# LANSDALE Semiconductor, Inc.

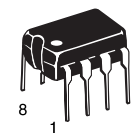
# ML1490
## RF/IF/Audio Amplifier
### Wideband Amplifier With AGC

**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° to +85°C

Note: See Similar ML1350 For Possible Option




**P DIP 8 = PP**
PLASTIC PACKAGE
CASE 626

**CROSS REFERENCE/ORDERING INFORMATION**

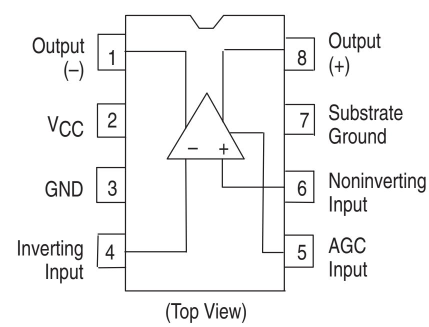
| PACKAGE | MOTOROLA | LANSDALE |
|---|---|---|
| P DIP 8 | MC1490P | ML1490PP |

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

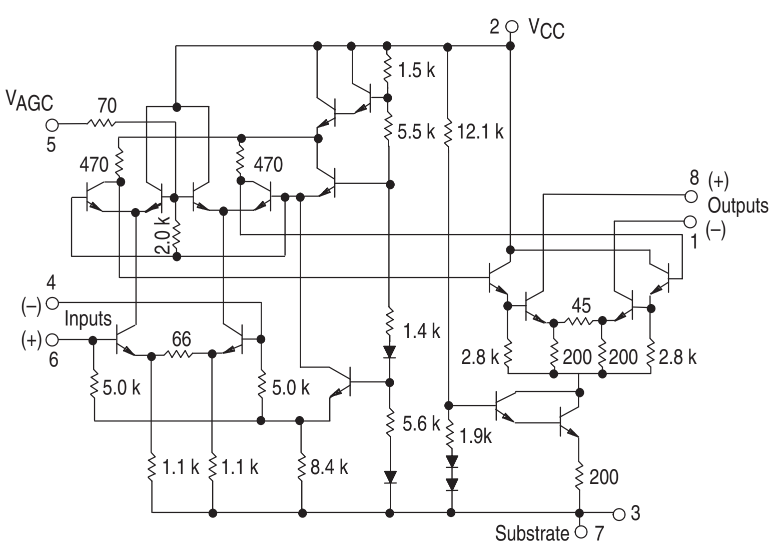
**MAXIMUM RATINGS** ($T_A$ = +25°C, unless otherwise noted.)

| 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 | °C |
| Storage Temperature Range | $T_{stg}$ | –65 to +150 | °C |
| Junction Temperature | $T_J$ | +150 | °C |

**PIN CONNECTIONS**




**Representative Schematic Diagram**




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

**SCATTERING PARAMETERS**
($V_{CC}$ = +12 Vdc, $T_A$ = +25°C, $Z_o$ = 50 Ω)

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

**ELECTRICAL CHARACTERISTICS** ($V_{CC}$ = 12 Vdc, f = 60 MHz, BW = 1.0 MHz, $T_A$ = 25°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 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)**

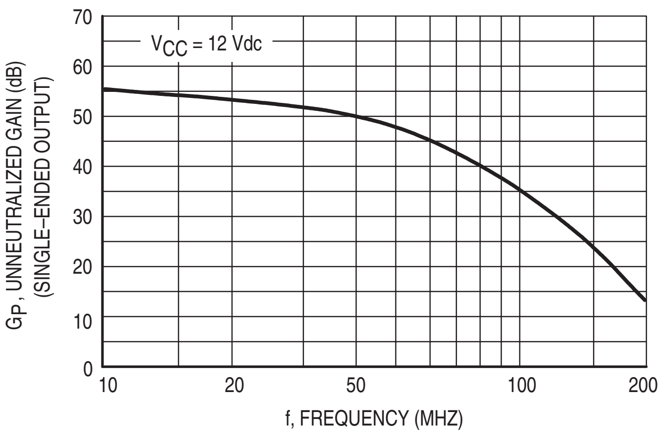



**Figure 2. Voltage Gain versus Frequency (Video Amplifier, See Figure 20)**

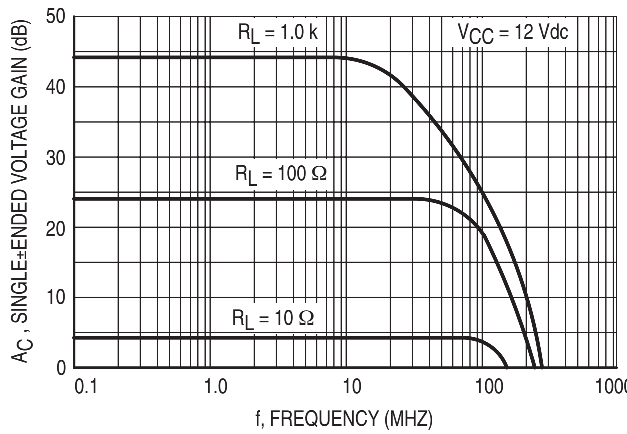



**Figure 3. Dynamic Range: Output Voltage versus Input Voltage (Video Amplifier, See Figure 20)**

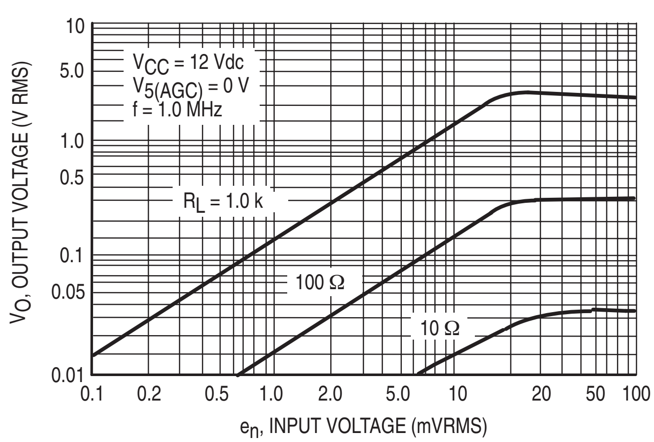
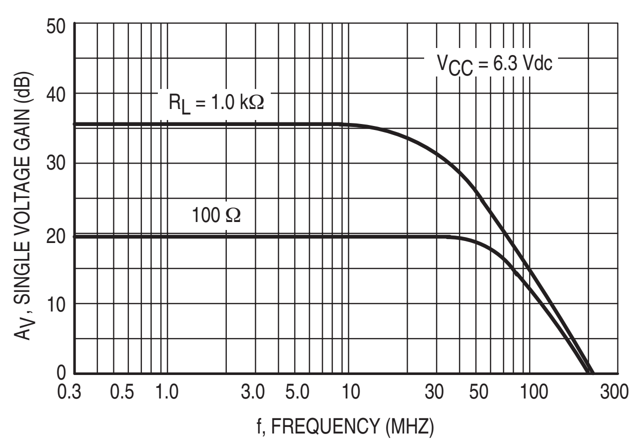



**Figure 4. Voltage Gain versus Frequency (Video Amplifier, See Figure 20)**



*Legacy Applications Information*

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

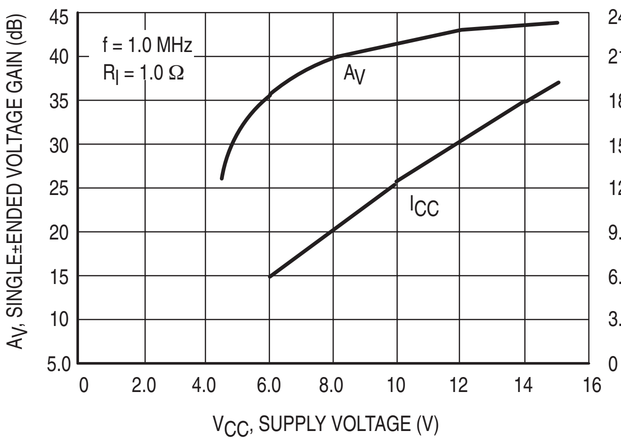



**Figure 6. Typical Gain Reduction versus AGC Voltage**

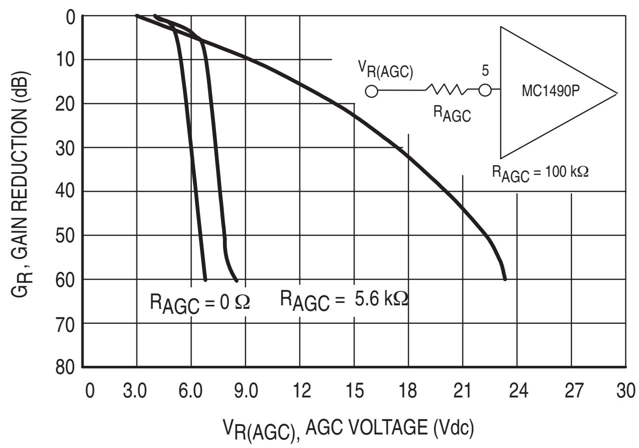



**Figure 7. Typical Gain Reduction versus AGC Current**

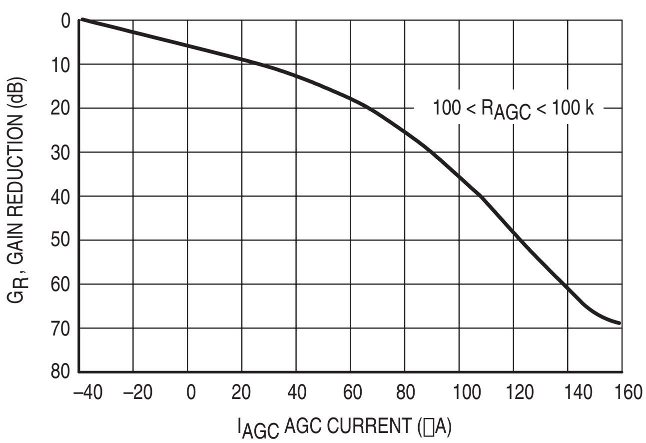



**Figure 8. Fixed Tuned Power Gain Reduction versus Temperature (See Test Circuit, Figure 19)**

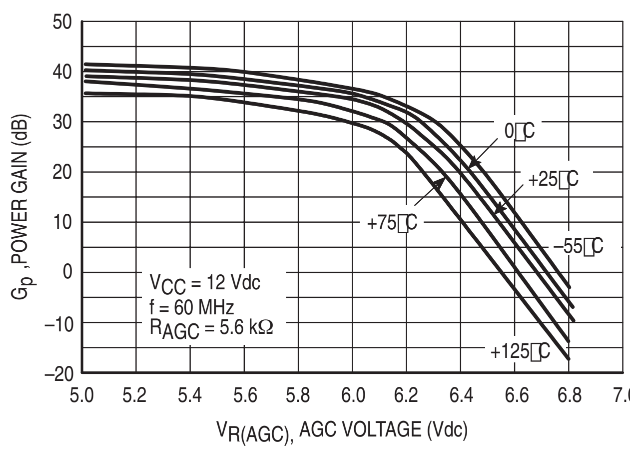



**Figure 9. Power Gain versus Supply Voltage (See Test Circuit, Figure 19)**

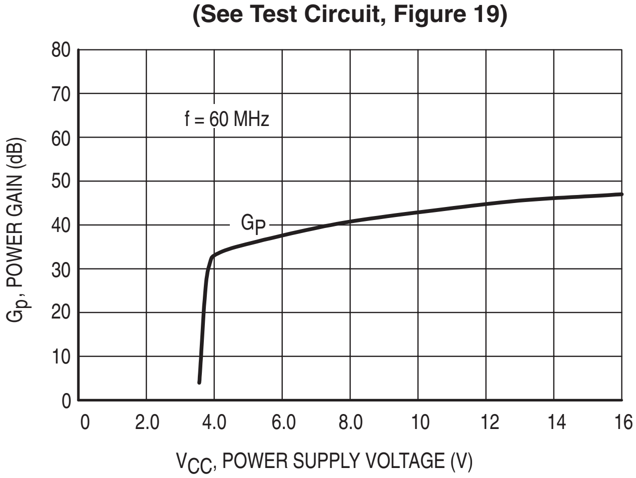
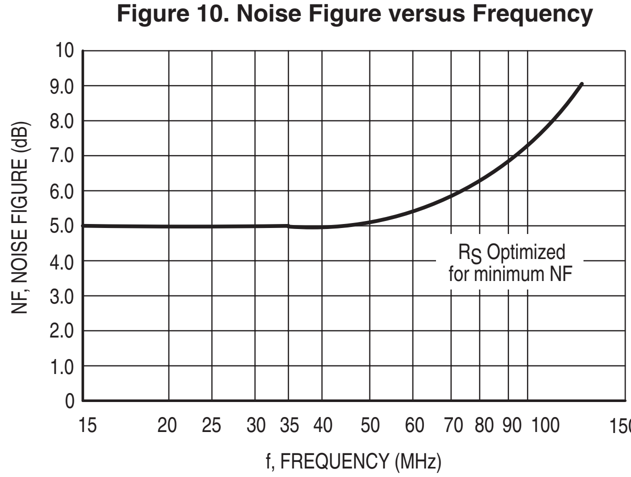



**Figure 10. Noise Figure versus Frequency**



*Legacy Applications Information*

**Figure 11. Noise Figure versus Source Resistance**

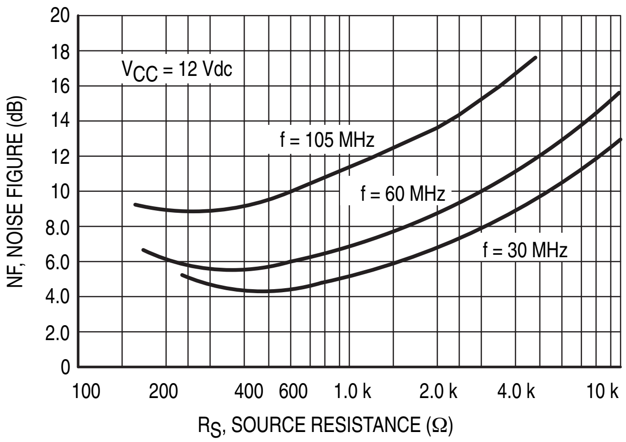



**Figure 12. Noise Figure versus AGC Gain Reduction**

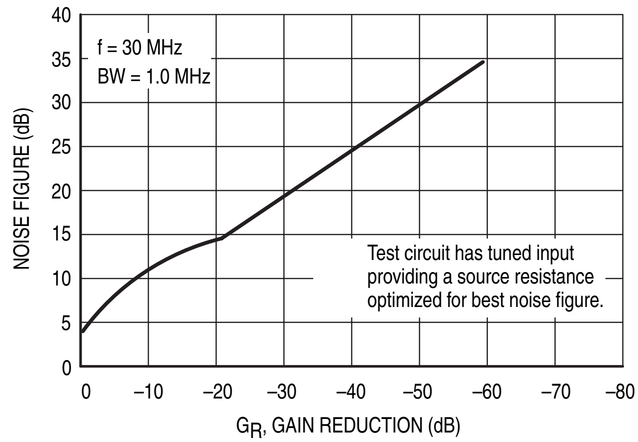



**Figure 13. Harmonic Distortion versus AGC Gain Reduction for AM Carrier (For Test Circuit, See Figure 14)**

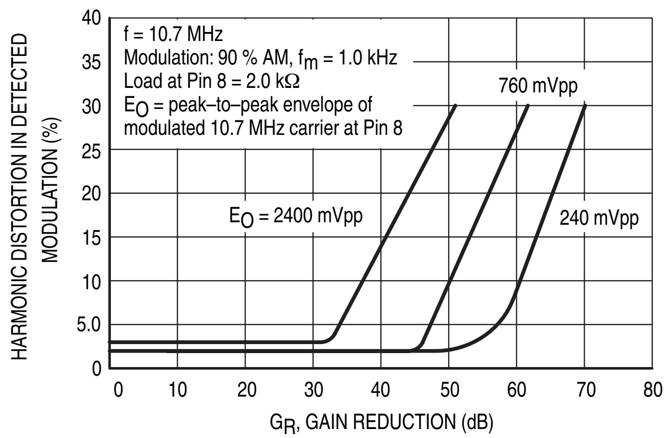
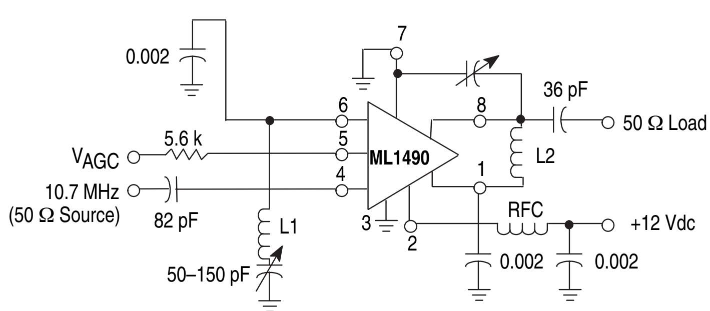



**Figure 14. 10.7 MHz Amplifier Gain 55 dB, BW 100 kHz**




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)

*Legacy Applications Information*

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

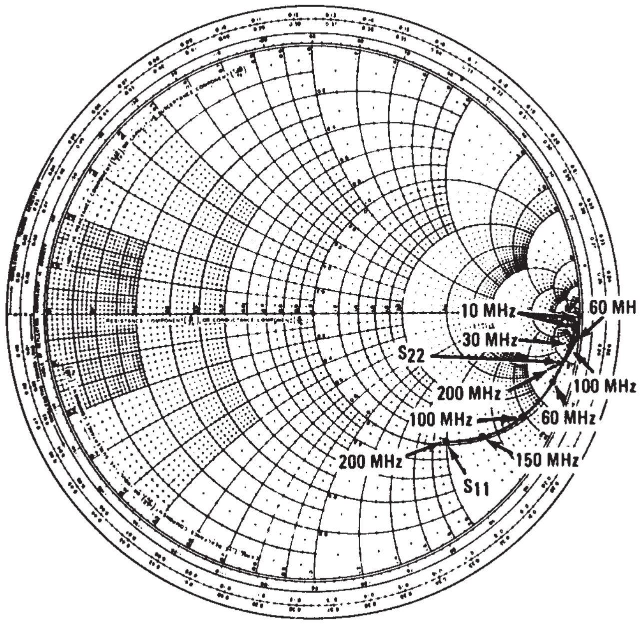



**Figure 16. $S_{11}$ and $S_{22}$, Input and Output Reflection Coefficient**

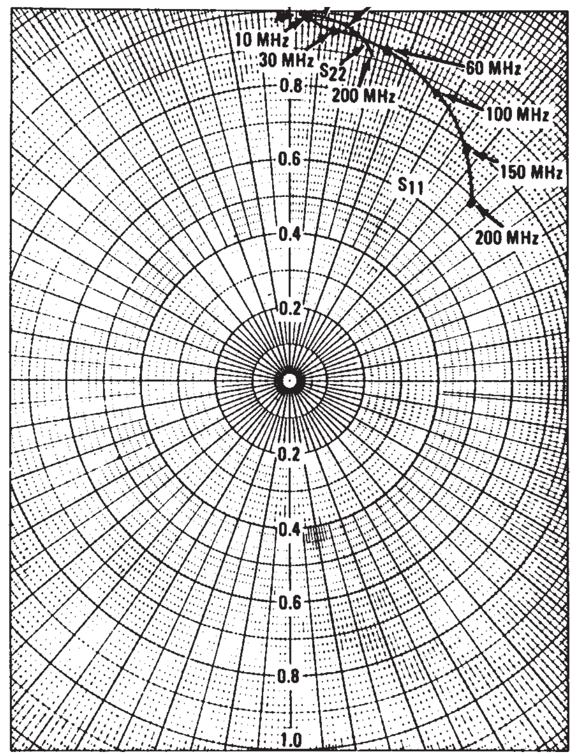



**Figure 17. $S_{21}$, Forward Transmission Coefficient (Gain)**

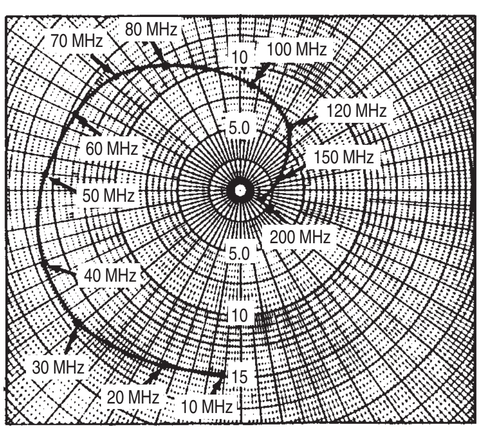
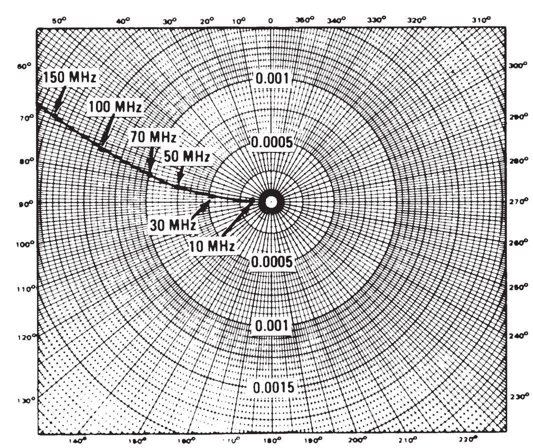
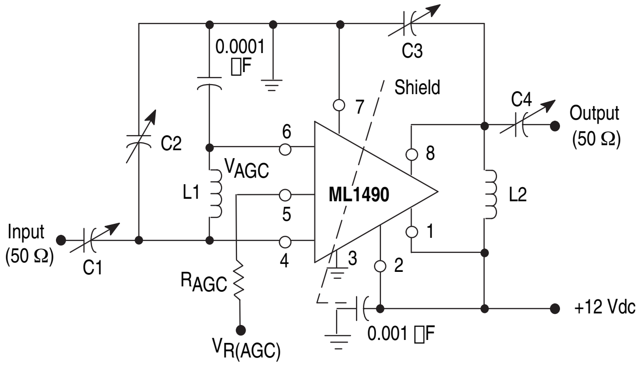



**Figure 18. $S_{12}$, Reverse Transmission Coefficient (Feedback)**



## *Legacy Applications Information*

**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**

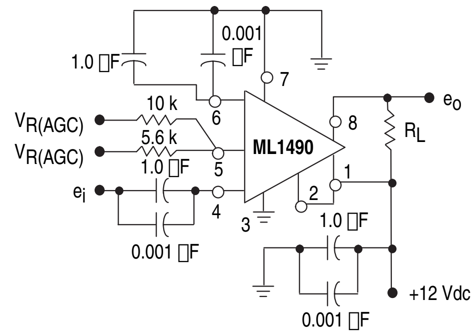
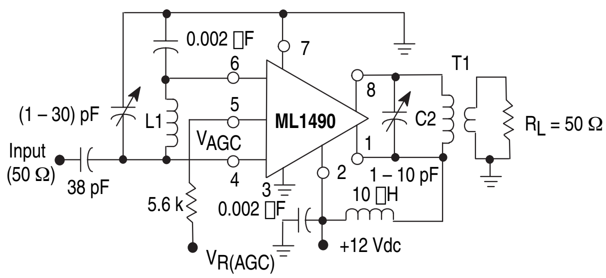
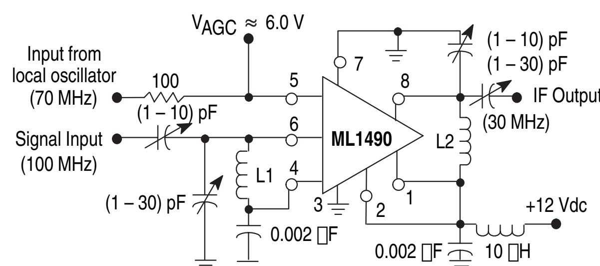



**Figure 21. 30 MHz Amplifier**
**(Power Gain = 50 dB, BW   1.0 MHz)**



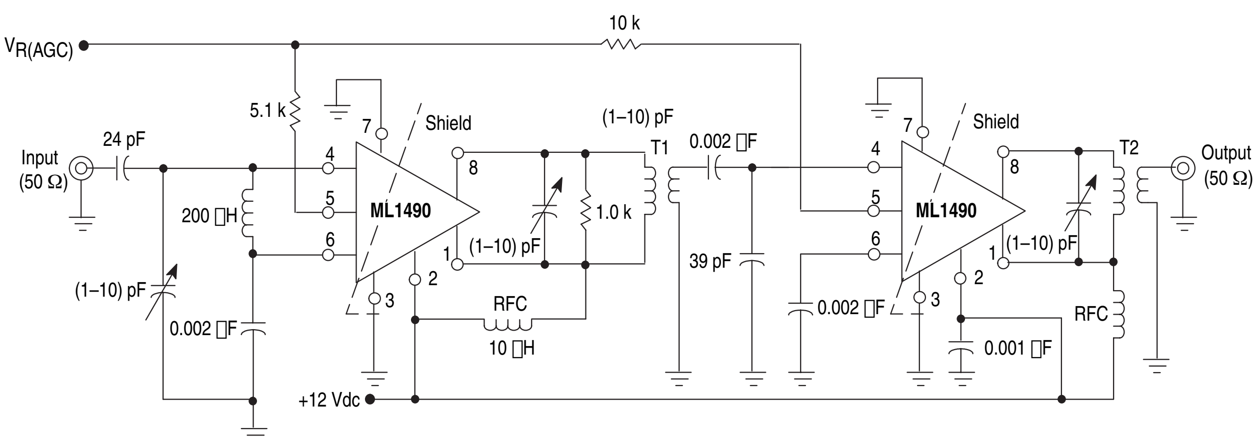

L1 = 12 turns, #22 AWG wire on a Toroid core,
(T37–6 micro metal or equiv).
T1: Primary = 17 turns, #20 AWG wire on a Toroid core, (T44–6).
Secondary = 2 turns, #20 AWG wire.

**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 ≈ 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 ≈ 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 $V_r$. Diode D1 rectifies the positive peaks of Q1's output only when these peaks are greater than $V_r \approx 7.0$ 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 kΩ 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.)

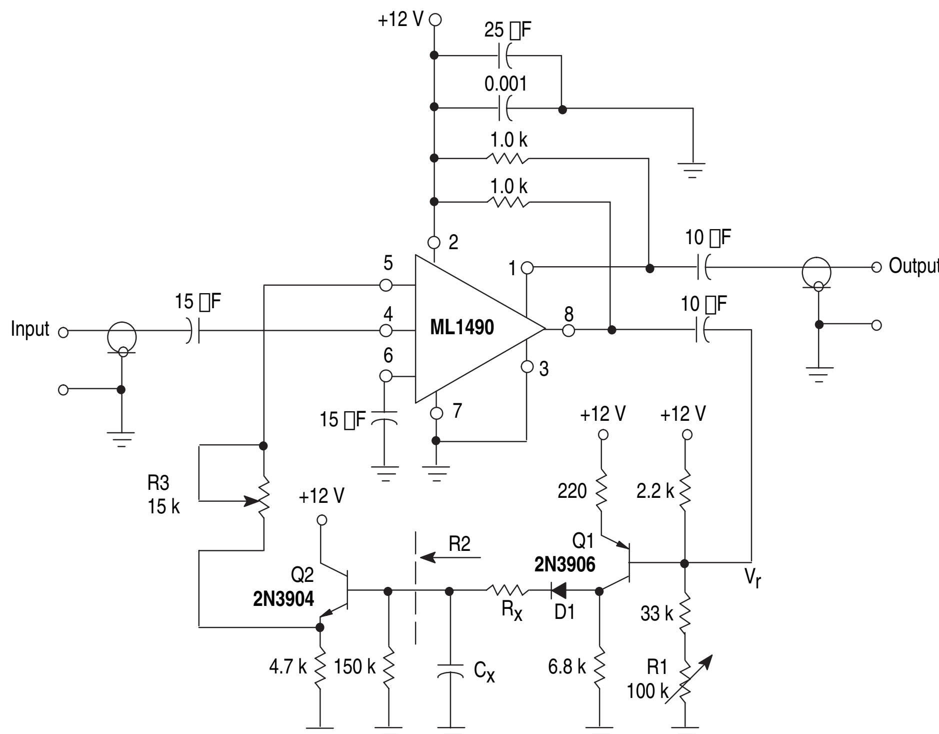
The emitter–follower Q2 drives the AGC Pin 5 of the ML1490PP and reduces the gain. R3 controls the slope of signal compression.

**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 | |

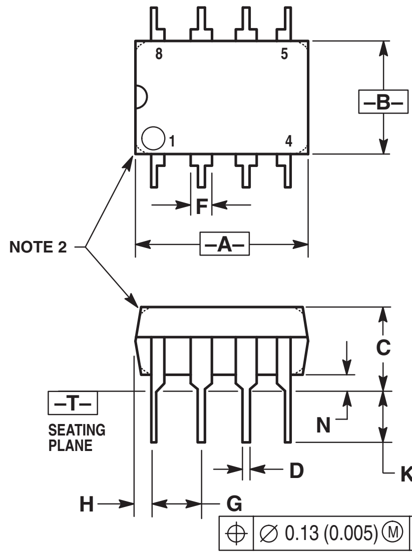
**Notes:**
(1) Decay = 300 ms
Attack = 20 ms
(2) $C_X$ = 7.5 µF
$R_X$ = 0 (Short)
(3) Decay = 20 ms
Attack = 3.0 ms
(4) $C_X$ = 0.68 µF
$R_X$ = 1.5 kΩ

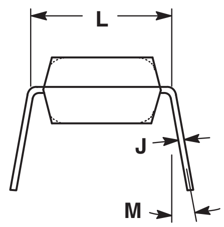
**Figure 24. Speech Compressor**



## OUTLINE DIMENSIONS

**P DIP = PP**
(ML1490PP)
PLASTIC PACKAGE
CASE 626–05
ISSUE K




NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 9.40 | 10.16 | 0.370 | 0.400 |
| B | 6.10 | 6.60 | 0.240 | 0.260 |
| C | 3.94 | 4.45 | 0.155 | 0.175 |
| D | 0.38 | 0.51 | 0.015 | 0.020 |
| F | 1.02 | 1.78 | 0.040 | 0.070 |
| G | 2.54 BSC | | 0.100 BSC | |
| H | 0.76 | 1.27 | 0.030 | 0.050 |
| J | 0.20 | 0.30 | 0.008 | 0.012 |
| K | 2.92 | 3.43 | 0.115 | 0.135 |
| L | 7.62 BSC | | 0.300 BSC | |
| M | — | 10° | — | 10° |
| N | 0.76 | 1.01 | 0.030 | 0.040 |