LOW POWER QUAD OPERATIONAL AMPLIFIERS AZ324

General Description

The AZ324 consists of four independent, high gain and internally frequency compensated operational amplifiers. It is specifically designed to operate from a single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltages.

The AZ324 series are compatible with industry standard 324.

The AZ324 series are available in 2 Packages: DIP-14 and SOIC-14.

Features

- Internally Frequency Compensated for Unity Gain
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mV (Typical)
- Low Supply Current: 0.5mA (Typical)
- Wide Power Supply Voltage Range:
  Single Supply: 3V to 18V
  Dual Supplies: ±1.5V to ±9V
- Input Common Mode Voltage Range Includes Ground
- Large Output Voltage Swing: 0V to V_{CC}-1.5V
- Power Drain Suitable for Battery Operation

Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

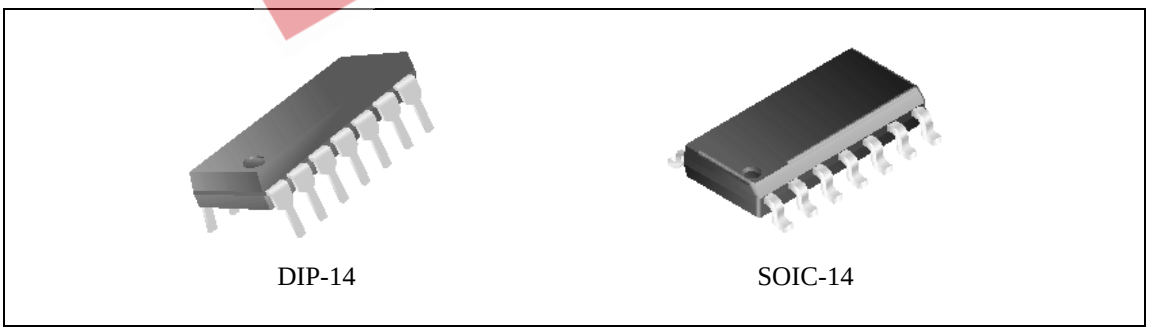
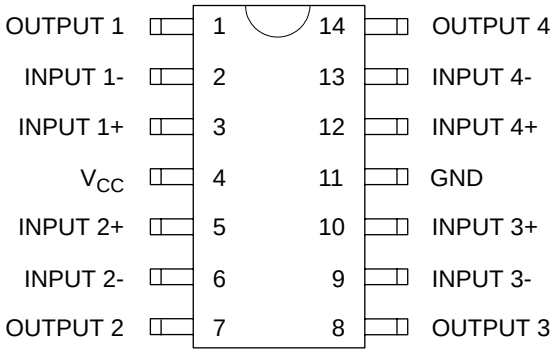


Figure 1. Package Types of AZ324

Pin Configuration

M Package/P Package

(SOIC-14/DIP-14)



Top View

Figure 2. Pin Configuration of AZ324

Functional Block Diagram

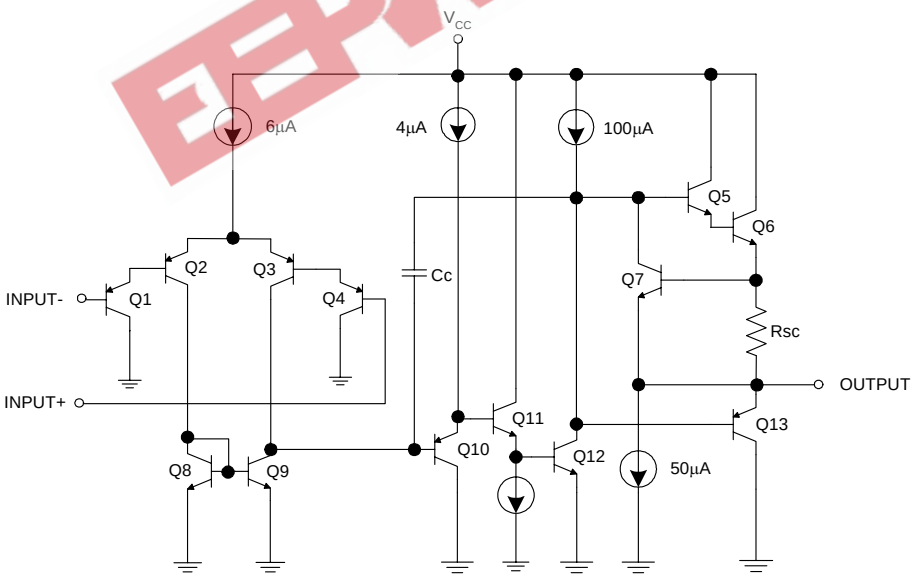
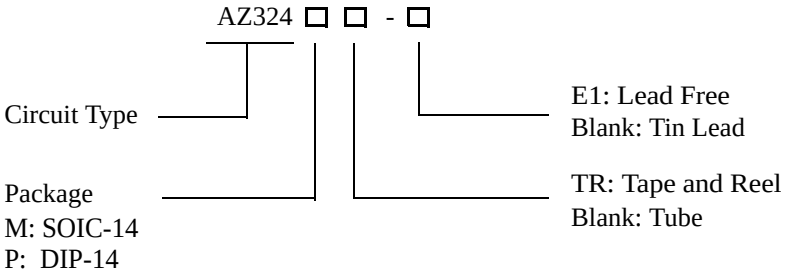


Figure 3. Functional Block Diagram of AZ324

(Each Amplifier)

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOIC-14	-40 to 85 °C	AZ324M	AZ324M-E1	AZ324M	AZ324M-E1	Tube
		AZ324MTR	AZ324MTR-E1	AZ324M	AZ324M-E1	Tape & Reel
DIP-14	-40 to 85 °C	AZ324P	AZ324P-E1	AZ324P	AZ324P-E1	Tube

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value		Unit
Power Supply Voltage	V_{CC}	20		V
Differential Input Voltage	V_{ID}	20		V
Input Voltage	V_{IC}	-0.3 to 20		V
Input Current (V_{IN}<-0.3V) (Note 2)		50		mA
Output Short Circuit to Ground (One Amplifier) V_{CC}≤12V and T_A=25°C (Note 3)		Continuous		
Power Dissipation (T_A=25°C)	P_D	DIP	1130	mW
		SOIC	800	
Operating Junction Temperature	T_J	150		°C
Storage Temperature Range	T_{STG}	-65 to 150		°C
Lead Temperature (Soldering, 10 Seconds)	T_{LEAD}	260		°C

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device under these conditions is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: This input current will only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistors becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also lateral NPN parasitic transistor action on the IC chip. This transistor action can cause the output voltages of the op amps to go to the V_{CC} voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative. This is not destructive and normal output states will re-establish when the input voltage, which was negative, again returns to a value greater than -0.3V (at 25°C)

Note 3: Short circuits from the output to V_{CC} can cause excessive heating and eventual destruction. When considering short circuits to ground, the maximum output current is approximately 40mA independent of the magnitude of V_{CC}. At values of supply voltage in excess of +12V, continuous short circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	3	18	V
Ambient Operating Temperature Range	T_A	-40	85	°C

Electrical Characteristics

Operating Conditions: V_{CC}=5V, GND=0V, T_A=25 °C unless otherwise specified.

Parameter		Symbol	Test Conditions		Min	Typ	Max	Unit
Input Offset Voltage		V_{IO}	V_O=1.4V, R_S=0Ω, V_{CC}=5V to 15V			2	5	mV
Input Bias Current (Note 4)		I_{BIAS}	I_{IN}+ or I_{IN}-, V_{CM}=0V			20	200	nA
Input Offset Current		I_{IO}	I_{IN}+ - I_{IN}-, V_{CM}=0V			5	50	nA
Input Common Mode Voltage Range (Note 5)		V_{IR}	V_{CC}=15V		0		V_{CC}-1.5	V
Supply Current		I_{CC}	R_L=∞, Over full temperature range on all OP Amps	V_{CC}=15V		1	2	mA
				V_{CC}=5V		0.5	1.2	
Large Signal Voltage Gain		G_V	V_{CC}=15V, R_L≥ 2kΩ, V_O=1V to 11V		85	100		dB
Common Mode Rejection Ratio		CMRR	DC, V_{CC}=15V, V_{CM}=0V to (V_{CC}-1.5)V		65	85		dB
Power Supply Rejection Ratio		PSRR	V_{CC}=5V to 15V		70	90		dB
Channel Separation (Note 6)		CS	f=1KHz to 20KHz (Input Referred)			-120		dB
Output Current	Source	I_{SOURCE}	V_{IN}+=1V, V_{IN}-=0V, V_{CC}=15V, V_O=2V		20	45		mA
	Sink	I_{SINK}	V_{IN}+=0V, V_{IN}-=1V, V_{CC}=15V, V_O=2V		10	20		mA
			V_{IN}+=0V,V_{IN}-=1V, V_{CC}=15V, V_O=0.2V		12	50		μA
Output Short Circuit to Ground		I_{SC}	V_{CC}=15V			45	60	mA
Output Voltage Swing		V_{OH}	V_{CC}=15V, R_L=2kΩ		12			V
			V_{CC}=15V, R_L=10kΩ		12.5	13.5		
		V_{OL}	V_{CC}=5V, R_L=10kΩ			5	20	mV

Note 4: The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.

Note 5: The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at 25°C). The upper end of the common-mode voltage range is $_{VCC}$-1.5V (at 25°C), but either or both inputs can go to +18V without damages, independent of the magnitude of the V_{CC}.

Note 6: Due to proximity of external components, insure that coupling is not originating via stray capacitors between these external parts. This typically can be detected as this type of capacitance increases at higher frequencies.

Typical Performance Characteristics

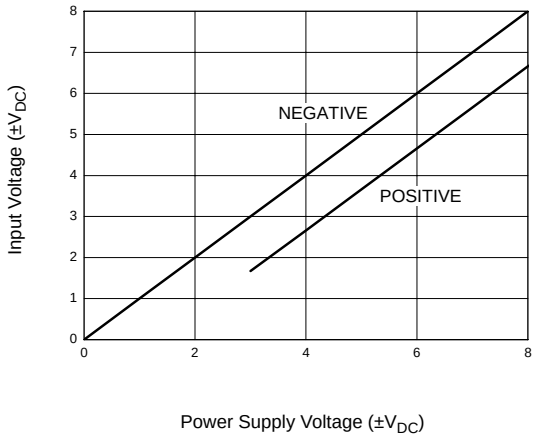


Figure 4. Input Voltage Range

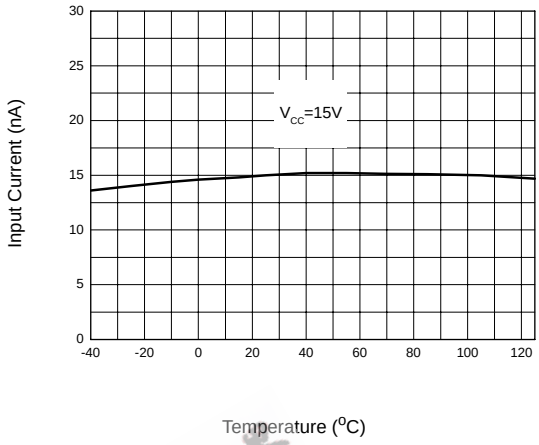


Figure 5. Input Current

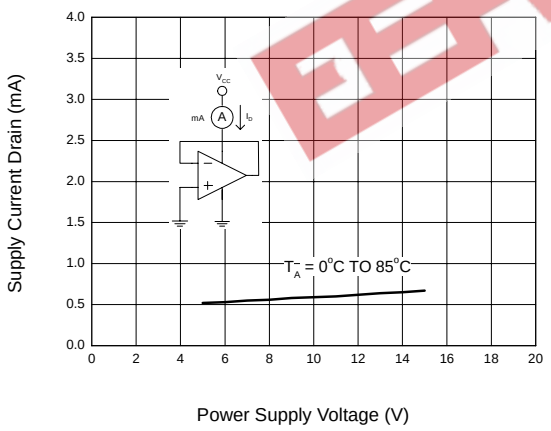


Figure 6. Supply Current

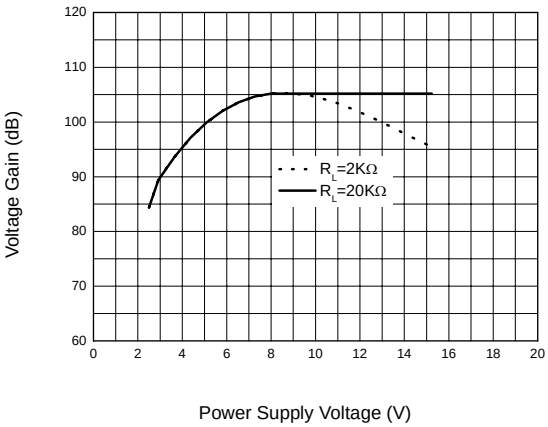


Figure 7. Voltage Gain

Typical Performance Characteristics (Continued)

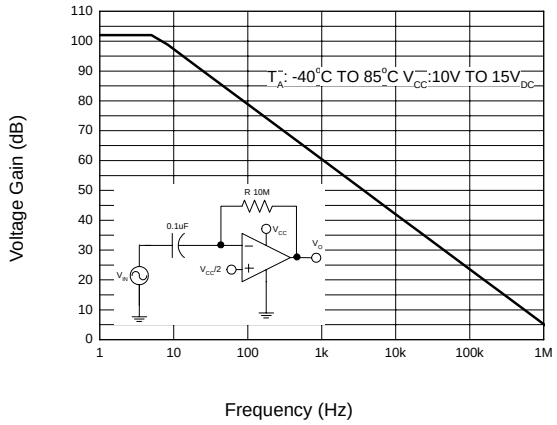


Figure 8. Open Loop Frequency Response

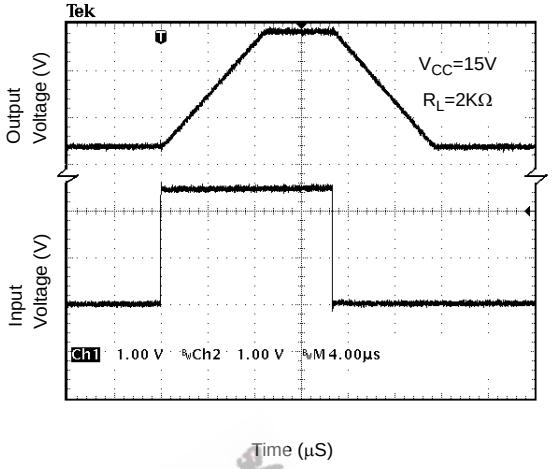


Figure 9. Voltage Follower Pulse Response

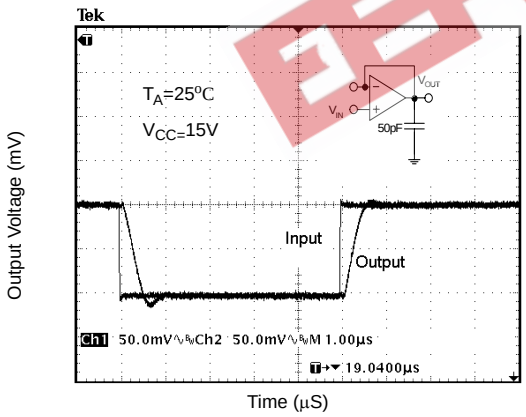


Figure 10. Voltage Follower Pulse Response (Small Signal)

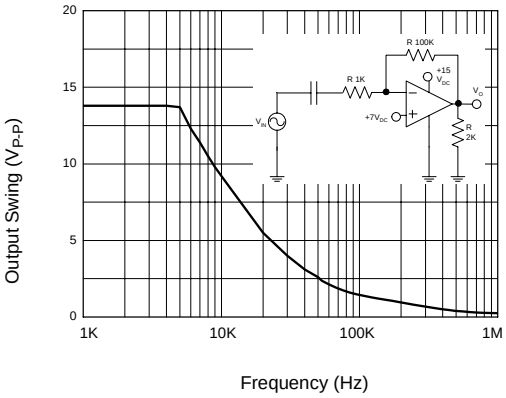


Figure 11. Large Signal Frequency Response

Typical Performance Characteristics (Continued)

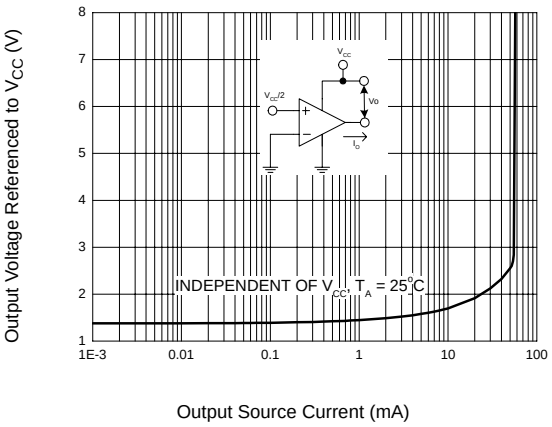


Figure 12. Output Characteristics Current Sourcing

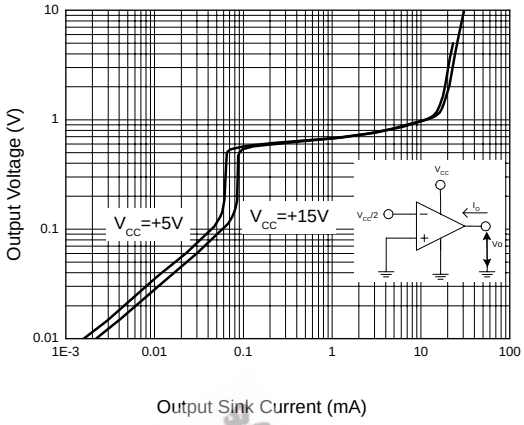


Figure 13. Output Characteristics Current Sinking

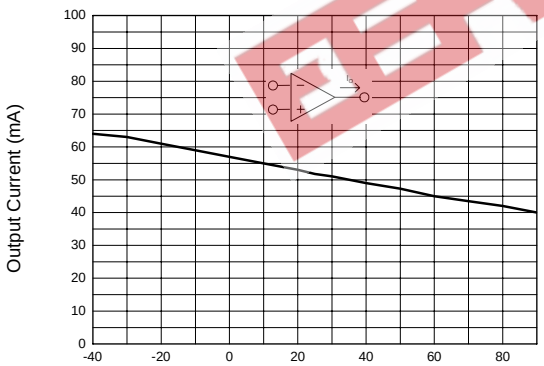


Figure 14. Current Limiting

Typical Applications

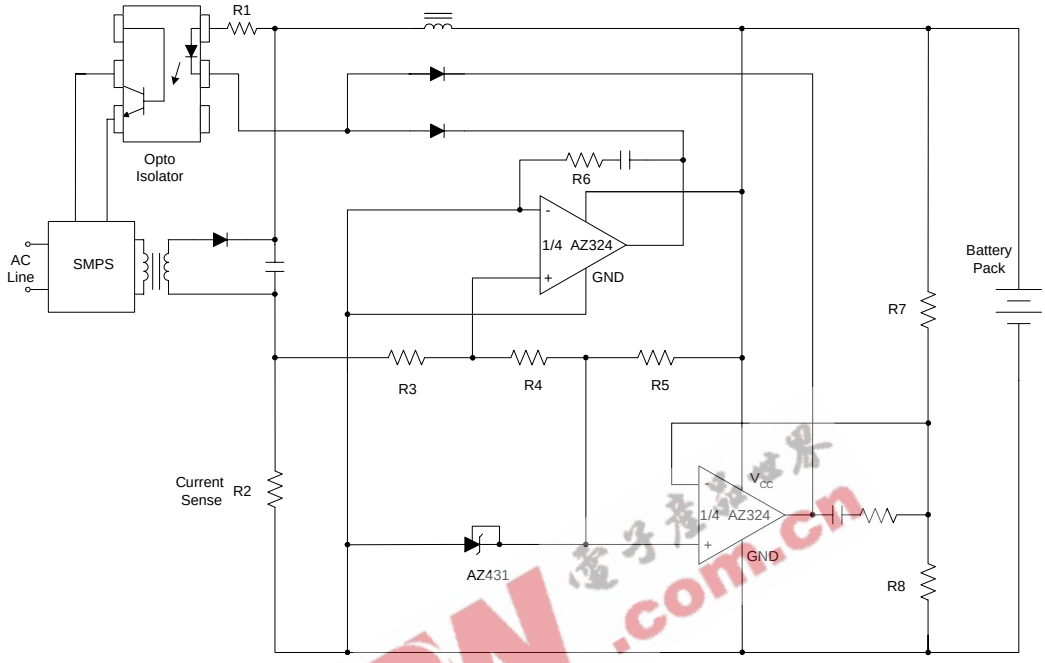


Figure 15. Battery Charger

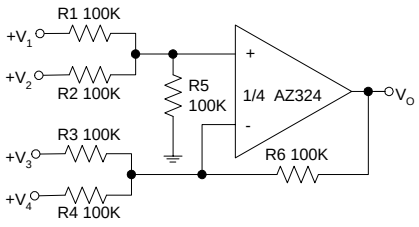


Figure 16. DC Summing Amplifier

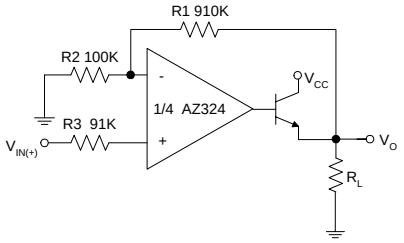


Figure 17. Power Amplifier

Typical Applications (Continued)

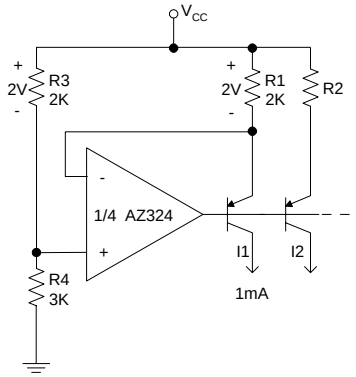


Figure 18. Fixed Current Sources

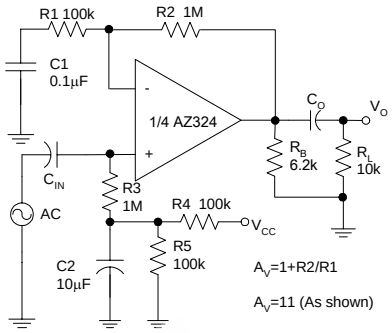


Figure 19. AC Coupled Non-Inverting Amplifier

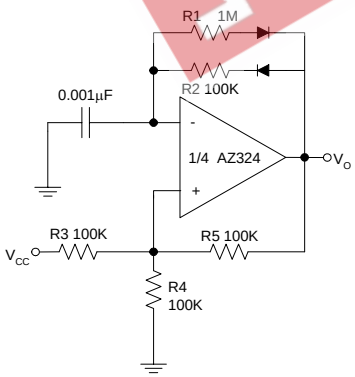


Figure 20. Pulse Generator

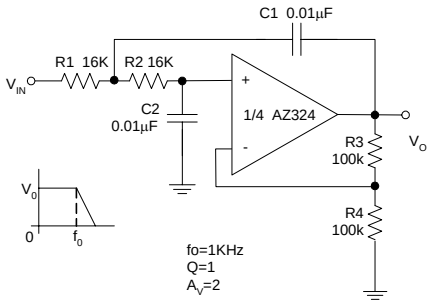
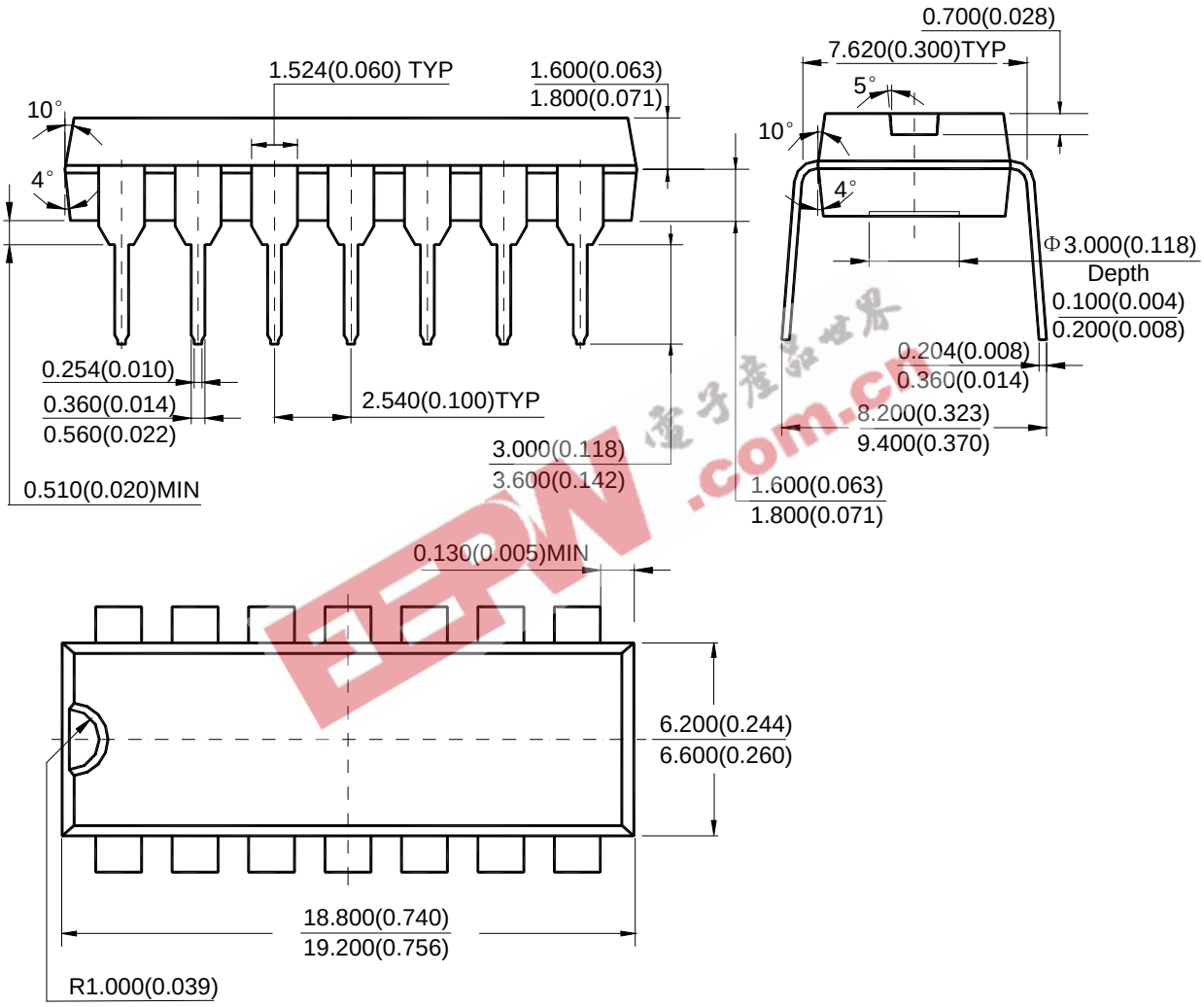


Figure 21. DC Coupled Low-Pass RC Active Filter

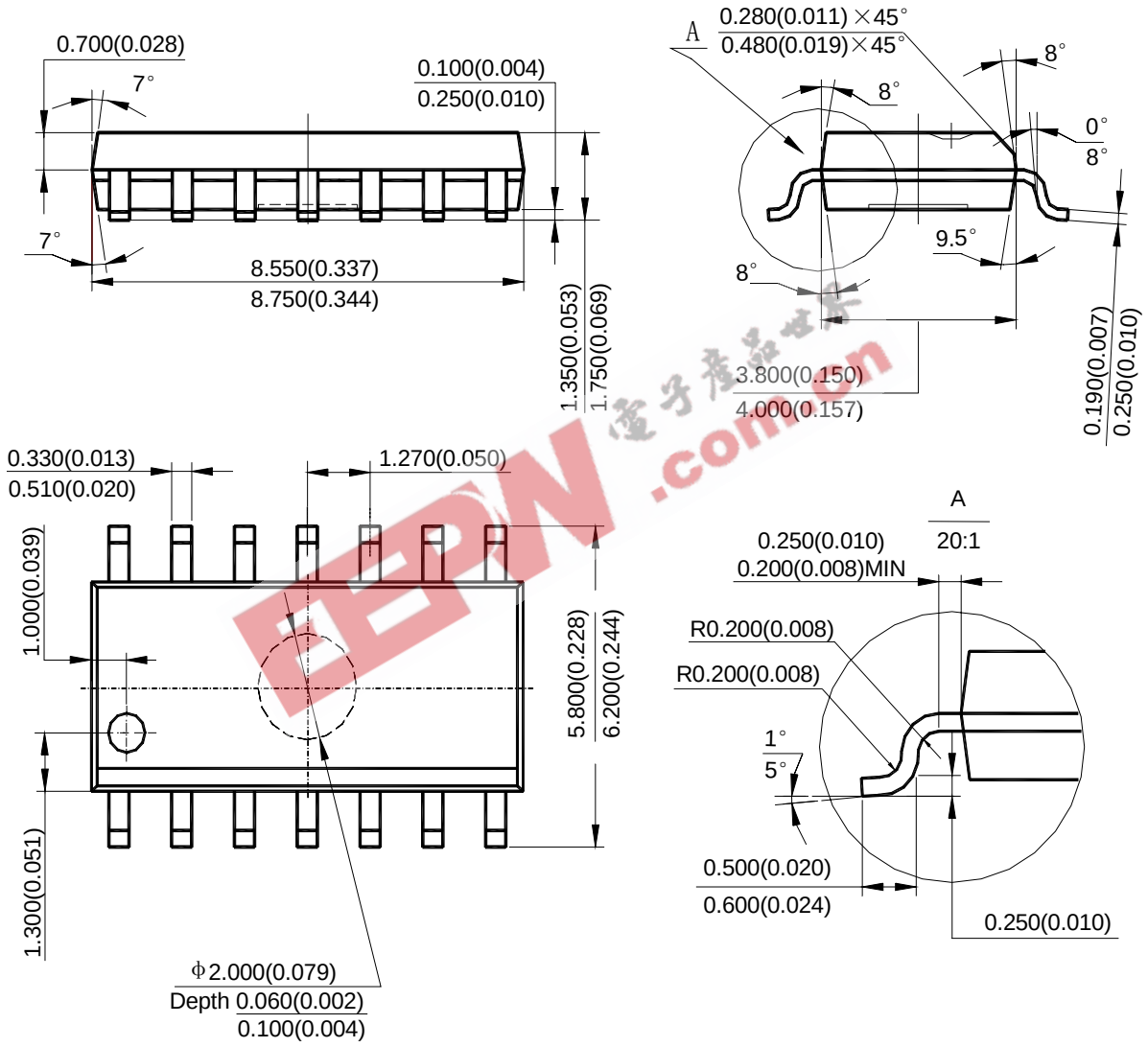
Mechanical Dimensions

DIP-14 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

SOIC-14 **Unit: mm(inch)**



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