

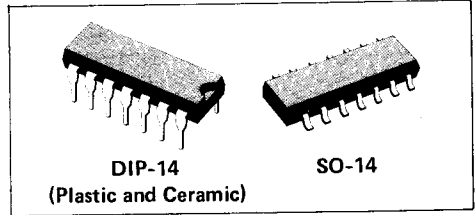
MC1489
MC1489A

LINEAR INTEGRATED CIRCUITS

QUAD LINE RECEIVERS

- INPUT RESISTANCE – 3.0K to 7.0K Ω
- INPUT SIGNAL RANGE – $\pm 30V$
- INPUT THRESHOLD HYSTERESIS BUILT-IN
- RESPONSE CONTROL:
 - a) LOGIC THRESHOLD SHIFTING
 - b) INPUT NOISE FILTERING

with data communications equipment in conformance with the specifications of EIA Standard No. RS-232C.



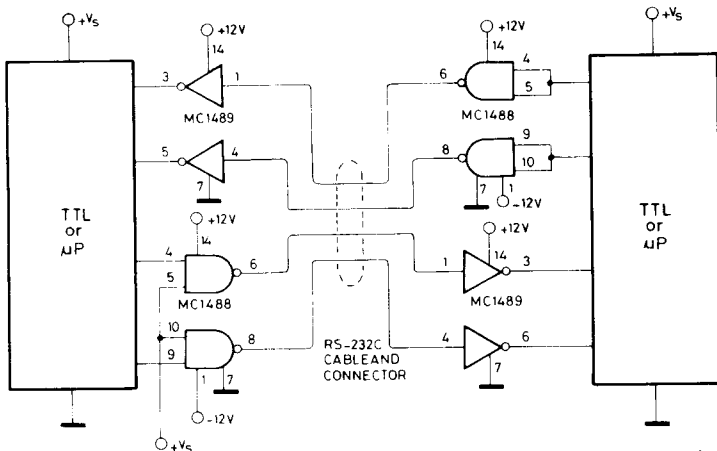
The MC1489 monolithic quad line receivers are designed to interface data terminal equipment

ABSOLUTE MAXIMUM RATINGS

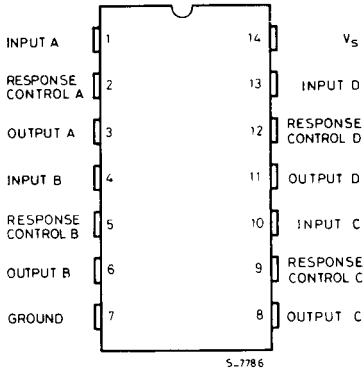
V_S	Power supply voltage	10	V
V_I	Input voltage range	± 30	V
I_{OL}	Output load current	20	mA
P_{tot}	Power dissipation	1	W
T_{amb}	Operating ambient temperature	0 to 75	$^{\circ}C$
T_{stg}	Storage temperature range	-65 to 150	$^{\circ}C$

ORDERING NUMBER: MC1489L, MC1489AL (DIP-14 Ceramic)
MC1489P, MC1489AP (DIP-14 Plastic)
MC1489D, MC1489AD (SO-14)

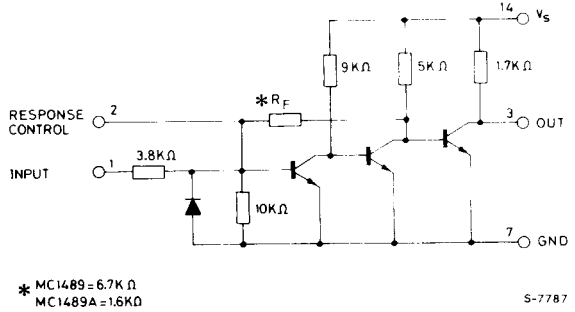
Typical Application: RS232C data transmission



CONNECTION DIAGRAM
(Top view)



SCHEMATIC DIAGRAM (1/4 of circuit shown)



* MC1489 = 6.7K Ω
MC1489A = 1.6K Ω

S-7787

ELECTRICAL CHARACTERISTICS (Response control pin is open; $V_S = 5V$, $T_{amb} = 0$ to $75^\circ C$ unless otherwise specified)

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{IH}	Positive input current $V_{IH} = 25V$ $V_{IH} = 3V$	3.6 0.43		8.3	mA
I_{IL}	Negative input current $V_{IL} = -25V$ $V_{IL} = -3V$	-3.6 -0.43		-8.3	mA
V_{IH}	Input Turn-on threshold voltage $T_{amb} = 25^\circ C$ $I_L = -0.5mA$ $V_{OH} \geq 2.5V$ for MC1489 $V_{OH} \geq 2.5V$ for MC1489A	1 1.75	1.95	1.5 2.25	V
V_{IL}	Input Turn-off threshold voltage $T_{amb} = 25^\circ C$ $I_L = -0.5A$ $V_{OH} \geq 2.5V$ for MC1489 $V_{OH} \geq 2.5V$ for MC1489A	0.75 0.75	0.8	1.25 1.25	V
V_{OH}	Output voltage high $V_{IH} = 0.75V$ $I_L = 0.5mA$ input open circuit	2.5 2.5	4 4	5 5	V V
V_{OL}	Output voltage low $V_{IL} = 3V$ $I_L = 10mA$		0.2	0.45	V
I_{OS}	Output short circuit current		-3	-4	mA
I_S	Power supply current All gates "on" $V_{IH} = 5V$ $I_O = 0mA$		16	26	mA
P_C	Power consumption $V_{IH} = 5V$		80	130	mW

SWITCHING CHARACTERISTICS ($V_S = 5V$, $T_{amb} = 25^\circ C$, see Fig. 1)

t_{PLH}	Propagation Delay time $R_L = 3.9K\Omega$		25	85	ns
t_{TLH}	Rise time $R_L = 3.9K\Omega$		120	175	ns
t_{PHL}	Propagation Delay time $R_L = 390K\Omega$		25	50	ns
t_{THL}	Fall time $R_L = 390K\Omega$		10	20	ns

MC1489 MC1489A

TEST CIRCUITS

Fig. 1 - Switching response

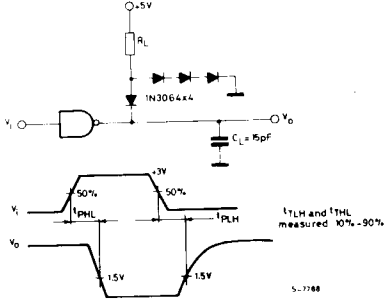


Fig. 2 - Response control node

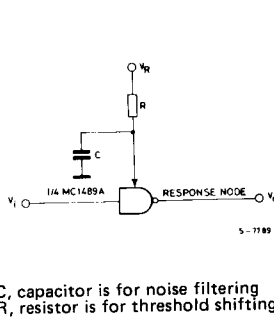


Fig. 3 - Input current

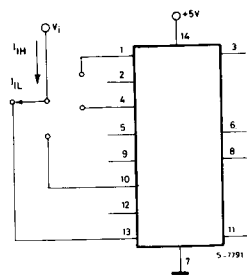


Fig. 4 - Output short-circuit current

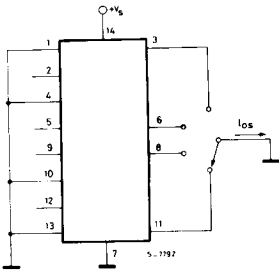


Fig. 5 - Output voltage and input threshold voltage

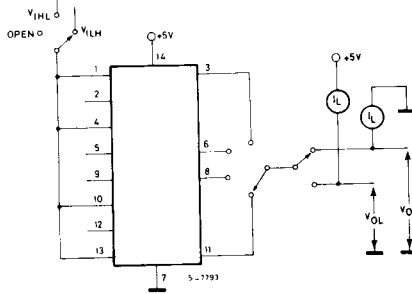
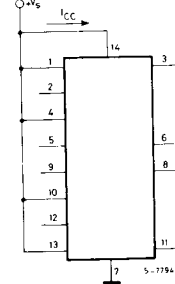


Fig. 6 - Power supply current



TYPICAL CHARACTERISTICS ($V_S = 5V$, $T_{amb} = 25^\circ C$ unless otherwise specified)

Fig. 7 - Input current

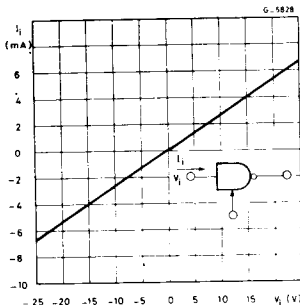


Fig. 8 - MC1489 input threshold voltage adjustment

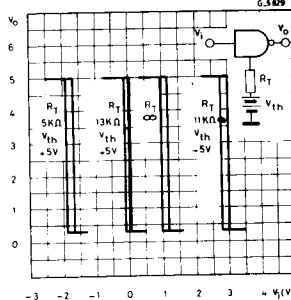


Fig. 9 - MC1489A input threshold voltage adjustment

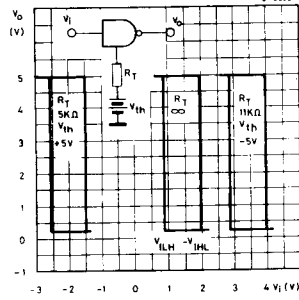


Fig. 10 - Input threshold voltage vs. temperature

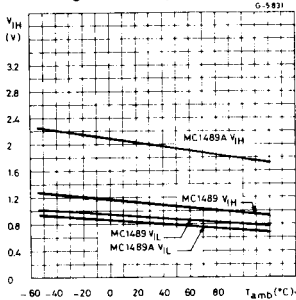
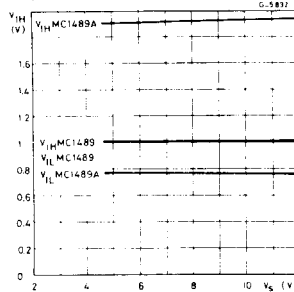


Fig. 11 - Input threshold vs. power-supply voltage



APPLICATION INFORMATION

General Information

The Electronic Industries Association (EIA) has released the RS-232C specification detailing the requirements for the interface between data processing equipment and data communications equipment. This standard specifies not only the number and type of interface leads, but also the voltage levels to be used. The MC1488 quad driver and its companion circuit, the MC1489 quad receiver, provide a complete interface system between DTL or TTL logic levels and the RS-232C defined levels. The RS-232C requirements as applied to receivers are discussed herein.

The required input impedance is defined as between 3000 Ω and 7000 Ω for input voltages between 3.0 and 25V in magnitude; and any voltage on the receiver input in an open circuit condition must be less than 2.0V in magnitude. The MC1489 circuits meet these requirements with a maximum open circuit voltage of one V_{BE} .

The receiver shall detect a voltage between -3.0 and -25V as a Logic "1" and inputs between + 3.0 and + 2.5V as a Logic "0". On some interchange leads, an open circuit of power "OFF" condition (300 Ω or more to ground) shall be decoded as an "OFF" condition or Logic "1". For this reason, the input hysteresis thresholds of the MC1489 circuits are all above ground. Thus an open or grounded input will cause the same output as a negative or Logic "1" input.

Device Characteristics

The MC1489 interface receivers have internal feedback from the second stage to the input stage providing input hysteresis for noise rejection. The MC1489 input has typical turn-on voltage of 1.25V and turn-off of 1.0V for a typical hysteresis of 250mV. The MC1489A has typical turn-on of 1.95V and turn-off of 0.8V for typically 1.15V of hysteresis.

Each receiver section has an external response control node in addition to the input and output pins, thereby allowing the designer to vary the input threshold voltage levels. A resistor can be connected between this node and an external power supply. Figure 2, 4 and 5 illustrate the input threshold voltage shift possible through this technique.

This response node can also be used for the filtering of high-frequency, high-energy noise pulses. Figures 8 and 9 show typical noise-pulse rejection for external capacitors of various sizes.

These two operations on the response node can be combined or used individually for may combinations of interfacing applications. The MC1489 circuits are particularly useful for interfacing between MOS circuits and MDTL/MTTL logic systems. In this application, the input threshold voltages are adjusted. (with the appropriate supply and resistor values) to fall in the center of the MOS voltage logic levels. (See Figure 10).

APPLICATION INFORMATION (continued)

The response node may also be used as the receiver input as long as the designer realizes that he may not drive this node with a low impedance source to a voltage greater than one diode above

ground or less than one diode below ground. This feature is demonstrated in Figure 11 where two receivers are slaved to the same line that must still meet the RS-232C impedance requirement.

Fig. 12 - Typical Turn-on threshold vs. capacitance from response control pin to GND

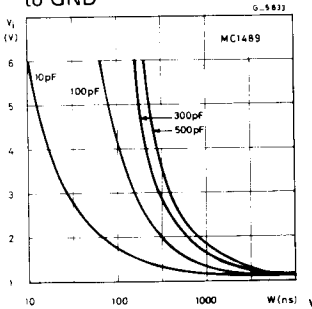


Fig. 13 - Typical Turn-on threshold vs. capacitance from response control pin to GND

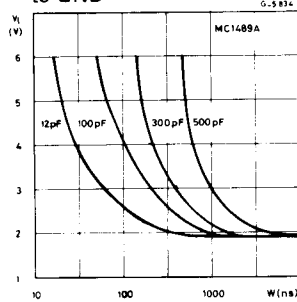
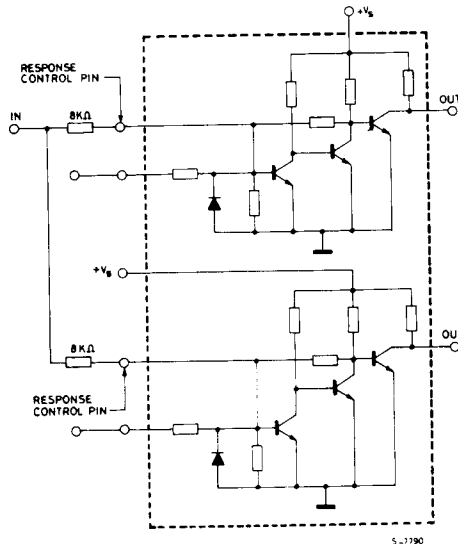
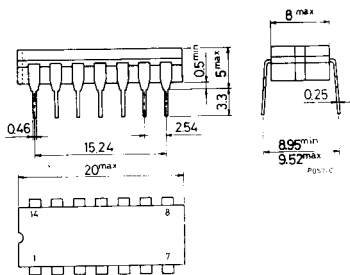


Fig. 14 - Typical paralleling of two MC1489/A receivers to meet RS-232C

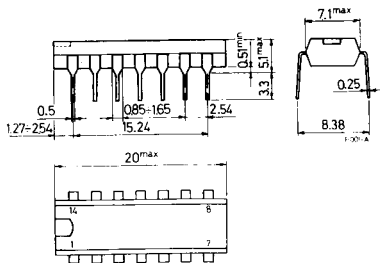


MECHANICAL DATA (Dimensions in mm)

DIP-14 (Ceramic)



DIP-14 (Plastic)



SO-14

