FAIRCHILD

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μA757 Gain-Controlled IF Amplifier

Special Function Products

Description

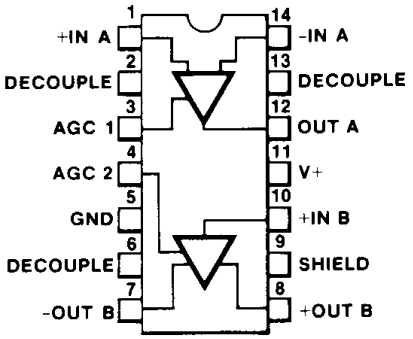
The μA757 is a monolithic high performance, Gain Controlled IF Amplifier constructed using the Fairchild Planar epitaxial process. The amplifier contains two different sections which may be operated independently, or in cascade, from audio frequencies to 25 MHz. The μA757 is intended primarily as a high gain controlled, intermediate frequency amplifier in AM or FM communications receivers. It also has excellent performance when operated in FM receivers as a limiting amplifier.

- **70 dB GAIN AT 10.7 MHz**
- **70 dB AGC RANGE AT 10.7 MHz**
- **300 mV INPUT SIGNAL CAPABILITY**
- **CONSTANT I/O IMPEDANCE WITH AGC**
- **STABLE GAIN WITH SUPPLY VOLTAGE AND TEMPERATURE AT ALL LEVELS OF GAIN REDUCTION**

Absolute Maximum Ratings

Supply Voltage	+15 V
Voltage at any Output Terminal	+24 V
Voltage at either AGC Terminal Note 1	±12 V
Differential Voltage at either Input (Pins 1 and 14, Pins 2 and 10)	±5 V
Internal Power Dissipation Note 2	670 mW
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	0°C to +70°C
Pin Temperature (Soldering, 60 s)	300°C

Connection Diagram
14-Pin DIP



(Top View)

Order Information

Type	Package	Code	Part No.
μA757C	Ceramic DIP	6A	μA757DC

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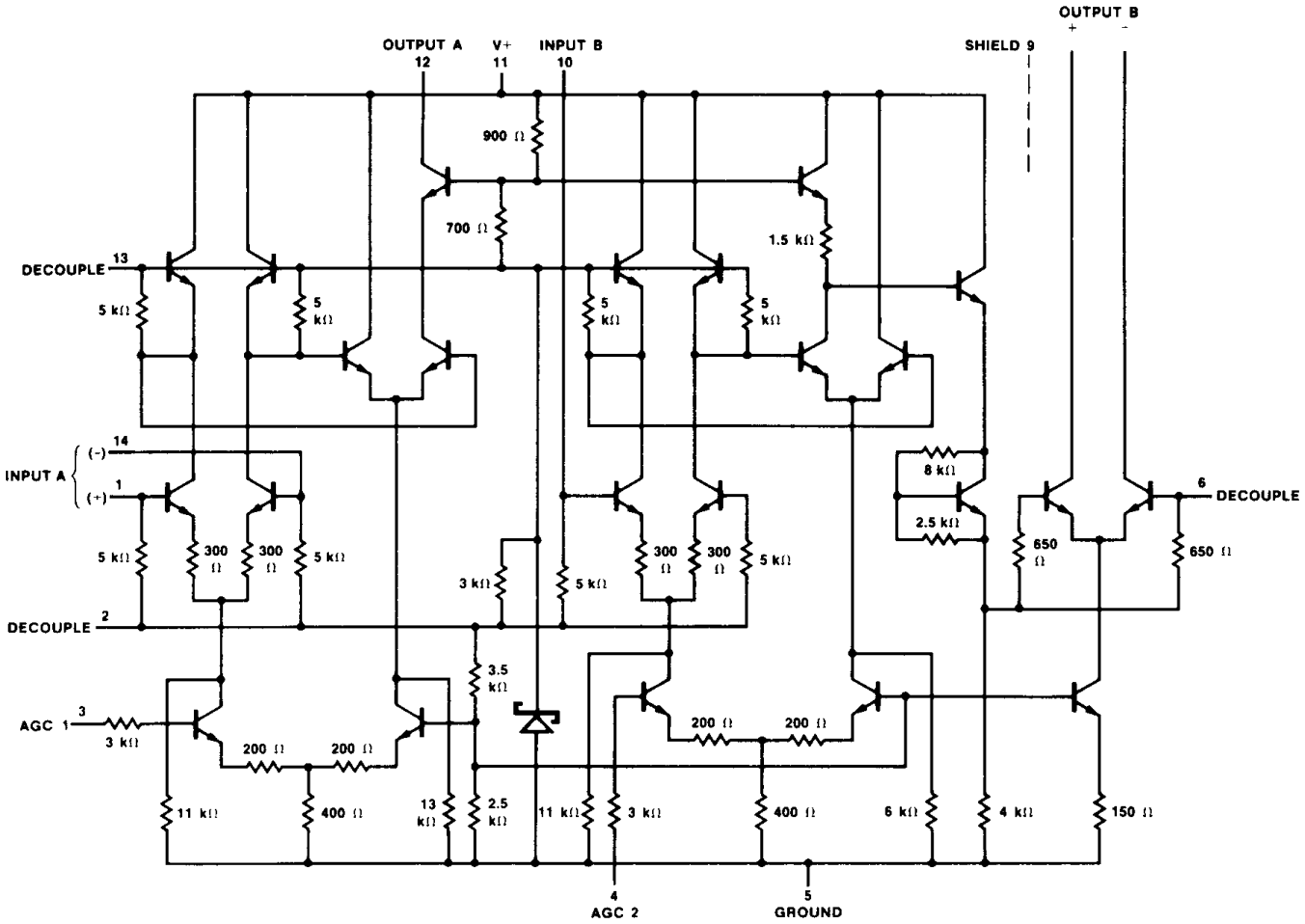
Notes

1. For supply voltages less than +12 V, the absolute maximum voltage at either AGC terminal is equal to the supply voltage.
2. Rating applies to ambient temperatures up to 70°C. Above 70°C ambient derate linearly at 8.3 mW/°C.

Equivalent Circuit



μA757
Electrical Characteristics V+ = +12 V, T_A = 25°C, unless otherwise specified

Characteristic	Condition	Test Circuit	Min	Typ	Max	Min	Typ	Max	Unit
Supply Current	$V_{AGC\ 1,2}$ = +0.8 V $V_{AGC\ 1,2}$ = +3.0 V	1		13 17	17 20		14 18	17 22	mA mA
Internal Power Dissipation	$V_{AGC\ 1,2}$ = +0.8 V $V_{AGC\ 1,2}$ = +3.0 V	1		170 200	210 240		170 220	210 270	mW mW
Voltage Gain at no Reduction	$V_{AGC\ 1,2}$ = +0.8 V, f = 500 kHz $V_{AGC\ 1,2}$ = +0.8 V, f = 10.7 MHz	2 2	65 60	74 70		65 60	74 70		dB dB
Voltage Gain at Partial Gain Reduction	$V_{AGC\ 1,2}$ = +1.7 V, f = 500 kHz $V_{AGC\ 1,2}$ = +1.7 V, f = 10.7 MHz	2 2	20	39 37	46	20	39 37	46	dB dB
Voltage Gain at Full Gain Reduction	$V_{AGC\ 1,2}$ = +3.0 V, f = 500 kHz $V_{AGC\ 1,2}$ = +3.0 V, f = 10.7 MHz	2 2		2.0 1.0	10 8		2.0 1.0	10 8	dB dB
Current into either AGC Terminal	$V_{AGC\ 1,2}$ = +3.0 V	1		15	50		15	50	μA
Gain Reduction Sensitivity	$V_{AGC\ 1,2}$ = +1.7 V, f = 500 kHz	2		50			50		dB/V
Input Voltage for −3 dB Limiting at Output	$V_{AGC\ 1,2}$ = +0.8 V, f = 500 kHz	2		0.5			0.5		mV
Intermodulation Products	Two-tone signal f_1 = 500 kHz, e_1 = 100 mV f_2 = 510 kHz, e_2 = 100 mV I_{OUT} = 1 mA p-p	2		−50			−50		dB
Section 1									
Input Resistance at either Input Terminal	$V_{AGC\ 1}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 1}$ = +3.0 V, f = 10.7 MHz		3.0	5.0 4.5		3.0	5.0 4.5		kΩ kΩ
Input Capacitance at either Input Terminal	$V_{AGC\ 1}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 1}$ = +3.0 V, f = 10.7 MHz			2.5 2.2			2.5 2.2		pF pF
Output Resistance	$V_{AGC\ 1}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 1}$ = +3.0 V, f = 10.7 MHz			100 100			100 100		kΩ kΩ
Output Capacitance	$V_{AGC\ 1}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 1}$ = +3.0 V, f = 10.7 MHz			2.6 2.2			2.6 2.2		pF pF
Forward Transadmittance	$V_{AGC\ 1}$ = +0.8 V, f = 500 kHz $V_{AGC\ 1}$ = +0.8 V, f = 10.7 MHz			14 13			14 13		mmho mmho
Peak-to-Peak Output Current	$V_{AGC\ 1}$ = +3.0 V, f = 500 kHz Output in full limiting		0.25	0.4		0.25	0.4		mA
Output Saturation Voltage	I_{OUT} = 0.1 mA, $V_{AGC\ 1}$ = +3.0 V			8.0	9.0		8.0	9.0	V
Noise Figure	R_S = 1.0 kΩ, f = 10.7 MHz R_S = 1.0 kΩ, f = 500 kHz			8.0 8.0			8.0 8.0		dB dB
Interfering Signal Voltage at Input for 1.0% Cross Modulation	Carrier signal, f_c = 500 kHz Interfering signal, f_i = 510 kHz I_{OUT} = 0.5 mAp-p, $V_{AGC\ 1}$ = +0.8 V			15			15		mV

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Section 2
Electrical Characteristics (Cont.) V+ = +12 V, T_A = 25°C, unless otherwise specified

Characteristic	Condition	Test Circuit	Min	Typ	Max	Min	Typ	Max	Unit
Input Resistance	$V_{AGC\ 2}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 2}$ = +3.0 V, f = 10.7 MHz		3.0	5.0 4.5		3.0	5.0 4.5		kΩ kΩ
Input Capacitance	$V_{AGC\ 2}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 2}$ = +3.0 V, f = 10.7 MHz			2.5 2.2			2.5 2.2		pF pF
Output Resistance at either Output Terminal	$V_{AGC\ 2}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 2}$ = +3.0 V, f = 10.7 MHz			26 20			26 20		kΩ kΩ
Output Capacitance at either Output Terminal	$V_{AGC\ 2}$ = +0.8 V, f = 10.7 MHz $V_{AGC\ 2}$ = +3.0 V, f = 10.7 MHz			2.2 2.5			2.2 2.5		pF pF
Forward Transadmittance	$V_{AGC\ 2}$ = +0.8 V, f = 500 kHz $V_{AGC\ 2}$ = +0.8 V, f = 10.7 MHz			440 280			440 280		mmho mmho
Quiescent Output Current at either Output Terminal	$V_{AGC\ 2}$ = +3.0 V		1.7	2.4	3.5	1.7	2.4	3.5	mA
Peak-to-Peak Current at either Output Terminal	$V_{AGC\ 2}$ = +3.0 V, f = 500 kHz Output in full limiting		3.8	4.8	7.0	3.8	4.8	7.0	mA
Output Saturation Voltage at either Output Terminal	I_{OUT} = 1.0 mA, $V_{AGC\ 2}$ = +3.0 V			5.0	6.0		5.0	6.0	V
Power Supply Sensitivity	V_S = 12 V to 15 V 0 dB Gain Reduction 30 dB Gain Reduction 60 dB Gain Reduction			 0.5 0.8 1.0			 0.5 0.8 1.0		 dB/V dB/V dB/V

μA757
Electrical Characteristics (Cont.) V+ = +12 V, T_A = +125°C, unless otherwise specified

Characteristic	Condition	Test Circuit	Min	Typ	Max	Unit
Supply Current	$V_{AGC\ 1,2}$ = +0.8 V $V_{AGC\ 1,2}$ = +3.0 V	1		14 17	17 20	mA mA
Internal Power Dissipation	$V_{AGC\ 1,2}$ = +0.8 V $V_{AGC\ 1,2}$ = +3.0 V	1		170 200	210 240	mW mW
Voltage Gain at no Gain Reduction	$V_{AGC\ 1,2}$ = +0.8 V, f = 500 kHz $V_{AGC\ 1,2}$ = +0.8 V, f = 10.7 MHz	2 2	55	71 62		dB dB
Voltage Gain at Partial Gain Reduction	$V_{AGC\ 1,2}$ = +1.7 V, f = 500 kHz	2		35		dB
Voltage Gain at Full Gain Reduction	$V_{AGC\ 1,2}$ = +3.0 V, f = 500 kHz $V_{AGC\ 1,2}$ = +3.0 V, f = 10.7 MHz	2 2		2.0 −1.0	15	dB dB
Current into either AGC Terminal	$V_{AGC\ 1,2}$ = +3.0 V	1		15	50	μA
Section 1						
Peak-to-Peak Output Current	$V_{AGC\ 1}$ = +3.0 V, f = 500 kHz Output in full limiting		0.2	0.4		mA
Output Saturation Voltage	I_{OUT} = 0.1 mA, $V_{AGC\ 1}$ = +3.0 V			8.0	9.4	V
Section 2						
Quiescent Output Current at either Output Terminal	$V_{AGC\ 2}$ = +3.0 V		1.7	2.8	3.5	mA
Peak-to-Peak Current at either Output Terminal	$V_{AGC\ 2}$ = +3.0 V, f = 500 kHz Output in full limiting		3.8	5.6	7.0	mA
Output Saturation Voltage at either Output Terminal	I_{OUT} = 1.0 mA, $V_{AGC\ 2}$ = +3.0 V			6.0	7.0	V

μA757
Electrical Characteristics V+ = +12 V, T_A = −55°C, unless otherwise specified

Characteristic	Condition	Test Circuit	Min	Typ	Max	Unit
Supply Current	$V_{AGC\ 1,2}$ = +0.8 V $V_{AGC\ 1,2}$ = +3.0 V	1		10 14	17 20	mA mA
Internal Power Dissipation	$V_{AGC\ 1,2}$ = +0.8 V $V_{AGC\ 1,2}$ = +3.0 V	1		120 170	210 240	mW mW
Voltage Gain at no Gain Reduction	$V_{AGC\ 1,2}$ = +0.8 V, f = 500 kHz $V_{AGC\ 1,2}$ = +0.8 V, f = 10.7 MHz	2 2	55	68 64		dB dB
Voltage Gain at Partial Gain Reduction	$V_{AGC\ 1,2}$ = +1.7 V, f = 500 kHz	2		28		dB
Voltage Gain at Full Gain Reduction	$V_{AGC\ 1,2}$ = +3.0 V, f = 500 kHz $V_{AGC\ 1,2}$ = +3.0 V, f = 10.7 MHz	2 2		2.0 −3.0	15	dB dB
Current into either AGC Terminal	$V_{AGC\ 1,2}$ = +3.0 V	1		30	70	μA
Section 1						
Peak-to-Peak Output Current	$V_{AGC\ 1}$ = +3.0 V, f = 500 kHz Output in full limiting		0.2	0.4		mA
Output Saturation Voltage	I_{OUT} = 0.1 mA, $V_{AGC\ 1}$ = +3.0 V			8.0	9.0	V
Section 2						
Quiescent Output Current at either Output Terminal	$V_{AGC\ 2}$ = +3.0 V		1.0	1.7	3.5	mA
Peak-to-Peak Current at either Output Terminal	$V_{AGC\ 2}$ = +3.0 V, f = 500 kHz Output in full limiting		2.3	3.4	7.0	mA
Output Saturation Voltage at either Output Terminal	I_{OUT} = 1.0 mA, $V_{AGC\ 2}$ = +3.0 V			4.0	6.0	V

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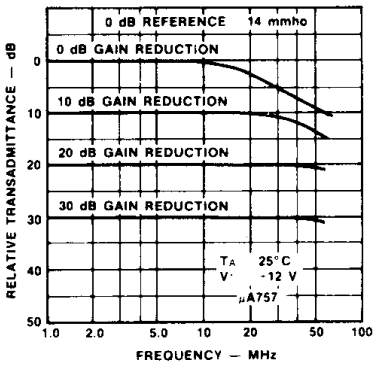
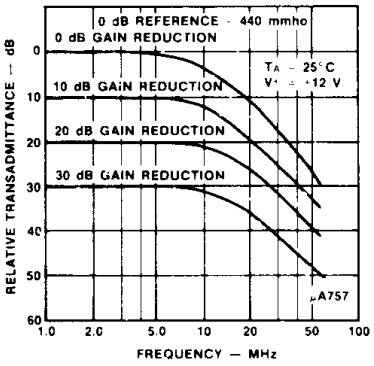
Typical Performance Curves

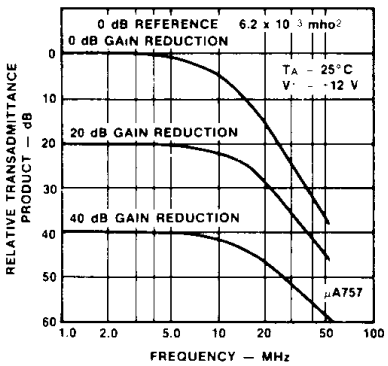
Section 1 Forward Transadmittance vs Frequency



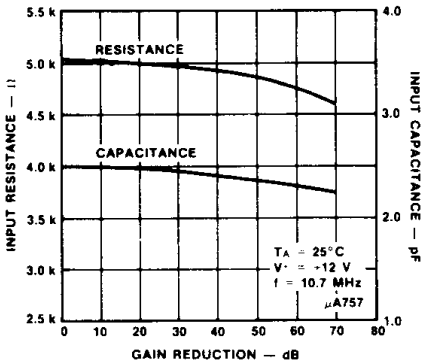
Section 2 Forward Transadmittance vs Frequency



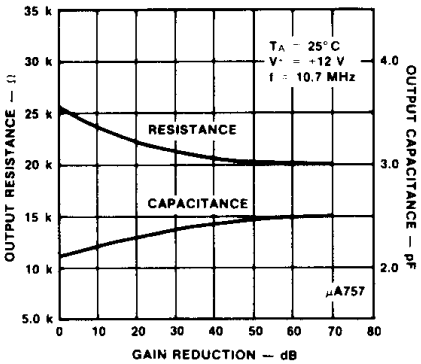
Product of Sections 1 and 2 Forward Transadmittance vs Frequency



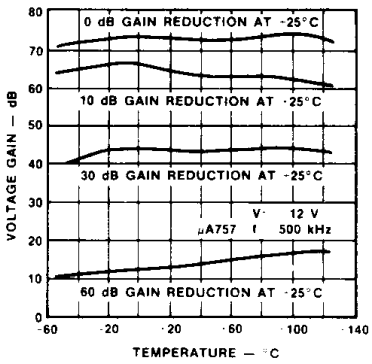
Section 1 and 2 Input Resistance and Capacitance vs Gain Reduction



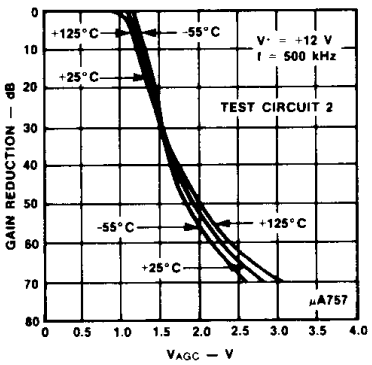
Section 2 Output Resistance and Capacitance vs Gain Reduction



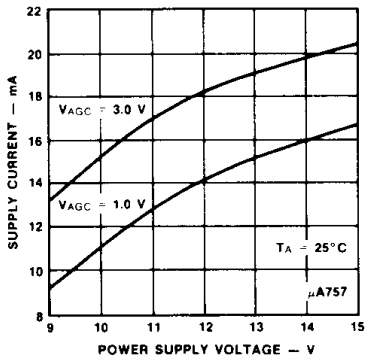
Voltage Gain vs Temperature



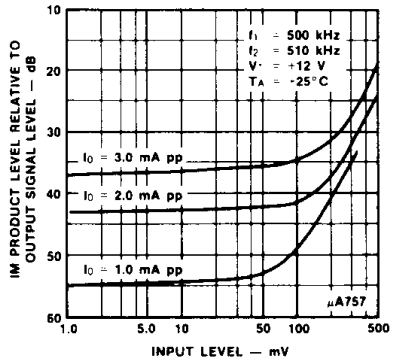
Gain Reduction vs Gain Control Voltage



Power Supply Current vs Supply Voltage

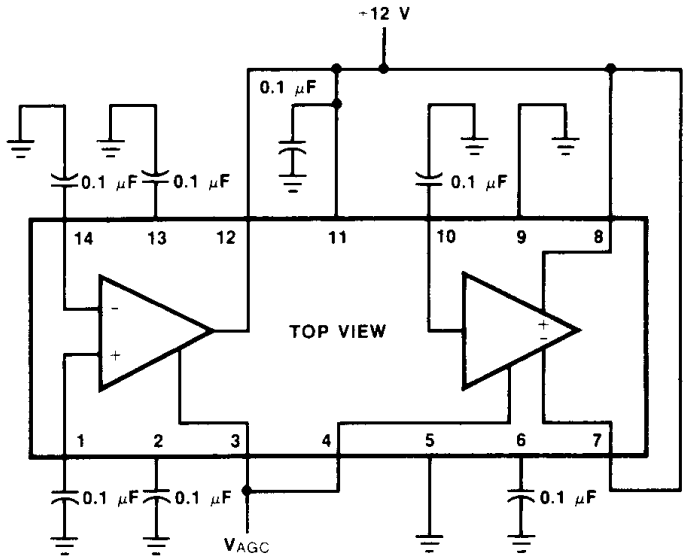


Two Tone IM Distortion Products vs Input Signal Level



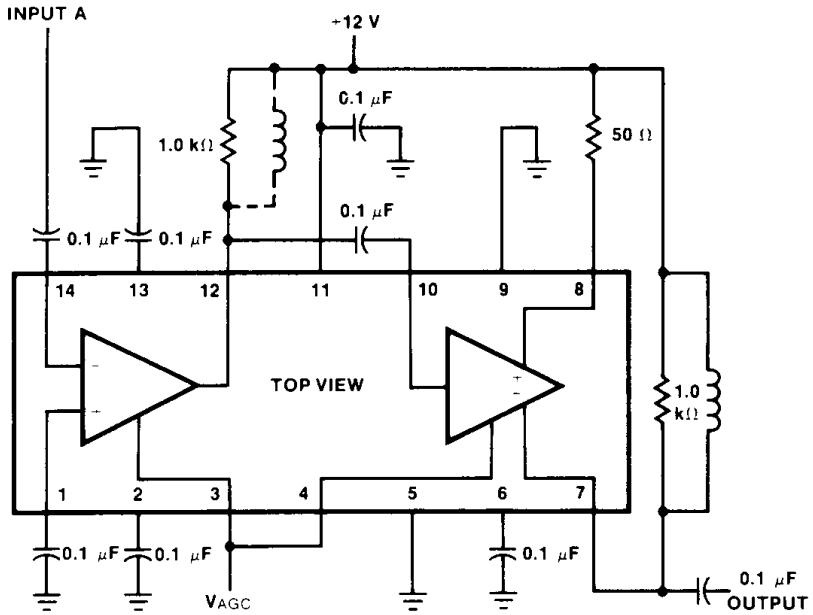
Test Circuit

Test Circuit 1 (Note)



Note
For 10.7 MHz measurements, interstage capacitance and Section 2 output capacitance are tuned out. Pin 9 should be connected to GND.

Test Circuit 2 (Note)



Note
Rating applies to ambient temperatures up to 70°C. Above 70°C ambient derate linearly at 8.3 mW/°C.