FAIRCHILD

A Schlumberger Company

μA727
Temperature-Controlled Differential Preamplifier

Special Function Products

Description

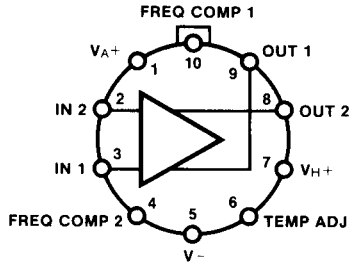
The μA727 is a monolithic, fixed gain, Differential Input/Output Preamplifier, constructed with the Fairchild Planar epitaxial process, mounted in a high thermal resistance package, and held at constant temperature by active regulator circuitry. The high gain and low-standby dissipation of the regulator 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

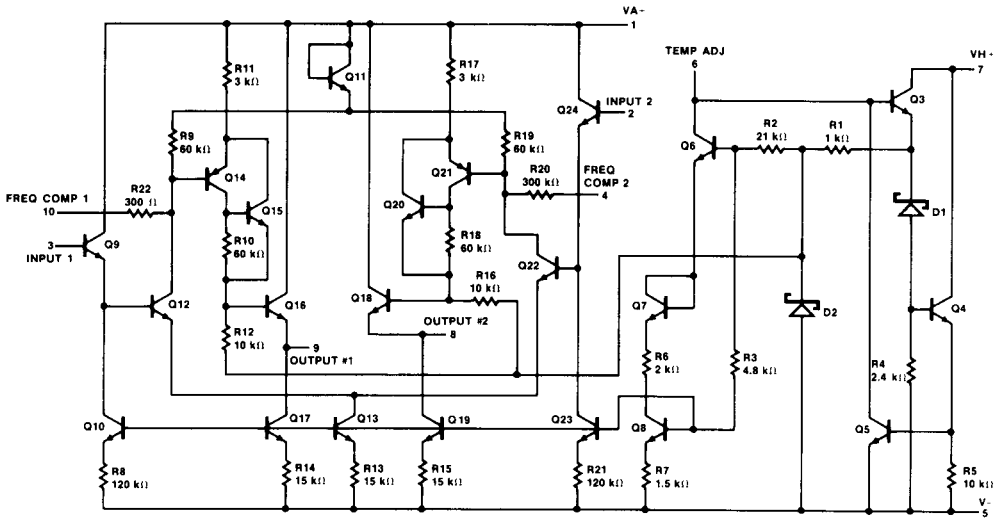


(Top View)

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.

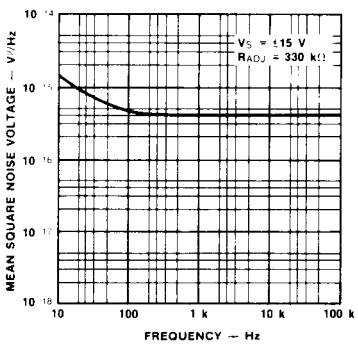
Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50\ \Omega$		2.0	10	mV
Input Offset Current			2.5	15	nA
Input Bias Current			12	40	nA
Input Offset Voltage Drift	$R_S \leq 50\ \Omega$, $+25°C \leq T_A \leq +125°C$		0.6	1.5	μV/°C
	$R_S \leq 50\ \Omega$, $-55°C \leq T_A \leq +25°C$		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, $R_S \leq 50\ \Omega$		3.0		μV_{rms}
Long Term Drift	$R_S \leq 50\ \Omega$		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

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.

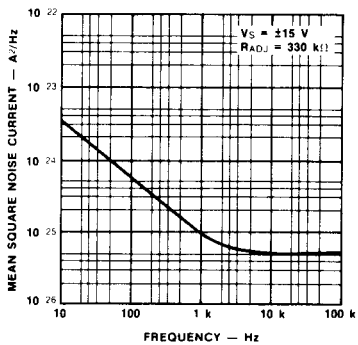
Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage	$R_S \leq 50\ \Omega$		2.0	10	mV
Input Offset Current			2.5	25	nA
Input Bias Current			12	75	nA
Input Offset Voltage Drift	$R_S \leq 50\ \Omega$		0.6	3.0	μV/°C
Input Offset Current Drift			2.0		pA/°C
Input Bias Current Drift			15		pA/°C
Differential 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, $R_S \leq 50\ \Omega$		3.0		μV_{rms}
Long Term Drift	$R_S \leq 50\ \Omega$		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

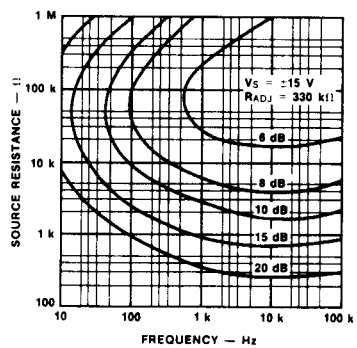
Noise Voltage vs Frequency



Noise Current vs Frequency

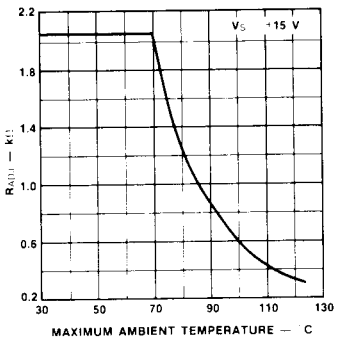


Spot Noise Contours

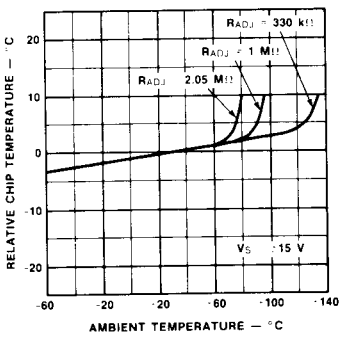


Typical Performance Curves (Cont.)

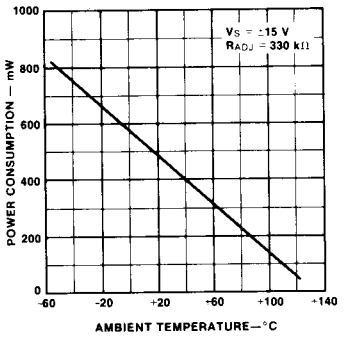
Recommended R_{ADJ} vs Maximum Ambient Temperature



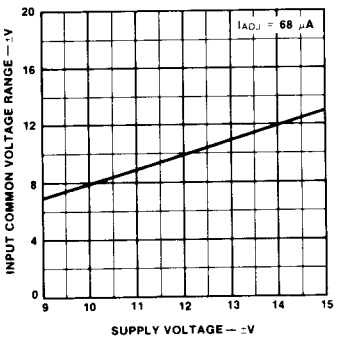
Relative Chip Temperature vs Ambient Temperature



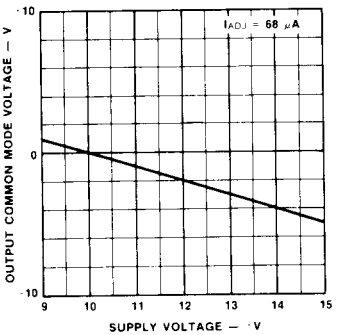
Power Consumption vs Ambient Temperature



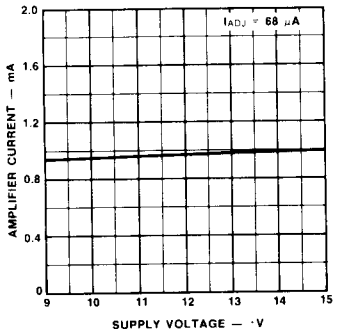
Input Common-Mode Voltage Range vs Supply Voltage



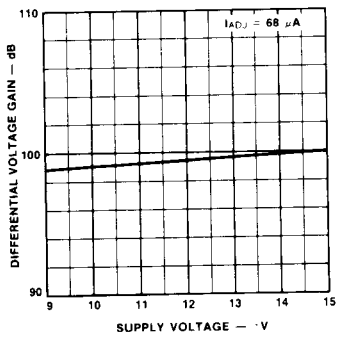
Output Common-Mode Voltage vs Supply Voltage



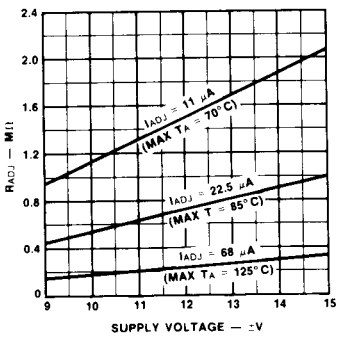
Amplifier Current vs Supply Voltage



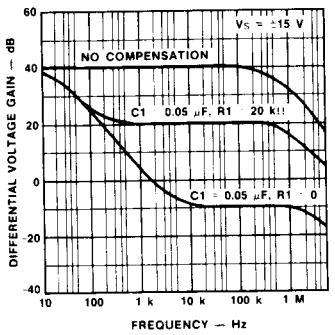
Differential Voltage Gain vs Supply Voltage



Required R_{ADJ} for Constant I_{ADJ} vs Supply Voltage



Open Loop Frequency Response for Various Values of Compensation



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