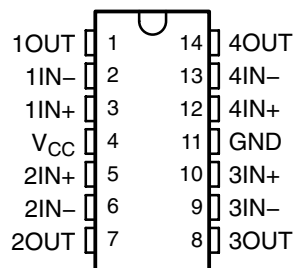
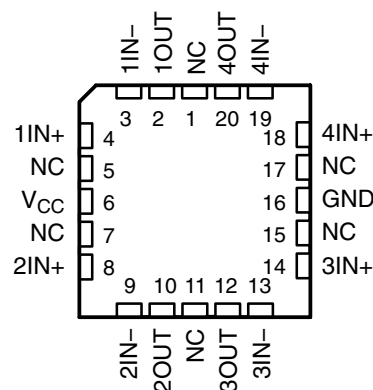


## SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

- 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)**



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

SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

## ORDERING INFORMATION<sup>†</sup>

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	MAX TESTED V <sub>CC</sub>	PACKAGE <sup>‡</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	7 mV	30 V	PDIP (N)	Tube of 25	LM324N	LM324N
					LM324KN	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	LM324
				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
				Tube of 25	LM324KAN	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	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
				Tube of 25	LM224KAN	LM224KAN
			SOIC (D)	Tube of 50	LM224AD	LM224A
				Reel of 2500	LM224ADR	
				Tube of 50	LM224KAD	LM224KA
				Reel of 2500	LM224KADR	

<sup>†</sup> 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).

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



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

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

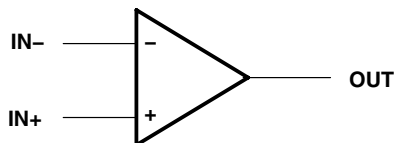
SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

**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	
–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	CDIP (J)	Tube of 25	LM124AJ	LM124AJ
			CFP (W)	Tube of 25	LM124AW	LM124AW
			LCCC (FK)	Tube of 55	LM124AFK	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).

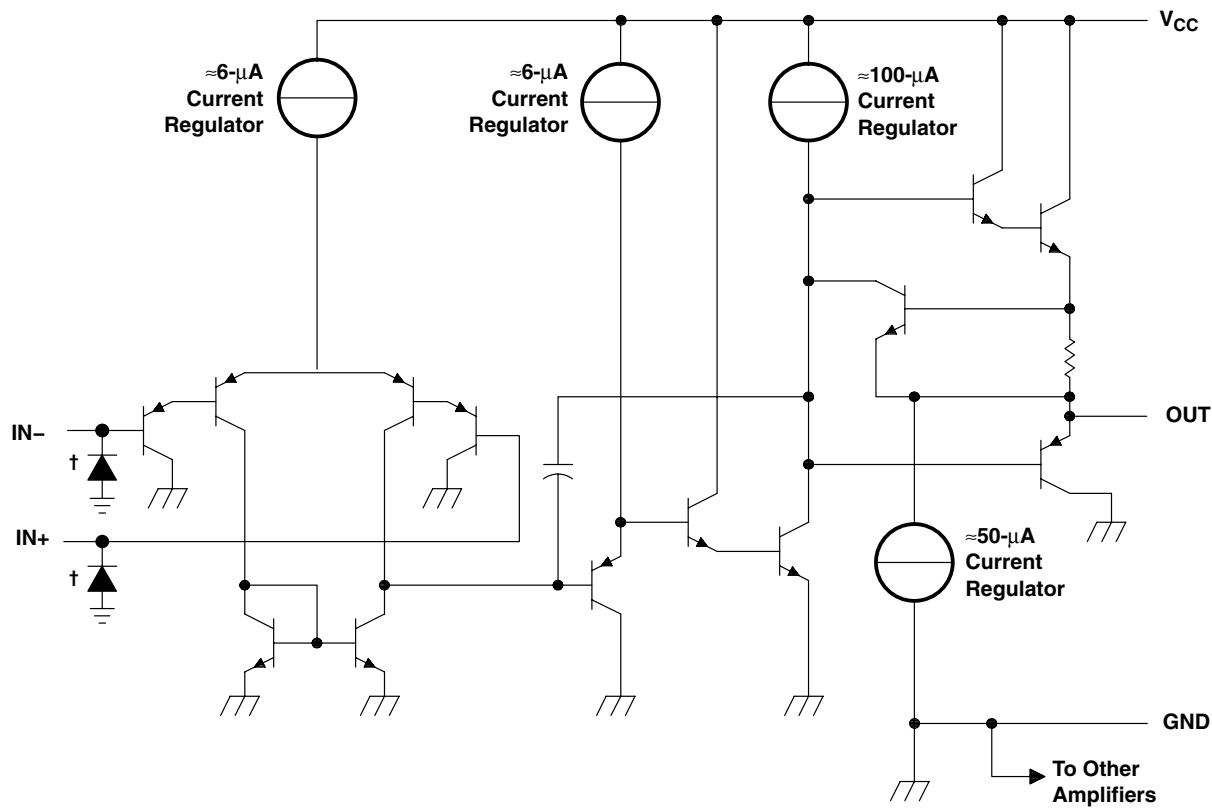
**symbol (each amplifier)**



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

SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

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

SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

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

		LM2902	ALL OTHER DEVICES	UNIT
Supply voltage, $V_{CC}$ (see Note 1)		$\pm 13$ or 26	$\pm 16$ or 32	V
Differential input voltage, $V_{ID}$ (see Note 2)		$\pm 26$	$\pm 32$	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) $T_A = 25^\circ\text{C}$ , $V_{CC} \leq 15$ 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	$^\circ\text{C}$

<sup>†</sup> 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:
1. All voltage values (except differential voltages and  $V_{CC}$  specified for the measurement of  $I_{OS}$ ) are with respect to the network GND.
  2. Differential voltages are at  $IN+$ , with respect to  $IN-$ .
  3. Short circuits from outputs to  $V_{CC}$  can cause excessive heating and eventual destruction.
  4. 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.
  5. The package thermal impedance is calculated in accordance with JESD 51-7.
  6. 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.
  7. 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	$\pm 2$	kV



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

SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

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

PARAMETER			TEST CONDITIONS†	T <sub>A</sub> ‡	LM124 LM224			LM324 LM324K			UNIT
					MIN	TYP§	MAX	MIN	TYP§	MAX	
V <sub>IO</sub>	Input offset voltage	V <sub>CC</sub> = 5 V to MAX, V <sub>IC</sub> = V <sub>ICRmin</sub> , V <sub>O</sub> = 1.4 V		25°C	3	5		3	7	mV	
				Full range		7			9		
I <sub>IO</sub>	Input offset current	V <sub>O</sub> = 1.4 V		25°C	2	30		2	50	nA	
				Full range		100			150		
I <sub>IB</sub>	Input bias current	V <sub>O</sub> = 1.4 V		25°C	–20	–150		–20	–250	nA	
				Full range		–300			–500		
V <sub>ICR</sub>	Common-mode input voltage range	V <sub>CC</sub> = 5 V to MAX		25°C	0 to V <sub>CC</sub> – 1.5		0 to V <sub>CC</sub> – 1.5		V		
				Full range	0 to V <sub>CC</sub> – 2		0 to V <sub>CC</sub> – 2				
V <sub>OH</sub>	High-level output voltage	R <sub>L</sub> = 2 kΩ		25°C	V <sub>CC</sub> – 1.5		V <sub>CC</sub> – 1.5		V		
		R <sub>L</sub> = 10 kΩ		25°C							
		V <sub>CC</sub> = MAX	R <sub>L</sub> = 2 kΩ	Full range	26		26				
			R <sub>L</sub> ≥ 10 kΩ	Full range	27	28	27	28			
V <sub>OL</sub>	Low-level output voltage	R <sub>L</sub> ≤ 10 kΩ		Full range	5	20	5	20	mV		
A <sub>VD</sub>	Large-signal differential voltage amplification	V <sub>CC</sub> = 15 V, V <sub>O</sub> = 1 V to 11 V, R <sub>L</sub> ≥ 2 kΩ		25°C	50	100	25	100	V/mV		
				Full range	25		15				
CMRR	Common-mode rejection ratio	V <sub>IC</sub> = V <sub>ICRmin</sub>		25°C	70	80	65	80	dB		
k <sub>SVR</sub>	Supply-voltage rejection ratio (ΔV <sub>CC</sub> /ΔV <sub>IO</sub> )			25°C	65	100	65	100	dB		
V <sub>O1</sub> /V <sub>O2</sub>	Crosstalk attenuation	f = 1 kHz to 20 kHz		25°C	120		120		dB		
I <sub>O</sub>	Output current	V <sub>CC</sub> = 15 V, V <sub>ID</sub> = 1 V, V <sub>O</sub> = 0	Source	25°C	–20	–30	–60	–20	–30	–60	mA
				Full range	–10			–10			
		V <sub>CC</sub> = 15 V, V <sub>ID</sub> = –1 V, V <sub>O</sub> = 15 V	Sink	25°C	10	20		10	20		
				Full range	5			5			
		V <sub>ID</sub> = –1 V, V <sub>O</sub> = 200 mV		25°C	12	30		12	30	μA	
I <sub>OS</sub>	Short-circuit output current	V <sub>CC</sub> at 5 V, GND at –5 V	V <sub>O</sub> = 0,	25°C	±40	±60	±40	±60	mA		
I <sub>CC</sub>	Supply current (four amplifiers)	V <sub>O</sub> = 2.5 V, No load		Full range	0.7	1.2	0.7	1.2	mA		
		V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5 V <sub>CC</sub> , 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**

SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

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

PARAMETER		TEST CONDITIONS†		T <sub>A</sub> ‡	LM2902			LM2902V			UNIT	
					MIN	TYP§	MAX	MIN	TYP§	MAX		
V <sub>IO</sub>	Input offset voltage	V <sub>CC</sub> = 5 V to MAX, V <sub>IC</sub> = V <sub>ICRmin</sub> , V <sub>O</sub> = 1.4 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			
ΔV <sub>IO</sub> /ΔT	Input offset voltage temperature drift	R <sub>S</sub> = 0 Ω		Full range					7	μV/°C		
I <sub>IO</sub>	Input offset current	V <sub>O</sub> = 1.4 V		25°C		2	50		2	50	nA	
				Full range			300		150			
ΔI <sub>IO</sub> /ΔT	Input offset current temperature drift			Full range					10	pA/°C		
I <sub>IB</sub>	Input bias current	V <sub>O</sub> = 1.4 V		25°C		–20	–250		–20	–250	nA	
				Full range			–500		–500			
V <sub>ICR</sub>	Common-mode input voltage range	V <sub>CC</sub> = 5 V to MAX		25°C		0 to V <sub>CC</sub> – 1.5		0 to V <sub>CC</sub> – 1.5		V		
				Full range		0 to V <sub>CC</sub> – 2		0 to V <sub>CC</sub> – 2				
V <sub>OH</sub>	High-level output voltage	R <sub>L</sub> = 2 kΩ		25°C						V		
		R <sub>L</sub> = 10 kΩ		25°C		V <sub>CC</sub> – 1.5		V <sub>CC</sub> – 1.5				
		V <sub>CC</sub> = MAX	R <sub>L</sub> = 2 kΩ	Full range		22		26				
			R <sub>L</sub> ≥ 10 kΩ	Full range		23	24		27			
V <sub>OL</sub>	Low-level output voltage	R <sub>L</sub> ≤ 10 kΩ		Full range		5	20		5	20	mV	
A <sub>VD</sub>	Large-signal differential voltage amplification	V <sub>CC</sub> = 15 V, V <sub>O</sub> = 1 V to 11 V, R <sub>L</sub> ≥ 2 kΩ		25°C		25	100		25	100	V/mV	
				Full range		15			15			
CMRR	Common-mode rejection ratio	V <sub>IC</sub> = V <sub>ICRmin</sub>		25°C		50	80		60	80	dB	
k <sub>SVR</sub>	Supply-voltage rejection ratio (ΔV <sub>CC</sub> /ΔV <sub>IO</sub> )			25°C		50	100		60	100	dB	
V <sub>O1</sub> /V <sub>O2</sub>	Crosstalk attenuation	f = 1 kHz to 20 kHz		25°C			120			120	dB	
I <sub>O</sub>	Output current	V <sub>CC</sub> = 15 V, V <sub>ID</sub> = 1 V, V <sub>O</sub> = 0	Source	25°C		–20	–30	–60	–20	–30	–60	mA
				Full range		–10			–10			
		V <sub>CC</sub> = 15 V, V <sub>ID</sub> = –1 V, V <sub>O</sub> = 15 V	Sink	25°C		10	20		10	20		
				Full range		5			5			
		V <sub>ID</sub> = –1 V, V <sub>O</sub> = 200 mV		25°C			30		12	40	μA	
I <sub>OS</sub>	Short-circuit output current	V <sub>CC</sub> at 5 V, GND at –5 V	V <sub>O</sub> = 0,	25°C		±40	±60		±40	±60	mA	
I <sub>CC</sub>	Supply current (four amplifiers)	V <sub>O</sub> = 2.5 V,	No load	Full range		0.7	1.2		0.7	1.2	mA	
		V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5 V <sub>CC</sub> ,	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 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 <sub>A</sub> ‡	LM124A			LM224A			LM324A, LM324KA			UNIT
						MIN	TYP §	MAX	MIN	TYP §	MAX	MIN	TYP §	MAX	
V <sub>IO</sub>	Input offset voltage	V <sub>CC</sub> = 5 V to 30 V, V <sub>IC</sub> = V <sub>ICRmin</sub> , V <sub>O</sub> = 1.4 V		25°C	2			2 3			2 3			mV	
				Full range	4			4			5				
I <sub>IO</sub>	Input offset current	V <sub>O</sub> = 1.4 V		25°C	10			2 15			2 30			nA	
				Full range	30			30			75				
I <sub>IB</sub>	Input bias current	V <sub>O</sub> = 1.4 V		25°C	-50			-15 -80			-15 -100			nA	
				Full range	-100			-100			-200				
V <sub>ICR</sub>	Common-mode input voltage range	V <sub>CC</sub> = 30 V		25°C	0 to V <sub>CC</sub> - 1.5			0 to V <sub>CC</sub> - 1.5			0 to V <sub>CC</sub> - 1.5			V	
				Full range	0 to V <sub>CC</sub> - 2			0 to V <sub>CC</sub> - 2			0 to V <sub>CC</sub> - 2				
V <sub>OH</sub>	High-level output voltage	R <sub>L</sub> = 2 kΩ		25°C	V <sub>CC</sub> - 1.5			V <sub>CC</sub> - 1.5			V <sub>CC</sub> - 1.5			V	
		V <sub>CC</sub> = 30 V	R <sub>L</sub> = 2 kΩ	Full range	26			26			26				
			R <sub>L</sub> ≥ 10 kΩ	Full range	27			27 28			27 28				
V <sub>OL</sub>	Low-level output voltage	R <sub>L</sub> ≤ 10 kΩ		Full range	20			5 20			5 20			mV	
A <sub>VD</sub>	Large-signal differential voltage amplification	V <sub>CC</sub> = 15 V, V <sub>O</sub> = 1 V to 11 V, R <sub>L</sub> ≥ 2 kΩ		25°C	50	100	50	100	25	100	V/mV				
				Full range	25		25		15						
CMRR	Common-mode rejection ratio	V <sub>IC</sub> = V <sub>ICRmin</sub>		25°C	70		70	80	65	80	dB				
k <sub>SVR</sub>	Supply-voltage rejection ratio (ΔV <sub>CC</sub> /ΔV <sub>IO</sub> )			25°C	65		65	100	65	100	dB				
V <sub>O1</sub> /V <sub>O2</sub>	Crosstalk attenuation	f = 1 kHz to 20 kHz		25°C	120			120			120			dB	
I <sub>O</sub>	Output current	V <sub>CC</sub> = 15 V, V <sub>ID</sub> = 1 V, V <sub>O</sub> = 0	Source	25°C	-20			-20	-30	-60	-20	-30	-60	mA	
				Full range	-10			-10							
		V <sub>CC</sub> = 15 V, V <sub>ID</sub> = -1 V, V <sub>O</sub> = 15 V	Sink	25°C	10			10	20	10	20				
				Full range	5			5		5					
		V <sub>ID</sub> = -1 V, V <sub>O</sub> = 200 mV	25°C	12			12	30	12	30	μA				
I <sub>OS</sub>	Short-circuit output current	V <sub>CC</sub> at 5 V, V <sub>O</sub> = 0	GND at -5 V,	25°C	±40	±60	±40	±60	±40	±60	mA				
I <sub>CC</sub>	Supply current (four amplifiers)	V <sub>O</sub> = 2.5 V, No load		Full range	0.7	1.2	0.7	1.2	0.7	1.2	mA				
		V <sub>CC</sub> = 30 V, No load	V <sub>O</sub> = 15 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  
 QUADRUPLER OPERATIONAL AMPLIFIERS  
 SLOS066T – SEPTEMBER 1975 – MARCH 2010

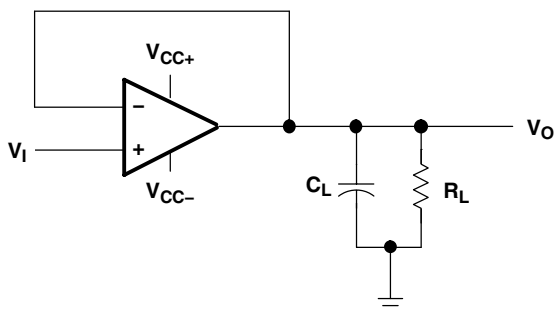


**LM124, LM124A, LM224, LM224A, LM324, LM324A, LM2902, LM2902V,  
LM224K, LM224KA, LM324K, LM324KA, LM2902K, LM2902KV, LM2902KAV  
QUADRUPLE OPERATIONAL AMPLIFIERS**

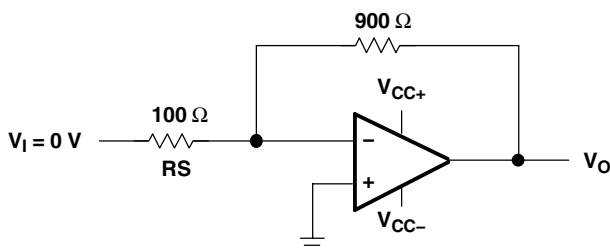
SLOS066T – SEPTEMBER 1975 – REVISED MARCH 2010

**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	$R_S = 100\text{ }\Omega$ , $V_I = 0\text{ V}$ , $f = 1\text{ kHz}$ (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 (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	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	POST-PLATE	N / A for Pkg Type	-55 to 125	77043012A LM124FKB	<a href="#">Samples</a>
7704301CA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704301CA LM124JB	<a href="#">Samples</a>
7704301DA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704301DA LM124WB	<a href="#">Samples</a>
77043022A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	77043022A LM124AFKB	<a href="#">Samples</a>
7704302CA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	7704302CA LM124AJB	<a href="#">Samples</a>
7704302DA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-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 (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	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   CU SN	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 (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM224DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	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>
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>
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>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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   CU SN	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>
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>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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>
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>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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   CU SN	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>
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>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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   CU SN	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   CU SN	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>
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>



Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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   CU SN	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>
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>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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>
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>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
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   CU SN	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   CU SN	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>
LM324PWRG3	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>
LM324PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	L324	<a href="#">Samples</a>
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	<a href="#">Samples</a>

(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) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**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**


\*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	16.8	6.5	9.5	2.3	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	16.8	6.5	9.5	2.3	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
LM224DRG3	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.3	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	16.8	6.5	9.5	2.3	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
LM2902DRG3	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.3	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

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
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
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
LM324ADR	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.3	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	16.8	6.5	9.5	2.3	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
LM324DRG3	SOIC	D	14	2500	330.0	16.8	6.5	9.5	2.3	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
LM324PWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
LM324PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	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	333.2	345.9	28.6
LM224ADR	SOIC	D	14	2500	364.0	364.0	27.0
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	364.0	364.0	27.0
LM224DR	SOIC	D	14	2500	367.0	367.0	38.0
LM224DRG3	SOIC	D	14	2500	364.0	364.0	27.0
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	364.0	364.0	27.0
LM2902DR	SOIC	D	14	2500	333.2	345.9	28.6
LM2902DR	SOIC	D	14	2500	367.0	367.0	38.0
LM2902DRG3	SOIC	D	14	2500	364.0	364.0	27.0
LM2902DRG4	SOIC	D	14	2500	333.2	345.9	28.6
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



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM2902KVQPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LM2902KVQPWRG4	TSSOP	PW	14	2000	367.0	367.0	35.0
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
LM324ADR	SOIC	D	14	2500	364.0	364.0	27.0
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	364.0	364.0	27.0
LM324DR	SOIC	D	14	2500	333.2	345.9	28.6
LM324DRG3	SOIC	D	14	2500	364.0	364.0	27.0
LM324DRG4	SOIC	D	14	2500	333.2	345.9	28.6
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
LM324PWR	TSSOP	PW	14	2000	364.0	364.0	27.0
LM324PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
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



PINS ** DIM	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)

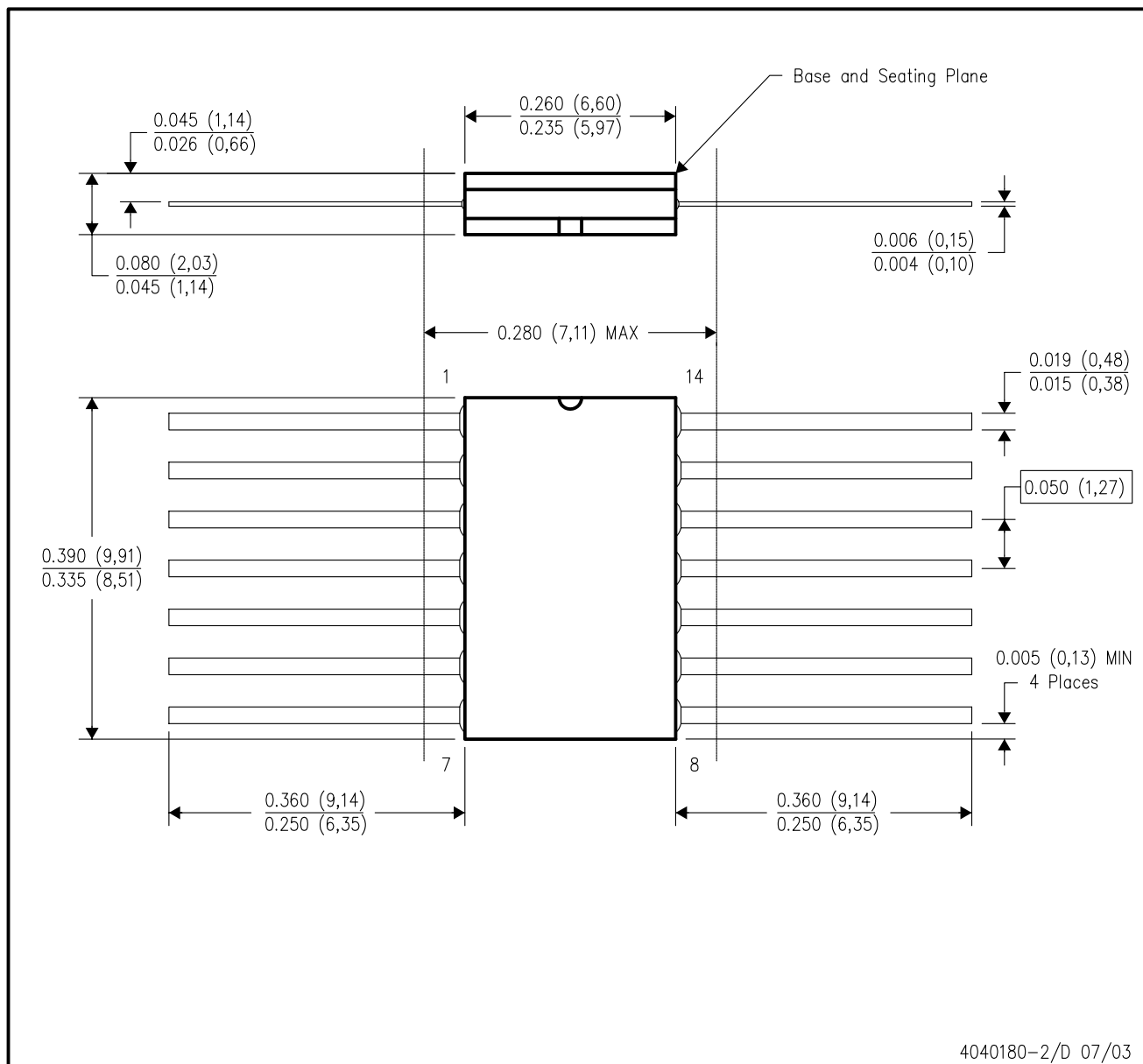


4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. 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.
- C. 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.
- D. 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)

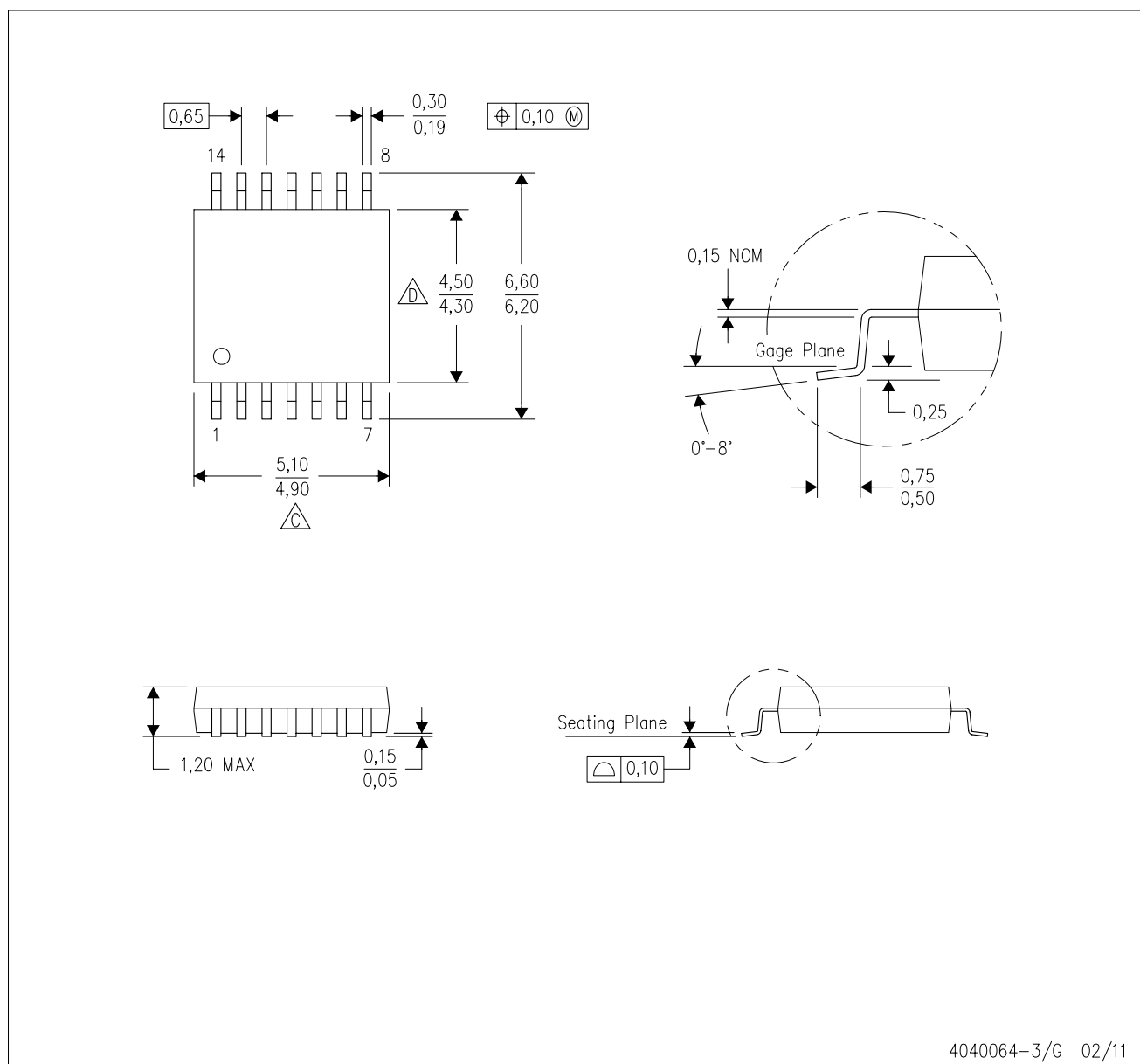
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. 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.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

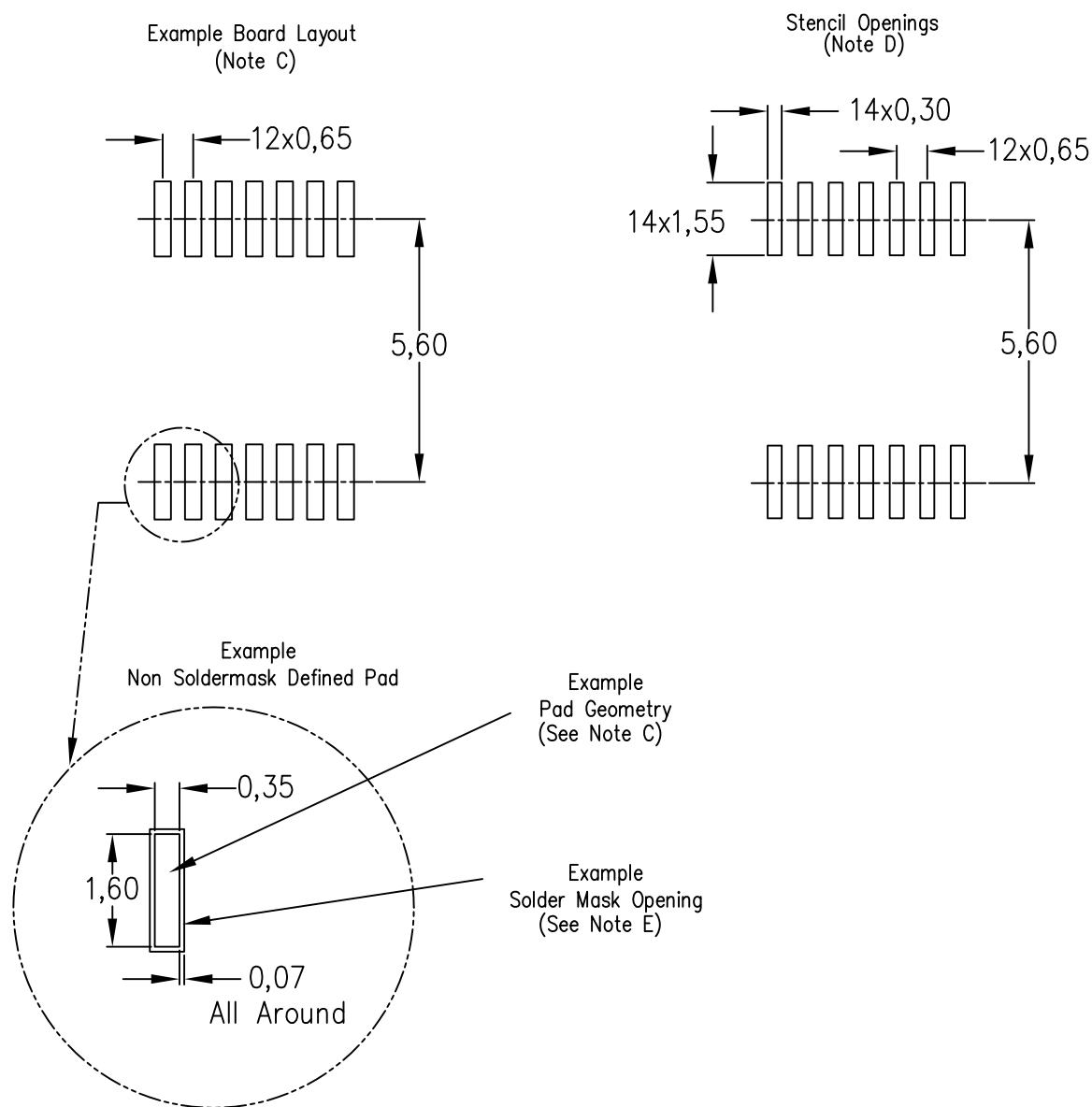


4040064-3/G 02/11

- 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



4211284-2/F 12/12

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. 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.
  - E. 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

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)