FAIRCHILD
A Schlumberger Company

µA727
Temperature-Controlled
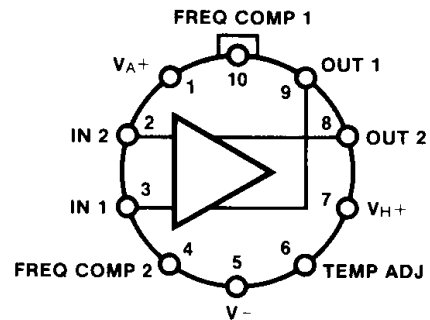# Differential Preamplifier

Special Function Products

Description
The µA727 is a monolithic, fixed gain, Differential Input/Output Preamplifier, constructed with the Fairchild Planar epitaxial process, mounted in a high thermal resistance package, and held at constant temperature by active regulator circuitry. The high gain and low-standby dissipation of the regulator circuit give tight temperature control over a wide ambient temperature range. The device is intended for use as a self-contained input stage in very low drift dc amplifiers, replacing complex chopper-stabilized amplifiers in such applications as thermo-couple bridges, strain-gauge transducers, and a/d converters.

- **VERY LOW OFFSET DRIFTS**
- **HIGH INPUT IMPEDANCE   300 MΩ**
- **WIDE COMMON MODE RANGE C_{MRR} = 100 dB**

Absolute Maximum Ratings
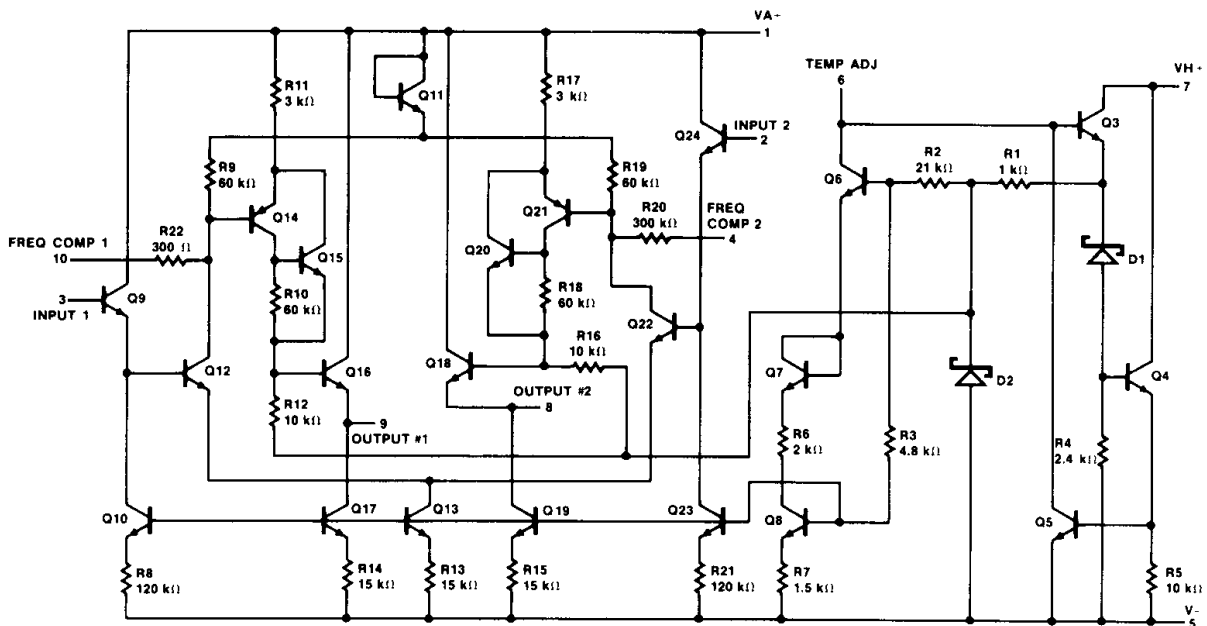|	
Operating Temperature Range	
Military (µA727)	−55°C to +125°C
Commercial (µA727C)	−20°C to +85°C
Storage Temperature Range	−65°C to +150°C
Pin Temperature (Soldering, 60 s)	300°C
Internal Power Dissipation	500 mW
Supply Voltage (Amplifier and Heater)	± 18 V
Differential Input Voltage	± 10 V
Common Mode Input Voltage	± 15 V

Connection Diagram
10-Pin Metal Package

(Top View)

Order Information
Type	Package	Code	Part No.
µA727	Metal	5U	µA727HM
µA727C	Metal	5U	µA727HC

Equivalent Circuit

μA727
Electrical Characteristics $-55°C \leq T_A \leq +125°C$, $V_H+ = +15$ V, $V- = -15$ V, $R_{ADJ} = 330$ kΩ, unless otherwise specified.

Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50$ Ω		2.0	10	mV
Input Offset Current			2.5	15	nA
Input Bias Current			12	40	nA
Input Offset Voltage Drift	$R_S \leq 50$ Ω, $+25°C \leq T_A \leq +125°C$		0.6	1.5	μV/°C
	$R_S \leq 50$ Ω, $-55°C \leq T_A \leq +25°C$		0.6	1.5	μV/°C
Input Offset Current Drift	$+25°C \leq T_A \leq +125°C$		2.0		pA/°C
	$-55°C \leq T_A \leq +25°C$		2.0		pA/°C
Input Bias Current Drift	$-55°C \leq T_A \leq +125°C$		15		pA/°C
Differential Input Resistance			300		MΩ
Common-Mode Input Resistance			1000		MΩ
Input Voltage Range		± 12	± 13		V
Supply Voltage Rejection Ratio	$R_S \leq 100$ kΩ		80		μV/V
Common-Mode Rejection Ratio	$R_S \leq 100$ kΩ	80	100		dB
Output Resistance			1.0	4.0	kΩ
Output Common-Mode Voltage		−6.0	−5.0	−4.0	V
Differential Output Voltage Swing		± 5.0	± 7.0	± 10	V
Output Sink Current		10	30	80	μA
Differential Load Rejection			5.0	10	μV/μA
Differential Voltage Gain		60	100	250	
Low Frequency Noise	BW = 10 Hz to 500 Hz, $R_S \leq 50$ Ω		3.0		μVrms
Long Term Drift	$R_S \leq 50$ Ω		5.0		μV/week
Amplifier Supply Current	$T_A = +25°C$		1.0	2.0	mA
Heater Supply Current	$T_A = +25°C$		10	15	mA

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µA727C
Electrical Characteristics $-20°C \leq T_A \leq +85°C$, $V_H+ = V_A+ = +15$ V, $V- = -15$ V, $R_{ADJ} = 1$ MΩ, unless otherwise specified.

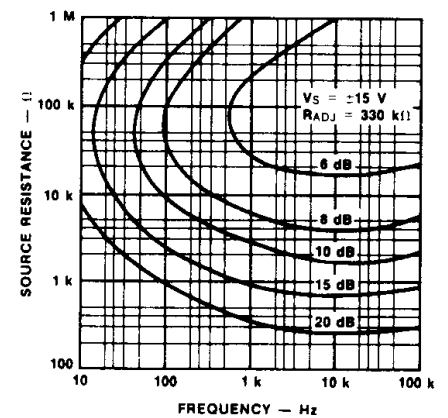| Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50$ Ω		2.0	10	mV
Input Offset Current			2.5	25	nA
Input Bias Current			12	75	nA
Input Offset Voltage Drift	$R_S \leq 50$ Ω		0.6	3.0	µV/°C
Input Offset Current Drift			2.0		pA/°C
Input Bias Current Drift			15		pA/°C
Differential Input Resistance			300		MΩ
Common Mode Input Resistance			1000		MΩ
Input Voltage Range		± 12	± 13		V
Supply Voltage Rejection Ratio	$R_S \leq 100$ kΩ		80		µV/V
Common Mode Rejection Ratio	$R_S \leq 100$ kΩ	70	100		dB
Output Resistance			1.0	4.0	kΩ
Output Common Mode Voltage		−7.0	−5.0	−4.0	V
Differential Output Voltage Swing		± 3.0	± 7.0	± 10	V
Output Sink Current		10	30	80	µA
Differential Load Rejection			5.0	15	µV/µA
Differential Voltage Gain		50	100	250	
Low Frequency Noise	BW = 10 Hz to 500 Hz, $R_S \leq 50$ Ω		3.0		µV$_{rms}$
Long Term Drift	$R_S \leq 50$ Ω		5.0		µV/week
Amplifier Supply Current	$T_A = +25°C$		1.0	2.0	mA
Heater Supply Current	$T_A = +25°C$		10	15	mA

Typical Performance Curves

Noise Voltage vs Frequency
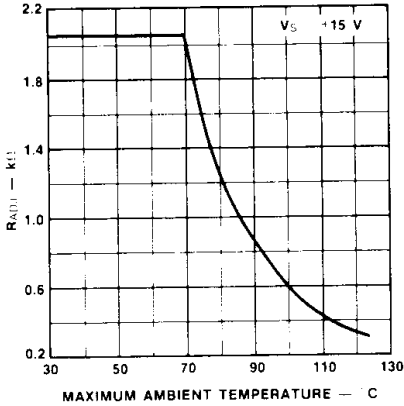

Noise Current vs Frequency
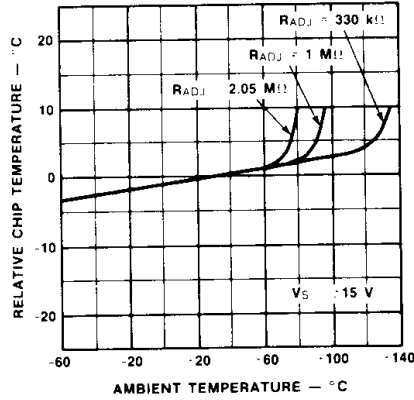

Spot Noise Contours
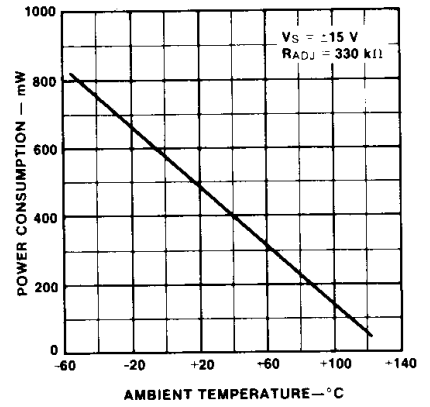
Typical Performance Curves (Cont.)

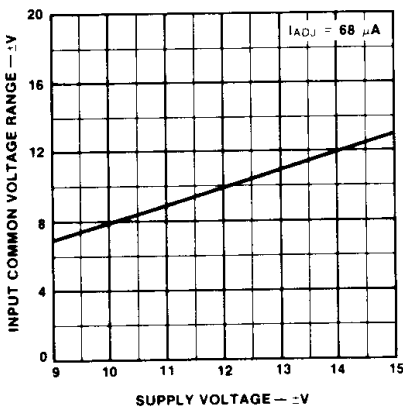### Recommended R_ADJ vs Maximum Ambient Temperature

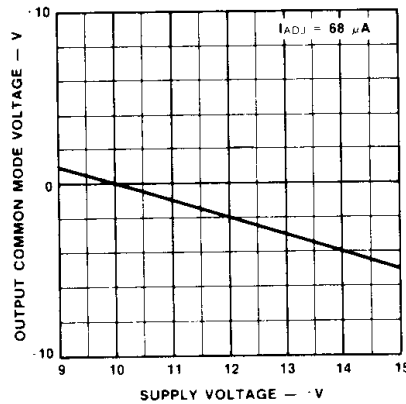### Relative Chip Temperature vs Ambient Temperature
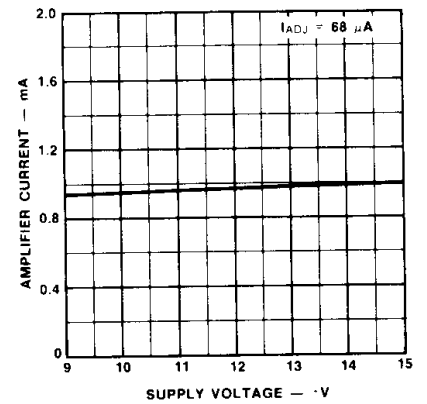
Power Consumption vs Ambient Temperature
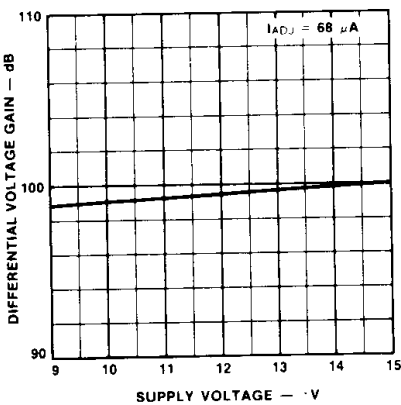
Input Common-Mode Voltage Range vs Supply Voltage
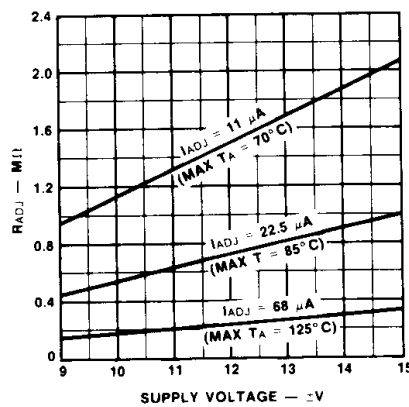
Output Common-Mode Voltage vs Supply Voltage

Amplifier Current vs Supply Voltage

Differential Voltage Gain vs Supply Voltage

Required R_ADJ for Constant I_ADJ vs Supply Voltage

Open Loop Frequency Response for Various Values of Compensation

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