FM IF System

Includes: IF amplifier, quadrature detector, AF preamplifier and specific circuits for AGC, AFC, muting (squelch), and tuning meter.

For FM IF amplifier applications in high fidelity, automotive, and communications receivers.

Description

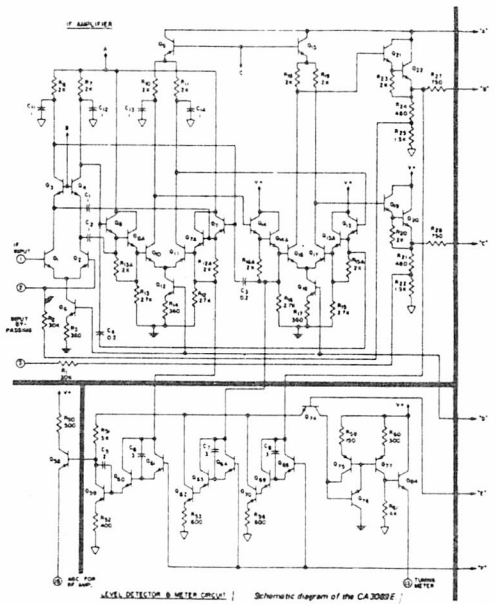
CA 3089E is a monolithic integrated circuit that provides all the functions of a comprehensive FM-IF system. Figure 1 is a block diagram showing the CA 3089E features, which include a three-stage FM-IF-amplifier/limiter configuration with level detectors for each stage, a doubly-balanced quadrature FM detector and an audio amplifier that features the optional use of a muting (squelch) circuit.

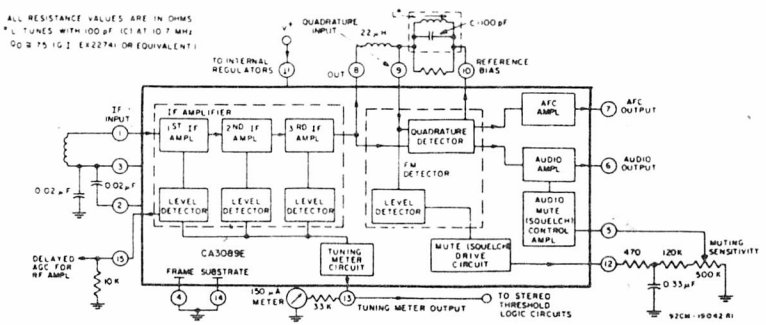
The advanced circuit design of the IF system includes desirable deluxe features such as delayed AGC for the RF tuner, an AFC drive circuit, and an output signal to drive a tuning meter and/or provide stereo switching logic. In addition, internal power supply regulators maintain a nearly constant current drain over the voltage supply range of +8.5 to +16 volts.

The CA 3089E is ideal for high-fidelity operation. Distortion in a CA 3089E FM-IF system is primarily a function of the phase linearity characteristic of the outboard detector coil.

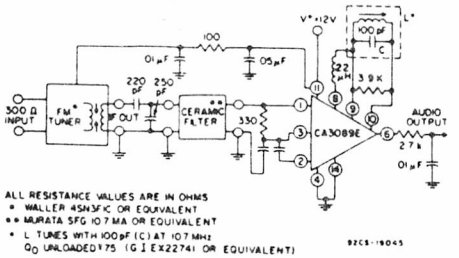
Maximum ratings: absolute maximum values, at $T_A = 25°C$

DC supply voltage:	
between terminals 11 and 4	16 V
between terminals 11 and 14	16 V
DC current (out of terminal 15)	2 mA
Device dissipation:	
up to $T_A = 60°C$	600 mW
above $T_A = 60°C$	derate linearly 6.7 mW/°C
Ambient temperature range:	
Operating	−55 to +125°C
Storage	−65 to +150°C
Lead temperature (during soldering):	
at distance not less than 1/32" (0.79 mm) from case for 10 seconds max.	+265°C

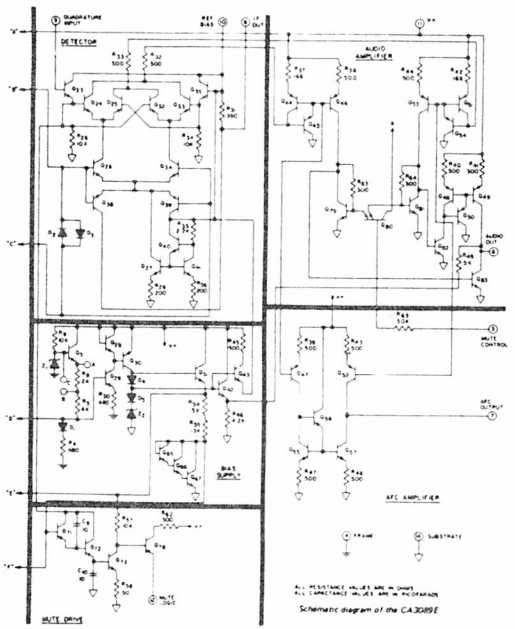




Block diagram of the CA3089E.



Typical FM tuner using the CA3089E with a single-tuned detector coil.



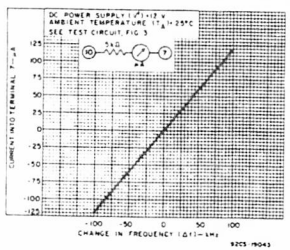
ELECTRICAL CHARACTERISTICS, at $T_A = 25°C$, $V^+ = 12$ Volts

CHARACTERISTIC	SYMBOL	TEST CONDITIONS			LIMITS			UNITS
				Circuit Fig. No.	Min	Typ	Max	
Static (DC) Characteristics								
Quiescent Circuit Current	I_{11}	No signal input. Non muted		3, 4	16	23	30	mA
DC Voltages								
Terminal 1 (IF Input)	V_1				1.2	1.9	2.4	V
Terminal 2 (AC Return to Input)	V_2				1.2	1.9	2.4	V
Terminal 3 (DC Bias to Input)	V_3				1.2	1.9	2.4	V
Terminal 6 (Audio Output)	V_6				5.0	5.6	6.0	V
Terminal 10 (DC Reference)	V_{10}				5.0	5.6	6.0	V
Dynamic Characteristics								
Input Limiting Voltage (3 dB point)	V_i(lim)	–		3, 4	–	1.2	2.5	µV
AM Rejection (Term. 6)	AMR	$V_{IN} = 0.1$ V, AM Mod. = 30%	$f_0 = 10.7$ MHz		45	55	–	dB
Recovered AF Voltage (Term. 6)	V_O(AF)				300	400	500	mV
Total Harmonic Distortion *		$V_{IN} = 0.1$ V	$f_{mod} = 400$ Hz, Deviation = 75 kHz					
Single Tuned, (Term. 6)	THD			3	–	0.5	1.0	%
Double Tuned (Term. 6)	THD			4	–	0.1	–	%
Signal plus Noise to Noise Ratio (Term. 6)	S + N/N			3, 4	60	67	–	dB

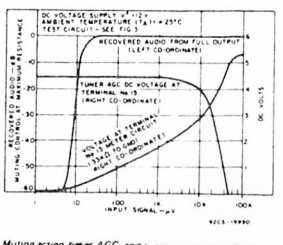
* THD characteristics are essentially a function of the phase characteristics of the network connected between terminals 8, 9, and 10.

Features

- Exceptional limiting sensitivity: 12 µV typ. at −3 dB point
- Low distortion: 0.1% typ. (with double-tuned coil)
- Single-coil tuning capability
- High recovered audio: 400 mV 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



AFC characteristics (current at Term. 7 as a function of change in frequency).



Muting action, tuner AGC, and tuning meter output as a function of input signal voltage.