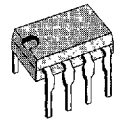
SGS-THOMSON MICROELECTRONICS

MC33002/A/B
MC34002/A/B
MC35002/A/B

GENERAL PURPOSE DUAL JFET OPERATIONAL AMPLIFIERS

- LOW POWER CONSUMPTION
- WIDE COMMON-MODE (UP TO V_{CC}^+) AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 16V/µs (typ)



N
DIP8
(Plastic Package)

D
SO8
(Plastic Micropackage)

H
TO99
(Metal Can)

DESCRIPTION

These circuits are high speed J-FET input dual operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.

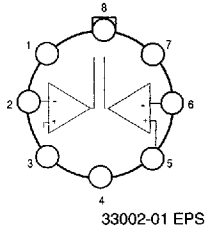
ORDER CODES

Part Number	Temperature	Package		
		H	N	D
MC34002/A/B	0°C, +70°C	•	•	•
MC33002/A/B	–40°C, +105°C	•	•	•
MC35002/A/B	–55°C, +125°C	•	•	•

33002-01 TBL

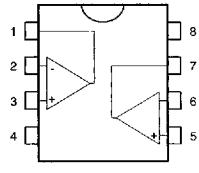
PIN CONNECTIONS (top views)

TO99



33002-01 EPS

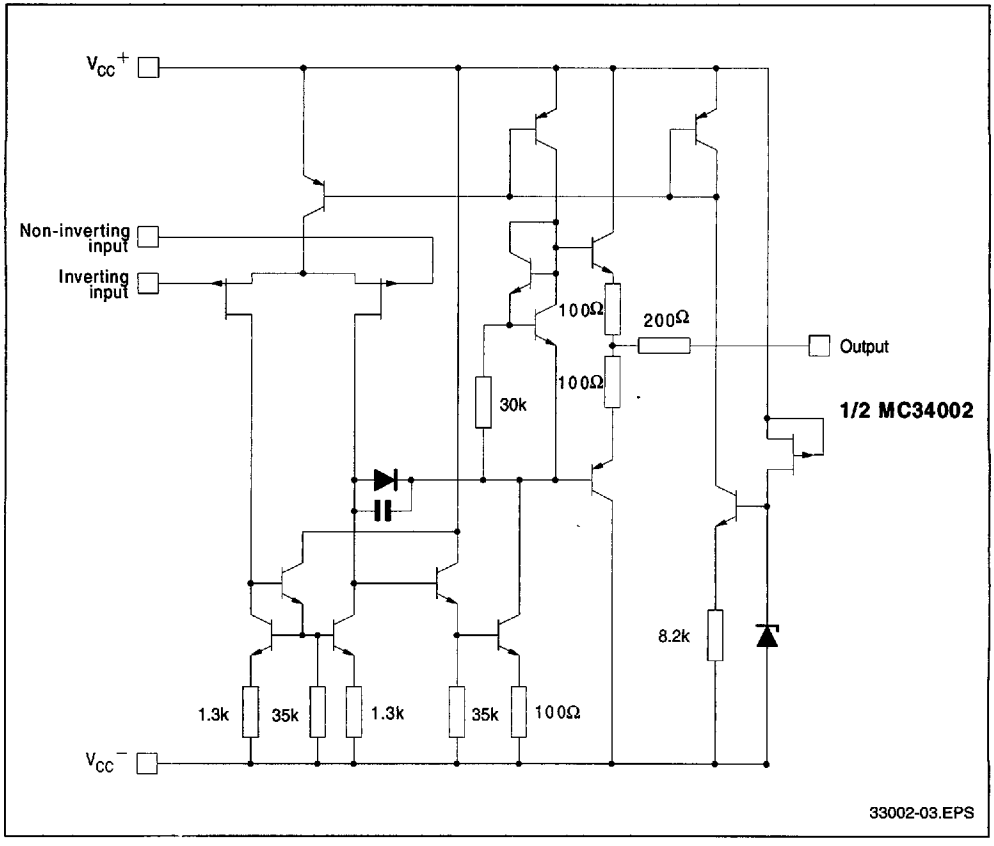
DIP8/SO8



33002-02.EPS

1 - Output 1
2 - Inverting input 1
3 - Non-inverting input 1
4 - V_{CC}^-
5 - Non-inverting input 2
6 - Inverting input 2
7 - Output 2
8 - V_{CC}^+

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage - (note 1)		±18	V
V_I	Input Voltage - (note 3)		±15	V
V_{id}	Differential Input Voltage - (note 2)		±30	V
P_{tot}	Power Dissipation		680	mW
	Output Short-circuit Duration (note 4)		Infinite	
T_{oper}	Operating Free Air Temperature Range	MC34002, A, B MC33002, A, B MC35002, A, B	0 to 70 –40 to 105 –55 to 125	°C
T_{stg}	Storage Temperature Range		–65 to 150	°C

33002-02.TBL

Notes : 1 All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^+ and V_{CC}^-.
2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
3 The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. The output may be shorted to ground or to either supply. Temperature and /or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

ELECTRICAL CHARACTERISTICS

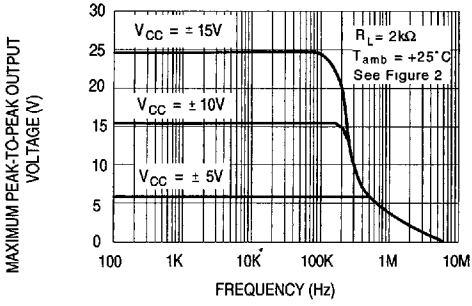
V_{CC} = ±15V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	MC35002A,B MC33002A,B MC34002A,B			MC35002 MC33002 MC34002			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage (R_S ≤10kΩ) T_{amb} = 25°C MC35002B, MC34002B, MC33002B MC35002A, MC34002A, MC33002A T_{min} ≤ T_{amb} ≤ T_{max} MC35002B, MC34002B, MC33002B MC35002A, MC34002A, MC33002A		 3 1 	 5 2 7 4		 3 	 10 13 	mV
DV_{io}	Input Offset Voltage Drift		10			10		µV/°C
I_{io}	Input Offset Current * T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}		5	50 4		5	100 4	pA nA
I_{ib}	Input Bias Current * T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}.		20	200 20		20	200 20	pA nA
A_{vd}	Large Signal Voltage Gain (R_L = 2kΩ, V_O = ±10V) T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}.	50 25	200		25 15	200		V/mV
SVR	Supply Voltage Rejection Ratio (R_S ≤ 10kΩ) T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}	80 80	86		70 70	86		dB
I_{CC}	Supply Current, per Amp, no Load T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}		1.4	2.5 2.8		1.4	2.5 2.8	mA
V_{icm}	Input Common Mode Voltage Range	±11	+15 -12		±11	+15 -12		V
CMR	Common Mode Rejection Ratio (R_S ≤ 10kΩ) T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}	80 80	86		70 70	86		dB
Ios	Output Short-circuit Current T_{amb} = 25°C T_{min} ≤ T_{amb} ≤ T_{max}	10 10	40	60 60	10 10	40	60 60	mA
$\pm V_{OPP}$	Output Voltage Swing T_{amb} = 25°C R_L = 2kΩ R_L = 10kΩ T_{min} ≤ T_{amb} ≤ T_{max} R_L = 2kΩ R_L = 10kΩ	 10 12 10 12	 12 13.5 	 	 10 12 10 12	 12 13.5 	 	V
SR	Slew Rate (V_{in} = 10V, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain)	12	16		12	16		V/µs
t_r	Rise Time (V_{in} = 20mV, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain)		0.1			0.1		µs
K_{OV}	Overshoot (V_{in} = 20mV, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain)		10			10		%
GBP	Gain Bandwidth Product (f = 100kHz, T_{amb} = 25°C, V_{in} = 10mV, R_L = 2kΩ, C_L = 100pF)	2.5	4		2.5	4		MHz
R_i	Input Resistance		10^{12}			10^{12}		Ω
THD	Total Harmonic Distortion (f = 1kHz, A_V = 20dB, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, V_O = $2V_{PP}$)		0.01			0.01		%
e_n	Equivalent Input Noise Voltage (f = 1kHz, R_s = 100Ω)		15			15		$\frac{nV}{\sqrt{Hz}}$
Øm	Phase Margin		45			45		Degrees
V_{O1}/V_{O2}	Channel Separation (A_{vd} = 100)		120			120		dB

* The input bias currents are junction leakage currents which approximately double for every 10°C increase in the junction temperature

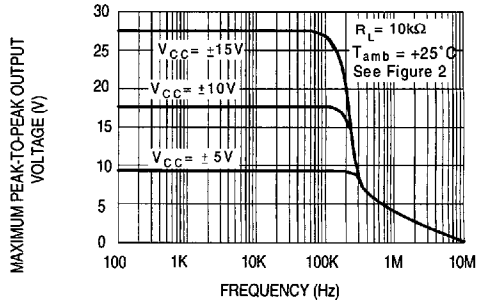
33002-03.TBL

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



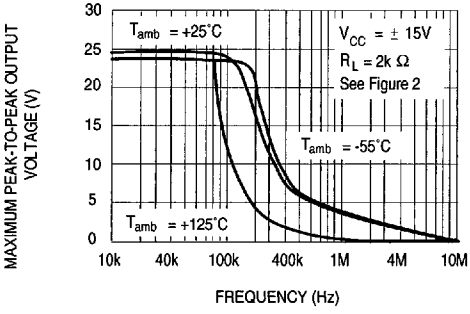
33002-04.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



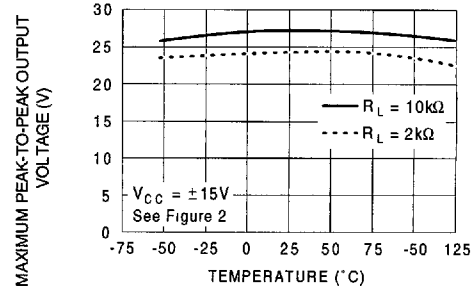
33002-05.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



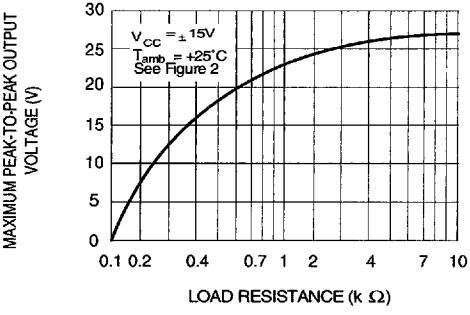
33002-06.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREE AIR TEMP.



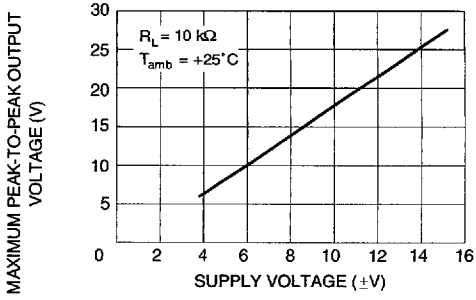
33002-07.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



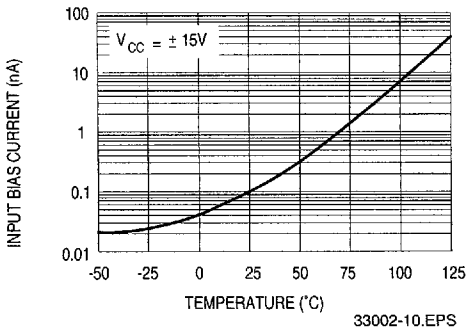
33002-08.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



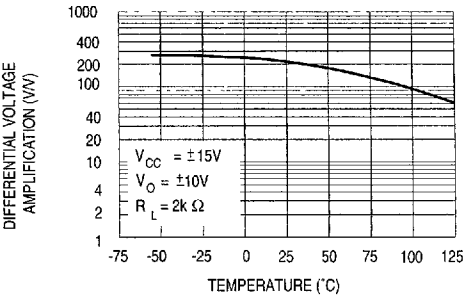
33002-09.EPS

INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE



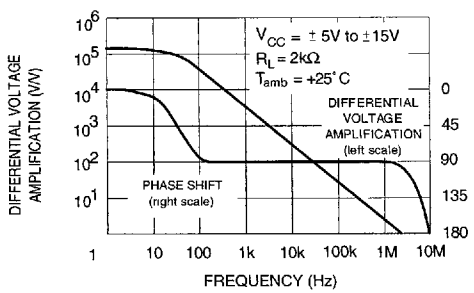
33002-10.EPS

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE



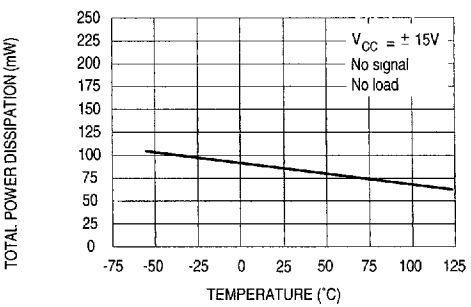
33002-11 EPS

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



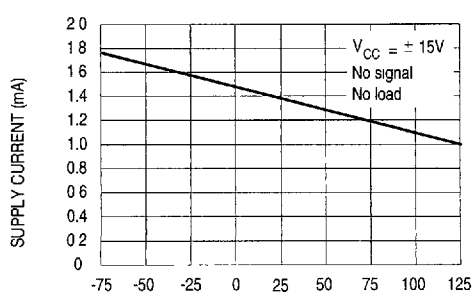
33002-12 EPS

TOTAL POWER DISSIPATION VERSUS FREE AIR TEMPERATURE



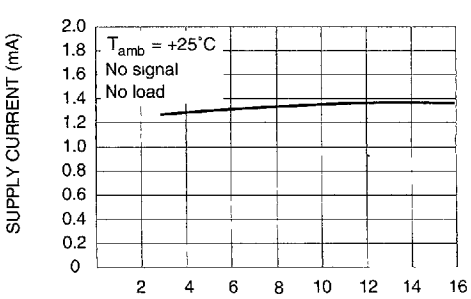
33002-13.EPS

SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE



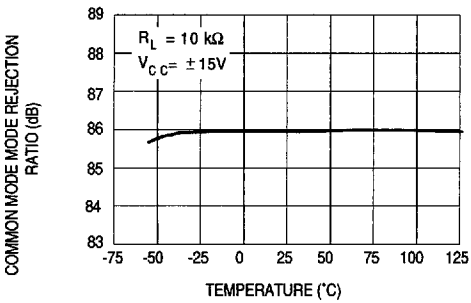
33002-14 EPS

SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



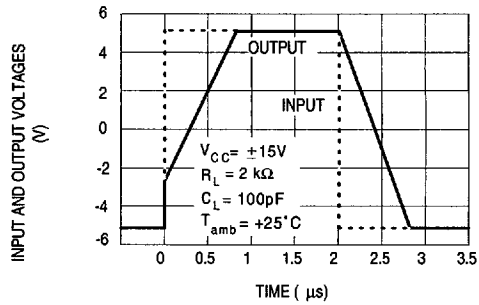
33002-15 EPS

COMMON MODE REJECTION RATIO VERSUS FREE AIR TEMPERATURE



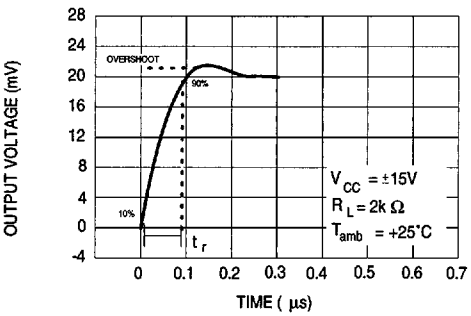
33002-16.EPS

VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



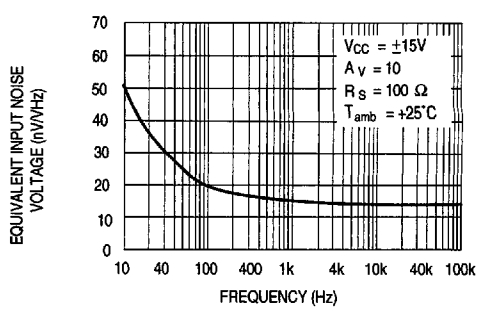
33002-17.EPS

OUTPUT VOLTAGE VERSUS ELAPSED TIME



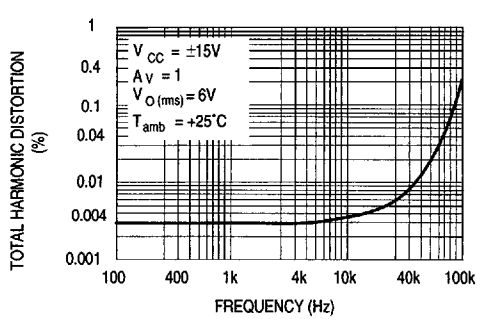
33002-18.EPS

EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



33002-19.EPS

TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



33002-20.EPS

PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

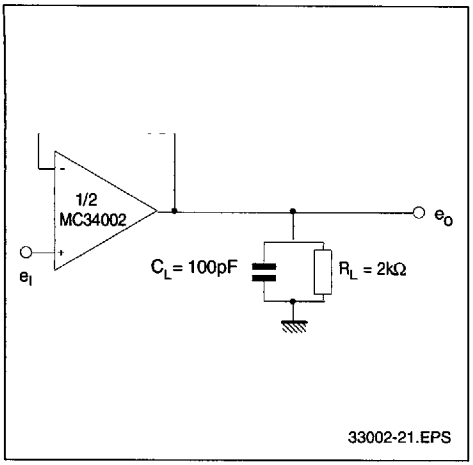
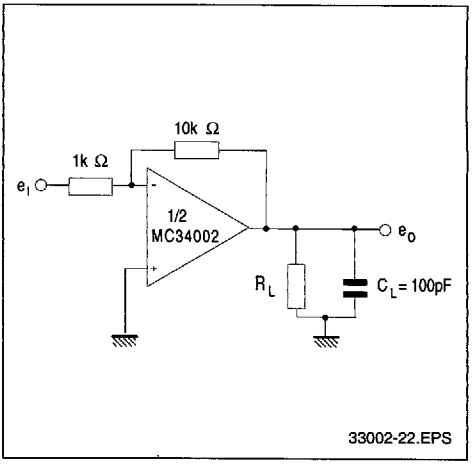


Figure 2 : Gain-of-10 Inverting Amplifier



TYPICAL APPLICATION

100KHz QUADRUPLE OSCILLATOR