

MN54AC299-X REV 1B0

Original Creation Date: 07/01/96

Last Update Date: 03/31/97

Last Major Revision Date: 07/01/96

8 - Input Universal Shift/Storage Register With Common Parallel I/O Pins

General Description

The AC299 is an 8-bit universal shift/storage register with 3-state outputs. Four modes of operation are possible; hold (store), shift left, shift right and load data. The parallel load inputs and flip-flop outputs are multiplexed to reduce the total number of package pins. Additional outputs are provided for flip-flops Q0, Q7 to allow easy serial cascading. A separate active LOW Master Reset is used to reset the register.

Industry Part Number

54AC299

Prime Die

Z299

NS Part Numbers

54AC299DMQB

54AC299FMQB

54AC299LMQB

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

- Icc and Ioz reduced by 50%
- Common parallel I/O for reduced pin count
- Additional serial inputs and outputs for expansion
- Four operating modes: shift left, shift right, load and store
- TRI-STATE outputs for bus-oriented applications
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
- AC299: 5962-88754

(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 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
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

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. Obviously 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	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: -55 C to 125 C. 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, VINL=0.0V	1, 2	INPUTS		0.1	uA	1
			1, 2	INPUTS		1.0	uA	2, 3
IIL	Low Level input current	VCC=5.5V, VM=0.0V, VINH=5.5V	1, 2	INPUTS		-1.0	uA	1, 2, 3
VOL	Low level output Voltage	VCC=3.0V, VIH=2.1V, VIL=0.9V, IOL=12.0mA	1, 2	OUTPUTS		.36	V	1
			1, 2	OUTPUTS		.50	V	2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOL=24.0mA	1, 2	OUTPUTS		.36	V	1
			1, 2	OUTPUTS		.50	V	2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=24.0mA	1, 2	OUTPUTS		.36	V	1
			1, 2	OUTPUTS		.50	V	2, 3
		VCC=3.0V, VIH=2.1V, VIL=0.9V, IOL=50.0uA	1, 2	OUTPUTS		.10	V	1, 2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOL=50.0uA	1, 2	OUTPUTS		.10	V	1, 2, 3
VIOH	Dynamic output Current LOW	VCC=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, VIH=2.1V, VIL=0.9V, IOH=-50.0uA	1, 2	OUTPUTS	2.90		V	1, 2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOH=-50.0uA	1, 2	OUTPUTS	4.40		V	1, 2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-50.0uA	1, 2	OUTPUTS	5.40		V	1, 2, 3
		VCC=3.0V, VIH=2.1V, VIL=0.9V, IOH=-12.0mA	1, 2	OUTPUTS	2.56		V	1
			1, 2	OUTPUTS	2.40		V	2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOH=-24.0mA	1, 2	OUTPUTS	3.86		V	1
			1, 2	OUTPUTS	3.70		V	2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-24.0mA	1, 2	OUTPUTS	4.86		V	1
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-50.0mA	1, 2, 5	OUTPUTS	3.85		V	1, 2, 3
ICCH	Supply Current Outputs HIGH	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	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: -55 C to 125 C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCL	Supply Current Outputs LOW	VCC=5.5V, VINL=0.0V, VINH=5.5V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
IC CZ	Supply Current Outputs Tri-State	VCC=5.5V, VINL=0.0V, VINH=5.5V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
IOZH	Maximum TRI-STATE Leakage Current High	VCC=3.0V, VM=3.0V, VINH=3.0V, VIH=2.1V	1, 2	OUTPUTS		.30	uA	1
			1, 2	OUTPUTS		5.5	uA	2, 3
		VCC=4.5V, VM=4.5V, VINH=4.5V, VIH=3.15V	1, 2	OUTPUTS		.30	uA	1
			1, 2	OUTPUTS		5.5	uA	2, 3
		VCC=5.5V, VM=5.5V, VINH=5.5V, VIH=3.85V	1, 2	OUTPUTS		.30	uA	1
			1, 2	OUTPUTS		5.5	uA	2, 3
IOZL	Maximum TRI-STATE Leakage Current Low	VCC=3.0V, VM=0.0V, VINL=0.0V, VIH=2.1V	1, 2	OUTPUTS		- .30	uA	1
			1, 2	OUTPUTS		-5.5	uA	2, 3
		VCC=4.5V, VM=0.0V, VINL=0.0V, VIH=3.15V	1, 2	OUTPUTS		- .30	uA	1
			1, 2	OUTPUTS		-5.5	uA	2, 3
		VCC=5.5V, VM=0.0V, VINL=0.0V, VIH=3.85V	1, 2	OUTPUTS		- .30	uA	1
			1, 2	OUTPUTS		-5.5	uA	2, 3

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=4.5V	3, 4, 7	CP to Q0 or Q7	1.5	14.0	ns	9
			3, 4, 7	CP to Q0 or Q7	1.5	17.5	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to Q0 or Q7	1.5	14.5	ns	9
			3, 4, 7	CP to Q0 or Q7	1.5	18.0	ns	10, 11

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
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to I/On	1.5	14.5	ns	9
			3, 4, 7	CP to I/On	1.5	17.0	ns	10, 11
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to I/On	1.5	16.0	ns	9
			3, 4, 7	CP to I/On	1.5	18.5	ns	10, 11
tpHL(3)	Propagation Delay	VCC=4.5V	3, 4, 7	MR to Q0 or Q7	1.5	15.5	ns	9
			3, 4, 7	MR to Q0 or Q7	1.5	18.5	ns	10, 11
tpLZ(1)	Output Disable Time	VCC=4.5V	3, 4, 7	OE to I/On	1.5	12.5	ns	9
			3, 4, 7	OE to I/On	1.5	16.0	ns	10, 11
tpHZ(1)	Output Disable Time	VCC=4.5V	3, 4, 7	OE to I/On	1.5	14.0	ns	9
			3, 4, 7	OE to I/On	1.5	17.0	ns	10, 11
tpZL(1)	Output Enable Time	VCC=4.5V	3, 4, 7	OE to I/On	1.5	13.0	ns	9
			3, 4, 7	OE to I/On	1.5	16.0	ns	10, 11
tpZH(1)	Output Enable Time	VCC=4.5V	3, 4, 7	OE to I/On	1.5	12.5	ns	9
			3, 4, 7	OE to I/On	1.5	15.0	ns	10, 11
tpHL(4)	Propagation Delay	VCC=4.5V	3, 4, 7	MR to I/On	1.5	15.0	ns	9
			3, 4, 7	MR to I/On	1.5	18.0	ns	10, 11
ts(H/L)(1)	Setup Time HIGH or LOW	VCC=4.5V	6	Sn to CP	6.0		ns	9
			6	Sn to CP	7.0		ns	10, 11

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
th(H/L)(1)	Hold Time HIGH or LOW	VCC=4.5V	6	Sn to CP	2.0		ns	9
			6	Sn to CP	2.5		ns	10, 11
ts(H/L)(2)	Setup Time HIGH or LOW	VCC=4.5V	6	I/On to CP	3.5		ns	9
			6	I/On to CP	4.0		ns	10, 11
th(H/L)(2)	Hold Time HIGH or LOW	VCC=4.5V	6	I/On to CP	2.0		ns	9, 10, 11
ts(H/L)(3)	Setup Time HIGH or LOW	VCC=4.5V	6	DS7 or DS0 to CP	4.0		ns	9
			6	DS7 or DS0 to CP	5.0		ns	10, 11
th(H/L)(3)	Hold Time HIGH or LOW	VCC=4.5V	6	DS7 or DS0 to CP	1.5		ns	9, 10, 11
tw(L)(1)	MR Pulse Width, LOW	VCC=4.5V	6	MR	5.0		ns	9, 10, 11
tw(H/L)(2)	CP Pulse Width HIGH or LOW	VCC=4.5V	6	CP	5.0		ns	9, 10, 11
tREC(1)	Recovery Time	VCC=4.5V	6	MR to CP	2.5		ns	9, 10, 11
fMAX(1)	Maximum Input Frequency	VCC=4.5V	6		90		MHz	9
			6		80		MHz	10, 11
tpLH(5)	Propagation Delay	VCC=3.0V	3, 4	CP to Q0 or Q7	1.0	20.5	ns	9
			3, 4	CP to Q0 or Q7	1.0	25.5	ns	10, 11
tpHL(5)	Propagation Delay	VCC=3.0V	3, 4	CP to Q0 or Q7	1.0	21.5	ns	9
			3, 4	CP to Q0 or Q7	1.0	26.5	ns	10, 11

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
tpLH(6)	Propagation Delay	VCC=3.0V	3, 4	CP to I/On	1.0	20.5	ns	9
			3, 4	CP to I/On	1.0	24.5	ns	10, 11
tpHL(6)	Propagation Delay	VCC=3.0V	3, 4	CP to I/On	1.0	23.0	ns	9
			3, 4	CP to I/On	1.0	26.5	ns	10, 11
tpHL(7)	Propagation Delay	VCC=3.0V	3, 4	MR to Q0 or Q7	1.0	22.5	ns	9
			3, 4	MR to Q0 or Q7	1.0	27.0	ns	10, 11
tpLZ(2)	Output Disable Time	VCC=3.0V	3, 4	OE to I/On	1.0	17.5	ns	9
			3, 4	OE to I/On	1.9	21.5	ns	10, 11
tpHZ(2)	Output Disable Time	VCC=3.0V	3, 4	OE to I/On	1.0	19.0	ns	9
			3, 4	OE to I/On	1.0	22.5	ns	10, 11
tpZL(2)	Output Enable Time	VCC=3.0V	3, 4	OE to I/On	1.0	19.5	ns	9
			3, 4	OE to I/On	1.0	23.5	ns	10, 11
tpZH(2)	Output Enable Time	VCC=3.0V	3, 4	OE to I/On	1.0	18.5	ns	9
			3, 4	OE to I/On	1.0	22.0	ns	10, 11
tpHL(8)	Propagation Delay	VCC=3.0V	3, 4	MR to I/On	1.0	21.5	ns	9
			3, 4	MR to I/On	1.0	26.5	ns	10, 11
ts(H/L)(4)	Setup Time HIGH or LOW	VCC=3.0V	6	Sn to CP	8.5		ns	9
			6	Sn to CP	9.5		ns	10, 11
th(H/L)(4)	Hold Time HIGH or LOW	VCC=3.0V	6	Sn to CP	2.0		ns	9, 10, 11

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
ts(H/L)(5)	Setup Time HIGH or LOW	VCC=3.0V	6	I/On to CP	5.5		ns	9
			6	I/On to CP	6.0		ns	10, 11
th(H/L)(5)	Hold Time HIGH or LOW	VCC=3.0V	6	I/On to CP	1.5		ns	9, 10, 11
ts(H/L)(6)	Setup Time HIGH or LOW	VCC=3.0V	6	DS7 or DS0 to CP	6.5		ns	9
			6	DS7 or DS0 to CP	7.5		ns	10, 11
th(H/L)(6)	Hold Time HIGH or LOW	VCC=3.0V	6	DS7 or DS0 to CP	1.0		ns	9
			6	DS7 or DS0 to CP	1.5		ns	10, 11
tw(L)(3)	Pulse Width LOW	VCC=3.0V	6	MR	5.0		ns	9
			6	MR	5.5		ns	10, 11
tw(H/L)(4)	CP Pulse Width HIGH or LOW	VCC=3.0V	6	CP	5.0		ns	9
			6	CP	5.5		ns	10, 11
tREC(2)	Recovery Time	VCC=3.0V	6	MR to CP	2.5		ns	9, 10, 11
fMAX(2)	Maximum Input Frequency	VCC=3.0V	6		90		MHz	9
			6		70		MHz	10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C 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: SCREEN 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 & +125C TEMPERATURE, SUBGROUPS A9 & 10.

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

Note 6: GUARANTEED BUT NOT TESTED. (DESIGN CHARACTERIZATION DATA)

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