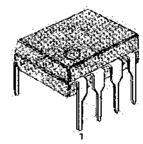
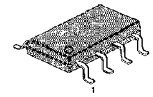
DUAL OPERATIONAL AMPLIFIERS

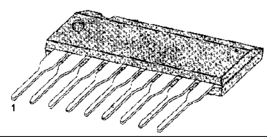
The LM258 series consists of four independent, high gain, internally Frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltage.
Operation from split power supplies is also possible and the low power Supply current drain is independent of the magnitude of the power Supply voltage. Application areas include transducer amplifier, DC gain blocks and all the conventional OP amp circuits which now can be easily implemented in single 8 SOP power supply system.

8 DIP





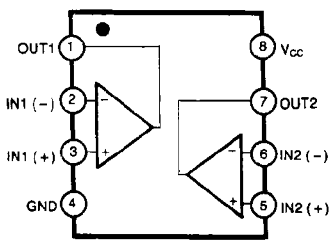
9 SIP

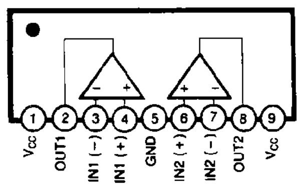


FEATURES

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide power supply range: LM258/A, LM358/A: 3V~32V (or ±1.5V~16V)
  LM2904: 3V~26V (or ±1.5V~13V)
- Input common-mode voltage range Includes ground
- Large output voltage swing: 0V DC to Vcc - 1.5V DC
- Power drain suitable for battery operation.

BLOCK DIAGRAM

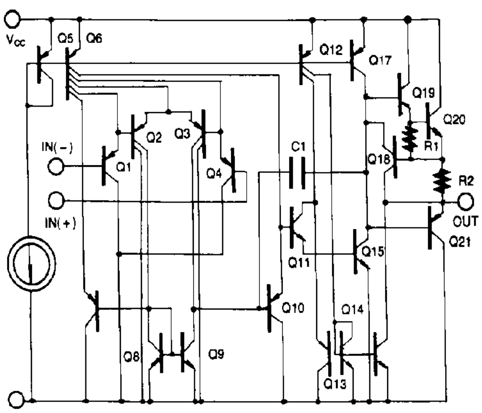




ORDERING INFORMATION

Device	Package	Operating Temperature
LM358N LM358AN	8 DIP	0 ~ + 70°C
LM358S LM358AS	9 SIP	
LM358M LM358AM	8 SOP	
LM258N LM258AN	8 DIP	-25 ~ + 85 °C
LM258S LM258AS	9 SIP	
LM258M LM258AM	8 SOP	
LM2904N	8 DIP	-40 ~ + 85 °C
LM2904S	9 SIP	
LM2904M	8 SOP	

SCHEMATIC DIAGRAM (One section only)



FAIRCHILD SEMICONDUCTOR™

Rev. B

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	LM258/LM258A	LM358/LM358A	LM2904	Unit
Supply Voltage	V_{CC}	±16 or 32	±16 or 32	±13 or 26	V
Differential Input Voltage	$V_{I(DIFF)}$	32	32	26	V
Input Voltage	V_I	-0.3 to +32	-0.3 to +32	-0.3 to +26	V
Output Short Circuit to GND $V_{CC} \leq V$, $T_A = 25°C$(One Amp)		Continuous	Continuous	Continuous	
Operating Temperature Range	T_{OPR}	-25 ~ + 85	0 ~ + 70	-40 ~ + 85	°C
Storage Temperature Range	T_{STG}	-65 ~ + 150	-65 ~ + 150	-65 ~ + 150	°C

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V, V_{EE} = GND, T = 25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM258			LM358			LM2904			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V_{IO}	V_{CM} = 0V to V_{CC} -1.5V $V_{O(P)}$ = 1.4V, R_S = 0Ω		2.9	5.0		2.9	7.0		2.9	7.0	mV
Input Offset Current	I_{IO}			3	30		5	50		5	50	nA
Input Bias Current	I_{BIAS}			45	150		45	250		45	250	nA
Input Common-Mode Voltage Range	$V_{I(R)}$	V_{CC} = 30V (KA2904, V_{CC} = 26V)	0		V_{CC} -1.5	0		V_{CC} -1.5	0		V_{CC} -1.5	V
Supply Current	I_{CC}	R_L = ∞, V_{CC} = 30V (KA2902, V_{CC} = 26V)		0.8	2.0		0.8	2.0		0.8	2.0	mA
		R_L = ∞,over full temperature range		0.5	1.2		0.5	1.2		0.5	1.2	mA
Large Signal Voltage Gain	G_V	V_{CC} = 15V, $R_L \geq 2K\Omega$ $V_{O(P)}$ = 1V to 11V	50	100		25	100		25	100		V/mV
Output Voltage Swing	$V_{O(H)}$	V_{CC} = 30V; R_L = 2KΩ	26			26			22			V
		V_{CC} = 26V for 2904; R_L = 10KΩ	27	28		27	28		23	24		V
	$V_{O(L)}$	V_{CC} = 5V, $R_L \geq 10K\Omega$		5	20		5	20		5	100	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	10	30		10	30		10	30		mA
	I_{SINK}	$V_{I(+)}$ = 0V, $V_{I(-)}$ = 1V V_{CC} = 15V, $V_{O(P)}$ = 2V	10	15		10	15		10	15		mA
		$V_{I(+)}$ = 0V, $V_{I(-)}$ = 1V V_{CC} = 15V, $V_{O(P)}$ = 200mA	12	100		12	100					µA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}			V_{CC}			V_{CC}	V

ELECTRICAL CHARACTERISTICS

(V_{CC}=5.0V, V_{EE}=GND, unless otherwise specified)
The following specification apply over the range of - 25 °C ≤ T_A ≤ + 85 °C for the KA258; and the 0 °C ≤ T_A ≤ + 70 °C for the LM358; and the -40 °C ≤ T_A ≤ +85 °C for the LM2904

Characteristic	Symbol	Test Conditions	LM258			LM358			LM2904			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V_{IO}	V_{CM} = 0V to V_{CC} = 1.5V $V_{O(P)}$ = 1.4V, R_S = 0Ω			7.0			9.0			10.0	mV
Input Offset Voltage Drift	V_{IO}	R_S = 0Ω		7.0			7.0			7.0		μV/°C
Input Offset Current	I_{IO}				100			150		45	200	nA
Input Offset Current Drift	$\Delta I_{IO}/\Delta T$			10			10			10		pA/°C
Input Bias Current	I_{BIAS}			40	300		40	500		40	500	nA
Input Common-Mode Voltage Range	$V_{I(R)}$	V_{CC} = 30V (KA2904, V_{CC} = 26V)	0		V_{CC} =2.0	0		V_{CC} =2.0	0		V_{CC} =2.0	V
Large Signal Voltage Gain	G_V	V_{CC} = 15V, R_L≥2.0KΩ $V_{O(P)}$ = 1V to 11V	25			15			15			V/mV
Output Voltage Swing	$V_{O(H)}$	V_{CC} = 30V, R_L = 2KΩ	26			26			26			V
		V_{CC} = 26V for 2904, R_L = 10KΩ	27	28		27	28		27	28		V
	$V_{O(L)}$	V_{CC} = 5V, R_L≥10KΩ		5	20		5	20		5	20	mV
Output Current	I_{SOURCE}	$V_{I(+)}$ = 1V, $V_{I(-)}$ = 0V V_{CC} = 15V, $V_{O(P)}$ = 2V	10	30		10	30		10	30		mA
	I_{SINK}	$V_{I(+)}$ = 0V, $V_{I(-)}$ = 1V V_{CC} = 15V, $V_{O(P)}$ = 2V	5	8		5	9		5	9		mA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}			V_{CC}			V_{CC}	V

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V. V_{EE}=GND. T_A=25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM258A			LM358A			Unit
			Min	Typ	Max	MIn	Typ	Max	
Input Offset Voltage	V_{IO}	V_{CM} = 0V to V_{CC} = 1.5V $V_{O(P)}$ = 1.4V, R_S = 0Ω		1.0	3.0		2.0	3.0	mV
Input Offset Current	I_{IO}			2	15		5	30	nA
Input Bias Current	I_{BIAS}			40	80		45	100	nA
Input Common-Mode Voltage Range	$V_{I(R)}$	V_{CC} = 30V	0		V_{CC} =1.5	0		V_{CC} =1.5	V
Supply Current	I_{CC}	R_L = ∞,V_{CC} = 30V		0.8	2.0		0.8	2.0	mA
		RL = ∞,over full temperature range		0.5	1.2		0.5	1.2	mA
Large Signal Voltage Gain	G_V	V_{CC} = 15V, R_L≥2KΩ V_O = 1V to 11V	50	100		25	100		V/mV
Output Voltage Swing	V_{OH}	V_{CC} = 30V, R_L = 2KΩ	26			26			V
		V_{CC} = 26V for 2904, R_L = 10KΩ	27	28		27	28		V
	$V_{O(L)}$	V_{CC} = 5V, R_L≥10KΩ		5	20		5	20	mV
Common-Mode Rejection Ratio	CMRR		70	85		65	85		dB
Power Supply Rejection Ratio	PSRR		65	100		65	100		dB
Channel Separation	CS	f = 1KHz to 20KHz		120			120		dB
Short Circuit to GND	I_{SC}			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		mA
	I_{SINK}	$V_{I(+)}$ = 1V, $V_{I(-)}$ = 0V V_{CC} = 15V, $V_{O(P)}$ = 2V	10	15		10	15		mA
		V_{in+} = 0V, V_{in-} = 1V $V_{O(P)}$ = 200mV	12	100		12	100		μA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}			V_{CC}	V

ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0V, V_{EE} = GND. unless otherwise specified)

The following specification apply over the range of -25 °C ≤ T_A ≤ +85 °C for the LM258A; and the 0 °C ≤ T_A ≤ +70 °C for the LM358A

Characteristic	Symbol	Test Conditions	LM258A			LM358A			Unit
			Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V_{IO}	V_{CM} = 0V to V_{CC} = 1.5V $V_{O(P)}$ = 1.4V, R_S = 0Ω			4.0			5.0	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$			7.0	15		7.0	20	μV/°C
Input Offset Current	I_{IO}				30			75	nA
Input Offset Current Drift	$\Delta I_{IO}/\Delta T$			10	200		10	300	pA/°C
Input Bias Current	I_{BIAS}			40	100		40	200	nA
Input Common-Mode Voltage Range	$V_{I(R)}$	V_{CC} = 30V	0		Vcc =2.0	0		Vcc =2.0	V
Output Voltage Swing	$V_{O(H)}$	V_{CC} = 30V, R_L = 2KΩ	26			26			V
		V_{CC} = 30V, R_L = 10KΩ	27	28		27	28		V
	$V_{O(L)}$	V_{CC} = 5V, R_L≥10KΩ		5	20		5	20	mV
Large Signal Voltage Gain	G_V	V_{CC} = 15V, R_L≥2.0KΩ $V_{O(P)}$ = 1V to 11V	25			15			V/mV
Output Current	I_{SOURCE}	$V_{I(+)}$ = 1V, $V_{I(-)}$ = 0V V_{CC} = 15V, $V_{O(P)}$ = 2V	10	30		10	30		mA
	I_{SINK}	$V_{I(+)}$ = 1V, $V_{I(-)}$ = 0V V_{CC} = 15V, $V_{O(P)}$ = 2V	5	9		5	9		mA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}			V_{CC}	V

TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 1 SUPPLY CURRENT

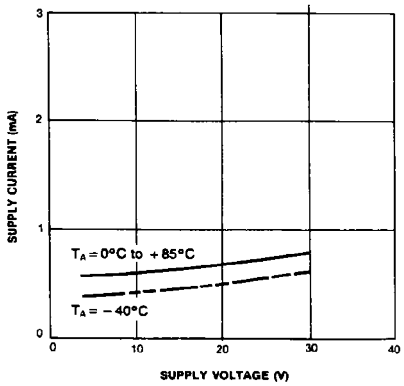


Fig. 2 VOLTAGE GAIN

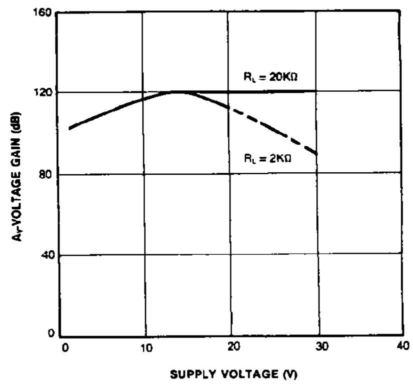


Fig. 3 OPEN LOOP FREQUENCY RESPONSE

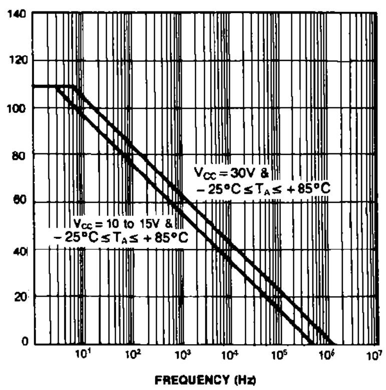


Fig. 4 LARGE SIGNAL FREQUENCY

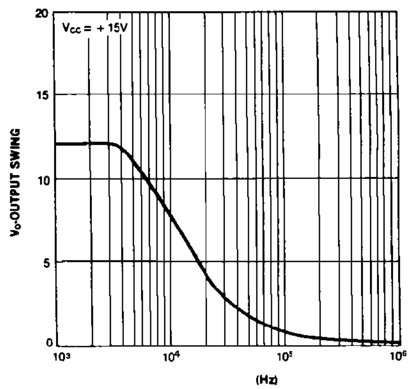


Fig. 5 OUTPUT CHARACTERISTICS CURRENT SOURCING

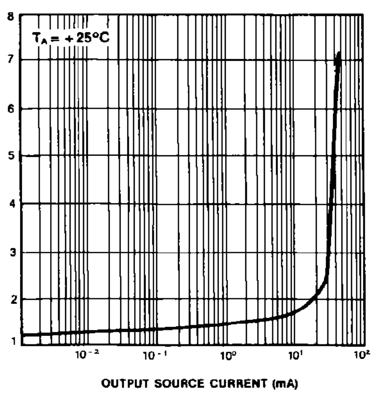


Fig. 6 OUTPUT CHARACTERISTICS CURRENT SINKING

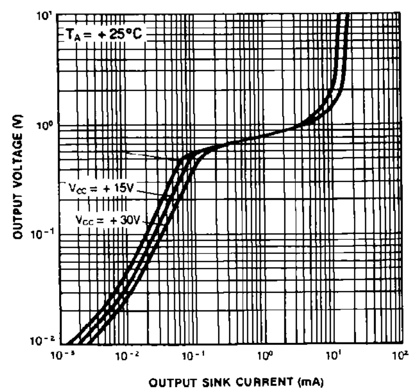


Fig. 7 INPUT VOLTAGE RANGE

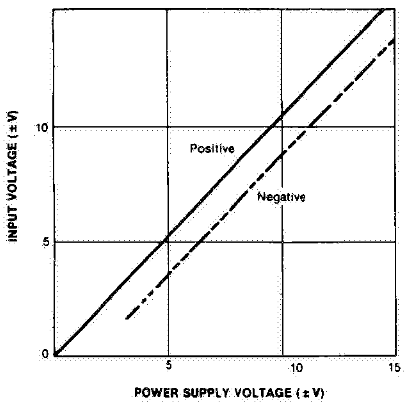


Fig. 8 COMMON-MODE REJECTION RATIO

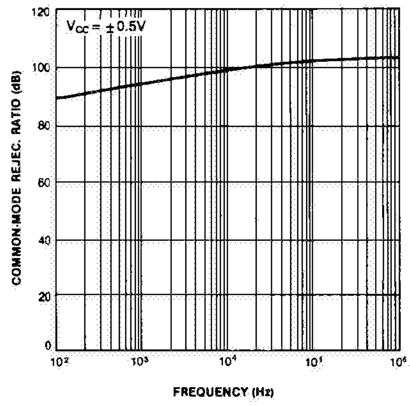


Fig. 9 CURRENT LIMITING

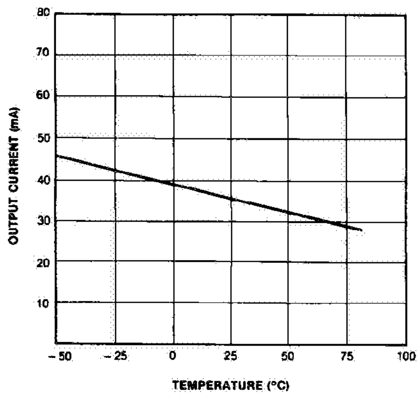


Fig. 10 INPUT CURRENT

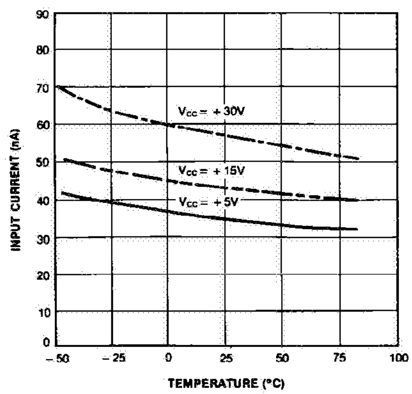


Fig. 11 VOLTAGE FOLLOWER PULSE RESPONSE

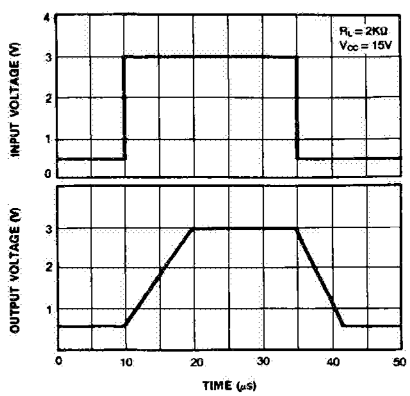
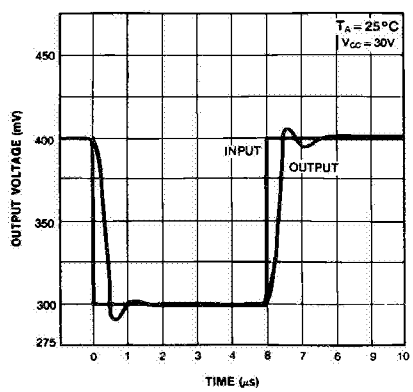


Fig. 12 VOLTAGE FOLLOWER PULSE RESPONSE (SMALL SIGNAL)



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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

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No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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