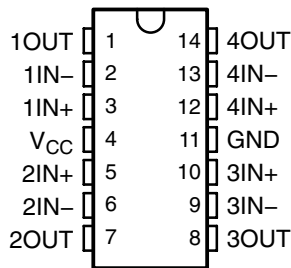


# LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V, LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV QUADRUPLE OPERATIONAL AMPLIFIERS

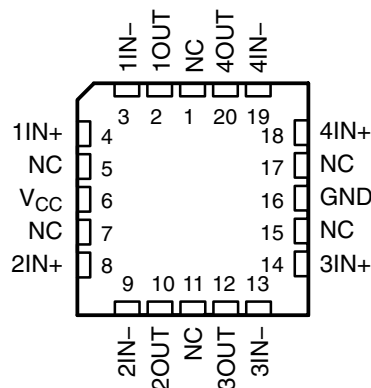
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- **2-kV ESD Protection for:**
  - LM224K, LM224KA
  - LM324K, LM324KA
  - LM2902K, LM2902KV, LM2902KAV
- **Wide Supply Ranges**
  - Single Supply . . . 3 V to 32 V  
(26 V for LM2902)
  - Dual Supplies . . .  $\pm 1.5$  V to  $\pm 16$  V  
( $\pm 13$  V for LM2902)
- **Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ**
- **Common-Mode Input Voltage Range Includes Ground, Allowing Direct Sensing Near Ground**
- **Low Input Bias and Offset Parameters**
  - Input Offset Voltage . . . 3 mV Typ  
A Versions . . . 2 mV Typ
  - Input Offset Current . . . 2 nA Typ
  - Input Bias Current . . . 20 nA Typ  
A Versions . . . 15 nA Typ
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . 32 V (26 V for LM2902)**
- **Open-Loop Differential Voltage Amplification . . . 100 V/mV Typ**
- **Internal Frequency Compensation**

LM124 . . . D, J, OR W PACKAGE  
LM124A . . . J OR W PACKAGE  
LM224, LM224A, LM224K, LM224KA . . . D OR N PACKAGE  
LM324, LM324K . . . D, N, NS, OR PW PACKAGE  
LM324A . . . D, DB, N, NS, OR PW PACKAGE  
LM324KA . . . D, N, NS, OR PW PACKAGE  
LM2902 . . . D, N, NS, OR PW PACKAGE  
LM2902K . . . D, DB, N, NS, OR PW PACKAGE  
LM2902KV, LM2902KAV . . . D OR PW PACKAGE  
(TOP VIEW)



LM124, LM124A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

These devices consist of four independent high-gain frequency-compensated operational amplifiers that are designed specifically to 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 3 V to 32 V (3 V to 26 V for the LM2902), and  $V_{CC}$  is at least 1.5 V 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, the LM124 can be operated directly from the standard 5-V supply that is used in digital systems and provides the required interface electronics, without requiring additional  $\pm 15$ -V supplies.

**LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V,  
LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV  
QUADRUPLE OPERATIONAL AMPLIFIERS**

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**ORDERING INFORMATION†**

$T_A$	$V_{IOmax}$ AT 25°C	MAX TESTED $V_{CC}$	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	7 mV	30 V	PDIP (N)	Tube of 25	LM324N	LM324N
						LM324KN
			SOIC (D)	Tube of 50	LM324D	LM324
				Reel of 2500	LM324DR	
				Reel of 2500	LM324DRG3	
				Tube of 50	LM324KD	LM324K
				Reel of 2500	LM324KDR	
				SOP (NS)	Reel of 2000	LM324NSR
			Tube of 50		LM324KNS	LM324K
			Reel of 2000		LM324KNSR	
	TSSOP (PW)	Tube of 90	LM324PW	L324		
		Reel of 2000	LM324PWR			
		Tube of 90	LM324KPW	L324K		
		Reel of 2000	LM324KPWR			
	3 mV	30 V	PDIP (N)	Tube of 25	LM324AN	LM324AN
						LM324KAN
			SOIC (D)	Tube of 50	LM324AD	LM324A
				Reel of 2500	LM324ADR	
				Tube of 50	LM324KAD	LM324KA
				Reel of 2500	LM324KADR	
SOP (NS)			Reel of 2000	LM324ANSR	LM324A	
			Tube of 50	LM324KANS	LM324KA	
			Reel of 2000	LM324KANSR		
SSOP (DB)			Reel of 2000	LM324ADBR	LM324A	
TSSOP (PW)			Tube of 90	LM324APW	L324A	
			Reel of 2000	LM324APWR		
			Tube of 90	LM324KAPW	L324KA	
			Reel of 2000	LM324KAPWR		
-25°C to 85°C	5 mV	30 V	PDIP (N)	Tube of 25	LM224N	LM224N
						LM224KN
			SOIC (D)	Tube of 50	LM224D	LM224
				Reel of 2500	LM224DR	
				Tube of 50	LM224KD	LM224K
				Reel of 2500	LM224KDR	
	3 mV	30 V	PDIP (N)	Tube of 25	LM224AN	LM224AN
						LM224KAN
			SOIC (D)	Tube of 50	LM224AD	LM224A
				Reel of 2500	LM224ADR	
Tube of 50	LM224KAD	LM224KA				
Reel of 2500	LM224KADR					

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at [www.ti.com](http://www.ti.com).

‡ Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).



# LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V, LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV QUADRUPLE OPERATIONAL AMPLIFIERS

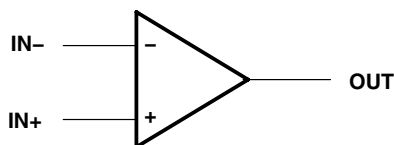
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## ORDERING INFORMATION (CONTINUED)

$T_A$	$V_{IOmax}$ AT 25°C	MAX TESTED $V_{CC}$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING	
-40°C to 125°C	7 mV	26 V	PDIP (N)	Tube of 25	LM2902N	LM2902N	
				Tube of 25	LM2902KN	LM2902KN	
			SOIC (D)	Tube of 50	LM2902D	LM2902	
				Reel of 2500	LM2902DR		
				Tube of 50	LM2902KD	LM2902K	
				Reel of 2500	LM2902KDR		
			SOP (NS)	Reel of 2000	LM2902NSR	LM2902	
				Tube of 50	LM2902KNS	LM2902K	
				Reel of 2000	LM2902KNSR		
			SSOP (DB)	Tube of 80	LM2902KDB	L2902K	
				Reel of 2000	LM2902KDBR		
			TSSOP (PW)	Tube of 90	LM2902PW	L2902	
	Reel of 2000	LM2902PWR					
	Tube of 90	LM2902KPW		L2902K			
	Reel of 2000	LM2902KPWR					
	2 mV	32 V	SOIC (D)	Reel of 2500	LM2902KVQDR	L2902KV	
Reel of 2000				LM2902KVQPWR	L2902KV		
TSSOP (PW)			Reel of 2500	LM2902KAVQDR	L2902KA		
			Reel of 2000	LM2902KAVQPWR	L2902KA		
-55°C to 125°C	5 mV	30 V	CDIP (J)	Tube of 25	LM124J	LM124J	
			CFP (W)	Tube of 25	LM124W	LM124W	
			LCCC (FK)	Tube of 55	LM124FK	LM124FK	
			SOIC (D)	Tube of 50	LM124D	LM124	
				Reel of 2500	LM124DR		
	2 mV	30 V	30 V	CDIP (J)	Tube of 25	LM124AJ	LM124AJ
				CFP (W)	Tube of 25	LM124AW	LM124AW
				LCCC (FK)	Tube of 55	LM124AFK	LM124AFK
					Tube of 55	LM124AFK	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

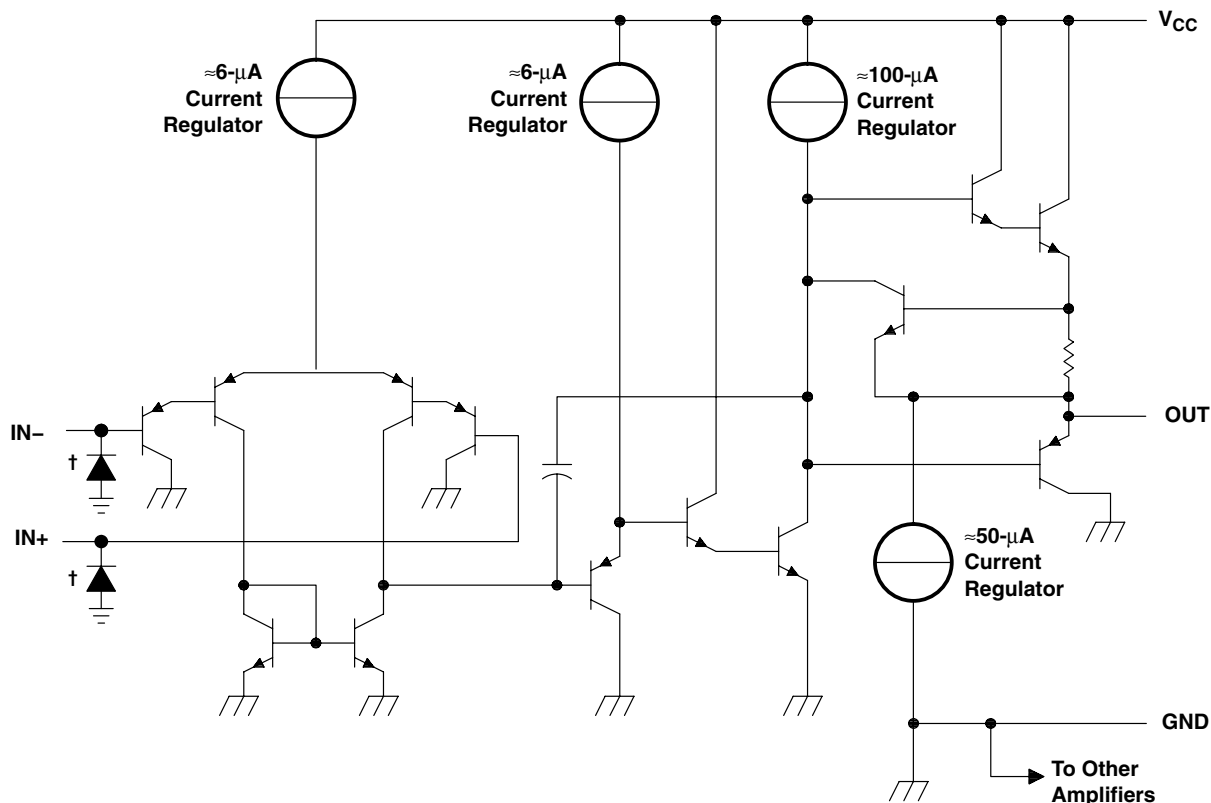
### symbol (each amplifier)



# LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V, LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV QUADRUPLE OPERATIONAL AMPLIFIERS

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## schematic (each amplifier)



COMPONENT COUNT (total device)	
Epi-FET	1
Transistors	95
Diodes	4
Resistors	11
Capacitors	4

† ESD protection cells - available on LM324K and LM324KA only

# LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V, LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV QUADRUPLE OPERATIONAL AMPLIFIERS

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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†**

		LM2902	ALL OTHER DEVICES	UNIT
Supply voltage, $V_{CC}$ (see Note 1)		±13 or 26	±16 or 32	V
Differential input voltage, $V_{ID}$ (see Note 2)		±26	±32	V
Input voltage, $V_I$ (either input)		-0.3 to 26	-0.3 to 32	V
Duration of output short circuit (one amplifier) to ground at (or below) $T_A = 25^\circ\text{C}$ , $V_{CC} \leq 15\text{ V}$ (see Note 3)		Unlimited	Unlimited	
Package thermal impedance, $\theta_{JA}$ (see Notes 4 and 5)	D package	86	86	$^\circ\text{C/W}$
	DB package	96	96	
	N package	80	80	
	NS package	76	76	
	PW package	113	113	
Package thermal impedance, $\theta_{JC}$ (see Notes 6 and 7)	FK package		5.61	$^\circ\text{C/W}$
	J package		15.05	
	W package		14.65	
Operating virtual junction temperature, $T_J$		150	150	$^\circ\text{C}$
Case temperature for 60 seconds	FK package		260	$^\circ\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J or W package	300	300	$^\circ\text{C}$
Storage temperature range, $T_{stg}$		-65 to 150	-65 to 150	$^\circ\text{C}$

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
- All voltage values (except differential voltages and  $V_{CC}$  specified for the measurement of  $I_{OS}$ ) are with respect to the network GND.
  - Differential voltages are at  $IN+$ , with respect to  $IN-$ .
  - Short circuits from outputs to  $V_{CC}$  can cause excessive heating and eventual destruction.
  - Maximum power dissipation is a function of  $T_J(\text{max})$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of  $150^\circ\text{C}$  can affect reliability.
  - The package thermal impedance is calculated in accordance with JESD 51-7.
  - Maximum power dissipation is a function of  $T_J(\text{max})$ ,  $\theta_{JC}$ , and  $T_C$ . The maximum allowable power dissipation at any allowable case temperature is  $P_D = (T_J(\text{max}) - T_C)/\theta_{JC}$ . Operating at the absolute maximum  $T_J$  of  $150^\circ\text{C}$  can affect reliability.
  - The package thermal impedance is calculated in accordance with MIL-STD-883.

## ESD protection

TEST CONDITIONS		TYP	UNIT
Human-Body Model	LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV	±2	kV



# LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V, LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV QUADRUPLE OPERATIONAL AMPLIFIERS

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## electrical characteristics at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	$T_A$ ‡	LM124 LM224			LM324 LM324K			UNIT		
			MIN	TYP§	MAX	MIN	TYP§	MAX			
$V_{IO}$ Input offset voltage	$V_{CC} = 5\text{ V to MAX}$ , $V_{IC} = V_{ICRmin}$ , $V_O = 1.4\text{ V}$	25°C		3	5		3	7	mV		
		Full range			7			9			
$I_{IO}$ Input offset current	$V_O = 1.4\text{ V}$	25°C		2	30		2	50	nA		
		Full range			100			150			
$I_{IB}$ Input bias current	$V_O = 1.4\text{ V}$	25°C		-20	-150		-20	-250	nA		
		Full range			-300			-500			
$V_{ICR}$ Common-mode input voltage range	$V_{CC} = 5\text{ V to MAX}$	25°C		0 to $V_{CC} - 1.5$		0 to $V_{CC} - 1.5$			V		
		Full range		0 to $V_{CC} - 2$		0 to $V_{CC} - 2$					
$V_{OH}$ High-level output voltage	$R_L = 2\text{ k}\Omega$	25°C		$V_{CC} - 1.5$			$V_{CC} - 1.5$			V	
	$R_L = 10\text{ k}\Omega$	25°C									
	$V_{CC} = \text{MAX}$	$R_L = 2\text{ k}\Omega$	Full range		26		26				
		$R_L \geq 10\text{ k}\Omega$	Full range		27	28	27	28			
$V_{OL}$ Low-level output voltage	$R_L \leq 10\text{ k}\Omega$	Full range		5	20		5	20	mV		
$A_{VD}$ Large-signal differential voltage amplification	$V_{CC} = 15\text{ V}$ , $V_O = 1\text{ V to }11\text{ V}$ , $R_L \geq 2\text{ k}\Omega$	25°C		50	100		25	100	V/mV		
		Full range		25			15				
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}$	25°C		70	80		65	80	dB		
$k_{SVR}$ Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )		25°C		65	100		65	100	dB		
$V_{O1}/V_{O2}$ Crosstalk attenuation	$f = 1\text{ kHz to }20\text{ kHz}$	25°C		120			120			dB	
$I_O$ Output current	$V_{CC} = 15\text{ V}$ , $V_{ID} = 1\text{ V}$ , $V_O = 0$	Source	25°C		-20	-30	-60	-20	-30	-60	mA
			Full range			-10			-10		
	$V_{CC} = 15\text{ V}$ , $V_{ID} = -1\text{ V}$ , $V_O = 15\text{ V}$	Sink	25°C		10	20		10	20		
			Full range		5			5			
	$V_{ID} = -1\text{ V}$ , $V_O = 200\text{ mV}$	25°C		12	30		12	30	$\mu\text{A}$		
$I_{OS}$ Short-circuit output current	$V_{CC}$ at 5 V, GND at -5 V	$V_O = 0$ ,	25°C		$\pm 40$	$\pm 60$		$\pm 40$	$\pm 60$	mA	
$I_{CC}$ Supply current (four amplifiers)	$V_O = 2.5\text{ V}$ , No load	Full range		0.7	1.2		0.7	1.2	mA		
	$V_{CC} = \text{MAX}$ , $V_O = 0.5 V_{CC}$ , No load	Full range		1.4	3		1.4	3			

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified. MAX  $V_{CC}$  for testing purposes is 26 V for LM2902 and 30 V for the others.

‡ Full range is -55°C to 125°C for LM124, -25°C to 85°C for LM224, and 0°C to 70°C for LM324.

§ All typical values are at  $T_A = 25^\circ\text{C}$ .



# LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V, LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV QUADRUPLE OPERATIONAL AMPLIFIERS

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**electrical characteristics at specified free-air temperature,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS†		$T_A$ ‡	LM2902			LM2902V			UNIT
				MIN	TYP§	MAX	MIN	TYP§	MAX	
$V_{IO}$ Input offset voltage	$V_{CC} = 5\text{ V}$ to MAX, $V_{IC} = V_{ICRmin}$ , $V_O = 1.4\text{ V}$	Non-A-suffix devices	25°C	3 7		3 7				mV
			Full range			10		10		
		A-suffix devices	25°C			1 2				
			Full range					4		
$\Delta V_{IO}/\Delta T$ Input offset voltage temperature drift	$R_S = 0\ \Omega$		Full range			7				$\mu\text{V}/^\circ\text{C}$
$I_{IO}$ Input offset current	$V_O = 1.4\text{ V}$		25°C	2 50		2 50				nA
			Full range			300		150		
$\Delta I_{IO}/\Delta T$ Input offset current temperature drift			Full range			10				$\text{pA}/^\circ\text{C}$
$I_{IB}$ Input bias current	$V_O = 1.4\text{ V}$		25°C	-20 -250		-20 -250				nA
			Full range			-500		-500		
$V_{ICR}$ Common-mode input voltage range	$V_{CC} = 5\text{ V}$ to MAX		25°C	0 to $V_{CC} - 1.5$		0 to $V_{CC} - 1.5$				V
			Full range	0 to $V_{CC} - 2$		0 to $V_{CC} - 2$				
$V_{OH}$ High-level output voltage	$R_L = 2\text{ k}\Omega$		25°C							V
			25°C	$V_{CC} - 1.5$		$V_{CC} - 1.5$				
	$V_{CC} = \text{MAX}$	$R_L = 2\text{ k}\Omega$	Full range	22		26				
		$R_L \geq 10\text{ k}\Omega$	Full range	23 24		27				
$V_{OL}$ Low-level output voltage	$R_L \leq 10\text{ k}\Omega$		Full range	5 20		5 20				mV
$A_{VD}$ Large-signal differential voltage amplification	$V_{CC} = 15\text{ V}$ , $V_O = 1\text{ V}$ to $11\text{ V}$ , $R_L \geq 2\text{ k}\Omega$		25°C	25 100		25 100				V/mV
			Full range	15		15				
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}$		25°C	50 80		60 80				dB
$k_{SVR}$ Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )			25°C	50 100		60 100				dB
$V_{O1}/V_{O2}$ Crosstalk attenuation	$f = 1\text{ kHz}$ to $20\text{ kHz}$		25°C	120		120				dB
$I_O$ Output current	$V_{CC} = 15\text{ V}$ , $V_{ID} = 1\text{ V}$ , $V_O = 0$	Source	25°C	-20 -30 -60		-20 -30 -60				mA
			Full range	-10		-10				
	$V_{CC} = 15\text{ V}$ , $V_{ID} = -1\text{ V}$ , $V_O = 15\text{ V}$	Sink	25°C	10 20		10 20				
			Full range	5		5				
$V_{ID} = -1\text{ V}$ , $V_O = 200\text{ mV}$			25°C	30		12 40				$\mu\text{A}$
$I_{OS}$ Short-circuit output current	$V_{CC}$ at $5\text{ V}$ , GND at $-5\text{ V}$	$V_O = 0$ ,	25°C	$\pm 40$ $\pm 60$		$\pm 40$ $\pm 60$				mA
$I_{CC}$ Supply current (four amplifiers)	$V_O = 2.5\text{ V}$ , No load	No load	Full range	0.7 1.2		0.7 1.2				mA
	$V_{CC} = \text{MAX}$ , $V_O = 0.5 V_{CC}$		Full range	1.4 3		1.4 3				

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified. MAX  $V_{CC}$  for testing purposes is 26 V for LM2902 and 32 V for LM2902V.

‡ Full range is  $-40^\circ\text{C}$  to  $125^\circ\text{C}$  for LM2902.

§ All typical values are at  $T_A = 25^\circ\text{C}$ .



electrical characteristics at specified free-air temperature,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		$T_A$ ‡	LM124A			LM224A			LM324A, LM324KA			UNIT
				MIN	TYP§	MAX	MIN	TYP§	MAX	MIN	TYP§	MAX	
$V_{IO}$ Input offset voltage	$V_{CC} = 5\text{ V to }30\text{ V},$ $V_{IC} = V_{ICRmin}, V_O = 1.4\text{ V}$		25°C			2			2		3		mV
			Full range			4			4			5	
$I_{IO}$ Input offset current	$V_O = 1.4\text{ V}$		25°C			10			2		15		nA
			Full range			30			30			75	
$I_{IB}$ Input bias current	$V_O = 1.4\text{ V}$		25°C			-50			-15		-80		nA
			Full range			-100			-100			-200	
$V_{ICR}$ Common-mode input voltage range	$V_{CC} = 30\text{ V}$		25°C	0 to $V_{CC} - 1.5$		0 to $V_{CC} - 1.5$			0 to $V_{CC} - 1.5$			V	
			Full range	0 to $V_{CC} - 2$		0 to $V_{CC} - 2$			0 to $V_{CC} - 2$				
$V_{OH}$ High-level output voltage	$R_L = 2\text{ k}\Omega$ $V_{CC} = 30\text{ V}$		25°C	$V_{CC} - 1.5$		$V_{CC} - 1.5$			$V_{CC} - 1.5$			V	
			Full range	$R_L = 2\text{ k}\Omega$	26		26			26			
					Full range	$R_L \geq 10\text{ k}\Omega$	27		27 28				27 28
$V_{OL}$ Low-level output voltage	$R_L \leq 10\text{ k}\Omega$		Full range	20			5 20			5 20			mV
$A_{VD}$ Large-signal differential voltage amplification	$V_{CC} = 15\text{ V}, V_O = 1\text{ V to }11\text{ V},$ $R_L \geq 2\text{ k}\Omega$		25°C	50	100	50	100	25	100	V/mV			
			Full range	25		25		15					
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}$		25°C	70		70	80	65	80	dB			
$k_{SVR}$ Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )			25°C	65		65	100	65	100	dB			
$V_{O1}/V_{O2}$ Crosstalk attenuation	$f = 1\text{ kHz to }20\text{ kHz}$		25°C	120			120			120			dB
$I_O$ Output current	$V_{CC} = 15\text{ V},$ $V_{ID} = 1\text{ V},$ $V_O = 0$	Source	25°C	-20		-20 -30 -60			-20 -30 -60			mA	
			Full range	-10		-10			-10				
	$V_{CC} = 15\text{ V},$ $V_{ID} = -1\text{ V},$ $V_O = 15\text{ V}$	Sink	25°C	10		10 20			10 20				
			Full range	5		5			5				
	$V_{ID} = -1\text{ V},$	$V_O = 200\text{ mV}$	25°C	12		12 30			12 30			$\mu\text{A}$	
$I_{OS}$ Short-circuit output current	$V_{CC}$ at 5 V, $V_O = 0$	GND at -5 V,	25°C	$\pm 40 \pm 60$		$\pm 40 \pm 60$			$\pm 40 \pm 60$			mA	
$I_{CC}$ Supply current (four amplifiers)	$V_O = 2.5\text{ V},$	No load	Full range	0.7 1.2		0.7 1.2			0.7 1.2			mA	
	$V_{CC} = 30\text{ V},$ No load	$V_O = 15\text{ V},$	Full range	1.4 3		1.4 3			1.4 3				

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified.

‡ Full range is -55°C to 125°C for LM124A, -25°C to 85°C for LM224A, and 0°C to 70°C for LM324A.

§ All typical values are at  $T_A = 25^\circ\text{C}$ .

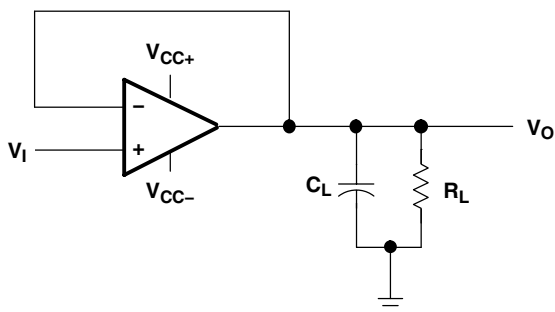


**LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V,  
LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV  
QUADRUPLE OPERATIONAL AMPLIFIERS**

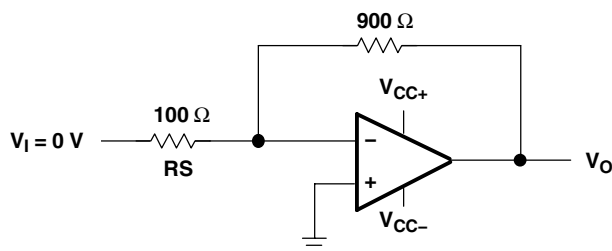
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operating conditions,  $V_{CC} = \pm 15\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
SR	Slew rate at unity gain	$R_L = 1\text{ M}\Omega$ , $C_L = 30\text{ pF}$ , $V_I = \pm 10\text{ V}$ (see Figure 1)	0.5	$\text{V}/\mu\text{s}$
$B_1$	Unity-gain bandwidth	$R_L = 1\text{ M}\Omega$ , $C_L = 20\text{ pF}$ (see Figure 1)	1.2	MHz
$V_n$	Equivalent input noise voltage	$R_S = 100\ \Omega$ , $V_I = 0\text{ V}$ , $f = 1\text{ kHz}$ (see Figure 2)	35	$\text{nV}/\sqrt{\text{Hz}}$



**Figure 1. Unity-Gain Amplifier**



**Figure 2. Noise-Test Circuit**

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
5962-7704301VCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-7704301VC A LM124JQMLV	<a href="#">Samples</a>
5962-9950403V9B	ACTIVE	XCEPT	KGD	0	100	TBD	Call TI	N / A for Pkg Type	-55 to 125		<a href="#">Samples</a>
5962-9950403VCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9950403VC A LM124AJQMLV	<a href="#">Samples</a>
77043012A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Call TI	-55 to 125	77043012A LM124FKB	<a href="#">Samples</a>
7704301CA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Call TI	-55 to 125	7704301CA LM124JB	<a href="#">Samples</a>
7704301DA	ACTIVE	CFP	W	14	1	TBD	Call TI	Call TI	-55 to 125	7704301DA LM124WB	<a href="#">Samples</a>
77043022A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Call TI	-55 to 125	77043022A LM124AFKB	<a href="#">Samples</a>
7704302CA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Call TI	-55 to 125	7704302CA LM124AJB	<a href="#">Samples</a>
7704302DA	ACTIVE	CFP	W	14	1	TBD	Call TI	Call TI	-55 to 125	7704302DA LM124AWB	<a href="#">Samples</a>
JM38510/11005BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510 /11005BCA	<a href="#">Samples</a>
LM124ADR	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-55 to 125		
LM124AFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	77043022A LM124AFKB	<a href="#">Samples</a>
LM124AJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	LM124AJ	<a href="#">Samples</a>
LM124AJB	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704302CA LM124AJB	<a href="#">Samples</a>
LM124AWB	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704302DA LM124AWB	<a href="#">Samples</a>
LM124D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	LM124	<a href="#">Samples</a>
LM124DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	LM124	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM124DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	LM124	<a href="#">Samples</a>
LM124DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	LM124	<a href="#">Samples</a>
LM124FKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	77043012A LM124FKB	<a href="#">Samples</a>
LM124J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	LM124J	<a href="#">Samples</a>
LM124JB	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704301CA LM124JB	<a href="#">Samples</a>
LM124N	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	-55 to 125		
LM124W	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	LM124W	<a href="#">Samples</a>
LM124WB	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704301DA LM124WB	<a href="#">Samples</a>
LM224AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224A	<a href="#">Samples</a>
LM224ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224A	<a href="#">Samples</a>
LM224ADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224A	<a href="#">Samples</a>
LM224ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224A	<a href="#">Samples</a>
LM224ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224A	<a href="#">Samples</a>
LM224ADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224A	<a href="#">Samples</a>
LM224AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224AN	<a href="#">Samples</a>
LM224ANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224AN	<a href="#">Samples</a>
LM224D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>
LM224DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>
LM224DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM224DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>
LM224DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>
LM224DRG3	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>
LM224DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224	<a href="#">Samples</a>
LM224KAD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224KA	<a href="#">Samples</a>
LM224KADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224KA	<a href="#">Samples</a>
LM224KADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224KA	<a href="#">Samples</a>
LM224KADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224KA	<a href="#">Samples</a>
LM224KADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224KA	<a href="#">Samples</a>
LM224KADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224KA	<a href="#">Samples</a>
LM224KAN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224KAN	<a href="#">Samples</a>
LM224KANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224KAN	<a href="#">Samples</a>
LM224KD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224K	<a href="#">Samples</a>
LM224KDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224K	<a href="#">Samples</a>
LM224KDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224K	<a href="#">Samples</a>
LM224KDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224K	<a href="#">Samples</a>
LM224KDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224K	<a href="#">Samples</a>
LM224KDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-25 to 85	LM224K	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM224KN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224KN	<a href="#">Samples</a>
LM224KNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224KN	<a href="#">Samples</a>
LM224N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224N	<a href="#">Samples</a>
LM224NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-25 to 85	LM224N	<a href="#">Samples</a>
LM2902D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902DRG3	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902KAVQDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KA	<a href="#">Samples</a>
LM2902KAVQDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KA	<a href="#">Samples</a>
LM2902KAVQPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KA	<a href="#">Samples</a>
LM2902KAVQPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KA	<a href="#">Samples</a>
LM2902KD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KDB	ACTIVE	SSOP	DB	14	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KDBE4	ACTIVE	SSOP	DB	14	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM2902KDBG4	ACTIVE	SSOP	DB	14	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 125	LM2902KN	<a href="#">Samples</a>
LM2902KNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 125	LM2902KN	<a href="#">Samples</a>
LM2902KNSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KNSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KNSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902K	<a href="#">Samples</a>
LM2902KPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902K	<a href="#">Samples</a>
LM2902KVQDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KV	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM2902KVQDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KV	<a href="#">Samples</a>
LM2902KVQPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KV	<a href="#">Samples</a>
LM2902KVQPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902KV	<a href="#">Samples</a>
LM2902N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 125	LM2902N	<a href="#">Samples</a>
LM2902NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 125	LM2902N	<a href="#">Samples</a>
LM2902NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LM2902	<a href="#">Samples</a>
LM2902PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902PWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 125		
LM2902PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902PWRE4	ACTIVE	TSSOP	PW	14		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902PWRG3	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	L2902	<a href="#">Samples</a>
LM2902QN	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	-40 to 125		
LM324AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADBLE	OBSOLETE	SSOP	DB	14		TBD	Call TI	Call TI			
LM324ADBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>




Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM324ADBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324AN	<a href="#">Samples</a>
LM324ANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324AN	<a href="#">Samples</a>
LM324ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324ANSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324A	<a href="#">Samples</a>
LM324APW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324A	<a href="#">Samples</a>
LM324APWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324A	<a href="#">Samples</a>
LM324APWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324A	<a href="#">Samples</a>
LM324APWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI			
LM324APWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324A	<a href="#">Samples</a>
LM324APWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324A	<a href="#">Samples</a>



Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM324APWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324A	<a href="#">Samples</a>
LM324D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324DRG3	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324KAD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KADRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KAN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324KAN	<a href="#">Samples</a>
LM324KANE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324KAN	<a href="#">Samples</a>
LM324KANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM324KANSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324KA	<a href="#">Samples</a>
LM324KAPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324KA	<a href="#">Samples</a>
LM324KAPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324KA	<a href="#">Samples</a>
LM324KAPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324KA	<a href="#">Samples</a>
LM324KAPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324KA	<a href="#">Samples</a>
LM324KAPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324KA	<a href="#">Samples</a>
LM324KAPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324KA	<a href="#">Samples</a>
LM324KD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324KN	<a href="#">Samples</a>
LM324KNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324KN	<a href="#">Samples</a>
LM324KNSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KNSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>
LM324KNSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324K	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM324KPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324K	<a href="#">Samples</a>
LM324KPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324K	<a href="#">Samples</a>
LM324KPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324K	<a href="#">Samples</a>
LM324KPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324K	<a href="#">Samples</a>
LM324KPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324K	<a href="#">Samples</a>
LM324KPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324K	<a href="#">Samples</a>
LM324N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324N	<a href="#">Samples</a>
LM324NE3	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	LM324N	<a href="#">Samples</a>
LM324NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	LM324N	<a href="#">Samples</a>
LM324NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LM324	<a href="#">Samples</a>
LM324PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>
LM324PWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>
LM324PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>
LM324PWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI	0 to 70		
LM324PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>
LM324PWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM324PWRG3	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	L324	
LM324PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	
LM324Y	OBSOLETE	DIESALE	Y	0		TBD	Call TI	Call TI			
M38510/11005BCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510 /11005BCA	

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

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**OTHER QUALIFIED VERSIONS OF LM124, LM124-SP, LM124M, LM2902 :**

- Catalog: [LM124](#), [LM124](#)
- Automotive: [LM2902-Q1](#)
- Enhanced Product: [LM2902-EP](#)
- Military: [LM124M](#), [LM124M](#)
- Space: [LM124-SP](#), [LM124-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM124DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224ADRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224ADRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224KADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM224KDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM2902DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM2902DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM2902DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM2902DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM2902KAVQPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM2902KAVQPWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM2902KDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM2902KNSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
LM2902KPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM2902KVQPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM2902KVQPWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM2902NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
LM2902PWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
LM2902PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM2902PWRG3	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
LM2902PWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM324ADBR	SSOP	DB	14	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
LM324ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324ADRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324ANSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
LM324APWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
LM324APWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM324APWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM324DR	SOIC	D	14	2500	330.0	16.4	6.55	9.05	2.1	8.0	16.0	Q1
LM324DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324KADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324KANSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
LM324KAPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM324KDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LM324KNSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
LM324KPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM324NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
LM324PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LM324PWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
LM324PWRG3	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
LM324PWRG4	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM124DR	SOIC	D	14	2500	367.0	367.0	38.0
LM224ADR	SOIC	D	14	2500	367.0	367.0	38.0
LM224ADR	SOIC	D	14	2500	333.2	345.9	28.6
LM224ADRG4	SOIC	D	14	2500	367.0	367.0	38.0
LM224ADRG4	SOIC	D	14	2500	333.2	345.9	28.6
LM224DR	SOIC	D	14	2500	367.0	367.0	38.0
LM224DRG4	SOIC	D	14	2500	367.0	367.0	38.0
LM224KADR	SOIC	D	14	2500	367.0	367.0	38.0
LM224KDR	SOIC	D	14	2500	367.0	367.0	38.0
LM2902DR	SOIC	D	14	2500	367.0	367.0	38.0
LM2902DR	SOIC	D	14	2500	333.2	345.9	28.6
LM2902DRG4	SOIC	D	14	2500	333.2	345.9	28.6
LM2902DRG4	SOIC	D	14	2500	367.0	367.0	38.0
LM2902KAVQPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM2902KAVQPWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0
LM2902KDR	SOIC	D	14	2500	367.0	367.0	38.0
LM2902KNSR	SO	NS	14	2000	367.0	367.0	38.0
LM2902KPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM2902KVQPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM2902KVQPWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM2902NSR	SO	NS	14	2000	367.0	367.0	38.0
LM2902PWR	TSSOP	PW	14	2000	364.0	364.0	27.0
LM2902PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM2902PWRG3	TSSOP	PW	14	2000	364.0	364.0	27.0
LM2902PWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0
LM324ADBR	SSOP	DB	14	2000	367.0	367.0	38.0
LM324ADR	SOIC	D	14	2500	367.0	367.0	38.0
LM324ADRG4	SOIC	D	14	2500	367.0	367.0	38.0
LM324ANSR	SO	NS	14	2000	367.0	367.0	38.0
LM324APWR	TSSOP	PW	14	2000	364.0	364.0	27.0
LM324APWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM324APWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0
LM324DR	SOIC	D	14	2500	385.0	388.0	194.0
LM324DR	SOIC	D	14	2500	367.0	367.0	38.0
LM324DR	SOIC	D	14	2500	333.2	345.9	28.6
LM324DRG4	SOIC	D	14	2500	333.2	345.9	28.6
LM324DRG4	SOIC	D	14	2500	367.0	367.0	38.0
LM324KADR	SOIC	D	14	2500	367.0	367.0	38.0
LM324KANSR	SO	NS	14	2000	367.0	367.0	38.0
LM324KAPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM324KDR	SOIC	D	14	2500	367.0	367.0	38.0
LM324KNSR	SO	NS	14	2000	367.0	367.0	38.0
LM324KPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM324NSR	SO	NS	14	2000	367.0	367.0	38.0
LM324PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM324PWR	TSSOP	PW	14	2000	364.0	364.0	27.0
LM324PWRG3	TSSOP	PW	14	2000	364.0	364.0	27.0
LM324PWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0

# J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211283-3/E 08/12

- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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