

The Infinite Bandwidth Company™

General Description

The MIC918 is a high-speed operational amplifier with a gain-bandwidth product of 51MHz. The part is unity gain stable. Ithas a very low 550A supply current, and features the IttyBitty TM SOT-23-5 package and SC-70 package. Supply voltage range is from $\pm 2.5V$ to $\pm 9V$, allowing the MIC918 to be used in low-voltage circuits or applications requiring large dynamic range.

The MIC918 is stable driving any capacitative load and achieves excellent PSRR and CMRR, making it much easier to use than most conventional high-speed devices. Low supply voltage, low power consumption, and small packing make the MIC918 ideal for portable equipment. The ability to drive capacitative loads also makes it possible to drive long coaxial cables.

IN- V- IN+

2 1

A30

SOT-23-5 or SC-70

OUT

Part

Identification

MIC918

51MHz Low-Power SOT-23-5/SC-70 Op Amp

Final Information

Features

- 51MHz gain bandwidth product
- 550µA supply current
- SOT-23-5 or SC-70 packages
- 1500V/µs slew rate
- drives any capacitive load
- Unity gain stable

Applications

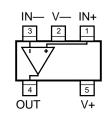
- Video
- Imaging
- Ultrasound
- Portable equipment
- Line drivers

Ordering Information

Part Number	Junction Temp. Range	Package
MIC918BM5	–40°C to +85°C	SOT-23-5*
MIC918BC5	–40°C to +85°C	SC-70

* Contact factory about SOT-23-5 package.

Functional Pinout



SOT-23-5 or SC-70

Pin Number	Pin Name	Pin Function
1	IN+	Noninverting Input
2	V–	Negative Supply (Input)
3	IN–	Inverting Input
4	OUT	Output: Amplifier Output
5	V+	Positive Supply (Input)

Pin Description

Pin Configuration

Supply Voltage $(V_{V+} - V_{V-})$	
Differentail Input Voltage $(V_{IN+} - V_{IN-})$	
Input Common-Mode Range (V _{IN+} , V _{IN-}) V _{V+} to V _{V-}	
Lead Temperature (soldering, 5 sec.) 260°C	
Storage Temperature (T _S) 150°C	
ESD Rating, Note 4 1.5kV	

Operating Ratings (Note 2)

Supply Voltage (V _S)	±2.5V to ±9V
Junction Temperature (T _J)	40°C to +85°C
Package Thermal Resistance	
SOT-23-5	
SC-70-5	450°C/W

Electrical Characteristics (±5V)

 $V+=+5V, V-=-5V, V_{CM}=0V, R_{L}=10M\Omega; T_{J}=25^{\circ}C, \text{ bold } \text{values indicate } -40^{\circ}C \leq T_{J} \leq +85^{\circ}C; \text{ unless noted.}$

Symbol	Parameter	Condition	Min	Тур	Max	Units
V _{OS}	Input Offset Voltage			0.43	5	mV
V _{os}	V _{OS} Temperature Coefficient			1		μV/°C
I _B	Input Bias Current			0.26	0.6	μA
I _{os}	Input Offset Current			0.04	0.3	μA
V _{CM}	Input Common-Mode Range	CMRR > 72dB	-3.25		+3.25	V
CMRR	Common-Mode Rejection Ratio	-2.5V < V _{CM} < +2.5V	75	85		dB
PSRR	Power Supply Rejection Ratio	±3.5V < V _S < ±9V	95	104		dB
A _{VOL}	Large-Signal Voltage Gain	$R_L = 2k, V_{OUT} = \pm 2V$	65	82		dB
		$R_L = 100\Omega, V_{OUT} = \pm 1V$		85		dB
V _{OUT}	Maximum Output Voltage Swing	positive, $R_L = 2k\Omega$	+3.0	3.6		V
		negative, $R_L = 2k\Omega$		-3.6	-3.0	V
		positive, $R_L = 200\Omega$	+1.5	3.0		V
		negative, $R_L = 200\Omega$, Note 5		-2.5	-1.0	V
GBW	Unity Gain-Bandwidth Product			45		MHz
PM	Phase Margin			54		0
BW	-3dB Bandwidth			95		MHz
SR	Slew Rate	C=1.7pF, Gain=1, V_{OUT} =5V, peak to peak, positive SR = 450V/ μ s		850		V/µs
I _{SC}	Short-Circuit Output Current	source	45	63		mA
		sink	20	45		mA
I _S	Supply Current	No Load		0.55	0.80	mA
	Input Voltage Noise	f = 10kHz		10		nV/√Hz
	Input Current Noise	f = 10kHz		0.8		pA/√Hz

Electrical Characteristics

 $V\text{+}=\text{+}9V, \ V\text{-}=-9V, \ V_{CM}=0V, \ R_{L}=10M\Omega; \ T_{J}=25^{\circ}C, \ \text{bold} \ \text{values indicate} \ -40^{\circ}C \leq T_{J} \leq \text{+}85^{\circ}C; \ \text{unless noted}$

Symbol	Parameter	Condition	Min	Тур	Max	Units
V _{OS}	Input Offset Voltage			0.3	5	mV
V _{OS}	Input Offset Voltage Temperature Coefficient			1		μV/°C
I _B	Input Bias Current			0.23	0.60	μA
I _{os}	Input Offset Current			0.04	0.3	μA
V _{CM}	Input Common-Mode Range	CMRR > 75dB	-7.25		+7.25	V
CMRR	Common-Mode Rejection Ratio	-6.5V < V _{CM} < +6.5V	60	91		dB
PSRR	Power Supply Rejection Ratio	±3.5V < V _S < ±9V	95	104		dB

Symbol	Parameter	Condition	Min	Тур	Max	Units
A _{VOL}	Large-Signal Voltage Gain	$R_L = 2k, V_{OUT} = \pm 2V$	75	84		dB
		$R_L = 100\Omega, V_{OUT} = \pm 1V$		93		dB
V _{OUT}	Maximum Output Voltage Swing	positive, $R_L = 2k\Omega$	6.5	7.5		V
		negative, $R_L = 2k\Omega$		-7.5	-6.2	V
GBW	Unity Gain-Bandwidth Product	$R_{L} = 1k\Omega$		51		MHz
PM	Phase Margin			55		0
BW	–3dB Bandwidth	$A_V = 2, R_L = 470\Omega$		109		MHz
SR	Slew Rate	C=1.7pF, Gain=1, V_{OUT} =5V, peak to peak, positive SR = 450V/ μ s		1500		V/µs
I _{SC}	Short-Circuit Output Current	source	50	65		mA
		sink	30	50		mA
I _S	Supply Current	No Load		0.55	0.8	mA
	Input Voltage Noise	f = 10kHz		10		nV/√Hz
	Input Current Noise	f = 10kHz		0.8		pA/√Hz

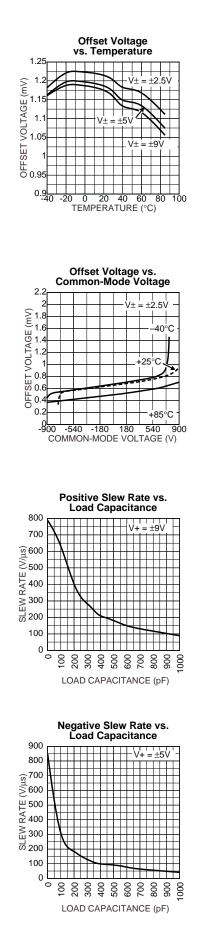
Note 1. Exceeding the absolute maximum rating may damage the device.

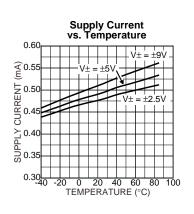
Note 2. The device is not guaranteed to function outside its operating rating.

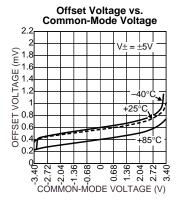
Note 3. Exceeding the maximum differential input voltage will damage the input stage and degrade performance (in particular, input bias current is likely to change).

Note 4. Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF.

Note 5. Output swing limited by the maximum output sink capability, refer to the short-circuit current vs. temperature graph in "Typical Characteristics."







Negative Slew Rate vs. Load Capacitance

200 300 500 600 700 800

LOAD CAPACITANCE (pF)

Positive Slew Rate

vs. Supply Voltage

·V+ = ±9V

006

000

1600

1400

1200 1000 STEM KATE (Λ/μs) 100 80(40

200

800

(sn/700

/ RATE // RATE // 800

400

300

200

100

0

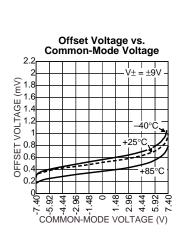
0 1

POSITIVE SLEW

0

0

8



Supply Current vs. Supply Voltage

3.8 5.1 6.4 7.7 SUPPLY VOLTAGE (V)

+85⁶C

+25°C

-40[°]C

0.62

0.60

<u>م</u>

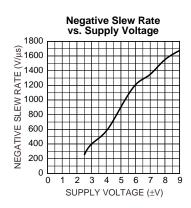
0.56 0.54 0.52 0.50 0.56

× 0.48 1 0.46 0.44

0 42

0.40L

Positive Slew Rate vs. Load Capacitance 500 V+ = 450 400 400 350 300 250 400 300 250 200 150 100 100 50 0 0 100 200 300 400 500 600 700 800 900 000 LOAD CAPACITANCE (pF)

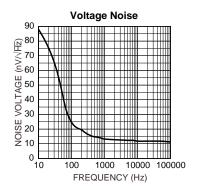


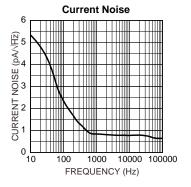
MIC918

2 3 4 5 6

SUPPLY VOLTAGE (±V)

7 8 9





Applications Information

The MIC918 is a high-speed, voltage-feedback operational amplifier featuring very low supply current and excellent stability. This device is unity gain stable, capable of driving high capacitance loads.

Driving High Capacitance

The MIC918 is stable when driving high capacitance, making it ideal for driving long coaxial cables or other high-capacitance loads.

Phase margin remains constant as load capacitance is increased. Most high-speed op amps are only able to drive limited capacitance.

Note: increasing load capacitance does reduce the speed of the device. In applications where the load capacitance reduces the speed of the op amp to an unacceptable level, the effect of the load capacitance can be reduced by adding a small resistor (<100 Ω) in series with the output.

Feedback Resistor Selection

Conventional op amp gain configurations and resistor selection apply, the MIC918 is NOT a current feedback device.

Also, for minimum peaking, the feedback resistor should have low parasitic capacitance, usually 470Ω is ideal. To use the part as a follower, the output should be connected to input via a short wire.

Layout Considerations

All high speed devices require careful PCB layout. The following guidelines should be observed: Capacitance, particularly on the two inputs pins will degrade performance; avoid large copper traces to the inputs. Keep the output signal away from the inputs and use a ground plane. It is important to ensure adequate supply bypassing capacitors are located close to the device.

Power Supply Bypassing

Regular supply bypassing techniques are recommended. A 10μ F capacitor in parallel with a 0.1μ F capacitor on both the positive and negative supplies are ideal. For best performance all bypassing capacitors should be located as close to the op amp as possible and all capacitors should be low ESL (equivalent series inductance), ESR (equivalent series resistance). Surface-mount ceramic capacitors are ideal.

Thermal Considerations

The SOT-23-5 package and the SC-70 package, like all small packages, has a high thermal resistance. It is important to ensure the IC does not exceed the maximum operating junction (die) temperature of 85°C. The part can be operated up to the absolute maximum temperature rating of 125°C, but between 85°C and 125°C performance will degrade, in particular CMRR will reduce.

An MIC918 with no load, dissipates power equal to the quiescent supply current \times supply voltage

$$P_{D(no \, load)} = \left(V_{V+} - V_{V-}\right)I_{S}$$

When a load is added, the additional power is dissipated in the output stage of the op amp. The power dissipated in the device is a function of supply voltage, output voltage and output current.

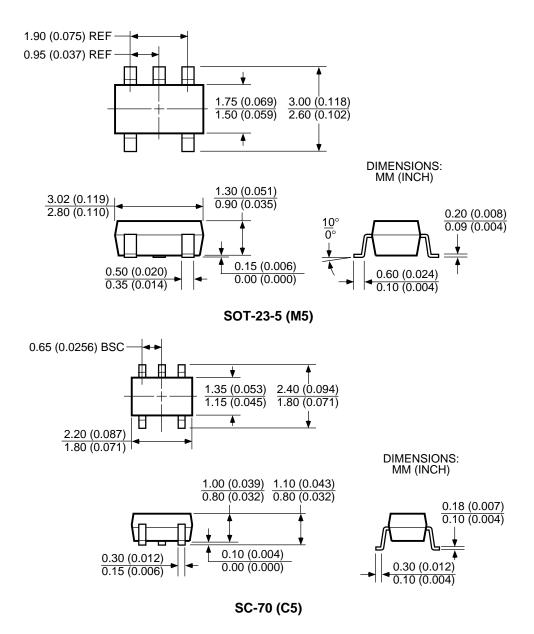
$$P_{D(output \, stage)} = (V_{V+} - V_{OUT})I_{OUT}$$

Total Power Dissipation = $P_{D(no \ load)} + P_{D(output \ stage)}$

Ensure the total power dissipated in the device is no greater than the thermal capacity of the package. The SOT23-5 package has a thermal resistance of 260C/W.

Max. Allowable Power Dissipation = $\frac{T_{J(max)} - T_{A(max)}}{260W}$

Package Information



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