ORDERING INFORMATION

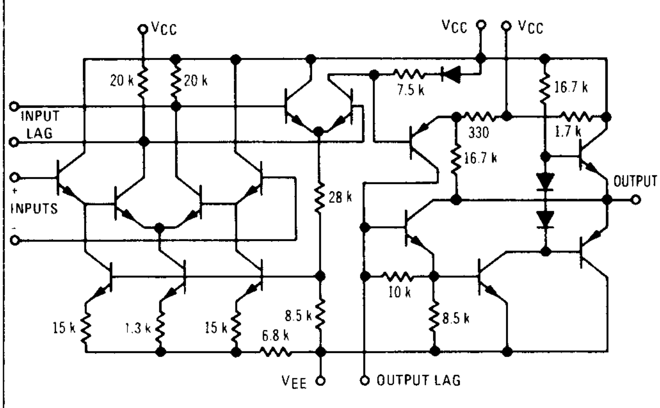
Device	Temperature Range	Package
MC1433F	0°C to +70°C	Ceramic Flat
MC1433G	0°C to +70°C	Metal Can
MC1433L	0°C to +70°C	Ceramic DIP
MC1433P	0°C to +70°C	Plastic DIP
MC1533F	−55°C to +125°C	Ceramic Flat
MC1533G	−55°C to +125°C	Metal Can
MC1533L	−55°C to +125°C	Ceramic DIP

MC1433
MC1533

OPERATIONAL AMPLIFIER

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

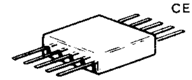
- High-Performance Open Loop Gain Characteristics
  A_{vol} = 60,000 typical
- Low Temperature Drift – ±5 μV/°C
- Large Output Voltage Swing – ±13 V typical @ ±15 V Supply
- Low Output Impedance – z_O = 100 ohms typical

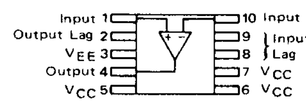


OPERATIONAL AMPLIFIER

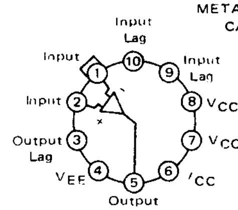
SILICON MONOLITHIC INTEGRATED CIRCUIT

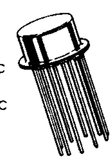
F SUFFIX
CERAMIC PACKAGE
CASE 606
TO-91



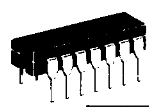


G SUFFIX
METAL PACKAGE
CASE 603B

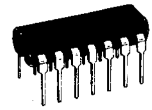


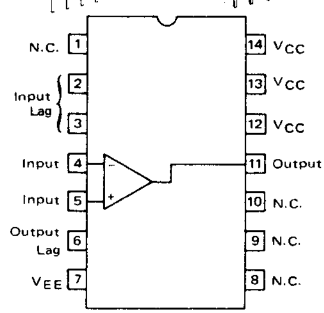


L SUFFIX
CERAMIC PACKAGE
CASE 632
TO-116



P SUFFIX
PLASTIC PACKAGE
CASE 646
(MC1433P Only)





ELECTRICAL CHARACTERISTICS (V_{CC} = +15 Vdc, V_{EE} -15 Vdc, T_A = +25°C unless otherwise noted)

Characteristic	Symbol	MC1533			MC1433			Unit
		Min	Typ	Max	Min	Typ	Max	
Open Loop Voltage Gain (T_A = +25°C) (T_A = T_{low} ① to T_{high} ①)	A_{VOL}	 40,000 35,000	 60,000 50,000	 – –	 30,000 20,000	 60,000 50,000	 – –	–
Output Impedance (f = 20 Hz)	z_o	–	100	150	–	100	150	Ω
Input Impedance (f = 20 Hz)	z_i	500	1000	–	300	600	–	kΩ
Output Voltage Range (R_L = 10 kΩ) (R_L = 2 kΩ)	V_o	 ±12 ±11	 ±13 ±12	 – –	 ±12 ±10	 ±13 ±12	 – –	V_{peak}
Input Common Mode Voltage Range	V_{ICR}	+9.0 -8.0	+10 -9.0	– –	+8.0 -8.0	+9.0 -9.0	– –	V_{peak}
Common Mode Rejection Ratio	CMRR	90	100	–	80	100	–	dB
Input Bias Current (T_A = +25°C) (T_A = T_{low})	I_{IB}	 – –	 0.5 –	 1.0 3.0	 – –	 0.5 –	 2.0 4.0	µA
Input Offset Current (T_A = +25°C) (T_A = T_{low}) (T_A = T_{high})	I_{IO}	 – – –	 0.03 – –	 0.15 0.5 0.2	 – – –	 0.1 – –	 0.50 0.75 0.75	µA
Input Offset Voltage ② (T_A = +25°C) (T_A = T_{low}, T_{high})	V_{IO}	 – –	 1.0 –	 5.0 6.0	 – –	 1.0 –	 7.5 10	mV
Step Response (C_2 = 10 pF) Gain = 100, 10% overshoot, R_1 = 10 kΩ, R_2 = 1.0 MΩ, R_3 = 100 Ω, C_1 = 0.01 µF	 t_{TLH} t_{pd} SR	 – – –	 0.25 0.1 6.2	 – – –	 – – –	 0.25 0.1 6.2	 – – –	 µs µs V/µs
Gain = 10, no overshoot, R_1 = 10 kΩ, R_2 = 100 kΩ, R_3 = 10 Ω, C_1 = 0.1 µF	t_{TLH} t_{pd} SR	– – –	0.3 0.1 2.9	– – –	– – –	0.3 0.1 2.9	– – –	µs µs V/µs
Gain = 1, 5% overshoot, R_1 = 10 kΩ, R_2 = 10 kΩ, R_3 = 10 Ω, C_1 = 1.0 µF	t_{TLH} t_{pd} SR	– – –	0.2 0.1 2.0	– – –	– – –	0.2 0.1 2.0	– – –	µs µs V/µs
Average Temperature Coefficient of Input Offset Voltage (T_A = T_{low} to +25°C) (T_A = +25°C to T_{high})	$\Delta V_{IO}/\Delta T$	 – –	 8.0 5.0	 – –	 – –	 10 8.0	 – –	µV/°C
Average Temperature Coefficient of Input Offset Current (T_A = T_{low} to T_{high}) (T_A = +25°C to T_{high})	$\Delta I_{IO}/\Delta T$	 – –	 0.1 0.05	 – –	 – –	 0.1 0.05	 – –	nA/°C
DC Power Consumption (Power Supply = ±15 V, V_o = 0)	P_C	–	125	170	–	125	240	mW
Positive Supply Sensitivity (V_{EE} constant)	PSRR+	–	50	150	–	50	200	µV/V
Negative Supply Sensitivity (V_{CC} constant)	PSSR-	–	50	150	–	50	200	µV/V

① T_{high} = +75°C for MC1433, +125°C for MC1533; T_{low} = 0 for MC1433, -55°C for MC1533

② Input offset voltage (V_{IO}) may be adjusted to zero.

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

Rating	Symbol	Value	Unit
Power Supply Voltage MC1533,MC1433 MC1533,MC1433	V_{CC} V_{EE}	+20,+18 -20,-18	Vdc Vdc
Differential Input Voltage Range	V_{IDR}	±10	Volts
Common Mode Input Voltage Range	V_{ICR}	$\pm V_{CC}$	Volts
Load Current	I_L	10	mA
Output Short Circuit Duration	t_S	0.1	s
Power Dissipation (Package Limitation)	P_D		
Metal Package		680	mW
Derate above T_A = +25°C		4.6	mW/°C
Flat Package		500	mW
Derate above T_A = +25°C		3.3	mW/°C
Dual In-Line Ceramic Package		625	mW
Derate above T_A = +25°C		5.0	mW/°C
Dual In-Line Plastic Package		400	mW
Derate above T_A = +25°C		3.3	mW/°C
Operating Ambient Temperature Range MC1533 MC1433	T_A	 -55 to +125 0 to +75	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

TYPICAL CHARACTERISTICS

FIGURE 2 – TEST CIRCUIT

V_{CC} = +15 Vdc, V_{EE} = -15 Vdc, T_A = +25°C

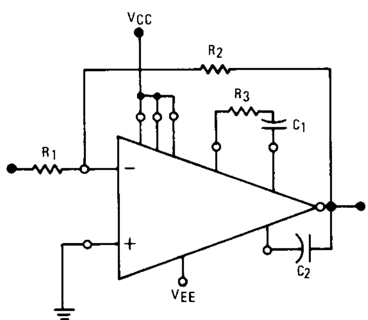


Fig. No.	Curve No.	Test Conditions				
		R_1 (Ω)	R_2 (Ω)	R_3 (Ω)	C_1 (μF)	C_2 (pF)
3	1	10 k	10 k	10	1.0	10
	2	10 k	100 k	10	0.1	10
	3	10 k	1.0 M	100	0.01	10
	3	1.0 k	1.0 M	390	0.002	10
4	1	10 k	10 k	10	1.0	10
	2	10 k	100 k	10	0.1	10
	3	10 k	1.0 M	100	0.01	10
	4	1.0 k	1.0 M	390	0.002	10
5	1	0	∞	10	1.0	10
	2	0	∞	10	0.1	10
	3	0	∞	100	0.01	10
	4	0	∞	390	0.002	10

TYPICAL CHARACTERISTICS (continued)

(V_{CC} = +15 Vdc, V_{EE} -15 Vdc, T_A = +25°C unless otherwise noted)

FIGURE 3 – LARGE-SIGNAL RANGE versus FREQUENCY

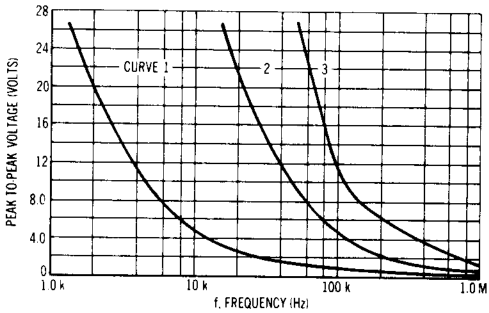


FIGURE 4 – VOLTAGE GAIN versus FREQUENCY

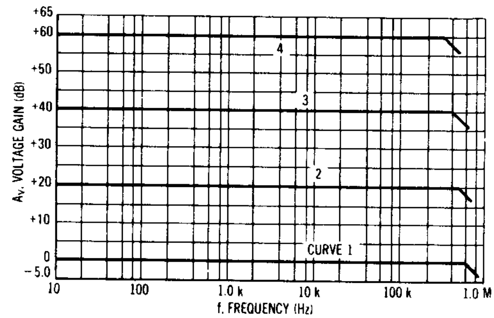


FIGURE 5 – OFFSET ADJUST CIRCUIT

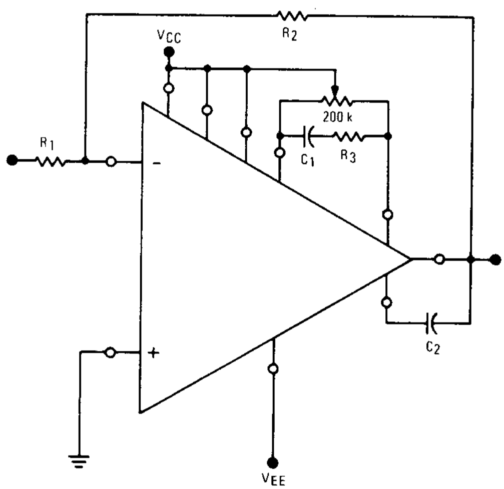
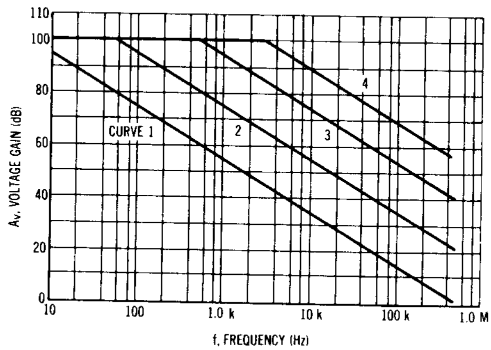


FIGURE 6 – OPEN LOOP VOLTAGE GAIN versus FREQUENCY (HIGH GAIN CONFIGURATION)



3

TYPICAL CHARACTERISTICS (continued)

FIGURE 7 – POWER CONSUMPTION versus POWER SUPPLY VOLTAGE

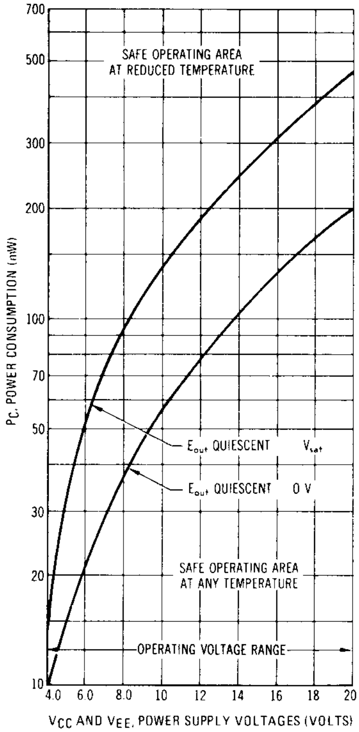


FIGURE 8 – VOLTAGE GAIN versus POWER SUPPLY VOLTAGE

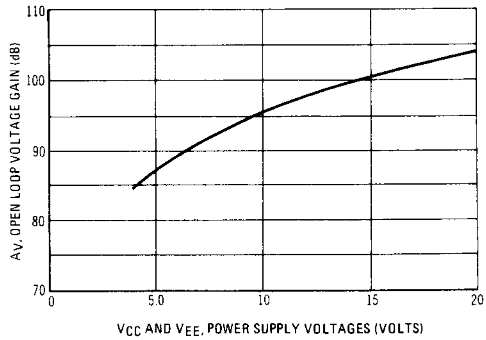


FIGURE 9 – COMMON MODE RANGE versus POWER SUPPLY VOLTAGE

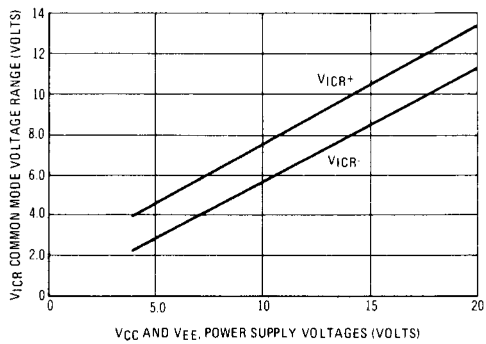


FIGURE 10 – INPUT NOISE VOLTAGE versus SOURCE RESISTANCE