

## Standard Products

# ACT4433 Dual Transceivers

for MIL-STD-1553/MIL-STD-1760 & SAE-AS15531

[www.aeroflex.com/Avionics](http://www.aeroflex.com/Avionics)

February 18, 2005



## FEATURES

- ❑ Small size, light weight and low power dissipation dual transceiver
- ❑ *Smaller Case Outline than ACT4489D*
- ❑ Bipolar supply  $\pm 12\text{V}$ , Logic supply  $+5\text{V}$
- ❑ Outstanding MIL-STD-1553/MIL-STD-1760/SAE-AS15531 performance
- ❑ Monolithic construction
- ❑ Designed for commercial, industrial and aerospace applications
- ❑ MIL-PRF-38534 compliant devices available
- ❑ Aeroflex-Plainview is a Class H & K MIL-PRF-38534 manufacturer

## GENERAL DESCRIPTION

The Aeroflex-Plainview ACT4433 is a next generation monolithic transceiver design which provides full compliance to MIL-STD-1553A/B and 1760 requirements in a small package with lower pin count than the ACT4489D, for those designs with less board space.

The dual channel Model ACT4433 performs the front-end analog function of inputting and outputting data through a transformer to the MIL-STD-1553 data bus.

Design of this transceiver reflects particular attention to active filter performance. This results in low bit and word error rate with superior waveform purity and minimal 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 power leads as well as signal lines. Hence, each channel may be connected to a different data bus with no interaction.

## TRANSMITTER

The Transmitter section accepts bi-phase TTL data at the input and when coupled to the data bus with a 1:1 ratio transformer the data bus signal is typically 7 Volts P-P at point A (See Figure 5). When both DATA and  $\overline{\text{DATA}}$  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 the removal of the transmitter output from the line. A logic “1” signal applied to the “INHIBIT” takes priority over the condition of the data inputs and disables the transmitter (See Transmitter Logic Waveform, Figure 1).

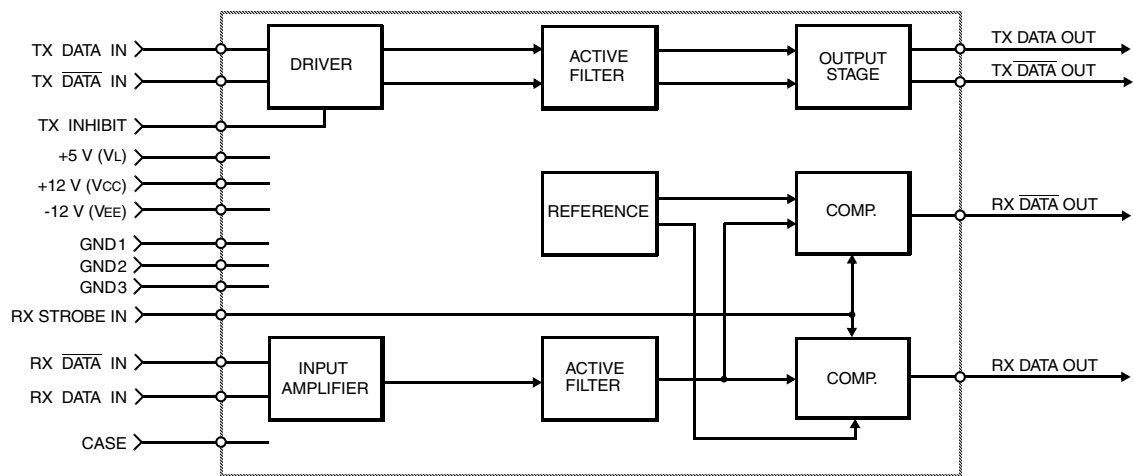
The Transmitter may be safely operated for an indefinite period with the 1553 bus (point A) short circuited at 100% duty cycle.

## RECEIVER

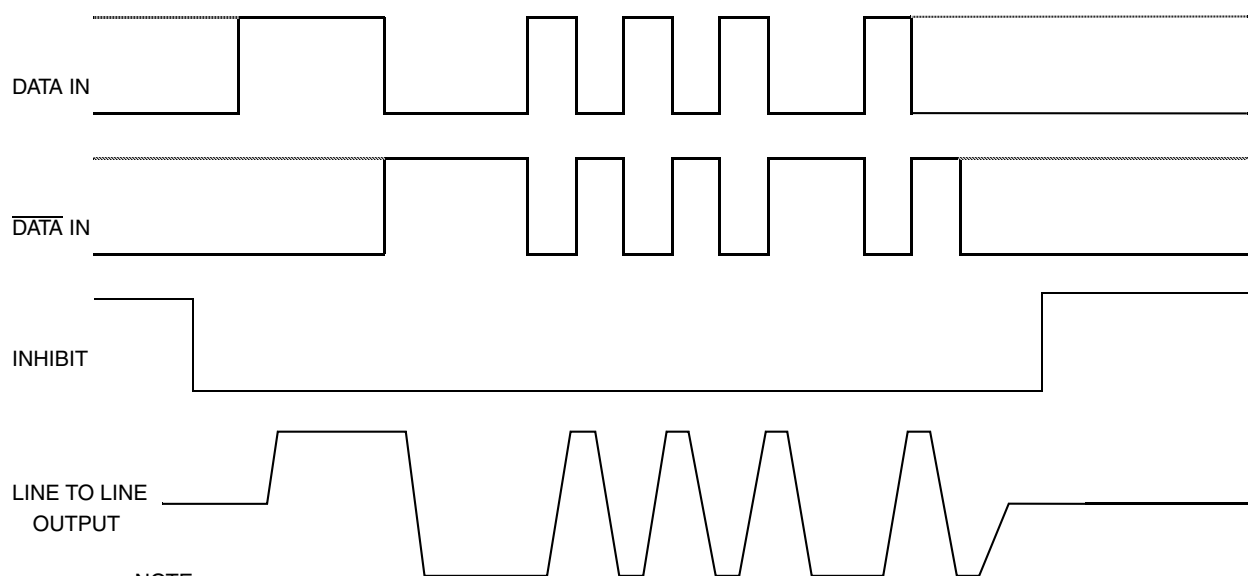
The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are DATA and  $\overline{\text{DATA}}$ , and represent positive and negative excursions of the input beyond a pre-determined threshold (See Receiver Logic Waveform, Figure 2).

The pre-set internal thresholds will detect data bus signals, point A Figure 5, exceeding 1.20 Volts P-P and reject signals less than 0.6 Volts P-P when used with a transformer (See Figure 5 for transformer data and typical connection).

A low level at the RX Strobe input inhibits the DATA and  $\overline{\text{DATA}}$  outputs. If unused, a 2K pull-up to +5 Volts is recommended.



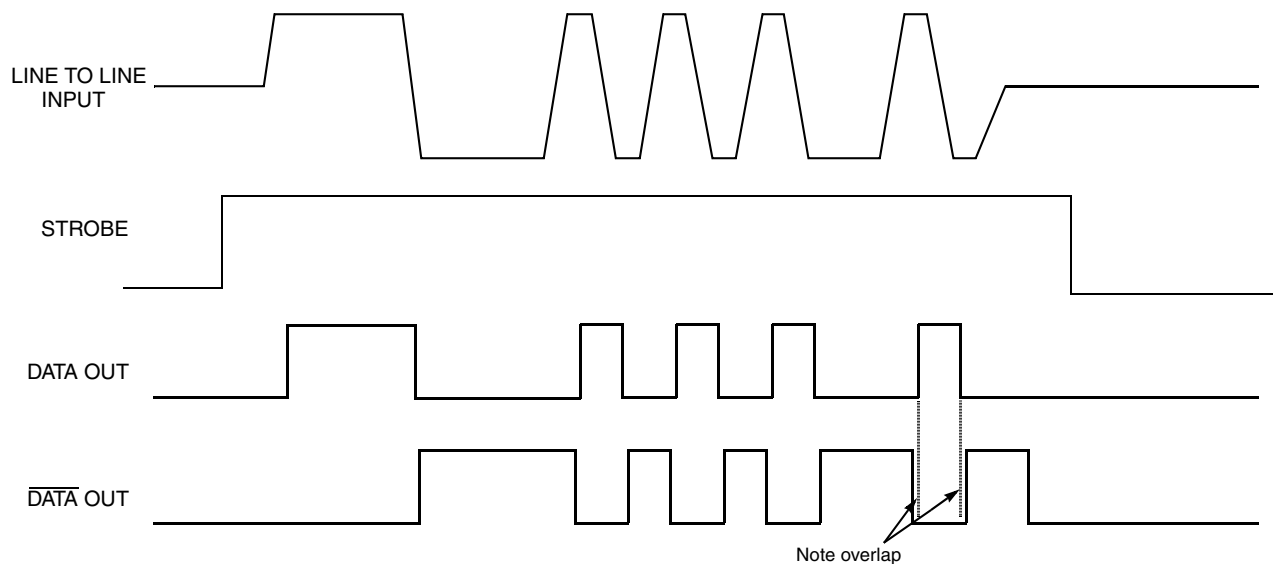
**BLOCK DIAGRAM (WITHOUT TRANSFORMER)**



NOTE:

DATA and  $\overline{\text{DATA}}$  inputs must be complementary waveforms or 50% duty cycle average, with no delays between them, and must be in the same state during off times (both high or low).

**FIGURE 1 – TRANSMITTER LOGIC WAVEFORMS IDEALIZED**



**FIGURE 2 – RECEIVER LOGIC WAVEFORMS IDEALIZED**

## ABSOLUTE MAXIMUM RATINGS

Operating Case Temperature	-55°C to +125°C
Storage Case Temperature	-65°C to +150°C
Power Supply Voltages VCC VEE VL	-0.3 VDC to +18 VDC +0.3 VDC to -18 VDC -0.3 VDC to +7.0 VDC
Logic Input Voltage	-0.3 VDC to +5.5 VDC
Receiver Differential Input	±40VP-P
Receiver Input Voltage (Common Mode)	±10V
Driver Peak Output Current	300 mA
Total Package Power Dissipation over the Full Operating Case Temperature Range	2.5 Watts (Note: Normal operation conditions require one transmitter on and the other off at any given time)
Maximum junction to Case Temperature	10°C
Thermal resistance – Junction to Case	4°C/W

## ELECTRICAL CHARACTERISTICS – DRIVER SECTION 2/ 3/

### INPUT CHARACTERISTICS, TX DATA IN OR TX DATA IN

Parameter	Condition	Symbol	Min	Typ	Max	Unit
"0" Input Current	V <sub>IN</sub> = 0.4V	I <sub>ILD</sub>	-	-0.1	-0.2	mA
"1" Input Current	V <sub>IN</sub> = 2.7V	I <sub>IHD</sub>	-	1	40	µA
"0" Input Voltage		V <sub>ILD</sub>	-	-	0.7	V
"1" Input Voltage		V <sub>IHD</sub>	2.0	-	-	V

### INHIBIT CHARACTERISTICS

"0" Input Current	V <sub>IN</sub> = 0.4V	I <sub>ILI</sub>	-	-0.1	-0.2	mA
"1" Input Current	V <sub>IN</sub> = 2.7V	I <sub>IHI</sub>	-	1.0	40	µA
"0" Input Voltage		V <sub>ILI</sub>	-	-	0.7	V
"1" Input Voltage		V <sub>IHI</sub>	2	-	-	V
Delay from TX inhibit, (0→1) to inhibited output	From mid pt inhibit to ±1.2V Figure 5, Point B	t <sub>DXOFF</sub>	-	175	225	nS
Delay from TX inhibit, (1→0) to active output		t <sub>DXON</sub>	-	90	150	nS
Differential Output Noise, inhibit mode		V <sub>NOI</sub>	-	2	10	mVp-p
Differential Output Impedance (inhibited) Note 1. See Figure 5	Point B	Z <sub>OI</sub>	2K	-	-	Ω
	Point C	Z <sub>OI</sub>	1K	-	-	Ω

### OUTPUT CHARACTERISTICS

Differential output level	Figure 5, Point A	V <sub>O</sub>	6.5	7.5	9.0	Vp-p
Rise and fall times (10% to 90% of Vp-p output)		t <sub>R</sub> / t <sub>F</sub>	100	160	300	nS
Output Offset at point A on Figure 3, 2.5µS after midpoint crossing of the parity bit of the last word of a 660µS message.		V <sub>OS</sub>	-	-	±90	mVpeak
Delay from 50% point of TX DATA or TX DATA input to zero crossing of differential signal		t <sub>DTX</sub>	-	100	200	nS

## ELECTRICAL CHARACTERISTICS – RECEIVER SECTION

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Voltage Range, Figure 5 Point B	TXFMR 1:1	VIDR	-	-	40	VPK
Common Mode Rejection Ratio (Note 3)		CMRR	45	-	-	dB
"1" State – Rx Data or Rx $\overline{\text{Data}}$ Output	IOH = -0.4 mA	VOH	2.5	3.7	-	V
"0" State – Rx Data or Rx $\overline{\text{Data}}$ Output	IOI = 4 mA	VOL	-	0.35	0.5	V
Delay (average) from Differential Input Zero Crossings to RX DATA and RX $\overline{\text{Data}}$ Output 50% points		tdXT	-	270	400	nS
Input Threshold Voltage (referred to the bus)	100KHz–1MHz	VTH	0.60	0.75	1.15	VP-P

### STROBE CHARACTERISTICS (LOGIC "0" INHIBITS OUTPUT)

"0" Input Current	Vs = 0.4V	IIL	-	-0.1	-0.2	mA
"1" Input Current	Vs = 2.7V	IIH	-	1	+40	μA
"0" Input Voltage		VIL	-	-	0.7	V
"1" Input Voltage		VIH	2.0	-	-	V
Strobe Delay (Turn-on or Turn-off)		tSD	-	50	100	nS

## POWER DATA

### POWER SUPPLY CURRENTS – PER CHANNEL – SEE FIGURE 4

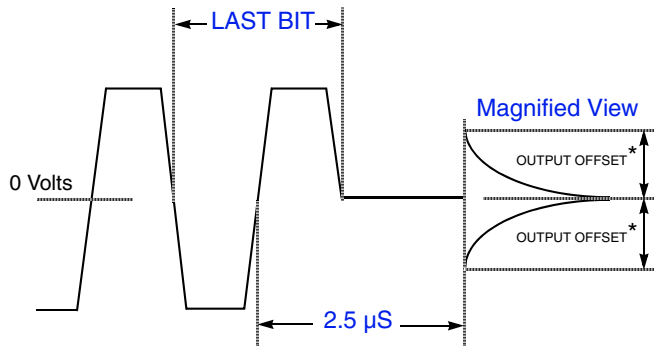
Transmitter Standby	I <sub>CC</sub> I <sub>EE</sub> I <sub>L</sub>	- - -	0 12 18	1 16 30	mA
25% duty cycle	I <sub>CC</sub> I <sub>EE</sub> I <sub>L</sub>	- - -	58 12 18	63 20 30	
50% duty cycle	I <sub>CC</sub> I <sub>EE</sub> I <sub>L</sub>	- - -	115 12 18	125 20 30	
100% duty cycle	I <sub>CC</sub> I <sub>EE</sub> I <sub>L</sub>	- - -	230 12 18	250 20 30	

### POWER SUPPLY VOLTAGES

±12V Operating Power Supply Voltage Range	V <sub>CC</sub>	+11.40	+12.00	+12.60	V
	V <sub>EE</sub>	-11.40	-12.00	-12.60	V
+5V Operating Power Supply Voltage Range)	V <sub>L</sub>	+4.75	+5.00	+5.25	V

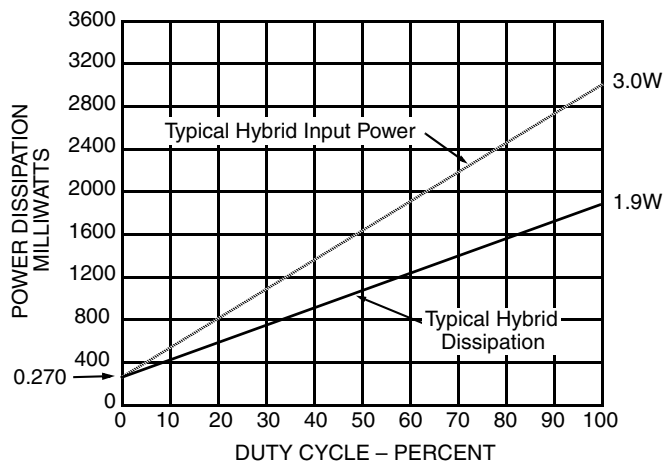
Notes:

1. Power on or off, measured from 75KHz to 1MHz at point A and transformer self impedance of 3KΩ minimum at 1MHz.
2. Power Supplies: +12 Volts ±0.60 V & +5 Volts ±0.5V, bypassed by 10 μF (Tantalum recommended) Capacitor minimum. All measurements & specifications apply over the temperature range of -55°C to +125°C (Case temperature) unless otherwise specified.
3. When measured as shown per Figure 5 with ± 10 Volt peak, line to ground, DC to 2MHz
4. Typical power is measured with V<sub>BUS</sub> at point A = 7.5 VP-P



\*Offset measured at point A in Figure 5

**FIGURE 3 – TRANSMITTER (TX) OUTPUT OFFSET**

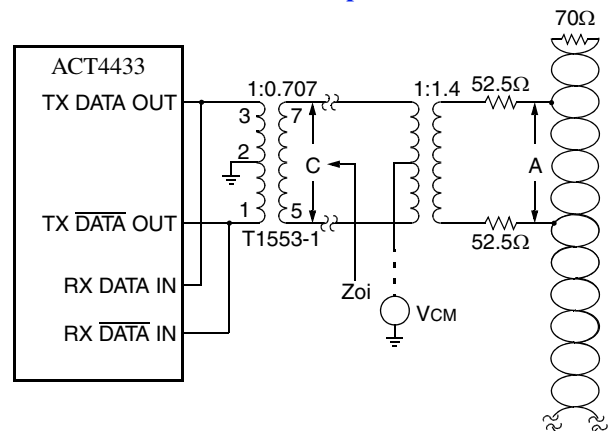


Note:  $V_{CC} = +12V$ ,  $V_{EE} = -12V$ ,  $V_L = +5V$ , Transformer ratio 1:1,  $V_{BUS}$  (point A) at 7VP-P.

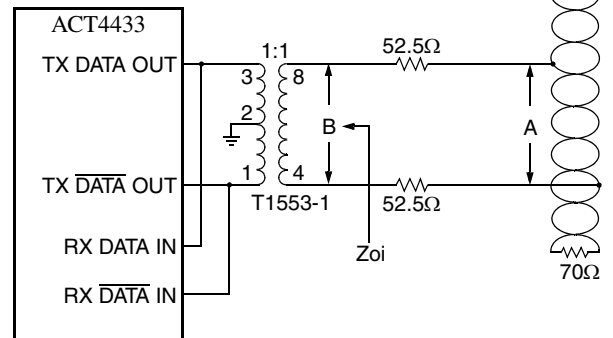
**FIGURE 4 – POWER DISSIPATION VS. DUTY CYCLE**

(Total hybrid with one channel transmitting and the other not powered)

### Transformer Coupled Stub



### Direct Coupled Stub



Transformer Model use Technitrol Part# 1553-1 or equivalent

**FIGURE 5 – TYPICAL 1553 BUS CONNECTION**

**FIGURE 6 – LEAD NUMBERS & FUNCTIONS**

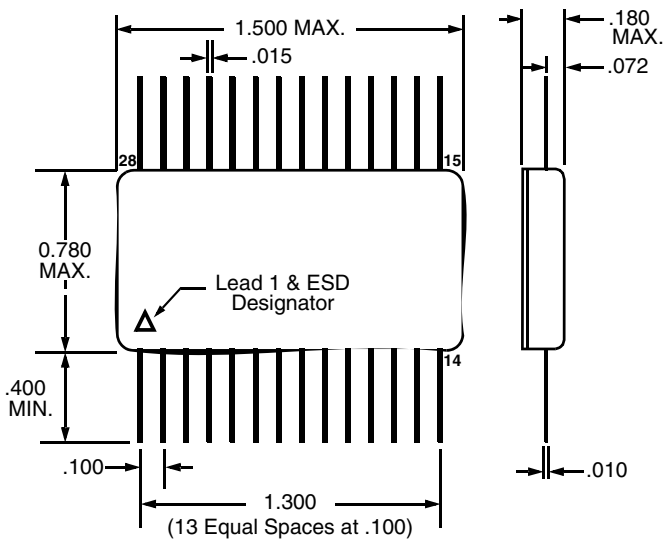
Pin #	Function	Channel
1	TX DATA OUT/ RX DATA IN	A
2	TX $\overline{\text{DATA}}$ OUT/ RX $\overline{\text{DATA}}$ IN	A
3	GROUND	A
4	RX STROBE	A
5	RX $\overline{\text{DATA}}$ OUT	A
6	RX DATA OUT	A
7	CASE	A
8	TX DATA OUT/ RX DATA IN	B
9	TX $\overline{\text{DATA}}$ OUT/ RX $\overline{\text{DATA}}$ IN	B
10	GROUND	B
11	RX STROBE	B
12	RX $\overline{\text{DATA}}$ OUT	B
13	RX DATA OUT	B
14	NC	B
15	GROUND	B
16	-V <sub>EE</sub>	B
17	V <sub>L</sub>	B
18	TX INHIBIT	B
19	TX $\overline{\text{DATA}}$ IN	B
20	TX DATA IN	B
21	+V	B
22	GROUND	A
23	-V <sub>EE</sub>	A
24	V <sub>L</sub>	A
25	TX INHIBIT	A
26	TX $\overline{\text{DATA}}$ IN	A
27	TX DATA IN	A
28	+V <sub>CC</sub>	A

## CONFIGURATIONS AND ORDERING INFORMATION

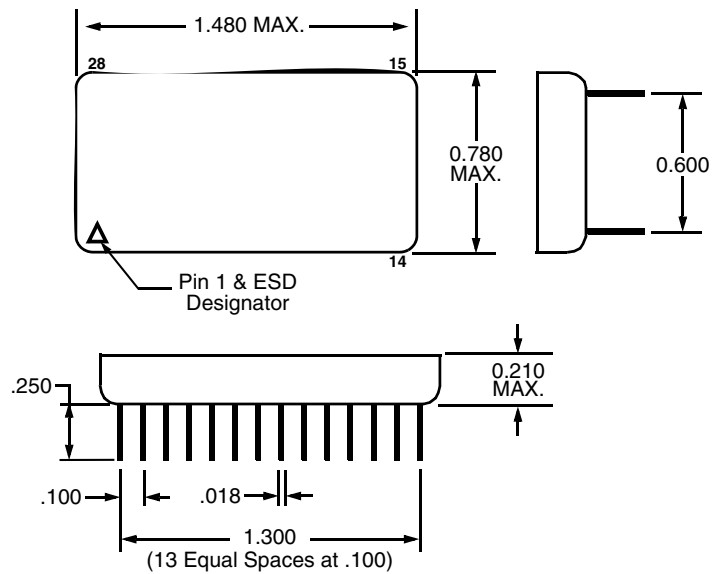
Model No.	Receiver Data level	DESC SMD	Case	Configuration
ACT4433-D	Normally Low	Pending	Plug-In Package	Dual
ACT4433-DI	Normally High			
ACT4433-DF	Normally Low		Flat Package	
ACT4433-DFI	Normally High			

## PACKAGE CONFIGURATION OUTLINE

**Flat Package**



**Plug-In Package**



**Notes**

1. Dimensions shown are in inches
2. Pins are equally spaced at  $0.100 \pm 0.002$  tolerance, non-cumulative, each row

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