ACT4419D
Dual Variable Amplitude Transceivers for MIL-STD-1553

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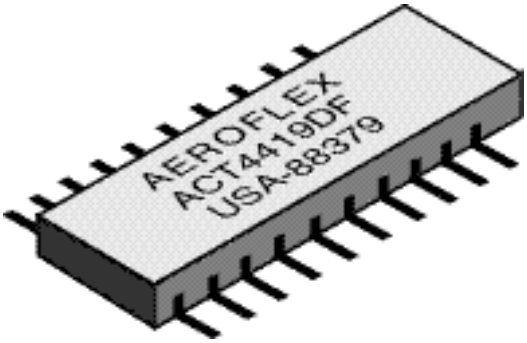
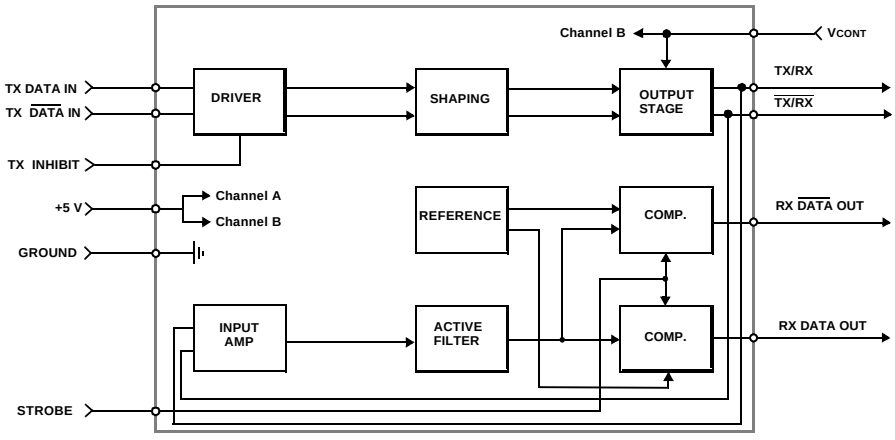
CIRCUIT TECHNOLOGY
www.aeroflex.com

Features

- **World's smallest and lowest standby power dual variable amplitude transceiver 0.3" x 1.2" packages**
- **Lowest standby power**
- **Dual transceiver meets military data bus requirements, MIL-STD-1553**
- **Low power dissipation at full output power**
- **Single +5V power supply**
- **Current source output**
- **Monolithic construction using Dielectrically Isolated (D.I.)**
- **Processed and screened to MIL-STD-883 specs**
- **Radiation Hard to 300 KRADS total dose**
- **DESC SMD pending**
- **+5V Control line**



ACT4419D Dual Transceivers



Block Diagram (without Transformer, Channel A shown)

General Description

The Aeroflex Circuit Technology model ACT4419D is a next generation D.I. monolithic transceiver which provides variable amplitude in full compliance with MIL-STD-1553 data bus requirements with the lowest standby power consumption available and one power supply operation.

The dual channel model ACT4419D performs the front-end analog function of inputting and outputting data through a transformer to a MIL-STD-1553 data bus.

Design of these transceivers 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.

Variable amplitude is adjusted with factory preset 0 – 5 Vdc control line at 1 mA maximum input current at 5 Volts.

Transmitter

The Transmitter section accepts bi-phase TTL data at the input and when coupled to the data bus with a **primary grounded center tap 1:2.5 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 7.1 Volts nominal P-P at A-A' (See Figure 5). When both DATA and $\overline{\text{DATA}}$ inputs are held low, 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" applied to the "INHIBIT" takes priority over the condition of the data inputs and disables the transmitter. (See Transmitter Logic Waveform, Figure 1).

The transceiver utilizes an active filter to suppress harmonics above 1MHz. The Transmitter may be safely operated at 100% duty cycle for an indefinite period into a short circuited 1553 bus.

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).

Note: Receiver outputs are normally low.

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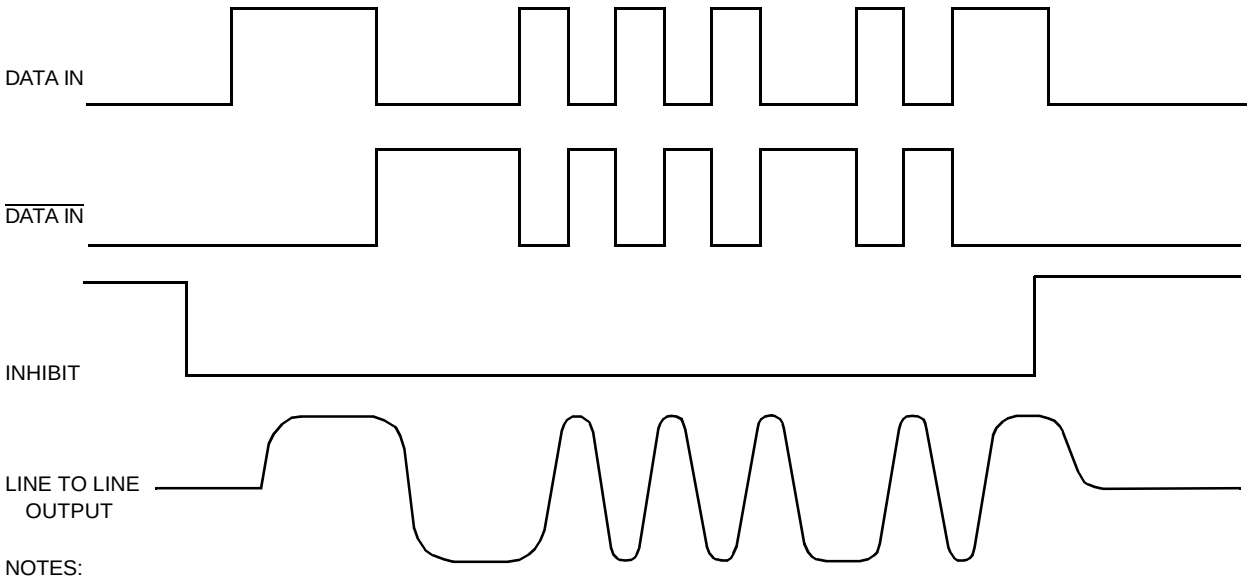
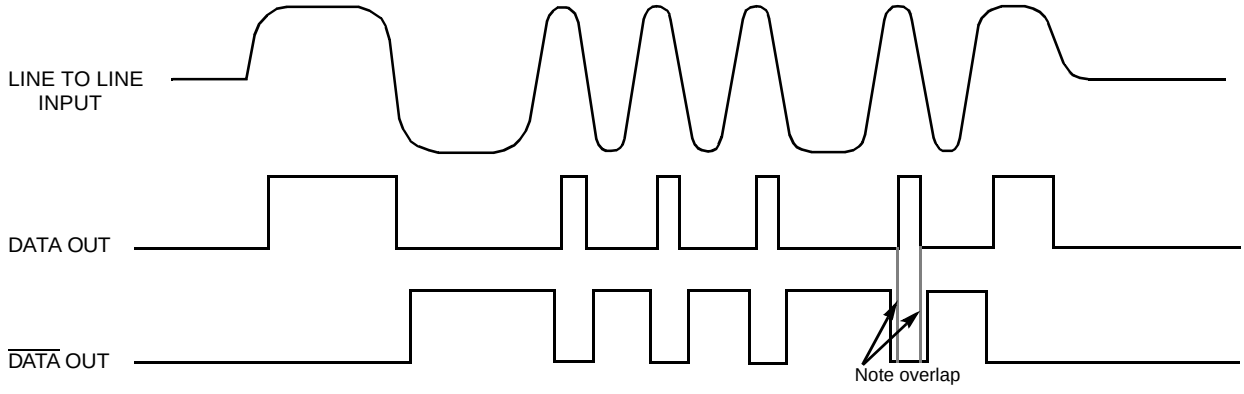
The pre-set internal thresholds will detect data bus signals exceeding 1.150 Volts P-P and reject signals less than 0.6 Volts P-P when used with a 1:2.5 turns ratio transformer. (See transformer data and typical connection, Figure 5).

Figure 1 - Transmitter Logic Waveforms



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

Figure 2 - Receiver Logic Waveforms



Absolute Maximum Ratings

Operating Case Temperature	-55°C to +125°C
Storage Case Temperature	-65°C to +150°C
Positive Power Supply Voltage	+5.0 V to +7.0 V
Receiver Differential Input	±10 V
Receiver Input Voltage (Common Mode)	±5 V
Driver Peak Output Current	650 mA
Total Package Power Dissipation over the Full Operating Case Temperature Rise	2 Watt **(Note: Normal operation conditions require one transmitter on and the other off at any given time.**
Maximum Junction To Case Temperature Rise for the Hottest Device	10°C
Thermal Resistance, Junction to Bottom of Case	5°C/W

Electrical Characteristics – Driver Section 1/ 3/

Input Characteristics, TX DATA IN or TX $\overline{\text{DATA}}$ IN

Parameter	Condition	Symbol	Min	Typ	Max	Unit
"0" Input Current	V_{IN} = 0.4 V	I_{ILD}	-	-0.2	-0.4	mA
"1" Input Current	V_{IN} = 2.7 V	I_{IHD}	-	1	40	µA
"0" Input Voltage	-	V_{ILD}	-	-	0.7	V
"1" Input Voltage	-	V_{IHD}	2.0	-	-	V

Inhibit Characteristics

"0" Input Current	V_{IN} = 0.4V	I_{ILI}	-	-0.2	-0.4	mA
"1" Input Current	V_{IN} = 2.7V	I_{IHI}	-	1.0	40	µA
"0" Input Voltage	-	V_{ILI}	-	-	0.7	V
"1" Input Voltage	-	V_{IHI}	2	-	-	V
Delay from TX inhibit,(0→1) to inhibited output	-	t_{DXOFF}	-	200	300	nS
Delay from TX inhibit, (1→0) to active output	-	t_{DXON}	-	100	180	nS
Differential Output Noise, inhibit mode	-	V_{NOI}	-	2	10	mVp-p
Differential Output Impedance 2/	-	Z_{OI}	2K	-	-	Ω

Output Characteristics

Differential output level (direct coupled stub)	Pt. A - A'	V_O	6.6	7.1	7.6	V p-p
Differential output level (transformer coupled)	Pt. B - B'	V_O	18.7	20.1	21.5	V p-p
Rise and Fall times	-	t_R & t_F	100	170	300	nS
Output Offset 4/	Pt. A - A'	V_{OS}	-	-	±90	mV peak
Delay from 50% point of TX DATA or TX $\overline{\text{DATA}}$ input to zero crossing of differential signal	-	t_{DTX}	-	120	180	nS
Output Voltage Delta, Pt. A - A' 5/	-	$V_{O\Delta D}$	0	±71	±142	mVp-p
Output Voltage Delta, Pt. B - B' 5/	-	$V_{O\Delta S}$	0	±200	±400	mVp-p
Control Line Input Resistance	-	R_{CONT}	-	5	-	KΩ

Electrical Characteristics – Receiver Section 1/ 3/

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Voltage Range	Pt. A - A'	V_{IDR}	-		20	V peak
Common Mode Rejection Ratio	-	CMRR	45	-	-	dB

Strobe Characteristics (Logic "0" inhibits output) (NOTE: If not used, a 1K pullup to 5V is recommended)

"0" Input Current	V_S = 0.4 V	I_{IL}	-	-0.2	-0.4	mA
"1" Input Current	V_S = 2.7V	I_{IH}	-	1	+40	µA
"0" Input Voltage	-	V_{IL}	-	-	0.7	V
"1" Input Voltage	-	V_{IH}	2.0	-	-	V
Strobe Delay (turn-on)	-	$t_{SD(ON)}$	-	90	150	nS
Strobe Delay (turn-off)	-	$t_{SD(OFF)}$	-	90	150	nS

Threshold Characteristics (Sinewave input)

Input Threshold Voltage(referred to the bus)	100KHz-1MHz	V_{TH}	0.60	0.8	1.15	Vp-p

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

"1" State	I_{OH} = -0.4 mA	V_{OH}	2.5	3.5	-	V
"0" State	I_{OL} = 4 mA	V_{OL}	-	0.3	0.5	V
Delay, (average)from differential input zero crossings to RX DATA and RX $\overline{\text{DATA}}$ output 50% points	-	t_{DRX}	-	320	400	nS

Power Data 1/ 3/

Maximum Current per Channel (other channel in standby)

Duty Cycle	Typ	Max
Transmitter Standby	50 mA	65 mA
25% duty cycle	155 mA	185 mA
50% duty cycle	290 mA	335 mA
100% duty cycle	560 mA	650 mA

Power Supply Voltage Range

+V	4.75 to 5.5 Volts

Notes: 1. V_{CC} = 5 Volts ±0.1 V, T_C = -55°C to +125°C, unless otherwise specified.
2. Power ON/OFF, measured from 75KHz to 1MHz at Point A-A'. See Figure 5.
3. All typical values are measured at +25°C.
4. At point A-A' on Figure 5, 2.5 µS after midpoint crossing of the parity bit of the last word of a 660 µS message.
5. Output Voltage Delta ($V_{O\Delta}$) = $V_{O(IDEAL)}$ - $V_{O(MEASURED)}$, where $V_{O(IDEAL)}$ = Slope x V_{CONT} and Slope = $\Delta V_O \div \Delta V_{CONT}$, See Figure 3.

Figure 3 – Transmitter Output Amplitude (V_O) vs V_{CONT} Voltage

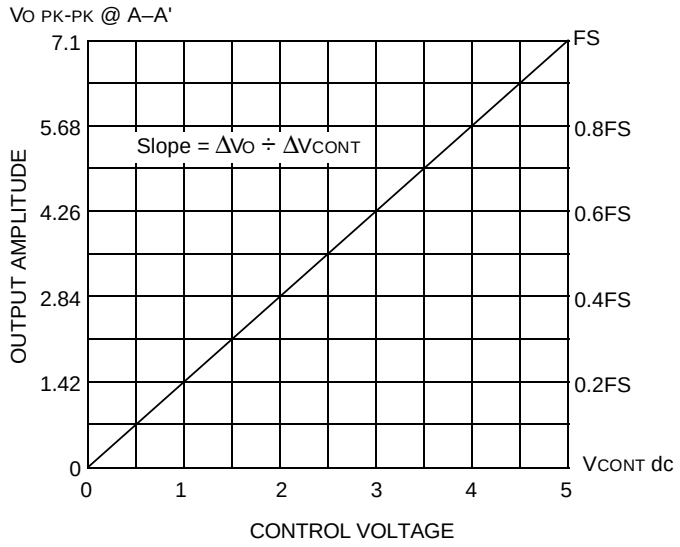
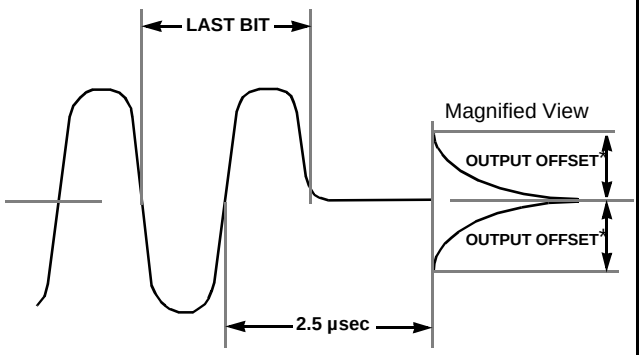
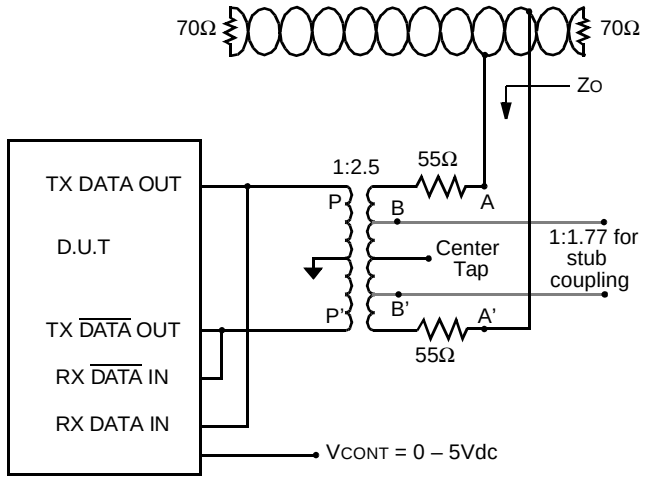


Figure 4 – Transmitter (TX) Output Offset



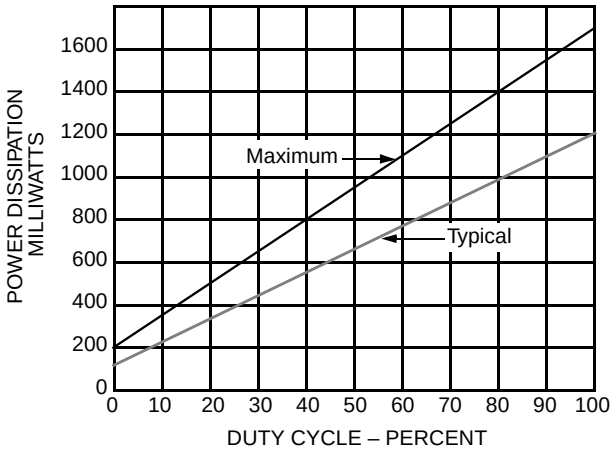
*Offset measured at point A-A' in Figure 5

Figure 5 – Typical Transformer Connection



Transformer:
Use Technitrol 1553-45 or Equivalent

Figure 6 – Power Dissipation vs. Duty Cycle (Total hybrid with one channel transmitting and the other in standby)



Note: Vcc = 5 Volts, V_{bus} (Pt. A-A') at 7.1 Volts P-P

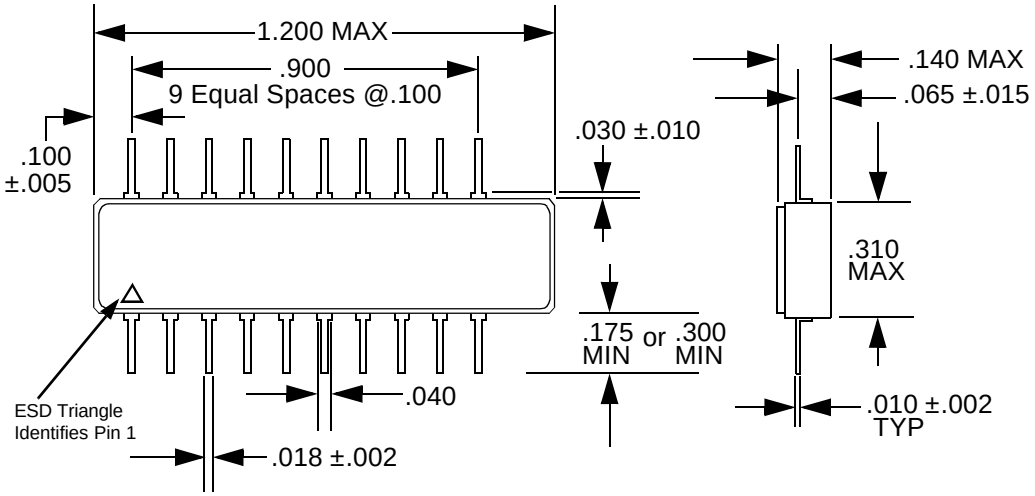
Configurations and Ordering Information

Model No.	DESC No.	Receiver Data level	Case	Specs.	Configuration
ACT4419-D *	Pending	Normally Low	DIP	1553	Dual
ACT4419-DF *	Pending	Normally Low	Flat Package	1553	Dual

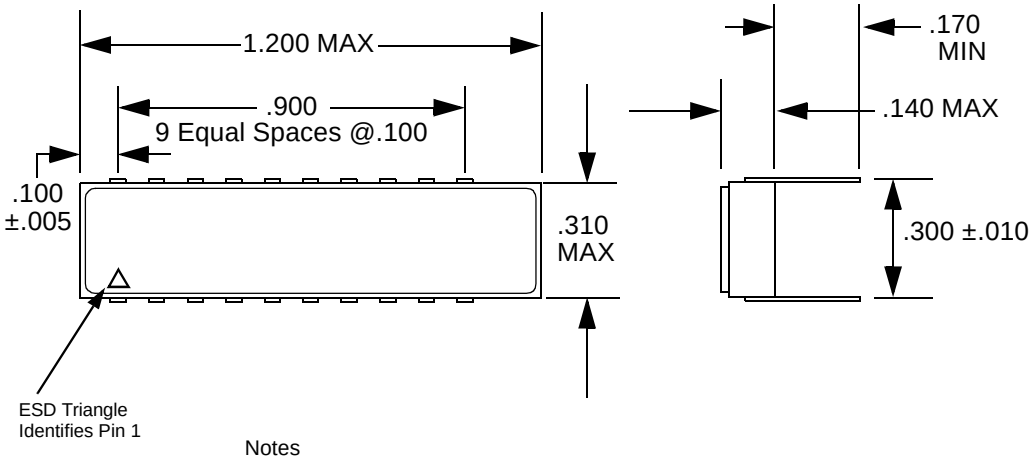
* For 10V Control voltage consult factory.

Package Dimensions and Pin Outs

Flat Package



DIP Package



Notes
1. Dimensions shown are in inches

Pin #'s & Functions	
1	VCONT A & B (0 – 5Vdc)
2	TX/RX A
3	$\overline{\text{TX/RX}}$ A
4	STROBE A
5	GROUND A
6	+5Vdc A & B
7	TX/RX B
8	$\overline{\text{TX/RX}}$ B
9	STROBE B
10	GROUND B
11	RX $\overline{\text{DATA}}$ OUT B
12	RX DATA OUT B
13	TX INHIBIT B
14	TX DATA IN B
15	TX $\overline{\text{DATA}}$ IN B
16	RX $\overline{\text{DATA}}$ OUT A
17	RX DATA OUT A
18	TX INHIBIT A
19	TX DATA IN A
20	TX $\overline{\text{DATA}}$ IN A

Specifications subject to change without notice.

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