



## NATIONAL HYBRID, INC.

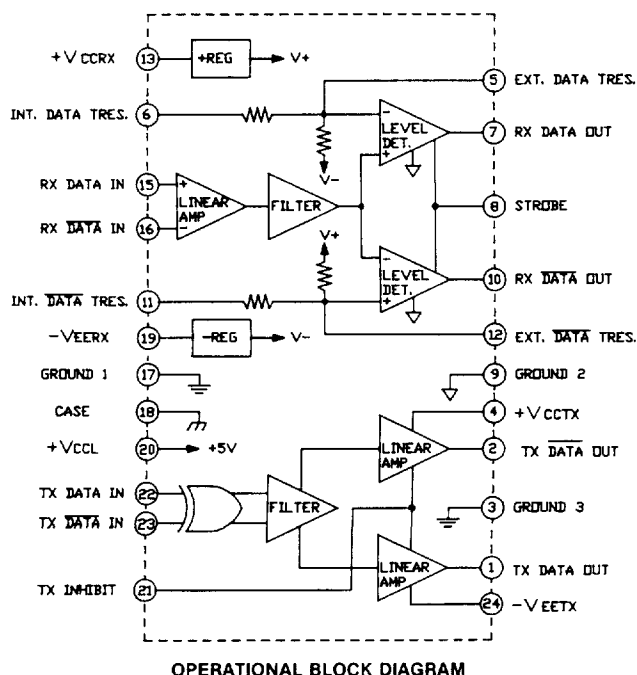
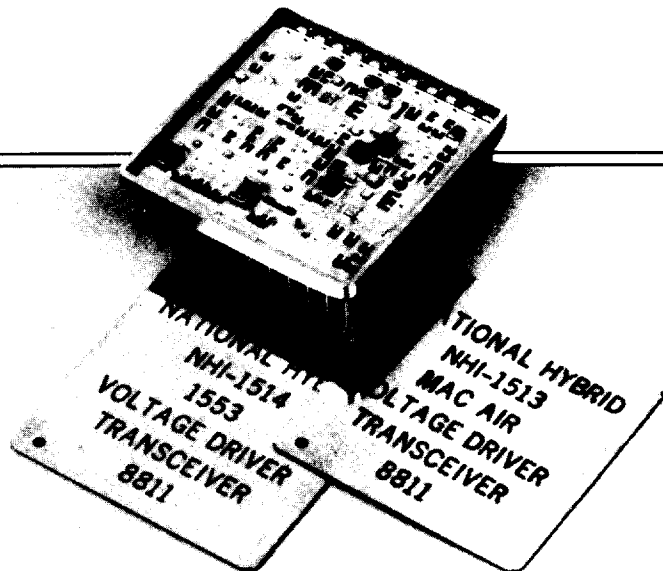
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Mil-Std-1772  
Certified & Qualified

# Mil-Std-1553/MacAir Products NHI-1513 Series Voltage Driver Single Transceivers

### FEATURES:

- 1.5 Watt Total Hybrid Dissipation at 25% Transmitting Duty Cycle.
- Meets MIL-STD-1553A/B and MACAIR.
- TTL Compatible.
- Screened to MIL-STD-883.
- Thick Film Hybrid Technology.
- Integrated Receiver and Driver.
- Plug-in or Flat Pack Configuration.
- Receiver Filtering Enhances S/N Ratio.
- Improved Receiver and Transmitter Filtering.



OPERATIONAL BLOCK DIAGRAM

NOTE: 1. Pin 14 is used on NHI-1515 to control the transmitter output amplitude.  
2. All grounds must be externally connected together.

### GENERAL DESCRIPTION:

These National Hybrid Data Bus Transceivers contain differential voltage source drivers and differential receivers. They are intended for applications using a MIL-STD-1553A/B data bus or a MACAIR data configured data bus. The NHI-1513 transceiver is specifically designed to comply with the requirements of the following MACAIR specifications: A-3818, A-5232, A-5690, and A-4905. The transmitter section of this unit contains a specially designed filter which suppresses the higher order components of the transmission in accordance with the MACAIR specifications and producing sinusoidal output waveform. This filter also complies with the group delay requirements of the MACAIR document.

The NHI-1514 transceiver produces a trapezoidal waveform during transmission.

The NHI-1515 transceiver is identical to the NHI-1513 unit but it incorporates a voltage control pin which allows the transmitter output level to be adjusted from 0 volts to maximum level as the control voltage is varied from 0 to +10 volts.

The NHI-1516 and NHI-1517 are separate receivers and transmitters respectively. The Transmitter produces a trapezoidal output wave form for MIL-STD 1553A/B applications.

### TRANSMITTER

The transmitter section of these devices is driven by complementary TTL signals into the TX DATA and TX DATA\* inputs. This produces a nominal 30 volt peak to peak signal across a 140 ohm load. The transmitter is coupled to the bus via a 1:1 transformer whose secondary is connected to two 52 ohm isolation resistors which feed the terminated 70 ohm bus. This will produce a nominal voltage on the bus of 7.5 volts peak to peak.

The transmitter is automatically inhibited and placed in the high impedance state when both TX DATA and TX DATA\* inputs are either at a logic "1" or a logic "0" simultaneously. A logic "1" applied to the TX INHIBIT input is used as a manual override and will disable the transmitter and place it in the high impedance state.

### RECEIVER

The receiver is transformer coupled to the bus by a 1:1 transformer. Its differential input stage drives a filter and threshold comparator. TTL data is outputted at the RX DATA and RX DATA\* outputs. The positive and negative thresholds may be controlled by internally set resistors. This is accomplished by grounding pins 6 and 11. The thresholds may also be set externally by putting resistors from pins 5 and 12 to ground.

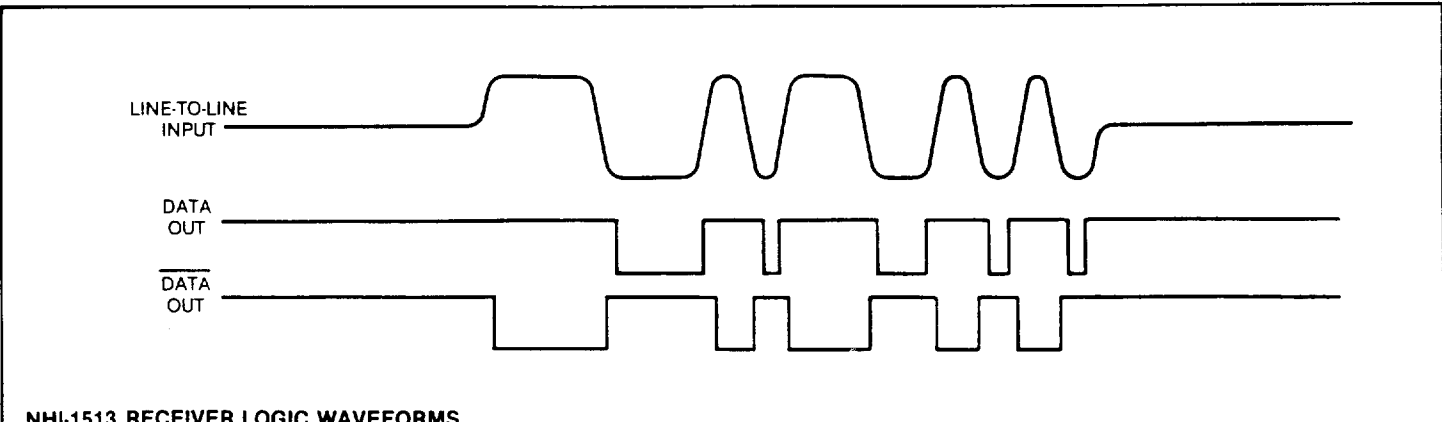
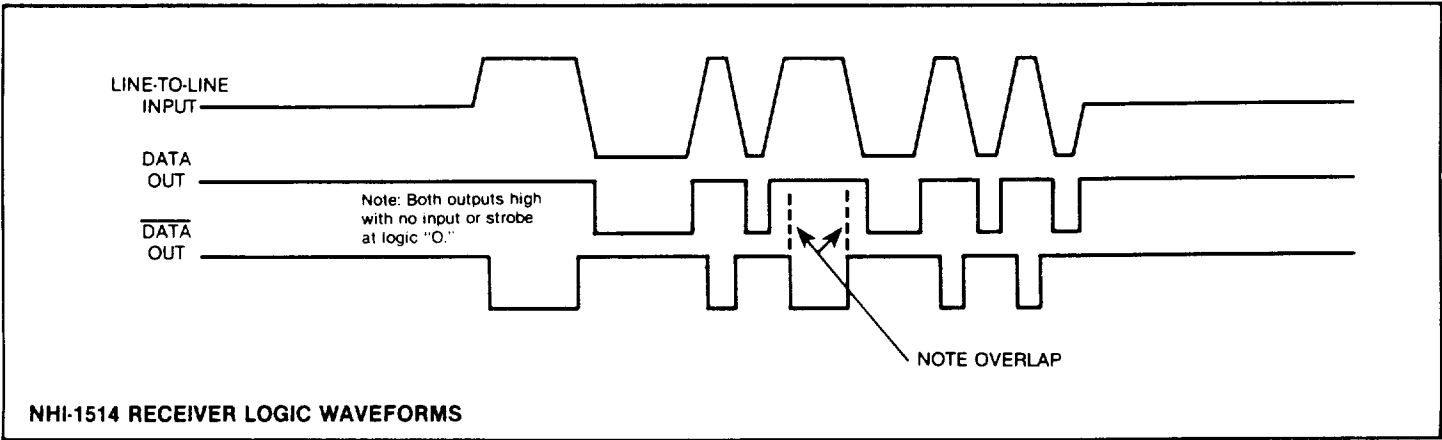
The receiver outputs can be inhibited and pulled high by putting a logic "0" on the strobe input.

Pinouts for NHI-1513/14/15

ELECTRICAL PARAMETERS, RECEIVER

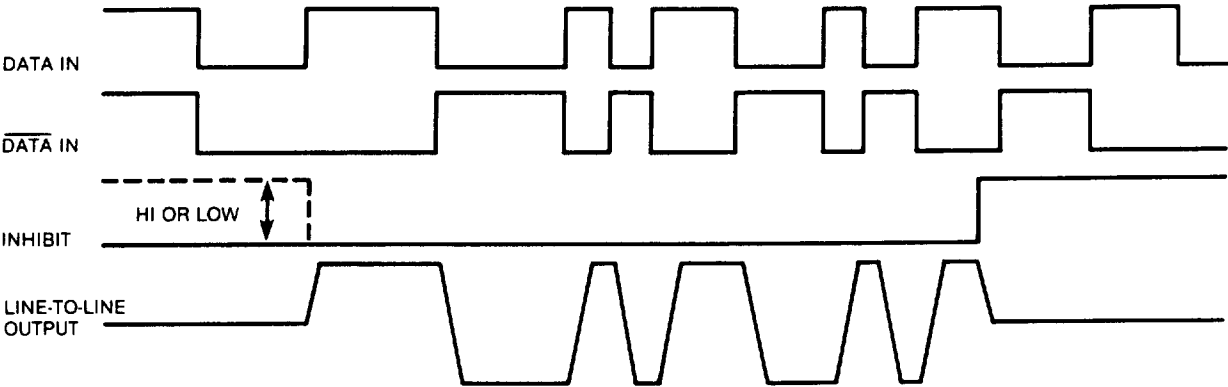
| PARAMETER  |          | SYMBOL                            | MIN              | TYP  | MAX     | UNITS      |
|--|----------|-----------------------------------|------------------|------|---------|------------|
| Power Supply Voltages  |          | VCCR <sub>X</sub>                 | + 11.75          |      | + 15.75 | V          |
|  |          | VEER <sub>X</sub>                 | - 11.75          |      | - 15.75 | V          |
|  |          | VCCL                              | + 4.5            |      | + 5.5   | V          |
| Differential Input Impedance   | f = 1MHz | Z <sub>IN</sub>                   | 6K               |      |         | ohms       |
| Differential Voltage Range   |          | V <sub>IDR</sub>                  | ± 20             |      |         | V peak     |
| Input Common Mode Voltage Range  |          | V <sub>IDR</sub>                  | ± 10             |      |         | V peak     |
| Common Mode Rejection Ratio  |          | CMRR                              | 40               |      |         | dB         |
| Strobe Characteristics (Logic "0" inhibits Output)   |          |                                   |                  |      |         |            |
| "0" Input Current (V strobe = 0.5V)  |          | I <sub>IL</sub>                   |                  |      | - 4     | mA         |
| "1" Input Current (V strobe = 2.7V)  |          | I <sub>IH</sub>                   |                  |      | 400     | μA         |
| "0" Input Voltage  |          | V <sub>IL</sub>                   |                  |      | 0.7     | V          |
| "1" Input Voltage  |          | V <sub>IH</sub>                   | 2.0              |      |         | V          |
| Strobe Delay (turn-on or turn-off)   |          | t <sub>SD</sub>                   |                  | 6    |         | nS         |
| Threshold Characteristics (Sinewave input, 100KHz to 1MHz)   |          |                                   |                  |      |         |            |
| Note: Threshold voltages are referred to the Input.  |          |                                   |                  |      |         |            |
| Internal (Pin 6 and 11 grounded)   |          | V <sub>TH1</sub>                  | .75              |      | .95     | V p-p      |
| External (Pin 6 and 11 open; threshold setting resistors from Pin 5 to ground and from Pin 12 to ground; R <sub>TH</sub> Max = 10K ohms) |          | R <sub>TH</sub> /V <sub>TH1</sub> |                  | 4000 |         | ohms/V p-p |
| Filter Characteristics (Pin 6 and 11 Grounded)   |          |                                   |                  |      |         |            |
| (Sinewave input)   |          | f = 2MHz                          | V <sub>TH2</sub> | 0.8  | 1.5     | V p-p      |
|  |          | f = 4MHz                          | V <sub>TH4</sub> | 4.2  | 8.5     | V p-p      |
| Output Characteristics. RX Data and $\overline{\text{Data}}$   |          |                                   |                  |      |         |            |
| "1" State (I <sub>SOURCE</sub> = -1 ma.)   |          | V <sub>OH</sub>                   | 2.5              | 3.3  |         | V          |
| "0" State (I <sub>SINK</sub> = 10 ma)  |          | V <sub>OL</sub>                   |                  |      | 0.5     | V          |
| Note: With Receiver input below threshold, both RX Data and $\overline{\text{RX Data}}$ outputs remain in "1" state.                     |          |                                   |                  |      |         |            |
| Delay (average) from differential input zero crossings to RX Data and $\overline{\text{RX Data}}$ output 50% points.                     |          | t <sub>DRX</sub>                  |                  | 290  |         | nS         |

Note 1: Assumes unit in free air (natural convection cooling).



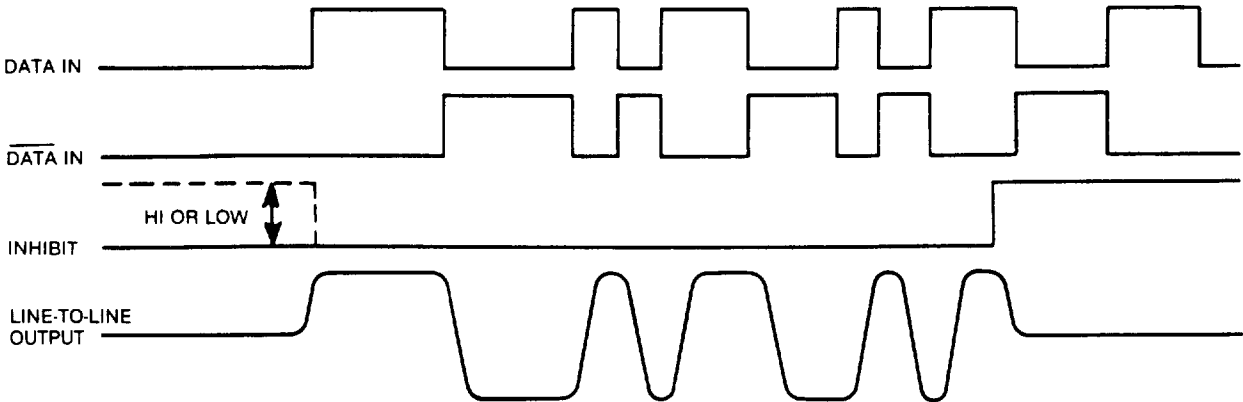
ELECTRICAL PARAMETERS, TRANSMITTER

| PARAMETER/CONDITION   | SYMBOL   | MIN                         | TYP                   | MAX                           | UNITS  |
|---|--|-----------------------------|-----------------------|-------------------------------|--|
| Power Supply Voltage Ranges   | $V_{CCTX}$<br>$V_{EETX}$<br>$V_{CCL}$                            | + 11.75<br>− 11.75<br>+ 4.5 |                       | + 15.75<br>− 15.75<br>+ 5.5   | V<br>V<br>V                                      |
| Input Characteristics, TX Data in or TX $\overline{\text{Data}}$ in "0"<br>Input Current ( $V_{IN} = 0.4V$ )<br>"1" Input Current ( $V_{IN} = 2.7V$ )<br>"0" Input Voltage<br>"1" Input Voltage   | $I_{ILD}$<br>$I_{IHD}$<br>$V_{ILD}$<br>$V_{IHD}$                 |                             |                       | − 1.1<br>100<br>0.7<br>2.0    | mA<br>$\mu A$<br>V<br>V                          |
| Inhibit Characteristic<br>"0" Input Current ( $V_{IN} = 0.4V$ )<br>"1" Input Current ( $V_{IN} = 2.7V$ )<br>"0" Input Voltage<br>"1" Input Voltage  | $I_{ILI}$<br>$I_{IHI}$<br>$V_{ILI}$<br>$V_{IHI}$                 |                             |                       | − 0.8<br>50<br>0.7            | mA<br>$\mu A$<br>V<br>V                          |
| Delay from TX Inhibit (0 → 1) to inhibited output impedance<br>Delay from TX inhibit (1 → 0) to active output impedance<br>Differential output impedance (inhibited) at MHz   | $t_{DXOFF}$<br>$t_{DXON}$<br>$Z_{O1}$                            |                             | 350<br>150<br>10K     |                               | nS<br>nS<br>ohms                                 |
| Output Characteristics<br>Differential output level (140 ohm load)<br>Differential Active output impedance at 1 MHz<br>Rise and Fall times (10% to 90% of p-p output) (NHI-1514)<br>Rise and Fall times (10% to 90%) (NHI-1513)<br>Output offset at point A in Fig. 1 (35 ohm load) 2.5 $\mu S$ after mid bit crossing of the parity bit of the last word of a 660 $\mu S$ message<br>Delay from 50% point of TX Data or TX $\overline{\text{Data}}$ input to zero crossing of differential output NHI-1514<br>NHI-1513 | $V_O$<br>$Z_{OA}$<br>$t_r$<br>$V_{OS}$<br>$t_{DTX}$<br>$t_{DTX}$ | 26<br>4<br>100<br>240       | 30<br>4<br>150<br>300 | 35<br><br>300<br><br>$\pm 75$ | V p-p<br>ohms<br>nS<br>nS<br>mV peak<br>nS<br>nS |
| Amplitude Control Characteristics<br>NHI-1515 only  | $V_{CNTRL}$  | 0                           |                       | + 10                          | V  |



Note: DATA and DATA inputs must be complementary waveforms, with a 50% duty cycle and no gate delays between them.

NHI-1514 TRANSMITTER LOGIC WAVEFORMS

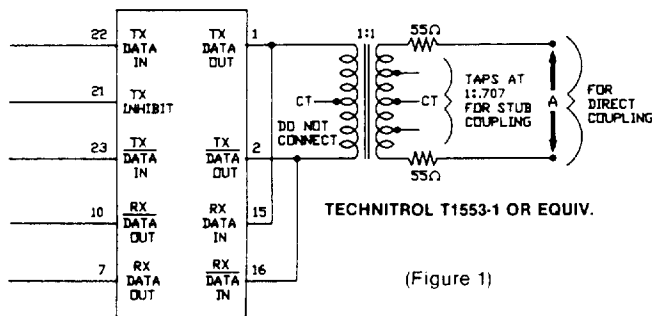


Note: DATA and DATA inputs must be complementary waveforms, with a 50% duty cycle and no gate delays between them.

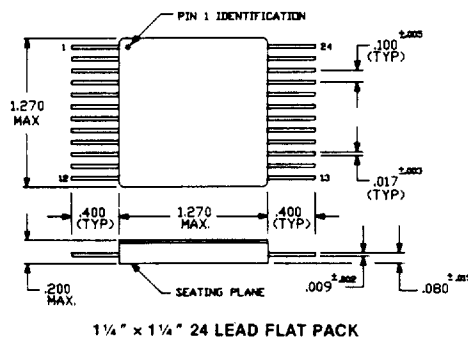
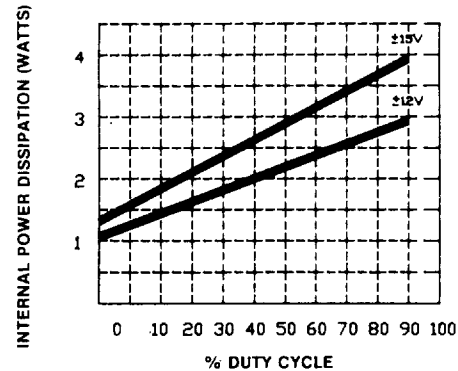
# Voltage Driver Single Transceivers

## POWER AND THERMAL DATA, TOTAL HYBRID (DRIVER AND RECEIVER)

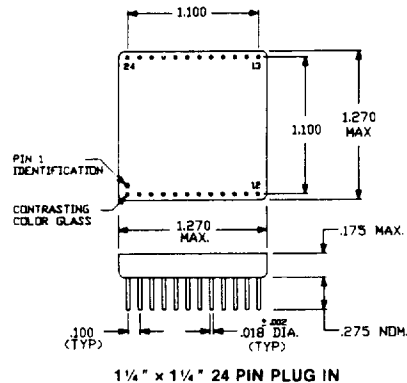
| PARAMETER/CONDITION  | SYMBOL   | MIN | TYP            | MAX            | UNITS |
|--|--|-----|----------------|----------------|-------|
| Total Supply Current "Standby" mode, or transmitting at less than 1% duty cycle (e.g. 20 $\mu$ S of transmission every 2mS or longer interval) | I <sub>CCS</sub><br>I <sub>EES</sub><br>I <sub>CCL</sub> |     | 40<br>30<br>12 | 45<br>35<br>15 | mA    |
| Total Supply Current transmitting at 1MHz into a 35 ohms load at point A in Figure 1 with 25% Duty Cycle..                                     | I <sub>CC25</sub><br>I <sub>EE25</sub>                   |     | 70<br>60       | 80<br>70       | mA    |
| (I <sub>CCL</sub> limits do not change with mode of operation or duty cycle) 100% Duty Cycle   | I <sub>CC100</sub><br>I <sub>EE100</sub>                 |     | 150<br>145     | 165<br>160     | mA    |
| Thermal Resistance, junction-to-case, of most critical device  | $\theta_{JC}$  |     |                | 28             | °C/W  |
| Allowable transmitting duty cycle when case is held to + 125 °C maximum  |  |     |                | 100            | %     |
|  |  |     |                | 100            | %     |



TYPICAL APPLICATION



1 1/4" x 1 1/4" 24 LEAD FLAT PACK



1 1/4" x 1 1/4" 24 PIN PLUG IN

| MODEL | DESCRIPTION   |
|-------|---|
| 1513  | MACAIR TRANSCEIVER (SINUSOIDAL OUTPUT)  |
| 1514  | MIL-STD-1553 A/B TRANSCEIVER (TRAPEZOIDAL OUTPUT)                                 |
| 1515  | MACAIR TRANSCEIVER VARIABLE OUTPUT LEVEL CONTROLLED BY A DC VOLTAGE OF 0-10 VOLTS |
| 1516  | RECEIVER ONLY   |
| 1517  | TRANSMITTER ONLY (TRAPEZOIDAL OUTPUT)   |



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