ACT 4458 / 4464
SINGLE SUPPLY TRANSCEIVERS
FOR MIL-STD-1553/1760

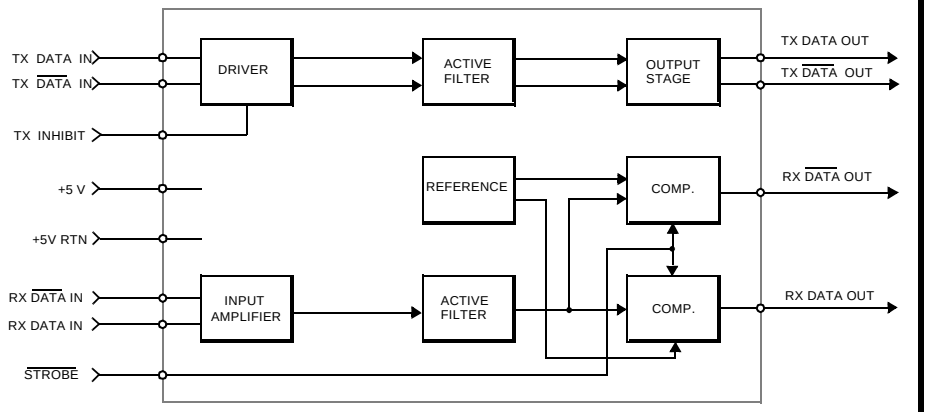
AEROFLEX
CIRCUIT TECHNOLOGY
www.aeroflex.com/act1.htm

Features

- **Single 5 Volt Supply Operation**
- **Low Power Dissipation**
- **Small Size & Light Weight**
- **Dual Transceivers Save Space & Cost**
- **Outstanding MIL-STD-1553 performance**
- **Processed and Screened to Mil-STD-883 Specs**
- **Radiation Hard Dielectric Isolation Monolithic construction for Severe Environments**
- **Superior High Frequency Line Transient and Input Ripple Rejection**
- **Input and Output TTL Compatible Design**
- **DESC SMD# 5962-92061**



Case Style
ACT 4458FP
Actual Size



Block Diagram (without Transformer)

General Description:

The Aeroflex Circuit Technology ACT4458 / 4464 series are next generation monolithic transceiver designs which provides full compliance with MIL-STD-1553A/B and 1760 requirements in the smallest packages with low power consumption and single power supply operation.

The ACT4458 / 4464 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 1:2.5 ratio transformer, isolated on the data bus side with two 52.5 Ohm fault isolation resistors, and loaded by

two 70 Ohm terminations, the data bus signal is typically 7.5 volts 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 Waveform, Figure 1.) The Transmitter may be safely operated for an indefinite period with the bus (point A-A') short circuited at 100% duty cycle.

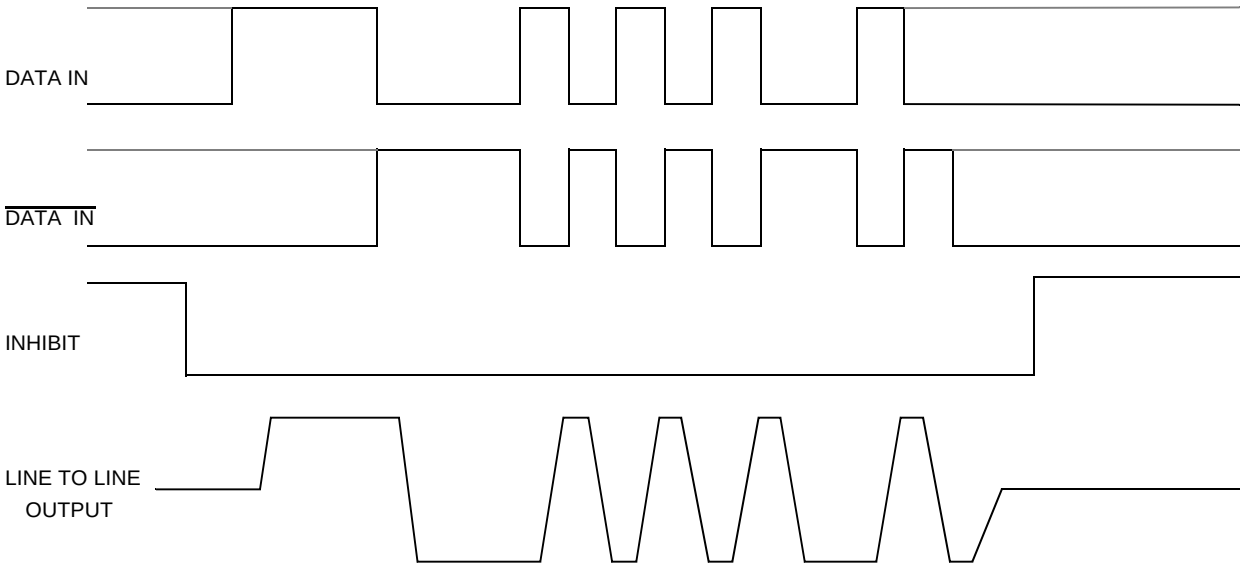
Receiver:

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 Waveform. Figure 2.)

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 connection.)

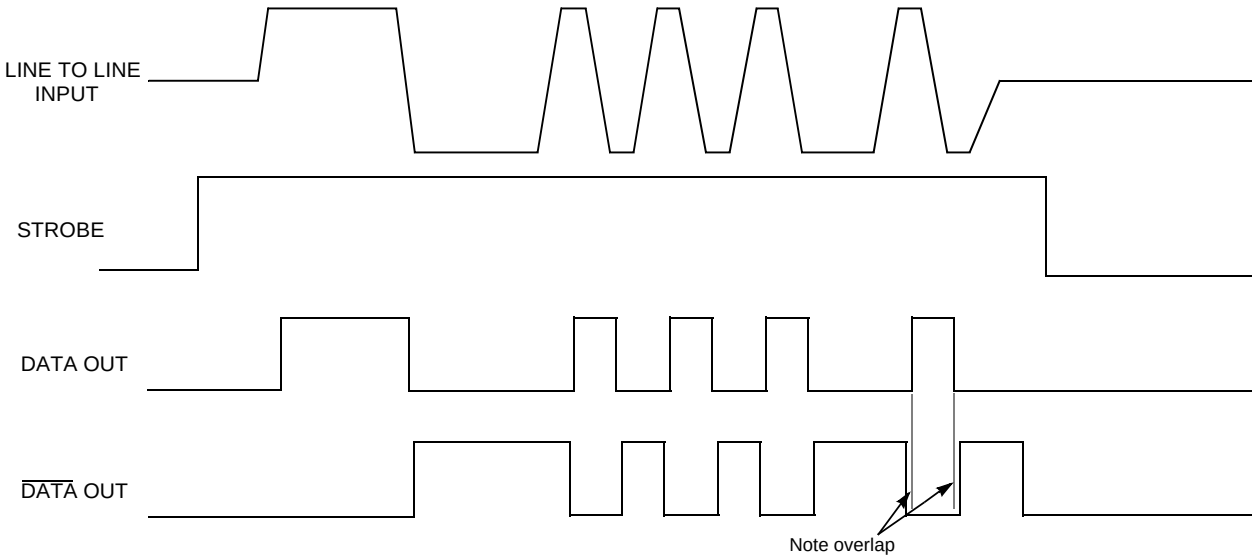
A low level at the Strobe input inhibits the DATA and $\overline{\text{DATA}}$ outputs. If unused, a 2K pull-up to +5 Volts is recommended

Figure 1 — Transmitter Logic Waveforms Idealized*



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 2 — Receiver Logic Waveforms Idealized*



* See Figure 8 For Actual Waveforms

Absolute Maximum Ratings

Operating case temperature	-55°C to +125°C
Storage case temperature	-65°C to +150°C
Power supply voltage	-0.3 V to +7.0 V
Logic input voltage	-0.3 V to +5.5 V
Receiver differential input	±10 V
Receiver input voltage (common mode)	±5 V
Driver peak output current	600 mA
Total package power dissipation over the full operating case temperature rise	2 Watts **(Note: Normal operation conditions require one transceiver on and the other off.)**
Maximum junction to case temperature	10°C
Thermal resistance – junction to case	5°C/W

Electrical Characteristics — Driver Section

Input Characteristics, TX DATA in or TX $\overline{\text{DATA}}$ in (Notes 2 & 3 apply)

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	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}	2.0			V
Delay from TX inhibit, (0→1) to inhibited output		t_{DXOFF}		250	350	nS
Delay from TX inhibit, (1→0) to active output		t_{DXON}		150	250	nS
Differential output noise, inhibit mode		V_{NOI}		2	10	mV_{P-P}
Differential output impedance (inhibited)	Note 1	Z_{OI}	2K			Ω

Output Characteristics

Differential output level	R_L=35 Ω	V_O	6	7.5	9	V_{P-P}
Rise and fall times(10% to 90% of P-P output)		t_r	100	200	300	nS
Output offset at point A-A' on Figure 5, 2.5µS after midpoint crossing of the parity bit of the last word of a 660µS 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		t_{DTX}		120	250	nS

Note 1. Power on or off, measured from 75KHz to 1MHz at point A-A' and transformer self impedance of 3KΩ minimum

Electrical Characteristics — Receiver Section

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Receiver Input Voltage Range (See Figure 5, point P–P')	TXFMR 2.12:1	V_{IDR}		14	20	V_{P-P}
Common Mode Rejection Ratio (Note 3)		CMRR	45			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	+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

Threshold Characteristics (Sinewave Input)

Input Threshold Voltage (referred to the bus)	100KHz–1MHz	V_{TH}	0.60	0.82	1.10	V_{P-P}

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

"1" State	I_{OH} = -0.4 mA	V_{OH}	2.5	3.7		V
"0" State	I_{OL} = -4.0 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_{DRX}		340	500	nS

Power Data

Power Supply Currents – Per Channel

Transmitter Standby	Note 4	I_{CC}		18	30	mA
25% duty cycle				150	175	
50% duty cycle				300	350	
100% duty cycle				600	700	

Power Supply Voltage

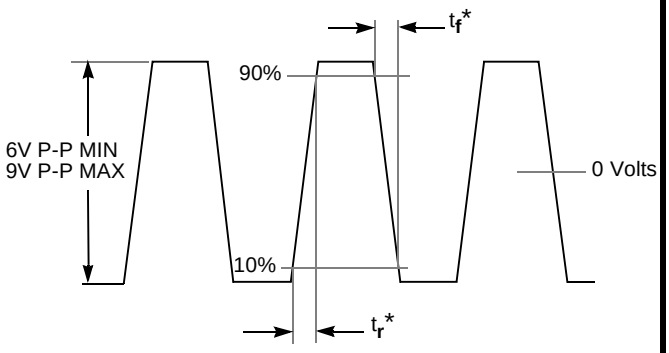
Operating Power Supply Voltage Range		V_{CC}	+4.75	+5.00	+5.50	V

Note 2: V_{cc} = 5 Volts ±0.1 V, bypassed by 2.2 µF (Tantalum recommended) Capacitor minimum. All measurements & specifications apply over the temperature range of -55°C to +125°C (case temperature) unless otherwise specified.

Note 3: When measured at point A-A' with ± 10 Volt peak, line to ground, DC to 2MHz

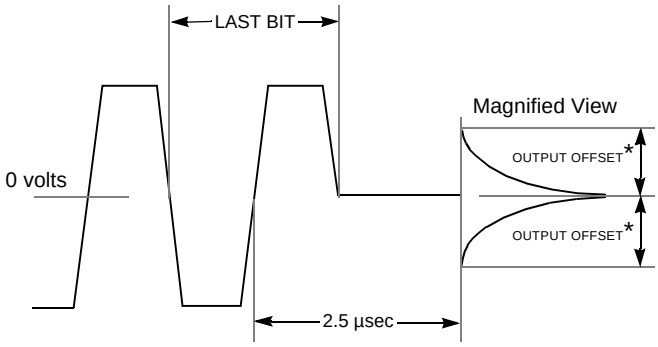
Note 4: Typical power is measured with V_{bus} at point A-A' = 7.5 V_{P-P}

Figure 3 – Transmitter (TX) Output Wave form



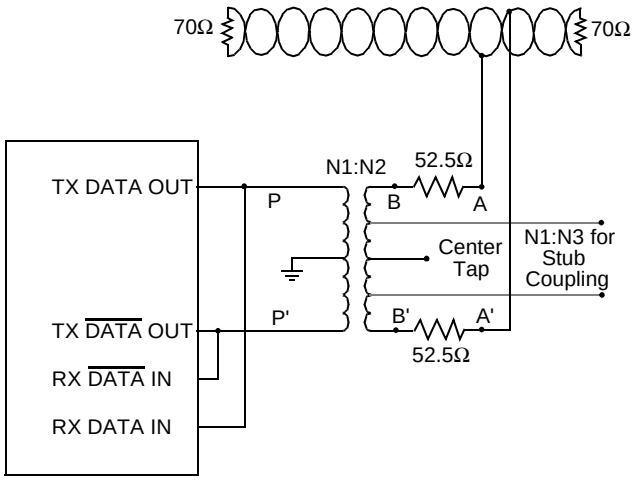
* Rise and fall times measured at point A-A' in Figure 5

Figure 4 – Transmitter (TX) Output offset



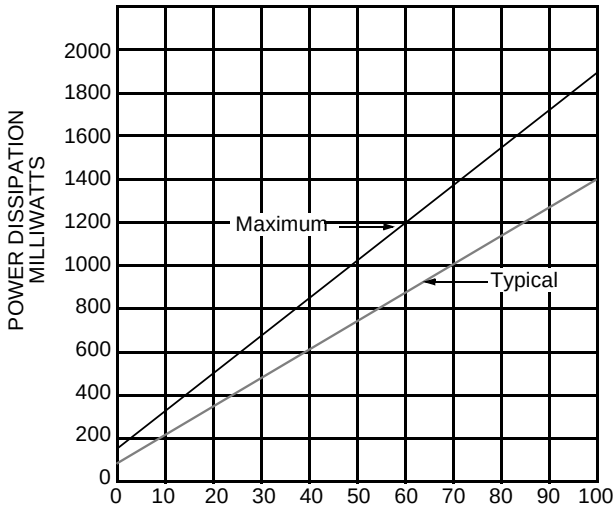
*Offset measured at point A-A' in Figure 5

Figure 5 – Typical direct transformer connection



Transformer turns ratios:
N1:N2 = 1:2.5
N1:N3 = 1:1.77
Use Technitrol 1553-45 or equivalent

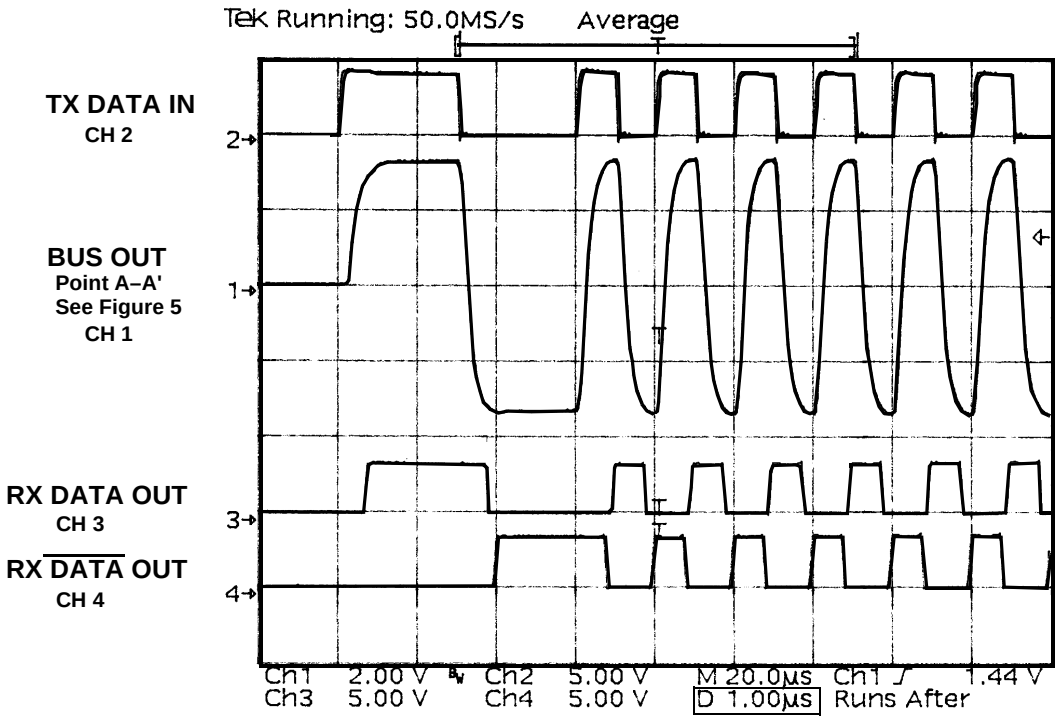
Figure 6 – Power Dissipation vs. Duty Cycle (Total hybrid with one channel transmitting and the other not powered)



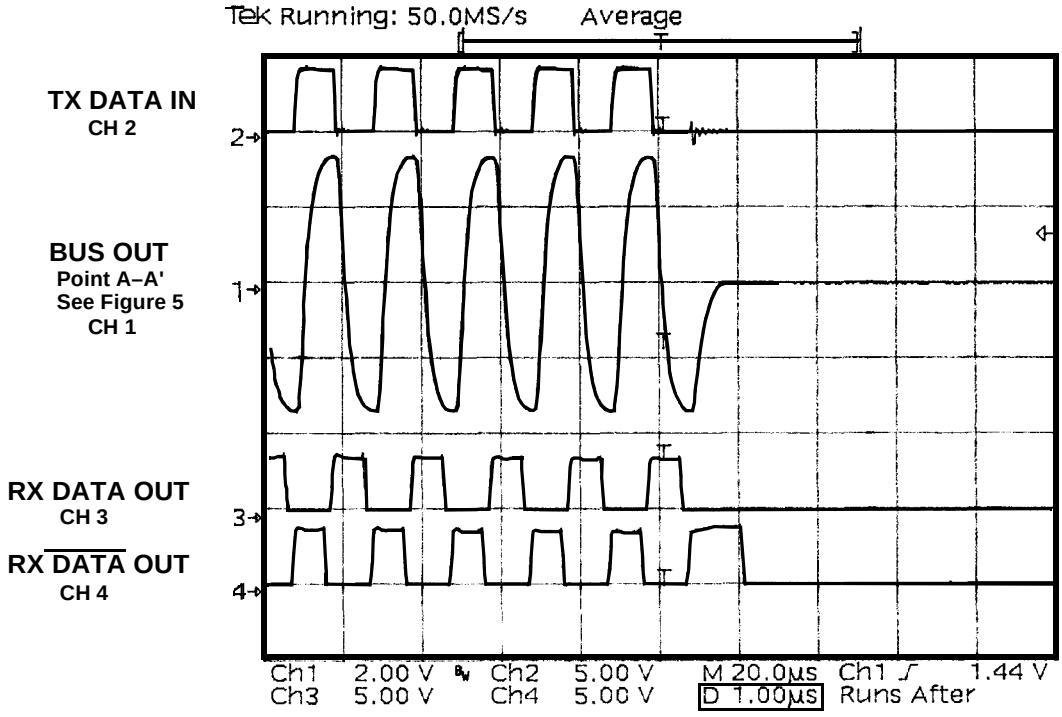
Note:Vcc=5 Volts,Transformer ratio 1:2.5, V_{bus} (pt A-A') at 7.5 Volts P-P

Figure 8 ***ACTUAL HYBRID WAVEFORMS* — 25°C TYPICAL***

START OF WORD – 33 WORD TRANSMISSION



END OF WORD – 33 WORD TRANSMISSION



*** Oscilloscope used is a TEK TDS540 with Probe 6139A.**

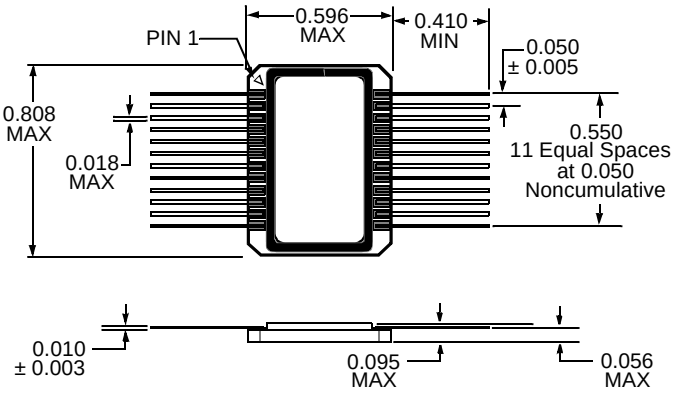
Figure 7 – Pin Numbers & Functions

ACT4458/4464		
Pin #	**Function**	**Channel**
1	TX DATA OUT/RX DATA IN	A
2	TX $\overline{\text{DATA}}$ OUT/RX $\overline{\text{DATA}}$ IN	A
3	GROUND 1	A
4	RX DATA OUT	A
5	STROBE	A
6	RX $\overline{\text{DATA}}$ OUT	A
7	TX DATA OUT/RX DATA IN	B
8	TX $\overline{\text{DATA}}$ OUT/RX $\overline{\text{DATA}}$ IN	B
9	GROUND 1	B
10	RX DATA OUT	B
11	STROBE	B
12	RX $\overline{\text{DATA}}$ OUT	B
13	GROUND 2	B
14	+5V	B
15	GROUND 3	B
16	INHIBIT	B
17	TX DATA IN	B
18	TX $\overline{\text{DATA}}$ IN	B
19	GROUND 2	A
20	+5V	A
21	GROUND 3	A
22	INHIBIT	A
23	TX DATA IN	A
24	TX $\overline{\text{DATA}}$ IN	A

Configurations and Ordering Information

Model No.	DESC No.	Receiver Data level	Case	Configuration
ACT 4458	5962-92061-07	Normally Low Rx	Flat Package	Dual
ACT 4464	5962-92061-08	Normally High Rx	Flat Package	Dual

Model ACT4458/4464 Flat Package



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

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Specifications subject to change without notice.