MIC862

Dual Ultra Low Power Op Amp in SOT23-8

Final Information

General Description

The MIC862 is a dual low power operational amplifier in SOT23-8 package. It is designed to operate in the 2V to 5V range, rail-to-rail output, with input common-mode to ground. The MIC862 provides 3MHz gain-bandwidth product while consuming only a 31µA/Channel supply current.

With low supply voltage and SOT23-8 packaging, MIC862 provides two channels as general-purpose amplifiers for portable and battery-powered applications. Its package provides the maximum performance available while maintaining an extremely slim form factor. The minimal power consumption of this IC maximizes the battery life potential.

Features

- SOT23-8 packaging
- 3MHz gain-bandwidth product
- 5MHz, –3dB bandwidth
- 31µA supply current
- Rail-to-rail output
- Ground sensing at input (common mode to GND)
- Drive large capactive loads
- Unity gain stable

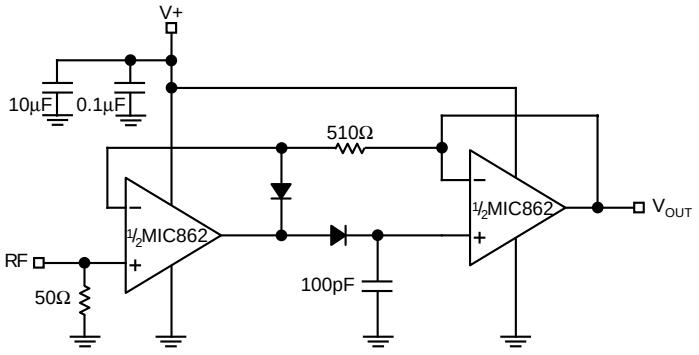
Applications

- Portable equipment
- Medical Insrument
- PDAs
- Pagers
- Cordless phones
- Consumer electronics

Ordering Information

Part Number	Marking	Ambient Temp. Range	Package
MIC862BM8	A34	–40°C to +85°C	SOT23-8

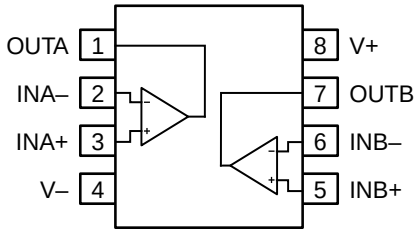
Typical Application



Peak Detector Circuit for AM Radio

Teeny is a trademark of Micrel, Inc.

Pin Configuration



SOT23-8 (M8)

Pin Description

Pin Number	Pin Name	Pin Function
1	OUTA	Output: Amplifier A Output
2	INA–	Amplifier A Inverting (Input)
3	INA+	Amplifier A Non-Inverting (Input)
4	V–	Negative Supply
5	INB+	Amplifier B Non-Inverting (Input)
6	INB–	Amplifier B Inverting (Input)
7	OUTB	Output: Amplifier B Output
8	V+	Positive Supply

Absolute Maximum Ratings (Note 1)

Supply Voltage ($V_{V+} – V–$) ..... +6.0V
Differential Input Voltage ($|V_{IN+} – V_{IN–}|$), Note 4 ..... +6.0V
Input Voltage ($V_{IN+} – V_{IN–}$) ..... V_+ + 0.3V, V_- –0.3V
Lead Temperature (soldering, 5 sec.) ..... 260°C
Output Short Circuit Current Duration ..... Indefinite
Storage Temperature (T_S) ..... 150°C
ESD Rating, **Note 3**

Operating Ratings (Note 2)

Supply Voltage (V+ – V–) ..... +2V to +5.25V
Ambient Temperature Range ..... –40°C to +85°C
Package Thermal Resistance ..... PCB boards
θ_{JA} (using 4 layer PCB) ..... 100°C/W
θ_{JC} (using 4 layer PCB) ..... 70°C/W

Electrical Characteristics

V+ = +2V, V– = 0V, V_{CM} = V+/2; R_L= 500kΩ to V+/2; T_A= 25°C, unless otherwise noted. **Bold** values indicate –40°C≤ T_A≤ +85°C.

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{OS}	Input Offset Voltage		**–6** –5	0.1	**6** 5	mV
	Differential Offset Voltage			0.5		mV
	Input Offset Voltage Temp Coefficient			6		µV/°C
I_B	Input Bias Current			10		pA
I_{OS}	Input Offset Current			5		pA
V_{CM}	Input Voltage Range (from V–)	CMRR > 50dB	**0.5**	1		V
CMRR	Common-Mode Rejection Ratio	0 < V_{CM} < 1V	**45**	75		dB
PSRR	Power Supply Rejection Ratio	Supply voltage change of 2V to 2.7V	**50**	78		dB
A_{VOL}	Large-Signal Voltage Gain	R_L = 5kΩ, V_{OUT} = 1.4V_{P-P}	**66**	74		dB
		R_L = 100kΩ, V_{OUT} = 1.4V_{P-P}	**75**	89		dB
		R_L = 500kΩ, V_{OUT} = 1.4V_{P-P}	**85**	100		dB
V_{OUT}	Maximum Output Voltage Swing	R_L = 5kΩ	**V+–80mV**	V+–55mV		V
		R_L = 500kΩ	**V+–3mV**	V+–1.4mV		V
V_{OUT}	Minimum Output Voltage Swing	R_L = 5kΩ		V–+14mV	**V–+ 20mV**	mV
		R_L = 500kΩ		V–+0.85mV	**V–+ 3mV**	mV
GBW	Gain-Bandwidth Product	R_L = 20kΩ, C_L = 2pF, Av = 11		2.1		MHz
PM	Phase Margin	R_L = 20kΩ, C_L = 2pF, Av = 11		57		°
BW	–3dB Bandwidth	R_L = 1MΩ, C_L = 2pF, Av = 1		4.2		MHz
SR	Slew Rate	R_L = 1MΩ, C_L = 2pF, Av = 1, Positive Slew Rate = 1.5V/µs		2		V/µs
I_{SC}	Short-Circuit Output Current	Source	**1.8**	2.6		mA
		Sink	**1.5**	2.2		mA
I_S	Supply Current (per op amp)	No Load		27	**43**	µA
	Channel-to-Channel Crosstalk	Note 5		–100		dB

V+ = +2.7V, V– = 0V, V_{CM} = V+/2; R_L= 500kΩ to V+/2; T_A= 25°C, unless otherwise noted. **Bold** values indicate –40°C≤ T_A≤ +85°C.

V_{OS}	Input Offset Voltage		**–6** –5	0.1	**6** 5	mV
	Differential Offset Voltage			0.5		mV
	Input Offset Voltage Temp Coefficient			6		µV/°C
I_B	Input Bias Current			10		pA
I_{OS}	Input Offset Current			5		pA
V_{CM}	Input Voltage Range	CMRR > 60dB	**1**	1.8		V
CMRR	Common-Mode Rejection Ratio	0 < V_{CM} < 1.35V	**65**	83		dB

Symbol	Parameter	Condition	Min	Typ	Max	Units
PSRR	Power Supply Rejection Ratio	Supply voltage change of 2.7V to 3V	**60**	85		dB
A_{VOL}	Large-Signal Voltage Gain	R_L = 5kΩ, V_{OUT} = $2V_{P-P}$	**65**	77		dB
		R_L = 100kΩ, V_{OUT} = $2V_{P-P}$	**80**	90		dB
		R_L = 500kΩ, V_{OUT} = $2V_{P-P}$	**90**	101		dB
GBW	Gain-Bandwidth Product	R_L = 20kΩ, C_L = 2pF, Av = 11		2.3		MHz
PM	Phase Margin	R_L = 20kΩ, C_L = 2pF, Av = 11		50		°
BW	–3 dB Bandwidth	R_L = 1MΩ, C_L = 2pF, Av = 1		4.2		MHz
SR	Slew Rate	R_L = 1MΩ, C_L = 2pF, Av = 1 Positive Slew Rate 1.5V/µs		3		V/µs
I_{SC}	Short-Circuit Output Current	Source	**4.5**	6.3		mA
		Sink	**4.5**	6.2		mA
I_S	Supply Current (per op amp)	No Load		28	**45**	µA
	Channel-to-Channel Crosstalk	Note 5		–120		dB

V+= +5V, V–= 0V, V_{CM}= V+/2; R_L= 500kΩ to V+/2; T_A= 25°C, unless otherwise noted. **Bold** values indicate –40°C≤ T_A≤ +85°C.

V_{OS}	Input Offset Voltage		**–6** –5	0.1	**6** 5	mV
	Differential Offset Voltage			0.5		mV
	Input Offset Voltage Temp Coefficient			6		µV/°C
I_B	Input Bias Current			10		pA
I_{OS}	Input Offset Current			5		pA
V_{CM}	Input Voltage Range (from V–)	CMRR > 60dB	**3.5**	4.1		V
CMRR	Common-Mode Rejection Ratio	0 < V_{CM} < 3.5V,	**60**	87		dB
PSRR	Power Supply Rejection Ratio	Supply voltage change from 3V to 5V	**60**	92		dB
A_{VOL}	Large-Signal Voltage Gain	R_L = 5kΩ, V_{OUT} = $4.8V_{P-P}$	**65**	73		dB
		R_L = 100kΩ, V_{OUT} = $4.8V_{P-P}$	**80**	86		dB
		R_L = 500kΩ, V_{OUT} = $4.8V_{P-P}$	**89**	96		dB
V_{OUT}	Maximum Output Voltage Swing	R_L = 5kΩ	**V+–50mV**	V+–37mV		V
		R_L = 500kΩ	**V+–3mV**	V+–1.3mV		V
V_{OUT}	Minimum Output Voltage Swing	R_L = 5kΩ		V–+24mV	**V–+ 40mV**	mV
		R_L = 500kΩ		V–+0.7mV	**V–+ 3mV**	mV
GBW	Gain-Bandwidth Product	R_L = 20kΩ, C_L = 2pF, Av = 11		3		MHz
PM	Phase Margin			45		°
BW	–3 dB Bandwidth	R_L = 1MΩ, C_L = 2pF, Av = 1		5		MHz
SR	Slew Rate	R_L = 1MΩ, C_L = 2pF, Av = 1 Positive Slew Rate 1.8V/µs		4		V/µs
I_{SC}	Short-Circuit Output Current	Source	**17**	23		mA
		Sink	**18**	27		mA
I_S	Supply Current (per op amp)	No Load		31	**47**	µA
	Channel-to-Channel Crosstalk	Note 5		–120		dB

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

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

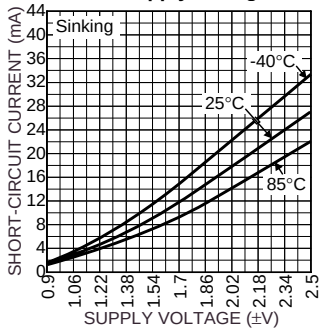
Note 3. Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF. Pin 4 is ESD sensitive

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.

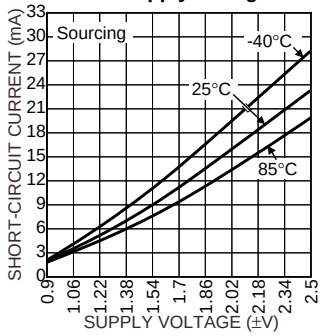
Note 5. DC signal referenced to input. Refer to Typical Characteristics graphs for AC performance.

Typical Characteristics

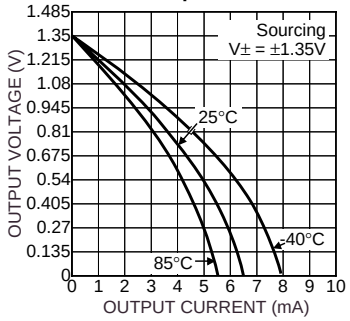
Short Circuit Current vs. Supply Voltage



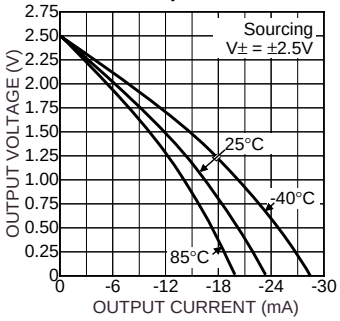
Short Circuit Current vs. Supply Voltage



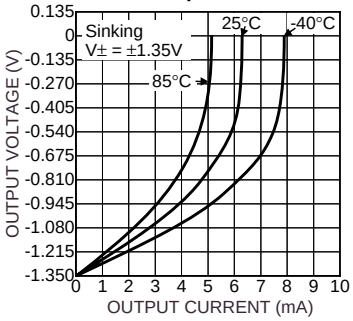
Output Voltage vs. Output Current



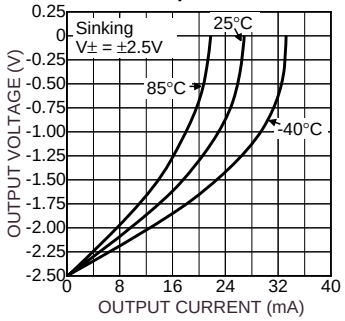
Output Voltage vs. Output Current



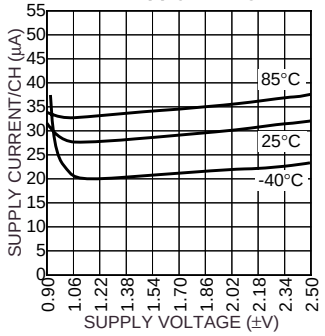
Output Voltage vs. Output Current



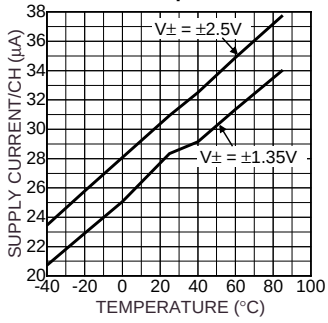
Output Voltage vs. Output Current



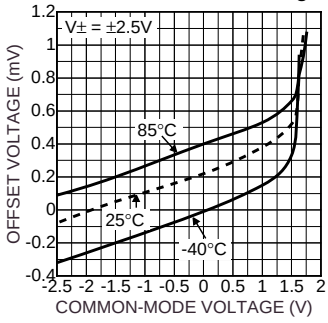
Supply Current vs. Supply Voltage



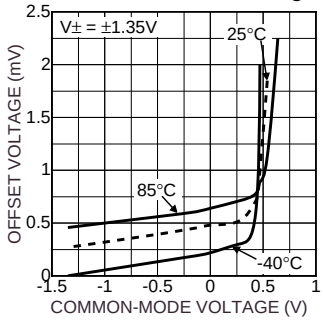
Supply Current/Ch vs. Temperature



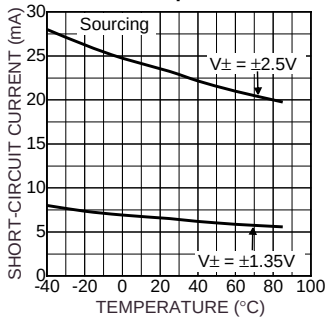
Offset Voltage vs. Common-Mode Voltage



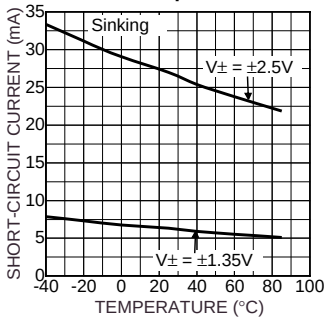
Offset Voltage vs. Common-Mode Voltage



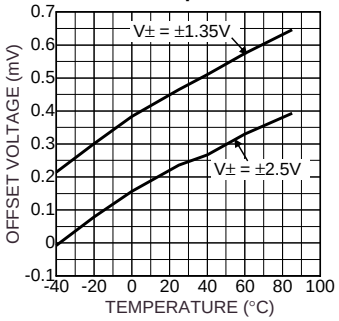
Short Circuit Current vs. Temperature



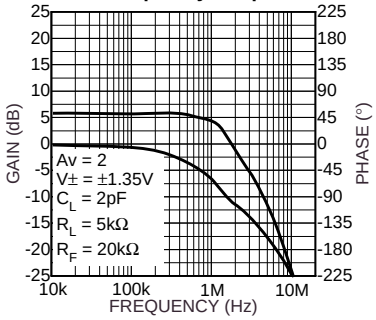
Short Circuit Current vs. Temperature



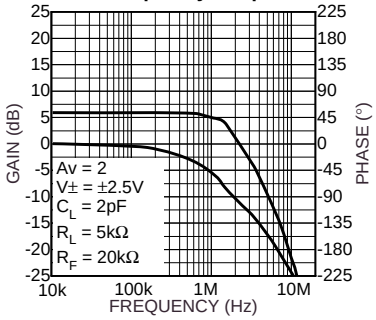
Offset Voltage vs. Temperature



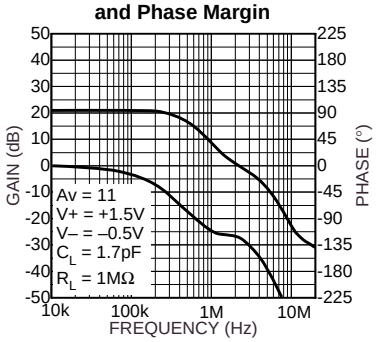
Gain Frequency Response



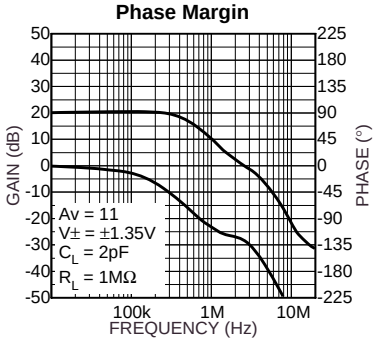
Gain Frequency Response



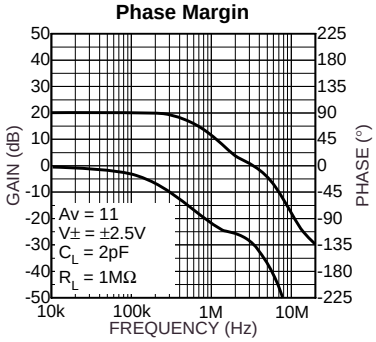
Gain Bandwidth and Phase Margin



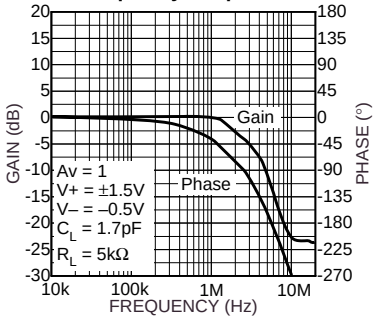
Gain Bandwidth and Phase Margin



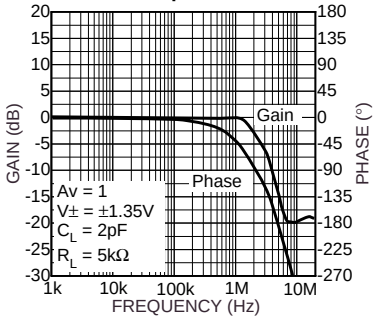
Gain Bandwidth and Phase Margin



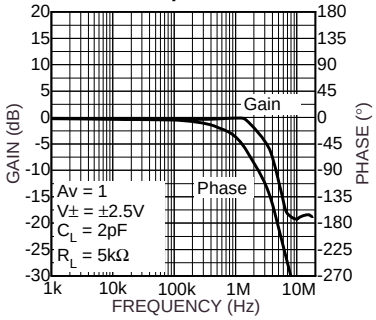
Unity Bandwidth Frequency Response



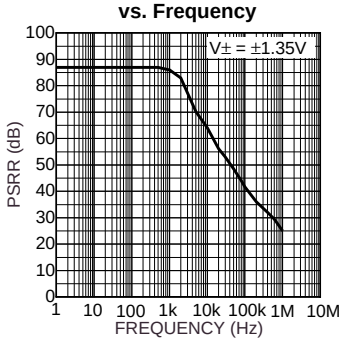
Unity Gain Frequency Response



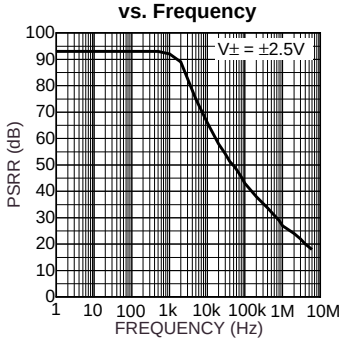
Unity Gain Frequency Response



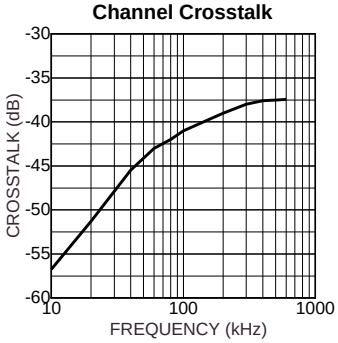
PSRR vs. Frequency



PSRR vs. Frequency

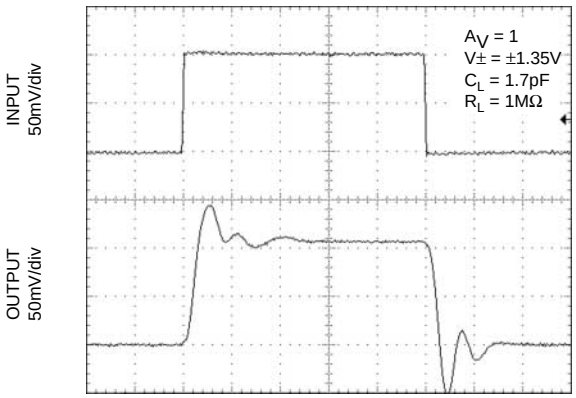


Channel to Channel Crosstalk

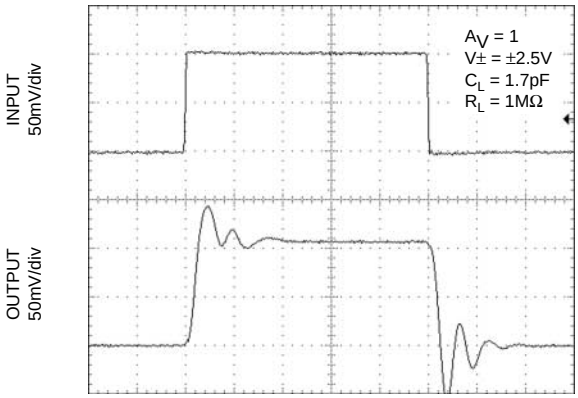


Functional Characteristics

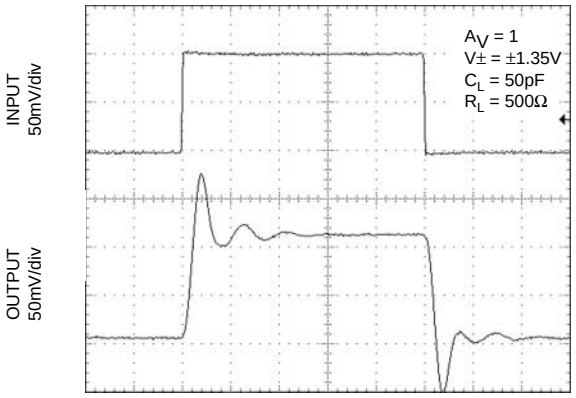
Small Signal Response



Small Signal Response



Small Signal Response



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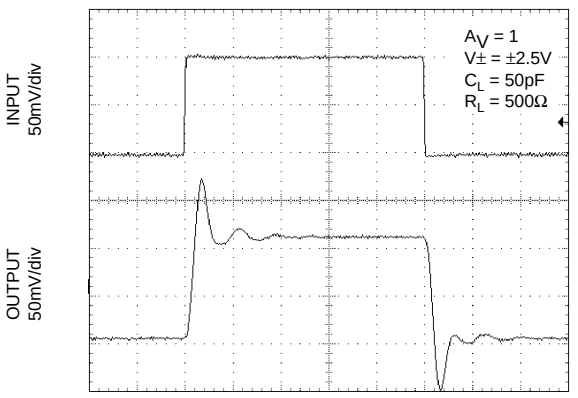
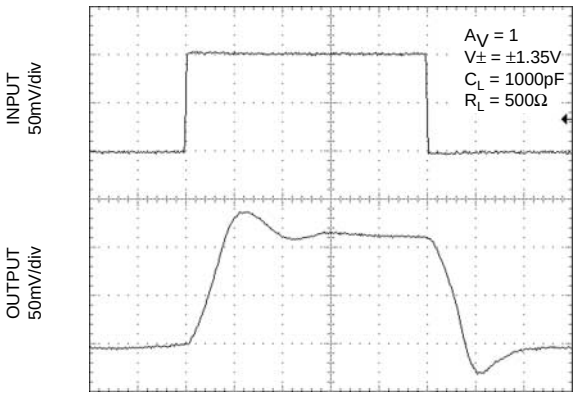
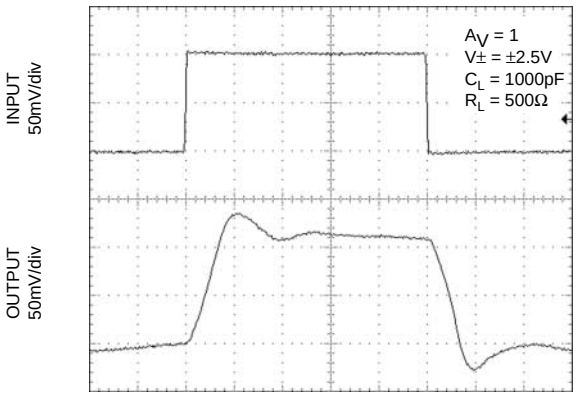


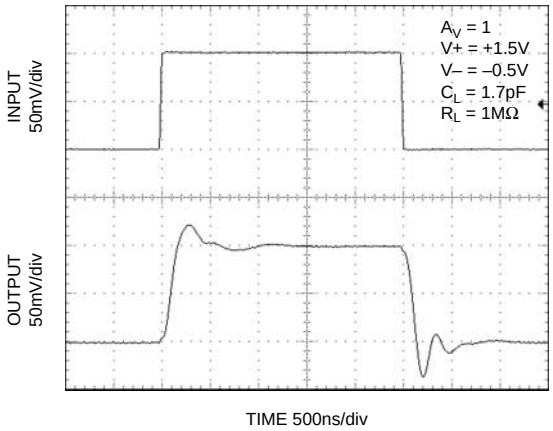
Small Signal Response



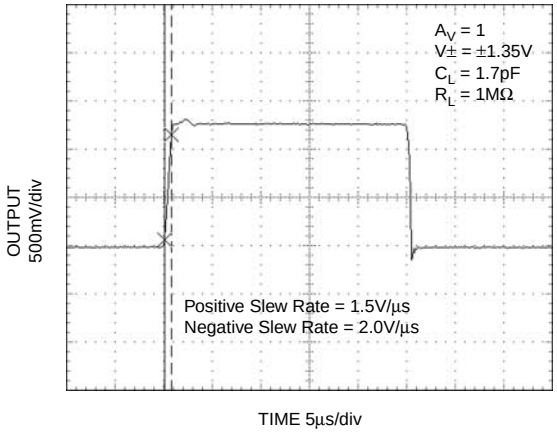
Small Signal Response



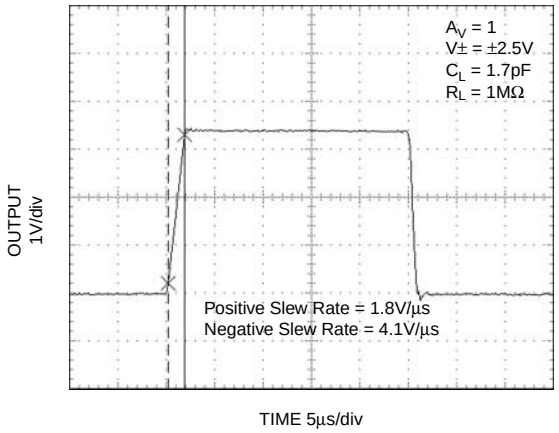
Small Signal Pulse Response



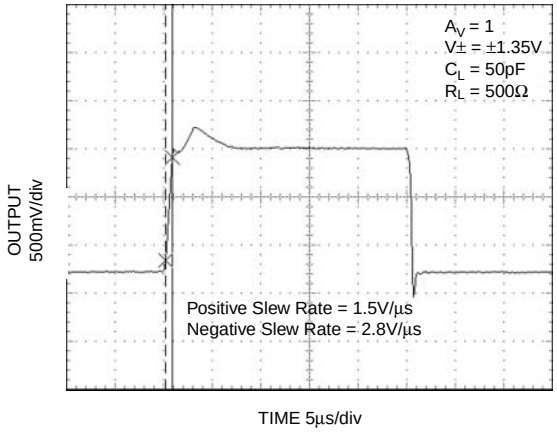
Large Signal Response



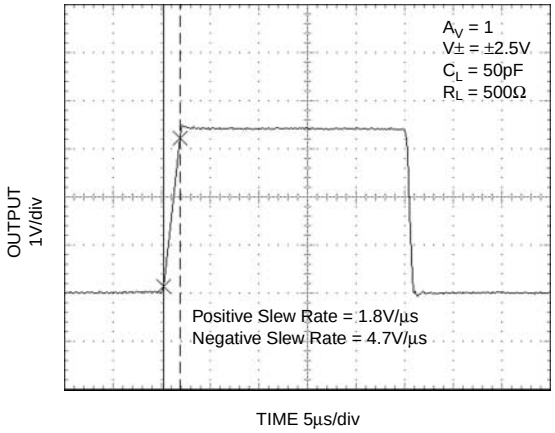
Large Signal Response



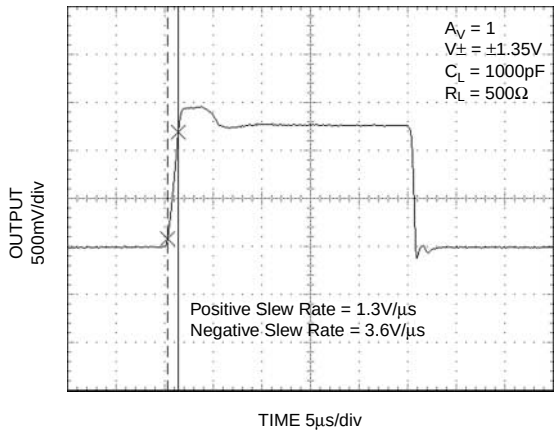
Large Signal Response



Large Signal Response



Large Signal Pulse Response



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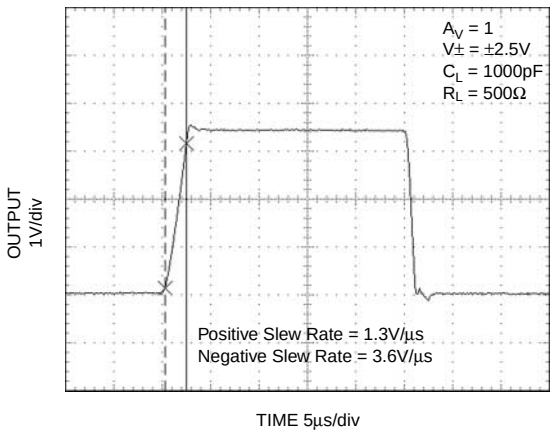

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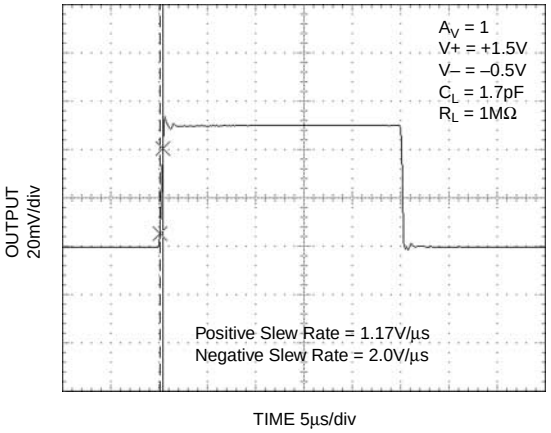
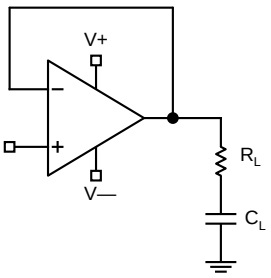
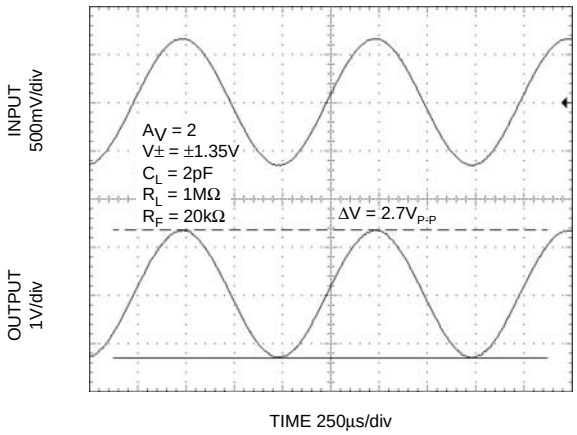
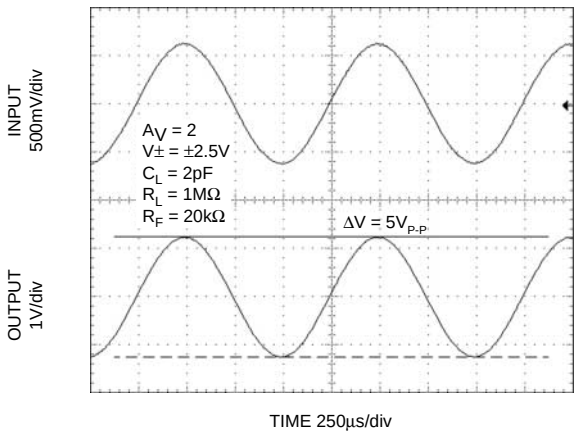




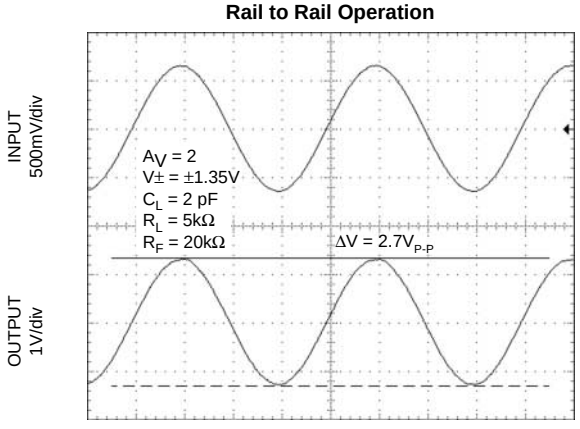
Rail to Rail Operation



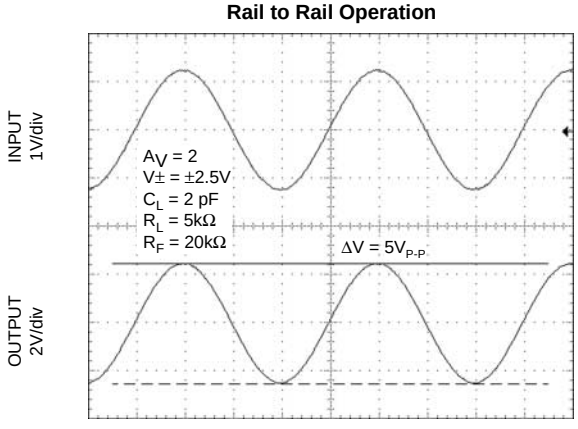
Rail to Rail Operation



Rail to Rail Operation



Rail to Rail Operation



Applications Information

Power Supply Bypassing

Regular supply bypassing techniques are recommended. A 10µF capacitor in parallel with a 0.1µF 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.

Supply and Loading Resistive Considerations

The MIC862 is intended for single supply applications configured with a grounded load. It is not advisable to operate the MIC862 under either of the following conditions:

1). A grounded load and split supplies (+/-V)

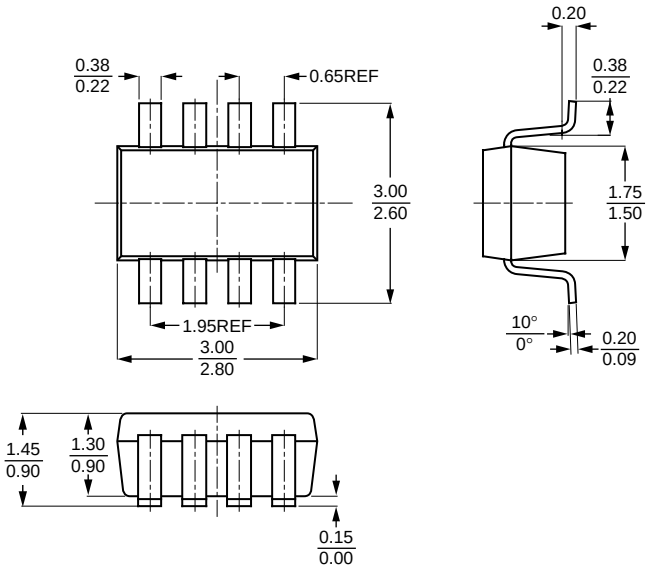
2). A single supply where the load is terminated above ground.

Under the above conditions, if the load is less than 20kOhm and the output swing is greater than 1V(peak), there may be some instability when the output is sinking current.

Capacitive Load

When driving a large capacitive load, a resistor of 500Ω is recommended to be connected between the op-amp output and the capacitive load to avoid oscillation.

Package Information



SOT-23-8 (M8)

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