National Semiconductor

MICROCIRCUIT DATA SHEET

MN54AC251-X REV 1B0

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8-Input Multiplexer With TRI-STATE Outputs

General Description

The AC251 is a high-speed 8-input digital multiplexer. It provides, in one package, the ability to select one bit of data from up to eight sources. It can be used as a universal function generator to generate any logic function of four variables. Both assertion and negation outputs are provided.

Industry Part Number

54AC251

NS Part Numbers

54AC251DMQB
54AC251FMQB
54AC251LMQB

Prime Die

Z251

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{o}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%
- Multifunctional capability
- On-chip select logic decoding
- Inverting and noninverting TRI-STATE outputs
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
  - ACT251: 5962-89599

(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 specification 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, Temperature 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, VINL=0.0V	1, 2	INPUT		0.1	uA	1
			1, 2	INPUT		1.0	uA	2, 3
IIL	Low Level Input Current	VCC=5.5V, VM=0.0V, VINH=5.5V	1, 2	INPUT		-0.1	uA	1
			1, 2	INPUT		-1.0	uA	2, 3
VOL	Low Level Output Voltage	VCC=3.0V, VIH=2.1V, VIL=0.9V, IOL=12.0mA, VINH=3.0V, VINL=0.0V	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=3.0V, VIH=2.1V, VIL=0.9V, IOL=50.0uA, VINH=3.0V, VINL=0.0V	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOL=50.0uA, VINH=4.5V, VINL=0.0V	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=24.0mA, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=50.0uA, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOL=24.0mA, VINH=4.5V, VINL=0.0V	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
VIOL	Dynamic Output Current Low	VCC=5.5V, VIH=3.85V, VIL=1.65V, IOL=50.0mA, VINH=5.5V, VINL=0.0V	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High Level Output Voltage	VCC=3.0V, VIH=2.1V, VIL=0.9V, IOH=-50.0uA, VINH=3.0V, VINL=0.0V	1, 2	OUTPUT	2.90		V	1, 2, 3
		VCC=3.0V, VIH=2.1V, VIL=.90V, IOH=-12.0mA, VINH=3.0V, VINL=0.0V	1, 2	OUTPUT	2.56		V	1
			1, 2	OUTPUT	2.40		V	2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-24.0mA, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT	4.86		V	1
			1, 2	OUTPUT	4.70		V	2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOH=-24.0mA, VINH=4.5V, VINL=0.0V	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=4.5V, VIH=3.15V, VIL=1.35V, IOH=-50.0uA, VIHN=4.5V, VINL=0.0V	1, 2	OUTPUT	4.40		V	1, 2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-50.0uA, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT	5.40		V	1, 2, 3
VIOH	Dynamic Output Current High	VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-50.0mA, VINH=5.5V, VINL=0.0V	1, 2, 5	OUTPUT	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, Temperature 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, VINL=0.0V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCZ	Supply Current Outputs Tri-State	VCC=5.5V, VINH=5.5V, VINL=0.0V	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, VINL=0.0V, VIH=2.1V	1, 2	OUTPUT		0.25	uA	1
			1, 2	OUTPUT		5.0	uA	2, 3
		VCC=4.5V, VM=4.5V, VINH=4.5V, VINL=0.0V, VIH=3.15V	1, 2	OUTPUT		0.25	uA	1
			1, 2	OUTPUT		5.0	uA	2, 3
		VCC=5.5V, VM=5.5V, VINH=5.5V, VINL=0.0V, VIH=3.85V	1, 2	OUTPUT		0.25	uA	1
			1, 2	OUTPUT		5.0	uA	2, 3
IOZL	Maximum TRI-STATE Leakage Current Low	VCC=3.0V, VM=0.0V, VINH=3.0V, VINL=0.0V, VIH=2.1V	1, 2	OUTPUT		-0.25	uA	1
			1, 2	OUTPUT		-5.0	uA	2, 3
		VCC=4.5V, VM=0.0V, VINH=4.5V, VINL=0.0V, VIH=3.15V	1, 2	OUTPUT		-0.25	uA	1
			1, 2	OUTPUT		-5.0	uA	2, 3
		VCC=5.5V, VM=0.0V, VINH=5.5V, VINL=0.0V, VIH=3.85V	1, 2	OUTPUT		-0.25	uA	1
			1, 2	OUTPUT		-5.0	uA	2, 3

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, RL=500 OHMS, TRISE=3ns, TFALL=3ns, Temp Range: -55C to125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

tpLH(1)	Propagation Delay	VCC=4.5V	3, 4, 6	In to Z or Z	1.5	10.0	ns	9
			3, 4, 6	In to Z or Z	1.5	12.0	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 6	In to Z or Z	1.5	10.0	ns	9
			3, 4, 6	In to Z or Z	1.5	12.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 6	Sn to Z or Z	1.5	12.5	ns	9
			3, 4, 6	Sn to Z or Z	1.5	15.5	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, TRISE=3ns, TFALL=3ns, Temp Range: -55C to125C. 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	Sn to Z or Z	1.5	12.5	ns	9
			3, 4, 6	Sn to Z or Z	1.5	15.5	ns	10, 11
tpZH(1)	Output Enable Time	VCC=4.5V	3, 4, 6	$\overline{OE}$ to Z or Z	1.5	8.0	ns	9
			3, 4, 6	$\overline{OE}$ to Z or Z	1.5	10.0	ns	10, 11
tpZL(1)	Output Enable Time	VCC=4.5V	3, 4, 6	$\overline{OE}$ to Z or Z	1.5	8.0	ns	9
			3, 4, 6	$\overline{OE}$ to Z or Z	1.5	10.0	ns	10, 11
tpHZ(1)	Output Disable Time	VCC=4.5V	3, 4, 6	$\overline{OE}$ to Z or Z	1.5	9.5	ns	9
			3, 4, 6	$\overline{OE}$ to Z or Z	1.5	11.0	ns	10, 11
tpLZ(1)	Output Disable Time	VCC=4.5V	3, 4, 6	$\overline{OE}$ to Z or Z	1.5	8.0	ns	9
			3, 4, 6	$\overline{OE}$ to Z or Z	1.5	10.0	ns	10, 11
tpLH(3)	Propagation Delay	VCC=3.0V	3, 4	In to Z or Z	1.0	14.0	ns	9
			3, 4	In to Z or Z	1.0	17.0	ns	10, 11
tpHL(3)	Propagation Delay	VCC=3.0V	3, 4	In to Z or Z	1.0	14.0	ns	9
			3, 4	In to Z or Z	1.0	16.5	ns	10, 11
tpLH(4)	Propagation Delay	VCC=3.0V	3, 4	Sn to Z or Z	1.0	17.5	ns	9
			3, 4	Sn to Z or Z	1.0	21.0	ns	10, 11
tpHL(4)	Propagation Delay	VCC=3.0V	3, 4	Sn to Z or Z	1.0	17.5	ns	9
			3, 4	Sn to Z or Z	1.0	21.0	ns	10, 11
tpZH(2)	Output Enable Time	VCC=3.0V	3, 4	$\overline{OE}$ to Z or Z	1.0	11.0	ns	9
			3, 4	$\overline{OE}$ to Z or Z	1.0	13.0	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, TRISE=3ns, TFALL=3ns, Temp Range: -55C to125C. 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=3.0V	3, 4	$\overline{OE}$ to Z or Z	1.0	11.0	ns	9
			3, 4	$\overline{OE}$ to Z or Z	1.0	13.0	ns	10, 11
tpHZ(2)	Output Disable Time	VCC=3.0V	3, 4	$\overline{OE}$ to Z or Z	1.0	11.5	ns	9
			3, 4	$\overline{OE}$ to Z or Z	1.0	14.0	ns	10, 11
tpLZ(2)	Output Disable Time	VCC=3.0V	3, 4	$\overline{OE}$ to Z or Z	1.0	11.0	ns	9
			3, 4	$\overline{OE}$ to Z or Z	1.0	13.0	ns	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, 2MSEC DURATION MAX.
Note 6: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MIN. LIMITS.