LOW POWER DUAL OPERATIONAL AMPLIFIERS AS358/358A

General Description

The AS358/358A consist of two independent, high gain and internally frequency compensated operational amplifiers, they are 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. Typical applications include transducer amplifiers, DC gain blocks and most conventional operational amplifier circuits.

The AS358/358A series are compatible with industry standard 358. AS358A has more stringent input offset voltage than AS358.

The AS358 is available in DIP-8, TDIP-8, SOIC-8, TSSOP-8 and MSOP-8 packages, AS358A is available in DIP-8 and SOIC-8 packages.

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:
  Single Supply: 3V to 36V
  Dual Supplies: ± 1.5V to ± 18V
- Input Common Mode Voltage Range Includes Ground
- Large Output Voltage Swing: 0V to V_{CC} -1.5V

Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

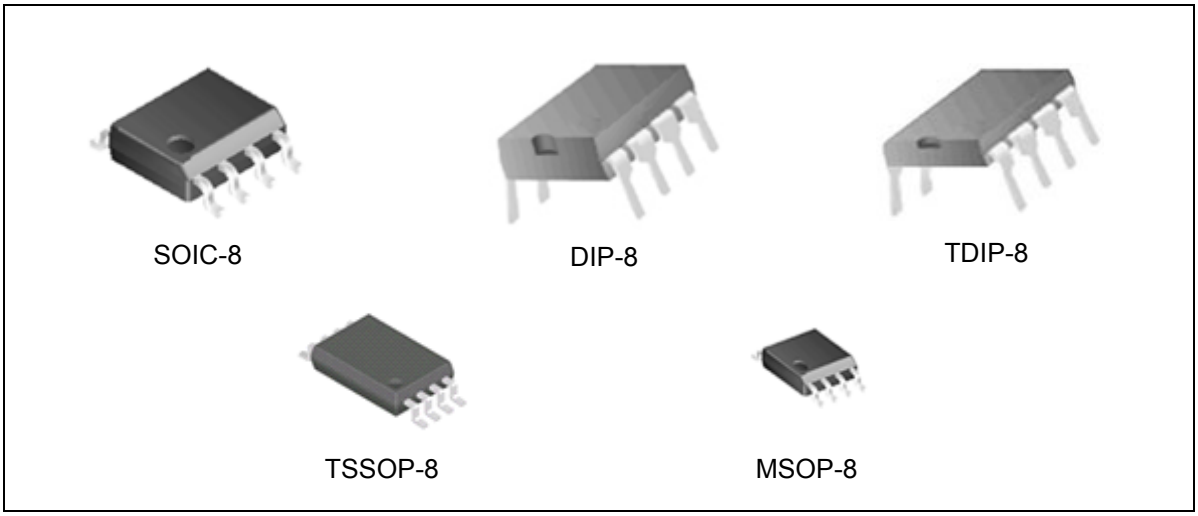
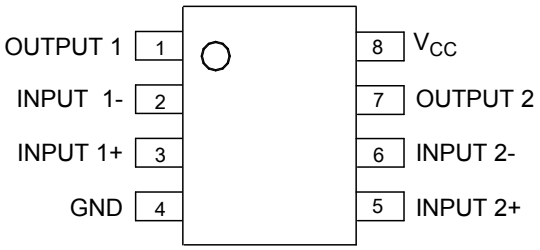


Figure 1. Package Types of AS358/358A

Pin Configuration

M/G/MM Package
(SOIC-8/TSSOP-8/MSOP-8)



P/PT Package
(DIP-8/TDIP-8)

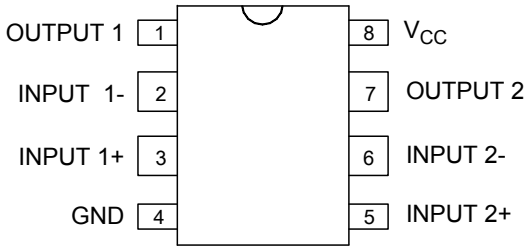


Figure 2. Pin Configuration of AS358/358A (Top View)

Functional Block Diagram

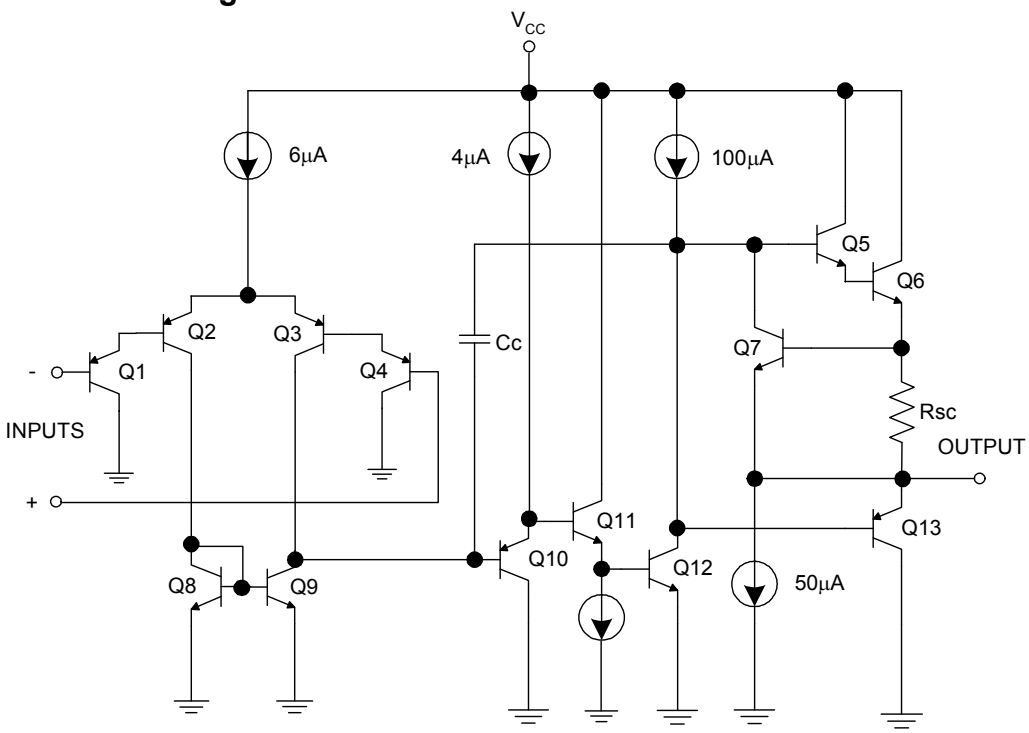
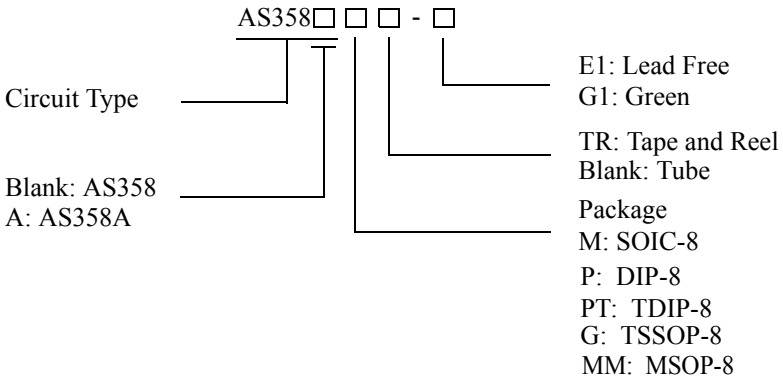


Figure 3. Functional Block Diagram of AS358/358A

(Each Amplifier)

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
SOIC-8	-40 to 85°C	AS358M-E1	AS358M-G1	AS358M-E1	AS358M-G1	Tube
		AS358MTR-E1	AS358MTR-G1	AS358M-E1	AS358M-G1	Tape & Reel
		AS358AM-E1	AS358AM-G1	AS358AM-E1	AS358AM-G1	Tube
		AS358AMTR-E1	AS358AMTR-G1	AS358AM-E1	AS358AM-G1	Tape & Reel
DIP-8	-40 to 85°C	AS358P-E1	AS358P-G1	AS358P-E1	AS358P-G1	Tube
		AS358AP-E1	AS358AP-G1	AS358AP-E1	AS358AP-G1	Tube
TDIP-8	-40 to 85°C		AS358PT-G1		AS358PT-G1	Tube
TSSOP-8	-40 to 85°C	AS358GTR-E1	AS358GTR-G1	EG3A	GG3A	Tape & Reel
MSOP-8	-40 to 85°C	AS358MMTR-E1	AS358MMTR-G1	AS358MM-E1	AS358MM-G1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value		Unit
Power Supply Voltage	V_{CC}	40		V
Differential Input Voltage	V_{ID}	40		V
Input Voltage	V_{IC}	-0.3 to 40		V
Power Dissipation (T_A=25°C)	P_D	DIP-8	830	mW
		SOIC-8	550	
		TSSOP-8	500	
		MSOP-8	470	
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 at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	3	36	V
Ambient Operating Temperature Range	T_A	-40	85	°C

Electrical Characteristics

Limits in standard typeface are for T_A=25°C, **bold** typeface applies over -40°C to 85°C (Note 2), V_{CC}=5V, GND=0V, 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 30V	AS358		2	5	mV
							7	
				AS358A		2	3	
							5	
Average Temperature Coefficient of Input Offset Voltage		$\Delta V_{IO}/\Delta T$	T_A=-40 to 85°C			7		μV/°C
Input Bias Current		I_{BIAS}	I_{IN}+ or I_{IN}-, V_{CM}=0V			20	200	nA
							200	
Input Offset Current		I_{IO}	I_{IN}+ - I_{IN}-, V_{CM}=0V			5	30	nA
							100	
Input Common Mode Voltage Range (Note 3)		V_{IR}	V_{CC}=30V		0		V_{CC}-1.5	V
Supply Current		I_{CC}	T_A=-40 to 85°C, R_L=∞, V_{CC}=30V			0.7	2	mA
			T_A=-40 to 85°C, R_L=∞, V_{CC}=5V			0.5	1.2	
Large Signal Voltage Gain		G_V	V_{CC}=15V, V_O=1V to 11V, R_L ≥ 2kΩ		85	100		dB
					80			
Common Mode Rejection Ratio		CMRR	DC, V_{CM}=0V to (V_{CC}-1.5)V		60	70		dB
					60			
Power Supply Rejection Ratio		PSRR	V_{CC}=5V to 30V		70	100		dB
					60			
Channel Separation		CS	f=1kHz to 20kHz			-120		dB
Output Current	Source	I_{SOURCE}	V_{IN}+=1V, V_{IN}-=0V, V_{CC}=15V, V_O=2V		20	40		mA
					20			
	Sink	I_{SINK}	V_{IN}+=0V, V_{IN}-=1V, V_{CC}=15V, V_O=2V		10	15		mA
					5			
			V_{IN}+=0V,V_{IN}-=1V,V_{CC}=15V, V_O=0.2V		12	50		μA
Output Short Circuit Current to Ground		I_{SC}	V_{CC}=15V			40	60	mA
Output Voltage Swing		V_{OH}	V_{CC}=30V, R_L=2kΩ		26			V
					26			
			V_{CC}=30V, R_L=10kΩ		27	28		
					27			
		V_{OL}	V_{CC}=5V, R_L= 10kΩ			5	20	mV
							30	
Thermal Resistance (Junction to Case)		θ_{JC}	DIP-8			53		°C/W
			SOIC-8			78		

Note 2: Limits over the full temperature are guaranteed by design, but not tested in production.

Electrical Characteristics (Continued)

Note 3: 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 V_{CC}-1.5V (at 25°C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V_{CC}.

Typical Performance Characteristics

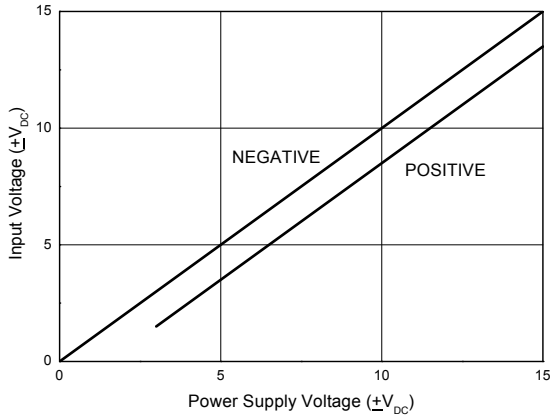


Figure 4. Input Voltage Range

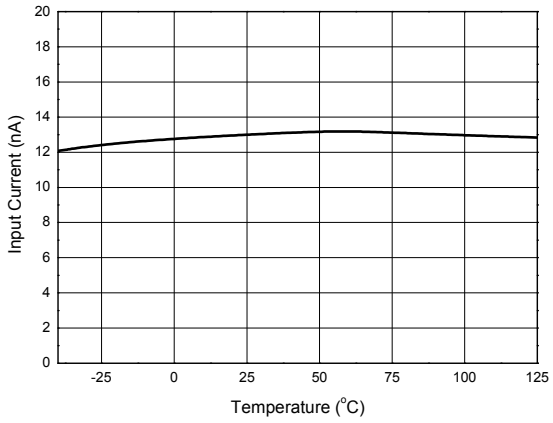


Figure 5. Input Current

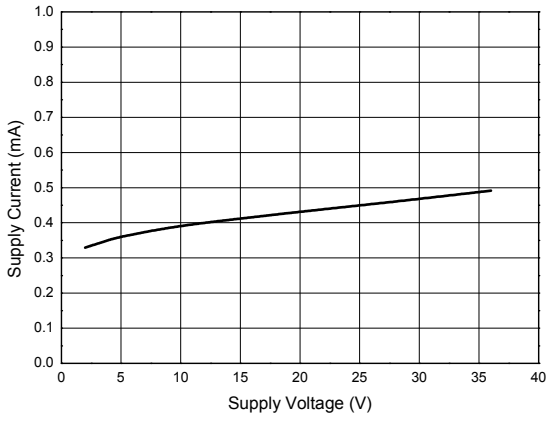


Figure 6. Supply Current

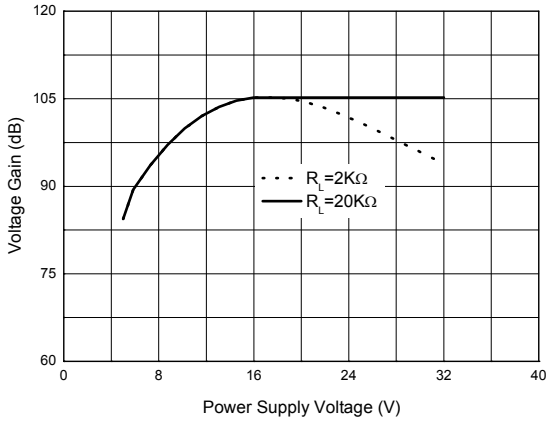


Figure 7. Voltage Gain

Typical Performance Characteristics (Continued)

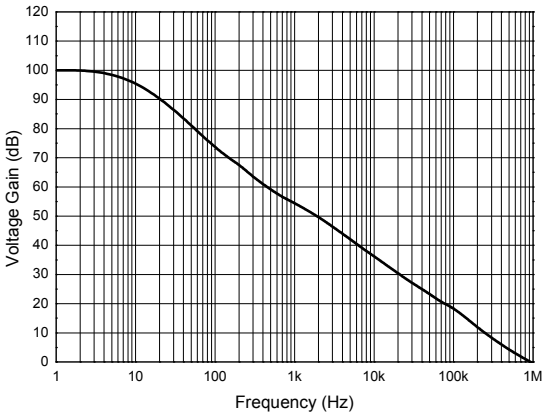


Figure 8. Open Loop Frequency Response

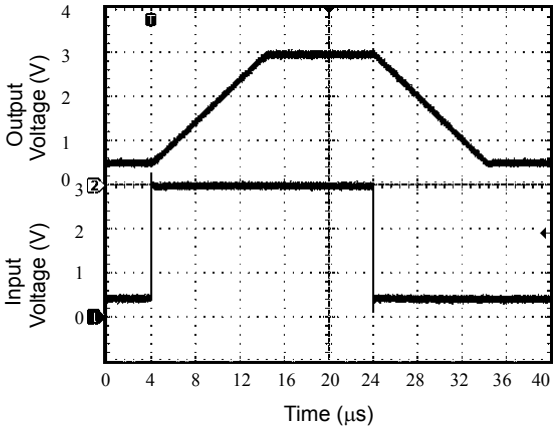


Figure 9. Voltage Follower Pulse Response

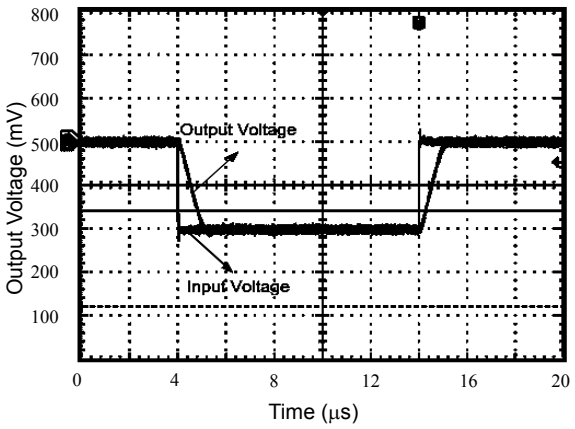


Figure 10. Voltage Follower Pulse Response (Small Signal)

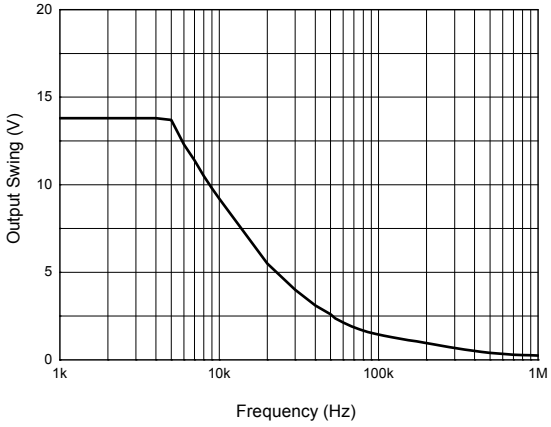


Figure 11. Large Signal Frequency Response

Typical Performance Characteristics (Continued)

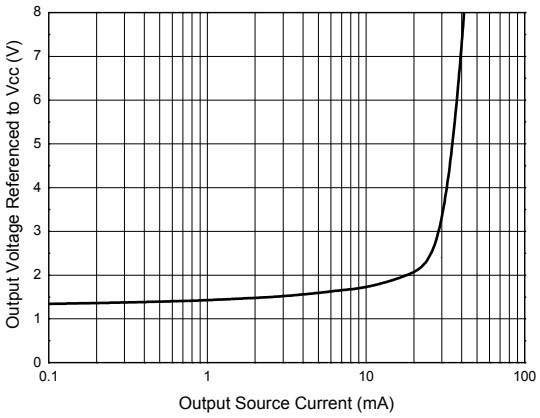


Figure 12. Output Characteristics：Current Sourcing

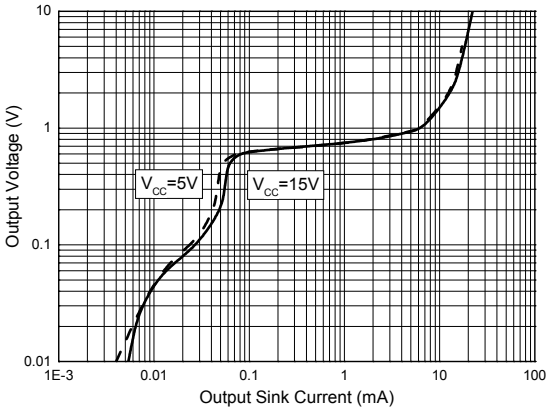


Figure 13. Output Characteristics：Current Sinking

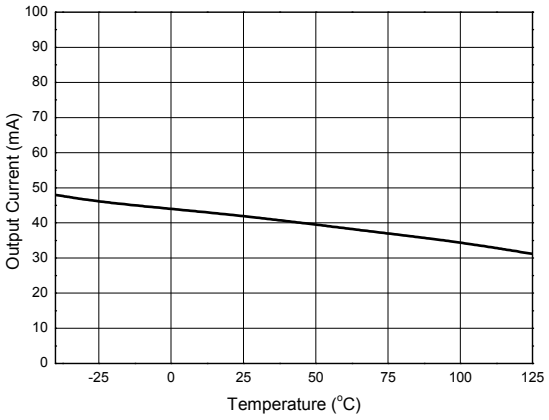


Figure 14. Current Limiting

Typical Application

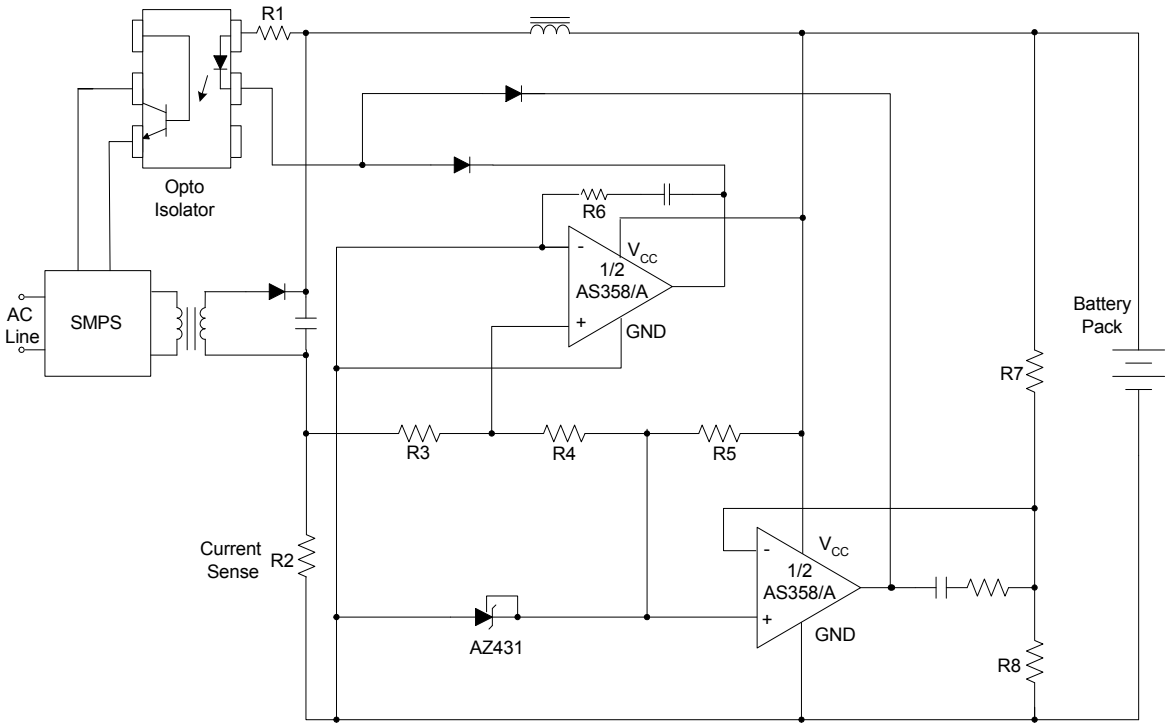


Figure 15. Battery Charger

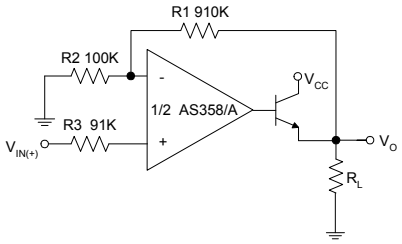


Figure 16. Power Amplifier

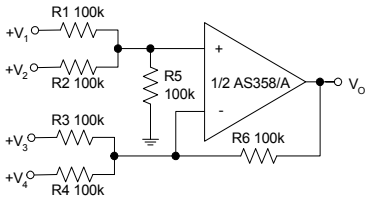


Figure 17. DC Summing Amplifier

Typical Application (Continued)

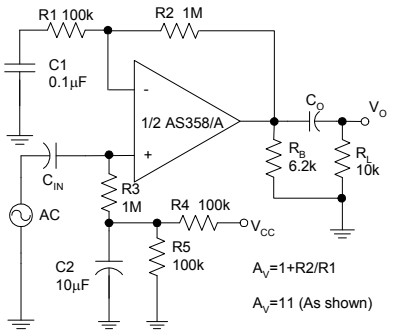


Figure 18. AC Coupled Non-Inverting Amplifier

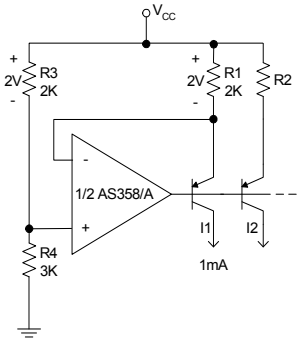


Figure 19. Fixed Current Sources

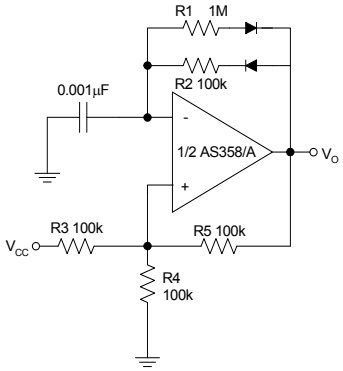


Figure 20. Pulse Generator

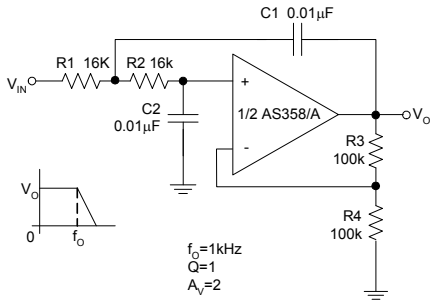
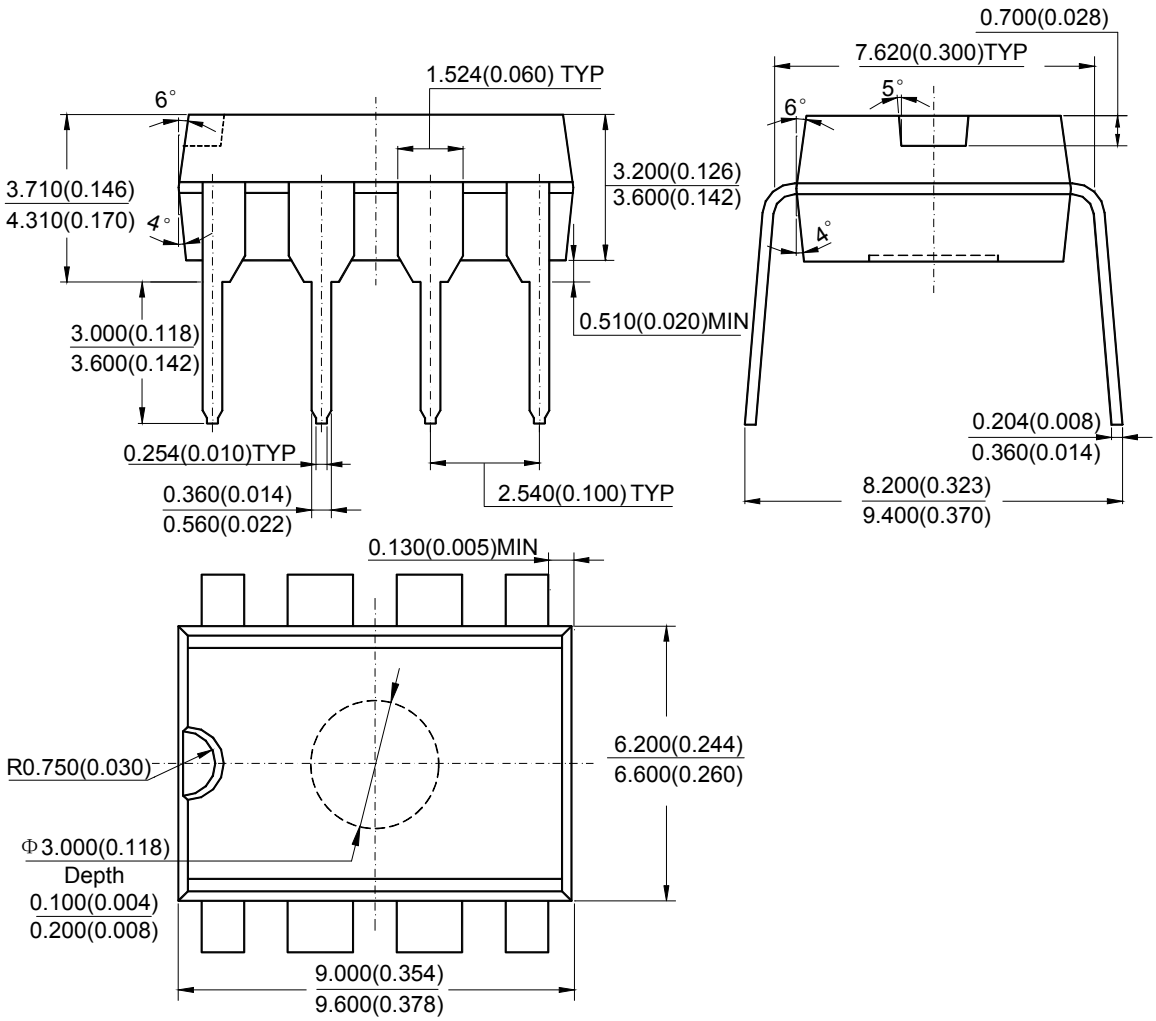


Figure 21. DC Coupled Low-Pass Active Filter

Mechanical Dimensions

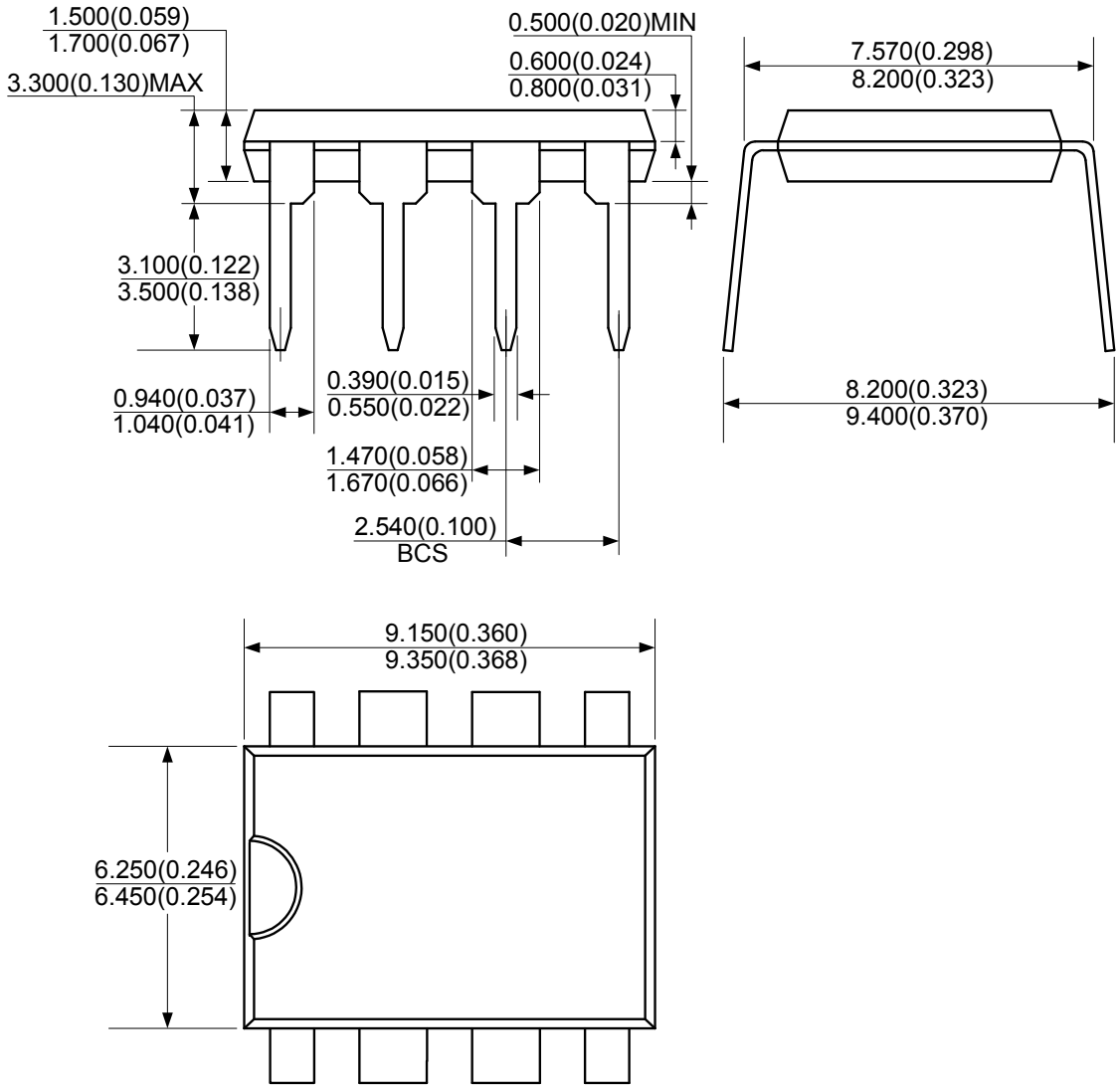
DIP-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mechanical Dimensions (Continued)

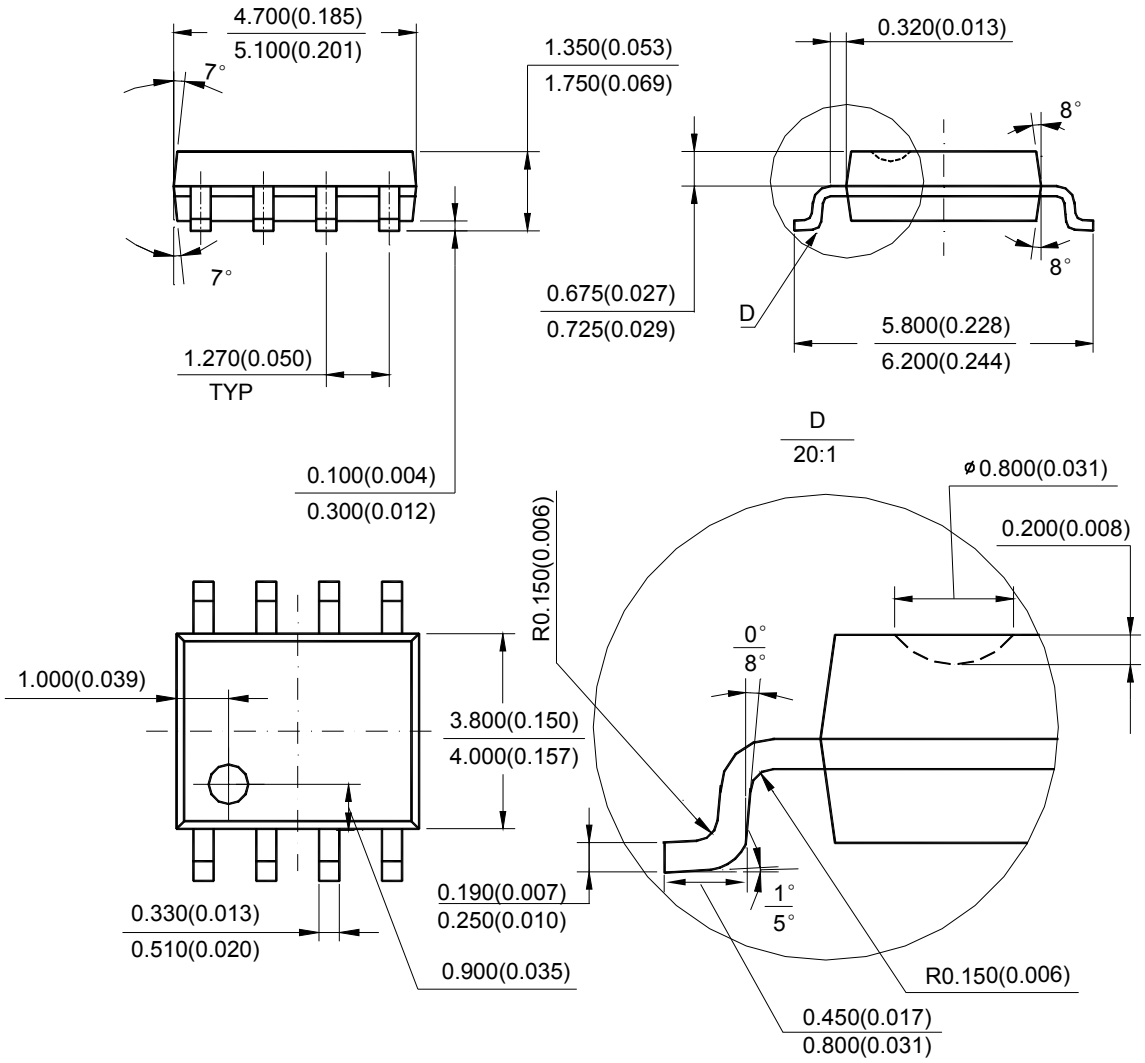
TDIP-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mechanical Dimensions (Continued)

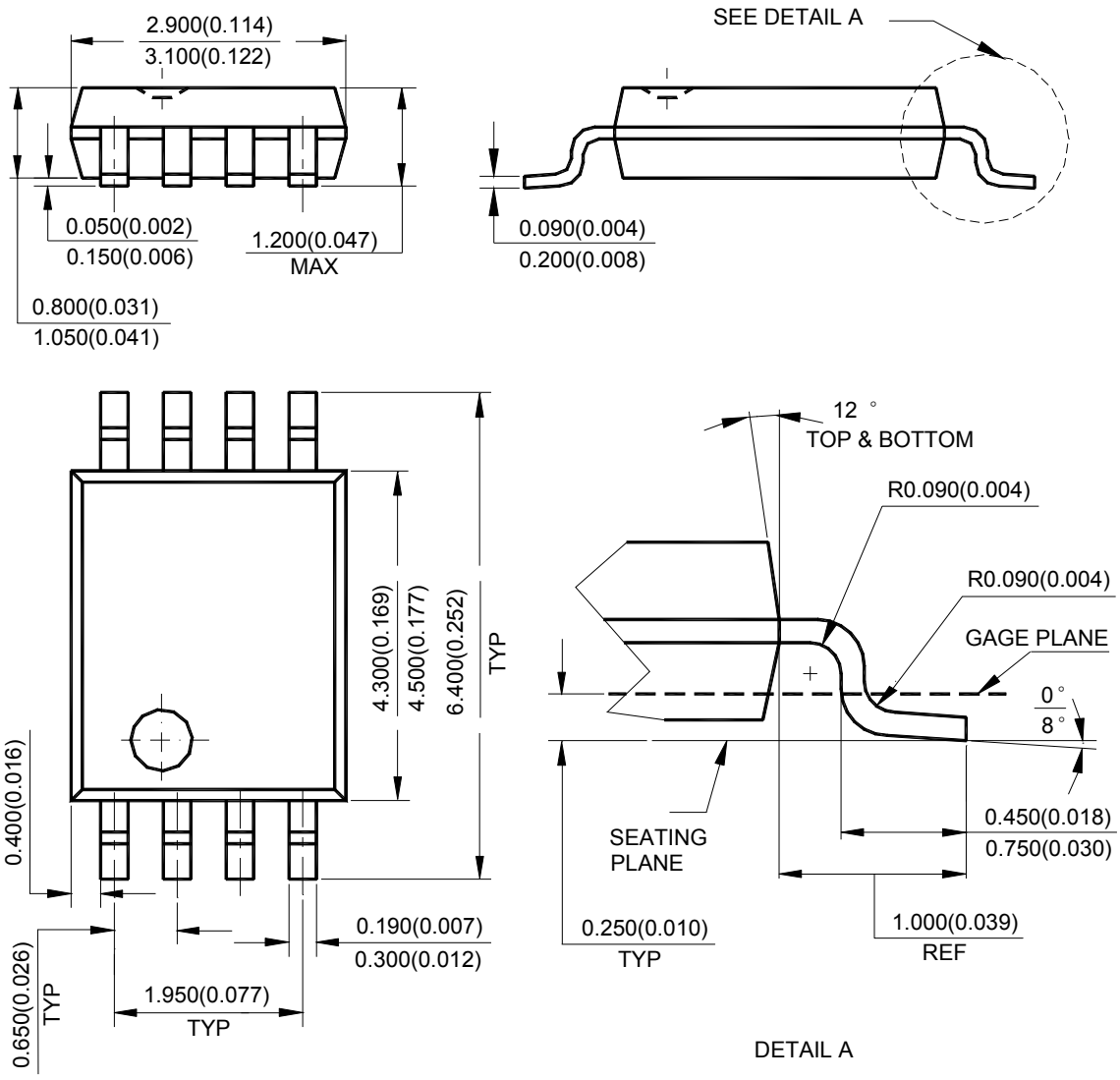
SOIC-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mechanical Dimensions (Continued)

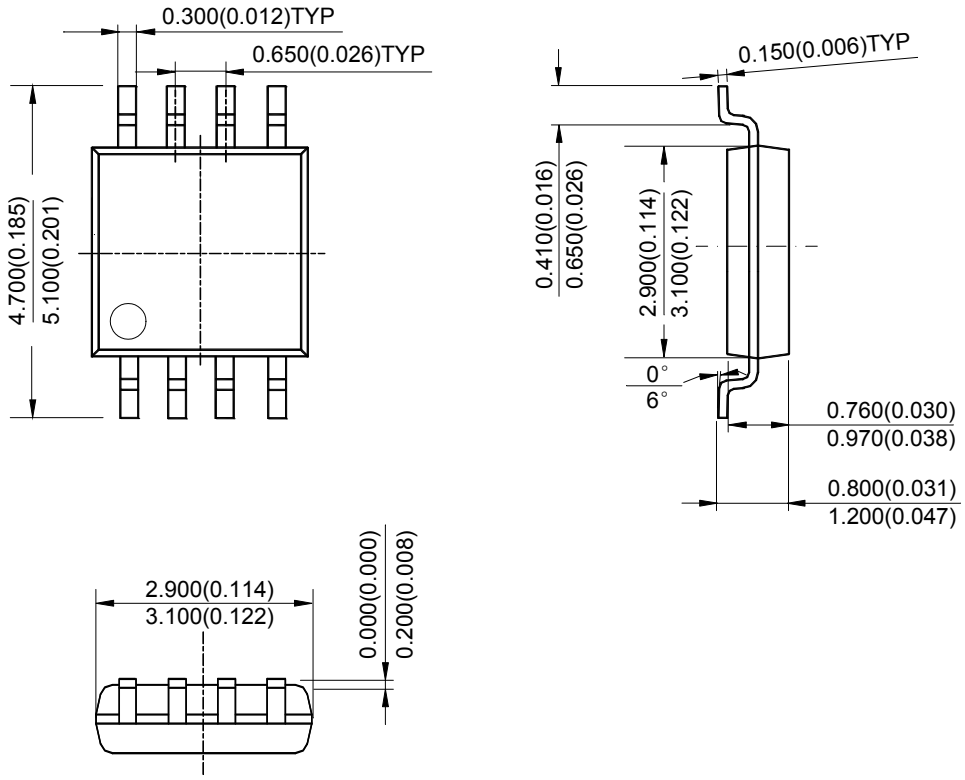
TSSOP-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mechanical Dimensions (Continued)

MSOP-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.



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