FOR USE AS LAMP, RELAY, OR MOS DRIVERS
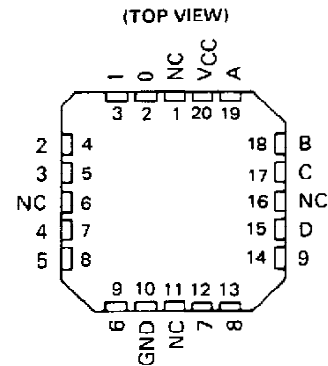
- Full Decoding of Input Logic

- SN54145, SN74145, and SN74LS145 Have 80-mA Sink-Current Capability

- All Outputs Are Off for Invalid BCD Input Conditions

- Low Power Dissipation of 'LS145 . . . 35 mW Typical

SN54145, SN54LS145 . . . J OR W PACKAGE
SN74145 . . . N PACKAGE
SN74LS145 . . . D OR N PACKAGE
(TOP VIEW)

```
    0 [ 1  U 16 ] VCC
    1 [ 2    15 ] A
    2 [ 3    14 ] B
    3 [ 4    13 ] C
    4 [ 5    12 ] D
    5 [ 6    11 ] 9
    6 [ 7    10 ] 8
  GND [ 8     9 ] 7
```

SN54LS145 . . . FK PACKAGE
(TOP VIEW)

```
        NC  VCC
      1  0  NC  A
      3   2   1  20  19
    2 [ 4           18 ] B
    3 [ 5           17 ] C
   NC [ 6           16 ] NC
    4 [ 7           15 ] D
    5 [ 8           14 ] 9
      9  10  11  12  13
      6  GND  NC  7  8
```
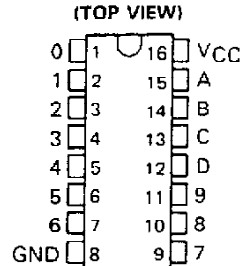
NC - No internal connection

FUNCTION TABLE

NO.	INPUTS			OUTPUTS									
	D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	L	L	L	L	L	H	H	H	H	H	H	H	H	H
1	L	L	L	H	H	L	H	H	H	H	H	H	H	H
2	L	L	H	L	H	H	L	H	H	H	H	H	H	H
3	L	L	H	H	H	H	H	L	H	H	H	H	H	H
4	L	H	L	L	H	H	H	H	L	H	H	H	H	H
5	L	H	L	H	H	H	H	H	H	L	H	H	H	H
6	L	H	H	L	H	H	H	H	H	H	L	H	H	H
7	L	H	H	H	H	H	H	H	H	H	H	L	H	H
8	H	L	L	L	H	H	H	H	H	H	H	H	L	H
9	H	L	L	H	H	H	H	H	H	H	H	H	H	L
INVALID	H	L	H	L	H	H	H	H	H	H	H	H	H	H
	H	L	H	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	L	H	H	H	H	H	H	H	H	H	H
	H	H	L	H	H	H	H	H	H	H	H	H	H	H
	H	H	H	L	H	H	H	H	H	H	H	H	H	H
	H	H	H	H	H	H	H	H	H	H	H	H	H	H

H = high level (off), L = low level (on)

description

These monolithic BCD-to-decimal decoder/drivers consist of eight inverters and ten four-input NAND gates. The inverters are connected in pairs to make BCD input data available for decoding by the NAND gates. Full decoding of valid BCD input logic ensures that all outputs remain off for all invalid binary input conditions. These decoders feature high-performance, n-p-n output transistors designed for use as indicator/relay drivers or as open-collector logic-circuit drivers. Each of the high-breakdown output transistors (15 volts) of the SN54145, SN74145, or SN74LS145 will sink up to 80 milliamperes of current. Each input is one Series 54/74 or Series 54LS/74LS standard load, respectively. Inputs and outputs are entirely compatible for use with TTL or DTL logic circuits, and the outputs are compatible for interfacing with most MOS integrated circuits. Power dissipation is typically 215 milliwatts for the '145 and 35 milliwatts for the 'LS145.

logic diagram

```
INPUT A (15) ─▷○─                    (1) OUTPUT 0
                                      (2) OUTPUT 1
                                      (3) OUTPUT 2
INPUT B (14) ─▷○─                    (4) OUTPUT 3
                                      (5) OUTPUT 4
                                      (6) OUTPUT 5
INPUT C (13) ─▷○─                    (7) OUTPUT 6
                                      (9) OUTPUT 7
                                      (10) OUTPUT 8
INPUT D (12) ─▷○─                    (11) OUTPUT 9
```
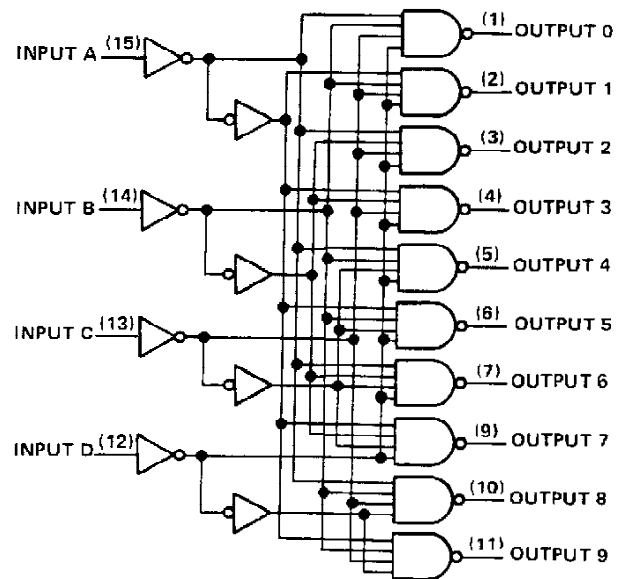
Pin numbers shown are for D, J, N, and W packages.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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
Maximum current into any output (off-state) . . . . 1 mA
Operating free-air temperature range: SN54145 . . . . −55°C to 125°C
SN74145 . . . . 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

	SN54145			SN74145			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, $V_{O(off)}$			15			15	V
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} = MIN, I_I = −12 mA				−1.5	V
$I_{O(off)}$	Off-state output current	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, $V_{O(off)}$ = 15 V				250	μA
$V_{O(on)}$	On-state output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V	$I_{O(on)}$ = 80 mA	0.5	0.9		V
			$I_{O(on)}$ = 20 mA			0.4	
I_I	Input current at maximum input voltage	V_{CC} = MAX, V_I = 5.5 V				1	mA
I_{IH}	High-level input current	V_{CC} = MAX, V_I = 2.4 V				40	μA
I_{IL}	Low-level input current	V_{CC} = MAX, V_I = 0.4 V				−1.6	mA
I_{CC}	Supply current	V_{CC} = MAX, See Note 2	SN54145		43	62	mA
			SN74145		43	70	

† 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°C.
NOTE 2: I_{CC} is measured with all inputs grounded and outputs open.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 15 pF, R_L = 100 Ω, See Note 3		50	ns
t_{PHL}	Propagation delay time, high-to-low-level output			50	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs
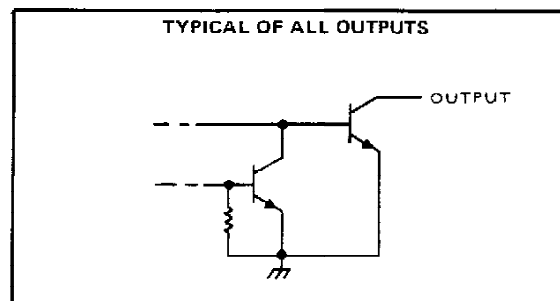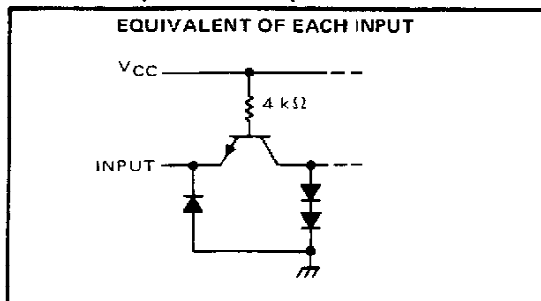
EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS
V_{CC} — — — 4 kΩ INPUT — — —	— — — OUTPUT

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: SN54LS145 . . . . $-55°C$ to $125°C$
                       SN74LS145 . . . . $0°C$ 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

	SN54LS145			SN74LS145			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, $V_{O(off)}$			15			15	V
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[†]		SN54LS145			SN74LS145			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} = MIN,	I_I = -18 mA			-1.5			-1.5	V
$I_{O(off)}$	Off-state output current	V_{CC} = MIN, V_{IL} = V_{IL} max,	V_{IH} = 2 V, V_{OH} = 15 V			250			250	μA
$V_{O(on)}$	On-state output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max	I_{OL} = 12 mA	0.25		0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
			I_{OL} = 80 mA					2.3	3	
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 7 V			0.1			0.1	mA
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7 V			20			20	μA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.4 V			-0.4			-0.4	mA
I_{CC}	Supply current	V_{CC} = 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°C.
NOTE 2: I_{CC} is measured with all inputs grounded and outputs open.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 45 pF, R_L = 665 Ω, See Note 3		50	ns
t_{PHL}	Propagation delay time, high-to-low-level output			50	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

schematic of inputs and outputs
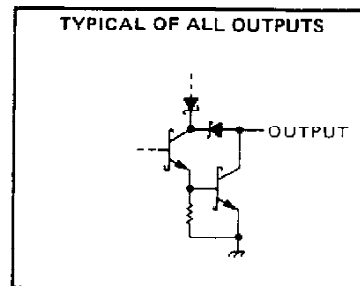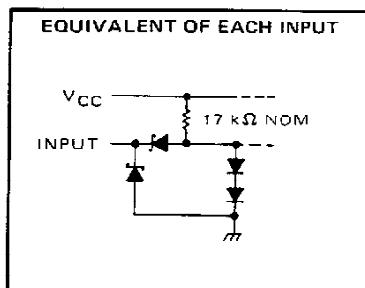
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SN54LS145, BCD-to-Decimal Decoders/Drivers
DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN54LS145	SN74LS145
Voltage Nodes (V)	5	5
Vcc range (V)	4.5 to 5.5	4.75 to 5.25
Input Level	TTL	TTL
Output Level	TTL	TTL
Output Drive (mA)		-0.4/8
Output	2S	2S
From	4	4
To	10	10

FEATURES   ▲Back to Top

FOR USE AS LAMP, RELAY, OR MOS DRIVERS

- Full Decoding of Input Logic
- SN54145, SN74145, and SN74LS145 Have 80-mA Sink-Current Capability
- All Outputs Are Off for Invalid BCD Input Conditions
- Low Power Dissipation of 'LS145 ... 35 mW Typical

DESCRIPTION   ▲Back to Top

These monolithic BCD-to-decimal decoder/drivers consist of eight inverters and ten four-input NAND gates. The inverters are connected in pairs to make BCD input data available for decoding by the NAND gates. Full decoding of valid BCD input logic ensures that all outputs remain off for all invalid binary input conditions. These decoders feature high-performance, n-p-n output transistors designed for use as indicator/relay drivers or as open-collector logic-circuit drivers. Each of the high-breakdown output transistors (15 volts) of the SN54145, SN74145, or SN74LS145 will sink up to 80 milliamperes of current. Each input is one Series 54/74 or Series 54LS/74LS standard load, respectively. Inputs and outputs are entirely compatible for use with TTL or DTL logic circuits, and the outputs are compatible for interfacing with most MOS integrated circuits. Power dissipation is typically 215 milliwatts for the '145 and 35 milliwatts for the 'LS145.

TECHNICAL DOCUMENTS   ▲Back to Top

To view the following documents, Acrobat Reader 4.0 is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

DATASHEET   ▲Back to Top

Full datasheet in Acrobat PDF: sn54ls145.pdf (204 KB) (Updated: 03/01/1988)

APPLICATION NOTES   ▲Back to Top

View Application Notes for Digital Logic

Product Folder: SN54LS145, BCD-to-Decimal Decoders/Drivers

- [Designing With Logic (Rev. C)](#) (SDYA009C - Updated: 06/01/1997)
- [Designing with the SN54/74LS123 (Rev. A)](#) (SDLA006A - Updated: 03/01/1997)
- [Evaluation of Nickel/Palladium/Gold-Finished Surface-Mount Integrated Circuits](#) (SZZA026 - Updated: 06/20/2001)
- [Input and Output Characteristics of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)
- [TI IBIS File Creation, Validation, and Distribution Processes](#) (SZZA034 - Updated: 08/29/2002)
- [Understanding and Interpreting Texas Instruments Standard-Logic Products Data Sh (Rev. A)](#) (SZZA036A - Updated: 02/27/2003)

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- [Enhanced Plastic Portfolio Brochure](#) (SGZB004, 387 KB - Updated: 08/19/2002)
- [Logic Reference Guide](#) (SCYB004, 1032 KB - Updated: 10/23/2001)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 167 KB - Updated: 07/28/2000)
- [Military Brief](#) (SGYN138, 803 KB - Updated: 10/10/2000)
- [Overview of IEEE Std 91-1984, Explanation of Logic Symbols Training Booklet (Rev. A)](#) (SDYZ001A, 138 KB - Updated: 07/01/1996)
- [Palladium Lead Finish User's Manual](#) (SDYV001, 2041 KB - Updated: 11/01/1996)
- [QML Class V Space Products Military Brief (Rev. A)](#) (SGZN001A, 257 KB - Updated: 10/07/2002)

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- [LOGIC Pocket Data Book](#) (SCYD013, 4837 KB - Updated: 12/05/2002)

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DEVICE INFORMATION — Updated Daily
TI INVENTORY STATUS — As Of 09:00 AM GMT, 17 Apr 2003
REPORTED DISTRIBUTOR INVENTORY — As Of 09:00 AM GMT, 17 Apr 2003

ORDERABLE DEVICE	STATUS	PACKAGE TYPE | PINS	TEMP (°C)	DSCC NUMBER	PRODUCT CONTENT	BUDGETARY PRICING QTY | $US	STD PACK QTY	IN STOCK	IN PROGRESS QTY | DATE	LEAD TIME	DISTRIBUTOR COMPANY | REGION	IN STOCK	PURCHASE
85084012A	ACTIVE	LCCC (FK) | 20	-55 TO 125		View Contents	1KU | 7.75	1	26*	3642 | 20 May	6 WKS	None Reported View Distributors		
									>10k | 27 May				
8508401EA	ACTIVE	CDIP (J) | 16	-55 TO 125		View Contents	1KU | 2.00	1	230*	>10k | 20 May	6 WKS	Avnet | Americas	32	BUY NOW
8508401FA	ACTIVE	CFP (W) | 16	-55 TO 125		View Contents	1KU | 7.29	1	11*	>10k | 20 May	6 WKS	Avnet | Americas	10	BUY NOW
SN54LS145J	ACTIVE	CDIP (J) | 16	-55 TO 125		View Contents	1KU | 1.70	1	99*	28 | 21 Apr	6 WKS	Avnet | Americas	118	BUY NOW
									>10k | 20 May		Avnet-SILICA | Europe	36	BUY NOW
SNJ54LS145FK	ACTIVE	LCCC (FK) | 20	-55 TO 125	85084012A	View Contents	1KU | 7.75	1	0*	3580 | 20 May	6 WKS	None Reported View Distributors		
									>10k | 27 May				
SNJ54LS145J	ACTIVE	CDIP (J) | 16	-55 TO 125	8508401EA	View Contents	1KU | 2.00	1	811*	>10k | 20 May	6 WKS	EBV Electronik | Europe	5	BUY NOW
SNJ54LS145W	ACTIVE	CFP (W) | 16	-55 TO 125	8508401FA	View Contents	1KU | 7.29	1	0*	>10k | 20 May	6 WKS	None Reported View Distributors		

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