GENERAL DESCRIPTION

The RM4136 and RC4136 include four independent high gain operational amplifiers internally compensated and constructed on a single silicon chip using the planar epitaxial processes.

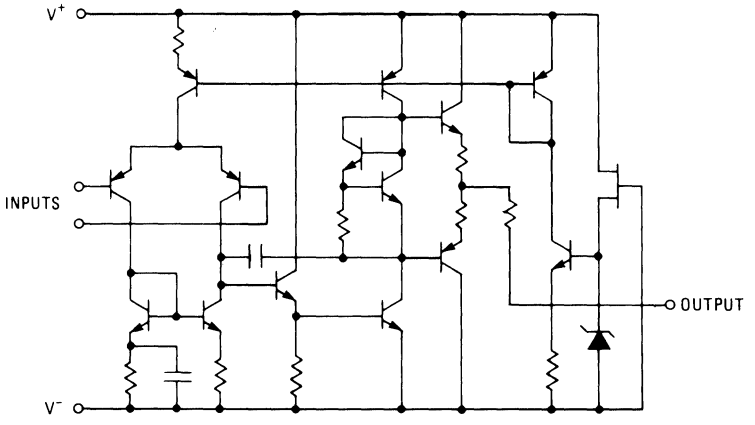
These amplifiers meet or exceed all specifications for 741 type amplifiers. Excellent channel separation allows the use of the 4136 quad amplifier in all 741 operational amplifier applications providing the highest possible packaging density.

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.

DESIGN FEATURES

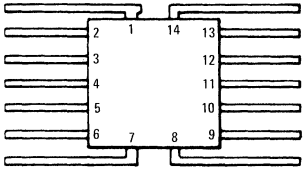
- Unity Gain Bandwidth, 3MHz
- Short-Circuit Protection
- No Frequency Compensation Required
- No Latch-up
- Large Common Mode and Differential Voltage Ranges
- Low Power Consumption
- Parameter Tracking Over Temperature Range
- Gain and Phase Match Between Amplifiers

SCHEMATIC DIAGRAM (1/4 Shown)



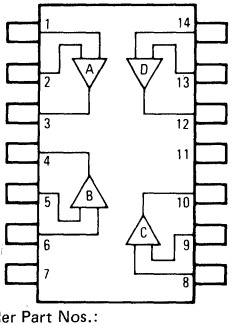
CONNECTION INFORMATION

CJ
Flatpak



Order Part No.:
RM4136CJ

DC and DB
Dual In-line Packages
(Top View)



Order Part Nos.:
RM4136DC, RV4136DB, RV4136DC,
RC4136DB, RC4136DC

PIN	FUNCTION
1	-INPUT (A)
2	+INPUT (A)
3	OUTPUT (A)
4	OUTPUT (B)
5	+INPUT (B)
6	-INPUT (B)
7	$-V_{CC}$
8	-INPUT C
9	+INPUT (C)
10	OUTPUT (C)
11	$+V_{CC}$
12	OUTPUT (D)
13	+INPUT (D)
14	-INPUT (D)

ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... RM4136: ±22V	Storage Temperature Range ..... −65°C to +150°C
RV4136, RC4136: ±18V	Operating Temperature Range .. RM4136: −55°C to +125°C
Internal Power Dissipation (Note 1) 800mW	RC4136: 0°C to +70°C
Differential Input Voltage ..... ±30V	RV4136: −40°C to +85°C
Input Voltage (Note 2) ..... ±15V	Lead Temperature (Soldering, 60s) ..... 300°C
	Output Short-Circuit Duration (Note 3) ..... Indefinite

ELECTRICAL CHARACTERISTICS (V_{CC} = ±15V, T_A = +25°C unless otherwise noted.)

PARAMETER	CONDITIONS	RM4136			RV4136, RC4136			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$R_S \leq 10$ kΩ		0.5	4.0		0.5	* 6.0	mV
Input Offset Current			5.0	150		5.0	* 200	nA
Input Bias Current			40	400		40	* 500	nA
Input Resistance		0.3	5.0		0.3	5.0		MΩ
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ V_{out} = ±10V	50,000	300,000		* 20,000	300,000		V/V
Output Voltage Swing	$R_L \geq 10$ kΩ	±12	±14		* ±12	±14		V
	$R_L \geq 2$ kΩ	±10	±13		* ±10	±13		V
Input Voltage Range		±12	±14		* ±12	±14		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	100		* 70	100		dB
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		10	150		10	* 150	μV/V
Power Consumption	$R_L = \infty$, All Outputs		210	340		210	* 340	mW
Transient Response (unity gain) V_{in} = 20 mV R_L = 2 kΩ $C_L \leq 100$ pF								
Risetime			0.13			0.13		μs
Overshoot			5.0			5.0		%
Unity Gain Bandwidth			3.0			3.0		MHz
Slew Rate (unity gain)	$R_L \geq 2$ kΩ		1.5			1.0		V/μs
Channel Separation (Gain = 100)	f = 10 kHz R_S = 1 kΩ		90			90		dB
The following specifications apply for $-55°C \leq T_A \leq +125°C$ for RM4136; $0°C \leq T_A \leq +70°C$ for RC4136.								
Input Offset Voltage	$R_S \leq 10$ kΩ			6.0			* 7.5	mV
Input Offset Current				* 500			300	nA
Input Bias Current				* 1500			800	nA
Large-Signal Voltage Gain	$R_L \geq 2$ kΩ V_{out} = ±10V	25,000			* 15,000			V/V
Output Voltage Swing	$R_L \geq 2$ kΩ	±10			* ±10			V
Power Consumption	T_A = High		180	300		180	* 300	mW
	T_A = Low		240	400		240	* 400	mW

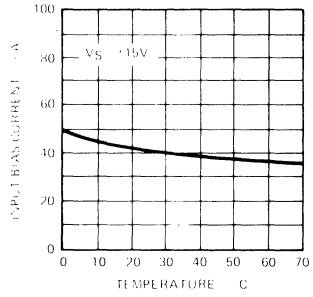
* = RV limits

NOTES:

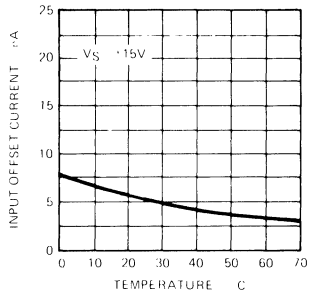
1. Rating applies for case temperature to +25°C; derate linearly at 6.4 mW/°C for ambient temperatures above +25°C.
2. For supply voltages less than ±15V the absolute maximum input voltage is equal to the supply voltage.
3. Short-circuit may be to ground or one amplifier only. I_{CC} = 45mA (typical).

TYPICAL ELECTRICAL DATA

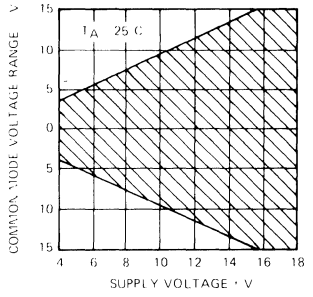
Input Bias Current as a Function of Ambient Temperature



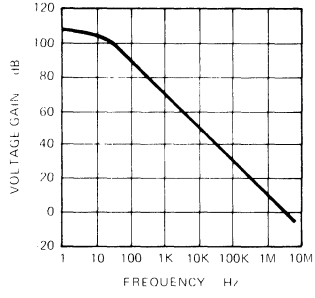
Input Offset Current as a Function of Ambient Temperature



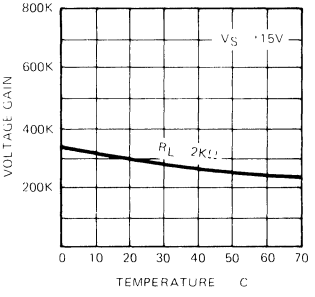
Common Mode Range as a Function of Supply Voltage



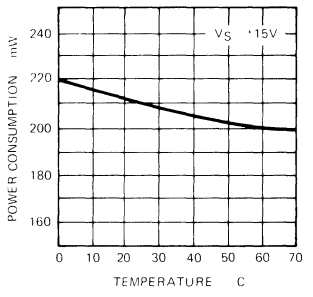
Open Loop Voltage Gain as a Function of Frequency



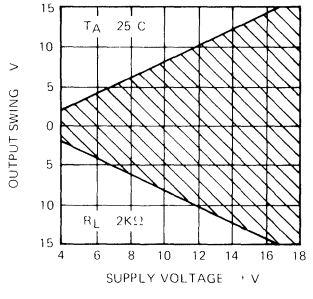
Open Loop Gain as a Function of Temperature



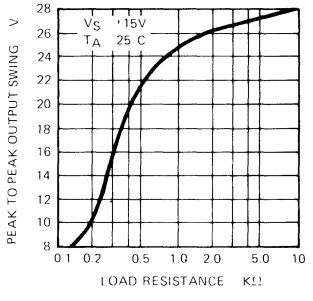
Power Consumption as a Function of Ambient Temperature



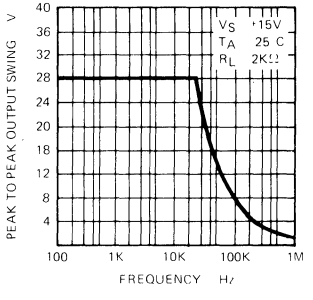
Typical Output Voltage as a Function of Supply Voltage



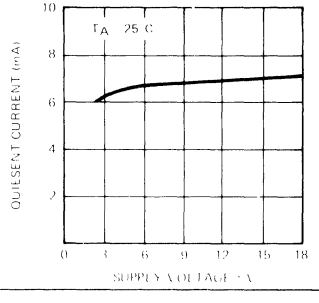
Output Voltage Swing as a Function of Load Resistance



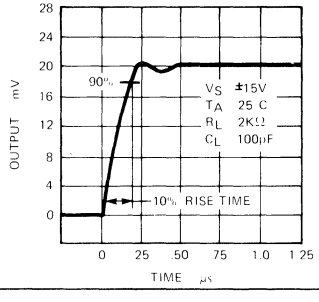
Output Voltage Swing as a Function of Frequency



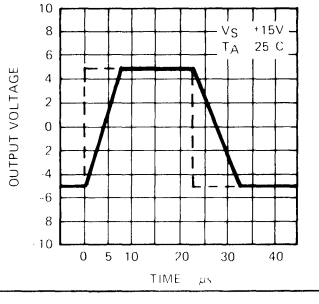
Quiesent Current as a Function of Supply Voltage



Transient Response

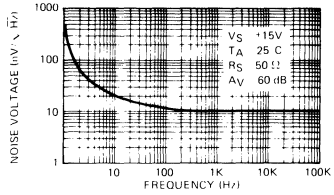


Voltage Follower Large-Signal Pulse Response

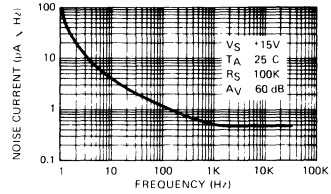


TYPICAL ELECTRICAL DATA

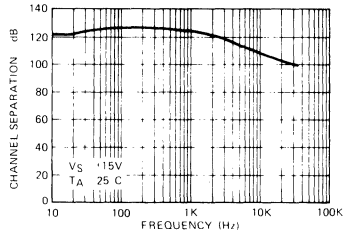
Input Noise Voltage as a Function of Frequency



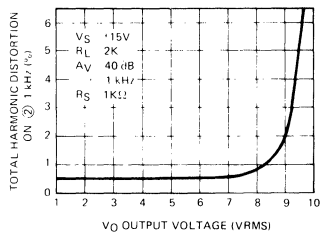
Input Noise Current as a Function of Frequency



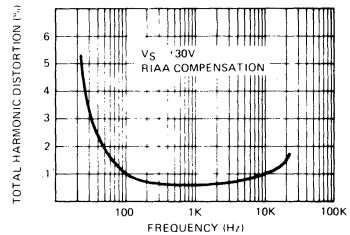
Channel Separation



Total Harmonic Distortion vs Output Voltage



Distortion vs Frequency V_O = 1vrms



ELECTRICAL CHARACTERISTICS COMPARISON (V_{CC} = ±15V, T_A = +25°C)

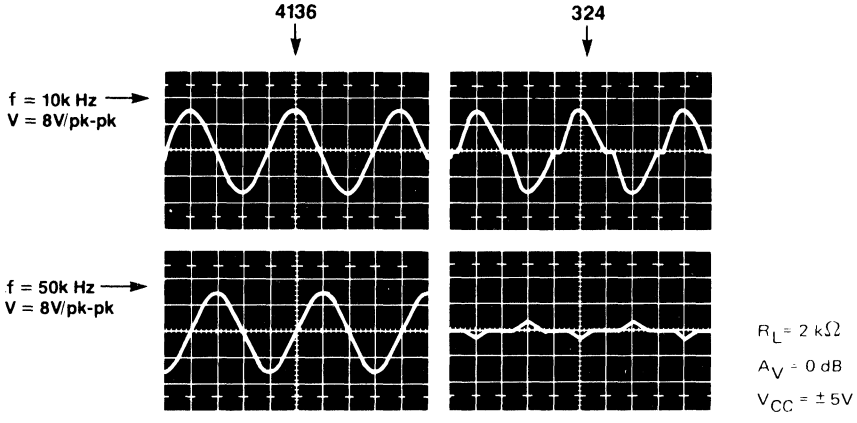
PARAMETER		RC4136 (typ)	RC741 (typ)	LM324 (typ)	UNIT
Input Offset Voltage		0.5	2.0	2	mV
Input Offset Current		5	10	5	nA
Input Bias Current		40	80	55	nA
Input Resistance		5	2		MΩ
Large-Signal Voltage Gain (R_L = 2 kΩ)		300,000	200,000	100,000	V/V
Output Voltage Swing (R_L = 2 kΩ)		±13V	±13V	$\lvert+V_{CC} - 1.2V\rvert$ to $-V_{CC}$	$\overline{V}$
Input Voltage Range		±14V	±13V	$\lvert+V_{CC} - 1.5V\rvert$ to $-V_{CC}$	$\overline{V}$
Common-Mode Rejection Ratio		100	90	85	dB
Supply Voltage Rejection Ratio		10	30	10	μV/V
Transient Response (gain = 1)	Risetime	0.13	0.3		μs
	Overshoot	5	5		%
Unity-Gain Bandwidth		3	0.8	0.8	MHz
Unity-Gain Slew Rate		1.0	0.5	0.5	V/μs
Input Noise Voltage (f_O = 1 kHz)		10	22.5		$nV/\sqrt{Hz}$
Output Short-Circuit Current		±45	±25		mA

RAYTHEON

4136 vs. 741

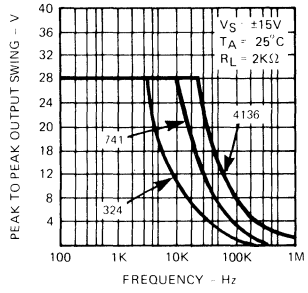
Although the 324 is an excellent device for single-supply applications where ground-sensing is important, it is a poor substitute for four 741's in split-supply circuits.

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.

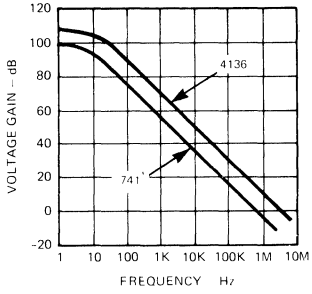


Comparative Cross-over Distortion

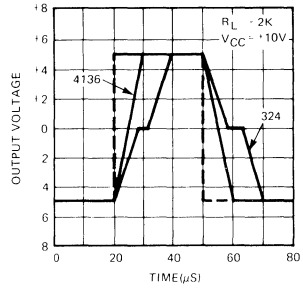
Output Voltage Swing as a Function of Frequency



Open Loop Voltage Gain as a Function of Frequency

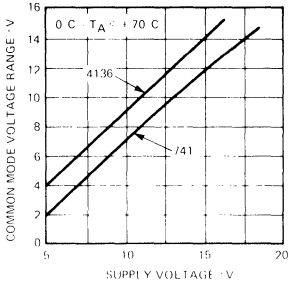


Voltage Follower Large-Signal Pulse Response

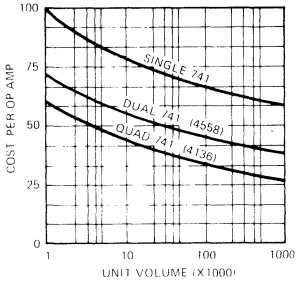


Typical Characteristics Curves Comparison

Input Common Mode Voltage Range as a Function of Supply Voltage

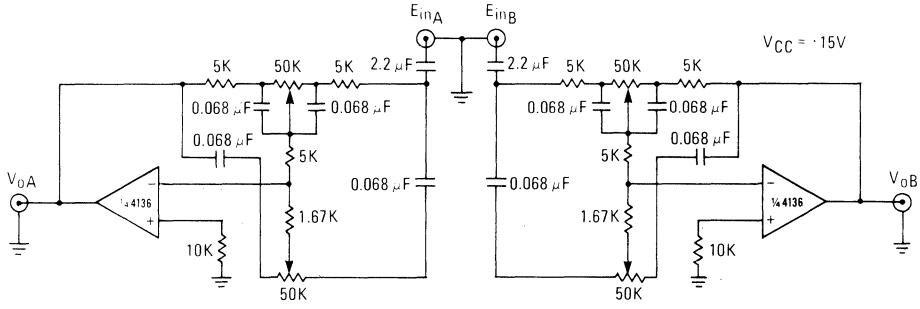


Unit Cost Comparisons

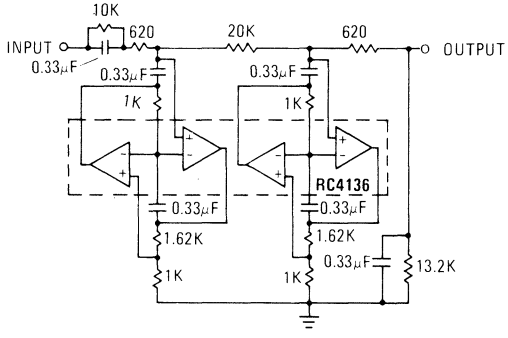


4136 TYPICAL APPLICATIONS

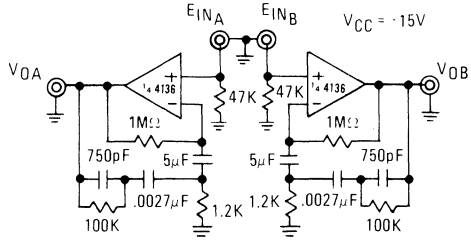
Stereo Tone Control



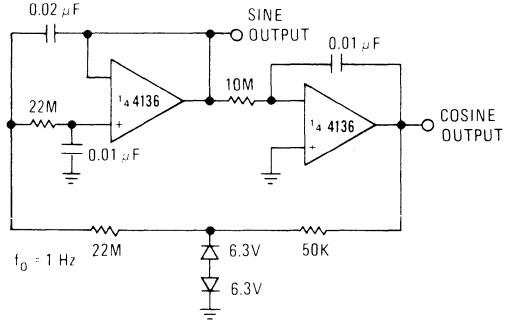
400 Hz Lowpass Butterworth Active Filter



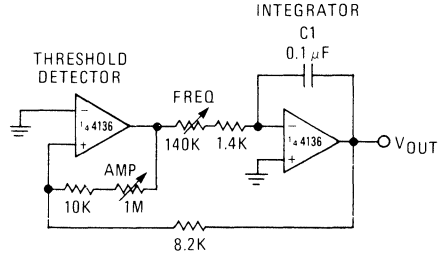
RIAA Preamplifier



Low Frequency Sine Wave Generator with Quadrature Output



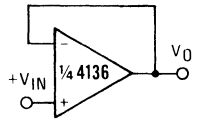
Triangular-Wave Generator



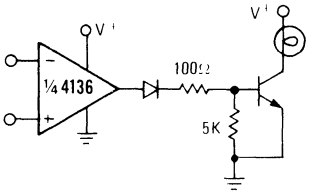
RAYTHEON

4136 TYPICAL APPLICATIONS

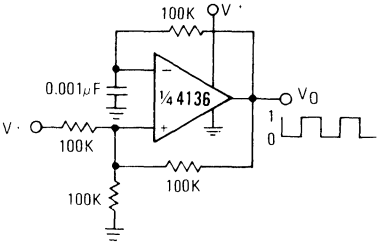
Voltage Follower



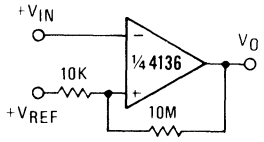
Lamp Driver



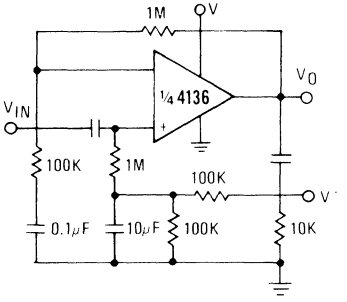
Squarewave Oscillator



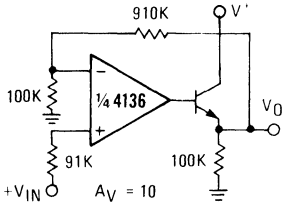
Comparator With Hysteresis



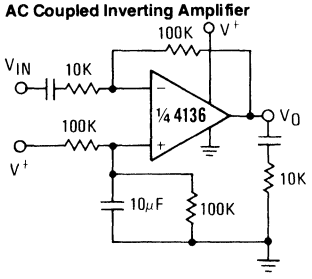
AC Coupled Non-Inverting Amplifier



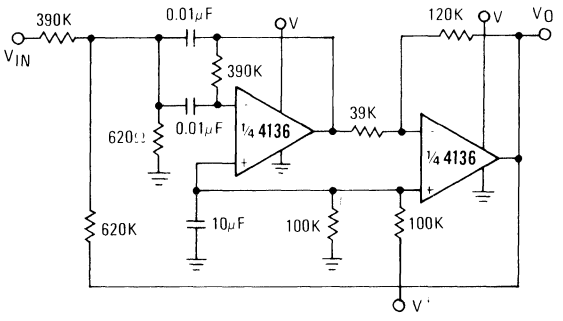
Power Amplifier



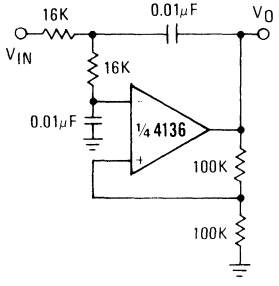
AC Coupled Inverting Amplifier



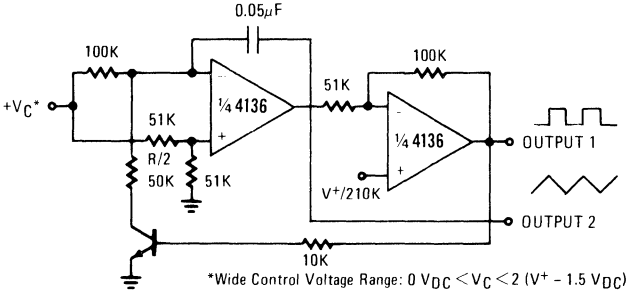
1 kHz Bandpass Active Filter



DC Coupled 1 kHz Low-Pass Active Filter



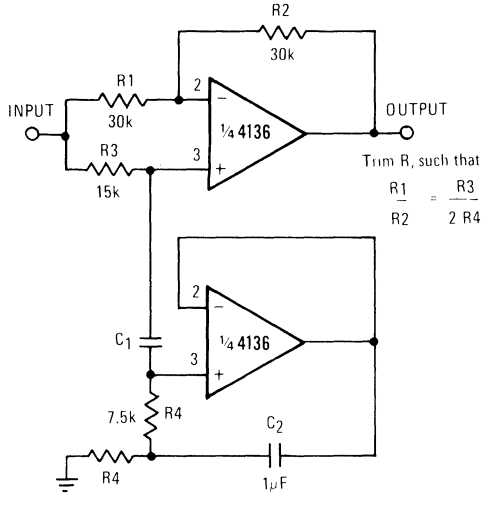
Voltage Controlled Oscillator (VCO)



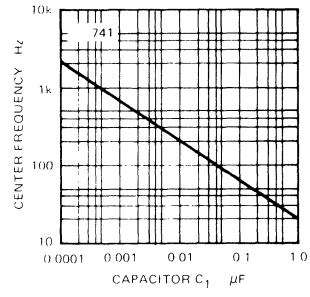
*Wide Control Voltage Range: 0 $V_{DC} < V_C < 2$ ($V^+ - 1.5\ V_{DC}$)

4136 TYPICAL APPLICATIONS

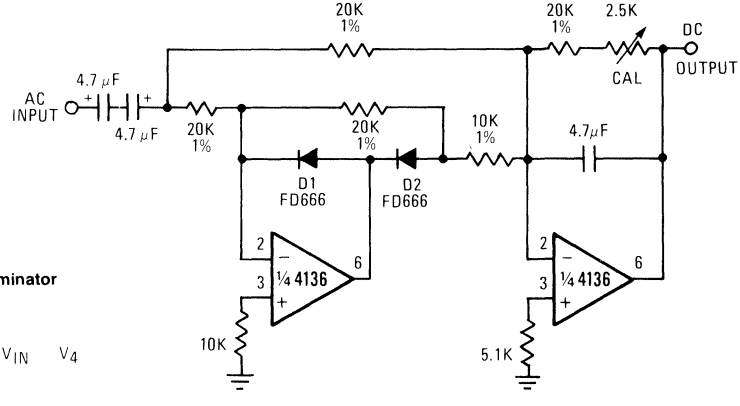
Notch Filter Using the 4136 as a Gyrator



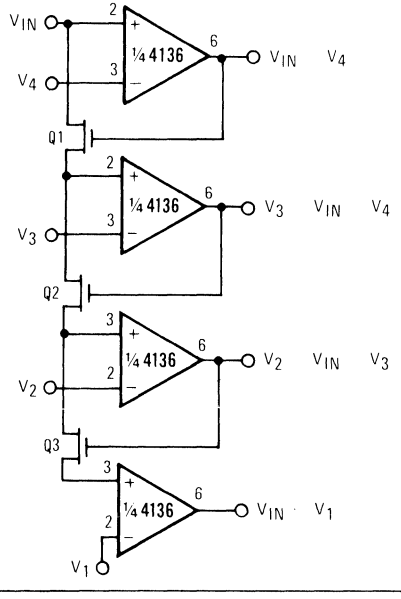
Notch Frequency as a Function of C_1



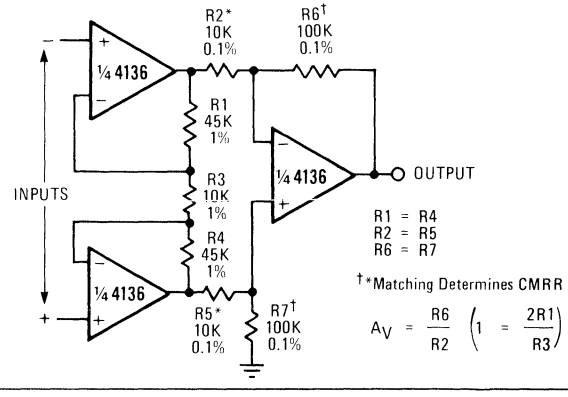
Full-Wave Rectifier and Averaging Filter



Multiple Aperture Window Discriminator



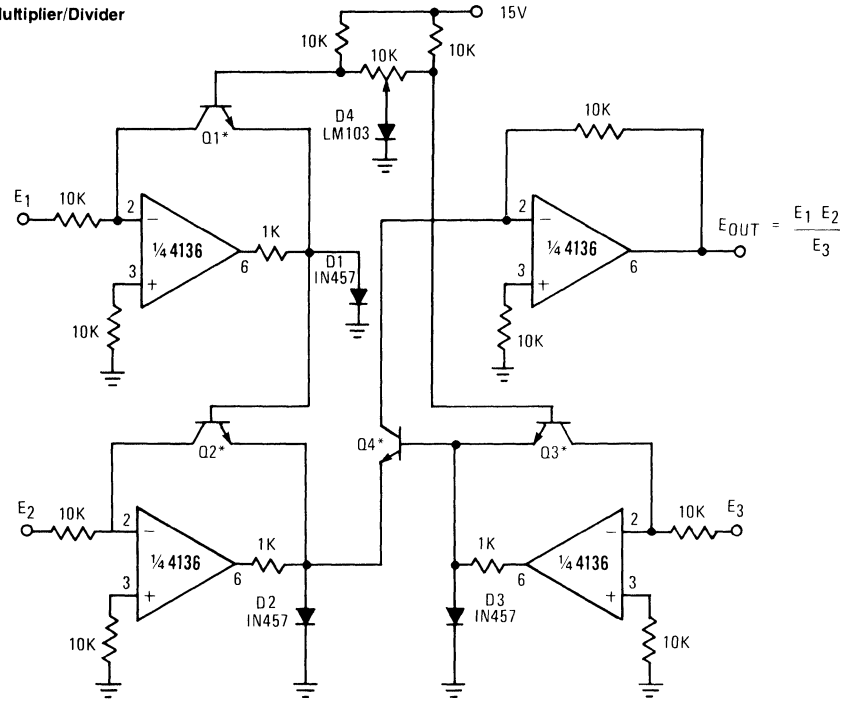
Differential Input Instrumentation Amplifier with High Common Mode Rejection



RAYTHEON

4136 TYPICAL APPLICATIONS

Analog Multiplier/Divider



Noise Measurement Test Circuit