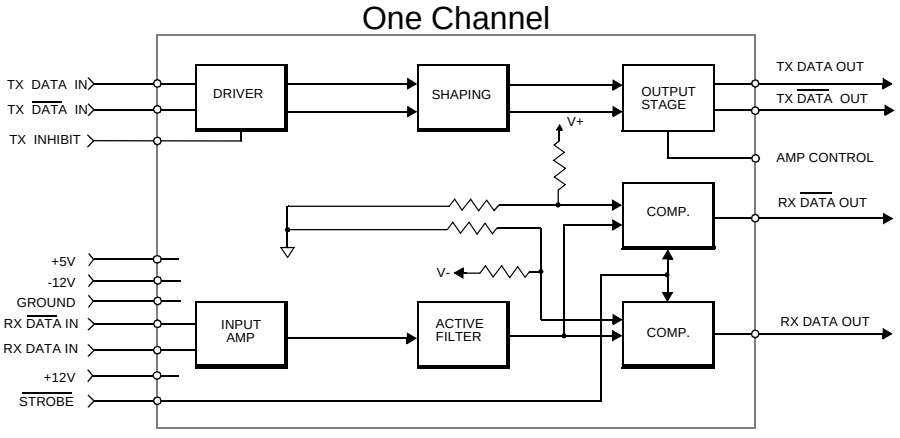
ACT4418 Molded Dual Variable Amplitude Transceivers for MACAIR A3818, A5690, A5232, A4905 & MIL-STD-1553

AEROFLEX
CIRCUIT TECHNOLOGY
www.aeroflex.com/act1.htm

Features

- **ACT4418 Dual Transceivers meets MIL-STD-1553A&B, Macair A3818, A4905, A5232 and A5690 Specs**
- **±12 Volt Power Supply Operation**
- **Voltage source output for higher bus drive power**
- **Molded Plug-in package**
- **Monolithic construction using linear ASICs**
- **Variable TX Amplitude**
- **Processed and Screened to Mil-STD-883 Specs for Industrial temperature range**



Block Diagram (without Transformer)

General Description

The Aeroflex Circuit Technology ACT4418D is a new generation monolithic transceivers which provide full compliance with Macair and MIL-STD-1553 data bus requirements while providing variable amplitude control.

The ACT4418D performs the front-end analog function of inputting and outputting data through a transformer to a MIL-STD-1553 or Macair data bus. The ACT4418D can be considered a "Universal" Transceiver in that it is compatible with MIL-STD-1553A, B, Macair A-3818, A-4905, A-5232 and A-5690.

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. The ACT4418D active filter design has additional high frequency roll-off to provide the required Macair low harmonic distortion waveform without increasing the pulse delay characteristics significantly.

Efficient transmitter electrical and thermal design provides low internal power dissipation and heat rise at high and well as low duty cycles.

Variable amplitude is adjusted with 0–10 Vdc on the control pin.

Transmitter:

The Transmitter section accepts bi-phase TTL data at the input and when coupled to the data bus with a 1:1 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 7.5 volts typical P -P at A-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" applied to the "INHIBIT" takes priority over the condition of the data inputs and disables the transmitter. (See Transmitter Logic Waveforms,Figure 1.)

The transmitter utilizes an active filter to suppress harmonics above 1 MHz to meet Macair specifications A-3818, A-4905, A-5232 and A-5690. The transmitter may be safely operated for an indefinite period at 100% duty cycle into a data bus short circuit.

Receiver:

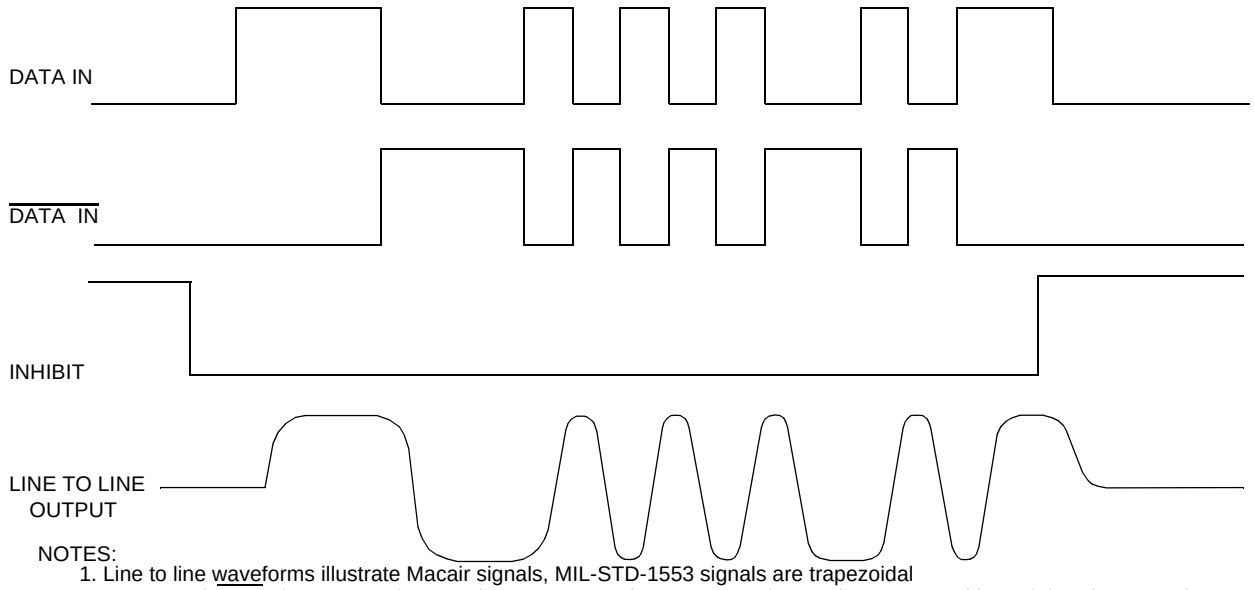
The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are DATA and $\overline{\text{DATA}}$, and represent positive and negative excursions of the input beyond a pre-determined threshold.

(See Receiver Logic Waveforms, Figure 2.)

The internal threshold is nominally set to detect data bus signals exceeding 1.05 Volts P-P and reject signals less than 0.6 volts P-P when used with a 1:1 turns ratio transformer (See Figure 5 for transformer data and typical connection).

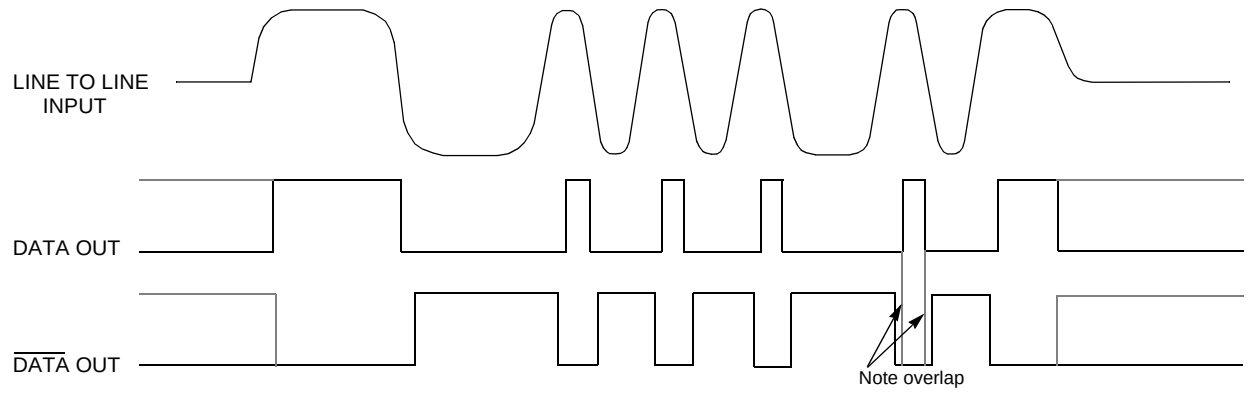
A low level at the Strobe input inhibits the DATA and $\overline{\text{DATA}}$ outputs. If unused, a 2K pull-up to +5 Volts is recommended

Figure 1 Transmitter Logic Waveforms



NOTES:
1. Line to line waveforms illustrate Macair signals, MIL-STD-1553 signals are trapezoidal
2. DATA and $\overline{\text{DATA}}$ inputs must be complementary waveforms or 50% duty cycle average, with no delays between them.
3. DATA and $\overline{\text{DATA}}$ must be in the same state during off time (both high or low).

Figure 2 Receiver Logic Waveforms



NOTE: Waveforms shown are for normally low devices. For normally high receiver output level devices, the receiver outputs are swapped as shown by the dashed lines

Absolute Maximum Ratings

Operating case temperature	-40°C to +85°C	
Storage case temperature	-65°C to +150 °C	
Power supply Voltages	±12 V P.S. to ±15V MAX	+5 V P.S. to +7V MAX
Logic input Voltage	-0.3 V to +5.5 V	
Receiver differential input	±40 V	
Receiver input voltage (common mode)	±10V	
Transmitter peak output current	110 mA	
Total package power dissipation over the full operating case temperature range (100% duty cycle)	1.65 mW	
T_J Maximum	150°C	
Maximum junction to air temperature rise (100 % duty cycle)	60°C	
Maximum Junction-Air thermal resistance for free air	36°C/W	

Electrical Characteristics, Transmitter Section

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}		1.0	40	µA
"0" Input Voltage		V_{IHD}			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	Note 1	t_{DXOFF}		400	500	nS
Delay from TX inhibit, (1→0) to active output	Note 1	t_{DXON}		400	500	nS
Differential output noise, inhibit mode		V_{NOI}		0.8	10	mV p-p
Differential output impedance (inhibited)	Note 2	Z_{OI}	2K			Ω

Output Characteristics

Differential output level at point B–B' Fig 5, Vcont = 10 Vdc, See Fig 3 for control voltage versus output level	R_L = 140 Ω	V_O	28	30	36	V p-p
Rise and fall times (10% to 90% of p-p output)		t_r	200	250	300	nS
Output offset at point A-A'on Fig 5, 2.5 µS after midpoint crossing of the parity bit of the last word of a 660 µS message	R_L = 35 Ω	V_{OS}			±90	mV peak
Delay from 50% point of TX DATA or TX $\overline{\text{DATA}}$ input to zero crossing of differential signal. (note 1.)		t_{DTX}		330	450	nS

Electrical Characteristics, Receiver Section

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Input Voltage Range		V_{IDR}			40	V p-p
Input Common Mode Voltage Range	Note 1	V_{ICR}	10			V p-p
Common Mode Rejection Ratio Note 3	Note 1	CMRR	40			dB

Strobe Characteristics (Logic "O" inhibits output)

"0" Input Current	V_S=0.4 V	I_{IL}		-0.2	-0.4	mA
"1" Input Current	V_S=2.7V	I_{IH}		-1.0	+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}			150	nS

Threshold Characteristics (Sinewave input)

Internal Threshold Voltage (referred to the bus)	100KHz-1 MHz	V_{TH}	0.60	0.8	1.05	V_{P-P}

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

"1" State	I_{OH} = -0.4 mA	V_{OH}	2.5	3.6		V
"0" State	I_{OL} = 4 mA	V_{OL}		0.35	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}		300	450	nS

Power Data

Power Supply Currents (Typical) – Per Channel – See Figure 4 (Power supplies set at +12V, -12V, +5V)

Duty Cycle		+V	-V	5V
Transmitter Standby		30mA	50mA	25mA
25% duty cycle	Note 1	50mA	70mA	
50% duty cycle		75mA	95mA	
100% duty cycle	Note 1	120mA	140mA	

Note: Typical currents for V_{O} AT 140Ω = 30V_{P-P}

Recommended Power Supply Voltage Range

+V	+11.4 Volts to +12.6 Volts
-V	-11.4 Volts to -12.6 Volts
Logic	+4.5 Volts to + 5.5 Volts

Figure 3 Transmitter (TX) Output Amplitude vs Control Voltage

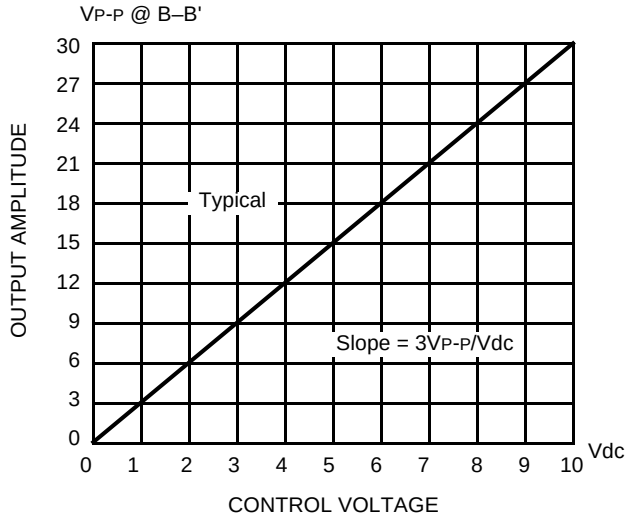
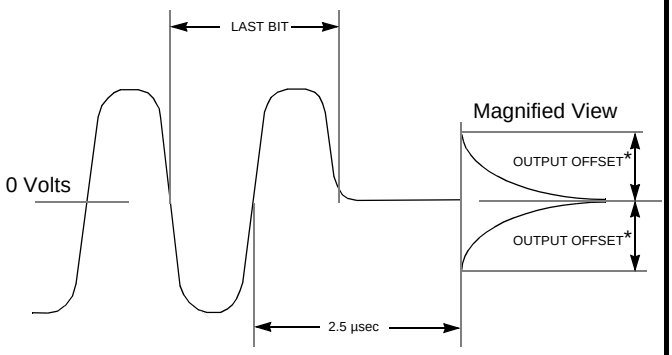
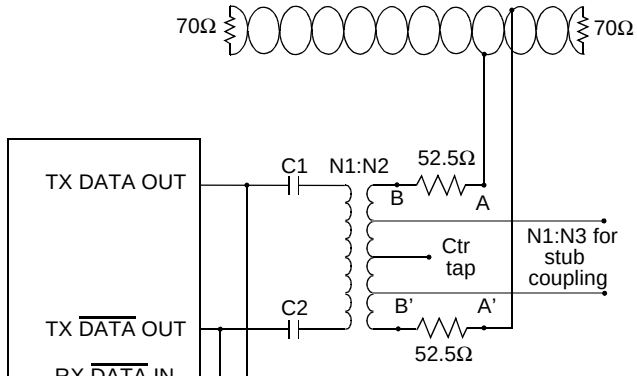


Figure 4 Transmitter (TX) Output offset



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

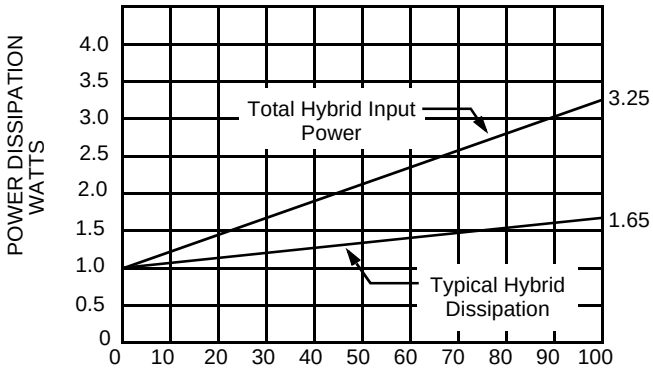
Figure 5 Typical Transformer Connection (Total hybrid with one channel transmitting and the other not powered – 100% Duty Cycle)



C1 & C2 are ≥ 0.47µF, BX Ceramic Capacitors.

Transformer turns ratios:
N1:N2 = 1:1
N1:N3 = 1:0.707
Use Aeroflex 25T1553-1

Figure 6 Typical Hybrid Power Dissipation vs Duty Cycle (Total with one channel transmitting and the other not powered)



For VOP-P = 30 V at 140Ω

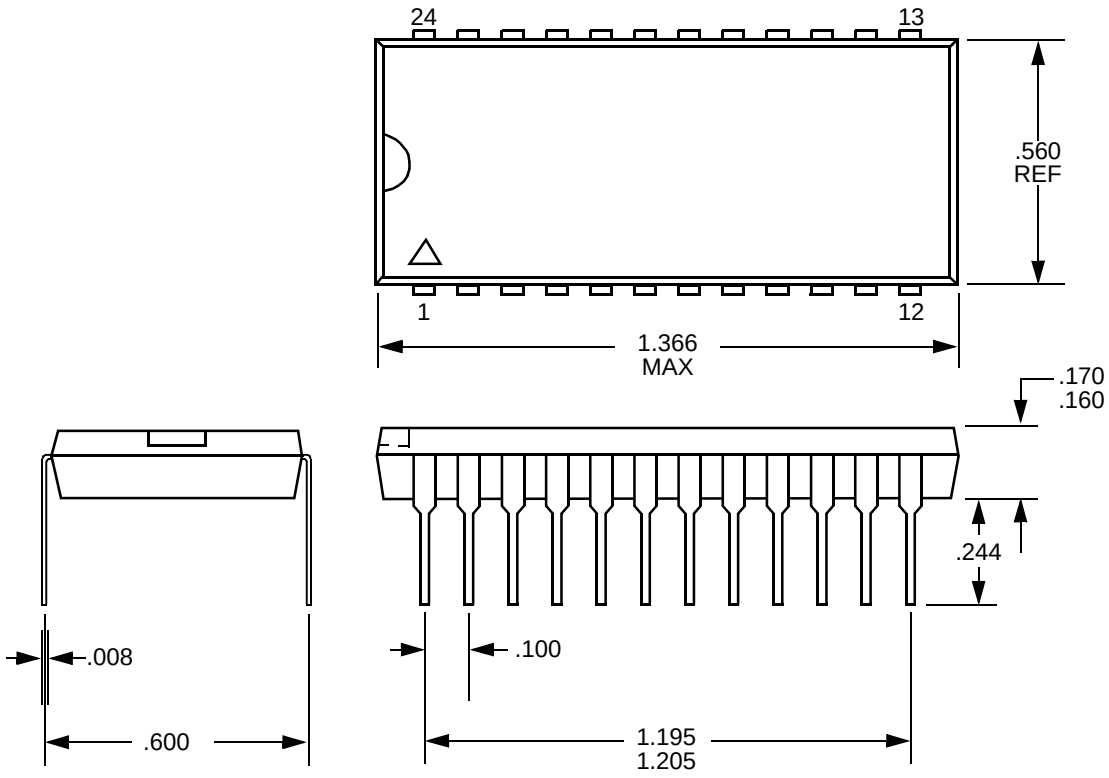
NOTES

1. Characteristics guaranteed by design, not production tested.
2. Power on or off, measured from 75KHz to 1MHz at point A-A' and transformer self impedance of 3KΩ minimum at 1 MHz.
3. Specifications apply over the temperature range of -40°C to +85°C (Case Temperature) unless otherwise noted.
4. All typical values are measured at +25°C.

Figure 6 – Lead Numbers & Functions

ACT4418D		
Pin #	**Function**	**Channel**
1	Tx INHIBIT	A
2	Tx DATA IN	A
3	Tx $\overline{\text{DATA}}$ IN	A
4	STROBE	A
5	CONTROL VOLTAGE	A
6	+5v	
7	Rx $\overline{\text{DATA}}$ OUT	B
8	Rx DATA OUT	B
9	TxRx $\overline{\text{DATA}}$ OUT	B
10	TxRx DATA OUT	B
11	V_{EE}	B
12	V_{CC}	B
13	Tx INHIBIT	B
14	Tx DATA IN	B
15	Tx $\overline{\text{DATA}}$ IN	B
16	STROBE	B
17	CONTROL VOLTAGE	B
18	GROUND	
19	Rx $\overline{\text{DATA}}$ OUT	A
20	Rx DATA OUT	A
21	TxRx $\overline{\text{DATA}}$ OUT	A
22	TxRx DATA OUT	A
23	V_{EE}	A
24	V_{CC}	A

Package Outline



Ordering Information

Model No.	Receiver Data level	Case	Specs.
ACT4418D	Normally Low	24 Pin Plug In	1553 & Macair

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