# *Rail-to-Rail Output Low Voltage, High Slew Rate, Wide Bandwidth Dual Operational Amplifiers*

## FEATURES

・CMOS rail to rail output
・2.7 to 5.5V single supply operation
・Gain-Bandwidth Product : 12MHz
・High slew rate : 6V/µs
・No crossover distortion
・Space saving package (SOP8)
・Cost efficient
・Pin assignments is the same as the general-purpose dual operational amplifiers

## APPLICATIONS

・Active filters
・Servo amplifier
・Multimedia system
・Digital to Analog Converter buffers
・Laptop、Set-Top BOX
・Microphone preamplifier
・Cross-reference to low voltage application :
  NJM2100, BA4510
  TLV2632, TLV2772
  TS462

## DESCRIPTION

The MS2100 is high slew rate CMOS operation amplifier optimize for low voltage, single supply operation. It designed to be used for general purpose amplifier of general electronic equipment for consumer appliances.

## BLOCK DIAGRAM
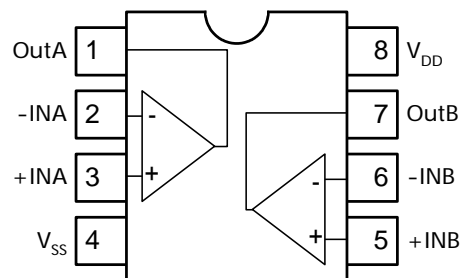


## PINNING

| Symbol | Pin | Description |
|--------|-----|-------------|
| OutA | 1 | output A |
| -INA | 2 | inverting input A |
| +INA | 3 | non-inverting input A |
| $V_{SS}$ | 4 | negative supply |
| +INB | 5 | non-inverting input B |
| -INB | 6 | inverting input B |
| OutB | 7 | output B |
| $V_{DD}$ | 8 | positive supply |



**Pin configuration**
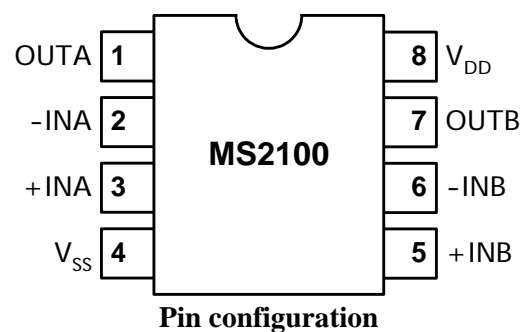
## ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $V_{DD}$ | Single power supply voltage | 2.7 | 5 | 5.5 | V |
| Topr | Operating temperature | -20 | - | 85 | ℃ |
| Tstg | Storage temperature | -40 | - | 125 | ℃ |
| $V_{ESD}$ | Electrostatic handling | -2000 | - | 2000 | V |

## 5V DC ELECTRICAL CHARACTERISTICS

(Ta=25℃, $V_{DD}$=5V, $V_{SS}$=0V, $V_{CM}$=$V_O$= $V_{DD}$/2)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{OS}$ | Input offset voltage | | - | 1 | 5 | mV |
| CMRR | Common mode rejection ratio | $0 \leqq V_{CM} \leqq 4V$ | 70 | 80 | - | dB |
| +PSRR | Positive Power supply rejection ratio | Ripple = 400mV , 100Hz | - | 69 | - | dB |
| -PSRR | Negative Power supply rejection ratio | Ripple = 400mV , 100Hz | | 67 | | dB |
| $V_{CM}$ | Common mode voltage | CMRR $\geq$ 50dB | 0.2 | - | 4 | V |
| $V_O$ | Output voltage swing | $R_L \geqq 2.5k\Omega$ | - | $V_{DD}$-25 | $V_{DD}$-15 | mV |
| $I_S$ | Supply current | Dual Amplifiers | - | 2.2 | - | mA |

## 5V AC ELECTRICAL CHARACTERISTICS

(Ta=25℃, $V_{DD}$=5V, $V_{SS}$=0V, $V_{CM}$=$V_O$= $V_{DD}$/2)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| SR | Slew rate | | - | 6 | - | V/μs |
| GBWP | Gain bandwidth product | | - | 12 | - | MHz |
| (THD+N)/S | Total harmonic distortion plus noise | f = 1kHz, Av = -1  $R_L$ > 10k, Vin = 4Vpp | - | -77 | -70 | dB |

## 2.7V DC ELECTRICAL CHARACTERISTICS

(Ta=25℃, $V_{DD}$=2.7V, $V_{SS}$=0V, $V_{CM}$=$V_O$= $V_{DD}$/2)

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{OS}$ | Input offset voltage | | - | 1 | 5 | mV |
| CMRR | Common mode rejection ratio | $0 \leqq V_{CM} \leqq 1.7V$ | 65 | 75 | - | dB |
| +PSRR | Positive Power supply rejection ratio | Ripple = 200mV , 100Hz | - | 55 | - | dB |
| -PSRR | Negative Power supply rejection ratio | Ripple = 200mV , 100Hz | | 54 | | dB |
| $V_{CM}$ | Common mode voltage | CMRR $\geq$ 50dB | 0.2 | - | 1.7 | V |
| $V_O$ | Output voltage swing | $R_L \geqq 2.5k\Omega$ | | $V_{DD}$-70 | $V_{DD}$-60 | mV |
| $I_S$ | Supply current | Dual Amplifiers | - | 1.9 | - | mA |

## 2.7V AC ELECTRICAL CHARACTERISTICS

(Ta=25℃, $V_{DD}$=2.7V, $V_{SS}$=0V, $V_{CM}$=$V_O$= $V_{DD}$/2)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------|-----|-----|-----|------|
| SR | Slew rate | | - | 5 | - | V/μs |
| GBWP | Gain bandwidth product | | - | 11 | - | MHz |
| (THD+N) /S | Total harmonic distortion plus noise | f = 1kHz, Av = -1 $R_L$ > 10k, Vin = 2Vpp | - | -72 | -65 | dB |

## APPLICATION INFORMATION    (Single Supply)

### Voltage Follower



Vout = Vin
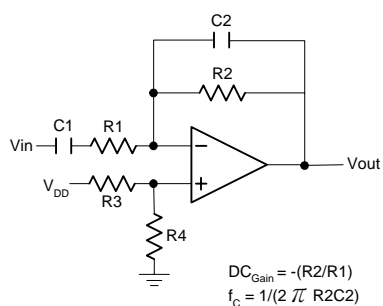
### Difference Amplifier



R1=R3, R2=R4
Vout = (R2/R1)(V2-V1)+$V_{DD}$/2
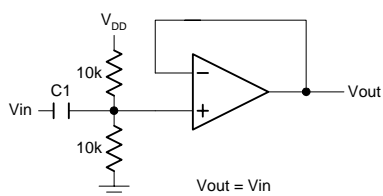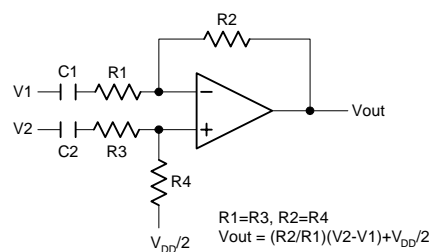
### Inverting Amplifier



$DC_{Gain}$ = -(R2/R1)
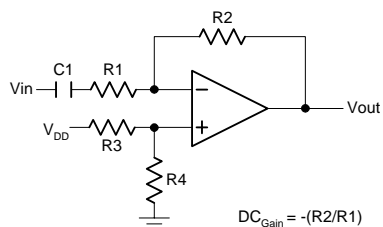
### Simple High-Pass Filter



$DC_{Gain}$ = 1
$f_C$ = 1/(2 π R1C1)
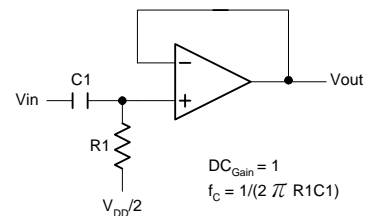
### Simple Low-Pass Filter



$DC_{Gain}$ = -(R2/R1)
$f_C$ = 1/(2 π R2C2)

### 2nd Order Multiple Feedback Low-Pass Filter
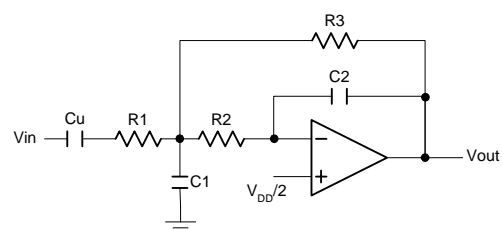
## EXTERNAL DIMENSIONS
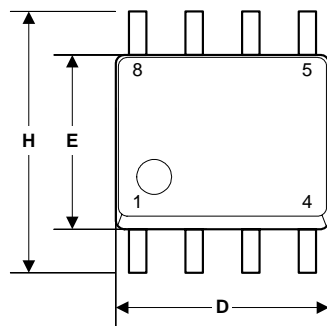
| Symbol | Dimension in mm | | Dimension in inch | |
|--------|------|------|--------|--------|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | 0.0532 | 0.0688 |
| A1 | 0.10 | 0.25 | 0.0040 | 0.0098 |
| B | 0.33 | 0.51 | 0.013 | 0.020 |
| C | 0.19 | 0.25 | 0.0075 | 0.0098 |
| D | 4.80 | 5.00 | 0.1890 | 0.1968 |
| H | 5.80 | 6.20 | 0.2284 | 0.2440 |
| E | 3.80 | 4.00 | 0.1497 | 0.1574 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.40 | 1.27 | 0.016 | 0.050 |
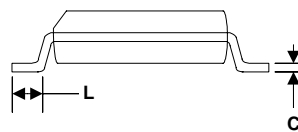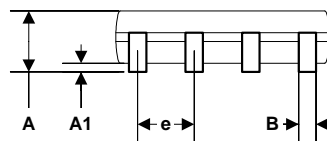
**SOP8**

## TAPE AND REEL   (Unit : mm)
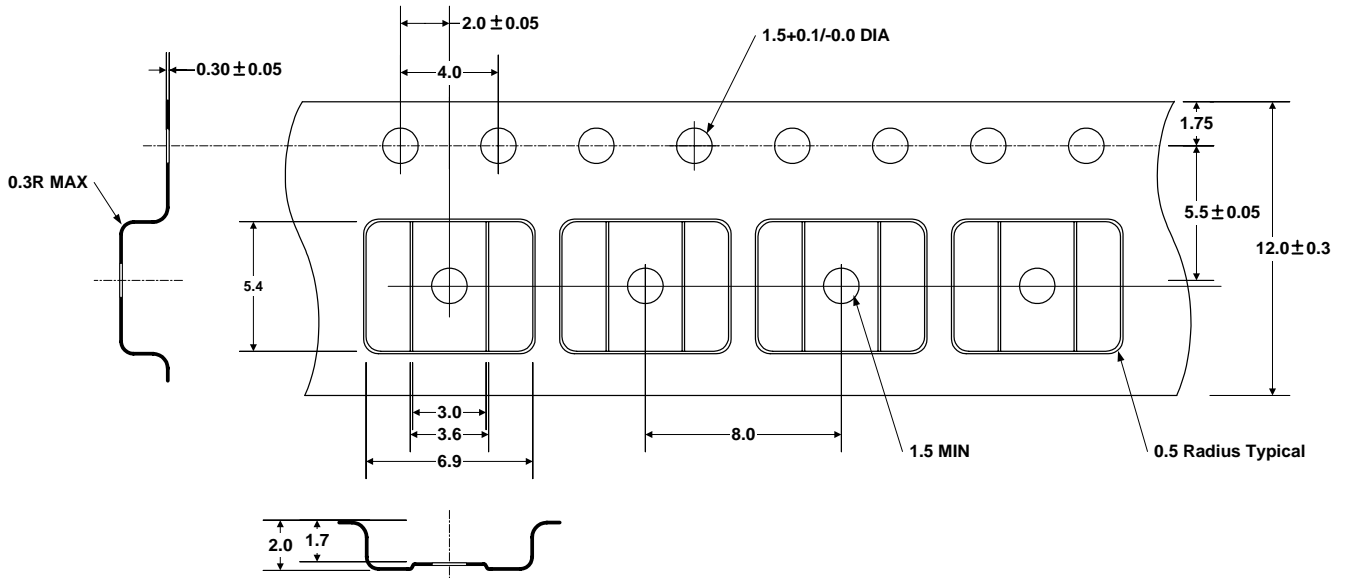
## ORDERING INFORMATION

| Package | Part number | Packaging Marking | Transport Media |
|---------|-------------|-------------------|-----------------|
| 8-Pin SOP | MS2100TR | MS2100 | 2.5k Units Tape and Reel |
| 8-Pin SOP | MS2100U | MS2100 | 100 Units Tube |
| 8-Pin SOP (lead free) | MS2100GTR | MS2100G | 2.5k Units Tape and Reel |
| 8-Pin SOP (lead free) | MS2100GU | MS2100G | 100 Units Tube |