NOVEMBER 1967

18/18/02 μA719

HIGH GAIN RF AMPLIFIER/FM DETECTOR

FAIRCHILD LINEAR INTEGRATED CIRCUITS

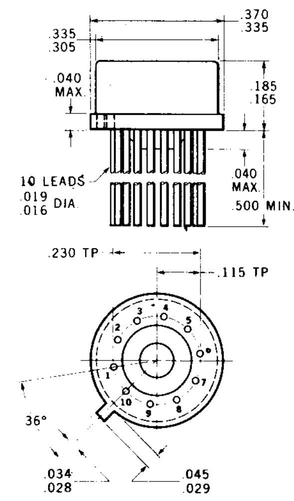
- **HIGH GAIN AT 10.7 MHz**
- **AGC RANGE > 30 dB**
- **TWO SEPARATE AMPLIFIERS**
- **SUPPLY VOLTAGE 5 TO 15 VOLTS**
- **OPTIONAL FM QUADRATURE DETECTOR**

GENERAL DESCRIPTION — The μA719 is a high gain RF amplifier/FM detector which contains two independent amplifier sections designed for IF systems to 50 MHz. Section 1 utilizes three cascaded emitter coupled amplifiers having high gain and a reverse AGC capability. In addition, Section 1 may be used as an amplifier limiter and quadrature detector for FM systems. Section 2 is a single stage amplifier useful from DC to 50 MHz.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	15 V
Output Collector Voltage (Section 1)	20 V
Voltage between "High Input 1" and "Low Input 1" Terminals	±5.0 V
Voltage between "Quad" and "Ground" Terminals	0 to +4.0 V
Voltage between "Input 2" and "Ground" Terminals	±2.0 V
Power Dissipation (Note 1)	350 mW
Maximum Chip Temperature	+150°C
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−55°C to +125°C
Lead Temperature (Soldering, 60 second time limit)	300°C

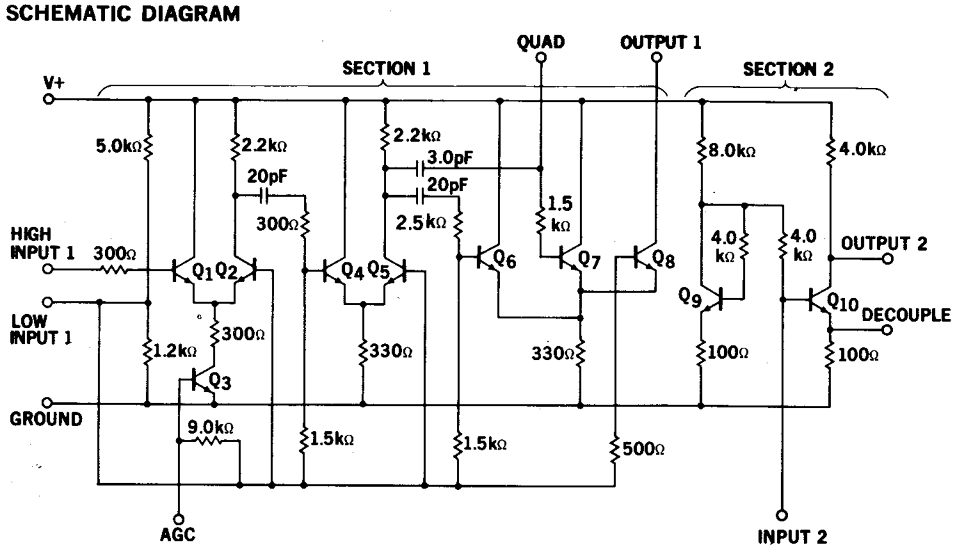
PHYSICAL DIMENSIONS
(In accordance with JEDEC TO—100)



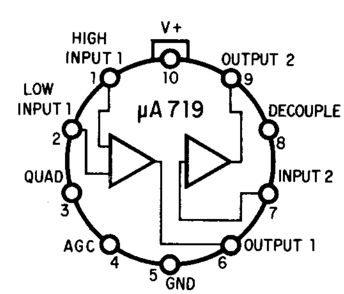
NOTES: All dimensions in inches
Leads are gold-plated Kovar
Package weight is 1.02 grams

ORDER PART NO.
U5F7719312

SCHEMATIC DIAGRAM



CONNECTION DIAGRAM
(TOP VIEW)



NOTE:
(1) Rating applies for ambient temperatures to +125°C if the package case to ambient thermal resistance is lowered to 40°C/Watt by the addition of a heat dissipator. Derate linearly 5.6 mW/°C for ambient temperatures above 87°C.

SGS-FAIRCHILD: LONDON - MILAN - PARIS - STOCKHOLM - STUTTGART

SGS FAIRCHILD

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2981877, 3015048, 3025589, 3064167, 3108359, 3117260; OTHER PATENTS PENDING.

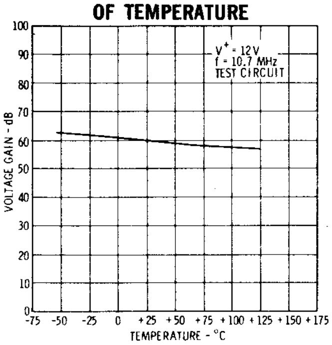
ELECTRICAL CHARACTERISTICS (T_A = 25°C, V^+ = 12 V, Test Circuit 1 unless otherwise specified)

PARAMETER (See Definitions)	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current	T_A = +25°C	12	18	25	mA
	T_C = −55°C		17.5		mA
	T_C = +125°C		17		mA
Supply Current	V^+ = 9.0 V,	6.0	12.5	18.5	mA
Power Dissipation	T_A = +25°C	144	216	300	mW
	T_C = −55°C		210		mW
	T_C = +125°C		204		mW
Power Dissipation	V^+ = 9.0 V,	54	113	167	mW
Section 1 Quiescent Output Current		1.0	2.5	4.0	mA
Section 1 DC Voltage at AGC Terminal		0.55	0.73	1.25	V
Section 1 AGC Current For 30 dB AGC	f = 10.7 MHz, Test Circuit 3		170	250	μA
Section 1 Output Current	f = 1.0 MHz, Test Circuit 8		4.4		mA_{p-p}
Section 1 Voltage Gain	f = 10.7 MHz, Test Circuit 3				
	T_A = +25°C	53	60		dB
	T_C = −55°C		63		dB
	T_C = +125°C		58		dB
Section 1 Voltage Gain	f = 10.7 MHz, Test Circuit 3, V^+ = 9.0 V		53		dB
Section 1 Input Voltage For −3.0 dB Limiting	f = 4.5 MHz, Test Circuit 4		1.5	4.0	mV
Section 1 Noise Figure	R_S = 1.0 kΩ, Test Circuit 5				
	f = 4.5 MHz		7.0		dB
	f = 10.7 MHz		7.0		dB
Section 2 DC Voltage at Output 2		5.2	6.3	7.4	V
Section 2 Voltage Gain	f = 1.0 kHz, Test Circuit 2	22	31		dB
Section 2 Voltage at Output 2 Without Clipping	f = 1.0 kHz, Test Circuit 2		10		V_{p-p}

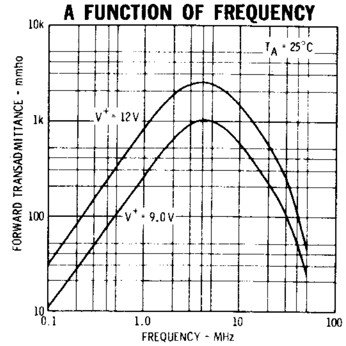
PARAMETERS (See Definitions)	TEST CONDITIONS	f = 4.5 MHz TYP.	f = 10.7 MHz TYP.	UNITS
SECTION 1				
Input Conductance	$e_{IN} \leq$ 20 mV Test Circuit 6	170	300	μmho
Input Capacitance	$e_{IN} \leq$ 20 mV Test Circuit 6	7.5	6.3	pF
Output Conductance	Test Circuit 7	50	130	μmho
Output Capacitance	Test Circuit 7	6.7	5.4	pF
Forward Transadmittance	Test Circuit 8	2200	1400	mmho
Forward Transadmittance	Test Circuit 8 V^+ = 9.0 V	1000	600	mmho
Quad Conductance	Test Circuit 9	200	330	μmho
Quad Capacitance	Test Circuit 9	8.0	7.0	pF
Gain Maximum Available (GMA)	Test Circuit 5	83	71	dB
Gain Maximum Stable (GMS)	Test Circuit 5	85	78	dB
SECTION 2				
Input Conductance	Test Circuit 10			
	Pin #8 Unbypassed	300	300	μmho
	Pin #8 Bypassed	360	460	μmho
Input Capacitance	Test Circuit 10			
	Pin #8 Unbypassed	3.3	3.3	pF
	Pin #8 Bypassed	10.4	8.7	pF
Output Conductance	Test Circuit 11			
	Pin #8 Unbypassed	250	260	μmho
	Pin #8 Bypassed	270	340	μmho
Output Capacitance	Test Circuit 11			
	Pin #8 Unbypassed	5.2	5.2	pF
	Pin #8 Bypassed	8.9	8.0	pF
Forward Transadmittance	Test Circuit 12			
	Pin #8 Unbypassed	8.0	8.0	mmho
	Pin #8 Bypassed	34	34	mmho
Gain Maximum Available (GMA)	Pin #8 Unbypassed	24	24	dB
	Pin #8 Bypassed	35	32	dB

TYPICAL PERFORMANCE CURVES

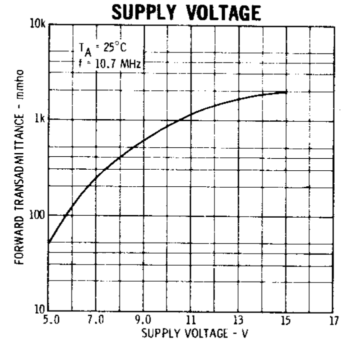
SECTION 1
VOLTAGE GAIN AS A FUNCTION OF TEMPERATURE



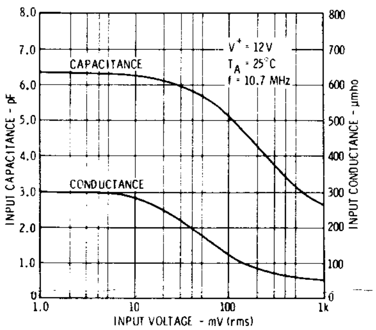
SECTION 1
FORWARD TRANSADMITTANCE AS A FUNCTION OF FREQUENCY



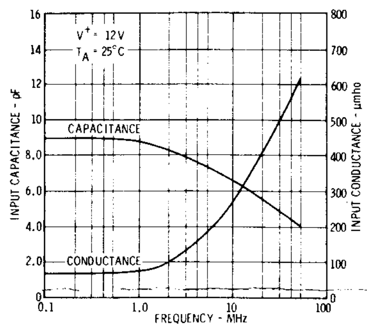
SECTION 1
FORWARD TRANSADMITTANCE AS A FUNCTION OF SUPPLY VOLTAGE



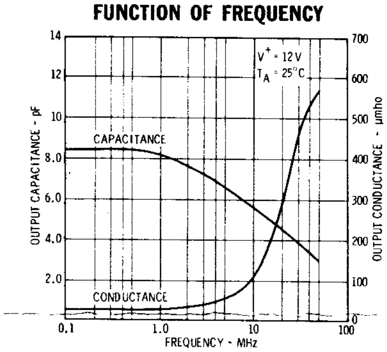
SECTION 1
INPUT CAPACITANCE AND CONDUCTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE



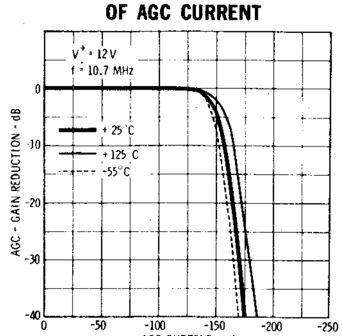
SECTION 1
INPUT CAPACITANCE AND CONDUCTANCE AS A FUNCTION OF FREQUENCY



SECTION 1
OUTPUT CAPACITANCE AND CONDUCTANCE AS A FUNCTION OF FREQUENCY



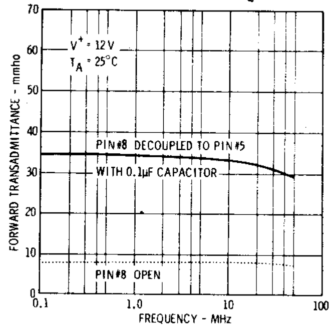
SECTION 1
AGC AS A FUNCTION OF AGC CURRENT



TYPICAL PERFORMANCE CURVES

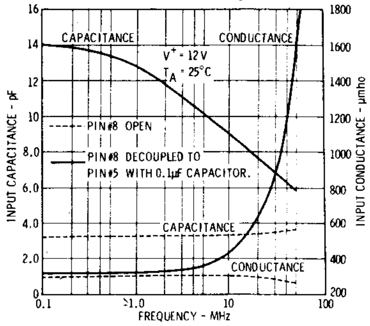
SECTION 2

FORWARD TRANSADMITTANCE AS A FUNCTION OF FREQUENCY



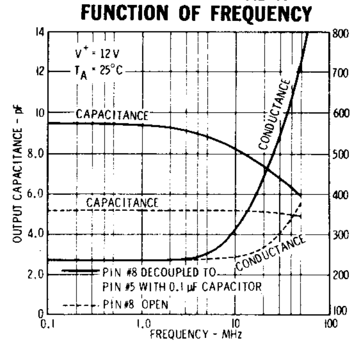
SECTION 2

INPUT CAPACITANCE AND CONDUCTANCE AS A FUNCTION OF FREQUENCY

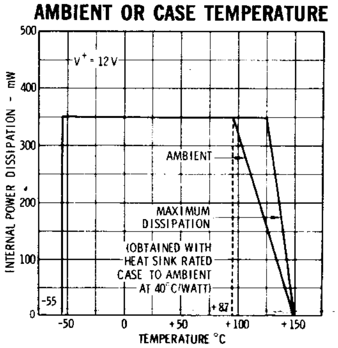


SECTION 2

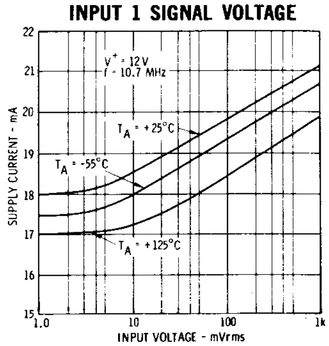
OUTPUT CAPACITANCE AND CONDUCTANCE AS A FUNCTION OF FREQUENCY



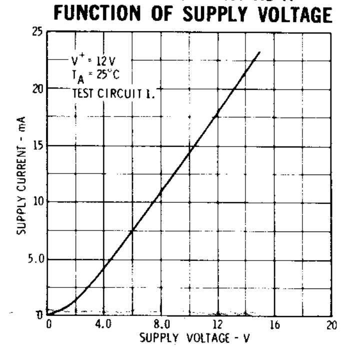
MAXIMUM INTERNAL DISSIPATION AS A FUNCTION OF EITHER AMBIENT OR CASE TEMPERATURE



SUPPLY CURRENT AS A FUNCTION OF INPUT 1 SIGNAL VOLTAGE



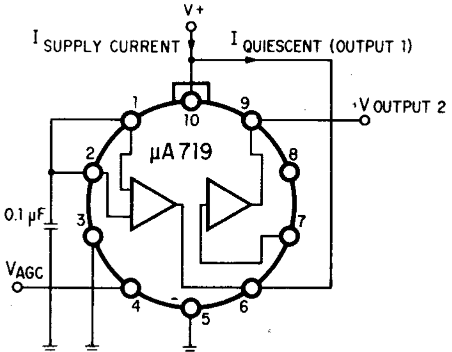
SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



TEST CIRCUITS

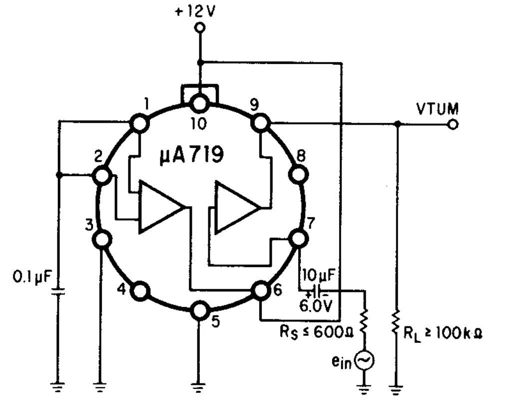
TEST CIRCUIT 1

DC MEASUREMENTS



TEST CIRCUIT 2

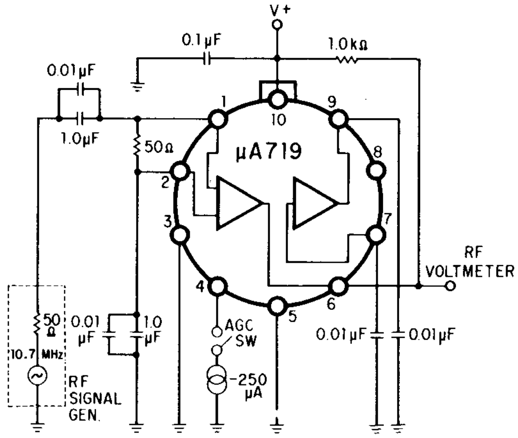
SECTION 2 GAIN AND OUTPUT VOLTAGE SWING



TEST CIRCUITS

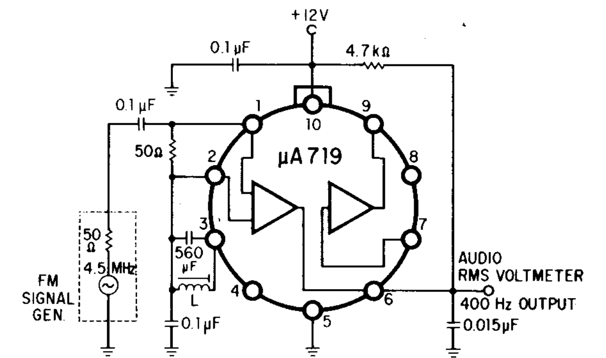
TEST CIRCUIT 3

10.7 MHz VOLTAGE GAIN AND AGC



TEST CIRCUIT 4

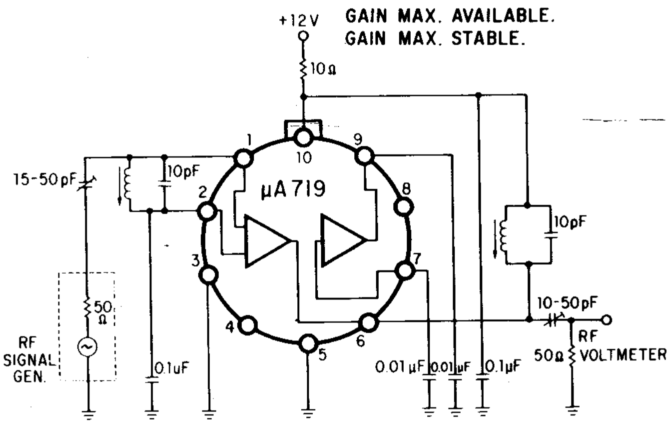
-3.0 dB LIMITING AT 4.5 MHz USING A QUADRATURE DETECTOR*



INPUT SIGNAL 4.5 MHz 25kHz DEVIATION AT 400 Hz UNLOADED QUALITY FACTOR OF QUADRATURE TANK INDUCTOR IS 65.
*SEE DEFINITIONS

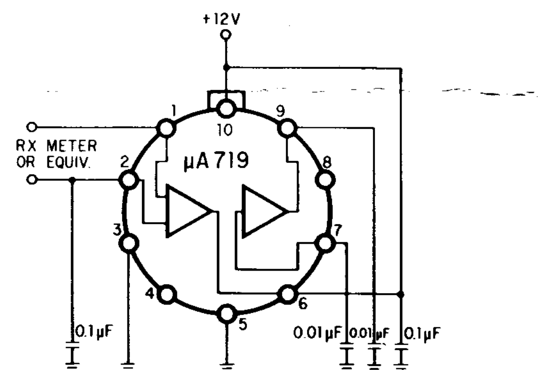
TEST CIRCUIT 5

SECTION 1: NOISE FIGURE.
GAIN MAX. AVAILABLE.
GAIN MAX. STABLE.



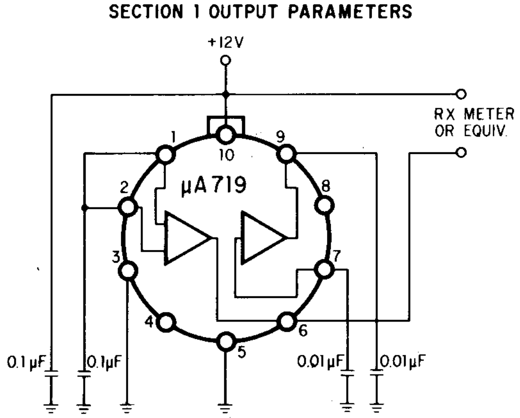
TEST CIRCUIT 6

SECTION 1 INPUT PARAMETERS



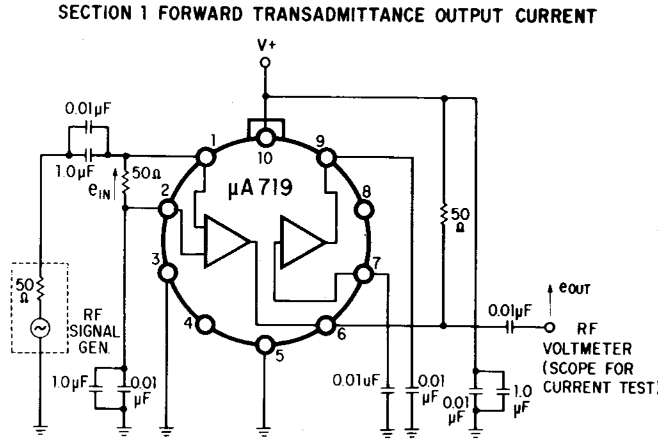
TEST CIRCUIT 7

SECTION 1 OUTPUT PARAMETERS



TEST CIRCUIT 8

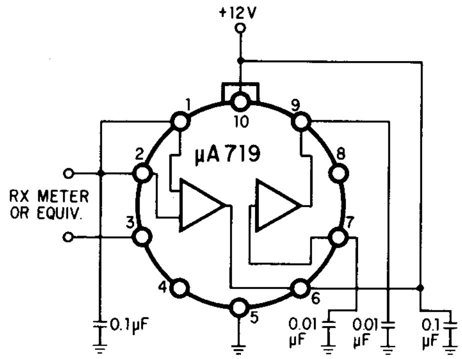
SECTION 1 FORWARD TRANSADMITTANCE OUTPUT CURRENT



FORWARD TRANSADMITTANCE = $\frac{e_{OUT}}{e_{IN}} \cdot \frac{1}{50} \cdot 10^3$ mmho

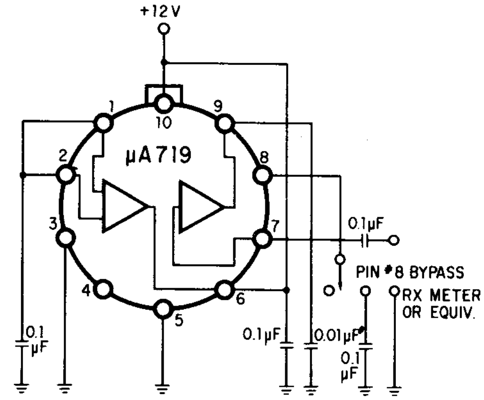
TEST CIRCUIT 9

SECTION 1 QUAD PARAMETERS



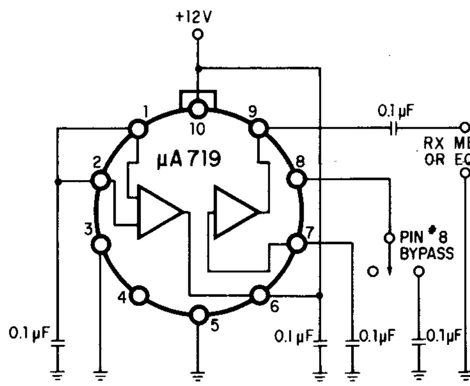
TEST CIRCUIT 10

SECTION 2 INPUT PARAMETERS



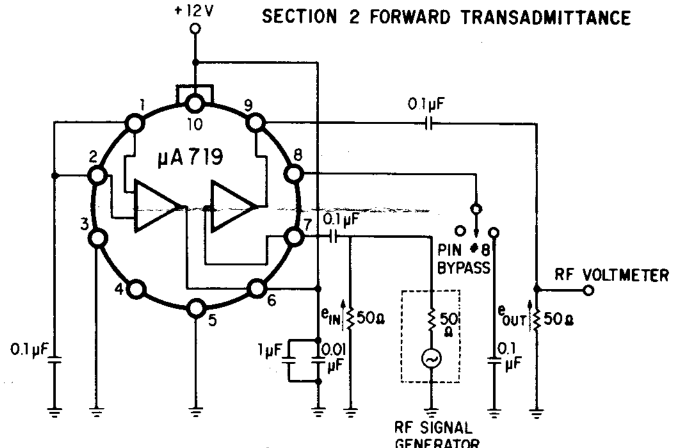
TEST CIRCUIT 11

SECTION 2 OUTPUT PARAMETERS



TEST CIRCUIT 12

SECTION 2 FORWARD TRANSADMITTANCE



FORWARD TRANSADMITTANCE $= \frac{e_{OUT}}{e_{IN}} \cdot \frac{1}{50} \cdot 10^3$ mmho

DEFINITION OF TERMS

Gain Maximum Available (GMA) — This gain figure is the theoretical maximum power gain of an amplifier with conjugate matching at both the input and the output terminals and assumes no reverse transadmittance (feedback component) in the amplifier.

$$\text{GMA} = \frac{|\text{forward transadmittance}|^2}{4 \times \text{input conductance} \times \text{output conductance}}$$

Gain Maximum Stable (GMS) — This gain figure gives the maximum possible gain based on stability criteria only. This gain figure does not necessarily represent the realizable power gain of an amplifier. For unneutralized amplifiers, the maximum power gain realizable based on normal circuit tolerances is either (GMS - 6.0 dB) or GMA, whichever is smaller.

$$\text{GMS} = \frac{|\text{forward transadmittance}|}{|\text{reverse transadmittance}|}$$

Input Voltage For —3.0 dB Limiting — Refer to Test Circuit 4 which shows the μA719 being used as an amplifier, limiter, and FM detector (simple quadrature type with the LC tank circuit connected between pins No. 3 and No. 2). An input FM signal (carrier frequency 4.5 MHz, ±25 kHz deviation at 400 Hz) of 50 mV rms is applied to the μA719 and the value of the recovered audio output signal (400 Hz) at pin No. 6 is noted. The —3.0 dB input limiting voltage is defined as the value of the input voltage to produce an output voltage 3dB below the output level obtained with 50 mV rms of input signal.