

Standard Products

ACT4445 Transceiver for MIL-STD-1553 in a Chipscale Package

www.aeroflex.com/Avionics

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Features

- ❑ Transceiver meets MIL-STD-1553A & B
- ❑ Bipolar Supply $\pm 15V$, Logic Supply +5V
- ❑ Replacement for ACT4487
- ❑ Current source output
- ❑ Monolithic construction
- ❑ Designed for commercial, industrial and aerospace applications
- ❑ Miniature Chipscale Package Bumped Chip Carrier™ (BCC++)

Note: BCC++ and Bumped Chip Carrier are Trademarks of Fujitsu Ltd.

DESCRIPTION

The Aeroflex Plainview ACT 4445 is a monolithic transceiver that provides full compliance to MIL-STD-1553A/B requirements in a small package, with low power consumption.

The ACT 4445 series performs the front-end analog function of inputting and outputting data through a transformer to the MIL-STD-1553 data bus.

Design of this transceiver 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

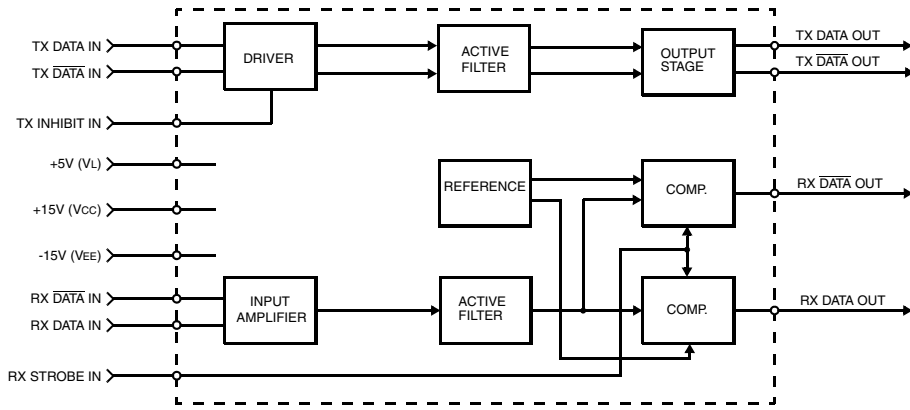
The Transmitter section accepts bi-phase TTL data at the input and when coupled to the data bus with a 1.4:1 transformer the data bus signal produced is 7.5 Volts typical P-P at Point A (See Figure 3 or 4). When both DATA and $\overline{\text{DATA}}$ inputs are held low or high, the transmitter output 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” signal applied to the “INHIBIT” takes priority over the condition of the data inputs and disables the transmitter (See Transmitter Logic Waveform, Figure 1). The Transmitter may be safely operated for an indefinite period with the bus (Point A) short circuited at 100% duty cycle.

RECEIVER

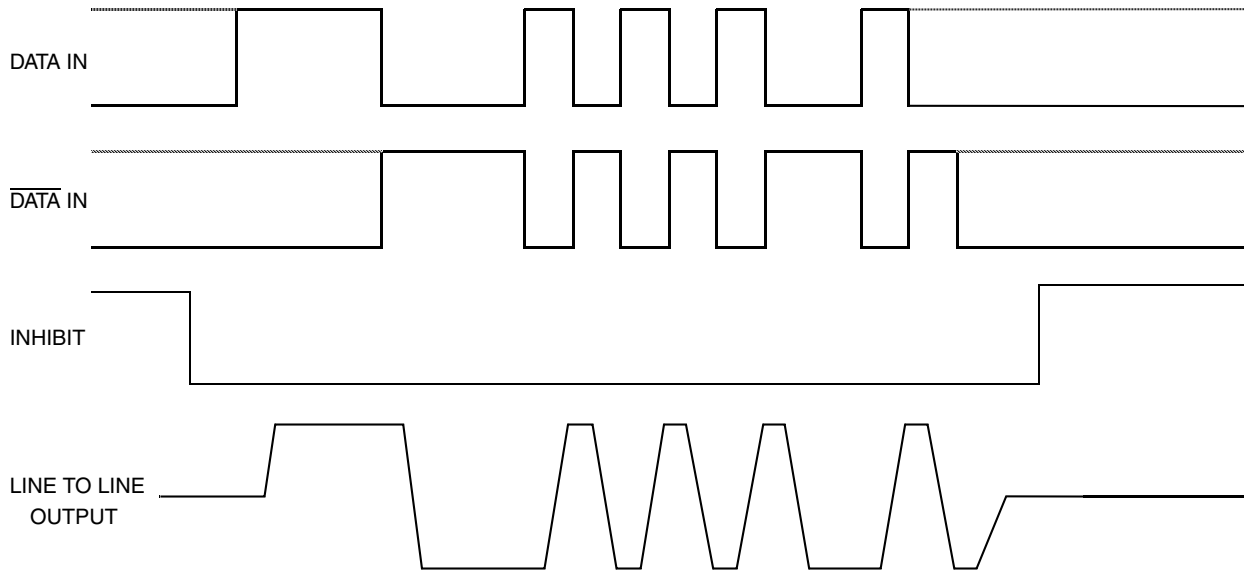
The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are DATA and $\overline{\text{DATA}}$, and represent positive and negative excursions of the input beyond a pre-determined threshold (See Receiver Logic Waveforms - Figure 2).

The pre-set internal thresholds will detect data bus signals, Point A Figure 3 or 4, exceeding 1.20 Volts P-P and reject signals less than 0.6 Volts P-P when used with a transformer (See Figure 3 or 4 for transformer data and typical connection).

A low level at the RX Strobe input inhibits the DATA and $\overline{\text{DATA}}$ outputs. If unused RX Strobe is internally pulled high.

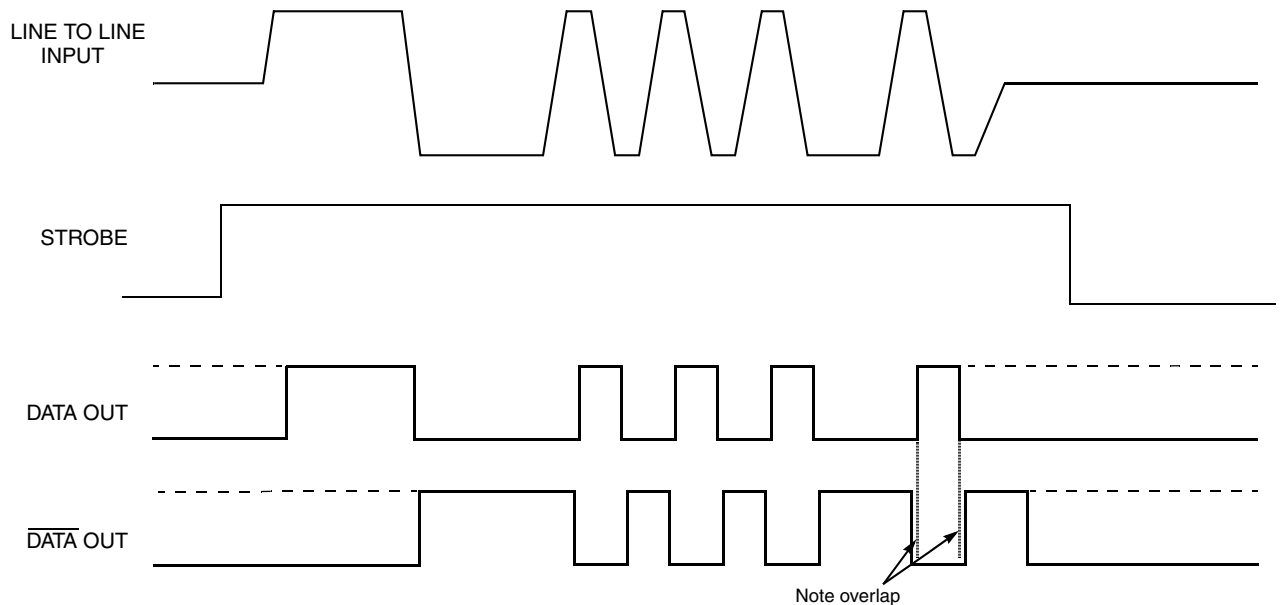


BLOCK DIAGRAM (WITHOUT TRANSFORMER)



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



**FIGURE 2 - RECEIVER LOGIC WAVEFORMS
NORMALLY HIGH OR LOW OUTPUT IN STANDBY (SEE FIGURE 3 OR 4)**

ABSOLUTE MAXIMUM RATINGS

Operating Case Temperature	-40°C to +85°C
Storage Case Temperature	-65°C to +150°C
Power supply voltage VCC VEE VL	-0.3 to +18 VDC +0.3 to -18 VDC -0.3 to +7.0 VDC
Logic Input Voltage	-0.3 V to +5.5 VDC
Receiver Differential Input	±40 V
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
Maximum Junction to Case Temperature	2.5°C
Thermal Resistance – Junction to Case	1°C/W

ELECTRICAL CHARACTERISTICS – DRIVER SECTION 2/ 3/

INPUT CHARACTERISTICS, TX DATA IN OR TX DATA IN

Parameter	Condition	Symbol	Min	Typ	Max	Unit
"0" Input Current	V _{IN} = 0.4 V	I _{ILD}	-	-0.1	-0.2	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} = 0.4 V	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	From mid point inhibit to ±1.2V Point A, See Figure 3 or 4	t _{DXOFF}	-	300	500	nS
Delay from TX inhibit, (1→0) to active output		t _{DXON}	-	300	500	nS
Differential output noise, inhibit mode		V _{NOI}	-	0.8	10	mVP-P
Differential output impedance (inhibited) (Note 1) See Figure 3 or 4.	Point A	Z _{OI}	2K	-	-	Ω

OUTPUT CHARACTERISTICS

Differential output level	Figure 3 or 4 Point A	V _O	6	7.5	9	V _{P-P}
Rise and Fall times (10% to 90% at Point A output)		t _R & t _F	100	160	300	nS
Output offset, Figure 5, 2.5μS after midpoint crossing of the parity bit of the last word of a 660μS message		V _{OS}	-	-	± 90	mV _{PK}
Delay from 50% point of TX DATA or TX DATA input to zero crossing of differential signal		t _{DXT}	-	100	200	nS

ELECTRICAL CHARACTERISTICS – RECEIVER SECTION

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Receiver Input Voltage Range (See Figure 3 or 4, Point A)	TXFMR 1.4:1	V _{IDR}	-	-	40	V _{P-P}
Common Mode Rejection Ratio (Note 3)		CMRR	45	-	-	dB
"1" State – Rx Data or Rx $\overline{\text{Data}}$ Output	I _{OH} = -0.4 mA	V _{OH}	2.5	3.7	-	V
"0" State – Rx Data or Rx $\overline{\text{Data}}$ Output	I _{OI} = 4 mA	V _{OL}	-	0.35	0.5	V
Delay (average) from Differential Input Zero Crossings to RX Data and RX $\overline{\text{DATA}}$ Output 50% Points		t _{DXT}	-	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 = 0.4 V	I _{IL}	-	-0.1	-0.2	mA
"1" Input Current	V _S = 2.7 V	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

POWER SUPPLY CURRENTS – PER CHANNEL – SEE FIGURE 6

Duty Cycle	Condition	Symbol	Typ	Max	Unit
Transmitter Standby		I _{CC}	0	1	mA
		I _{EE}	12	16	
		I _L	18	30	
25%		I _{CC}	45	50	
	I _{EE}	12	20		
	I _L	18	30		
50%	I _{CC}	90	100		
	I _{EE}	12	20		
	I _L	18	30		
100%	I _{CC}	180	200		
	I _{EE}	12	20		
	I _L	18	30		

RECOMMENDED POWER SUPPLY VOLTAGE RANGE

V _{CC}	+14.25 to +15.75 Volts
V _{EE}	-14.25 to -15.75 Volts
V _L	+4.75 to +5.25 Volts

- Notes:
- Power on or off, measured from 75KHz to 1MHz at Point A and transformer self impedance of 3KΩ minimum at 1MHz.
 - Power Supplies: ±15VDC ±0.75VDC & +5VDC ±0.25VDC, bypassed by 10 μF (Tantalum recommended) Capacitor minimum. All measurements & specifications apply over the temperature range of -40°C to +85°C (case temperature) unless otherwise specified.
 - When measured as shown per Figure 3 or 4 with ± 10V_{PK}, line to ground, DC to 2MHz
 - Typical power is measured with V_{BUS} at Point A = 7.5V_{P-P}

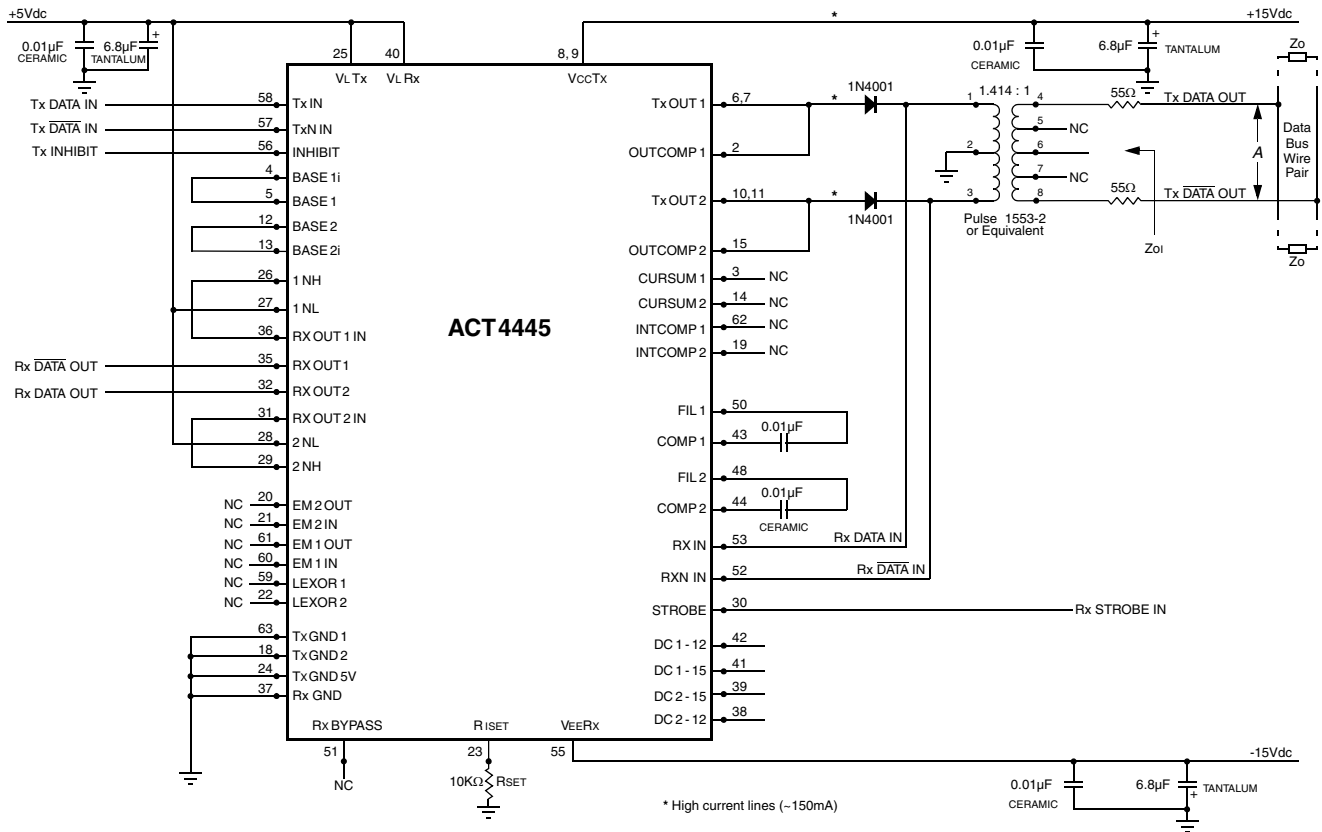


FIGURE 3 – TYPICAL CONNECTIONS – DATABUS INTERFACE, DIRECT COUPLED STUB, NORMALLY HIGH RECEIVER IDLE STATE

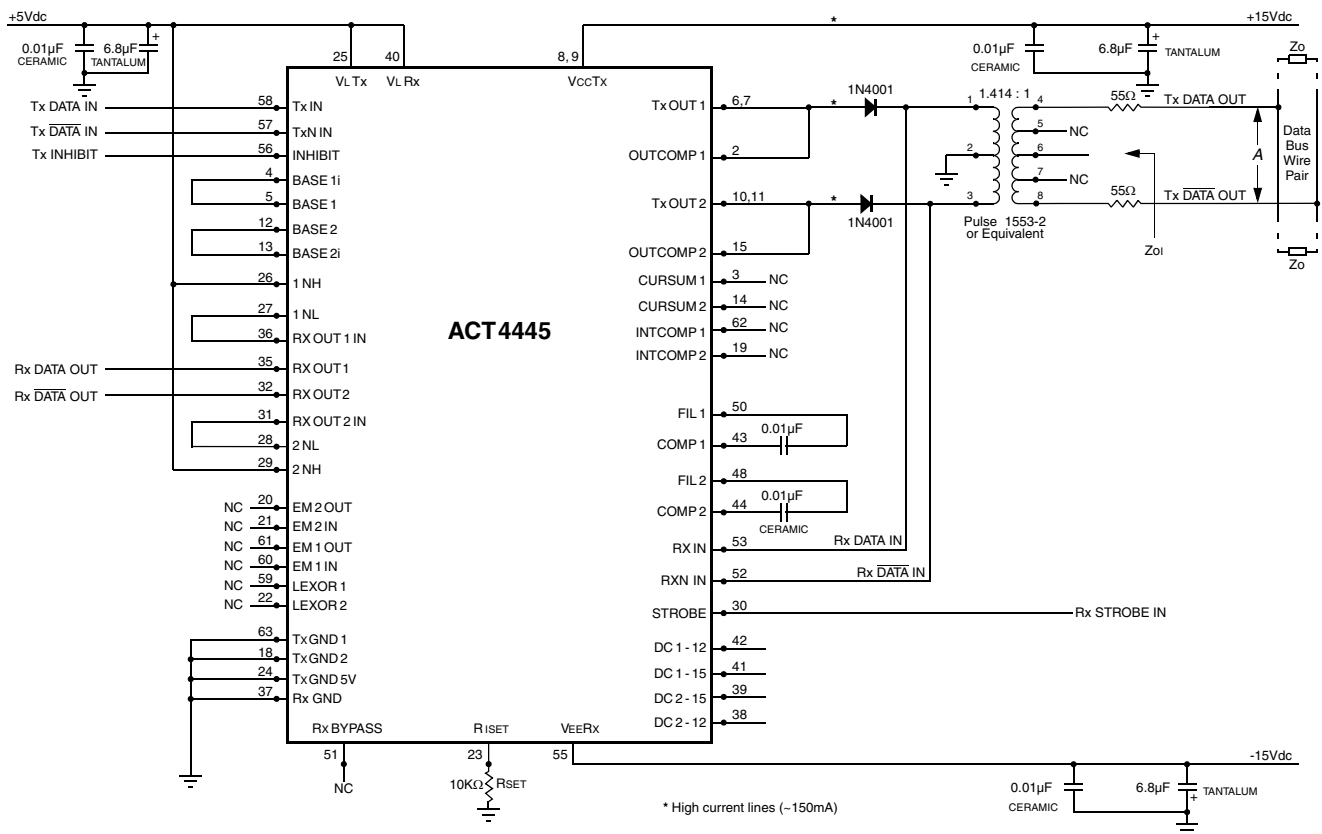
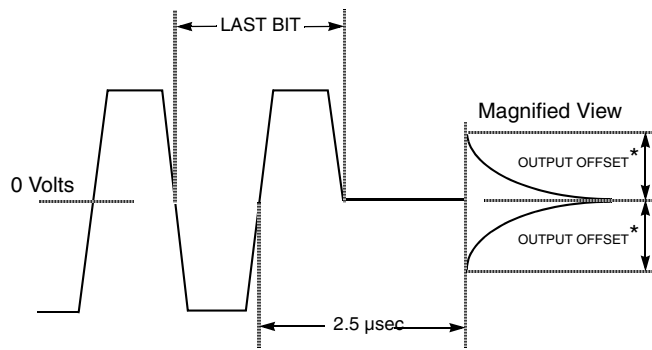
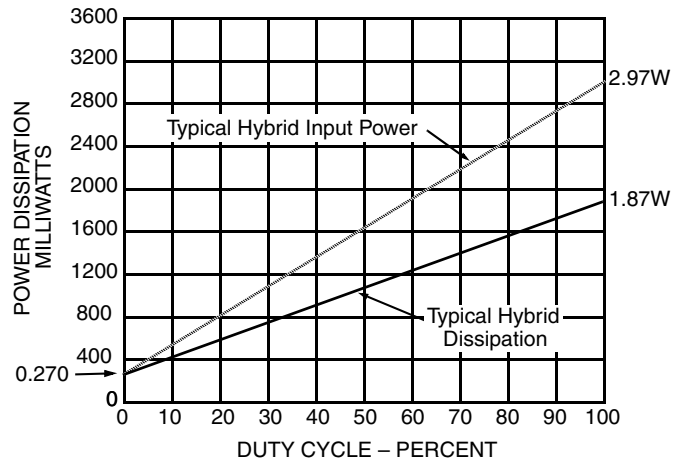


FIGURE 4 – TYPICAL CONNECTIONS – DATABUS INTERFACE, DIRECT COUPLED STUB, NORMALLY LOW RECEIVER IDLE STATE



*Offset measured at Point A in Figure 3 or 4

FIGURE 5 – TRANSMITTER (TX) OUTPUT WAVE FORM



Note: $V_{CC} = +15VDC$, $V_{EE} = -15VDC$, $V_L = +5VDC$, Transformer ratio 1.4:1, V_{BUS} (Figure 3 or 4 - Point A) at 7.5VP-P.

FIGURE 6 – TYPICAL HYBRID POWER DISSIPATION vs DUTY CYCLE

PACKAGE PIN OUT DESCRIPTION - ACT4445

Pin #	Function	Pin #	Function
1	NC	33	NC
2	OUTCOMP 1	34	NC
3	CURSUM1	35	RXOUT 1
4	BASE 1i	36	RXOUT 1 IN
5	BASE 1	37	RX GND
6	TXOUT 1*	38	DC2 - 12
7	TXOUT 1*	39	DC2 - 15
8	VccTx*	40	VL Rx
9	VccTx*	41	DC1 - 15
10	TXOUT 2*	42	DC1 - 12
11	TXOUT 2*	43	COMP 1
12	BASE 2	44	COMP 2
13	BASE 2i	45	NC
14	CURSUM 2	46	NC
15	OUTCOMP 2	47	NC
16	NC	48	FIL 2
17	NC	49	NC
18	TX GND 2	50	FIL 1
19	INTCOMP 2	51	RXBYPASS
20	EM2 OUT	52	RXN IN
21	EM2 IN	53	RX IN
22	IEXOR 2	54	NC
23	R ISET	55	VEERX
24	TX GND 5V	56	INHIBIT
25	VL Tx	57	TXN IN
26	1NH	58	TX IN
27	1NL	59	IEXOR 1
28	2 NL	60	EM1 IN
29	2 NH	61	EM1 OUT
30	STROBE	62	INTCOMP 1
31	RXOUT 2 IN	63	TX GND 1
32	RXOUT 2	64	NC

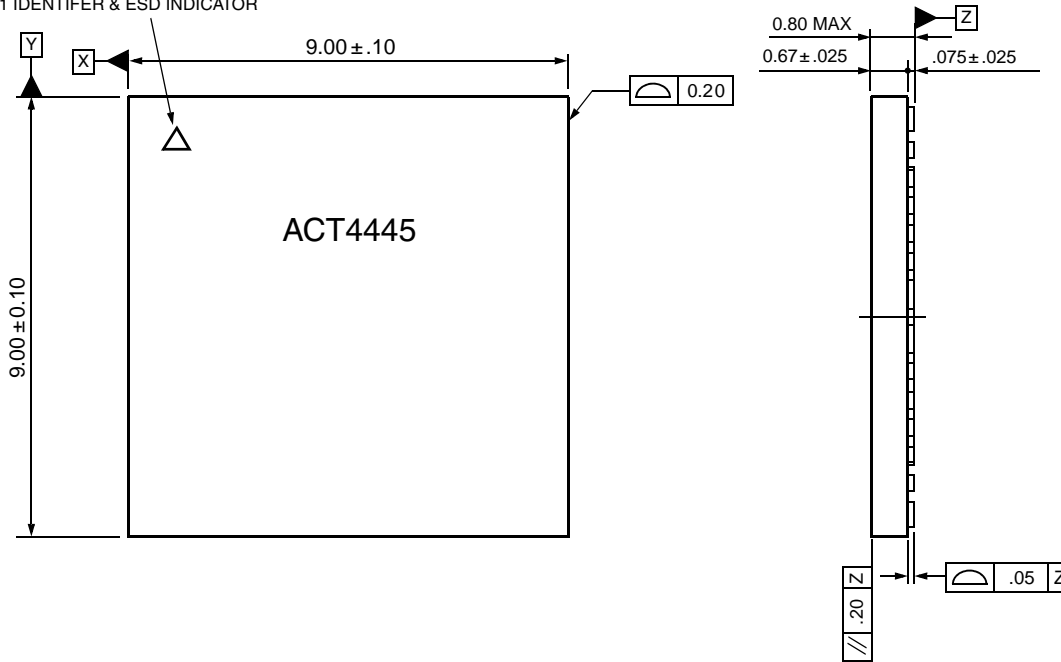
NC = No Connect

* High Current Line (~100mA)

PACKAGE DESCRIPTION

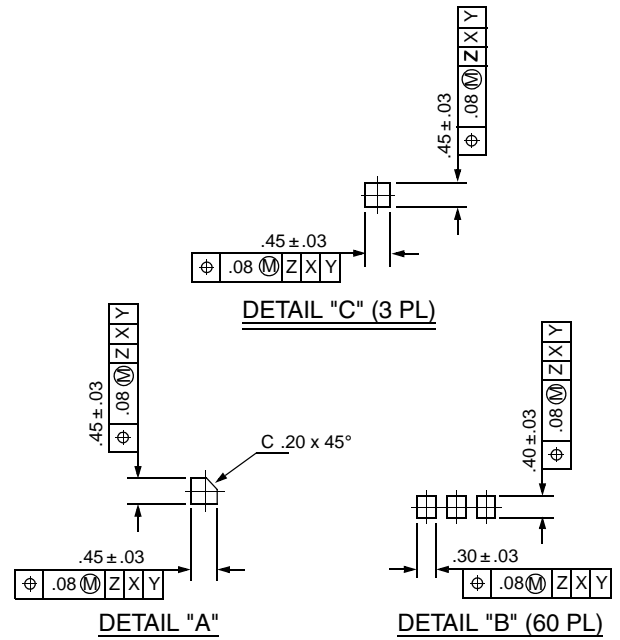
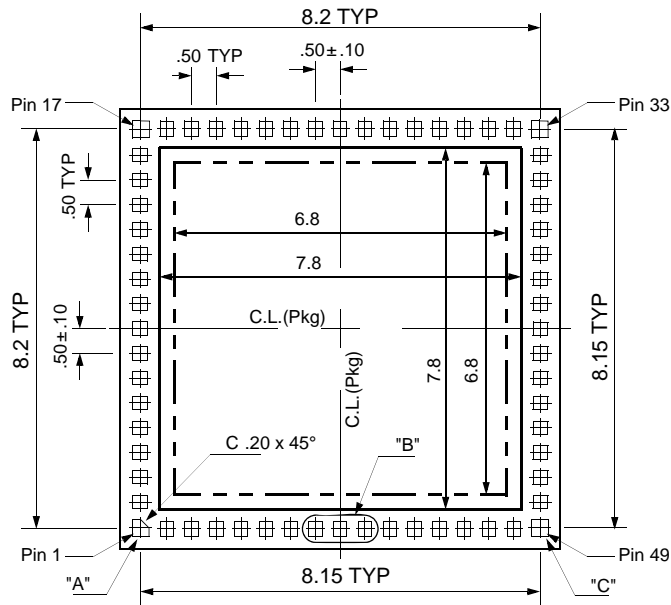
TOP VIEW

PIN 1 IDENTIFIER & ESD INDICATOR



mm	Inches
9	.354
8.2	.323
8.15	.321
0.8	.0315
0.67	.026
0.5	.020
0.45	.018
0.3	.012
0.2	.008
0.1	.00394
0.08	.00315
0.075	.00295
0.05	.002
0.03	.0012
0.025	.001
0.020	.0008

BOTTOM VIEW



Note
1. Dimensions in millimeters

CONFIGURATIONS AND ORDERING INFORMATION

Model No.	Screening Level	Receiver and Transmitter Data Levels	Package
ACT4445	Industrial Temperature -40°C to +85°C	User Configurable (See Figure 3 & 4)	64 Bump Chip Carrier

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