

# ARX4404 & 4407 Transceivers for MACAIR A3818, A5690, A5232, A4905 & MIL-STD-1553

## Features

- ARX4404 Transceiver meets MIL-STD-1553A & B, Macair A3818, A4905, A5232 and A5690 specs
- ARX4407 Transceiver meets MIL-STD-1553 specs
- Bipolar Supply  $\pm 15V$  to  $\pm 12V$ , Logic Supply  $+5V$
- Direct replacement for CT3231 and CT3232
- Voltage source output for higher bus drive power
- Plug-in, flat package or low profile flat package
- Monolithic construction using linear ASICs
- Variable receiver threshold capability
- Low receiver data level versions, ARX4440, 4467
- Processed and screened to MIL-STD-883 specs
- DESC SMD (Standard Military Drawing)
- MIL-PRF-38534 Compliant Devices Available

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## General Description

The Aeroflex Laboratories transceiver models ARX4404 and ARX4407 are new generation monolithic transceivers which provide full compliance with Macair and MIL-STD-1553 data bus requirements

The model ARX4404 and model ARX4407 perform the front-end analog function of inputting and outputting data through a transformer to a MIL-STD-1553 or Macair data bus. The ARX4404 can be considered a "Universal" Transceiver in that it is compatible with MIL-STD-1553A, B, Macair A-3818, A-4905, A-5232 and A-5690. The ARX4407 is compatible with MIL-STD-1553A and B.

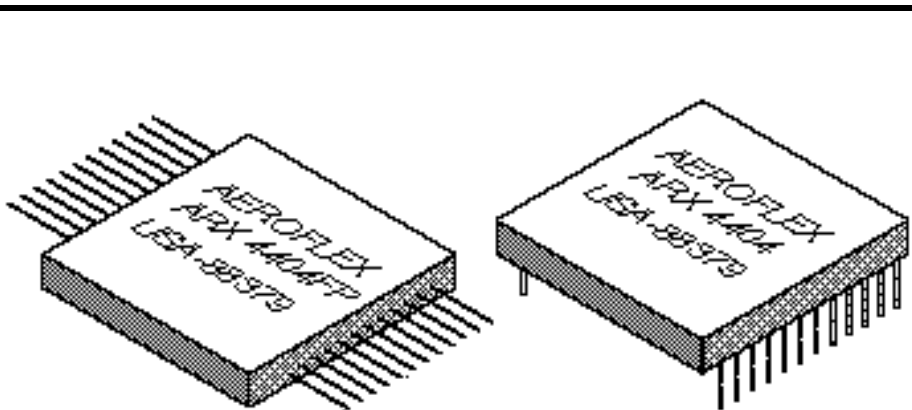
Design of these transceivers reflects particular attention to active filter performance. This results in low bit and word error rate with superior waveform purity and minimal zero crossover distortion. The ARX4404 series active filter design has additional high frequency roll-off to provide the required Macair 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.

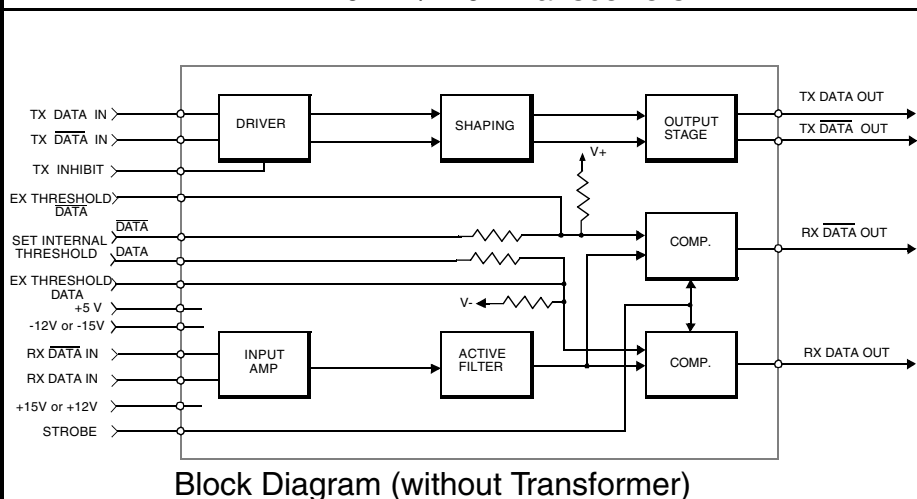
An optional receiver input threshold adjustment can be accomplished by the use of the "Set Internal Threshold" terminals.

### Transmitter

The Transmitter section accepts bi-phase TTL data at the input and when coupled to the data bus with a



ARX4404FP/4404 Transceivers



Block Diagram (without Transformer)

1:1 transformer, isolated on the data bus side with two 52.5 Ohm fault isolation resistors, and loaded by two 70 Ohm terminations plus additional receivers, the data bus signal produced is 7.0 Volts minimum 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 Waveforms, Figure 1.)

The transmitter utilizes an active filter to suppress harmonics above 1 MHz to meet Macair specifications A-3818, A-4905, A-5232 and A-5690. The transmitter may be safely operated for an indefinite period at 100% duty cycle into a data bus short circuit.

### Receiver

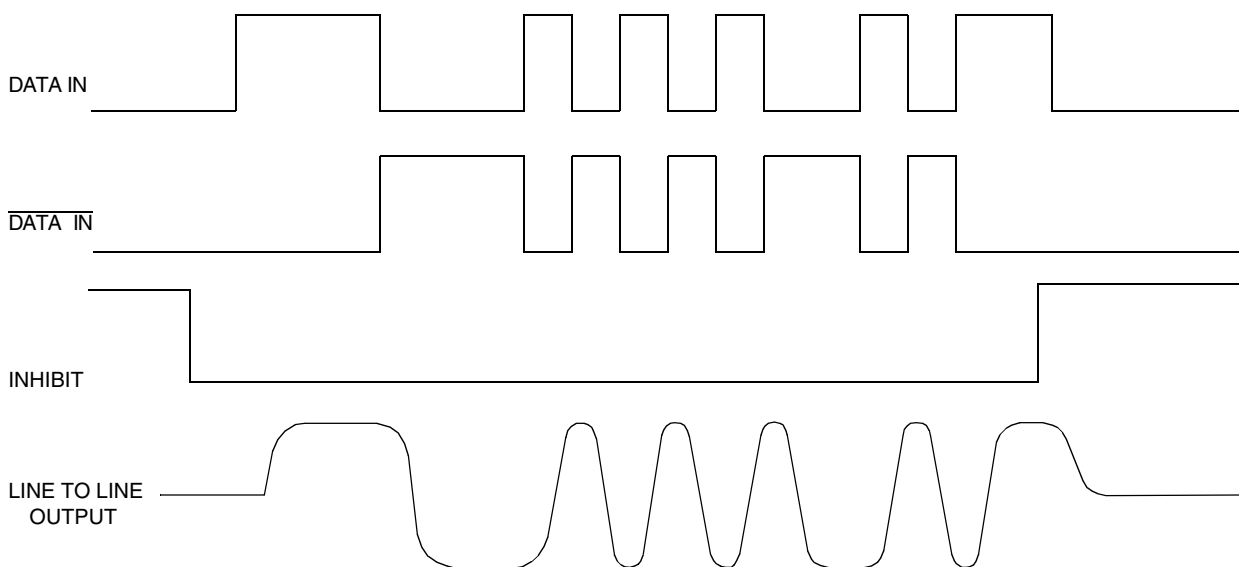
The Receiver section accepts bi-phase differential data at the input and produces two TTL signals at the output. The outputs are DATA and  $\overline{\text{DATA}}$ , and represent positive and negative excursions of the input beyond a pre-determined threshold. (See Receiver Logic Waveforms, Figure 2.)

The internal threshold is nominally

set to detect data bus signals exceeding 1.05 Volts P-P and reject signals less than 0.6 Volts P-P when used with a 1:1 turns ratio transformer. (See Figure 5 for transformer data and typical connection.) This threshold setting can be held by grounding the appropriate pins or modified with the use of external resistors.

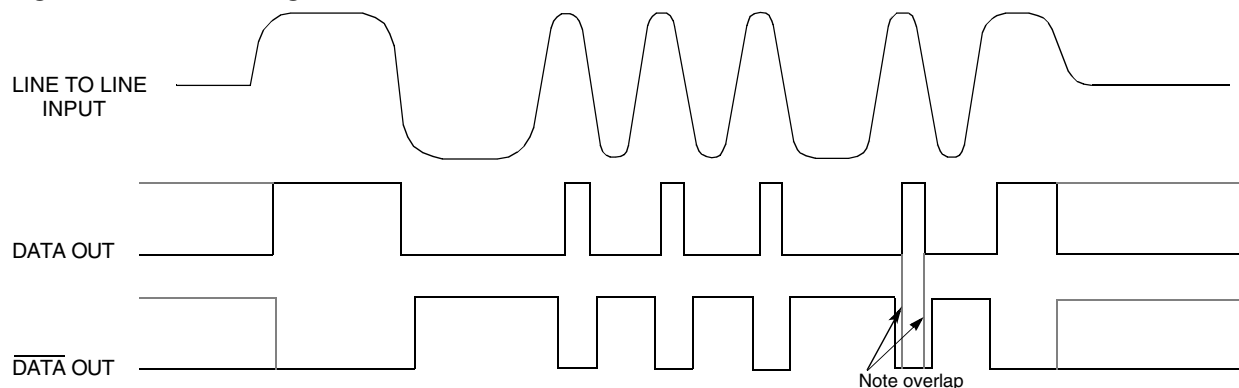
A low level at the Strobe input inhibits the DATA and  $\overline{\text{DATA}}$  outputs. If unused, a 2K Ohm pull-up to +5 Volts is recommended.

**Figure 1 - Transmitter Logic Waveforms**



- Notes: 1. Line to line waveforms illustrate Macair signals, MIL-STD-1553 signals are trapezoidal  
 2. DATA and  $\overline{\text{DATA}}$  inputs must be complementary waveforms or 50% duty cycle average, with no delays between them.  
 3. DATA and  $\overline{\text{DATA}}$  must be in the same state during off time (both high or low).

**Figure 2 - Receiver Logic Waveforms**



NOTE: Waveforms shown are for normally low devices. For normally high receiver output level devices, the receiver outputs are swapped as shown by the dashed lines

## Absolute Maximum Ratings

Operating case temperature	-55°C to +125°C	
Storage Case Temperature	-65°C to +150°C	
Power Supply Voltages	±16 V	+7 V
Logic Input Voltage	-0.3 V to +5.5 V	
Receiver Differential Input	±40 V	
Receiver Input Voltage (Common Mode)	±10V	
Driver Peak Output Current	300 mA	
Total Package Power Dissipation over the Full Operating Case Temperature Range	3.6 Watts	
Maximum Junction to Case Temperature	18°C	
Junction-Case, Thermal Resistance	5°C/W	

## Electrical Characteristics, Transmitter Section

### Input Characteristics, TX DATA IN or TX DATA IN

Parameter	Condition	Symbol	Min	Typ	Max	Unit
"0" Input Current	$V_{IN} = 0.4 \text{ V}$	$I_{ILD}$	-	-0.2	-0.4	mA
"1" Input Current	$V_{IN} = 2.7 \text{ V}$	$I_{IHD}$	-	1.0	40	μA
"0" Input Voltage		$V_{IHD}$	-	-	0.7	V
"1" Input Voltage		$V_{IHD}$	2.0	-	-	V

### Inhibit Characteristics

"0" Input Current	$V_{IN} = 0.4 \text{ V}$	$I_{ILI}$	-	-0.2	-0.4	mA
"1" Input Current	$V_{IN} = 2.7 \text{ V}$	$I_{IHI}$	-	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	Note 1	$t_{DXOFF}$	-	300	450	nS
Delay from TX inhibit, (1→0) to active output	Note 1	$t_{DXON}$	-	300	450	nS
Differential output noise, inhibit mode		$V_{NOI}$	-	0.8	10	mVp-p
Differential output impedance (inhibited)	Note 2	$Z_{OI}$	2K	-	-	Ω

### Output Characteristics

Differential output level	$R_L = 35 \Omega$	$V_O$	7	7.5	9	Vp-p
Rise and fall times (10% to 90% of p-p output)	ARX4404	$t_R$ & $t_F$	200	250	300	nS
	ARX4407		100	180	300	
Output offset at point A-A' on Fig 5., 2.5 μS after midpoint crossing of the parity bit of the last word of a 660 μS message	$R_L = 35 \Omega$	$V_{OS}$			±90	mVpeak
Delay from 50% point of TX DATA or TX DATA input to zero crossing of differential signal. (Note 1)	ARX4404	$t_{DTX}$		240	300	nS
	ARX4407			150	300	nS

## Electrical Characteristics, Receiver Section

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Differential Input Impedance	f = 1MHz	Z <sub>IN</sub>	20K	100K		Ω
Differential Input Voltage Range		V <sub>IDR</sub>	-	-	40	Vp-p
Input Common Mode Voltage Range	Note 1	V <sub>ICR</sub>	10	-	-	Vp-p
Common Mode Rejection Ratio Note 3	Note 1	CMRR	40	-	-	dB

### Strobe Characteristics (Logic "0" Inhibits Output)

"0" Input Current	V <sub>S</sub> = 0.4 V	I <sub>IL</sub>	-	-0.2	-0.4	mA
"1" Input Current	V <sub>S</sub> = 2.7 V	I <sub>IH</sub>	-	-1.0	+40	μA
"0" Input Voltage		V <sub>IL</sub>	-	-	0.7	V
"1" Input Voltage		V <sub>IH</sub>	2.0	-	-	V
Strobe Delay (Turn-on or Turn-off)	Note 1	t <sub>SD</sub>	-	-	150	nS

### Threshold Characteristics (Sinewave Input)

Internal Threshold Voltage (Referred to the bus) Pins 6 and 11 grounded	100KHz-1MHz	V <sub>TH</sub>	0.60	0.80	1.15	Vp-p
External Threshold Pins 6 & 11 open, Pin 5 with a 5.9K resistor to GND, Pin 12 with a 6.65K resistor to GND, 1MHz Sinewave applied to point A-A"		V <sub>TH(EXT)</sub>	1.5	1.9	2.3	Vp-p

### Output Characteristics, RX DATA and RX $\overline{\text{DATA}}$

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

### Power Data

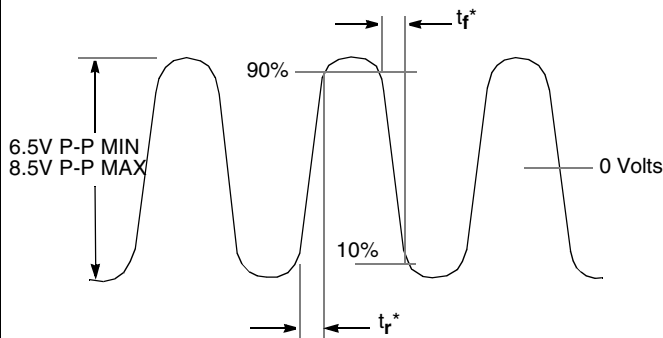
#### Power Supply Currents (Power Supplies set at +15V, -15V, +5V)

Transmitter Standby	I <sub>CC</sub>	30	60	mA
	I <sub>EE</sub>	50	75	
	I <sub>L</sub>	25	35	
25% duty cycle	I <sub>CC</sub>	50	85	
	I <sub>EE</sub>	70	105	
	I <sub>L</sub>	25	35	
50% duty cycle	I <sub>CC</sub>	75	110	
	I <sub>EE</sub>	45	130	
	I <sub>L</sub>	25	35	
100% duty cycle	I <sub>CC</sub>	120	160	
	I <sub>EE</sub>	140	180	
	I <sub>L</sub>	25	35	

### Recommended Power Supply Voltage Range

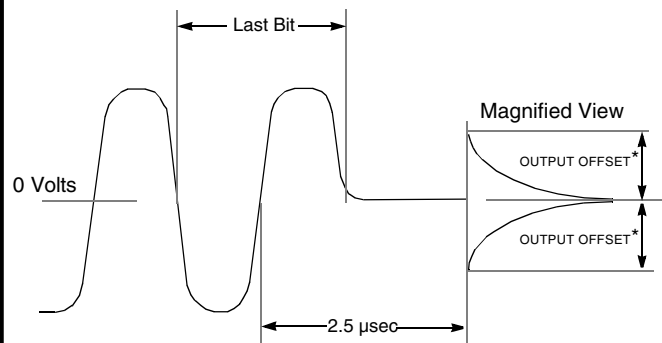
+V	+11.4 Volts to +15.75 Volts
-V	-11.4 Volts to -15.75 Volts
Logic	+4.5 Volts to +5.5 Volts

**Figure 3 - Transmitter (TX) Output Wave form**



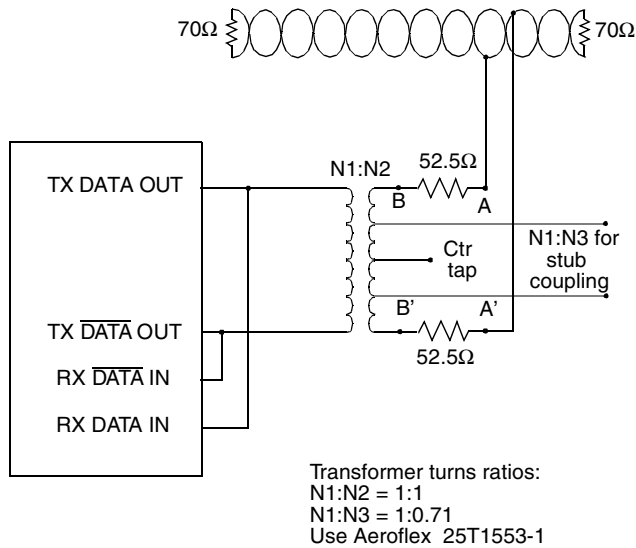
\* Rise and fall times measured at point A-A' in Fig 5

**Figure 4 - Transmitter (TX) Output offset**

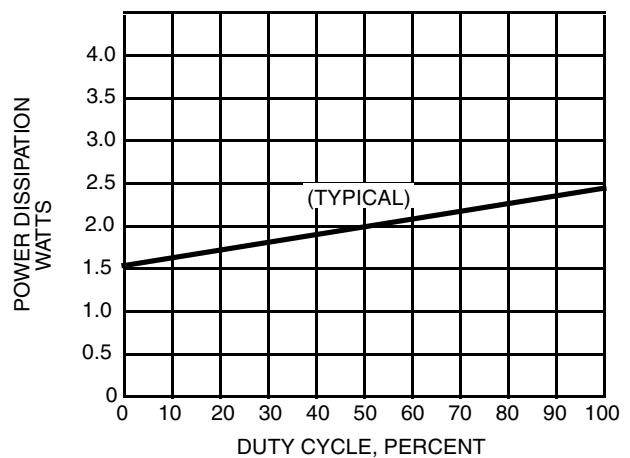


\*Offset measured at point A-A' in Fig 5

**Figure 5 - Typical Transformer connection**



**Figure 6 - Power Dissipation vs. Duty Cycle**



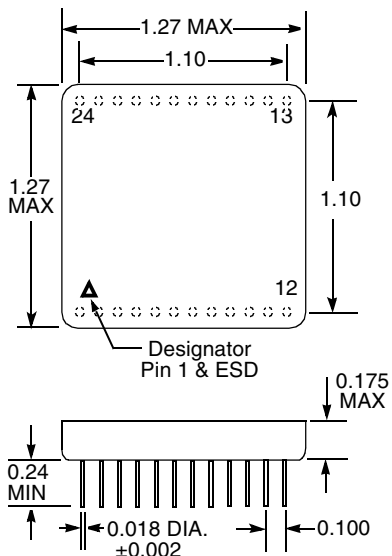
**Notes:**

1. Characteristics guaranteed by design, not production tested.
2. Measured from 75KHz to 1MHz at point A-A' with transformer self impedance of 3KΩ minimum, power on or off.
3. Specifications apply over the temperature range of -55°C to +125°C (case temperature) unless otherwise noted.
4. All typical values are measured at +25°C

The information contained in this data sheet is believed to be accurate; however, Aeroflex Circuit Technology assumes no responsibility for its use, and no licence or rights are granted by implication or otherwise in connection therewith.

# AEROFLEX CIRCUIT TECHNOLOGY

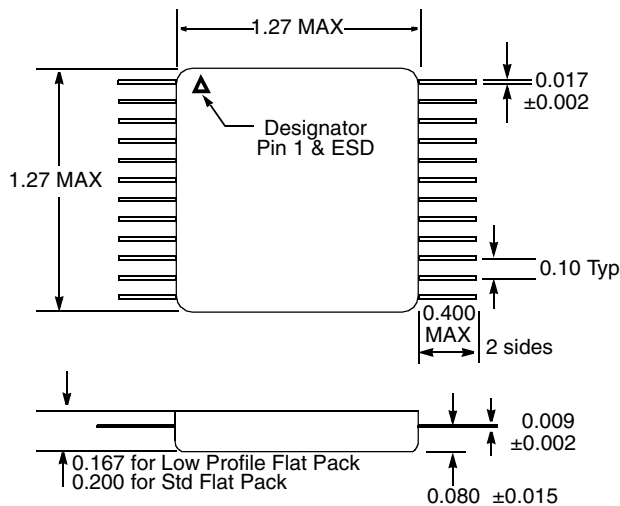
## PLUG-IN PACKAGE



## Pin Connections

1. TX DATA OUT
2. TX DATA OUT
3. TX GND (+5V)
4. +15V (TX)
5. EXT. DATA THRES
6. INT. DATA THRES
7. RX DATA OUT
8. STROBE
9. RX GND (+5V)
10. RXDATA OUT
11. INT DATA THRES
12. EXT DATA THRES
13. +15V (RX)
14. N.C.
15. RX DATA IN
16. RX DATA IN
17. GND
18. CASE GND
19. -15V (RX)
20. +5V
21. TX INHIBIT
22. TX DATA IN
23. TX DATA IN
24. -15V (TX)

## FLAT PACKAGE



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

### Special Note

If using the	<b>4404</b>	To replace the	<b>3404</b>
	<b>4440</b>		<b>3464</b>
	<b>4407</b>		<b>3407</b>
	<b>4467</b>		<b>3467</b>

Please note that Pins 6 and 11 must be *GROUND*ED in order for the receiver to operate. These Pins were *No Connect* in the 3400 Series, because the External Variable Threshold was not an option.

## Configurations and Ordering Information

DESC No.	Model No.	Receiver Data level	Case	Specs.
5962-9174909HXC	ARX4404-001-1	Normally High	Plug In	1553 & Macair
5962-9174909HXA	ARX4404-001-2	Normally High	Plug In	1553 & Macair
5962-9174909HYC	ARX4404-201-1	Normally High	Flat Pack	1553 & Macair
5962-9174909HYA	ARX4404-201-2	Normally High	Flat Pack	1553 & Macair
5962-9174908HXC	ARX4407-001-1	Normally High	Plug In	1553
5962-9174908HXA	ARX4407-001-2	Normally High	Plug In	1553
5962-9174908HYC	ARX4407-201-1	Normally High	Flat Pack	1553
5962-9174908HYA	ARX4407-201-2	Normally High	Flat Pack	1553
To Be Assigned	ARX4440	Normally Low	Plug In	1553 & Macair
To Be Assigned	ARX4440-FP	Normally Low	Flat Pack	1553 & Macair
To Be Assigned	ARX4467	Normally Low	Plug In	1553
To Be Assigned	ARX4467-FP	Normally Low	Flat Pack	1553

Specifications subject to change without notice

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