

6MHz, Rail-to-Rail I/O CMOS Op Amps

Feature

- Stable 6MHz GBWP with Low I_Q of Only 330 μ A Typical per Amplifier
- Offset Voltage: +/-1mV Maximum
- High Slew Rate: 3.7V/ μ s
- Input Bias Current: 1pA Typical
- CMRR/PSRR:100dB/100dB
- Settling time to 0.1% with 2V Step: 0.46us
- Beyond the Rails Input Common-Mode Range
- Output Swing to within 10mV Typical of each Rail
- No Phase Reversal for Overdriven Inputs
- Supply Voltage Range: 2.5V to 5.5V
- -40 $^{\circ}$ C to 125 $^{\circ}$ C Operation Range
- Green, Popular Type Package

Applications

- Active Filters, ASIC Input or Output Amplifier
- Sensor Interface
- Smoke/Gas/Environment Sensors
- Portable Instruments and Mobile Device
- Audio Output
- PCMCIA Cards
- Battery or Solar Power Systems
- Medical Equipment
- Piezo Electrical Transducer Amplifier

General Description

The HT8631/2/4 are CMOS op-amps with low offset, stable high frequency response, low power, low supply voltage, and rail-to-rail inputs and outputs.

HT8631/2/4 have a high gain-bandwidth product of 6MHz, 3.7V/ μ s slew rate while consuming only 380 μ A of supply current per amplifier. The maximum input offset voltage is 1mV for HT8631/2/4. Beyond the rail input and rail-to-rail output characteristics allow the full power-supply voltage to be used for signal range. The operating range is from 2.5V to 5.5V.

This combination of features makes the HT8631/2/4 superior among rail-to-rail input/output CMOS op amps in its power class. It is specified over the extended industrial temperature range -40 $^{\circ}$ C to +125 $^{\circ}$ C.

The HT8631/2/4 can be used as cost-effective plug-in replacements for many commercially available op amps to reduce power and improve input/output range and performance.

Absolute Maximum Ratings

(If out of these ratings, the filter may be fail or damaged)

Table 1

Symbol	parameter	rating	units
VDD	Power supply	6	V
T _A	Operating ambient Temperature Range	-40~+125	°C
T _{STG}	Storage Temperature	-65~+150	°C

Recommended Operating Conditions

Table 2

Symbol	parameter	rating	units
VDD	Power supply	2.5~5.5	V
T _A	Operating ambient Temperature Range	-40~+125	°C

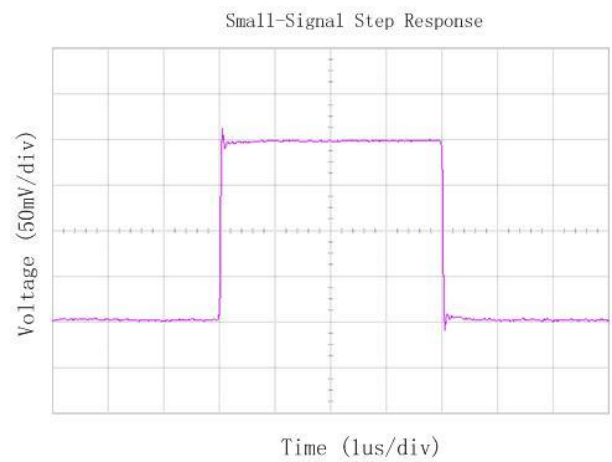
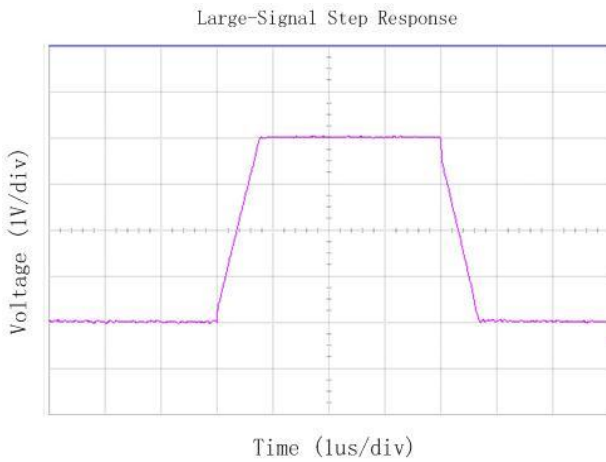
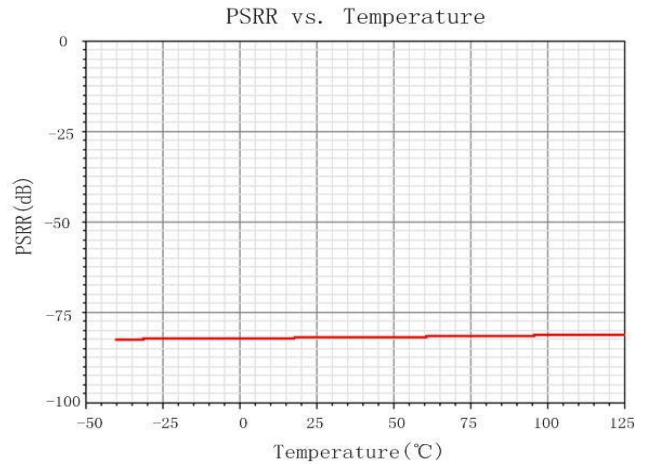
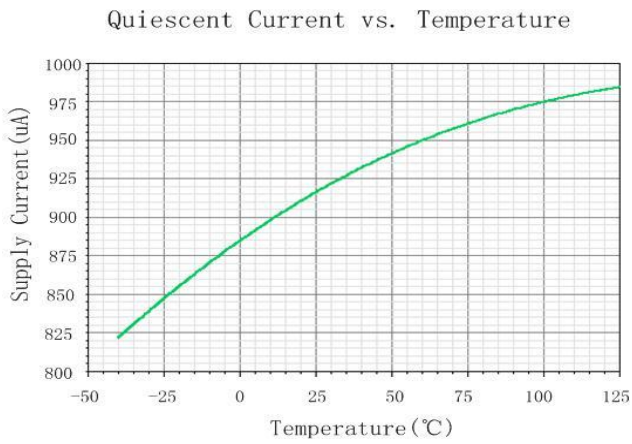
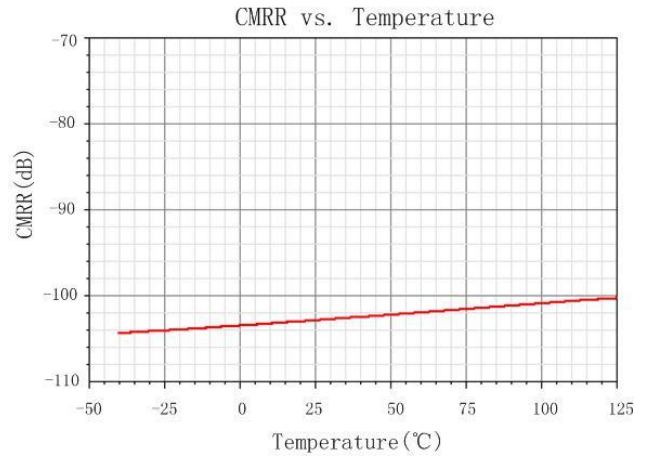
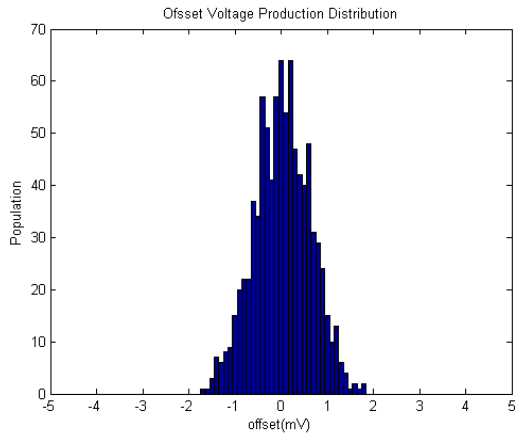
Electrical Characteristics

Specifications are at $T_A=+27^{\circ}\text{C}$, $V_{DD}=5\text{V}$, $V_{CM}=V_{OUT}=V_{DD}/2$, $R_L=10\text{Kohm}$, $C_L=100\text{pF}$

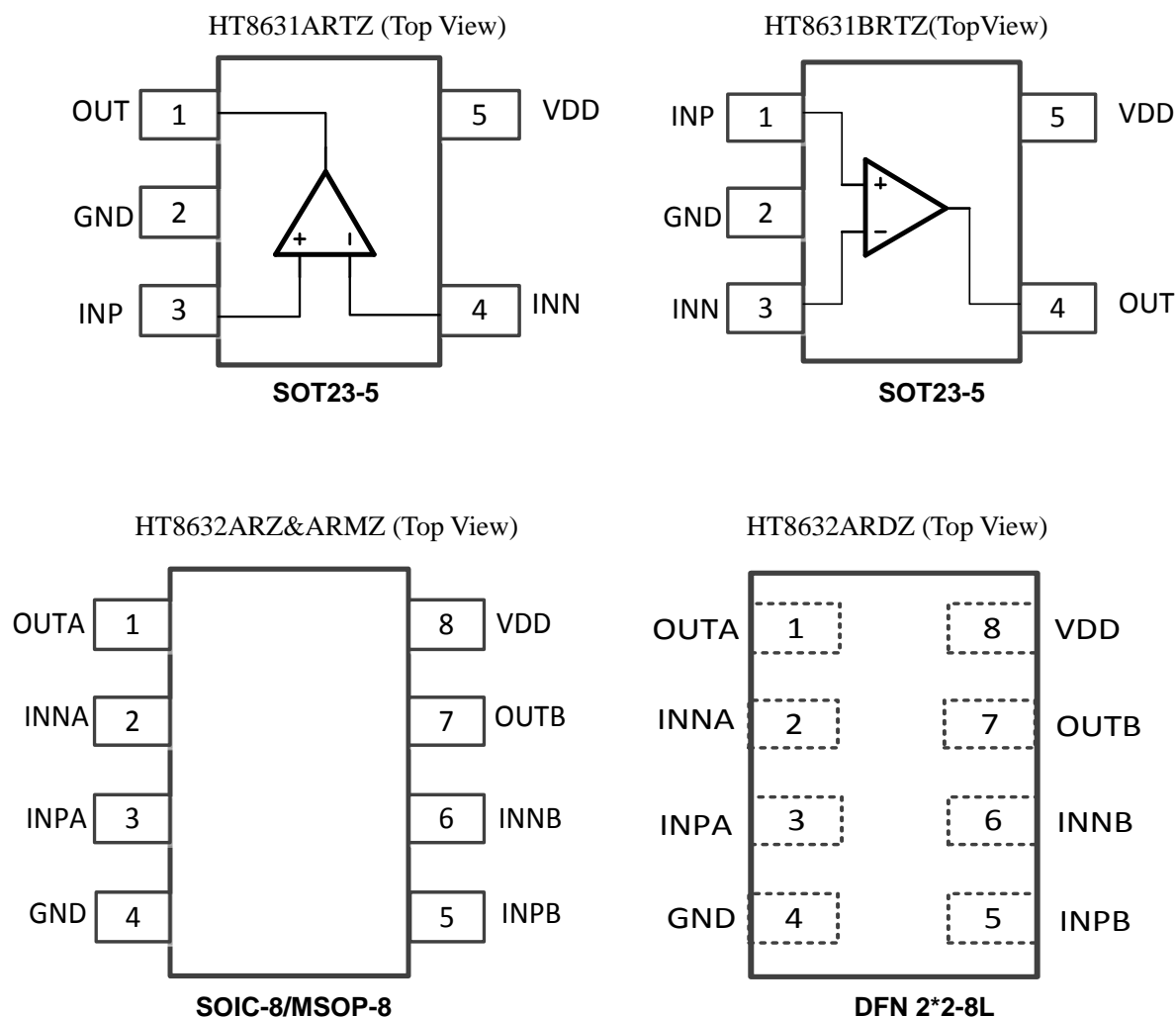
Symbol	Parameter	Spec			Units
		Min	Typ	Max	
VCC	Operating Supply Voltage	2.5	5	5.5	V
V _{OS}	Input Offset Voltage	-1	+/-0.5	+2	mV
V _{OS_TC}	Input Offset voltage Temp Drift		4		$\mu\text{V}/^{\circ}\text{C}$
e _n	Input Voltage Noise Density: f=1KHz		25		nV/ $\sqrt{\text{Hz}}$
C _{IN}	Input Capacitance	Differential	1.5		pF
		Common Mode	3.0		
R _{IN}	Input Resistance	>100			G Ω
I _Q	Quiescent Current per Amplifier		330	590	μA
I _{out}	Output Current		50		mA
V _{in_cm}	Common mode Input voltage	0		VDD-0.1	V
V _{OL}	Output Voltage from supply Swing		10		mV
CMRR	Common Mode Rejection Ratio		100		dB
I _{sc}	Output short-circuit current		80		mA
PM	Phase Margin		65		$^{\circ}$
GM	Gain Margin		-10		dB
GBWP	Gain-Bandwidth Product		6		MHz
PSRR	Power supply rejection ratio: 1Hz 1KHz		100		dB
			72		
t _s	Settling time, 1.5V to 3.5V, Unity Gain: 0.1%		0.46		μs
SR	Slew Rate		3.7		μs
THD+Noise	Total Harmonic Distortion and Noise: f=1KHz		0.0007		%

Typical performance characteristics

At $T_A=+27^\circ\text{C}$, $V_{DD}=5\text{V}$, $V_{CM}=V_{OUT}=V_{DD}/2$, $R_L=10\text{K}\Omega$, $C_L=100\text{pF}$



PIN Definition



Name	I/O	Analog/Digital	Description
INP	I	A	Non-Inverting Input of Amplifier. Voltage range of this pin can go from 0 to VDD.
GND	GROUND	GROUND	Ground pin. Connect to the most negative supply, ALL GND pads are connected on die.
INN	I	A	Inverting Input of Amplifier. This pin has same voltage range as INP.
OUT	O	A	Amplifier Output. The voltage range extends to within millivolts of each supply rail.
VDD	POWER	POWER	Power supply (5V) ,connect to positive voltage supply

Application Circuits

The HT8631/2/4 of operational amplifier can operate with power supply voltages from 2.5V to 5.5V. Each amplifier draws only 330uA quiescent current. The HT8631/2/4 can driver larger capacitive loads in unity-gain without oscillation. The unity-gain follower (buffer) is the most sensitive configuration to capacitive loading. When driving large capacitive loads with the HT8631/2 OPA, a small series resistor at the output improves the feedback loop's phase margin and stability by making the output load resistive at higher frequencies.

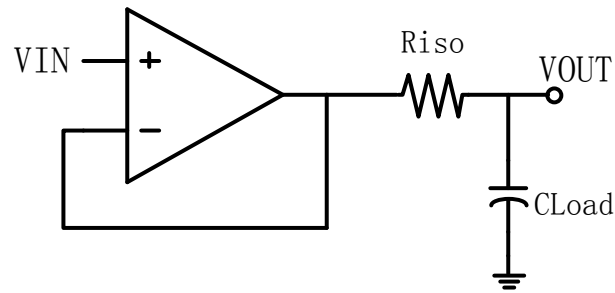


Fig.3 Applications Circuits of HT8631/2/4

SOT23-5 package

Figure 10. SOT23-5 package mechanical drawing

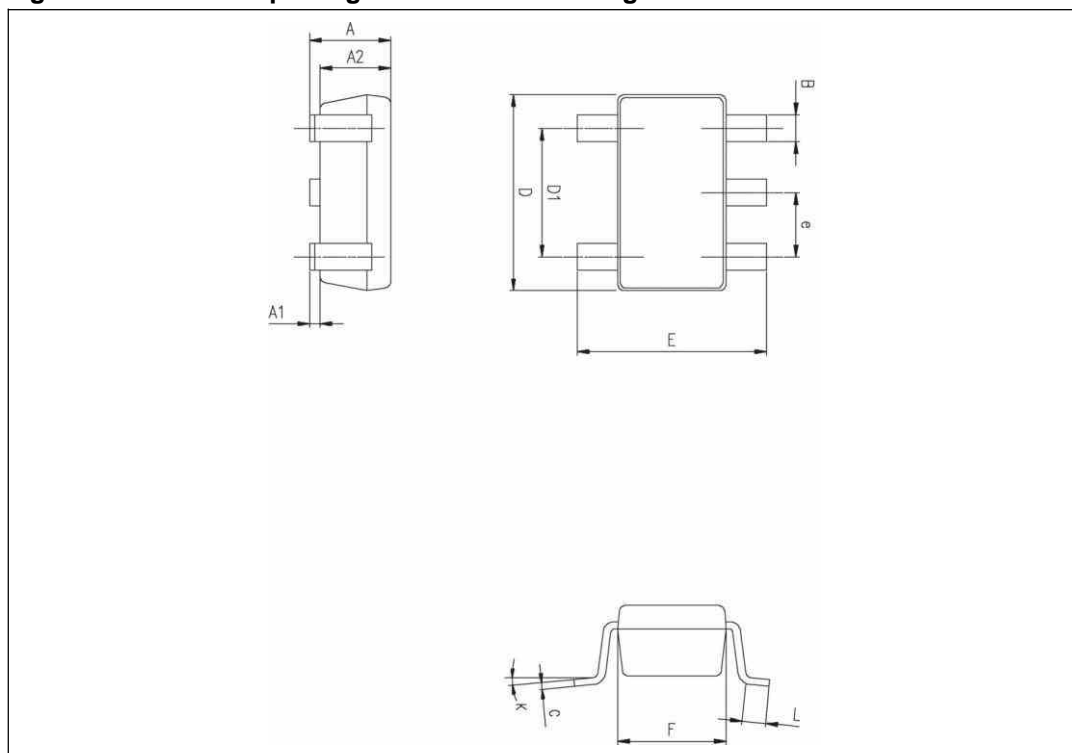


Table 5. SOT23-5 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90	1.20	1.45	0.035	0.047	0.057
A1			0.15			0.006
A2	0.90	1.05	1.30	0.035	0.041	0.051
B	0.35	0.40	0.50	0.013	0.015	0.019
C	0.09	0.15	0.20	0.003	0.006	0.008
D	2.80	2.90	3.00	0.110	0.114	0.118
D1		1.90			0.075	
e		0.95			0.037	
E	2.60	2.80	3.00	0.102	0.110	0.118
F	1.50	1.60	1.75	0.059	0.063	0.069
L	0.10	0.35	0.60	0.004	0.013	0.023
K	0 degrees		10 degrees			

SC70-5 (SOT323-5) package

Figure 11. SC70-5 (SOT323-5) package mechanical drawing

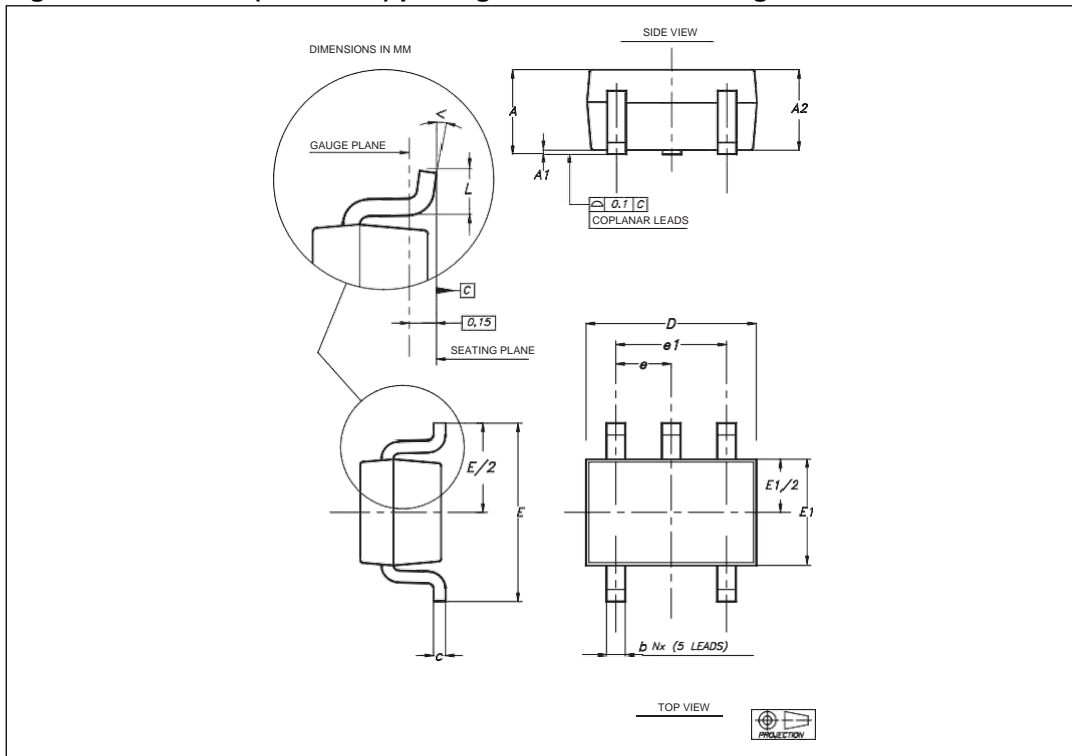
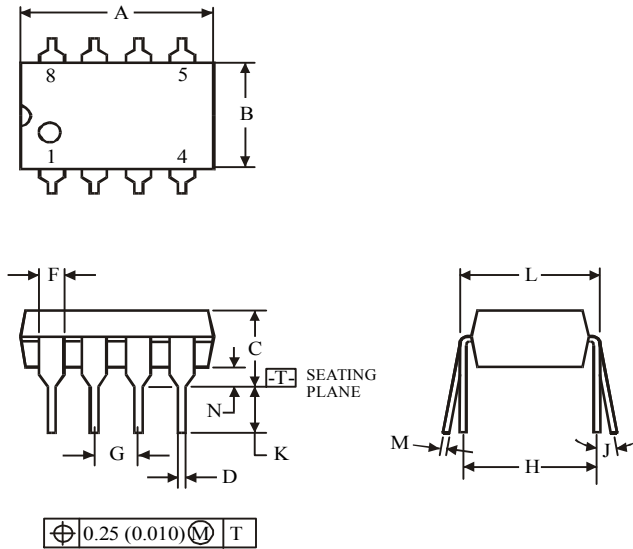
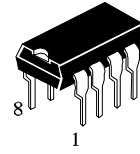


Table 6. SC70-5 (or SOT323-5) package mechanical data

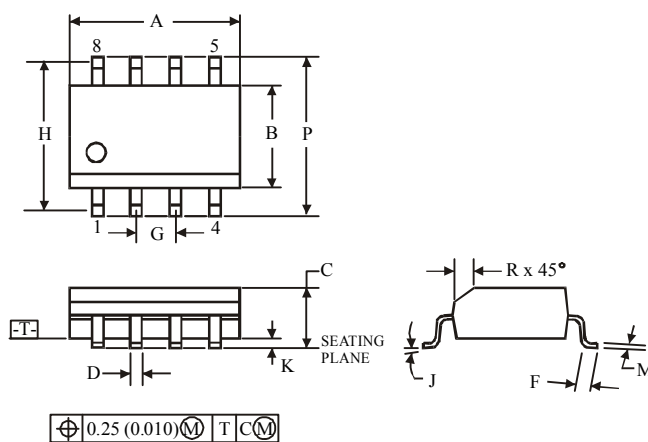
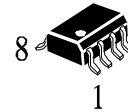
Ref	Dimensions					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.80		1.10	0.315		0.043
A1			0.10			0.004
A2	0.80	0.90	1.00	0.315	0.035	0.039
b	0.15		0.30	0.006		0.012
c	0.10		0.22	0.004		0.009
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E1	1.15	1.25	1.35	0.045	0.049	0.053
e		0.65			0.025	
e1		1.30			0.051	
L	0.26	0.36	0.46	0.010	0.014	0.018
<	0°		8°			

(DIP8)


Symbol	Dimension, mm	
	MIN	MAX
A	8.51	10.16
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

NOTES:

- Dimensions "A", "B" do not include mold flash or protrusions.
Maximum mold flash or protrusions 0.25 mm (0.010) per side.

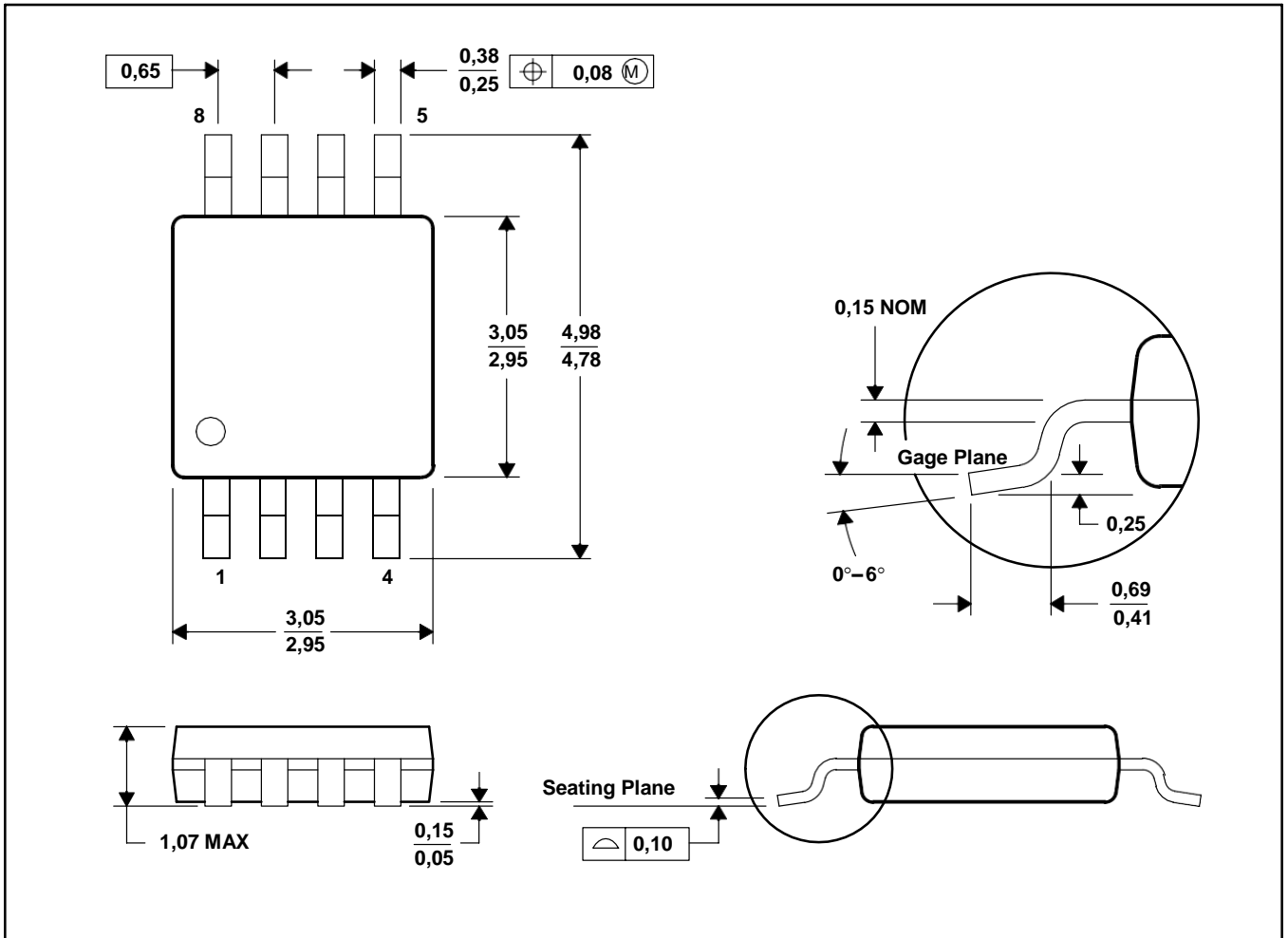
(SOP8)


Symbol	Dimension, mm	
	MIN	MAX
A	4.8	5
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

NOTES:

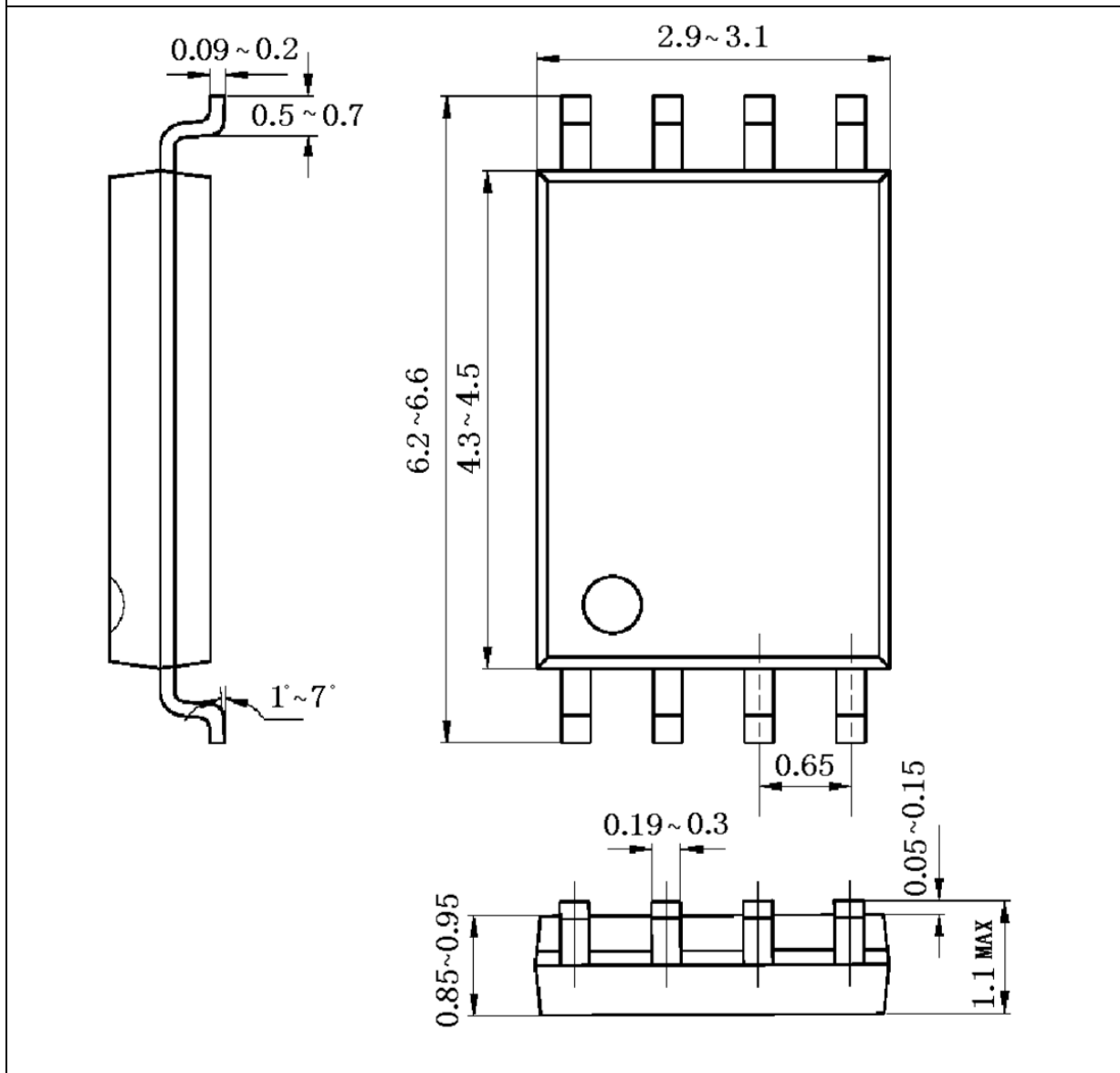
- Dimensions A and B do not include mold flash or protrusion.
- Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B - 0.25 mm (0.010) per side.

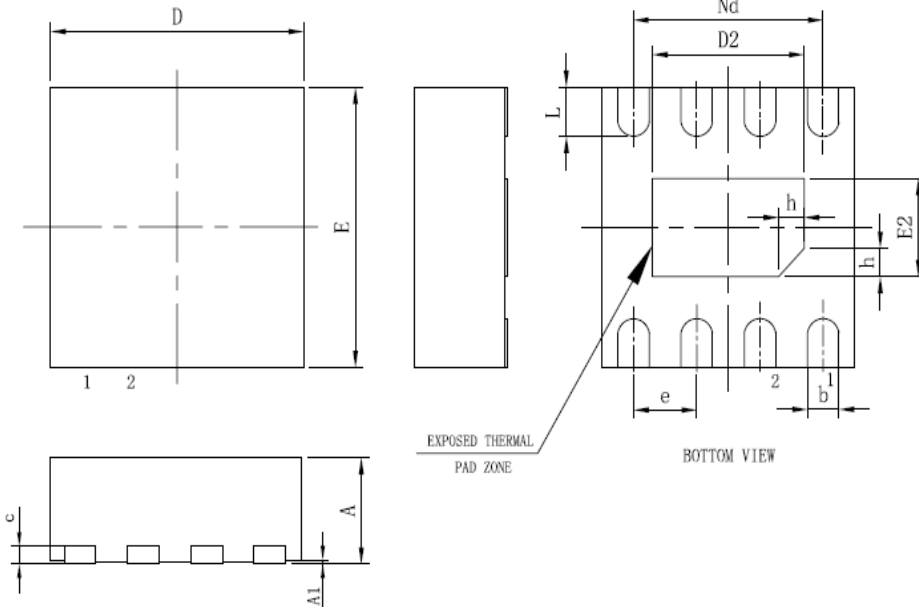
MSOP8



TSSOP8

Unit:mm



DFN-8L


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	1.90	2.00	2.10
D2	1.10	1.20	1.30
e	0.50BSC		
Nd	1.50BSC		
E	1.90	2.00	2.10
E2	0.60	0.70	0.80
L	0.30	0.35	0.40
h	0.15	0.20	0.25
载体尺寸 (mil)	63X39		