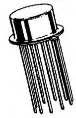
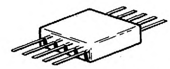
MC1533

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



Lead 4 connected to case

CASE 71
"G" SUFFIX



CASE 72
(TO-91)
"F" SUFFIX

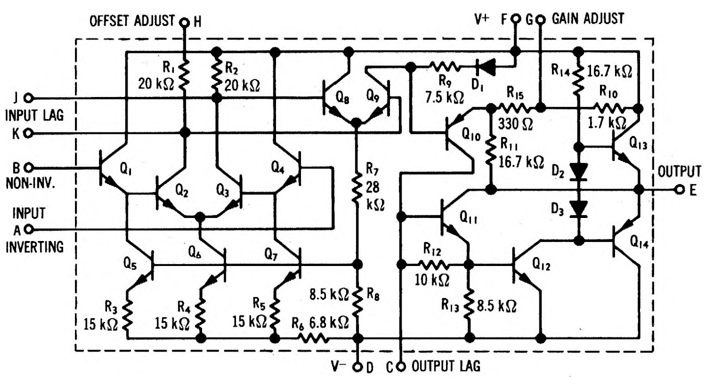
Typical Amplifier Features:

- High-Performance Open Loop Gain Characteristics
  A_{VOL} = 60,000 typical
- Low Temperature Drift — ±5.0 μV/°C
- Large Output Voltage Swing — ±13 V Typical @ ±15 V Supply
- Low Output Impedance — Z_{out} = 100 ohms typical
- Input Offset Voltage Adjustable to Zero

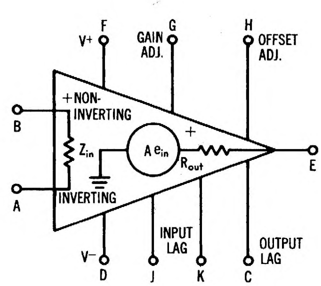
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage	V^+ V^-	+20 -20	Vdc Vdc
Differential Input Signal	V_{in}	±10	Volts
Common Mode Input Swing	CMV_{in}	$\pm V^+$	Volts
Load Current	I_L	10	mA
Output Short Circuit Duration	t_S	1.0	s
Power Dissipation (Package Limitation) Metal Can Derate above T_A = 25°C Flat Package Derate above T_A = 25°C	P_D	 680 4.6 500 3.3	 mW mW/°C mW mW/°C
Operating Temperature Range	T_A	-55 to +125	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

CIRCUIT SCHEMATIC

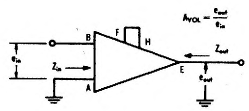
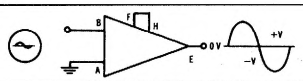
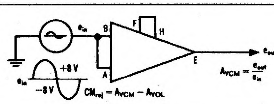
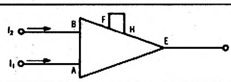
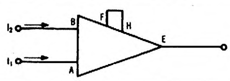
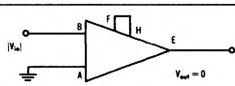
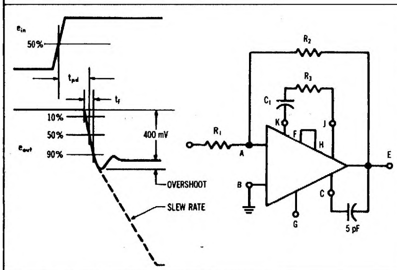
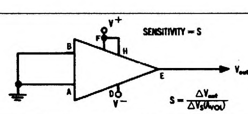


EQUIVALENT CIRCUIT



PIN CONNECTIONS										
Schematic	A	B	C	D	E	F	G	H	J	K
"G" Package	1	2	3	4	5	6	7	8	9	10
"F" Package	10	1	2	3	4	5	6	7	8	9

ELECTRICAL CHARACTERISTICS ($V^+ = +15$ Vdc, $V^- = -15$ Vdc, $T_A = 25°C$ unless otherwise noted)

Characteristic Definitions (1)	Characteristic	Symbol	Min	Typ	Max	Unit
	Open Loop Voltage Gain (V @ Pin G = +15 Vdc) (Pin G open) (V @ Pin G = +15 Vdc, T_A = -55°C, +125°C) (Pin G open, T_A = -55°C, +125°C)	A_{VOL}	 40,000 15,000 35,000 12,000	 60,000 30,000 50,000 25,000	 150,000 60,000 150,000 60,000	-
	Output Impedance (Pin G open, f = 20 Hz)	Z_{out}	-	100	150	Ω
	Input Impedance (Pin G open, f = 20 Hz)	Z_{in}	500	1000	-	kΩ
	Output Voltage Swing (R_L = 10 kΩ) (R_L = 2 kΩ)	V_{out}	 ±12 ±11	 ±13 ±12	 - -	V_{peak}
	Input Common Mode Voltage Swing	CMV_{in}	+9 -8	+10 -9	- -	V_{peak}
	Common Mode Rejection Ratio (V @ Pin G = +15 Vdc) (Pin G open)	CM_{rej}	 90 80	 100 94	 - -	dB
	Input Bias Current $\left(I_b = \frac{I_1 + I_2}{2}\right)$, ($T_A$ = +25°C) (T_A = -55°C)	I_b	 - -	 0.5 -	 1.0 3.0	µA
	Input Offset Current ($I_{io} = I_1 - I_2$) ($I_{io} = I_1 - I_2$, T_A = -55°C) ($I_{io} = I_1 - I_2$, T_A = +125°C)	I_{io}	 - - -	 0.03 - -	 0.15 0.5 0.2	µA
	Input Offset Voltage (2) (T_A = 25°C) (T_A = -55°C, + 125°C)	V_{io}	 - -	 1.0 -	 5.0 6.0	mV
	Step Response (Gain = 100, 15% overshoot, R_1 = 1 kΩ, R_2 = 100 kΩ, R_3 = 100 Ω, C_1 = 0.002 µF)	t_f t_{pd} dV_{out}/dt (3)	- - -	0.15 0.06 11.0	- - -	µs µs V/µs
	(Gain = 10, no overshoot, R_1 = 1 kΩ, R_2 = 10 kΩ, R_3 = 10 Ω, C_1 = 0.05 µF)	t_f t_{pd} dV_{out}/dt (3)	- - -	0.3 0.1 1.5	- - -	µs µs V/µs
	(Gain = 1, 20% overshoot, R_1 = 10 kΩ, R_2 = 10 kΩ, R_3 = 5 Ω, C_1 = 0.1 µF)	t_f t_{pd} dV_{out}/dt (3)	- - -	0.2 0.3 0.8	- - -	µs µs V/µs
	Average Temperature Coefficient of Input Offset Voltage (T_A = -55°C to +25°C) (T_A = +25°C to +125°C)	TC_{Vio}	 - -	 8.0 5.0	 - -	µV/°C
	Average Temperature Coefficient of Input Offset Current (T_A = -55°C to +125°C) (T_A = +25°C to +125°C)	TC_{Iio}	 - -	 0.1 0.05	 - -	nA/°C
	DC Power Dissipation (Power Supply = ±15 V, V_{out} = 0)	P_D	-	120	170	mW
	Positive Supply Sensitivity (V^- constant)	S^+	-	50	150	µV/V
	Negative Supply Sensitivity (V^+ constant)	S^-	-	50	150	µV/V

(1) All definitions imply linear operation

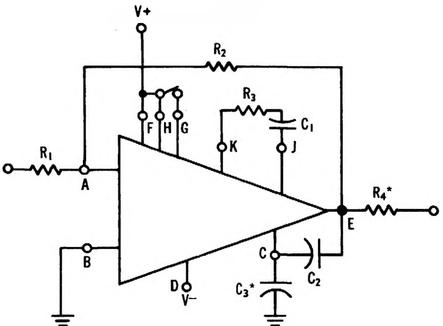
(2) Input offset voltage (V_{io}) may be adjusted to zero by varying the potential on pin H

(3) dV_{out}/dt = Slew Rate

TYPICAL OUTPUT CHARACTERISTICS

FIGURE 1 — TEST CIRCUIT

$V^+ = +15$ Vdc, $V^- = -15$ Vdc, $T_A = 25°C$



*FOR CAPACITIVE LOADS, $R_4 = 47\ \Omega$ OR $C_3 = 47$ pF

Fig. No.	Curve No.	Test Conditions					
		$R_1 (\Omega)$	$R_2 (\Omega)$	$R_3 (\Omega)$	C_1	C_2 (pF)	C_3 (pF)
2	1	10k	10k	5	1 μF	10	47
	2	10k	100k	10	0.1 μF	10	47
	3	1k	1M	510	820 pF	10	47
	3	10k	1M	100	0.05 μF	10	47
	4	1k	1M	100	0.05 μF	3	47
	4	1k	1M	510	820 pF	3	47
3	1 (Low Gain)	1k	1M	10	1000 pF	10	47
	1 (High Gain)	1k	1M	510	820 pF	10	47
	2 (Low Gain)	10k	1M	10	0.01 μF	10	47
	2 (High Gain)	10k	1M	100	0.01 μF	10	47
	3 (Low Gain)	10k	100k	10	0.1 μF	10	47
	3 (High Gain)	10k	100k	10	0.1 μF	10	47
	4 (Low Gain)	10k	10k	10	1 μF	10	47
	4 (High Gain)	10k	10k	5	1 μF	10	47
4	1	0	∞	10	1 μF	10	47
	2	0	∞	10	0.1 μF	10	47
	3	0	∞	10	0.01 μF	10	47
	4	0	∞	10	1000 pF	10	47
	5	0	∞	10	100 pF	10	47
5	1	0	∞	10	1 μF	10	47
	2	0	∞	10	0.1 μF	10	47
	3	0	∞	10	0.01 μF	10	47
	4	0	∞	10	1000 pF	10	47
	5	0	∞	10	100 pF	10	47

FIGURE 2 — LARGE-SIGNAL SWING versus FREQUENCY

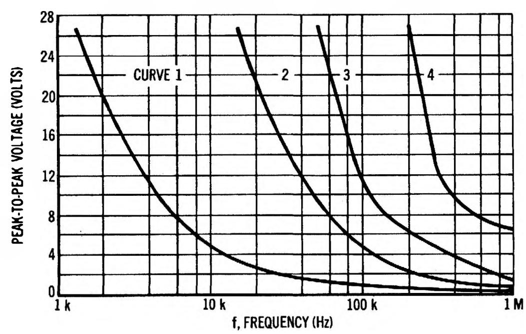


FIGURE 3 — VOLTAGE GAIN versus FREQUENCY

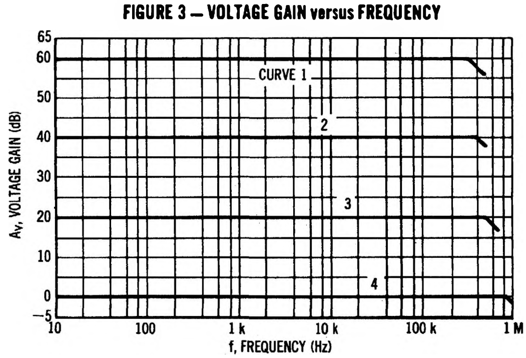


FIGURE 4 — OPEN LOOP VOLTAGE GAIN versus FREQUENCY
(LOW GAIN CONFIGURATION)

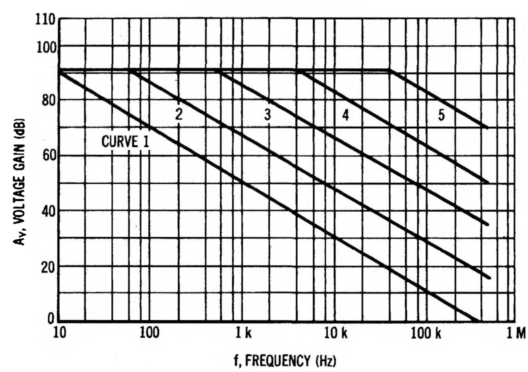
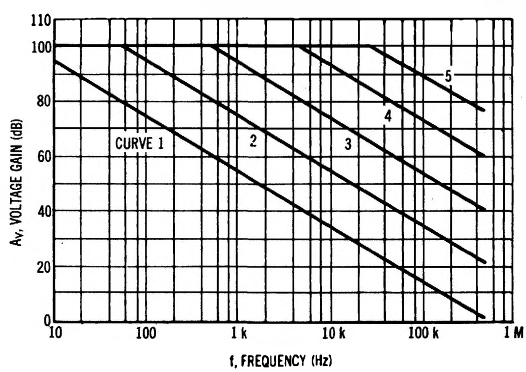


FIGURE 5 — OPEN LOOP VOLTAGE GAIN versus FREQUENCY
(HIGH GAIN CONFIGURATION)



TYPICAL CHARACTERISTICS

FIGURE 6 — POWER DISSIPATION versus POWER SUPPLY VOLTAGE

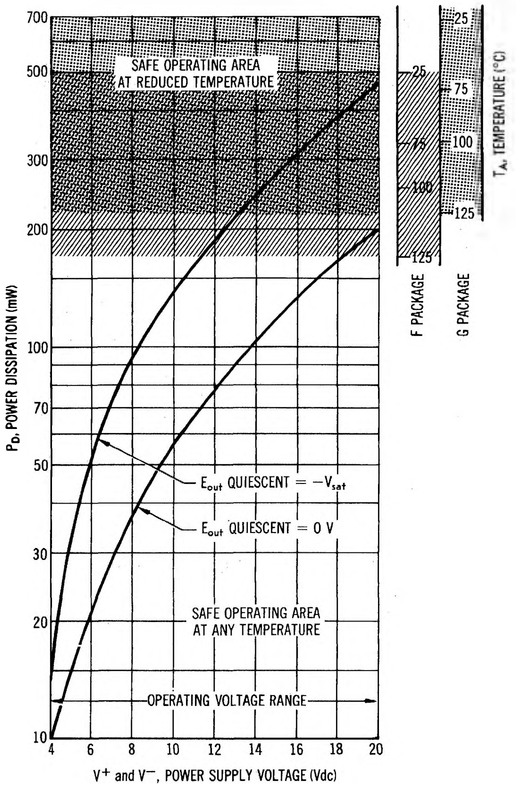


FIGURE 7 — VOLTAGE GAIN versus POWER SUPPLY VOLTAGE

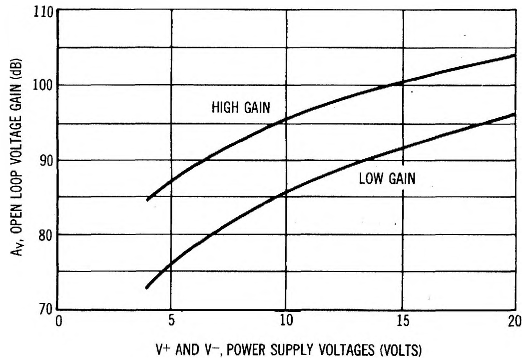


FIGURE 8 — COMMON MODE SWING versus POWER SUPPLY VOLTAGE

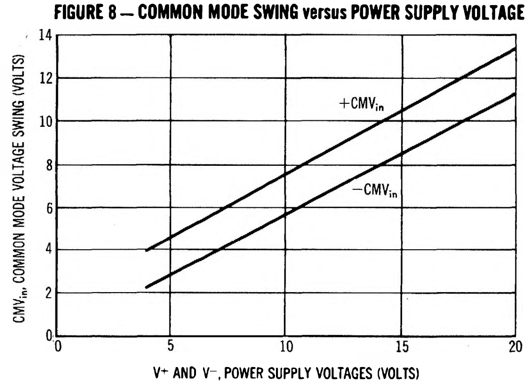


FIGURE 9 — INPUT OFFSET VOLTAGE versus TEMPERATURE

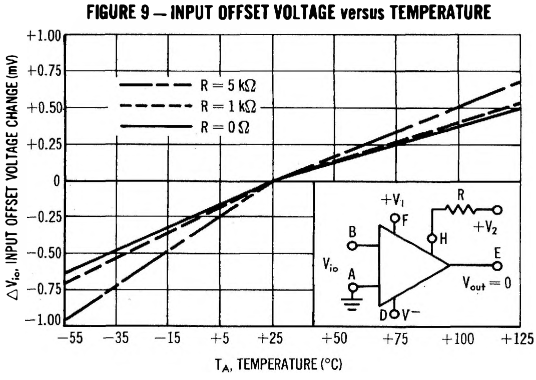


FIGURE 10 — INPUT NOISE VOLTAGE versus SOURCE RESISTANCE