



MC1489 MC1489A

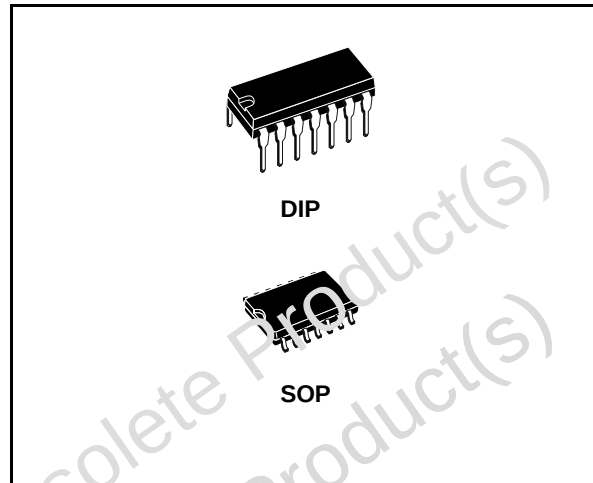
Quad line receivers

General features

- Input resistance $-3k$ to $7k\Omega$
- Input signal range $\pm 30V$
- Input threshold hysteresis built-in
- Response control:
 - a) Logic threshold shifting
 - b) Input noise filtering

Description

The MC1489 monolithic quad line receivers are designed to interface data terminal equipment with data communications equipment in conformance with the specifications of EIA Standard N° RS232C.



Order code

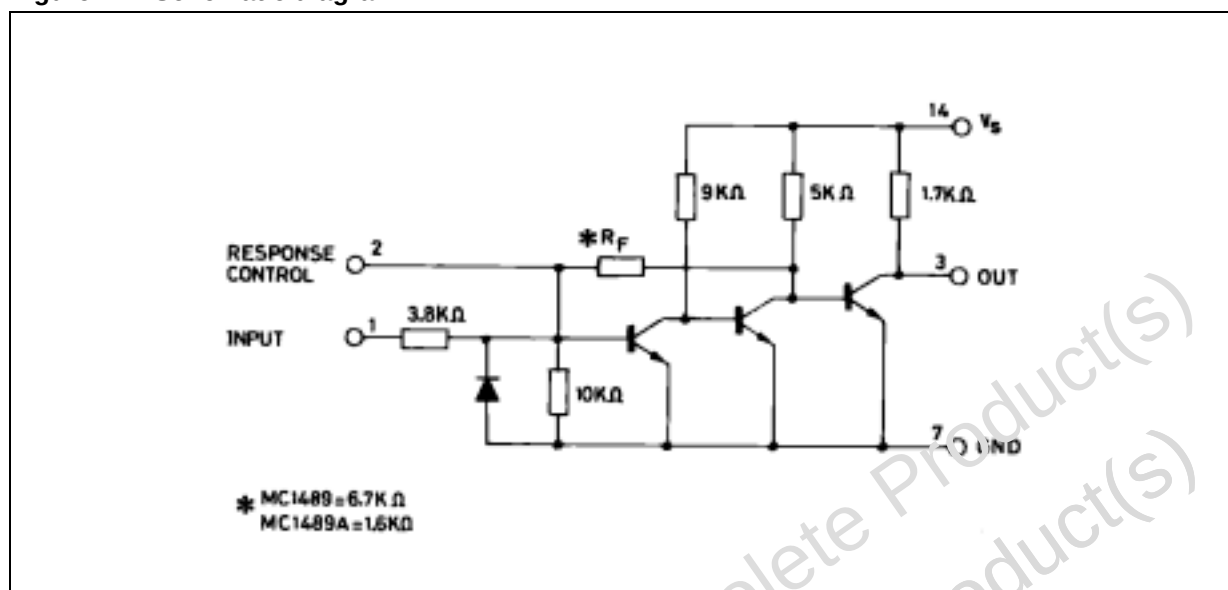
Part Number	
DIP14	SO14 (Tape & reel)
MC1489P	MC1489D1013TR
MC1489AP	MC1488AD1013TR

Contents

1	Diagram	3
2	Pin description	4
3	Maximum ratings	5
4	Electrical characteristics	6
5	Test circuit	7
6	Typical applications	9
7	Typical characteristics	10
8	Application information	11
	8.1 Device characteristics	11
9	Revision history	16

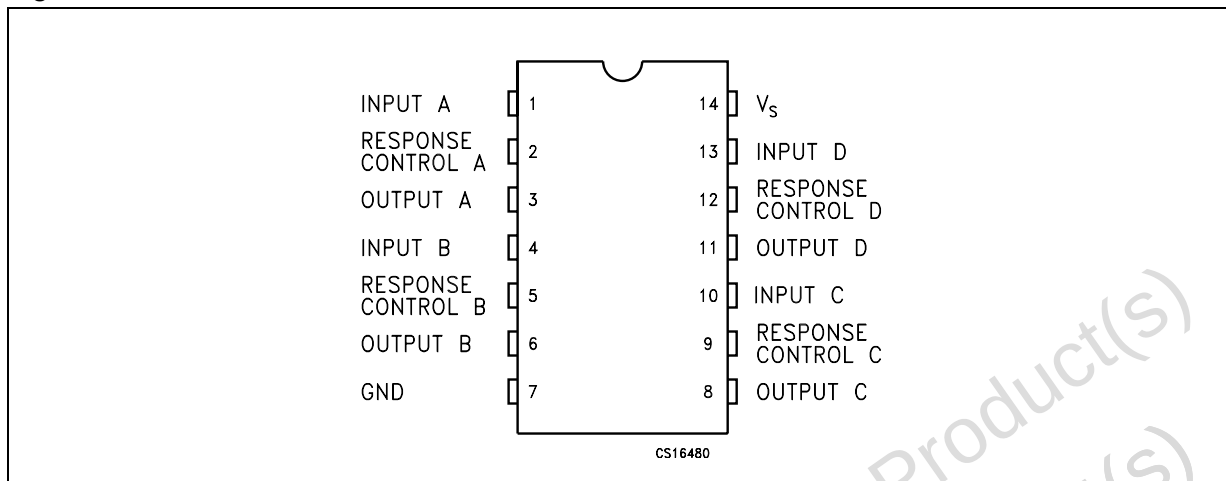
1 Diagram

Figure 1. Schematic diagram



2 Pin description

Figure 2. Pin connections



3 Maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
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	°C
T_{stg}	Storage temperature range	-65 to 150	°C

Note: Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 2. Thermal data

Symbol	Parameter	Plastic DIP14	SO14	Unit
R_{thJA}	Thermal resistance junction-ambient Max	200	165	°C/W

4 Electrical characteristics

Table 3. Electrical characteristics (Response control pin in open; $V_S = 5V$, $T_{amb} = 0$ to $75^\circ C$, unless otherwise specified)

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

Table 4. Switching characteristics ($V_S = 5V$, $T_{amb} = 25^\circ C$)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{PLH}	Propagation delay time	$R_L = 3.9 K\Omega$		25	85	ns
t_{THL}	Rise time	$R_L = 3.9 K\Omega$		120	175	ns
t_{PHL}	Propagation delay time	$R_L = 390 \Omega$		25	50	ns
t_{FHL}	Fall time	$R_L = 390 \Omega$		10	20	ns

5 Test circuit

Figure 3. Switching response

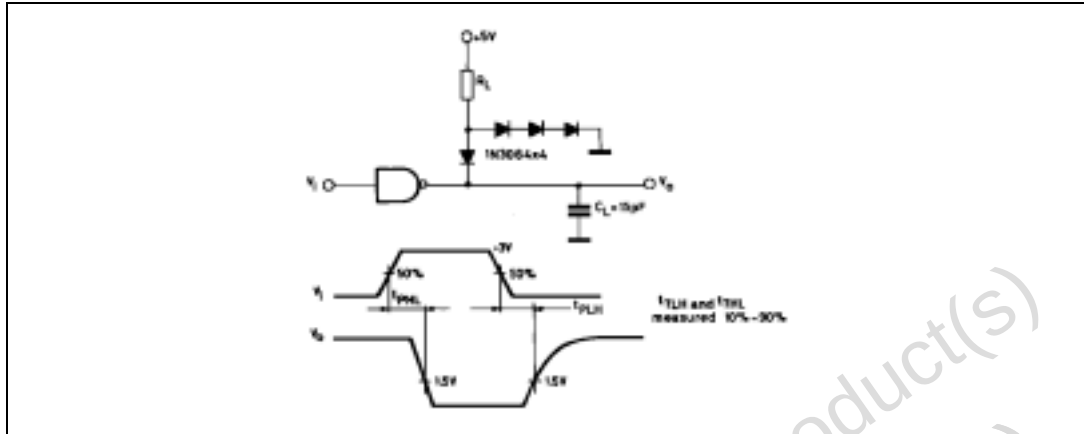


Figure 4. Response control node

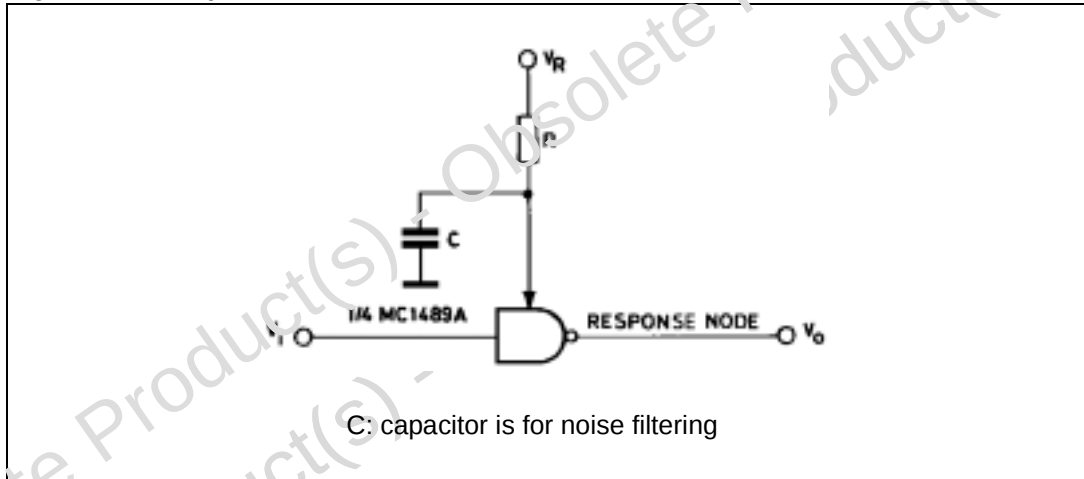


Figure 5. Input current

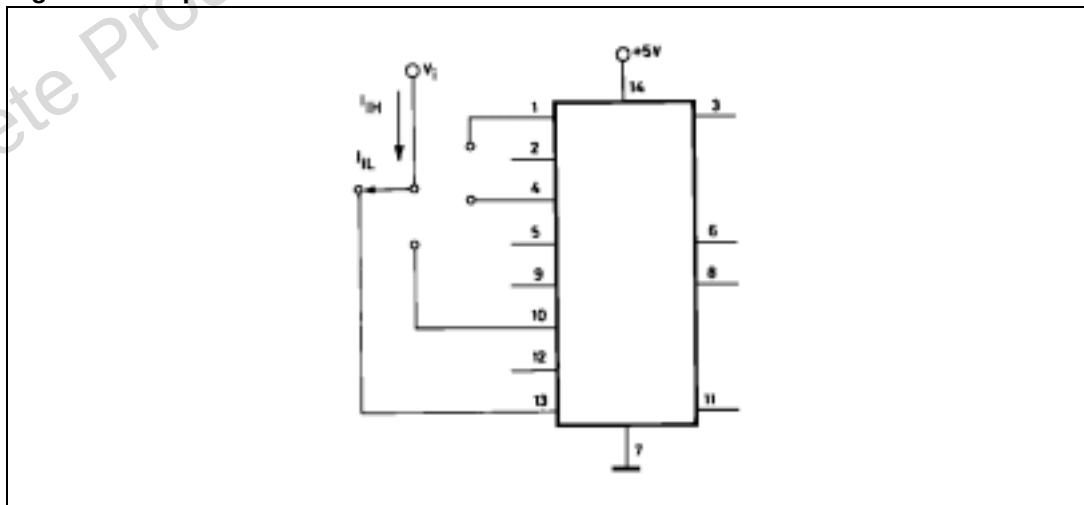


Figure 6. Output short-circuit current

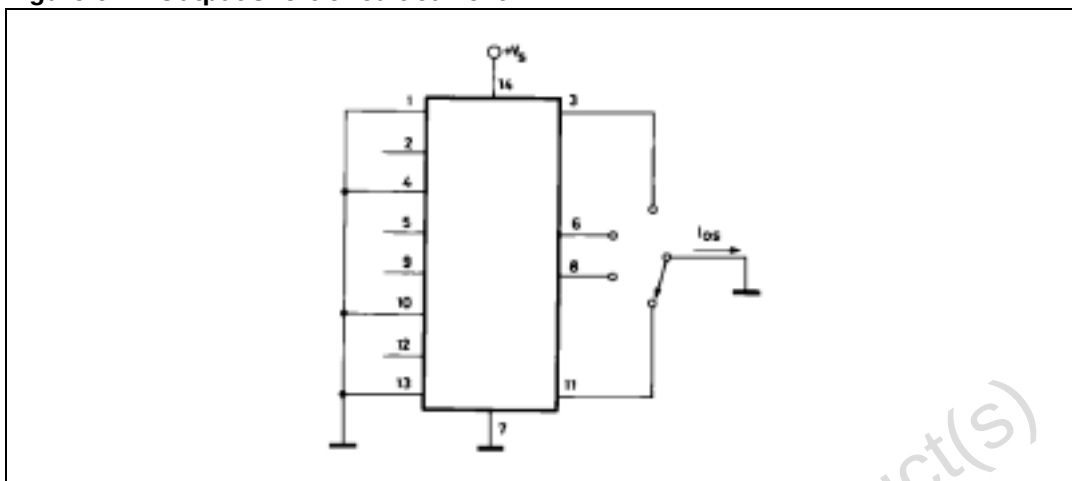


Figure 7. Output voltage and input threshold voltage

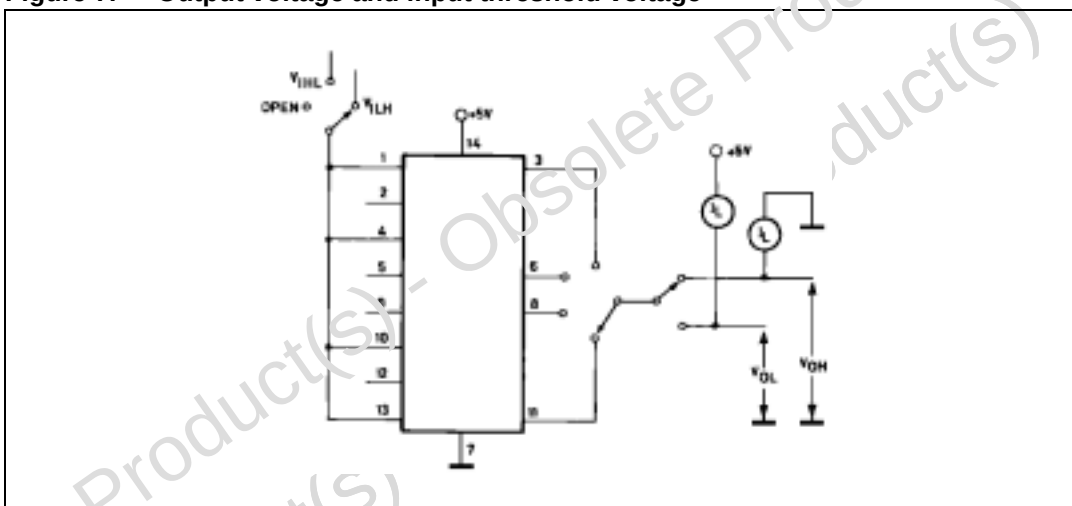
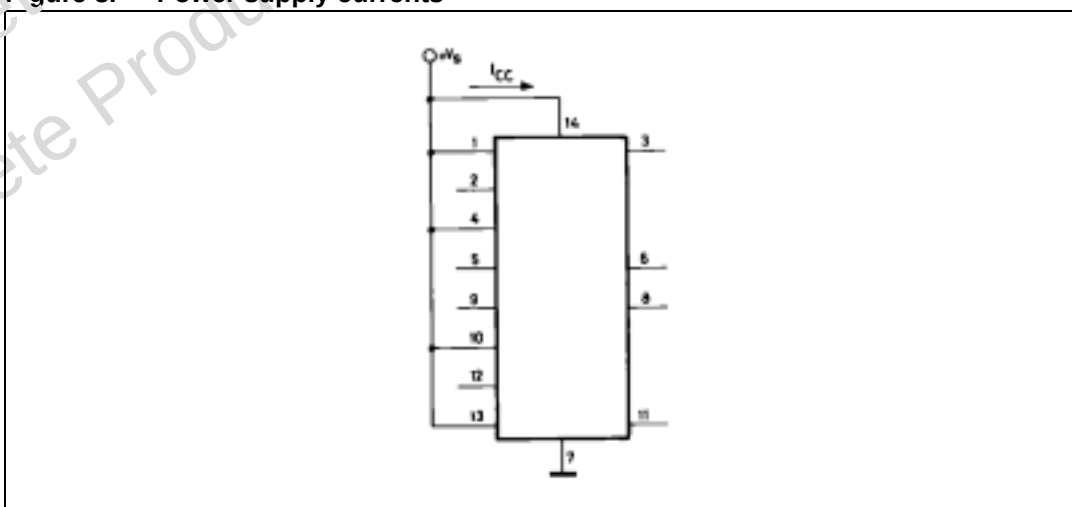
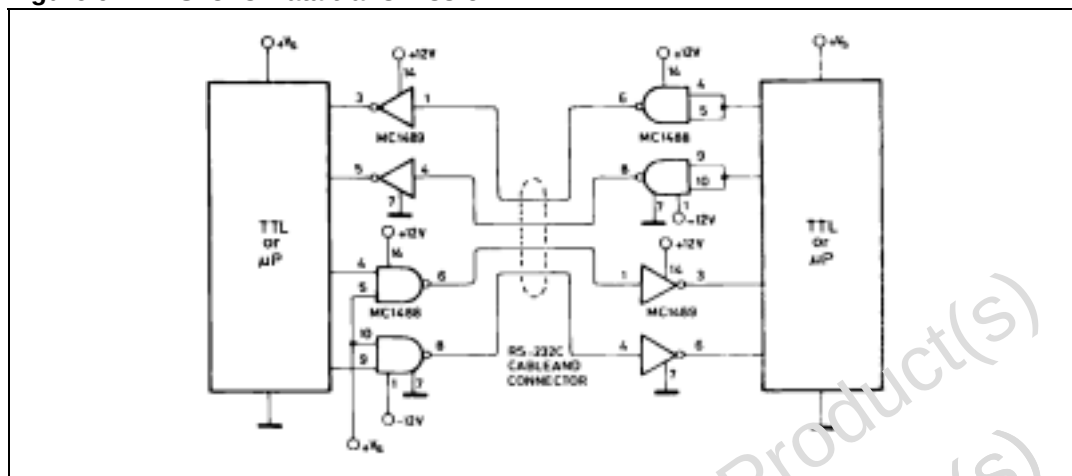


Figure 8. Power supply currents



6 Typical applications

Figure 9. RS232C Data transmission



7 Typical characteristics

($V_S = 5V$, $T_{amb} = 25^\circ C$)

Figure 10. Input current vs input voltage

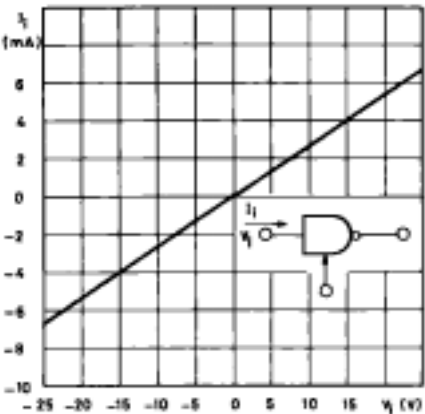


Figure 11. MC1489 Input threshold voltage adjustment

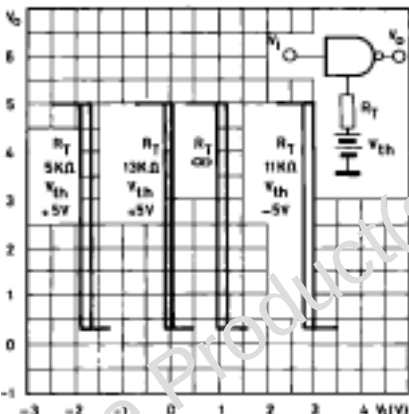


Figure 12. MC1489A Input threshold voltage adjustment

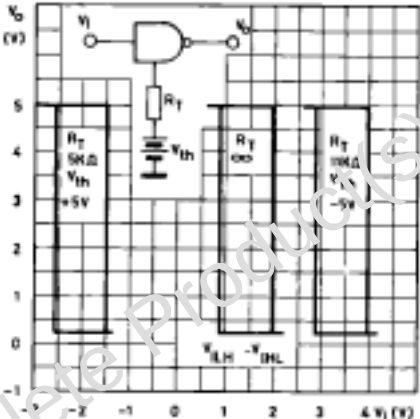


Figure 13. Input threshold vs temperature

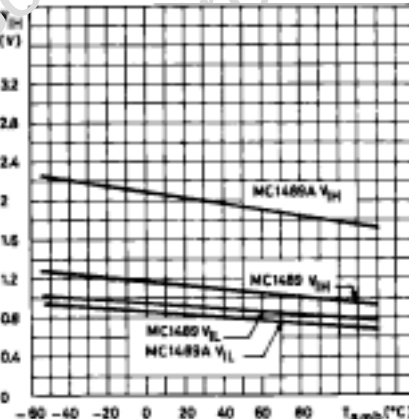
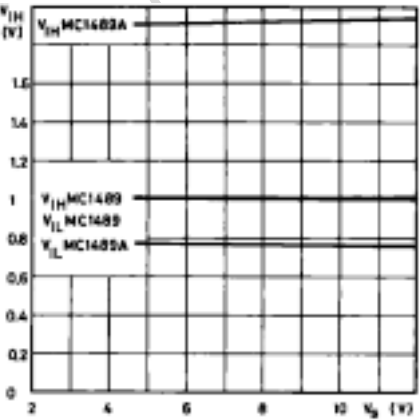


Figure 14. Input threshold vs power supply voltage



8 Application 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 3000Ω and 7000Ω 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 (300Ω or more to ground) shall be decoded as an "OFF" condition or Logic "1". For the 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.

8.1 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 1.0 V 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 4.](#), [Figure 6.](#) and [Figure 7.](#) illustrate the input threshold voltage shift possible through this technique.

This response node can also be used for the filtering of the high-frequency, high-energy noise pulses. [Figure 11.](#) and [Figure 12.](#) 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 many 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 13.](#)).

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 14.](#) where two receivers are slaved to the same line that must still meet the RS-232C impedance requirement.

)

Figure 15. Typical turn-on threshold vs capacitance from response control pin to GND

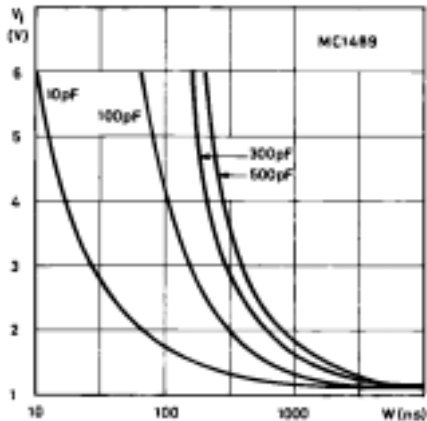


Figure 16. Typical turn-on threshold vs capacitance from response control pin to GND

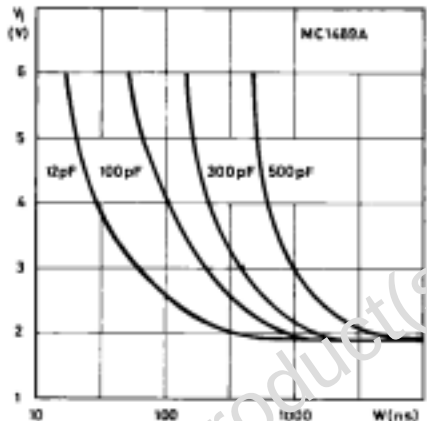
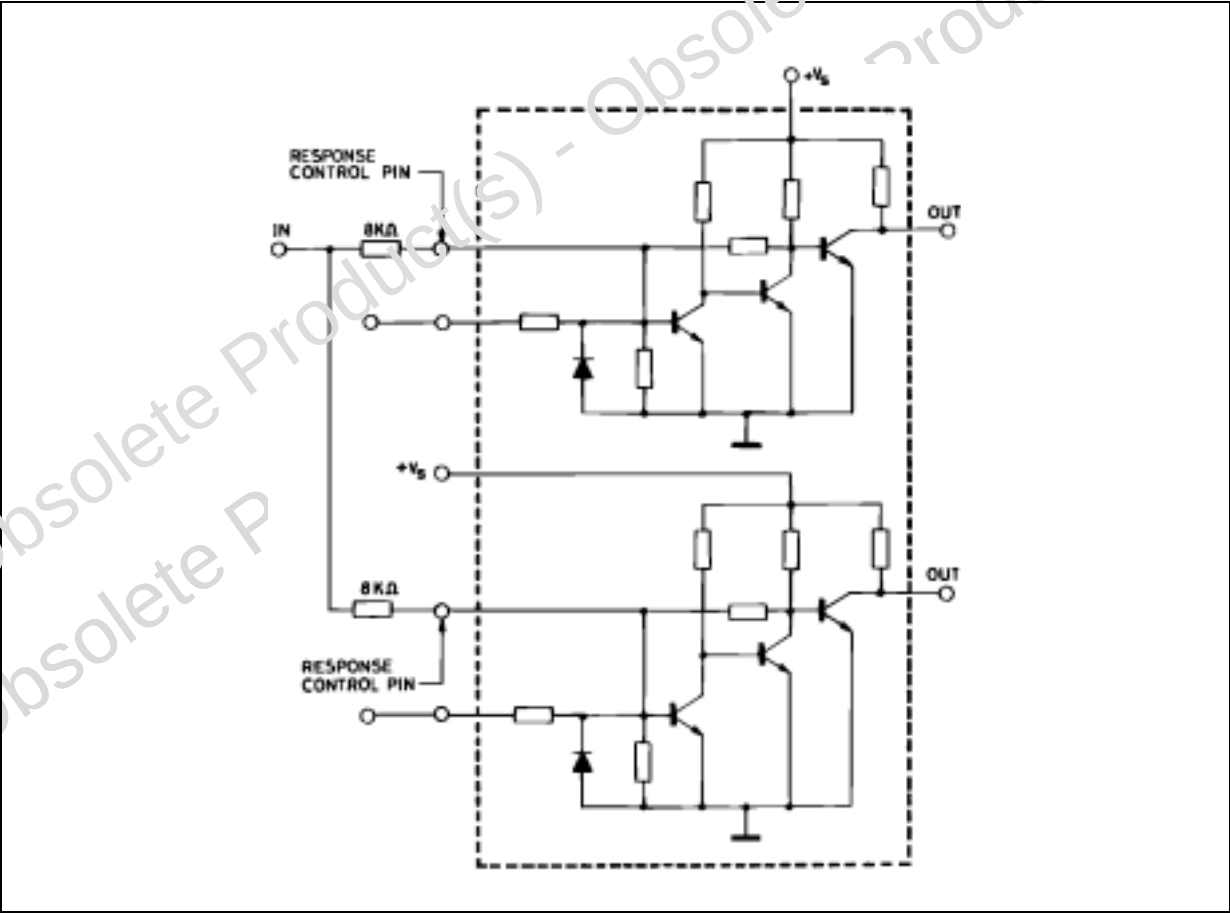
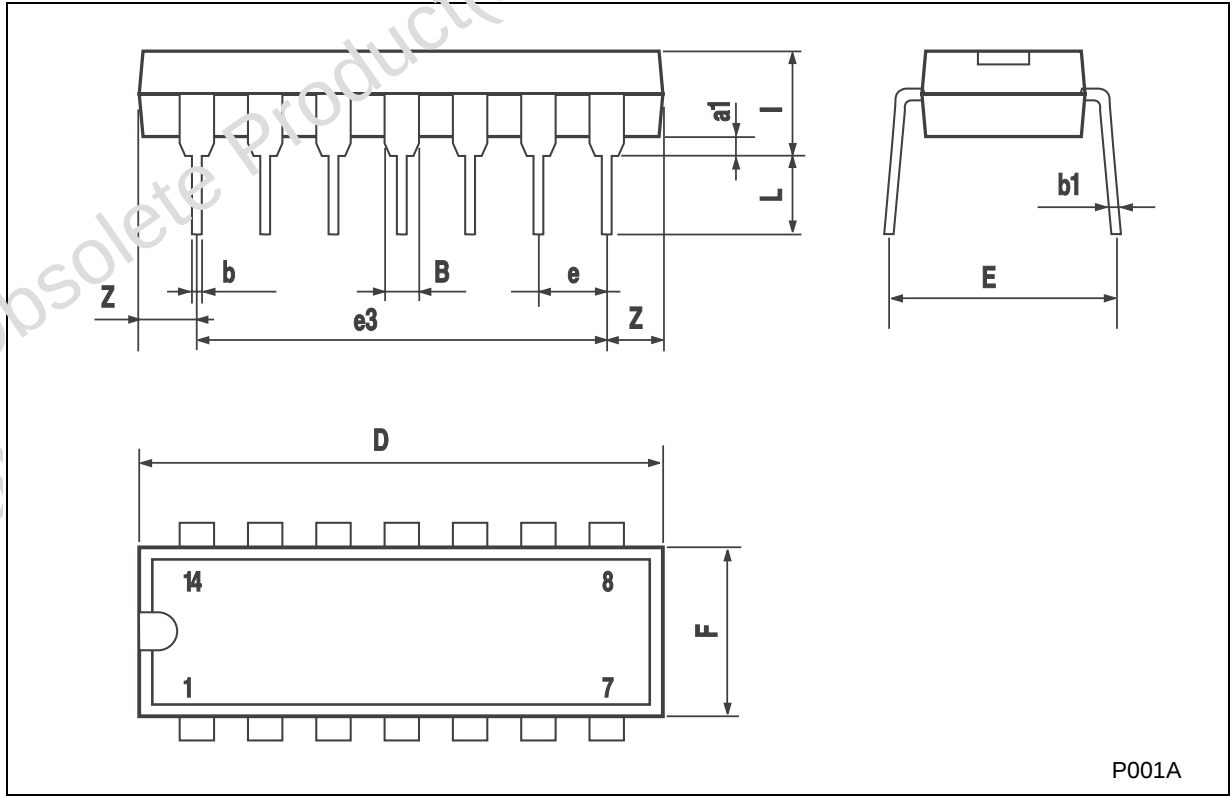


Figure 17. Typical paralleling of two MC1489/A Receivers to meet RS-232C



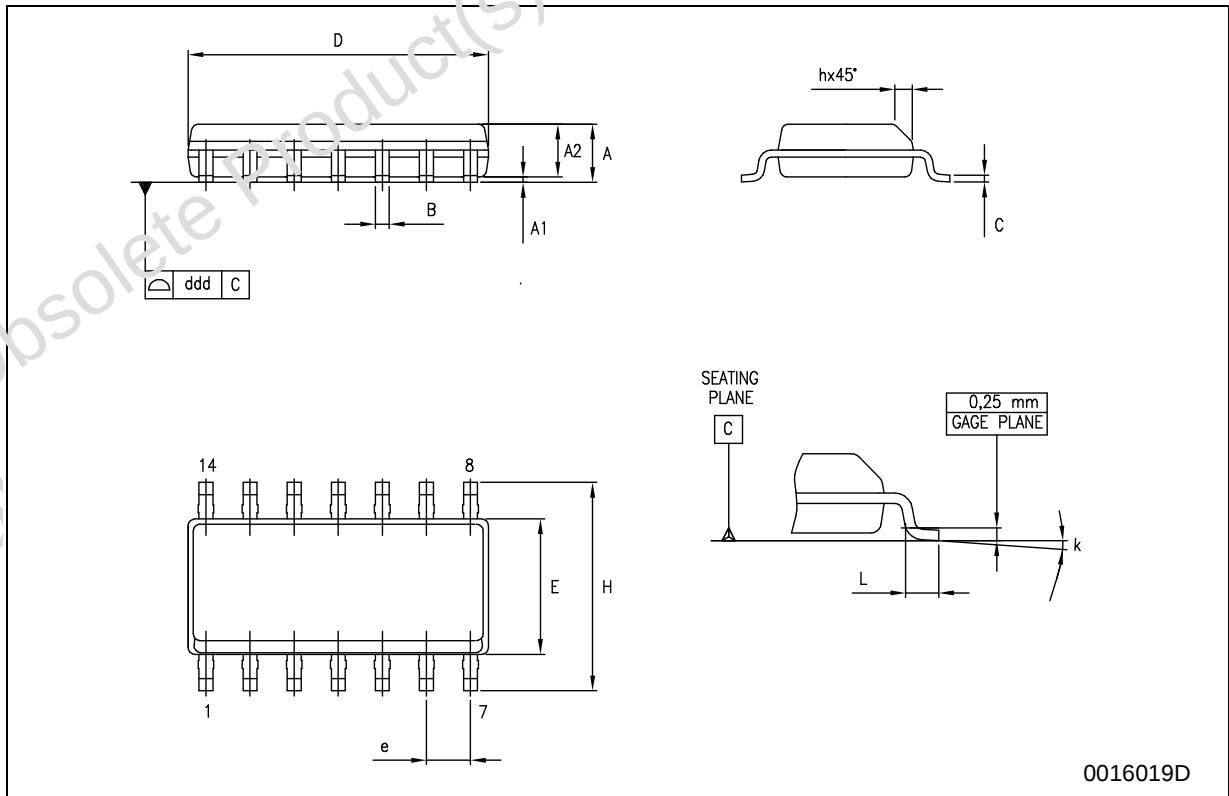
Plastic DIP-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



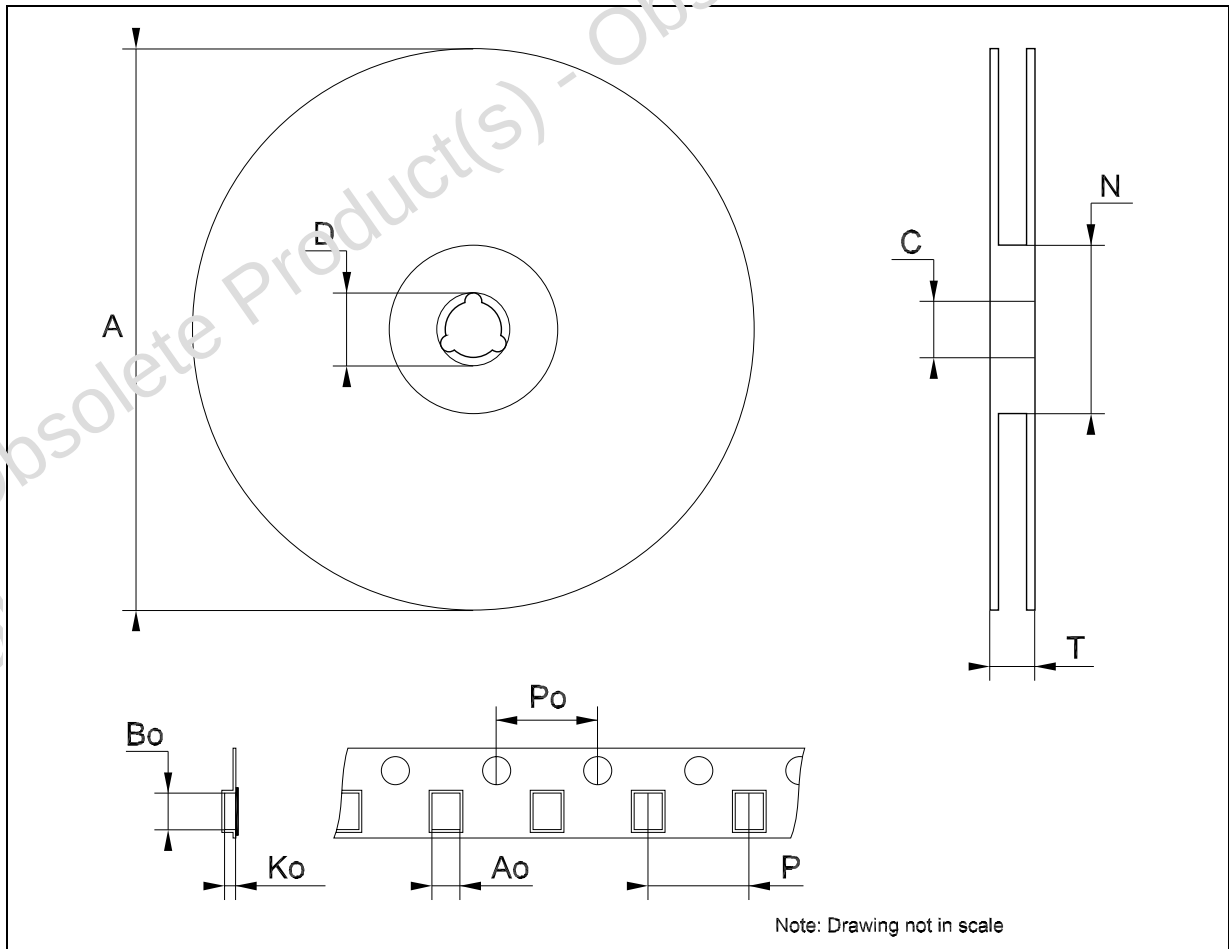
SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.1		0.25	0.004		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	8.55		8.75	0.337		0.344
E	3.8		4.0	0.150		0.157
e		1.27			0.050	
H	5.8		6.2	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.4		1.27	0.016		0.050
k	0°		0°	0°		8°
ddd			0.100			0.004



Tape & Reel SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.4		6.6	0.252		0.260
Bo	9		9.2	0.354		0.362
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



9 Revision history

Table 5. Revision history

Date	Revision	Changes
13-Apr-2006	4	Order codes has been updated and new template.

Obsolete Product(s) - Obsolete Product(s)
Obsolete Product(s) - Obsolete Product(s)

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED REPRESENTATIVE OF ST, ST PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS, WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2006 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com