HARRIS

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CA2111A

May 1999

FM IF Amplifier-Limiter and Quadrature Detector

Features

- **Input Limiting Voltage At 10.7MHz 400μV**
- **Input Limiting Voltage At 4.5, 5.5MHz 250μV**
- **Typical AM Rejection At 10.7MHz. 45dB**
- **Provision for Output from 3-Stage IF Amplifier Section**
- **Low Harmonic Distortion**
- **Quadrature Detection Permits Simplified Single-Coil Tuning**
- **Extremely Low AFC Voltage Drift Over Full Operating Temperature Range**
- **Minimum Number of External Components Required**

Applications

- **FM IF Sound**
- **TV Sound IF**

Description

The CA2111A provides a multistage wideband amplifier-limiter, a quadrature detector, and an emitter-follower output stage. This device is designed for use in FM receivers and in the sound IF sections of TV receivers. In addition, an output terminal is provided which allows the use of the amplifier-limiter as a straight 60dB wideband amplifier.

The amplifier-limiter features the excellent limiting characteristic of 3 cascaded differential amplifiers. The quadrature detector requires only one coil in the associated outboard circuit and therefore, tuning is a simple procedure.

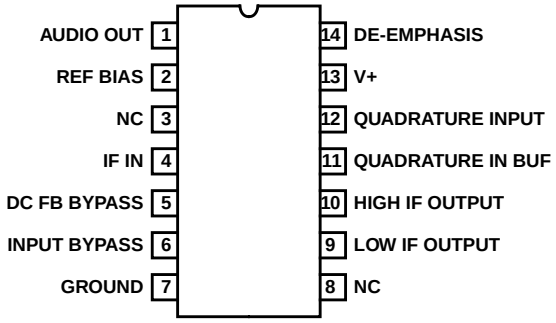
A unique feature of the CA2111A is its exceptionally low AFC voltage drift over the full operating-temperature range.

Part Number Information

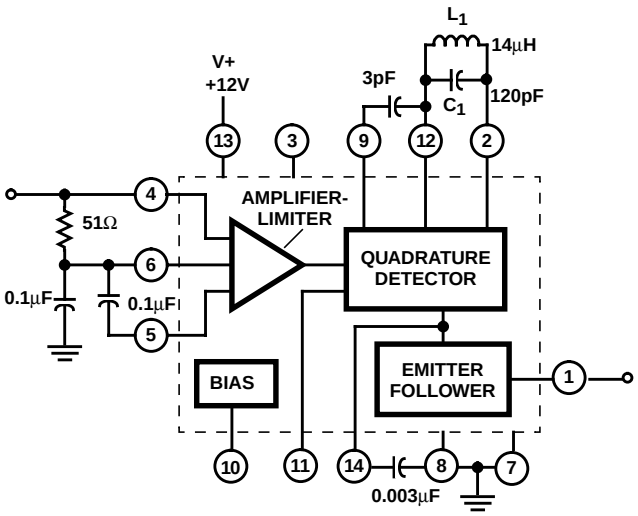
PART NUMBER	TEMP. RANGE (^{O}C)	PACKAGE	PKG. NO.
CA2111AE	-40 to 85	14 Ld PDIP	E14.3

Pinout

CA2111A
(PDIP)
TOP VIEW



Block Diagram



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper IC Handling Procedures.
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File Number **612.2**

Absolute Maximum Ratings $T_A = 25^oC$

Supply Voltage (V+ to V-) 16V

Operating Conditions

Temperature Range . . . . . -40^oC to 85^oC
Supply Voltage Range (Typical) . . . . . 8V to 12V

Thermal Information

Thermal Resistance (Typical, Note 1)	θ_{JA} ($^oC/W$)
PDIP Package	150

Maximum Junction Temperature (Plastic Package) . . . . . 150^oC
Maximum Storage Temperature Range . . . . . -65^oC to 150^oC
Maximum Lead Temperature (Soldering 10s) . . . . . 300^oC

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

1. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

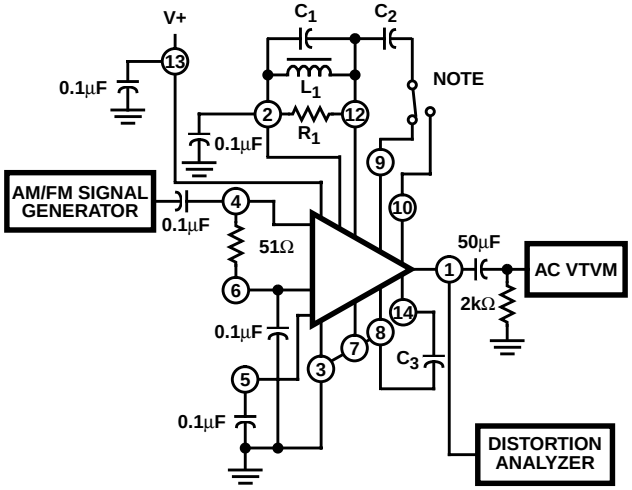
Electrical Specifications $T_A = 25^oC$ Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Terminal 1 DC Voltage	V_1	V+ = 12V	-	5.4	-	V
		V+ = 8V	-	3.7	-	V
Terminals 4, 5, 6, 10 DC Voltage	$V_{4, 5, 6, 10}$	V+ = 8V	-	1.35	-	V
Terminals 2, 12 DC Voltage	$V_{2, 12}$	V+ = 8V	-	3.5	-	V
Supply Current, Pin 13	I_{13}	V+ = 8V	-	14	-	mA
		V+ = 12V	-	16	-	mA
Amplifier Input Resistance	R_4	f_O = 10.7MHz	-	7	-	kΩ
Amplifier Input Capacitance	C_4		-	11	-	pF
Detector Input Resistance	R_{12}		-	70	-	kΩ
Detector Input Capacitance	C_{12}		-	2.7	-	pF
Amplifier Output Resistance	R_{10}		-	60	-	Ω
Detector Output Resistance	R_1		-	200	-	Ω
De-emphasis Resistance	R_{14}		-	8.8	-	kΩ
DYNAMIC CHARACTERISTICS f_O = 10.7MHz, Δf = ±75kHz, V+ = 8V, FM Modulation Frequency = 400Hz, Source Resistance = 50Ω						
Input Limiting Threshold Voltage	$V_{I(LIM)}$		-	400	600	μV_{RMS}
AM Rejection	AMR	$V_I = 10mV_{RMS}$, 100% FM, 30% AM	-	37	-	dB
Amplifier Voltage Gain	A_V	$V_I = 50\mu V_{RMS}$	-	55	-	dB
Detector Recovered Audio Output	$V_{O(AF)}$	$V_I = 10mV_{RMS}$	-	0.3	-	V_{RMS}
Total Harmonic Distortion	THD	$V_I = 10mV_{RMS}$	-	1	-	%
DYNAMIC CHARACTERISTICS f_O = 10.7MHz, Δf = ±75kHz, V+ = 12V, FM Modulation Frequency = 400Hz, Source Resistance = 50Ω						
Input Limiting Threshold Voltage	$V_{I(LIM)}$		-	400	600	μV_{RMS}
AM Rejection	AMR	$V_I = 10mV_{RMS}$, 100% FM, 30% AM	-	45	-	dB
Amplifier Voltage Gain	A_V	$V_I = 50\mu V_{RMS}$	-	55	-	dB
Detector Recovered Audio Output	$V_{O(AF)}$	$V_I = 10mV_{RMS}$	-	0.48	-	V_{RMS}
Total Harmonic Distortion	THD	$V_I = 10mV_{RMS}$	-	1	-	%
DYNAMIC CHARACTERISTICS f_O = 4.5MHz, Δf = ±25kHz, V+ = 12V, FM Modulation Frequency = 400Hz, Source Resistance = 50Ω						
Input Limiting Threshold Voltage	$V_{I(LIM)}$		-	250	400	μV_{RMS}
AM Rejection	AMR	$V_I = 10mV_{RMS}$, 100% FM, 30% AM	-	36	-	dB

Electrical Specifications $T_A = 25^oC$ Unless Otherwise Specified **(Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Amplifier Voltage Gain	A_V	$V_I = 50\mu V_{RMS}$	-	60	-	dB
Detector Recovered Audio Output	$V_{O(AF)}$	$V_I = 10mV_{RMS}$	-	0.72	-	V_{RMS}
Total Harmonic Distortion	THD	$V_I = 10mV_{RMS}$	-	1.5	-	%
DYNAMIC CHARACTERISTICS $f_O = 5.5MHz$, $\Delta f = \pm 50kHz$, V+ = 12V, FM Modulation Frequency = 400Hz, Source Resistance = 50Ω						
Input Limiting Threshold Voltage	$V_{I(LIM)}$		-	250	400	μV_{RMS}
AM Rejection	AMR	$V_I = 10mV_{RMS}$, 100% FM, 30% AM	-	40	-	dB
Amplifier Voltage Gain	A_V	$V_I = 50\mu V_{RMS}$	-	60	-	dB
Detector Recovered Audio Output	$V_{O(AF)}$	$V_I = 10mV_{RMS}$	-	1.2	-	V_{RMS}
Total Harmonic Distortion	THD	$V_I = 10mV_{RMS}$	-	3	-	%

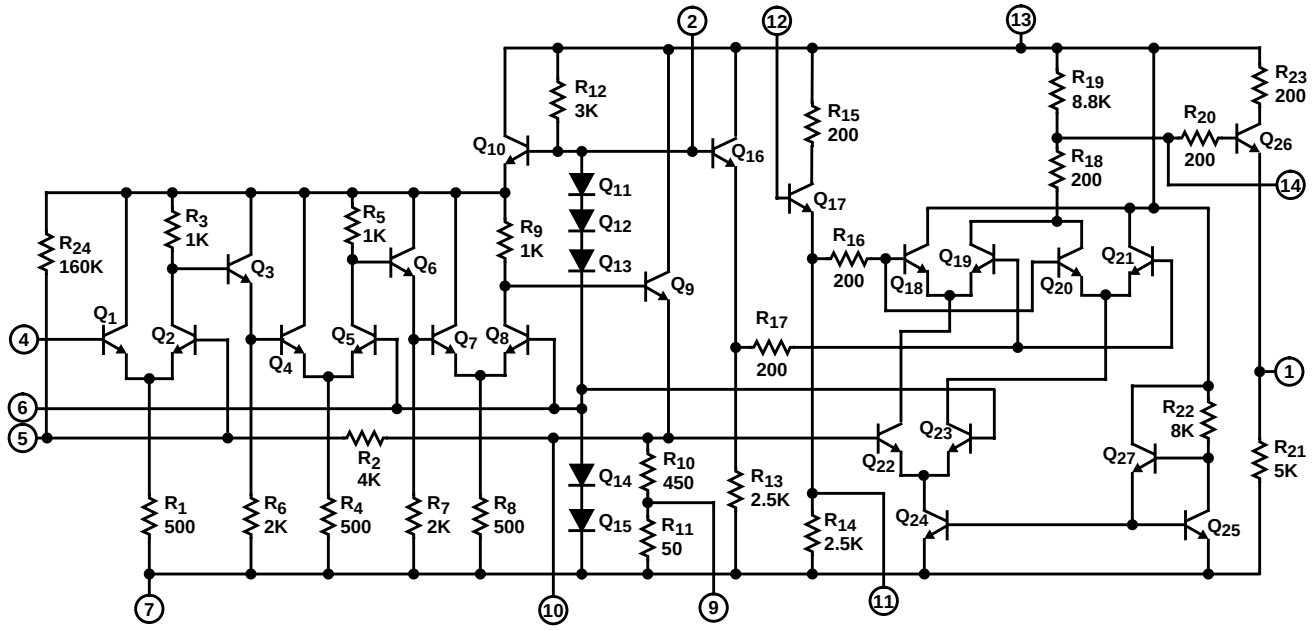
Test Circuit



NOTE: Input to the quadrature coil can be from either terminal 9 or terminal 10. Terminal 9 is normally used because it lessens the possibility of overloads during tuning. The use of terminal 10 increases the limiting sensitivity significantly and has been used successfully in these tests.

COMPONENT VALUES							DETECTOR TRANSFER CHARACTERISTICS	
f	L_1	C_1	R_1	Q	C_2	C_3	UPPER PEAK	LOWER PEAK
MHz	μH	pF	kΩ	-	pF	μF	MHz	MHz
4.5	14	120	20	30	3	0.003	4.58	4.42
5.5	8	100	20	30	3	0.003	5.63	5.37
10.7	2	120	3.9	20	4.7	0.01	10.9	10.5

Schematic Diagram



Typical Performance Curves

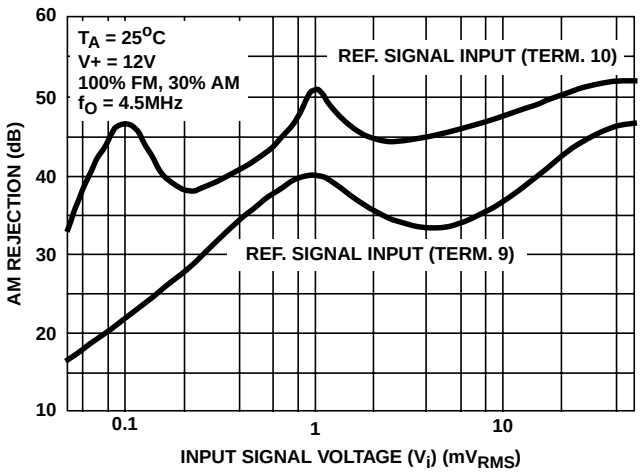


FIGURE 2. AM REJECTION vs INPUT VOLTAGE (AT 4.5MHz)

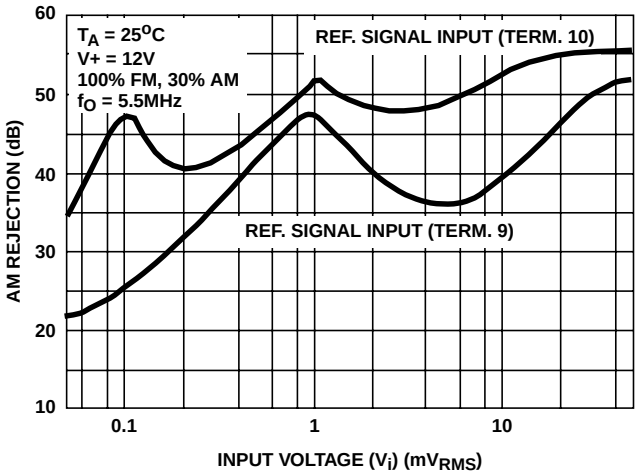


FIGURE 3. AM REJECTION vs INPUT VOLTAGE (AT 5.5MHz)

Typical Performance Curves (Continued)

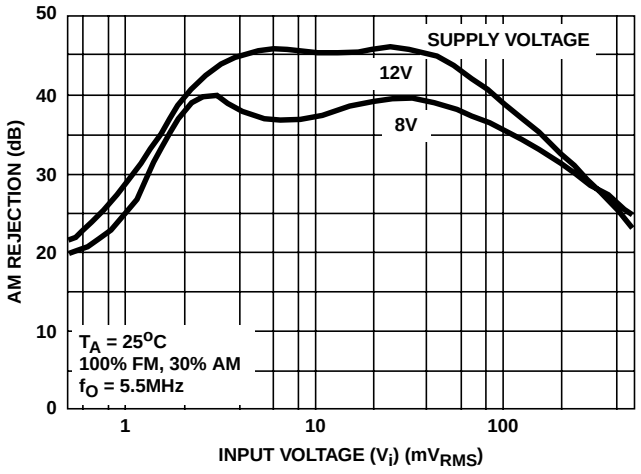


FIGURE 4. AM REJECTION vs INPUT VOLTAGE (AT 10.7MHz)

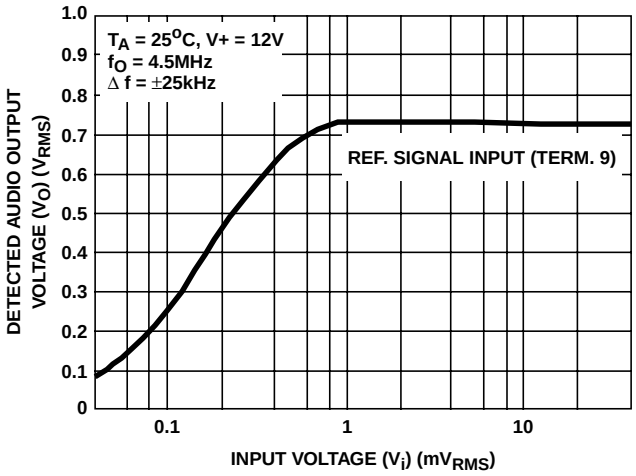


FIGURE 5. DETECTED AUDIO OUTPUT vs INPUT VOLTAGE (4.5MHz)

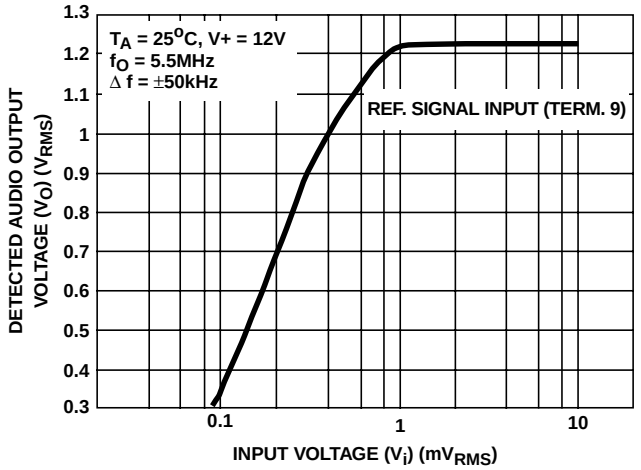


FIGURE 6. DETECTED AUDIO OUTPUT vs INPUT VOLTAGE (AT 5.5MHz)

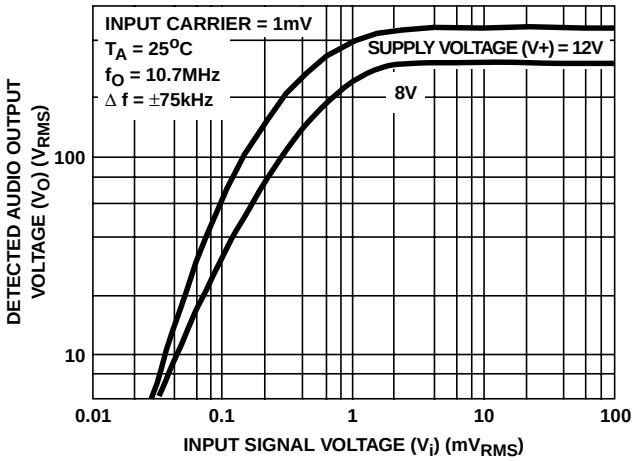


FIGURE 7. DETECTED AUDIO OUTPUT VOLTAGE vs INPUT VOLTAGE (AT 10.7MHz)

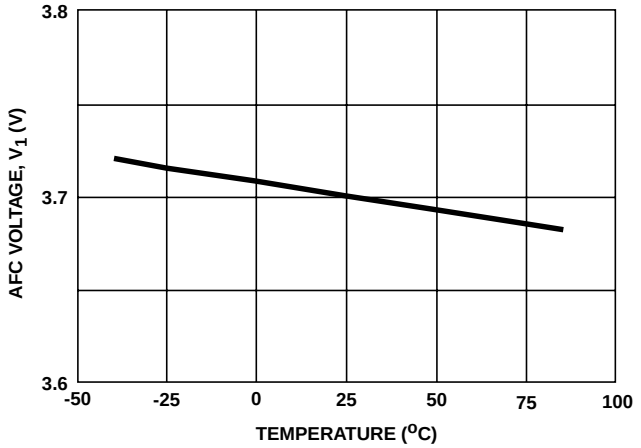


FIGURE 8. AFC VOLTAGE vs AMBIENT TEMPERATURE

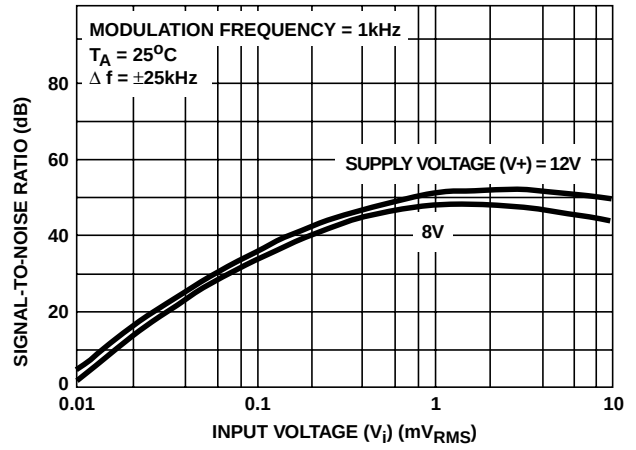


FIGURE 9. SIGNAL-TO-NOISE RATIO vs INPUT VOLTAGE