UMW LM324

Quadruple Operational Amplifiers

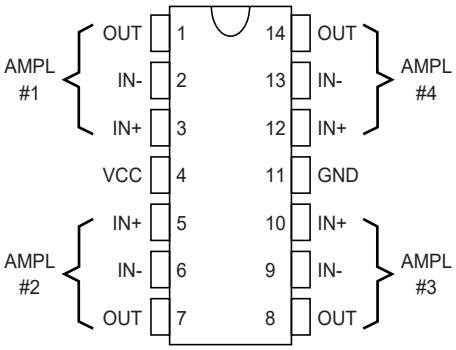
1.Description

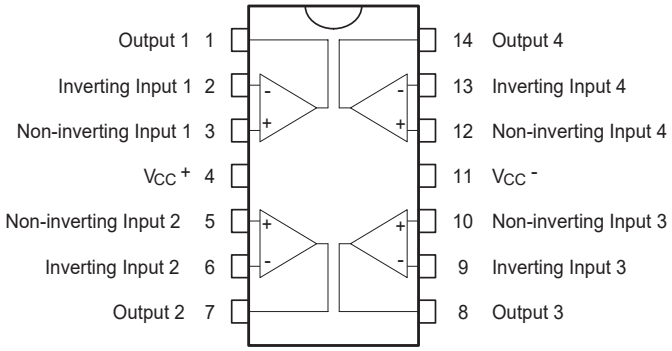
The UMW LM324 consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits.

2.Features

- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset voltage and offset current
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- DC voltage gain 100 V/ mV Typ
- Internally frequency compensation

3.Pinning information





4.Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply voltage	V_{CC}	±16 or 32	V
Input voltage, LM324	V_i	-0.3 to 32	V
Differential input voltage	V_{id}	32	V
Power dissipation: D suffix	P_{tot}	400	mW
Output short-circuit duration		Infinite	
Operating temperature range, LM324	T_{OPER}	0 to 70	°C

5.Electrical Characteristics

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Input offset voltage	V_{IO}	V_{CC}=5V to MAX	25°C		3	7	mV
		V_{IC}=V_{ICR} min, V_O=1.4V	Full temperature range			9	mV
Average temperature coefficient of input offset voltage	αV_{IO}		Full temperature range		7		μV/°C
Input offset current	I_{IO}	V_O=1.4V	25°C		2	50	nA
			Full temperature range			150	nA
Average temperature coefficient of input offset current	αI_{IO}		Full temperature range		10		pA/°C
Input bias current	I_{IB}	V_O=1.4V	25°C		-20	-200	nA
			Full temperature range			-400	nA
Common-mode input voltage range	V_{ICR}	V_{CC}=5V to MAX	25°C			V_{CC}-1.5	V
			Full temperature range			V_{CC}-2.0	V
High-level output voltage	V_{OH}	R_L=2kΩ	25°C	V_{CC}-1.5			V
		V_{CC}=MAX R_L=2kΩ	Full temperature range	26			
		V_{CC}=MAX R_L=10kΩ	Full temperature range	27	28		
Low-level output voltage	V_{OL}	R_L=10kΩ	Full temperature range		5	20	mV
Large-signal differential voltage amplification	A_{VD}	V_{CC}=15V V_O=1V to 11V R_L≥2kΩ	25°C	25	100		V/mV
			Full temperature range	15			

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Common-mode rejection ratio	CMRR	V_{CC}=5V to MAX V_{IC}=V_{ICR} min	25°C	65	80		dB
Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	k_{SVR}	V_{CC}=5V to MAX	25°C	65	100		dB
Crosstalk attenuation	V_O1/V_O2	f=1kHz to 20 kHz	25°C		120		dB
Output current	I_O	V_{CC}=15V V_{ID}=1V, V_O=0	25°C	-20	-30		mA
			Full temperature range	-10			
		V_{CC}=15V V_{ID}=-1V, V_O=15V	25°C	10	20		
			Full temperature range	5			
		V_{ID}=-1V V_O=200mV	25°C	12	30		μA
Short-circuit output current	I_{OS}	V_{CC} at 5 V, GND at -5V, V_O=0	25°C		±40	±60	mA
Supply current (four amplifiers)	I_{CC}	V_O=2.5 V, No load	Full temperature range		0.7	1.2	mA
		V_{CC}=MAX V_O=0.5V_{CC},No load	Full temperature range		1.5	3	mA

* All characteristics are measured under open loop conditions with zero common-mode input voltage unless otherwise specified. "MAX" V_{CC} for testing purposes is 30 V. Operating temperature 0 - 70° C.

6.Typical Characteristic

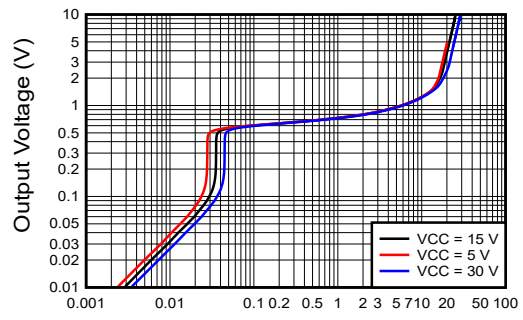


Figure 1: Output Current Characteristic

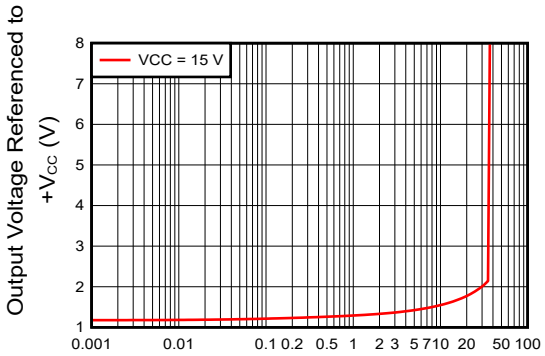


Figure 2: Output Pull Current Characteristic

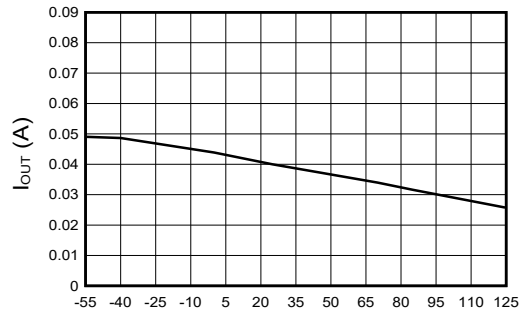


Figure 3: Pull Current Limit

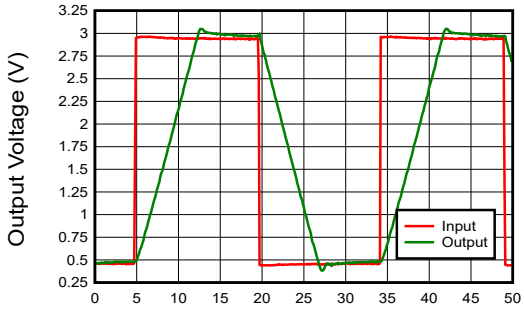


Figure 4: Voltage Follower Large Signal Pulse Response (50pF)

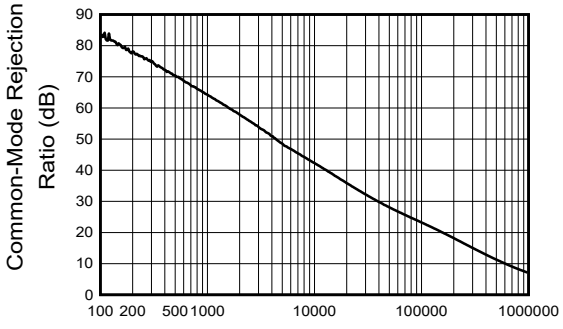


Figure 5: Common Mode Rejection Ratio

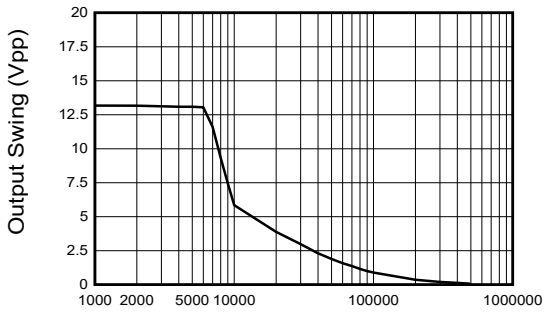
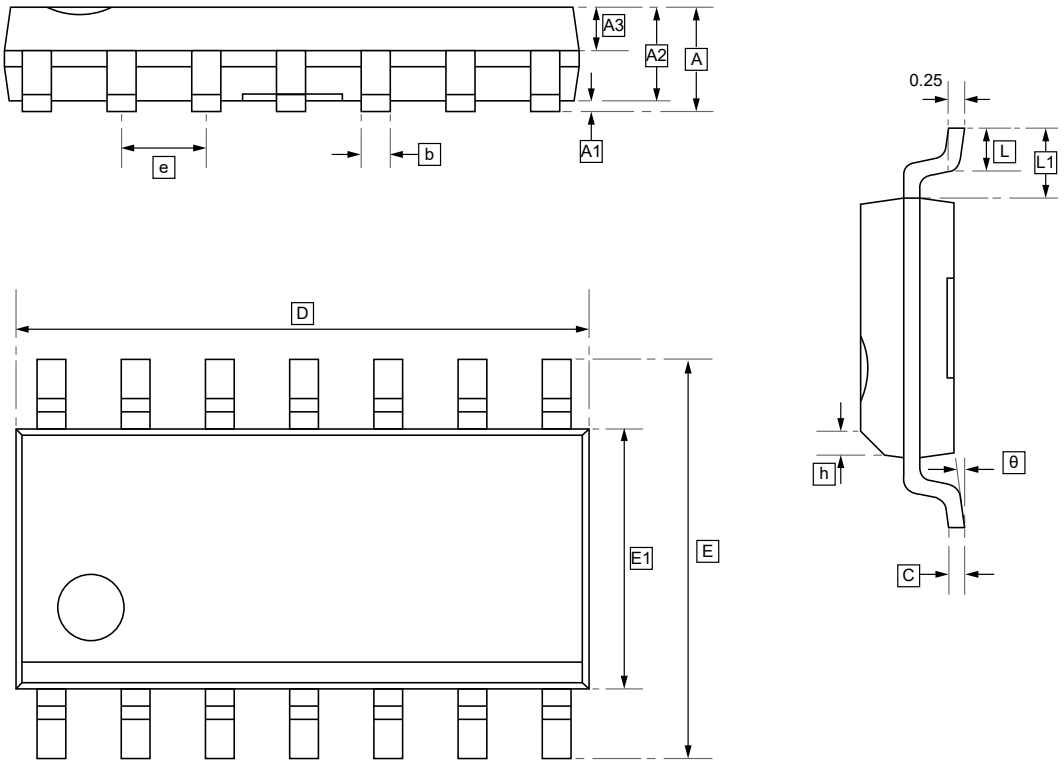


Figure 6: The relationship between the maximum output swing and frequency (V_{CC} = 15V)

7.1 SOP-14 Package Outline Dimensions

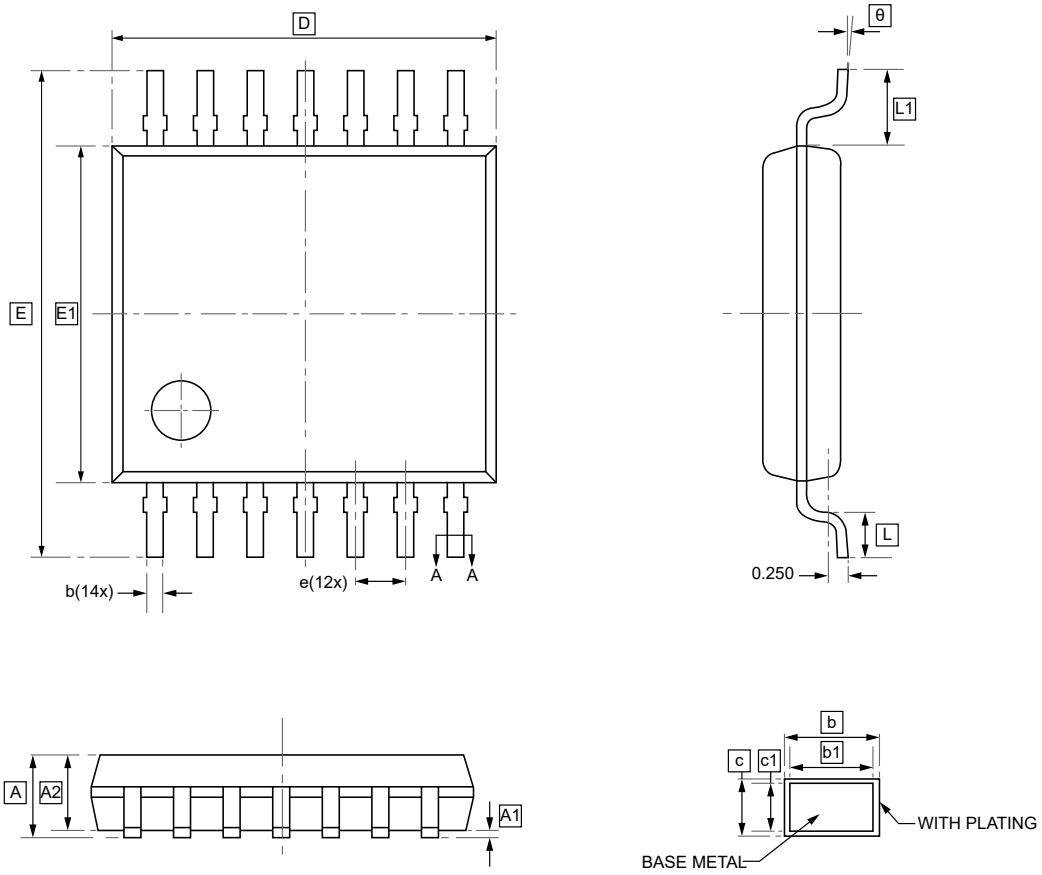


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	C	D	E	E1	e	h	L
Min	-	0.05	1.35	0.65	0.203	0.17	8.45	5.80	3.80	1.24	0.25	0.40
Max	1.75	0.25	1.55	0.75	0.305	0.25	8.85	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

7.2 TSSOP-14 Package Outline Dimensions



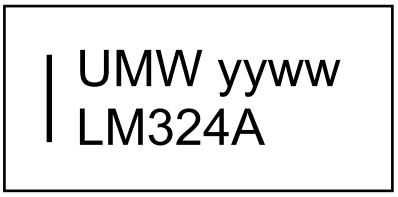
DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	c1	D	E	E1	e	L1
Min	-	0.05	0.90	0.20	0.19	0.13	0.120	4.90	6.20	4.30	0.65	0.85
Max	1.20	0.15	1.05	0.28	0.25	0.17	0.14	5.10	6.60	4.50	BSC	1.15

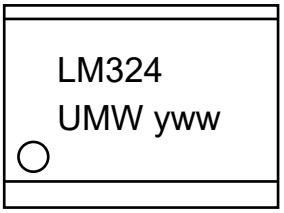
Symbol	L	θ
Min	0.45	0°
Max	0.75	8°

8.Ordering information

SOP-14



TSSOP-14



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW LM324ADR	LM324A	SOP-14	2500	Tape and reel
UMW LM324PT	LM324	TSSOP-14	4000	Tape and reel
UMW LM324PWR	LM324	TSSOP-14	4000	Tape and reel
UMW LM324APT	LM324	TSSOP-14	4000	Tape and reel

9.Disclaimer

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