MC1556G
MC1456G
MC1456CG

OPERATIONAL AMPLIFIERS

INTERNALLY COMPENSATED, HIGH PERFORMANCE MONOLITHIC OPERATIONAL AMPLIFIER

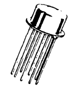
. . . designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components. For detailed information, see Application Note AN-522.

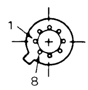
- Low Input Bias Current — 15 nA max
- Low Input Offset Current — 2.0 nA max
- Low Input Offset Voltage — 4.0 mV max
- Fast Slew Rate — 2.5 V/μs typ
- Large Power Bandwidth — 40 kHz typ
- Low Power Consumption — 45 mW max
- Offset Voltage Null Capability
- Output Short-Circuit Protection
- Input Over-Voltage Protection

OPERATIONAL AMPLIFIER INTEGRATED CIRCUIT

EPITAXIAL PASSIVATED

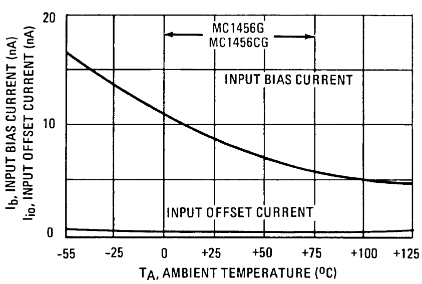
CASE 601
TO-99





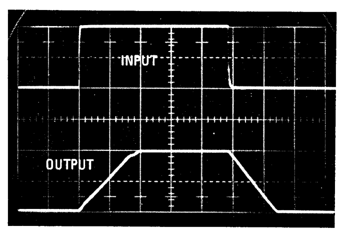
(bottom view)

TYPICAL INPUT BIAS CURRENT AND INPUT OFFSET CURRENT versus TEMPERATURE for MC1556G



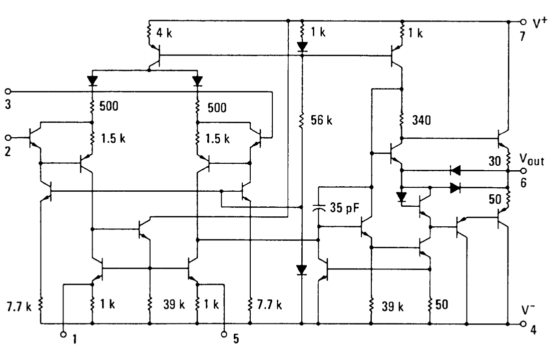
VOLTAGE-FOLLOWER PULSE RESPONSE

5 VOLTS/DIVISION

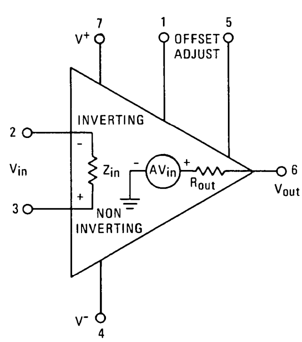


2 μs/DIVISION

CIRCUIT SCHEMATIC



EQUIVALENT CIRCUIT



See Packaging Information Section for outline dimensions.

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

Rating	Symbol	MC1556G	MC1456G MC1456CG	Unit
Power Supply Voltage	V^+	+22	+18	Vdc
	V^-	-22	-18	
Differential Input Signal	V_{in}	$\pm V^+$		Volts
Common-Mode Input Swing	CMV_{in}	$\pm V^+$		Volts
Load Current	I_L	20		mA
Output Short Circuit Duration	t_S	Continuous		
Power Dissipation (Package Limitation)	P_D	680		mW
Derate above T_A = +25°C		4.6		mW/°C
Operating Temperature Range	T_A	-55 to +125	0 to +75	°C
Storage Temperature Range	T_{stg}	-65 to +150	-65 to +150	°C

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

			MC1556G			MC1456G			MC1456CG			
Characteristic	**Fig.**	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
Input Bias Current		I_b										nAdc
T_A = +25°C			–	8.0	15	–	15	30	–	15	90	
$T_A = T_{low}$ to T_{high} (See Note 1)			–	–	30	–	–	40	–	–	–	
Input Offset Current		$\|I_{io}\|$										nAdc
T_A = +25°C			–	1.0	2.0	–	5.0	10	–	5.0	30	
T_A = +25°C to T_{high}			–	–	3.0	–	–	14	–	–	–	
$T_A = T_{low}$ to +25°C			–	–	5.0	–	–	14	–	–	–	
Input Offset Voltage		$\|V_{io}\|$										mVdc
T_A = +25°C			–	2.0	4.0	–	5.0	10	–	5.0	12	
$T_A = T_{low}$ to T_{high}			–	–	6.0	–	–	14	–	–	–	
Differential Input Impedance (Open-Loop, f = 20 Hz)												
Parallel Input Resistance		R_p	–	5.0	–	–	3.0	–	–	3.0	–	Megohms
Parallel Input Capacitance		C_p	–	6.0	–	–	6.0	–	–	6.0	–	pF
Common-Mode Input Impedance (f = 20 Hz)		Z_{in}	–	250	–	–	250		–	250	–	Megohms
Common-Mode Input Voltage Swing	1	CMV_{in}	±12	±13	–	±11	±12	–	±10.5	±12	–	V_{pk}
Equivalent Input Noise Voltage (A_V = 100, R_s = 10 k ohms, f = 1.0 kHz, BW = 1.0 Hz)	2	e_n	–	45			45	–	–	45	–	nV/(Hz)½
Common-Mode Rejection Ratio (f = 100 Hz)	3	CM_{rej}	80	110	–	70	110	–	–	110	–	dB
Open-Loop Voltage Gain, (V_{out} = ±10 V, R_L = 2.0 k ohms)	4,5,6	A_{VOL}										V/V
T_A = +25°C			100,000	200,000	–	70,000	100,000	–	25,000	100,000	–	
$T_A = T_{low}$ to T_{high}			40,000	–	–	40,000	–	–	–	–	–	
Power Bandwidth (A_V = 1, R_L = 2.0 k ohms, THD≤5%, V_{out} = 20 Vp-p)	9	P_{BW}	–	40	–	–	40	–		40	–	kHz
Unity Gain Crossover Frequency (open-loop)	5	f_c	–	1.0	–	–	1.0	–	–	1.0	–	MHz
Phase Margin (open-loop, unity gain)	5,7		–	70	–	–	70	–	–	70	–	degrees
Gain Margin	5,7		–	18	–	–	18	–	–	18	–	dB
Slew Rate (Unity Gain)		dV_{out}/dt	–	2.5	–	–	2.5	–	–	2.5	–	V/µs
Output Impedance (f = 20 Hz)		Z_{out}	–	1.0	2.0	–	1.0	2.5	–	1.0	–	kohms
Short-Circuit Output Current	8	I_{SC}	–	-17, +9.0	–	–	-17, +9.0	–	–	-17, +9.0	–	mAdc
Output Voltage Swing (R_L = 2.0 k ohms)	10	V_{out}	±12	±13	–	±11	±12	–	±10	±12	–	V_{pk}
Power Supply Sensitivity												µV/V
V^- = constant, $R_s \le$ 10 k ohms		S+		50	100	–	75	200	–	75	–	
V^+ = constant, $R_s \le$ 10 k ohms		S–		50	100	–	75	200	–	75	–	
Power Supply Current		I_D+	–	1.0	1.5	–	1.3	3.0	–	1.3	4.0	mAdc
		I_D-	–	1.0	1.5	–	1.3	3.0	–	1.3	4.0	
DC Quiescent Power Dissipation (V_{out} = 0)	11	P_D	–	30	45	–	40	90	–	40	120	mW

Note 1: T_{low}: 0° for MC1456G and MC1456CG
-55°C for MC1556G

T_{high}: +75°C for MC1456G and MC1456CG
+125°C for MC1556G

TYPICAL CHARACTERISTICS

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

FIGURE 1 – INPUT COMMON-MODE SWING versus POWER SUPPLY VOLTAGE

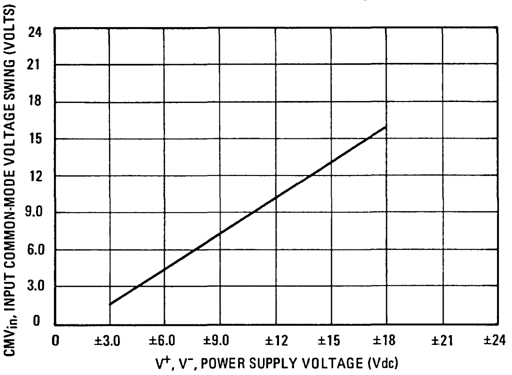


FIGURE 2 – SPECTRAL NOISE DENSITY

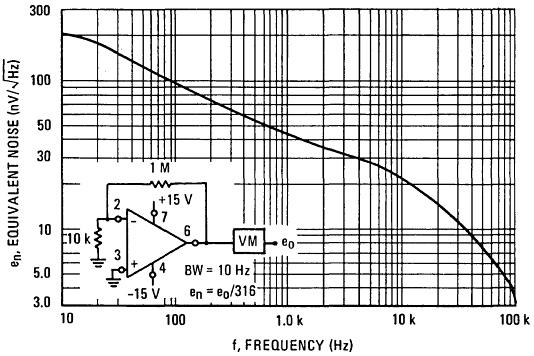


FIGURE 3 – COMMON-MODE REJECTION RATIO versus FREQUENCY

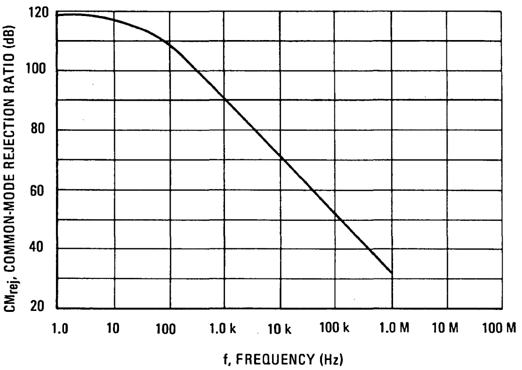


FIGURE 4 – OPEN-LOOP VOLTAGE GAIN versus TEMPERATURE

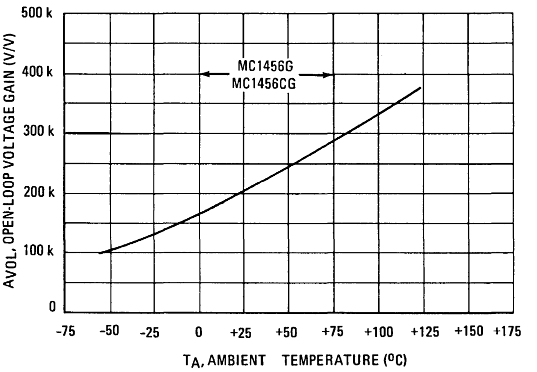


FIGURE 5 – OPEN-LOOP FREQUENCY RESPONSE

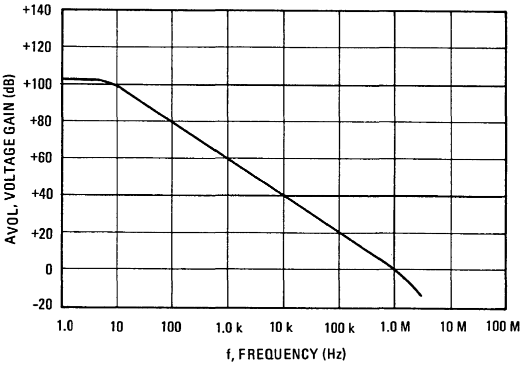
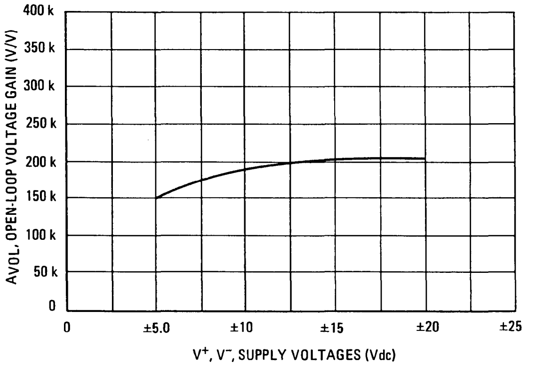


FIGURE 6 – OPEN-LOOP VOLTAGE GAIN versus SUPPLY VOLTAGES



TYPICAL CHARACTERISTICS (continued)

FIGURE 7 – OPEN-LOOP PHASE SHIFT

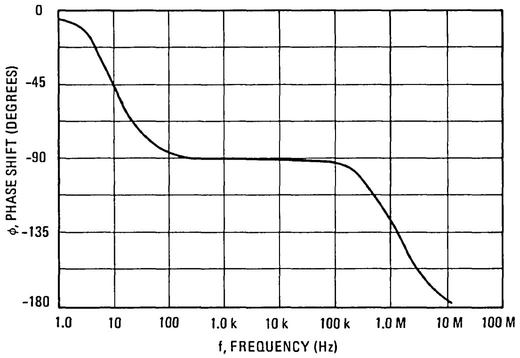


FIGURE 8 – OUTPUT SHORT-CIRCUIT CURRENT versus TEMPERATURE

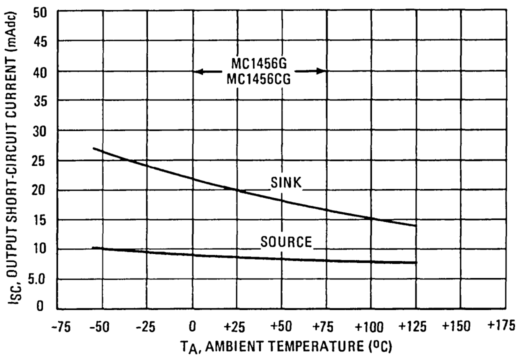


FIGURE 9 – POWER BANDWIDTH

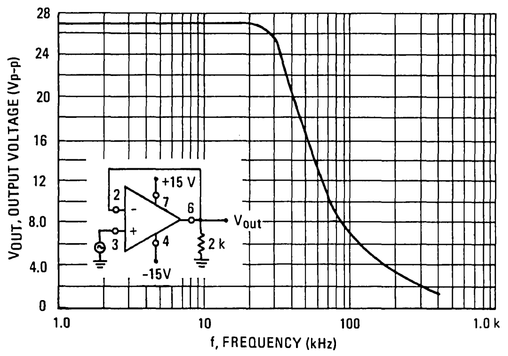


FIGURE 10 – OUTPUT VOLTAGE SWING versus LOAD RESISTANCE

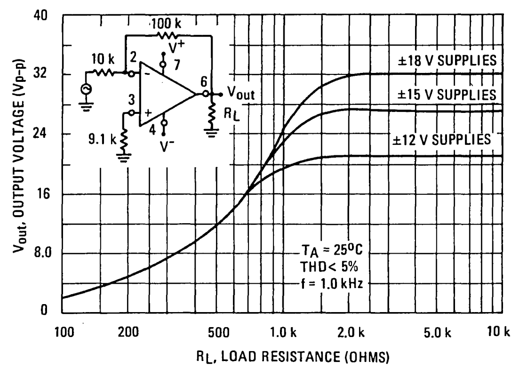
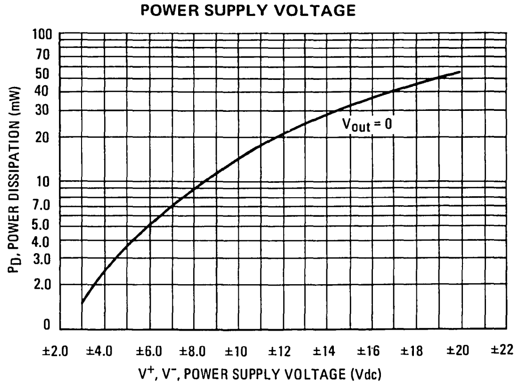


FIGURE 11 – POWER DISSIPATION versus POWER SUPPLY VOLTAGE



TYPICAL APPLICATIONS

Where values are not given for external components they must be selected by the designer to fit the requirements of the system.

FIGURE 12 – INVERTING FEEDBACK MODEL

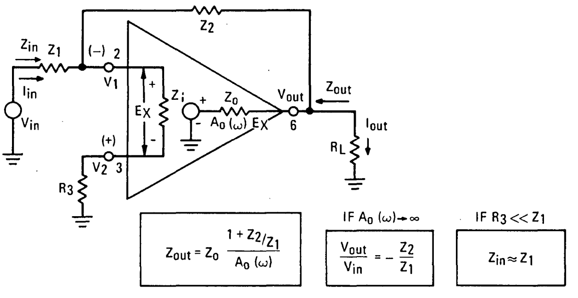


FIGURE 13 – NON-INVERTING FEEDBACK MODEL

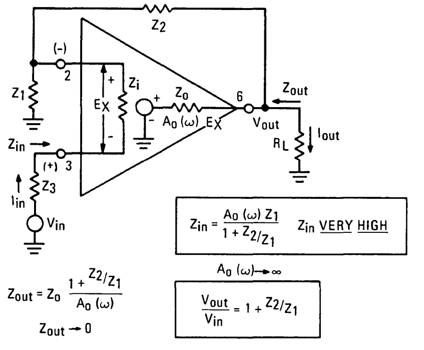


FIGURE 14 – LOW-DRIFT SAMPLE AND HOLD

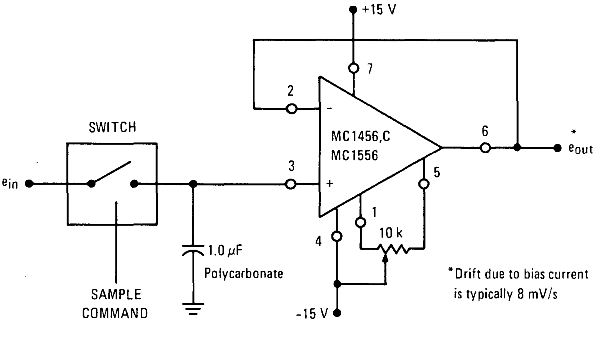
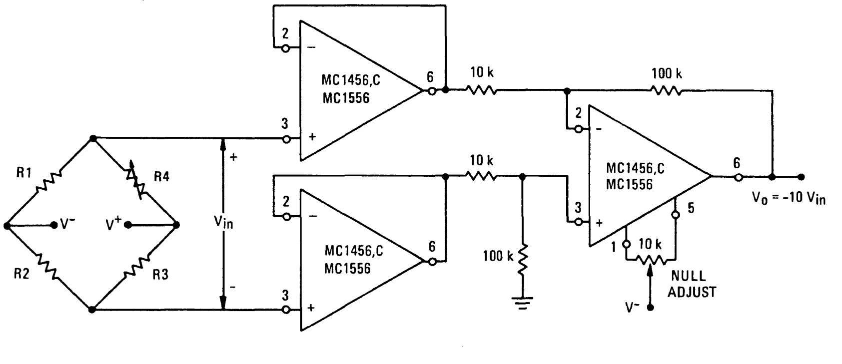
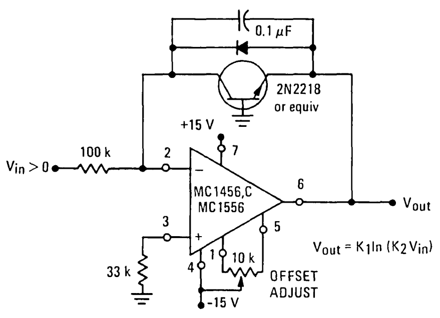


FIGURE 15 – HIGH IMPEDANCE BRIDGE AMPLIFIER



TYPICAL APPLICATIONS (continued)

FIGURE 16 – LOGARITHMIC AMPLIFIER



See Application Note AN-261 for further detail.

FIGURE 17 – VOLTAGE OFFSET NULL CIRCUIT

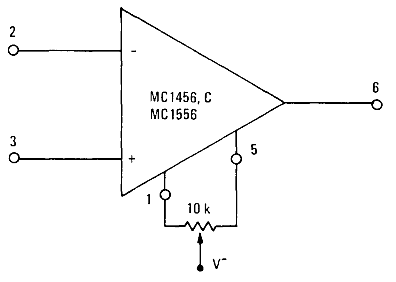


FIGURE 18 – HIGH INPUT IMPEDANCE, HIGH OUTPUT CURRENT VOLTAGE FOLLOWER