

MN54AC821-X REV 1B0

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10-Bit D Flip-Flop with TRI-STATE Outputs
General Description

The AC821 is a 10-bit D flip-flop with TRI-STATE outputs arranged in a broadside pinout.
 The AC821 is functionally identical to the AM29821.

Industry Part Number

54AC821

NS Part Numbers

 54AC821DMQB
 54AC821FMQB
 54AC821LMQB

Prime Die

Z821

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp Description Temp (°C)

1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- TRI-STATE outputs for bus interfacing
- Noninverting outputs
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
- AC821: 5962-91606

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage (Vcc)	-0.5V to +7.0V
DC Input Diode Current (Iik)	
Vi = -0.5V	-20 mA
Vi = Vcc + 0.5V	+20 mA
DC Input Voltage (Vi)	-0.5V to Vcc + 0.5V
DC Output Diode Current (Iok)	
Vo = -0.5V	-20 mA
Vo = Vcc + 0.5V	+20 mA
DC Output Voltage (Vo)	-0.5V to Vcc + 0.5V
DC Output Source or Sink Current (Io)	±50 mA
DC Vcc or Ground Current per Output Pin (Icc or Ignd)	±50 mA
Storage Temperature (Tstg)	-65 C to +150 C
Junction Temperature (Tj)	
CDIP	175 C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (Vcc)	2.0V to 6.0V
Input Voltage (Vi)	0V to Vcc
Output Voltage (Vo)	0V to Vcc
Operating Temperature (Ta)	-55 C to +125 C
Minimum Input Edge Rate (Delta V/Delta t)	
AC Devices	
Vin from 30% to 70% of Vcc	
Vcc @ 3.0V, 4.5V, 5.5V	125 mV/ns

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
 DC: VCC 3.0V to 5.5V, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High Level Input Current	VCC=5.5V, VM=5.5V	1, 2	INPUTS		1.0	uA	2, 3
			1, 2	INPUTS		0.1	uA	1
IIL	Low Level Input Current	VCC=5.5V, VM=0.0V	1, 2	INPUTS		-1.0	uA	2, 3
			1, 2	INPUTS		-0.1	uA	1
VOL	Low Level Output Voltage	VCC=3.0V, VINH=3.0V, VIL=0.9V, IOL=50.0uA	1, 2	OUTPUTS		.10	V	1, 2, 3
		VCC=4.5V, VINH=4.5V, VIL=1.35V, IOL=50.0uA	1, 2	OUTPUTS		.10	V	1, 2, 3
		VCC=5.5V, VINH=5.5V, VIL=1.65V, IOL=50.0uA	1, 2	OUTPUTS		.10	V	1, 2, 3
		VCC=3.0V, VINH=3.0V, VIL=0.9V, IOL=12.0mA	1, 2	OUTPUTS		.40	V	2, 3
			1, 2	OUTPUTS		.32	V	1
		VCC=4.5V, VINH=4.5V, VIL=1.35V, IOL=24.0mA	1, 2	OUTPUTS		.50	V	2, 3
			1, 2	OUTPUTS		.36	V	1
		VCC=5.5V, VINH=5.5V, VIL=1.65V, IOL=24.0mA	1, 2	OUTPUTS		.50	V	2, 3
	1, 2	OUTPUTS		.36	V	1		
VIOLOW	Dynamic Output Current LOW	VCC=5.5V, VINH=5.5V, VIL=1.65V, IOL=50.0mA	1, 2, 5	OUTPUTS		1.65	V	1, 2, 3
VOH	High Level Output Voltage	VCC=3.0V, VINL=0.0V, VIH=2.1V, VIL=0.9V, IOH=-50.0uA	1, 2	OUTPUTS	2.90		V	1, 2, 3
		VCC=4.5V, VINL=0.0V, VIH=3.15V, VIL=1.35V, IOH=-50.0uA	1, 2	OUTPUTS	4.40		V	1, 2, 3
		VCC=5.5V, VINL=0.0V, VIH=3.85V, VIL=1.65V, IOH=-50.0uA	1, 2	OUTPUTS	5.40		V	1, 2, 3
		VCC=3.0V, VINL=0.0V, VIH=2.1V, VIL=0.9V, IOH=-12.0mA	1, 2	OUTPUTS	2.40		V	2, 3
			1, 2	OUTPUTS	2.56		V	1
		VCC=4.5V, VINH=4.5V, VIH=3.15V, VIL=1.35V, IOH=-24.0mA	1, 2	OUTPUTS	3.70		V	2, 3
			1, 2	OUTPUTS	3.86		V	1
		VCC=5.5V, VINH=5.5V, VIH=3.85V, VIL=1.65V, IOH=-24.0mA	1, 2	OUTPUTS	4.70		V	2, 3
	1, 2	OUTPUTS	4.86		V	1		
VIOHIGH	Dynamic Output Current HIGH	VCC=5.5V, VINH=5.5V, VIH=3.85V, VIL=1.65V, IOH=-50.0mA	1, 2, 5	OUTPUTS	3.85		V	1, 2, 3

Electrical Characteristics

DC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
 DC: VCC 3.0V to 5.5V, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IOZH	Maximum TRI-STATE Current	VCC=3.0V, VM=3.0V, VINH=3.0V, VINL=0.0V, VIH=2.1V	1, 2	OUTPUTS		10.0	uA	2, 3
			1, 2	OUTPUTS		0.5	uA	1
		VCC=4.5V, VM=4.5V, VINH=4.5V, VINL=0.0V, VIH=3.15V	1, 2	OUTPUTS		10.0	uA	2, 3
			1, 2	OUTPUTS		0.5	uA	1
		VCC=5.5V, VM=5.5V, VINH=5.5V, VINL=0.0V, VIH=3.85V	1, 2	OUTPUTS		10.0	uA	2, 3
			1, 2	OUTPUTS		0.5	uA	1
IOZL	Maximum TRI-STATE Current	VCC=3.0V, VM=0.0V, VINH=3.0V, VIH=2.1V	1, 2	OUTPUTS		-10.0	uA	2, 3
			1, 2	OUTPUTS		-0.5	uA	1
		VCC=4.5V, VM=0.0V, VINH=4.5V, VIH=3.15V	1, 2	OUTPUTS		-10.0	uA	2, 3
			1, 2	OUTPUTS		-0.5	uA	1
		VCC=5.5V, VM=0.0V, VINH=5.5V, VIH=3.85V	1, 2	OUTPUTS		-10.0	uA	2, 3
			1, 2	OUTPUTS		-0.5	uA	1
ICCH	Supply Current Outputs HIGH	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		160	uA	2, 3
			1, 2	VCC		8.0	uA	1
ICCL	Supply Current Outputs LOW	VCC=5.5V, VINL=0.0V	1, 2	VCC		160	uA	2, 3
			1, 2	VCC		8.0	uA	1
IC CZ	Supply Current Outputs Tri-State	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		160	uA	2, 3
			1, 2	VCC		8.0	uA	1

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: CL=50pf, RL=500 OHMS, TR=3.0ns, TF=3.0ns, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

tpLH(1)	Propagation Delay	VCC=3.0V	3, 4, 7	CP to On	1.0	13.0	ns	10, 11
			3, 4, 7	CP to On	1.0	11.0	ns	9
tpHL(1)	Propagation Delay	VCC=3.0V	3, 4, 7	CP to On	1.0	13.0	ns	10, 11
			3, 4, 7	CP to On	1.0	11.0	ns	9

Electrical Characteristics

AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: CL=50pf, RL=500 OHMS, TR=3.0ns, TF=3.0ns, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP
 11 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpZH(1)	Output Enable Time	VCC=3.0V	3, 4, 7	\overline{OE} to On	1.0	13.0	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.0	11.0	ns	9
tpZL(1)	Output Enable Time	VCC=3.0V	3, 4, 7	\overline{OE} to On	1.0	13.0	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.0	11.0	ns	9
tpHZ(1)	Output Disable Time	VCC=3.0V	3, 4, 7	\overline{OE} to On	1.0	12.0	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.0	11.0	ns	9
tpLZ(1)	Output Disable Time	VCC=3.0V	3, 4, 7	\overline{OE} to On	1.0	12.0	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.0	11.0	ns	9
ts(H/L)(1)	Setup Time HIGH or LOW	VCC=3.0V	6	Dn to CP	3.0		ns	9, 10, 11
th(H/L)(1)	Hold Time HIGH or LOW	VCC=3.0V	6	Dn to CP	3.0		ns	9, 10, 11
tw(H/L)(1)	CP Pulse Width	VCC=3.0V	6	CP	6.0		ns	10, 11
			6	CP	5.0		ns	9
fMAX(1)	Maximum Clock Frequency	VCC=3.0V	6	CP	95		MHz	9, 10, 11
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to On	1.5	9.5	ns	10, 11
			3, 4, 7	CP to On	1.5	8.0	ns	9
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to On	1.5	9.5	ns	10, 11
			3, 4, 7	CP to On	1.5	8.0	ns	9
tpZH(2)	Output Enable Time	VCC=4.5V	3, 4, 7	\overline{OE} to On	1.5	9.5	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.5	8.0	ns	9

Electrical Characteristics

AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: CL=50pf, RL=500 OHMS, TR=3.0ns, TF=3.0ns, Temp. Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP
 11 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpZL(2)	Output Enable Time	VCC=4.5V	3, 4, 7	\overline{OE} to On	1.5	9.5	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.5	8.0	ns	9
tpHZ(2)	Output Disable Time	VCC=4.5V	3, 4, 7	\overline{OE} to On	1.5	10.0	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.0	9.0	ns	9
tpLZ(2)	Output Disable Time	VCC=4.5V	3, 4, 7	\overline{OE} to On	1.5	10.0	ns	10, 11
			3, 4, 7	\overline{OE} to On	1.5	9.0	ns	9
ts(H/L)(2)	Setup Time HIGH or LOW	VCC=4.5V	6	Dn to CP	3.0		ns	9, 10, 11
th(H/L)(2)	Hold Time HIGH or LOW	VCC=4.5V	6	Dn to CP	3.0		ns	9, 10, 11
tw(H/L)(2)	CP Pulse Width	VCC=4.5V	6	CP	5.0		ns	9, 10, 11
fMAX(2)	Maximum Clock Frequency	VCC=4.5V	6	CP	95		MHz	9, 10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125 TEMPERATURE, SUBGROUPS 1, 2, 7, & 8.

Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT + 25C & +125C TEMPERATURE, SUBGROUPS A1, 2, 7, & 8.

Note 3: SAMPLE TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY, SUBGROUP A9.

Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125 C TEMPERATURE, SUBGROUPS A9 & 10.

Note 5: TRANSMISSION LINE DRIVING TEST, GUARDBAND LIMITS SET FOR +25C, 2 MSEC DURATION MAX.

Note 6: NOT TESTED AT +125C & -55C TEMPERATURE (DESIGN CHARACTERIZATION DATA).

Note 7: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBAND 4.5V MIN. LIMITS.