Standard Products

ACT4480-DFI Dual Transceiver

for H009 Specification

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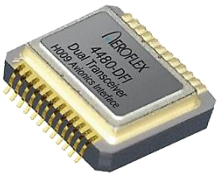


February 27, 2013

FEATURES

- Dual transceiver meets McDonnell Douglas H009 data bus specifications
- Operates with ±12V to ±15 and +5V power supplies
- Monolithic construction using linear ASICs
- Packaging – Low profile ceramic
  - 0.60"W x 0.80"L x 0.14"H
- Designed for commercial, industrial and aerospace applications
- Full MIL-PRF-38534 qualification pending

DESCRIPTION

The Aeroflex Plainview transceiver model ACT4480-DFI is a new generation monolithic transceiver which provides compliance with H009 data bus requirements using three DC power supplies operation. The dual channel ACT4480-DFI performs the front-end analog function of inputting and outputting data through a transformer to a H009 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. The active filter design provides the required H009 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. The receiver input threshold is set internally.

TRANSMITTER

The Transmitter section accepts complementary TTL data at the input, and when coupled to the data bus with a 1:1 transformer, isolated on the transceiver side with two 34 Ohm bus terminating resistors, with the bus terminated by a 175 Ohm resistor, the data bus signal produced is 20V$_{P-P}$ nominal at A-A' (See Figure 5). When both DATA and $\overline{\text{DATA}}$ inputs are held low or high, the transmitter output remains a low impedance and signal is “removed” from the line. In addition, an overriding “INHIBIT" input returns the output to a high impedance state. 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 2).

The transmitter utilizes an active filter to suppress harmonics above 1MHz to meet H009 specifications. 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 3).

The internal threshold is nominally set to detect data bus signals exceeding 2.0V$_{P-P}$ 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 (Pin is internally pulled up).

ABSOLUTE MAXIMUM RATINGS

Operating Case Temperature	-55°C to +125°C	
Storage Case Temperature	-65°C to +150°C	
Power Supply Voltages	± 18V	+ 7V
Logic Input Voltage	-0.3V to +5.5V	
Receiver Differential Input	± 40V	
Receiver Input Voltage (Common Mode)	± 10V	
Driver Peak Output Current	15mA	
Total Package Power Dissipation over the Full Operating Case Temperature Range	3.6 Watts	
Maximum Junction to Case Temperature (100% duty cycle)	18°C	
Junction-Case, Thermal Resistance	5°C / W 1/	

1/ It is recommended this hybrid be heat sunk to lower case temperature so the junction temperature never exceeds 135°C.

ELECTRICAL CHARACTERISTICS – DRIVER SECTION 1/ 2/

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

Parameter	Condition	Symbol	Min	Typ	Max	Unit
"0" Input Current	V_{IN} = 0.4V	I_{ILD}	-	-0.2	-0.4	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}	-	-0.2	-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	500	nS
Delay from TX inhibit, (1→0) to active output	-	t_{DXON}	-	150	400	nS
Differential Output Noise, inhibit mode	-	V_{NOI}	-	2	10	mVp-p
Differential Output Impedance (inhibited)	4/	Z_{OI}	10K	-	-	Ω

OUTPUT CHARACTERISTICS

Differential output level (175Ω)	Point A - A'	V_O	16	20	24	V p-p
Rise and Fall Times (10% to 90% of p-p output)	-	tR & tF	200	260	300	nS
Output Offset, Figure 4 5/	Point A - A'	V_{OS}	-	-	± 260	mV peak
Delay from 50% point of TX DATA or TX $\overline{\text{DATA}}$ input to zero crossing of differential signal 1/	-	t_{DTX}	-	280	400	nS

ELECTRICAL CHARACTERISTICS – RECEIVER SECTION 1/ 2/

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Voltage Range 3/	Point A-A'	V_{IDR}	-	-	20	V_{PEAK}
Common Mode Rejection Ratio 3/	-	C_{MMR}	45	-	-	dB

STROBE CHARACTERISTICS (Logic '0' Inhibits Output) (NOTE: If not used, a 1K pullup to 5V is recommended)

"0" Input Current	V_S = 0.4V	IIL	-	- 0.2	- 0.4	mA
"1" Input Current	V_S = 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)	-	$T_{SD(ON/OFF)}$	-	90	150	nS

THRESHOLD CHARACTERISTICS (Sinewave Input)

Internal Threshold Voltage, Point A-A' Figure 5	1MHz	V_{TH}	1.5	2.0	3.0	V_{P-P}

OUTPUT CHARACTERISTICS, RX DATA AND RX $\overline{\text{DATA}}$

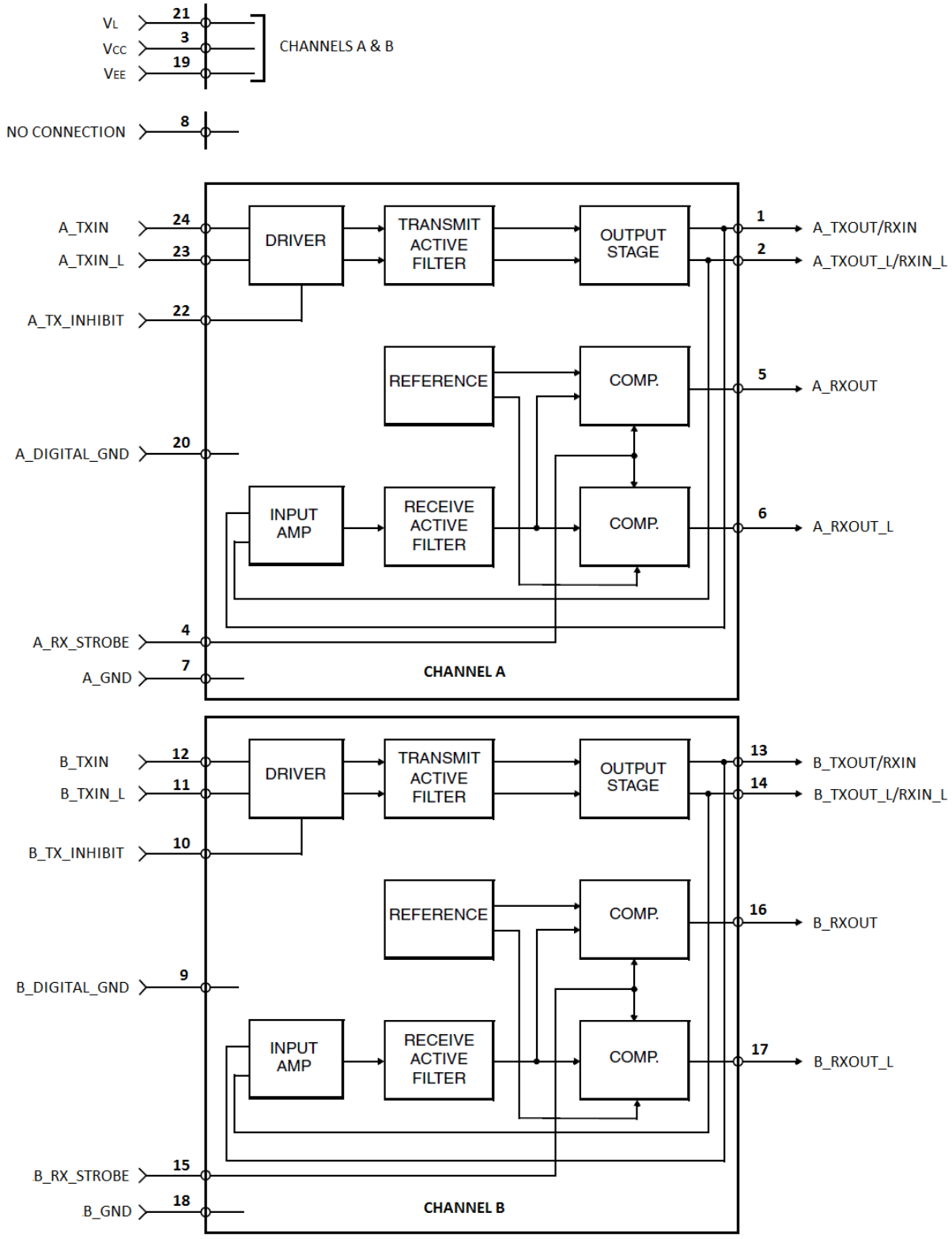
"1" State	I_{OH} = -0.4mA	V_{OH}	2.5	3.6	-	V
"0" State	I_{OL} = 4mA	V_{OL}	-	0.35	0.5	V
Delay, (average) from differential input zero crossings to RX DATA and RX $\overline{\text{DATA}}$ output	6/ 50% points	t_{DRX}	-	300	450	nS

POWER SUPPLY CURRENT

V_{CC} = +12V to +15V, V_{EE} = -12V to -15V, V_L = +5V

Duty Cycle	Condition	Symbol	Typ	Max	Unit
Transmitter Standby	Point A - A' Z_O = 175Ω, V_O = 21V_{P-P} Figure 5	I_{CC} I_{EE} I_L	12 30 32	20 50 40	mA
50%		I_{CC} I_{EE} I_L	52 70 32	66 90 40	
100%		I_{CC} I_{EE} I_L	95 112 32	120 130 40	

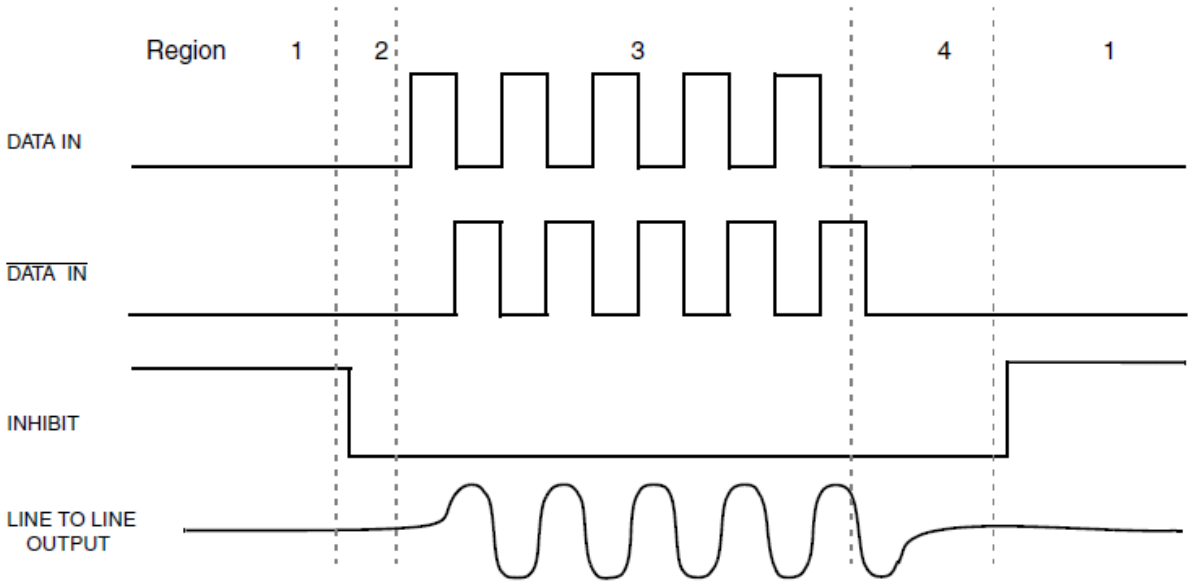
Notes:
1. V_{CC} = +15Volts ± 0.75V, V_{EE} = -15Volts ± 0.75V, V_{IL} = +5 Volts ± 0.5V, T_C = -55°C to +125°C, unless otherwise specified.
2. All typical values are measured at +25°C.
3. Characteristics guaranteed by design, not production tested.
4. Power ON/OFF, measured 1MHz at Point A-A' Figure 4.
5. At point A-A' on Figure 4 or 5, 2.5µS after midpoint crossing of the parity bit of the last word.
6. This test is performed while the Transceiver is reading its own transmission. This condition is called "Wraparound". Standard TTL loads applied to RX DATA Outputs.



BLOCK DIAGRAM
(WITHOUT TRANSFORMER, CHANNEL A SHOWN)
CHANNEL A (CHANNEL B)

DATA	$\overline{\text{DATA}}$	INHIBIT	OUTPUT
X	X	H	High Z
H	H	L	Low Z (No signal)
L	L	L	
H	L	L	Low Z (Signal)
L	H	L	

FIGURE 1 – TX OUTPUT TRUTH TABLE



Notes: 1. Data and $\overline{\text{DATA}}$ inputs must be complementary waveforms or 50% duty cycle average, with no delays between them, and in the same state during the off time (both high and low).
2. **Region 1;** no output signal, High Z state, (Receive Mode), **Region 2;** No Output signal, Low Z state, **Region 3**; Transmitter signal on, low Z (Transmitter mode), **Region 4;** No Output signal, Low Z state, (Terminate Mode).

FIGURE 2 – TRANSMITTER LOGIC WAVEFORMS

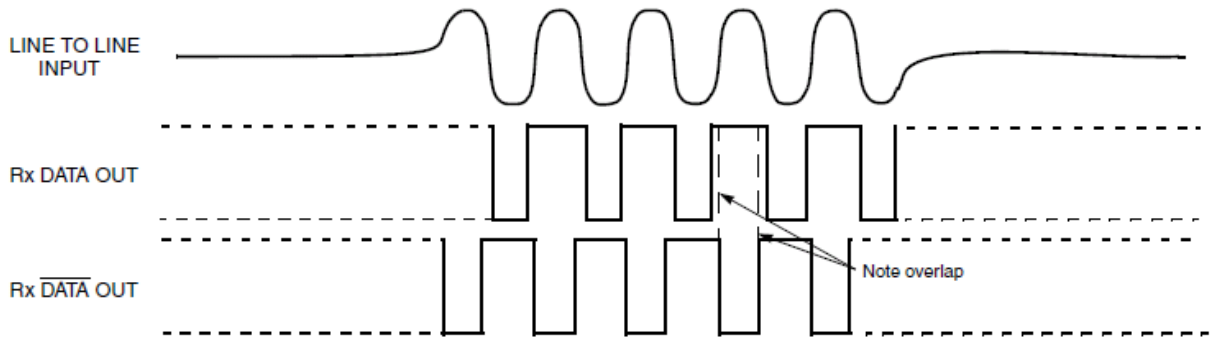
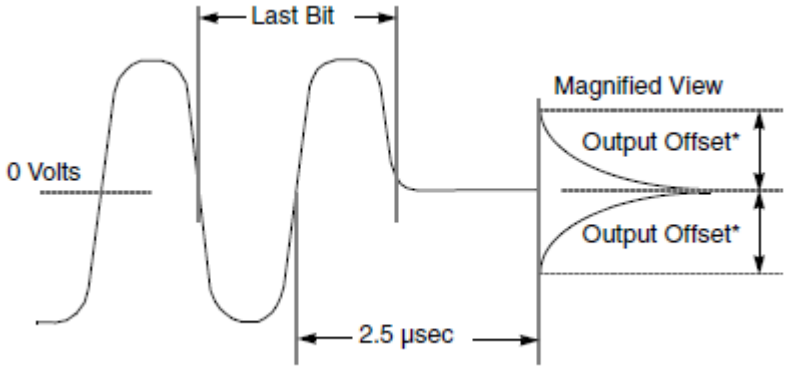
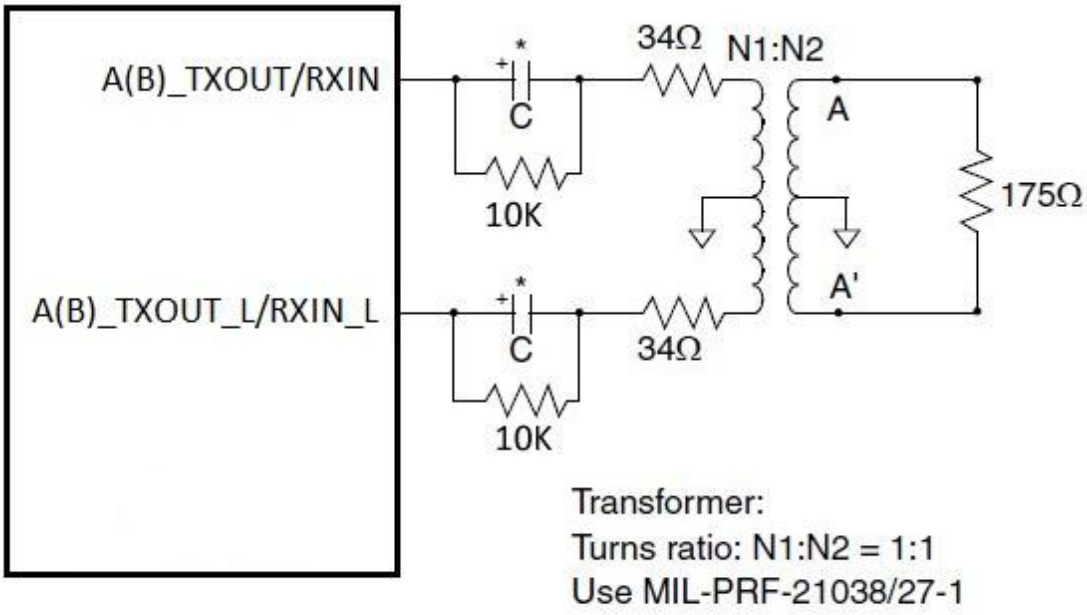


FIGURE 3 – RECEIVER LOGIC WAVEFORMS



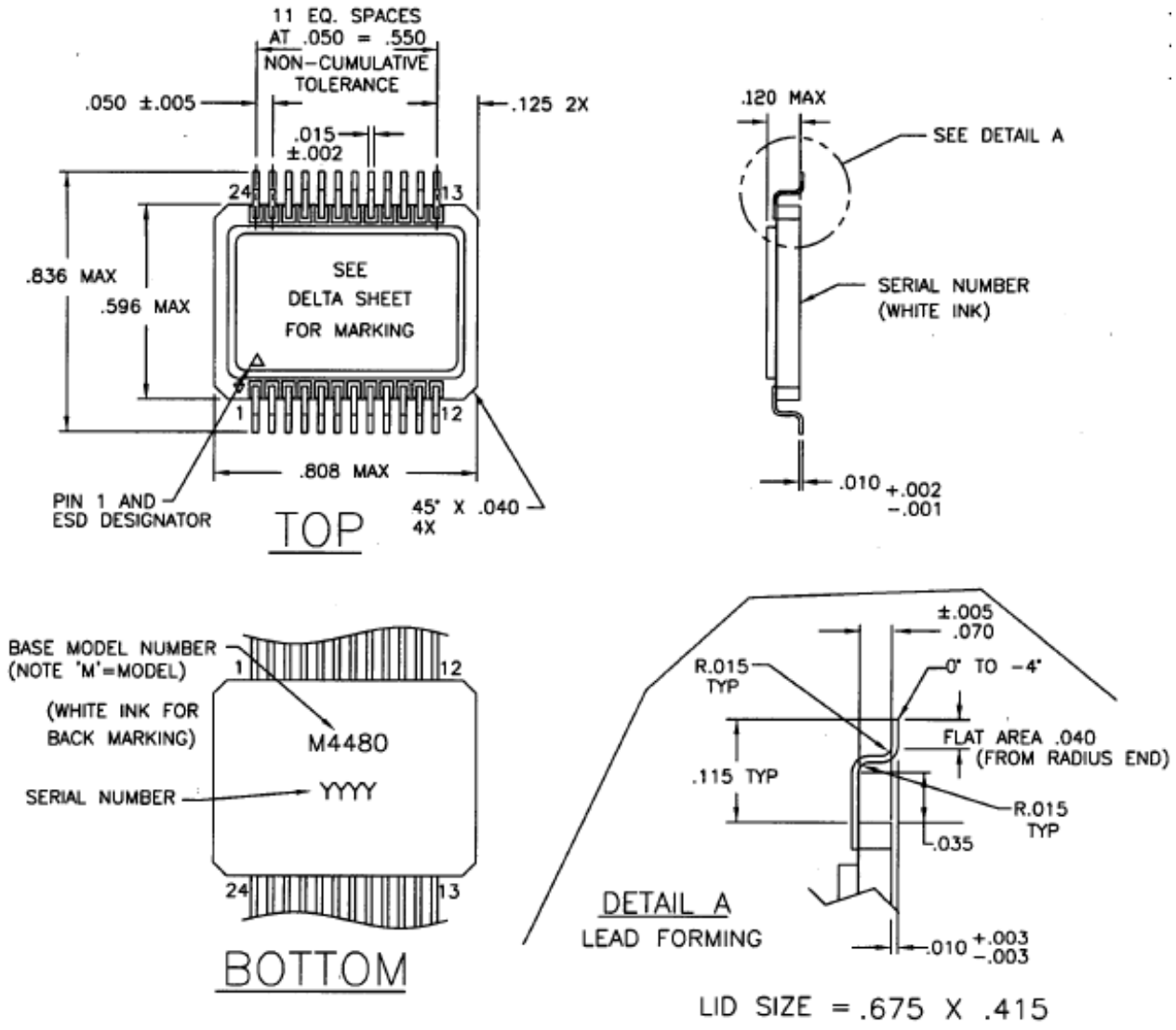
*Offset measured at point A-A' in Figure 5

FIGURE 4 – TRANSMITTER (TX) OUTPUT OFFSET



* External capacitors and resistors are required for each output.
Recommended capacitors: 1µF 50V ceramic or tantalum.
Recommended resistors: 1/4 W minimum

FIGURE 5 – TYPICAL TRANSFORMER CONNECTION



Dimensions shown are in inches.

FIGURE 6 – PACKAGE CONFIGURATION OUTLINE

Pin#	Function	Channel
1	A_TXOUT / RXIN	A
2	A_TXOUT_L / RXIN_L	A
3	VCC	-
4	A_RX_STROBE	A
5	A_RXOUT	A
6	A_RXOUT_L	A
7	A_GND	A
8	NO CONNECTION	-
9	B_DIGITAL_GND	B
10	B_TX_INHIBIT	B
11	B_TX_IN_L	B
12	B_TX_IN	B
13	B_TXOUT/RXIN	B
14	B_TXOUT_L / RXIN_L	B
15	B_RX_STROBE	B
16	B_RXOUT	B
17	B_RXOUT_L	B
18	B_GND	B
19	VEE	-
20	A_DIGITAL_GND	A
21	VL	-
22	A_TX_INHIBIT	A
23	A_TX_IN_L	A
24	A_TX_IN	A

FIGURE 7 - LEAD NUMBERS & FUNCTIONS

ACT4480 Power Dissipation

Total Power Input

The ACT4480-DFI uses ±15 Volt supplies and a +5 Volt supply.

Total Input Power: Channel A transmitting, Channel B in standby

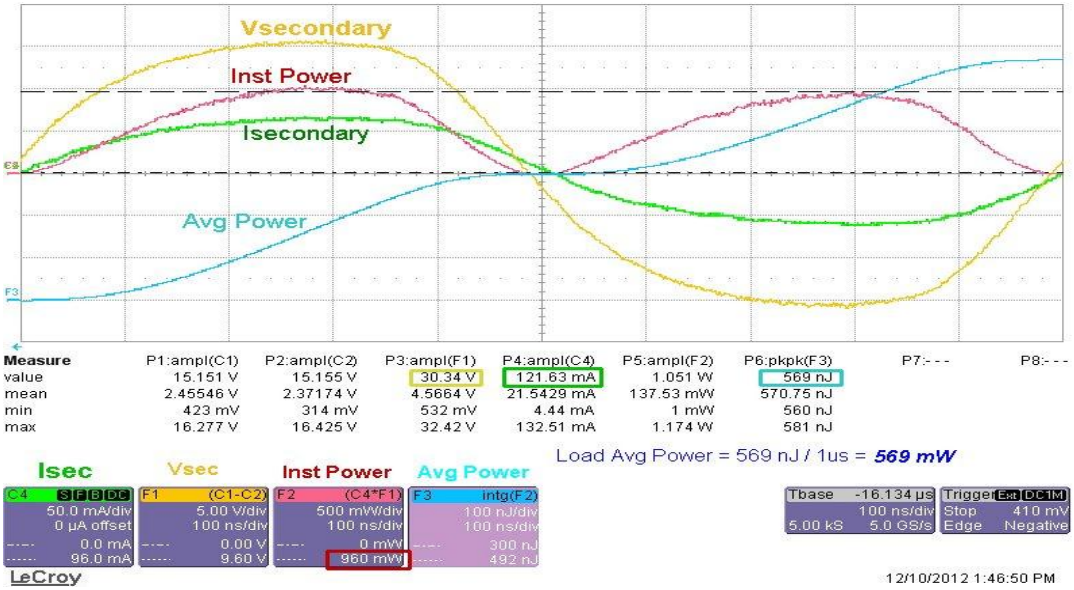
Conditions	Supply Voltages	Supply Current (100% Duty Cycle)	Power
CH_A: Transmitting at 30vpk-pk into a 243Ω load resistance. CH_B: Standby (Receive mode, Transmitter inhibited)	+15 Volts	76mA	1.140 Watts
	-15 Volts	93mA	1.395 Watts
	+5 Volts	33mA	0.165 Watts
	Total Power		2.700 Watts

Total Input Power: Channel A and Channel B in standby

Conditions	Supply Voltages	Supply Current (100% Duty Cycle)	Power
CH_A: Standby (Receive mode, Transmitter inhibited) CH_B: Standby (Receive mode, Transmitter inhibited)	+15 Volts	12mA	0.180 Watts
	-15 Volts	30mA	0.450 Watts
	+5 Volts	31mA	0.155 Watts
	Total Power		0.785 Watts

Load Power (measured)

$V_{SECONDARY}$:	30.0Vpk-pk, line to line, measured across RLoad	
RLoad:	34 + 34 + 175	= 243 Ω
$I_{SECONDARY}$:	15.0Vpk / 243 Ohms	= 61.73mApk
Instantaneous Power:	15.0V * 61.73mA	= 926mWatts (960mW measured)
Average Power		= 569mW
Total Hybrid Power Dissipation:	2.7W – 569mW	= 2.131 Watts
Θjc		= 3.02°C/W (Calculated)
Junction Temperature Rise over Case	CH_A Die Transmitting	= 2.131 x 3.02°C/W = 6.40°C
Junction Temperature Rise over Case	CH_B Die Standby	= 0.785 x 3.02°C/W = 2.37°C



CONFIGURATIONS AND ORDERING INFORMATION

Model No.	Screening	DESC SMD	Receiver Data level	Case
ACT4480-DFI-7	Commercial flow, +25°C testing only	N/A	Normally High	Flat Pack
ACT4480-DFI	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Military Applications.	Pending	Normally High	Flat Pack

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