

High Voltage, Internally Compensated Operational Amplifier

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.

- Maximum Supply Voltage: ± 40 Vdc (MC1536)
- Output Voltage Swing:
 ± 30 Vpk(min) ($V_{CC} = +36$ V, $V_{EE} = -36$ V) (MC1536)
 ± 22 Vpk(min) ($V_{CC} = +28$ V, $V_{EE} = -28$ V)
- Input Bias Current: 20 nA max (MC1536)
- Input Offset Current: 3.0 nA max (MC1536)
- Fast Slew Rate: 2.0 V/ μ s typ
- Internally Compensated
- Offset Voltage Null Capability
- Input Overvoltage Protection
- A_{VOL} : 500,000 typ
- Characteristics Independent of Power Supply Voltages:
(± 5.0 Vdc to ± 36 Vdc)

**Figure 1. Differential Amplifier with ± 20 V
Common Mode Input Voltage Range**

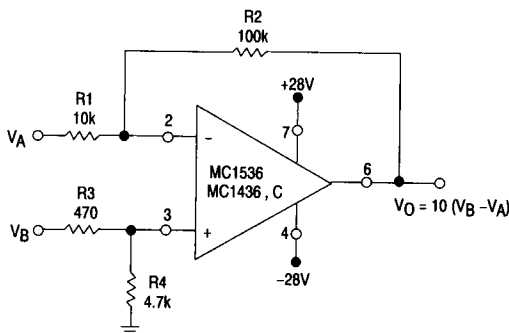
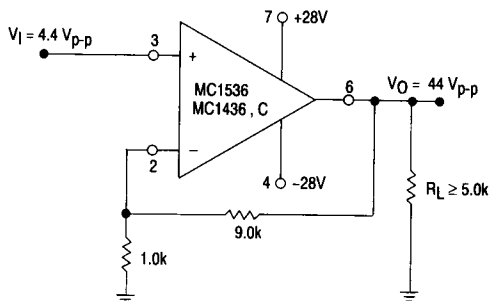


Figure 2. Typical Noninverting X10 Voltage Amplifier



MC1436, C
MC1536

OPERATIONAL AMPLIFIER

**SILICON MONOLITHIC
INTEGRATED CIRCUIT**



P1 SUFFIX
PLASTIC PACKAGE
CASE 626

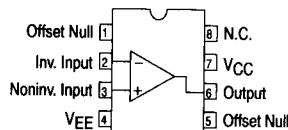


U SUFFIX
CERAMIC PACKAGE
CASE 693



D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO-8)

PIN CONNECTIONS



ORDERING INFORMATION

Device	Temperature Range	Package
MC1436CD, D	0° to +70°C	SO-8
MC1436P1, CP1		Plastic DIP
MC1436CU, U		Ceramic DIP
MC1536U	-55° to +125°C	Ceramic DIP

MC1436,C, MC1536

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

Rating	Symbol	MC1536	MC1436	MC1436C	Unit
Power Supply Voltage	V _{CC} V _{EE}	+40 -40	+34 -34	+30 -30	Vdc
Input Differential Voltage Range	V _{IDR}	Note 3			V
Input Common Mode Voltage Range	V _{ICR}	Note 3			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	-55 to +125	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.)

Characteristics	Symbol	MC1536		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}	—	8.0	20 35	—	15 —	40 55	nAdc
Input Offset Current T _A = +25°C T _A = +25°C to T _{high} T _A = T _{low} to +25°C	I _{IO}	—	1.0	3.0 4.5 7.0	—	5.0 — —	10 14 14	nAdc
Input Offset Voltage T _A = +25°C T _A = T _{low} to T _{high}	V _{IO}	—	2.0	5.0 7.0	—	5.0 —	10 14	mVdc
Differential Input Impedance (Open-loop, f ≤ 5.0 Hz)	r _p	—	10	—	—	10	—	MΩ
Parallel Input Resistance	C _p	—	2.0	—	—	2.0	—	pF
Common Mode Input Impedance (f ≤ 5.0 Hz)	z _{ic}	—	250	—	—	250	—	MΩ
Input Common Mode Voltage Range	V _{ICR}	±24	±25	—	±22	±25	—	Vpk
Equivalent Input Noise Voltage (A _v = 100, R _G = 10 kΩ, f = 1.0 kHz, BW = 1.0 Hz)	e _n	—	50	—	—	50	—	nV/(Hz) ^{1/2}
Common Mode Rejection (dc)	CMR	80	110	—	70	110	—	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}	100,000 50,000 —	500,000 — 200,000	— — —	70,000 50,000 —	500,000 — 200,000	50,000 — 200,000	V/V
Power Bandwidth (Voltage Follower) (A _v = 1, R _L = 5.0 kΩ, THD ≤ 5%, V _O = 40 V _{p-p})	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	—	—	±17	—	mA
Output Voltage Range (R _L = 5.0 kΩ) V _{CC} = +28 Vdc, V _{EE} = -28 Vdc V _{CC} = +36 Vdc, V _{EE} = -36 Vdc	V _O	±22 ±30	±23 ±32	— —	±20 —	±22 —	±20 —	V _{pk}
Power Supply Rejection V _{EE} = Constant, R _S ≤ 10 kΩ V _{CC} = Constant, R _S ≤ 10 kΩ	PSR + PSR -	— —	15 15	100 100	— —	35 35	200 200	μV/V
Power Supply Current (See Note 2)	I _{CC} I _{EE}	— —	2.2 2.2	4.0 4.0	— —	2.6 2.6	5.0 5.0	mA
DC Quiescent Power Consumption (V _O = 0)	P _C	—	124	224	—	146	280	mW

- NOTES:**
1. T_{low} = 0°C for MC1436,C, T_{high} = +70°C for MC1436,C, -55°C for MC1536
 2. V_{CC} = V_{EE} = 5.0 Vdc to 36 Vdc for MC1536
V_{CC} = V_{EE} = 5.0 Vdc to 30 Vdc for MC1436
V_{CC} = V_{EE} = 5.0 Vdc to 28 Vdc for MC1436C
 3. Either or both input voltages must not exceed the magnitude of V_{CC} or V_{EE} +3.0 V.

MC1436,C, MC1536

Figure 3. Low-Drift Sample and Hold

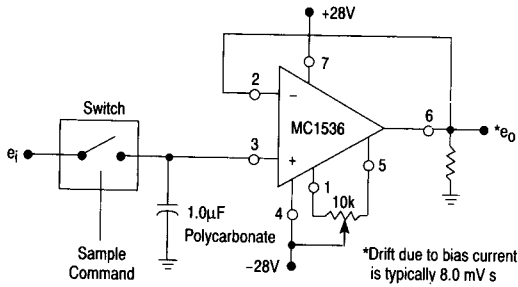


Figure 4. Power Bandwidth

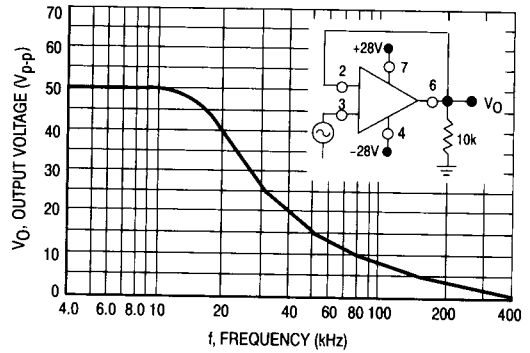


Figure 5. Peak Output Voltage Swing versus Power Supply Voltage

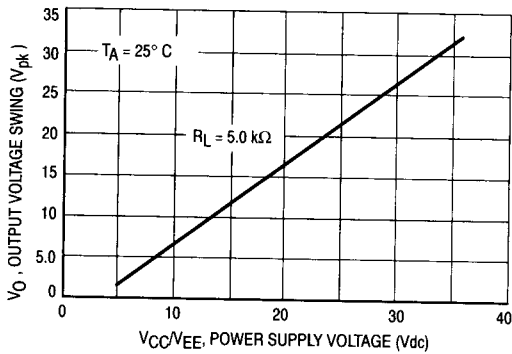


Figure 6. Open-Loop Frequency Response

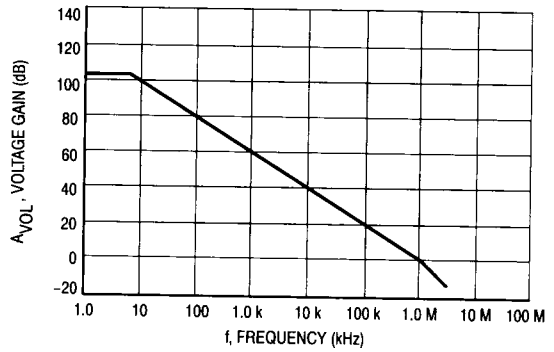


Figure 7. Output Short Circuit Current versus Temperature

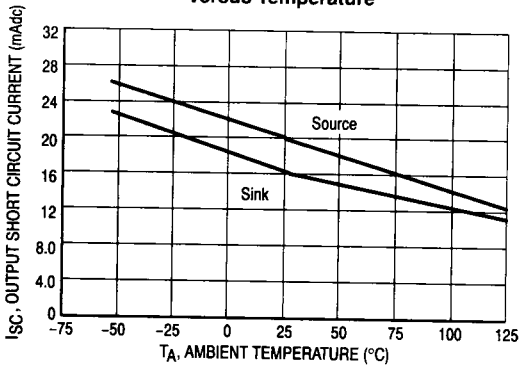
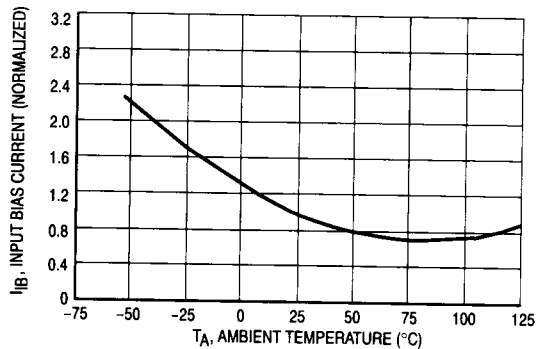


Figure 8. Input Bias Current versus Temperature



MC1436,C, MC1536

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Figure 9. Inverting Feedback Model

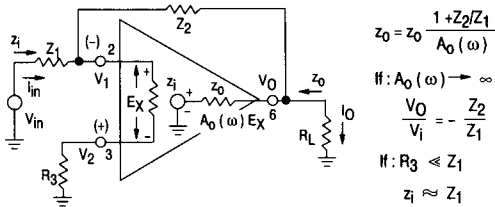


Figure 10. Noninverting Feedback Model

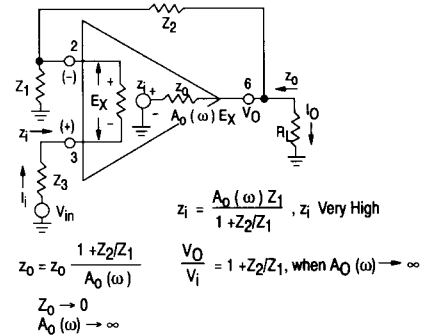


Figure 11. Audio Amplifier

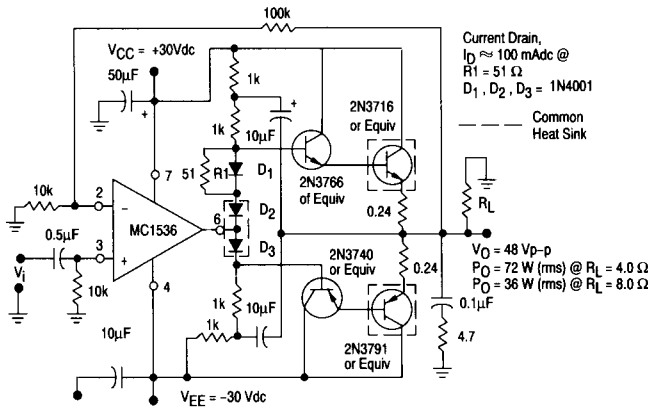


Figure 12. Voltage Controlled Current Source or Transconductance Amplifier with 0 V to 40 V Compliance

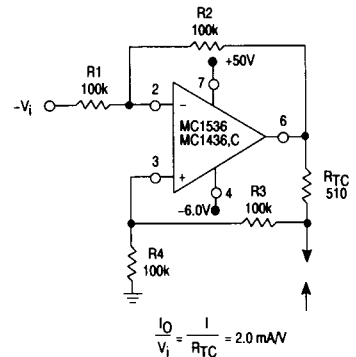


Figure 13. Representative Circuit Schematic

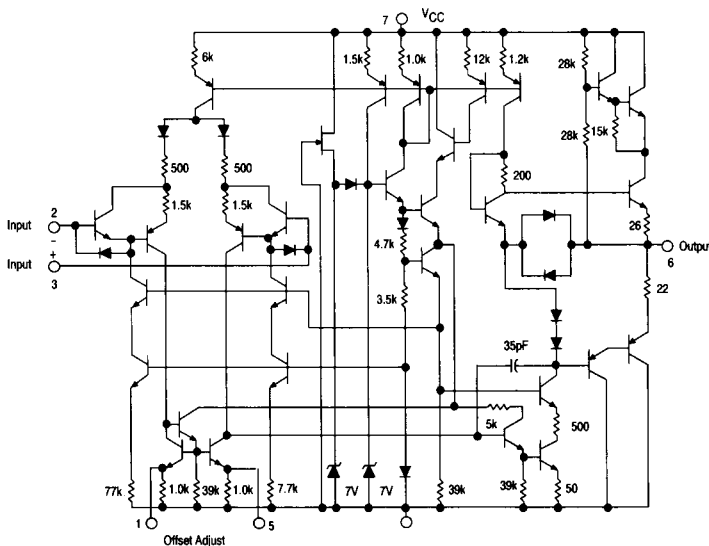


Figure 14. Equivalent Circuit

