μA4136

QUAD OPERATIONAL AMPLIFIERS

FAIRCHILD LINEAR INTEGRATED CIRCUITS

GENERAL DESCRIPTION — The μA4136 monolithic Quad Operational Amplifiers consists of four independent high gain, internally frequency compensated operational amplifiers. The specifically designed low noise input transistors allow the μA4136 to be used in low noise signal processing applications such as audio preamplifiers and signal conditioners. They are constructed using the Fairchild Planar* Epitaxial process. The simplified output stage completely eliminates crossover distortion under any load conditions, has large source and sink capacity, and is short-circuit protected. A novel current source stabilizes output parameters over a wide power supply voltage range.

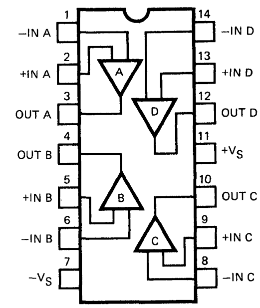
- **UNITY GAIN BANDWIDTH 3 MHz**
- **CONTINUOUS SHORT CIRCUIT PROTECTION**
- **NO FREQUENCY COMPENSATION REQUIRED**
- **NO LATCH-UP**
- **LARGE COMMON MODE AND DIFFERENTIAL VOLTAGE RANGES**
- **μA741 OPERATIONAL AMPLIFIER TYPE PERFORMANCE**
- **PARAMETER TRACKING OVER TEMPERATURE RANGE**
- **GAIN AND PHASE MATCH BETWEEN AMPLIFIERS**

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	
μA4136	±22 V
μA4136C	±18 V
Differential Input Voltage (Note 1)	±30 V
Input Voltage (Note 1)	±15 V
Internal Power Dissipation (Note 2)	670 mW
Output Short Circuit Duration (Note 3)	Indefinite
Operating Temperature Range	
μA4136	−55°C to +125°C
μA4136C	0°C to +70°C
Storage Temperature Range	
Molded Package	−55°C to +125°C
Hermetic Package	−65°C to +150°C
Pin Temperature	
Molded Package (Soldering, 10 s)	260°C
Hermetic Package (Soldering, 60 s)	300°C

CONNECTION DIAGRAM
14-PIN DIP
(TOP VIEW)

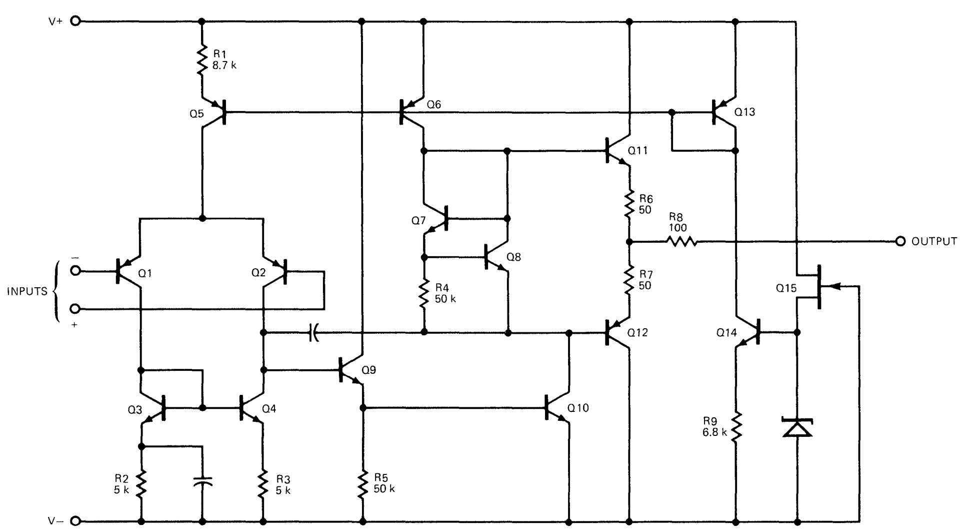
PACKAGE OUTLINE **6A 9A**
PACKAGE CODE D P



ORDER INFORMATION

TYPE	PART NO.
μA4136	μA4136DM
μA4136C	μA4136DC
μA4136C	μA4136PC

1/4 OF EQUIVALENT CIRCUIT



*Planar is a patented Fairchild process.

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$, $V_S = ±15V$ unless otherwise specified

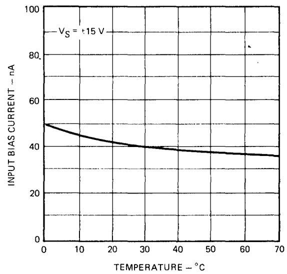
CHARACTERISTICS	CONDITIONS	μA4136 MIN	μA4136 TYP	μA4136 MAX	μA4136C MIN	μA4136C TYP	μA4136C MAX	UNITS
Input Offset Voltage	$R_S \leqslant 10\ k\Omega$		0.5	5.0		0.5	6.0	mV
Input Offset Current			5.0	200		5.0	200	nA
Input Bias Current			40	500		40	500	nA
Input Resistance		0.3	5.0		0.3	5.0		MΩ
Large Signal Voltage Gain	$R_L \geqslant 2\ k\Omega$, $V_{OUT} = \pm 10\ V$	50,000	300,000		20,000	300,000		
Output Voltage Swing	$R_L \geqslant 10\ k\Omega$	±12	±14		±12	±14		V
	$R_L \geqslant 2\ k\Omega$	±10	±13		±10	±13		V
Input Voltage Range		±12	±14		±12	±14		V
Common Mode Rejection Ratio	$R_S \leqslant 10\ k\Omega$	70	90		70	90		dB
Supply Voltage Rejection Ratio	$R_S \leqslant 10\ k\Omega$		30	150		30	150	μV/V
Power Consumption			210	340		210	340	mW
Transient Response (Unity Gain) Risetime	$V_{IN} = 20\ mV$, $R_L = 2\ k\Omega$, $C_L \leqslant 100\ pF$		0.13			0.13		μs
Transient Response (Unity Gain) Overshoot	$V_{IN} = 20\ mV$, $R_L = 2\ k\Omega$, $C_L \leqslant 100\ pF$		5.0			5.0		%
Unity Gain Bandwidth			3.0			3.0		MHz
Slew Rate (Unity Gain)	$R_L \geqslant 2\ k\Omega$		1.5			1.0		V/μs
Channel Separation (Open Loop)	f = 10 kHz, $R_S = 1\ k\Omega$		105			105		dB
(Gain = 100)	f = 10 kHz, $R_S = 1\ k\Omega$		105			105		dB
The following specifications apply for $-55°C \leqslant T_A \leqslant +125°C$ for μA4136; $0°C \leqslant T_A \leqslant +70°C$ for μA4136C.								
Input Offset Voltage	$R_S \leqslant 10\ k\Omega$			6.0			7.5	mV
Input Offset Current				500			300	nA
Input Bias Current				1500			800	nA
Large Signal Voltage Gain	$R_L \geqslant 2\ k\Omega$, $V_{OUT} = \pm 10\ V$	25,000			15,000			
Output Voltage Swing	$R_L \geqslant 2\ k\Omega$, $V_S = \pm 15\ V$	±12			±10			V
Power Consumption	T_A = High		180	300		180	300	mW
	T_A = Low		240	400		240	400	

NOTES:

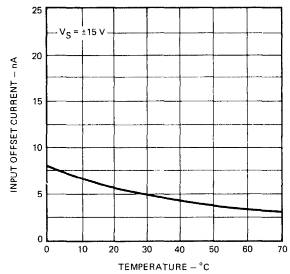
1. For supply voltage less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
2. Rating applies to ambient temperature up to 70°C. Above $T_A = 70°C$, derate linearly at 8.3 mW/°C.
3. Short-circuit may be to ground, one amplifier only. I_{SC} = 45 mA (Typical).

TYPICAL PERFORMANCE CURVES

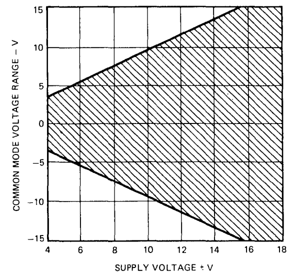
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



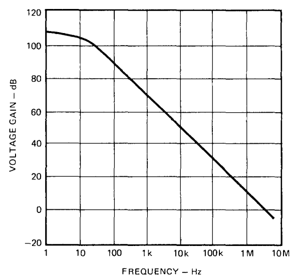
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



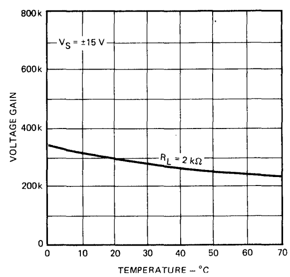
COMMON MODE RANGE AS A FUNCTION OF SUPPLY VOLTAGE



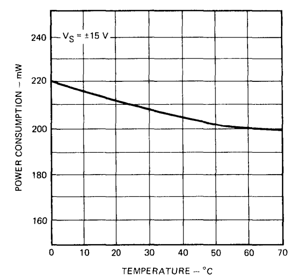
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



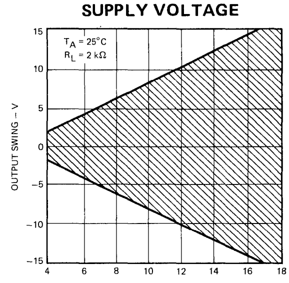
OPEN LOOP GAIN AS A FUNCTION OF TEMPERATURE



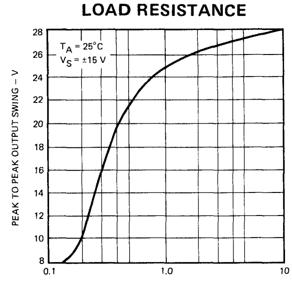
POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE



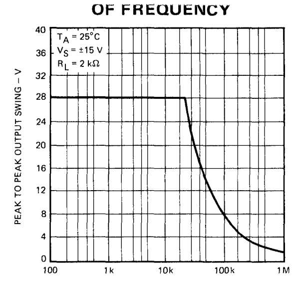
TYPICAL OUTPUT VOLTAGE AS A FUNCTION OF SUPPLY VOLTAGE



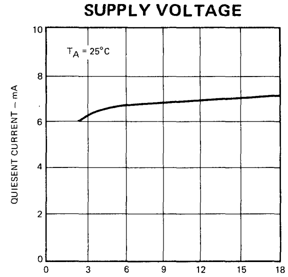
OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE



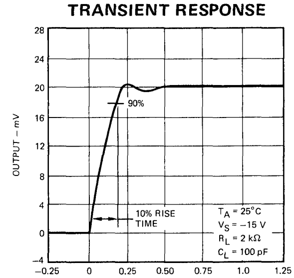
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



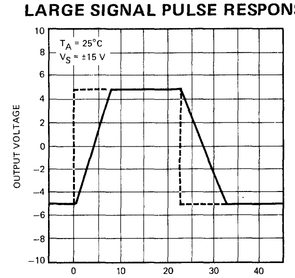
QUIESENT CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



TRANSIENT RESPONSE

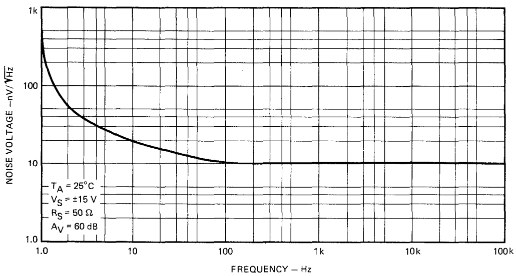


VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE

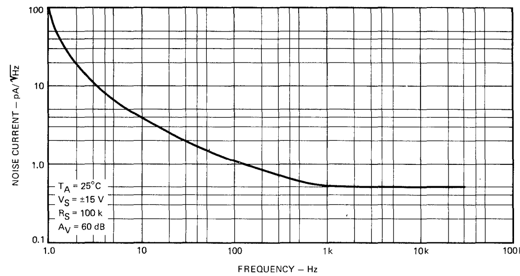


TYPICAL PERFORMANCE CURVES (Cont'd)

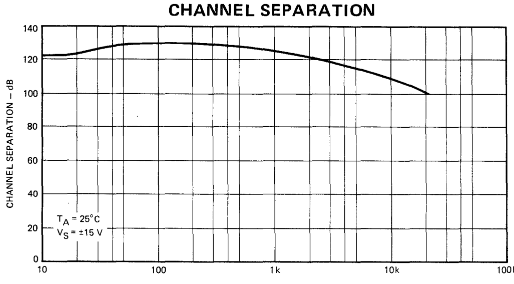
INPUT NOISE VOLTAGE AS A FUNCTION OF FREQUENCY



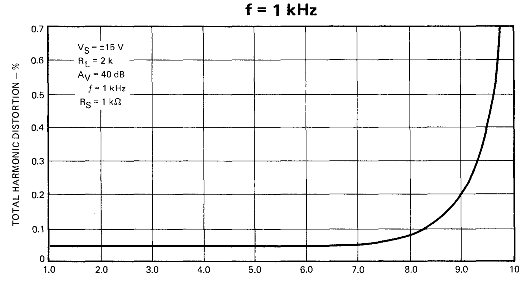
INPUT NOISE CURRENT AS A FUNCTION OF FREQUENCY



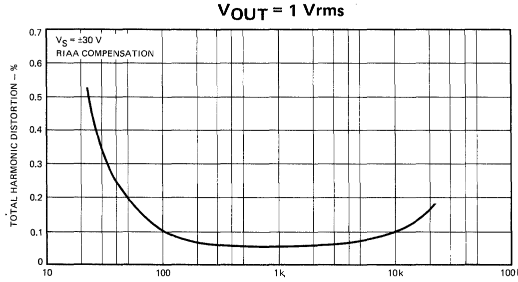
CHANNEL SEPARATION



TOTAL HARMONIC DISTORTION AS A FUNCTION OF OUTPUT VOLTAGE f = 1 kHz

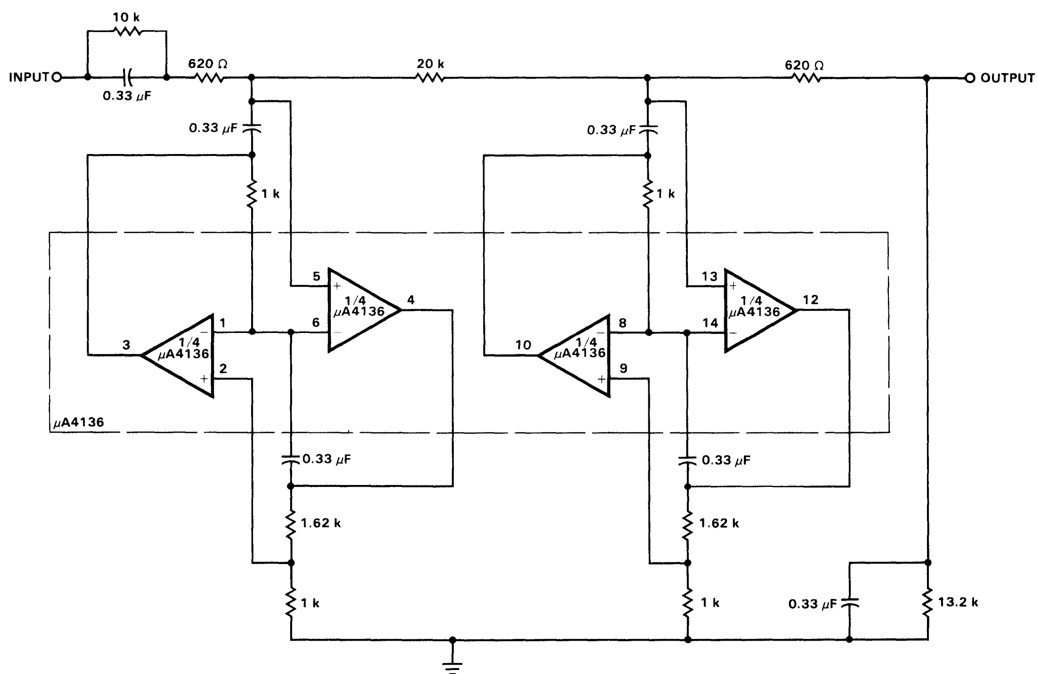


DISTORTION AS A FUNCTION OF FREQUENCY V_{OUT} = 1 Vrms

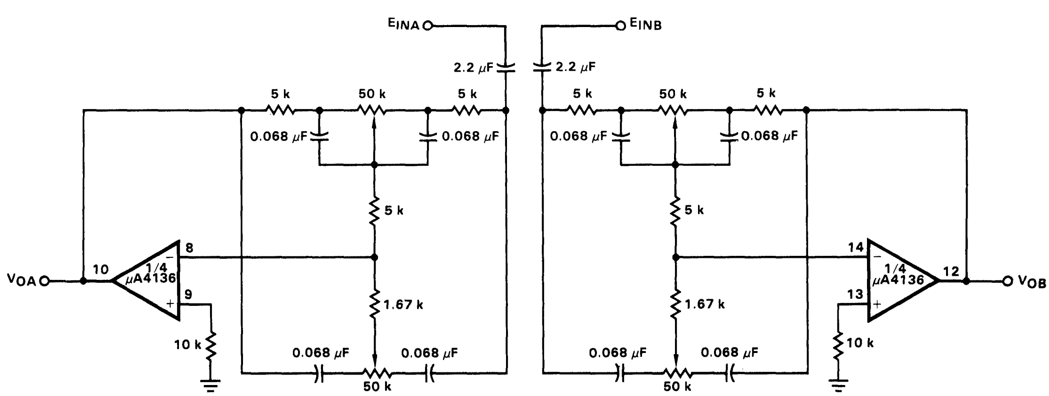


TYPICAL APPLICATIONS

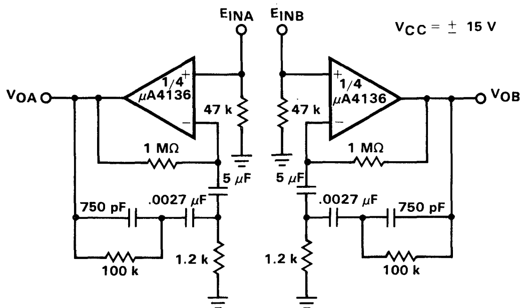
400 Hz LOWPASS BUTTERWORTH ACTIVE FILTER



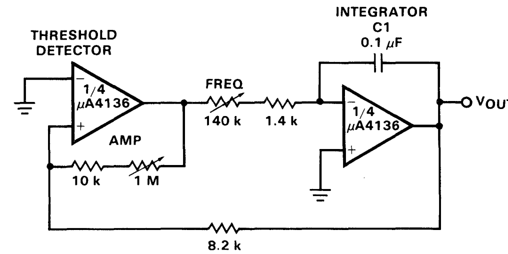
STEREO TONE CONTROL



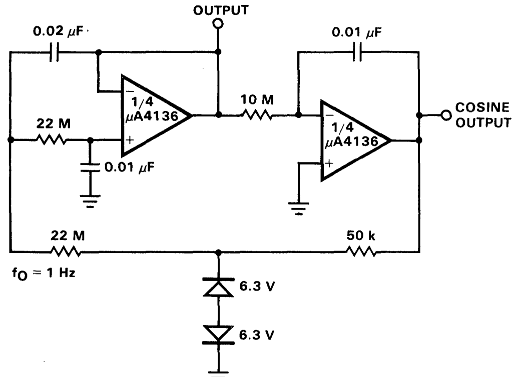
RIAA PREAMPLIFIER



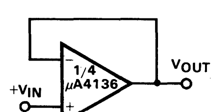
TRIANGULAR-WAVE GENERATOR



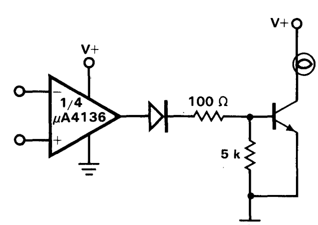
LOW FREQUENCY SINE WAVE GENERATOR
WITH QUADRATURE OUTPUT



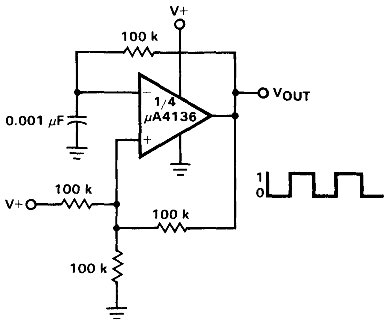
VOLTAGE FOLLOWER



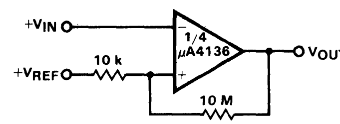
LAMP DRIVER



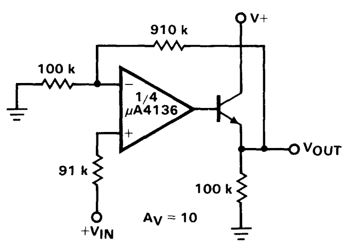
SQUAREWAVE OSCILLATOR



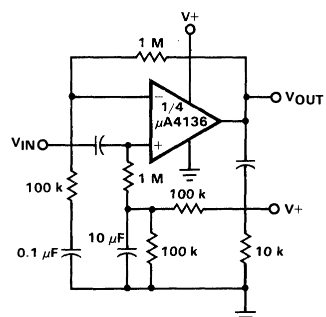
COMPARATOR WITH HYSTERESIS



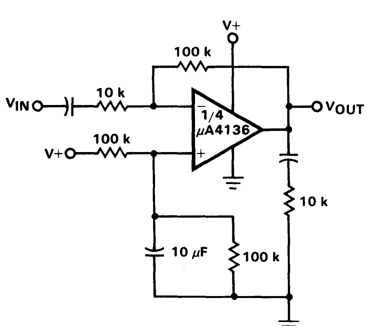
POWER AMPLIFIER



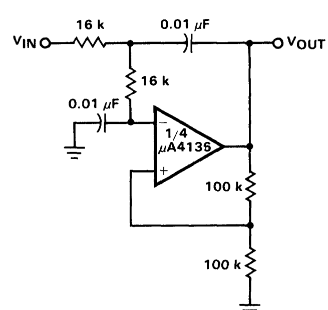
AC COUPLED NON-INVERTING AMPLIFIER



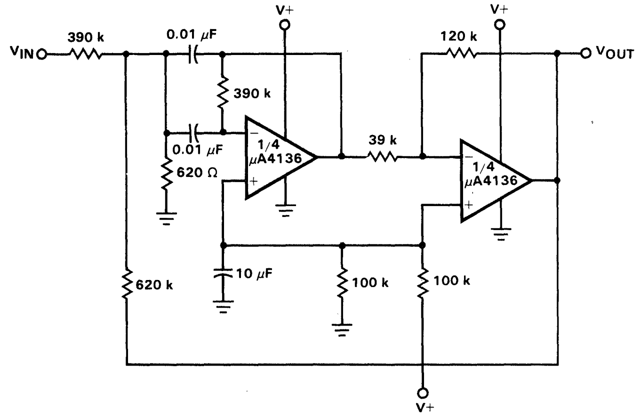
AC COUPLED INVERTING AMPLIFIER



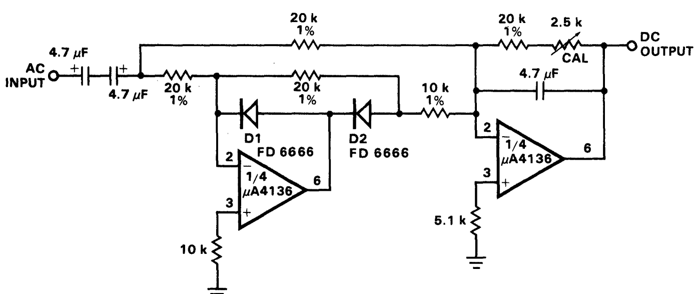
DC COUPLED 1 kHz LOW-PASS ACTIVE FILTER



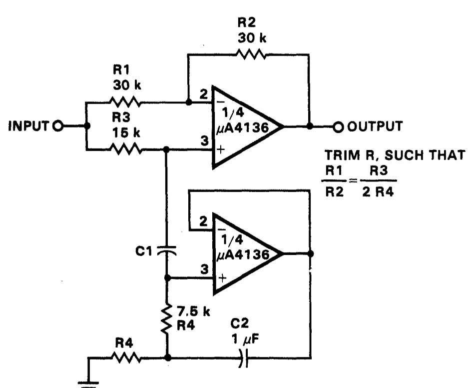
1 kHz BANDPASS ACTIVE FILTER



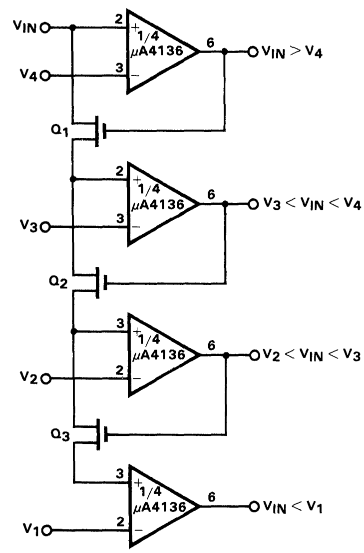
FULL-WAVE RECTIFIER AND AVERAGING FILTER



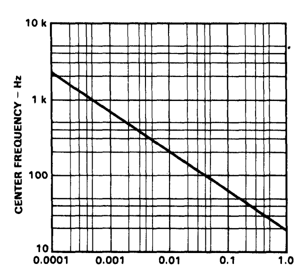
NOTCH FILTER USING THE μA4136 AS A GYRATOR



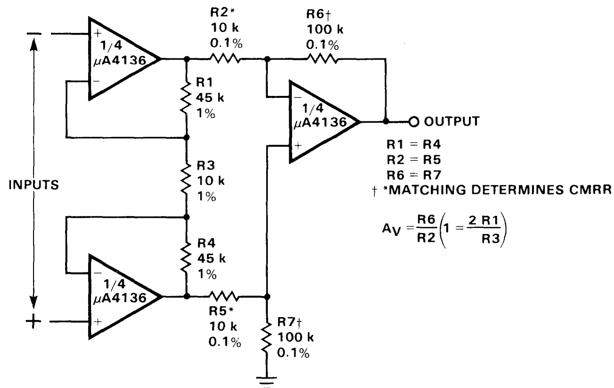
MULTIPLE APERTURE WINDOW DISCRIMINATOR



NOTCH FREQUENCY AS A FUNCTION OF C1



DIFFERENTIAL INPUT INSTRUMENTATION AMPLIFIER WITH HIGH COMMON MODE REJECTION



ANALOG MULTIPLIER/DIVIDER