

Legacy Device: Motorola MC1490

The ML1490 is an integrated circuit featuring wide-range AGC for use in RF/IF amplifiers and audio amplifiers.

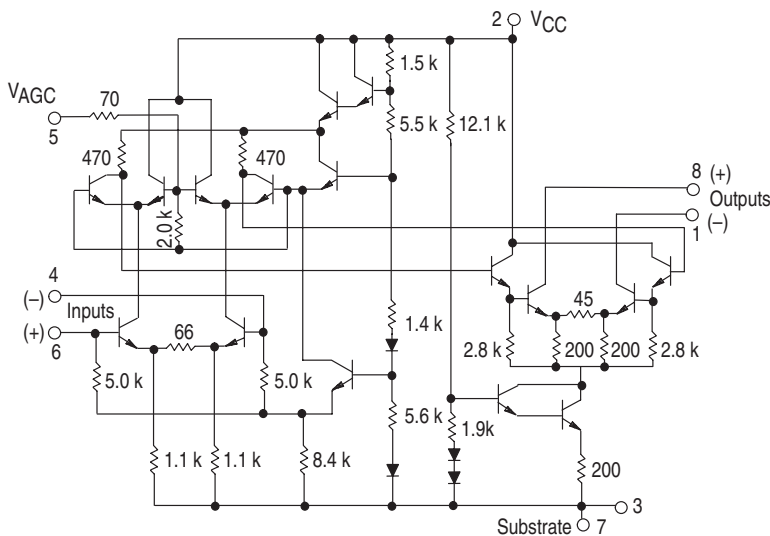
- High Power Gain:
 - 50 dB Typ at 10 MHz
 - 45 dB Typ at 60 MHz
 - 35 dB Typ at 100 MHz
- Wide Range AGC: 60 dB Min, DC to 60 MHz
- 6.0 V to 15 V Operation, Single Polarity Supply
- Operating Temperature Range $T_A = -40^\circ$ to $+85^\circ\text{C}$

Note: See Similar ML1350 For Possible Option

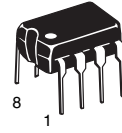
MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$, unless otherwise noted.)

| Rating | Symbol | Value | Unit |
|-----------------------------|-----------|-----------------|------------------|
| Power Supply Voltage | V_{CC} | +18 | Vdc |
| AGC Supply | V_{AGC} | V_{CC} | Vdc |
| Input Differential Voltage | V_{ID} | 5.0 | Vdc |
| Operating Temperature Range | T_A | -40 to $+85$ | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -65 to $+150$ | $^\circ\text{C}$ |
| Junction Temperature | T_J | +150 | $^\circ\text{C}$ |

Representative Schematic Diagram



Pins 3 and 7 should both be connected to circuit ground.



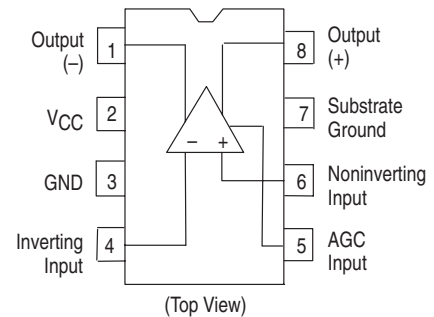
P DIP 8 = PP
PLASTIC PACKAGE
CASE 626

CROSS REFERENCE/ORDERING INFORMATION

| PACKAGE | MOTOROLA | LANSDALE |
|---------|----------|----------|
| P DIP 8 | MC1490P | ML1490PP |

Note: Lansdale lead free (Pb) product, as it becomes available, will be identified by a part number prefix change from **ML** to **MLE**.

PIN CONNECTIONS



SCATTERING PARAMETERS

($V_{CC} = +12$ Vdc, $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$)

| Parameter | Symbol | f = MHz | | Unit |
|----------------------------------|-----------------------------|-----------------|-----------------|----------|
| | | 30 | 60 | |
| Input Reflection Coefficient | $ S_{11} $ θ_{11} | 0.95 -7.3 | 0.93 -16 | - deg |
| Output Reflection Coefficient | $ S_{22} $ θ_{22} | 0.99 -3.0 | 0.98 -5.5 | - deg |
| Forward Transmission Coefficient | $ S_{21} $ θ_{21} | 16.8 128 | 14.7 64.3 | - deg |
| Reverse Transmission Coefficient | S_{12} θ_{12} | 0.00048 84.9 | 0.00092 79.2 | - deg |

ELECTRICAL CHARACTERISTICS ($V_{CC} = 12\text{ Vdc}$, $f = 60\text{ MHz}$, $BW = 1.0\text{ MHz}$, $T_A = 25^\circ\text{C}$)

| Characteristic | Figure | Symbol | Min | Typ | Max | Unit |
|--|--------|-----------|-----|-----|-----|------|
| Power Supply Current Drain | – | I_{CC} | – | – | 17 | mA |
| AGC Range (AGC) 5.0 V Min to 7.0 V Max | 19 | M_{AGC} | –60 | – | – | dB |
| Output Stage Current (Sum of Pins 1 and 8) | – | I_O | 4.0 | – | 7.5 | mA |
| Single-Ended Power Gain $R_S = R_L = 50\ \Omega$ | 19 | G_P | 40 | – | – | dB |
| Noise Figure $R_S = 50\ \text{Ohms}$ | 19 | NF | – | 6.0 | – | dB |
| Power Dissipation | – | P_D | – | 168 | 204 | mW |

Figure 1. Unneutralized Power Gain versus Frequency (Tuned Amplifier, See Figure 19)

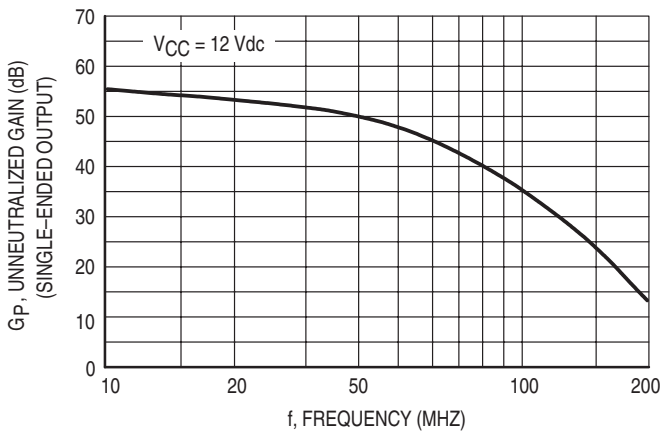


Figure 2. Voltage Gain versus Frequency (Video Amplifier, See Figure 20)

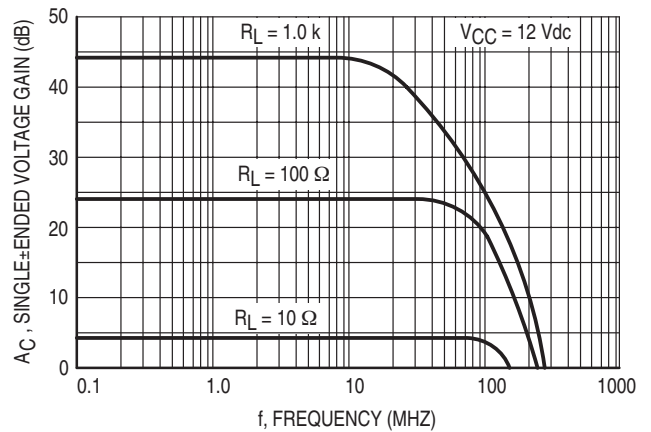


Figure 3. Dynamic Range: Output Voltage versus Input Voltage (Video Amplifier, See Figure 20)

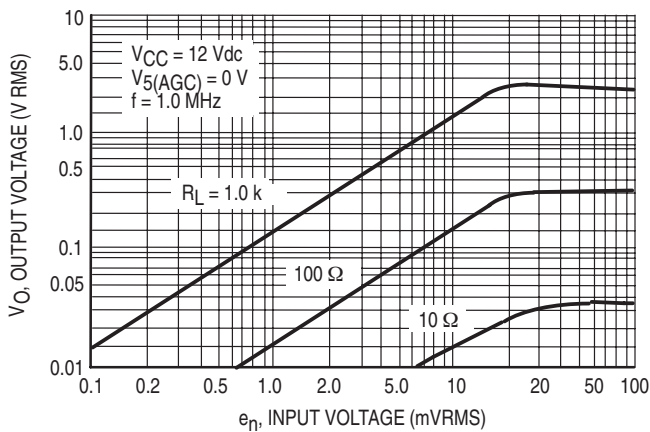
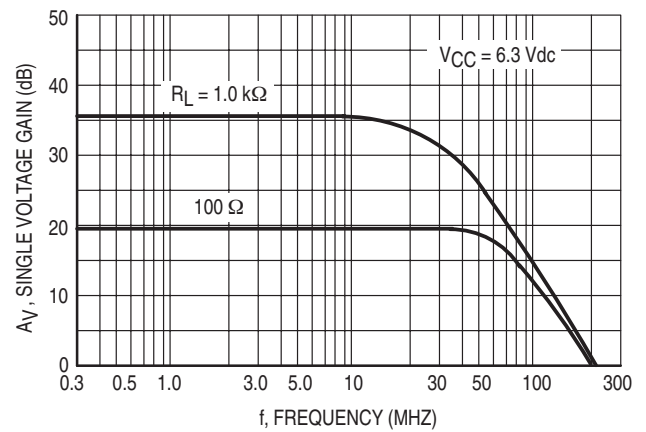


Figure 4. Voltage Gain versus Frequency (Video Amplifier, See Figure 20)



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Figure 5. Voltage Gain and Supply Current versus Supply Voltage (Video Amplifier, See Figure 20)

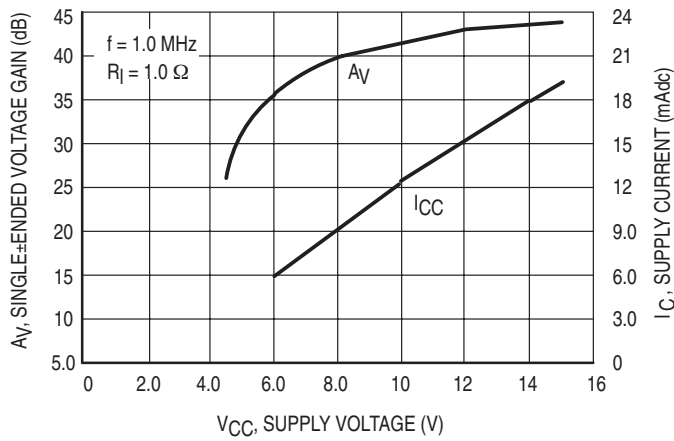


Figure 6. Typical Gain Reduction versus AGC Voltage

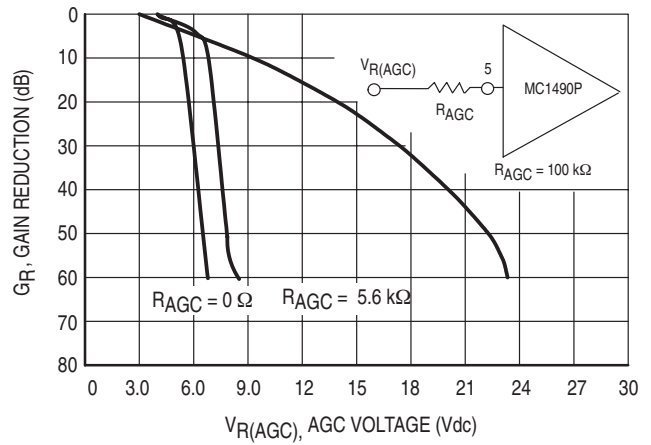


Figure 7. Typical Gain Reduction versus AGC Current

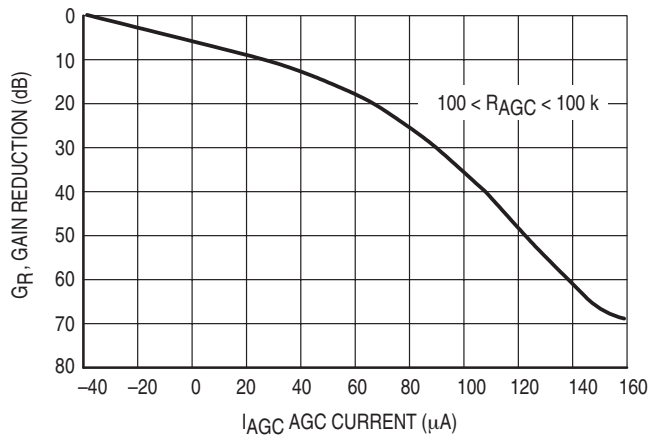


Figure 8. Fixed Tuned Power Gain Reduction versus Temperature (See Test Circuit, Figure 19)

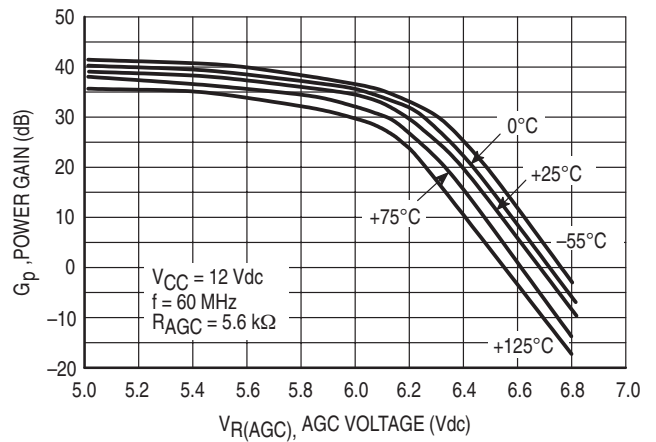


Figure 9. Power Gain versus Supply Voltage (See Test Circuit, Figure 19)

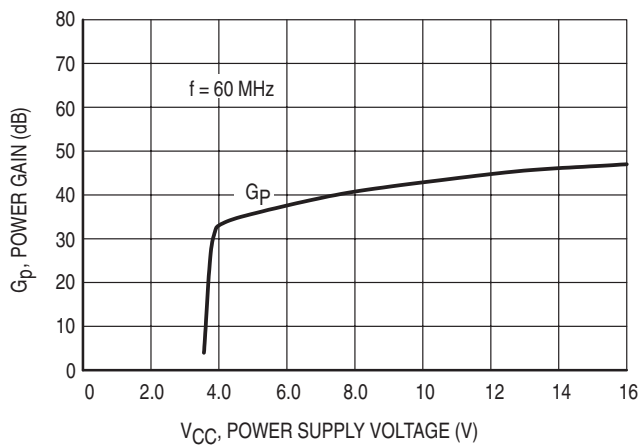
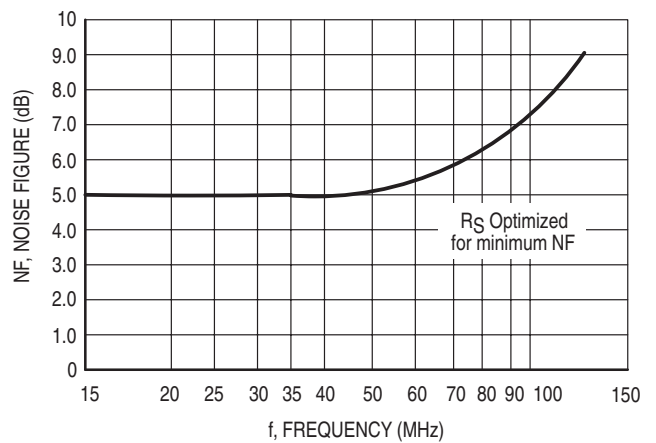


Figure 10. Noise Figure versus Frequency



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Figure 11. Noise Figure versus Source Resistance

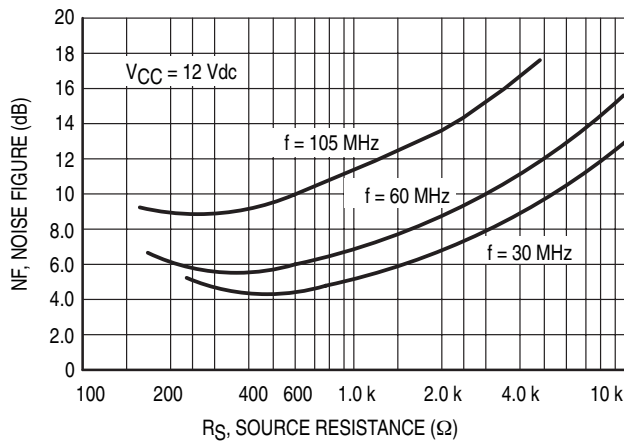


Figure 12. Noise Figure versus AGC Gain Reduction

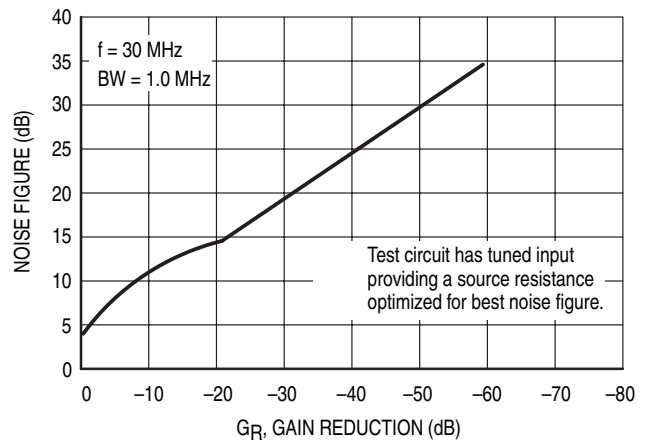


Figure 13. Harmonic Distortion versus AGC Gain Reduction for AM Carrier (For Test Circuit, See Figure 14)

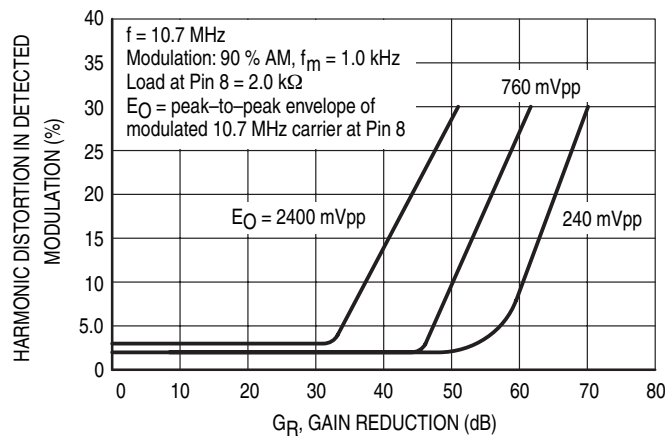
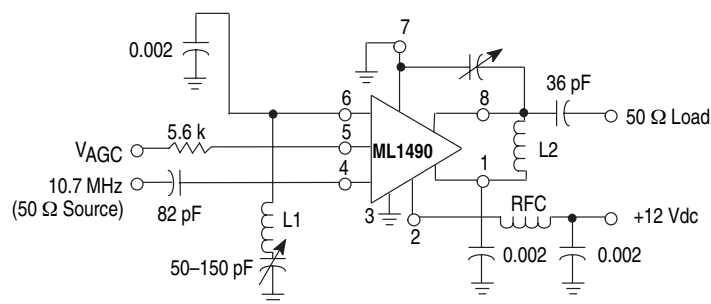


Figure 14. 10.7 MHz Amplifier Gain 55 dB, BW 100 kHz



L1 = 24 turns, #22 AWG wire on a T12-44 micro metal Toroid core (-124 pF)

L2 = 20 turns, #22 AWG wire on a T12-44 micro metal Toroid core (-100 pF)

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Figure 15. S_{11} and S_{22} , Input and Output Reflection Coefficient

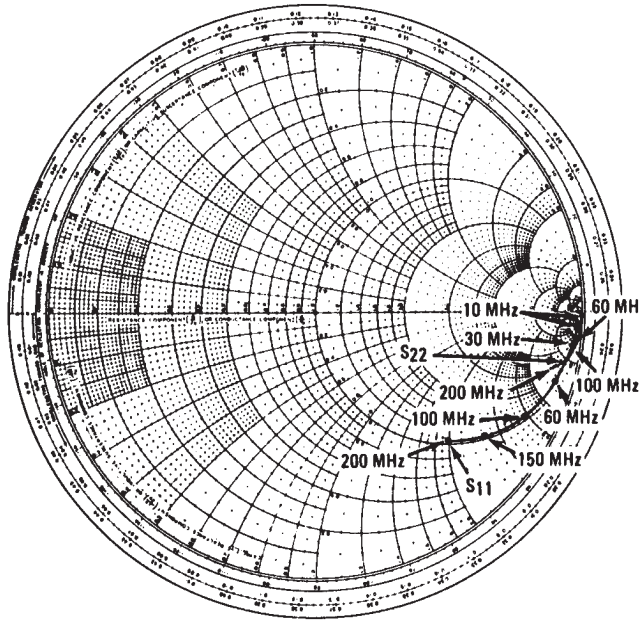


Figure 16. S_{11} and S_{22} , Input and Output Reflection Coefficient

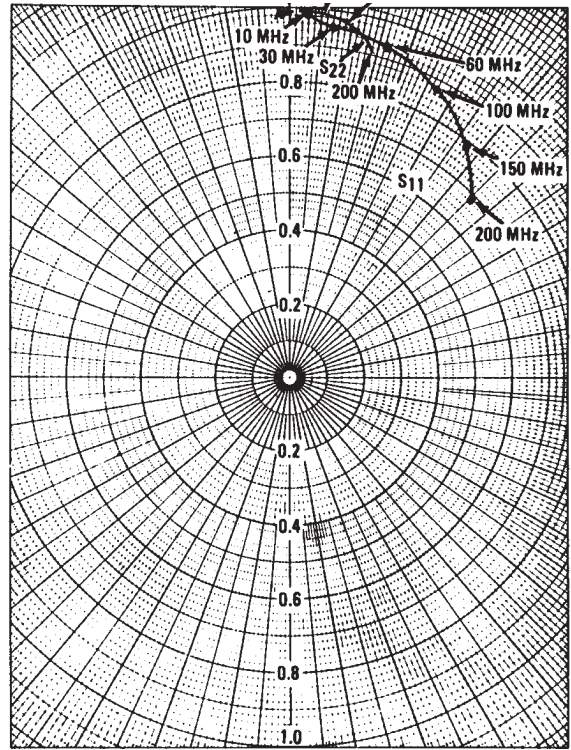


Figure 17. S_{21} , Forward Transmission Coefficient (Gain)

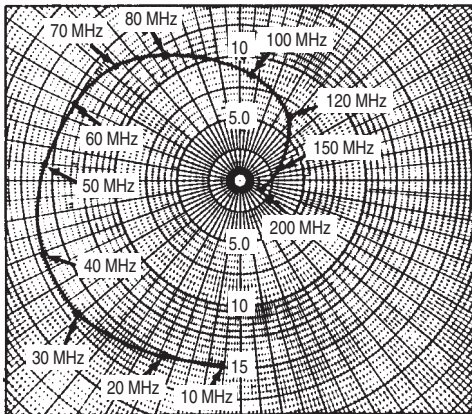
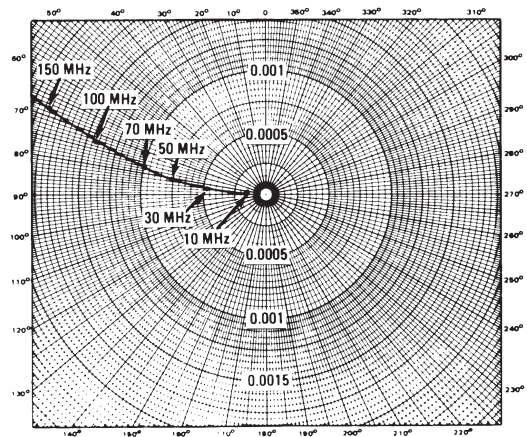
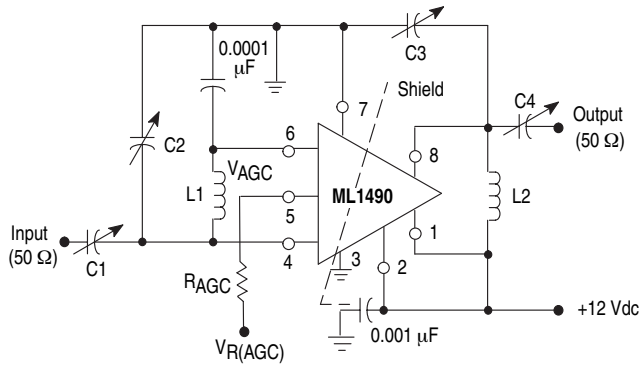


Figure 18. S_{12} , Reverse Transmission Coefficient (Feedback)



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Figure 19. 60 MHz Power Gain Test Circuit



L1 = 7 turns, #20 AWG wire, 5/16" Dia., 5/8" long
 L2 = 6 turns, #14 AWG wire, 9/16" Dia., 3/4" long
 C1, C2, C3 = (1-30) pF
 C4 = (1-10) pF

Figure 20. Video Amplifier

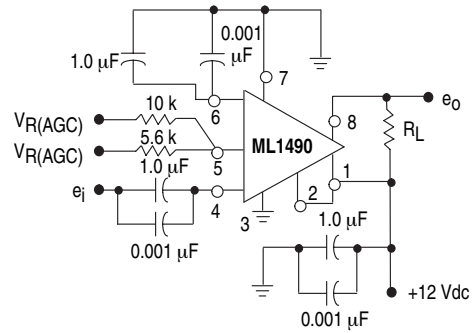
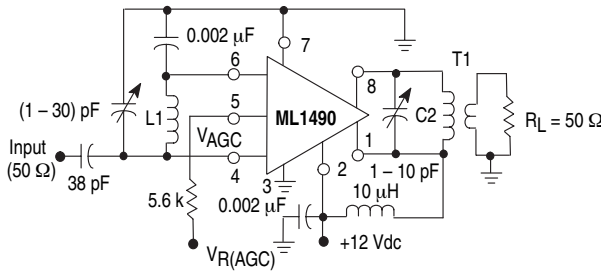
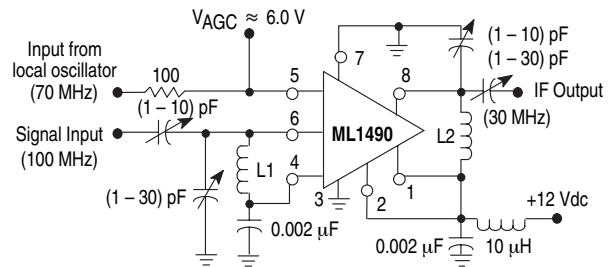


Figure 21. 30 MHz Amplifier
 (Power Gain = 50 dB, BW 1.0 MHz)



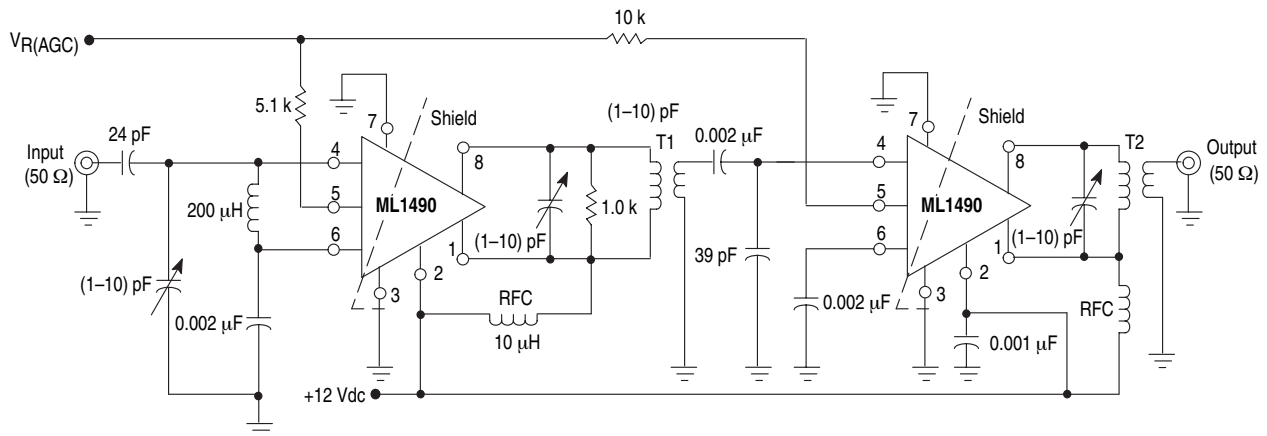
L1 = 12 turns, #22 AWG wire on a Toroid core, (T37-6 micro metal or equiv).
 T1: Primary = 17 turns, #20 AWG wire on a Toroid core, (T44-6).
 Secondary = 2 turns, #20 AWG wire.

Figure 22. 100 MHz Mixer



L1 = 5 turns, #16 AWG wire, 1/4", ID Dia., 5/8" long
 L2 = 16 turns, #20 AWG wire on a Toroid core, (T44-6).

Figure 23. Two-Stage 60 MHz IF Amplifier (Power Gain 80 dB, BW 1.5 MHz)



T1: Primary Winding = 15 turns, #22 AWG wire, 1/4" ID Air Core
 Secondary Winding = 4 turns, #22 AWG wire,
 Coefficient of Coupling \approx 1.0

T2: Primary Winding = 10 turns, #22 AWG wire, 1/4" ID Air Core
 Secondary Winding = 2 turns, #22 AWG wire,
 Coefficient of Coupling \approx 1.0

DESCRIPTION OF SPEECH COMPRESSOR

The amplifier drives the base of a PNP transistor operating common-emitter with a voltage gain of approximately 20. The control R1 varies the quiescent Q point of this transistor so that varying amounts of signal exceed the level V_T . Diode D1 rectifies the positive peaks of Q1's output only when these peaks are greater than $V_T \approx 7.0$ V. The resulting output is filtered by C_X , R_X .

R_X controls the charging time constant or attack time. C_X is involved in both charge and discharge. R2 (the 150 k Ω and input resistance of the emitter-follower Q2) controls the decay time. Making the decay long and attack short is accomplished by making R_X small and R2 large. (A Darlington emitter-follower may be needed if extremely slow decay times are required.)

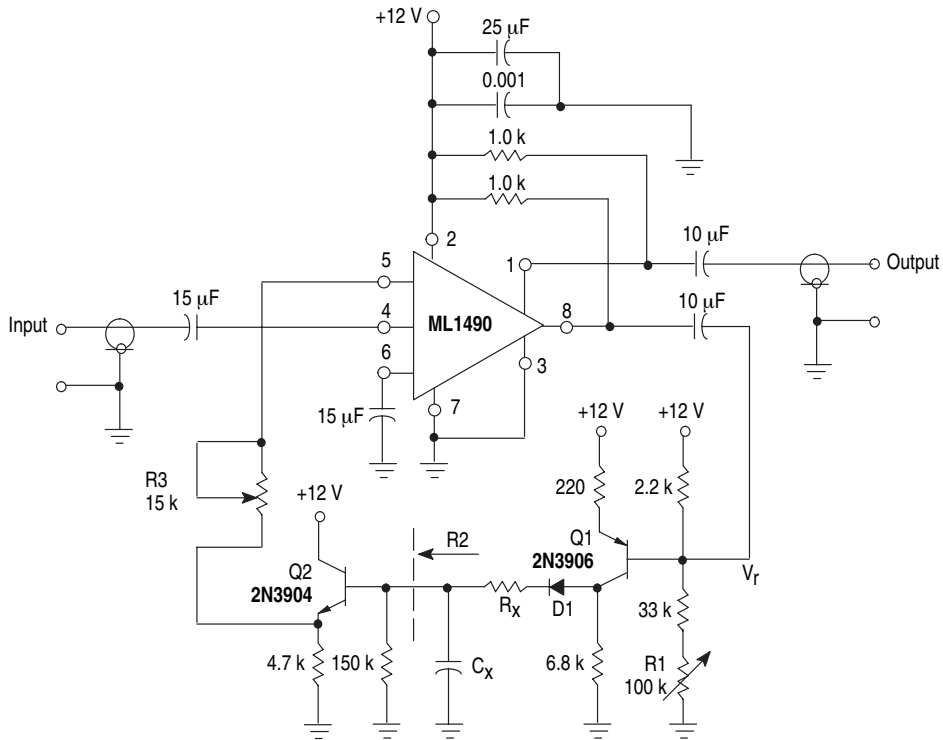
The emitter-follower Q2 drives the AGC Pin 5 of the ML1490PP and reduces the gain. R3 controls the slope of signal compression.

Table 1. Distortion versus Frequency

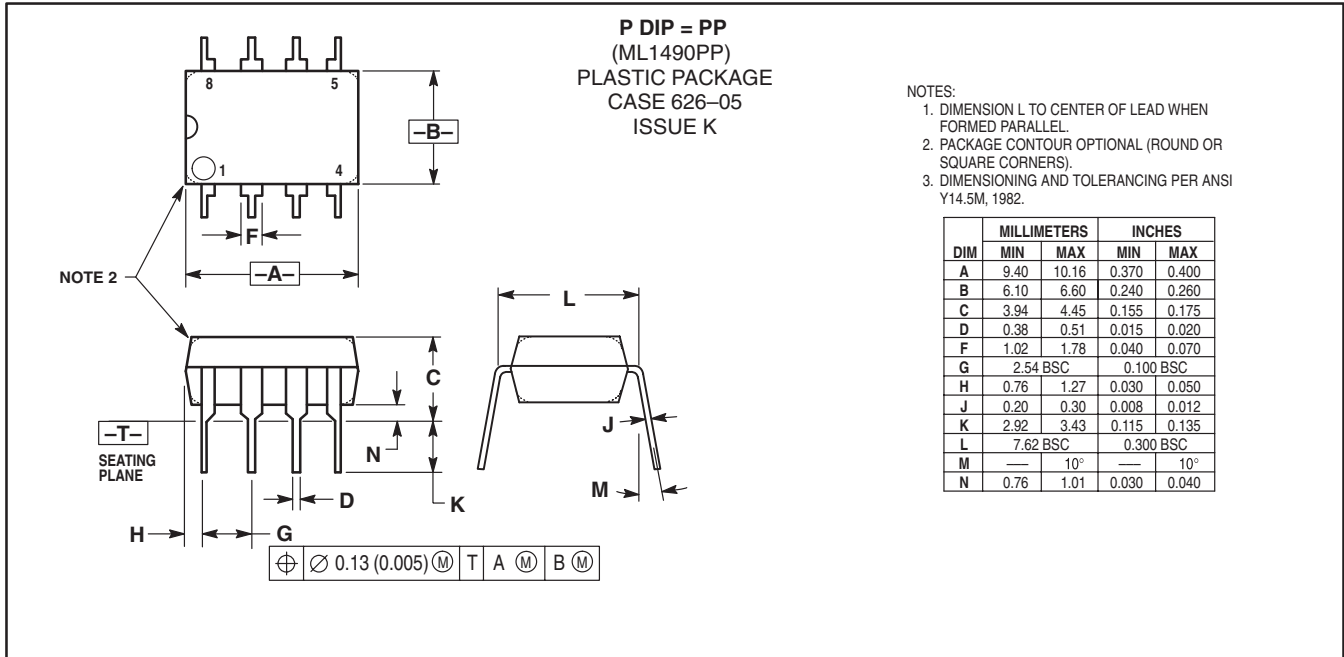
| Frequency | Distortion | | Distortion | |
|-----------|---------------|--------------|---------------|--------------|
| | 10 mV e_i | 100 mV e_i | 10 mV e_i | 100 mV e_i |
| 100 Hz | 3.5% | 12% | 15% | 27% |
| 300 Hz | 2% | 10% | 6% | 20% |
| 1.0 kHz | 1.5% | 8% | 3% | 9% |
| 10 kHz | 1.5% | 8% | 1% | 3% |
| 100 kHz | 1.5% | 8% | 1% | 3% |
| | Notes 1 and 2 | | Notes 3 and 4 | |

- Notes:** (1) Decay = 300 ms
Attack = 20 ms
(2) $C_X = 7.5 \mu\text{F}$
 $R_X = 0$ (Short)
- (3) Decay = 20 ms
Attack = 3.0 ms
(4) $C_X = 0.68 \mu\text{F}$
 $R_X = 1.5 \text{ k}\Omega$

Figure 24. Speech Compressor



OUTLINE DIMENSIONS



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