MB321

SINGLE LOW VOLTAGE OPERATIONAL AMPLIFIER

CBC Microelectronics
http://www.cbcv .net

General Description

The MB321 is a high gain and internally frequency compensated operational amplifier specifically designed to operate from a single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltages. Typical applications include battery charger, active filters, general purpose controllers and most conventional operational amplifier circuits.

SC70-5 SOT-23-5

Figure 1: Package Types of MB321

Features

- Excellent Phase Margin: 60 deg.
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mV (Typical)
- Low Supply Current: 0.35mA at V_{CC}=5V
- Wide Power Supply Voltage:
  Single Supply: 3V to 36V
  Dual Supplies: ±1.5V to ±18V
- Wide Input Common Mode Voltage Range: 0V to V_{CC}-1.5V

Pin Configuration

B/N Package

(SC70-5/SOT-23-5)

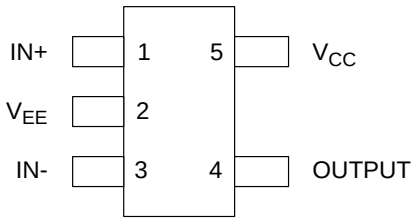
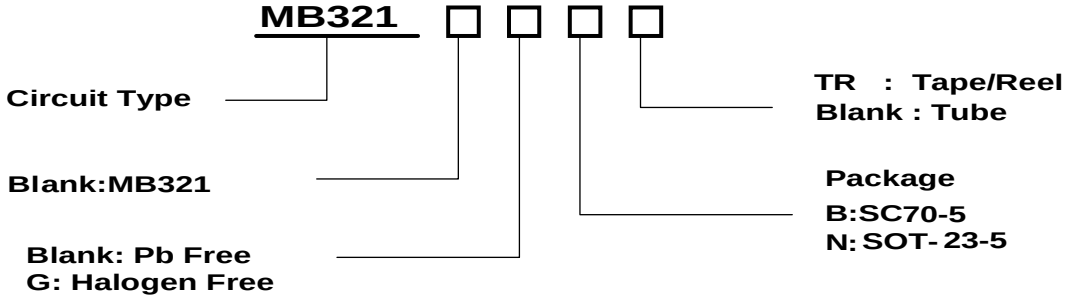


Figure 2: Pin Configuration of MB321 (Top View)

Applications

- Battery Charger
- Active Filters
- General Purpose Controllers, Instruments

Ordering Information



Package	Condition	Part Number		Marking ID		Packing Type
		Pb-free	Halogen-Free	Pb-free	Halogen-Free	
SC70-5	3.0mV	MB321B	MB321GB	B21	GB1	Tube
	3.0mV	MB321BTR	MB321GBTR	B21	GB1	Tape&Reel
SOT-23-5	3.0mV	MB321N	MB321GN	B321	GB21	Tube
	3.0mV	MB321NTR	MB321GNTR	B321	GB21	Tube

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Power Supply Voltage	V_S (V_{CC}-V_{EE})	40	V
Differential Input Voltage	V_{ID}	40	V
Input Voltage	V_{IN}	-0.3 to 40	V
Thermal Resistance to Ambient	$R_{\theta JA}$	260	$^oC/W$
Operating Junction Temperature	T_J	150	^oC
Storage Temperature Range	T_{STG}	-65 to 150	^oC
Lead Temperature (Soldering, 10 Seconds)	T_{LEAD}	260	^oC

Note 1: 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	Min	Max	Unit
Supply Voltage	V_{CC}	3	36	V
Ambient Operating Temperature Range	T_A	-40	85	^oC

Electrical Characteristics

Limits in standard typeface are for T_A=25^{o}C, **bold** typeface applies over -40^{o}C to 85^{o}C (Note 2), V_{CC}=5V, V_{EE}=0V, V_O=1.4V unless otherwise specified.

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Input Offset Voltage		V_{IO}	V_O=1.4V, R_S=0Ω, V_{CC}=5V to 30V (Note 3)		2	5	mV
						7	
Average Temperature Coefficient of Input Offset Voltage		$\Delta V_{IO}/\Delta T$	T_A=-40 to 85^{o}C		**7**		μV/^{o}C
Input Bias Current		I_{BIAS}	I_{IN}+ or I_{IN}-, V_{CM}=0V		20	100	nA
						200	
Input Offset Current		I_{IO}	I_{IN}+ - I_{IN}-, V_{CM}=0V		5	30	nA
						100	
Input Common Mode Voltage Range (Note 4)		V_{CM}	V_{CC}=30V, CMRR≥50dB	0		V_{CC}-1.5	V
Supply Current		I_{CC}	R_L=∞, V_{CC}=5V		0.35	0.80	mA
					0.45	**1.0**	
			R_L=∞, V_{CC}=30V		0.45	1.2	mA
					0.65	**1.5**	
Large Signal Voltage Gain		G_V	V_{CC}=15V, V_O=1V to 11V, R_L≥2kΩ	85	100		dB
				80			
Common Mode Rejection Ratio		CMRR	V_{CM}=0V to (V_{CC}-1.5)V, R_S≤10kΩ	60	70		dB
				60			
Power Supply Rejection Ratio		PSRR	V_{CC}=5V to 30V, R_S≤10kΩ	70	100		dB
				60			
Output Current	Source	I_{SOURCE}	V_{IN}+=1V, V_{IN}-=0V, V_{CC}=15V, V_O=2V	20	40		mA
				20			
	Sink	I_{SINK}	V_{IN}+=0V, V_{IN}-=1V, $V_{CC=}$15V, V_O=2V	10	15		mA
				5			
			V_{IN}+=0V, V_{IN}-=1V, V_{CC}=15V, V_O=0.2V	12	50		μA
Output Short Circuit Current to Ground		I_{SC}	V_{CC}=15V		40	60	mA
Output Voltage Swing		V_{OH}	V_{CC}=30V, R_L=2kΩ	26			V
				26			
			V_{CC}=30V, R_L=10kΩ	27	28		
				27			
		V_{OL}	V_{CC}=5V, R_L= 10kΩ		5	20	mV
						30	

Electrical Characteristics (Continued)

Limits in standard typeface are for T_A=25°C, **bold** typeface applies over -40°C to 85°C (Note 2), V_{CC}=5V, V_{EE}=0V, V_O=1.4V unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Total Harmonic Distortion	THD	f=1kHZ, AV=20dB, R_L=2kΩ, V_O=2Vp-p, C_L=100pF, V_{CC}=30V		0.015		%
Phase Margin	ϕ_M			60		Deg

Note 2: Limits over the full temperature are guaranteed by design, but not tested in production.

Note 3: Over the full input common-mode range 0V to V_{CC}-1.5V(at 25°C).

Note 4: The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at 25°C). The upper end of the common-mode voltage range is V_{CC}-1.5V (at 25°C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V_{CC}.

Typical Performance Characteristics

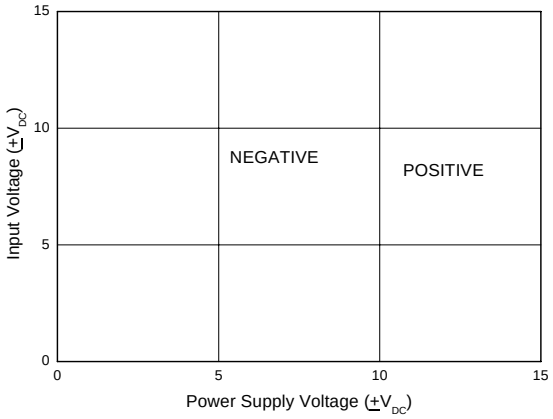


Figure 3. Input Voltage Range

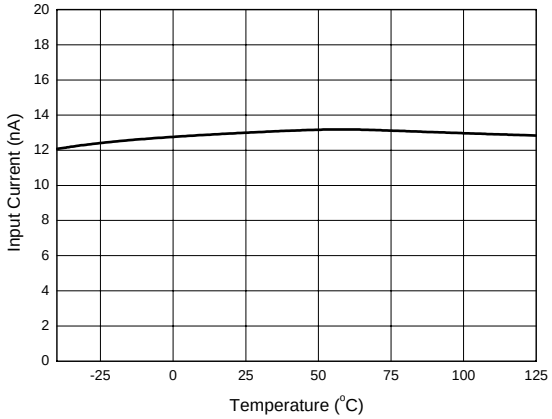


Figure 4. Input Current

Typical Application

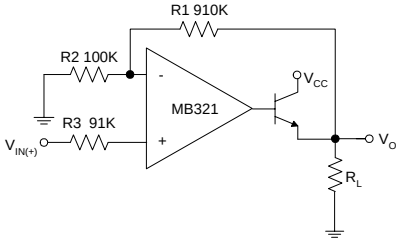


Figure 5. Power Amplifier

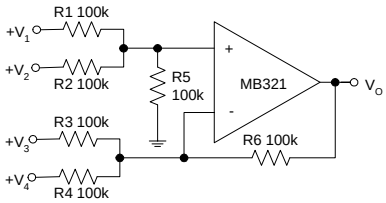


Figure 6. DC Summing Amplifier

Functional Block Diagram

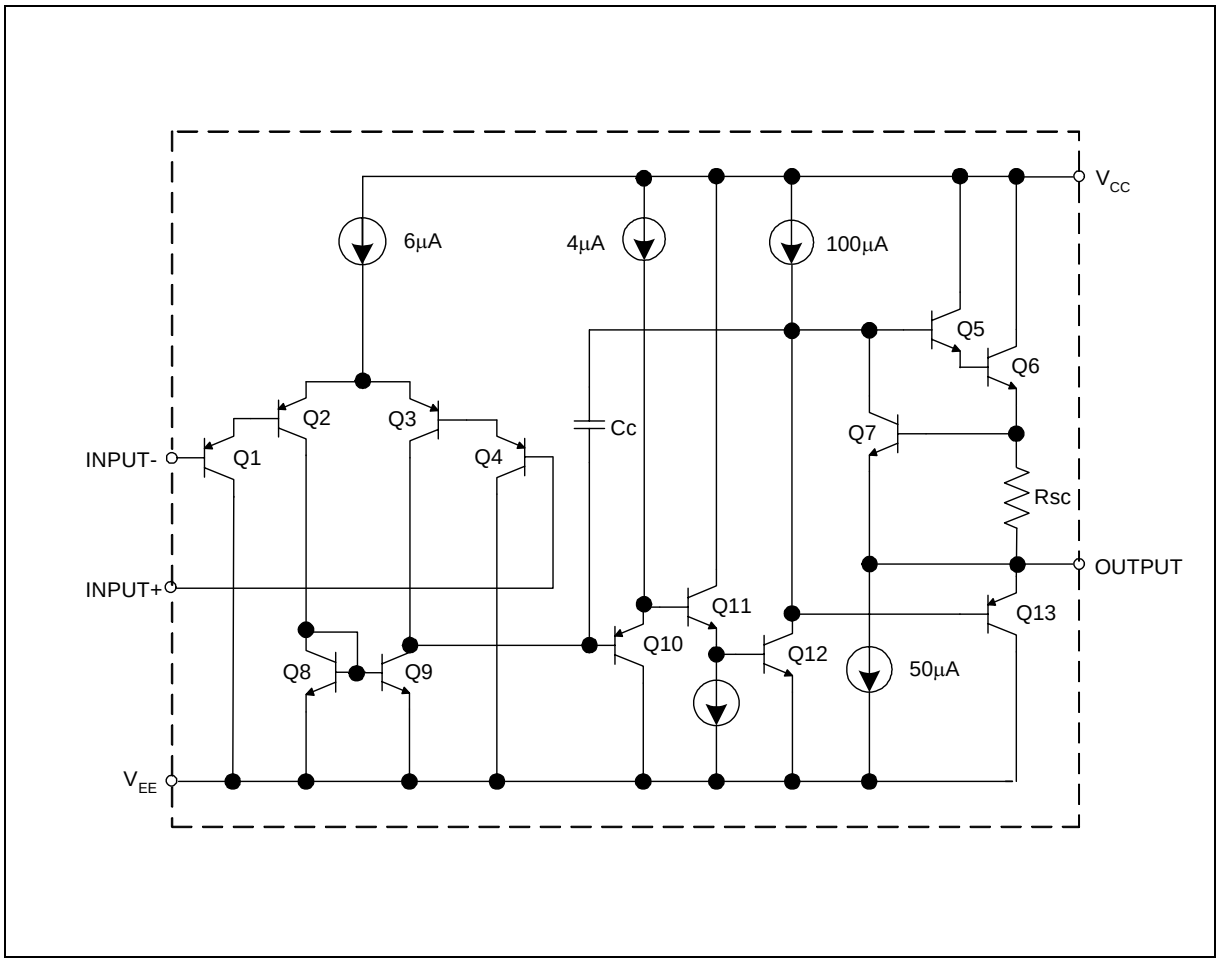
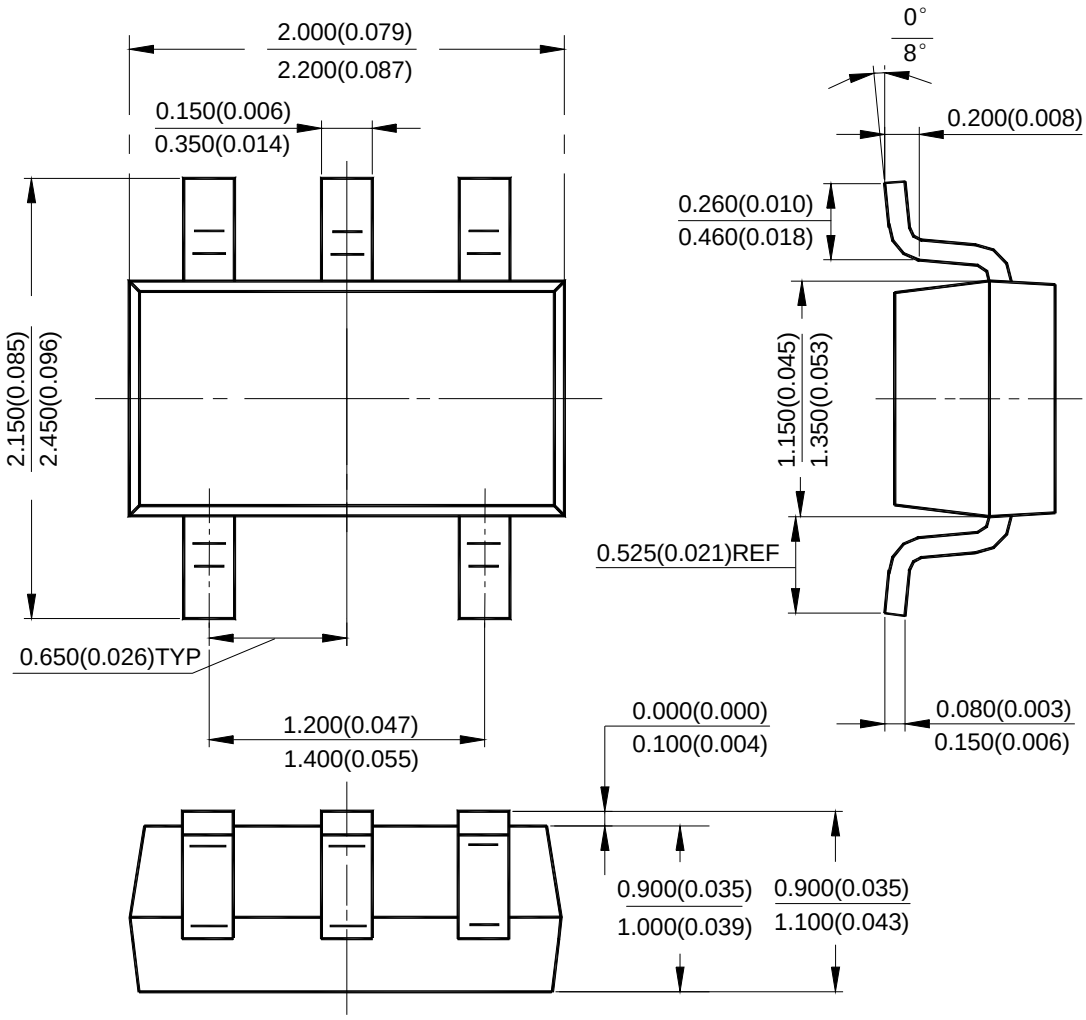


Figure 7 : Functional Block Diagram of MB321 (Each Amplifier)

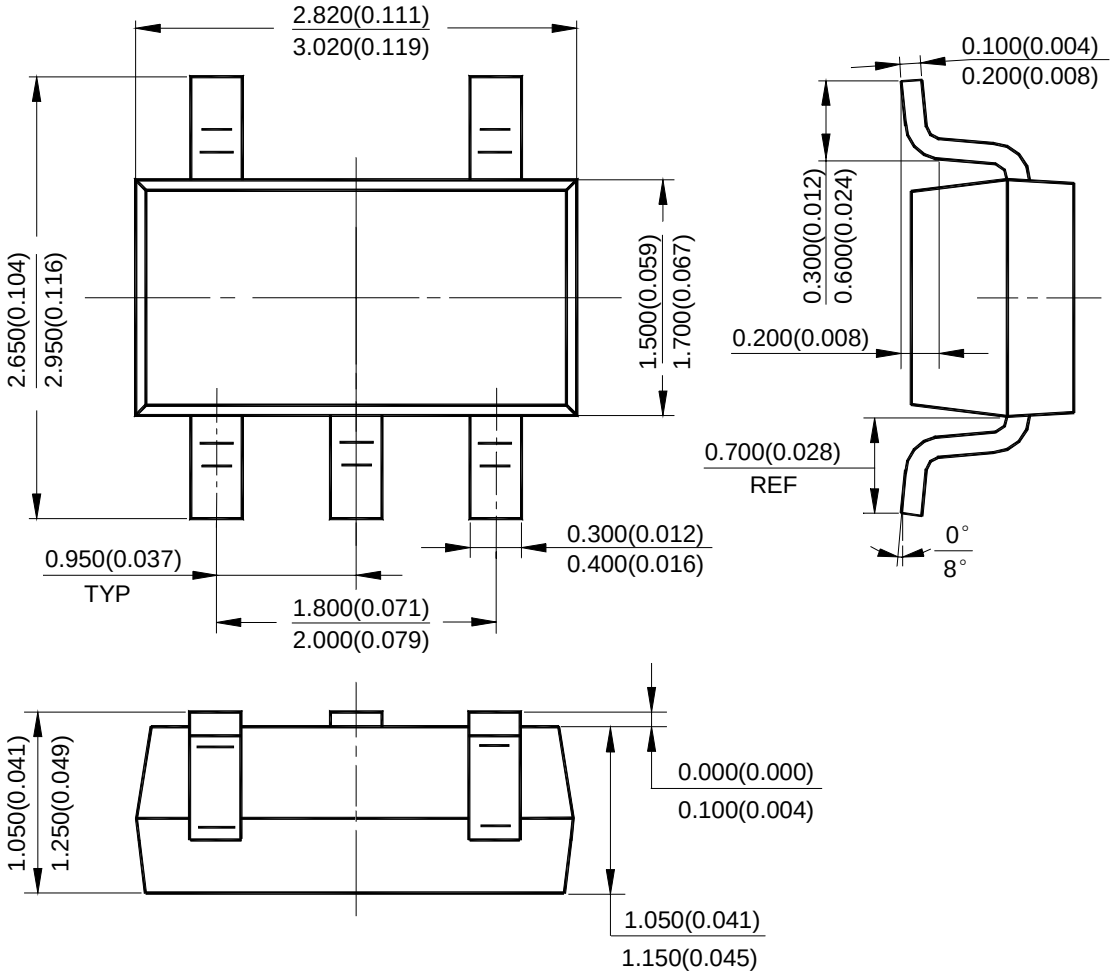
Mechanical Dimensions

SC70-5 **Unit: mm(inch)**



Mechanical Dimensions (Cont'd)

SOT-23-5 **Unit: mm(inch)**



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