Dual Operational Amplifiers

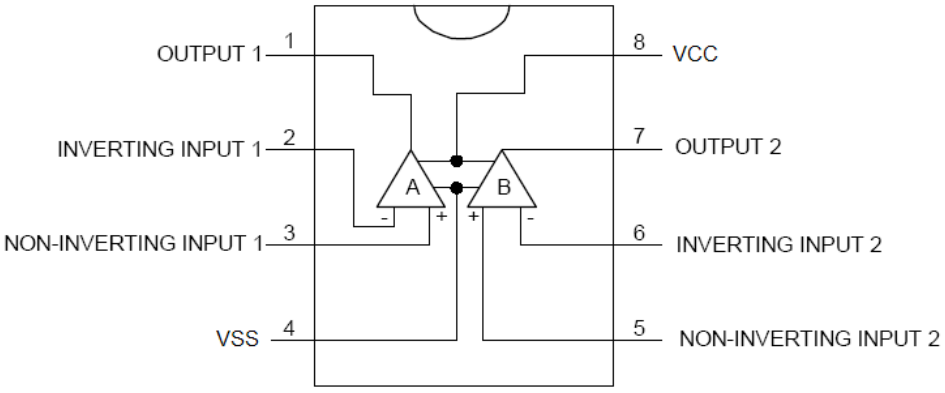
❖ GENERAL DESCRIPTION

These devices consist of two independent, high gain, internally frequency-compensated operational amplifiers designed operate from a single supply over a wide range of voltages. Operation from split supplies also is possible if the difference between the two supplies is 3V to 40V, and V_{CC} is at least 1.5V more positive than the input common-mode voltage, the low supply-current drain is independent of the magnitude of the power supply voltage.

❖ FEATURES

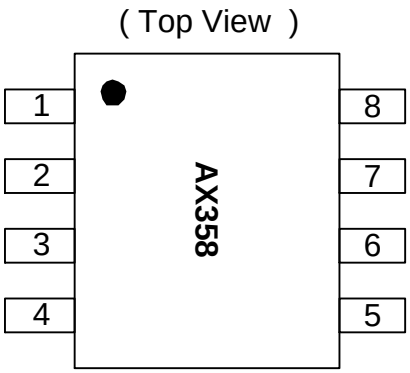
- Two internally compensated OP amps
- Wide power supply range: 3V to 40V
- Large output voltage swing: 0V to Vcc-1.5V
- Low input bias current
- Low input offset voltage and offset current
- Internally frequency compensated for unity gain
- Short Circuit Protected Outputs
- Input common-mode voltage range includes ground
- SOP-8L Pb-Free package

❖ BLOCK DIAGRAM



❖ PIN ASSIGNMET

The package of AX358 is SOP-8L; the pin assignment is given by:



SOP-8L

Pin	Description
1	Output 1 (V_O1)
2	Inverting input 1 (IN1-)
3	Non inverting input 1 (IN1+)
4	VSS
5	Non inverting input 2 (IN2+)
6	Inverting input 2 (IN2-)
7	Output 2 (V_O2)
8	VCC

❖ ORDER/MARKING INFORMATION

Order Information	Top Marking
AX358 X X Package Type S:SOP-8L Packing A : Taping	Logo ← AX358 → Part number YYWWX → ID code:internal WW: 01~52 Year: 10=2010 11=2011

❖ ABSOLUTE MAXIMUM RATINGS (at T_A=25°C)

Characteristics	Symbol	Rating	Unit
Power Supply Voltage (Single Supply)	V_{CC}	40	V
Power Supply Voltage (Split Supplies)	Vcc, Vss	±20	V
Input Differential Voltage Range	V_{IDR}	±20	V
Input Common Mode Voltage Range	V_{ICR}	-0.3 to V_{CC}	V
Output Short Circuit Duration	T_{SC}	Continuous	
Power Dissipation	PD	500	mW
Storage Temperature Range	T_{ST}	-55 to +165	°C
Operating Junction Temperature	T_{OPJ}	-40 to +125	°C
Junction Temperature Range	TJ	150	°C
Thermal Resistance from Junction to case	θ_{JC}	40	°C/W
Thermal Resistance from Junction to ambient	θ_{JA}	90	°C/W

❖ ELECTRICAL CHARACTERUSTICS (V_{CC} = 5V, T_A=25°C, unless otherwise specified)

Characteristics	Symbol	Conditions (Note1)		Min	Typ	Max	Units
Input offset voltage**(Note2)**	V_{IO}	V_{CC}=5V to MAX, V_{IC}=V_{ICR} min, V_O=1.4V	Full ange	1	5	11	mV
Average temperature coefficient of input offset voltage	αV_{IO}		Full range	-	7	-	uV/°C
Input offset current	I_{IO}	V_O=1.4V	25°C	-	2	50	nA
			Full range	-	-	150	
Average temperature coefficient of input offset current	αI_{IO}		Full range	-	10	-	pA/°C
Input bias current	I_{IB}	I_{IN}+ or I_{IN}-	25°C	-	-20	-250	nA
			Full range	-	-	-500	
Common-mode input voltage range	V_{ICR}	V_{CC}=5V to MAX	25°C	0 to V_{CC}-1.5	-	-	V
			Full range	0 to V_{CC}-2	-	-	V
High-level output voltage	V_{OH}	V_{CC}=MAX, R_L=2KΩ	Full range	26	-	-	V
		V_{CC}=MAX, $R_L \geqq$ 10KΩ	Full range	27	28	-	
Low-level output voltage	V_{OL}	$R_L \geqq$ 10KΩ	Full range	-	5	20	mV
Large-signal differential voltage amplification	A_{VD}	V_{CC}=15V, V_O=1V to 11V, RL $\geqq$ 2KΩ	25°C	25	100	-	V/mV
			Full range	15	-	-	
Common-mode rejection ratio	CMRR	V_{CC}=5V to MAX, V_{IC}=V_{ICR} min.	25°C	65	80	-	dB
Supply voltage rejection ratio ($\triangle V_{CC}/\triangle V_{IO}$)	K_{SVR}	V_{CC}=5V to MAX	25°C	65	100	-	dB
Crosstalk attenuation	V_O1/V_O2	F=1KHz to 20KHz	25°C	-	120	-	dB

❖ ELECTRICAL CHARACTERUSTICS (CONTINUE)

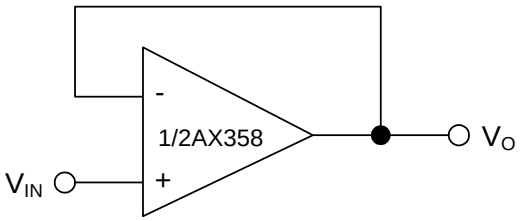
Output current	I_O	V_{CC}=15V, V_{ID}=1V, V_O=0V	25°C	-20	-30	-	mA
			Full range	-10	-	-	
		V_{CC}=15V, V_{ID}= -1V, V_O=2V	25°C	10	20	-	
			Full range	5	-	-	
		V_{ID}= -1V, V_O=200mV	25°C	12	30	-	uA
Short-circuit output current	I_{OS}	V_{CC} =15V, V_O=0V	25°C	-	40	-	mA
Supply current (two amplifiers)	I_{CC}	V_O-2.5V, No Load	Full range	-	0.7	1.2	mA
		V_{CC}=MAX, V_O=0.5V_{CC}, No Load	Full range	-	1	2	

Note1: All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. “MAX” VCC for testing purposes is 36 V. Full range is 0 °C to 70 °C.

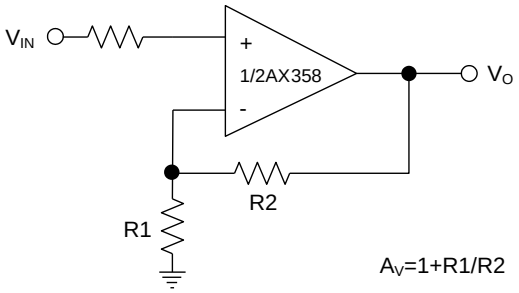
Note2: (VIN+) – (VIN-) > +1mV (min.) for V_O=1.4V.

❖ APPLICATION CIRCUIT

Volgate Follower

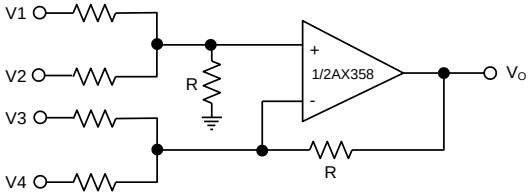


Non Inverting DC Amplifier



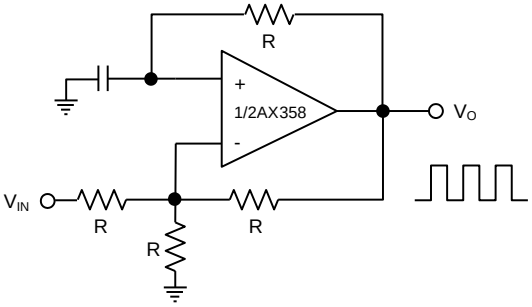
A_V=1+R1/R2

DC Summing Amplifier

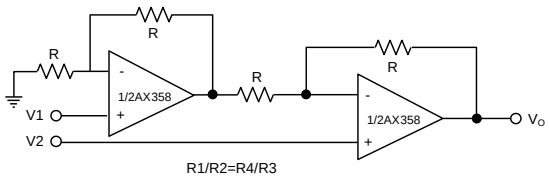


V_O=V1+V2-V3-V4
Where (V1+V2)≧(V3+V4)
To Keep V_O≧0V

Square-wave Oscillator

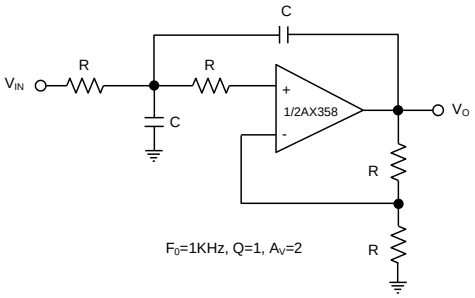


High Input Z, DC differential Amplifier



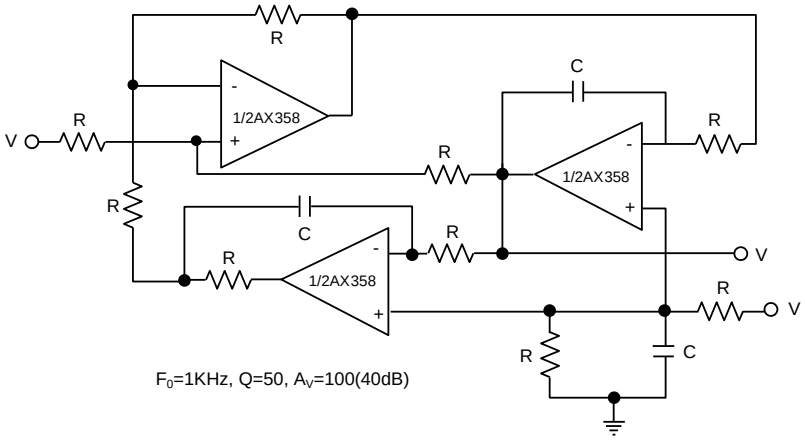
R1/R2=R4/R3
V_O=1+R4/R3(V2=V1)
As shown V_O=2(V2-V1)

DC Coupled Low-Pass RC Active Filter



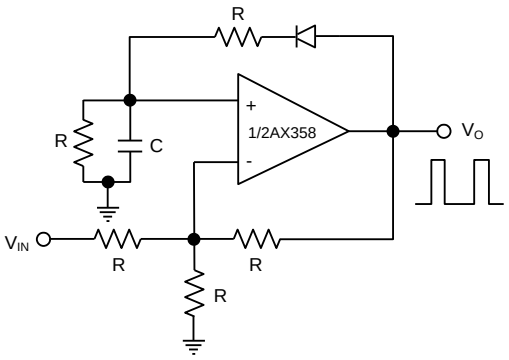
F_0=1KHz, Q=1, A_V=2

Active Band-Pass Filter

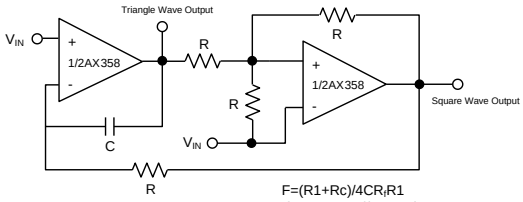


F_0=1KHz, Q=50, A_V=100(40dB)

Pulse Generator

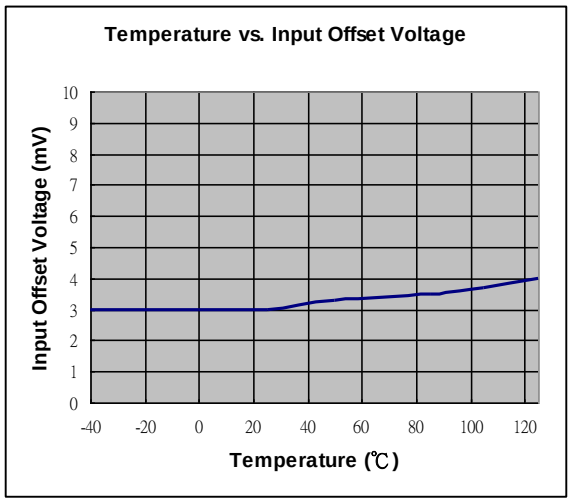


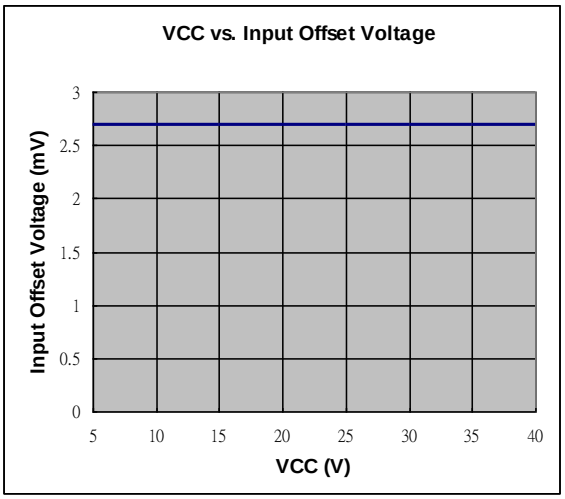
Function Generator

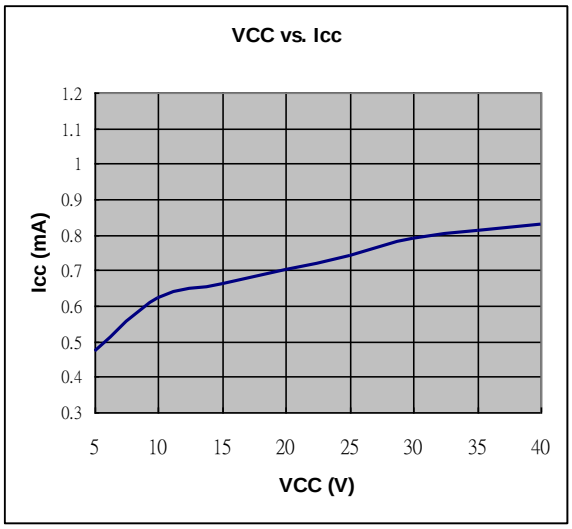


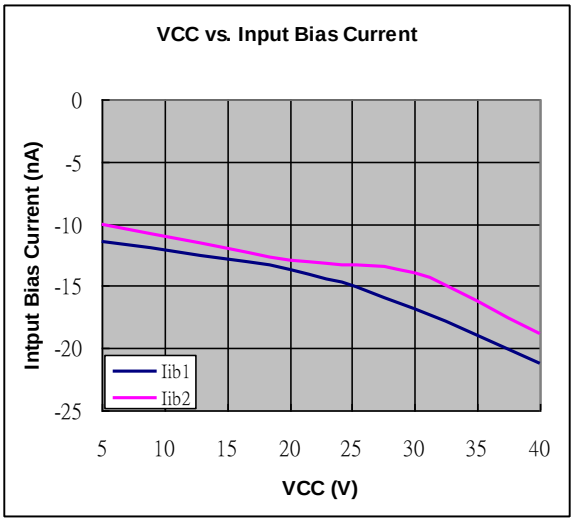
F=(R1+Rc)/4CRfR1
If R3=R2*R1/(R1+R2)

❖ TYPICAL CHARACTERISTICS

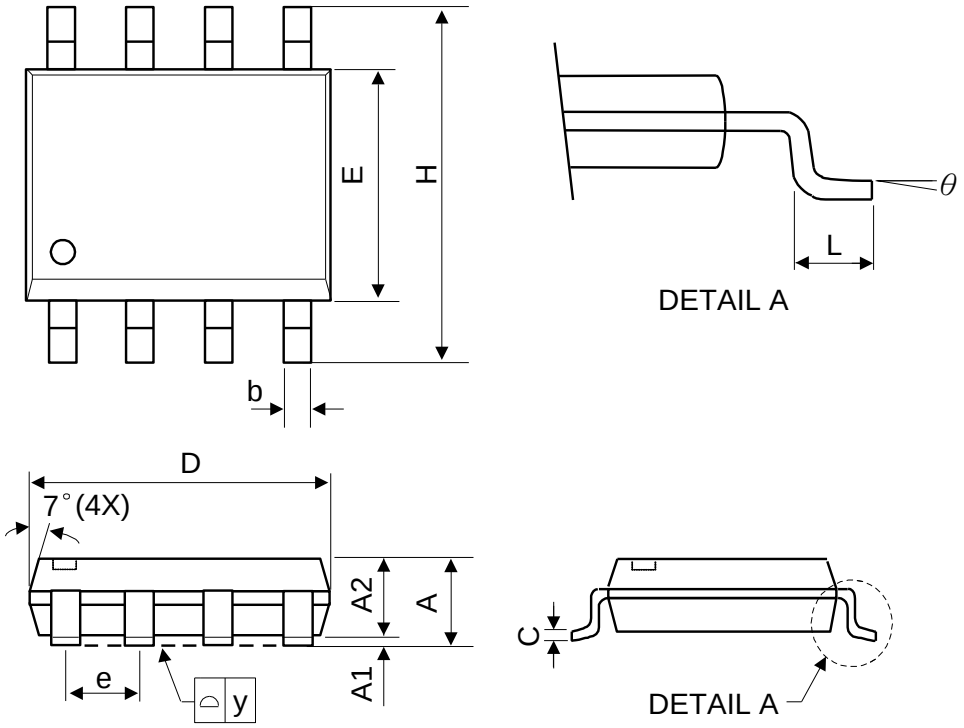








❖ PACKAGE OUTLINES



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.75	-	-	0.069
A1	0.1	-	0.25	0.04	-	0.1
A2	1.25	-	-	0.049	-	-
C	0.1	0.2	0.25	0.0075	0.008	0.01
D	4.7	4.9	5.1	0.185	0.193	0.2
E	3.7	3.9	4.1	0.146	0.154	0.161
H	5.8	6	6.2	0.228	0.236	0.244
L	0.4	-	1.27	0.015	-	0.05
b	0.31	0.41	0.51	0.012	0.016	0.02
e	1.27 BSC			0.050 BSC		
y	-	-	0.1	-	-	0.004
θ	0°	-	8°	0°	-	8°

Mold flash shall not exceed 0.25mm per side

JEDEC outline: MS-012 AA