



Linear Integrated Circuits

CA3005
CA3006

RF Amplifiers

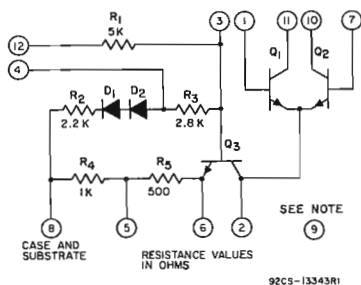
Monolithic Silicon

- Designed for use in Communications Equipment
- Balanced Differential Amplifier Configuration with Controlled Constant-Current Source to Provide Unexcelled Versatility
- Push-Pull Input and Output
- Wide and Narrow Band Amplifier
- AGC
- Detector
- RF, IF, and Video Frequency Capability
- Operation from DC to 100 MHz
- Mixer
- Limiter
- Modulator
- Cascode Amplifier



- Built-in Temperature Stability for Operation from -55°C to $+125^{\circ}\text{C}$
- Companion Application Note, ICAN 5022 "Application of RCA CA3004, CA3005, and CA3006 Integrated Circuit RF Amplifiers", covers characteristics of different operating modes, noise performance, cross-modulation, mixer, AGC limiter, detector, and amplifier design considerations.

SCHEMATIC DIAGRAM FOR CA3005 AND CA3006



NOTE: Connect Terminal No.9 to most positive dc supply voltage used for circuit.

Fig. 1

ABSOLUTE-MAXIMUM VOLTAGE LIMITS, at $T_{FA} = 25^{\circ}\text{C}$

Voltage limits shown for each terminal can be applied under the indicated voltage conditions for other terminals.

All voltages are with respect to GROUND (common terminal of Positive and Negative DC Supplies)

TERMINAL	VOLTAGE LIMITS		CONDITIONS	
	NEGATIVE	POSITIVE	TERMINAL	VOLTAGE
1	-3.5	+3.5	7	0
			8	-6
			9	+6
			10	+6
			11	+6
			12	0
2	TEST POINT: DO NOT APPLY VOLTAGE FROM EXTERNAL SOURCE			
3	-9.5	0	1	0
			7	0
			8	-9.5
			9	+6
			10	+6
			11	+6
4	-6	0	12	0
			1	0
			7	0
			8	-6
			9	+6
			10	+6
5	-12	0	11	+6
			12	0
			1	0
			7	0
			8	-6
			9	+6
6	-6	0	10	+6
			11	+6
			12	-6
			1	0
			7	0
			8	-6
7	-3.5	+3.5	9	+6
			10	+6
			11	+6
			12	0
			1	0
			8	-6

TERMINAL	VOLTAGE LIMITS		CONDITIONS	
	NEGATIVE	POSITIVE	TERMINAL	VOLTAGE
8	-12	0	1	0
			7	0
			9	+6
			10	+6
			11	+6
			12	0
9	0	+12	1	0
			7	0
			8	-6
			10	+6
			11	+6
			12	0
10	0	+12	1	0
			7	0
			8	-6
			9	+6
			11	+6
			12	0
11	0	+12	1	0
			7	0
			8	-6
			9	+6
			10	+6
			12	0
12	-9.5	0	8	-9.5
			9	+6
			10	+6
			11	+6
			11	+6
CASE	Internally connected to Terminal No.8 (substrate) DO NOT GROUND			

OPERATING-TEMPERATURE RANGE -55°C to $+125^{\circ}\text{C}$ STORAGE-TEMPERATURE RANGE -65°C to $+150^{\circ}\text{C}$

LEAD TEMPERATURE (During Soldering)

At distance $1/16 \pm 1/32$ inch ($1.59 \pm 0.79\text{mm}$)from case for 10 seconds max. $+265^{\circ}\text{C}$

MAXIMUM SINGLE-ENDED INPUT-

SIGNAL VOLTAGE $\pm 3.5\text{ V}$

MAXIMUM COMMON-MODE INPUT-

SIGNAL VOLTAGE -2.5 V , $+3.5\text{ V}$

MAXIMUM DEVICE DISSIPATION 300 mW

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

CHARACTERISTICS	SYMBOLS	SPECIAL TEST CONDITIONS Terminals No.3,4,5, and 6 Not Connected Except Where Noted	TEST CIRCUITS	LIMITS								TYPICAL CHARAC- TERISTICS CURVES
				TYPE CA3005				TYPE CA3006				
			Fig.	Min.	Typ.	Max.	Min.	Typ.	Max.	Fig.		
STATIC CHARACTERISTICS												
Input Offset Voltage	V _{IO}		Fig.3	—	2.6	5	—	0.8	1	mV	Fig.2	
Input Offset Current	I _{IO}		Fig.4	—	1.4	—	—	1.4	—	μA	Fig.2	
Input Bias Current	I _{IB}		Fig.4	—	19	40	—	19	40	μA	Fig.5	
Quiescent Operating Current	I _{IO} or I _{II}	TERMINALS										
		4	5									
		NC	NC	Fig.8	—	1	—	1	—	mA	Fig.6	
		NC	NC	Fig.8	—	2.7	—	2.7	—	mA	NONE	
		-VEE	-VEE	Fig.8	—	0.45	—	0.45	—	mA	NONE	
Quiescent Operating Current Ratio	I _{IO} I _{II}		Fig.8	—	1.05	—	—	1.05	—	—	Fig.7	
Device Dissipation	P _T		Fig.8	—	26	—	—	26	—	mW	NONE	
DYNAMIC CHARACTERISTICS												
Power Gain	G _p	f = 100 MHz	Cascode Configuration	Fig.10	16	20	—	16	20	—	dB	Fig.9
		Differential-Ampl. Configuration	Fig.12	14	16	—	14	16	—	dB	Fig.11	
Noise Figure	NF	f = 100 MHz	Cascode Configuration	Fig.10	—	7.8	9	—	7.8	9	dB	Fig.13
		Differential Ampl. Configuration	Fig.12	—	7.8	9	—	7.8	9	dB	Fig.14	
Common-Mode Rejection Ratio	CMR	f = 1 kHz		Fig.16	—	101	—	—	101	—	dB	Fig.15
AGC Range (Max. Voltage Gain to Complete Cutoff)	AGC	f = 1.75 MHz		Fig.17	-60	—	—	-60	—	—	dB	NONE

TYPICAL STATIC CHARACTERISTICS AND TEST CIRCUITS FOR TYPES CA3005 AND CA3006

INPUT OFFSET VOLTAGE AND CURRENT

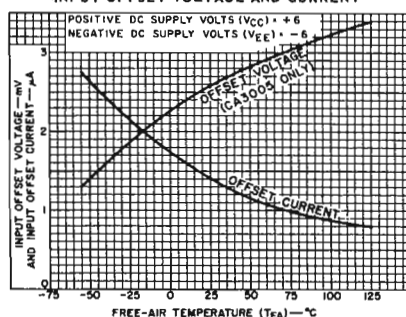


Fig. 2

92CS-13317

INPUT OFFSET VOLTAGE TEST CIRCUIT

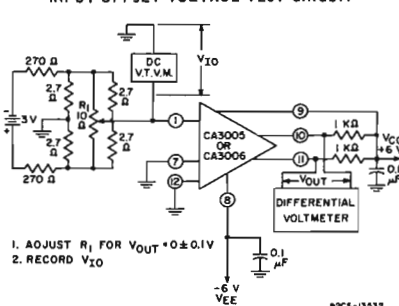


Fig. 3

92CS-15532

TYPICAL STATIC CHARACTERISTICS AND TEST CIRCUITS FOR TYPES CA3005 AND CA3006

INPUT BIAS CURRENT

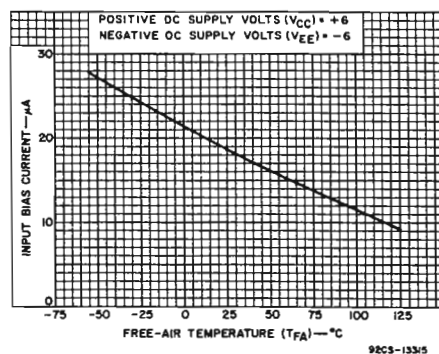


Fig. 4

QUIESCENT OPERATING CURRENT

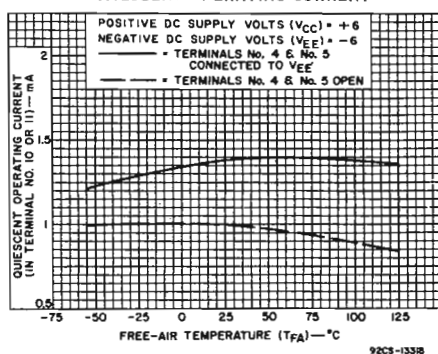


Fig. 5

QUIESCENT OPERATING CURRENT RATIO

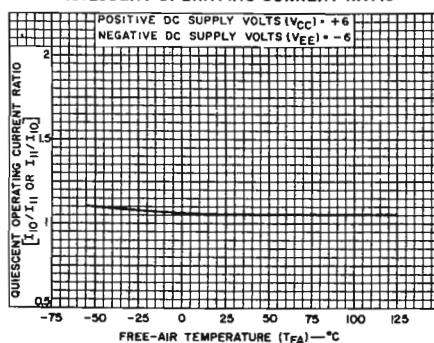


Fig. 6

TYPICAL DYNAMIC CHARACTERISTICS AND TEST CIRCUITS FOR TYPES CA3005 AND CA3006

POWER-GAIN (CASCODE CONFIGURATION)

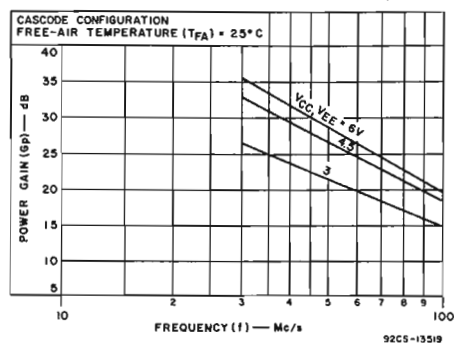


Fig.7

POWER-GAIN (DIFFERENTIAL-AMPLIFIER CONFIGURATION)

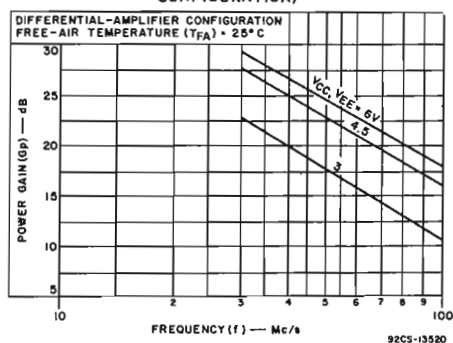
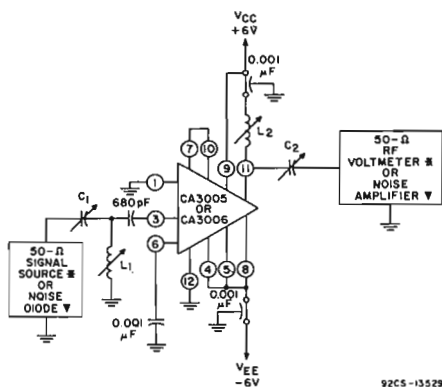


Fig.9

NOISE FIGURE AND POWER-GAIN TEST CIRCUIT (CASCODE CONFIGURATION)



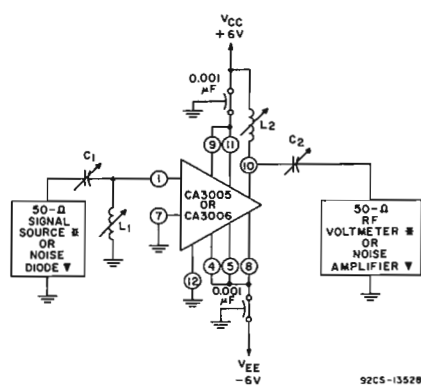
f Mc/s	C_1 pF	C_2 pF	L_1 μ H	L_2 μ H
30	14-150	5-40	0.3-0.6	0.8-1.4
100	5-40	5-40	0.07-0.12	0.15-0.3

* FOR POWER-GAIN TEST

▼ FOR NOISE-FIGURE TEST

Fig.8

NOISE FIGURE AND POWER-GAIN TEST CIRCUIT (DIFFERENTIAL AMPLIFIER CONFIGURATION)



f Mc/s	C_1 pF	C_2 pF	L_1 μ H	L_2 μ H
30	5-40	1.5-20	1.2-2	1.2-2
100	1-12	1-12	0.4-0.7	0.25-0.5

* FOR POWER-GAIN TEST

▼ FOR NOISE-FIGURE TEST

Fig.10

TYPICAL DYNAMIC CHARACTERISTICS FOR TYPES CA3005 AND CA3006

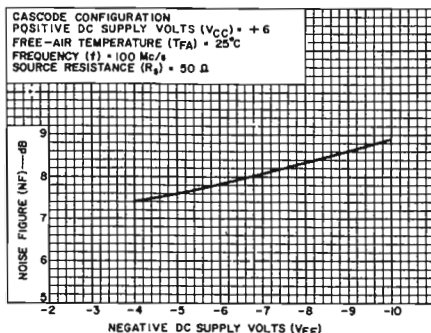
100-Mc/s NOISE FIGURE VS. V_{EE} (CASCODE CONFIGURATION)

Fig. 11

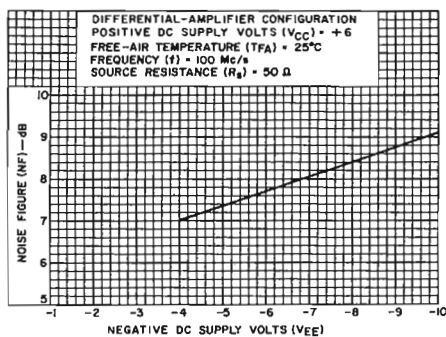
100 Mc/s NOISE FIGURE VS. V_{EE} (DIFFERENTIAL AMPLIFIER CONFIGURATION)

Fig. 12

COMMON-MODE-REJECTION RATIO

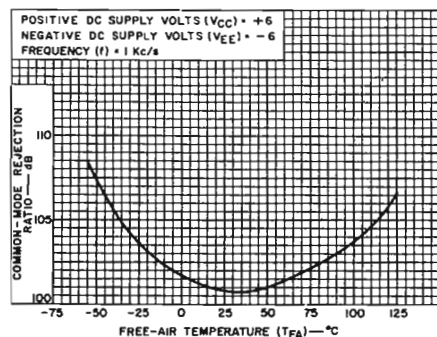


Fig. 13

AGC RANGE TEST CIRCUIT

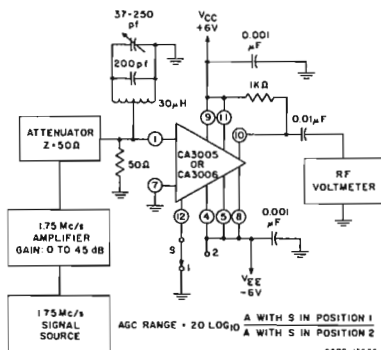


Fig. 15

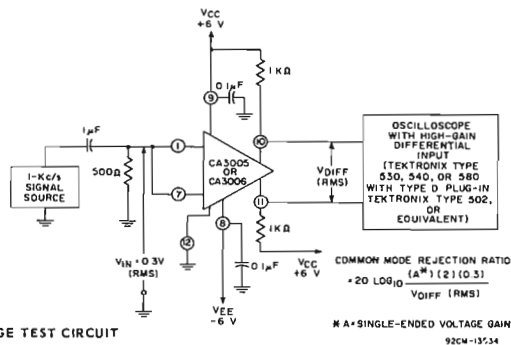


Fig. 14