



CBC Microelectronics

(MAV861/862/864)

***Single/Dual/Quad Low Power General
Purpose R-R I/O Op amps***



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Description

The MAV861/862/864 is single/dual/quad low-cost, wide bandwidth, low noise general purpose op amp, with Rail-to-Rail input & output. 6MHz GBP (Gain-Bandwidth-Product) and 3.6V/us slew rate can cover most applications like pre signal conditions with low power supply voltage, 2.5V to 5.5V.

Rail-Rail of Input and Output feature offers the benefits for low voltage system, like 5.0V, 3.3V or 2.5V power rail.

Available Package:

MAV861: SOT-23-5, SC-70-5

MAV862: SOIC-8, MSOP-8

MAV864: SOIC-14, TSSOP-14

Features

- (VCC=5V, VEE=0V)
- Operation Voltage: 2.1V to 5.5V
- Quiescent Current/CH: 350uA(Typ.)
- Offset Voltage: 0.7mV(Typ.)/3.5mV(Max.)
- Bias current: 1.0pA(Typ.)
- Offset Current: 1.0pA(Typ.)
- CMRR: 90dB
- PSRR: 95dB
- Open Loop Gain: 100dB
- VICM: -0.1V to 5.1V
- Output Swing headroom Voltage: 10mV(Typ.)
- Source/Sink Current: ±50mA
- Gain bandwidth: 6MHz
- Slew rate: 3.6V/us
- Temperature Range: -40°C to +125°C

Applications

- Signal condition for Audio
- Smoker Sensor
- Potable Medical Device
- Battery-Powered Systems

Ordering Information

Channel	Product Number	Package	Operation Temperature	Marking ID
Single	MAV861GBTR	SC70-5	-40°C~+125°C	6GB
Single	MAV861GNTR	SOT23-5	-40°C~+125°C	6GN
Dual	MAV862GMTR	SOP-8	-40°C~+125°C	862G
Dual	MAV862GLTR	MSOP-8	-40°C~+125°C	862G
Quad	MAV864GMTR	SOP-14	-40°C~+125°C	MAV864G
Quad	MAV864GRTR	TSSOP-14	-40°C~+125°C	MAV864G

PIN Configurations

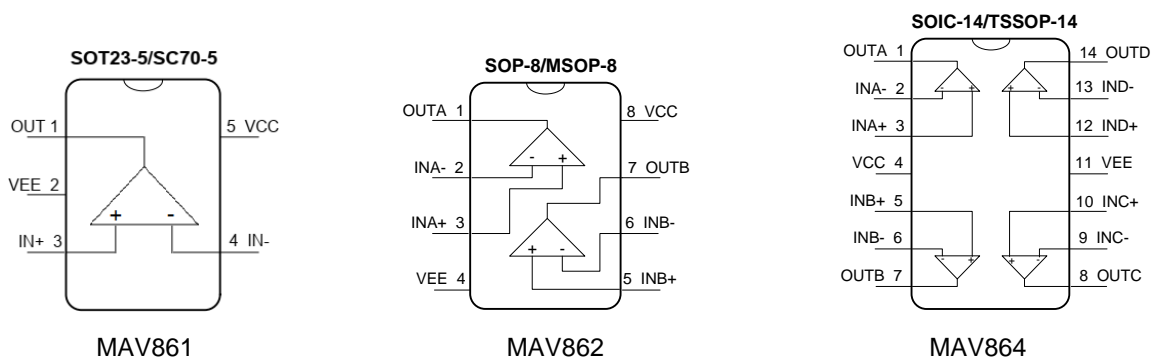


Figure 1: Package types of MAV861/862/864

**Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp****Absolute Maximum Ratings (Note1)**

Parameter	Symbol	Value	Unit	
Power Supply Voltage	V_{CC} to V_{EE}	-0.3 to 7.5	V	
Input Voltage	IN+/IN-	$V_{EE}-0.5$ to $V_{CC}+0.5$	V	
Operation junction temperature	T_J	150	°C	
Storage temperature Range	T_{STG}	-65 to 150	°C	
Lead Temperature (Soldering, 10 Seconds)	T_{LEAD}	260	°C	
Thermal Resistance	MAV861	SC70-5	265	°C/W
		SOT23-5	250	°C/W
	MAV862	SOP-8	120	°C/W
		MSOP-8	135	°C/W
	MAV864	SOIC-14	80	°C/W
		TSSOP-14	100	°C/W
ESD MM	ESD_{MM}	400	V	
ESD HBM	ESD_{HBM}	4000	V	

Note1

Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	2.5 ~ 5.5	V
Input Voltage	V_{in}	0 ~ 5	V
Ambient Operation Temperature Range	T_A	-40 ~ +125	°C



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Electrical Characteristics (Note2)

Test Condition: $V_{CC}=5V$, $V_{EE}=0V$, $V_{ICM}=2.5V$, $V_o=V_{CC}/2$, $R_L>100k\Omega$, unless otherwise specified, all limits are test at $T_A=25^\circ C$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Input Offset Voltage	V_{IO}			0.7	3.5	mV	
Input Offset Voltage Tc	$\Delta V_{IO}/\Delta T$	$T_A = -40$ to $125^\circ C$		2.7		$\mu V/^\circ C$	
Input Bias Current	I_B	$T_A = -40$ to $125^\circ C$		1.0		pA	
Input Offset Current	I_{IO}	$T_A = -40$ to $125^\circ C$		1.0		pA	
Input Common-Mode Voltage Range	V_{CM}	For $CMRR \geq 50dB$	-0.1		5.6	V	
Supply Current per Channel/AMP	I_{CC}	$V_{CC}=5V$, $T_A = -40$ to $125^\circ C$		350		μA	
		$V_{CC}=2.5V$, $T_A = -40$ to $125^\circ C$		320		μA	
Open Loop Voltage Gain	A_v	$R_L=600$	92	100		dB	
		$R_L=10K$	100	110		dB	
Common Mode Rejection Ratio	CMRR	$T_A = -40$ to $125^\circ C$ $V_{CC}=5.5V$, $-0.1V \leq V_{cm} \leq 4V$	75	90		dB	
		$T_A = -40$ to $125^\circ C$ $V_{CC}=5.5V$, $-0.1V \leq V_{cm} \leq 5.6V$	66	90		dB	
Power Supply Rejection Ratio	PSRR	$2.5V \leq V_{CC} \leq 5.5V$, $V_o=1V$, $V_{CM}=1V$	75	95		dB	
Output Current	I_{SOURCE}	$V_o=0V$		50		mA	
	I_{SINK}	$V_o=5V$		50		mA	
Output Voltage Swing	V_{OH}	$R_L=600$	4.90			V	
		$R_L=10K$	4.985				
	V_{OL}	$R_L=600$			100		mV
		$R_L=10K$			15		
Slew Rate	SR	Unity Gain, $R_L=600$, 2V Output Step		3.6		V/us	
Gain-Bandwidth Product	GBWP	$R_L=10k$		6		MHz	
Phase Margin	Φ_m	$R_L=10k$, $CL=100p$		70		Deg	
Gain Margin	G_M	$R_L=10k$, $CL=100p$		15		dB	
Settling time	t_s	Unity Gain, $R_L=600$, 2V Output Step			1	us	
Voltage Noise Density	e_n	$f=1kHz$		20		nV/\sqrt{Hz}	
Total Harmonic Distortion	THD+N	$f=10kHz$, $R_L=600$, $CL=100p$, 1V Output Step		0.015		%	

Note 2:

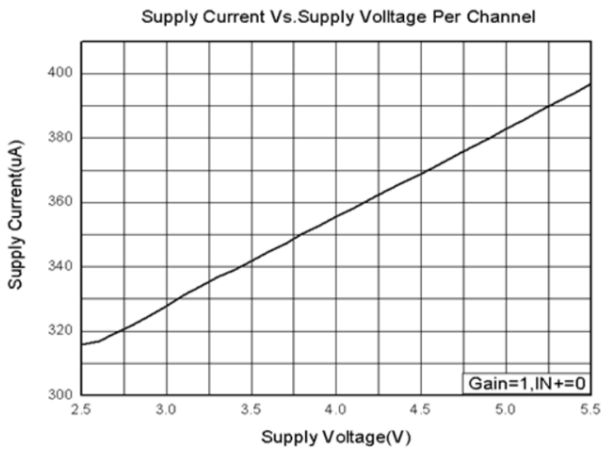
All devices are 100% production tested at $T_A = +25^\circ C$; all specifications over the automotive temperature range is guaranteed by design, not production tested. Parameter is guaranteed by design.



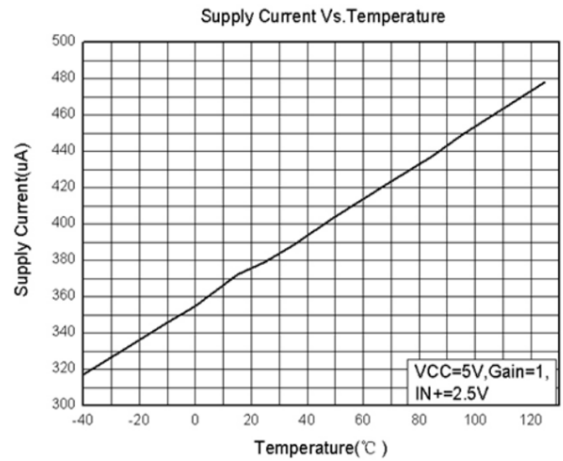
Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Characteristics

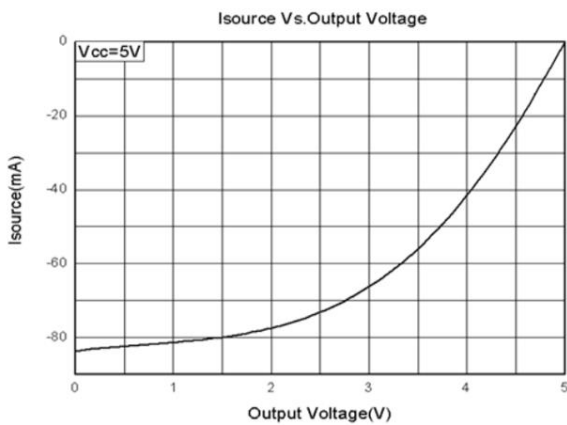
Supply Current vs. Supply Voltage Per Channel



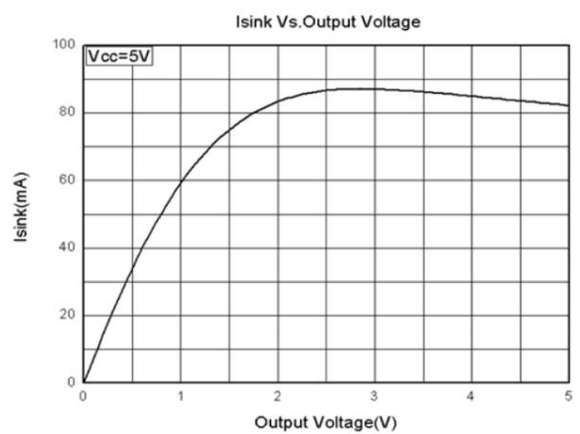
Supply Current vs. Temperature



I_{SOURCE} vs. Output Voltage



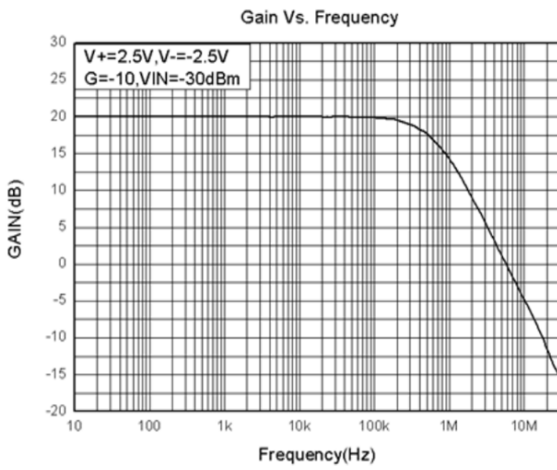
I_{SINK} vs. Output Voltage



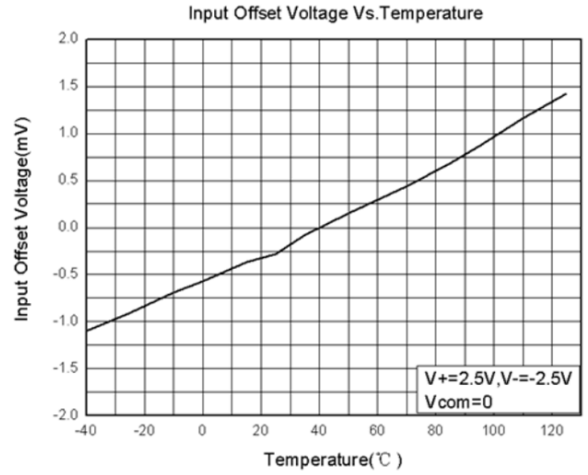


Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

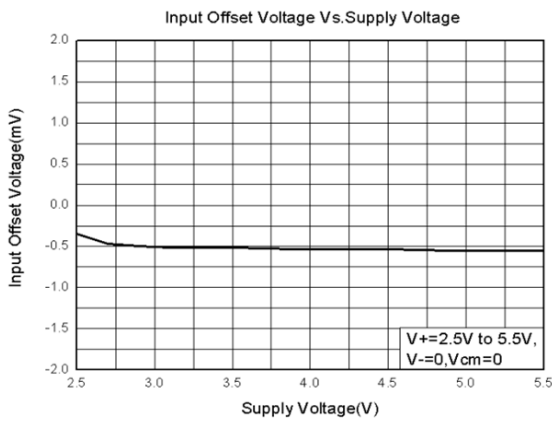
Gain vs. Frequency



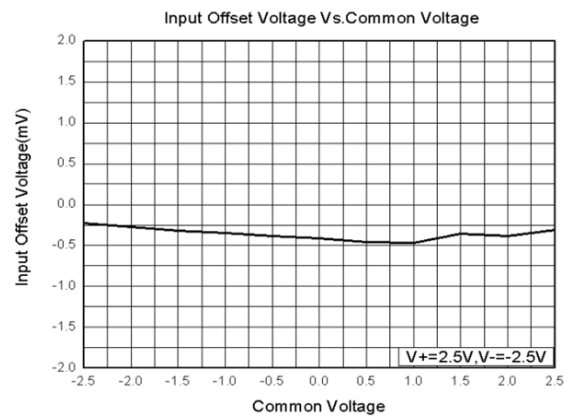
Input Offset Voltage vs. Temperature



Input Offset Voltage vs. Supply Voltage



Input Offset Voltage vs. Common Voltage





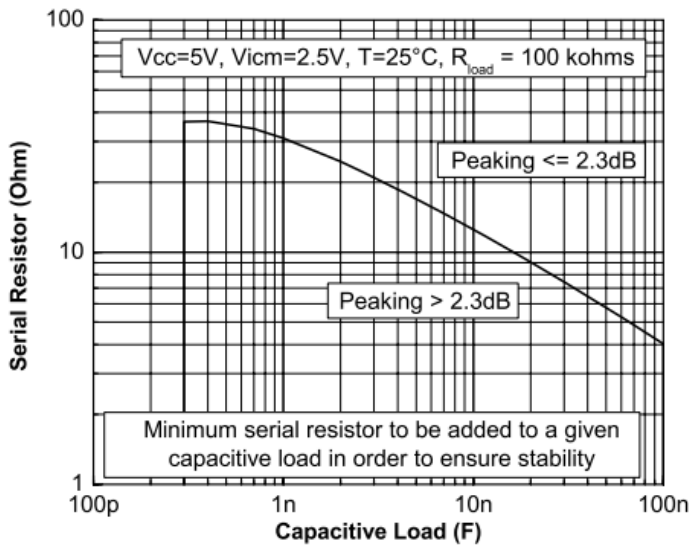
Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Applications

Driving resistive and capacitive loads

These products are low-voltage, low-power operational amplifiers optimized to drive rather large resistive loads above 2 kΩ

In a *follower* configuration, these operational amplifiers can drive capacitive loads up to 100 pF with no oscillations. When driving larger capacitive loads, adding a small in-series resistor at the output can improve the stability of the device (shows the recommended in-series resistor values). Once the in-series resistor value has been selected, the stability of the circuit should be tested on bench and simulated with the simulation model.

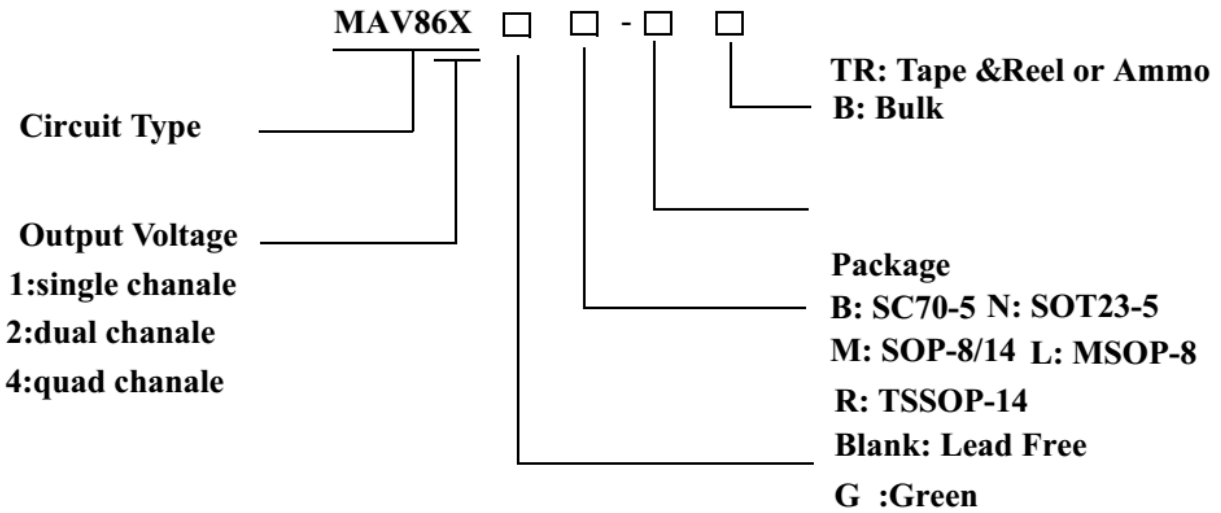


In-series resistor vs. capacitive load



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Ordering Information



Channel	Product Number	Package	Quantity/REEL	Marking ID	Operation Temperature
Single	MAV861GBTR	SC70-5	3000	6GB	-40°C~+125°C
Single	MAV861GNTR	SOT23-5	3000	6GN	-40°C~+125°C
Dual	MAV862GMTR	SOP-8	4000	862G	-40°C~+125°C
Dual	MAV862GLTR	MSOP-8	3000	862G	-40°C~+125°C
Quad	MAV864MTR	SOP-14	4000	MAV864	-40°C~+125°C
Quad	MAV864RTR	TSSOP-14	4000	MAV864	-40°C~+125°C
Quad	MAV864GMTR	SOP-14	4000	MAV864G	-40°C~+125°C
Quad	MAV864GRTR	TSSOP-14	4000	MAV864G	-40°C~+125°C

Note3

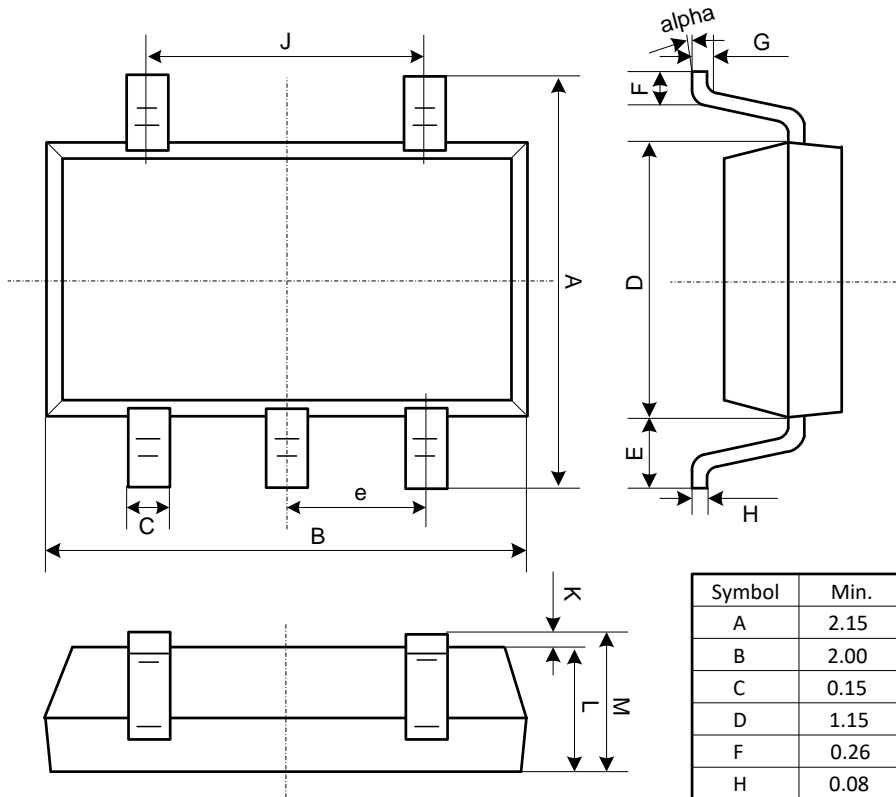
Based on ROHS Y2012 spec, Halogen free can cover Lead free, so for most package types MicroAudio does only product Halogen free products instead of lead free products.



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Package Outline Dimensions

SC70-5 Unit (mm)

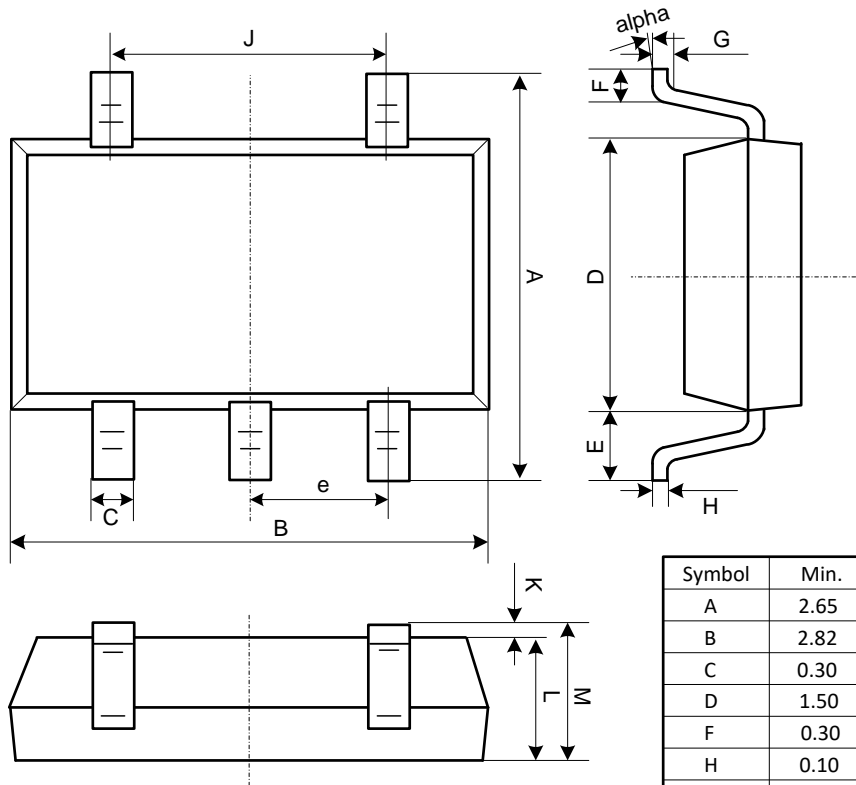


Symbol	Min.	Max.
A	2.15	2.45
B	2.00	2.20
C	0.15	0.35
D	1.15	1.35
F	0.26	0.46
H	0.08	0.15
K	0.00	0.10
L	0.90	1.00
M	0.90	1.10
J	1.20	1.40
alpha	0.0°	8.0°
e	0.65	
E	0.525	
G	0.20	



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

SOT23-5 Unit (mm)

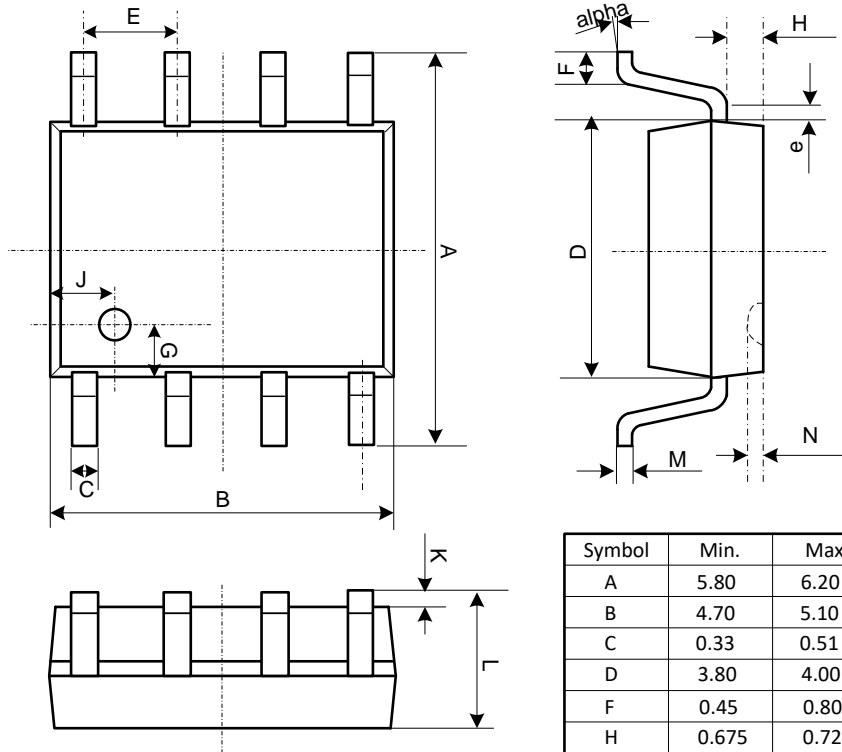


Symbol	Min.	Max.
A	2.65	2.95
B	2.82	3.02
C	0.30	0.40
D	1.50	1.70
F	0.30	0.60
H	0.10	0.20
K	0.00	0.15
L	0.90	1.30
M	1.10	1.45
J	1.80	2.00
alpha	0.0°	8.0°
e	0.95	
E	0.70	
G	0.20	



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

SOIC-8 Unit (mm)

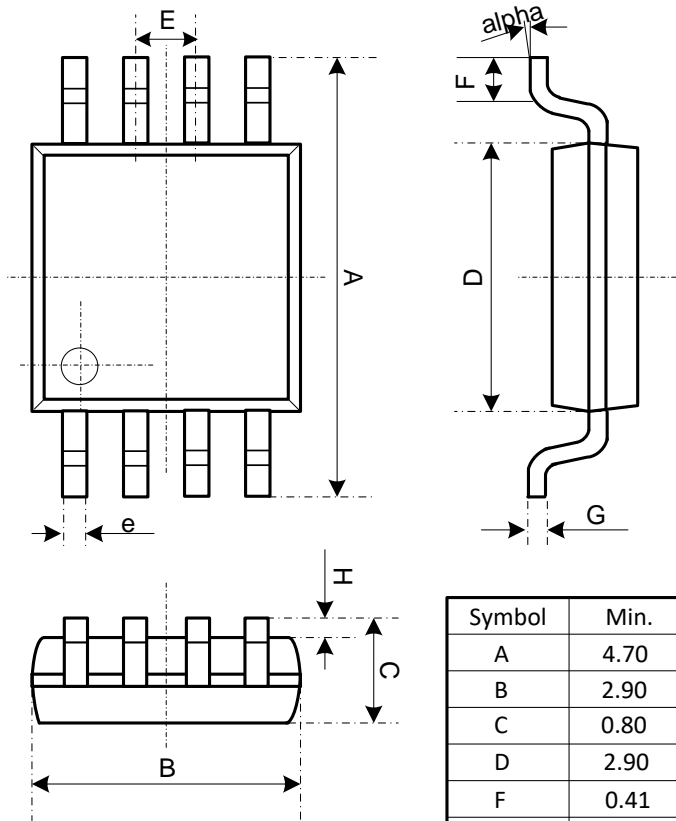


Symbol	Min.	Max.
A	5.80	6.20
B	4.70	5.10
C	0.33	0.51
D	3.80	4.00
F	0.45	0.80
H	0.675	0.725
K	0.10	0.30
L	1.35	1.75
M	0.19	0.25
alpha	1.0°	5.0°
J	1.00	
e	0.32	
E	1.27	
G	0.90	
N	0.20	



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

MSOP-8 Unit (mm)

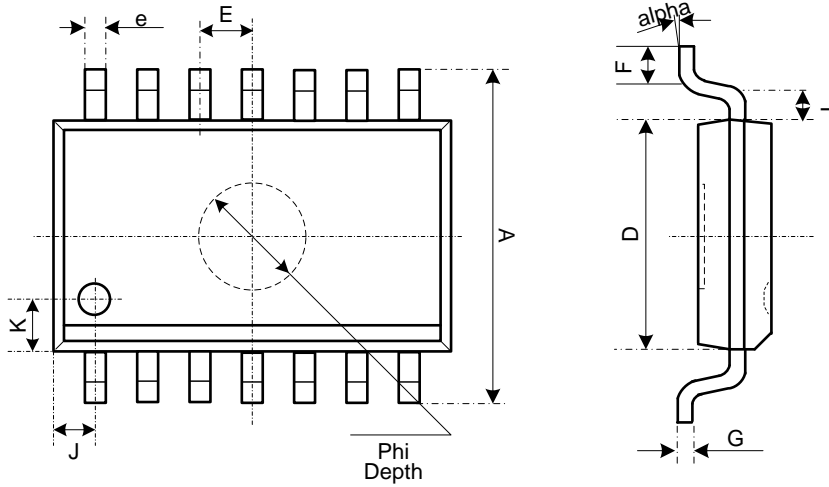


Symbol	Min.	Max.
A	4.70	5.10
B	2.90	3.10
C	0.80	1.20
D	2.90	3.10
F	0.41	0.65
H	0.00	0.20
alpha	0.0°	6.0°
e	0.30	
E	0.65	
G	0.15	



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

SOIC-14 Unit (mm)

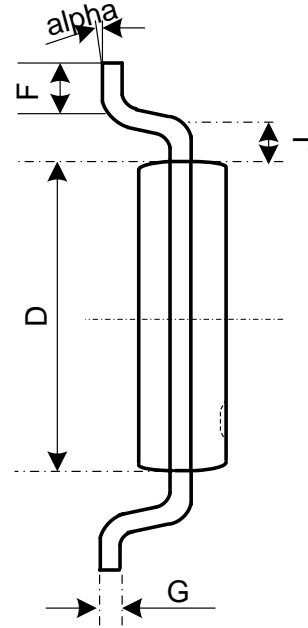
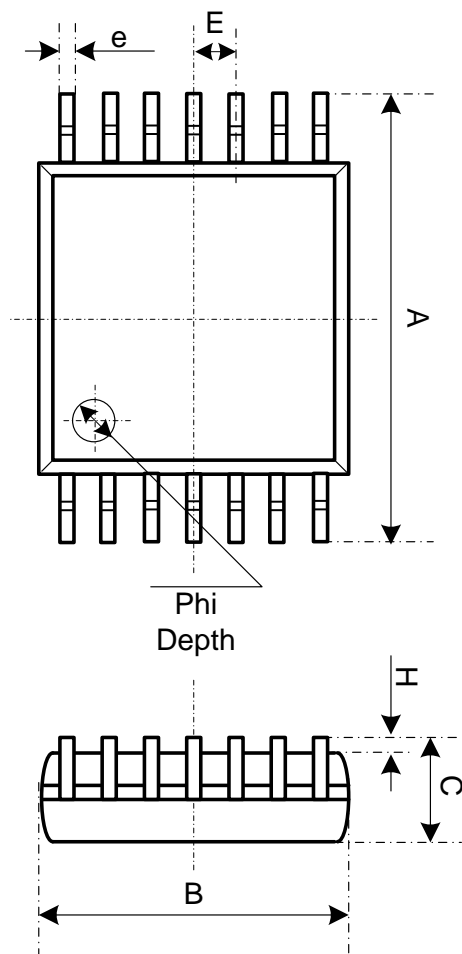


Symbol	Min.	Max.
A	5.80	6.20
B	8.55	8.75
C	1.35	1.75
D	3.80	4.00
F	0.50	0.60
H	0.10	0.25
alpha	4.0°	12.0°
e	0.33	0.51
G	0.19	0.25
L	0.20	0.25
Depth	0.06	0.10
E	1.27	
Phi	2.00	
J	1.00	
K	1.30	



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

TSSOP-14 Unit (mm)



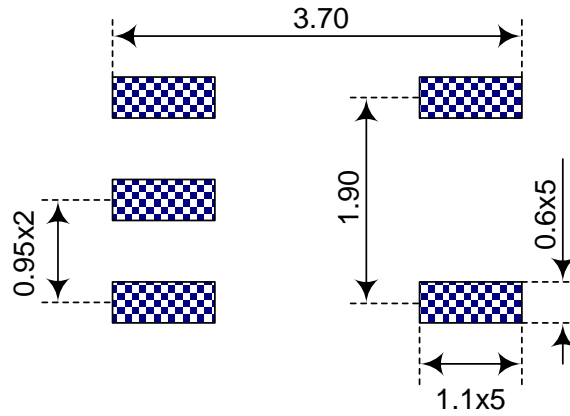
Symbol	Min.	Max.
A	6.20	6.60
B	4.86	5.06
C	0.95	1.20
D	4.30	4.50
F	0.45	0.75
H	0.05	0.15
alpha	0.0°	8.0°
e	0.20	0.28
G	0.10	0.19
Phi	0.95	1.05
Depth	0.00	0.10
E	0.65	
J	0.20	



Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Recommended PAD Layout Pattern

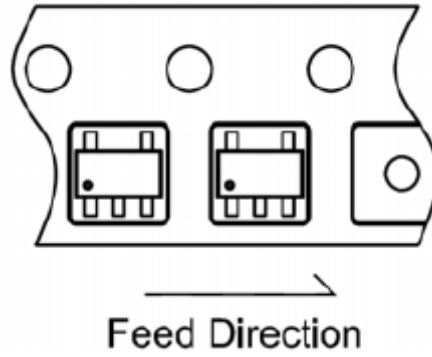
SOT-23-5 Unit (mm)





Single/Dual/Quad Low Power General Purpose Rail-Rail Input/Output Op-amp

Taping Specification



Package Type	Reel size	Quantity/Reel
SOT-23-5	13"	3,000

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