

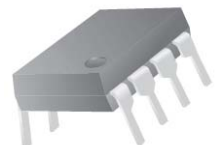
Dual Low Offset Operational Amplifier

General Description

- The LM358A/B series consist of two independent, high gain and internally frequency compensated operational amplifiers. They can 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 LM358A/B is available in SOP-8 and DIP-8 packages.



SOP-8



DIP-8



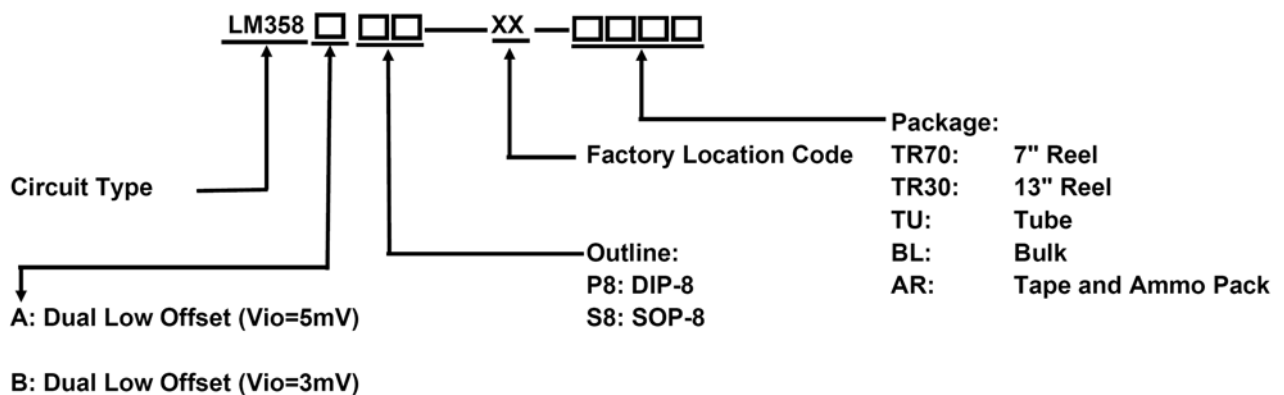
Features

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB Typical
- Wide power supply range:
Single Supply: 3V to 36 V
Dual Supplies: $\pm 1.5V$ to $\pm 18V$
- Input common-mode voltage range include ground
- RoHS Compliance

Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

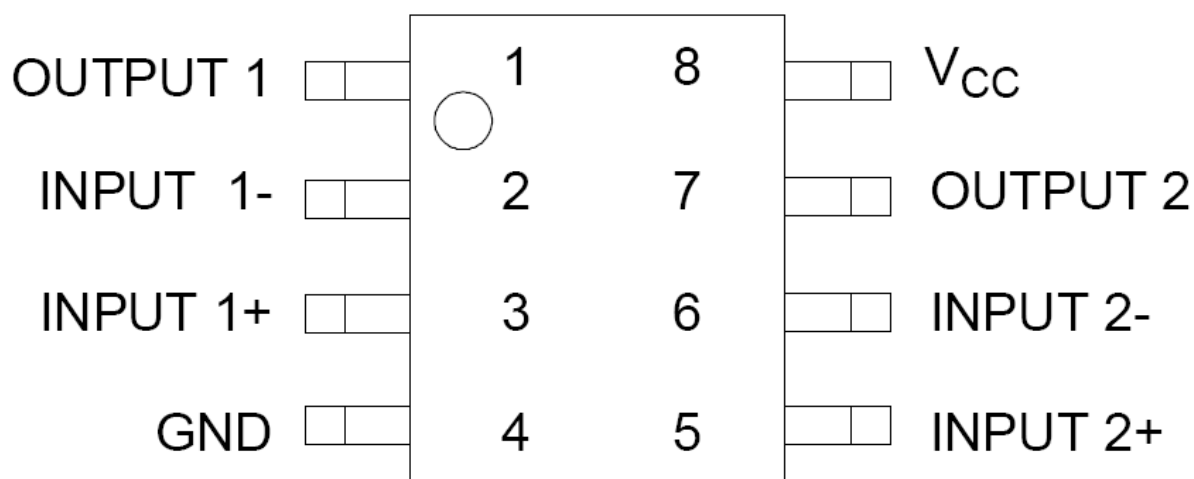
Ordering Information



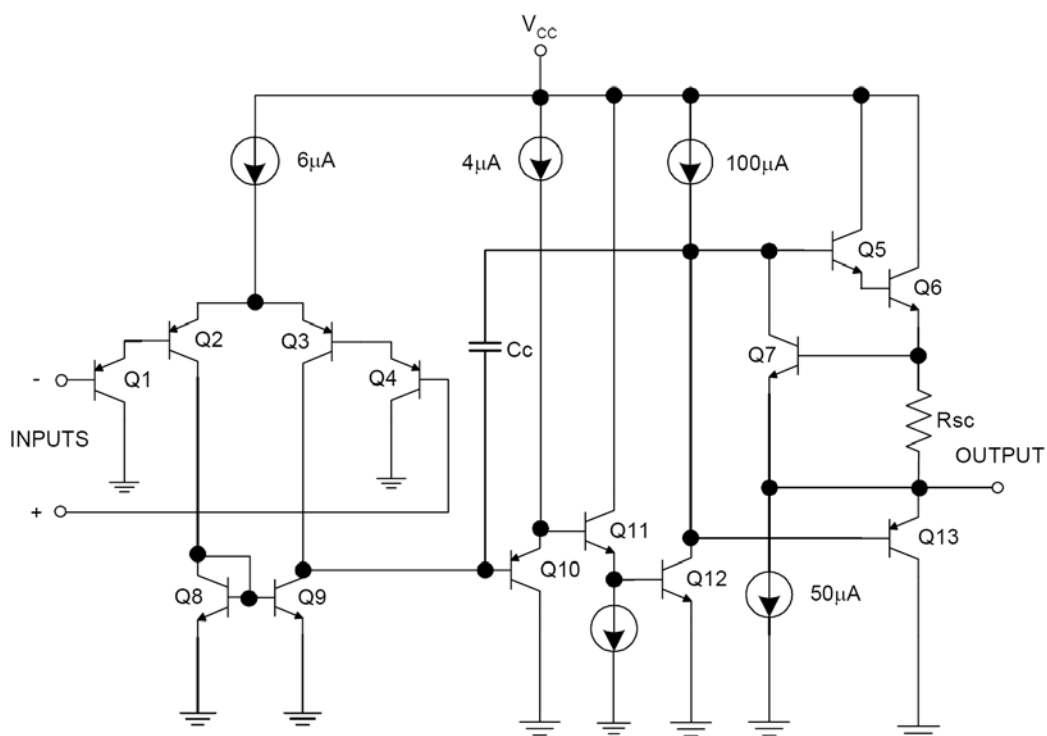
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LM358A LM358B

Internal Block Diagram



Functional Block Diagram



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LM358A LM358B

Absolute Maximum Ratings (Note1)

Symbol	Description	LM358A	LM358B	Unit
V _{CC}	Power Supply Voltage	±18		V
V _{I(DIFF)}	Differential Input Voltage	40		V
V _I	Input Voltage	-0.3 ~ +40		V
P _D	Power Dissipation	SOP-8	550	mW
		DIP-8	830	
T _J	Junction Temperature	150		°C
T _{OPR}	Operating Temperature Range	-40 ~ +85		°C
T _{STG}	Storage Temperature Range	-65 ~ +150		°C
T _L	Lead Temperature (Soldering 10s)	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.

Electrical Characteristics

(V_{CC}=5.0V, V_{EE}=GND, T_A=25°C, -40°C to 85°C (Note2) unless noted otherwise)

Symbol	Description	LM358A			LM358B			Unit	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
V _{IO}	Input Offset Voltage	-	2.0	5.0	-	2.0	3.0	mV	V _O =1.4V, R _S =0Ω V _{CC} =5V to 30V
ΔV _{IO} /ΔT	Average Temperature Coefficient of Input Offset Voltage	-	7.0	-	-	7.0	-	μV/°C	T _A =-40 to 85°C
I _{BIAS}	Input Bias Current	-	20	200	-	-	200	nA	I _{IN+} or I _{IN-} , V _{CM} =0V
I _{IO}	Input Offset Current	-	5	30	-	-	100	nA	I _{IN+} or I _{IN-} , V _{CM} =0V
V _{IR}	Input Common Mode Voltage (Note3)	0	-	V _{CC} -1.5	0	-	V _{CC} -1.5	V	V _{CC} =30V
I _{CC}	Power Supply Current	-	0.7	2.0	-	0.7	2.0	mA	T _A =-40 to 85°C R _L =∞, V _{CC} =30V
		-	0.5	1.2	-	0.5	1.2		T _A =-40 to 85°C R _L =∞, V _{CC} =5V

Dual Low Offset Operational Amplifier

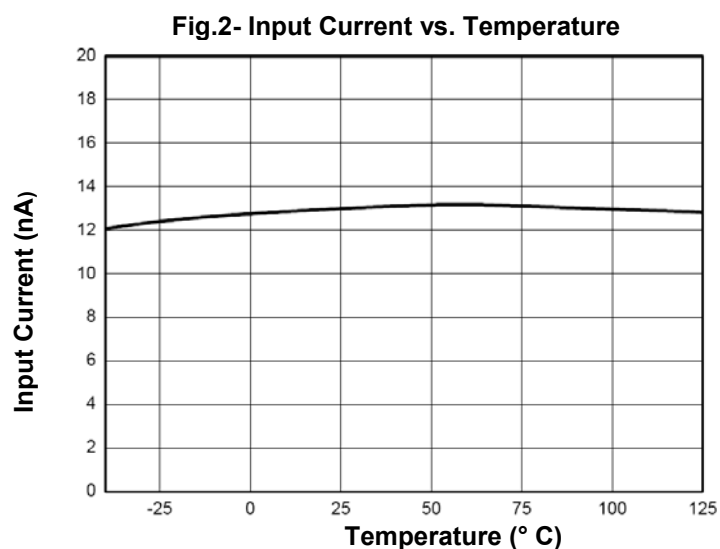
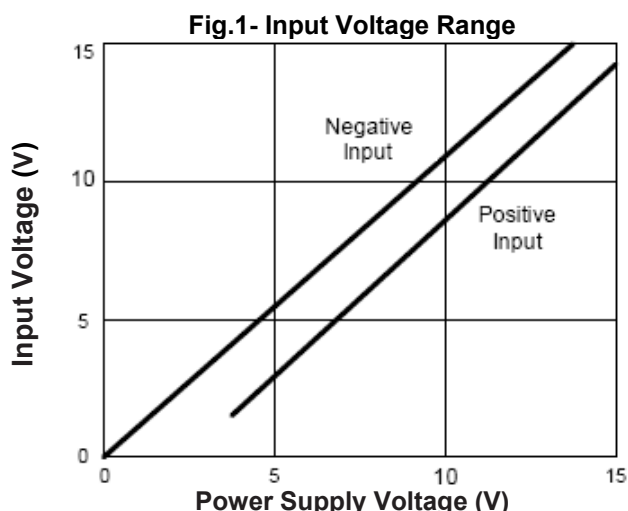
LM358A LM358B

Symbol	Description	LM358A			LM358B			Unit	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Gv	Large Singnal Voltage Gain	85	100	-	80	-	-	dB	$V_{CC}=15V, R_L \geq 2K\Omega$ $V_O=1V \sim 11V$
CMRR	Common Mode Rejection Ratio	60	70	-	60	-	-	dB	DC, $V_{CM}=0V$ to $V_{CC}-1.5V$
PSRR	Power Supply Rejection Ratio	70	100	-	60	-	-	dB	$V_{CC}=5V$ to $30V$
CS	Channel Separation	-	-120	-	-	-120	-	dB	$f=1KHZ \sim 20KHZ$
ISOURCE	Output Current	20	40	-	20	0	-	mA	$V_{I(+)}=1V, V_{I(-)}=0V$ $V_{CC}=15V, V_{O(P)}=2V$
ISINK		10	15	-	5	-	-	mA	$V_{I(+)}=0V, V_{I(-)}=1V$ $V_{CC}=15V, V_{O(P)}=2V$
		12	50	-	12	50	-	mA	$V_{I(+)}=0V, V_{I(-)}=1V$ $V_{CC}=15V, V_{O(P)}=0.2V$
Isc	Output Short Circuit Current to Ground	-	40	60	-	40	60	mA	$V_{CC}=15V$
Vo(H)	Output Voltage Swing	26	-	-	26	-	-	V	$V_{CC}=30V, R_L=2K\Omega$
Vo(L)		27	28	-	27	-	-		$V_{CC}=30V, R_L=10K\Omega$
		-	5	20	-	-	30	mV	$V_{CC}=5V, R_L=10K\Omega$

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

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 Characteristics Curves



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Fig.3- Supply Current vs Supply Voltage

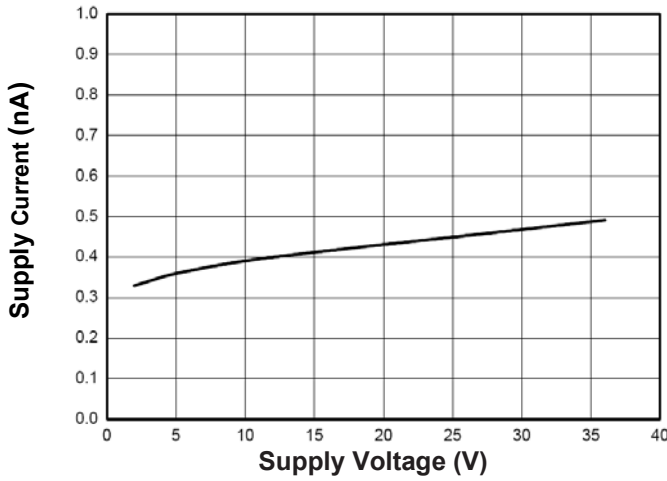


Fig.4- Voltage Gain vs Supply Voltage

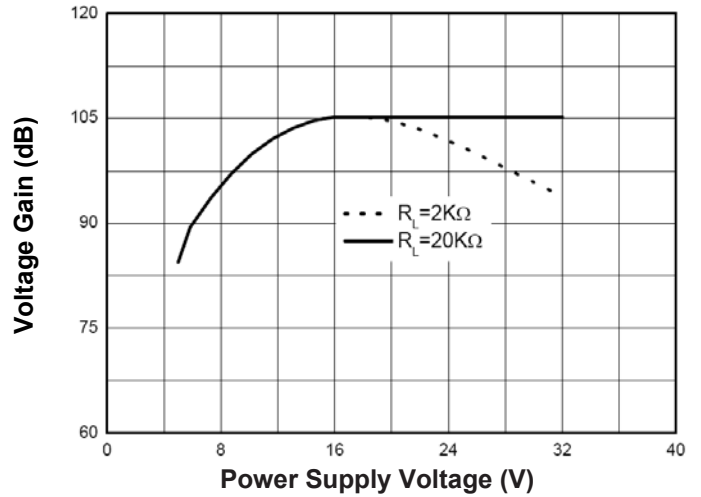


Fig.5- Open Loop Frequency Response

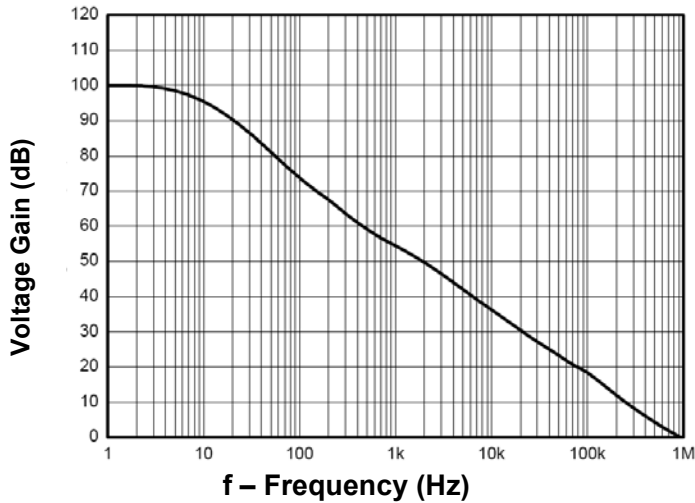
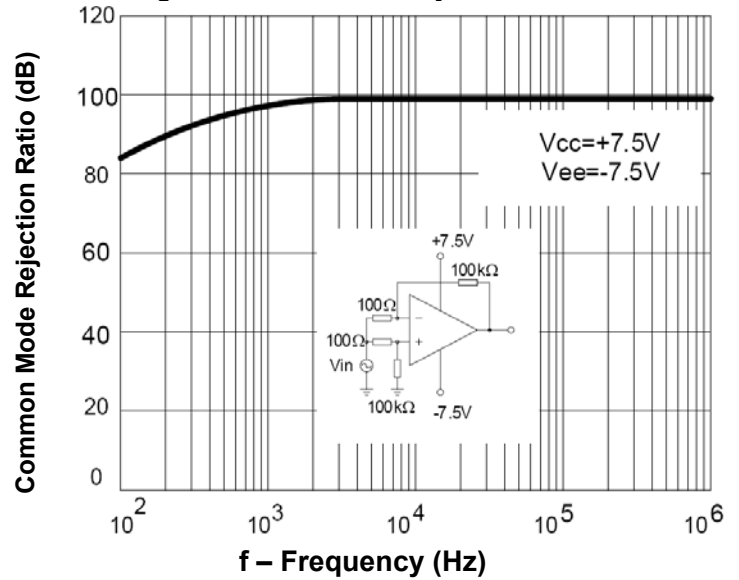


Fig.6- Common Mode Rejection Ratio



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Fig.7- Voltage Follower Pulse Response

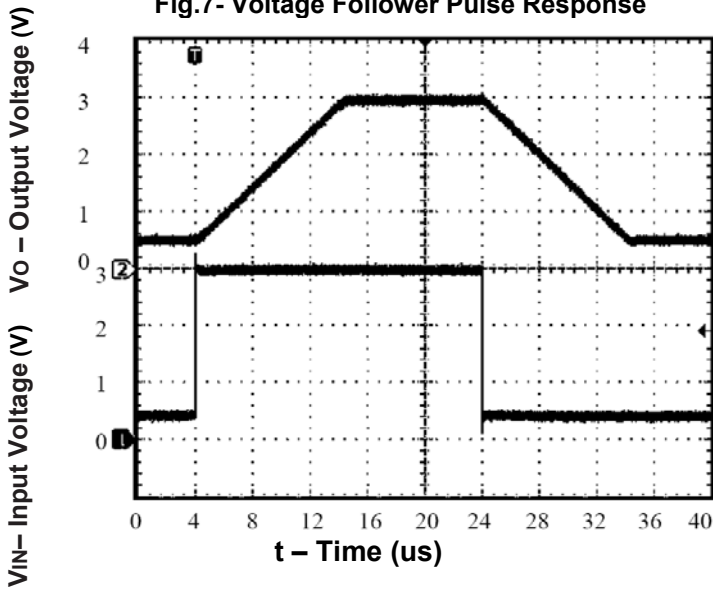


Fig.8- Voltage Follower Pulse Response (Small Signal)

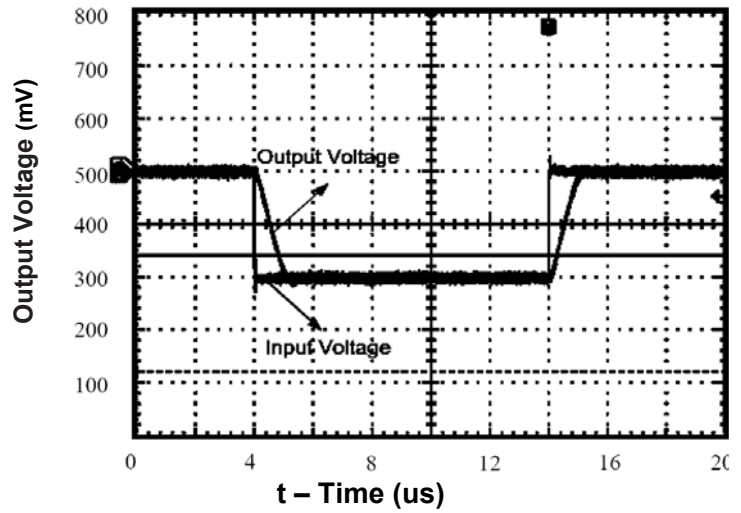


Fig.9- Large Signal Frequency Response

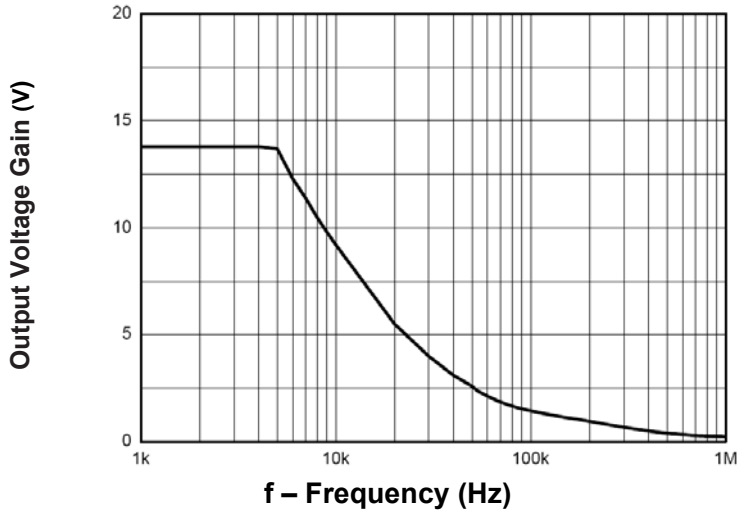
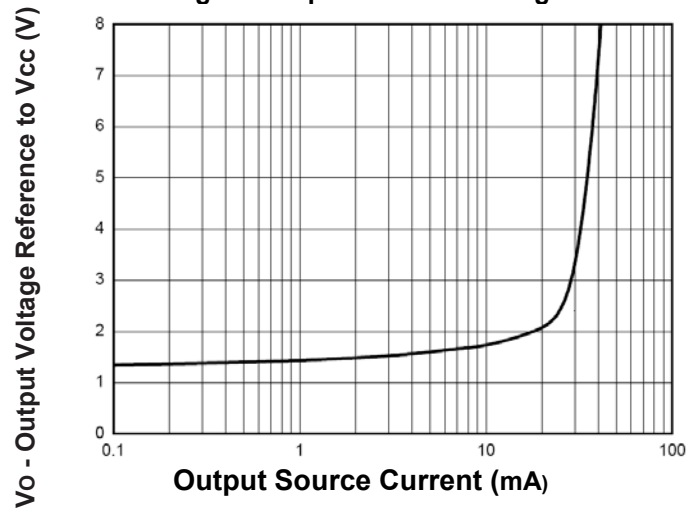


Fig.10- Output Current Sinking



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Fig.11- Output Sink Current

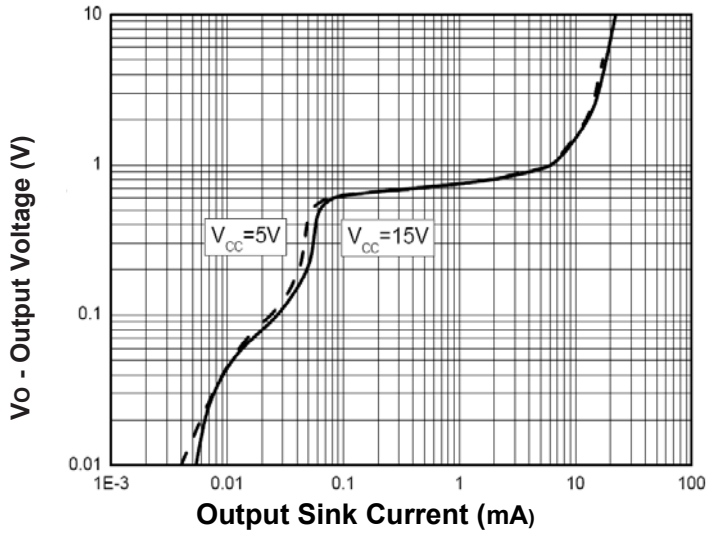
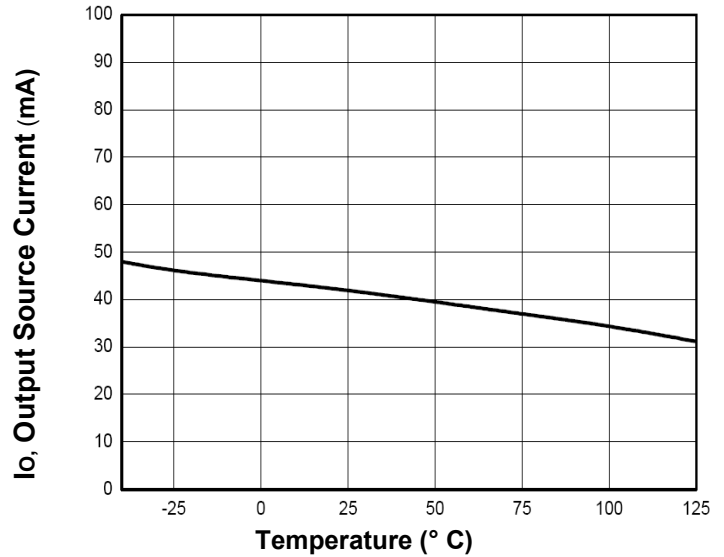


Fig.12- Current Limiting vs Temperature



Typical Application

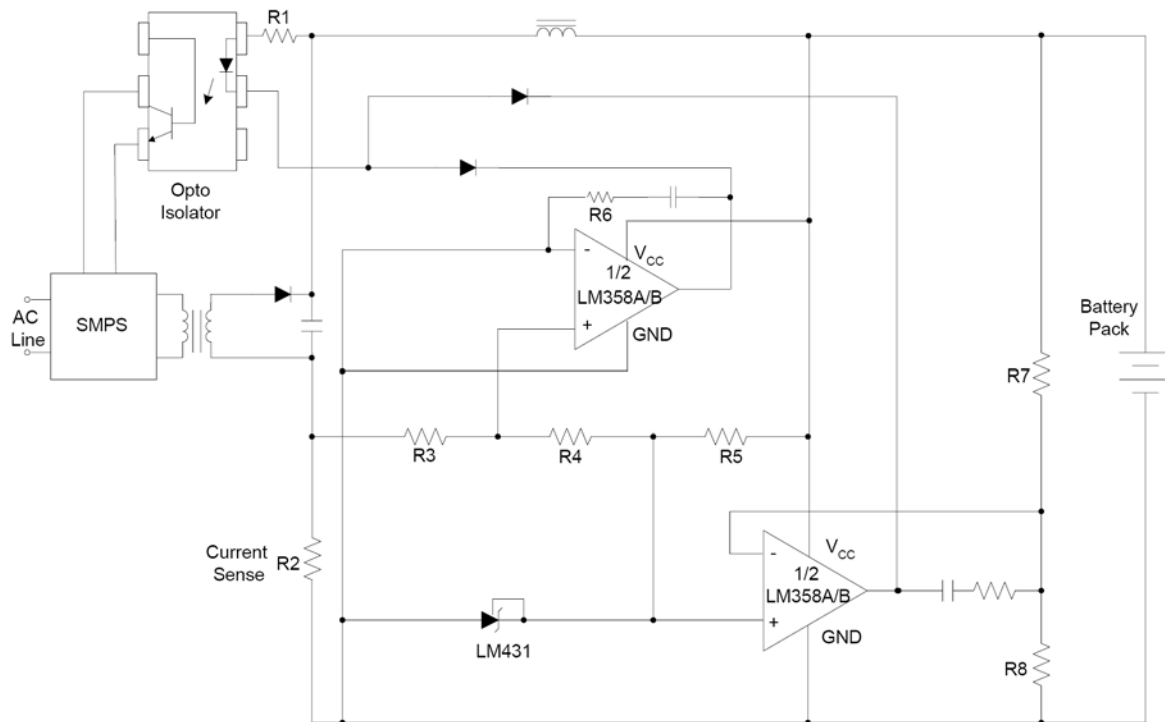


Fig.13- Battery Charger

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Typical Application (Continued)

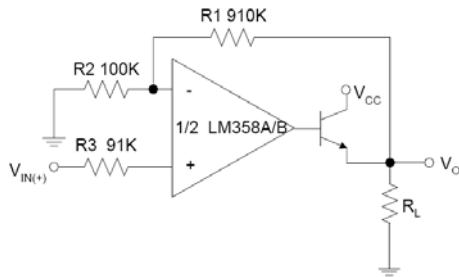


Fig.14- Power Amplifier

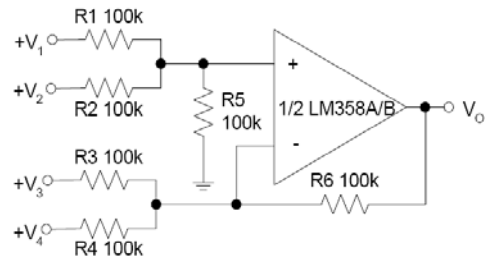


Fig.15- DC Summing Amplifier

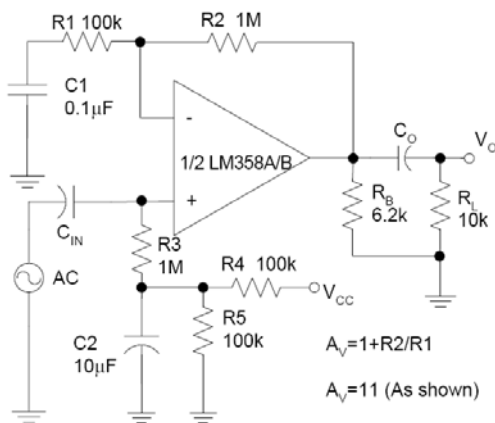


Fig.16- AC Coupled Non-Inverting Amplifier

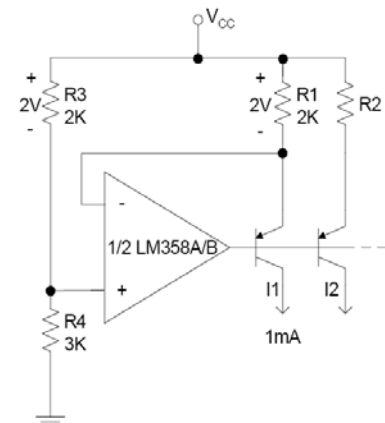


Fig.17- Fixed Current Sources

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Typical Application (Continued)

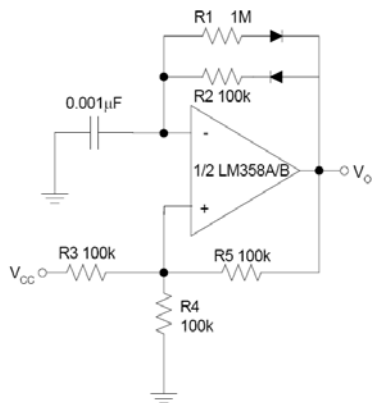


Fig.18- Pulse Generator

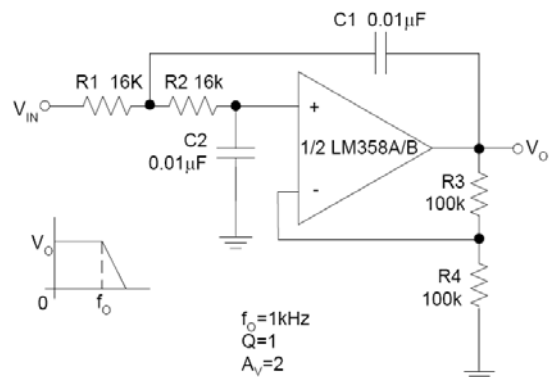
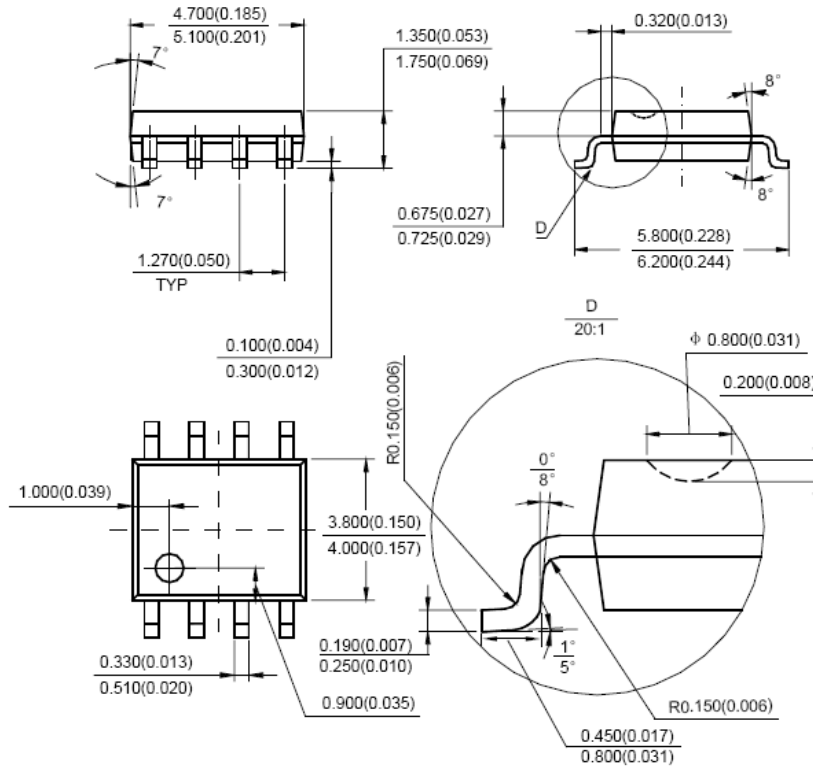


Fig.19- DC Coupled Low-Pass Active Filter

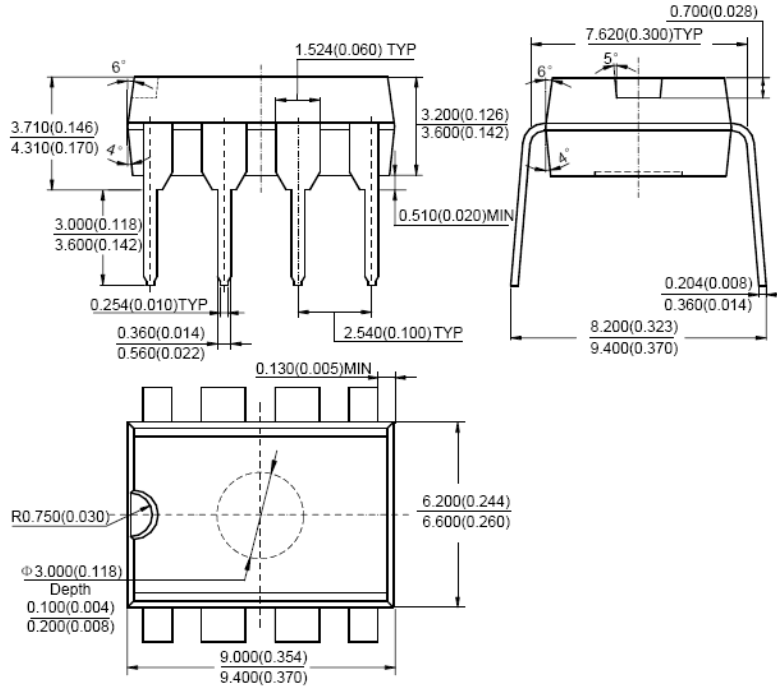
Dimensions in inches (mm)



SOP-8

Dual Low Offset Operational Amplifier

LM358A LM358B



DIP-8

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