National Semiconductor

May 1998

DS1489/DS1489A
Quad Line Receiver

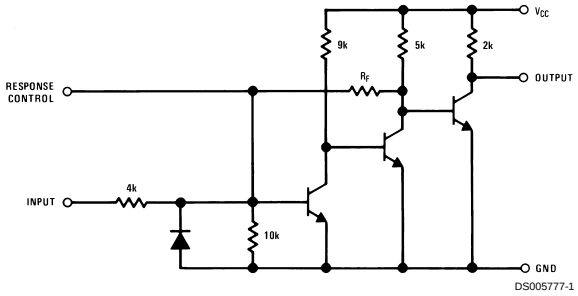
General Description

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 ±30V

Schematic and Connection Diagrams



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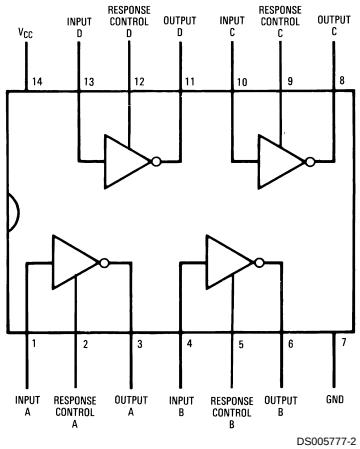
(¼ of unit shown)
DS1489: R_F = 10k
DS1489A: R_F = 2k

Dual-In-Line Package



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Top View
Order Number DS1489M, DS1489N
DS1489AM or DS1489AN
See NS Package Number M14A or N14A

AC Test Circuit and Voltage Waveforms

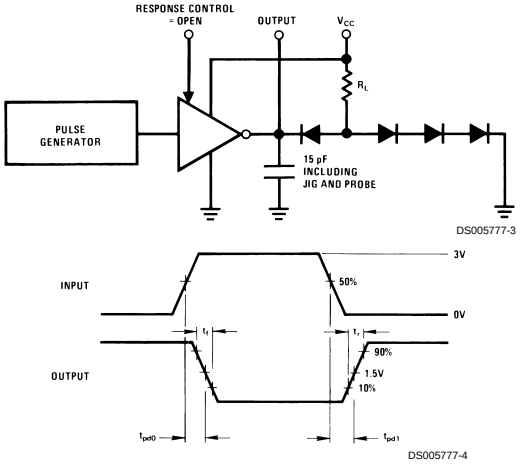


FIGURE 1.

Absolute Maximum Ratings (Note 2)

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 3)	1W
Operating Temperature Range	0˚C to +75˚C
Storage Temperature Range	−65˚C to +150˚C
Maximum Power Dissipation (Note 1) at 25˚C	
Molded DIP Package	1207 mW
SO Package	1042 mW
Lead Temperature (Soldering, 4 sec.)	260˚C

Note 1: Derate molded DIP package 9.7 mW/˚C above 25˚C; derate SO package 8.33 mW/˚C above 25˚C.

Electrical Characteristics (Notes 3, 4, 5)

DS1489/DS1489A: The following apply for V_{CC} = 5.0V ±1%, 0˚C ≤ T_A ≤ +75˚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˚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 = 390Ω, (*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 = 390Ω, (*Figure 1*) (AC Test Circuit)		9	20	ns

Note 2: "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 3: Unless otherwise specified min/max limits apply across the 0˚C to +75˚C temperature range for the DS1489 and DS1489A.

Note 4: 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 5: These specifications apply for response control pin = open.

Typical Characteristics V_{CC} = 5.0V, T_A = +25˚C unless otherwise noted

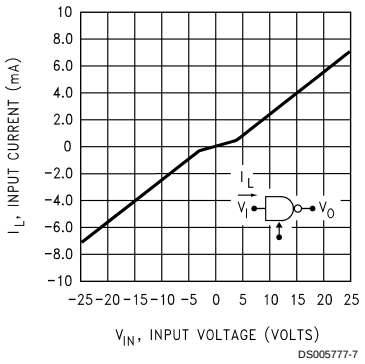


FIGURE 2. Input Current

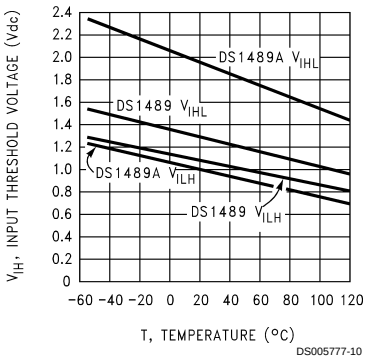


FIGURE 5. Input Threshold Voltage vs Temperature

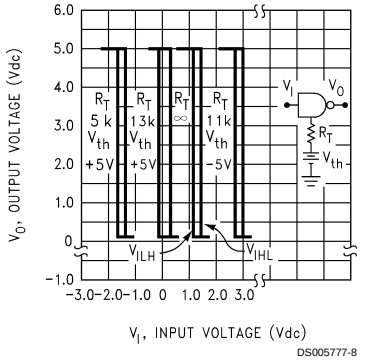


FIGURE 3. DS1489 Input Threshold Voltage Adjustment

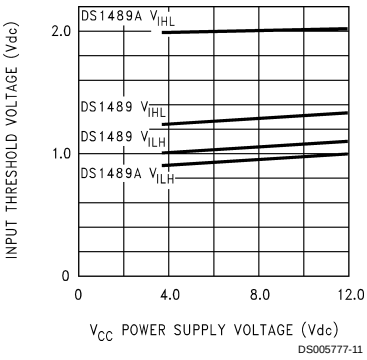


FIGURE 6. Input Threshold vs Power Supply Voltage

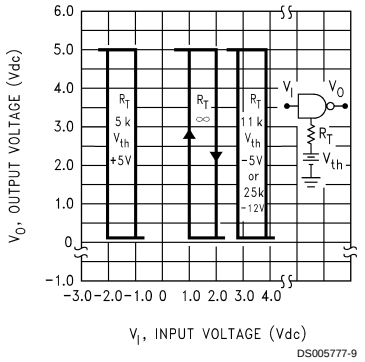


FIGURE 4. DS1489A Input Threshold Voltage Adjustment

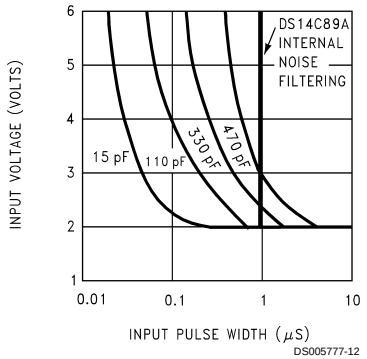
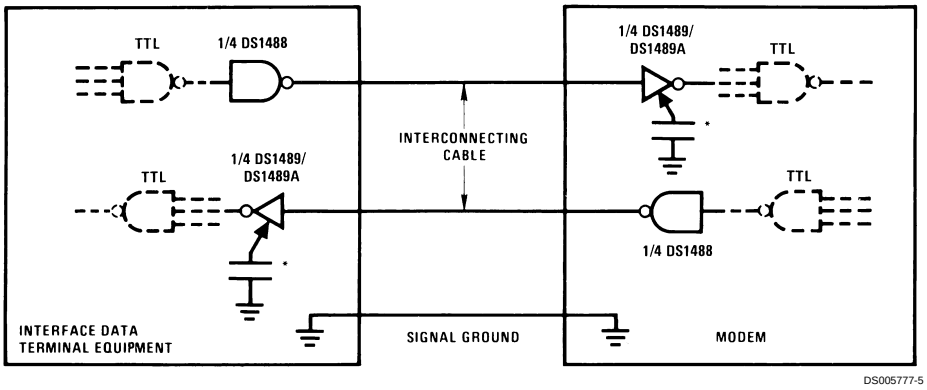


FIGURE 7. Noise Rejection vs Capacitance for DS1489A

Typical Application Information



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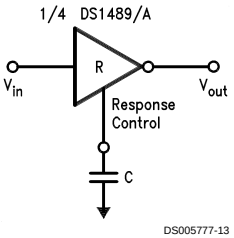
*Optional for noise filtering.

Applications Using the Response Control Pin

Noise Filter
See *Figure 7*



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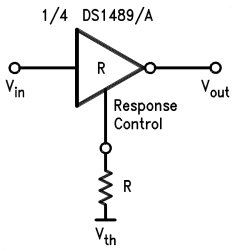
Threshold Shift
See *Figures 3, 4*



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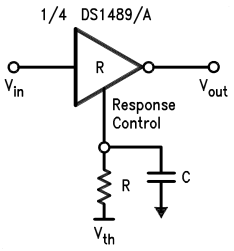
Noise Filter and Threshold Shift
See *Figures 3, 4, 7*



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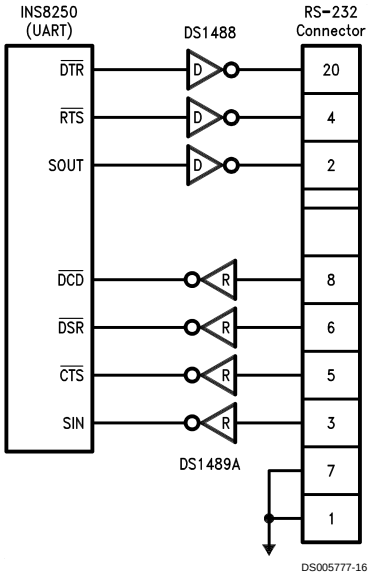
Application of DS1488, DS1489A and INS8250



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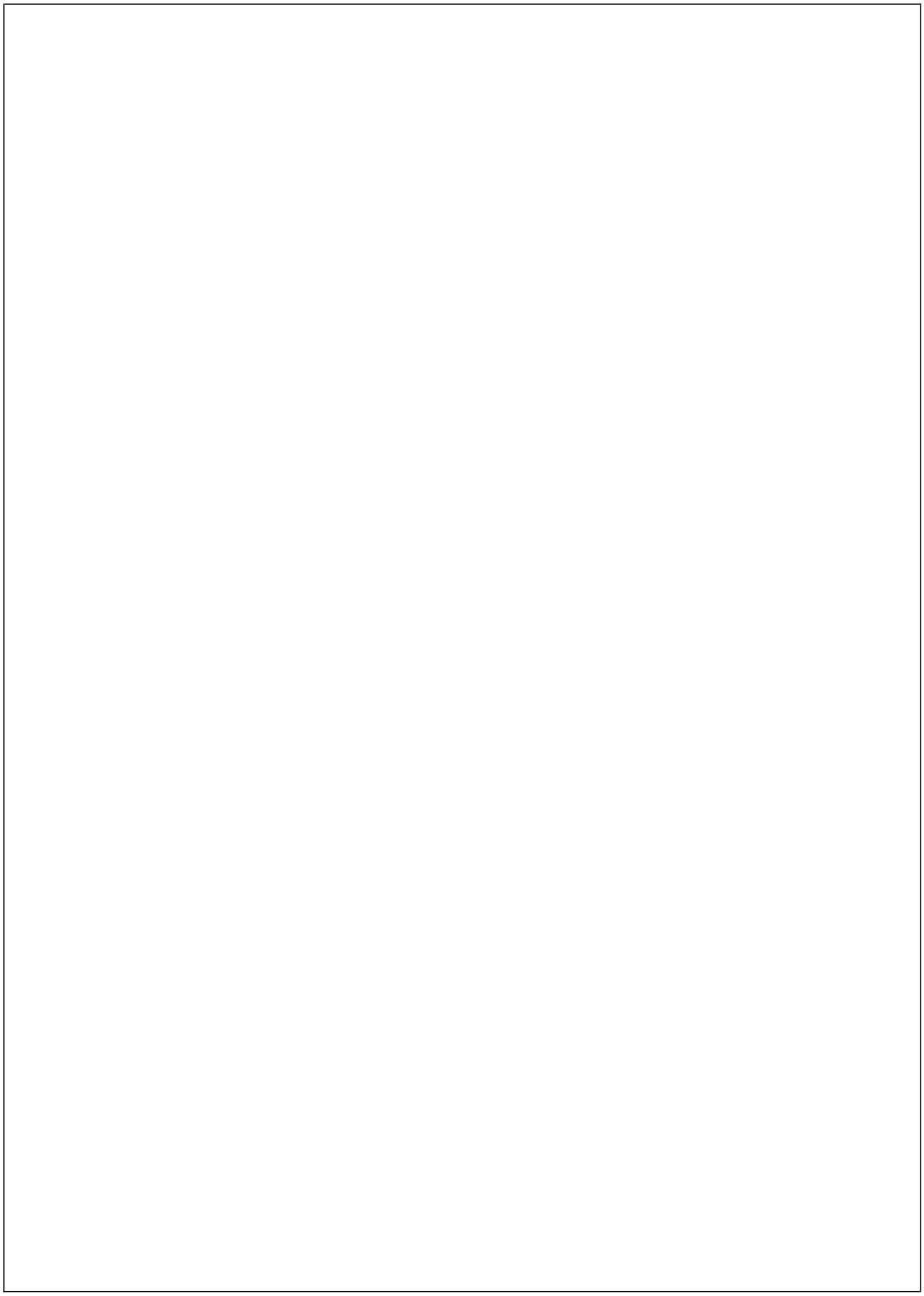
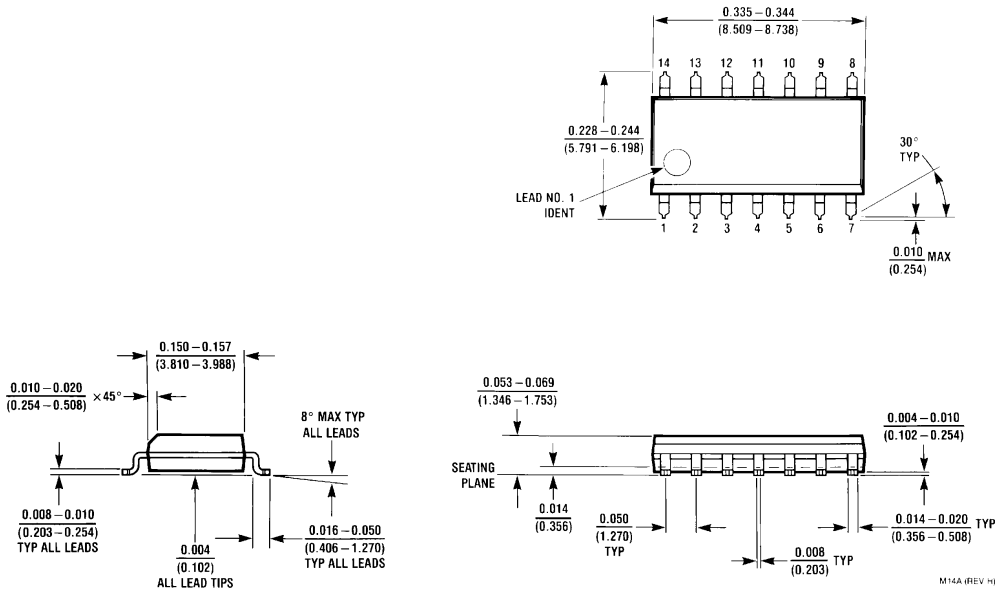
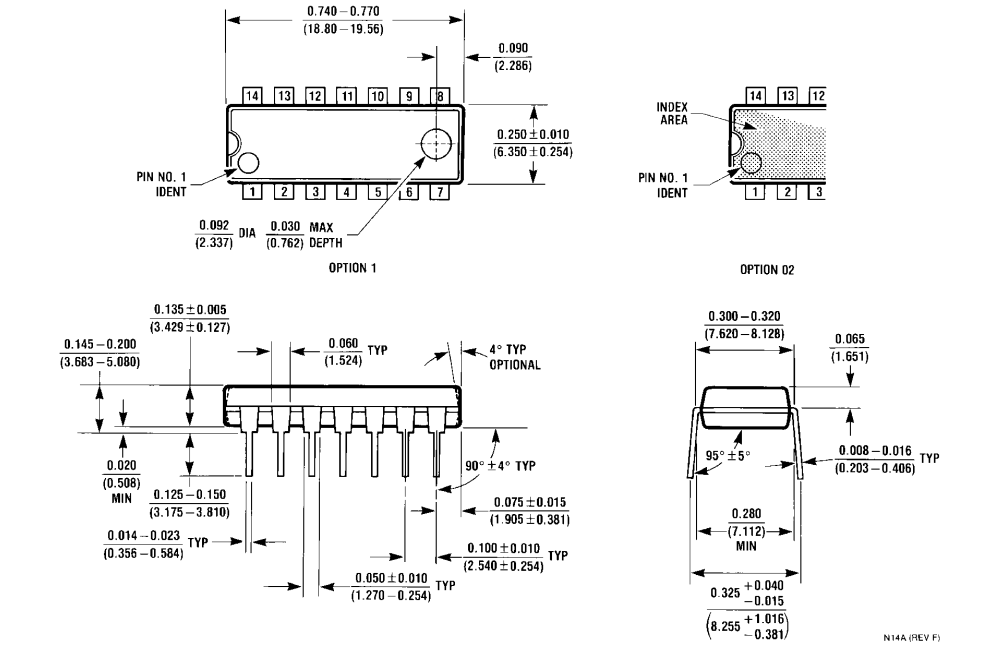


Physical Dimensions inches (millimeters) unless otherwise noted



SO Package (M)
Order Number DS1489M or DS1489AM
NS Package Number M14A



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

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