National Semiconductor

MICROCIRCUIT DATA SHEET

MN54ACQ245-X REV 2A0

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Octal Bidirectional Transceiver with TRI-STATE Inputs/Outputs

General Description

The ACQ245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 24 mA at both the A and B ports. The Transmit/Receiver (T/R) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH, Z condition.

The ACQ utilizes NSC Quiet Series technology to guarantee quiet output switching and improve dynamic threshold performance. FACT Quiet Series TM features GTO TM output control and undershoot corrector in addition to a split ground bus for superior performance.

Industry Part Number

54ACQ245

NS Part Numbers

54ACQ245DMQB
54ACQ245FMQB
54ACQ245LMQB

Prime Die

E245

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%
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Guaranteed pin-to-pin skew AC performance
- Improved latch-up immunity
- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs source/sink 24 mA
- Faster prop delays than the standard ACT245
- 4kV minimum ESD immunity (ACQ)
- Standard Military Drawing (SMD)
  - ACQ245: 5962- 92177

(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
DC Latch-Up Source or Sink Current	±300 mA
Junction Temperature (Tj)	
CDIP	175 C

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

Recommended Operating Conditions

(Note 1)

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)	
ACQ Devices	
Vin from 30% to 70% of Vcc	
Vcc @ 3.0V, 4.5V, 5.5V	125 mV/ns

Note 1: All commercial packaging is not recommended for applications requiring greater than 2000 temperature cycles from -40 C to + 125 C.

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	INPUTS		0.1	uA	1
			1, 2	INPUTS		1.0	uA	2, 3
IIL	Low level input current	VCC=5.5V, VM=0.0V, VINL=0.0V	1, 2	INPUTS		-0.1	uA	1
			1, 2	INPUTS		-1.0	uA	2, 3
VOL	Low level output current	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		.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
VIOL	Dynamic output current LOW	VCC=5.5V, VIL=0.0V, VIH=5.5V, 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=.09V, IOH=-12.0mA	1, 2	OUTPUTS	2.56		V	1
			1, 2	OUTPUTS	2.40		V	2, 3
		VCC=5.5V, VIH=3.85V, VIL=1.65V, IOH=-24.0mA	1, 2	OUTPUTS	4.86		V	1
			1, 2	OUTPUTS	4.70		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
VIOH	Dynamic output current High	VCC=5.5V, VIH=5.5V, VIL=0.0V, 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, 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
IOZH	Maximum TRI-STATE Leakage Current High	VCC=3.0V, VM=3.0V, VINH=5.5V, VINL=0.0V, VIH=2.1V	1, 2	OUTPUTS		0.25	uA	1
			1, 2	OUTPUTS		5.0	uA	2, 3
		VCC=4.5V, VM=4.5V, VINH=4.5V, VINL=0.0V, VIH=3.15V	1, 2	OUTPUTS		0.25	uA	1
			1, 2	OUTPUTS		5.0	uA	2, 3
		VCC=5.5V, VM=5.5V, VINH=5.5V, VINL=0.0V, VIH=3.85V	1, 2	OUTPUTS		0.25	uA	1
			1, 2	OUTPUTS		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	OUTPUTS		-0.25	uA	1
			1, 2	OUTPUTS		-5.0	uA	2, 3
		VCC=4.5V, VM=0.0V, VINH=4.5V, VINL=0.0V, VIH=3.15V	1, 2	OUTPUTS		-0.25	uA	1
			1, 2	OUTPUTS		-5.0	uA	2, 3
		VCC=5.5V, VM=0.0V, VINH=5.5V, VINL=0.0V, VIH=3.85V	1, 2	OUTPUTS		-0.25	uA	1
			1, 2	OUTPUTS		-5.0	uA	2, 3
ICCH	Positive Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCL	Negative Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCZ	High Impedance Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
VIKL		VCC=4.5V, IKL=-18mA	1, 2	INPUTS		-1.2	V	1, 2, 3
VIKH		VCC=4.5V, IKH=18mA	1, 2	INPUTS		5.7	V	1, 2, 3
VILD	Maximum low level Dynamic input voltage	VCC=5.0V, LOAD 50pF, 500 OHMS	6, 9	INPUTS		1.5	V	4
VIHD	Minimum high level Dynamic input voltage	VCC=5.0V, LOAD 50pF, 500 OHMS	6, 9	INPUTS	3.5		V	4
VOLP	Quiet output maximum dynamic VOL	VCC=5.0V, LOAD 50pF, 500 OHMS	6, 8	OUTPUTS		1.5	V	4
VOLV	Quiet output minimum dynamic VOL	VCC=5.0V, LOAD 50pF, 500 OHMS	6, 8	OUTPUTS		-1.2	V	4

Electrical Characteristics

AC PARAMETER

(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(1)	Propagation Delay	VCC=4.5V	3, 4, 7	An/Bn or Bn/An	2.0	6.5	ns	9
			3, 4, 7	An/Bn or Bn/An	2.0	8.5	ns	10
			3, 4, 7	An/Bn or Bn/An	1.5	8.5	ns	11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 7	An/Bn or Bn/An	2.0	6.5	ns	9
			3, 4, 7	An/Bn or Bn/An	2.0	7.5	ns	10
			3, 4, 7	An/Bn or Bn/An	1.5	7.5	ns	11
tpZL(1)	Output Enable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to An or Bn	2.0	9.0	ns	9
			3, 4, 7	$\overline{OE}$ to An or Bn	2.0	10.0	ns	10
			3, 4, 7	$\overline{OE}$ to An or Bn	1.5	10.0	ns	11
tpZH(1)	Output Enable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to An or Bn	2.0	8.5	ns	9
			3, 4, 7	$\overline{OE}$ to An or Bn	2.0	10.0	ns	10
			3, 4, 7	$\overline{OE}$ to An or Bn	1.5	10.0	ns	11
tpHZ(1)	Output Disable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to An or Bn	1.5	9.0	ns	9
			3, 4, 7	$\overline{OE}$ to An or Bn	1.5	10.0	ns	10, 11

Electrical Characteristics

AC PARAMETER(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(1)	Output Disable Time	VCC=4.5V	3, 4, 7	$\overline{OE}$ to An or Bn	1.5	9.0	ns	9
			3, 4, 7	$\overline{OE}$ to An or Bn	1.5	10.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC=3.0V	3, 4	An/Bn or Bn/An	2.0	8.5	ns	9
			3, 4	An/Bn or Bn/An	2.0	11.5	ns	10
			3, 4	An/Bn or Bn/An	1.5	11.5	ns	11
tpHL(2)	Propagation Delay	VCC=3.0V	3, 4	An/Bn or Bn/An	2.0	8.5	ns	9
			3, 4	An/Bn or Bn/An	2.0	10.0	ns	10
			3, 4	An/Bn or Bn/An	1.5	10.0	ns	11
tpZL(2)	Output Enable Time	VCC=3.0V	3, 4	$\overline{OE}$ to An or Bn	2.0	12.0	ns	9
			3, 4	$\overline{OE}$ to An or Bn	2.0	13.0	ns	10
			3, 4	$\overline{OE}$ to An or Bn	1.5	13.0	ns	11
tpZH(2)	Output Enable Time	VCC=3.0V	3, 4	$\overline{OE}$ to An or Bn	2.0	11.5	ns	9
			3, 4	$\overline{OE}$ to An or Bn	2.0	13.0	ns	10
			3, 4	$\overline{OE}$ to An or Bn	1.5	13.0	ns	11

Electrical Characteristics

AC PARAMETER(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
tpHZ(2)	Output Disable Time	VCC=3.0V	3, 4	$\overline{OE}$ to An or Bn	1.5	11.0	ns	9
			3, 4	$\overline{OE}$ to An or Bn	1.5	13.0	ns	10, 11
tpLZ(2)	Output Disable Time	VCC=3.0V	3, 4	$\overline{OE}$ to An or Bn	1.5	11.0	ns	9
			3, 4	$\overline{OE}$ to An or Bn	1.5	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, 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 GUARDBANDING 4.5V MIN. LIMITS.
Note 8: MAX NUMBER OF OUTPUTS DEFINED AS (N). DATA INPUTS ARE DRIVER 0V TO 5V. ONE OUTUT @ GND.
Note 9: MAX NUMBER OF DATA INPUTS (N) SWITCHING. N-1 INPUTS SWITCHING 0V TO 5V. INPUT-UNDER-TEST SWITCHING: 5V TO THRESHOLD (VILD), 0V TO THRESHOLD (VIHD), FREQ. = 1 MHz.