Standard Products
ACT4489 Single Transceiver
for MIL-STD-1553A/B, MIL-STD-1760 & SAE-AS15531

www.aeroflex.com/Avionics

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FEATURES

❑ Small size, light weight and low power dissipation single transceiver

❑ Bipolar supply ±12V, logic supply +5V

❑ Outstanding MIL-STD-1553/SAE-AS15531 performance

❑ Monolithic construction

❑ Input and output TTL compatible design

❑ Designed for commercial, industrial and aerospace applications

❑ MIL-PRF-38534 compliant devices available

❑ Aeroflex-Plainview is a Class H & K MIL-PRF-38534 manufacturer

DESCRIPTION

The Aeroflex-Plainview ACT4489 is the next generation monolithic transceiver design which provides full compliance with MIL-STD-1553A/B, MIL-STD-1760 and meets SAE-AS15531 requirements in a small package with low power consumption. The series performs the front-end analog function of inputting and outputting data through a transformer to the 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.
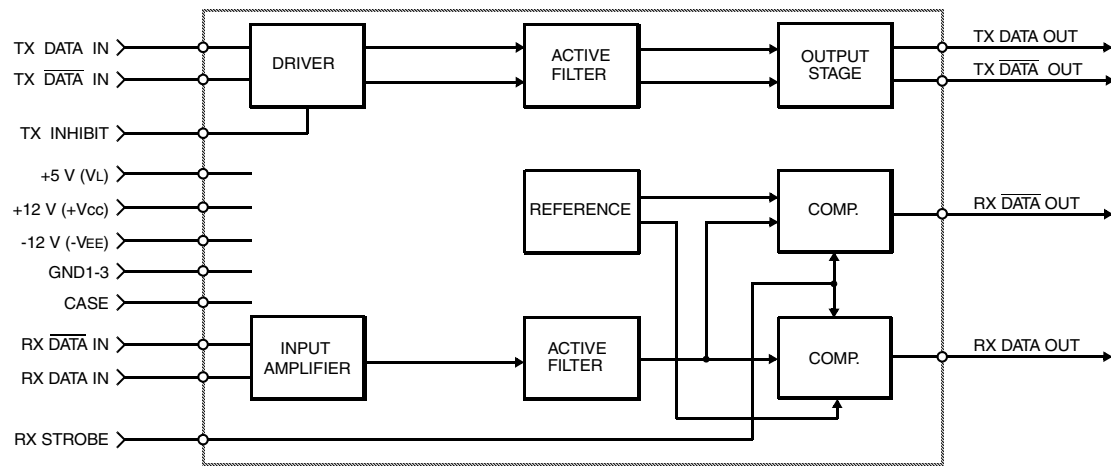
TRANSMITTER

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 7.0 VP-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" applied to the "INHIBIT" takes priority over the condition of the data inputs and disables the transmitter (See Figure 1 Transmitter Logic Waveform). The Transmitter may be safely operated for an indefinite period with the bus (Point A) short circuited at 100% duty cycle.
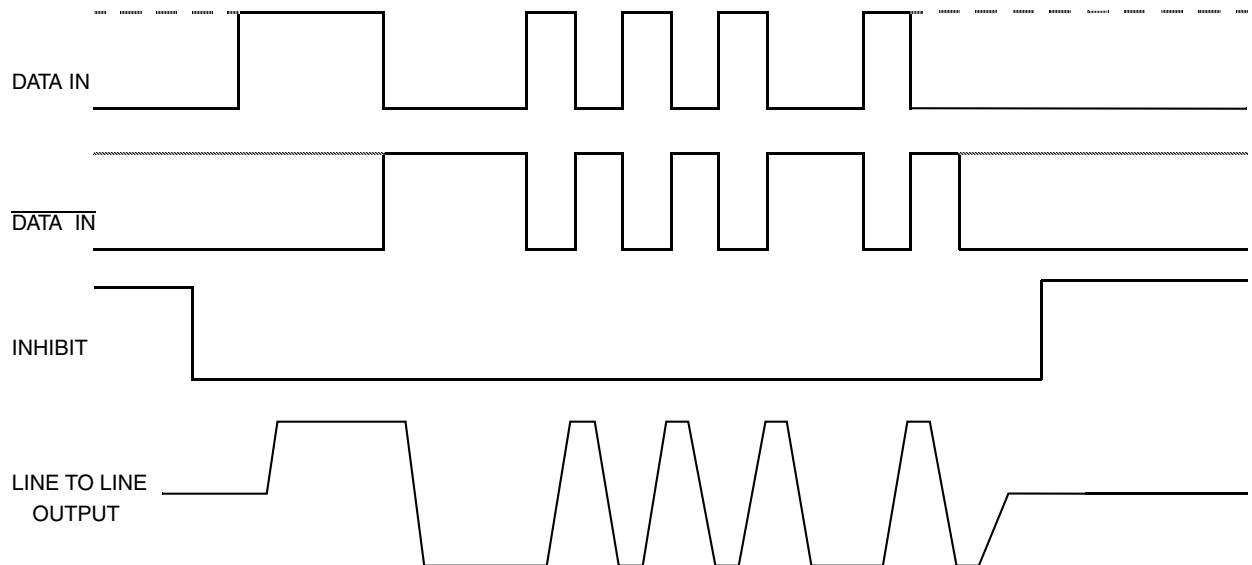
RECEIVER

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 Figure 2 Receiver Logic Waveform).

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

A low level at the RX STROBE IN input inhibits the DATA and $\overline{\text{DATA}}$ outputs.

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).

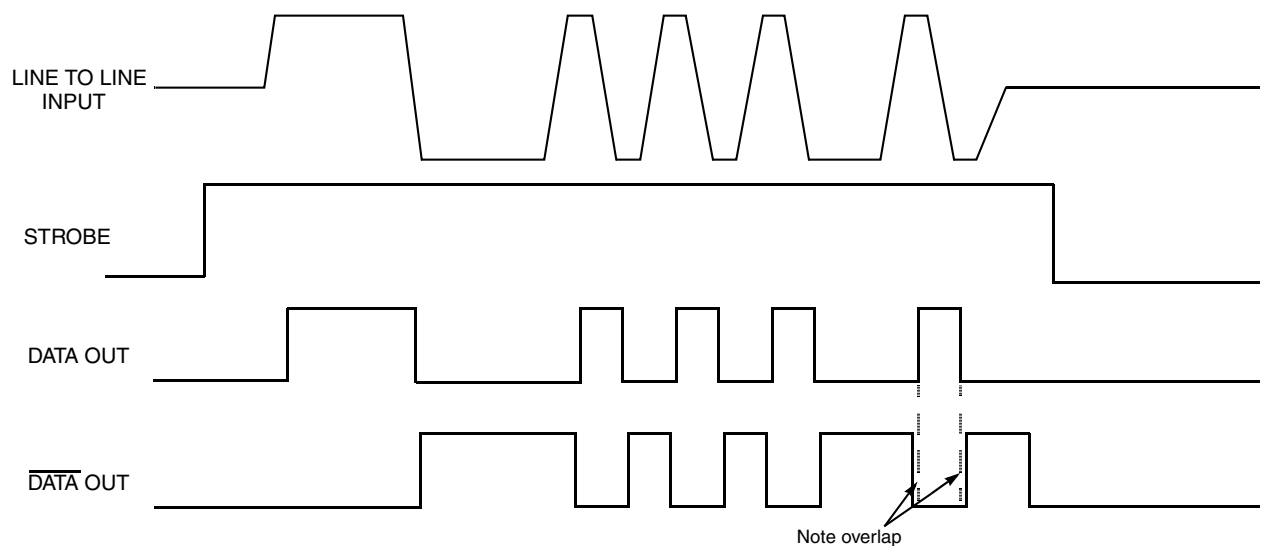**FIGURE 1 – TRANSMITTER LOGIC WAVEFORMS IDEALIZED**

Note overlap

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 voltage V_{CC} V_{EE} V_L	-0.3 V_{DC} to +18 V_{DC} +0.3 V_{DC} to -18 V_{DC} -0.3 V_{DC} to +7.0 V_{DC}
Logic input voltage	-0.3V_{DC} to +5.5V_{DC}
Receiver differential input	±40 Vp-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
Maximum junction to case temperature	10°C
Thermal resistance – Junction to case	4°C/W

ELECTRICAL CHARACTERISTICS – DRIVER SECTION (Note 2)

INPUT CHARACTERISTICS, TX DATA IN OR TX $\overline{\text{DATA IN}}$

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
"0" Input Current	V_{IN} = 0.4V	I_{ILD}	-	-0.1	-0.2	mA
"1" Input Current	V_{IN} = 2.7V	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}	-	-0.1	-0.2	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}	-	175	225	nS
Delay from TX inhibit, (1→0) to active output		t_{DXON}	-	90	150	nS
Differential Output Noise, inhibit mode		V_{NOI}	-	2	10	mVP-P
Differential Output Impedance (inhibited) Note 1 See Figure 5	Point B	Z_{OI}	2K	-	-	Ω
	Point C	Z_{OI}	1K	-	-	Ω

OUTPUT CHARACTERISTICS

Differential output level	Figure 5 Point A	V_O	6	7	9	VP-P
Rise and fall times (10% to 90% of p-p output)		t_R & t_F	100	160	300	nS
Output offset. See Figure 3. 2.5 µS after midpoint crossing of the parity bit of the last word of a 660µS message.		V_{OS}	-	-	±90	mVpeak
Delay from 50% point of TX DATA or $\overline{\text{TX DATA}}$ input to zero crossing of differential signal		t_{DTX}	-	100	200	nS

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ELECTRICAL CHARACTERISTICS – RECEIVER SECTION (Note 2)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Differential Voltage Range (See Figure 5, Point B)	TXFMR 1:1	V_{IDR}	-	-	40	V_{PK}
Common Mode Rejection Ratio (Note 3)		CMRR	45	-	-	dB
"1" State – Rx Data or Rx $\overline{Data}$ Output	I_{OH} = -0.4 mA	V_{OH}	2.5	3.7	-	V
"0" State – Rx Data or Rx $\overline{Data}$ Output	I_{OI} = 4 mA	V_{OL}	-	0.35	0.5	V
Delay (average) from Differential Input Zero Crossings to RX DATA and RX $\overline{DATA}$ Output 50% points		t_{DRX}	-	270	400	nS
Input Threshold Voltage (referred to the bus)	100KHz–1MHz	V_{TH}	0.60	0.75	1.20	V_{P-P}

STROBE CHARACTERISTICS (LOGIC "0" INHIBITS OUTPUT)

"0" Input Current	V_S = 0.4V	I_{IL}	-	-0.1	-0.2	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 or Turn-off)		t_{SD}	-	50	100	nS

POWER DATA (Note 2)

POWER SUPPLY CURRENTS – PER CHANNEL – SEE FIGURE 4

Transmitter Standby	Note 4	I_{CC} I_{EE} I_L	- - -	0 12 18	1 16 30	mA
25% Duty Cycle		I_{CC} I_{EE} I_L	- - -	58 12 18	63 20 30	
50% Duty Cycle		I_{CC} I_{EE} I_L	- - -	115 12 18	125 20 30	
100% Duty Cycle		I_{CC} I_{EE} I_L	- - -	230 12 18	250 20 30	

POWER SUPPLY VOLTAGE

|						
±12V Operating Power Supply Voltage Range		V_{CC} V_{EE}	+11.40 -11.40	+12.00 -12.00	+12.60 -12.60	V V
+5V Operating Power Supply Voltage Range		V_L	+4.50	+5.00	+5.50	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: +12VDC ±0.60V & +5VDC ±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 ± 10VPK, line to ground, DC to 2MHz
4. Typical power is measured with VBUS at point A = 7.0VP-P
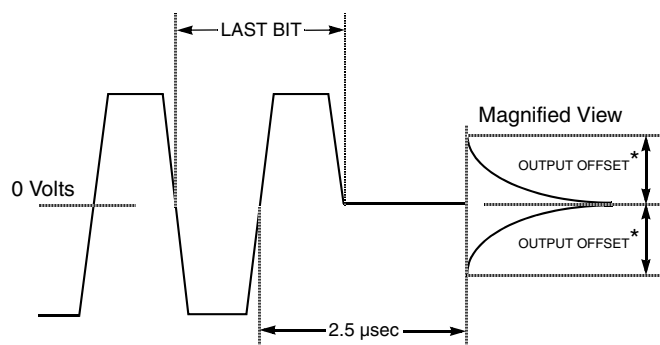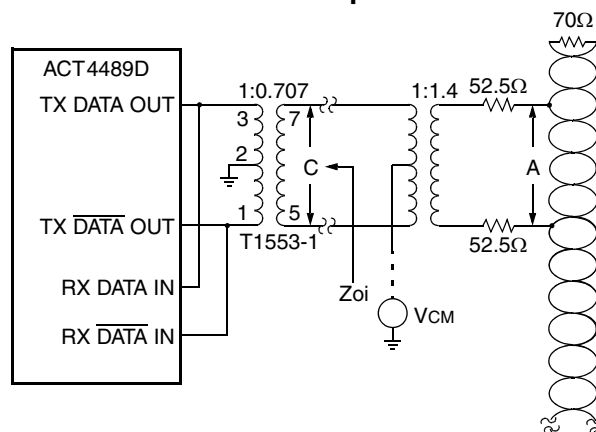
*Offset measured at Point A in Figure 5
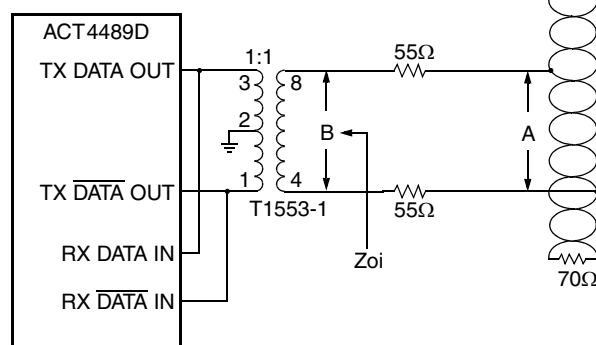
FIGURE 3 – TRANSMITTER (TX) OUTPUT OFFSET
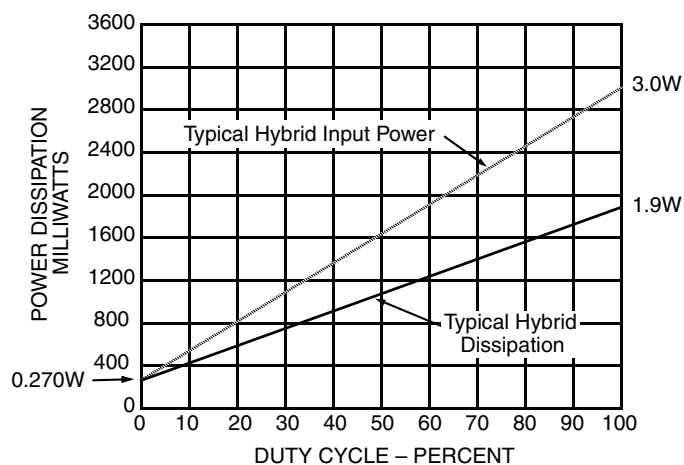
Note: V_{CC} = +12V_{DC}, V_{EE} = -12V_{DC}, V_L = +5V_{DC}, Transformer ratio 1:1, V_{BUS} (Point A) at 7.0V_{P-P}.

FIGURE 4 – POWER DISSIPATION VS. DUTY CYCLE

Transformer Coupled Stub

Direct Coupled Stub

Transformer Model use Technitrol Part# 1553-1 or equivalent

## FIGURE 5 – TYPICAL 1553 BUS CONNECTIONS

PIN NUMBERS & FUNCTIONS

Pin #	Function	Pin #	Function
1	TX DATA OUT	13	V_{CC}
2	TX $\overline{\text{DATA}}$ OUT	14	NC
3	GROUND	15	RX DATA IN
4	NC	16	RX $\overline{\text{DATA}}$ IN
5	NC	17	NC
6	NC	18	CASE
7	RX DATA OUT	19	V_{EE}
8	STROBE	20	V_L
9	GROUND	21	TX INHIBIT
10	RX $\overline{\text{DATA}}$ OUT	22	TX DATA IN
11	NC	23	TX $\overline{\text{DATA}}$ IN
12	NC	24	NC

PACKAGE CONFIGURATION OUTLINES

Plug In Package Outline
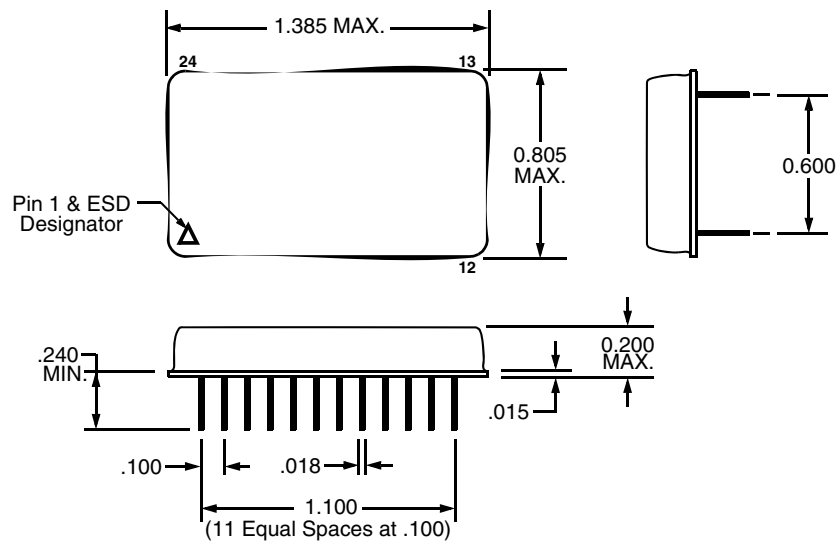
Flat Package Outline
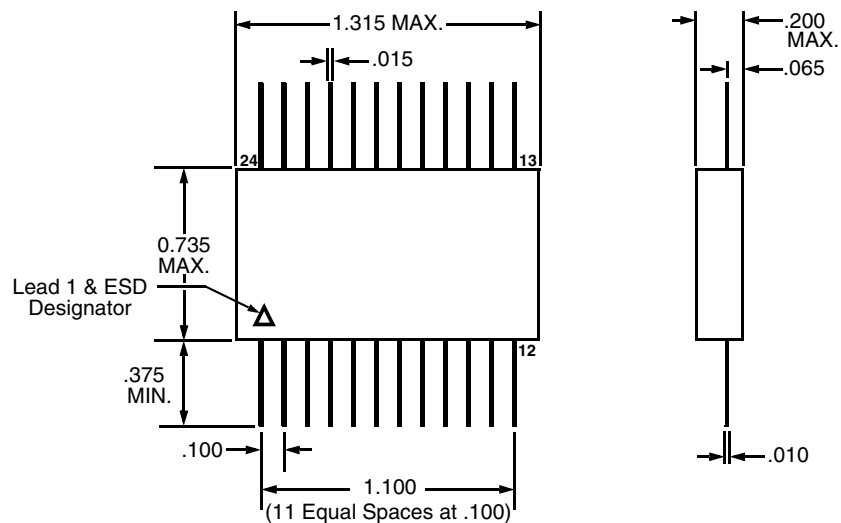
CONFIGURATIONS AND ORDERING INFORMATION

Model No.	Receiver Data level	Case
ACT 4489	Normally Low	Plug In
ACT 4489-I	Normally High	
ACT 4489-F	Normally Low	Flat Package
ACT 4489-FI	Normally High	

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused

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