



MOTOROLA

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MC1436, C

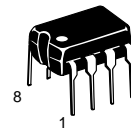
High Voltage, Internally Compensated Operational Amplifiers

The MC1436, C was designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

- Output Voltage Swing: $\pm 22 V_{pk(min)}$ ($V_{CC} = +28 V, V_{EE} = -28 V$)
- Fast Slew Rate: $2.0 V/\mu s$ Typ
- Internally Compensated
- Offset Voltage Null Capability
- Input Overvoltage Protection
- A_{VOL} : 500,000 Typ
- Characteristics Independent of Power Supply Voltages: ($\pm 5.0 V_{dc}$ to $\pm 36 V_{dc}$)

OPERATIONAL AMPLIFIERS

SEMICONDUCTOR TECHNICAL DATA



P1 SUFFIX
PLASTIC PACKAGE
CASE 626



D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO-8)

Figure 1. Differential Amplifier with $\pm 20 V$ Common Mode Input Voltage Range

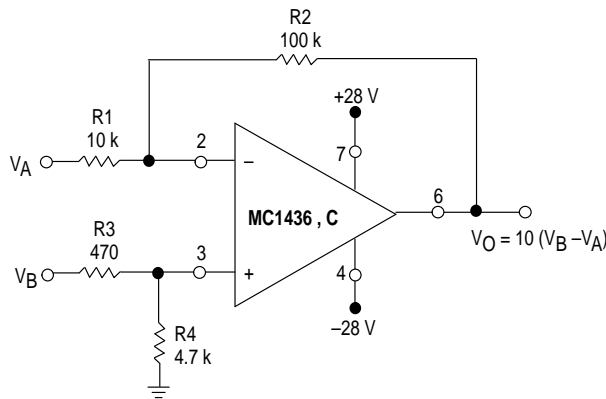
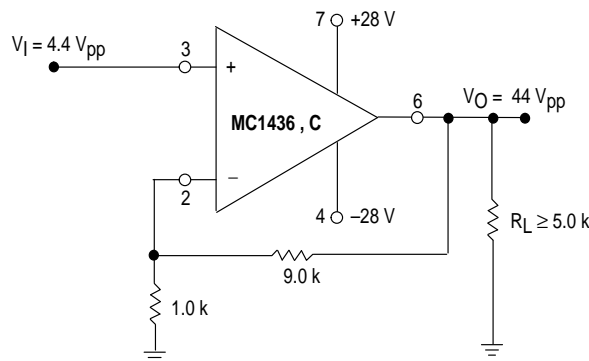
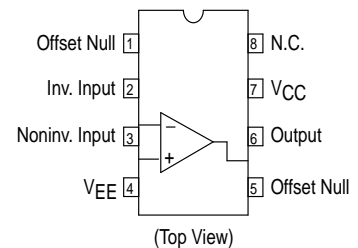


Figure 2. Typical Noninverting X10 Voltage Amplifier



PIN CONNECTIONS



ORDERING INFORMATION

| Device | Operating Temperature Range | Package |
|--------------|----------------------------------|-------------|
| MC1436CD,D | $T_A = 0^\circ$ to $+70^\circ C$ | SO-8 |
| MC1436CP1,P1 | | Plastic DIP |

MC1436, C

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

| Rating | Symbol | MC1436 | MC1436C | Unit |
|---|------------------------------------|-------------|------------|-------------|
| Power Supply Voltage | V _{CC} V _{EE} | +34 -34 | +30 -30 | Vdc |
| Input Differential Voltage Range | V _{IDR} | Note 2 | | V |
| Input Common Mode Voltage Range | V _{ICR} | Note 2 | | V |
| Output Short Circuit Duration (V _{CC} = V _{EE} = 28 Vdc, V _O = 0) | t _{SC} | 5.0 | | sec |
| Power Dissipation (Package Limitation) Derate above T _A = +25°C | P _D | 680 4.6 | | mW mW/°C |
| Operating Ambient Temperature Range | T _A | 0 to +70 | | °C |
| Storage Temperature Range | T _{stg} | -65 to +150 | | °C |

ELECTRICAL CHARACTERISTICS (V_{CC} = +28 V, V_{EE} = -28 V, T_A = 25°C, unless otherwise noted.)

| Characteristic | Symbol | MC1436 | | | MC1436C | | | Unit |
|--|----------------------------------|-----------------------|-------------------------|----------------|------------------|-------------------------|--------------|------------------------|
| | | Min | Typ | Max | Min | Typ | Max | |
| Input Bias Current T _A = +25°C T _A = T _{low} to T _{high} (See Note 1) | I _{IB} | - - | 15 - | 40 55 | - - | 25 - | 90 - | nAdc |
| Input Offset Current T _A = +25°C T _A = +25°C to T _{high} T _A = T _{low} to +25°C | I _{IO} | - - - | 5.0 - - | 10 14 14 | - - - | 10 - - | 25 - - | nAdc |
| Input Offset Voltage T _A = +25°C T _A = T _{low} to T _{high} | V _{IO} | - - | 5.0 - | 10 14 | - - | 5.0 - | 12 - | mVdc |
| Differential Input Impedance (Open loop, f ≤ 5.0 Hz) Parallel Input Resistance Parallel Input Capacitance | r _p C _p | - - | 10 2.0 | - - | - - | 10 2.0 | - - | MΩ pF |
| Common Mode Input Impedance (f ≤ 5.0 Hz) | z _{ic} | - | 250 | - | - | 250 | - | MΩ |
| Input Common Mode Voltage Range | V _{ICR} | ±22 | ±25 | - | ±18 | ±20 | - | Vpk |
| Equivalent Input Noise Voltage (A _v = 100, R _S = 10 kΩ, f = 1.0 kHz, BW = 1.0 Hz) | e _n | - | 50 | - | - | 50 | - | nV/(Hz) ^{1/2} |
| Common Mode Rejection (DC) | CMR | 70 | 110 | - | 50 | 90 | - | dB |
| Large Signal DC Open Loop Voltage Gain (V _O = ±10 V, R _L = 100 kΩ) T _A = +25°C T _A = T _{low} to T _{high} (V _O = ±10 V, R _L = 10 kΩ, T _A = +25°C) | A _{VOL} | 70,000 50,000 - | 500,000 - 200,000 | - - - | 50,000 - - | 500,000 - 200,000 | - - - | V/V |
| Power Bandwidth (Voltage Follower) (A _v = 1, R _L = 5.0 kΩ, THD ≤ 5%, V _O = 40 V _{pp}) | BW _p | - | 23 | - | - | 23 | - | kHz |
| Unity Gain Crossover Frequency (Open loop) | f _c | - | 1.0 | - | - | 1.0 | - | MHz |
| Phase Margin (Open loop, Unity Gain) | φ _m | - | 50 | - | - | 50 | - | Degrees |
| Gain Margin | A _M | - | 18 | - | - | 18 | - | dB |
| Slew Rate (Unity Gain) | SR | - | 2.0 | - | - | 2.0 | - | V/μs |
| Output Impedance (f ≤ 5.0 Hz) | z _O | - | 1.0 | - | - | 1.0 | - | kΩ |
| Short Circuit Output Current | I _{SC} | - | ±17 | - | - | ±19 | - | mAdc |

NOTES: 1. T_{low} = 0°C for MC1436,C T_{high} = +70°C for MC1436,C
 2. Either or both input voltages must not exceed the magnitude of V_{CC} or V_{EE} + 3.0 V.

MC1436, C

ELECTRICAL CHARACTERISTICS ($V_{CC} = +28\text{ V}$, $V_{EE} = -28\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.)

| Characteristic | Symbol | MC1436 | | | MC1436C | | | Unit |
|---|----------------------|----------|----------|-----|----------|----------|-----|-----------------|
| | | Min | Typ | Max | Min | Typ | Max | |
| Output Voltage Range ($R_L = 5.0\text{ k}\Omega$) $V_{CC} = +28\text{ Vdc}$, $V_{EE} = -28\text{ Vdc}$ $V_{CC} = +36\text{ Vdc}$, $V_{EE} = -36\text{ Vdc}$ | V_O | ± 20 | ± 22 | – | ± 20 | ± 22 | – | V_{pk} |
| Power Supply Rejection $V_{EE} = \text{Constant}$, $R_S \leq 10\text{ k}\Omega$ $V_{CC} = \text{Constant}$, $R_S \leq 10\text{ k}\Omega$ | PSR + PSR – | – | 35 | 200 | – | 50 | – | $\mu\text{V/V}$ |
| Power Supply Current (See Note 2) | I_{CC} I_{EE} | – | 2.6 | 5.0 | – | 2.6 | 5.0 | mAdc |
| DC Quiescent Power Consumption ($V_O = 0$) | P_C | – | 146 | 280 | – | 146 | 280 | mW |

NOTES: 2. $V_{CC} = V_{EE} = 5.0\text{ Vdc}$ to 30 Vdc for MC1436
 $V_{CC} = V_{EE} = 5.0\text{ Vdc}$ to 28 Vdc for MC1436C

Figure 3. Low-Drift Sample and Hold

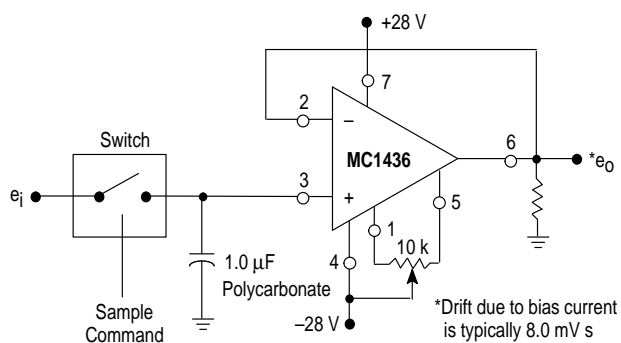


Figure 4. Power Bandwidth

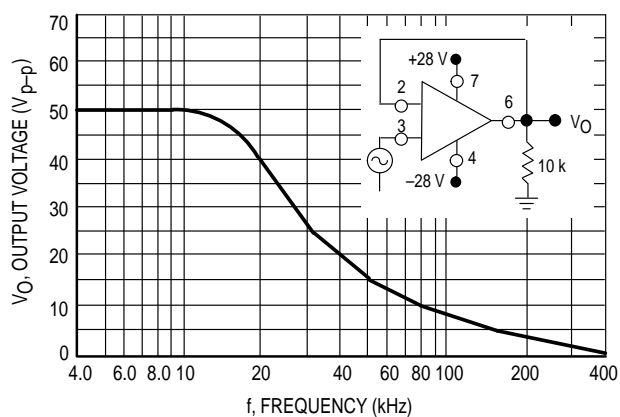


Figure 5. Peak Output Voltage Swing versus Power Supply Voltage

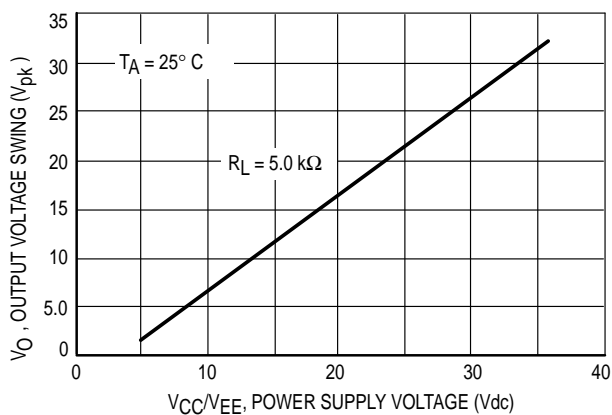
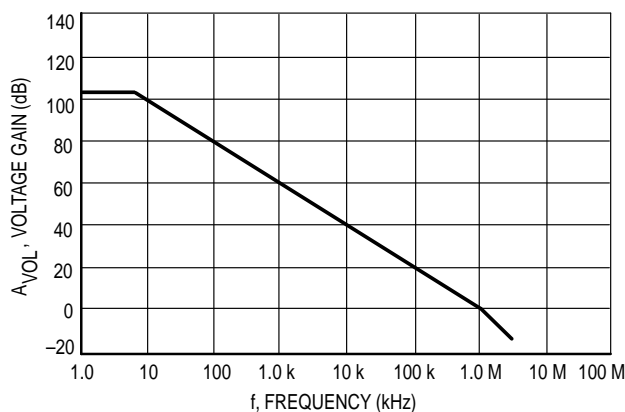


Figure 6. Open Loop Frequency Response



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Figure 7. Output Short Circuit Current versus Temperature

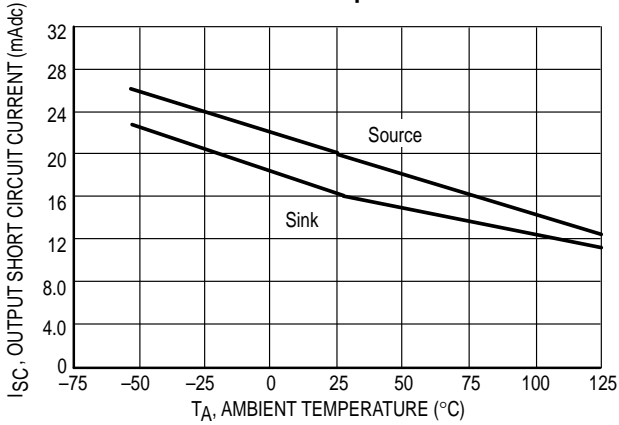


Figure 8. Input Bias Current versus Temperature

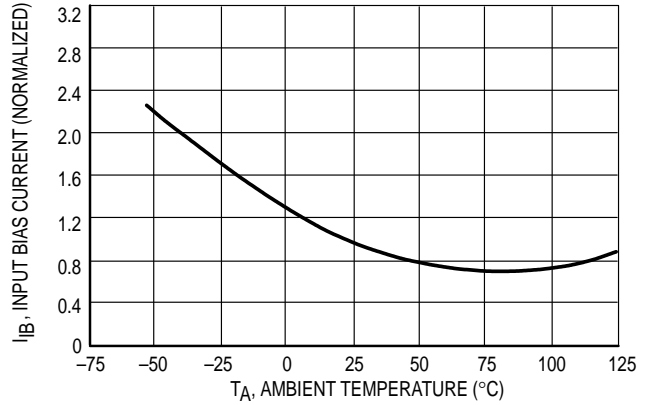


Figure 9. Inverting Feedback Model

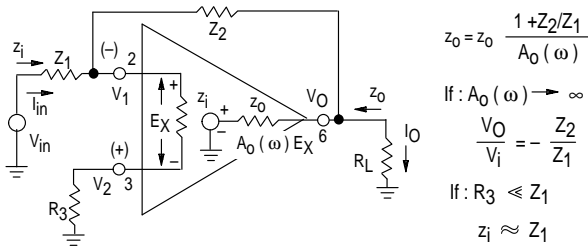


Figure 10. Noninverting Feedback Model

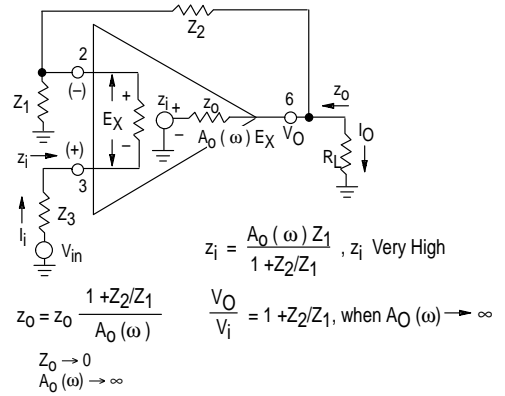
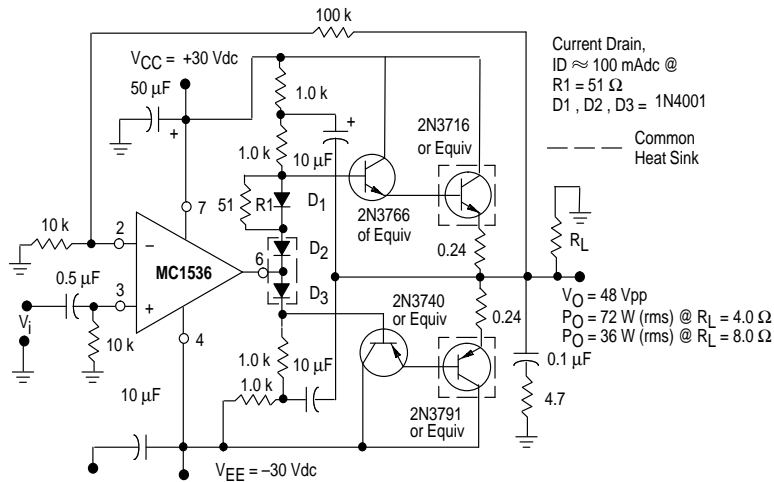


Figure 11. Audio Amplifier



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Figure 12. Voltage Controlled Current Source or Transconductance Amplifier with 0 V to 40 V Compliance

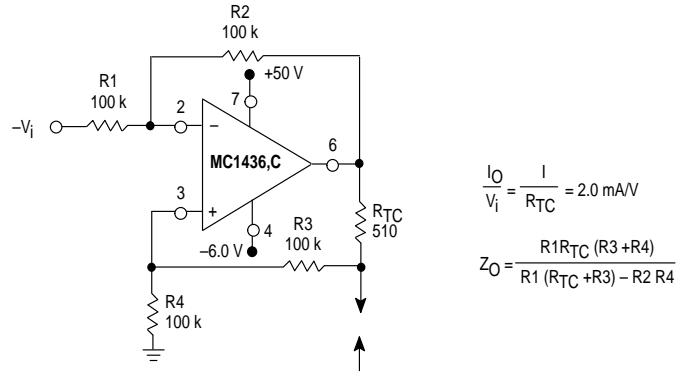


Figure 13. Representative Schematic Diagram

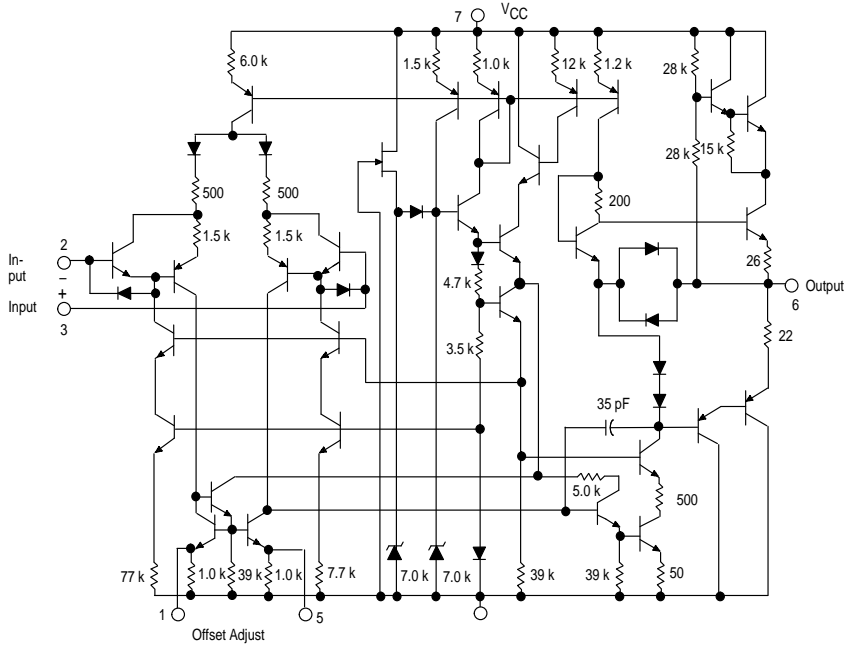
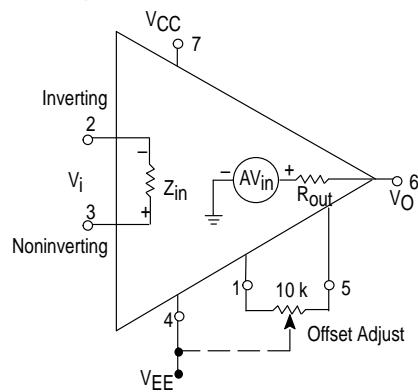


Figure 14. Equivalent Circuit



MC1436, C

OUTLINE DIMENSIONS

P1 SUFFIX
PLASTIC PACKAGE
CASE 626-05
ISSUE K

NOTE 2

SEATING PLANE

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | 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° | |
| N | 0.76 | 1.01 | 0.030 | 0.040 |

$\oplus \varnothing 0.13 (0.005) \text{ (M)}$ T A (M) B (M)

- 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.

D SUFFIX
PLASTIC PACKAGE
CASE 751-05
(SO-8)
ISSUE R


SEATING PLANE

| DIM | MILLIMETERS | |
|----------|-------------|------|
| | MIN | MAX |
| A | 1.35 | 1.75 |
| A1 | 0.10 | 0.25 |
| B | 0.35 | 0.49 |
| C | 0.18 | 0.25 |
| D | 4.80 | 5.00 |
| E | 3.80 | 4.00 |
| e | 1.27 BSC | |
| H | 5.80 | 6.20 |
| h | 0.25 | 0.50 |
| L | 0.40 | 1.25 |
| θ | 0° - 7° | |

$\oplus 0.25 \text{ (M)}$ C B (S) A (S)

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. DIMENSIONS ARE IN MILLIMETERS.
 3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

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