LM124/A/224/A/324/A/SA534-F,N-14,T
LM158/A/258/A/358A-F,N,T

DESCRIPTION

The LM124/SA534 series consists of four independent, high gain, internally frequency compensated operational amplifiers designed specifically to operate from a single power supply over a wide range of voltages.

The LM158 series consists of two operational amplifiers designed as above. Operation from dual supplies is also possible for both series and the low power supply current drain is independent of the magnitude of the power supply voltage.

FEATURES

- **Internally frequency compensated for unity gain**
- **Large dc voltage gain—(100dB)**
- **Wide bandwidth (unity gain)—1MHz (temperature compensated)**
- **Wide power supply range**
  Single supply—(3Vdc to 30Vdc) or dual supplies—(±1.5Vdc to ±15Vdc)
- **Very low supply current drain—essentially independent of supply voltage (1mW/op amp at +5Vdc)**
- **Low input biasing current—(45nAdc temperature compensated)**
- **Low input offset voltage—(2mVdc) and offset current—(5nAdc)**
- **Differential input voltage range equal to the power supply voltage**
- **Large output voltage—(0Vdc to V+—1.5Vdc swing)**
- **LM124 Mil std 883A,B,C available**

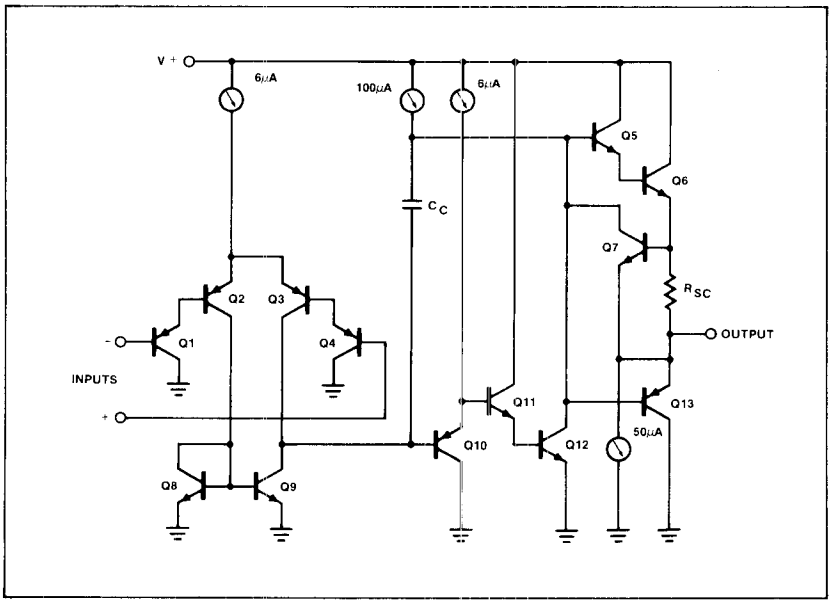
UNIQUE FEATURES

In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage.

The unity gain cross frequency is temperature compensated.

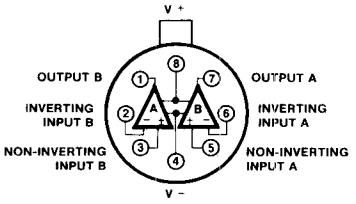
The input bias current is also temperature compensated.

EQUIVALENT SCHEMATIC



PIN CONFIGURATIONS

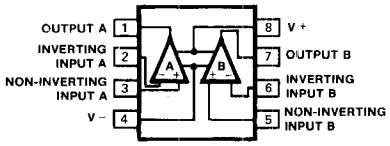
T PACKAGE



ORDER PART NO.

LM158T	LM258T
LM358T	LM158AT
LM258AT	LM358AT

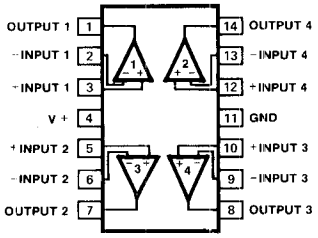
N PACKAGE



ORDER PART NO.

LM158N	LM258N
LM358N	LM158AN
LM258AN	LM358AN

F,N-14 PACKAGE



ORDER PART NO.

LM124N	LM224N	LM324N
LM124F	LM224F	LM324F
LM124AN	LM224AN	LM324AN
LM124AF	LM224AF	LM324AF
SA534N	SA534F	

ABSOLUTE MAXIMUM RATINGS

	PARAMETER	RATING	UNIT
V+	Supply voltage	32 or ±16	Vdc
	Differential input voltage	32	Vdc
	Input voltage	-0.3 to +32	Vdc
	Power dissipation[1]		
	T package	680	mW
	N package	570	mW
	F package	900	mW
	Output short-circuit to GND		
	1 amplifier[2]	Continuous	
	V+ < 15Vdc and T_A = 25°C		
	Input current (V_{IN} < -0.3V)[3]	50	mA
	Operating temperature range		
	LM324A, LM324, LM358	0 to +70	°C
	LM224A, LM224, LM258	-25 to +85	°C
	SA534	-40 to +85	°C
	LM124A, LM124, LM158	-55 to +125	°C
	Storage temperature range	-65 to +150	°C
	Lead temperature (soldering, 10sec)	300	°C

NOTES

1. For operating at high temperatures, all devices must be derated based on a +125°C maximum junction temperature and a thermal resistance of 175°C/W which applies for the device soldered in a printed circuit board, operating in a still air ambient. LM124/224 and LM158/258 can be derated based on a +150°C maximum junction temperature.
2. Short circuits from the output to V+ can cause excessive heating and eventual destruction. The maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15Vdc continuous short-circuits can exceed the power dissipation ratings and cause eventual destruction.
3. The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output, so no loading change exists on the input lines.

LM124/A/224/A/324/A/SA534-F,N-14,T
LM158/A/258/A/358A-F,N,T

DC ELECTRICAL CHARACTERISTICS (Cont'd) $V+ = 5V$, $T_A = 25°C$ unless otherwise specified.

PARAMETER		TEST CONDITIONS	LM124A			LM224A			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage[1]	$R_S \leq 10k\Omega$		1	2		1	3	mV
		$R_S \leq 10k\Omega$, over temp.			4			4	mV
V_{OS}	Drift	$R_S = 0\Omega$, over temp.		7	20		7	20	$\mu V/°C$
I_{BIAS}	Input current[2]	$I_{IN}(+) - I_{IN}(-)$		20	50		40	80	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.		40	100		40	100	nA
I_{OS}	Offset current	$I_{IN}(+) - I_{IN}(-)$		2	10		2	15	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.			30			30	nA
I_{OS}	Drift	over temp.		10	200		10	200	pA/°C
V_{CM}	Common mode voltage range[3]	$V+ = 30V$	0		V+-1.5	0		V+-1.5	V
		$V+ = 30V$, over temp.	0		V+-2	0		V+-2	V
C_{MRR}	Common mode rejection ratio		70	85		70	85		dB
V_{OUT}	Output voltage swing	$R_L = 2k\Omega$, $V+ = +30V$, over temp.	26			26			V
V_{OH}		$R_L \leq 10k\Omega$, over temp	27	28		27	28		V
V_{OL}		$R_L \leq 10k\Omega$, $V+ = 5V$, over temp.		5	20		5	20	V
I_{CC}	Supply current	$R_L = \infty$, $V_{CC} = 30V$, over temp.		1.5	3		1.5	3	mA
		$R_L = \infty$, on all op amps, over temp.		0.7	1.2		0.7	1.2	mA
A_{VOL}	Large signal voltage gain	$V+ = +15V$ (for large V_O swing), $R_L \geq 2k\Omega$	50	100		50	100		V/mV
		$V+ = +15V$ (for large V_O swing), $R_L \geq 2k\Omega$, over temp.	25			25			V/mV
	Amplifier-to-amplifier coupling[4]	f = 1kHz to 20kHz, input referred		-120			-120		dB
P_{SRR}		$R_S \leq 10k\Omega$	65	100		65	100		dB
	Output current								
	Source	$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, $V+ = 15Vdc$	20	40		20	40		mA
		$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, $V+ = 15Vdc$, over temp.	10	20		10	20		mA
	Sink	$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, $V+ = 15Vdc$	10	20		10	20		mA
		$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, $V+ = 15Vdc$, over temp.	10	15		5	8		mA
		$V_{IN}- = +1Vdc$, $V_O = 200mV$	12	50		12	50		μA
I_{SC}	Short circuit current[4]			40	60		40	60	mA
	Differential input voltage[6]				V+			V+	V

NOTES

1. $V_O = 1.4Vdc$, $R_S = 0\Omega$ with V+ from 5V to 30V and over full input common mode range (0Vdc+ to V+ -1.5V).
2. The direction of the input current is out of the IC due to the pnp input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.
3. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5, but either or both inputs can go to +32V without damage.
4. Short circuits from the output to V+ can cause excessive heating and eventual destruction. The maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15Vdc continous short-circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.
5. Due to proximity of external components, insure that coupling is not originating via stray capacitance between these external parts. This typically can be detected as this type of capacitive increases at higher frequencies.
6. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5V, but either or both inputs can go to +32Vdc without damage.

DC ELECTRICAL CHARACTERISTICS (Cont'd) $V+ = 5V$, $T_A = 25°C$ unless otherwise specified.

PARAMETER		TEST CONDITIONS	LM324A			LM124/LM224/ LM158/LM258			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage[1]	$R_S \leq 10k\Omega$		2	3		±2	±5	mV
		$R_S \leq 10k\Omega$, over temp.			5			±7	mV
V_{OS}	Drift	$R_S = 0\Omega$, over temp.		7	30		7		μV/°C
I_{BIAS}	Input current[2]	$I_{IN}(+) - I_{IN}(-)$		45	100		45	150	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.		40	200		40	300	nA
I_{OS}	Offset current	$I_{IN}(+) - I_{IN}(-)$		5	30		±3	±30	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.			75			±100	nA
I_{OS}	Drift	over temp.		10	300		10		pA/°C
V_{CM}	Common mode voltage range[3]	$V+ = 30V$	0		V+–1.5	0		V+–1.5	V
		$V+ = 30V$, over temp.	0		V+–2	0		V+–2	V
C_{MRR}	Common mode rejection ratio		65	85		70	85		dB
V_{OUT}	Output voltage swing	$R_L = 2k\Omega$, $V+ = +30V$, over temp.	26			26			V
V_{OH}		$R_L \leq 10k\Omega$, over temp	27	28		27	28		V
V_{OL}		$R_L \leq 10k\Omega$, $V+ = 5V$, over temp.		5	20		5	20	V
I_{CC}	Supply current	$R_L = \infty$, $V_{CC} = 30V$, over temp.		1.5	3		1.5	3	mA
		$R_L = \infty$, on all op amps, over temp.		0.7	1.2		0.7	1.2	mA
A_{VOL}	Large signal voltage gain	$V+ = +15V$ (for large V_O swing), $R_L \geq 2k\Omega$	25	100		50	100		V/mV
		$V+ = +15V$ (for large V_O swing), $R_L \geq 2k\Omega$, over temp.	15			25			V/mV
	Amplifier-to-amplifier coupling[4]	f = 1kHz to 20kHz, input referred		–120			–120		dB
P_{SRR}		$R_S \leq 10k\Omega$	65	100		65	100		dB
	Output current								
	Source	$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, $V+ = 15Vdc$	20	40		20	40		mA
		$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, $V+ = 15Vdc$, over temp.	10	20		10	20		mA
	Sink	$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, $V+ = 15Vdc$	10	20		10	20		mA
		$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, $V+ = 15Vdc$, over temp.	5	8		5	8		mA
		$V_{IN}- = +1Vdc$, $V_O = 200mV$	12	50		12	50		μA
I_{SC}	Short circuit current[4]			40	60		40	60	mA
	Differential input voltage[6]				V+			V+	V

NOTES

1. $V_O \cong 1.4Vdc$, $R_S = 0\Omega$ with V+ from 5V to 30V and over full input common mode range (0Vdc+ to V+ -1.5V).
2. The direction of the input current is out of the IC due to the pnp input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.
3. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5, but either or both inputs can go to +32V without damage.
4. Short circuits from the output to V+ can cause excessive heating and eventual destruction. The maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15Vdc continous short-circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.
5. Due to proximity of external components, insure that coupling is not originating via stray capacitance between these external parts. This typically can be detected as this type of capacitive increases at higher frequencies.
6. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5V, but either or both inputs can go to +32Vdc without damage.

LM124/A/224/A/324/A/SA534-F,N-14,T
LM158/A/258/A/358A-F,N,T

DC ELECTRICAL CHARACTERISTICS (Cont'd) $V+ = 5V$, $T_A = 25°C$ unless otherwise specified.

PARAMETER		TEST CONDITIONS	LM324/LM358			SA534			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage[1]	$R_S \leq 10k\Omega$		±2	±7		±2	±7	mV
		$R_S \leq 10k\Omega$, over temp.			±9			±9	mV
V_{OS}	Drift	$R_S = 0\Omega$, over temp.		7			7		µV/°C
I_{BIAS}	Input current[2]	$I_{IN}(+) - I_{IN}(-)$		45	250		45	250	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.		40	500		40	500	nA
I_{OS}	Offset current	$I_{IN}(+) - I_{IN}(-)$		±5	±50		±5	±50	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.			±150			±150	nA
I_{OS}	Drift	over temp.		10			10		pA/°C
V_{CM}	Common mode voltage range[3]	V+ = 30V	0		V+-1.5	0		V+-1.5	V
		V+ = 30V, over temp.	0		V+-2	0		V+-2	V
C_{MRR}	Common mode rejection ratio		65	70		65	70		dB
V_{OUT}	Output voltage swing	$R_L = 2k\Omega$, V+ = +30V, over temp.	26			26			V
V_{OH}		$R_L \leq 10k\Omega$, over temp	27	28		27	28		V
V_{OL}		$R_L \leq 10k\Omega$, V+ = 5V, over temp.		5	20		5	20	V
I_{CC}	Supply current	$R_L = \infty$, V_{CC} = 30V, over temp.		1.5	3		1.5	3	mA
		$R_L = \infty$, on all op amps, over temp.		0.7	1.2		0.7	1.2	mA
A_{VOL}	Large signal voltage gain	V+ = −15V (for large V_O swing), $R_L \geq 2k\Omega$	25	100		25	100		V/mV
		V+ = −15V (for large V_O swing), $R_L \geq 2k\Omega$, over temp.	15			15			V/mV
	Amplifier-to-amplifier coupling[4]	f = 1kHz to 20kHz, input referred		-120			-120		dB
P_{SRR}		$R_S \leq 10k\Omega$	65	100		65	100		dB
	Output current								
	Source	$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, V+ = 15Vdc	20	40		20	40		mA
		$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, V+ = 15Vdc, over temp.	10	20		10	20		mA
	Sink	$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, V+ = 15Vdc	10	20		10	20		mA
		$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, V+ = 15Vdc, over temp.	5	8		5	8		mA
		$V_{IN}- = +1Vdc$, $V_O = 200mV$	12	50		12	50		µA
I_{SC}	Short circuit current[4]			40	60		40	60	mA
	Differential input voltage[6]				V+			V+	V

NOTES

1. $V_O = 1.4Vdc$, $R_S = 0\Omega$ with V+ from 5V to 30V and over full input common mode range (0Vdc+ to V+ -1.5V).
2. The direction of the input current is out of the IC due to the pnp input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.
3. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5, but either or both inputs can go to +32V without damage.
4. Short circuits from the output to V+ can cause excessive heating and eventual destruction. The maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15Vdc continous short-circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.
5. Due to proximity of external components, insure that coupling is not originating via stray capacitance between these external parts. This typically can be detected as this type of capacitive increases at higher frequencies.
6. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5V, but either or both inputs can go to +32Vdc without damage

LM124/A/224/A/324/A/SA534-F,N-14,T
LM158/A/258/A/358A-F,N,T

DC ELECTRICAL CHARACTERISTICS

$V+ = 5V$, $T_A = 25°C$ unless otherwise specified.

PARAMETER		TEST CONDITIONS	LM158A			LM258A			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage[1]	$R_S \leq 10k\Omega$		1	2		1	3	mV
		$R_S \leq 10k\Omega$, over temp.			4			4	mV
V_{OS}	Drift	$R_S = 0\Omega$, over temp.		7	15		7	15	$\mu V/°C$
I_{BIAS}	Input current[2]	$I_{IN}(+) - I_{IN}(-)$		20	50		40	80	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.		40	100		40	100	nA
I_{OS}	Offset current	$I_{IN}(+) - I_{IN}(-)$		2	10		2	15	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.			30			30	nA
I_{OS}	Drift	over temp.		10	200		10	200	pA/°C
V_{CM}	Common mode voltage range[3]	$V+ = 30V$	0		V+-1.5	0		V+-1.5	V
		$V+ = 30V$, over temp.	0		V+-2	0		V+-2	V
C_{MRR}	Common mode rejection ratio		70	85		70	85		dB
V_{OUT}	Output voltage swing	$R_L = 2k\Omega$, $V+ = +30V$, over temp.	26			26			V
V_{OH}		$R_L \leq 10k\Omega$, over temp	27	28		27	28		V
V_{OL}		$R_L \leq 10k\Omega$, $V+ = 5V$, over temp.		5	20		5	20	V
I_{CC}	Supply current	$R_L = \infty$, $V_{CC} = 30V$, over temp.		1.5	3		1.5	3	mA
		$R_L = \infty$, on all op amps, over temp.		0.7	1.2		0.7	1.2	mA
A_{VOL}	Large signal voltage gain	$V+ = +15V$ (for large V_O swing), $R_L \geq 2k\Omega$	50	100		50	100		V/mV
		$V+ = +15V$ (for large V_O swing), $R_L \geq 2k\Omega$, over temp.	25			25			V/mV
	Amplifier-to-amplifier coupling[4]	$f = 1kHz$ to $20kHz$, input referred		-120			-120		dB
P_{SRR}		$R_S \leq 10k\Omega$	65	100		65	100		dB
	Output current								
	Source	$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, $V+ = 15Vdc$	20	40		20	40		mA
		$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, $V+ = 15Vdc$, over temp.	10	20		10	20		mA
	Sink	$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, $V+ = 15Vdc$	10	20		10	20		mA
		$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, $V+ = 15Vdc$, over temp.	5	8		5	8		mA
		$V_{IN}- = +1Vdc$, $V_O = 200mV$	12	50		12	50		μA
I_{SC}	Short circuit current[4]			40	60		40	60	mA
	Differential input voltage[6]				V+			V+	V

NOTES

1. $V_O = 1.4Vdc$, $R_S = 0\Omega$ with V+ from 5V to 30V and over full input common mode range (0Vdc+ to V+ -1.5V).
2. The direction of the input current is out of the IC due to the pnp input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.
3. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5, but either or both inputs can go to +32V without damage.
4. Short circuits from the output to V+ can cause excessive heating and eventual destruction. The maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15Vdc continous short-circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.
5. Due to proximity of external components, insure that coupling is not originating via stray capacitance between these external parts. This typically can be detected as this type of capacitive increases at higher frequencies.
6. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5V, but either or both inputs can go to +32Vdc without damage.

LM124/A/224/A/324/A/SA534-F,N-14,T
LM158/A/258/A/358A-F,N,T

DC ELECTRICAL CHARACTERISTICS (Cont'd) $V+ = 5V$, $T_A = 25°C$ unless otherwise specified.

PARAMETER		TEST CONDITIONS	LM358A			UNIT
			Min	Typ	Max	
V_{OS}	Offset voltage[1]	$R_S \leq 10k\Omega$		2	3	mV
		$R_S \leq 10k\Omega$, over temp.			5	mV
V_{OS}	Drift	$R_S = 0\Omega$, over temp.		7	20	$\mu V/°C$
I_{BIAS}	Input current[2]	$I_{IN}(+) - I_{IN}(-)$		45	100	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.		40	200	nA
I_{OS}	Offset current	$I_{IN}(+) - I_{IN}(-)$		5	30	nA
		$I_{IN}(+) - I_{IN}(-)$, over temp.			75	nA
I_{OS}	Drift	over temp.		10	300	pA/°C
V_{CM}	Common mode voltage range[3]	V+ = 30V	0		V+-1.5	V
		V+ = 30V, over temp.	0		V+-2	V
C_{MRR}	Common mode rejection ratio		65	85		dB
V_{OUT}	Output voltage swing	$R_L = 2k\Omega$, V+ = +30V, over temp.	26			V
V_{OH}		$R_L \leq 10k\Omega$, over temp	27	28		V
V_{OL}		$R_L \leq 10k\Omega$, V+ = 5V, over temp.		5	20	V
I_{CC}	Supply current	$R_L = \infty$, V_{CC} = 30V, over temp.		1.5	3	mA
		$R_L = \infty$, on all op amps, over temp.		0.7	1.2	mA
A_{VOL}	Large signal voltage gain	V+ = +15V (for large V_O swing), $R_L \geq 2k\Omega$	25	100		V/mV
		V+ = +15V (for large V_O swing), $R_L \geq 2k\Omega$, over temp.	15			V/mV
	Amplifier-to-amplifier coupling[4]	f = 1kHz to 20kHz, input referred		-120		dB
P_{SRR}		$R_S \leq 10k\Omega$	65	100		dB
	Output current					
	Source	$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, V+ = 15Vdc	20	40		mA
		$V_{IN}+ = +1Vdc$, $V_{IN}- = 0Vdc$, V+ = 15Vdc, over temp.	10	20		mA
	Sink	$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, V+ = 15Vdc	10	20		mA
		$V_{IN}- = +1Vdc$, $V_{IN}+ = 0Vdc$, V+ = 15Vdc, over temp.	5	8		mA
		$V_{IN}- = +1Vdc$, $V_O = 200mV$	12	50		μA
I_{SC}	Short circuit current[4]			40	60	mA
	Differential input voltage[6]				V+	V

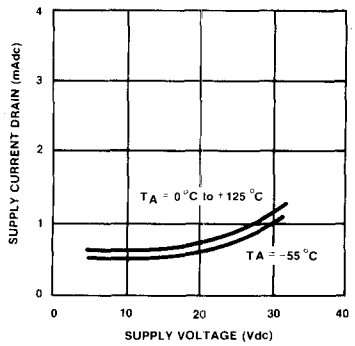
NOTES

1. $V_O \cong 1.4Vdc$, $R_S = 0\Omega$ with V+ from 5V to 30V and over full input common mode range (0Vdc+ to V+ -1.5V).
2. The direction of the input current is out of the IC due to the pnp input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.
3. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5, but either or both inputs can go to +32V without camage.
4. Short circuits from the output to V+ can cause excessive healing and eventual destruction. The maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15Vdc continous short-circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.
5. Due to proximity of external components, insure that coupling is not originating via stray capacitance between these external parts. This typically can be detected as this type of capacitive increases at higher frequencies.
6. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+ -1.5V, but either or both inputs can go to +32Vdc without damage.

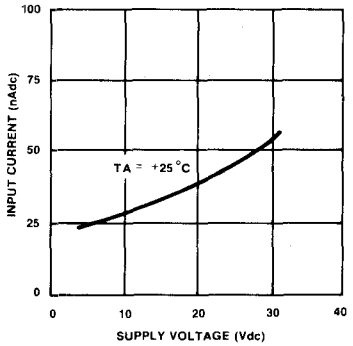
LM124/A/224/A/324/A/SA534-F,N-14,T
LM158/A/258/A/358A-F,N,T

TYPICAL PERFORMANCE CHARACTERISTICS

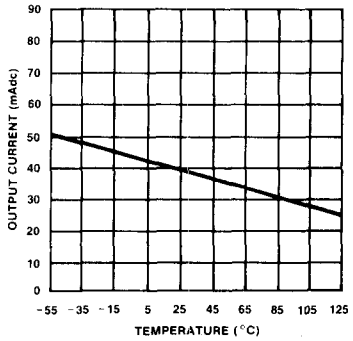
SUPPLY CURRENT



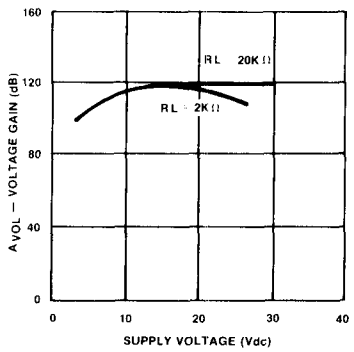
INPUT CURRENT



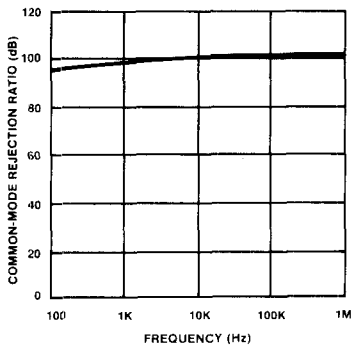
CURRENT LIMITING



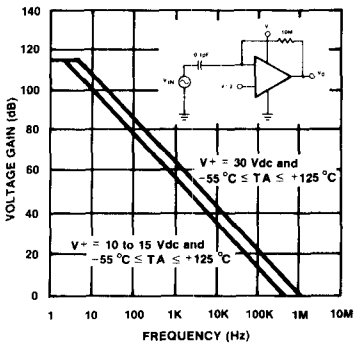
VOLTAGE GAIN



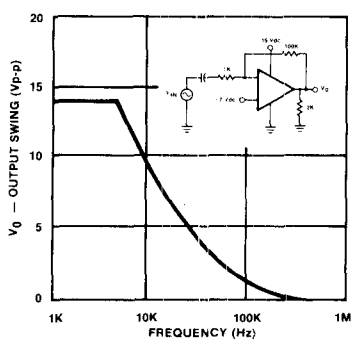
COMMON-MODE REJECTION RATIO



OPEN LOOP FREQUENCY RESPONSE



LARGE SIGNAL FREQUENCY RESPONSE



VOLTAGE FOLLOWER PULSE RESPONSE