Overview

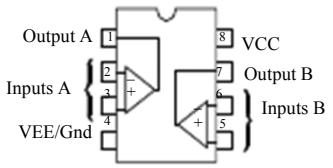
Features

LM258/LM358/LM2904

DUAL OPERATIONAL AMPLIFIERS

- Wide Range of Supply Voltages: 3 V to 32 V
  (LM2904: 3 V to 26 V) or Dual Supplies
- Low Supply Current Drain Independent of
  Supply Voltage : 0.8 mA Typ
- Common-Mode Range Extends to Negative Supply
- Low Input Bias and Offset Current
- Differential Input Voltage Range Equal to
  Maximum-Rated Supply Voltage :±32 V
  (±26 V for LM2904)
- Single And Split Supply Operation
- Internal Frequency Compensation
- Package: SOP-8, DIP

PIN CONNECTIONS



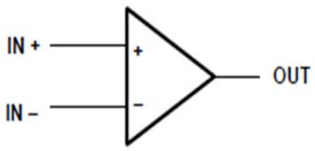
Description

These devices consist of two independent, high-gain, frequency-compensated operational amplifiers that were designed specifically to operate from a single supply over a wide range of voltages. Operation from split supply is also possible so long as the difference between the two Supplies is 3V to 32V (3V to 26V for the LM2904), and VCC 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 supply voltage. Applications include transducer amplifiers, dc amplification blocks, and all the conventional operational amplifier circuits that now can be more easily implemented in single-supply-voltage systems. For example, these device scan be operated directly off of the standard 5V supply that is used in digital systems and will easily provide the required interface electronics without requiring additional ±5V supplies.

The LM2904 is manufactured to demanding automotive requirements.

Symbol(Each Amplifier)



MAXIMUM RATINGS (T_A=+25^{0}C, unless otherwise noted.)

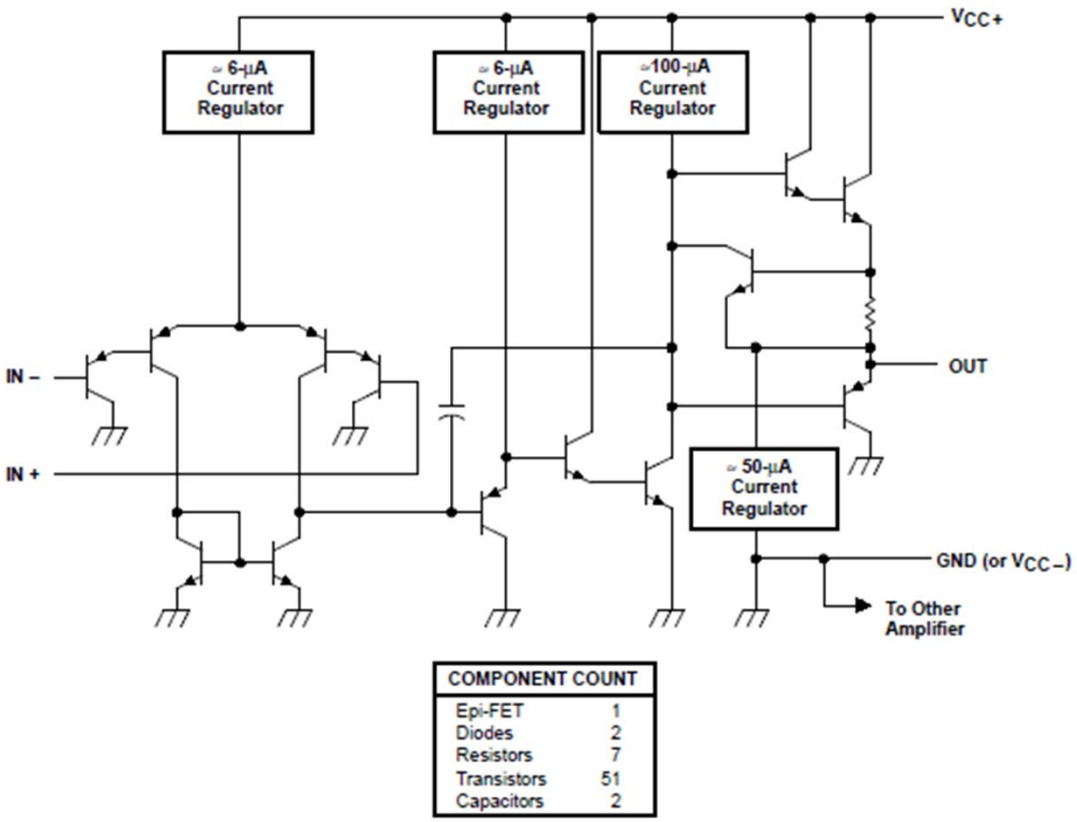
Parameter	Symbol	LM258	LM358	LM2904	Unit
Supply Voltage	Vcc	±16 or 32	±16 or 32	±16 or 32	V
Differential Input Voltage	$V_{I(DIFF)}$	32	32	32	V
Input Voltage	V_I	-0.3 to +32	-0.3 to +32	-0.3 to +32	V
Output Short Circuit to GND V_{CC}≤15V, T_A=25^{0}C(One Amp)	-	Continuous	Continuous	Continuous	-
Operating Temperature Range	T_{OPR}	-25~+85	0~+70	-40~+85	^{0}C
Storage Temperature Range	T_{STG}	-65~+150	-65~+150	-65~+150	^{0}C

Electrical Characteristics

(Vcc=5.0v, V_{EE}=GND, T_A=25^{0}C, unless otherwise noted)

Parameter	Symbol	Conditions	LM258			LM358			LM2904			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Valtage	V_{IO}	V_{CM}=0V to V_{CC} -1.5V $V_{O(P)}$=1.4V, RS=0 Ω	-	2.9	5.0	-	2.9	7.0	-	2.9	7.0	mV
Input Offset Current	I_{IO}	-	-	3	30	-	3	50	-	3	50	nA
Input Bias Current	I_{BIAS}	-	-	45	150	-	45	250	-	45	250	nA
Input Voltage Range	$V_{I(R)}$	V_{CC}=30V (LM2904,V_{CC}=26V)	0	-	VCC -1.5V	0	-	VCC -1.5V	0	-	VCC -1.5V	V
Supply Current	I_{CC}	R_L=∞, V_{CC}=30V (LM2904,V_{CC}=26V)	-	0.8	2.0	-	0.8	2.0	-	0.8	2.0	mA
		RL=∞, V_{CC}=26V	-	0.5	1.2	-	0.5	1.2	-	0.5	1.2	mA
Large Signal Voltage Gain	G_V	V_{CC}=15V, R_L=2k Ω $V_{O(P)}$=1V to 11V	50	100	-	25	100	-	25	100	-	V/mV
Output Volage Swing	$V_{O(H)}$	V_{CC}=30V (LM2904, V_{CC}=26V) R_L=2kΩ	26	-	-	26	-	-	26	-	-	V
		R_L=10kΩ	27	28	-	27	28	-	23	24	-	V
	$V_{O(L)}$	V_{CC}=5V, RL=10kΩ	-	5	20	-	5	20	-	5	20	mV
Common-Mode Rejection Ratio	CMRR	-	70	85	-	65	80	-	50	80	-	dB
Power Supply Rejection Ratio	PSRR	-	65	100	-	65	100	-	50	100	-	dB
Channel Separation	CS	f=1kHz to 20kHz	-	120	-	-	120	-	-	120	-	dB
Short Circuit to GND	I_{SC}	-	-	40	60	-	40	60	-	40	60	mA
Output Current	I_{SOURCE}	$V_{I(+)}$=1V, $V_{I(-)}$=0V V_{CC}=15V, $V_{O(P)}$=2V	20	30	-	20	30	-	20	30	-	mA
	I_{SINK}	$V_{I(+)}$=1V, $V_{I(-)}$=0V V_{CC}=15V, $V_{O(P)}$=2V	10	15	-	10	15	-	10	15	-	mA
		$V_{I(+)}$=1V, $V_{I(-)}$=0V V_{CC}=15V, $V_{O(P)}$=200mV	12	100	-	12	100	-	-	-	-	μA
Differential Input Voltage	$V_{I(DIFF)}$	-	-	-	V_{CC}	-	-	V_{CC}	-	-	V_{CC}	V

Schematic (each amplifier)



COMPONENT COUNT	
Epi-FET	1
Diodes	2
Resistors	7
Transistors	51
Capacitors	2

Large Signal Voltage Follower Response

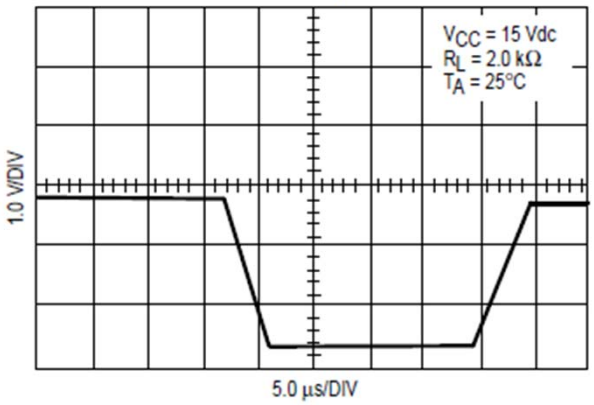


Figure 1. Input Voltage Range

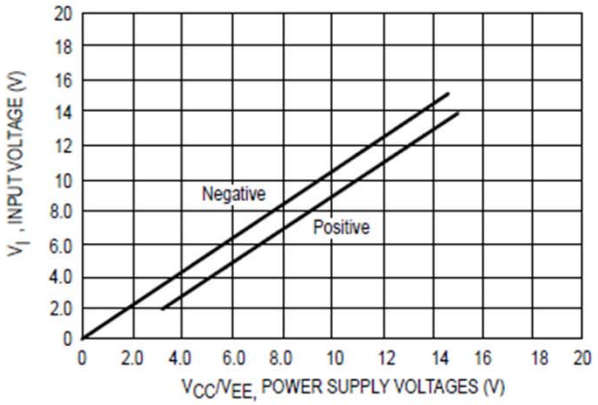


Figure 2. Large–Signal Open Loop Voltage Gain

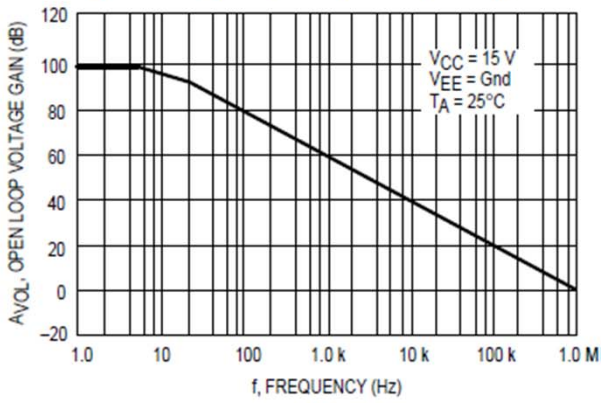


Figure 3. Large–Signal Frequency Response

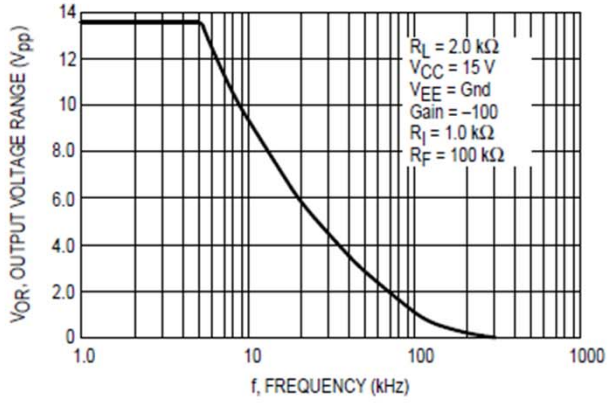


Figure 4. Small Signal Voltage Follower Pulse Response (Noninverting)

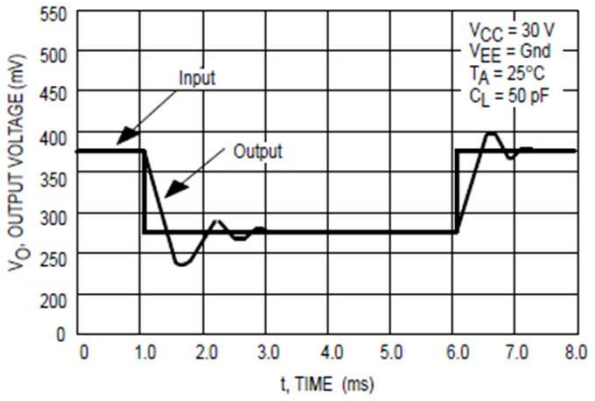


Figure 5. Power Supply Current versus Power Supply Voltage

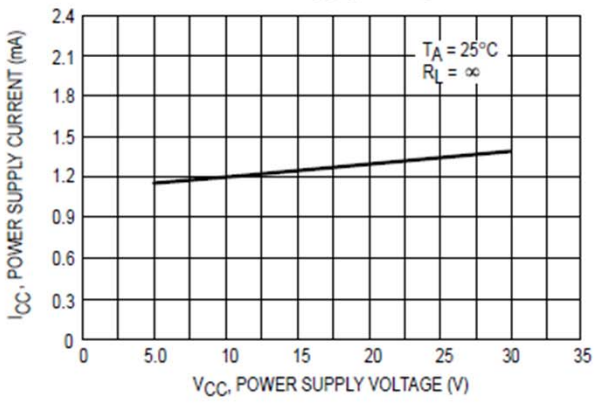


Figure 6. Input Bias Current versus Supply Voltage

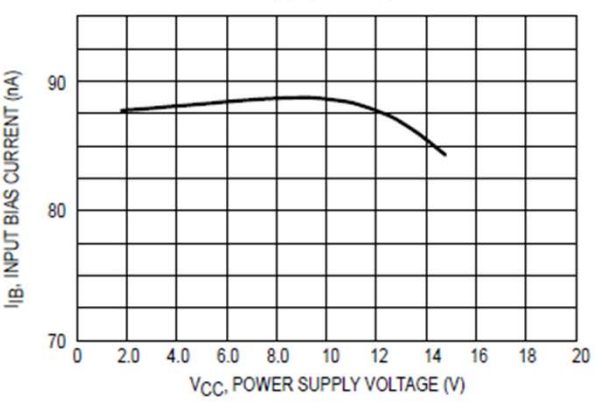


Figure7. Wien Bridge Oscillator

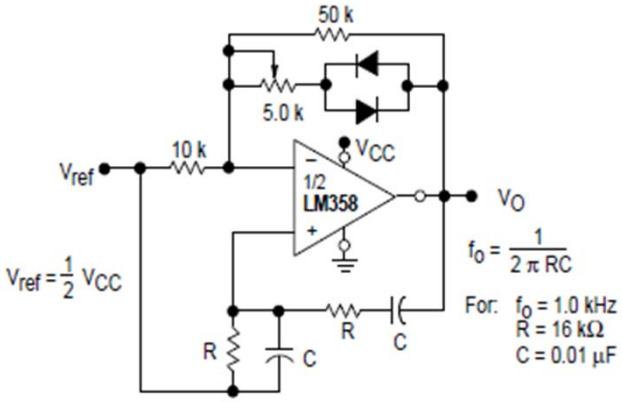


Figure 8. High Impedance Differential Amplifier

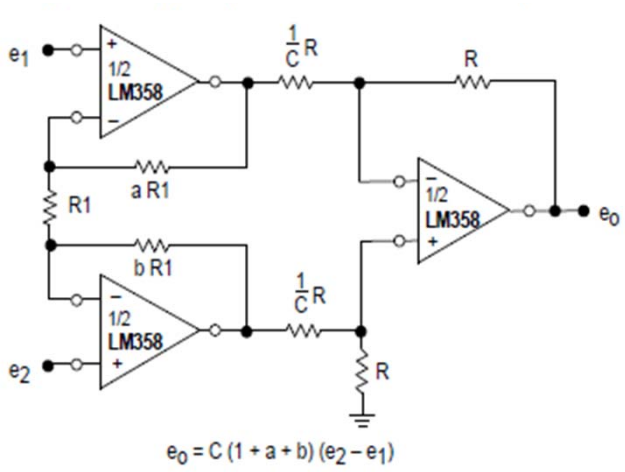


Figure 9. Voltage Reference

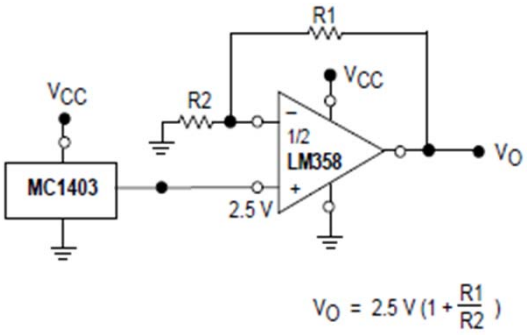


Figure 10. Comparator with Hysteresis

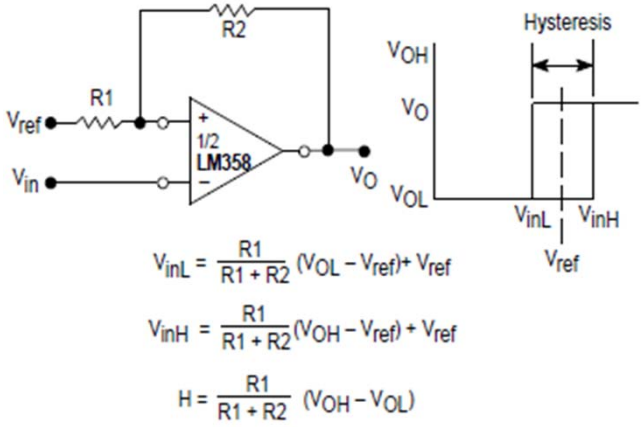
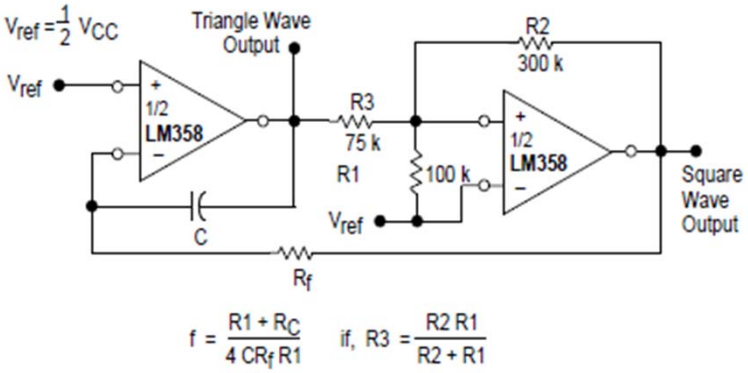
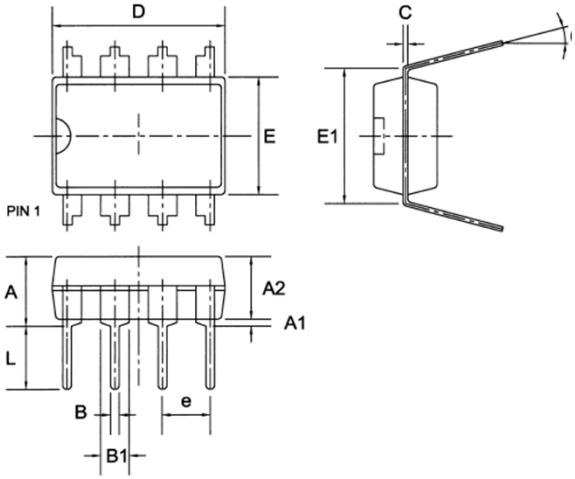


Figure 11. Function Generator

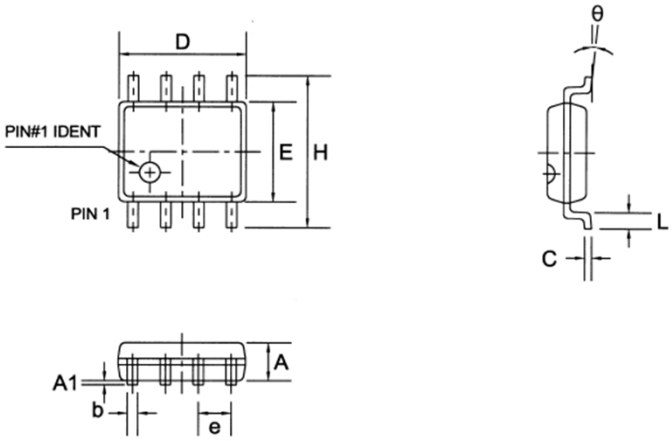


DIMENSION DIP-8



Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	—	—	4.31	—	—	0.170
A1	0.38	—	—	0.015	—	—
A2	3.15	3.40	3.65	0.124	0.134	0.144
B	0.38	0.46	0.51	0.015	0.018	0.020
B1	1.27	1.52	1.77	0.050	0.060	0.070
C	0.20	0.25	0.30	0.008	0.010	0.012
D	8.95	9.20	9.45	0.352	0.362	0.372
E	6.15	6.40	6.65	0.242	0.252	0.262
E1	—	7.62	—	—	0.300	—
e	—	2.54	—	—	0.100	—
L	3.00	3.30	3.60	0.118	0.130	0.142
θ	0°	—	15°	0°	—	15°

DIMENSION SOP-8



Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.30	1.50	1.70	0.051	0.059	0.067
A1	0.06	0.16	0.26	0.002	0.006	0.010
b	0.30	0.40	0.55	0.012	0.016	0.022
C	0.15	0.25	0.35	0.006	0.010	0.014
D	4.72	4.92	5.12	0.186	0.194	0.202
E	3.75	3.95	4.15	0.148	0.156	0.163
e	—	1.27	—	—	0.050	—
H	5.70	6.00	6.30	0.224	0.236	0.248
L	0.45	0.65	0.85	0.018	0.026	0.033
θ	0°	—	8°	0°	—	8°

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