



The Infinite Bandwidth Company™

# MIC820

Teeny™ Ultra Low Power Op Amp

## Final Information

### General Description

The MIC820 is a rail-to-rail output, operational amplifier in Teeny™ SC70 packaging. The MIC820 provides 5MHz, -3dB bandwidth while consuming an incredibly low 22µA supply current.

The SC70 packaging achieves significant board space savings over devices packaged in SOT-23 or MSOP-8 packaging. The SC70 occupies approximately half the board area of a SOT-23 package.

### Features

- Teeny™ SC70 packaging
- 5MHz, -3dB bandwidth product
- 4MHz gain-bandwidth product
- 22µA supply current
- Rail-to-Rail output
- Ground sensing at input common mode to GND
- Common mode to GND
- Drive large capacitive loads

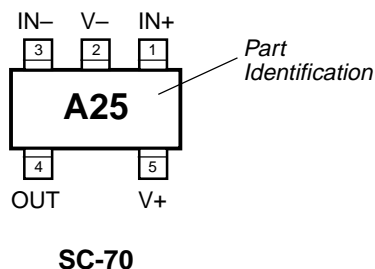
### Applications

- Portable equipment

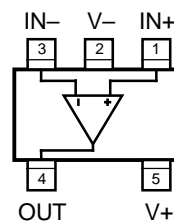
### Ordering Information

Part Number	Marking	Junction Temp. Range*	Package
MIC820BC5	A25	-40°C to +85°C	SC70-5

### Pin Configuration



### Functional Pinout



Teeny is a trademark of Micrel, Inc.

**Absolute Maximum Ratings (Note 1)**

Supply Voltage ( $V_{V+} - V_{V-}$ )	+6.0V
Differential Input Voltage ( $ V_{IN+} - V_{IN-} $ )	+6.0V
Input Voltage ( $V_{IN+} - V_{IN-}$ )	$V_{V+} + 0.3V, V_{V-} - 0.3V$
Lead Temperature (soldering, 5 sec.)	260°C
Output Short Circuit Current Duration	Indefinite
Storage Temperature ( $T_S$ )	150°C
ESD Rating, <b>Note 3</b>	

**Operating Ratings (Note 2)**

Supply Voltage ( $V_S$ )	+4.75V to +5.25V
Ambient Temperature Range	-40°C to +85°C
Package Thermal Resistance	450°C/W

**Electrical Characteristics (0V to 5V)**

$V_{V+} = +5V, V_{V-} = 0V, V_{CM} = V+/2; R_L = 1M\Omega; T_A = 25^\circ C$ , **bold** values indicate  $-40^\circ C \leq T_A \leq +85^\circ C$ ; unless noted.

Symbol	Parameter	Condition	Min	Typ	Max	Units
$V_{OS}$	Input Offset Voltage			1	15	mV
	Input Offset Voltage Temp Coefficient			13		$\mu V/^\circ C$
$I_B$	Input Bias Current			0.165	5	nA
$I_{OS}$	Input Offset Current			0.1	5	nA
$V_{CM}$	Input Voltage Range	CMRR > 35dB	0		$V_{CC}-2.5$	V
CMRR	Common-Mode Rejection Ratio	$0 < V_{CM} < 2.5V$	35	50		dB
PSRR	Power Supply Rejection Ratio	<b>Note 5</b>	40	70		dB
$A_{VOL}$	Large-Signal Voltage Gain	$R_L = 1M, -0.5 < V_{OUT} < 3.5V$	60	72		dB
$V_{OUT}$	Maximum Output Voltage Swing	$R_L = 200k$	4.95	5		V
$V_{OUT}$	Minimum Output Voltage Swing	$R_L = 200k$	0	50		mV
BW	-3db Bandwidth			5		MHz
GBW	Gain-Bandwidth Product			4		MHz
SR	Slew Rate			5		V/ $\mu s$
$I_{SC}$	Short-Circuit Output Current	Source	2	2.85		mA
		Sink	0.15	0.26		mA
$I_{GND}$	Supply Current	$V_{CC} = \pm 2.5V, V_{OUT} = 0V$		22	35	$\mu A$
		$V_{CC} = \pm 2.5V, V_{OUT} = -2.5V$		35	60	$\mu A$

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

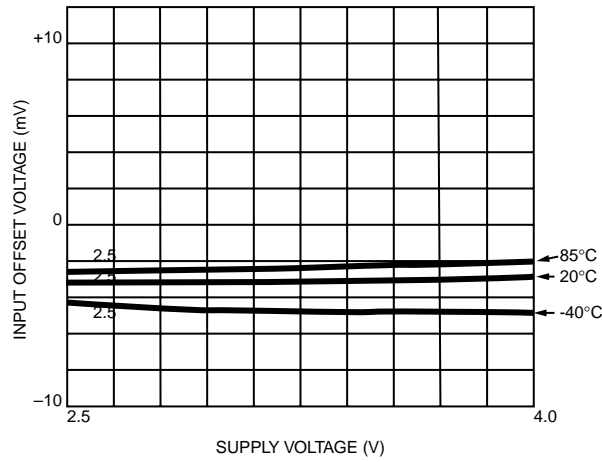
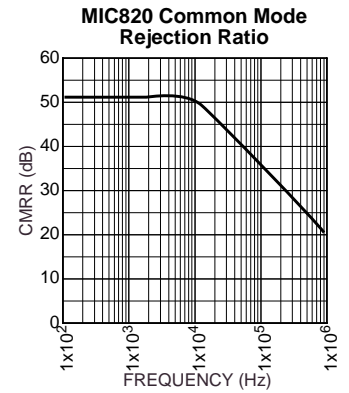
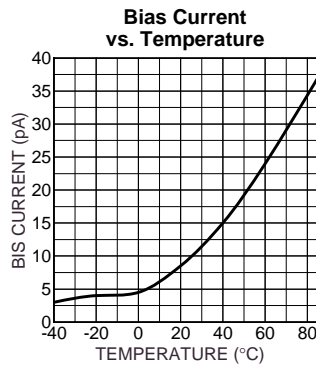
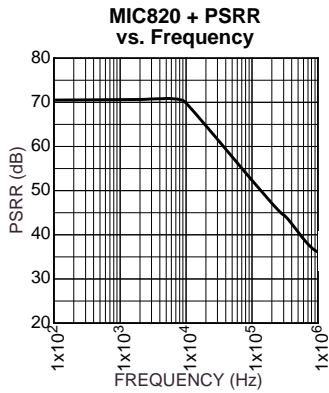
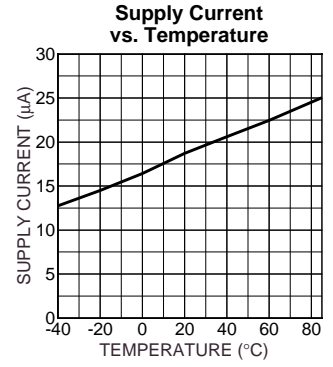
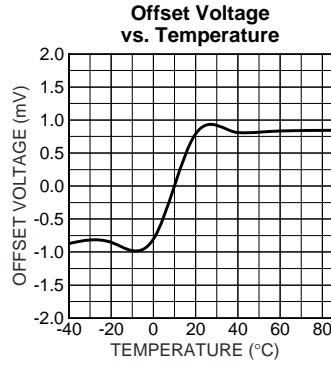
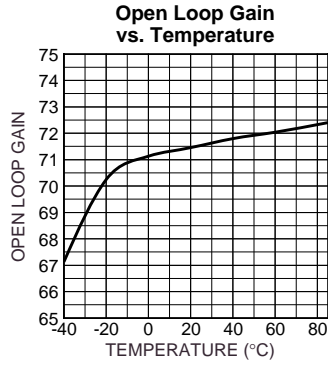
**Note 2.** The device is not guaranteed to function outside its operating rating.

**Note 3.** Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF. Pin 4 is ESD sensitive

**Note 4.** Exceeding the maximum differential input voltage will damage the input stage and degrade performance (in particular, input bias current is likely to increase).

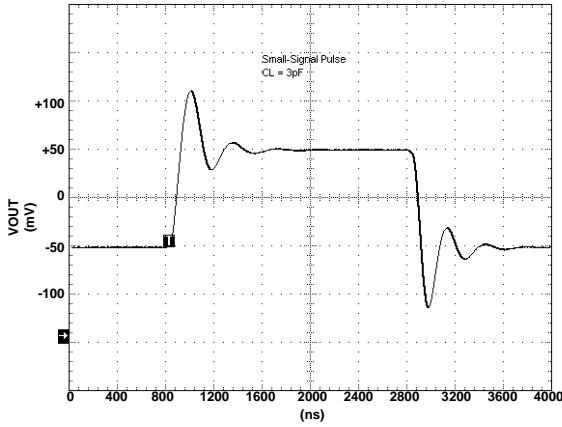
**Note 5.** Supply Voltage change of 1V.

# Typical Characteristics

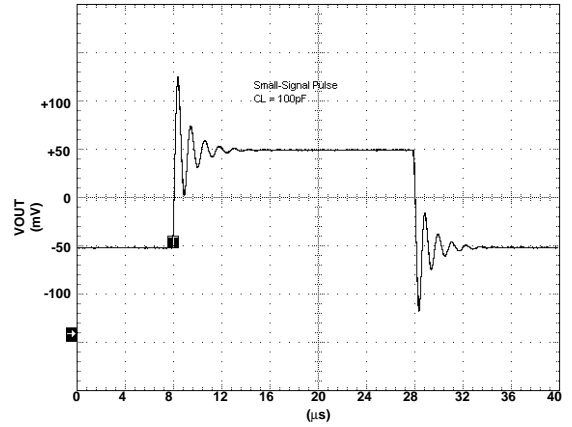


# Functional Characteristics

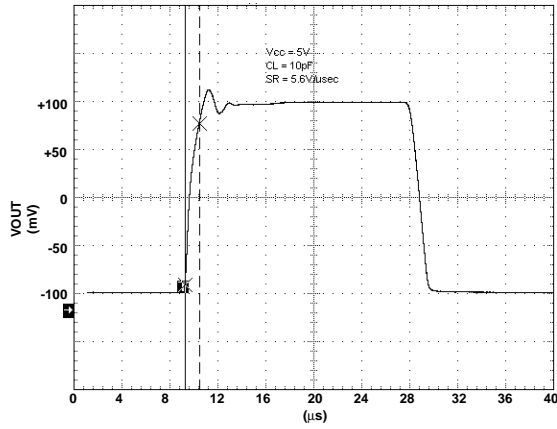
**Small-Signal Pulse Reponse**  
 $A_V=1$   $C_L=3pF$



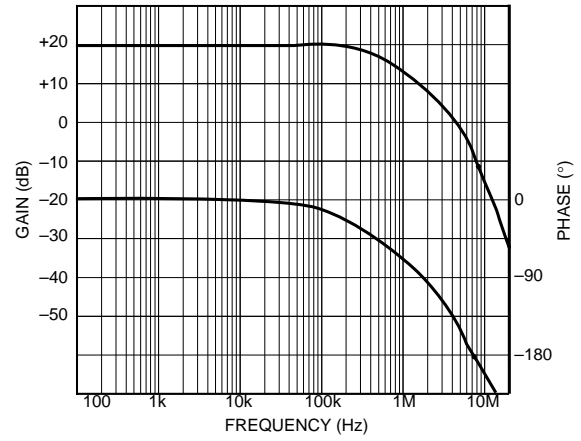
**Small-Signal Pulse Reponse**  
 $A_V=1$   $C_L=100pF$



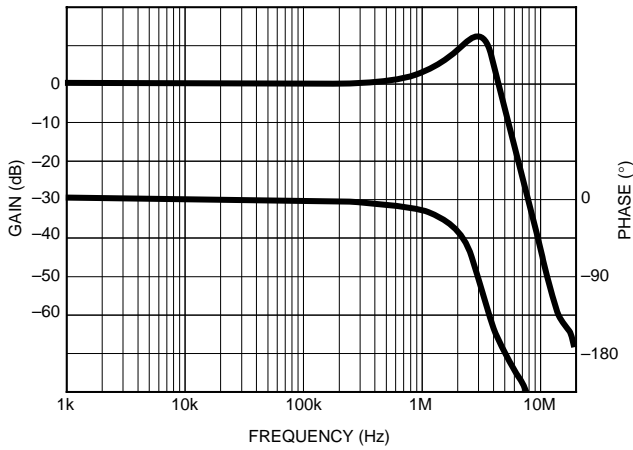
**Large-Signal Pulse Reponse**  
 $A_V=1$   $C_L=10pF$



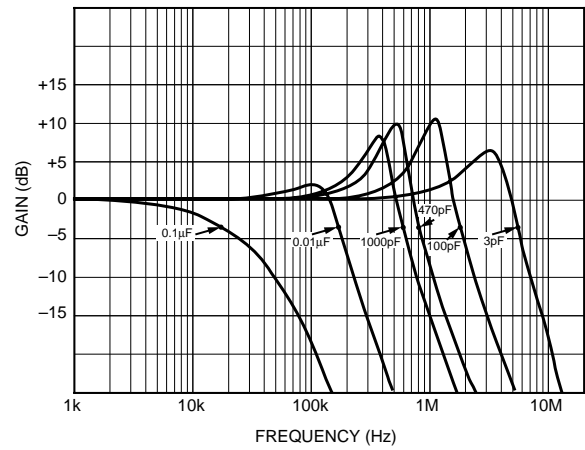
**Gain Bandwidth of MIC820**



**Closed Loop Frequency Response  $A_V = 1$**



**Closed Loop Gain ( $A_V = +1$ ) vs. Load Capacitance**

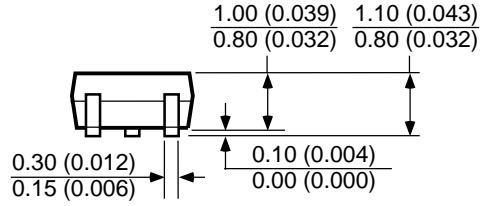
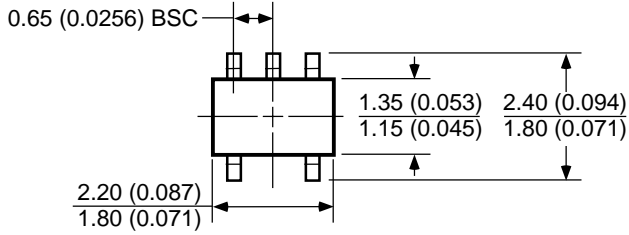


## Applications Information

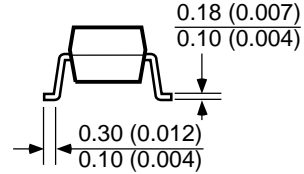
### Power Supply Bypassing

Regular supply bypassing techniques are recommended. A 10 $\mu$ F capacitor in parallel with a 0.1 $\mu$ 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.

**Package Information**



DIMENSIONS:  
MM (INCH)



**SC70-5**

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