

DS1489/DS1489A Quad Line Receiver

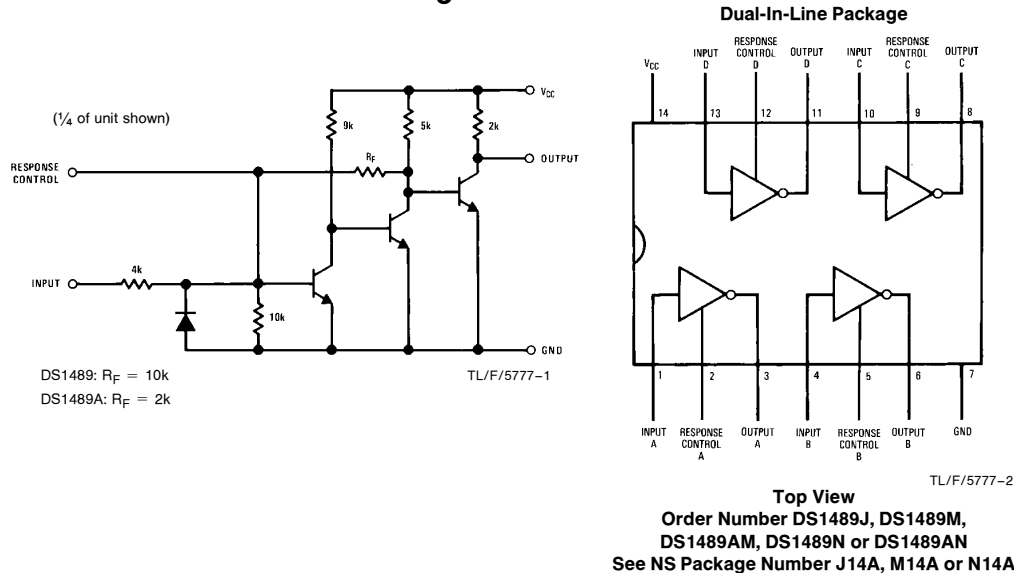
General Description

The DS1489/DS1489A are quad line receivers designed to interface data terminal equipment with data communications equipment. They are constructed on a single monolithic silicon chip. These devices satisfy the specifications of EIA Standard RS-232D. The DS1489/DS1489A meet and exceed the specifications of MC1489/MC1489A and are pin-for-pin replacements.

Features

- Four separate receivers per package
- Programmable threshold
- Built-in input threshold hysteresis
- "Fail safe" operating mode: high output for open inputs
- Inputs withstand $\pm 30V$

Schematic and Connection Diagrams



AC Test Circuit and Voltage Waveforms

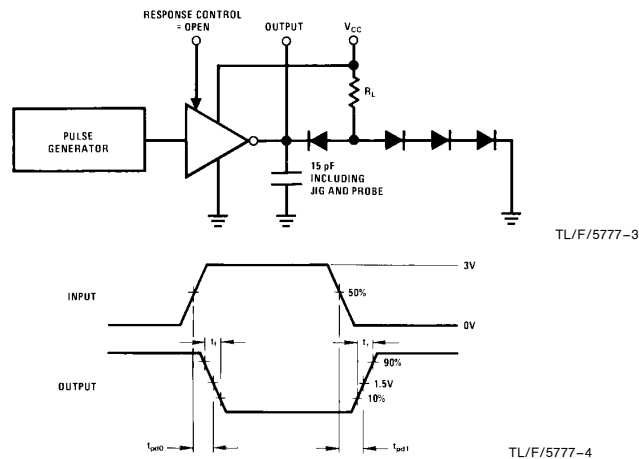


FIGURE 1

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Power Supply Voltage	10V
Input Voltage Range	± 30V
Output Load Current	20 mA
Power Dissipation (Note 2)	1W
Operating Temperature Range	0°C to +75°C
Storage Temperature Range	−65°C to +150°C

Maximum Power Dissipation* at 25°C

Cavity Package	1308 mW
Molded DIP Package	1207 mW
SO Package	1042 mW

Lead Temperature (Soldering, 4 sec.) 260°C

*Derate cavity package 8.7 mW/°C above 25°C; derate molded DIP package 9.7 mW/°C above 25°C; derate SO package 8.33 mW/°C above 25°C.

Electrical Characteristics (Notes 2, 3 and 4)

DS1489/DS1489A: The following apply for $V_{CC} = 5.0V \pm 1\%$, $0^\circ C \leq T_A \leq +75^\circ C$ unless otherwise specified.

Symbol	Parameter	Conditions			Min	Typ	Max	Units
V _{TH}	Input High Threshold Voltage	V _{OUT} ≤ 0.45V, I _{OUT} = 10 mA	DS1489	T _A = 25°C	1.0	1.25	1.5	V
					0.9		1.6	V
		DS1489A	T _A = 25°C	1.75	2.00	2.25	V	
				1.55		2.40	V	
V _{TL}	Input Low Threshold Voltage	V _{OUT} ≥ 2.5V, I _{OUT} = −0.5 mA	T _A = 25°C	0.75	1.00	1.25	V	
				0.65		1.35	V	
I _{IN}	Input Current	V _{IN} = +25V			+3.6	+5.6	+8.3	mA
		V _{IN} = −25V			−3.6	−5.6	−8.3	mA
		V _{IN} = +3V			+0.43	+0.53		mA
		V _{IN} = −3V			−0.43	−0.53		mA
V _{OH}	Output High Voltage	I _{OUT} = −0.5 mA	V _{IN} = 0.75V	2.6	3.8	5.0	V	
			Input = Open	2.6	3.8	5.0	V	
V _{OL}	Output Low Voltage	V _{IN} = 3.0V, I _{OUT} = 10 mA				0.33	0.45	V
I _{SC}	Output Short Circuit Current	V _{IN} = 0.75V				−3.0		mA
I _{CC}	Supply Current	V _{IN} = 5.0V				14	26	mA
P _d	Power Dissipation	V _{IN} = 5.0V				70	130	mW

Switching Characteristics $V_{CC} = 5V$, $T_A = 25^\circ C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd1}	Input to Output “High” Propagation Delay	$R_L = 3.9k$, (Figure 1) (AC Test Circuit)		28	85	ns
t_{pd0}	Input to Output “Low” Propagation Delay	$R_L = 390\Omega$, (Figure 1) (AC Test Circuit)		20	50	ns
t_r	Output Rise Time	$R_L = 3.9k$, (Figure 1) (AC Test Circuit)		110	175	ns
t_f	Output Fall Time	$R_L = 390\Omega$, (Figure 1) (AC Test Circuit)		9	20	ns

Note 1: “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. Except for “Operating Temperature Range” they are not meant to imply that the devices should be operated at these limits. The table of “Electrical Characteristics” provides conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the 0°C to +75°C temperature range for the DS1489 and DS1489A.

Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

Note 4: These specifications apply for response control pin = open.

Typical Characteristics $V_{CC} = 5.0V$, $T_A = +25^{\circ}C$ unless otherwise noted

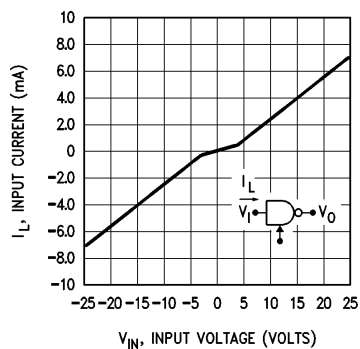


FIGURE 2. Input Current

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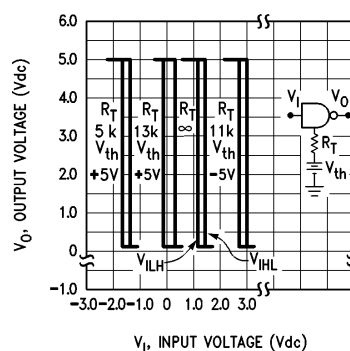


FIGURE 3. DS1489 Input Threshold Voltage Adjustment

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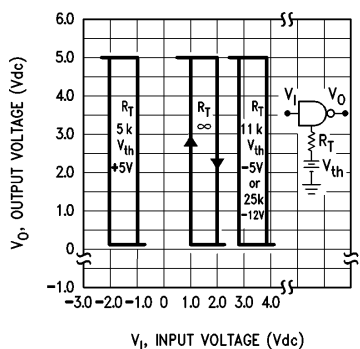


FIGURE 4. DS1489A Input Threshold Voltage Adjustment

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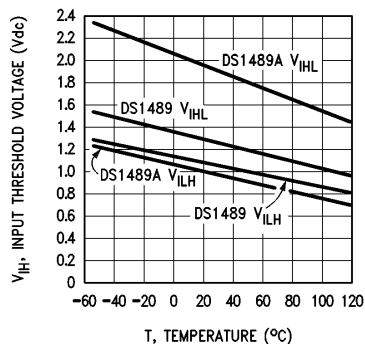


FIGURE 5. Input Threshold Voltage vs Temperature

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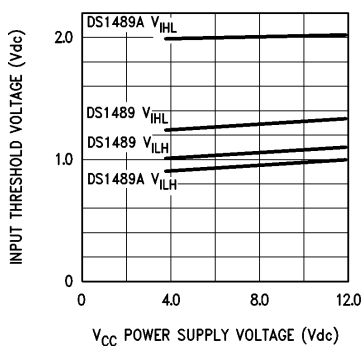


FIGURE 6. Input Threshold vs Power Supply Voltage

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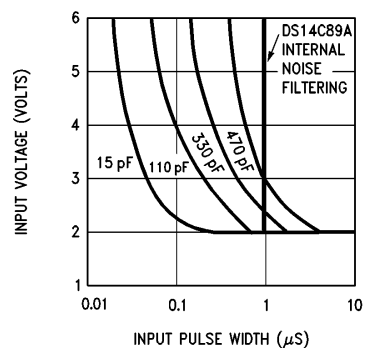
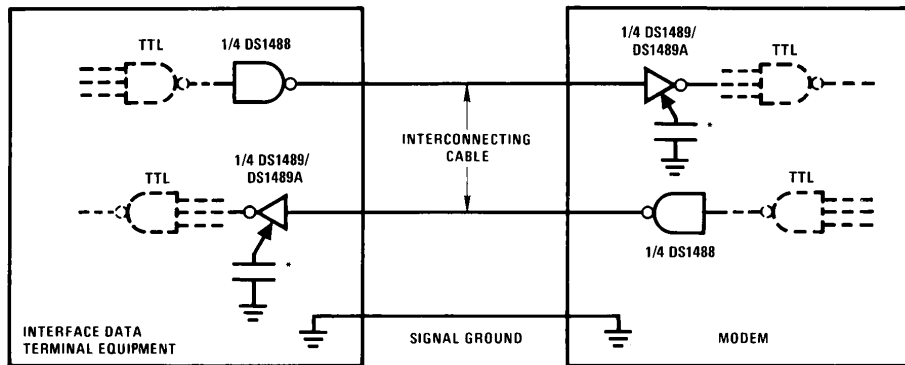


FIGURE 7. Noise Rejection vs Capacitance for DS1489A

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Typical Application Information

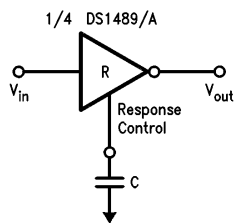


*Optional for noise filtering.

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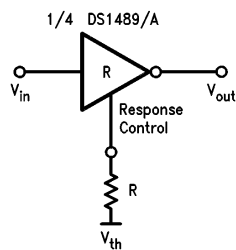
Applications Using the Response Control Pin

Noise Filter (See Figure 7)



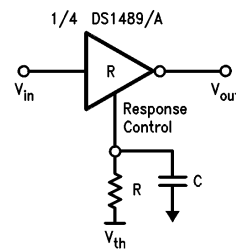
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Threshold Shift (See Figures 3 and 4)



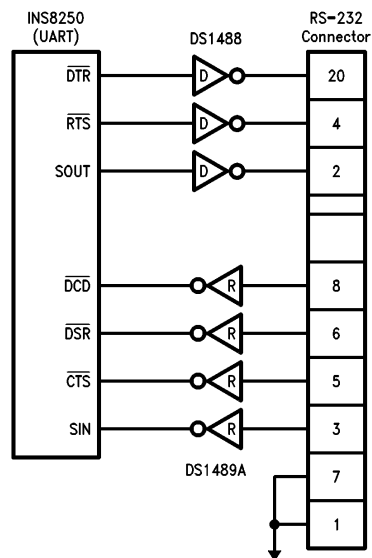
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Noise Filter and Threshold Shift (See Figures 3, 4 and 7)



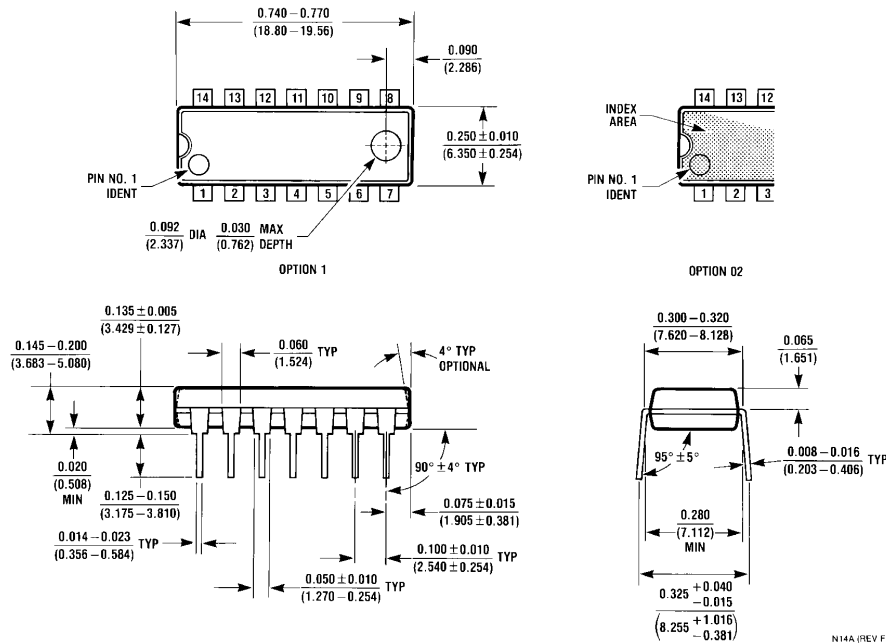
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Application of DS148, DS1489A and INS8250



TL/F/5777-16

The drawing shows the mechanical specifications for the J14A package. The top view (top) shows a rectangular package with a width of 0.785 inches (19.939 mm) and a height of 0.220 to 0.310 inches (5.588 to 7.874 mm). The package has 14 pins, numbered 1 through 14. The side view (bottom) shows the package with a maximum height of 0.180 inches (4.572 mm) and a maximum width of 0.290 to 0.320 inches (7.366 to 8.128 mm). The package is shown with a 95° ± 5° angle and a 10° MAX angle. The package is shown with a 0.018 to 0.041 inches (0.457 to 1.041 mm) height. The package is shown with a 0.008 to 0.012 inches (0.203 to 0.305 mm) height. The package is shown with a 0.098 inches (2.489 mm) height. The package is shown with a 0.100 to 0.010 inches (2.540 to 0.254 mm) height. The package is shown with a 0.125 to 0.200 inches (3.175 to 5.080 mm) height. The package is shown with a 0.150 inches (3.81 mm) height. The package is shown with a 0.020 to 0.060 inches (0.508 to 1.524 mm) height. The package is shown with a 0.060 ± 0.005 inches (1.524 ± 0.127 mm) height. The package is shown with a 0.018 ± 0.003 inches (0.457 ± 0.076 mm) height. The package is shown with a 0.100 ± 0.010 inches (2.540 ± 0.254 mm) height. The package is shown with a 0.125 ± 0.005 inches (3.175 ± 0.127 mm) height. The package is shown with a 0.150 ± 0.005 inches (3.81 ± 0.127 mm) height. The package is shown with a 0.175 ± 0.005 inches (4.425 ± 0.127 mm) height. The package is shown with a 0.200 ± 0.005 inches (5.080 ± 0.127 mm) height. The package is shown with a 0.220 ± 0.005 inches (5.588 ± 0.127 mm) height. The package is shown with a 0.240 ± 0.005 inches (6.096 ± 0.127 mm) height. The package is shown with a 0.260 ± 0.005 inches (6.604 ± 0.127 mm) height. The package is shown with a 0.280 ± 0.005 inches (7.112 ± 0.127 mm) height. The package is shown with a 0.300 ± 0.005 inches (7.620 ± 0.127 mm) height. The package is shown with a 0.320 ± 0.005 inches (8.128 ± 0.127 mm) height. The package is shown with a 0.340 ± 0.005 inches (8.636 ± 0.127 mm) height. The package is shown with a 0.360 ± 0.005 inches (9.144 ± 0.127 mm) height. The package is shown with a 0.380 ± 0.005 inches (9.652 ± 0.127 mm) height. The package is shown with a 0.400 ± 0.005 inches (10.160 ± 0.127 mm) height. The package is shown with a 0.420 ± 0.005 inches (10.668 ± 0.127 mm) height. The package is shown with a 0.440 ± 0.005 inches (11.176 ± 0.127 mm) height. The package is shown with a 0.460 ± 0.005 inches (11.684 ± 0.127 mm) height. The package is shown with a 0.480 ± 0.005 inches (12.192 ± 0.127 mm) height. The package is shown with a 0.500 ± 0.005 inches (12.700 ± 0.127 mm) height. The package is shown with a 0.520 ± 0.005 inches (13.208 ± 0.127 mm) height. The package is shown with a 0.540 ± 0.005 inches (13.716 ± 0.127 mm) height. The package is shown with a 0.560 ± 0.005 inches (14.224 ± 0.127 mm) height. The package is shown with a 0.580 ± 0.005 inches (14.732 ± 0.127 mm) height. The package is shown with a 0.600 ± 0.005 inches (15.240 ± 0.127 mm) height. The package is shown with a 0.620 ± 0.005 inches (15.748 ± 0.127 mm) height. The package is shown with a 0.640 ± 0.005 inches (16.256 ± 0.127 mm) height. The package is shown with a 0.660 ± 0.005 inches (16.764 ± 0.127 mm) height. The package is shown with a 0.680 ± 0.005 inches (17.272 ± 0.127 mm) height. The package is shown with a 0.700 ± 0.005 inches (17.780 ± 0.127 mm) height. The package is shown with a 0.720 ± 0.005 inches (18.288 ± 0.127 mm) height. The package is shown with a 0.740 ± 0.005 inches (18.796 ± 0.127 mm) height. The package is shown with a 0.760 ± 0.005 inches (19.304 ± 0.127 mm) height. The package is shown with a 0.780 ± 0.005 inches (19.812 ± 0.127 mm) height. The package is shown with a 0.800 ± 0.005 inches (20.320 ± 0.127 mm) height. The package is shown with a 0.820 ± 0.005 inches (20.828 ± 0.127 mm) height. The package is shown with a 0.840 ± 0.005 inches (21.336 ± 0.127 mm) height. The package is shown with a 0.860 ± 0.005 inches (21.844 ± 0.127 mm) height. The package is shown with a 0.880 ± 0.005 inches (22.352 ± 0.127 mm) height. The package is shown with a 0.900 ± 0.005 inches (22.860 ± 0.127 mm) height. The package is shown with a 0.920 ± 0.005 inches (23.368 ± 0.127 mm) height. The package is shown with a 0.940 ± 0.005 inches (23.876 ± 0.127 mm) height. The package is shown with a 0.960 ± 0.005 inches (24.384 ± 0.127 mm) height. The package is shown with a 0.980 ± 0.005 inches (24.892 ± 0.127 mm) height. The package is shown with a 1.000 ± 0.005 inches (25.400 ± 0.127 mm) height. The package is shown with a 1.020 ± 0.005 inches (25.908 ± 0.127 mm) height. The package is shown with a 1.040 ± 0.005 inches (26.416 ± 0.127 mm) height. The package is shown with a 1.060 ± 0.005 inches (26.924 ± 0.127 mm) height. The package is shown with a 1.080 ± 0.005 inches (27.432 ± 0.127 mm) height. The package is shown with a 1.100 ± 0.005 inches (27.940 ± 0.127 mm) height. The package is shown with a 1.120 ± 0.005 inches (28.448 ± 0.127 mm) height. The package is shown with a 1.140 ± 0.005 inches (28.956 ± 0.127 mm) height. The package is shown with a 1.160 ± 0.005 inches (29.464 ± 0.127 mm) height. The package is shown with a 1.180 ± 0.005 inches (29.972 ± 0.127 mm) height. The package is shown with a 1.200 ± 0.005 inches (30.480 ± 0.127 mm) height. The package is shown with a 1.220 ± 0.005 inches (30.988 ± 0.127 mm) height. The package is shown with a 1.240 ± 0.005 inches (31.496 ± 0.127 mm) height. The package is shown with a 1.260 ± 0.005 inches (32.004 ± 0.127 mm) height. The package is shown with a 1.280 ± 0.005 inches (32.512 ± 0.127 mm) height. The package is shown with a 1.300 ± 0.005 inches (33.020 ± 0.127 mm) height. The package is shown with a 1.320 ± 0.005 inches (33.528 ± 0.127 mm) height. The package is shown with a 1.340 ± 0.005 inches (34.036 ± 0.127 mm) height. The package is shown with a 1.360 ± 0.005 inches (34.544 ± 0.127 mm) height. The package is shown with a 1.380 ± 0.005 inches (35.052 ± 0.127 mm) height. The package is shown with a 1.400 ± 0.005 inches (35.560 ± 0.127 mm) height. The package is shown with a 1.420 ± 0.005 inches (36.068 ± 0.127 mm) height. The package is shown with a 1.440 ± 0.005 inches (36.576 ± 0.127 mm) height. The package is shown with a 1.460 ± 0.005 inches (37.084 ± 0.127 mm) height. The package is shown with a 1.480 ± 0.005 inches (37.592 ± 0.127 mm) height. The package is shown with a 1.500 ± 0.005 inches (38.100 ± 0.127 mm) height. The package is shown with a 1.520 ± 0.005 inches (38.608 ± 0.127 mm) height. The package is shown with a 1.540 ± 0.005 inches (39.116 ± 0.127 mm) height. The package is shown with a 1.560 ± 0.005 inches (39.624 ± 0.127 mm) height. The package is shown with a 1.580 ± 0.005 inches (40.132 ± 0.127 mm) height. The package is shown with a 1.600 ± 0.005 inches (40.640 ± 0.127 mm) height. The package is shown with a 1.620 ± 0.005 inches (41.148 ± 0.127 mm) height. The package is shown with a 1.640 ± 0.005 inches (41.656 ± 0.127 mm) height. The package is shown with a 1.660 ± 0.005 inches (42.164 ± 0.127 mm) height. The package is shown with a 1.680 ± 0.005 inches (42.672 ± 0.127 mm) height. The package is shown with a 1.700 ± 0.005 inches (43.180 ± 0.127 mm) height. The package is shown with a 1.720 ± 0.005 inches (43.688 ± 0.127 mm) height. The package is shown with a 1.740 ± 0.005 inches (44.196 ± 0.127 mm) height. The package is shown with a 1.760 ± 0.005 inches (44.704 ± 0.127 mm) height. The package is shown with a 1.780 ± 0.005 inches (45.212 ± 0.127 mm) height. The package is shown with a 1.800 ± 0.005 inches (45.720 ± 0.127 mm) height. The package is shown with a 1.820 ± 0.005 inches (46.228 ± 0.127 mm) height. The package is shown with a 1.840 ± 0.005 inches (46.736 ± 0.127 mm) height. The package is shown with a 1.860 ± 0.005 inches (47.244 ± 0.127 mm) height. The package is shown with a 1.880 ± 0.005 inches (47.752 ± 0.127 mm) height. The package is shown with a 1.900 ± 0.005 inches (48.260 ± 0.127 mm) height. The package is shown with a 1.920 ± 0.005 inches (48.768 ± 0.127 mm) height. The package is shown with a 1.940 ± 0.005 inches (49.276 ± 0.127 mm) height. The package is shown with a 1.960 ± 0.005 inches (49.784 ± 0.127 mm) height. The package is shown with a 1.980 ± 0.005 inches (50.292 ± 0.127 mm) height. The package is shown with a 2.000 ± 0.005 inches (50.80

Physical Dimensions inches (millimeters) (Continued)

Molded Dual-In-Line Package (N)
Order Number DS1489N or DS1489AN
NS Package Number N14A

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