Low Power Dual Operational Amplifier

SOP-8

DIP-8

General Description

- The LM358B series consist of two independent, high gain, internally frequency compensated operational amplifiers. They are specially designed to operated from a single power supply. Operation from split power supply is also possible and the lower 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 LM358B series are available in SOP-8, DIP-8 packages

RoHS Compliant

Features

- Internally Frequency Compensated for Unity Gain
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mA (Typical)
- Low Supply Current: 0.5mA (Typical)
- Wide Power Supply Voltage:
  Single Supply: 3V to 36 V
  Dual Supplies: ±1.5V to ±18V
- Input Common Mode Voltage Range Include Ground
- Large Output Voltage Swing: 0V to V_{CC}-1.5V
- RoHS Compliance

Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

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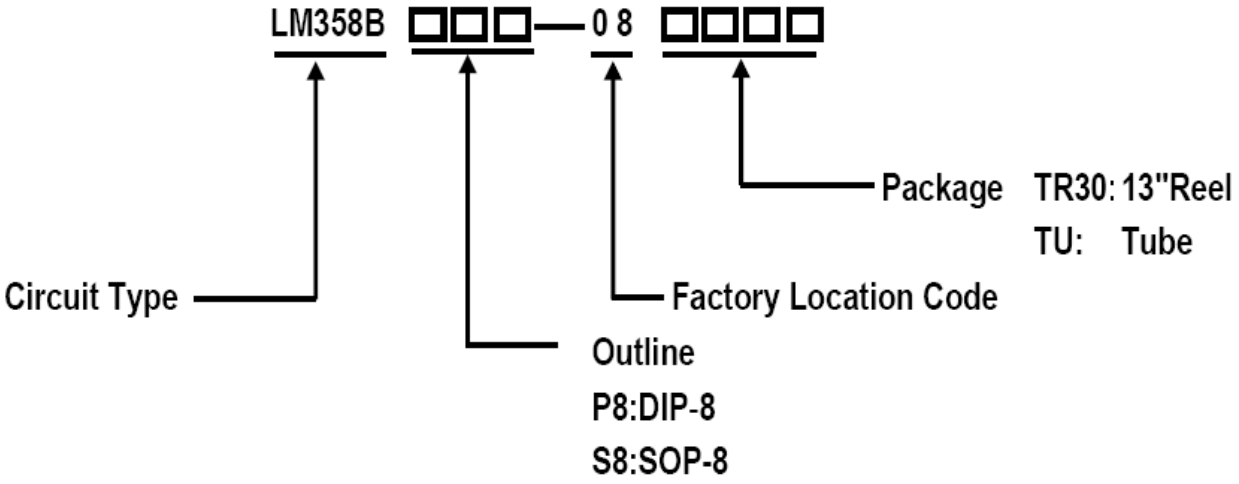
Ordering Information



Marking Information

Outline	Temperature Range	PN	Marking Code	Package Type
DIP-8	-40 to 85°C	LM358BP8	AS358AP-E1	Tube
SOP-8	-40 to 85°C	LM358BS8	AS358AM-E1	Tube Tape & Reel

Packing Information

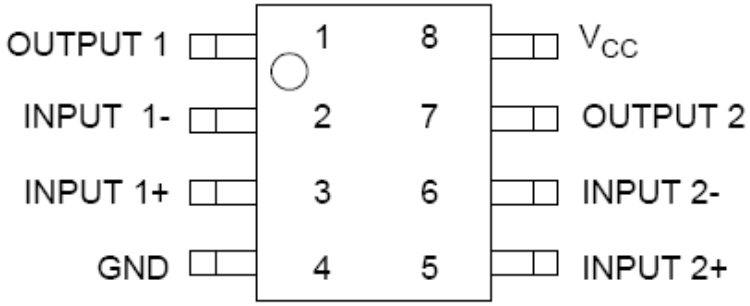
Tube Package

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes /Outer Box
DIP-8	50	40	2000	5
SOP-8	100	100	10000	5

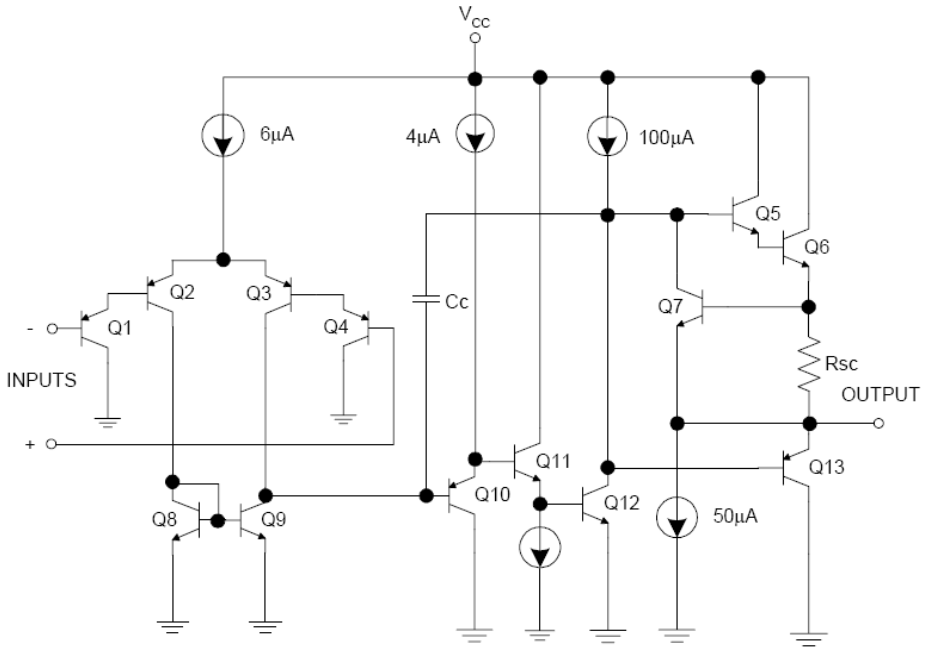
Tape & Reel Package

Package Type	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Boxes /Outer Box
SOP-8	4000	2	8000	8

Pin Configuration (Top View)



Functional Block Diagram



Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CC}	Power Supply Voltage		40	V
V_{ID}	Differential Input Voltage		40	V
V_{IC}	Input Voltage		-0.3 to 40	V
P_D	Power Dissipation (T_A=25° C)	DIP-8	830	mW
		SOP-8	550	
T_J	Operating Junction Temperature		150	° C
T_{STG}	Storage Temperature Range		-65 to +150	° C
T_{LEAD}	Lead Temperature (Soldering, 10 seconds)		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

Symbol	Description	Ratings		Unit
		Min.	Max.	
V_{CC}	Supply Voltage	3	36	V
T_A	Ambient Operating Temperature Range	-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.

Symbol	Description		Min.	Typ.	Max.	Unit	Conditions
V_{IO}	Input Offset Voltage		-	2	3	mV	V_O=1.4V, R_S=0Ω V_{CC}=5V to 30V
				-	**5**		
$\Delta V_{IO}/\Delta T$	Average Temperature Coefficient of Input Offset Voltage		-	**7**	-	μV/°C	
I_{BIAS}	Input Bias Current		-	20	200	nA	I_{IN}+ or I_{IN}-, V_{CM}=0V
			-	-	**200**		
I_{IO}	Input Offset Current		-	5.0	30	nA	I_{IN}+ - I_{IN}-, V_{CM}=0V
			-	-	**100**		
V_{IR}	Input Common Mode Voltage Range (Note 3)		0	-	V_{CC}-1.5	V	V_{CC}=30V
I_{CC}	Supply Current		-	**0.7**	**2**	mA	R_L=∞, V_{CC}=30V
			-	**0.5**	**1.2**		R_L=∞, V_{CC}=5V
G_V	Large Signal Voltage Gain		85	100	-	dB	V_{CC}=15V, V_O=1V to 11V, $R_L \geqslant$2KΩ
			80	-	-		
CMRR	Common Mode Rejection Ratio		60	70	-	dB	DC, V_{CM}=0V to (V_{CC}-1.5)V
			60	-	-		
PSRR	Power Supply Rejection Ratio		70	100	-	dB	V_{CC}=5V to 30V
			60	-	-		
CS	Channel Separation		-	-120	-	dB	f=1KHz to 20KHz
I_{SOURCE}	Output Current	Source	20	40	-	mA	V_{IN}+=1V, V_{IN}-=0V, V_{CC}=15V, V_O=2V
			20	-	-		
I_{SINK}		Sink	10	15	-	mA	V_{IN}+=0V, V_{IN}-=1V, V_{CC}=15V, V_O=2V
			5	-	-		
			12	50	-	μA	V_{IN}+=0V, V_{IN}-=1V, V_{CC}=15V, V_O=0.2V
I_{SC}	Output Short Circuit Current to Ground		-	40	60	mA	V_{CC}=15V

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
V_{OH}	Output Voltage Swing	26	-	-	V	V_{CC}=30V, R_L=2KΩ
		26	-	-		
		27	28	-		V_{CC}=30V, R_L=10KΩ
		27	-	-		
V_{OL}		-	5	20	mV	V_{CC}=5V, R_L=10KΩ
		-	-	**30**		

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

Fig.1- Input Voltage Range

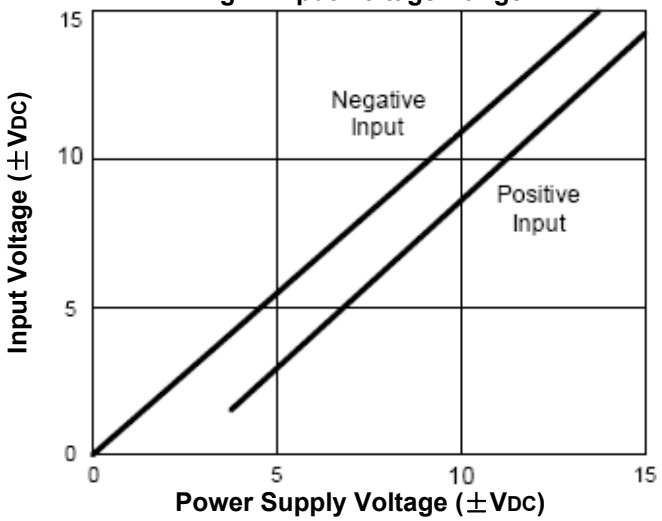


Fig.2- Input Current vs. Temperature

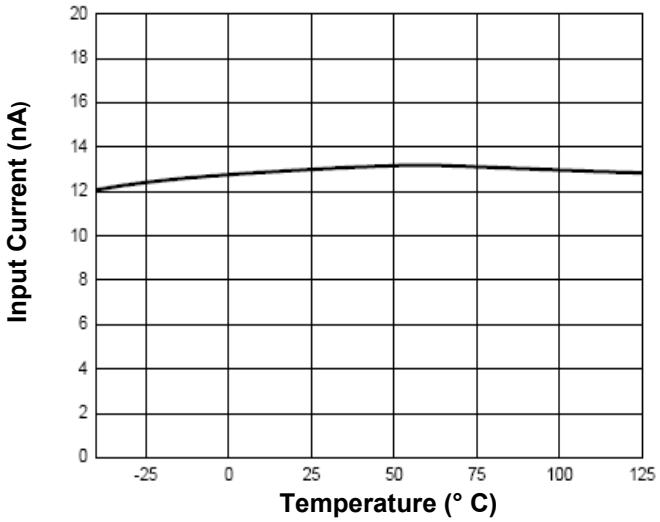


Fig.3- Supply Current

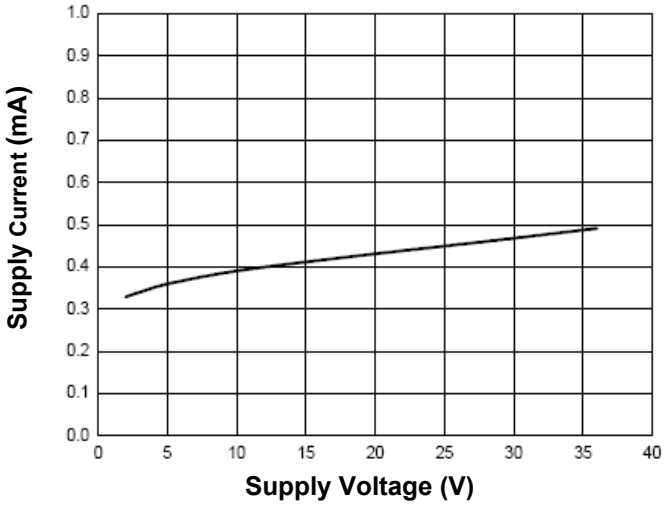


Fig.4- Voltage Gain

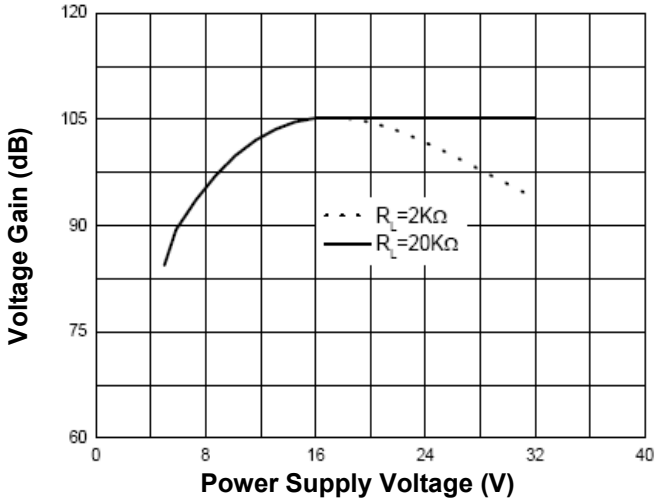


Fig.5- Open Loop Frequency Response

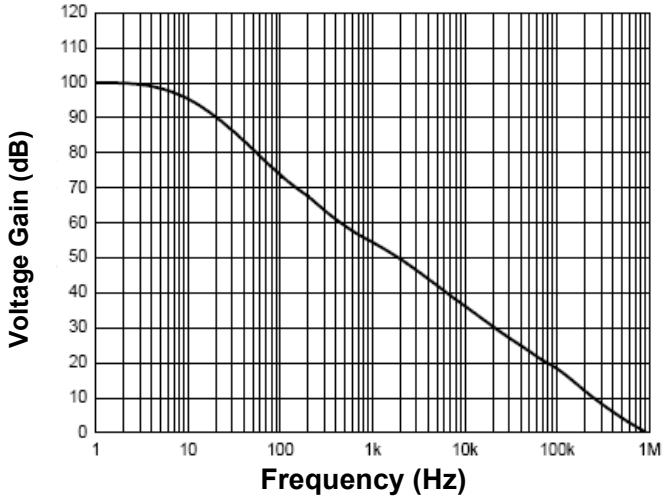


Fig.6- Voltage Follower Pulse Response

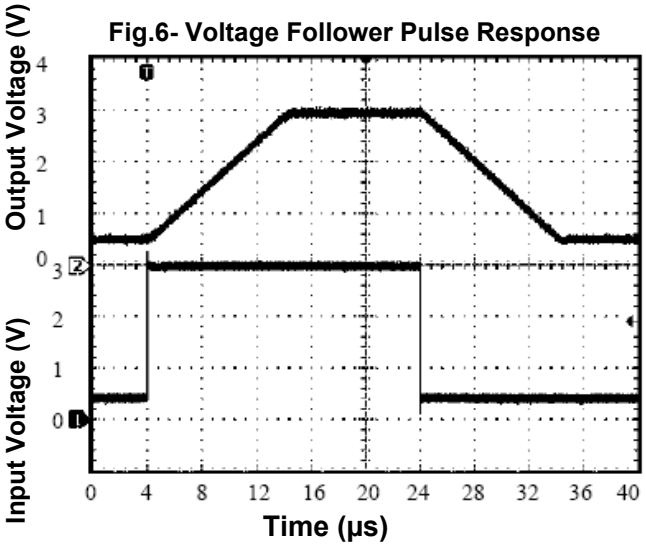


Fig.7- Voltage Follower Pulse Response (Small Signal)

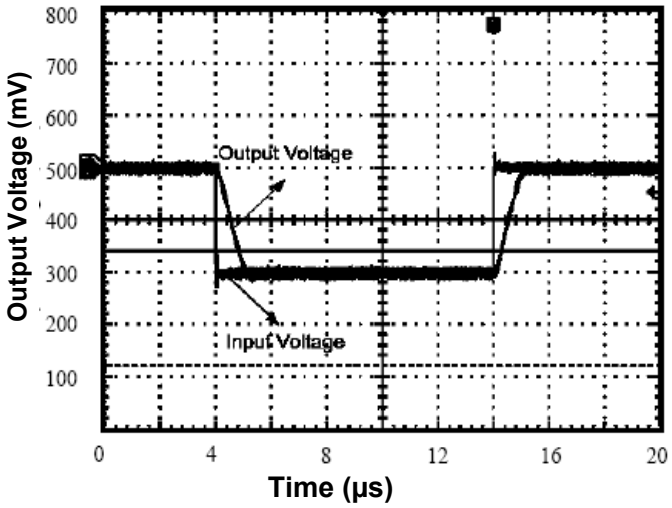


Fig.8- Large Signal Frequency Response

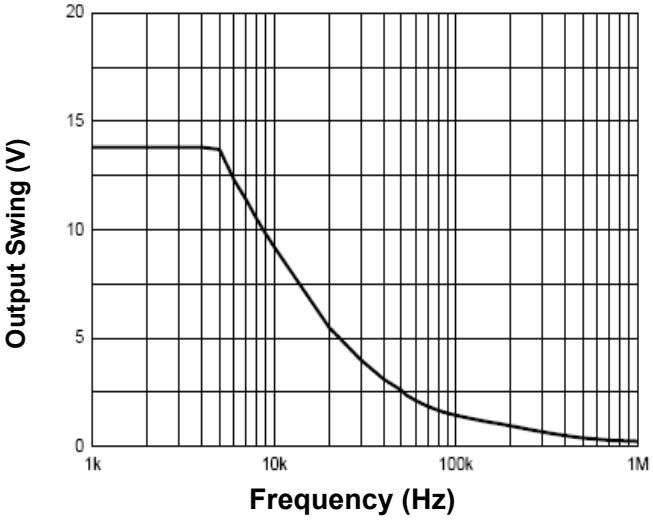


Fig.9- Output Characteristics: Current Sourcing

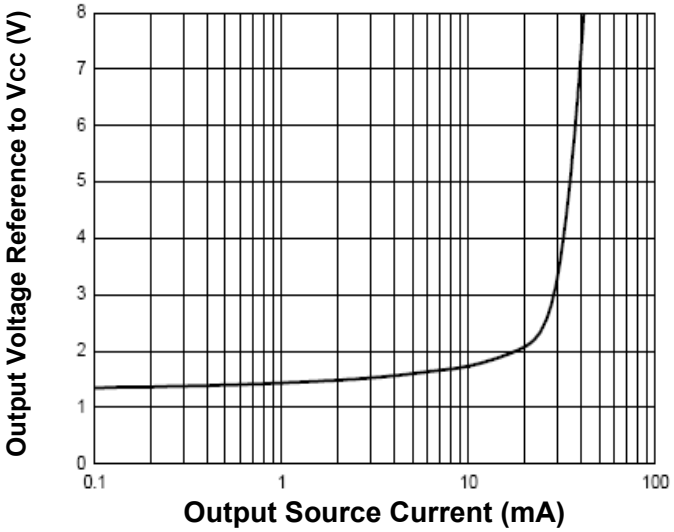


Fig.10- Output Characteristics: Current Sinking

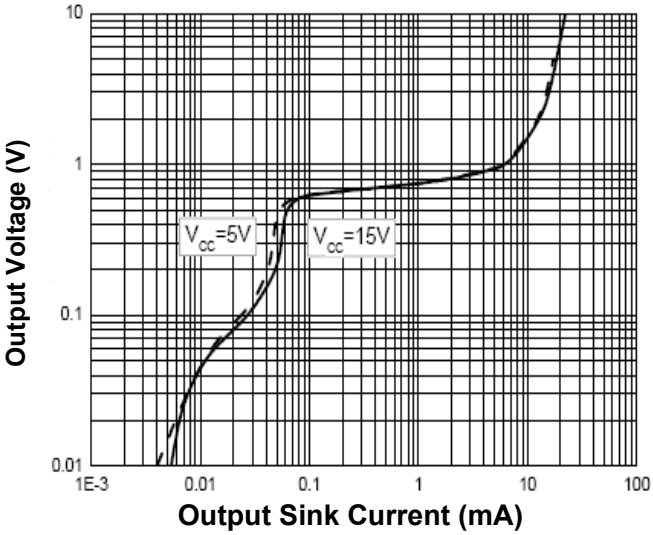
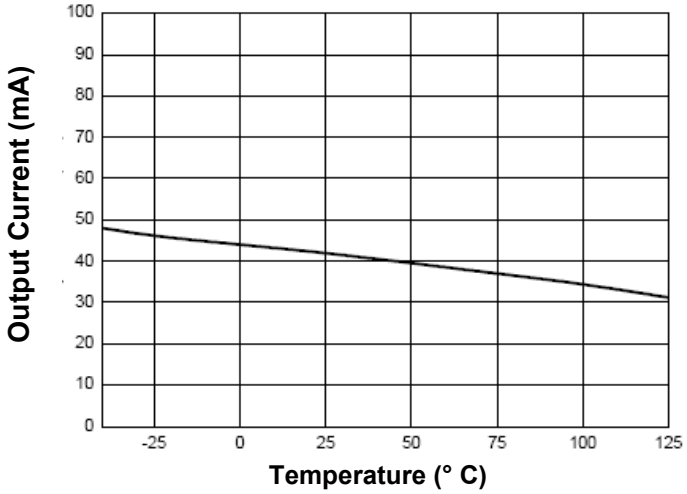


Fig.11- Current Limiting vs Temperature



Typical Application

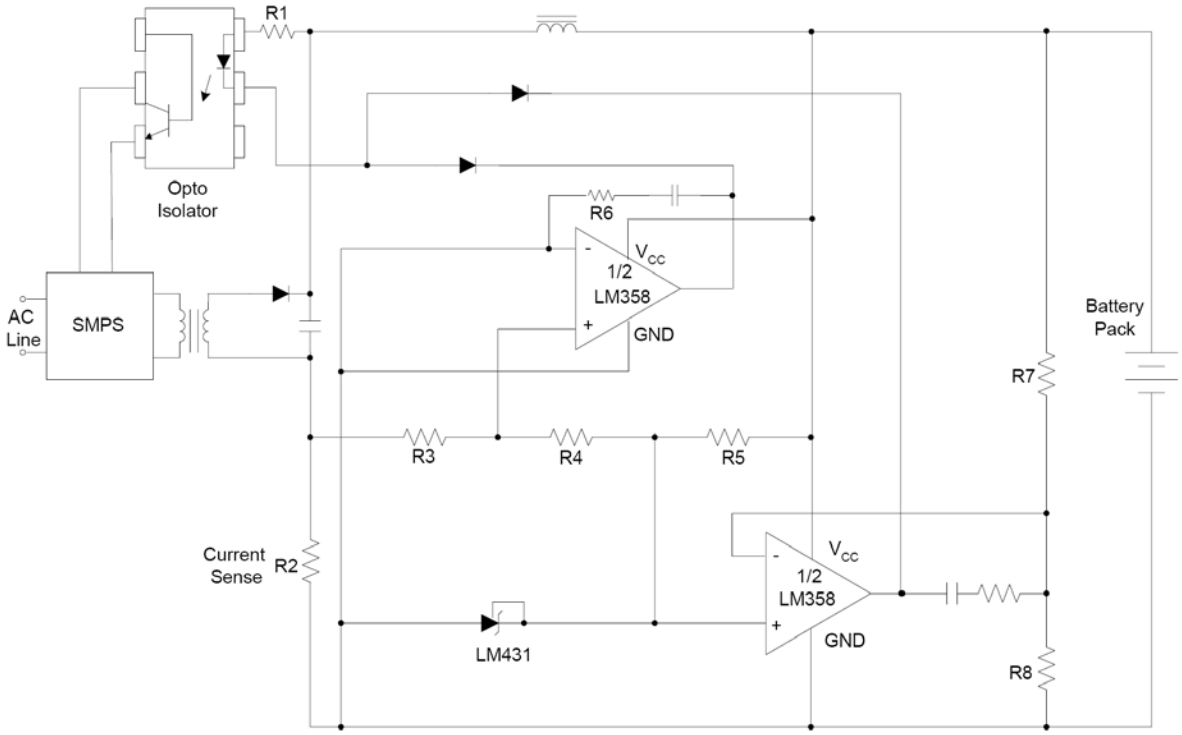


Fig.12- Battery Charger

Typical Application (Continued)

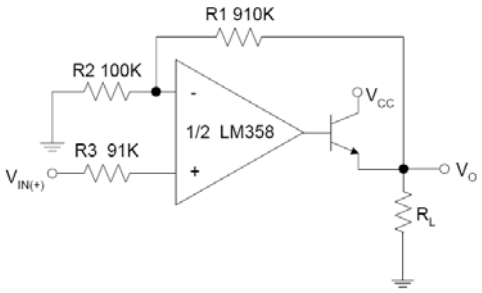


Fig.13- Power Amplifier

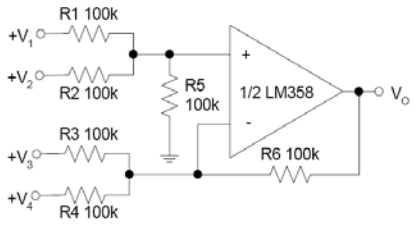


Fig.14- DC Summing Amplifier

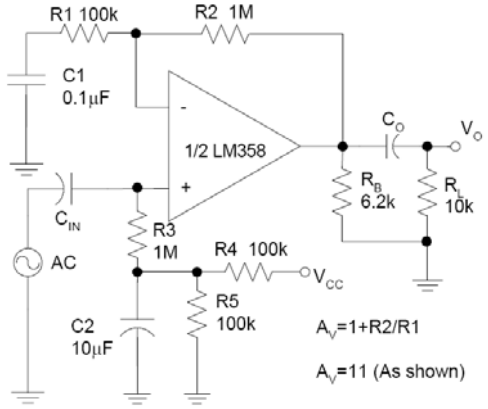


Fig.15- AC Coupled Non-Inverting Amplifier

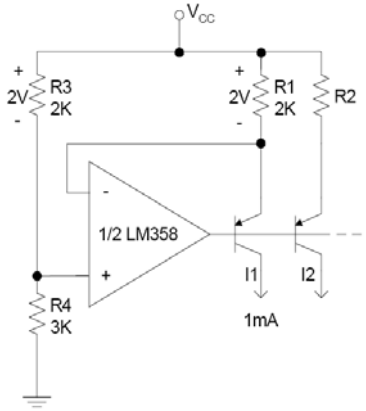


Fig.16- Fixed Current Sources

Typical Application (Continued)

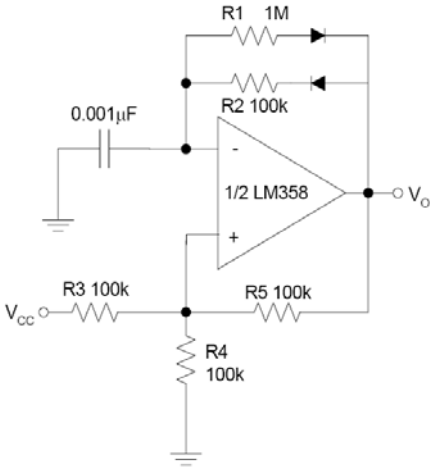


Fig.17- Pulse Generator

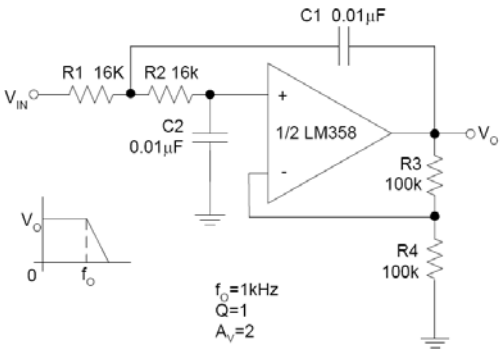
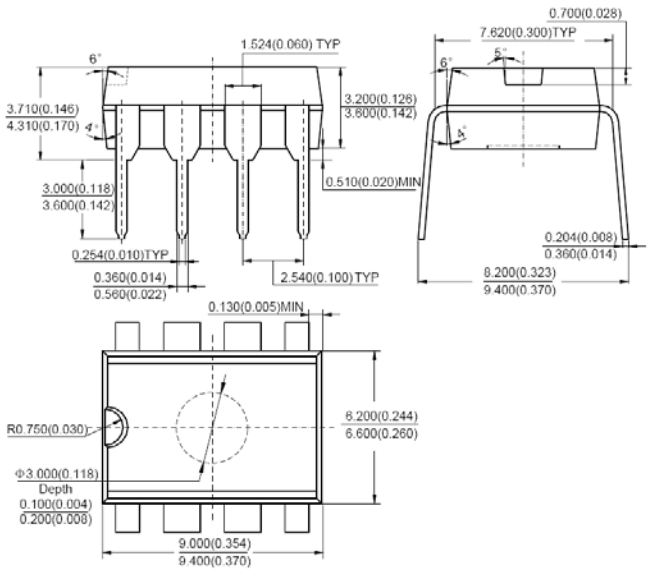
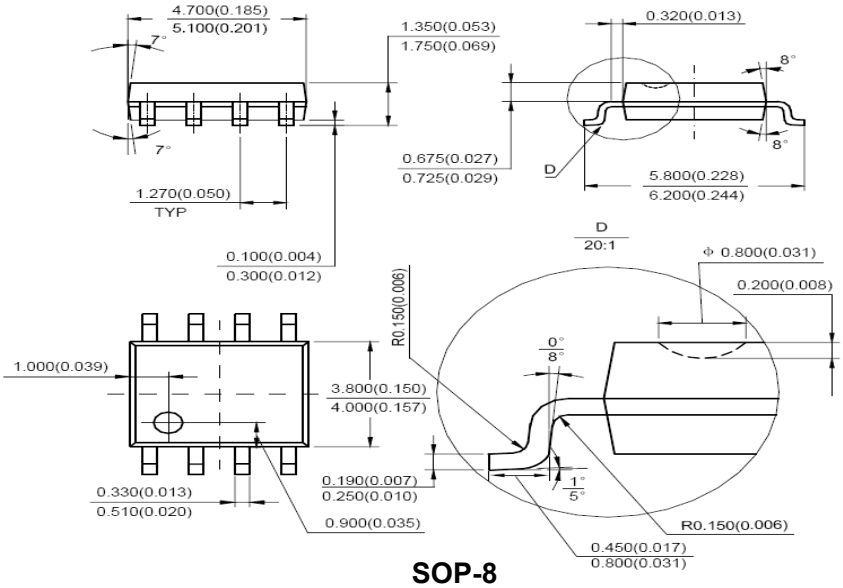


Fig.18- DC Coupled Low-Pass Active Filter

Dimensions in mm (inch)



DIP-8



SOP-8

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