FAIRCHILD
A Schlumberger Company

μA733
Differential Video Amplifier

Linear Division Special Functions

Description

The μA733 is a monolithic two-stage differential input, differential output video amplifier constructed using the Fairchild Planar Epitaxial process. Internal series shunt feedback is used to obtain wide bandwidth, low phase distortion, and excellent gain stability. Emitter follower outputs enable the device to drive capacitive loads and all stages are current source biased to obtain high power supply and common mode rejection ratios. It offers fixed gains of 10, 100 or 400 without external components, and adjustable gains from 10 to 400 by the use of a single external resistor. No external frequency compensation components are required for any gain option. The device is particularly useful in magnetic tape or disc file systems using phase or NRZ encoding and in high speed thin film or plated wire memories. Other applications include general purpose video and pulse amplifiers where wide bandwidth, low phase shift, and excellent gain stability are required.

- **120 MHz Bandwidth Typ**
- **250 kΩ Input Resistance Typ**
- **Selectable Gains Of 10, 100, And 400**
- **No Frequency Compensation Required**

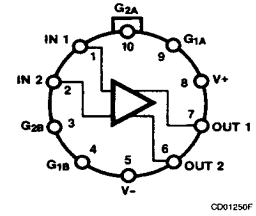
Absolute Maximum Ratings

Storage Temperature Range	
Metal Can and Ceramic DIP	−65°C to +175°C
Molded DIP and SO-14	−65°C to +150°C
Operating Temperature Range	
Extended (μA733M)	−55°C to +125°C
Commercial (μA733C)	0°C to +70°C
Lead Temperature	
Metal Can and Ceramic DIP (soldering, 60 s)	300°C
Molded DIP and SO-14 (soldering, 10 s)	265°C
Internal Power Dissipation[1, 2]	
10L-Metal Can	1.07 W
14L-Ceramic DIP	1.36 W
14L-Molded DIP	1.04 W
SO-14	0.93 W
Supply Voltage	±8.0 V
Differential Input Voltage	±5.0 V
Common Mode Input Voltage	±6.0 V
Output Current	10 mA

Notes

1. $T_{J\ Max}$ = 150°C for the Molded DIP, and 175°C for the Metal Can and Ceramic DIP.
2. Ratings apply to ambient temperature at 25°C. Above this temperature, derate the 10L-Metal Can at 7.1 mW/°C, the 14L-Ceramic DIP at 9.1 mW/°C, the 14L-Molded DIP at 8.3 mW/°C, and the SO-14 at 7.5 mW/°C.

Connection Diagram
10-Lead Metal Package
(Top View)



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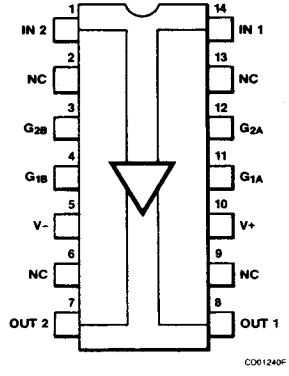
Note
Pin 5 connected to case.

Order Information

Device Code	Package Code	Package Description
μA733HM	5X	Metal
μA733HC	5X	Metal

Connection Diagram
14-Lead DIP and SO-14 Package
(Top View)



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Order Information

Device Code	Package Code	Package Description
μA733DM	6A	Ceramic DIP
μA733DC	6A	Ceramic DIP
μA733PC	9A	Molded DIP
μA733SC	KD	Molded Surface Mount

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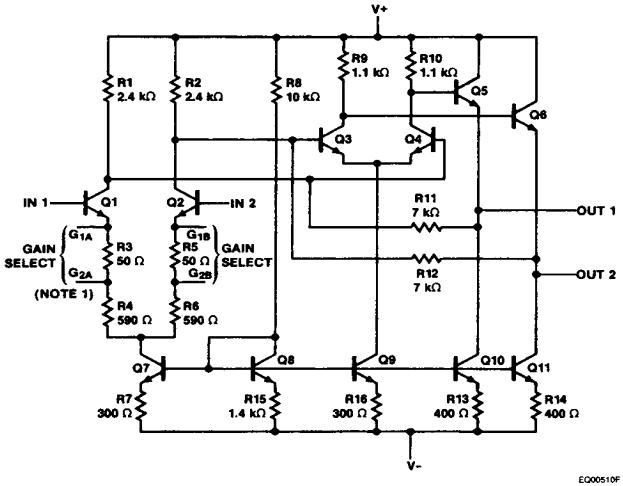
Equivalent Circuit



μA733 and μA733C
Electrical Characteristics $T_A = 25°C$, $V_{CC} = \pm 6.0$ V unless otherwise specified.

Symbol	Characteristic	Condition[1]		μA733 Min	μA733 Typ	μA733 Max	μA733C Min	μA733C Typ	μA733C Max	Unit
A_{VD}	Differential Voltage Gain		Gain 1	300	400	500	250	400	600	V/V
			Gain 2	90	100	110	80	100	120	
			Gain 3	9.0	10	11	8.0	10	12	
BW	Bandwidth	$R_S = 50\ \Omega$	Gain 1		40			40		MHz
			Gain 2		90			90		
			Gain 3		120			120		
t_r	Risetime	$R_S = 50\ \Omega$, $V_O = 1.0\ V_{p-p}$	Gain 1		10.5			10.5		ns
			Gain 2		4.5	10		4.5	12	
			Gain 3		2.5			2.5		
t_{PD}	Propagation Delay	$R_S = 50\ \Omega$, $V_O = 1.0\ V_{p-p}$	Gain 1		7.5			7.5		ns
			Gain 2		6.0	10		6.0	10	
			Gain 3		3.6			3.6		
Z_I	Input Impedance		Gain 1		4.0			4.0		kΩ
			Gain 2	20	30		10	30		
			Gain 3		250			250		
C_I	Input Capacitance		Gain 2		2.0			2.0		pF
I_{IO}	Input Offset Current				0.4	3.0		0.4	5.0	μA

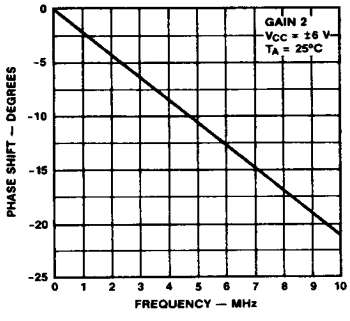
μA733 and μA733C (Cont.)
Electrical Characteristics $T_A = 25°C$, $V_{CC} = \pm 6.0$ V unless otherwise specified.

Symbol	Characteristic	Condition[1]	μA733			μA733C			Unit
			Min	Typ	Max	Min	Typ	Max	
I_{IB}	Input Bias Current			9.0	20		9.0	30	μA
e_n	Input Noise Voltage	$R_S = 50\ \Omega$, BW = 1.0 kHz to 10 MHz		12			12		μV_{rms}
V_{IR}	Input Voltage Range		±1.0			±1.0			V
CMR	Common Mode Rejection	$V_{CM} = \pm 1.0$ V, Gain 2	60	86		60	86		dB
PSRR	Supply Voltage Rejection Ratio	$\Delta V_{CC} = \pm 0.5$ V, Gain 2	50	70		50	70		dB
V_{OS}	Output Offset Voltage	Gain 1		0.6	1.5		0.6	1.5	V
		Gain 2 and Gain 3		0.35	1.0		0.35	1.5	
V_{OCM}	Output Common Mode Voltage		2.4	2.9	3.4	2.4	2.9	3.4	V
V_{OP}	Output Voltage Swing		3.0	4.0		3.0	4.0		V_{p-p}
I_{O-}	Output Sink Current		2.5	3.6		2.5	3.6		mA
R_O	Output Resistance			20			20		Ω
I_{CC}	Supply Current			18	24		18	24	mA
The following specifications apply over the range of $-55°C \leq T_A \leq 125°C$ for μA733 and $0°C \leq T_A \leq 70°C$ for μA733C.									
A_{VD}	Differential Voltage Gain	Gain 1	200		600	250		600	V/V
		Gain 2	80		120	80		120	
		Gain 3	8.0		12	8.0		12	
Z_I	Input Impedance	Gain 2	8.0			8.0			kΩ
I_{IO}	Input Offset Current				5.0			6.0	μA
I_{IB}	Input Bias Current				40			40	μA
V_{IR}	Input Voltage Range		±1.0			±1.0			V
CMR	Common Mode Rejection		50			50			dB
PSRR	Power Supply Rejection Ratio		50			50			dB
V_{OS}	Output Offset Voltage	Gain 1			1.5			1.5	V
		Gain 2 and Gain 3			1.2			1.5	
V_{OP}	Output Swing		2.5			2.8			V_{p-p}
I_{O-}	Output Sink Current		2.2			2.5			mA
I_{CC}	Supply Current				27			27	mA

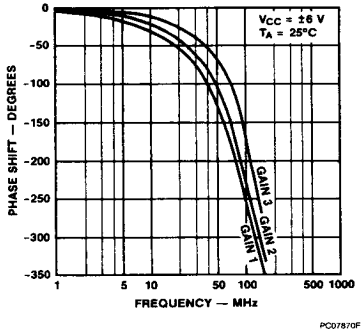
Notes
1. Gain Select leads G_{1A} and G_{1B} connected together for Gain 1.
2. Gain Select leads G_{2A} and G_{2B} connected together for Gain 2.
3. All Gain Select leads open for Gain 3.

Typical Performance Curves

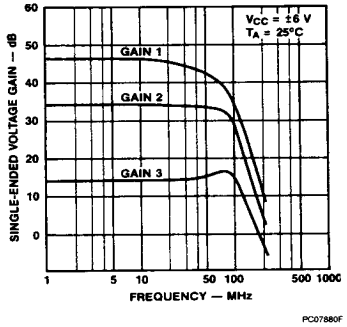
Phase Shift vs Frequency



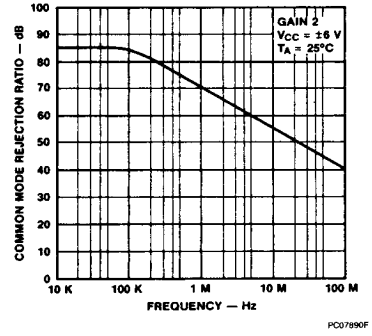
Phase Shift vs Frequency



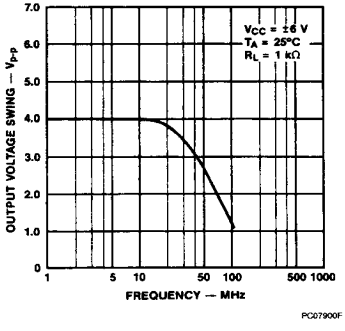
Voltage Gain vs Frequency



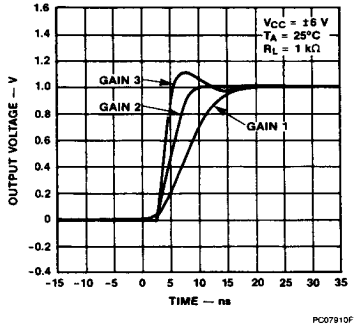
Common Mode Rejection Ratio vs Frequency



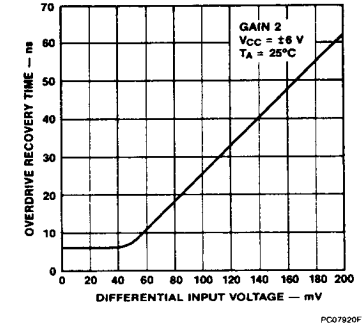
Output Voltage Swing vs Frequency



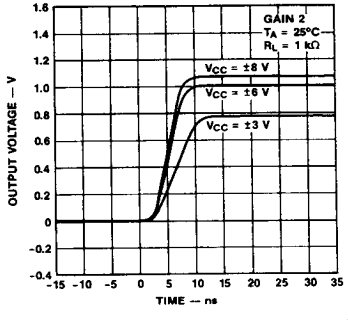
Pulse Response



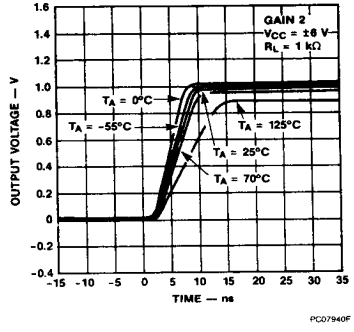
Differential Overdrive Recovery Time



Pulse Response vs Supply Voltage

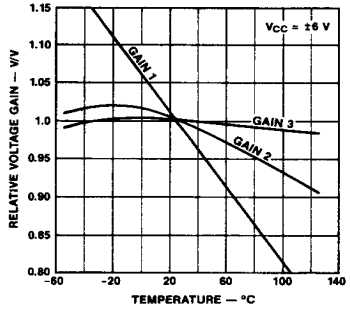


Pulse Response vs Temperature



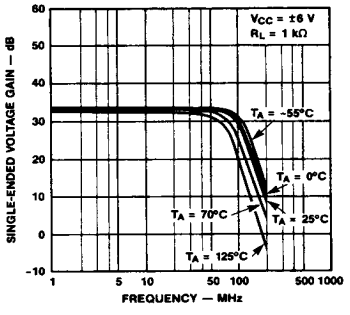
Typical Performance Curves (Cont.)

Voltage Gain vs Temperature



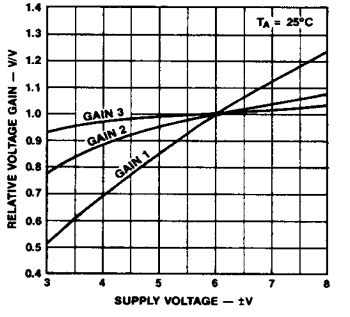
PC07950F

Gain vs Frequency vs Temperature



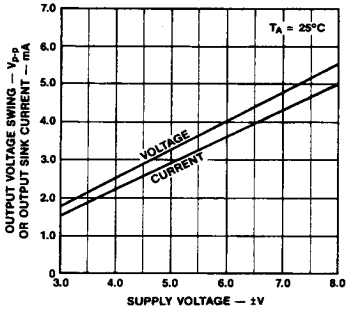
PC07960F

Voltage Gain vs Supply Voltage



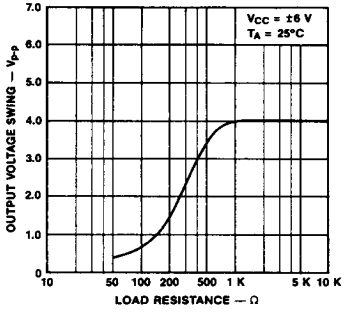
PC07970F

Output Voltage and Current Swing vs Supply Voltage



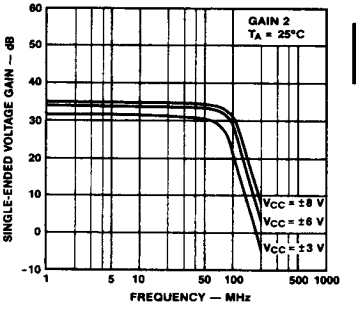
PC07980F

Output Voltage Swing vs Load Resistance



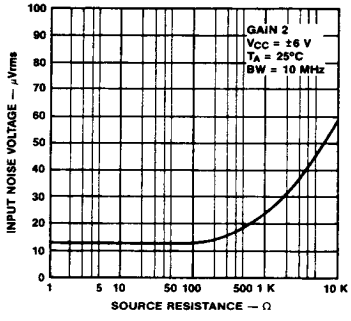
PC07990F

Gain vs Frequency vs Supply Voltage



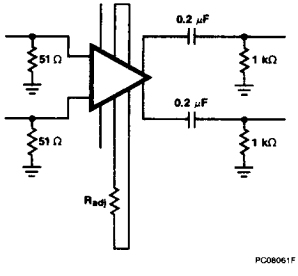
PC08000F

Input Noise Voltage vs Source Resistance



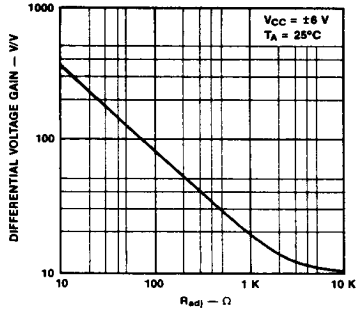
PC08010F

Voltage Gain Adjust Circuit



PC08061F

Voltage Gain vs R_{adj}



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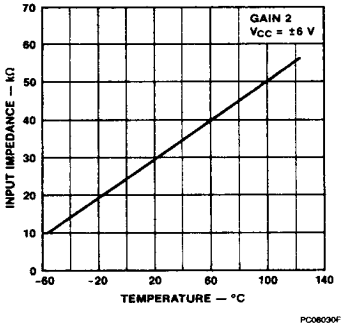
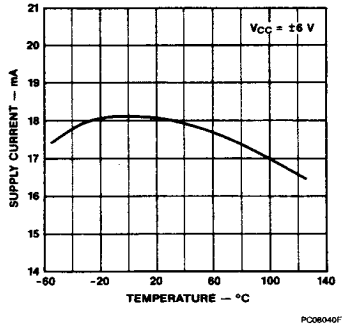
Typical Performance Curves (Cont.)

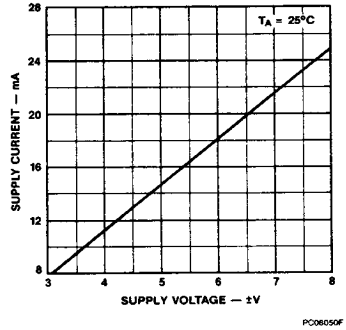
Input Impedance vs Temperature



Supply Current vs Temperature



Supply Current vs Supply Voltage



Typical Applications

Oscillator Frequency for Various Capacitor Values