

FAIRCHILD

A Schlumberger Company

μ A715

High Speed

Operational Amplifier

Linear Division Operational Amplifiers

Description

The μ A715 is a high speed, high gain, monolithic operational amplifier constructed using the Fairchild Planar Epitaxial process. It is intended for use in a wide range of applications where fast signal acquisition or wide bandwidth is required. The μ A715 features fast settling time, high slew rate, low offsets, and high output swing for large signal applications. In addition, the device displays excellent temperature stability and will operate over a wide range of supply voltages. The μ A715 is ideally suited for use in A/D and D/A converters, active filters, deflection amplifiers, video amplifiers, phase-locked loops, multiplexed analog gates, precision comparators, sample-and-holds, and general feedback applications requiring DC wide bandwidth operation.

- **High Slew Rate** — 100 V/ μ s
(Inverting, $A_V = 1$) Typically
- **Fast Settling Time** — 800 ns Typically
- **Wide Bandwidth** — 65 MHz Typically
- **Wide Operating Supply Range**
- **Wide Input Voltage Ranges**

Absolute Maximum Ratings

Storage Temperature Range	-65°C to +175°C
Operating Temperature Range	
Extended (μ A715M)	-55°C to +125°C
Commercial (μ A715C)	0°C to +70°C
Lead Temperature	
Metal Can and Ceramic DIP (soldering, 60 s)	300°C
Internal Power Dissipation ^{1, 2}	
10L-Metal Can	1.07 W
14L-Ceramic DIP	1.36 W
Supply Voltage	± 18 V
Differential Input Voltage	± 15 V
Input Voltage ³	± 15 V

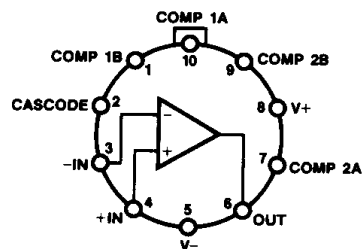
Notes

1. $T_J \text{ Max} = 175^\circ\text{C}$.
2. Ratings apply to ambient temperature at 25°C. Above this temperature, derate the 10L-Metal Can at 7.1 mW/°C, and the 14L-Ceramic DIP at 9.1 mW/°C.
3. For supply voltages less than ± 15 V, the absolute maximum input voltage is equal to the supply voltage.

Connection Diagram

10-Lead Metal Package

(Top View)



CD00700F

Lead 5 connected to case.

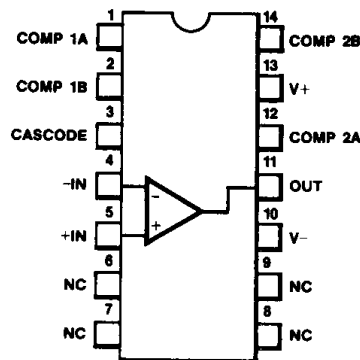
Order Information

Device Code	Package Code	Package Description
μ A715HM	5X	Metal
μ A715HC	5X	Metal

Connection Diagram

14-Lead DIP

(Top View)

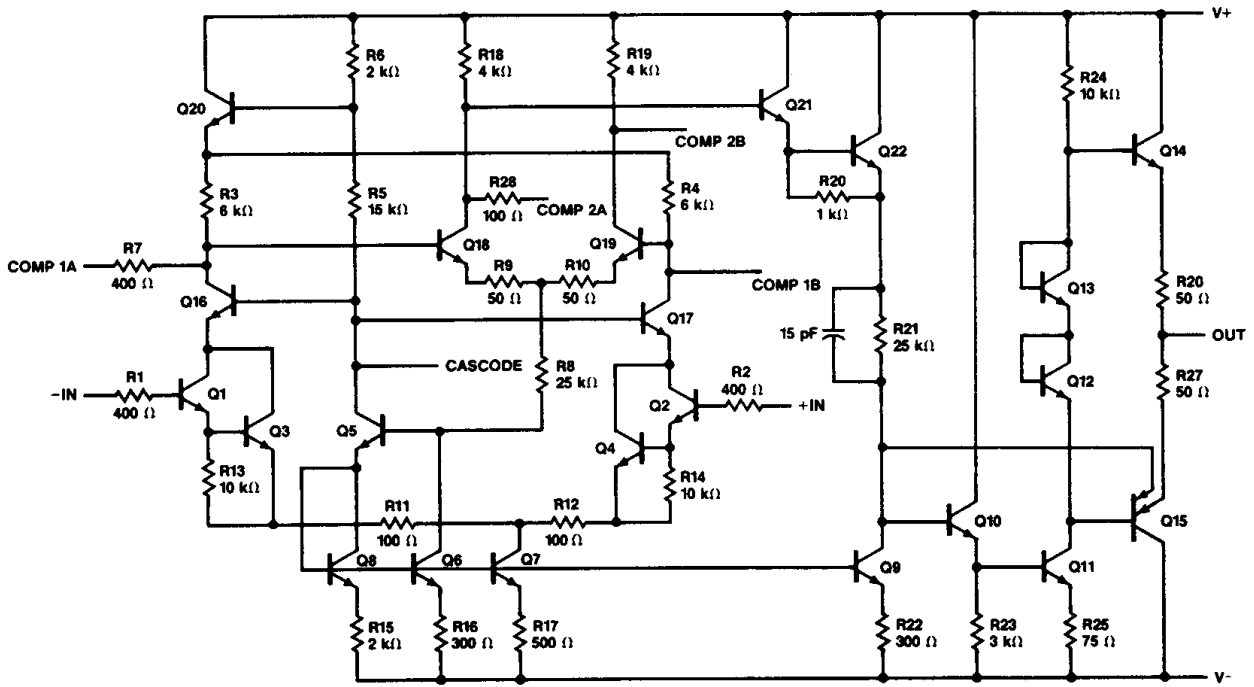


CD00711F

Order Information

Device Code	Package Code	Package Description
μ A715DM	6A	Ceramic DIP
μ A715DC	6A	Ceramic DIP

Equivalent Circuit



EQ00141F

μA715

μA715 and μA715C

Electrical Characteristics $T_A = 25^\circ\text{C}$, $V_{CC} = \pm 15\text{ V}$, unless otherwise specified.

Symbol	Characteristic	Condition	μA715			μA715C			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{IO}	Input Offset Voltage	$R_S \leq 10\text{ k}\Omega$		2.0	5.0		2.0	7.5	mV
I_{IO}	Input Offset Current			70	250		70	250	nA
I_{IB}	Input Bias Current			400	750		400	1500	nA
Z_I	Input Impedance			1.0			1.0		MΩ
R_O	Output Resistance			75			75		Ω
I_{CC}	Supply Current			5.5	7.0		5.5	10	mA
P_c	Power Consumption			165	210		165	300	mW
V_{IR}	Input Voltage Range		± 10	± 12		± 10	± 12		V
A_{VS}	Large Signal Voltage Gain	$R_L \geq 2.0\text{ k}\Omega$, $V_O = \pm 10\text{ V}$	15	30		10	30		V/mV
V	Settling Time	$V_O = \pm 5.0\text{ V}$, $A_V = 1.0$		800			800		ns
TR	Transient Response	Rise time		30	60		30	75	ns
		Overshoot		25	40		25	50	%
SR	Slew Rate	$A_V = 100$		70			70		V/μs
		$A_V = 10$		38			38		
		$A_V = 1.0$ (non-inverting)	15	18		10	18		
		$A_V = 1.0$ (inverting)		100			100		

The following specifications apply over the range of $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ for the μA715, and $0^\circ\text{C} \leq T_A \leq +70^\circ\text{C}$ for the μA715C.

V_{IO}	Input Offset Voltage	$R_S \leq 10\text{ k}\Omega$			7.5			10	mV
I_{IO}	Input Offset Current	$T_A = T_{A\text{ Max}}$			250			250	nA
		$T_A = T_{A\text{ Min}}$			800			750	
I_{IB}	Input Bias Current	$T_A = T_{A\text{ Max}}$			750			1500	nA
		$T_A = T_{A\text{ Min}}$			4.0			7.5	
CMR	Common Mode Rejection	$R_S \leq 10\text{ k}\Omega$	74	92		74 ¹	92 ¹		db
PSRR	Power Supply Rejection Ratio	$R_S \leq 10\text{ k}\Omega$		45	300		45 ¹	400 ¹	μV/V
A_{VS}	Large Signal Voltage Gain	$R_L \geq 2.0\text{ k}\Omega$, $V_O = \pm 10\text{ V}$	10			8			V/mV
V_{OP}	Output Voltage Swing	$R_L = 2.0\text{ k}\Omega$	± 10	± 13		± 10	± 13		V

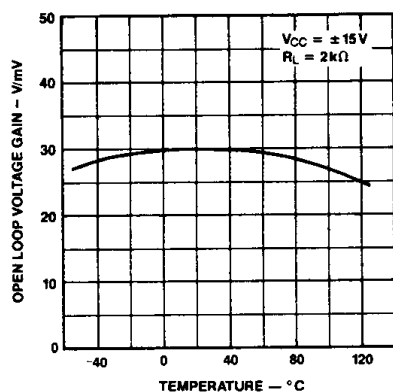
Note

1. $T_A = 25^\circ\text{C}$ only.

$\mu A715$

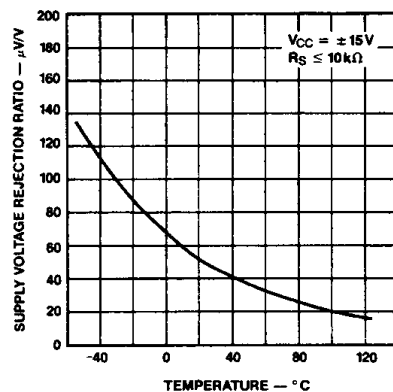
Typical Performance Curves for $\mu A715$ and $\mu A715C$

Voltage Gain vs Temperature ($\mu A715$)



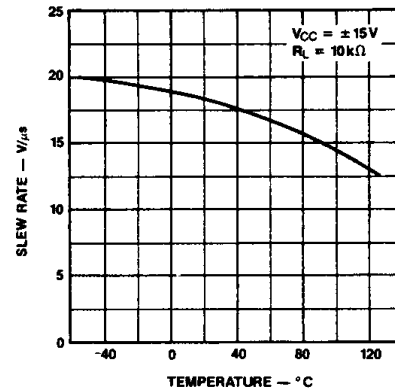
PC04600F

Supply Voltage Rejection Ratio vs Temperature ($\mu A715$)



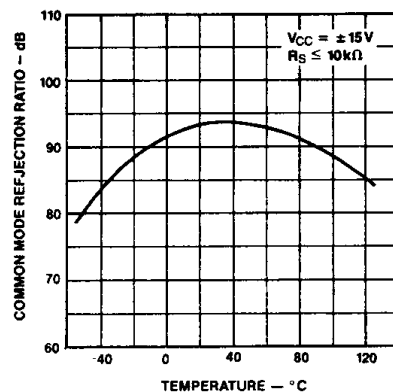
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Slew Rate vs Temperature ($\mu A715$)



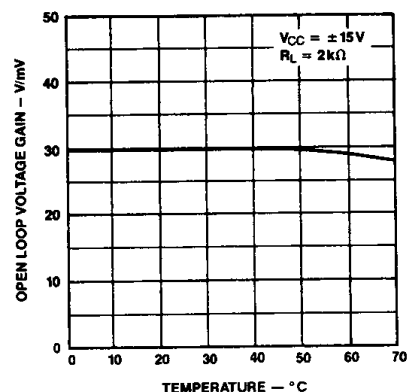
PC04620F

Common Mode Rejection Ratio vs Temperature ($\mu A715$)



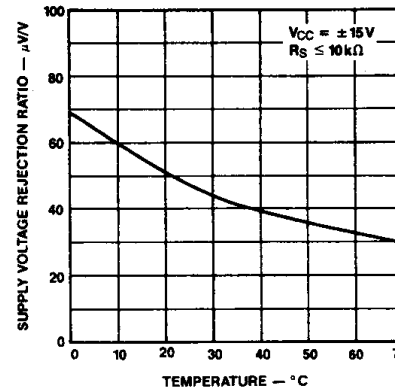
PC04630F

Voltage Gain vs Temperature ($\mu A715C$)



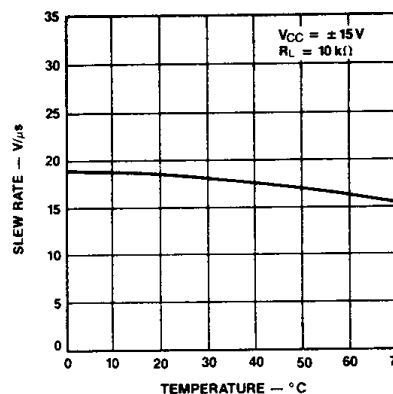
PC04640F

Supply Voltage Rejection Ratio vs Temperature ($\mu A715C$)



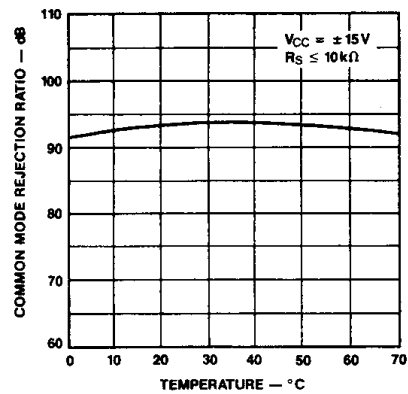
PC04650F

Slew Rate vs Temperature ($\mu A715C$)



PC04660F

Common Mode Rejection Ratio vs Temperature ($\mu A715C$)

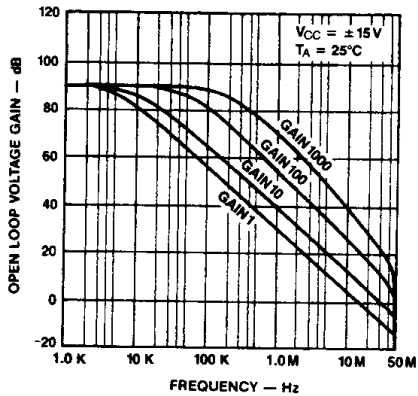


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μ A715

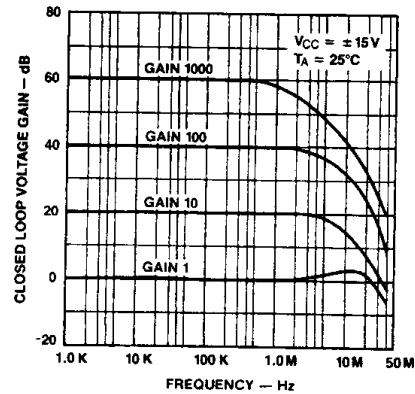
Typical Performance Curves for μ A715 and μ A715C

Frequency Response For Open Loop Gains (Note 1)



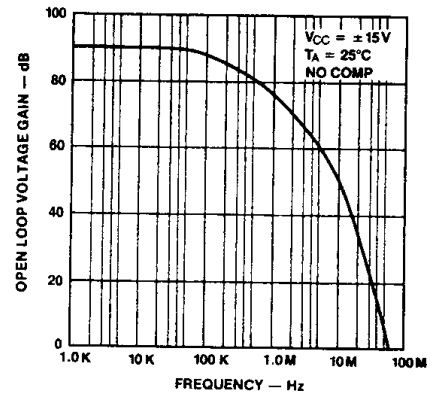
PC04681F

Frequency Response for Closed Loop Gains



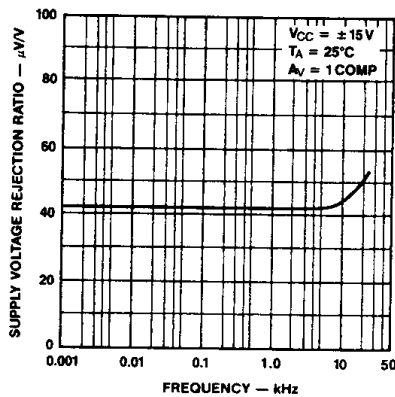
PC04691F

Voltage Gain vs Frequency



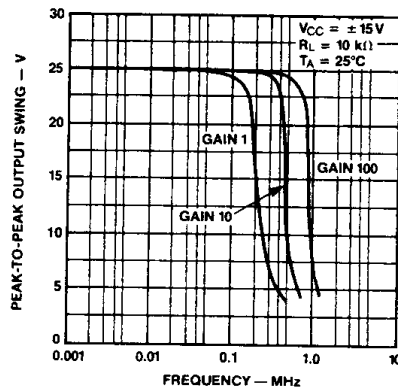
PC04701F

Supply Voltage Rejection Ratio vs Frequency



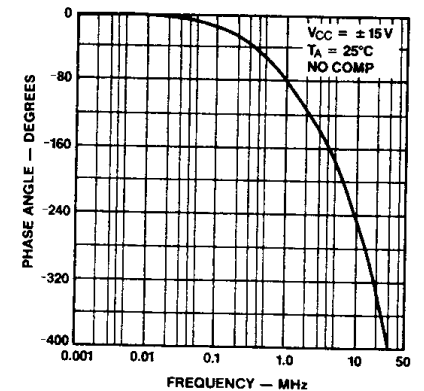
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Output Swing vs Frequency for Closed Loop Gains



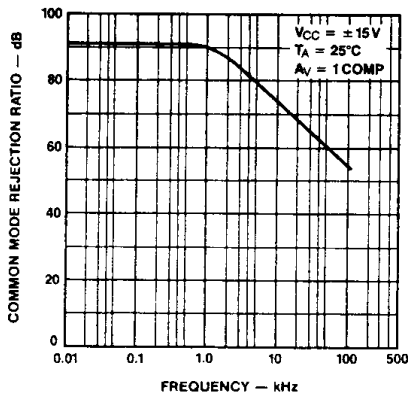
PC04720F

Open Loop Phase vs Frequency



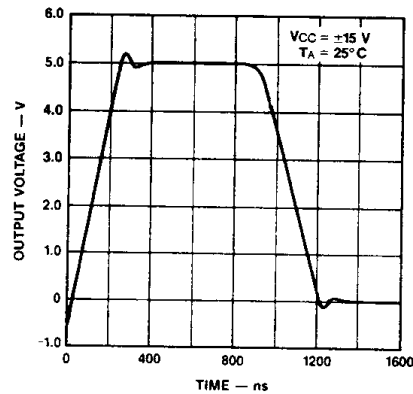
PC04730F

Common Mode Rejection Ratio vs Frequency



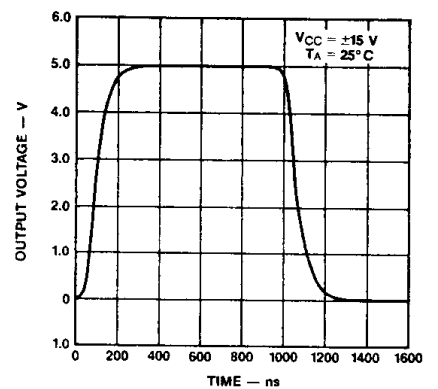
PC04740F

Unity Gain Large Signal Pulse Response



PC04750F

Large Signal Pulse Response for Gain 10



PC04760F

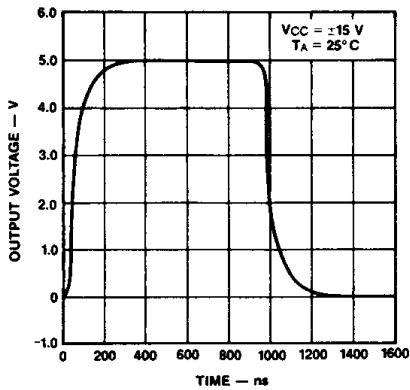
Note

- See "Non-Inverting Compensation Components Value Table" for Closed Loop Gain values.

μ A715

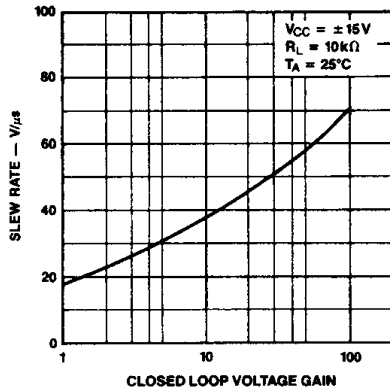
Typical Performance Curves for μ A715 and μ A715C (Cont.)

Large Signal Pulse Response for Gain 100



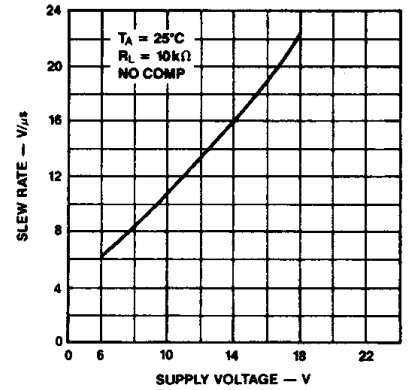
PC04770F

Slew Rate vs Closed Loop Voltage Gain



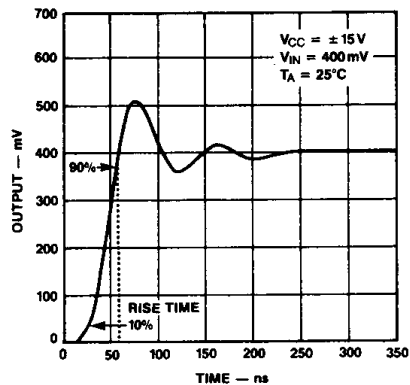
PC04781F

Slew Rate vs Supply Voltage



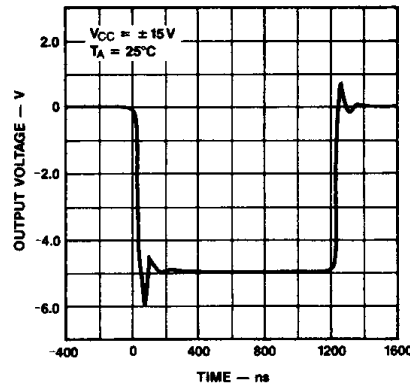
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Voltage Follower Transient Response



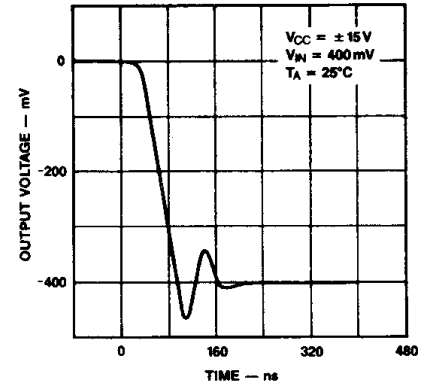
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Inverting Unity Gain Large Signal Pulse Response



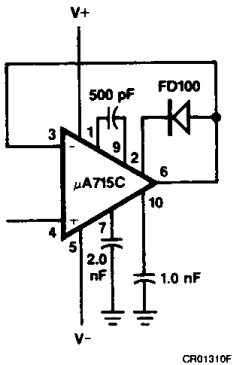
PC04810F

Small Signal Pulse Response Inverting Unity Gain



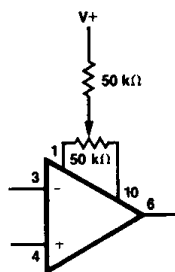
PC04830F

Voltage Follower (Note 1)



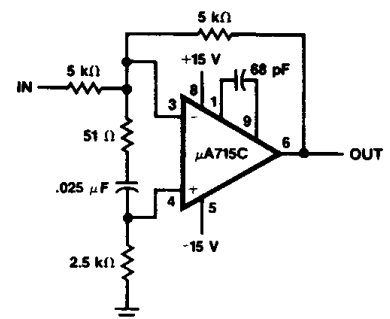
CR01310F

Voltage Offset Null Circuit (Note 1)



CR01321F

High Slew Rate Circuit (Note 1)



CR01491F

Note

- Lead numbers apply to metal package.

μ A715

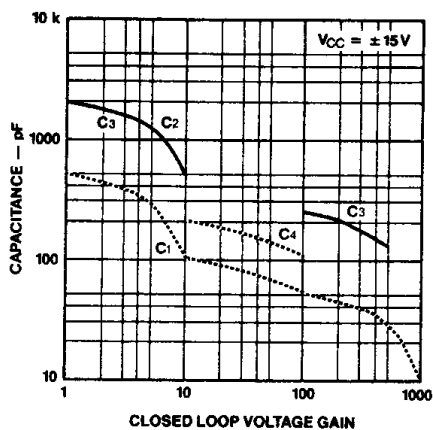
Non-Inverting Compensation Components Values

Closed Loop Gain	C1	C2	C3
1000	10 pF		
100	50 pF		250 pF
10 (Note)	100 pF	500 pF	1000 pF
1	500 pF	2000 pF	1000 pF

Note

For gain 10, compensation may be simplified by removing C2, C3 and adding a 200 pF capacitor (C4) between Lead 7 and 10.

Suggested Values of Compensation Capacitors vs Closed Loop Voltage Gain



PC04841F

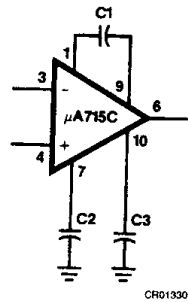
Layout Instructions

Layout — The layout should be such that stray capacitance is minimal.

Supplies — The supplies should be adequately bypassed. Use of 0.1 μ F high quality ceramic capacitors is recommended.

Ringing — Excessive ringing (long acquisition time) may occur with large capacitive loads. This may be reduced by isolating the capacitive load with a resistance of 100 Ω .

Frequency Compensation Circuit



CR01330F

Note

Lead numbers apply to metal package.

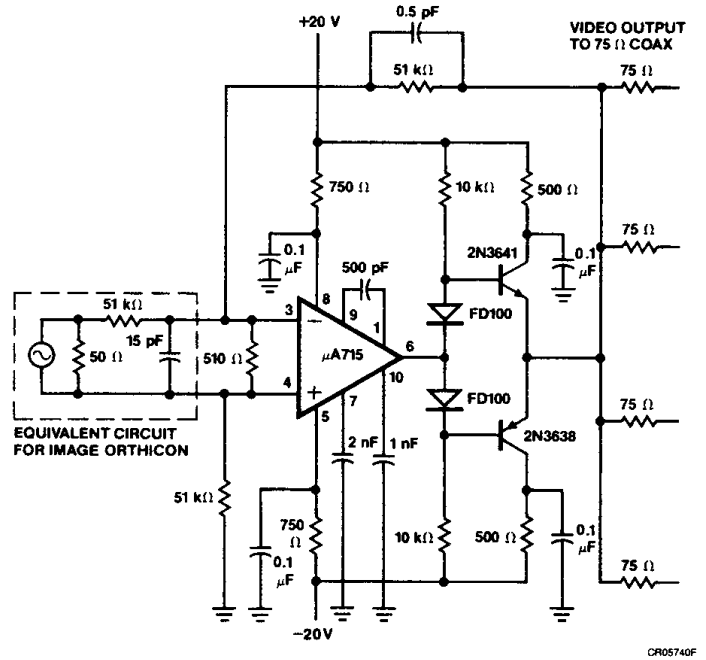
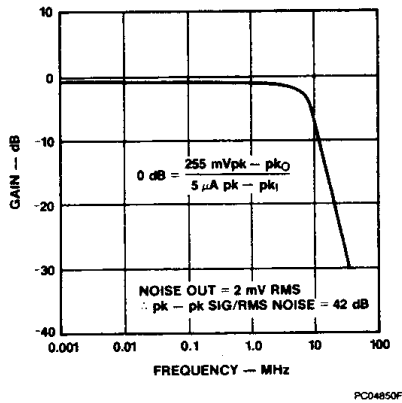
Large source resistances may also give rise to the same problem and this may be decreased by the addition of a capacitance across the feedback resistance. A value of around 50 pF for unity gain configuration and around 3.0 pF for gain 10 should be adequate.

Latch Up — This may occur when the amplifier is used as a voltage follower. The inclusion of a diode between leads 6 and 2 with the cathode toward lead 2 is the recommended preventive measure.

μ A715

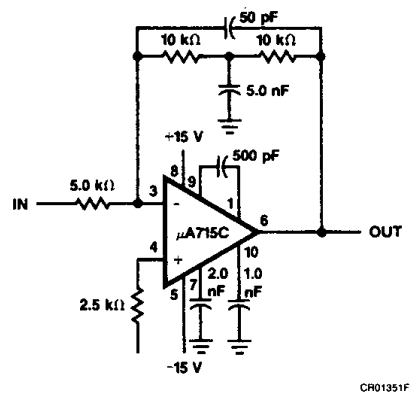
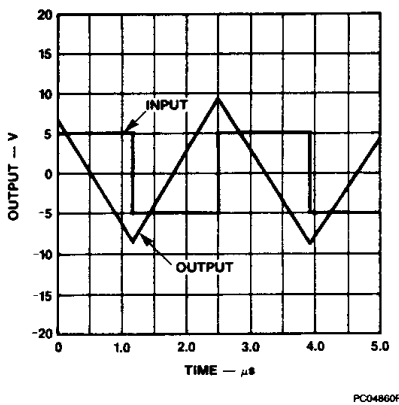
Typical Applications

Wide Bank Video Amplifier Drive Capability With 75 Ω Coax Cable



7

High Speed Integrator



Note
All lead numbers shown refer to metal package.