

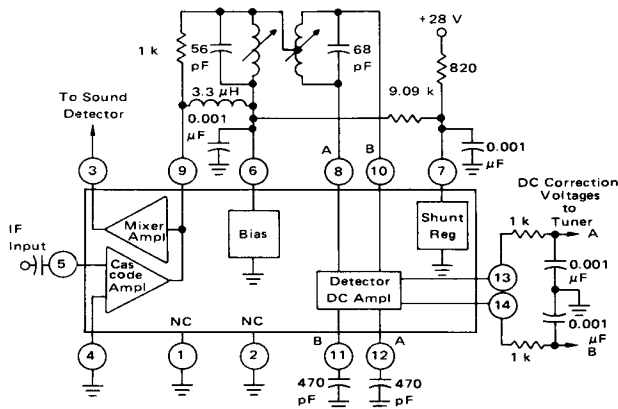
CA3139

TV AUTOMATIC FINE TUNING CIRCUIT WITH INTERCARRIER MIXER/AMPLIFIER

The CA3139 is a monolithic TV Automatic Fine Tuning (AFT) circuit that provides an AFT voltage and an amplified 4.5 MHz intercarrier sound signal. When connected to an output of an IF amplifier the CA3139 provides the signal processing (amplification and detection) necessary to generate the AFT correction signals required by the TV tuner. It also mixes the video and sound IF carriers and amplifies the resultant 4.5 MHz intercarrier sound signal.

- Cascode Type High Gain Amplifier
(15 mV input for rated output)
- AFT Differential Peak Detector
- Differential Amplifier
- Bipolar Outputs
- Five Stage Intercarrier Mixer/Amplifier
- Internal Voltage Regulator
- For Use in Either Color or Monochrome Receivers

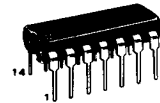
FIGURE 1 — BLOCK DIAGRAM AND TYPICAL APPLICATION



All resistor values are in ohms.

TV AUTOMATIC FINE TUNING CIRCUIT

SILICON MONOLITHIC INTEGRATED CIRCUIT



E SUFFIX
PLASTIC PACKAGE
CASE 646



Q SUFFIX
PLASTIC PACKAGE
CASE 647

PIN CONNECTIONS

1	NC	DC Amp B Out	14
2	NC	DC Amp A Out	13
3	Intercarrier Out	Filter A	12
4	Substrate	Filter B	11
5	IF Input	Det B Input	10
6	Det Bias	IF Amp Output	9
7	Shunt Reg.	Det A Input	8

ORDERING INFORMATION

Device	Temperature Range	Package
CA3139E	-40 to +85°C	Plastic DIP
CA3139Q	-40 to +85°C	Plastic QIL

MAXIMUM RATINGS ($T_A = 25^{\circ}\text{C}$, unless otherwise noted)

Rating	Symbol	Value	Unit
Shunt Regulator Input Current	I_7	50	mA
Detector Bias Current	I_6	2	mA
Junction Temperature	T_J	150	°C
Operating Temperature Range	T_A	-40 to +85	°C
Storage Temperature Range	T_{sta}	-65 to +150	°C

ELECTRICAL CHARACTERISTICS ($V_{CC} = 28 \text{ Vdc}$, $V_{in} = 0$, $T_A = 25^\circ\text{C}$, Test Circuit—Figure 2)*

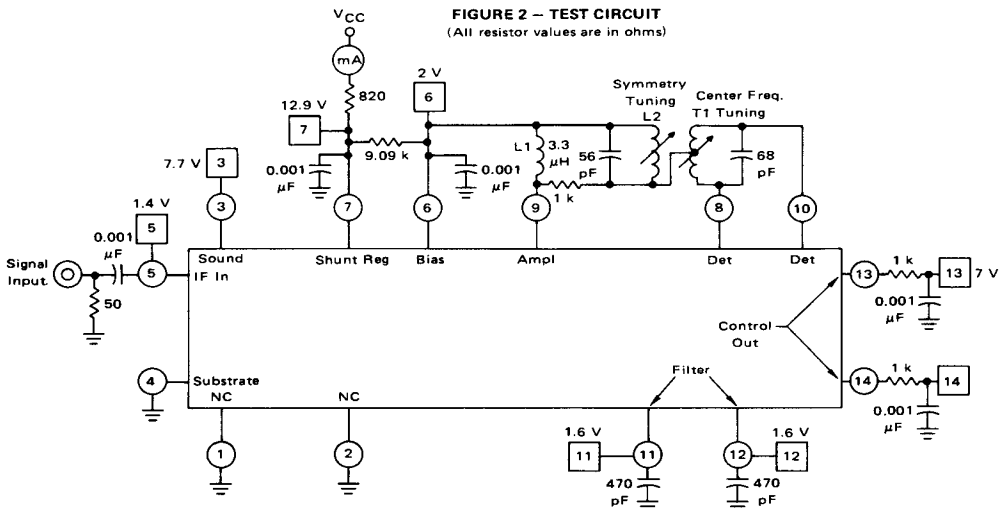
Characteristics		Min	Typ	Max	Unit
Supply Current I+		15	18	20	mA
Shunt Regulator Voltage		12	13	14.5	V _{dc}
Quiescent Voltage at Pin 3		4.5	7.7	10	V
Quiescent Voltage(1) at Pins 13 and 14. Pins 13 and 14 Connected		6	7	8.5	V _{dc}
Quiescent Voltage Differential, Pins 13 to 14		-0.8	-	+0.8	V _{dc}
Quiescent Voltage at Pin 6		1.4	2.3	2.6	V _{dc}
Correction Voltage at Pin 13 (See Note 2)	f = 44.65 MHz	2.2	-	4.7	V _{dc}
	f = 45.69 MHz	1.2	-	4.4	
	f = 45.81 MHz	9.6	-	13.8	
	f = 46.85 MHz	9.1	-	12.1	
Correction Voltage at Pin 14 (See Note 2)	f = 44.65 MHz	9.1	-	12.1	V _{dc}
	f = 44.69 MHz	9.6	-	13.8	
	f = 45.81 MHz	1.2	-	4.4	
	f = 45.85 MHz	2.2	-	4.7	
4.5 MHz Output (See Note 2)	Two-Tone Input f ₁ = 45.75 MHz at 15 mV f ₂ = 41.25 MHz at 5 mV	50	-	200	mV _{rms}

*Unless otherwise specified.

NOTES: 1. $V_{13} = 0.55 V_7 \pm 0.7 V$.

2. Resistor from Pin 6 to Pin 7 = 9.09 k Ω . Crossover steepens and "Bow Tie" width increases when resistor is decreased in value. Total peak swing decreases slightly.

FIGURE 2 – TEST CIRCUIT
(All resistor values are in ohms)



NOTES:

1. Use 10 k Ω Isolation Resistor at dc voltmeter probe tip when making dc measurements.
2. Typical no-signal dc potentials are shown.
3. Boxes represent test points.

- L2** — 4-1/2 turns #22 wire; O.D. = 0.25" (typ); Q (unloaded) = 100 (min); f = 41.25 MHz; Inductance = 0.18 μ H (typ).
- T1** — 3-1/2 turns (center tapped) #20 wire; O.D. = 0.25" (typ); Q (unloaded) = 140 (min); f = 46.75 MHz; Inductance = 0.18 μ H (typ).

CIRCUIT DESCRIPTION

The five functional blocks of the CA3139 as shown in Figure 1 are briefly described below.
(See Figure 3 for schematic diagram.)

1. **Cascode Amplifier** — consists of Q1, emitter-follower; Q2, common-emitter amplifier; and Q3, common-base amplifier. The input to the cascode amplifier (pin 5) is normally AC coupled since Q1 is internally biased.

2. **Bias Circuit** — Transistor Q4 and resistors R1, R4, R5, and an external resistor (shown as 9.09 k Ω in Figure 1) connected to pin 7 make up the bias circuit. Lower values of the external resistor will increase the gain of the amplifier (9.1 k Ω is nominal) thereby increasing the AFT "Bow Tie" width and crossover slope (reduced values of the external resistor will have the opposite effect).

3. **Mixer/Amplifier** — The cascode amplifier output (pin 9) is internally connected to the base of Q13. Transistors Q13 through Q17 make up the intercarrier mixer/amplifier. Q14 is used in the down-conversion of the video IF carrier (41.25 MHz) to give a 4.5 MHz FM signal. The video IF carrier, sound IF carrier and upper

conversion signals are removed using a low-pass filter. Q16 and C3 are used to further amplify and filter the 4.5 MHz signal. This 4.5 MHz signal output is at pin 3.

4. **AFT Detector and DC Amplifier** — Detection and amplification is accomplished by Q6 through Q12. The detector inputs (pins 8 and 10) are connected to the discriminator transformer and biased through the transformer at pin 6 voltage. Q7 and Q8 total current is held constant by Q10, Q11, and Q12 (current-mirror transistors). Peak detection is assured through the use of external filter capacitors at pins 11 and 12. Correction voltages at pins 13 and 14 are given in the Electrical Characteristics Table.

5. **Voltage Regulator** — consisting of D1, D2, Z1, Z2, and Q5 is an active shunt type and is used to reduce the dynamic resistance.

FIGURE 3 — CIRCUIT SCHEMATIC
(Resistors are measured in ohms)

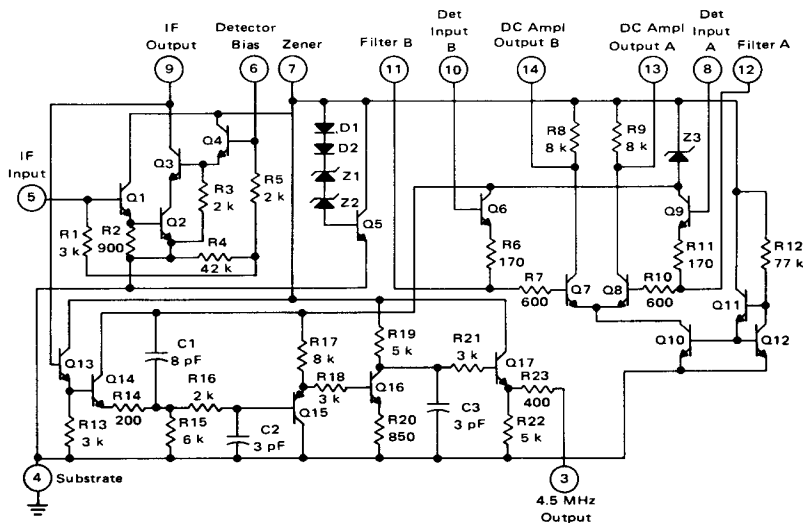


FIGURE 4 — TYPICAL TUNER CONNECTION

