

TV VIDEO IF AMPLIFIER

MC1352 MC1353

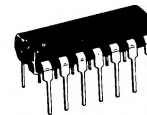
TV VIDEO IF AMPLIFIER WITH AGC AND KEYER CIRCUIT

... a monolithic IF amplifier with a complete gated wide-range AGC system for use as the 1st and 2nd IF stages and AGC keyer and amplifier in color or monochrome TV receivers.

- Power Gain at 45 MHz, 52 dB typ
- Extremely Low Reverse-Transfer Admittance – $\ll 1.0 \mu\text{mho typ}$
- Nearly Constant Input and Output Admittance Over AGC Range
- Single-Polarity Power-Supply Operation
- High-Gain Gated AGC System for Either Positive or Negative-Going Video Signals
- Control Signal Available for Delayed AGC of Tuner
- Two Complementary Devices – MC1352 and MC1353 – Offer Opposite Tuner AGC Polarity

TV VIDEO IF AMPLIFIER WITH AGC AND KEYER CIRCUIT

MONOLITHIC SILICON INTEGRATED CIRCUIT

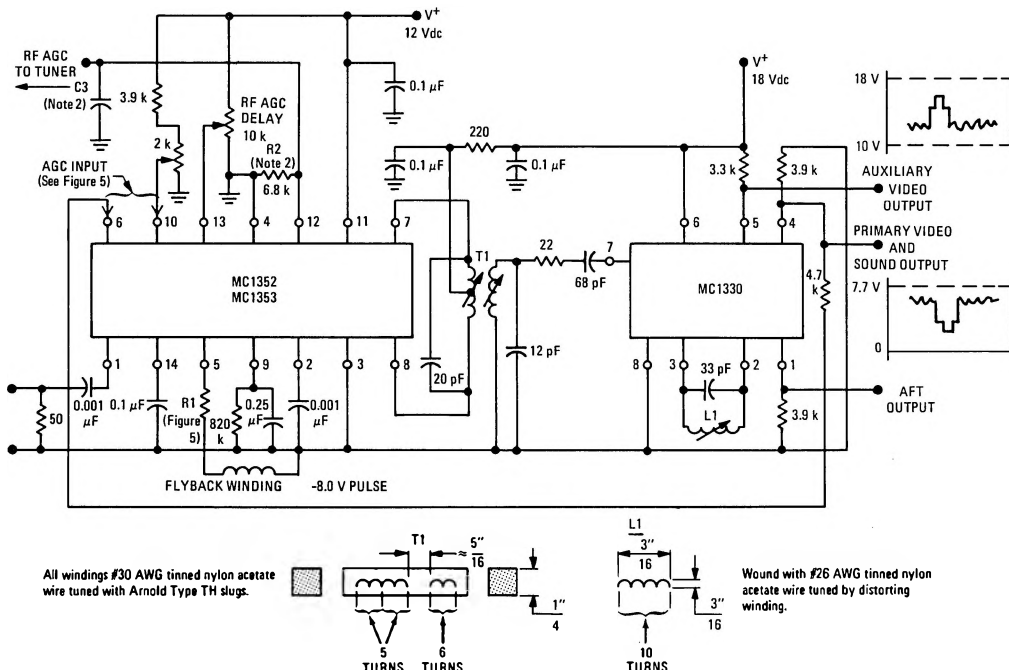


P SUFFIX
PLASTIC PACKAGE
CASE 605
TO-116

PQ SUFFIX
PLASTIC PACKAGE
CASE 647



FIGURE 1 – TYPICAL VIDEO IF AMPLIFIER APPLICATION



MC1352, MC1353(continued)

MAXIMUM RATINGS (Voltages referenced to pin 4, ground; $T_A = +25^{\circ}\text{C}$ unless otherwise noted)

Rating	Value	Unit
Power Supply (Pin 11)	+18	Vdc
Output Supply (Pins 7 and 8)	+18	Vdc
Signal Input Voltage (Pin 1 or 2, other pin ac grounded)	10	V _{p-p}
AGC Input Voltage (Pin 6 or 10, other pin ac grounded)	+6.0	Vdc
Gating Voltage, Pin 5	+10, -20	Vdc
Power Dissipation	625	mW
Derate above $T_A = +25^{\circ}\text{C}$	5.0	mW/ $^{\circ}\text{C}$
Operating Temperature Range	0 to +70	$^{\circ}\text{C}$
Storage Temperature Range	-55 to +150	$^{\circ}\text{C}$

Maximum Ratings as defined in MIL-S-19500, Appendix A.

ELECTRICAL CHARACTERISTICS ($V_+ = +12\text{ Vdc}$, Voltages referenced to pin 4, ground; $T_A = +25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Min	Typ	Max	Unit
AGC Range	—	75	—	dB
Power Gain				dB
$f = 35\text{ MHz}$ or 45 MHz	—	52	—	
$f = 58\text{ MHz}$	—	50	—	
Maximum Differential Output Voltage Swing				V _{p-p}
0 dB AGC	—	16.8	—	
-30 dB AGC	—	8.4	—	
Voltage Range for RF-AGC at Pin 12				Vdc
Maximum	—	7.0	—	
Minimum	—	0.2	—	
IF Gain Change Over RF-AGC Range	—	10	—	dB
Output Stage Current ($I_7 + I_8$)	—	5.7	—	mA _{dc}
Total Supply Current ($I_7 + I_8 + I_{11}$)	—	27	31	mA _{dc}
Total Power Dissipation	—	325	370	mW

DESIGN PARAMETERS, TYPICAL VALUES ($V_+ = 12\text{ Vdc}$, $T_A = +25^{\circ}\text{C}$ unless otherwise noted)

Parameters	Symbol	$f = 35\text{ MHz}$	$f = 45\text{ MHz}$	$f = 58\text{ MHz}$	Unit
Single-Ended Input Admittance	g_{11} b_{11}	0.55 2.25	0.70 2.80	1.1 3.75	mmhos
Input Admittance Variations with AGC (0 to 60 dB)	Δg_{11} Δb_{11}	50 0	60 0	— —	μmhos
Differential Output Admittance	g_{22} b_{22}	20 430	40 570	75 780	μmhos
Output Admittance Variations with AGC (0 to 60 dB)	Δg_{22} Δb_{22}	3.0 80	4.0 100	— —	μmhos
Reverse Transfer Admittance	$ y_{12} $	$\ll 1.0$	$\ll 1.0$	$\ll 1.0$	μmho
Forward Transfer Admittance					
Magnitude	$ y_{12} $	260	240	210	mmhos
Angle (0 dB AGC)	$\angle Y_{21}$	-73	-100	-135	degrees
Angle (-30 dB AGC)	$\angle Y_{21}$	-52	-72	-96	
Single-Ended Input Capacitance		9.5	10	10.5	pF
Differential Output Capacitance		2.0	2.0	2.5	pF

MC1352, MC1353 (continued)

FIGURE 2 – CIRCUIT SCHEMATIC

KEYER AND AGC AMPLIFIER

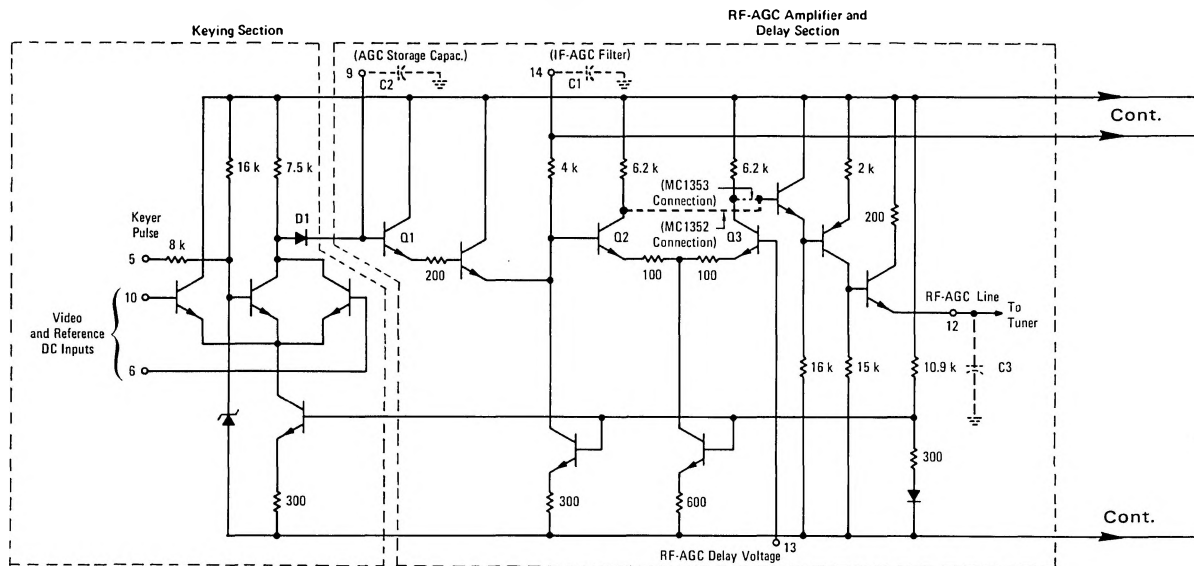
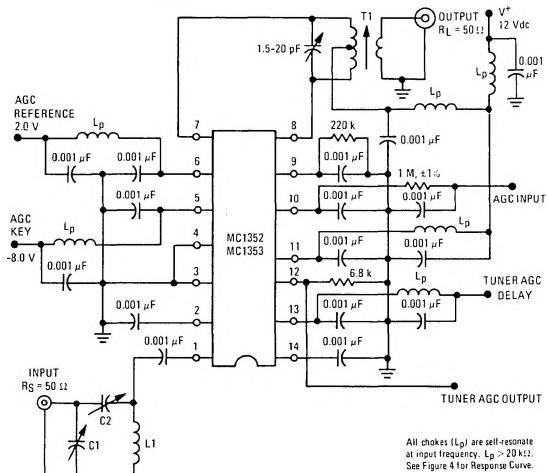


FIGURE 3 – POWER GAIN, AGC AND NOISE TEST CIRCUIT



	35 and 45 MHz	58 MHz
L1	0.4 μ H	0.3 μ H
T1	1.3-3.4 μ H	1.2-3.8 μ H
C1	48-100 pF	40-80 pF
C2	8-60 pF	12-45 pF

L1 and T1 = #26 AWG Tinned Nylon Acetate Wire.

L1 @ 35 or 45 MHz = 7-1/4 Turns on a 1/4" coil form
 @ 58 MHz = 6 Turns on a 1/4" coil form
 T1 Primary Winding = 18 Turns on a 1/4" coil form
 Secondary Winding = 2 Turns Wound Evenly over Primary
 Winding for 35 or 45 MHz and 1
 Turn for 58 MHz
 Slug = Arnold TH Material 1/2" long

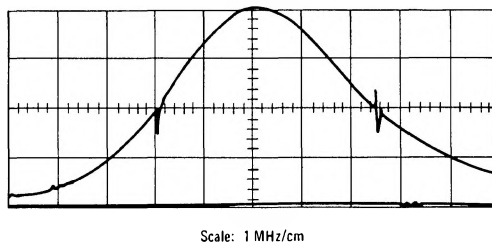
GENERAL OPERATING INFORMATION

Each device, MC1352 and MC1353, consists of an AGC section and an IF signal amplifier (Figure 2) subdivided into different functions as indicated by the illustration.

A gating pulse, a reference level, and a composite video signal are required for proper operation of the AGC section. Either positive or negative-going video may be used; necessary connections and signal levels are shown in Figure 1. The essential difference is that the video is fed into Pin 10 and the AGC reference level is applied to Pin 6 for a video signal with positive-going sync while the input connections are reversed for negative-going sync.

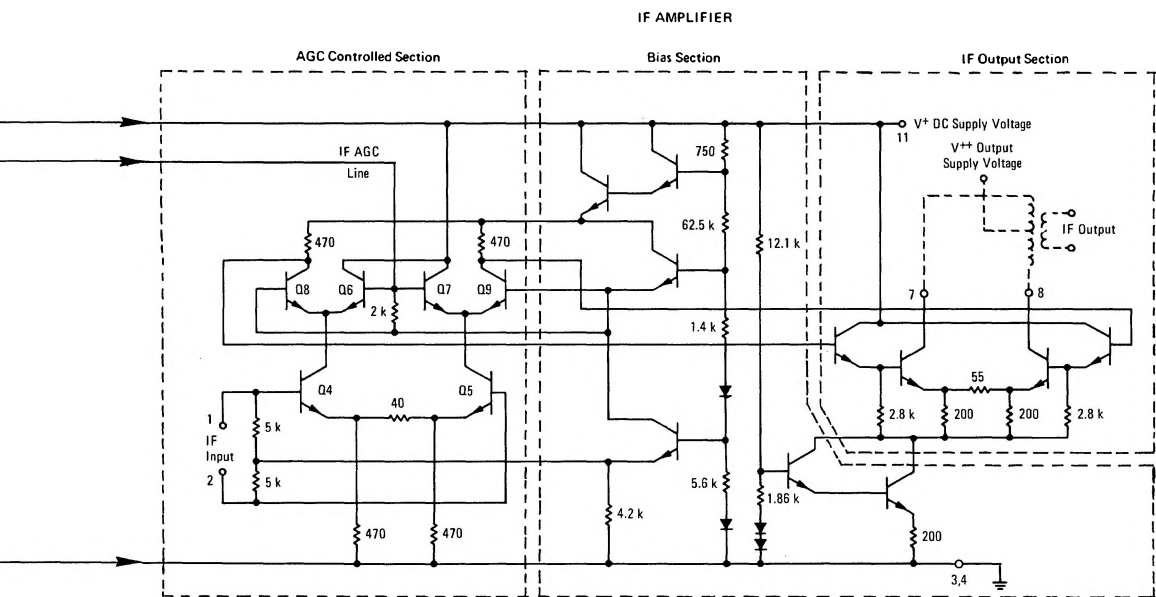
The action of the gating section is such that the proper voltage,

**FIGURE 4 – TEST CIRCUIT RESPONSE CURVE
(45 and 58 MHz)**



Scale: 1 MHz/cm

MC1352, MC1353(continued)



V_C is maintained across the external capacitor, C2, for a particular video level and dc reference setting. The voltage V_C is the result of the charge delivered through D1 and the charge drained by Q1. The charge delivered occurs during the time of the gating pulse, and its magnitude is determined by the amplitude of the video signal relative to the dc reference level. The voltage V_C is delivered via the IF-AGC amplifier and applied to the variable gain stage of the IF signal amplifier and is also applied to the RF-AGC amplifier, where it is compared to the fixed RF-AGC delay voltage reference by the differential amplifier, Q2 and Q3. The following stages amplify the output signal of either Q2 for MC1352, or Q3 for MC1353 and shift the dc levels causing the RF-AGC voltage to vary (positive-going for MC1352 or negative-going for MC1353).

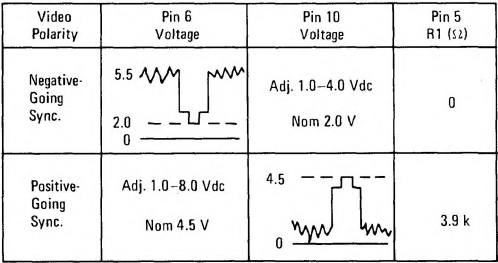
The input amplifiers (Q4 and Q5) operate at constant emitter currents so that input impedance remains independent of AGC action. Input signals may be applied single-ended or differentially (for ac). Terminals 1 and 2 may be driven from a transformer, but a dc path from either terminal to ground is not permitted.

AGC action occurs as a result of an increasing voltage on the base of Q6 and Q7 causing those transistors to conduct more heavily thereby shunting signal current from the interstage amplifiers Q8 and Q9. The output amplifiers are fed from an active current source to maintain constant quiescent bias thereby holding output admittance nearly constant.

NOTES:

1. The 12-V supply must have a low ac impedance to prevent low-frequency instability in the RF-AGC loop. This can be achieved by a 12-V zener diode and a large decoupling capacitor. (5 μ F).
2. Choices of C1, C2 and C3 depend somewhat on the set designers' preference concerning AGC stability versus AGC recovery speed. Typical values are C1 = 0.1 μ F, C2 = 0.25 μ F, C3 = 10 μ F.
3. To set a fixed IF-AGC operating point (e.g., for receiver alignment) connect a 22 k Ω resistor from pin 9 to pin 11 to give minimum gain, then bias pin 14 to give the correct operating point using a 200 k Ω variable resistor to ground.
4. Although the unit will normally be operating with a very high power gain, the pin configuration has been carefully chosen so that shielding between input and output terminals will not normally be necessary even when a standard socket is used.

FIGURE 5 – TYPICAL AGC APPLICATION CHART



MC1352, MC1353 (continued)

TYPICAL CHARACTERISTICS
($V^+ = +12\text{ Vdc}$, $T_A = +25^\circ\text{C}$ unless otherwise noted)

FIGURE 6 – SINGLE-ENDED INPUT ADMITTANCE

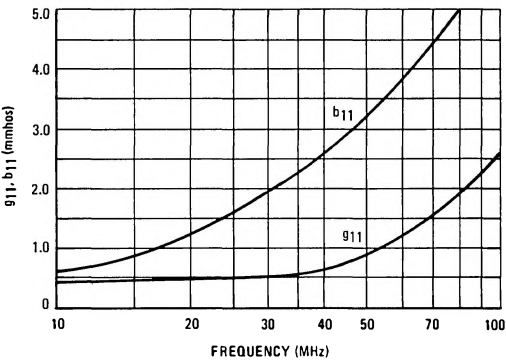


FIGURE 7 – DIFFERENTIAL OUTPUT ADMITTANCE

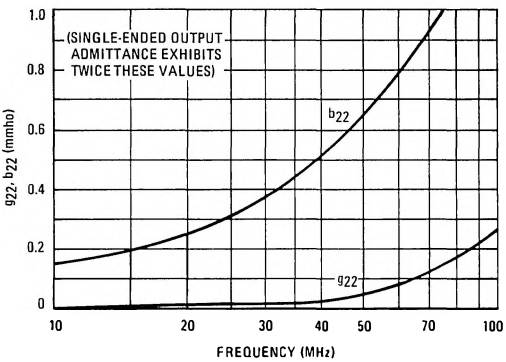


FIGURE 8 – FORWARD TRANSFER ADMITTANCE

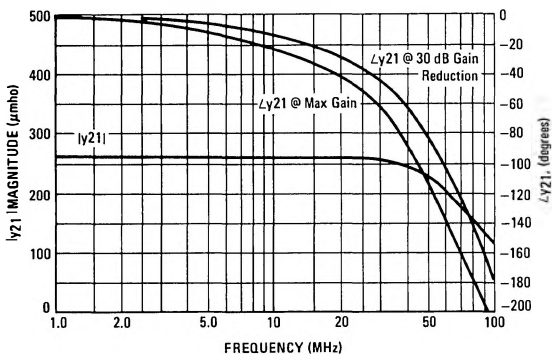


FIGURE 9 – DIFFERENTIAL OUTPUT VOLTAGE

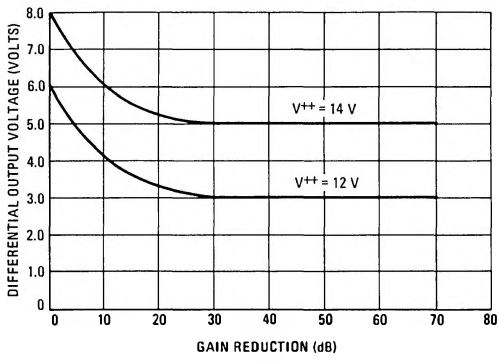


FIGURE 10 – MC1352 AGC CHARACTERISTICS

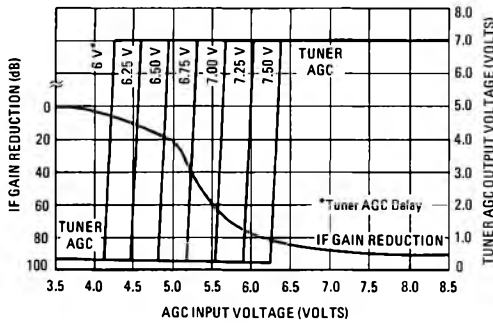
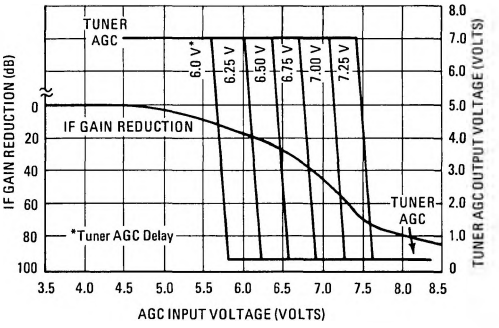


FIGURE 11 – MC1353 AGC CHARACTERISTICS

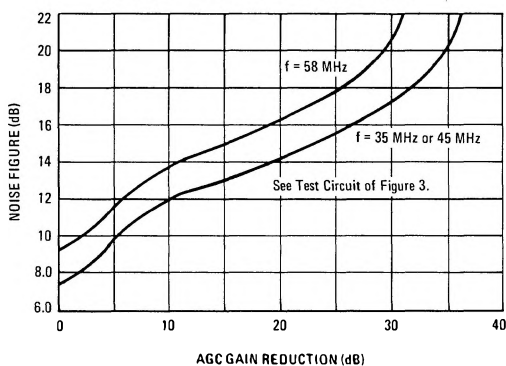


MC1352, MC1353(continued)

TYPICAL CHARACTERISTICS (continued)

($V^+ = +12$ Vdc, $T_A = +25^\circ\text{C}$ unless otherwise noted)

FIGURE 12 – TYPICAL NOISE FIGURE



For additional information see "A High-Performance Monolithic IF Amplifier Incorporating Electronic Gain Control", by W. R. Davis and J. E. Solomon, IEEE Journal on Solid State Circuits, December 1968.