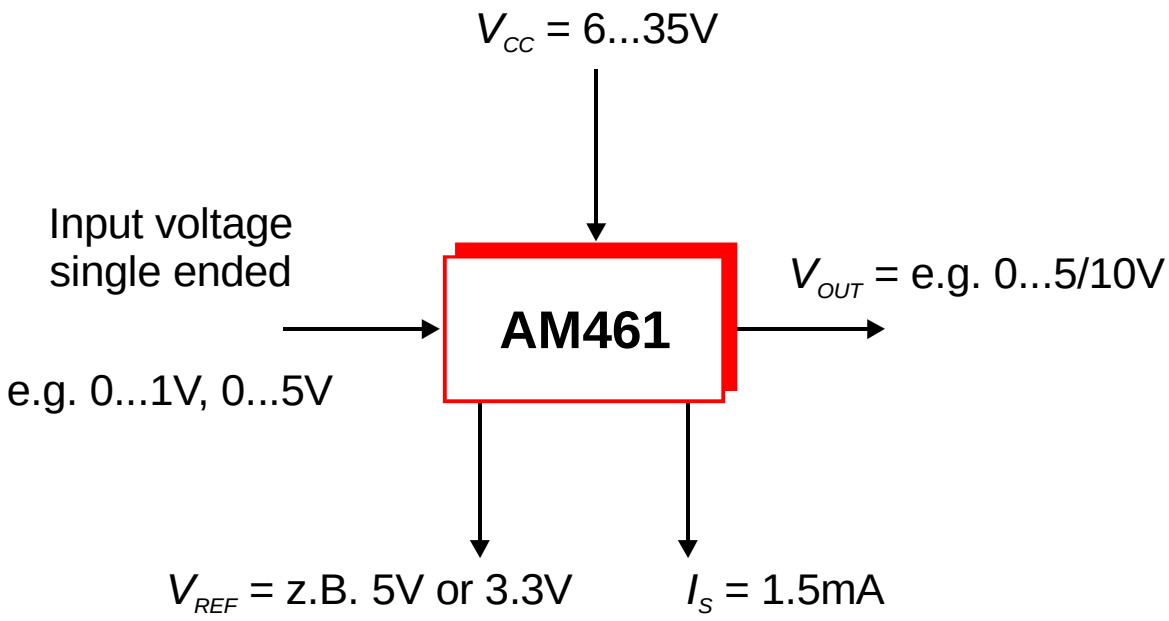
AMPLIFIER AND PROTECTION IC AM461

PRINCIPLE FUNCTION

Amplification of Single Ended Signals (Voltage)
Protection Functions for External Devices
Additional Adjustable Current/Voltage Source



TYPICAL APPLICATIONS

- Impedance Converter
- Adjustable Voltage Source
- Voltage Regulator with Additional Functions
- Protection IC for Microcontroller (Frame ASIC Concept [1])
- Protected Current Source

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FEATURES

- **Supply Voltage Range: 6...35V**
- **Wide Operating Temperature Range: –40°C...+85°C**
- **Voltage Reference: 5V**
- **Additional Voltage/Current Source**
- **Operational Amplifier Stage with Integrated Driver Output**
- **Adjustable Gain**
- **Adjustable Output Voltage Range e.g. 0...5/10V, others**
- **Reverse Polarity Protection**
- **Short Circuit Protection**
- **Output Current Limitation**
- **Low-Cost: Replaces a Multitude Number of Discrete Components**

DESCRIPTION

The AM461 is a universal useable amplifier and protection IC with a multitude of additional functions. The IC contains of an externally adjustable operational amplifier for conditioning of single ended input signals. This amplifier has an integrated output driver stage with the ability to source up to 5mA without the need of any external transistor. In addition, a voltage reference for the supply of external components and another operational amplifier that can be used as current/voltage source or comparator is integrated.

Basic features of the IC are the wide range integrated of protection functions. The IC is protected against reverse polarity and has a build-in output current limitation. Using the amplifier IC AM461 it is possible to generate stable standard voltages ranges (e.g. 0-5/10V) in an easy and low-cost way.

BLOCK DIAGRAM

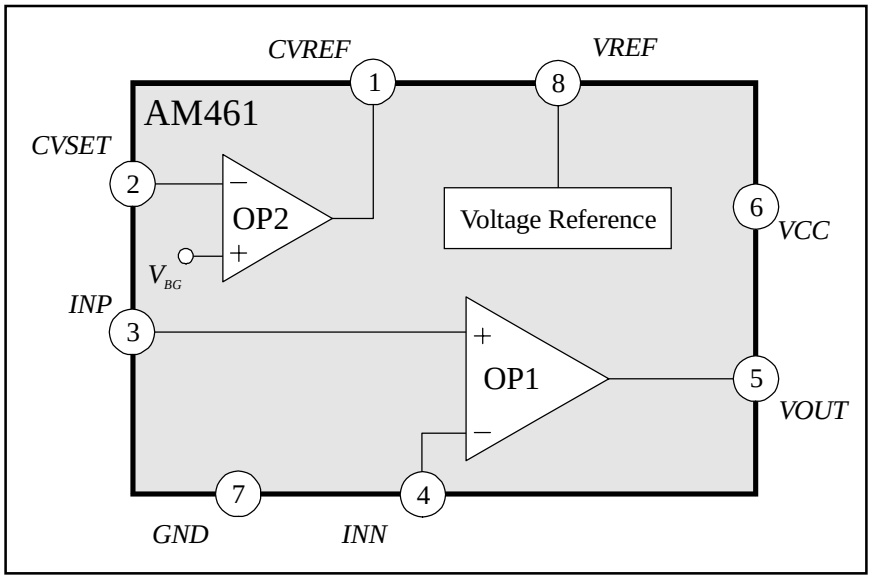

Figure 1: Block diagram AM461

ELECTRICAL SPECIFICATIONS

T_{amb} = 25°C, V_{CC} = 24V, I_{REF} = 1mA, C_1 = 2.2µF (unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Voltage Range	V_{CC}		6		35	V
Quiescent Current	I_{CC}	T_{amb} = – 40...+85°C, I_{REF} = 0mA			1.5	mA
Temperature Specifications						
Operating	T_{amb}		–40		85	°C
Storage	T_{st}		–55		125	°C
Junction	T_J				150	°C
Thermal Resistance	Θ_{ja}	DIL8 plastic package		110		°C/W
	Θ_{ja}	SO8 plastic package		180		°C/W
Voltage Reference						
Voltage	V_{REF}		4.75	5.00	5.25	V
Current	I_{REF}		1.0		10.0	mA
V_{REF} vs. Temperature	dV_{REF}/dT	T_{amb} = – 40...+85°C		±90	±140	ppm/°C
Line Regulation	dV_{REF}/dV	V_{CC} = 6V...35V		30	80	ppm/V
	dV_{REF}/dV	V_{CC} = 6V...35V, I_{REF} ≈ 5mA		60	150	ppm/V
Load Regulation	dV_{REF}/dI			0.05	0.10	%/mA
	dV_{REF}/dI	I_{REF} ≈ 5mA		0.06	0.15	%/mA
Current/Voltage Source OP2						
Internal Reference	V_{BG}		1.20	1.27	1.35	V
V_{BG} vs. Temperature	dV_{BG}/dT	T_{amb} = – 40...+85°C		±60	±140	ppm/°C
Current Source: $I_{CV} = V_{BG}/R_{SET}$						
Adjustable Current Range	I_{CVREF}		0		10	mA
Output Voltage	V_{CVREF}	V_{CC} < 18V	V_{BG}		V_{CC} – 4	V
	V_{CVREF}	V_{CC} ≥ 18V	V_{BG}		13	V
Voltage Source: $V_{CV} = V_{BG}\,(1 + R_4 / R_3)$						
Adjustable Voltage Range	V_{CVREF}	V_{CC} < 18V	0.4		V_{CC} – 4	V
	V_{CVREF}	V_{CC} ≥ 18V	0.4		13	V
Output Current	I_{CVREF}	Source, $R_3 + R_4 \geq 100k\Omega$			10	mA
	I_{CVREF}	Sink			–100	µA
Load Capacitance @ *CVREF*	C_{CVREF}	Source mode	0	1	10	nF

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Voltage Output Stage OP1						
Adjustable Gain	G_{OP1}		1			
Input Range	IR	V_{CC} < 10V	0		V_{CC} – 5	V
	IR	V_{CC} ≥ 10V	0		5	V
Power Supply Rejection Ratio	$PSRR$		80	90		dB
Offset Voltage	V_{OS}			±0.5	±2	mV
V_{OS} vs. Temperature	dV_{OS}/dT			±3	±7	µV/°C
Input Bias Current	I_B			5	12	nA
I_B vs. Temperature	dI_B/dT			3.5	10	pA/°C
Output Voltage Range	V_{OUT}	V_{CC} < 18V	0		V_{CC} – 5	V
	V_{OUT}	V_{CC} ≥ 18V	0		13	V
Output Current Limitation	I_{LIM}	V_{OUT} ≥ 10V, $R_1 + R_2$ ≥ 100kΩ	5	7	10	mA
Output Current	I_{OUT}	Source	0		I_{LIM}	mA
Output Resistance	R_{OUT}	Source		0.5		Ω
Load Resistance	R_L		2	10	100	kΩ
Load Capacitance @ *VOUT*	C_L		0		500	nF
Protection Functions						
Protection against reverse polarity		*Ground* vs. V_{CC} vs. V_{OUT}, R_1 ≥ 20kΩ			35	V

Currents flowing into the IC are negative

BOUNDARY CONDITIONS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Sum Gain Resistors	$R_1 + R_2$		20	100	200	kΩ
Sum Reference Adjustment Resistors	$R_3 + R_4$		20	100	200	kΩ
Stabilisation Capacitance @ *VREF*	C_1		1.9	2.2	5.0	µF

BLOCK DIAGRAM AND PINOUT AM461

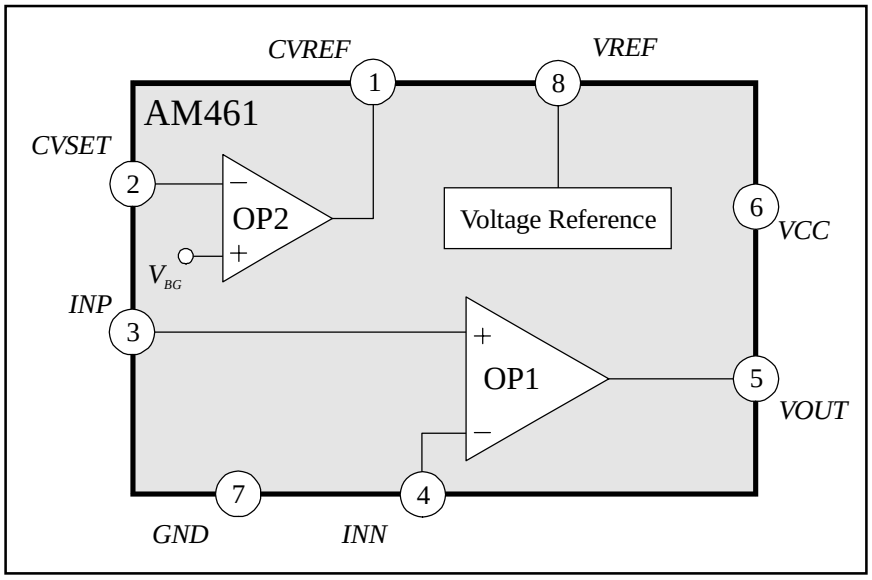

Figure 2: Block diagram AM461

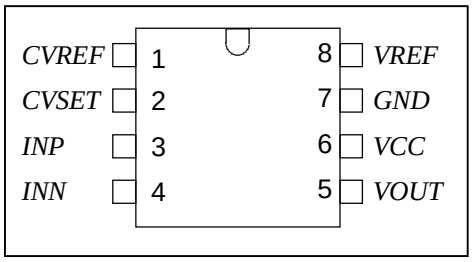

Figure 3: Pinout AM461

PIN	NAME	DESIGNATION
1	*CVREF*	Output OP2
2	*CVSET*	Input OP2
3	*INP*	Positive input OP1
4	*INN*	Negative input OP1
5	*VOUT*	Voltage output
6	*VCC*	Supply voltage
7	*GND*	IC ground
8	*VREF*	Output voltage reference

Table1: Pinout AM461

PRINCIPLE APPLICATION EXAMPLES

- Application as processor interface

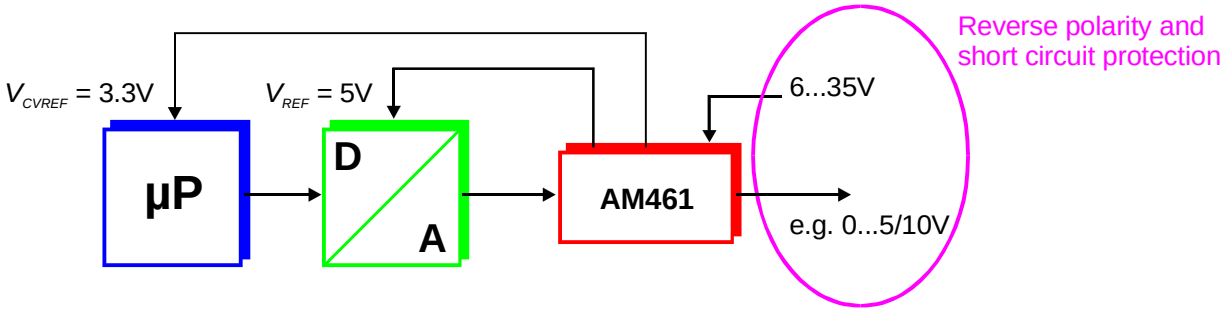

Figure 4: Application as processor interface

- Application as amplifier IC and impedance converter

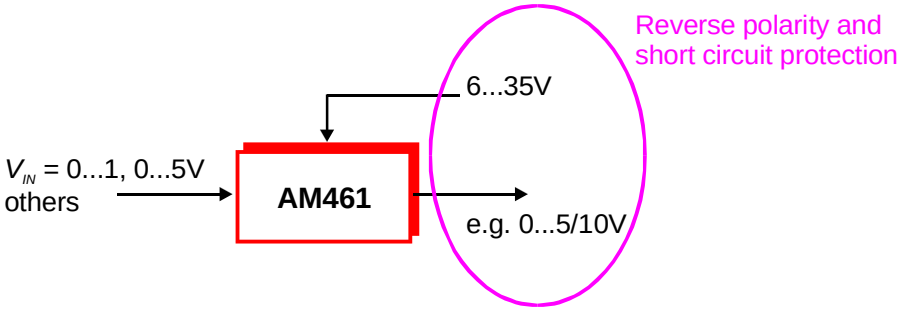

Figure 5: Application as amplifier IC and impedance converter

- Application as voltage regulator and protection IC for controllers

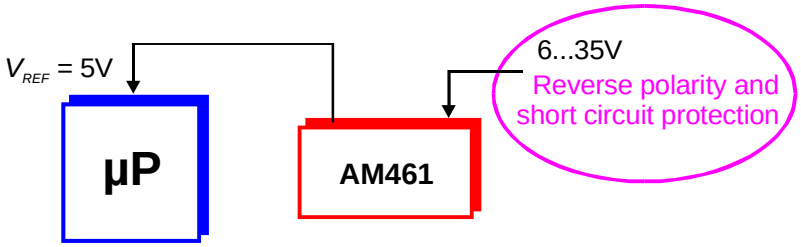

Figure 6: Application as voltage regulator and protection IC for controllers

DELIVERY

The AM461 amplifier and protection IC is available in

- DIP08, SO08

ADDITIONAL LITERATURE

[1] Concept of Frame ASICs: http://www.Frame-ASIC.com/

[2] Analog Microelectronics‘ Homepage: http://www.analogmicro.info/

NOTES