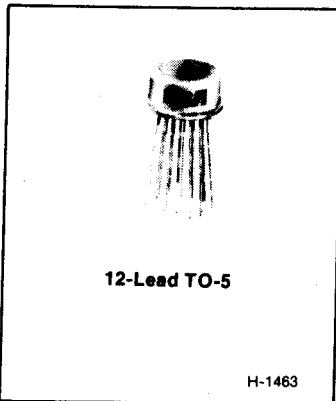


Operational Amplifiers

CA3021, CA3022, CA3023

Low-Power Wideband Amplifiers



Features:

- Lower DC Power Drain:

$$P_r \begin{cases} \text{CA3021} = 4 \text{ mW typ.} \\ \text{CA3022} = 12.5 \text{ mW typ.} \\ \text{CA3023} = 35 \text{ mW tp.} \end{cases} \text{ at } V_{cc} = 6 \text{ V}$$

- Excellent frequency response:

$$\begin{matrix} -3\text{dB} \\ \text{BW} \end{matrix} \begin{cases} \text{CA3021} = 2.4 \text{ MHz typ.} \\ \text{CA3022} = 7.5 \text{ MHz typ.} \\ \text{CA3023} = 16 \text{ MHz typ.} \end{cases}$$

- High Voltage Gain:

$$A \begin{cases} \text{CA3021} = 56 \text{ dB typ. at } 0.5 \text{ MHz} \\ \text{CA3022} = 57 \text{ dB typ. at } 2.5 \text{ MHz} \\ \text{CA3023} = 53 \text{ dB typ. at } 5 \text{ MHz} \end{cases}$$

- Wide AGC Range: 33 dB typ.

- Only one power supply (4.5 to 12 V) required

- Hermetically sealed 12-lead TO-5-style package

- Operation from -55°C to $+125^\circ\text{C}$

Applications:

- Gain-controlled linear amplifiers
- AM/FM IF amplifiers
- Video amplifiers
- Limiters

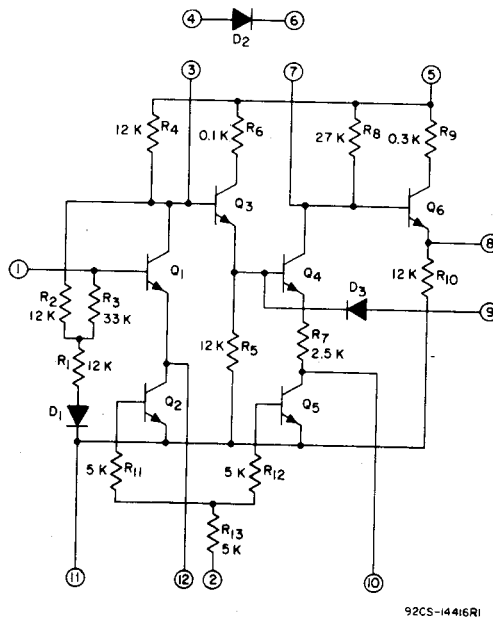


Fig. 1 - Schematic diagram for CA3021, CA3022, and CA3023.

Linear Integrated Circuits

CA3021, CA3022, CA3023

ABSOLUTE-MAXIMUM RATINGS:

OPERATING-TEMPERATURE RANGE	-55°C to +125°C	
STORAGE-TEMPERATURE RANGE	-65°C to +150°C	
LEAD TEMPERATURE (During Soldering):		
At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm)		
from case for 10 seconds max.	+265°C	
DEVICE DISSIPATION, P _T	120 max.	mW
INPUT-SIGNAL VOLTAGE	-3, +3 max.	V
DC VOLTAGES AND CURRENTS	See Table Below	

TERMINAL	VOLTAGE OR CURRENT LIMITS		CIRCUIT CONDITIONS	
	NEGATIVE	POSITIVE	TERMINAL	CONDITIONS
1	-3V	+3V	1	Connected to Voltage Source through 100Ω Resistor
			5	+12V
			10, 11, 12	Ground
2	-3V	+12V	5	+12V
			10, 11, 12	Ground
3	0V	+12V	5	+12V
			10, 11, 12	Ground
4	-12V	+12V	6, 11	Ground
	10 max. mA			
5	0V	+18V	10, 11, 12	Ground
6	-12V	+12V	5, 11	Ground
	10 max. mA			

TERMINAL	VOLTAGE OR CURRENT LIMITS		CIRCUIT CONDITIONS	
	NEGATIVE	POSITIVE	TERMINAL	CONDITIONS
7	0V	+12V	5	+12V
			10, 11, 12	Ground
8	20 max. mA		5	+12V
			10, 11, 12	Ground
9	-0.5V	+3V	5	+12V
			10, 11, 12	Ground
10	0V	+4V	2,5	+12V
			11	Ground
11	-6V	+12V	2	Ground
			5	+12V
12	0V	+4V	2,5	+12V
			11	Ground

Operational Amplifiers

CA3021, CA3022, CA3023

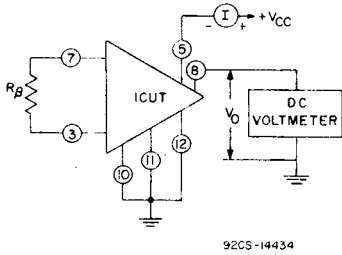
ELECTRICAL CHARACTERISTICS, at $T_A = 25^\circ\text{C}$, $V_{CC} = +6\text{V}$, unless otherwise specified

CHARACTERISTIC	SYMBOL	TEST CONDITIONS			LIMITS									TYPICAL CHARACTERISTIC CURVE	
		TEST SETUP AND PROCEDURE	FEEDBACK RESISTANCE (R_B) BETWEEN TERMINALS 3 AND 7	FREQUENCY f	CA3021 (TA5219)			CA3022 (TA5236)			CA3023 (TA5218)				UNITS
					Fig.	Ω	MHz	Min.	Typ.	Max.	Min.	Typ.	Max.		
Device Dissipation	P_T	2	∞	-	1	4	8	-	-	-	-	-	-	mW	3a,d
			∞	-	-	-	-	5	12.5	24	-	-	-	mW	3b,d
			∞	-	-	-	-	-	-	-	24	35	48	mW	3c,d
Quiescent Output Voltage	V_o	2	39k	-	-	2.2	-	-	-	-	-	-	V	-	
			10k	-	-	-	-	-	1.9	-	-	-	V		
			4.7k	-	-	-	-	-	-	-	1.3	-	V		
AGC Source Current	I_{AGC}	4	$V_{AGC} = +6\text{V}$			-	0.8	-	-	0.8	-	0.8	-	mA	-
Voltage Gain	A	5	560k	0.5	50	56	-	-	-	-	-	-	-	dB	6a
			39k	0.8	40	46	-	-	-	-	-	-	-	dB	6a,d
			39k	2.5	-	-	-	50	57	-	-	-	-	dB	6b
			10k	3	-	-	-	40	44	-	-	-	-	dB	6b,d
			18k	5	-	-	-	-	-	-	50	53	-	dB	6c
			4.7k	10	-	-	-	-	-	-	40	44	-	dB	6c,d
Bandwidth at -3 dB Point	BW	5	39k	-	0.8	2.4	-	-	-	-	-	-	-	MHz	6a
			10k	-	-	-	-	3	7.5	-	-	-	-	MHz	6b
			4.7k	-	-	-	-	-	-	-	10	16	-	MHz	6c
Input-Impedance Components	Input Resistance	R_{IN}	7	39k	1	-	4000	-	-	-	-	-	-	Ω	-
				10k	5	-	-	-	-	1300	-	-	-	Ω	
				4.7k	10	-	-	-	-	-	-	300	-	Ω	
	Input Capacitance	C_{IN}	7	39k	1	-	11	-	-	-	-	-	-	pF	-
				10k	5	-	-	-	-	18	-	-	-	pF	
				4.7k	10	-	-	-	-	-	-	13	-	pF	
Output Resistance	R_{OUT}	8	39k	1	-	300	-	-	-	-	-	-	Ω	-	
			10k	5	-	-	-	-	120	-	-	-	Ω		
			4.7k	10	-	-	-	-	-	-	100	-	Ω		
Noise Figure	NF	9	39k	1	-	4.2	8.5	-	-	-	-	-	dB	-	
			10k	1	-	-	-	-	4.4	8.5	-	-	dB		
			4.7k	1	-	-	-	-	-	-	6.5	8.5	dB		
AGC Range	AGC	10	-	1	-	33	-	-	-	-	-	-	dB	-	
			-	5	-	-	-	-	33	-	-	-	dB		
			-	10	-	-	-	-	-	-	33	-	dB		
Maximum Output Voltage (RMS Value)	v_{out}	5	39k	1	-	0.6	-	-	-	-	-	-	$V_{(rms)}$	-	
			10k	5	-	-	-	-	0.7	-	-	-	$V_{(rms)}$		
			4.7k	10	-	-	-	-	-	-	0.5	-	$V_{(rms)}$		

Linear Integrated Circuits

CA3021, CA3022, CA3023

TEST SETUP FOR MEASUREMENT OF DEVICE DISSIPATION AND QUIESCENT OUTPUT VOLTAGE



$$P_T = V_{CC} (I)$$

Fig. 2

DEVICE DISSIPATION VS DC SUPPLY VOLTAGE FOR CA3022

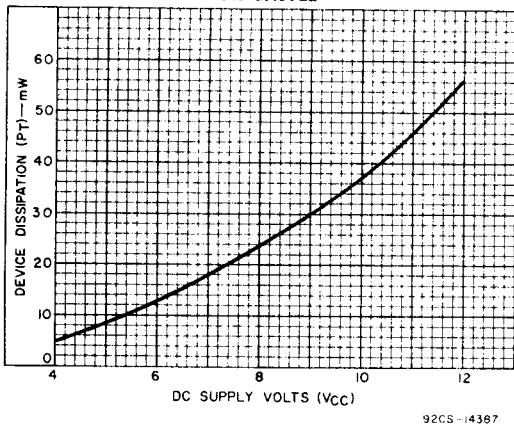


Fig. 3(b)

DEVICE DISSIPATION VS DC SUPPLY VOLTAGE FOR CA3021

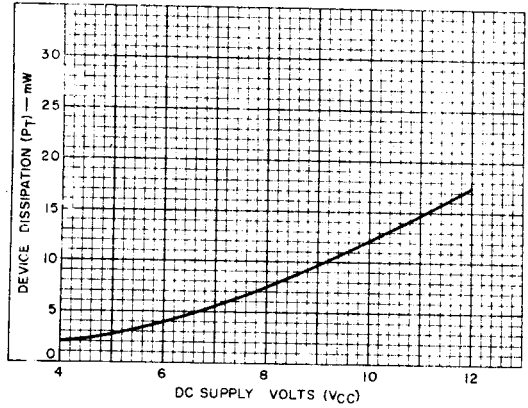


Fig. 3(a)

DEVICE DISSIPATION VS DC SUPPLY VOLTAGE FOR CA3023

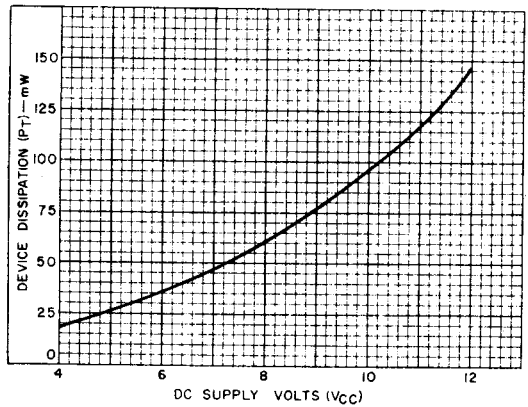


Fig. 3(c)

DEVICE DISSIPATION VS TEMPERATURE FOR CA3021, CA3022, AND CA3023

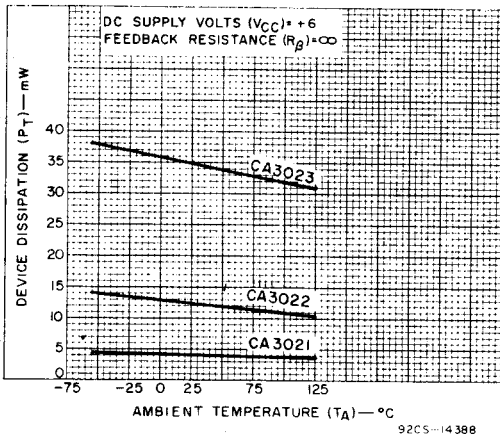
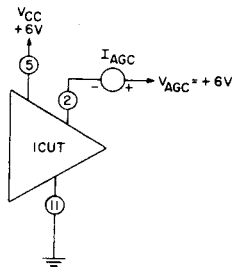


Fig. 3(d)

TEST SETUP FOR MEASUREMENT OF AGC SOURCE CURRENT

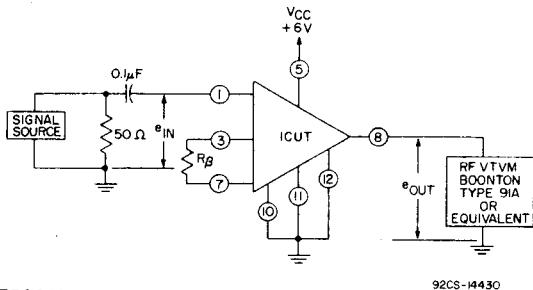


I_{AGC} IS THE CURRENT FLOWING INTO TERMINAL 2.

Fig. 4

CA3021, CA3022, CA3023

TEST SETUP FOR MEASUREMENTS OF VOLTAGE-GAIN, -3dB BANDWIDTH, AND MAXIMUM OUTPUT VOLTAGE



PROCEDURES

Voltage Gain:

(a) Set e_{in} = 0.5 mV at frequency specified, read e_{out} Voltage Gain

$$(A) = 20 \text{ Log}_{10} \frac{e_{out}}{e_{in}}$$

Bandwidth:

(a) Set e_{out} to a convenient reference voltage at $f = 100 \text{ kHz}$ and record corresponding value of e_{in} .

(b) Increase the frequency, keeping e_{in} constant until e_{out} drops 3-dB. Record Bandwidth.

Fig. 5

VOLTAGE GAIN VS FREQUENCY FOR CA3022

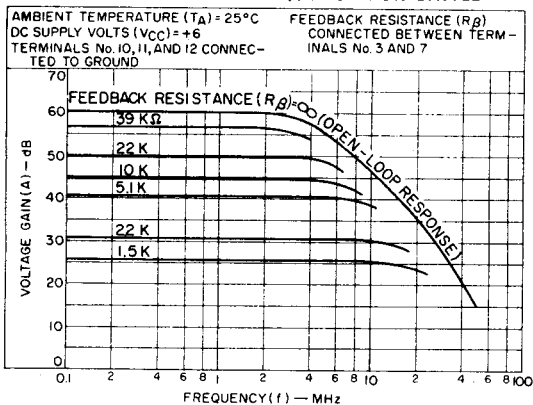


Fig. 6(b)

VOLTAGE GAIN VS FREQUENCY FOR CA3021

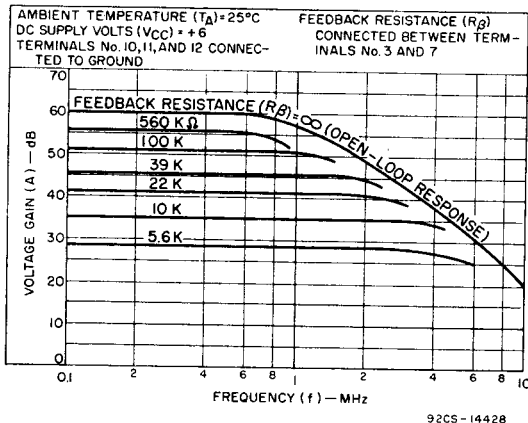


Fig. 6(a)

VOLTAGE GAIN VS FREQUENCY FOR CA3023

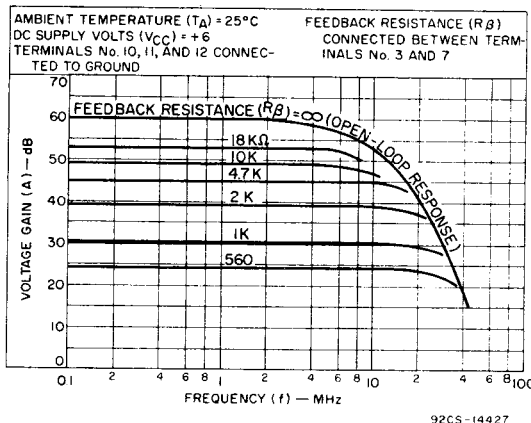


Fig. 6(c)

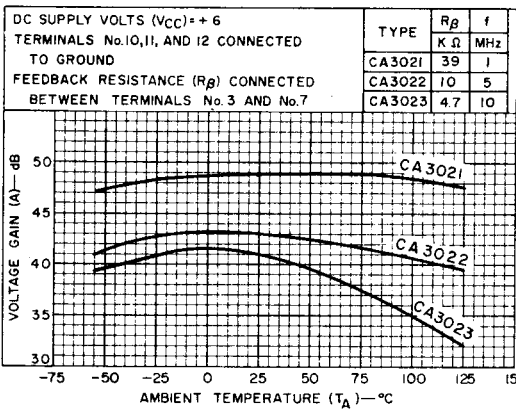


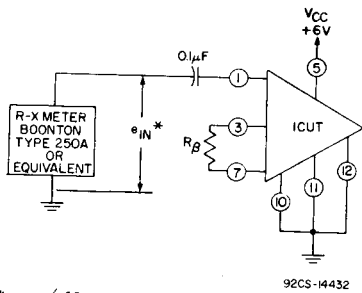
Fig. 6(d)

VOLTAGE GAIN VS TEMPERATURE FOR CA3021, CA3022, AND CA3023

Linear Integrated Circuits

CA3021, CA3022, CA3023

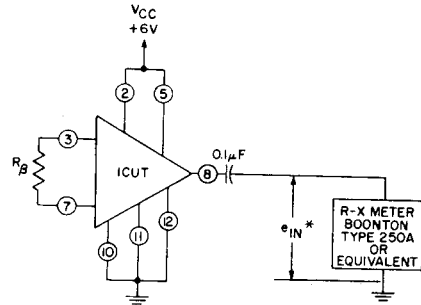
TEST SETUP FOR MEASUREMENT OF INPUT-IMPEDANCE COMPONENTS



* $e_{in} \leq 10 \text{ mV}$

Fig.7

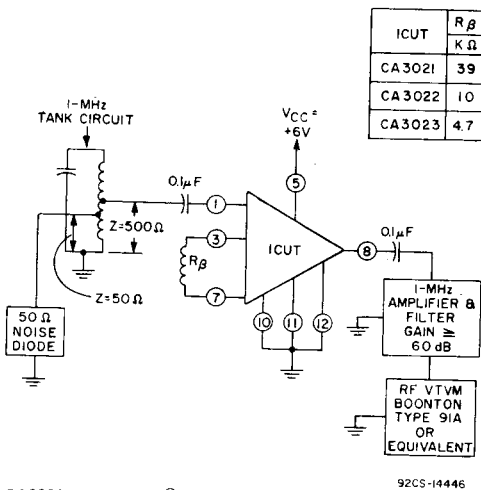
TEST SETUP FOR MEASUREMENT OF OUTPUT RESISTANCE



* $e_{in} \leq 10 \text{ mV}$

Fig.8

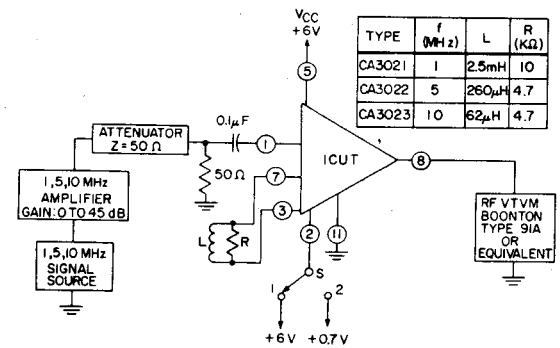
TEST SETUP FOR MEASUREMENT OF NOISE FIGURE



CA3021 - $R_{\beta} = 39 \text{ k}\Omega$
 CA3022 - $R_{\beta} = 10 \text{ k}\Omega$
 CA3023 - $R_{\beta} = 4.7 \text{ k}\Omega$

Fig.9

TEST SETUP FOR MEASUREMENT OF AGC RANGE



$$\text{AGC RANGE} = 20 \text{ LOG}_{10} \frac{A \text{ WITH S IN POSITION 1}}{A \text{ WITH S IN POSITION 2}}$$

(A = VOLTAGE GAIN)

	f MHz
CA3021	1
CA3022	5
CA3023	10

Fig. 10