

MN54AC541-X REV 2B1

Original Creation Date: 07/01/96
Last Update Date: 03/18/02
Last Major Revision Date: 12/15/99

Octal Buffer/Line Driver With TRI-State Outputs

General Description

The AC541 is similar in function to the AC244, except that the inputs and outputs are on opposite sides of the package (see Connection Diagrams). This pinout arrangement makes this device especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

The AC541 is an octal buffer/line driver designed to be employed as a memory and address driver, clock driver and bus-oriented transmitter/receiver. The AC541 is a non-inverting option of the AC540.

Industry Part Number

54AC541

Prime Die

Z541

NS Part Numbers

54AC541DMQB
54AC541FMQB
54AC541LMQB
54AC541WG-QML

Controlling Document

SEE FEATURES SECTION

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

- I_{cc} and I_{oz} reduced by 50%
- TRI-STATE outputs
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors
- Output source/sink 24 mA
- AC540 provides inverted outputs

Standard Military Drawing (SMD)

54AC541DMQB	5962-8870601RA
54AC541FMQB	5962-8870601SA
54AC541LMQB	5962-88706012A
54AC541WG-QML	5962-8870601ZA

(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	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: -55°C 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		.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
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
VOH	High Level Output Voltage	VCC=3.0V, VIL=0.9V, VIH=2.1V, IOH=-50.0uA	1, 2	OUTPUTS	2.90		V	1, 2, 3
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOH=-50.0uA	1, 2	OUTPUTS	4.40		V	1, 2, 3
		VCC=5.5V, VIL=1.65V, VIH=3.85V, IOH=-50.0uA	1, 2	OUTPUTS	5.40		V	1, 2, 3
		VCC=3.0V, VIL=0.9V, VIH=2.1V, IOH=-12.0mA	1, 2	OUTPUTS	2.56		V	1
			1, 2	OUTPUTS	2.40		V	2, 3
		VCC=4.5V, VIL=1.35V, VIH=3.15V, IOH=-24.0mA	1, 2	OUTPUTS	3.86		V	1
			1, 2	OUTPUTS	3.70		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

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, VIH=2.1V	1, 2	OUTPUTS		0.25	uA	1
			1, 2	OUTPUTS		5.0	uA	2, 3
		VCC=4.5V, VM=4.5V, VIH=3.15V	1, 2	OUTPUTS		0.25	uA	1
			1, 2	OUTPUTS		5.0	uA	2, 3
		VCC=5.5V, VM=5.5V, VIH=3.85V	1, 2	OUTPUTS		0.25	uA	1
			1, 2	OUTPUTS		5.0	uA	2, 3
IOZL	Maximum TRI-STATE Current	VCC=3.0V, VM=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, VIH=3.15V	1, 2	OUTPUTS		-0.25	uA	1
			1, 2	OUTPUTS		-5.0	uA	2, 3
		VCC=5.5V, VM=0.0V, VIH=3.85V	1, 2	OUTPUTS		-0.25	uA	1
			1, 2	OUTPUTS		-5.0	uA	2, 3
ICCH	Supply Current Outputs HIGH	VCC=5.5V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCL	Supply Current Outputs LOW	VCC=5.5V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCZ	Supply Current Outputs Tri-State	VCC=5.5V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	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	In to On	1.5	6.0	ns	9
			3, 4, 7	In to On	1.5	7.0	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 7	In to On	1.5	6.0	ns	9
			3, 4, 7	In to On	1.5	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
tpZL(1)	Output Enable Time	VCC=4.5V	3, 4, 7	OE to On	1.5	7.5	ns	9
			3, 4, 7	OE to On	1.5	9.0	ns	10, 11
tpZH(1)	Output Enable Time	VCC=4.5V	3, 4, 7	OE to On	1.5	8.5	ns	9
			3, 4, 7	OE to On	1.5	10.0	ns	10, 11
tpHZ(1)	Output Disable Time	VCC=4.5V	3, 4, 7	OE to On	1.5	10.5	ns	9
			3, 4, 7	OE to On	1.5	12.0	ns	10, 11
tpLZ(1)	Output Disable Time	VCC=4.5V	3, 4, 7	OE to On	1.5	7.5	ns	9
			3, 4, 7	OE to On	1.5	9.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC=3.0V	3, 4	In to On	1.0	8.0	ns	9
			3, 4	In to On	1.0	10.0	ns	10, 11
tpHL(2)	Propagation Delay	VCC=3.0V	3, 4	In to On	1.0	8.0	ns	9
			3, 4	In to On	1.0	9.5	ns	10, 11
tpZL(2)	Output Enable Time	VCC=3.0V	3, 4	OE to On	1.0	10.0	ns	9
			3, 4	OE to On	1.0	12.5	ns	10, 11
tpZH(2)	Output Enable Time	VCC=3.0V	3, 4	OE to On	1.0	11.5	ns	9
			3, 4	OE to On	1.0	13.5	ns	10, 11
tpHZ(2)	Output Disable Time	VCC=3.0V	3, 4	OE to On	1.0	12.5	ns	9
			3, 4	OE to On	1.0	15.0	ns	10, 11
tpLZ(2)	Output Disable Time	VCC=3.0V	3, 4	OE to On	1.0	9.5	ns	9
			3, 4	OE to On	1.0	11.0	ns	10, 11

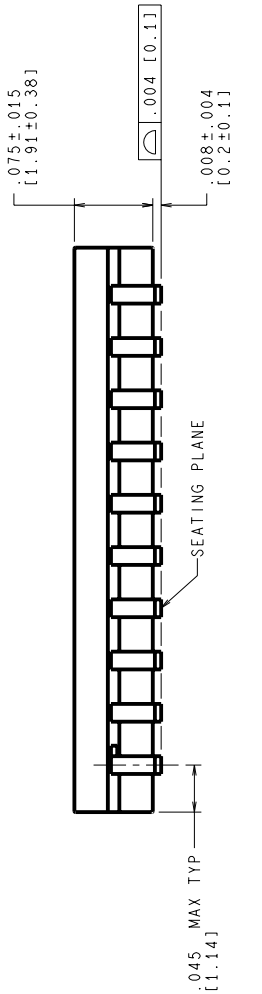
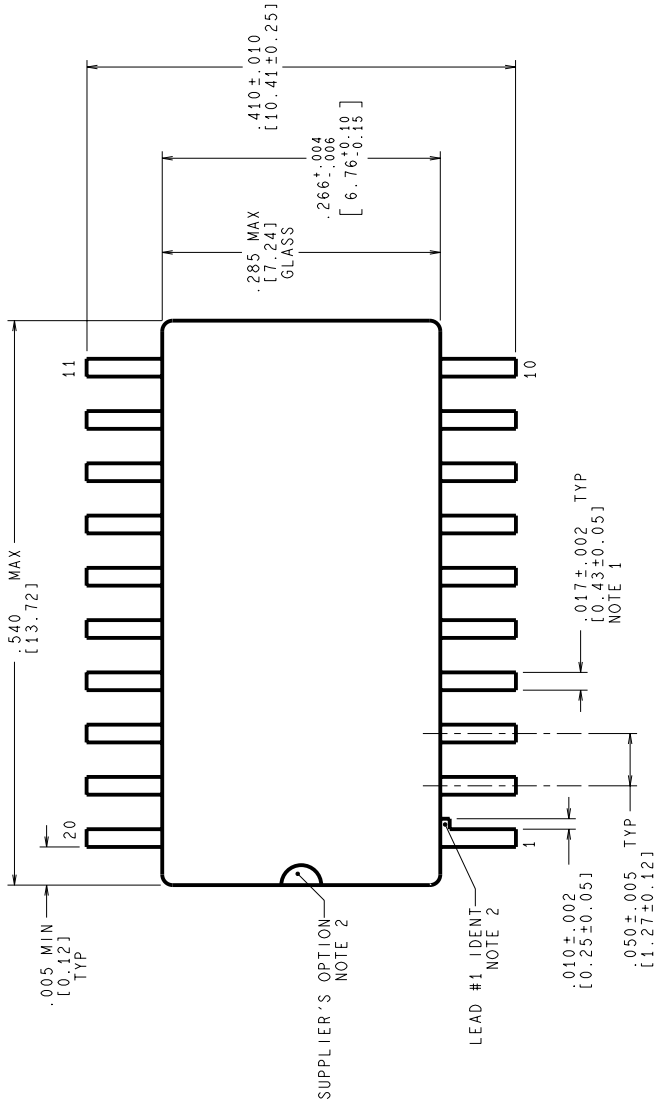
- Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C TEMPERATURE, SUBGROUPS 1, 2, 7, & 8.
- Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A1, 2, 7, & 8.
- Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY SUBGROUP A9.
- Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A9 & 10.
- Note 5: TRANSMISSION LINE DRIVING TEST, 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.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
WG20ARB	CERPACK, 20 LEAD GULL WING (P/P DWG)

See attached graphics following this page.

REVISIONS			
LTR	DESCRIPTION	E.C.N.	DATE
A	RELEASE TO DOCUMENT CONTROL	11842	10/13/1997 TL/KH
B	DIM .410 WAS .391; UPDATE NOTE 3.	12013	06/15/1998 MS/



NOTES: UNLESS OTHERWISE SPECIFIED

- LEAD FINISH: SOLDER DIPPED WITH Sn60 OR Sn63 SOLDER CONFORMING TO MIL-PRF-38535 TO A MINIMUM THICKNESS OF 200 MICRONS/ 5.08 MICROMETERS. SOLDER MAY BE APPLIED OVER LEAD BASIS METAL OR Sn PLATE. MAXIMUM LIMIT MAY BE INCREASED BY .003 IN/ 0.08mm AFTER LEAD FINISH APPLIED.
- LEAD IDENTIFICATION SHALL BE:
 - A NOTCH OR OTHER MARK WITHIN THIS AREA
 - A TAB ON LEAD 1, EITHER SIDE
- NO JEDEC REGISTRATION AS OF JUNE 1998.

MIL-PRF-38535 CONFIGURATION CONTROL

APPROVALS		DATE	REVISION	
DESIGN	TL/QUAN	10/13/1997	1	1
TEST	TL/CHK			
PROD	TL/CHK			
PROJECTION			DO NOT SCALE DRAWING	
SCALE		N/A	SIZE	
N/A			C (SC) MKT-WG20A	
REV			B	

National Semiconductor
2000 Semiconductor dr., Santa Clara, CA 95052-8000

**CERPACK,
20 LEAD,
GULL WING**

Revision History

Rev	ECN #	Rel Date	Originator	Changes
2A0	M0003612	03/18/02	Linda Collins	Update MDS from MN54AC541-X Rev. 1B0 to MDS MN54AC541-X Rev. 2A0. Added the word 'Method' to the Quality Conformance Inspection section of the MDS. Changed the min limit from 2.50 to 2.56 in the VOH 3.0V Vcc, IOH = -12mA DC parametric section. Also changed the test condition for VOH 5.5V Vcc from VOH = -24.0mA to IOH = -24.0mA. Added a space between 'TheAC541' and a hyphen in the word 'noninverting' in the General Description section of MDS. Deleted the statement 'Guardband limits set for +25C' from note 5.
2B1	M0003972	03/18/02	Rose Malone	Update MDS: MN54AC541-X, Rev. 2A0 to MN54AC541-X, Rev. 2B1. Added SMD Numbers and WG pkg to Main Table and Features Section, also added WG Mkt Dwg to Graphics Section.