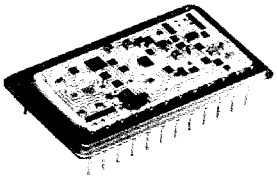
DDC
ILC DATA DEVICE CORPORATION

BUS-8553



MIL-STD-1553 TRANSCEIVER

DESCRIPTION

The BUS-8553 Transceiver is a complete transmitter and receiver conforming fully to MIL-STD-1553A and 1553B. Features of this high reliability transceiver include: Harris 15530 type Encoder/Decoder direct interface capability, ±15V or +15V and −12V power supply voltage requirements, and an internal (factory pre-set) threshold level.

Figure 1 illustrates a block diagram of the BUS-8553 Transceiver. The receiver section accepts phase-modulated bipolar data from a MIL-STD-1553 Data Bus and produces TTL signal data at its outputs: RX Data Out and RX $\overline{\text{Data}}$ Out. These outputs represent positive and negative excursions of the input Bus signals beyond a preset threshold level. The receiver can be taken off-line (outputs disabled) by the application of a logic "0" to the STROBE input.

The transmitter section accepts bipolar TTL signal data at its TX Data and TX $\overline{\text{Data}}$ input lines and produces a 28Vpp differential signal across a 140 Ohm load that's coupled to the TX Data and TX $\overline{\text{Data}}$ outputs via transformer. An external input, INHIBIT, takes priority over the transmitter inputs and disables the transmitter when activated with a logic "1".

The BUS-8553 Transceiver is packaged in a 24 pin DDIP, measuring 1.4 x 0.8 x 0.2 inches. Its small size, low power dissipation, and direct interface compatibility with Harris 15530 type Encoder/Decoder make it an excellent choice for any MIL-STD-1553A or 1553B Transceiver application.

FEATURES

- *MEETS ALL MIL-STD-1553A AND 1553B REQUIREMENTS*
- *VERY LOW POWER DISSIPATION*
- *IMPROVED FILTERING ON RECEIVER TO ENHANCE BIT ERROR RATE OF SYSTEM*
- *±15V OR +15V AND −12V POWER SUPPLY VOLTAGES*
- *SCREENED TO MIL-STD-883*
- *HARRIS 15530 ENCODER/DECODER DIRECT INTERFACE COMPATIBILITY*

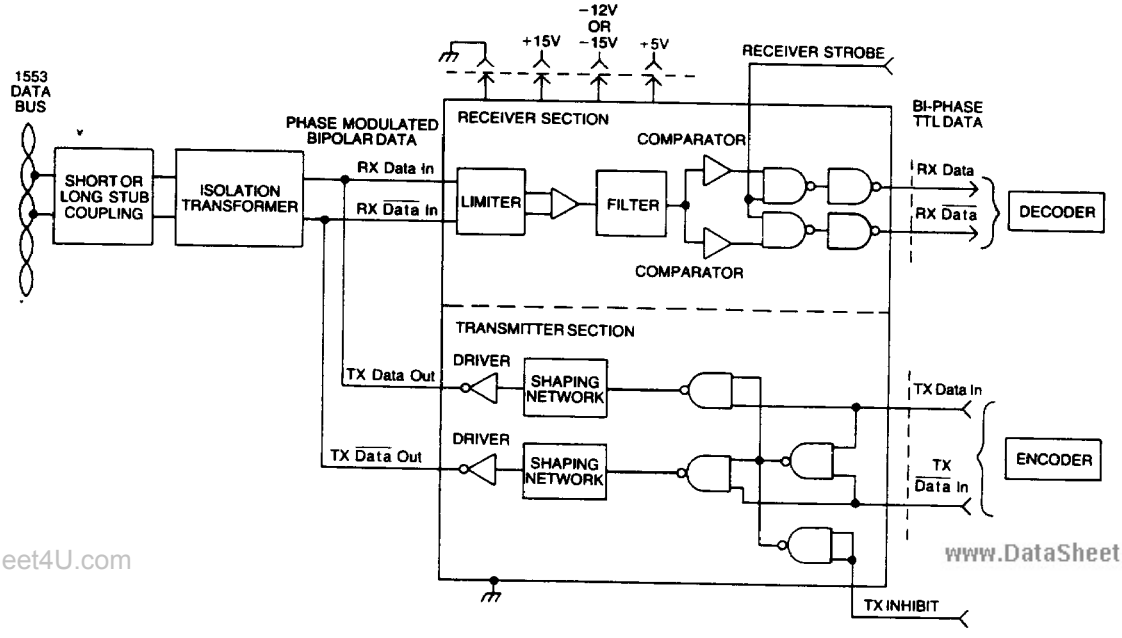


FIGURE 1. BUS-8553 BLOCK DIAGRAM

TABLE 1. BUS-8553 SPECIFICATIONS			
PARAMETER	**VALUE**		
RECEIVER			
Input Level	40Vpp, differential, max		
Internal Threshold(1)	0.56Vpp min, 1Vpp max		
CMRR	40 db, min		
Input Resistance, differential	7K Ohm, min		
Input Capacitance, differential	5pf, max		
DRIVER			
Output Level	28Vpp, nominal, across 140 Ohm load		
Rise/Fall Time	130ns, typical		
Output Noise	10mVpp, differential, max		
Output Offset	±90mVpp, max differential across 35Ω load		
Output Impedance (Non-Transmitting)			
Output Resistance, differential	10K Ohm, min		
Output Capacitance, differential	5pf, max		
LOGIC; TTL/CMOS Compatible			
Receiver Strobe Input	2 LSTTL loads, max		
All Logic Outputs (Receiver)	10 LSTTL loads, min		
Transmitter Inhibit Input	1 TTL load, max		
Transmitter TX Data and TX Data Inputs	2 TTL loads, max		
POWER SUPPLY REQMTS	**+5V±10%**	**+15V±5%**	**−15V±5%**
Non-Transmitting (typ/max)	40/50mA	30/40mA	25/30mA
Transmitting, 50% duty cycle (typ/max)	40/50mA	110/130mA	25/30mA
Transmitting, 100% duty cycle (typ/max)	40/50mA	200/220mA	25/30mA
THERMAL			
Operating Junction Temp.(2)	−55°C to 160°C		
Operating Case Temperature(2)	−55°C to 125°C		
Storage Temperature	−65°C to 150°C		
Thermal Resistance			
Junction to Case (Hottest Die)	110°C/W		
Case to Air	30°C/W		
POWER DISSIPATION	**Total Hybrid**		
Non-Transmitting (typ/max)	1.0/1.3W		
Transmitting, 50% duty cycle (typ/max)	1.7/2.0W		
Transmitting, 100% duty cycle (typ/max)	2.3/2.8W		
POWER DISSIPATION	**Hottest Die**		
Transmitting, 50% duty cycle (typ/max)	0.14/0.16W		
Transmitting, 100% duty cycle (typ/max)	0.28/0.31W		
MECHANICAL			
Size, 24 Pin DDIP, inches (mm)	1.4 x 0.8 x 0.2 (35.6 x 20.3 x 5.1)		
Weight	0.4 oz typ		

Notes:
(1) The Threshold Level, as referred to in this specification, is meant to be the maximum peak to peak voltage (measured on the Data Bus) that can be applied to the receiver without causing the output to change from the OFF state.
(2) For any transmitting duty cycle (derating not required).

GENERAL

Figure 1 illustrates a BUS-8553 Transceiver with connections to a MIL-STD-1553 data bus. Once transformer isolated, coupling to a MIL-STD-1553 Data Bus can be either short stub (direct) or long stub (transformer.) Figure 2 illustrates direct and transformer coupling between the transceiver and the data bus.

TRANSMIT OPERATING MODE

The transmitter section accepts encoded TTL data and converts this data to phase-modulated bipolar form by means of a wave-shaping network and driver circuitry. These driver outputs are coupled to a MIL-STD-1553 Data Bus by means of a transformer. These output terminals can be put into a high impedance state when transmitting by enabling the INHIBIT, or by placing both inputs at the same logic level. Table 2 is the truth table for the transmitter operating mode.

The transceiver's transmitter is able to operate in a "wraparound" mode; this allows output data to be monitored by the receiver section and returned to the decoder where it can be checked for errors.

TABLE 2. TRANSMITTER OPERATING MODE			
TX Data In	**TX $\overline{\text{Data}}$ In**	**TX INHIBIT**	**DRIVER OUTPUT(1)**
X(2)	X	H	OFF
0	0	X	OFF
0	1	L	ON(3)
1	0	L	ON
1	1	X	OFF(4)(5)

Notes:
(1) Driver Out = TX Data Out and TX$\overline{\text{Data}}$ Out.
(2) X = don't care.
(3) ON = low impedance.
(4) OFF = high impedance.
(5) The driver output terminals are in the high impedance mode during OFF time, independent of INHIBIT status.

RECEIVER OPERATING MODE

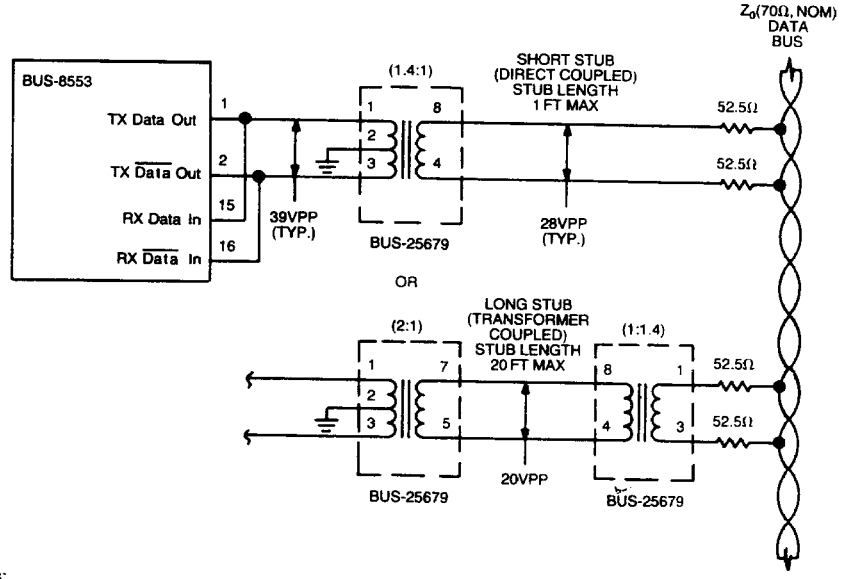
The receiver section accepts data from a MIL-STD-1553 Data Bus when properly coupled through a transformer in any of the two possible configurations (long or short stub), and converts it to bi-phase TTL and makes it available for decoding at the RX Data and RX $\overline{\text{Data}}$ output terminals. Applying a logic "0" to the STROBE input disables the receiver outputs, causing them both to go to a logic "0" state. When not being used, a 2K pull-up resistor should be connected between the STROBE input terminal (pin 8) and the +5V supply (pin 20).

BUS-8553 WAVEFORMS

Figure 3 illustrates the waveforms for the BUS-8553 Transceiver.

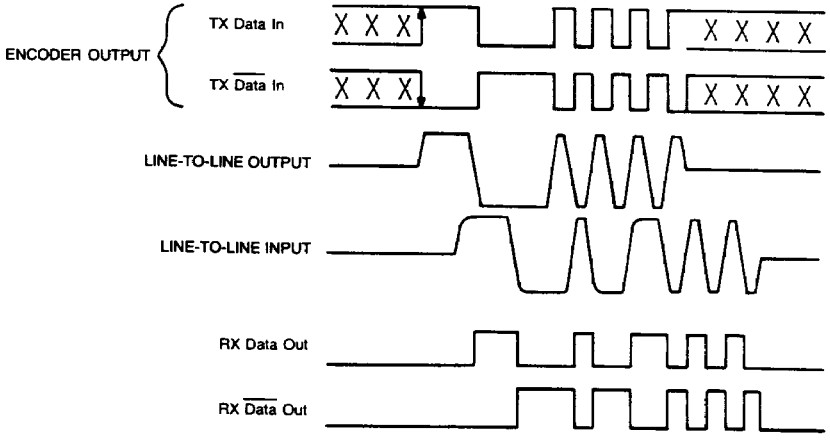
CAUTION

(1) Complementary inputs on the TX Data and TX $\overline{\text{Data}}$ for more than 10 seconds may cause permanent damage to the BUS-8553 at high temperatures due to high power dissipation in the driver output transistors.
(2) When transmitting, TX Data and TX $\overline{\text{Data}}$ inputs must be complementary waveforms of 50% duty cycle average, with no gate delays or skewing between them. It is recommended that the inputs be driven with a properly gated "D-type" flip-flop.



Notes:
(1) Only one connection can be made from the Transceiver to the MIL-STD-1553 Data Bus, either short or long stub, but not both.
(2) Value of isolation resistors are 52.5Ω ($0.75Z_0$).
(3) Bus must be terminated with its characteristic impedance at both ends.

FIGURE 2. TRANSCEIVER TO DATA BUS COUPLING CONNECTIONS

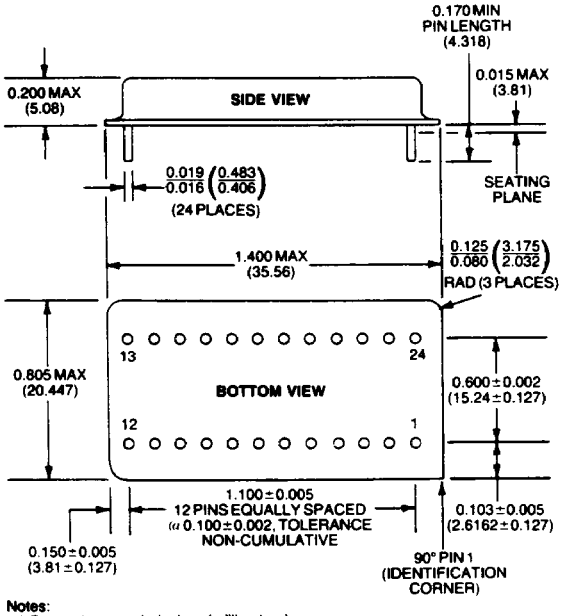


Notes:
(1) TX Data In and RX Data Out are TTL signals.
(2) TX Data In lines must be at opposite logic levels during transmission, and at the same logic level when not transmitting.
(3) LINE-TO-LINE output voltage is measured between TX Data and TX Data Out.
(4) LINE-TO-LINE input voltage is measured on the Data Bus.
(5) RX Data outputs are OFF when in the LOW state.
(6) The BUS-8553 can be interfaced to Smiths type Encoder/Decoder by switching the RX Data and RX Data output lines and inverting their signal with external inverting gates.

FIGURE 3. BUS-8553 WAVEFORMS

TABLE 3. BUS-8553 PIN CONNECTIONS 24 PIN DDIP

PIN	FUNCTION
1	TX Data Out
2	TX Data Out
3	GND
4	NC
5	NC
6	NC
7	RX Data Out
8	Strobe
9	GND
10	RX Data Out
11	NC
12	NC
13	+15VDC
14	NC
15	RX Data In
16	RX Data In
17	NC
18	GND
19	−12V or −15VDC
20	+5VDC
21	TX Inhibit
22	TX Data In
23	TX Data In
24	NC



Notes:
(1) Dimensions are in inches (millimeters).
(2) Lead identification numbers are for reference only.
(3) Lead cluster shall be centered within ±0.10 of outline dimensions. Lead spacing dimensions apply only at seating plane.
(4) Pin material meets solderability requirements of MIL-STD-202E, Method 208C.

FIGURE 4. MECHANICAL OUTLINE 24 PIN DDIP

ORDERING INFORMATION

BUS-8553-883B

Reliability Grade:

883B = Fully compliant with MIL-STD-883

B = Screened to MIL-STD-883 but without QCI testing.

Blank = Standard DDC procedures.

Mating Transformer BUS-25679