RC4136 General Performance Quad 741 Operational Amplifier

Features

- Unity gain bandwidth — 3 MHz
- Short circuit protection
- No frequency compensation required
- No latch-up
- Large common mode and differential voltage ranges
- Low power consumption
- Parameter tracking over temperature range
- Gain and phase match between amplifiers

Description

The 4136 is made up of four 741 type independent high gain operational amplifiers internally compensated and constructed on a single silicon chip using the planar epitaxial process.

This amplifier meets or exceeds all specifications for 741 type amplifiers. Excellent channel separation allows the use of the 4136 quad amplifier in all 741 operational amplifier applications providing the highest possible packaging density.

The specially designed low noise input transistors allow the 4136 to be used in low noise signal processing applications such as audio preamplifiers and signal conditioners.

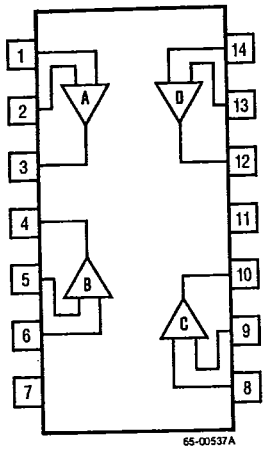
Ordering Information

Part Number	Package	Operating Temperature Range
RC4136N	N	0°C to +70°C
RC4136M	M	0°C to +70°C
RV4136N	N	-25° C to +85°C
RV4136D	D	-25° C to +85°C
RM4136D	D	-55°C to +125°C
RM4136D/883B*	D	-55°C to +125°C

Notes:
*/883B suffix denotes Mil-Std-883, Level B processing
N = 14-lead plastic DIP
D = 14-lead ceramic DIP
M = 14-lead plastic SOIC
Contact a Raytheon sales office or representative for ordering information on special package/temperature range combinations.

Connection Information

14-Lead
Dual In-Line Package
(Top View)



Pin	Function
1	-Input (A)
2	+Input (A)
3	Output (A)
4	Output (B)
5	+Input (B)
6	-Input (B)
7	$-V_S$
8	-Input (C)
9	+Input (C)
10	Output (C)
11	$+V_S$
12	Output (D)
13	+Input (D)
14	-Input (D)

Absolute Maximum Ratings

Supply Voltage
- RM4136 ..... ±22V
- RC4136, RV4136 ..... ±18V

Input Voltage* ..... ±30V
Differential Input Voltage 30V
Output Short Circuit Duration** ..... Indefinite
Storage Temperature
- Range ..... -65°C to +150°C

Operating Temperature Range
- RM4136 ..... -55°C to +125°C
- RV4136 ..... -25°C to +85°C
- RC4136 ..... 0°C to +70°C

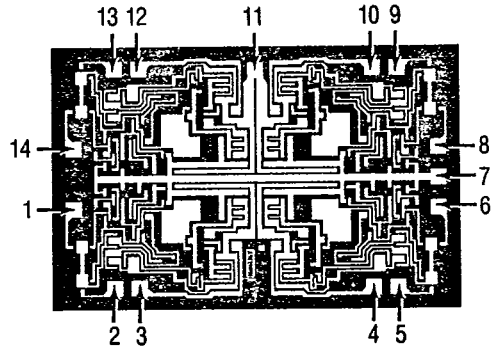
Lead Soldering Temperature
- (DIP, 60 sec) ..... +300°C
- (SO-14, 10 sec) ..... +260°C

*For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
**Short circuit may be to ground, typically 45 mA.

Thermal Characteristics

	14-Lead Small Outline	14-Lead Plastic DIP	14-Lead Ceramic DIP
Max. Junction Temp.	125°C	125°C	175°C
Max. P_D T_A <50°C	300 mW	468 mW	1042 mW
Therm. Res θ_{JC}	—	—	50°C/W
Therm. Res. θ_{JA}	200°C/W	160°C/W	120°C/W
For T_A >50°C Derate at	5.0 mW per °C	6.25 mW per °C	8.33 mW/ per °C

Mask Pattern



Die Size: 99 x 64 mils
Min. Pad Dimensions: 4 x 4 mils

Electrical Characteristics (V_S = ±15V and T_A = +25°C, unless otherwise noted)

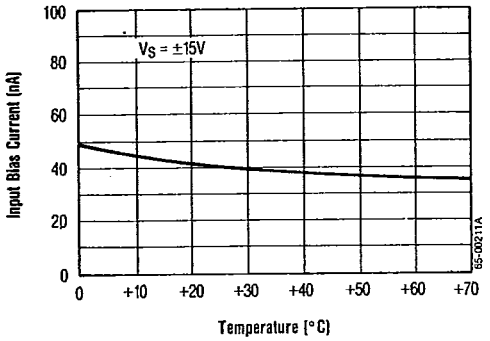
Parameters	Test Conditions	RM4136			RC/RV4136			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$R_S \leq 10k\Omega$		0.5	5.0		0.5	6.0	mV
Input Offset Current			5.0	200		5.0	200	nA
Input Bias Current			40	500		40	500	nA
Input Resistance		0.3	5.0		0.3	5.0		MΩ
Large Signal Voltage Gain	$R_L \geq 2k\Omega$, V_{OUT} = ±10V	50	300		20	300		V/mV
Output Voltage Swing	$R_L \geq 10k\Omega$	±12	±14		±12	±14		V
	$R_L \geq 2k\Omega$	±10	±13		±10	±13		
Input Voltage Range		±12	±14		±12	±14		V
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	70	100		70	100		dB
Power Supply Rejection Ratio	$R_S \leq 10k\Omega$	76	100		76	100		dB
Power Consumption	R_L = ∞, All Outputs		210	340		210	340	mW
Transient Response Rise Time	V_{IN} = 20mV, R_L = 2kΩ		0.13			0.13		μS
Overshoot	$C_L \leq 100pF$		5.0			5.0		%
Unity Gain Bandwidth			3.0			3.0		MHz
Slew Rate	$R_L \geq 2k\Omega$		1.5			1.0		V/μS
Channel Separation	f = 1.0kHz, R_S = 1kΩ		90			90		dB
The following specifications apply for -55°C ≤ T_A ≤ +125°C for RM4136; 0°C ≤ T_A ≤ +70°C for RC4136; -25°C ≤ T_A ≤ +85°C for RV4136, V_S = ±15V								
Input Offset Voltage	$R_S \leq 10k\Omega$			6.0			7.5	mV
Input Offset Current RM/RC4136				500			300	nA
RV4136							500	
Input Bias Current RM/RC4136				1500			800	nA
RV4136							1500	
Large Signal Voltage Gain	$R_L \geq 2k\Omega$, V_{OUT} = ±10V	25			15			V/mV
Output Voltage Swing	$R_L \geq 2k\Omega$	±10			±10			V
Power Consumption			240	400		240	400	mW

Electrical Characteristics Comparison (V_S = ±15V and T_A +25°C unless otherwise noted)

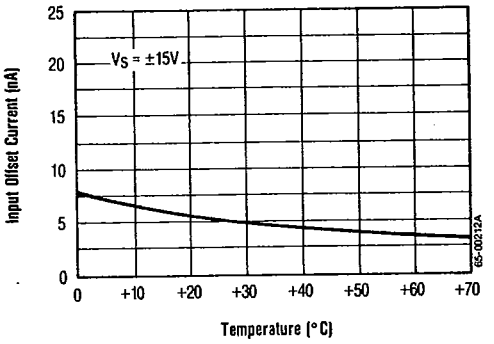
Parameter	RC4136 (Typ)	RC741 (Typ)	LM324 (Typ)	Units
Input Offset Voltage	0.5	2.0	2.0	mV
Input Offset Current	5.0	10	5.0	nA
Input Bias Current	40	80	55	nA
Input Resistance	5.0	2.0		MΩ
Large Signal Voltage Gain (R_L = 2kΩ)	300	200	100	V/mV
Output Voltage Swing (R_L = 2kΩ)	±13V	±13V	$\lvert+V_S - 1.2V\rvert$ to $-V_S$	V
Input Voltage Range	±14V	±13V	$\lvert+V_S - 1.5V\rvert$ to $-V_S$	V
Common Mode Rejection Ratio	100	90	85	dB
Power Supply Rejection Ratio	100	90	100	dB
Transient Response Rise Time	0.13	0.3		μS
Overshoot	5.0	5.0		%
Unity Gain Bandwidth	3.0	0.8	0.8	MHz
Slew Rate	1.0	0.5	0.5	V/μS
Input Noise Voltage Density (f = 1kHz)	10	22.5		$nV/\sqrt{Hz}$
Short Circuit Current	±45	±25		mA

Typical Performance Characteristics

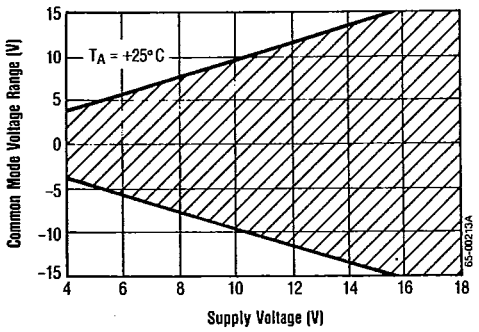
Input Bias Current as a Function of Ambient Temperature



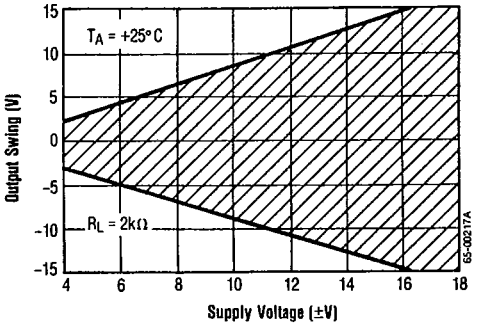
Input Offset Current as a Function of Ambient Temperature



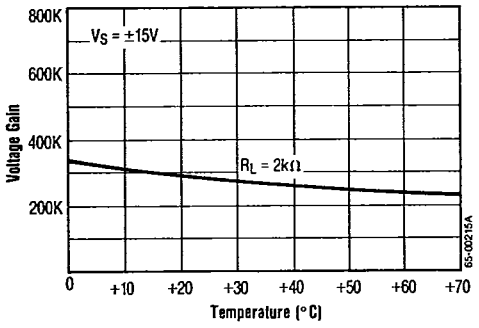
Common Mode Range as a Function of Supply Voltage



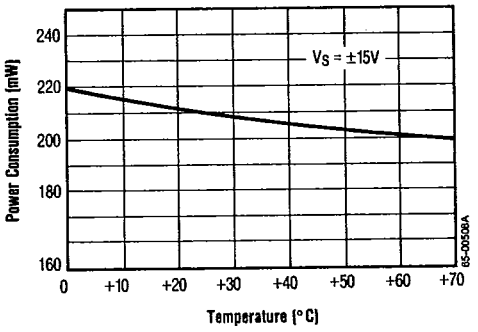
Typical Output Voltage as a Function of Supply Voltage



Open Loop Gain as a Function of Temperature

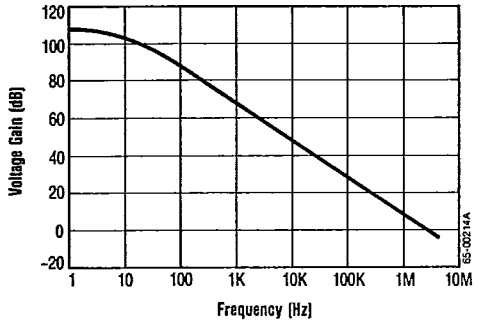


Power Consumption as a Function of Ambient Temperature

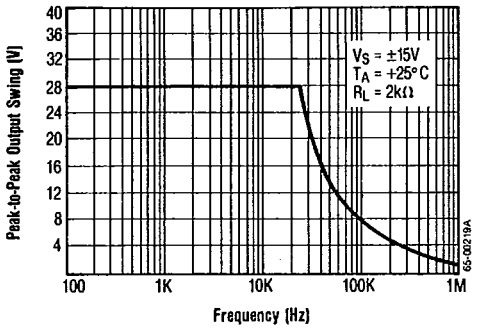


Typical Performance Characteristics (Continued)

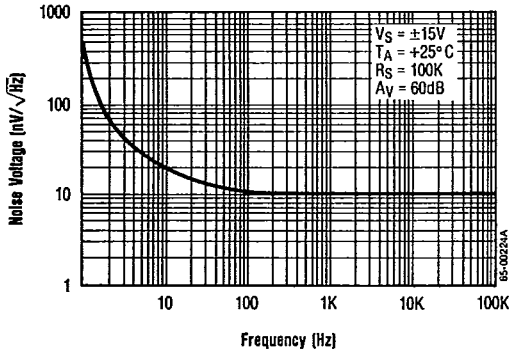
Open Loop Voltage Gain as a Function of Frequency



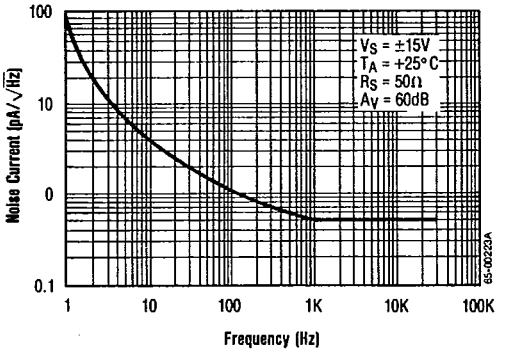
Output Voltage Swing as a Function of Frequency



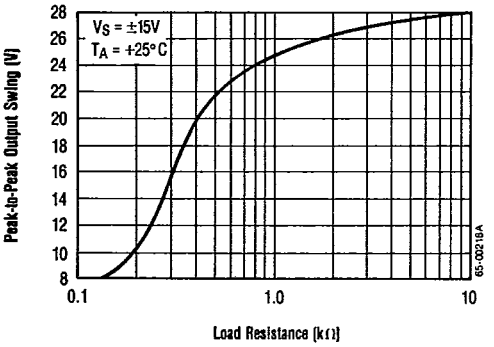
Input Noise Voltage as a Function of Frequency



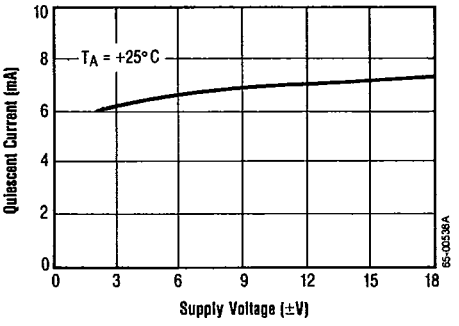
Input Noise Current as a Function of Frequency



Output Voltage Swing as a Function of Load Resistance



Quiescent Current as a Function of Supply Voltage



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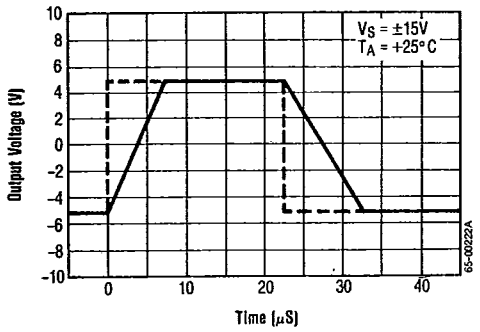
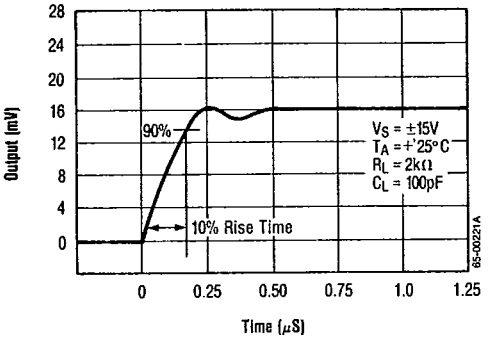
Typical Performance Characteristics (Continued)

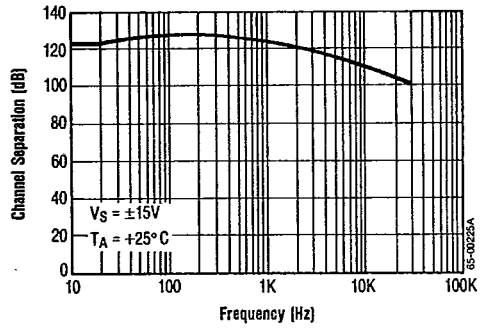
Voltage Follower Large Signal Pulse Response



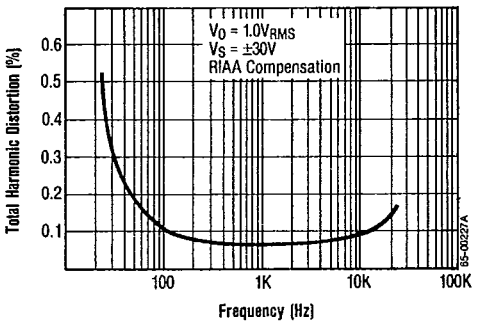
Transient Response



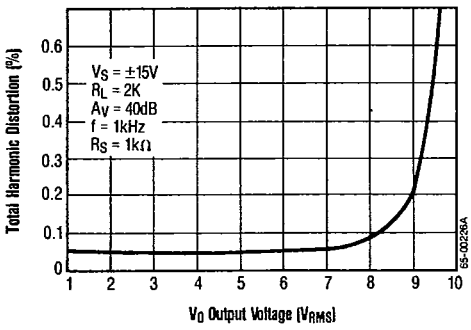
Channel Separation



Distortion vs. Frequency



Total Harmonic Distortion vs. Output Voltage

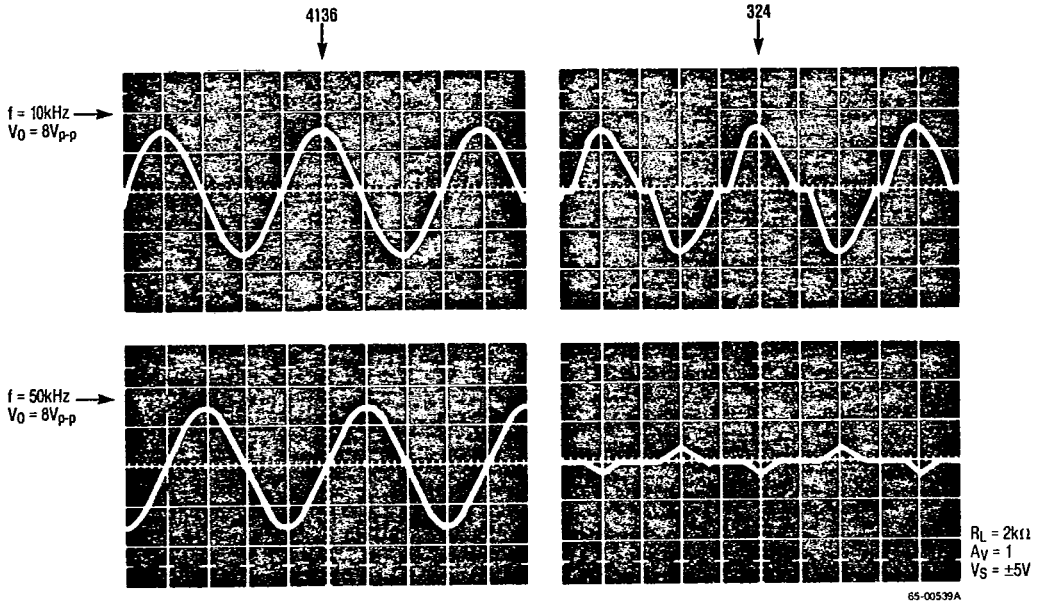


4136 Versus 741

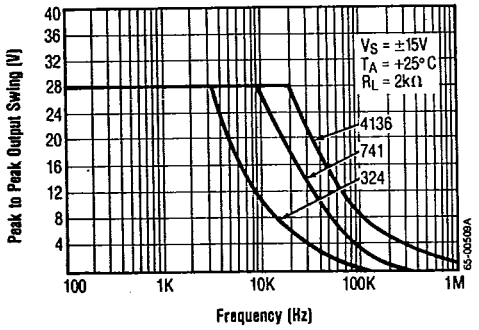
Although the 324 is an excellent device for single-supply applications where ground sensing is important, it is a poor substitute for four 741s in split supply circuits.

The simplified input circuit of the 4136 exhibits much lower noise than that of the 324 and exhibits no crossover distortion as compared with the 324 (see illustration). The 324 shows serious crossover distortion and pulse delay in attempting to handle a large signal input pulse.

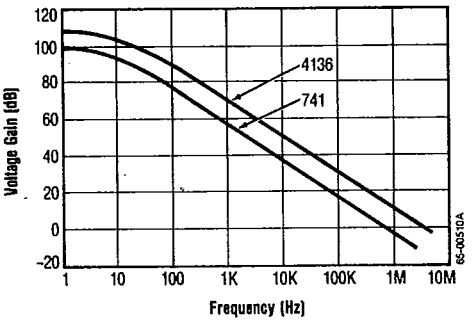
Comparative Crossover Distortion



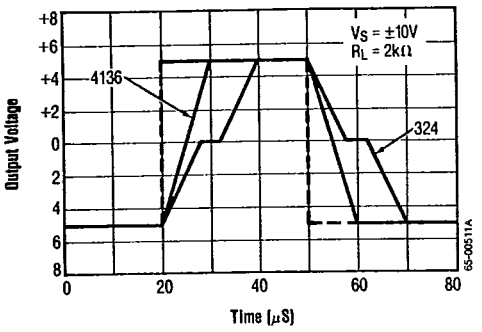
Output Voltage Swing as a Function of Frequency



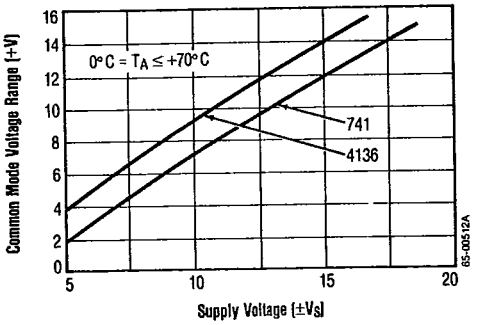
Open Loop Voltage Gain as a Function of Frequency



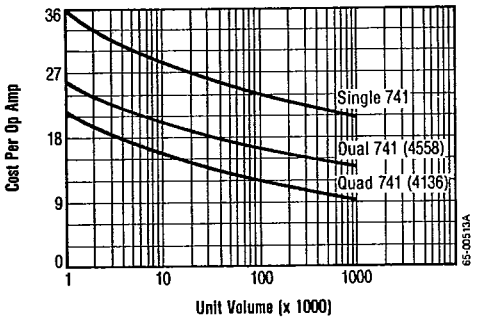
Voltage Follower Large Signal Pulse Response



Input Common Mode Voltage Range as a Function of Supply Voltage

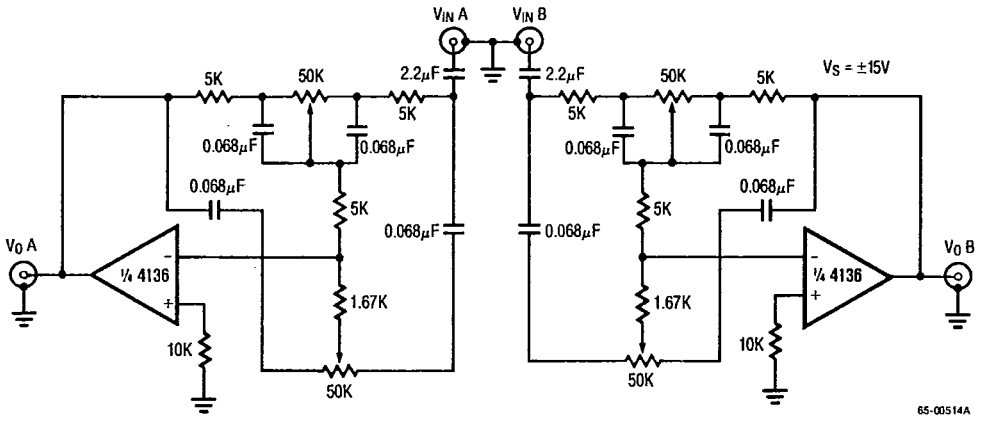


Unit Cost Comparisons

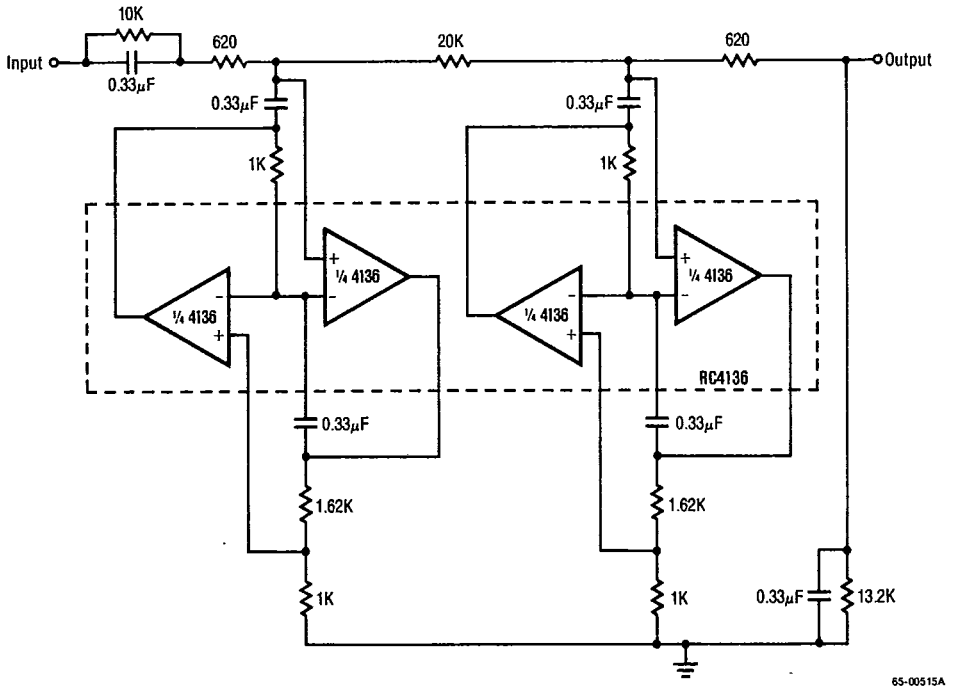


Typical Applications

Stereo Tone Control

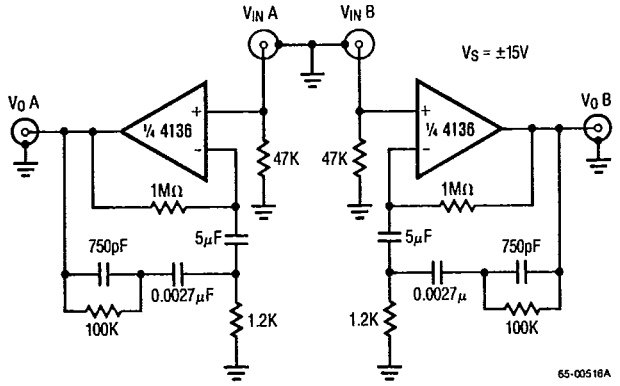


400 Hz Lowpass Butterworth Active Filter

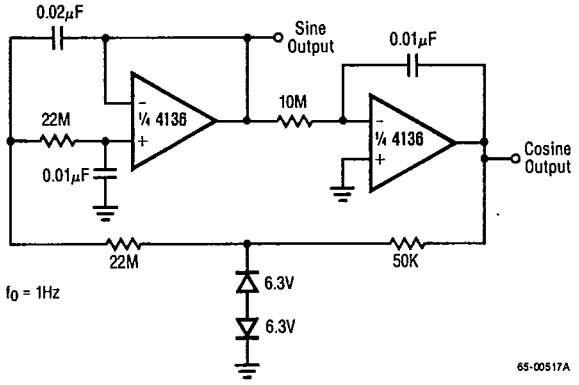


Typical Applications (Continued)

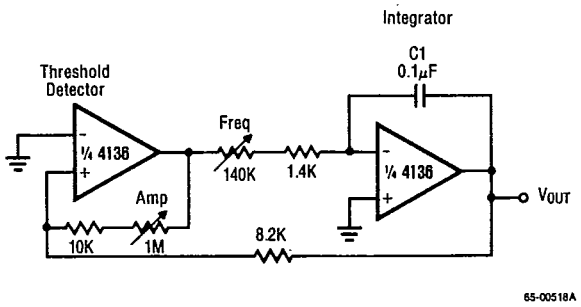
RIAA Preamplifier



Low Frequency Sine Wave Generator With Quadrature Output

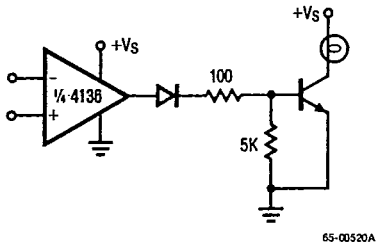


Triangular-Wave Generator

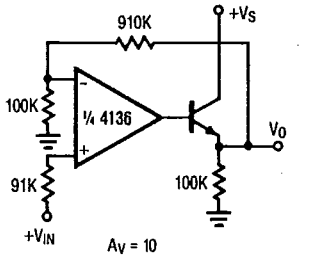


Typical Applications (Continued)

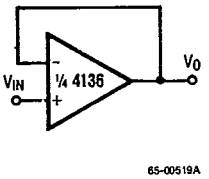
Lamp Driver



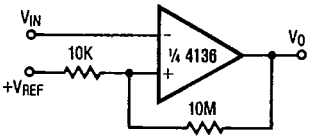
Power Amplifier



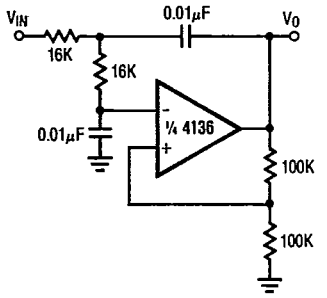
Voltage Follower



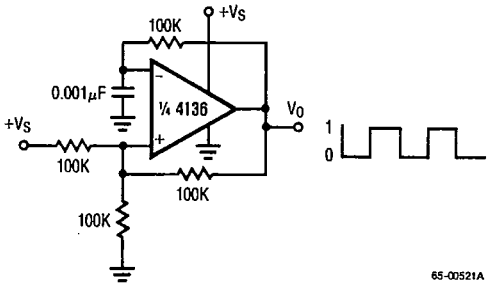
Comparator With Hysteresis



DC Coupled 1 kHz Lowpass Active Filter

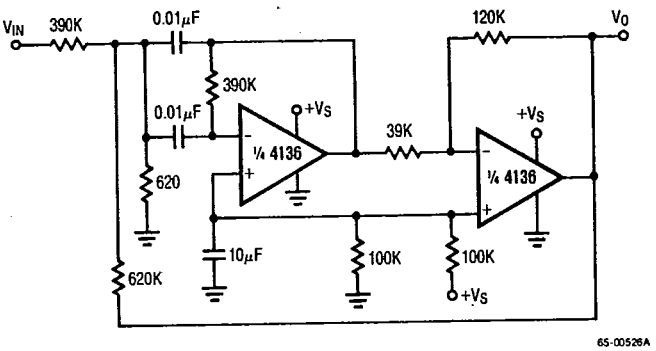


Squarewave Oscillator



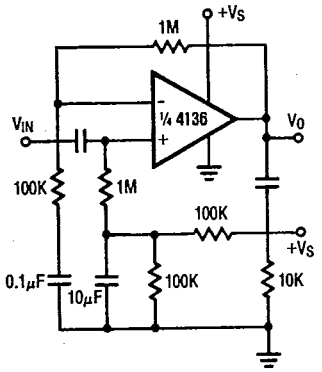
Typical Applications (Continued)

1 kHz Bandpass Active Filter



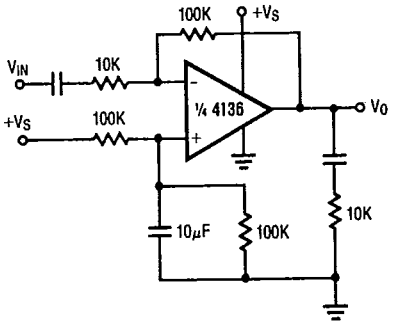
65-00526A

AC Coupled Non-Inverting Amplifier



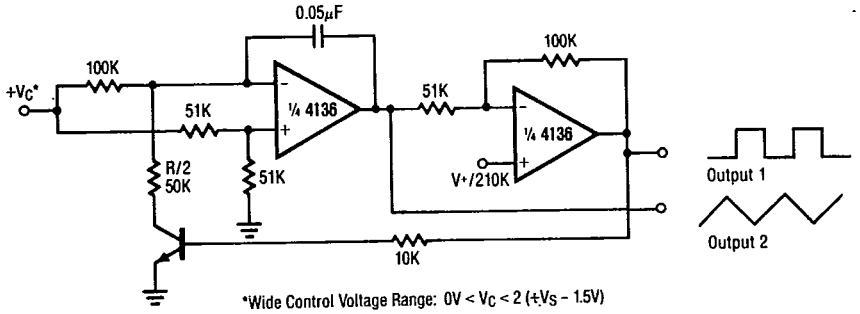
65-00524A

AC Coupled Inverting Amplifier



65-00525A

Voltage Controlled Oscillator (VCO)

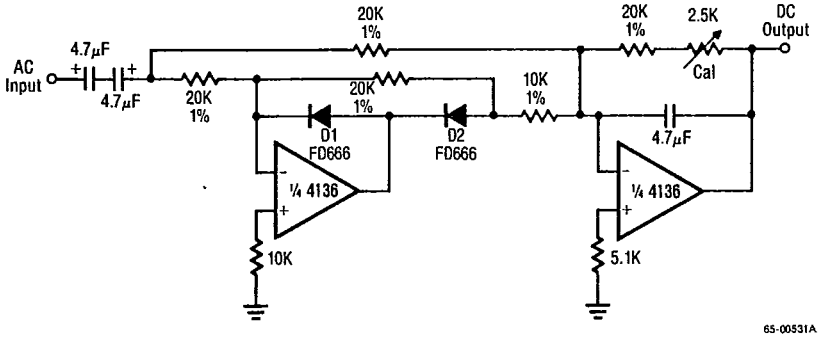


*Wide Control Voltage Range: 0V < Vc < 2 (+Vs - 1.5V)

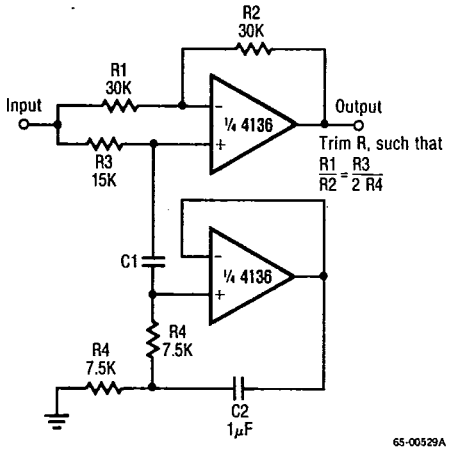
65-00528A

Typical Applications (Continued)

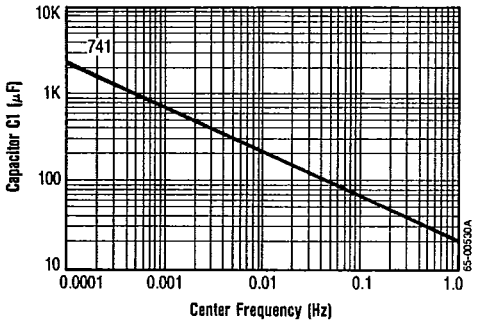
Full-Wave Rectifier and Averaging Filter



Notch Filter Using the 4136 as a Gyrator

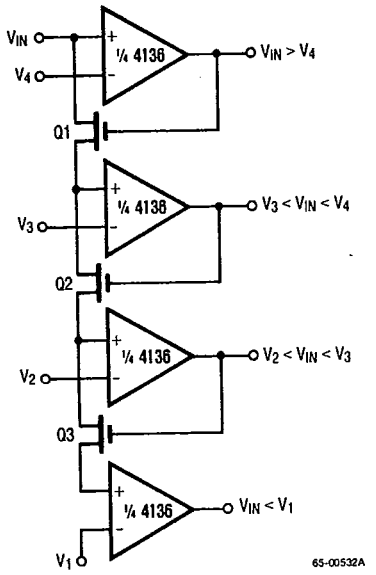


Notch Frequency as a Function of C1

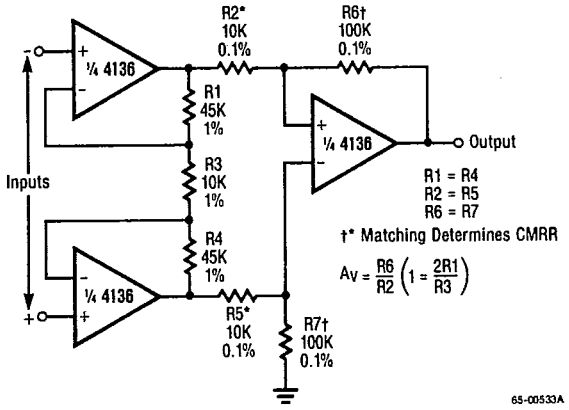


Typical Applications (Continued)

Multiple Aperture Window Discriminator

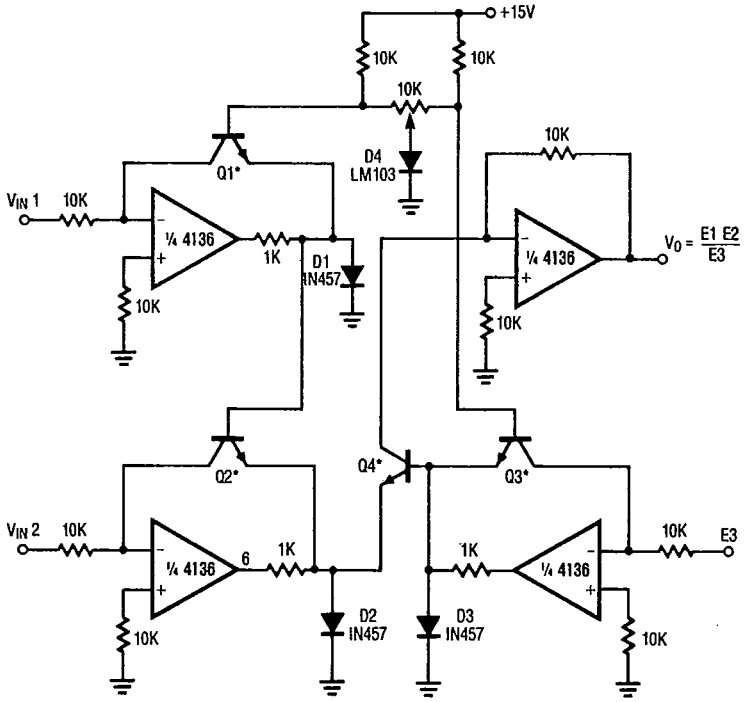


Differential Input Instrumentation Amplifier With High Common Mode Rejection



Typical Applications (Continued)

Analog Multiplier/Divider



*Matched Transistors

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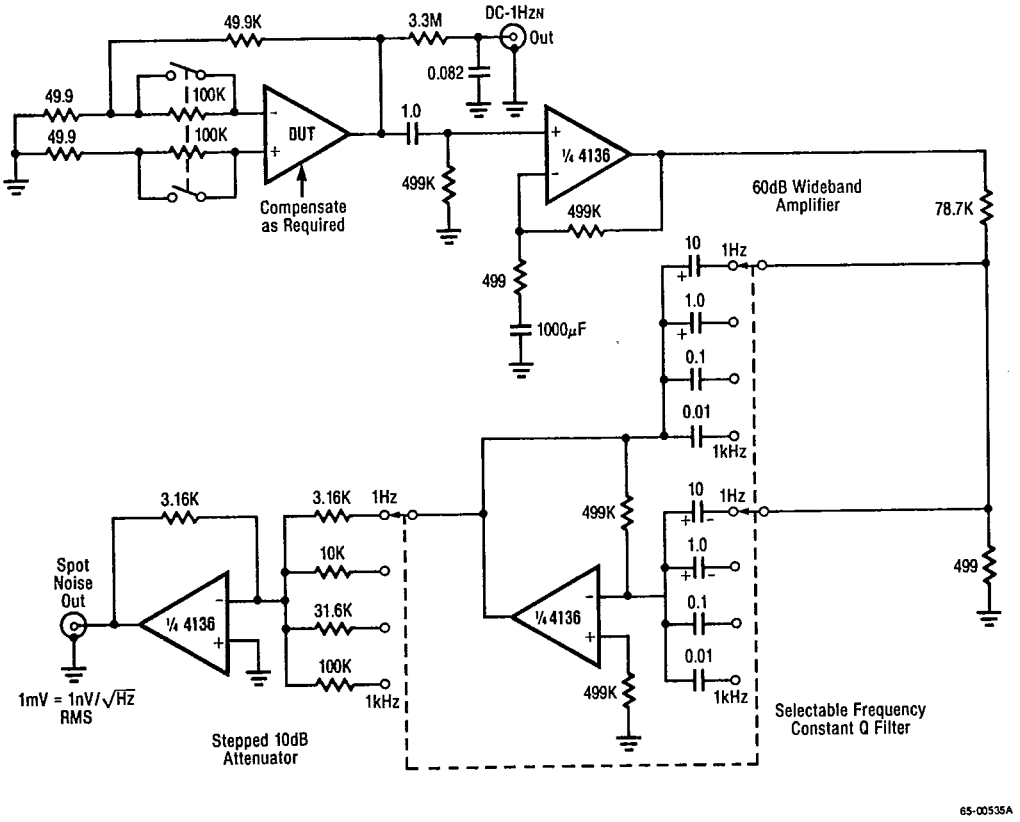
Typical Applications (Continued)

Spot Noise Measurement Test Circuit



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Schematic Diagram