

# ACT4487 DUAL TRANSCEIVER



For MIL-STD-1553A/B, MIL-STD-1760 &amp; SAE-AS15531

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The most important thing we build is trust

## FEATURES

- Small size, light weight and low power dissipation dual transceiver
- +5V / ±15V DC power supply operation
- 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
- DSCC Standard Microcircuit Drawing (SMD): 5962-87579 & 5962-89447

## GENERAL DESCRIPTION

The Aeroflex-Plainview ACT4487 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 the smallest package with lower pin count for those designs with less board space. 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.

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

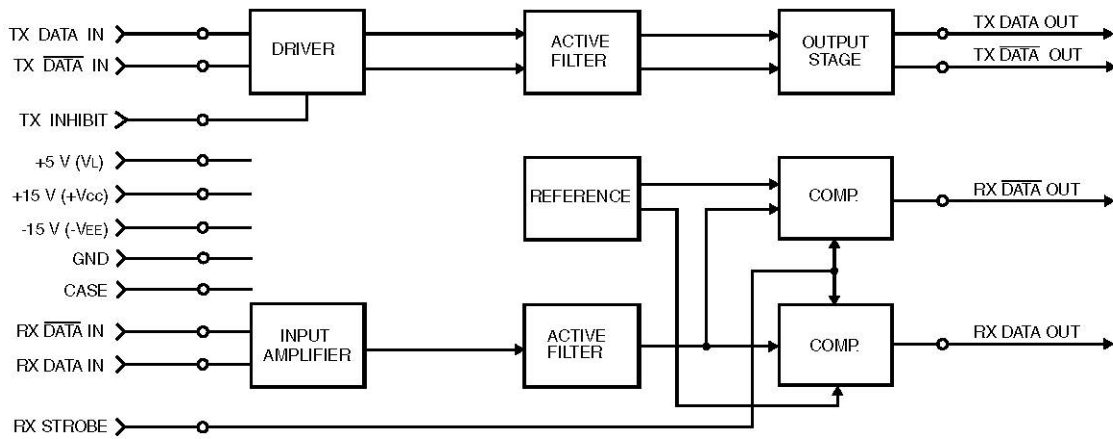
The transmitter section accepts bi-phase TTL data at the input and when coupled to the data bus with a 1.4:1 ratio transformer the data bus signal is typically 7.5 Volts P-P at Point A (See Figure 5). When both DATA and  $\overline{\text{DATA}}$  inputs are held low or high, the transmitter output becomes 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” 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

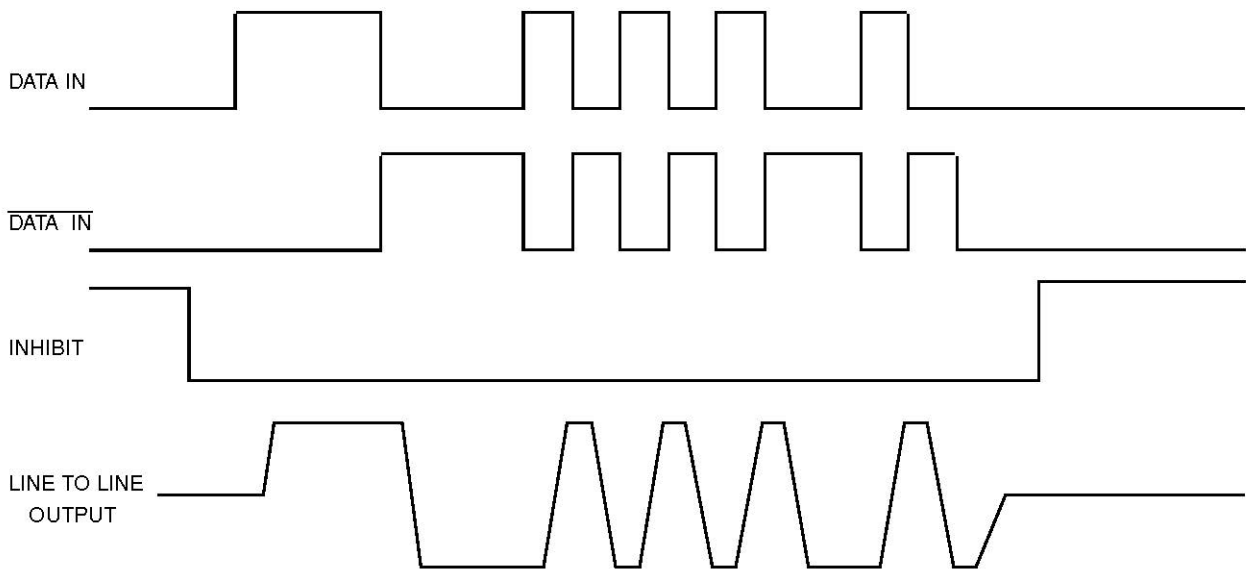
The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are DATA and  $\overline{\text{DATA}}$ , and represent positive and negative excursions of the input beyond a pre-determined threshold (See Figure 2 Receiver Logic Waveform).

The pre-set internal thresholds will detect data bus signals exceeding 1.20 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 connections).

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.

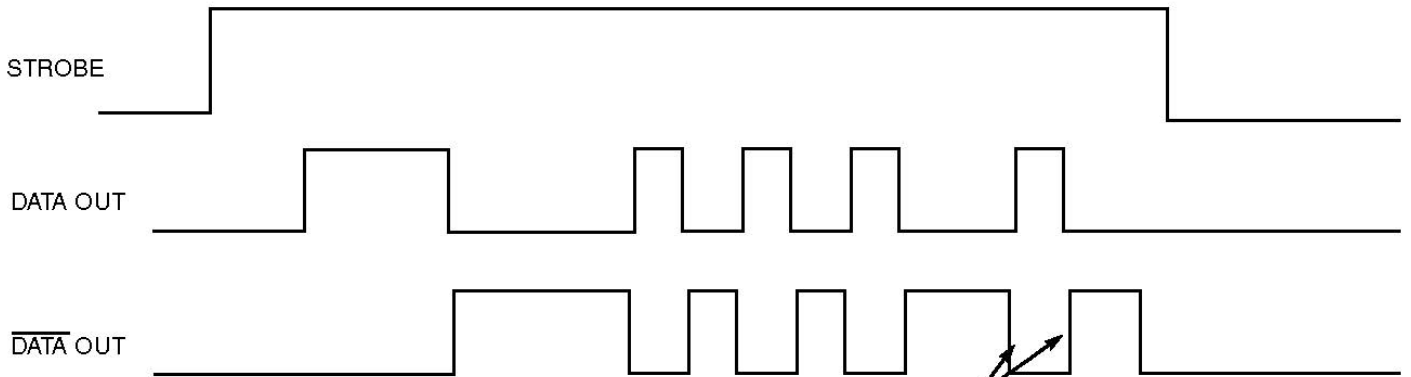


**BLOCK DIAGRAM (WITHOUT TRANSFORMER)**



**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:** Outputs shown are for ACT4487D and are Inverted for the ACT4487DI.

**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 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	-0.3VDC to +5.5VDC
Receiver differential input	±40 Vp-p
Receiver input voltage (common mode)	±10V
Driver peak output current	200 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 INPUT CHARACTERISTICS, TX DATA IN OR TX DATA IN (Notes 2 & 3 Apply)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
"0" Input Current	V <sub>IN</sub> = 0.4V	I <sub>ILD</sub>	-	-0.2	-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		t <sub>DXOFF</sub>	-	175	200	nS
Delay from TX inhibit, (1→0) to active output		t <sub>DXON</sub>	-	90	200	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	7.5	9	Vp-p
Rise and fall times (10% to 90% of p-p output)		t <sub>r</sub>	100	200	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 <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 (See Figure 5, Point B)	TXFMR 1.4:1	$V_{IDR}$	-	14	20	V <sub>pk</sub>
Common Mode Rejection Ratio (Note 3)		CMRR	45	-	-	dB
"1" State – Rx Data or Rx Data Output	$I_{OH} = -0.4 \text{ mA}$	$V_{OH}$	2.5	3.7	-	V
"0" State – Rx Data or Rx Data Output	$I_{OI} = 4 \text{ mA}$	$V_{OL}$	-	0.35	0.5	V
Delay (average) from Differential Input Zero Crossings to RX DATA and RX 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 <sub>p-p</sub>

### 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	$\mu A$
"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 POWER SUPPLY CURRENTS – PER CHANNEL

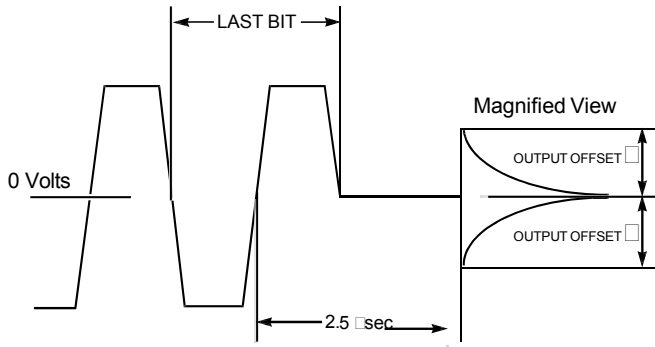
Transmitter Standby	Note 4	$I_{CC}$	-	0	1	mA
		$I_{EE}$	-	12	16	
		$I_L$	-	18	30	
25% Duty Cycle		$I_{CC}$	-	45	50	
		$I_{EE}$	-	12	20	
		$I_L$	-	18	30	
50% Duty Cycle		$I_{CC}$	-	90	100	
		$I_{EE}$	-	12	20	
		$I_L$	-	18	30	
100% Duty Cycle		$I_{CC}$	-	180	200	
		$I_{EE}$	-	12	20	
		$I_L$	-	18	30	

### POWER SUPPLY VOLTAGE

±15V Operating Power Supply Voltage Range	$V_{CC}$	+14.25	+15.00	+15.75	V
	$V_{EE}$	-14.25	-15.00	-15.75	V
+5V Operating Power Supply Voltage Range	$V_L$	+4.50	+5.00	+5.50	V

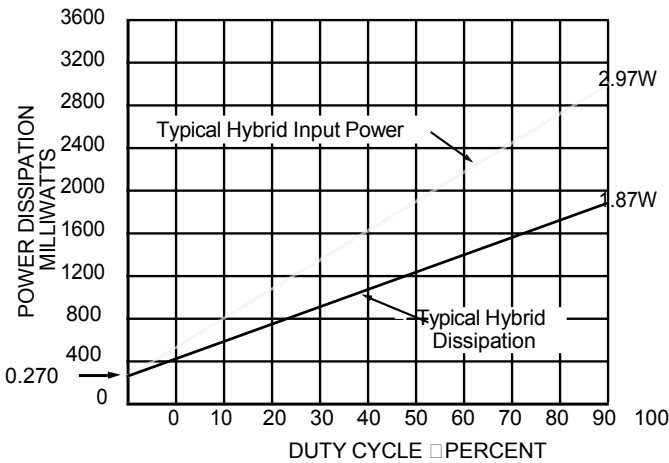
#### NOTES:

- Power on or off, measured from 75KHz to 1MHz at Point A and transformer self impedance of  $3K\Omega$  minimum at 1MHz.
- Power Supplies:  $\pm 15V_{DC} \pm 0.75V$  &  $+5V_{DC} \pm 0.5V$ , bypassed by  $10\mu F$  (Tantalum recommended) Capacitor minimum. All measurements & specifications apply over the temperature range of  $-55^\circ C$  to  $+125^\circ C$  (case temperature) unless otherwise specified.
- When measured as shown in Figure 5 with  $\pm 10V_p$ , line to ground, DC to 2MHz.
- Typical power is measured with  $V_{bus}$  at Point A = 7.5 V<sub>p-p</sub>.



Offset measured at Point A in Figure 5

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

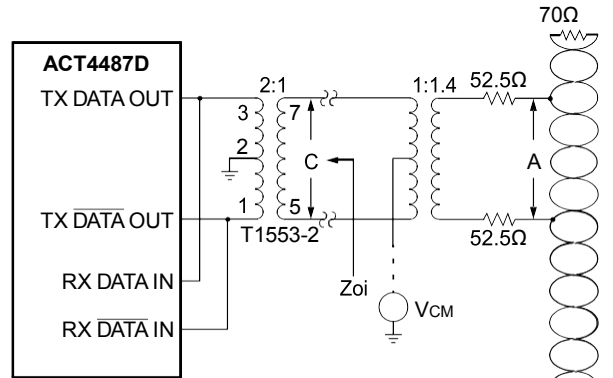


Note:  $V_{CC} = 15V$ ,  $V_{EE} = -15V$ ,  $V_L = 5V$ , Transformer ratio 1.4:1,  $V_{BUS}$  (Point A) at 7.5VP-P.

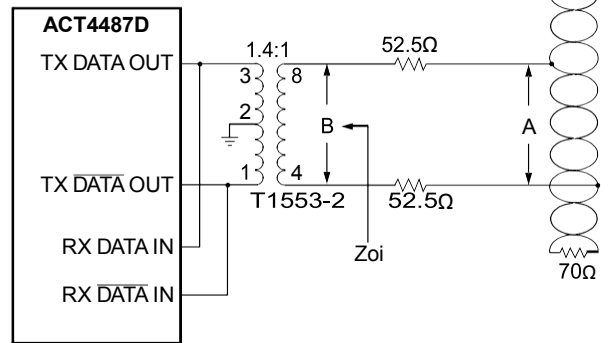
**FIGURE 4 – POWER DISSIPATION VS. DUTY CYCLE**

(Total, hybrid with one channel transmitting and the other not powered – 100% Duty Cycle)

**Transformer Coupled Stub**



**Direct Coupled Stub**

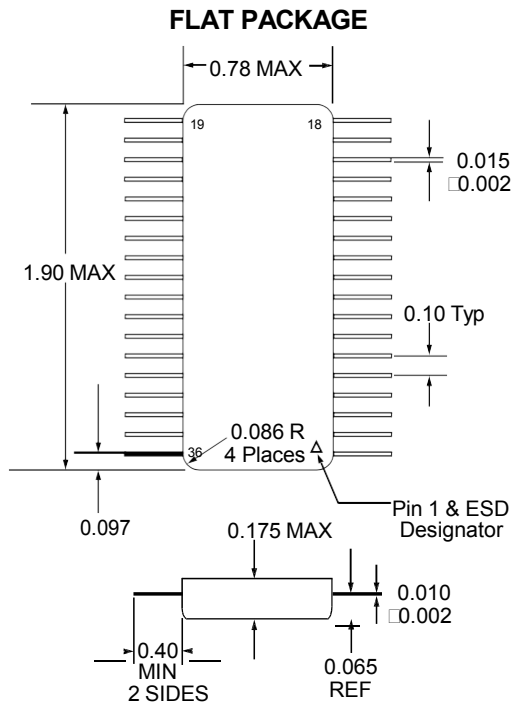
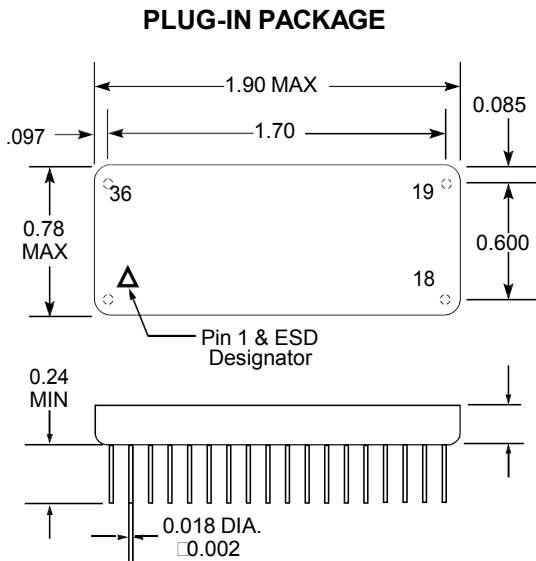


Transformer Model use Technitrol Part# 1553-2 or equivalent

**FIGURE 5 – TYPICAL 1553 BUS CONNECTIONS**

## PACKAGE CONFIGURATION OUTLINE

## PACKAGE PINS & FUNCTIONS



### Notes

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

Pin #	Function	Channel
1	TX DATA OUT	A
2	TX DATA OUT	A
3	GROUND	A
4	NC	
5	RX DATA OUT	A
6	STROBE	A
7	GROUND	A
8	RX DATA OUT	A
9	CASE	
10	TX DATA OUT	B
11	TX DATA OUT	B
12	GROUND	B
13	NC	
14	RX DATA OUT	B
15	STROBE	B
16	GROUND	B
17	RX DATA OUT	B
18	NC	
19	VCC	B
20	RX DATA IN	B
21	RX DATA IN	B
22	GROUND	B
23	VEE	B
24	+5V	B
25	INHIBIT	B
26	TX DATA IN	B
27	TX DATA IN	B
28	VCC	A
29	RX DATA IN	A
30	RX DATA IN	A
31	GROUND	A
32	VEE	A
33	+5 V	A
34	INHIBIT	A
35	TX DATA IN	A
36	TX DATA IN	A

## CONFIGURATIONS AND ORDERING INFORMATION

Model No.	DSCC No.	Receiver Data level	Case	Configuration
ACT 4487-D	5962-8757910X_	Normally Low	Plug In	Dual
ACT 4487-DI	5962-8944708HX_	Normally High		
ACT 4487-DF	5962-8757910Y_	Normally Low	Flat Package	
ACT 4487-DFI	5962-8944708HZ_	Normally High		

## REVISION HISTORY

Date	Rev. #	Change Description	Initials
01/23/2018	E	Update document to Cobham Format, Change Ordering Information from HU to HX	CL



# ***Cobham Semiconductor Solutions – Datasheet Definitions***

*Advanced Datasheet - Product In Development*

*Preliminary Datasheet - Shipping Prototype*

*Released Datasheet - Shipping QML & Reduced Hi – Rel*

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