

# Quadruple Line Drivers

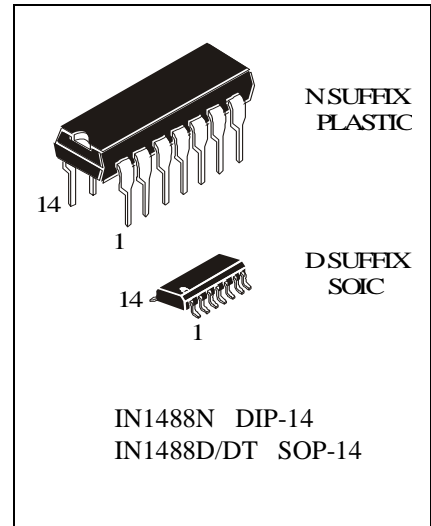
**IN1488**

The IN1488 is a monolithic quadruple line driver designed to interface data terminal equipment with data communication equipment in conformance with the specifications of EIA standard RS-232C.

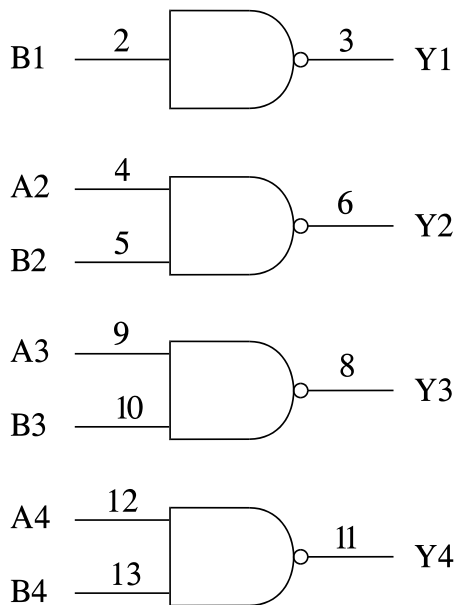
- Meets specifications of EIA RS-232C
- Current limited output  $\pm 10$  mA Typical
- Power-off output impedance  $300\Omega$  Min
- Simple slew rate control by load capacitor
- Flexible operating supply range
- Input are TTL and DTL circuits compatible

### ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping
IN1488N	$T_A = 0 \dots + 70 \text{ }^\circ\text{C}$	DIP-14	Tube
IN1488D		SOP-14	Tube
IN1488DT		SOP-14	Tape& Reel

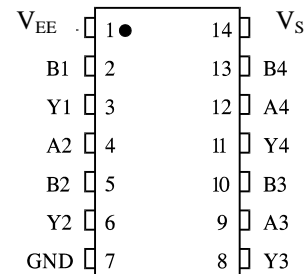


### LOGIC DIAGRAM



PIN 1 =  $V_{EE}$   
PIN 14 =  $V_S$   
PIN 7 = GND

### PIN ASSIGNMENT



### FUNCTION TABLE

Inputs		Output
A	B	Y
H	H	L
L	X	H
X	L	H

X - don't care

**MAXIMUM RATINGS\***

Symbol	Parameter	Value	Unit
$V_S$	Supply Voltage	15	V
$V_{EE}$	Supply Voltage	- 15	V
$V_I$	Input Voltage Range	- 15 to 7	V
$V_O$	Output Voltage Range	-15 to 15	V
$P_T$	Continuous Total Dissipation at (or below) 25°C	1	W
Tstg	Storage Temperature Range	-65 to 150	°C

\* Stresses beyond 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-rated conditions for extended periods may affect device reliability.

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
$V_S$	Supply Voltage		15	V
$V_{EE}$	Supply Voltage	-15		V
$V_{IL}$	Low Level Input Voltage	1.9		V
$V_{IH}$	High Level Input Voltage		0.8	V
$T_A$	Operating Temperature, All Package Types	-10	70	°C

DC ELECTRICAL CHARACTERISTICS (  $T_A = -10^{\circ}\text{C}$  to  $70^{\circ}\text{C}$  )

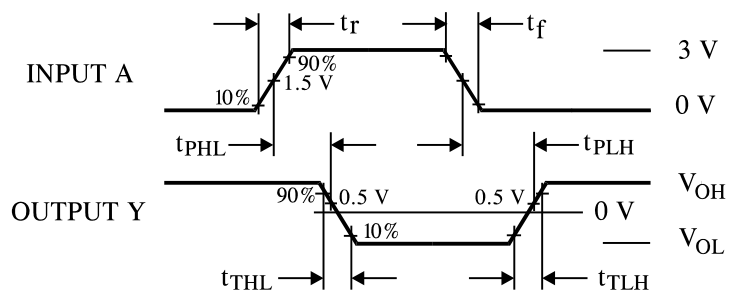
Symbol	Parameter	Test Conditions	Guaranteed Limits		Unit		
			Min	Max			
$V_{OH}$	High-Level Output Voltage	$V_{IL}=0.8\text{V}$ $R_L=3\text{k}\Omega$	$V_S=9\text{V}$ $V_{EE}=-9\text{V}$	6		V	
			$V_S=13.2\text{V}$ $V_{EE}=13.2\text{V}$	9			
$V_{OL}$	Low-Level Output Voltage	$V_{IH}=1.9\text{V}$ $R_L=3\text{k}\Omega$	$V_S=9\text{V}$ $V_{EE}=-9\text{V}$	-6		V	
			$V_S=13.2\text{V}$ $V_{EE}=-13.2\text{V}$	-9			
$I_{IH}$	High-Level Input Current	$V_I=5\text{V}$ $V_S=9\text{V}, V_{EE}=-9\text{V}$			10	$\mu\text{A}$	
$I_{IL}$	Low-Level Input Current	$V_I=0\text{V}$ $V_S=9\text{V}, V_{EE}=-9\text{V}$			-1.6	mA	
$I_{OS}^*$	Short-Circuit Output Current at High Level	$V_I=0.8\text{V}$ $V_O=0\text{V}$ $V_S=9\text{V}, V_{EE}=-9\text{V}$			-6	-12	mA
$I_{OS}^*$	Short-Circuit Output Current at Low Level	$V_I=1.9\text{V}$ $V_O=0\text{V}$ $V_S=9\text{V}, V_{EE}=-9\text{V}$			6	12	mA
$r_o$	Output Resistance, power off	$V_S=0\text{V}, V_{EE}=0\text{V}$ $V_O=-3\text{V}$ or $3\text{V}$			300		$\Omega$
$I_{OC+}$	Supply Current from $V_S$	$V_S=9\text{V},$	All inputs at 1.9V		20	mA	
			All inputs at 0.8V		6		
		$V_S=12\text{V}$	All inputs at 1.9V		25		
			All inputs at 0.8V		7		
		$V_S=15\text{V}$ $T_A=25^{\circ}\text{C}$	All inputs at 1.9V		34		
			All inputs at 0.8V		12		
$I_{OC-}$	Supply Current from $V_{EE}$	$V_{EE}=-9\text{V},$	All inputs at 1.9V		-17	mA	
			All inputs at 0.8V		-0.015		
		$V_{EE}=-12\text{V}$	All inputs at 1.9V		-23		
			All inputs at 0.8V		-0.015		
		$V_{EE}=-15\text{V}$ $T_A=25^{\circ}\text{C}$	All inputs at 1.9V		-34		
			All inputs at 0.8V		-2.5		

\* Not more than one output should be shorted at a time

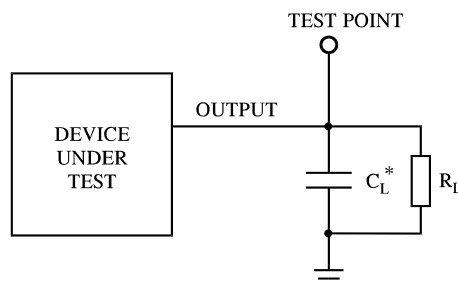
**AC ELECTRICAL CHARACTERISTICS**( $V_S=9V, V_{EE}=-9V, T_A=25^\circ C, t_r=t_f=5ns$ )

Symbol	Parameter	Test Condition	Guaranteed Limits		Unit
			Min	Max	
$t_{PLH}$	Propagation Delay Time, Low-to-High-Level Output	$R_L=3k\Omega, C_L=15pF$ See Figure 1		350	ns
$t_{PHL}$	Propagation Delay Time, High-to-Low-Level Output			175	ns
$t_{TLH}$	Transition Time, Low-to-High-Level Output *			100	ns
$t_{THL}$	Transition Time, High-to-Low-Level Output *			75	ns

\* Measured between 10% and 90% points of output waveform.



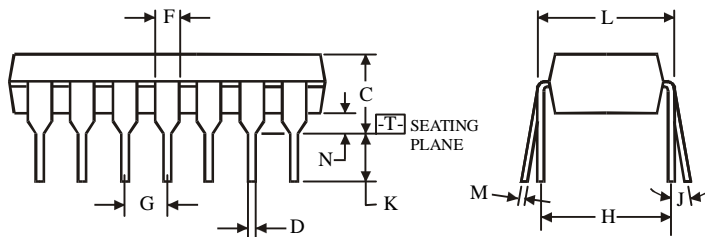
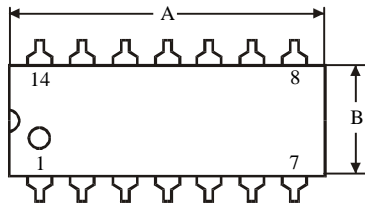
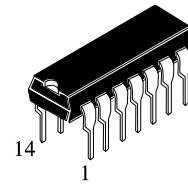
**Figure 1. Switching Waveforms**



\* Includes all probe and jig capacitance

**Figure 2. Test Circuit**

**N SUFFIX PLASTIC DIP  
(MS - 001AA)**



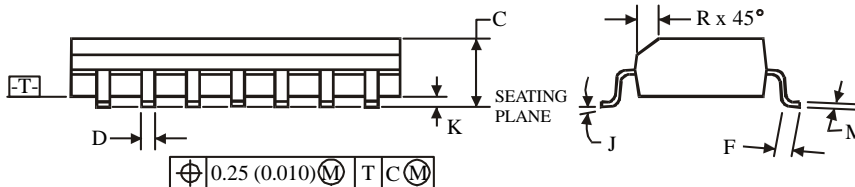
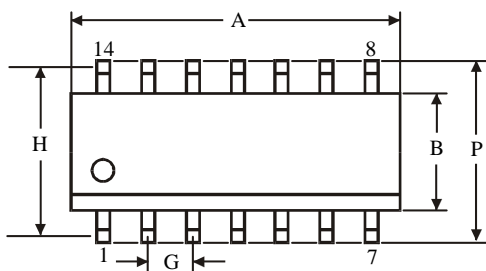
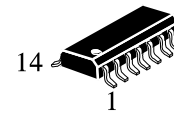
$\oplus 0.25 (0.010) \text{ (M) T}$

**NOTES:**

- Dimensions "A", "B" do not include mold flash or protrusions.  
Maximum mold flash or protrusions 0.25 mm (0.010) per side.

Symbol	Dimension, mm	
	MIN	MAX
A	18.67	19.69
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

**D SUFFIX SOIC  
(MS - 012AB)**



$\oplus 0.25 (0.010) \text{ (M) T C (M)}$

**NOTES:**

- Dimensions A and B do not include mold flash or protrusion.
- Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B - 0.25 mm (0.010) per side.

Symbol	Dimension, mm	
	MIN	MAX
A	8.55	8.75
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.27	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5