

TYPES SN5446A, '47A, '48, '49, SN54L46, 'L47, SN54LS47, 'LS48, 'LS49, SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

MARCH 1974. REVISED DECEMBER 1983

'46A, '47A, 'L46, 'L47, 'LS47
feature

- Open-Collector Outputs Drive Indicators Directly
- Lamp-Test Provision
- Leading/Trailing Zero Suppression

'48, 'LS48
feature

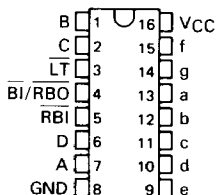
- Internal Pull-Ups Eliminate Need for External Resistors
- Lamp-Test Provision
- Leading/Trailing Zero Suppression

'49, 'LS49
feature

- Open-Collector Outputs
- Blanking Input

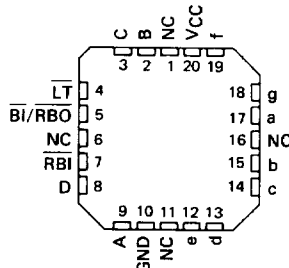
SN54L46, SN54L47 ... J PACKAGE
SN5446A, SN5447A, SN54LS47, SN5448,
SN54LS48 ... J OR W PACKAGE
SN7446A, SN7447A,
SN7448 ... J OR N PACKAGE
SN74LS47, SN74LS48 ... D, J OR N PACKAGE

(TOP VIEW)



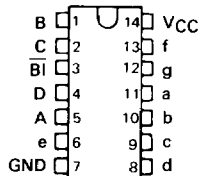
SN54LS47, SN54LS48 ... FK PACKAGE
SN74LS47, SN74LS48 ... FN PACKAGE

(TOP VIEW)



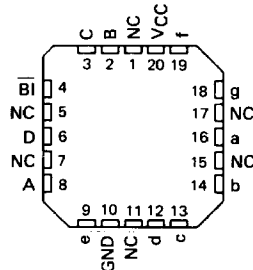
SN5449 ... W PACKAGE
SN54LS49 ... J OR W PACKAGE
SN74LS49 ... D, J OR N PACKAGE

(TOP VIEW)



SN54LS49 ... FK PACKAGE
SN74LS49 ... FN PACKAGE

(TOP VIEW)



NC - No internal connection

3

TTL DEVICES

PRODUCTION DATA

This document contains information 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

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**TYPES SN5446A, '47A, '48, '49, SN54L46, 'L47, SN54LS47, 'LS48, 'LS49, SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS**

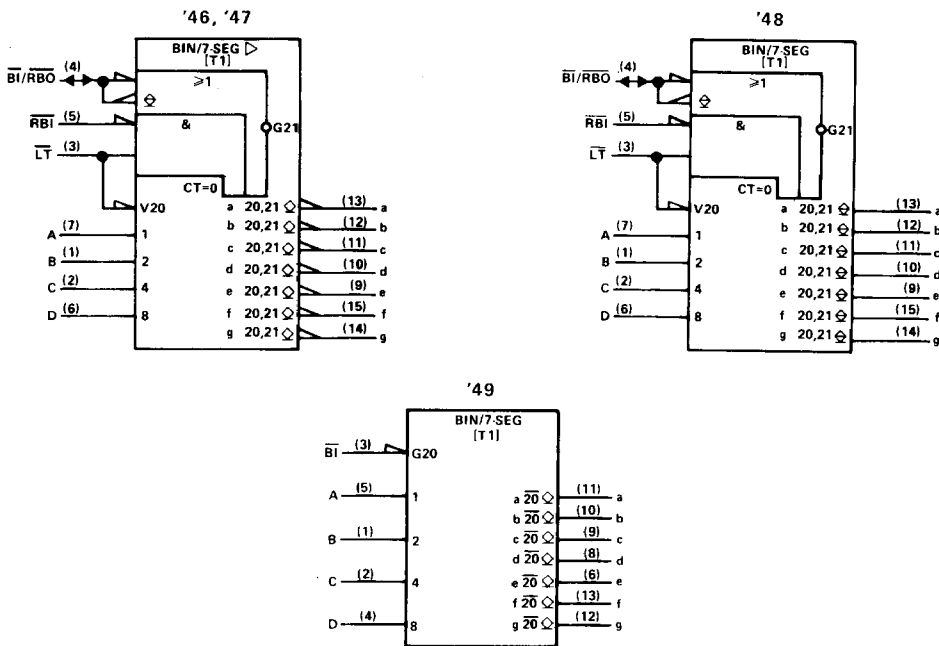
- All Circuit Types Feature Lamp Intensity Modulation Capability

TYPE	DRIVER OUTPUTS				TYPICAL POWER DISSIPATION	PACKAGES
	ACTIVE LEVEL	OUTPUT CONFIGURATION	SINK CURRENT	MAX VOLTAGE		
SN5446A	low	open-collector	40 mA	30 V	320 mW	J, W
SN5447A	low	open-collector	40 mA	15 V	320 mW	J, W
SN5448	high	2-k Ω pull-up	6.4 mA	5.5 V	265 mW	J, W
SN5449	high	open-collector	10 mA	5.5 V	165 mW	W
SN54L46	low	open-collector	20 mA	30 V	160 mW	J
SN54L47	low	open-collector	20 mA	15 V	160 mW	J
SN54LS47	low	open-collector	12 mA	15 V	35 mW	J, W
SN54LS48	high	2-k Ω pull-up	2 mA	5.5 V	125 mW	J, W
SN54LS49	high	open-collector	4 mA	5.5 V	40 mW	J, W
SN7446A	low	open-collector	40 mA	30 V	320 mW	J, N
SN7447A	low	open-collector	40 mA	15 V	320 mW	J, N
SN7448	high	2-k Ω pull-up	6.4 mA	5.5 V	265 mW	J, N
SN74LS47	low	open-collector	24 mA	15 V	35 mW	J, N
SN74LS48	high	2-k Ω pull-up	6 mA	5.5 V	125 mW	J, N
SN74LS49	high	open-collector	8 mA	5.5 V	40 mW	J, N

logic symbols

3

TTL DEVICES



Pin numbers shown on logic notation are for D, J or N packages.

**TYPES SN5446A, '47A, '48, '49, SN54L46, 'L47, SN54LS47, 'LS48, 'LS49,
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS**

**'48, 'LS48
FUNCTION TABLE**

DECIMAL OR FUNCTION	INPUTS					$\overline{BI}/R\overline{BO}^\dagger$	OUTPUTS							NOTE	
	LT	RBI	D	C	B		A	a	b	c	d	e	f		g
0	H	H	L	L	L	L	H	H	H	H	H	H	H	L	1
1	H	X	L	L	L	H	H	L	H	H	L	L	L	L	
2	H	X	L	L	H	L	H	H	H	L	H	H	L	H	
3	H	X	L	L	H	H	H	H	H	H	L	L	H		
4	H	X	L	H	L	L	H	L	H	H	L	L	H	H	
5	H	X	L	H	L	H	H	H	L	H	H	L	H	H	
6	H	X	L	H	H	L	H	L	L	H	H	H	H	H	
7	H	X	L	H	H	H	H	H	H	H	L	L	L	L	
8	H	X	H	L	L	L	H	H	H	H	H	H	H	H	
9	H	X	H	L	L	H	H	H	H	L	L	H	H	H	
10	H	X	H	L	H	L	H	L	L	L	H	L	L	H	
11	H	X	H	L	H	H	H	L	L	H	H	L	L	H	
12	H	X	H	H	L	L	H	L	H	L	L	L	H	H	
13	H	X	H	H	L	H	H	H	L	L	H	L	H	H	
14	H	X	H	H	H	L	H	L	L	L	H	H	H	H	
15	H	X	H	H	H	H	H	L	L	L	L	L	L	L	
BI	X	X	X	X	X	X	L	L	L	L	L	L	L	L	2
RBI	H	L	L	L	L	L	L	L	L	L	L	L	L	L	3
LT	L	X	X	X	X	X	H	H	H	H	H	H	H	H	4

H = high level, L = low level, X = irrelevant

- NOTES: 1. The blanking input (\overline{BI}) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBI) must be open or high, if blanking of a decimal zero is not desired.
2. When a low logic level is applied directly to the blanking input (\overline{BI}), all segment outputs are low regardless of the level of any other input.
3. When ripple-blanking input (\overline{RBI}) and inputs A, B, C, and D are at a low level with the lamp-test input high, all segment outputs go low and the ripple-blanking output (\overline{RBO}) goes to a low level (response condition).
4. When the blanking input/ripple-blanking output ($\overline{BI}/\overline{RBO}$) is open or held high and a low is applied to the lamp-test input, all segment outputs are high.

$\dagger \overline{BI}/\overline{RBO}$ is wire-AND logic serving as blanking input (\overline{BI}) and/or ripple-blanking output (\overline{RBO}).

**'49, 'LS49
FUNCTION TABLE**

DECIMAL OR FUNCTION	INPUTS					\overline{BI}	OUTPUTS							NOTE	
	D	C	B	A	a		b	c	d	e	f	g			
0	L	L	L	L	H	H	H	H	H	H	L	L	L	L	1
1	L	L	L	H	H	L	H	H	L	L	L	L	L	L	
2	L	L	H	L	H	H	H	L	H	H	L	L	H	H	
3	L	L	H	H	H	H	H	H	H	H	L	L	H		
4	L	H	L	L	H	L	H	H	L	L	L	H	H		
5	L	H	L	H	H	H	L	H	H	L	L	H	H		
6	L	H	H	L	H	L	L	H	H	H	H	H	H		
7	L	H	H	H	H	H	H	H	H	L	L	L	L		
8	H	L	L	L	H	H	H	H	H	H	L	L	H		
9	H	L	L	H	H	H	H	H	L	L	L	H	H		
10	H	L	H	L	H	L	L	L	H	H	L	L	H		
11	H	L	H	H	H	L	L	L	H	H	L	L	H		
12	H	H	L	L	H	L	H	L	L	L	L	H	H		
13	H	H	L	H	H	H	L	L	L	H	L	H	H		
14	H	H	H	L	H	L	L	L	H	H	H	H	H		
15	H	H	H	H	H	L	L	L	L	L	L	L	L		
BI	X	X	X	X	X	L	L	L	L	L	L	L	L	L	2

H = high level, L = low level, X = irrelevant

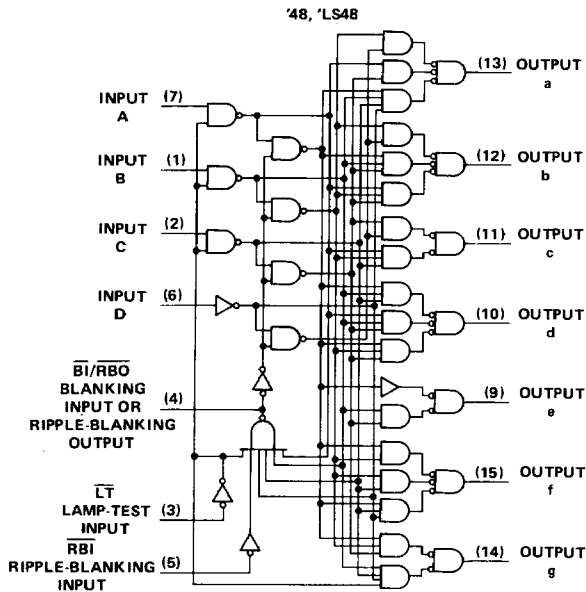
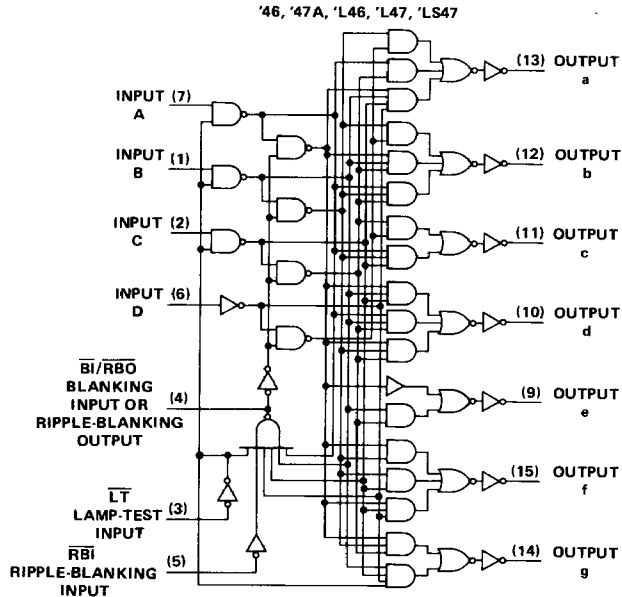
- NOTES: 1. The blanking input (\overline{BI}) must be open or held at a high logic level when output functions 0 through 15 are desired.
2. When a low logic level is applied directly to the blanking input (\overline{BI}), all segment outputs are low regardless of the level of any other input.

3

TTL DEVICES

TYPES SN5446A, '47A, '48, SN54L46, 'L47, SN54LS47, 'LS48,
SN7446A, '47A, '48, SN74LS47, 'LS48,
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

logic diagrams



Pin numbers shown on logic notation are for D, J or N packages.

3

TTL DEVICES

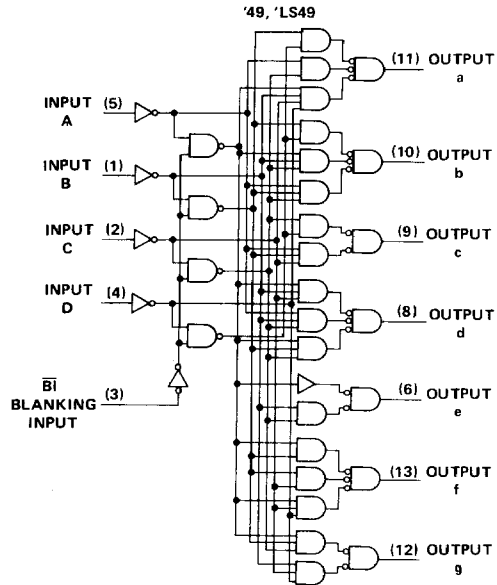
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3-197

TYPES SN5449, SN54LS49, SN74LS49
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

logic diagrams (continued)



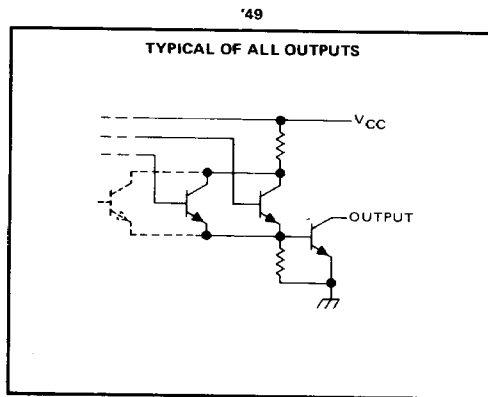
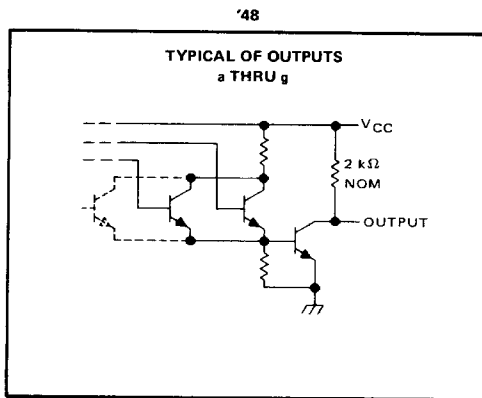
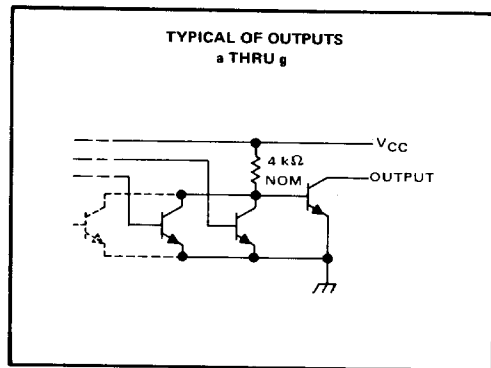
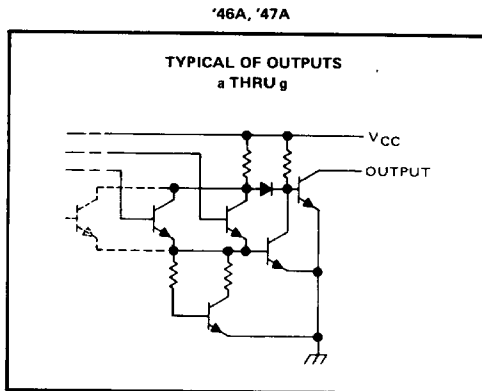
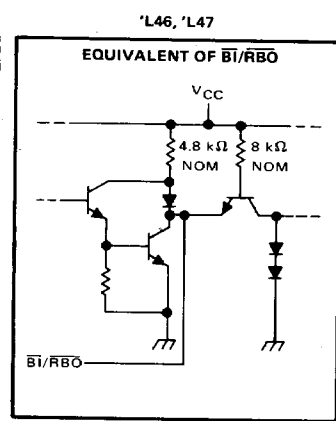
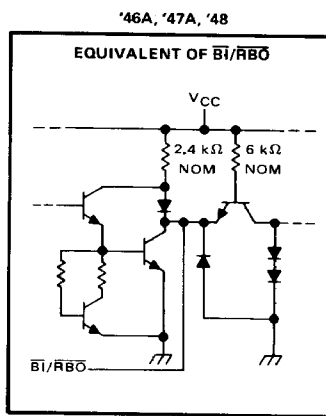
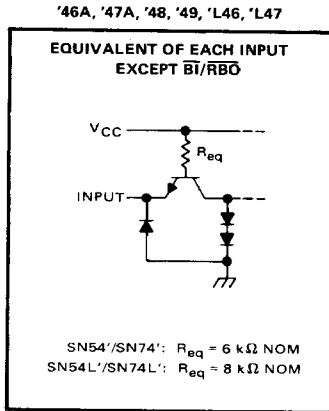
Pin numbers shown on logic notation are for D, J or N packages.

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TTL DEVICES

TYPES SN5446A, '47A, '48, '49, SN54L46, 'L47,
SN7446A, '47A, '48
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

schematics of inputs and outputs



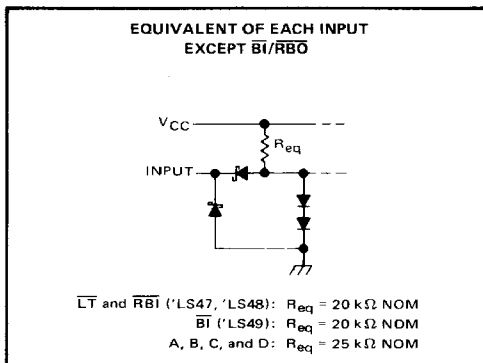
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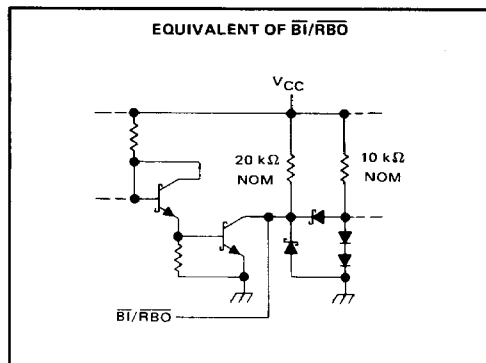
TYPES SN54LS47, 'LS48, 'LS49, SN74LS47, 'LS48, 'LS49 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

schematics of inputs and outputs

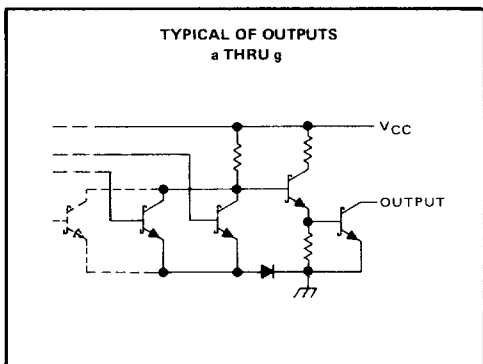
'LS47, 'LS48, 'LS49



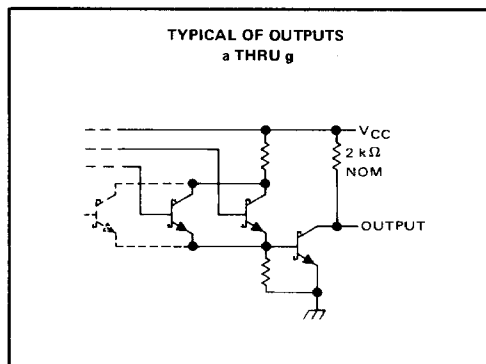
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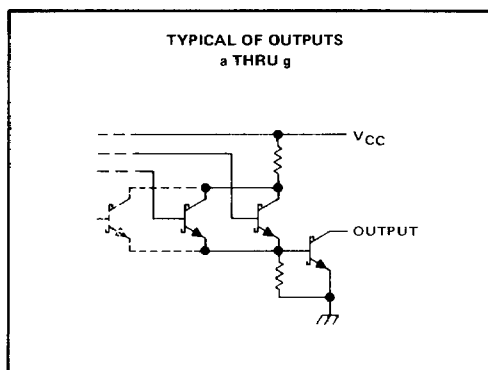
'LS47



'LS48



'LS49



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TTL DEVICES

TYPES SN5446A, SN5447A, SN7446A, SN7447A BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Current forced into any output in the off state	1 mA
Operating free-air temperature range: SN5446A, SN5447A	-55°C to 125°C
SN7446A, SN7447A	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN5446A			SN5447A			SN7446A			SN7447A			UNIT	
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX		
Supply voltage, V_{CC}	4.5	5	5.5	4.5	5	5.5	4.75	5	5.25	4.75	5	5.25	V	
Off-state output voltage, $V_{O(off)}$	a thru g			30			15			30			15	V
On-state output current, $I_{O(on)}$	a thru g			40			40			40			40	mA
High-level output current, I_{OH}	$\overline{BI}/\overline{RBO}$			-200			-200			-200			-200	μ A
Low-level output current, I_{OL}	$\overline{BI}/\overline{RBO}$			8			8			8			8	mA
Operating free-air temperature, T_A	-55	125	-55	125	0	70	0	70	0	70	0	70	°C	

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

PARAMETER		TEST CONDITIONS [†]	MIN	TYP [‡]	MAX	UNIT
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage				0.8	V
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$			-1.5	V
V_{OH}	High-level output voltage	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -200 \mu\text{A}$	2.4	3.7		V
V_{OL}	Low-level output voltage	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = 8 \text{ mA}$	0.27	0.4		V
$I_{O(off)}$	Off-state output current	a thru g $V_{CC} = \text{MAX}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $V_{D(off)} = \text{MAX}$			250	μ A
$V_{O(on)}$	On-state output voltage	a thru g $V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{O(on)} = 40 \text{ mA}$	0.3	0.4		V
I_I	Input current at maximum input voltage	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$			1	mA
I_{IH}	High-level input current	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$			40	μ A
I_{IL}	Low-level input current	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			-1.6	mA
		$\overline{BI}/\overline{RBO}$			-4	
I_{OS}	Short-circuit output current	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$			-4	mA
I_{CC}	Supply current	$V_{CC} = \text{MAX}$, See Note 2	SN54 [*]	64	85	mA
			SN74 [*]	64	103	

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡] All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{off}	Turn-off time from A input			100	ns
t_{on}	Turn-on time from A input			100	
t_{off}	Turn-off time from \overline{RBI} input			100	ns
t_{on}	Turn-on time from \overline{RBI} input			100	

NOTE 3: See General Information Section for load circuits and voltage waveforms. ; t_{off} corresponds to t_{pLH} and t_{on} corresponds to t_{pHL} .

3
TTL DEVICES

TYPES SN54L46, SN54L47

BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Peak output current ($t_w \leq 1$ ms, duty cycle $\leq 10\%$)	200 mA
Current forced into any output in the off state	1 mA
Operating free-air temperature range: SN54L46, SN54L47	-55°C to 125°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

		SN54L46			SN54L47			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage				0.8			V
$V_{O(off)}$	Off-state output voltage	a thru g			30			V
$I_{O(on)}$	On-state output current,	a thru g			20			mA
I_{OH}	High-level output current	$\overline{BI}/\overline{RBO}$			-0.1			mA
I_{OL}	Low-level output current	$\overline{BI}/\overline{RBO}$			4			mA
T_A	Operating free-air temperature	-55		125	-55		125	$^\circ\text{C}$

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

PARAMETER		MIN	TYP†	MAX	UNIT		
V_{IK}	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$				-1.5	V	
V_{OH}	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -0.1 \text{ mA}$	2.4	3.4			V	
V_{OL}	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 4 \text{ mA}$				0.2	0.4	V
$I_{O(off)}$	a thru g $V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, V_{O(off)} = \text{MAX}$				250	μA	
$V_{O(on)}$	a thru g $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{O(on)} = 20 \text{ mA}$				0.3	0.4	V
I_I	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$				1	mA	
I_{IH}	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$				20	μA	
I_{IL}	Any input except $\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$				-0.8	mA	
	$\overline{BI}/\overline{RBO}$				-2		
I_{OS}	$\overline{BI}/\overline{RBO}$ $V_{CC} = \text{MAX}$				-2	mA	
I_{CC}	$V_{CC} = \text{MAX},$ See Note 2	SN54L'		32	43	mA	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
t_{off}	Turn-off time from A input				200	ns
t_{on}	Turn-on time from A input				200	ns
t_{off}	Turn-off time from \overline{RBI} input				200	ns
t_{on}	Turn-on time from \overline{RBI} input				200	ns

$C_L = 15 \text{ pF}, R_L = 280 \Omega,$
See Note 3

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3 TTL DEVICES

TYPES SN54LS47, SN74LS47 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Peak output current ($t_w \leq 1$ ms, duty cycle $\leq 10\%$)	200 mA
Current forced into any output in the off state	1 mA
Operating free-air temperature range: SN54LS47	-55°C to 125°C
SN74LS47	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54LS47			SN74LS47			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
Off-state output voltage, $V_{O(off)}$	a thru g			15			V
On-state output current, $I_{O(on)}$	a thru g			12			24 mA
High-level output current, I_{OH}	$\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$			-50			μA
Low-level output current, I_{OL}	$\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$			1.6			3.2 mA
Operating free-air temperature, T_A	-55		125	0		70	$^\circ\text{C}$

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

PARAMETER		TEST CONDITIONS [†]	SN54LS47			SN74LS47			UNIT
			MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V_{IH}	High-level input voltage		2			2			V
V_{IL}	Low-level input voltage		0.7			0.8			V
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18$ mA	-1.5			-1.5			V
V_{OH}	High-level output voltage	$\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$ $V_{CC} = \text{MIN}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}, I_{OH} = -50$ μA	2.4	4.2		2.4	4.2		V
V_{OL}	Low-level output voltage	$\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$ $V_{CC} = \text{MIN}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 1.6$ mA		0.25	0.4	$I_{OL} = 3.2$ mA		V
$I_{O(off)}$	Off-state output current	a thru g $V_{CC} = \text{MAX}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}, V_{O(off)} = 15$ V	250			250			μA
$V_{O(on)}$	On-state output voltage	a thru g $V_{CC} = \text{MIN}, V_{IH} = 2$ V, $V_{IL} = V_{IL \text{ max}}$	$I_{O(on)} = 12$ mA		0.25	0.4	$I_{O(on)} = 24$ mA		V
I_I	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7$ V	0.1			0.1			mA
I_{IH}	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7$ V	20			20			μA
I_{IL}	Low-level input current	Any input except $\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$ $\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$ $V_{CC} = \text{MAX}, V_I = 0.4$ V	-0.4			-0.4			mA
I_{OS}	Short-circuit output current	$\bar{B}\bar{I}/\bar{R}\bar{B}\bar{O}$ $V_{CC} = \text{MAX}$	-0.3			-2			mA
I_{CC}	Supply current	$V_{CC} = \text{MAX},$ See Note 2	7	13		7	13		mA

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡]All typical values are at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{off}	Turn-off time from A input			100	ns
t_{on}	Turn-on time from A input	$C_L = 15$ pF, $R_L = 665 \Omega$		100	
t_{off}	Turn-off time from $\bar{R}\bar{B}\bar{I}$ input	See Note 3		100	ns
t_{on}	Turn-on time from $\bar{R}\bar{B}\bar{I}$ input			100	

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3
TTL DEVICES

TYPES SN5448, SN7448 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Operating free-air temperature range: SN5448	-55°C to 125°C
SN7448	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN5448			SN7448			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}	a thru g	-400		-400			μ A
	\bar{B} I/ \bar{R} B \bar{O}	-200		-200			
Low-level output current, I_{OL}	a thru g	6.4		6.4			mA
	\bar{B} I/ \bar{R} B \bar{O}	8		8			
Operating free-air temperature, T_A	-55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT	
V_{IH}	High-level input voltage		2			V	
V_{IL}	Low-level input voltage				0.8	V	
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5	V	
V_{OH}	High-level output voltage	a thru g	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OH} = \text{MAX}$	2.4	4.2	V	
		\bar{B} I/ \bar{R} B \bar{O}		2.4	3.7		
I_O	Output current	a thru g	$V_{CC} = \text{MIN}, V_O = 0.85 \text{ V},$ Input conditions as for V_{OH}	-1.3	-2	mA	
V_{OL}	Low-level output voltage		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OL} = \text{MAX}$	0.27	0.4	V	
I_I	Input current at maximum input voltage	Any input except \bar{B} I/ \bar{R} B \bar{O}	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1 mA	
I_{IH}	High-level input current	Any input except \bar{B} I/ \bar{R} B \bar{O}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40 μ A	
I_{IL}	Low-level input current	Any input except \bar{B} I/ \bar{R} B \bar{O}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-1.6 mA	
		\bar{B} I/ \bar{R} B \bar{O}				-4	
I_{OS}	Short-circuit output current	\bar{B} I/ \bar{R} B \bar{O}	$V_{CC} = \text{MAX}$			-4 mA	
I_{CC}	Supply current		$V_{CC} = \text{MAX},$ See Note 2	SN5448	53	76	mA
				SN7448	53	90	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation delay time, high-to-low-level output from A input	$C_L = 15 \text{ pF}, R_L = 1 \text{ k}\Omega,$ See Note 3			100	ns
t_{PLH}	Propagation delay time, low-to-high-level output from A input				100	
t_{PHL}	Propagation delay time, high-to-low-level output from \bar{R} B \bar{I} input				100	ns
t_{PLH}	Propagation delay time, low-to-high-level output from \bar{R} B \bar{I} input				100	

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

TYPES SN54LS48, SN74LS48 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range: SN54LS48	-55°C to 125°C
SN74LS48	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

		SN54LS48			SN74LS48			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}		4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}	a thru g	-100			-100			μ A
	$\overline{BI}/\overline{RBO}$	-50			-50			
Low-level output current, I_{OL}	a thru g	2			6			mA
	$\overline{BI}/\overline{RBO}$	1.6			3.2			
Operating free-air temperature, T_A		-55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS†		SN54LS48		SN74LS48		UNIT
				MIN	TYP‡	MAX	MIN	
V_{IH}	High-level input voltage			2		2		V
V_{IL}	Low-level input voltage			0.7		0.8		V
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$		-1.5		-1.5		V
V_{OH}	High-level output voltage	a thru g and $\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = \text{MAX}$	2.4	4.2	2.4	4.2	V
I_O	Output current	a thru g	$V_{CC} = \text{MIN}, V_O = 0.85 \text{ V},$ Input conditions as for V_{OH}	-1.3	-2	-1.3	-2	mA
V_{OL}	Low-level output voltage	a thru g	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 2 \text{ mA}$ $I_{OL} = 6 \text{ mA}$		$I_{OL} = 2 \text{ mA}$ $I_{OL} = 6 \text{ mA}$		V
		$\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 1.6 \text{ mA}$ $I_{OL} = 3.2 \text{ mA}$		$I_{OL} = 1.6 \text{ mA}$ $I_{OL} = 3.2 \text{ mA}$		V
I_I	Input current at maximum input voltage	Any input except $\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$	0.1		0.1		mA
I_{IH}	High-level input current	Any input except $\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$	20		20		μ A
I_{IL}	Low-level input current	Any input except $\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-0.4		-0.4		mA
		$\overline{BI}/\overline{RBO}$		-1.2		-1.2		
I_{OS}	Short-circuit output current	$\overline{BI}/\overline{RBO}$	$V_{CC} = \text{MAX}$	-0.3		-2		mA
I_{CC}	Supply current	$V_{CC} = \text{MAX},$ See Note 2		25	38	25	38	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL} Propagation delay time, high-to-low-level output from A input	$C_L = 15 \text{ pF}, R_L = 4 \text{ k}\Omega,$ See Note 3			100	ns
t_{PLH} Propagation delay time, low-to-high-level output from A input				100	
t_{PHL} Propagation delay time, high-to-low-level output from \overline{RBI} input	$C_L = 15 \text{ pF}, R_L = 6 \text{ k}\Omega,$ See Note 3			100	ns
t_{PLH} Propagation delay time, low-to-high-level output from \overline{RBI} input				100	

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES



TYPES SN5449

BCD-TO-SEVEN-SEGMENT DECODER/DRIVER

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Current forced into any output in the off state	1 mA
Operating free-air temperature range	-55°C to 125°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN5449			UNIT
	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	V
High-level output voltage, V_{OH}			5.5	V
Low-level output current, I_{OL}			10	mA
Operating free-air temperature, T_A	-55		125	°C

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

PARAMETER	TEST CONDITIONS†	SN5449		UNIT
		MIN	TYP‡	
V_{IH} High-level input voltage		2		V
V_{IL} Low-level input voltage			0.6	V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -10 \text{ mA}$		-1.5	V
I_{OH} High-level output current	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$		250	μA
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OL} = 10 \text{ mA}$	0.27	0.4	V
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		1	mA
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$		40	μA
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-1.6	mA
I_{CC} Supply current	$V_{CC} = \text{MAX},$ See Note 2	33	47	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL} Propagation delay time, high-to-low-level output from A input	$C_L = 15 \text{ pF}, R_L = 667 \Omega,$ See Note 3			100	ns
t_{PLH} Propagation delay time, low-to-high-level output from A input				100	
t_{PHL} Propagation delay time, high-to-low-level output from $\overline{RB1}$ input				100	ns
t_{PLH} Propagation delay time, low-to-high-level output from $\overline{RB1}$ input				100	

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

TYPES SN54LS49, SN74LS49 BCD-TO-SEVEN-SEGMENT-DECODERS/DRIVERS

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Current forced into any output in the off state	1 mA
Operating free-air temperature range: SN54LS49	-55°C to 125°C
SN74LS49	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54LS49			SN74LS49			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output voltage, V_{OH}	5.5			5.5			V
Low-level output current, I_{OL}	4			8			mA
Operating free-air temperature, T_A	-55			0			70 °C

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

PARAMETER	TEST CONDITIONS†	SN54LS49			SN74LS49			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH} High-level input voltage		2			2			V
V_{IL} Low-level input voltage					0.8			V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$				-1.5			V
I_{OH} High-level output current	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, V_{OH} = 5.5 \text{ V}$	250			250			µA
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 4 \text{ mA}$	0.25	0.4	0.25	0.4	V	
		$I_{OL} = 8 \text{ mA}$			0.35	0.5		
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$	0.1			0.1			mA
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$	20			20			µA
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-0.4			-0.4			mA
I_{CC} Supply current	$V_{CC} = \text{MAX},$ See Note 2	8 15			8 15			mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

NOTE 2: I_{CC} is measured with all outputs open and all inputs at 4.5 V.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL} Propagation delay time, high-to-low-level output from A input	$C_L = 15 \text{ pF}, R_L = 2 \text{ k}\Omega,$			100	ns
t_{PLH} Propagation delay time, low-to-high-level output from A input	See Note 3			100	
t_{PHL} Propagation delay time, high-to-low-level output from RB1 input	$C_L = 15 \text{ pF}, R_L = 6 \text{ k}\Omega,$			100	ns
t_{PLH} Propagation delay time, low-to-high-level output from RB1 input	See Note 3			100	

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES