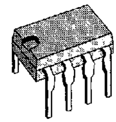
SGS-THOMSON MICROELECTRONICS

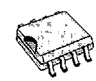
MC33001/A/B
MC34001/A/B
MC35001/A/B

GENERAL PURPOSE SINGLE JFET OPERATIONAL AMPLIFIERS

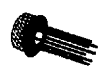
- LOW POWER CONSUMPTION
- WIDE COMMON-MODE (UP TO V_{CC}^+) AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J–FET INPUT STAGE
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 16V/µs (typ)



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)



H
TO99
(Metal Can)

DESCRIPTION

These circuits are high speed J–FET input single 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.

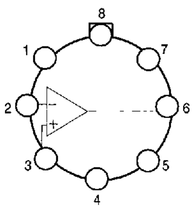
ORDER CODES

Part Number	Temperature	Package		
		H	N	D
MC34001/A/B	0°C, +70°C	•	•	•
MC33001/A/B	–40°C, +105°C	•	•	•
MC35001/A/B	–55°C, +125°C	•	•	•

33001-01 TBL

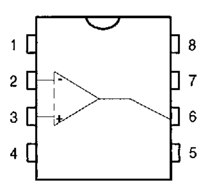
PIN CONNECTIONS (top views)

TO99



33001-01.EPS

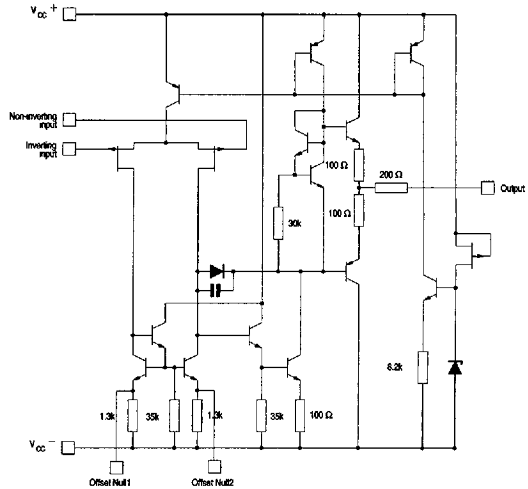
DIP8/SO8



33001-02.EPS

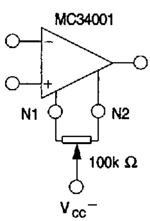
1 - Input Offset Null 1
2 - Inverting input
3 - Non-inverting input
4 - V_{CC}^-
5 - Input Offset Null 2
6 - Output
7 - V_{CC}^+
8 - N.C.

SCHEMATIC DIAGRAM



33001-03.EPS

INPUT OFFSET VOLTAGE NULL CIRCUITS



33001-04.EPS

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 MC34001, A, B MC33001, A, B MC35001, A, B	0 to 70 –40 to 105 –55 to 125	°C
T_{stg}	Storage Temperature Range	–65 to 150	°C

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

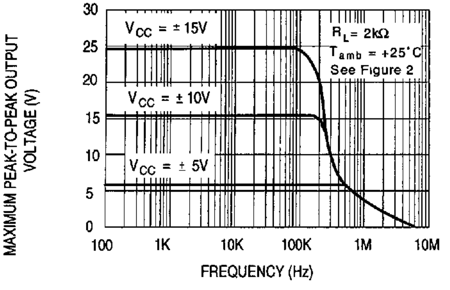
$V_{CC} = \pm15V$, $T_{amb} = 25°C$ (unless otherwise specified)

Symbol	Parameter	MC35001A,B MC33001A,B MC34001A,B			MC35001 MC33001 MC34001			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S \le 10k\Omega$)							mV
	$T_{amb} = 25°C$					3	10	
	MC35001B, MC34001B, MC33001B		3	5				
	MC35001A, MC34001A, MC33001A		0.4	2				
	$T_{min} \le T_{amb} \le T_{max}$						13	
	MC35001B, MC34001B, MC33001B			7				
	MC35001A, MC34001A, MC33001A			4				
DV_{io}	Input Offset Voltage Drift		10			10		µV/°C
I_{io}	Input Offset Current *							
	$T_{amb} = 25°C$		5	100		5	100	pA
	$T_{min} \le T_{amb} \le T_{max}$			4			4	nA
I_{ib}	Input Bias Current *							
	$T_{amb} = 25°C$		20	200		20	200	pA
	$T_{min} \le T_{amb} \le T_{max}$			20			20	nA
A_{vd}	Large Signal Voltage Gain ($R_L = 2k\Omega$, $V_O = \pm10V$)							V/mV
	$T_{amb} = 25°C$	50	200		25	200		
	$T_{min} \le T_{amb} \le T_{max}$	25			15			
SVR	Supply Voltage Rejection Ratio ($R_S \le 10k\Omega$)							dB
	$T_{amb} = 25°C$	80	86		70	86		
	$T_{min} \le T_{amb} \le T_{max}$	80			70			
I_{CC}	Supply Current, no Load							mA
	$T_{amb} = 25°C$		1.4	2.5		1.4	2.5	
	$T_{min} \le T_{amb} \le T_{max}$			2.8			2.8	
V_{icm}	Input Common Mode Voltage Range	±11	+15 -12		±11	+15 -12		V
CMR	Common Mode Rejection Ratio ($R_S \le 10k\Omega$)							dB
	$T_{amb} = 25°C$	80	86		70	86		
	$T_{min} \le T_{amb} \le T_{max}$	80			70			
Ios	Output Short-circuit Current							mA
	$T_{amb} = 25°C$	10	40	60	10	40	60	
	$T_{min} \le T_{amb} \le T_{max}$	10		60	10		60	
$\pm V_{OPP}$	Output Voltage Swing							V
	$T_{amb} = 25°C$ $R_L = 2k\Omega$	10	12		10	12		
	$R_L = 10k\Omega$	12	13.5		12	13.5		
	$T_{min} \le T_{amb} \le T_{max}$ $R_L = 2k\Omega$	10			10			
	$R_L = 10k\Omega$	12			12			
SR	Slew Rate ($V_{in} = 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25°C$, unity gain)	12	16		12	16		V/µs
t_r	Rise Time ($V_{in} = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25°C$, unity gain)		0.1			0.1		µs
K_{OV}	Overshoot ($V_{in} = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25°C$, unity gain)		10			10		%
GBP	Gain Bandwidth Product (f = 100kHz, $T_{amb} = 25°C$, $V_{in} = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$)	2.5	4		2.5	4		MHz
R_i	Input Resistance		10^{12}			10^{12}		Ω
THD	Total Harmonic Distortion (f = 1kHz, $A_V = 20dB$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25°C$, $V_O = 2V_{PP}$)		0.01			0.01		%
e_n	Equivalent Input Noise Voltage (f = 1kHz, $R_s = 100\Omega$)		15			15		$\frac{nV}{\sqrt{Hz}}$
Øm	Phase Margin		45			45		Degrees

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

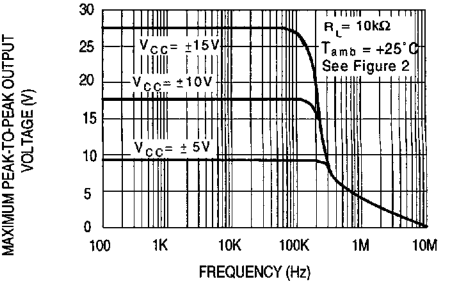
33001-03.TBL

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



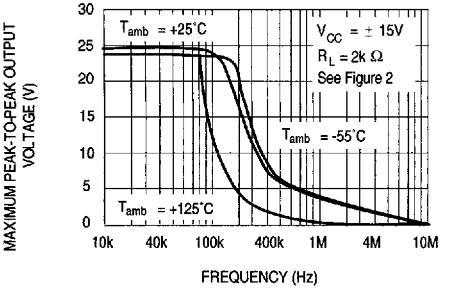
33001-05.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



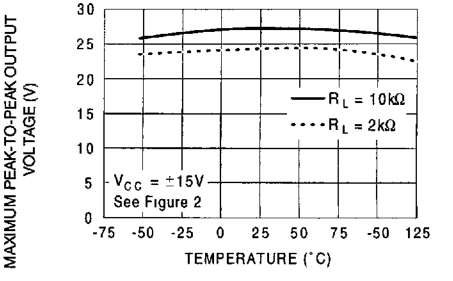
33001-06.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



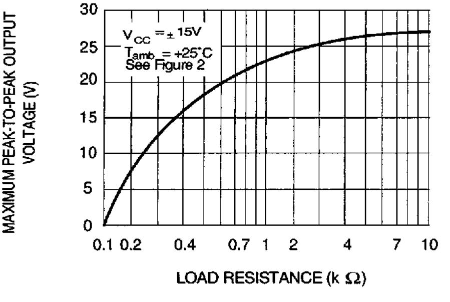
33001-07.EPS

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



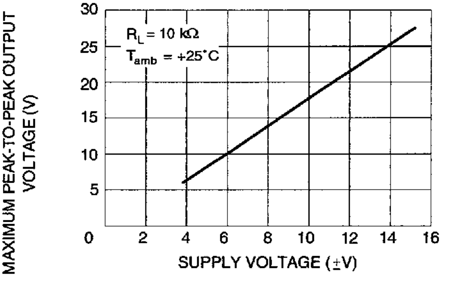
33001-08.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



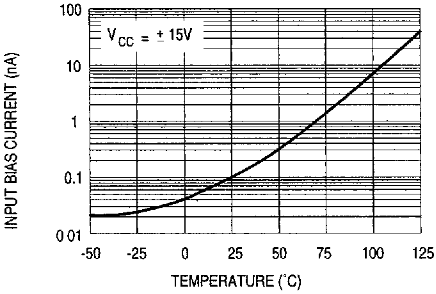
33001-09.EPS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



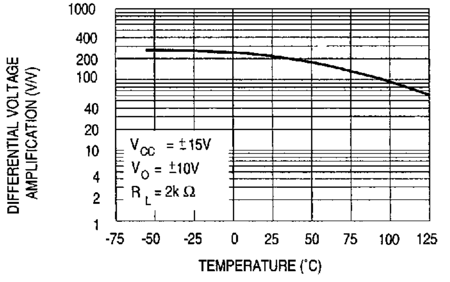
33001-10.EPS

INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE



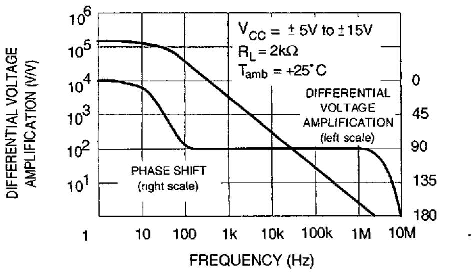
33001-11.EPS

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE



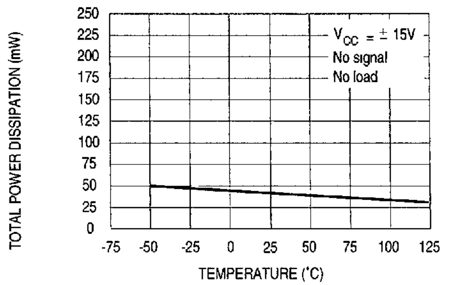
33001-12.EPS

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



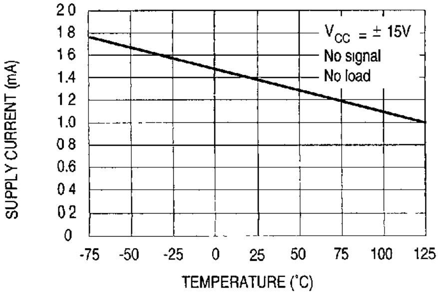
33001-13.EPS

TOTAL POWER DISSIPATION VERSUS FREE AIR TEMPERATURE



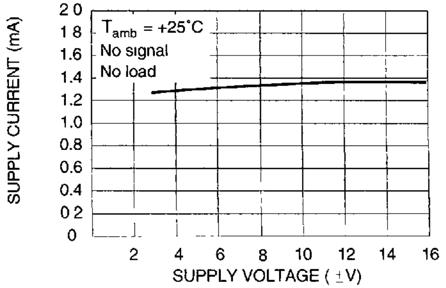
33001-14 EPS

SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE



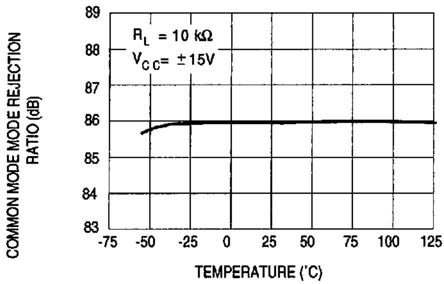
33001-15.EPS

SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



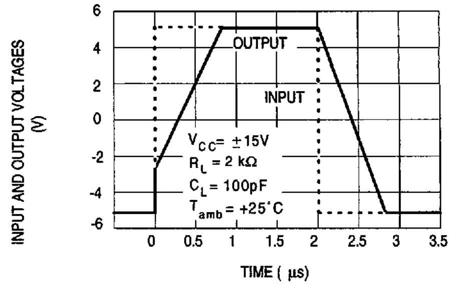
33001-16.EPS

COMMON MODE REJECTION RATIO VERSUS FREE AIR TEMPERATURE



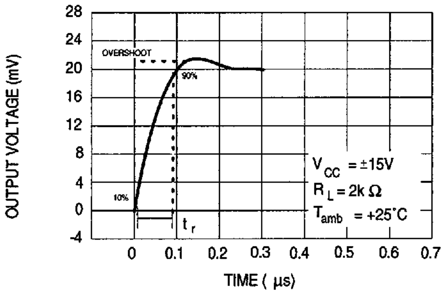
33001-17.EPS

VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



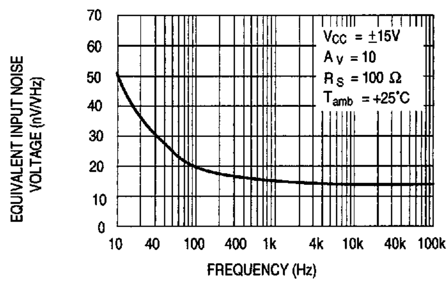
33001-18.EPS

OUTPUT VOLTAGE VERSUS ELAPSED TIME



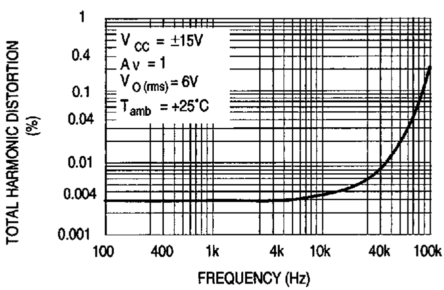
33001-19.EPS

EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



33001-20.EPS

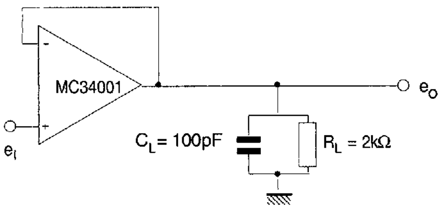
TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



33001-21.EPS

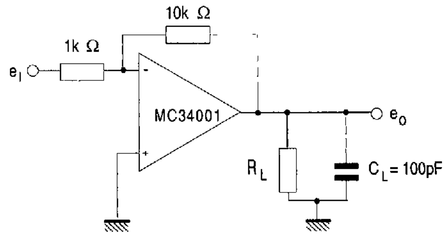
PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower



33001-22 EPS

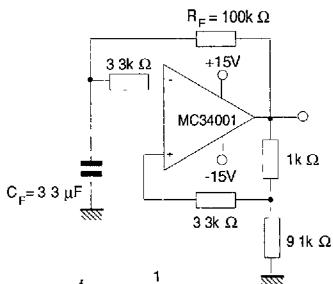
Figure 2 : Gain-of-10 Inverting Amplifier



33001-23.EPS

TYPICAL APPLICATIONS

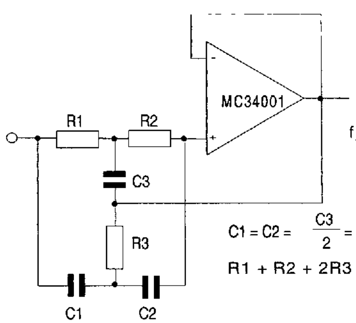
(0.5Hz) SQUARE WAVE OSCILLATOR



$$f_{osc} = \frac{1}{2 \times R_F C_F}$$

33001-24.EPS

HIGH Q NOTCH FILTER



$$f_o = \frac{1}{2 \times R_1 C_1} = 1\text{kHz}$$

$$C1 = C2 = \frac{C3}{2} = 100\text{pF}$$

R1 + R2 + 2R3 + 1.5MΩ

33001-25.EPS