ORDERING INFORMATION

Device	Temperature Range	Package
MC1430F,1431F	0°C to +70°C	Ceramic Flat
MC1430G,1431G	0°C to +70°C	Metal Can
MC1430P,1431P	0°C to +70°C	Plastic DIP
MC1530F,1531F	−55°C to +125°C	Ceramic Flat
MC1530G,1531G	−55°C to +125°C	Metal Can

MC1430, MC1431
MC1530, MC1531

OPERATIONAL AMPLIFIERS

SILICON MONOLITHIC INTEGRATED CIRCUIT

OPERATIONAL AMPLIFIER

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

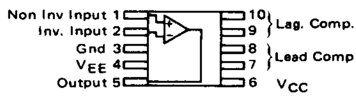
The MC1531 (MC1431) is provided with Darlington inputs to increase input impedance; otherwise the MC1531 (MC1431) circuit is identical with the MC1530 (MC1430) circuit.

- High Open Loop Voltage Gain – 4500 min (MC1530)
  – 2500 min (MC1531)
- High Input Impedance – 10 Kilohms min (MC1530)
  – 1.0 Megohm min (MC1531)
- Low Output Impedance – 50 Ohms max
- High Slew Rate – 6.0 V/µs typ @ A_{VS} = 10
- High Open Loop Bandwidth – 2.0 MHz typ (MC1530)
  0.4 MHz typ (MC1531)

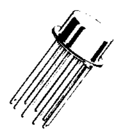
3

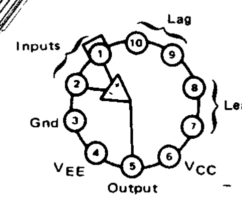
PIN CONNECTIONS

F SUFFIX
CERAMIC PACKAGE
CASE 606
TO-91

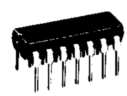


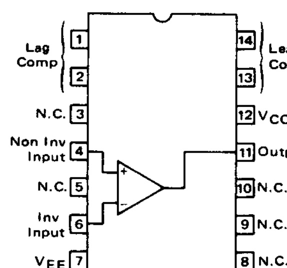
G SUFFIX
METAL PACKAGE
CASE 603 B





P SUFFIX
PLASTIC PACKAGE
CASE 646
(MC1430P/MC1431P only)





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

Rating	Symbol	Value	Unit
Power Supply Voltage MC1530, MC1531	V_{CC}, V_{EE}	+9.0, -9.0	Vdc
MC1430, MC1431	V_{CC}, V_{EE}	+8.0, -8.0	
Differential Input Voltage Range	V_{IDR}	± 5.0	Volts
Load Current	I_L	10	mA
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 Plastic Package MC1430, MC1431		400	mW
Derate above +25°C		3.3	mW/°C
Operating Ambient Temperature Range	T_A		°C
MC1530, MC1531		-55 to +125	
MC1430, MC1431		0 to +75	
Storage Temperature Range	T_{stg}		°C
Metal and Ceramic Package		-65 to +175	
Plastic Package MC1430, MC1431		-55 to +150	

CIRCUIT SCHEMATICS

FIGURE 1 – MC1530/MC1430 (STANDARD INPUT)

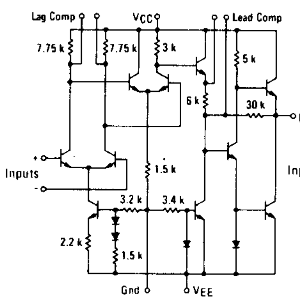
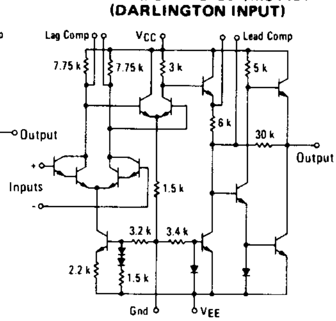


FIGURE 2 – MC1531/MC1431 (DARLINGTON INPUT)

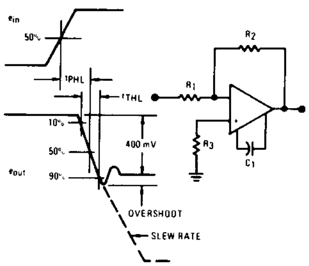


ELECTRICAL CHARACTERISTICS (V_{CC} = +6.0 Vdc, V_{EE} = -6.0 Vdc, T_A = +25°C unless otherwise noted)

Characteristic	Symbol	MC1530 Min	MC1530 Typ	MC1530 Max	MC1430 Min	MC1430 Typ	MC1430 Max	Unit
Input Bias Current	I_{IB}	–	3.0	10	–	5.0	15	μAdc
Input Offset Current	I_{IO}	–	0.2	2.0	–	0.4	4.0	μAdc
Input Offset Voltage T_A = +25°C	V_{IO}	–	1.0	5.0	–	2.0	10	mVdc
T_A = T_{low} ①		–	–	6.0	–	–	11	
T_A = T_{high} ①		–	–	6.0	–	–	12	
Single-Ended Input Impedance (Open-Loop, f = 30 Hz)	z_{is}	10	20	–	5.0	15	–	k Ω
Common-Mode Input Voltage Swing	V_{ICR}	± 2.0	± 2.7	–	± 2.0	± 2.5	–	V_{pk}
Equivalent Input Noise Voltage (Open-Loop, R_s = 50 ohms, BW = 5.0 MHz)	e_N	–	10	–	–	10	–	μV(rms)
Common-Mode Rejection Ratio (f = 100 Hz)	CMRR	70	75	–	65	75	–	dB
Open-Loop Voltage Gain, T_A = +25°C	A_{vol}	–	–	–	3000	5000	–	V/V
T_A = T_{low} to T_{high}		4500	5000	12,500	–	–	–	
Bandwidth (Open-Loop, -3.0 dB, no roll-off capacitance)	BW	1.0	2.0	–	1.0	2.0	–	MHz
Output Impedance (f = 100 Hz)	z_O	–	25	50	–	25	50	ohms
Output Voltage Swing (R_L = 1.0 k ohms)	V_O	± 4.5	± 5.2	–	± 4.0	± 5.0	–	V_{pk}
Power Supply Sensitivity ($R_s \leq$ 10 k Ω)	PSRR	–	100	–	–	100	–	μV/V
Power Supply Current	I_{CC}, I_{EE}	–	9.2	12.5	–	9.2	12.5	mAdc
DC Quiescent Power Consumption (V_O = 0)	P_C	–	110	150	–	110	150	mW

ELECTRICAL CHARACTERISTICS (V_{CC} = +6.0 Vdc, V_{EE} = -6.0 Vdc, T_A = +25°C unless otherwise noted)

Characteristic	Symbol	MC1531 Min	MC1531 Typ	MC1531 Max	MC1431 Min	MC1431 Typ	MC1431 Max	Unit
Input Bias Current	I_{IB}	–	0.025	0.150	–	0.1	0.3	μAdc
Input Offset Current	I_{IO}	–	0.003	0.025	–	0.01	0.1	μAdc
Input Offset Voltage T_A = +25°C	V_{io}	–	3.0	10	–	5.0	15	mVdc
T_A = T_{low} ①		–	–	18	–	–	–	
T_A = T_{high} ①		–	–	16.5	–	–	–	
Single-Ended Input Impedance (Open-Loop, f = 30 Hz)	z_{is}	1000	2000	–	300	600	–	k Ω
Common-Mode Input Voltage Swing	V_{ICR}	± 2.0	± 2.4	–	± 2.0	± 2.2	–	V_{pk}
Equivalent Input Noise Voltage (Open-Loop, R_s = 50 ohms, BW = 5.0 MHz)	e_N	–	20	–	–	20	–	μV(rms)
Common-Mode Rejection Ratio (f = 100 Hz)	CMRR	65	65	–	60	75	–	dB
Open-Loop Voltage Gain T_A = +25°C	A_{vol}	–	–	–	1500	3500	–	V/V
T_A = T_{low} to T_{high}		2500	3500	7000	–	–	–	
Bandwidth (Open-Loop, -3.0 dB, no roll-off capacitance)	BW	–	0.4	–	–	0.4	–	MHz
Output Impedance (f = 30 Hz)	z_O	–	25	50	–	25	50	ohms
Output Voltage Swing (R_L = 1.0 k ohms)	V_O	± 4.5	± 5.2	–	± 4.0	± 5.0	–	V_{pk}
Power Supply Sensitivity ($R_S \leq$ 10 k Ω)	PSRR	–	100	–	–	100	–	μV/V
Power Supply Current	I_{CC}, I_{EE}	–	9.2	12.5	–	9.2	12.5	mAdc
DC Quiescent Power Consumption (V_O = 0)	P_C	–	110	150	–	110	150	mW



STEP RESPONSE, TYPICAL CHARACTERISTICS
(V_{CC} = +6.0 Vdc, V_{EE} = -6.0 Vdc, V_O = 400 mVdc, T_A = +25°C)

Step Response	Symbol	MC1530 MC1430	MC1531 MC1431	
Gain = 100, 0% overshoot,	t_{THL}	0.13	0.36	μs
R_1 = 1.0 k ohm, R_2 = 100 k ohms,	t_{PHL}	0.11	0.21	μs
R_3 = 1.0 k ohm, C_1 = 750 pF	SR	33	16	V/μs
Gain = 10, 10% overshoot,	t_{THL}	0.34	0.30	μs
R_1 = 10 k ohms, R_2 = 100 k ohms,	t_{PHL}	0.25	0.28	μs
R_3 = 10 k ohms, C_1 = 6800 pF	SR	6.0	5.5	V/μs
Gain = 1.0, 5.0% overshoot,	t_{THL}	0.28	0.37	μs
R_1 = 10 k ohms, R_2 = 10 k ohms,	t_{PHL}	0.16	0.17	μs
R_3 = 5.0 k ohms, C_1 = 33,000 pF	SR	1.7	1.4	V/μs

① T_{low}: 0°C for MC1430, -55°C for MC1530; T_{high}: +75°C for MC1430, +125°C for MC1530
T_{low}: 0°C for MC1431, -55°C for MC1531; T_{high}: +75°C for MC1431, +125°C MC1531

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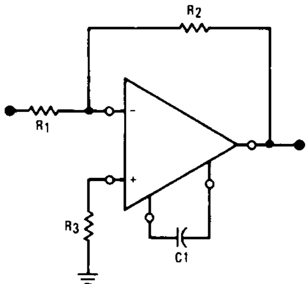
FIGURE 3 – TEST CIRCUIT



TYPICAL OUTPUT CHARACTERISTICS

(V_{CC} = +6.0 Vdc, V_{EE} = -6.0 Vdc, T_A = +25°C)

FIG. NO.	CURVE NO.	VOLTAGE GAIN	DEVICE NO.	TEST CONDITIONS			
				R_1 (kΩ)	R_2 (kΩ)	R_3 (Ω)	C_1 (pF)
5	1,2	100	MC1530/MC1430, MC1531/MC1431	1.0	100	1.0 k	750
	3	10	MC1530/MC1430, MC1531/MC1431	10	100	10 k	6800
	4	1	MC1530/MC1430, MC1531/MC1431	10	10	5.0 k	33,000
6	1	100	MC1530/MC1430	1.0	100	1.0 k	750
	2	10	MC1530/MC1430	10	100	10 k	6800
	3	10	MC1530/MC1430	1.0	10	1.0 k	6800
	4	1	MC1530/MC1430	10	10	5.0 k	33,000
	5	1	MC1530/MC1430	1.0	1.0	500	33,000
7	1	100	MC1531/MC1431	1.0	100	1.0 k	750
	2	10	MC1531/MC1431	10	100	10 k	6800
	3	1	MC1531/MC1431	10	10	5.0 k	33,000
8	1	A_{VOL}	MC1530/MC1430	0	-	0	0
	2	A_{VOL}	MC1530/MC1430	0	-	0	750
	3	A_{VOL}	MC1530/MC1430	0	-	0	6800
	4	A_{VOL}	MC1530/MC1430	0	-	0	33,000
9	1	A_{VOL}	MC1531/MC1431	0	-	0	0
	2	A_{VOL}	MC1531/MC1431	0	-	0	750
	3	A_{VOL}	MC1531/MC1431	0	-	0	6800
	4	A_{VOL}	MC1531/MC1431	0	-	0	33,000

FIGURE 4 – LARGE SIGNAL SWING versus FREQUENCY

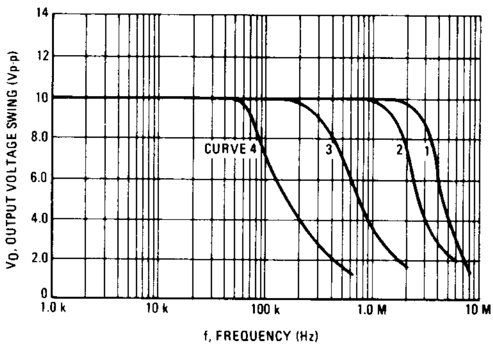


FIGURE 5 – MC1530/MC1430 VOLTAGE GAIN versus FREQUENCY

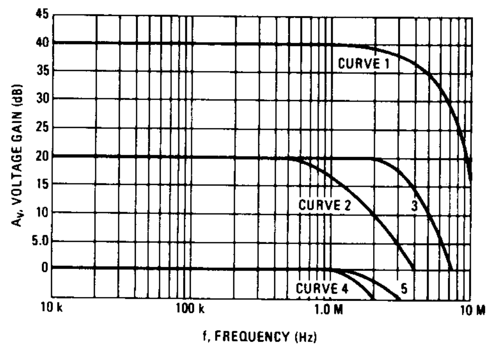


FIGURE 6 – MC1531/MC1431 VOLTAGE GAIN versus FREQUENCY

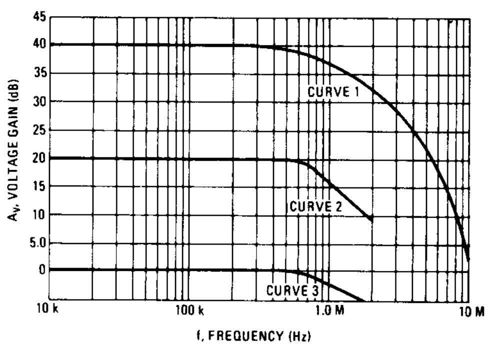


FIGURE 7 – MC1530/MC1430 OPEN LOOP VOLTAGE GAIN versus FREQUENCY

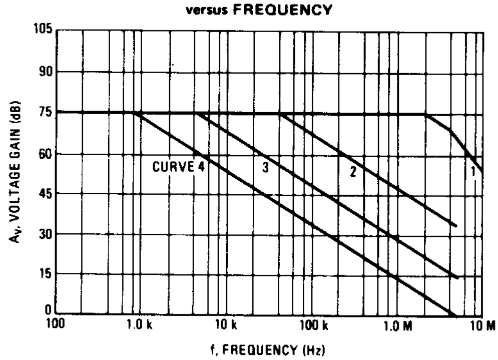


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FIGURE 8 – MC1531/MC1431 OPEN LOOP VOLTAGE GAIN versus FREQUENCY

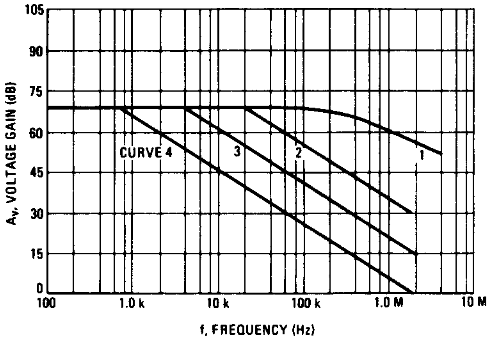

FIGURE 11 – COMMON-MODE SWING versus POWER SUPPLY VOLTAGE

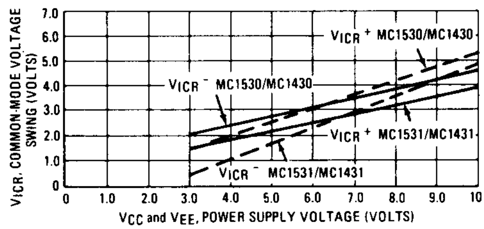

FIGURE 9 – VOLTAGE GAIN versus POWER SUPPLY VOLTAGE

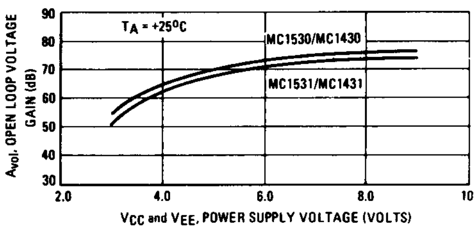

FIGURE 12 – POWER CONSUMPTION versus POWER SUPPLY VOLTAGE

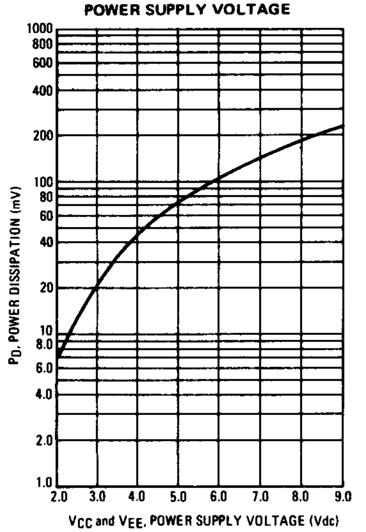

FIGURE 10 – OUTPUT VOLTAGE SWING versus LOAD RESISTANCE