

MN54AC646-X REV 2A0

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Octal Transceiver/Register With TRI-State Outputs
General Description

The AC646 consists of registered bus transceiver circuits, with outputs, D-type flip-flops and control circuitry providing multiplexed transmission of data directly from the input bus or from the internal storage registers. Data on the A or B bus will be loaded into the respective registers on the LOW-to- HIGH transition of the appropriate clock pin (CPAB or CPBA).

Industry Part Number

54AC646

Prime Die

Z646

NS Part Numbers

 54AC646DMQB
 54AC646FMQB
 54AC646LMQB

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883 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

- Independent registers for A and B buses
- Multiplexed real-time and stored data transfers
- TRI-STATE Outputs
- 300 mil slim dual-in-line package
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
- AC646: 5962-89682

(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 TM 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		0.1	uA	1
			1, 2	INPUTS		1.0	uA	2, 3
IIL	Low Level input Current	VCC=5.5V, VM=0.0V	1, 2	INPUTS		-0.1	uA	1
			1, 2	INPUTS		-1.0	uA	2, 3
VOL	Low Level output voltage	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
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=50.0uA	1, 2	OUTPUTS		.10	V	1, 2, 3
		VCC=3.0V, VIH=2.1V, VIL=0.9V, IOL=12.0mA	1, 2	OUTPUTS		.50	V	2, 3
		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
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=24.0mA	1, 2	OUTPUTS		.50	V	2, 3
VIOL	Dynamic Output Current LOW	VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=50.0mA	1, 2, 5	OUTPUTS		1.65	V	1, 2, 3
			1, 2	OUTPUTS	2.90		V	1, 2, 3
VOH	High Level Output Voltage	VCC=3.0V, VIL=0.9V, VIH=2.1V, IOH=-50.0uA	1, 2	OUTPUTS	4.40		V	1, 2, 3
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOH=-50.0uA	1, 2	OUTPUTS	5.40		V	1, 2, 3
		VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-50.0uA	1, 2	OUTPUTS	2.40		V	2, 3
		VCC=3.0V, VIL=0.9V, VIH=2.1V, IOH=-12.0mA	1, 2	OUTPUTS	2.56		V	1
			1, 2	OUTPUTS	3.70		V	2, 3
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOH=-24.0mA	1, 2	OUTPUTS	3.86		V	1
		VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-24.0mA	1, 2	OUTPUTS	4.70		V	2, 3
		VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-24.0mA	1, 2	OUTPUTS	4.86		V	1
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-50.0mA	1, 2, 5	OUTPUTS	3.85		V	1, 2, 3
			1, 2	VCC		8.0	uA	1
ICCH	Supply Current Outputs HIGH	VCC=5.5V	1, 2	VCC		160	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: -55C to 125C. 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	1, 2	VCC		8.0	uA	1
			1, 2	VCC		160	uA	2, 3
ICCZ	Supply Current Outputs Tri-State	VCC=5.5V	1, 2	VCC		8.0	uA	1
			1, 2	VCC		160	uA	2, 3
IOZH	Maximum TRI-STATE Current	VCC=3.0V, VM=3.0V, VIH=2.1V	1, 2	OUTPUTS		10.0	uA	2, 3
			1, 2	OUTPUTS		0.5	uA	1
		VCC=4.5V, VM=4.5V, VIH=3.15V	1, 2	OUTPUTS		10.0	uA	2, 3
			1, 2	OUTPUTS		0.5	uA	1
		VCC=5.5V, VM=5.5V, 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, VIH=2.1V	1, 2	OUTPUTS		-10.0	uA	2, 3
			1, 2	OUTPUTS		-0.5	uA	1
		VCC=4.5V, VM=0.0V, VIH=3.15V	1, 2	OUTPUTS		-10.0	uA	2, 3
			1, 2	OUTPUTS		-0.5	uA	1
		VCC=5.5V, VM=0.0V, VIH=3.85V	1, 2	OUTPUTS		-10.0	uA	2, 3
			1, 2	OUTPUTS		-0.5	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=4.5V	3, 4, 6	CP to Bus	1.5	11.0	ns	9
			3, 4, 6	CP to Bus	1.5	14.0	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 6	CP to Bus	1.5	10.0	ns	9
			3, 4, 6	CP to Bus	1.5	12.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 6	Bus to Bus	1.5	8.0	ns	9
			3, 4, 6	Bus to Bus	1.5	10.0	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
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 6	Bus to Bus	1.5	8.0	ns	9
			3, 4, 6	Bus to Bus	1.5	9.5	ns	10, 11
tpLH(3)	Propagation Delay	VCC=4.5V	3, 4, 6	SBA/SAB to Bus	1.5	10.0	ns	9
			3, 4, 6	SBA/SAB to Bus	1.5	12.0	ns	10, 11
tpHL(3)	Propagation Delay	VCC=4.5V	3, 4, 6	SBA/SAB to Bus	1.5	10.0	ns	9
			3, 4, 6	SBA/SAB to Bus	1.5	12.0	ns	10, 11
tpZH(1)	Enable Time	VCC=4.5V	3, 4, 6	$\bar{Q}$ to Bus	1.5	8.5	ns	9
			3, 4, 6	$\bar{Q}$ to Bus	1.5	9.5	ns	10, 11
tpZL(1)	Enable Time	VCC=4.5V	3, 4, 6	$\bar{Q}$ to Bus	1.5	9.5	ns	9
			3, 4, 6	$\bar{Q}$ to Bus	1.5	11.0	ns	10, 11
tpHZ(1)	Disable Time	VCC=4.5V	3, 4, 6	$\bar{Q}$ to Bus	1.5	10.0	ns	9
			3, 4, 6	$\bar{Q}$ to Bus	1.5	11.0	ns	10, 11
tpLZ(1)	Disable Time	VCC=4.5V	3, 4, 6	$\bar{Q}$ to Bus	1.5	9.0	ns	9
			3, 4, 6	$\bar{Q}$ to Bus	1.5	11.0	ns	10, 11
tpZH(2)	Enable Time	VCC=4.5V	3, 4, 6	DIR to Bus	1.5	8.5	ns	9
			3, 4, 6	DIR to Bus	1.5	10.5	ns	10, 11
tpZL(2)	Enable Time	VCC=4.5V	3, 4, 6	DIR to Bus	1.5	10.5	ns	9
			3, 4, 6	DIR to Bus	1.5	12.5	ns	10, 11
tpHZ(2)	Disable Time	VCC=4.5V	3, 4, 6	DIR to Bus	1.5	10.0	ns	9
			3, 4, 6	DIR to Bus	1.5	12.0	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
tpLZ(2)	Disable Time	VCC=4.5V	3, 4, 6	DIR to Bus	1.5	10.0	ns	9
			3, 4, 6	DIR to Bus	1.5	12.0	ns	10, 11
ts(H/L)(1)	Setup Time HIGH or LOW	VCC=4.5V	7	Bus to CP	4.0		ns	9
			7	Bus to CP	4.5		ns	10, 11
th(H/L)(1)	Hold Time HIGH or LOW	VCC=4.5V	7	Bus to CP	1.5		ns	9
			7	Bus to CP	2.0		ns	10, 11
tw (1)	Clock Pulse Width HIGH or LOW	VCC=4.5V	7	CP	5.0		ns	9, 10, 11
tpLH(4)	Propagation Delay	VCC=3.0V	3, 4	CP to Bus	1.0	16.0	ns	9
			3, 4	CP to Bus	1.0	20.0	ns	10, 11
tpHL(4)	Propagation Delay	VCC=3.0V	3, 4	CP to Bus	1.0	14.0	ns	9
			3, 4	CP to Bus	1.0	17.5	ns	10, 11
tpLH(5)	Propagation Delay	VCC=3.0V	3, 4	Bus to Bus	1.0	12.0	ns	9
			3, 4	Bus to Bus	1.0	15.0	ns	10, 11
tpHL(5)	Propagation Delay	VCC=3.0V	3, 4	Bus to Bus	1.0	11.5	ns	9
			3, 4	Bus to Bus	1.0	14.5	ns	10, 11
tpLH(6)	Propagation Delay	VCC=3.0V	3, 4	SBA/SAB to Bus	1.0	13.5	ns	9
			3, 4	SBA/SAB to Bus	1.0	17.0	ns	10, 11
tpHL(6)	Propagation Delay	VCC=3.0V	3, 4	SBA/SAB to Bus	1.0	13.5	ns	9
			3, 4	SBA/SAB to Bus	1.0	17.0	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
tpZH(3)	Enable Time	VCC=3.0V	3, 4	Q to Bus	1.0	11.0	ns	9
			3, 4	Q to Bus	1.0	13.0	ns	10, 11
tpZL(3)	Enable Time	VCC=3.0V	3, 4	Q to Bus	1.0	13.0	ns	9
			3, 4	Q to Bus	1.0	15.5	ns	10, 11
tpHZ(3)	Disable Time	VCC=3.0V	3, 4	Q to Bus	1.0	12.0	ns	9
			3, 4	Q to Bus	1.0	14.0	ns	10, 11
tpLZ(3)	Disable Time	VCC=3.0V	3, 4	Q to Bus	1.0	11.0	ns	9
			3, 4	Q to Bus	1.0	13.5	ns	10, 11
tpZH(4)	Enable Time	VCC=3.0V	3, 4	DIR to Bus	1.0	11.5	ns	9
			3, 4	DIR to Bus	1.0	14.5	ns	10, 11
tpZL(4)	Enable Time	VCC=3.0V	3, 4	DIR to Bus	1.0	13.5	ns	9
			3, 4	DIR to Bus	1.0	16.0	ns	10, 11
tpHZ(4)	Disable Time	VCC=3.0V	3, 4	DIR to Bus	1.0	12.5	ns	9
			3, 4	DIR to Bus	1.0	14.5	ns	10, 11
tpLZ(4)	Disable Time	VCC=3.0V	3, 4	DIR to Bus	1.0	14.0	ns	9
			3, 4	DIR to Bus	1.0	16.5	ns	10, 11
ts(H/L)(2)	Setup Time HIGH or LOW	VCC=3.0V	7	Bus to CP	5.0		ns	9
			7	Bus to CP	6.0		ns	10, 11
th(H/L)(2)	Hold Time HIGH or LOW	VCC=3.0V	7	Bus to CP	1.0		ns	9
			7	Bus to CP	1.5		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
tw(2)	Clock Pulse Width	VCC=3.0V	7	CP	5.0		ns	9, 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, GUARDBANDS LIMITS SET FOR +25C, 2MSEC DURATION MAX.

Note 6: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MIN. LIMITS.

Note 7: NOT TESTED AT +25C, +125C, OR -55C TEMPERATURE. GUARANTEED BY DESIGN CHARACTERIZATION DATA.