Description

The AS324/324A consist of four independent, high gain and internally frequency compensated operational amplifiers. They are specifically designed to operate from a single power supply. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. Typical applications include transducer amplifiers, DC gain blocks and most conventional operational amplifier circuits.

The AS324/324A series are compatible with industry standard 324. The AS324A has more stringent input offset voltage than AS324.

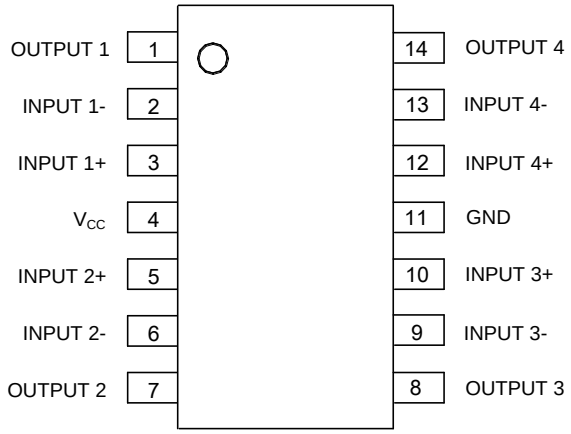
The AS324 is available in SO-14 and TSSOP-14 packages, and the AS324A is available in SO-14 package.

Features

- Internally Frequency Compensated for Unity Gain
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mV (Typical)
- Low Supply Current: 0.5mA (Typical)
- Wide Power Supply Voltage Range:
  - Single Supply: 3V to 36V
  - Dual Supplies: ±1.5V to ±18V
- Input Common Mode Voltage Range Includes Ground
- Large Output Voltage Swing: 0V to V_{CC} -1.5V
- Power Drain Suitable for Battery Operation
- Lead-Free Packages: SO-14, TSSOP-14
  - **Totally Lead-Free; RoHS Compliant (Notes 1 & 2)**
- Lead-Free Packages, Available in “Green” Molding Compound: SO-14, TSSOP-14
  - **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
  - **Halogen and Antimony Free. “Green” Device (Note 3)**

Pin Assignments

(Top View)



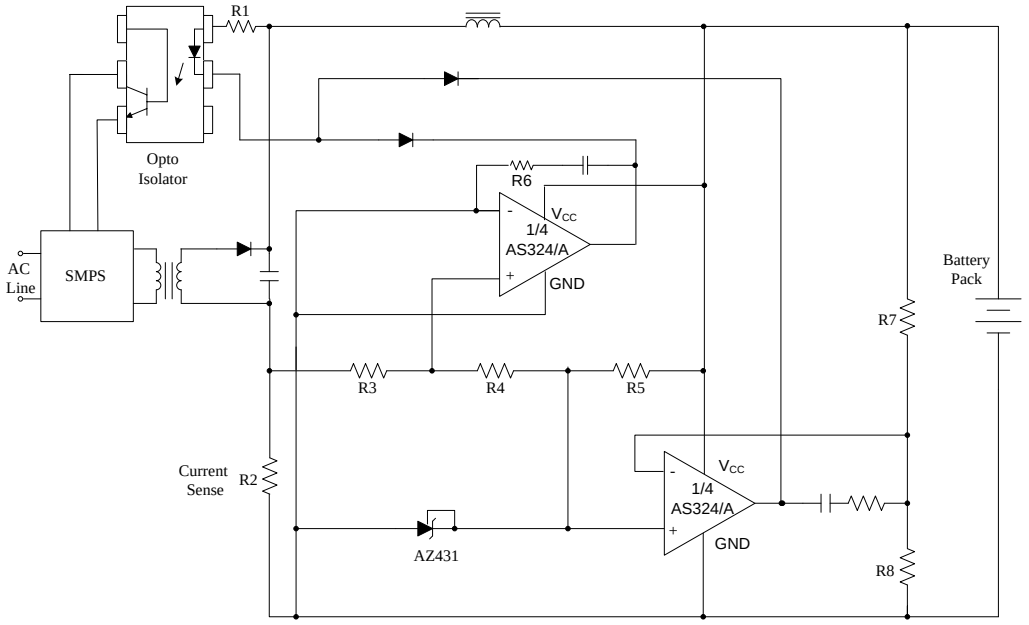
SO-14/TSSOP-14

Applications

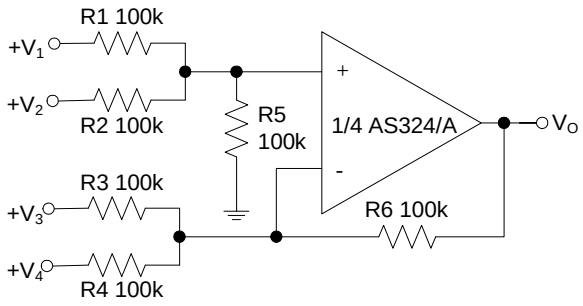
- Battery Charger
- Cordless Telephone
- Switching Power Supply

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

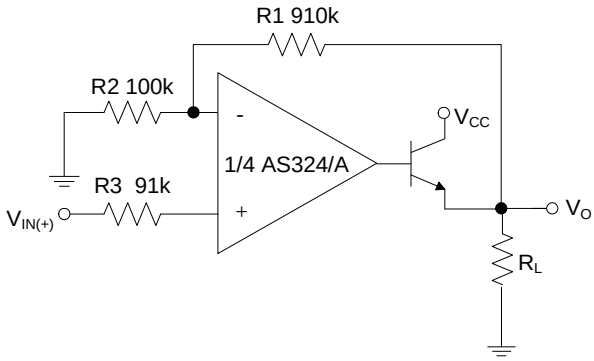
Typical Applications Circuit



Battery Charger

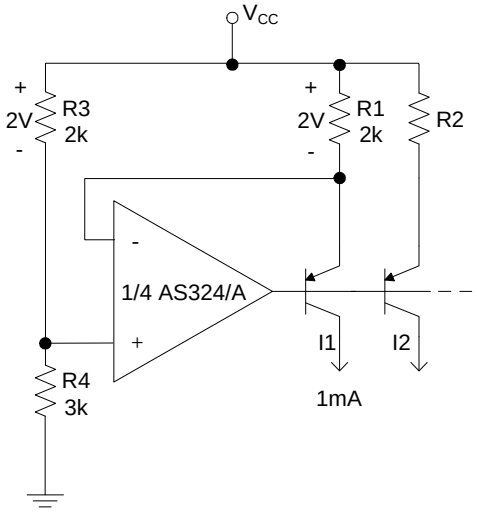


DC Summing Amplifier

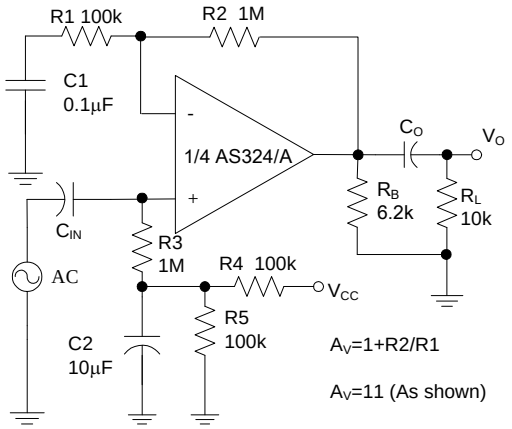


Power Amplifier

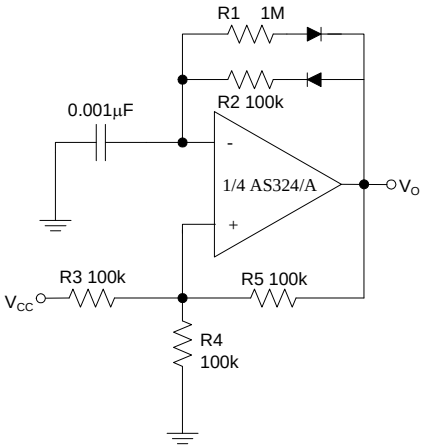
Typical Applications Circuit (Cont.)



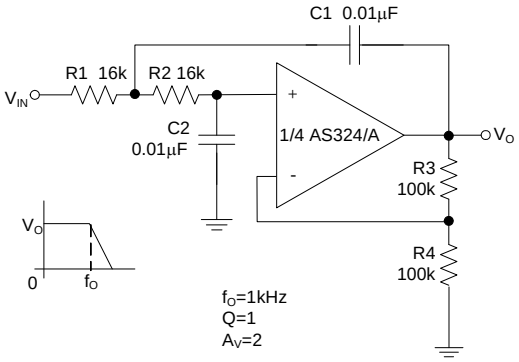
Fixed Current Sources



AC Coupled Non-Inverting Amplifier

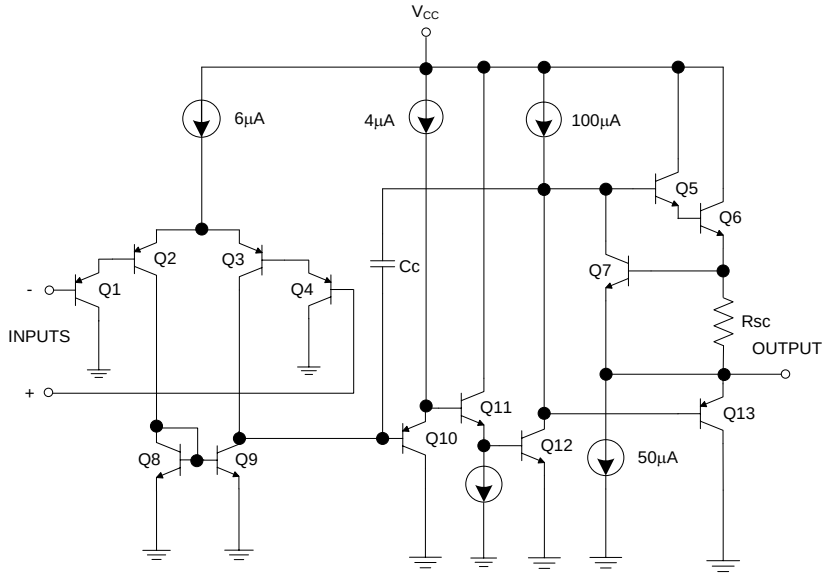


Pulse Generator



DC Coupled Low-Pass RC Active Filter

Functional Block Diagram



Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating		Unit
V_{CC}	Supply Voltage	40		V
V_{ID}	Differential Input Voltage	40		V
V_{IN}	Input Voltage	-0.3 to 40		V
P_D	Total Power Dissipation (T_A = +25°C)	SO-14	800	mW
		TSSOP-14	710	
T_J	Operating Junction Temperature	+150		°C
T_{STG}	Storage Temperature Range	-65 to +150		°C
T_{LEAD}	Lead Temperature (Soldering, 10 Seconds)	+260		°C

Note 4: Stresses greater than 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 Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3	36	V
T_A	Ambient Operating Temperature Range	-40	+85	°C

Electrical Characteristics (Limits in standard typeface are for T_A = +25°C, **bold** typeface applies over T_A = -40°C to +85°C (Note 5), V_{CC} = 5V, GND = 0V, unless otherwise specified.)

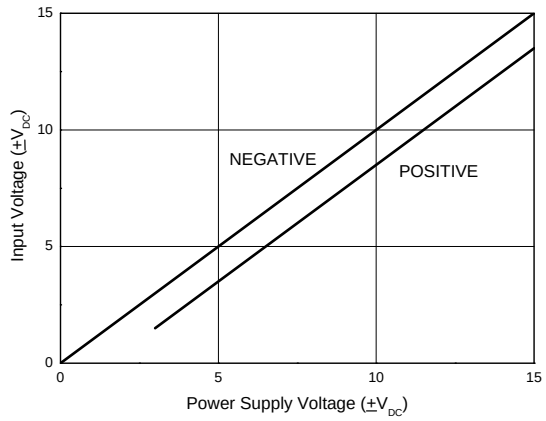
Symbol	Parameter		Conditions		Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage		V_O = 1.4V, R_S = 0Ω, V_{CC} = 5V to 30V	AS324	—	2	5	mV
					—	—	**7**	
				AS324A	—	2	3	mV
					—	—	**5**	
$\Delta V_{IO}/\Delta T$	Average Temperature Coefficient of Input Offset Voltage		T_A = -40 to +85°C		—	7	—	µV/°C
I_{IO}	Input Offset Current		I_{IN}+ - I_{IN}-, V_{CM} = 0V		—	5	30	nA
					—	—	**100**	
I_{BIAS}	Input Bias Current		I_{IN}+ or I_{IN}-, V_{CM} = 0V		—	20	100	nA
					—	—	**200**	
V_{IR}	Input Common Mode Voltage Range (Note 6)		V_{CC} = 30V		0	—	V_{CC}-1.5	V
I_{CC}	Supply Current		T_A = -40 to +85°C, R_L = ∞	V_{CC} = 30V	—	1.0	3	mA
				V_{CC} = 5V	—	0.7	1.2	
G_V	Large Signal Voltage Gain		V_{CC} = 15V, R_L ≥ 2kΩ, V_O = 1V to 11V		85	100	—	dB
					80	—	—	
CMRR	Common Mode Rejection Ratio		DC, V_{CM} = 0 to (V_{CC}-1.5)V		60	70	—	dB
					60	—	—	
PSRR	Power Supply Rejection Ratio		V_{CC} = 5 to 30V		70	100	—	dB
					60	—	—	
CS	Channel Separation		f = 1kHz to 20kHz		—	-120	—	dB
I_{SOURCE}	Output Current	Source	V_{IN}+ = 1V, V_{IN}- = 0V, V_{CC} = 15V, V_O = 2V		20	40	—	mA
					20	—	—	
I_{SINK}		Sink	V_{IN}+ = 0V, V_{IN}- = 1V, V_{CC} = 15V, V_O = 2V		10	15	—	mA
					5	—	—	
			V_{IN}+ = 0V, V_{IN}- = 1V, V_{CC} = 15V, V_O = 0.2V		12	50	—	µA
I_{SC}	Output Short Circuit Current to Ground		V_{CC} = 15V		—	40	60	mA
V_{OH}	Output Voltage Swing		V_{CC} = 30V, R_L = 2kΩ		26	—	—	V
					26	—	—	
			V_{CC} = 30V, R_L = 10kΩ		27	28	—	
					27	—	—	
V_{OL}			V_{CC} = 5V, R_L = 10kΩ		—	5	20	mV
					—	—	**30**	
θ_{JC}	Thermal Resistance (Junction to Case)		SO-14		—	18	—	°C/W
			TSSOP-14			20		
θ_{JA}	Thermal Resistance (Junction to Ambient)		SO-14		—	91	—	°C/W
			TSSOP-14			133		

Notes: 5. Limits over the full temperature are guaranteed by design, but not tested in production.

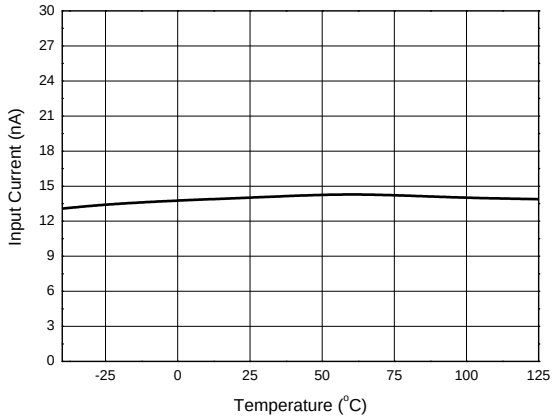
6. The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at +25°C). The upper end of the common-mode voltage range is V_{CC} -1.5V (at +25°C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V_{CC}.

Performance Characteristics

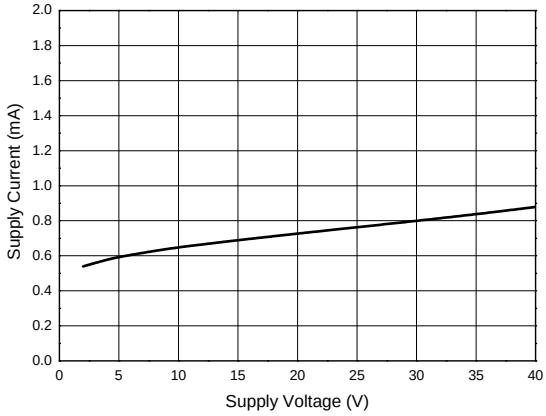
Input Voltage Range



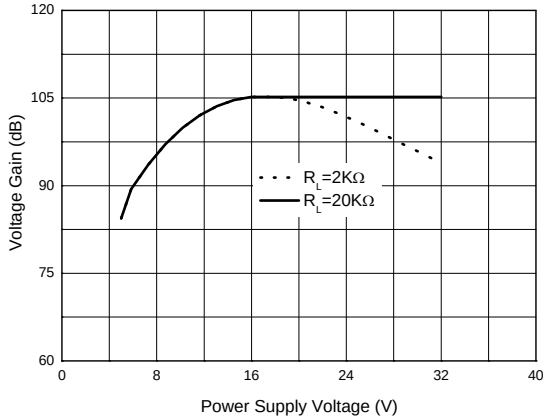
Input Current



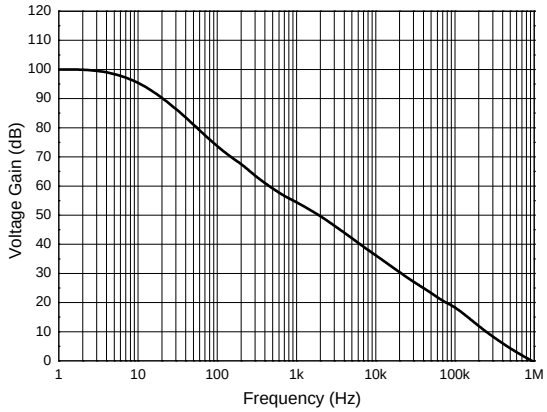
Supply Current



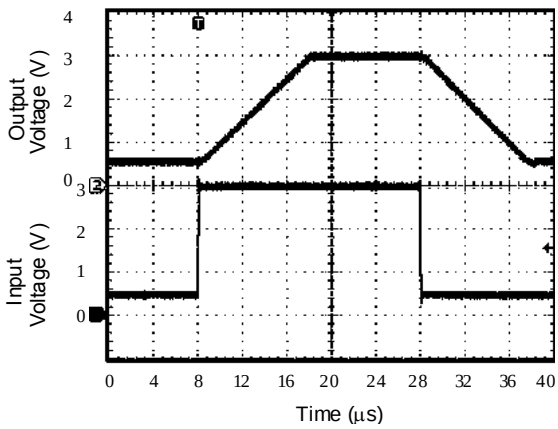
Voltage Gain



Open Loop Frequency Response

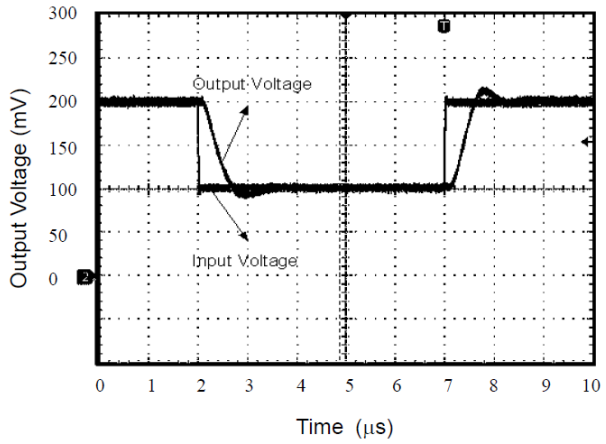


Voltage Follower Pulse Response

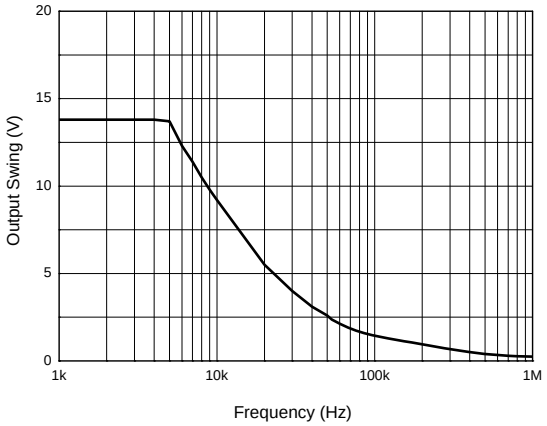


Performance Characteristics (Cont.)

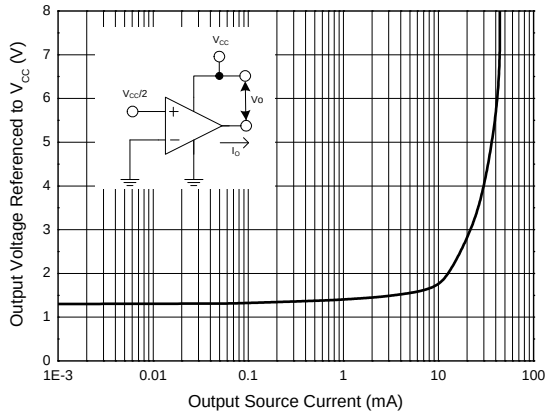
Voltage Follower Pulse Response (Small Signal)



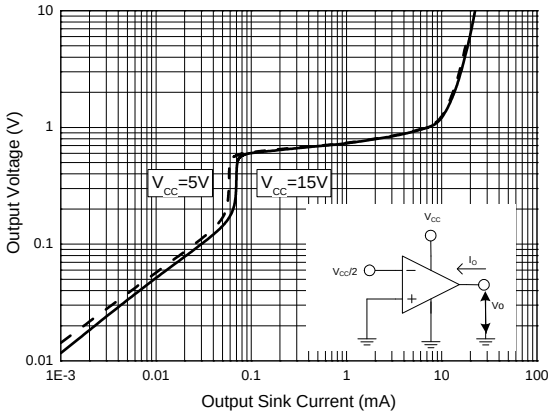
Large Signal Frequency Response



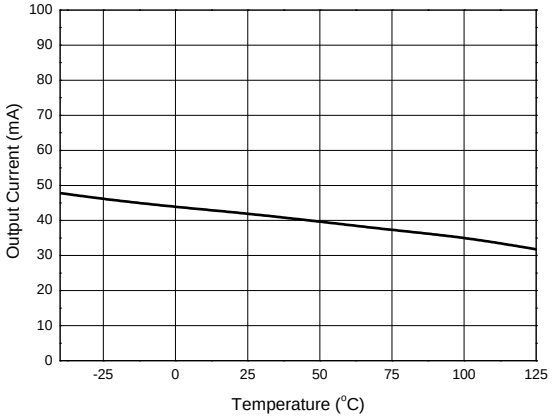
Output Characteristics: Current Sourcing



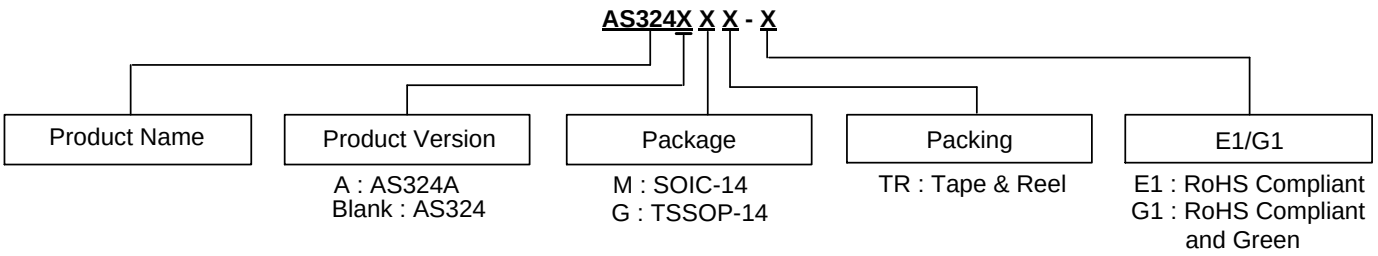
Output Characteristics: Current Sinking



Current Limiting



Ordering Information

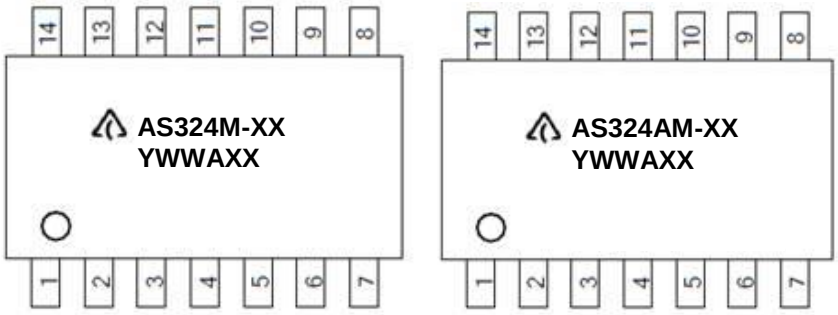


	Part Number	Package (Note 8)	RoHS Compliant Lead Free / Green	Marking ID	Packing	Quantity	Status (Note 7)	Alternative
Lead-Free	AS324M-E1	SO-14	Lead Free	AS324M-E1	Tube	NA	End of Life	AS324MTR-G1
Lead-Free	AS324MTR-E1	SO-14	Lead Free	AS324M-E1	Tape & Reel	2500	NRND	AS324MTR-G1
Lead-Free	AS324AM-E1	SO-14	Lead Free	AS324AM-E1	Tube	NA	End of Life	AS324AMTR-G1
Lead-Free	AS324AMTR-E1	SO-14	Lead Free	AS324AM-E1	Tape & Reel	2500	NRND	AS324MTR-G1
Lead-Free Green	AS324M-G1	SO-14	Green	AS324M-G1	Tube	NA	End of Life	AS324AMTR-G1
Lead-Free Green	AS324MTR-G1	SO-14	Green	AS324M-G1	Tape & Reel	2500	In Production	—
Lead-Free Green	AS324AM-G1	SO-14	Green	AS324AM-G1	Tube	NA	End of Life	AS324AMTR-G1
Lead-Free Green	AS324AMTR-G1	SO-14	Green	AS324AM-G1	Tape & Reel	2500	In Production	—
Lead-Free	AS324GTR-E1	TSSOP-14	Lead Free	EGS324	Tape & Reel	2500	NRND	AS324GTR-G1
Lead-Free Green	AS324GTR-G1	TSSOP-14	Green	GGS324	Tape & Reel	2500	In Production	—

Notes: 7. All variants in Tube packing with package SO-14 are End of Life.
All variants with package DIP-14 are End of Life without replacements.
NRND: Not Recommended for New Design.
8. For packaging details, go to our website at: https://www.diodes.com/design/support/packaging/diodes-packaging/.

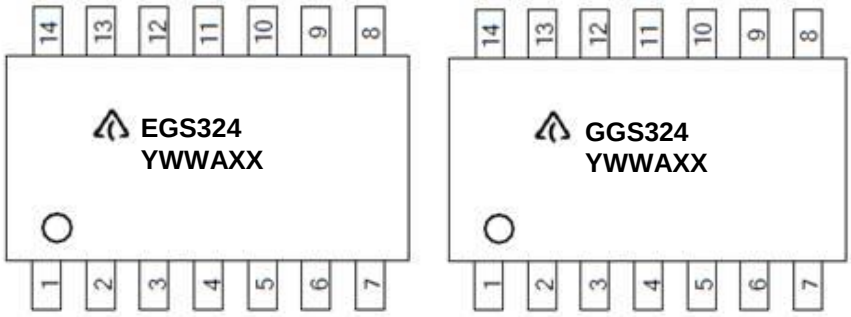
Marking information

(1) SO-14



First Line: Logo and Marking ID
(See Ordering Information)
Second Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: 7th and 8th Digits of Batch Number

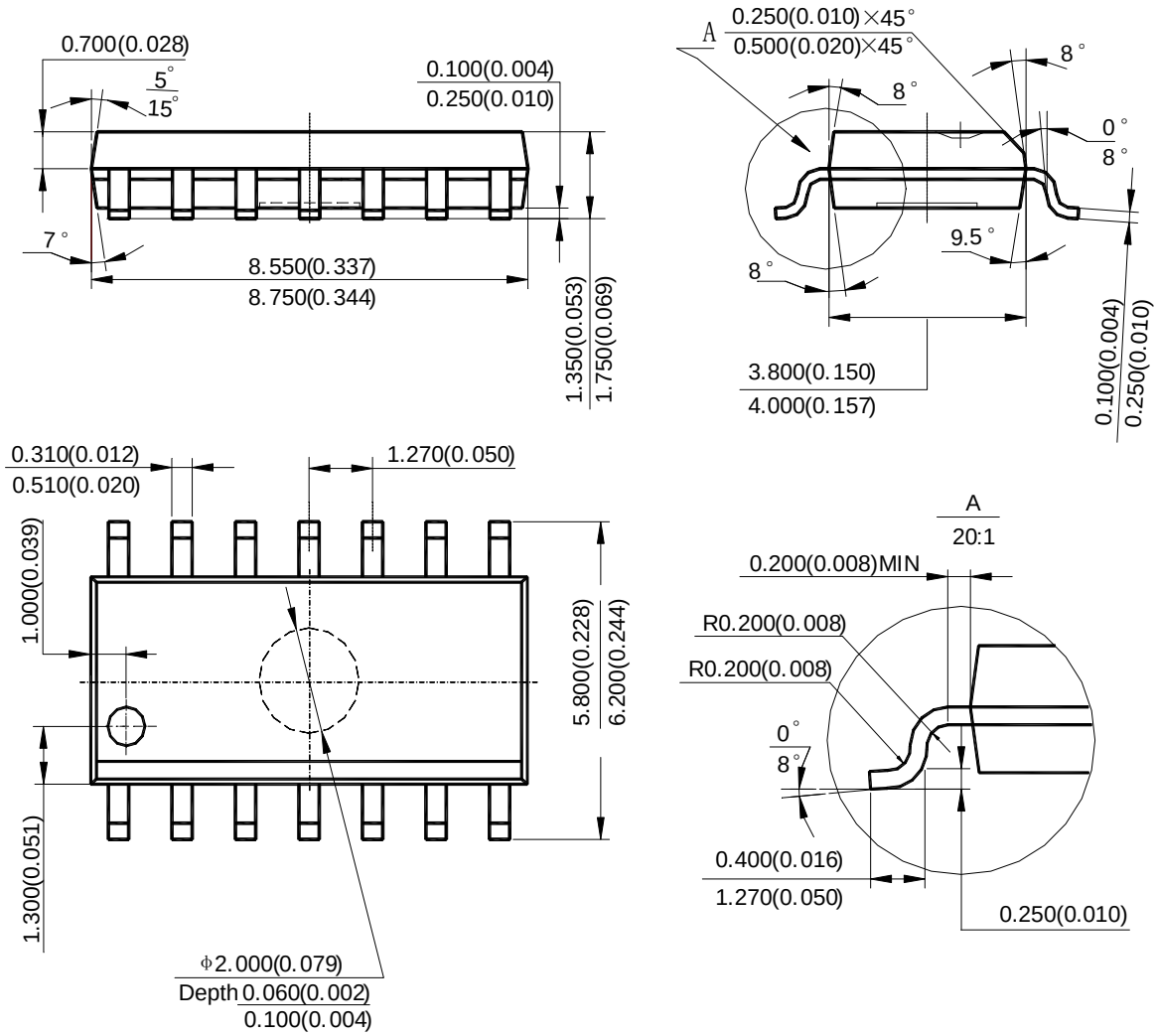
(2) TSSOP14



First Line: Logo and Marking ID
(See Ordering Information)
Second Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: 7th and 8th Digits of Batch Number

Package Outline Dimensions (All dimensions in mm(inch).)

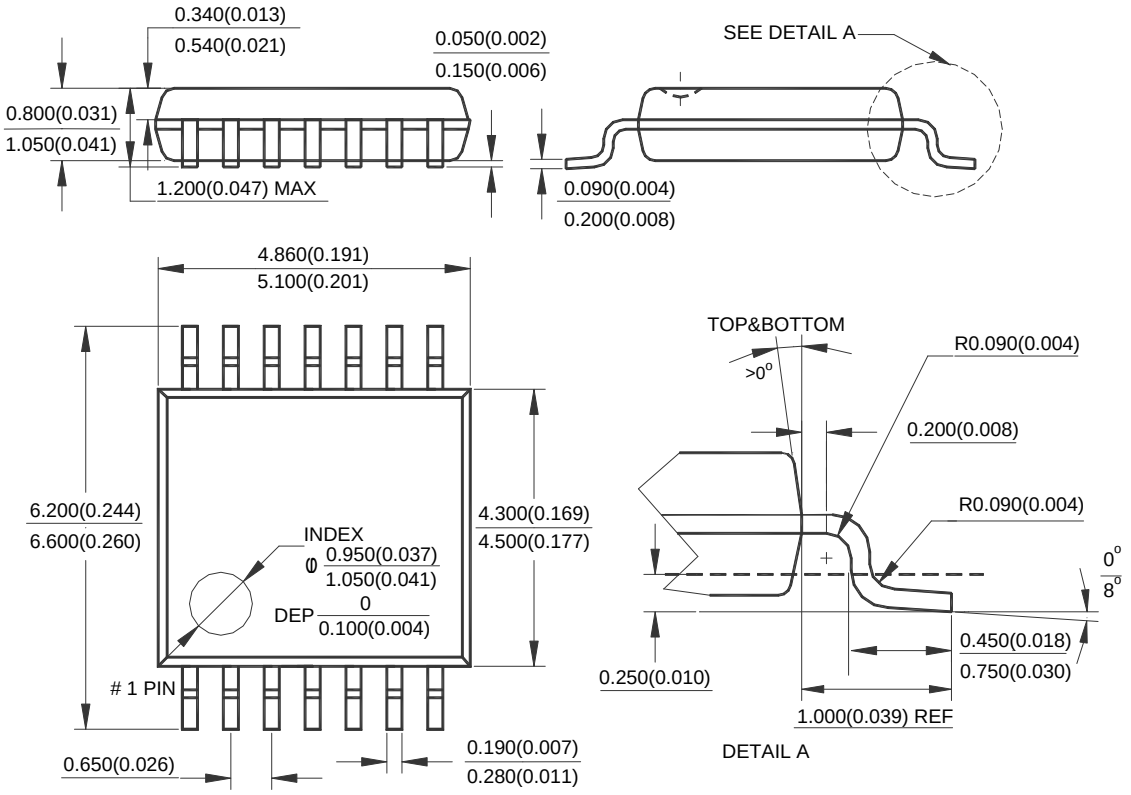
(1) Package Type: SO-14



Note: Eject hole, oriented hole and mold mark is optional.

Package Outline Dimensions (Cont. All dimensions in mm(inch).)

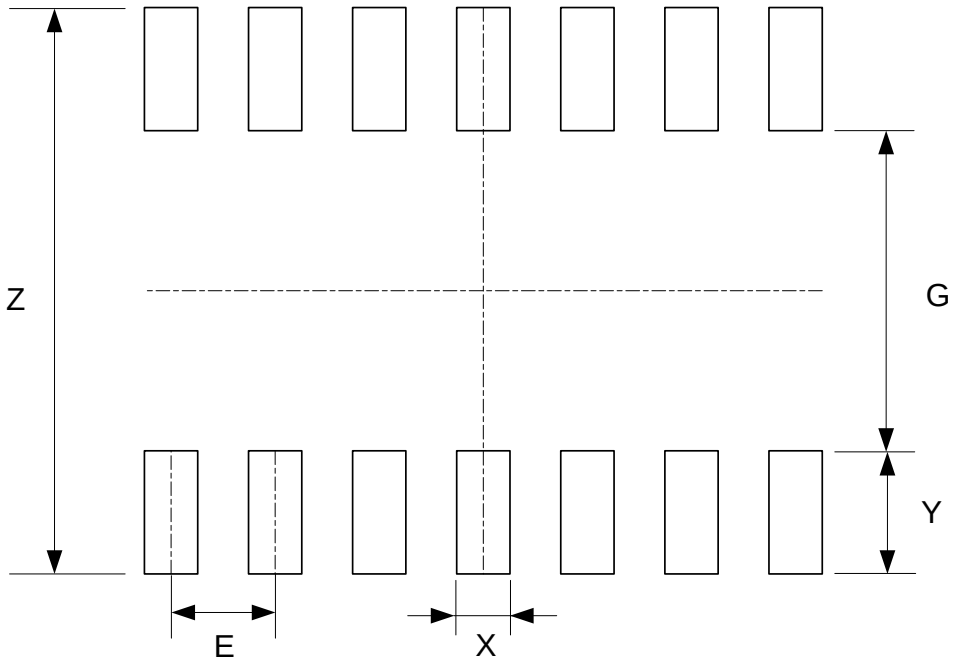
(2) Package Type: TSSOP-14



Note: Eject hole, oriented hole and mold mark is optional.

Suggested Pad Layout

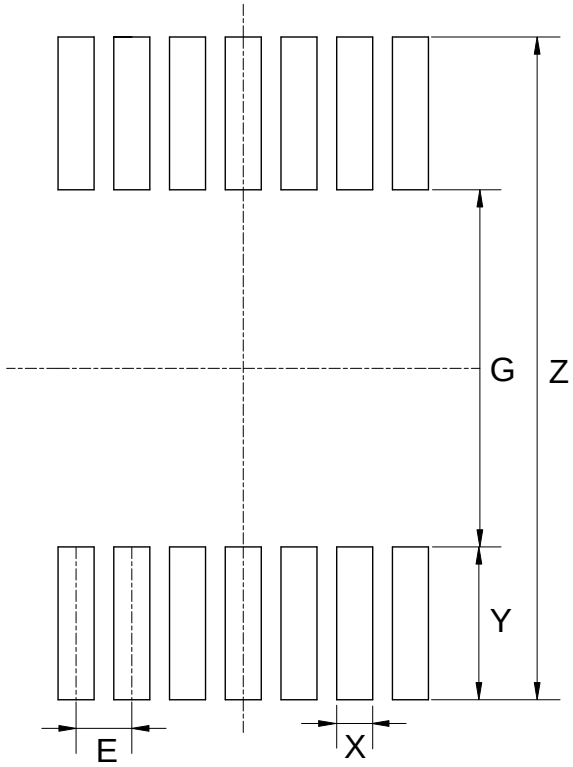
(1) Package Type: SO-14



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	1.270/0.050

Suggested Pad Layout (Cont.)

(2) Package Type: TSSOP-14



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	7.720/0.304	4.160/0.164	0.420/0.017	1.780/0.070	0.650/0.026

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

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

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