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μA734 Precision Voltage Comparator

Linear Products

Description

The μA734 is a Precision Voltage Comparator constructed on a single silicon chip using the Fairchild Planar epitaxial process. It is specifically designed for high accuracy level sensing and measuring applications. The μA734 is extremely useful for analog-to-digital converters with 12-bit accuracies and one mega-bit conversion rates. Maximum resolution is obtained by high gain, low input offset current, and low input offset voltage. Its superior temperature stability can be improved by offset nulling which further reduces offset voltage drift. Balanced or unbalanced supply operation and standard TTL logic compatibility enhance the μA734 versatility.

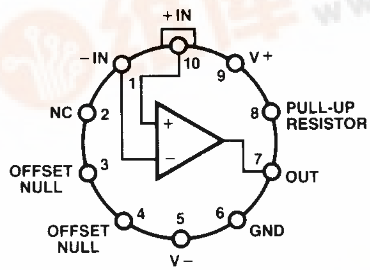
- **CONSTANT INPUT IMPEDANCE OVER DIFFERENTIAL INPUT RANGE**
- **HIGH INPUT IMPEDANCE—55 MΩ**
- **LOW DRIFT—3.5 μV/°C**
- **HIGH GAIN—60 k**
- **BALANCED OFFSET NULL CAPABILITY**
- **WIDE SUPPLY VOLTAGE RANGE—±5 V to ±18 V**
- **TTL COMPATIBLE**

Absolute Maximum Ratings

T_A = 25°C unless specified otherwise

Supply Voltage	±18 V
Peak Output Current	10 mA
Differential Input Voltage	±10 V
Input Voltage Range (Note 1)	±13 V
Voltage Between Offset Null and V−	±0.5 V
Internal Power Dissipation (Note 2)	
Metal Package	500 mW
Ceramic DIP	670 mW
Operating Temperature Range	
Military (μA734)	−55°C to +125°C
Commercial (μA734C)	0°C to +70°C
Storage Temperature Range	
Metal Can, DIP	−65°C to +150°C
Pin Temperature (Soldering, 60 s Max)	300°C

Connection Diagram
10-Pin Metal Package

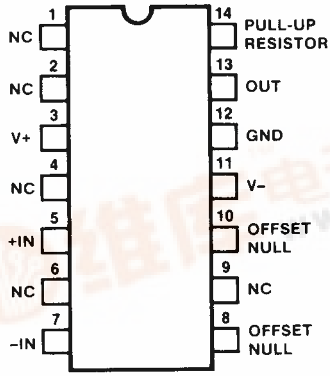


(Top View)

Order Information

Type	Package	Code	Part No.
μA734	Metal	5N	μA734HM
μA734C	Metal	5N	μA734HC

Connection Diagram
14-Pin DIP



(Top View)

Order Information

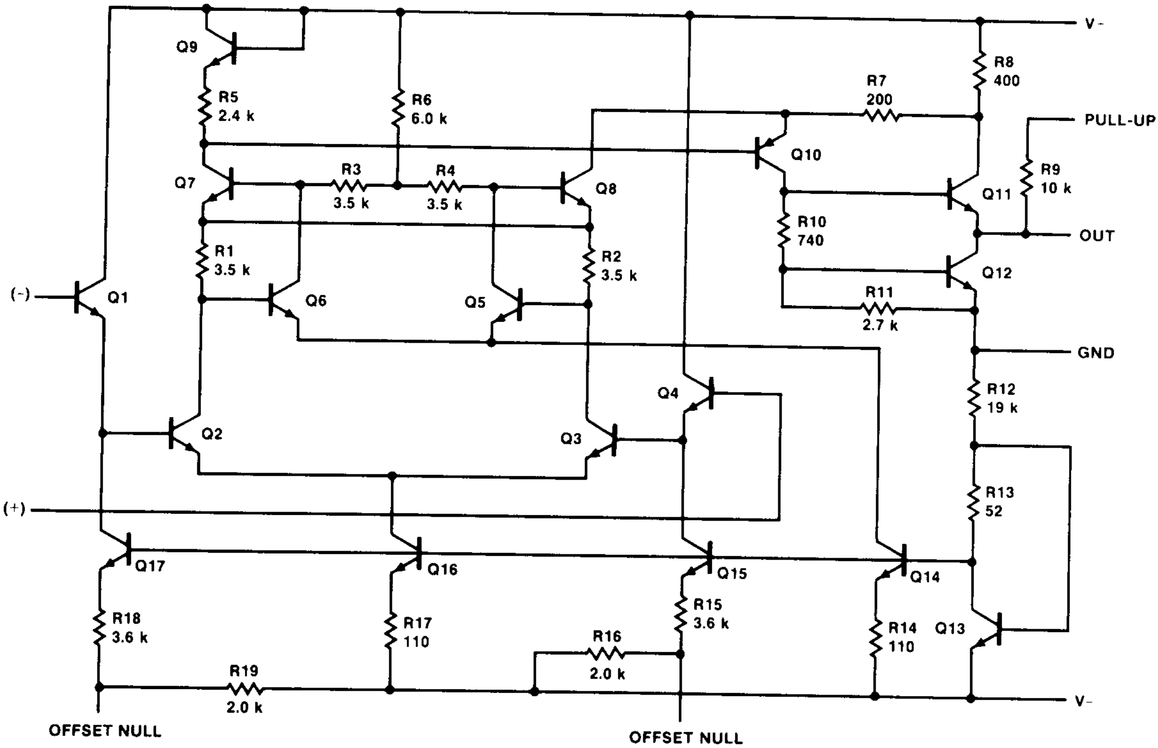
Type	Package	Code	Part No.
μA734	Ceramic DIP	6A	μA734DM
μA734C	Ceramic DIP	6A	μA734DC

Notes

1. Rating applies for ±15 V supplies. For other supply voltages the rating is within 2 V of either supply.

... peratures up to 70°C. Above ... at 6.3 mW/°C for metal package,

Equivalent Circuit



μA734C Electrical Characteristics T_A = 25°C, Pin 8 tied to +15 V, unless otherwise specified, V± = ±15V. (Note 3)

Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50$ kΩ		1.1	5.0	mV
Input Offset Current			3.5	25	nA
Input Bias Current			30	100	nA
Input Resistance		7.0	55		MΩ
Input Capacitance			3.0		pF
Offset Voltage Adjustment Range			8.5		mV
Large Signal Voltage Gain	R_L = 1.5 kΩ to +5.0 V	35 k	60 k		V/V
Positive Supply Current Output LOW			4.0	5.0	mA
Negative Supply Current Output LOW			1.5	2.0	mA
Power Consumption—Output LOW			82	105	mW
Transient Response	R_L = 1.5 kΩ to +5.0 V 5 mV Overdrive, 100 mV Pulse		200		ns

The following specifications apply for 0°C ≤ T_A ≤ +70°C

Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50$ kΩ		1.2	7.5	mV
Input Offset Current			4.0	45	nA
Average Input Offset Voltage Drift Without External Trim	$R_S \leq 50$ Ω		3.5	20	μV/°C
Average Input Offset Current Drift	T_A = +25°C to +70°C		0.02	0.3	nA/°C
	T_A = +25°C to 0°C		0.05	0.75	nA/°C
Input Bias Current				150	nA
Large Signal Voltage Gain	R_L = 1.5 kΩ to +5.0 V	25 k			V/V
Input Common Mode Voltage Range		±10			V
Differential Input Voltage Range		±10			V
Common Mode Rejection Ratio	$R_S \leq 50$ kΩ	70	100		dB
Supply Voltage Rejection Ratio V_S = ±5 V to ±18 V	$R_S \leq 50$ kΩ		6.0	100	μV/V
Output HIGH Voltage	I_{OUT} = 0.080 mA	7.0			V
	I_{OUT} = 0.080 mA, V_8 = +5.0 V	2.4		5.0	V
Output LOW Voltage	I_{SINK} = 3.2 mA			0.4	V
Positive Supply Current Output LOW				7.0	mA
Negative Supply Current Output LOW				2.5	mA
Power Dissipation—Output LOW				145	mW

μA734 Electrical Characteristics T_A = 25°C, Pin 8 tied to +15 V, unless otherwise specified, V± = ±15 V. (Note 3)

Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50$ kΩ		0.9	3.0	mV
Input Offset Current			1.5	10	nA
Input Bias Current			28	50	nA
Input Resistance		20	60		MΩ
Input Capacitance			3.0		pF
Offset Voltage Adjustment Range			8.5		mV
Large Signal Voltage Gain	R_L = 1.5 kΩ to +5.0 V	35 k	70 k		V/V
Positive Supply Current Output LOW			4.0	5.0	mA
Negative Supply Current Output LOW			1.5	2.0	mA
Power Consumption—Output LOW			82	105	mW
Transient Response	R_L = 1.5 kΩ to +5.0 V 5 mV Overdrive, 100 mV Pulse		200		ns

The following specifications apply for −55°C ≤ T_A ≤ +125°C

Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50$ kΩ		1.1	4.0	mV
Input Offset Current			3.0	20	nA
Average Input Offset Voltage Drift Without External Trim	$R_S \leq 50$ kΩ		2.5	15	μV/°C
Average Input Offset Current Drift	T_A = +25°C to +125°C T_A = +25°C to −55°C		0.01 0.05	0.1 0.4	nA/°C nA/°C
Input Bias Current				150	nA
Large Signal Voltage Gain	R_L = 1.5 kΩ to +5.0 V	25 k			V/V
Input Common Mode Voltage Range		±10			V
Differential Input Voltage Range		±10			V
Common Mode Rejection Ratio	$R_S \leq 50$ kΩ	70	100		dB
Supply Voltage Rejection Ratio V_S = ±5 V to ±18 V	$R_S \leq 50$ kΩ		5.0	100	μV/V
Output HIGH Voltage	I_{OUT} = 0.080 mA I_{OUT} = 0.080 mA, V_8 = +5.0 V	7.0 2.4		5.0	V V
Output LOW Voltage	I_{SINK} = 3.2 mA			0.4	V
Positive Supply Current Output LOW				7.0	mA
Negative Supply Current Output LOW				2.5	mA
Power Dissipation—Output LOW				145	mW

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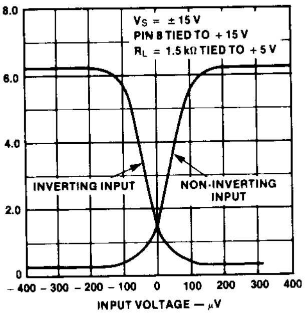
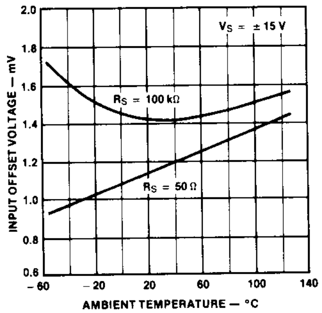
Note

Typical Performance Curves For μA734 and μA734C

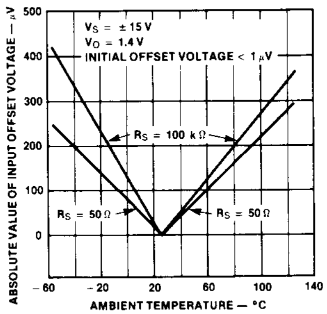
Transfer Characteristics



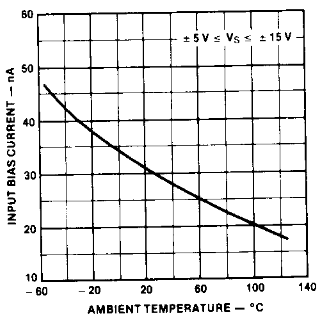
Un-Nulled Input Offset Voltage vs. Ambient Temperature



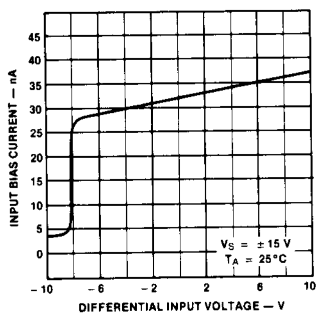
Input Offset Voltage Change vs. Ambient Temperature Nulled to Zero at 25°C



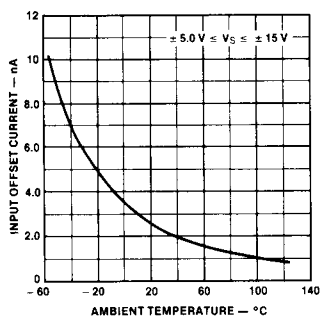
Input Bias Current vs. Ambient Temperature



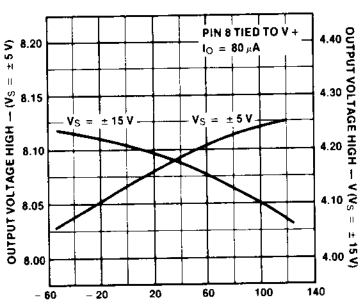
Input Bias Current vs. Differential Input Voltage



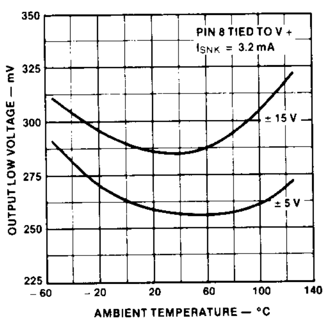
Input Offset Current vs. Ambient Temperature



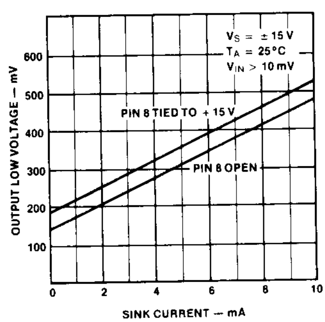
Output High Voltage vs. Supply Voltage and Ambient Temperature



Output Low Voltage vs. Supply Voltage and Ambient Temperature

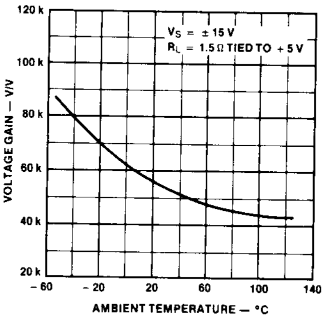


Output Voltage Low vs. Sink Current

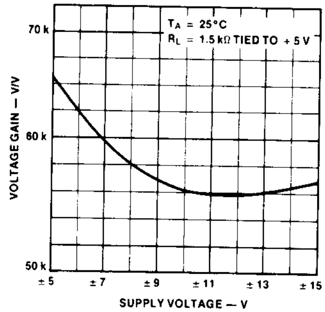


Typical Performance Curves for μA734 and μA734C (Cont.)

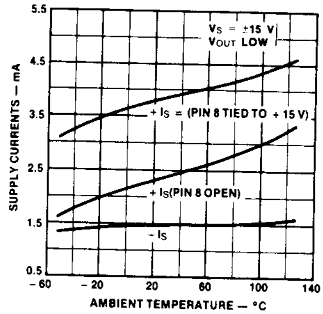
Voltage Gain vs. Ambient Temperature



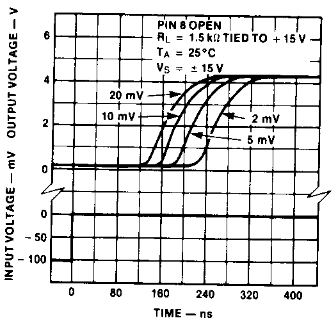
Voltage Gain vs. Supply Voltage



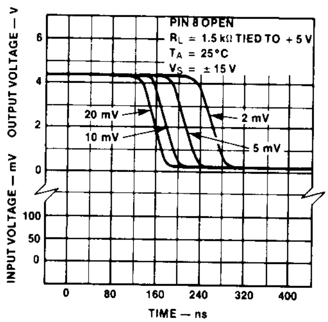
Positive and Negative Supply Currents vs. Ambient Temperature



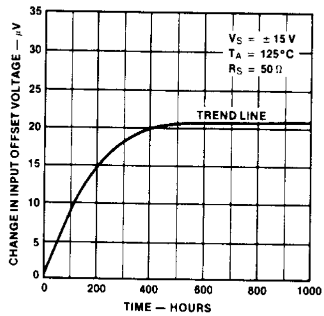
Response Time For Various Input Overdrives



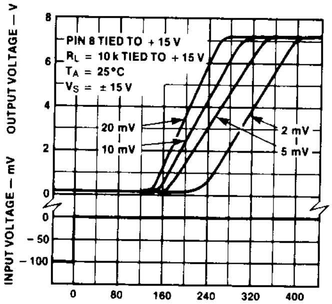
Response Time For Various Input Overdrives



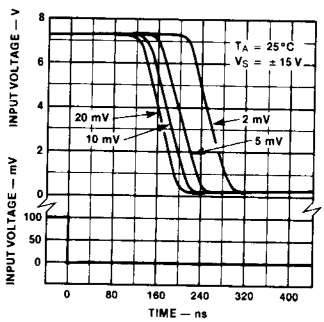
Input Offset Voltage Drift vs. Time



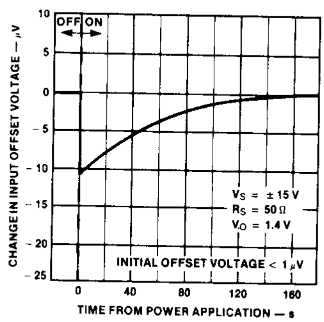
Response Time For Various Input Overdrives



Response Time For Various Input Overdrives

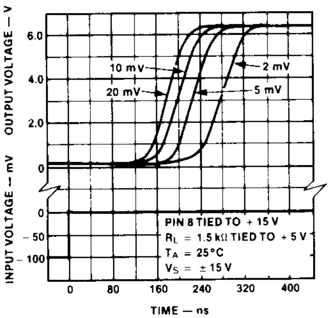


Stabilization Time of Input Offset Voltage From Power Turn-On

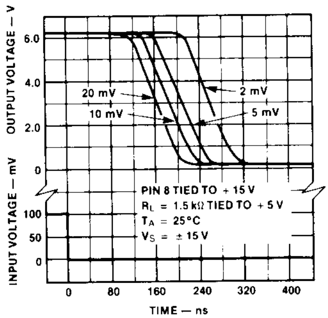


Typical Performance Curves for μA734 and μA734C (Cont.)

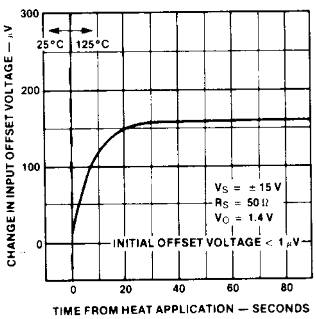
Response Time For Various Input Overdrives



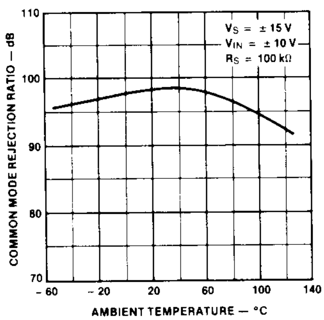
Response Time For Various Input Overdrives



Thermal Response of Input Offset Voltage To Step Change of Case Temperature

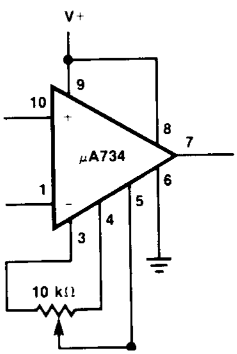


Common Mode Rejection Ratio vs. Ambient Temperature

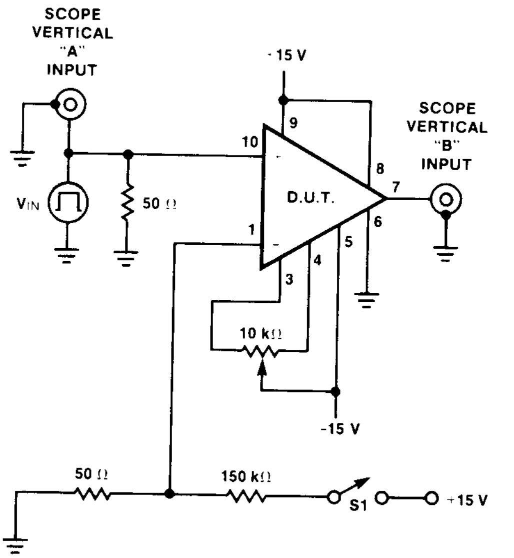


Test Circuits

Offset Null Circuit

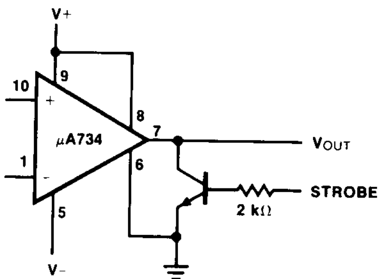


AC Test Circuit

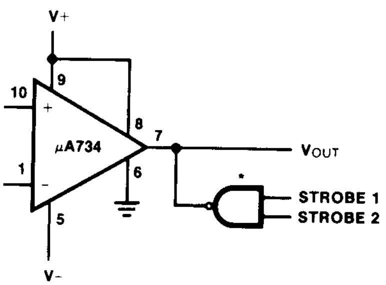


Typical Applications

Strobe Circuitry



Alternate Strobe Circuitry



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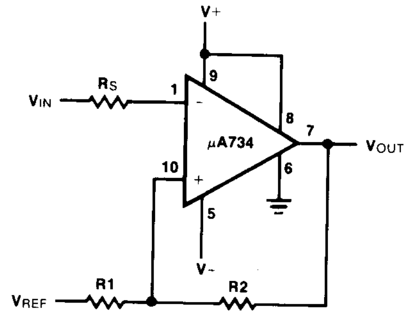
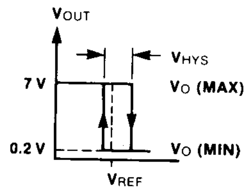
Typical Applications (Cont.)

Level Detector With Hysteresis

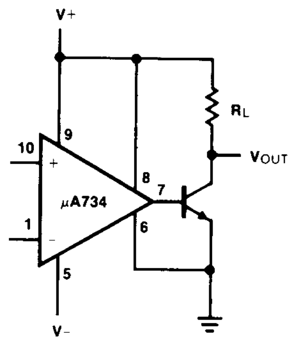




$$R_S = \frac{R_1 R_2}{R_1 + R_2} \text{ FOR MINIMUM OFFSET}$$

$$V_{HYS} = \frac{R_1 [V_{O\,MAX} - V_{O\,MIN}]}{R_1 + R_2}$$

High Power Output Circuits



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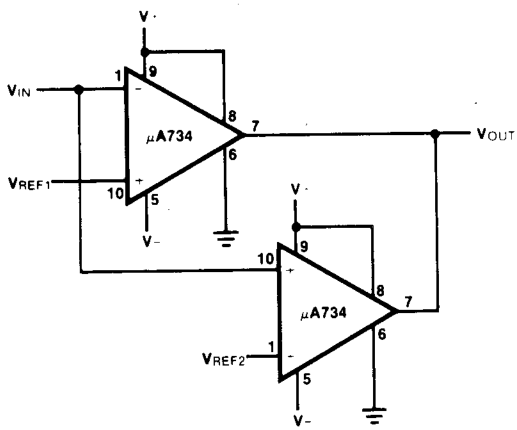
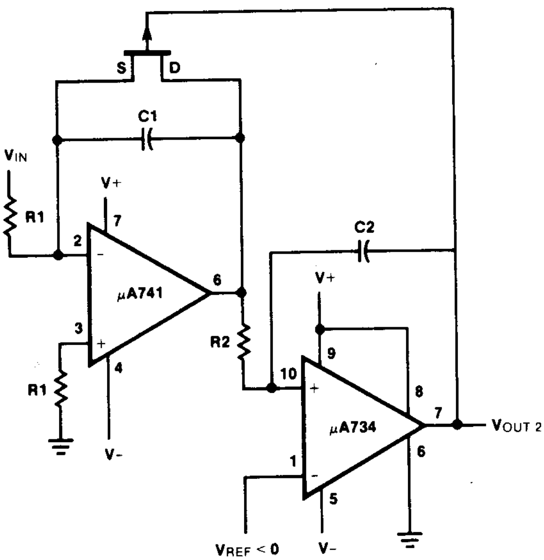
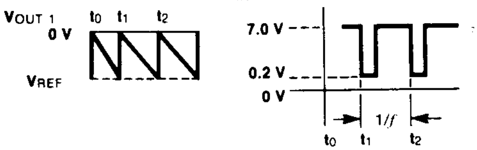
Typical Applications (Cont.)

Precision Dual Limit Go No Go Tester



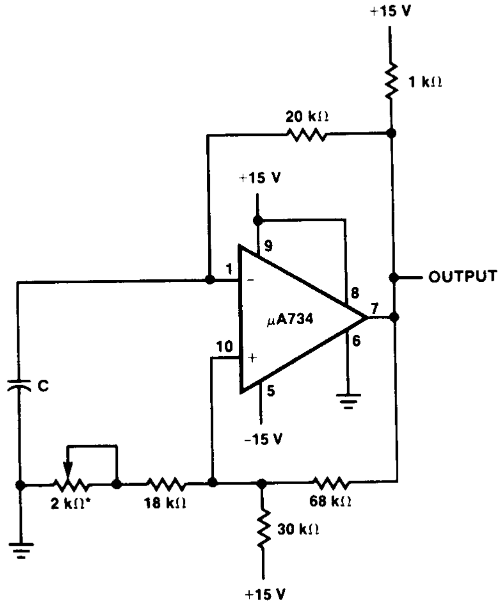
Voltage Controlled Oscillator

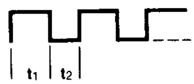




$$f = \frac{V_{IN}}{|V_{REF}|\, R_1\, C_1} \qquad R_2\, C_2 > \frac{|V_{REF}|\, C_1}{I_{DSS}}$$

Free Running Oscillator



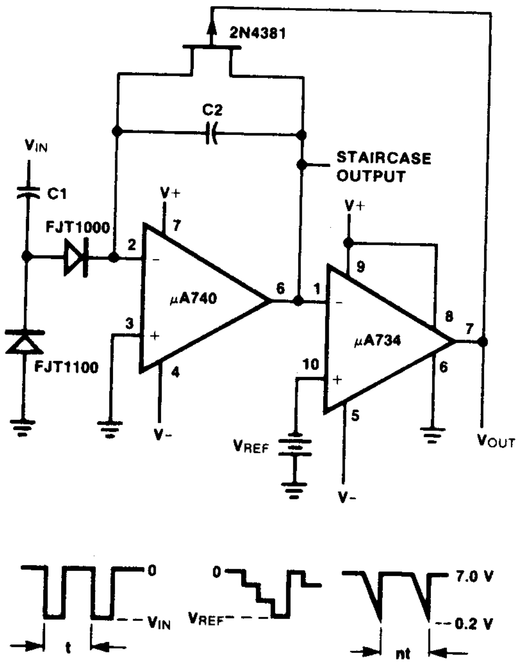


$C \cong 80 \times 10^{-6}\, t$

*Adjusts $\frac{T_1}{T_2}$

Typical Applications (Cont.)

Frequency Divider and Staircase Generator

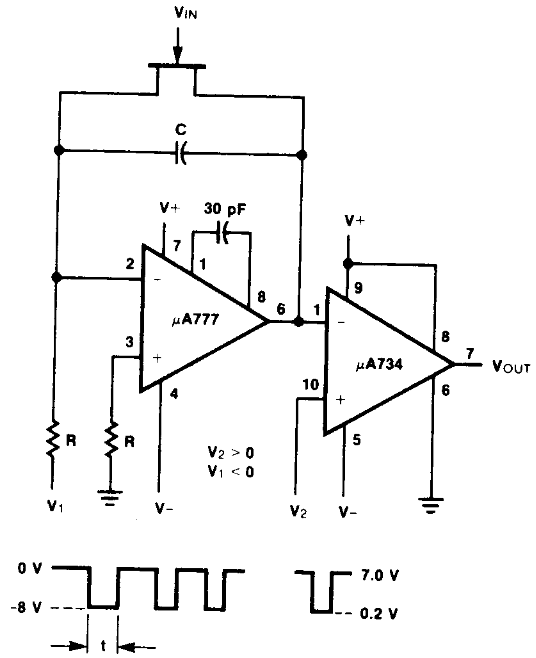


$$|V_{REF}| = 2V_D + N\left[3.5T + 2V_D - \frac{C_1 V_{IN}}{C_2}\right]$$

T in Seconds

V_D for FJT 1000 ≈ 0.31 V

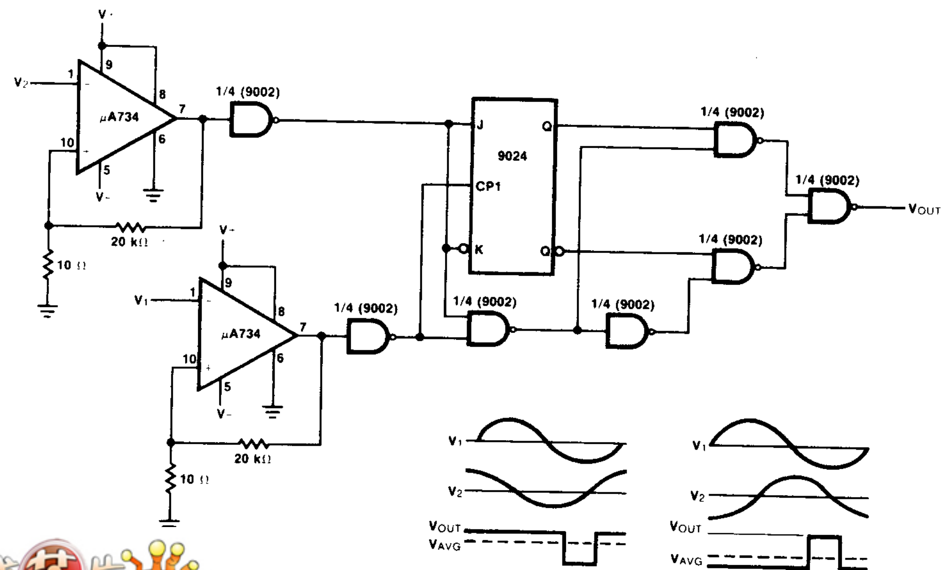
Pulse Width Discriminator



V_{OUT} Pulse Appears

Whenever $T > \frac{R\,C\,V_2}{V_1}$

Phase Meter



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