MC1536G
MC1436G
MC1436CG

OPERATIONAL AMPLIFIER

HIGH VOLTAGE, INTERNALLY COMPENSATED MONOLITHIC OPERATIONAL AMPLIFIER

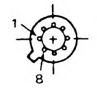
. . . designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

- Maximum Supply Voltage – ±40 Vdc (MC1536G)
- Output Voltage Swing –
  $\pm 30\ V_{pk(min)}$ ($V^{+} = +36$ V, $V^{-} = -36$ V) (MC1536G)
  $\pm 22\ V_{pk(min)}$ ($V^{+} = +28$ V, $V^{-} = -28$ V)
- Input Bias Current – 20 nA max (MC1536G)
- Input Offset Current – 3.0 nA max (MC1536G)
- Fast Slew Rate – 2.0 V/μs typ
- Internally Compensated
- Offset Voltage Null Capability
- Input Over-Voltage Protection
- A_{VOL} – 500,000 typ
- Characteristics Independent of Power Supply Voltages – (±5.0 Vdc to ±36 Vdc)

OPERATIONAL AMPLIFIER INTEGRATED CIRCUIT

EPITAXIAL PASSIVATED

METAL PACKAGE
CASE 601
TO-99



(bottom view)

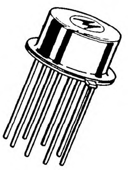


FIGURE 1 – DIFFERENTIAL AMPLIFIER WITH ±20 V COMMON-MODE INPUT VOLTAGE RANGE

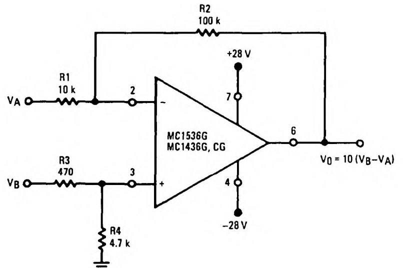


FIGURE 2 – VOLTAGE CONTROLLED CURRENT SOURCE or TRANSCONDUCTANCE AMPLIFIER WITH 0 TO 40 V COMPLIANCE

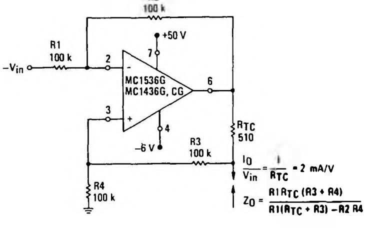


FIGURE 3 – TYPICAL NON-INVERTING X10 VOLTAGE AMPLIFIER

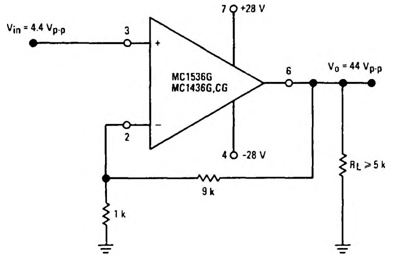
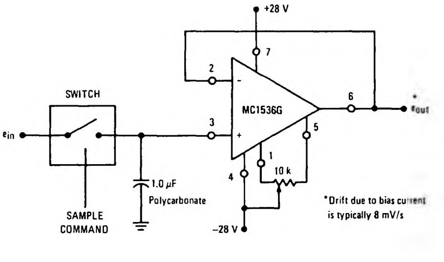


FIGURE 4 – LOW-DRIFT SAMPLE AND HOLD



See Packaging Information Section for outline dimensions.
See current MCC1536/1436 data sheet for standard linear chip information.

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

Rating	Symbol	MC1536G	MC1436G	MC1436CG	Unit
Power Supply Voltage	V^+ V^-	+40 -40	+34 -34	+30 -30	Vdc
Differential Input Signal	V_{in}	$\pm(V^+ + \lvert V^-\rvert -3)$			Volts
Common-Mode Input Swing	CMV_{in}	$+V^+, -(\lvert V^-\rvert -3)$			Volts
Output Short Circuit Duration ($V^+ = \lvert V^-\rvert$ = 28 Vdc, V_O = 0)	T_{SC}	5.0			s
Power Dissipation (Package Limitation) Derate above T_A = +25°C	P_D	680 4.6			mW mW/°C
Operating Temperature Range	T_A	-55 to +150	0 to +75		°C
Storage Temperature Range	T_{stg}	-65 to +150			°C

ELECTRICAL CHARACTERISTICS (V^+ = +28 Vdc, V^- = -28 Vdc, T_A = +25°C unless otherwise noted)

		MC1536G			MC1436G			MC1436CG			
Characteristics	Symbol	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
Input Bias Current	I_b										nAdc
T_A = +25°C		–	8.0	20	–	15	40	–	25	90	
$T_A = T_{low}$ to T_{high} (See Note 1)		–	–	35	–	–	55	–	–	–	
Input Offset Current	$\lvert I_{io}\rvert$										nAdc
T_A = +25°C		–	1.0	3.0	–	5.0	10	–	10	25	
T_A = +25°C to T_{high}		–	–	4.5	–	–	14	–	–	–	
$T_A = T_{low}$ to +25°C		–	–	7.0	–	–	14	–	–	–	
Input Offset Voltage	$\lvert V_{io}\rvert$										mVdc
T_A = +25°C		–	2.0	5.0	–	5.0	10	–	5.0	12	
$T_A = T_{low}$ to T_{high}		–	–	7.0	–	–	14	–	–	–	
Differential Input Impedance (Open-Loop, f ≤ 5.0 Hz)											
Parallel Input Resistance	R_p	–	10	–	–	10	–	–	10	–	Meg ohms
Parallel Input Capacitance	C_p	–	2.0	–	–	2.0	–	–	2.0	–	pF
Common-Mode Input Impedance (f ≤ 5.0 Hz)	$Z_{(in)}$	–	250	–	–	250		–	250	–	Meg ohms
Common-Mode Input Voltage Swing	CMV_{in}	±24	±25	–	±22	±25	–	±18	±20	–	V_{pk}
Equivalent Input Noise Voltage (A_V = 100, R_s = 10 k ohms, f = 1.0 kHz, BW = 1.0 Hz)	e_n	–	50	–	–	50	–	–	50	–	nV/(Hz)½
Common-Mode Rejection Ratio (dc)	CM_{rej}	80	110	–	70	110	–	50	90	–	dB
Large Signal dc Open Loop Voltage Gain	A_{VOL}										V/V
(V_O = ± 10 V, R_L = 100 k ohms) T_A = +25°C		100,000	500,000	–	70,000	500,000	–	50,000	500,000	–	
(V_O = ± 10 V, R_L = 100 k ohms) $T_A = T_{low}$ to T_{high}		50,000	–	–	50,000	–	–	–	–	–	
(V_O = ±10 V, R_L = 10 k ohms, T_A = +25°C)		–	200,000	–	–	200,000	–	–	200,000	–	
Power Bandwidth (Voltage Follower) (A_V = 1, R_L = 5.0 k ohms, THD ≤ 5%, V_O = 40 Vp-p)	P_{BW}	–	23	–	–	23	–	–	23	–	kHz
Unity Gain Crossover Frequency (open-loop)	f_c	–	1.0	–	–	1.0	–	–	1.0	–	MHz
Phase Margin (open-loop, unity gain)	ϕ	–	50	–	–	50	–	–	50	–	degrees
Gain Margin	A_{GM}	–	18	–	–	18	–	–	18	–	dB
Slew Rate (Unity Gain)	dV_{out}/dt	–	2.0	–	–	2.0	–	–	2.0	–	V/µs
Output Impedance (f ≤ 5.0 Hz)	Z_{out}	–	1.0	–	–	1.0	–	–	1.0	–	k ohms
Short-Circuit Output Current	I_{SC}	–	±17	–	–	±17	–	–	±19	–	mAdc
Output Voltage Swing (R_L = 5.0 k ohms)	V_O										V_{pk}
V^+ = +28 Vdc, V^- = -28 Vdc		±22	±23	–	±20	±22	–	±20	±22	–	
V^+ = +36 Vdc, V^- = -36 Vdc		±30	±32	–	–	–	–	–	–	–	
Power Supply Sensitivity (dc)											µV/V
V^- = constant, R_s ≤ 10 k ohms	S+	–	15	100	–	35	200	–	50	–	
V^+ = constant, R_s ≤ 10 k ohms	S-	–	15	100	–	35	200	–	50	–	
Power Supply Current (See Note 2)	I_{D^+}	–	2.2	4.0	–	2.6	5.0	–	2.6	5.0	mAdc
	I_{D^-}	–	2.2	4.0	–	2.6	5.0	–	2.6	5.0	
DC Quiescent Power Dissipation (V_{oi} = 0)	P_D	–	124	224	–	146	280	–	146	280	mW

Note 1: T_{low}: 0°C for MC1436G,CG
-55°C for MC1536G
T_{high}: +75°C for MC1436G,CG
+150°C for MC1536G

Note 2: $V^+ = \lvert V^-\rvert$ = 5.0 Vdc to 36 Vdc for MC1536G
$V^+ = \lvert V^-\rvert$ = 5.0 Vdc to 30 Vdc for MC1436G
$V^+ = \lvert V^-\rvert$ = 5.0 Vdc to 28 Vdc for MC1436CG

FIGURE 5 – POWER BANDWIDTH

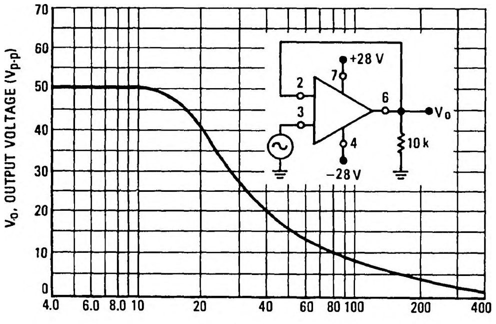


FIGURE 6 – PEAK OUTPUT VOLTAGE SWING versus POWER SUPPLY VOLTAGE

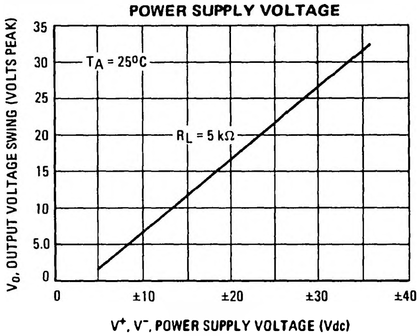


FIGURE 7 – OPEN-LOOP FREQUENCY RESPONSE

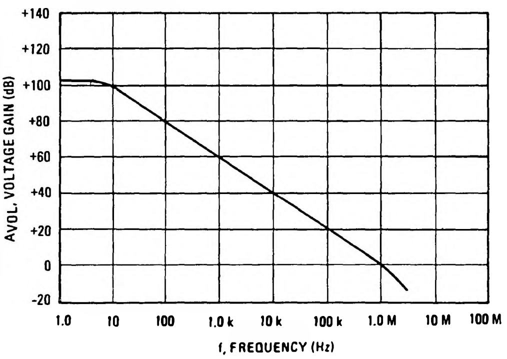


FIGURE 8 – OUTPUT SHORT-CIRCUIT CURRENT versus TEMPERATURE

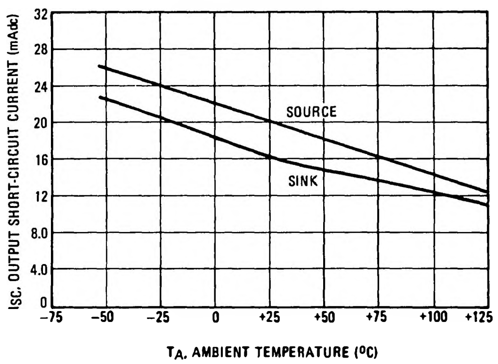


FIGURE 9 – INPUT BIAS CURRENT versus TEMPERATURE

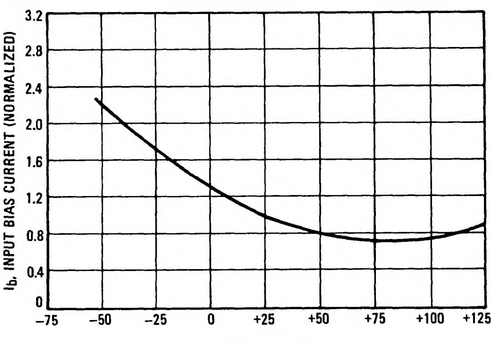


FIGURE 10 – INVERTING FEEDBACK MODEL

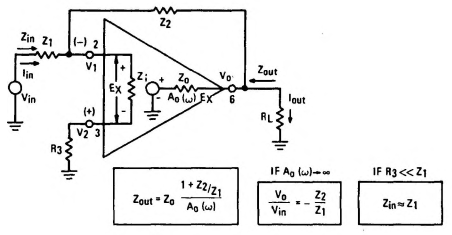


FIGURE 11 – NON-INVERTING FEEDBACK MODEL

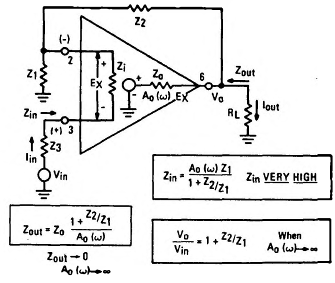


FIGURE 12 – AUDIO AMPLIFIER

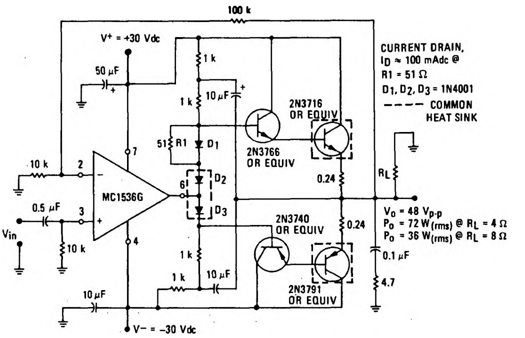


FIGURE 13 – CIRCUIT SCHEMATIC

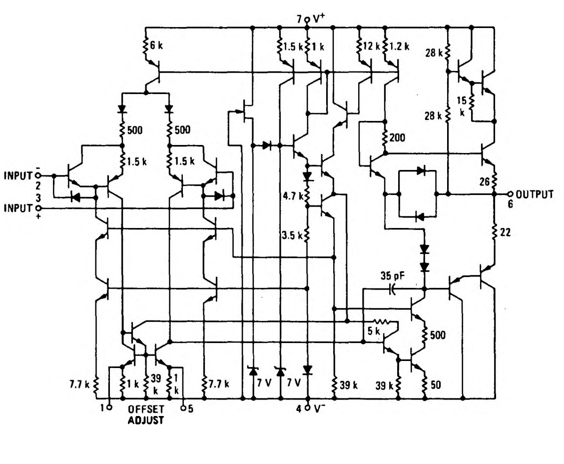


FIGURE 14 – EQUIVALENT CIRCUIT