

# FM IF SYSTEM

CA3089

## DESCRIPTION

CA3089 is a monolithic integrated circuit that provides all the functions of a comprehensive FM-IF system. Figure 6 is a block diagram showing the CA3089 features, which include a three-state FM-IF amplifier/limiter configuration with level detectors for each stage, a doubly-balanced quadrature FM detector and an audio amplifier that features the optional use of a muting (squelch) circuit.

The advanced circuit design of the IF system includes desirable features such as delayed AGC for the RF tuner, an AFC drive circuit, and an output signal to drive a tuning meter and/or provide stereo switching logic. In addition, internal power supply regulators maintain a nearly constant current drain over the voltage supply range of +8 to +18 volts.

The CA3089 is ideal for high-fidelity operation. Distortion in a CA3089 FM-IF system is primarily a function of the phase linearity characteristic of the outboard detector coil.

The CA3089 utilizes a 16-lead dual-in-line plastic package and can operate over the ambient temperature range of -40°C to +85°C.

## FEATURES

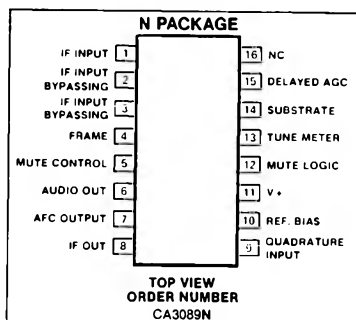
- **Exceptional limiting sensitivity:** 10 $\mu$ V typ. at -3dB point
- **Low distortion:** 0.1% typ. (with double-tuned coil)

- **Single-coil tuning capability**
- **High recovered audio:** 400mV typ.
- **Provides specific signal for control of interchannel muting (squelch)**
- **Provides specific signal for direct drive of a tuning meter**
- **Provides delayed AGC voltage for RF amplifier**
- **Provides a specific circuit for flexible AFC**
- **Internal supply/voltage regulators**

## APPLICATIONS

- **High-fidelity FM receivers**
- **Automotive FM receivers**
- **Communications FM receivers**

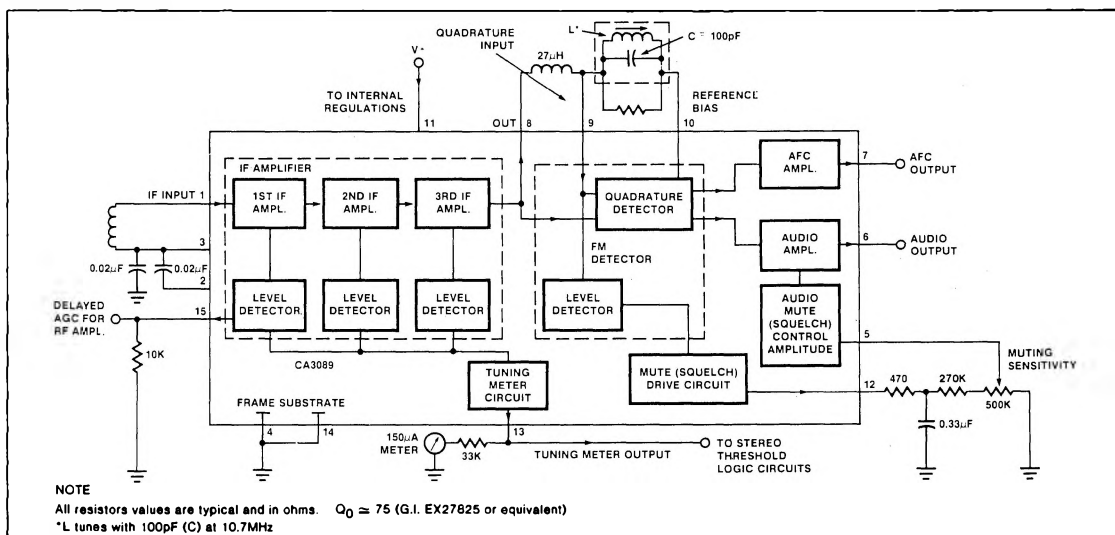
## PIN CONFIGURATION



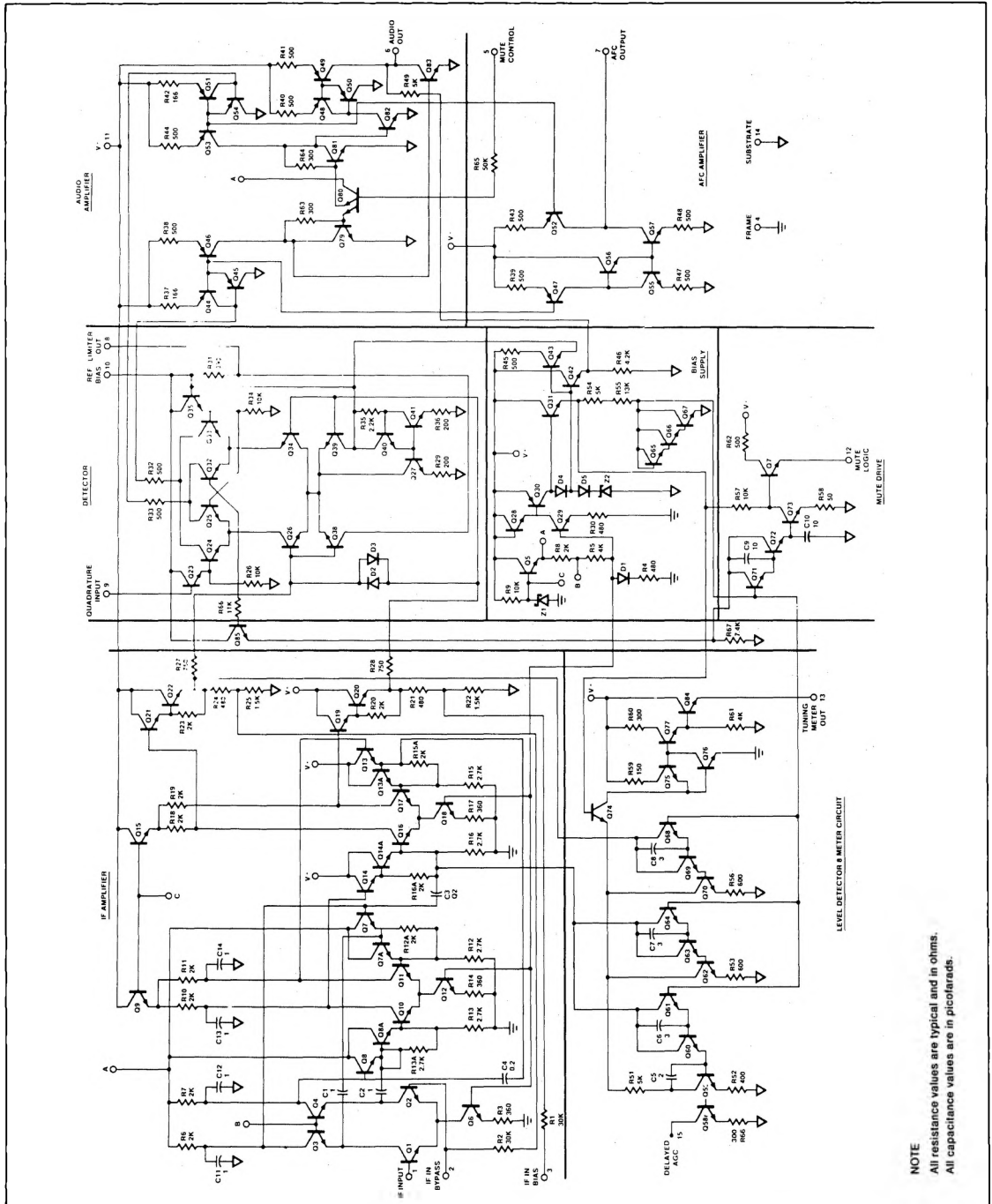
## ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
DC supply voltage:		
Between terminals 11 and 4	18	V
Between terminals 11 and 14	18	V
DC Current (out of terminal 15)	2	mA
Device dissipation:		
Up to T <sub>A</sub> = 60°C	600	mW
Above T <sub>A</sub> = 60°C	derate linearly	
	6.7	mW/°C
Ambient temperature range:		
Operating	-40 to +85	°C
Storage	-65 to +150	°C
Lead temperature (during soldering):		
At distance not less than 1/32" (0.79mm) from case for 10 seconds: max	+265	°C

## BLOCK DIAGRAM



EQUIVALENT SCHEMATIC



NOTE  
All resistance values are typical and in ohms.  
All capacitance values are in picofarads.

## FM IF SYSTEM

CA3089

DC ELECTRICAL CHARACTERISTICS  $T_A = 25^\circ\text{C}$ ,  $V^+ = 12\text{V}$  unless otherwise specified.

PARAMETER	TEST CONDITIONS	CA3089D2			UNIT
		Min	Typ	Max	
STATIC (DC) CHARACTERISTICS					
I <sub>11</sub> Quiescent circuit current	No signal input, non-muted	16	23	30	mA
DC Voltages: <sup>4</sup>					
V <sub>1</sub> Terminal 1 (IF input)	No signal input, non-muted	1.2	1.9	2.4	V
V <sub>2</sub> Terminal 2 (ac return to input)	No signal input, non-muted	1.2	1.9	2.4	V
V <sub>3</sub> Terminal 3 (dc bias to input)	No signal input, non-muted	1.2	1.9	2.4	V
V <sub>6</sub> Terminal 6 (audio output)	No signal input, non-muted	5.0	5.6	6.0	V
V <sub>7</sub> Terminal 7 (A.F.C.)	No signal input, non-muted	5.0	5.6	6.0	V
V <sub>10</sub> Terminal 10 (dc reference)	No signal input, non-muted	5.0	5.6	6.0	V
DYNAMIC CHARACTERISTICS					
V <sub>I(lim)</sub> Input limiting voltage (−3dB point) <sup>3</sup>			10	25	μV
AMR AM Rejection (terminal 6) <sup>4</sup>					
V <sub>O</sub> Recovered audio voltage (terminal 6) <sup>3</sup>	V <sub>IN</sub> = 0.1V, F <sub>O</sub> = 10.7MHz, f <sub>mod</sub> = 400Hz, AM Mod = 30%	45 400	55 500		dB mV
Total harmonic distortion: <sup>1</sup>					
THD Single tuned (terminal 6) <sup>3</sup>	f <sub>mod</sub> = 400Hz, V <sub>IN</sub> = 0.1		0.5	1.0	%
THD Double tuned (terminal 6) <sup>4</sup>			0.1		%
S+N/N Signal plus noise to noise ratio (terminal 6) <sup>3</sup>	Deviation = ±75kHz V <sub>IN</sub> = 0.1V	60	70		dB
MU <sub>IN</sub> Mute input (terminal 5)	V <sub>5</sub> = 2.5V	50	70		dB
MU <sub>OUT</sub> Mute output (terminal 12)	V <sub>IN</sub> = 50μV V <sub>IN</sub> = 0V	4.0		.5	V V
MTR Meter output (terminal 13)	V <sub>IN</sub> = 0.1V	2.5	3.5		V
	V <sub>IN</sub> = 500μV	1.0	1.5		V
	V <sub>IN</sub> = 0V			.7	V
AGC Delayed AGC (terminal 15)	V <sub>IN</sub> = .01V			.5	V
	V <sub>IN</sub> = 10μV	4.0	5.0		V
THD Double tuned (terminal 6) <sup>4</sup>	f <sub>mod</sub> = 400Hz V <sub>IN</sub> = 0.1		0.1		%

## NOTES

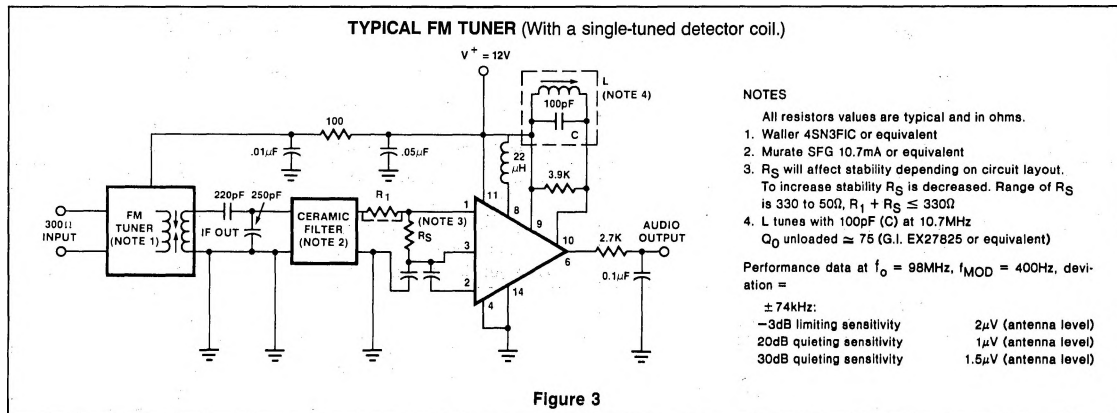
1. THD characteristics and Audio Level are essentially a function of the phase and Q characteristics of the network connected between terminals 6, 9, and 10.

2. Test circuit Figure 1.

3. Test circuit Figure 2.

4. Test circuit Figures 1 and 2.

## TEST CIRCUITS



## SYSTEM DESIGN CONSIDERATIONS

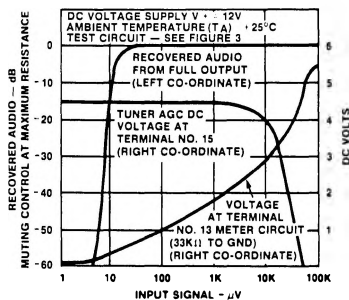
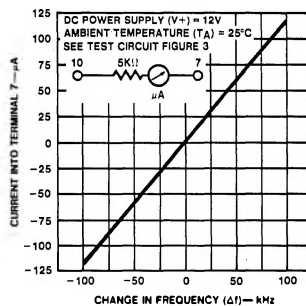
The CA3089 is a very high gain device and therefore careful consideration must be given to the layout of external components to minimize feedback. The input by-pass capacitors should be located close to the input terminals and the values

should not be large nor should the capacitors be of the type which might introduce inductive reactance to the circuit. An example of good by-pass capacitors would be ceramic disc with values in the range of .01 to .05 microfarad.

The input impedance of the CA3089 is approximately 10,000 ohms. It is *not*

recommended to match this impedance. The value of the input termination resistor should be as low as possible without degrading system operation. The lower the value of this resistor the greater the system stability. An input terminating resistor between 50 and 100 ohms is recommended.

## TYPICAL PERFORMANCE CHARACTERISTICS

MUTING ACTION, TUNER AGC  
(Tuning meter output as a function of input signal voltage.)AFC CHARACTERISTICS  
(Current at Term. 7 as a function of change in frequency.)

TEST CIRCUITS

