ARX 18553 & ARX 28553 TRANSCEIVERS for MIL-STD-1553

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An ARX Company

Features

- Low power dissipation
- Smallest single transceiver available
- Dual transceiver saves space, cost
- Outstanding MIL-STD-1553 electrical performance
- Dual transceiver package, power supply and logic state options
- Thick film hybrid technology

General Description:

The Aeroflex Laboratories Incorporated Models ARX 18553 and ARX 28553 are third generation transceiver designs which provide full compliance with MIL-STD-1553 A and B requirements in the smallest packages with lowest power consumption.
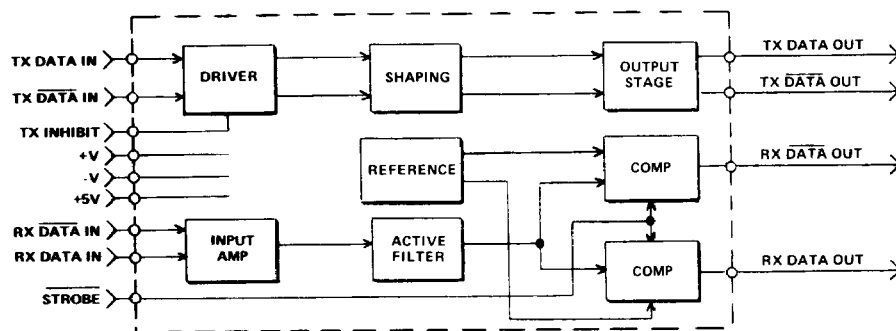
The single miniaturized Model ARX 18553 and Model ARX 28553 perform the front-end analog function of inputting and outputting data through a transformer to the data bus.
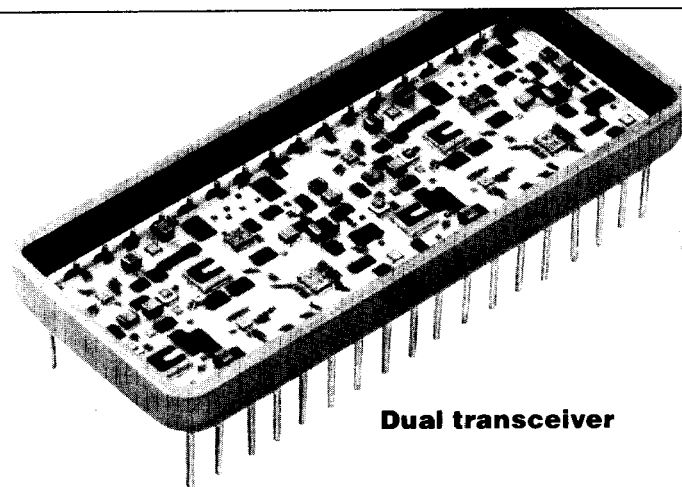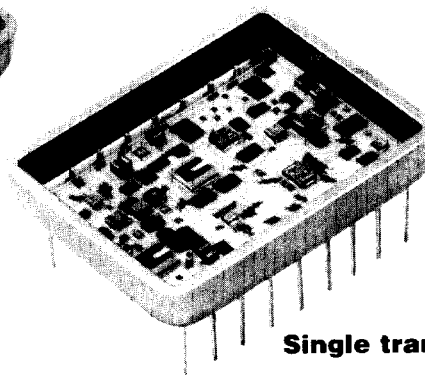
Dual transceiver   **Single transceiver**

Block diagram (without transformer)

Design of these transceivers reflects particular attention to filter performance for low bit and word error rate along with waveform purity and no zero crossover distortion. Efficient transmitter electrical and thermal design provides low internal power dissipation and heat rise at high as well as low duty cycles.

Each channel of the dual transceiver is completely separate from the other and fully independent. This includes all power leads as well as signal lines. Hence each channel may be connected to a different data bus with no interaction between them.

Transmitter:

The Transmitter section accepts bi-phase TTL data at the input and when coupled to

1

the data bus with a 1.4:1 transformer, isolated on the data bus side with two 52.5 ohm fault isolation resistors, and loaded by two 70 ohm terminations plus additional receivers, the data bus signal produced is 6.5 volts-nominal peak-to-peak at A-A'. See Figure 5.

When both "DATA" and "DATA" inputs are held low or high, the transmitter output becomes a high impedance and is "removed" from the line. In addition, an overriding "INHIBIT" input provides for removal of the transmitter output from the line. A logic "1" applied to the "INHIBIT" takes priority over the condition of the data inputs and disables the transmitter. See Transmitter Logic Waveform, Figure 1.

The Transmitter may be safely operated for an indefinite period with ouput short circuited at 100% duty cycle.

Receiver:

The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are "DATA" and "DATA", and represent positive and negative excursions (respectively) of the input beyond a pre-determined threshold. See Receiver Logic Waveform, Figure 2.

The pre-set internal thresholds will detect data bus signals exceeding 1.05 volt p-p and reject signals less than 0.5 volt p-p when used with a 1.4:1 transformer. (See Figure 5 for transformer data and typical connection.)

Figure 1. Transmitter Logic Waveforms

DATA IN

DATA IN

INHIBIT — HI OR LOW

LINE-TO-LINE OUTPUT
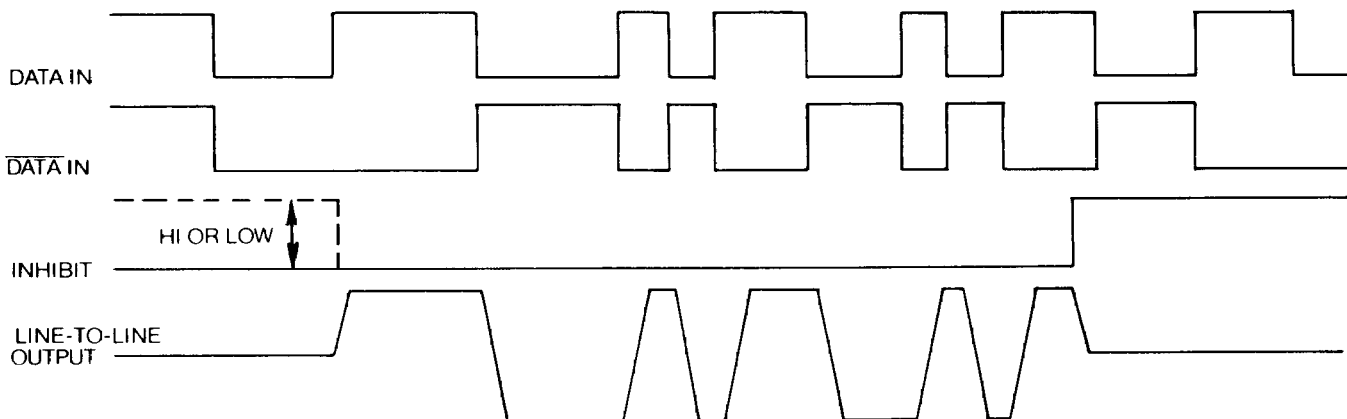
Notes:
1. DATA and DATA inputs must be complimentary waveforms, or 50% duty cycle average, with 5ns max delays between them.
2. DATA and DATA must be in the same state during off time. (Both high or both low)

Figure 2. Receiver Logic Waveforms

LINE-TO-LINE INPUT

DATA OUT

DATA OUT

100ns MAX

NOTE OVERLAP
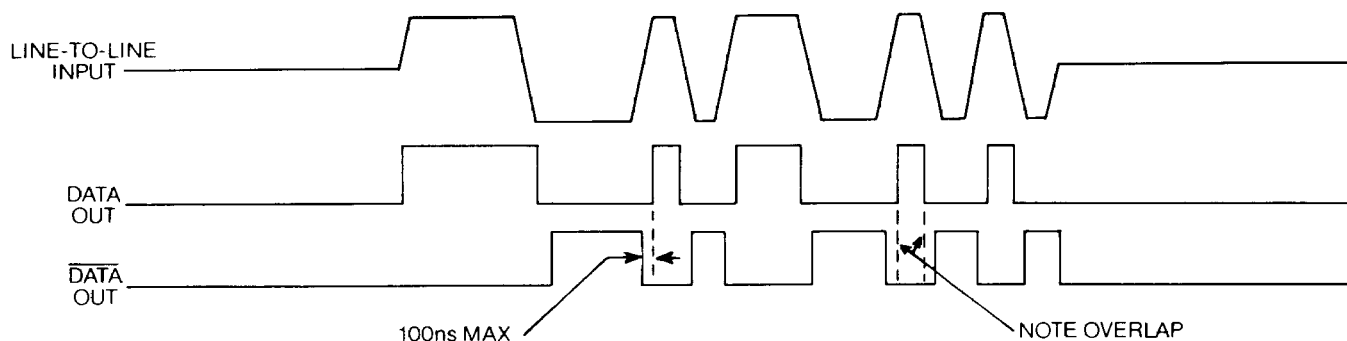
Note: A version with Logic highs in off condition is available.

Figure 3. Transmitter (TX) Data Differential Output Waveforms

6V P-P MIN.
9V P-P MAX.

90%

50%

10%

t_f^*

t_r^*
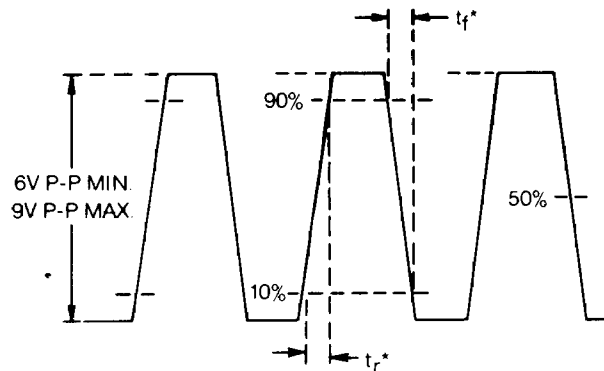
*Rise & Fall Times —
measured at point A-A' in figure 5.

Figure 4. Transmitter (TX) Output Offset

LAST BIT

OUTPUT OFFSET*

OUTPUT OFFSET*

2.5 usec
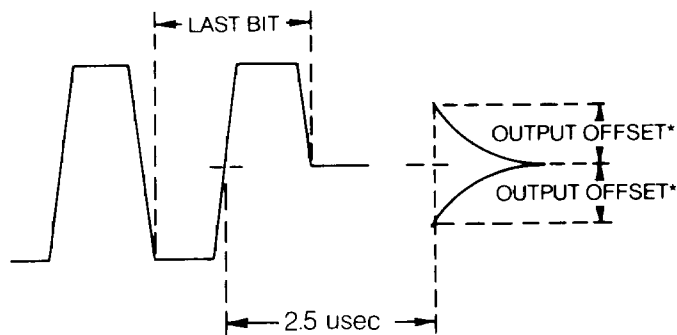
*Offset measured at
point A-A' in figure 5.

Figure 5. Typical Transformer Connection

70Ω

70Ω

52.5Ω
(NOMINAL)

N1:N2

(TX DATA OUT)

B

A

CENTER
TAP

N1:N3 FOR STUB
COUPLING

(TX DATA OUT)

B¹

A¹

52.5Ω
(NOMINAL)

(RX DATA IN)

(RX DATA IN)

Note: Since transmitter output and receiver
input terminals are separate, other multi-winding
transformer configurations may be used.
Consult Aeroflex engineering.
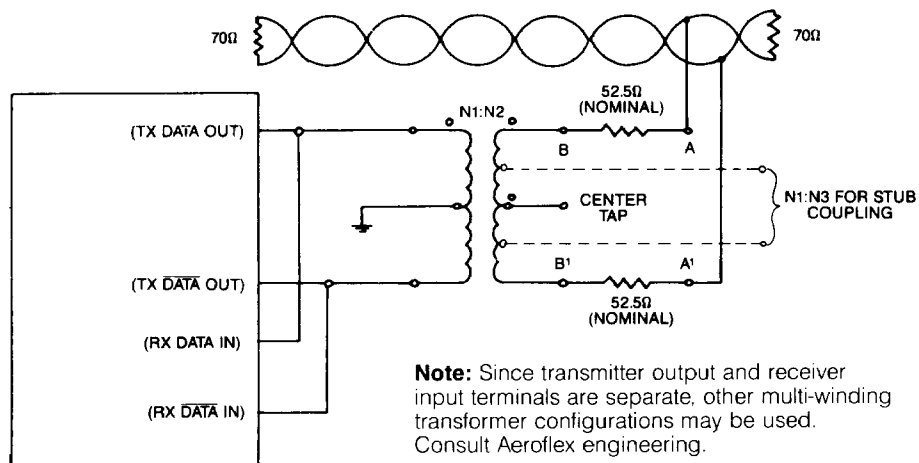
Electrical Characteristics, Receiver Section

PARAMETER	CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
Differential Input Impedance	f = 1MHz	Z_{IN}	7K			ohms
Differential Voltage Range		V_{IDR}			±20	V peak
Input Common Mode Voltage Range	Note 1	V_{ICR}	±10			V peak
Common Mode Rejection Ratio Note 2	Note 1	CMRR	40			dB

Strobe Characteristics (Logic "0" inhibits Output) If not used, a 1K ohm pullup to 5V is recommended.

"0" Input Current	V_S=0.4V	I_{IL}			−0.8	mA
"1" Input Current	V_S=2.7V	I_{IH}			40	μA
"0" Input Voltage		V_{IL}			0.7	V
"1" Input Voltage		V_{IH}	2.0			V
Strobe Delay (turn-on or turn-off)	Note 1	t_{SD}		6	20	nS
Threshold Characteristics (Sinewave input.) Note: Threshold voltages are referred to the bus.	10KHz to 1MHz	V_{TH}	0.50		1.05	Vp-p

Output Characteristics, RX DATA & $\overline{\text{DATA}}$

"1" State	I_{OH} = −4mA	V_{OH}	2.5	3.4		V
"0" State	I_{OL} = 4mA	V_{OL}			0.5	V
Delay (average) from differential input zero crossings to RX DATA and RX $\overline{\text{DATA}}$ output 50% points	Note 1	t_{DRX}		350	400	nS

Power Data

Voltage

15 volt versions	+ 14.25 to + 15.75 − 14.25 to − 15.75
12 volt versions	+ 11.40 to + 12.60 − 11.40 to − 12.60
Logic (all versions)	+ 4.50 to 5.50

Currents, maximums per channel

Duty cycle	+12V	−12V	5V	+15V	−15V	5V
0%	32mA	26mA	20mA	32mA	26mA	20mA
25% Note 1	108	26mA	20mA	90mA	26mA	20mA
50%	180	26mA	20mA	140mA	26mA	20mA

General

Temperature Range
Operating . . . . −55° to + 125°C
Storage . . . . −55° to + 150°C
Weight   Single . . . . 0.4 oz. typ.
                Dual . . . . 0.51 oz. typ.

Recommended transmitting duty cycle
when case is held to 75° C maximum 75%
125° C maximum 50%

Note 1. Characteristic guaranteed by design; not production tested.
Note 2. Measured at bus side of transformer, including contribution from transformer.

Configurations and Ordering Information

Model No.	Case	Power Supply	Transformer Turns Ratio N1 : N2	N1 : N3	Receiver Data Outputs	Configuration
ARX 18553	Plug In	±15V	1.4 : 1	2 : 1	Normally low	Single
ARX 28553	Plug In	±15V	1.4 : 1	2 : 1	Normally low	Dual
ARX 2416	Plug In	±15V	1.4 : 1	2 : 1	Normally high	Dual
ARX 2419	Plug In	±12V	1 : 1	1 :.707	Normally low	Dual
ARX 2425	Plug In	±12V	1 : 1	1 :.707	Normally high	Dual
ARX 2436	Plug In	±12V	1 : 1	1 :.707	Normally low	Single

Flat pack version of all dual devices are available.

Absolute Maximum Ratings

Supply voltage, V+	-0.3 to $+18.0$V
Supply voltage, V−	$+0.3$ to -18.0V
Supply voltage, V_L	-0.3 to $+7.0$V
Logic Input Voltage	-0.3 to $+5.5$V
Receiver Differential Input	± 20V (40V p-p)
Receiver Input Voltage (Common Mode)	± 10V
Driver Peak Output Current	300mA
Max. power dissipation (Total hybrid at 100% duty cycle)* (Total hybrid standby mode)	3.32 2.047
Maximum power dissipation in hottest die @ 100% duty cycle (Derates to zero in standby mode)	477mW
Θ_{JC} (junction to case) for hottest die	47.2 °C/W
Θ_{CA} (case to air) typical	20 °C/W
Max. junction to case temperature rise for the hottest device (@ 100% duty cycle)	22.5°C

* One channel transmitting at 100% duty cycle and the second channel at standby.

Electrical Characteristics, Driver Section

Input Characteristics, TX DATA in or TX DATA in

PARAMETER	CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
"0" Input Current	$V_{IN}=0.4$V	I_{ILD}			−3.2	mA
"1" Input Current	$V_{IN}=2.7$V	I_{IHD}			80	μA
"0" Input Voltage		V_{ILD}			0.7	V
"1" Input Voltage		V_{IHD}	2.0			V

Inhibit Characteristic

PARAMETER	CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
"0" Input Current	$V_{IN}=0.4$V	I_{ILI}			−1.6	mA
"1" Input Current	$V_{IN}=2.7$V	I_{IHI}			40	μA
"0" Input Voltage		V_{ILI}			0.7	V
"1" Input Voltage		V_{IHI}	2.0			V
Delay from TX Inhibit (0→1) to inhibited output	**Note 1**	t_{DXOFF}		150	200	nS
Delay from TX Inhibit (1→0) to active output	**Note 1**	t_{DXON}		30	100	nS
Differential output noise, inhibit mode		V_{NOi}			10	mVp-p
Differential output impedance (inhibited)		Z_{OI}	10K			ohms

Output Characteristics

PARAMETER	CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
Differential output level	$R_L = 35$ ohms	V_O	6	7.5	9	Vp-p
Rise and Fall times (10% to 90% of p-p output)		t_r	100		300	nS
Output offset at point A-A' in Fig. 5, 2.5 μS after mid-bit crossing of the parity bit of the last word of a 660 μs message	$R_L =35$ ohms	V_{OS}			± 90	mV peak
Delay from 50% point of TX DATA or TX Data input to zero crossing of differential output	**Note 1**	t_{DTX}		70	150	nS

Model ARX 28553 Dual In Line

Dot indicates Pin 1.
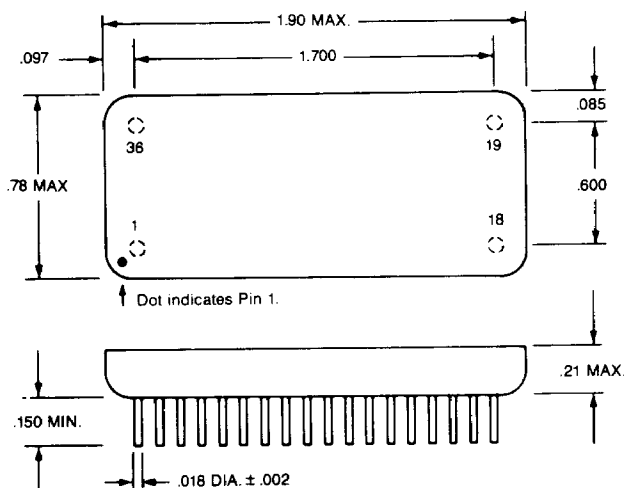
Model ARX 28553 Flat Pack

Dot indicates Pin 1.

.086R
4 PLACES

.40 MIN.
BOTH SIDES   .065 REF.
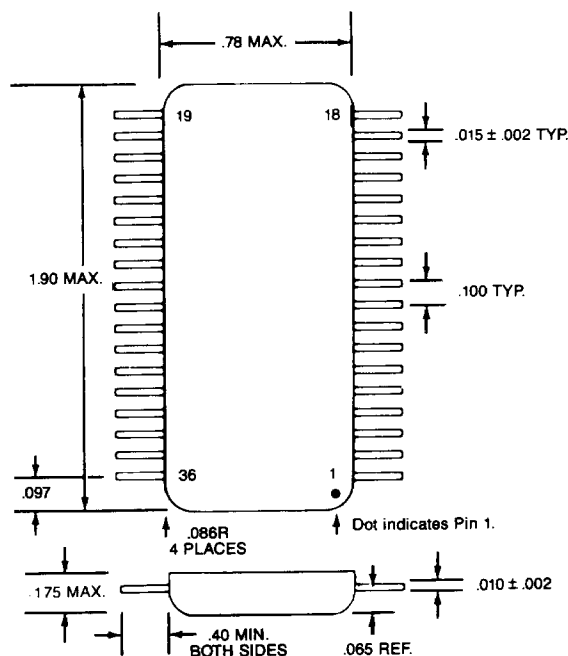
Model 28553 Pin Connection Table

P/N	FUNCTION
1	TX DATA OUT A
2	TX $\overline{\text{DATA}}$ OUT A
3	ANALOG GROUND
4	NC
5	RX DATA OUT A
6	STROBE A
7	GROUND
8	RX $\overline{\text{DATA}}$ OUT A
9	NC
10	TX DATA OUT B
11	TX $\overline{\text{DATA}}$ OUT B
12	ANALOG GROUND
13	NC
14	RX DATA OUT B
15	STROBE B
16	ANALOG GROUND
17	RX $\overline{\text{DATA}}$ OUT B
18	NC
19	+V B
20	RX DATA IN B
21	RX $\overline{\text{DATA}}$ IN B
22	GROUND
23	−V B
24	+5V B
25	INHIBIT B
26	TX DATA IN B
27	TX $\overline{\text{DATA}}$ IN B
28	+V A
29	RX DATA IN A
30	RX $\overline{\text{DATA}}$ IN A
31	GROUND
32	−V A
33	+5V A
34	INHIBIT A
35	TX DATA IN A
36	TX $\overline{\text{DATA}}$ IN A

Note: A and B denotes separate channels.

Model ARX 18553

Dot indicates Pin 1.
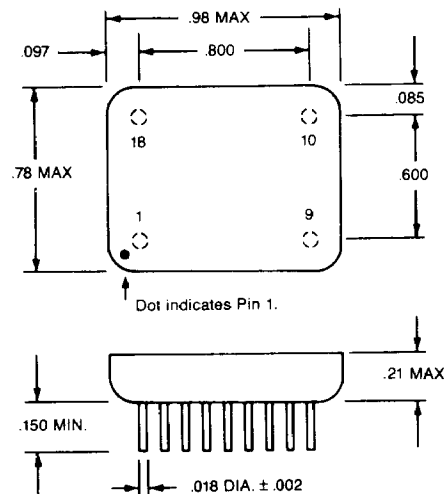
Model 18553 Pin Connection Table

P/N	FUNCTION
1	TX DATA OUT
2	TX $\overline{\text{DATA}}$ OUT
3	ANALOG GROUND
4	NC
5	RX DATA OUT
6	STROBE
7	GROUND
8	RX $\overline{\text{DATA}}$ OUT
9	NC
10	+V
11	RX DATA IN
12	RX $\overline{\text{DATA}}$ IN
13	GROUND
14	−V
15	+5V
16	INHIBIT
17	TX DATA IN
18	TX $\overline{\text{DATA}}$ IN

Notes:
1. Dimensions shown are in inches.
2. Lead identification numbers are for reference only.
3. Pins are equally spaced at .100 ± .002 tolerance, non-cumulative, each row.

Specifications subject to change without notice.

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