Dual Operational Amplifier



SOP-8



DIP-8



MSOP-8



TSSOP-8

RoHS Compliant

General Description

- The LM358 series consists of two independent high gain, internally frequency compensated operational amplifiers. It can be operated from a single power supply and also split power supplies.

- The LM358 is available in SOP-8, DIP-8, TSSOP-8 and MSOP-8 packages

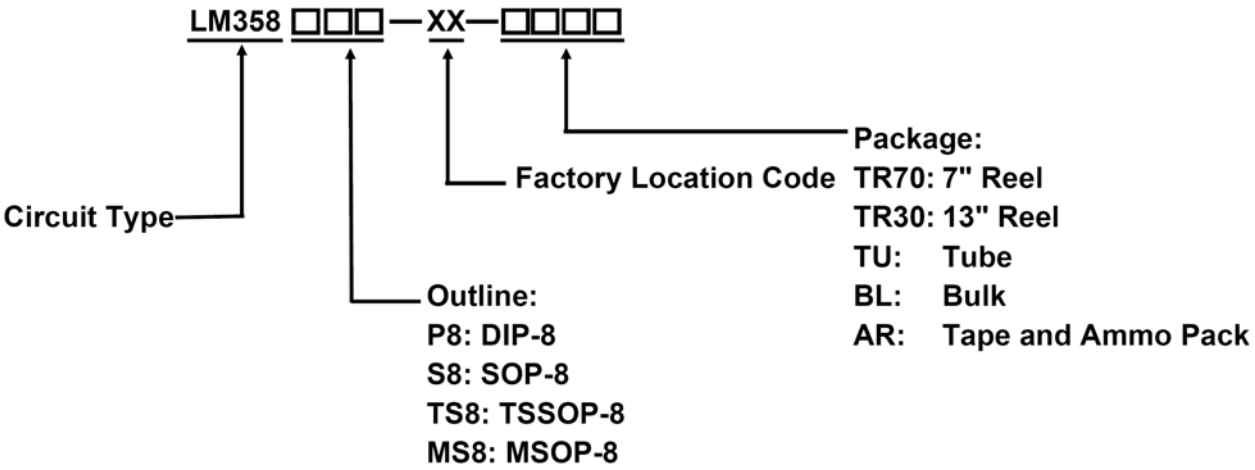
Features

- Internally frequency compensated for unity gain
- Wide power supply range 3V - 32 V
- Input common-mode voltage range include ground
- Large DC voltage gain: 100dB Typical
- RoHS Compliance

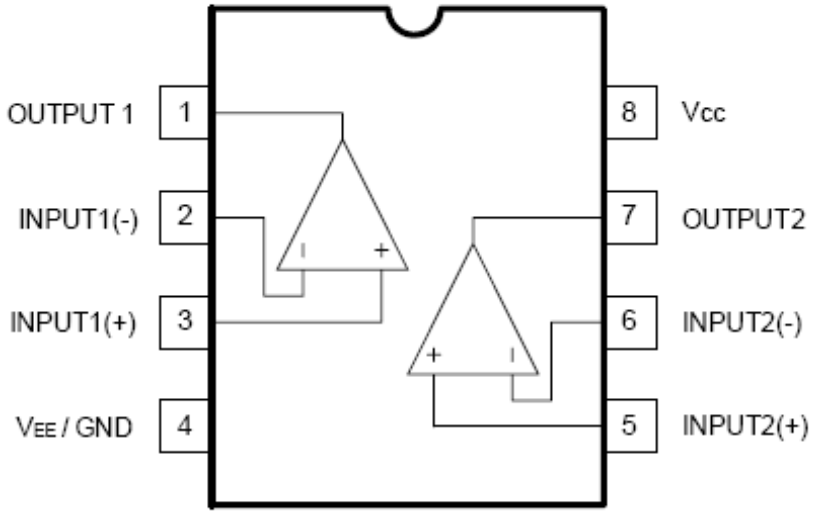
Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

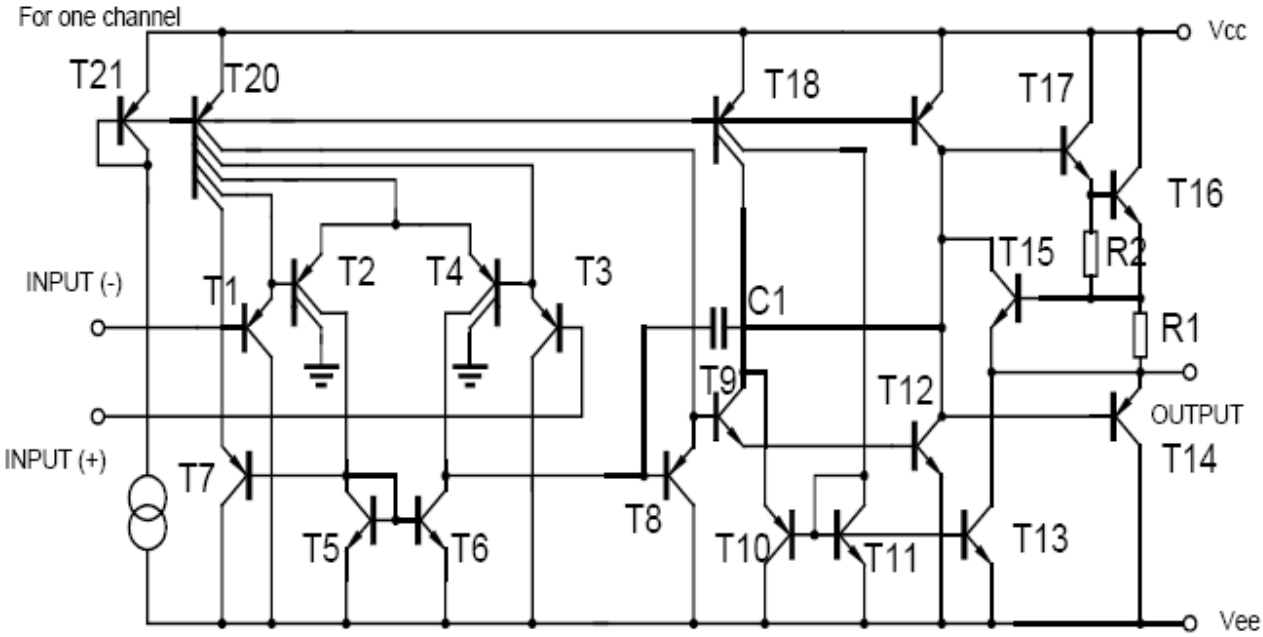
Ordering Information



Internal Block Diagram



Schematic Diagram



Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CC}	Supply Voltage		±16	V
$V_{I(DIFF)}$	Differential Input Voltage		±32	V
V_I	Input Voltage		-0.3 ~ +32	V
-	Output Short to Ground		Continuous	-
P_D	Power Dissipation	TSSOP-8	200	mW
		MSSOP-8	200	
		SOP-8	280	
		Dip-8	500	
T_J	Junction Temperature		125	° C
T_{OPR}	Operating Temperature Range		0 ~ +70	° C
T_{STG}	Storage Temperature Range		-65~ +150	° C

Note: Absolute maximum ratings are those beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

Electrical Characteristics *(V_{CC}=5.0V, V_{EE}=GND, T_A=25°C unless noted otherwise)*

Symbol	Description	LM358			Unit	Conditions
		Min.	Typ.	Max.		
$V_{I(OFF)}$	Input Offset Voltage	-	2.9	7	mV	V_{CM}=0V to V_{CC}-1.5V $V_{O(P)}$=1.4V,R_S=0Ω
$V_{I(CM)}$	Input Common Mode Voltage	0	-	V_{CC}-1.5	V	V_{CC}=30V
$V_{I(DIFF)}$	Differential Input Voltage	-	-	V_{CC}	V	-
$V_{O(H)}$	Output Voltage Swing	26	-	-	V	V_{CC}=30V, R_L=2KΩ
		27	28	-		V_{CC}=30V, R_L=10KΩ
$V_{O(L)}$		-	5	20	mV	V_{CC}=5V, R_L≥10KΩ
G_V	Large Singnal Voltage Gain	25	100	-	V/mV	V_{CC}=15V, R_L≥2KΩ $V_{O(P)}$=1V ~11V

Symbol	Description	LM358			Unit	Conditions
		Min.	Typ.	Max.		
I_{CC}	Power Supply Current	-	0.8	2.0	mA	$R_L=\infty$, V_{CC}=30V
		-	0.5	1.2		$R_L=\infty$, Full Temperature Range
$I_{I(OFF)}$	Input Offset Current	-	5	50	nA	-
I_{BIAS}	Input Bias Current	-	45	250	nA	-
I_{SC}	Short Circuit Current to Ground	-	40	60	mA	-
I_{SOURCE}	Output Current	10	30	-	mA	$V_{I(+)}$=1V, $V_{I(-)}$=0V V_{CC}=15V, $V_{O(P)}$=2V
I_{SINK}		10	15	-	mA	$V_{I(+)}$=0V, $V_{I(-)}$=1V V_{CC}=15V, $V_{O(P)}$=2V
		12	100	-	µA	$V_{I(+)}$=0V, $V_{I(-)}$=1V V_{CC}=15V, $V_{O(P)}$=200mV
CMRR	Common Mode Rejection Ratio	65	80	-	dB	-
PSRR	Power Supply Rejection Ratio	65	100	-	dB	-
CS	Channel Separation	-	120	-	dB	f=1KHZ ~ 20KHZ

Typical Characteristics Curves

Fig.1- Input Voltage Range

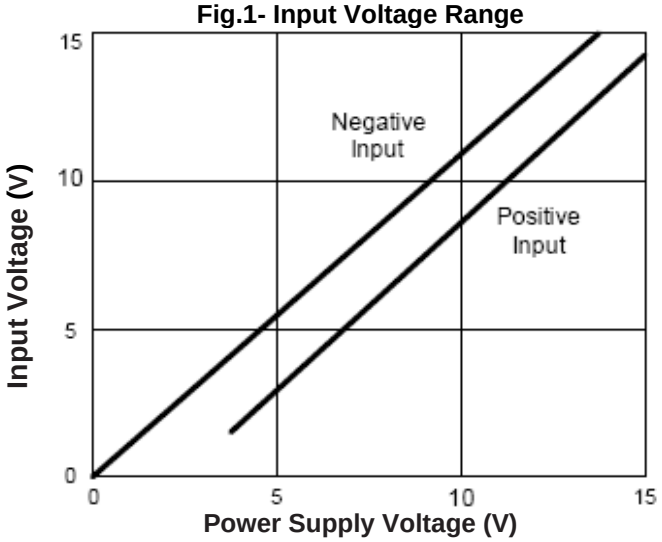


Fig.2- Input Current vs. Temperature

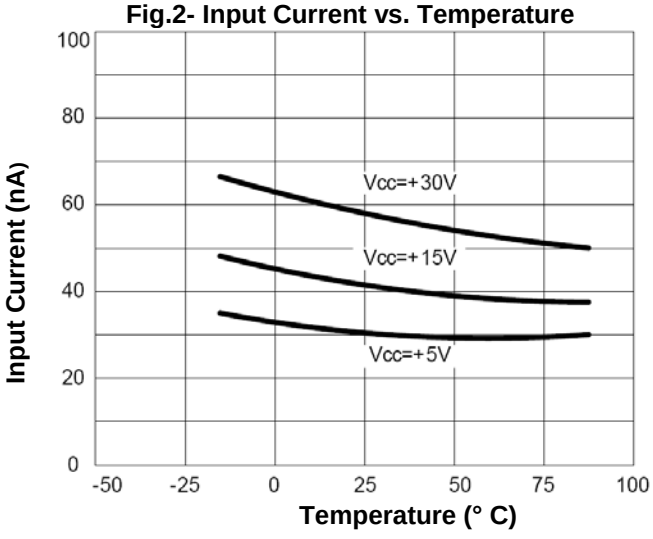


Fig.3- Input Current vs Supply Voltage

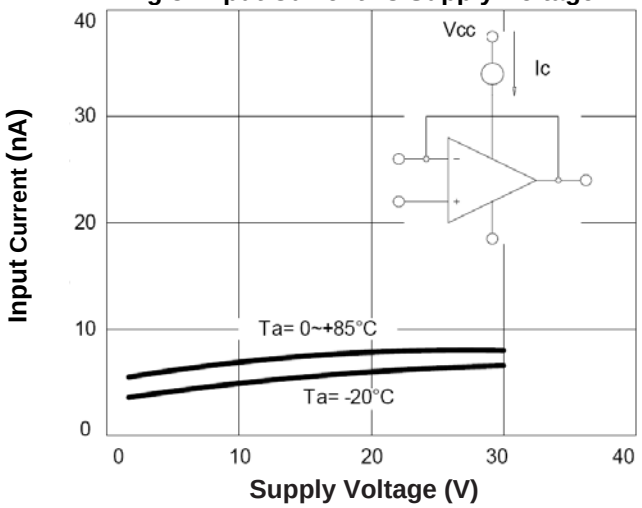


Fig.4- Voltage Gain vs Supply Voltage

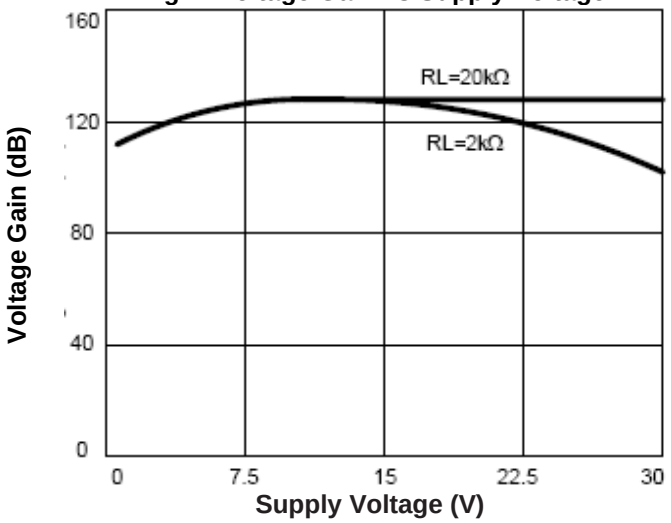


Fig.5- Open Loop Frequency Response

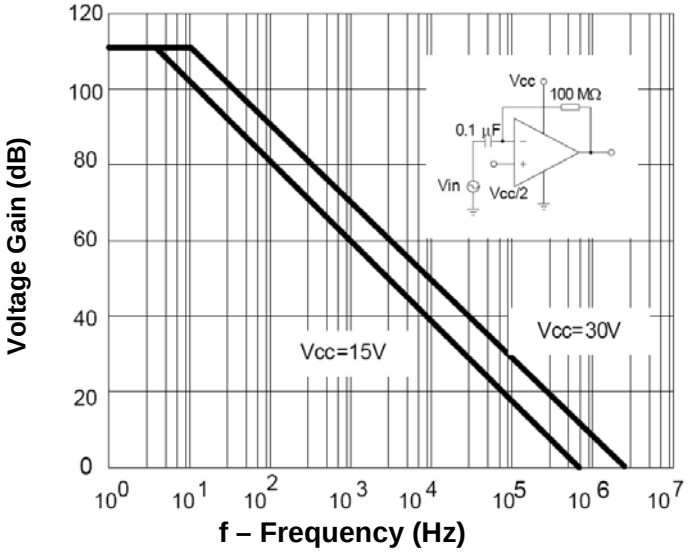


Fig.6- Common Mode Rejection Ratio

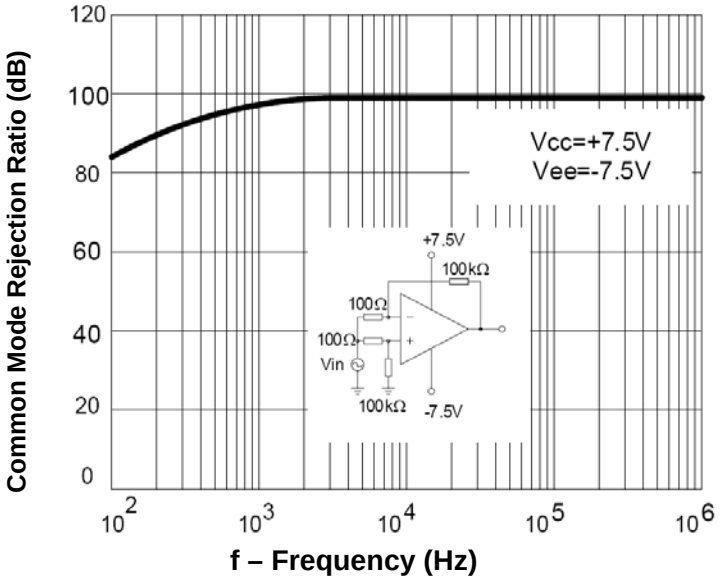


Fig.7- Voltage Follower Pulse Response

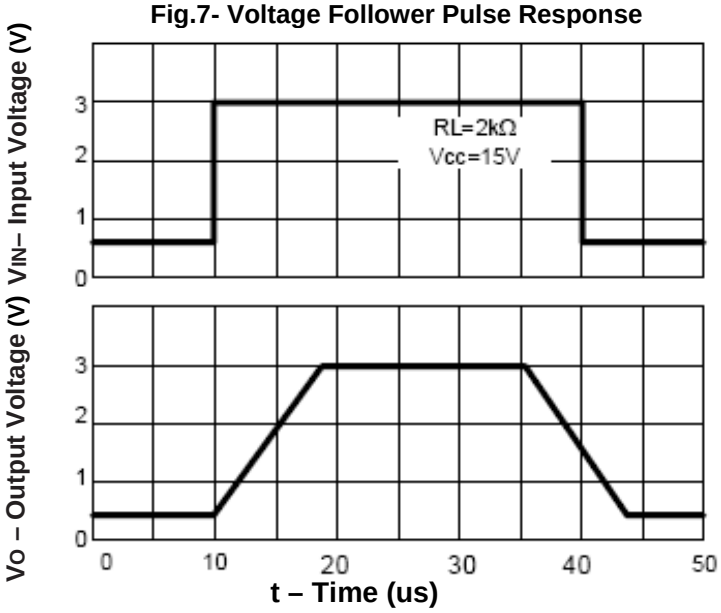


Fig.8- Voltage Follower Pulse Response (Small Signal)

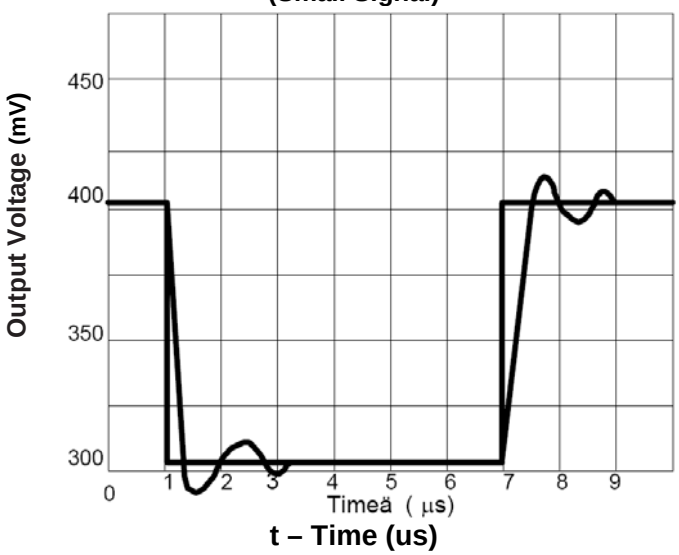


Fig.9- Gain vs Large Signal Frequency

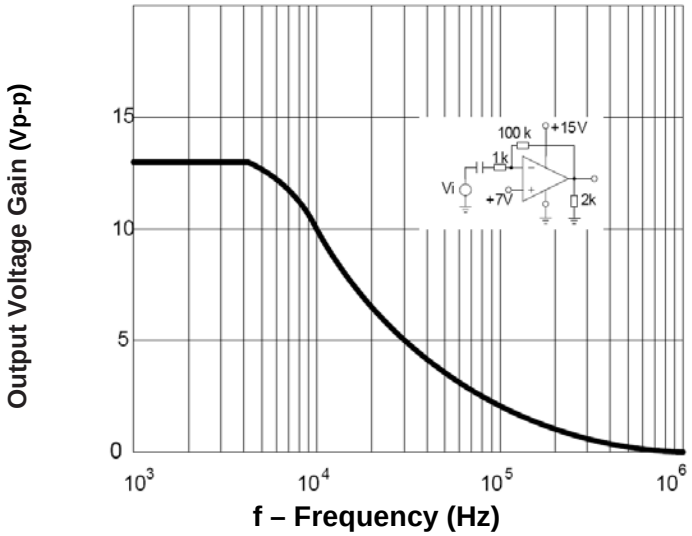


Fig.10- Output Current Sinking

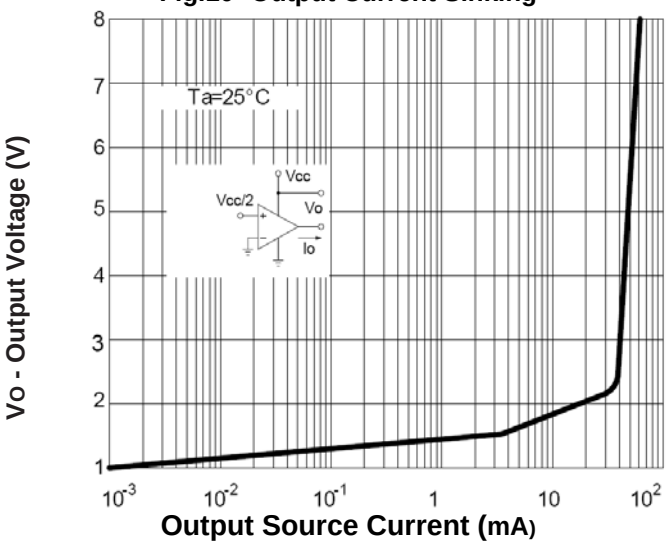


Fig.11- Output Sink Current

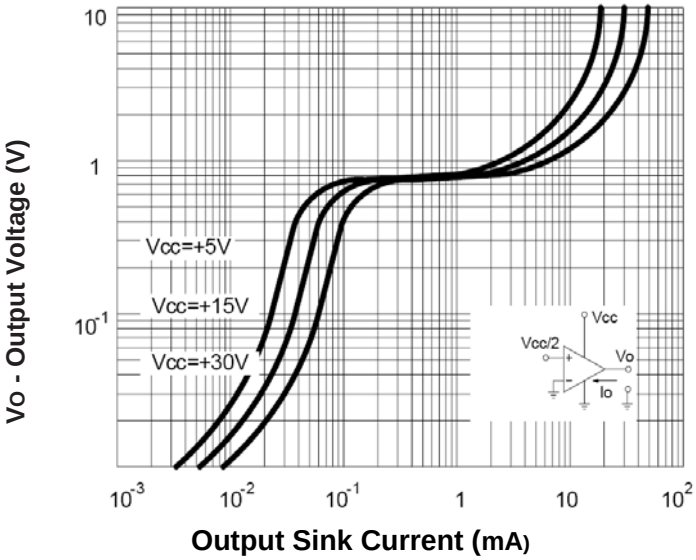
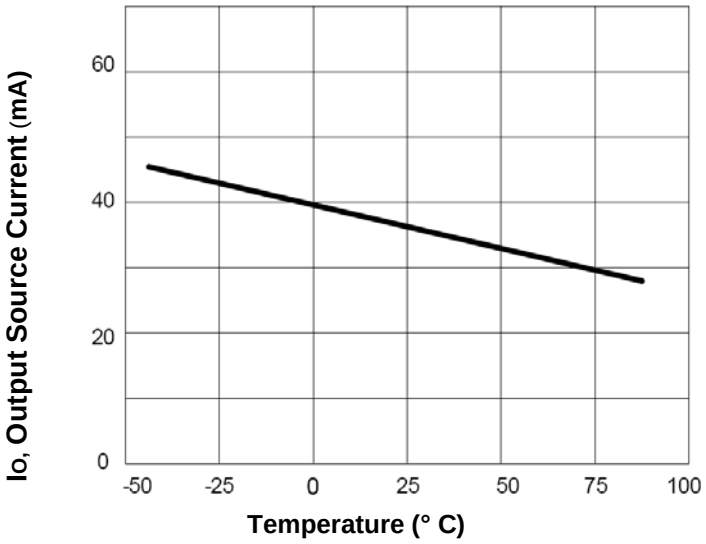


Fig.12- Current Limiting vs Temperature



Typical Application

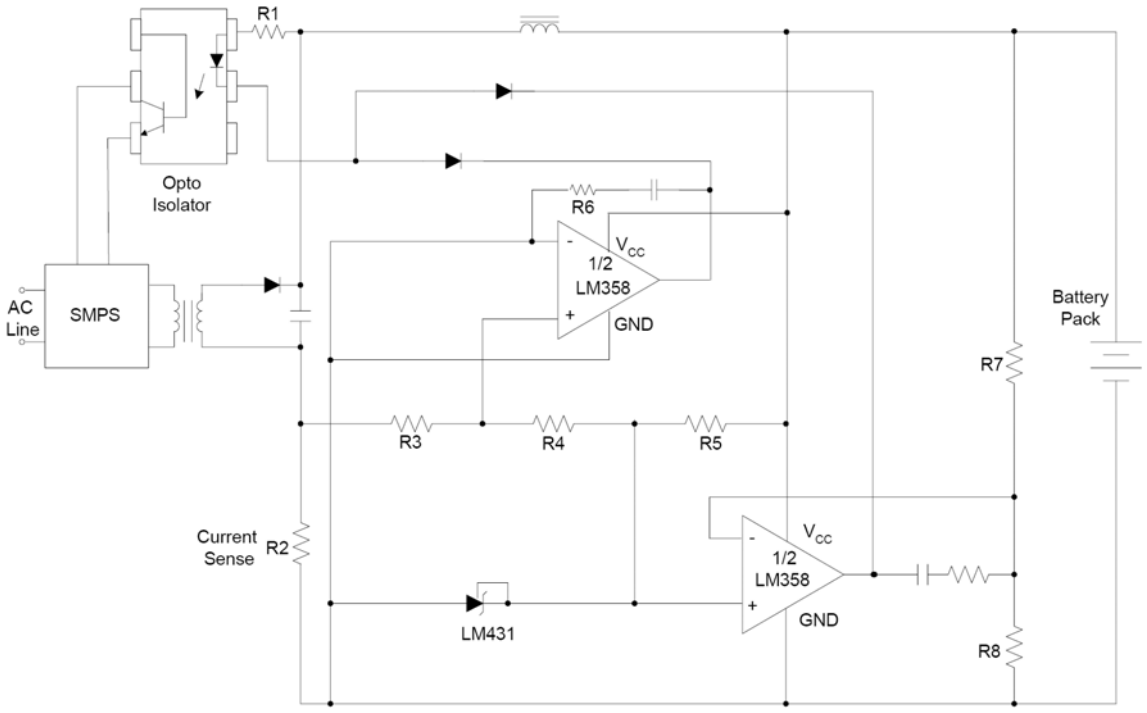


Fig.13- Battery Charger

Typical Application (Continued)

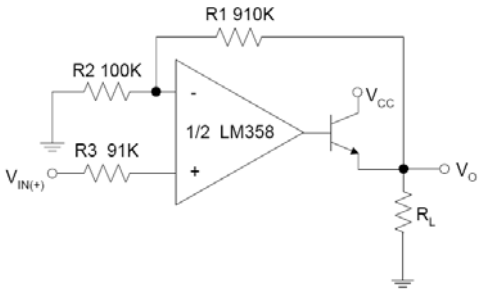


Fig.14- Power Amplifier

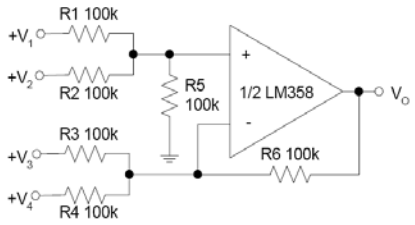


Fig.15- DC Summing Amplifier

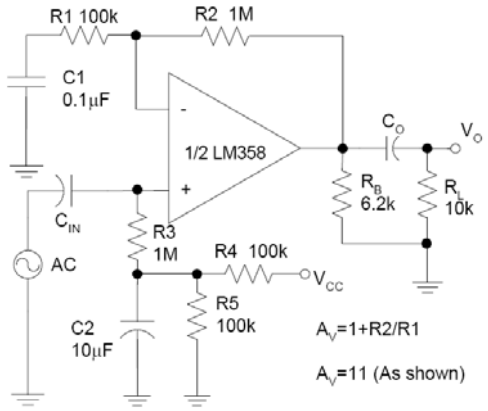


Fig.16- AC Coupled Non-Inverting Amplifier

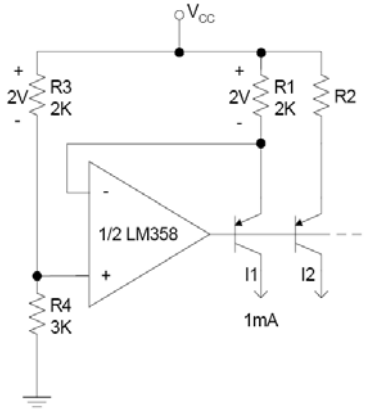


Fig.17- Fixed Current Sources

Typical Application (Continued)

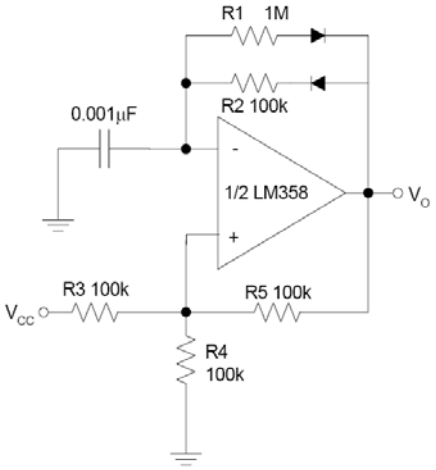


Fig.18- Pulse Generator

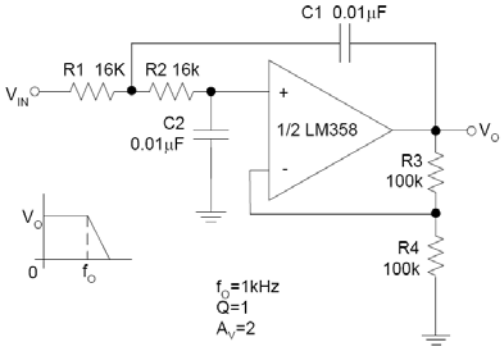
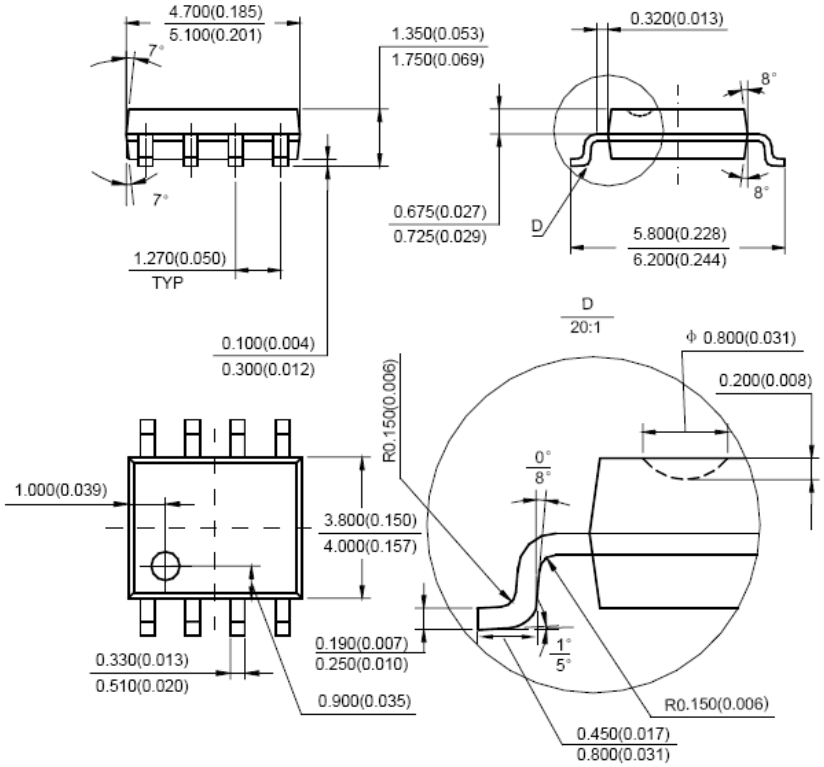
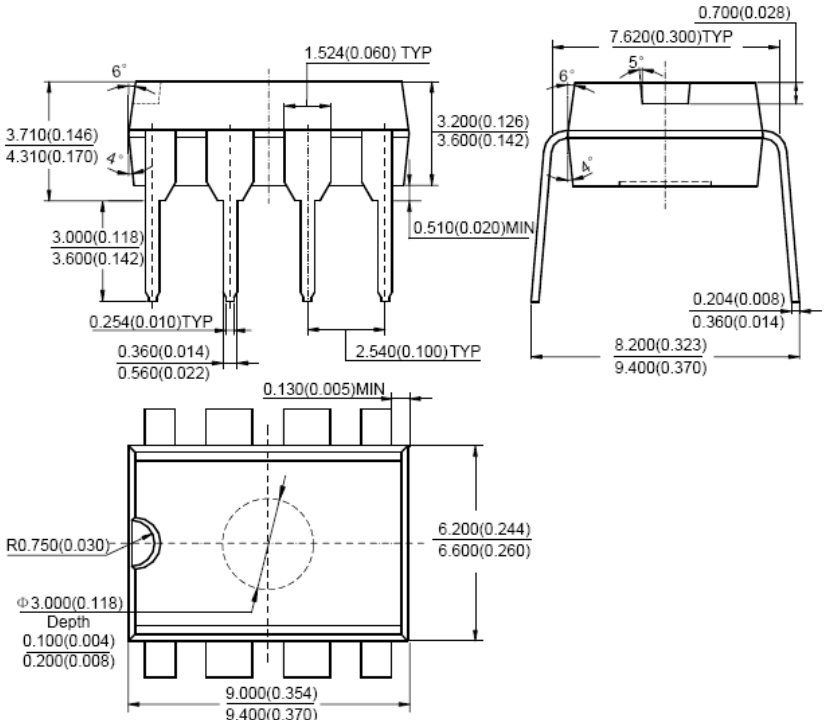


Fig.19- DC Coupled Low-Pass Active Filter

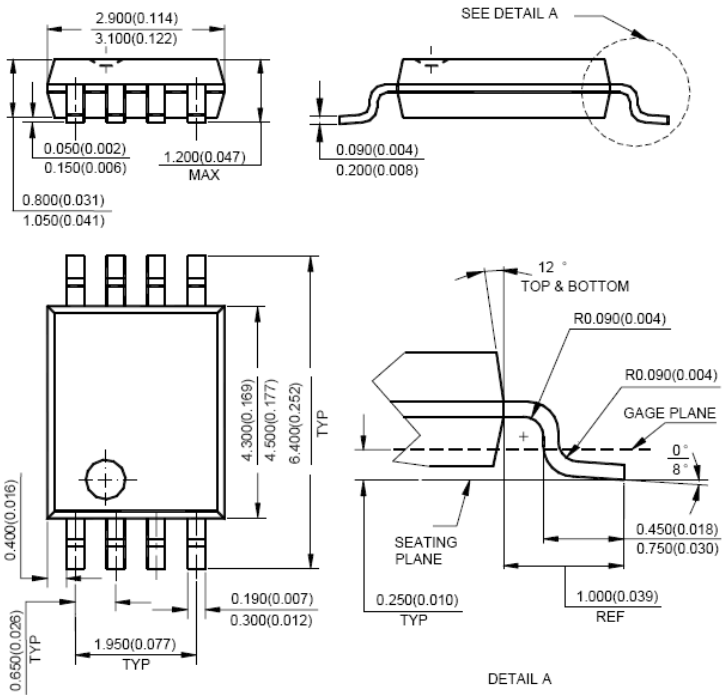
Dimensions in inches (mm)



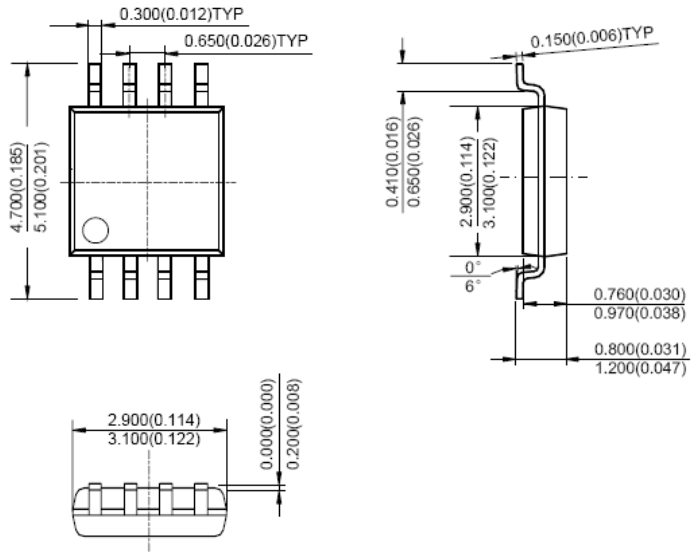
SOP-8


0.700(0.028)
7.620(0.300)TYP
1.524(0.060) TYP
6°
5°
6°
3.710(0.146)
4.310(0.170)
4°
3.200(0.126)
3.600(0.142)
4°
0.510(0.020)MIN
3.000(0.118)
3.600(0.142)
0.204(0.008)
0.360(0.014)
0.254(0.010)TYP
0.360(0.014)
0.560(0.022)
2.540(0.100)TYP
8.200(0.323)
9.400(0.370)
0.130(0.005)MIN
R0.750(0.030)
6.200(0.244)
6.600(0.260)
Φ3.000(0.118)
Depth
0.100(0.004)
0.200(0.008)
9.000(0.354)
9.400(0.370)

DIP-8


2.900(0.114)
3.100(0.122)
SEE DETAIL A
0.050(0.002)
0.150(0.006)
1.200(0.047)
MAX
0.090(0.004)
0.200(0.008)
0.800(0.031)
1.050(0.041)
12 °
TOP & BOTTOM
R0.090(0.004)
R0.090(0.004)
GAGE PLANE
4.300(0.169)
4.500(0.177)
6.400(0.252)
TYP
0°
8°
0.400(0.016)
SEATING
PLANE
0.450(0.018)
0.750(0.030)
0.190(0.007)
0.300(0.012)
0.250(0.010)
TYP
1.000(0.039)
REF
0.650(0.026)
TYP
1.950(0.077)
TYP
DETAIL A

TSSOP-8



MSOP-8

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