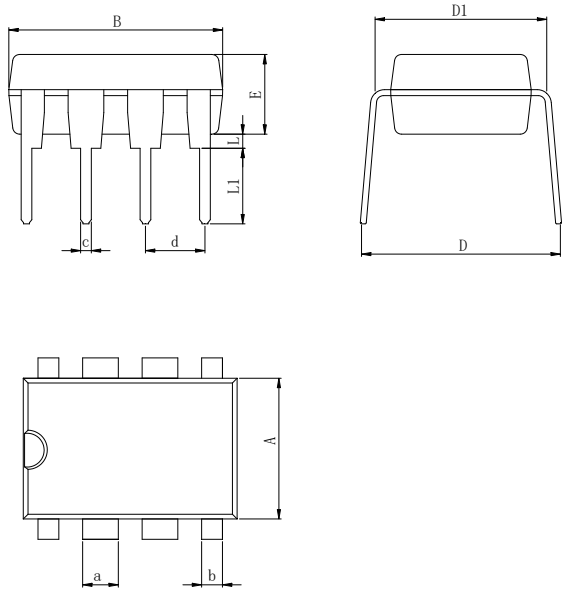
4.Application Curve Chart




Input Voltage VS Output Voltage of Inverting amplifier

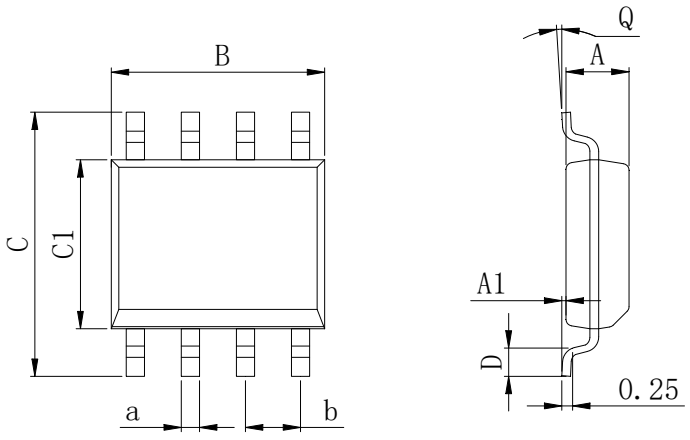
# 封装外形尺寸

## DIP-8



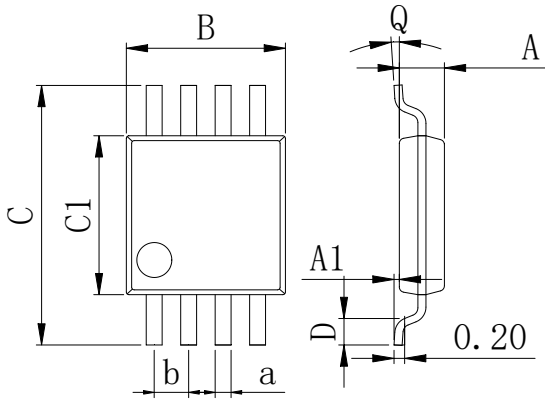

| Dimensions In Millimeters(DIP-8) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | B | D | D1 | E | L | L1 | a | b | c | d |
| **Min:** | 6.10 | 9.00 | 8.10 | 7.42 | 3.10 | 0.50 | 3.00 | 1.50 | 0.85 | 0.40 | 2.54 BSC |
| **Max:** | 6.68 | 9.50 | 10.9 | 7.82 | 3.55 | 0.70 | 3.60 | 1.55 | 0.90 | 0.50 | |

## SOP-8



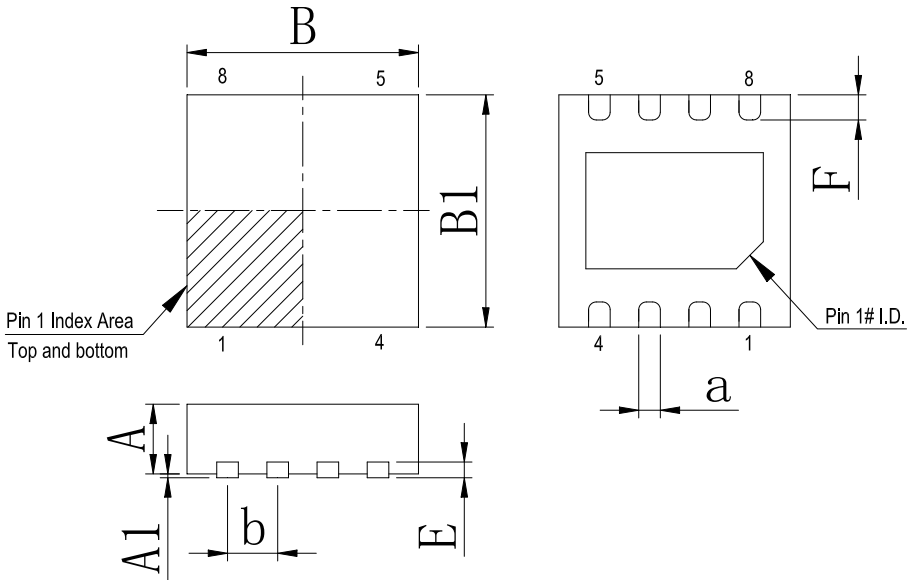

| Dimensions In Millimeters(SOP-8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | C | C1 | D | Q | a | b |
| **Min:** | 1.35 | 0.05 | 4.90 | 5.80 | 3.80 | 0.40 | 0° | 0.35 | 1.27 BSC |
| **Max:** | 1.55 | 0.20 | 5.10 | 6.20 | 4.00 | 0.80 | 8° | 0.45 | |

MSOP-8



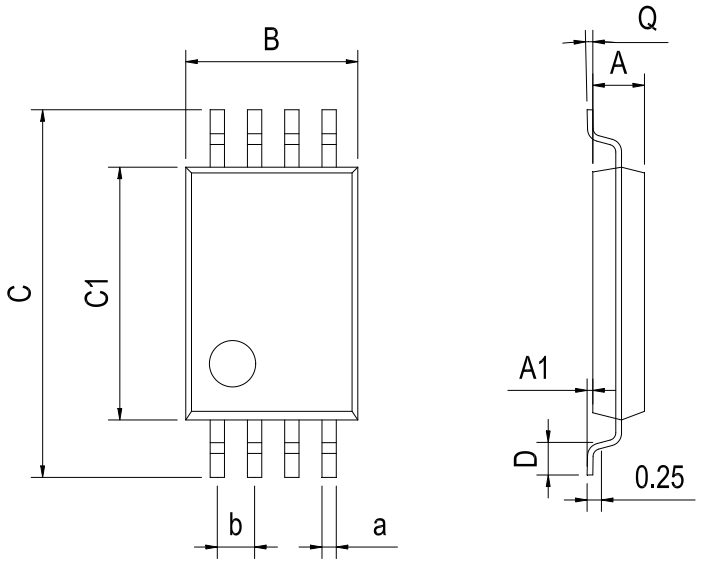

| Dimensions In Millimeters(MSOP-8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | C | C1 | D | Q | a | b |
| **Min:** | 0.80 | 0.05 | 2.90 | 4.75 | 2.90 | 0.35 | 0° | 0.25 | 0.65 BSC |
| **Max:** | 0.90 | 0.20 | 3.10 | 5.05 | 3.10 | 0.75 | 8° | 0.35 | |

DFN-8 2*2



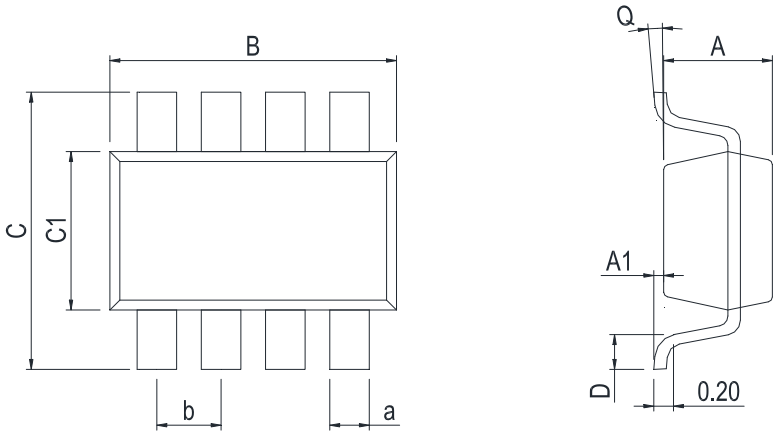

| Dimensions In Millimeters(DFN-8 2*2) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | B1 | E | F | a | b |
| **Min:** | 0.85 | 0 | 1.90 | 1.90 | 0.15 | 0.25 | 0.18 | 0.50TYP |
| **Max:** | 0.95 | 0.05 | 2.10 | 2.10 | 0.25 | 0.45 | 0.30 | |

TSSOP-8 (4.4*3.0)



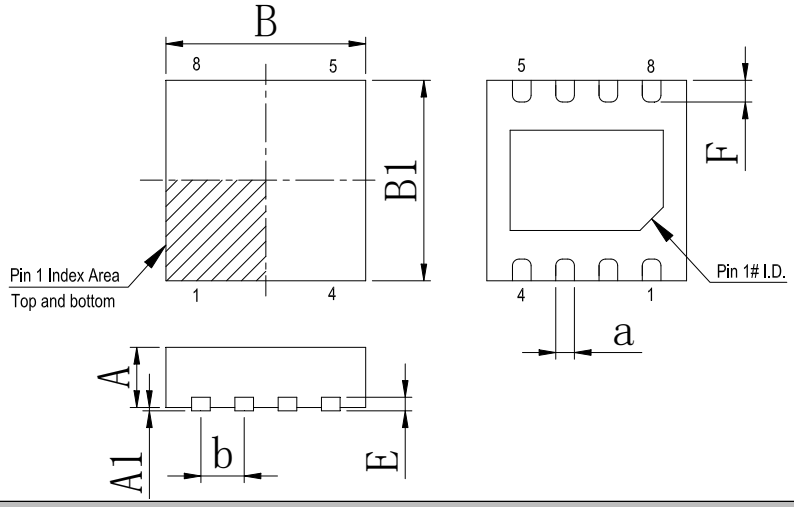

| Dimensions In Millimeters(TSSOP-8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | C | C1 | D | Q | a | b |
| **Min:** | 0.85 | 0.05 | 2.90 | 6.20 | 4.30 | 0.40 | 0° | 0.20 | 0.65 BSC |
| **Max:** | 0.95 | 0.20 | 3.10 | 6.60 | 4.50 | 0.80 | 8° | 0.25 | |

SOT-23-8




| Dimensions In Millimeters(SOT-23-8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | C | C1 | D | Q | a | b |
| **Min:** | 1.00 | 0.00 | 2.82 | 2.65 | 1.50 | 0.30 | 0° | 0.30 | 0.65 BSC |
| **Max:** | 1.15 | 0.15 | 3.02 | 2.95 | 1.70 | 0.60 | 8° | 0.50 | |

DFN-8 3*3




| Dimensions In Millimeters(DFN-8 3*3) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Symbol:** | **A** | **A1** | **B** | **B1** | **E** | **F** | **a** | **b** |
| **Min:** | 0.85 | 0.00 | 2.90 | 2.90 | 0.20 | 0.30 | 0.20 | 0.65 BSC |
| **Max:** | 0.95 | 0.05 | 3.10 | 3.10 | 0.25 | 0.50 | 0.34 | |

## Revision History

| Version Number | Date | Modified Content | Page |
|---|---|---|---|
| V1.0 | 2019-11 | newly revised | 1-10 |
| V1.1 | 2023-8 | Update packaging, add DFN-8 packaging, update DIP-8 size | 1、5、6 |
| V1.2 | 2024-10 | Add TSSOP-8/SOT-23-8 models and update SOT-23-8 package size diagram | 1、7 |

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