

LM3089 FM Receiver IF System

General Description

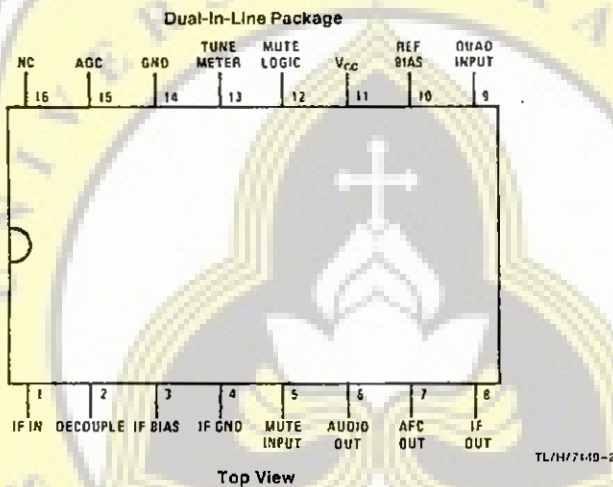
The LM3089 has been designed to provide all the major functions required for modern FM IF designs of automotive, high-fidelity and communications receivers.

Features

- Three stage IF amplifier/limiter provides 12 μ V (typ) -3 dB limiting sensitivity
- Balanced product detector and audio amplifier provide 400 mV (typ) of recovered audio with distortion as low as 0.1% with proper external coil designs.

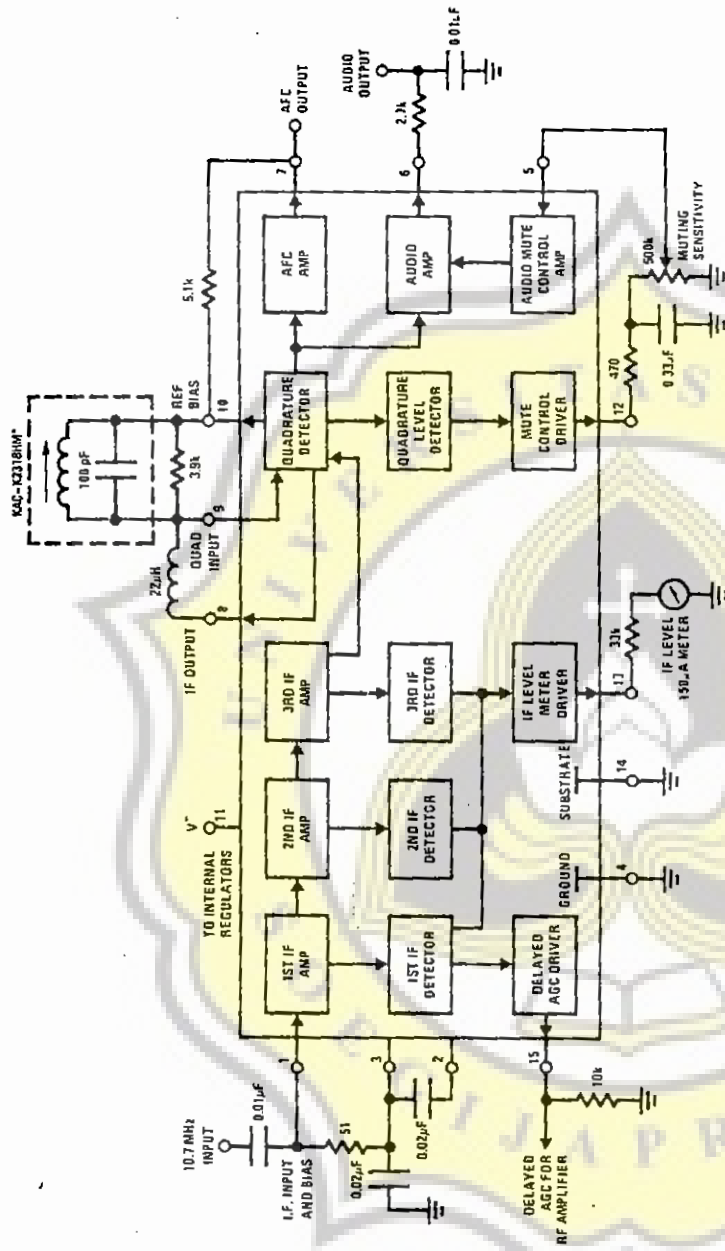
- Four internal carrier level detectors provide delayed AGC signal to tuner, IF level meter drive current and Interchannel mute control
- AFC amplifier provides AFC current for tuner and/or center tuning meters
- Improved operating and temperature performance, especially when using high Q quadrature coils in narrow band FM communications receivers
- No mute circuit latchup problems
- A direct replacement for CA3089E

Connection Diagram



LM3089 FM Receiver IF System

Block Diagram



TU-7-9-1

Tekco America
 1250 Foothill Drive
 Mount Prospect, IL 60056
 (312) 297-0070

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage Between Pin 11 and Pins 4, 14	+ 16V
DC Current Out of Pin 12	5 mA
DC Current Out of Pin 13	5 mA
DC Current Out of Pin 15	2 mA

Power Dissipation (Note 2)	1500 mW
Operating Temperature Range	40°C to + 85°C
Storage Temperature Range	65°C to + 150°C
Lead Temperature (Soldering, 10 seconds)	260°C

Electrical Characteristics (T_A = 25°C, V_{CC} = + 12V, see Test Circuit)

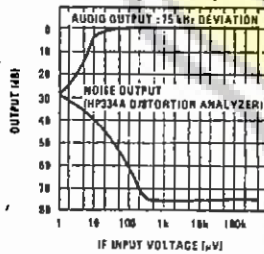
Symbol	Parameter	Conditions	Min	Typ	Max	Units
DC CHARACTERISTICS (V_{IN} = 0, NOT MUTED)						
I ₁₁	Supply Current		16	23	30	mA
V _{1, 2, 3}	IF Input and Bias		1.2	1.9	2.4	V
V ₆	Audio Output		5.0	5.6	6.0	V
V ₇	AFC Output		5.0	5.6	6.0	V
V ₁₀	Reference Bias		5.0	5.6	6.0	V
V ₁₂	Mute Control		5.0	5.4	6.0	V
V ₁₃	IF Level			0	0.5	V
V ₁₅	Delayed AGC		4.2	4.7	5.3	V
DYNAMIC CHARACTERISTICS f_o = 10.7 MHz, Δf = +75 kHz @ 400 Hz						
V _{IN} (LIM)	Input Limiting - 3 dB			12	25	μV
AMR	AM Rejection	V _{IN} = 100 mV, AM: 30%	45	55		-dB
V _O (AF)	Recovered Audio	V _{IN} = 10 mV	300	400	500	mVrms
THD	Total Harmonic Distortion					
	Single Tuned (Note 1)	V _{IN} = 100 mV		0.5	1.0	%
	Double Tuned (Note 1)	V _{IN} = 100 mV		0.1	0.3	%
S+N/N	Signal to Noise Ratio	V _{IN} = 100 mV	60	70		dB
V ₁₂	Mute Control	V _{IN} = 100 mV		0	0.5	V
V ₁₃	IF Level	V _{IN} = 100 mV	4.0	5.0	6.0	V
V ₁₃	IF Level	V _{IN} = 500 μV	1.0	1.5	2.0	V
V ₁₅	Delayed AGC	V _{IN} = 100 mV		0.1	0.5	V
V ₁₅	Delayed AGC	V _{IN} = 30 mV		2.5		V
V _O (AF)	Audio Muted	V _{IN} = 100 mV, V ₅ = + 2.5V		60		-dB

Note 1: Distortion is a function of quadrature coil used.

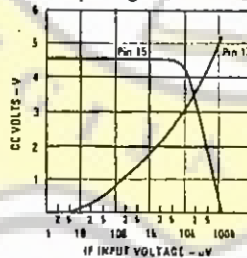
Note 2: For operation in ambient temperatures above 25°C, the device must be derated based on a 150°C maximum junction temperature and a thermal resistance of 80°C/W junction to ambient.

Typical Performance Characteristics

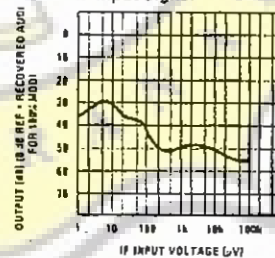
Typical S + N/N and IF Limiting Sensitivity vs IF Input Signal



Typical AGC (Pin 15) and Mute Output (Pin 13) vs IF Input Signal

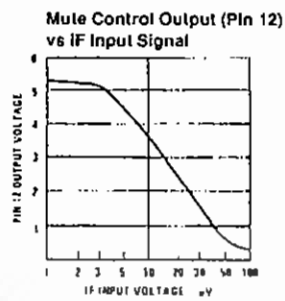
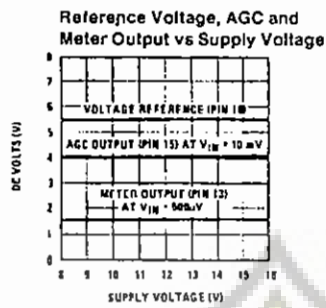
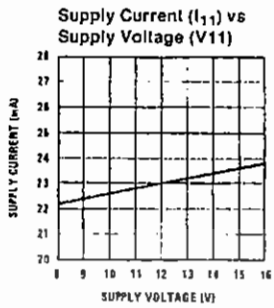


AM Rejection (30% Mod) vs IF Input Signal

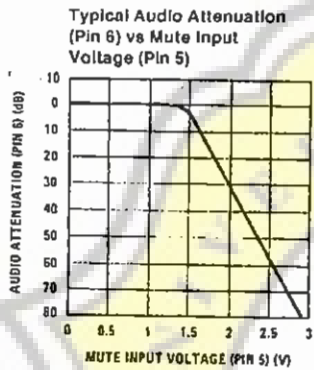


TL/H/7149-3

Typical Performance Characteristics

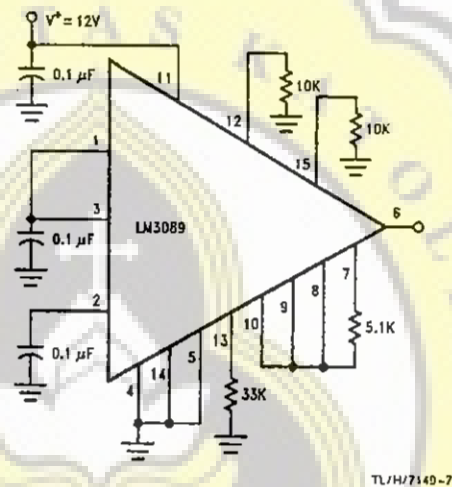


TL/H/7140-5



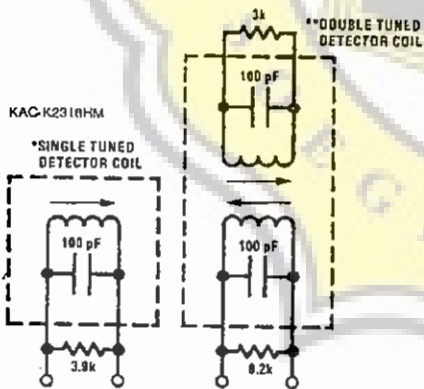
TL/H/7140-0

DC Test Circuit



TL/H/7140-7

AC Test Circuit



*For single tuned detector coil:
 f_0 tunes with 100 pF at 10.7 MHz
 Q_{UL} (unloaded) ≈ 75
 Q_L (loaded) ≈ 13 for $V_9 \approx 150$ mVrms

**For double tuned detector coil:
 Q_{ULPUL} ≈ 75
 $kQ \approx 0.7$ for $V_9 \approx 150$ mVrms

Note:

The recovered audio output voltage will be approximately 0.5 dB less when using the double tuned detector coil.

For proper operation of the mute circuit, the RF voltage at pin 0 should be 150 mVrms ± 30 mV.

TL/H/7140-8

