

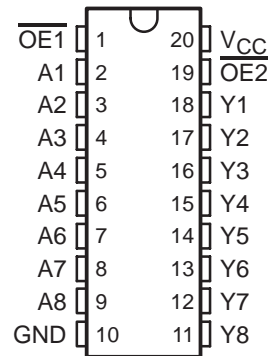
SN74AHC541-Q1 OCTAL BUFFER/DRIVER WITH 3-STATE OUTPUTS

SCLS603 – DECEMBER 2004

- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- Operating Range 2-V to 5.5-V V_{CC}
- Latch-Up Performance Exceeds 250 mA Per JESD 17

† Contact factory for details. Q100 qualification data available on request.

DW OR PW PACKAGE
(TOP VIEW)



description/ordering information

The SN74AHC541 octal buffer/driver is ideal for driving bus lines or buffer memory address registers. This device features inputs and outputs on opposite sides of the package to facilitate printed circuit board layout.

The 3-state control gate is a two-input AND gate with active-low inputs so that if either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all corresponding outputs are in the high-impedance state. The outputs provide noninverted data when they are not in the high-impedance state.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION

T_A	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	SOIC – DW	Tape and reel	SN74AHC541QDWRQ1	AHC541Q
	TSSOP – PW	Tape and reel	SN74AHC541QPWRQ1	AHC541Q

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE
(each buffer/driver)

INPUTS			OUTPUT
$\overline{OE1}$	$\overline{OE2}$	A	Y
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2004, Texas Instruments Incorporated

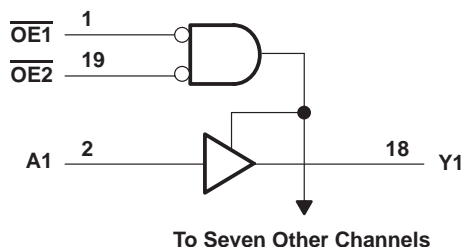
SN74AHC541-Q1

OCTAL BUFFER/DRIVER

WITH 3-STATE OUTPUTS

SCLS603 – DECEMBER 2004

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input voltage range, V_I (see Note 1)	-0.5 V to 7 V
Output voltage range, V_O (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	-20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 25 mA
Continuous current through V_{CC} or GND	± 75 mA
Package thermal impedance, θ_{JA} (see Note 2): DW package	58°C/W
PW package	83°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5	V
		$V_{CC} = 3$ V	2.1	
		$V_{CC} = 5.5$ V	3.85	
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V	0.5	V
		$V_{CC} = 3$ V	0.9	
		$V_{CC} = 5.5$ V	1.65	
V_I	Input voltage	0	5.5	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V	-50	μ A
		$V_{CC} = 3.3$ V ± 0.3 V	-4	mA
		$V_{CC} = 5$ V ± 0.5 V	-8	
I_{OL}	Low-level output current	$V_{CC} = 2$ V	50	μ A
		$V_{CC} = 3.3$ V ± 0.3 V	4	mA
		$V_{CC} = 5$ V ± 0.5 V	8	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3$ V ± 0.3 V	100	ns/V
		$V_{CC} = 5$ V ± 0.5 V	20	
T_A	Operating free-air temperature	-40	125	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			T _A = -40°C TO 125°C		T _A = -40°C TO 85°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = -50 μA	2 V	1.9	2		1.9		1.9	V	
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I _{OH} = -4 mA	3 V	2.58			2.48		2.48		
	I _{OH} = -8 mA	4.5 V	3.94			3.8		3.8		
V _{OL}	I _{OL} = 50 μA	2 V			0.1		0.1		V	
		3 V			0.1		0.1			
		4.5 V			0.1		0.1			
	I _{OL} = 4 mA	3 V			0.36		0.5			0.44
	I _{OL} = 8 mA	4.5 V			0.36		0.5			0.44
I _I	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1		±1	μA
I _{OZ} [†]	V _O = V _{CC} or GND, V _I (OE) = V _{IL} or V _{IH}	5.5 V			±0.25		±2.5		±2.5	μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			4		40		40	μA
C _i	V _I = V _{CC} or GND	5 V			2	10			10	pF
C _o	V _O = V _{CC} or GND	5 V			4					pF

[†] For input and output, I_{OZ} includes the input leakage current.

switching characteristics over recommended operating free-air temperature range,
 V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T _A = 25°C			T _A = -40°C TO 125°C		T _A = -40°C TO 85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	C _L = 15 pF		5	7	1	8.5	1	8.5	ns
t _{PHL}					5	7	1	8.5	1	8.5	
t _{PZH}	$\overline{\text{OE}}$	Y	C _L = 15 pF		6	10.5	1	11	1	11	ns
t _{PZL}					6	10.5	1	11	1	11	
t _{PHZ}	$\overline{\text{OE}}$	Y	C _L = 15 pF		7	11	1	12	1	12	ns
t _{PLZ}					7	11	1	12	1	12	
t _{PLH}	A	Y	C _L = 50 pF		7.5	10.5	1	12	1	12	ns
t _{PHL}					7.5	10.5	1	12	1	12	
t _{PZH}	$\overline{\text{OE}}$	Y	C _L = 50 pF		8	14	1	16	1	16	ns
t _{PZL}					8	14	1	16	1	16	
t _{PHZ}	$\overline{\text{OE}}$	Y	C _L = 50 pF		9	15.4	1	17.5	1	17.5	ns
t _{PLZ}					9	15.4	1	17.5	1	17.5	
t _{sk(o)}			C _L = 50 pF			1.5				1.5	ns

SN74AHC541-Q1

OCTAL BUFFER/DRIVER

WITH 3-STATE OUTPUTS

SCLS603 – DECEMBER 2004

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ TO 125°C		$T_A = -40^\circ\text{C}$ TO 85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	$C_L = 15\text{ pF}$	3.5	5		1	6	1	6	ns
t_{PHL}				3.5	5		1	6	1	6	
t_{PZH}	\overline{OE}	Y	$C_L = 15\text{ pF}$	4.7	7.2		1	8.5	1	8.5	ns
t_{PZL}				4.7	7.2		1	8.5	1	8.5	
t_{PHZ}	\overline{OE}	Y	$C_L = 15\text{ pF}$	5	7.5		1	8	1	8	ns
t_{PLZ}				5	7.5		1	8	1	8	
t_{PLH}	A	Y	$C_L = 50\text{ pF}$	5	7		1	8	1	8	ns
t_{PHL}				5	7		1	8	1	8	
t_{PZH}	\overline{OE}	Y	$C_L = 50\text{ pF}$	6.2	9.2		1	10.5	1	10.5	ns
t_{PZL}				6.2	9.2		1	10.5	1	10.5	
t_{PHZ}	\overline{OE}	Y	$C_L = 50\text{ pF}$	6	8.8		1	10	1	10	ns
t_{PLZ}				6	8.8		1	10	1	10	
$t_{sk(o)}$			$C_L = 50\text{ pF}$			1				1	ns

noise characteristics, $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 4)

PARAMETER	MIN	MAX	UNIT
$V_{OL(P)}$ Quiet output, maximum dynamic V_{OL}		0.8	V
$V_{OL(V)}$ Quiet output, minimum dynamic V_{OL}		-0.8	V
$V_{OH(V)}$ Quiet output, minimum dynamic V_{OH}	4.7		V
$V_{IH(D)}$ High-level dynamic input voltage	3.5		V
$V_{IL(D)}$ Low-level dynamic input voltage		1.5	V

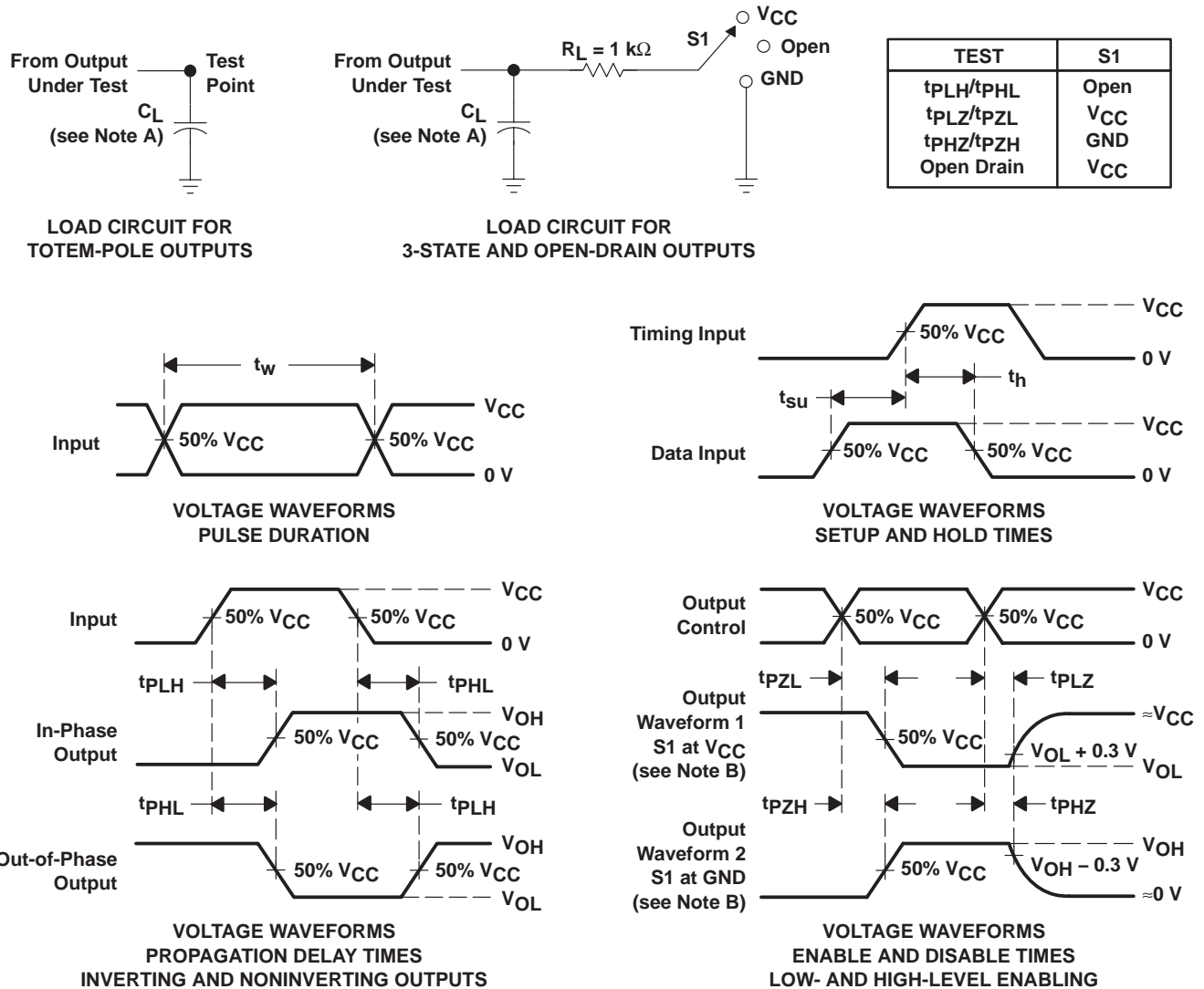
NOTE 4: Characteristics are for surface-mount packages only.

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	No load, $f = 1\text{ MHz}$	12	pF



PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O = 50\ \Omega$, $t_r \leq 3$ ns, $t_f \leq 3$ ns.
 D. The outputs are measured one at a time, with one input transition per measurement.
 E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265