

TYPES SN5442A THRU SN5444A, SN54L42 THRU SN54L44, SN54LS42, SN7442A THRU SN7444A, SN74L42 THRU SN74L44, SN74LS42 4-LINE-TO-10-LINE DECODERS (1-OF-10)

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TTL
MSI

'42A, 'L42, 'LS42 . . . BCD-TO-DECIMAL
'43A, 'L43 . . . EXCESS-3-TO-DECIMAL
'44A, 'L44 . . . EXCESS-3-GRAY-TO-DECIMAL

- All Outputs Are High for Invalid Input Conditions
- Also for Application as
4-Line-to-16-Line Decoders
3-Line-to-8-Line Decoders
- Diode-Clamped Inputs

SN5442A THRU SN5444A, SN54LS42 . . . J OR W PACKAGE
SN54L42 THRU SN54L44 . . . J PACKAGE
SN7442A THRU SN7444A,
SN74L42 THRU SN74L44, SN74LS42 . . . J OR N PACKAGE
(TOP VIEW)

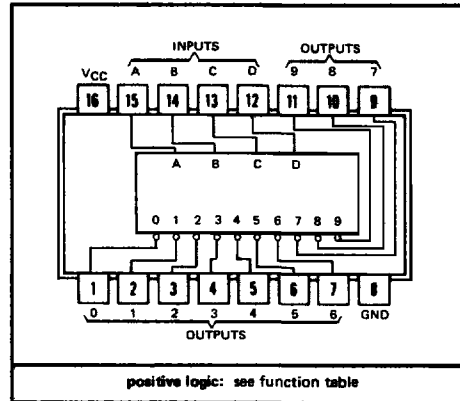
TYPES	TYPICAL POWER DISSIPATION	TYPICAL PROPAGATION DELAYS
'42A, '43A, '44A	140 mW	17 ns
'L42, 'L43, 'L44	70 mW	49 ns
'LS42	35 mW	17 ns

description

These monolithic decimal decoders 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 input logic ensures that all outputs remain off for all invalid input conditions.

The '42A, 'L42, and 'LS42 BCD-to-decimal decoders, the '43A and 'L43 excess-3-to-decimal decoders, and the '44A and 'L44 excess-3-gray-to-decimal decoders feature inputs and outputs that are compatible for use with most TTL and other saturated low-level logic circuits. D-c noise margins are typically one volt.

Series 54, 54L, and 54LS circuits are characterized for operation over the full military temperature range of -55°C to 125°C ; Series 74, 74L, and 74LS circuits are characterized for operation from 0°C to 70°C .



FUNCTION TABLE

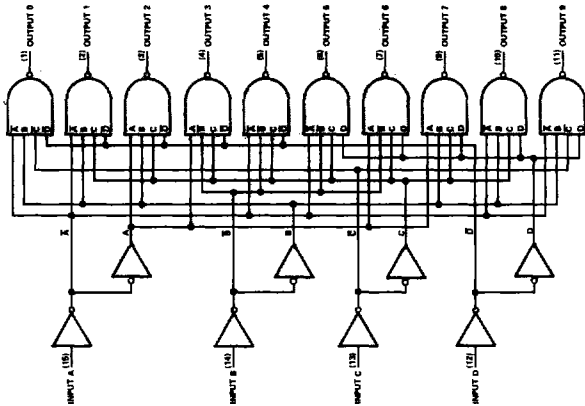
NO.	'42A, 'L42, 'LS42 BCD INPUT				'43A, 'L43 EXCESS-3-INPUT				'44A, 'L44 EXCESS-3-GRAY INPUT				ALL TYPES DECIMAL OUTPUT										
	D	C	B	A	D	C	B	A	D	C	B	A	0	1	2	3	4	5	6	7	8	9	
0	L	L	L	L	L	L	H	H	L	L	H	L	L	H	H	H	H	H	H	H	H	H	H
1	L	L	L	H	L	H	L	L	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H
2	L	L	H	L	L	H	L	L	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H
3	L	L	H	H	L	H	H	L	L	L	H	L	H	H	H	L	H	H	H	H	H	H	H
4	L	H	L	L	L	H	H	H	L	L	H	L	L	H	H	H	L	H	H	H	H	H	H
5	L	H	L	H	H	L	L	L	L	L	H	H	L	L	H	H	H	L	H	H	H	H	H
6	L	H	H	L	H	L	L	L	H	L	H	L	H	H	H	H	H	H	L	H	H	H	H
7	L	H	H	H	H	L	H	L	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H
8	H	L	L	L	H	L	H	H	L	L	H	H	L	H	H	H	H	H	H	L	H	L	H
9	H	L	L	H	H	H	L	L	L	L	H	L	H	L	H	H	H	H	H	H	L	L	H
INVALID	H	L	H	L	H	H	L	H	L	L	H	L	H	H	H	H	H	H	H	H	H	H	H
	H	L	H	H	H	H	H	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	L	H	H	H	H	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	H	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H
	H	H	H	H	L	L	H	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H

H = high level, L = low level

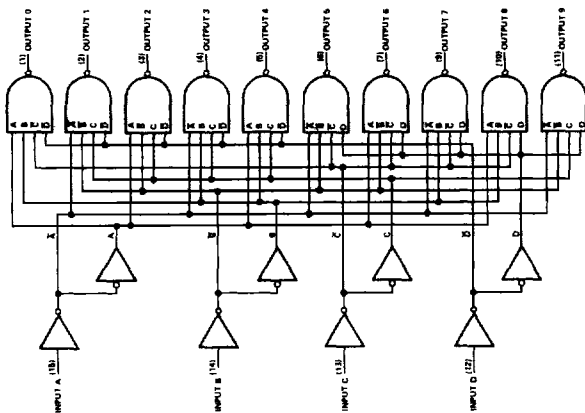
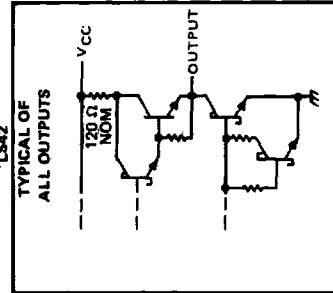
TYPES SN5442A THRU SN5444A, SN54L42 THRU SN54L44, SN54LS42, SN7442A THRU SN7444A, SN74L42 THRU SN74L44, SN74LS42 4-LINE-TO-10-LINE DECODERS (1-OF-10)

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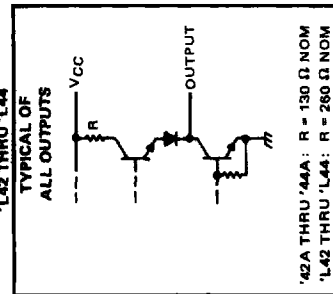
functional block diagrams and schematics of inputs and outputs



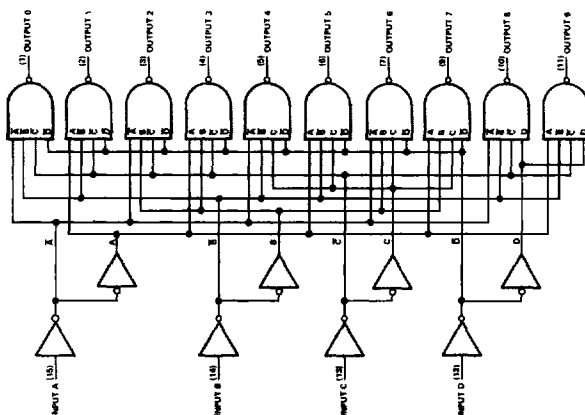
'44A, 'L44
EXCESS-3-GRAY-TO-DECIMAL DECODERS



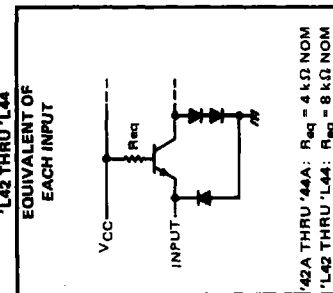
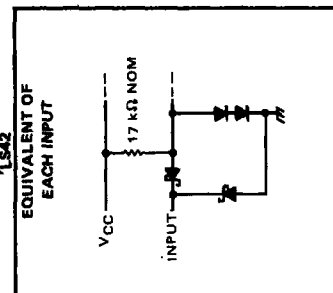
'42A THRU '44A
'L42 THRU 'L44
EXCESS-3-TO-DECIMAL DECODERS



'42A THRU '44A: R = 130 Ω NOM
'L42 THRU 'L44: R = 260 Ω NOM



'42A THRU '44A
'L42 THRU 'L44
BCD-TO-DECIMAL DECODERS



'42A THRU '44A: Req = 4 kΩ NOM
'L42 THRU 'L44: Req = 8 kΩ NOM

TYPES SN5442A, SN5443A, SN5444A, SN7442A, SN7443A, SN7444A

4-LINE-TO-10-LINE DECODERS (1-OF-10)

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: SN54 ⁴ Circuits	-55°C to 125°C
SN74 ⁴ Circuits	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

	SN5442A SN5443A SN5444A			SN7442A SN7443A SN7444A			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
	Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	
High-level output current, I_{OH}	-800			800			μ A
Low-level output current, I_{OL}	16			16			mA
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†	SN5442A SN5443A SN5444A			SN7442A SN7443A SN7444A			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
		V_{IH} High-level input voltage	2			2		
V_{IL} Low-level input voltage	0.8			0.8			V	
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-1.5			-1.5			V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -800 \mu\text{A}$	2.4	3.4		2.4	3.4	V	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA}$	0.2	0.4		0.2	0.4	V	
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$	1			1			mA
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$	40			40			μ A
I_{IL} Low level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-1.6			-1.6			mA
I_{OS} Short-circuit output current §	$V_{CC} = \text{MAX}$	-20	-55		-18	-55	mA	
I_{CC} Supply current	$V_{CC} = \text{MAX}$, See Note 2	28	41		28	56	mA	

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

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

§ Not more than one output should be shorted at a time.

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

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, B, C, or D through 2 levels of logic	$C_L = 15 \text{ pF}, R_L = 400 \Omega,$ See Note 3	14	25		ns
t_{PHL} Propagation delay time, high-to-low-level output from A, B, C, or D through 3 levels of logic		17	30		ns
t_{PLH} Propagation delay time, low-to-high-level output from A, B, C, and D through 2 levels of logic		10	25		ns
t_{PLH} Propagation delay time, low-to-high-level output from A, B, C, and D through 3 levels of logic		17	30		ns

NOTE 3: Load circuits and waveforms are shown on page 3-10.

TYPES SN54L42, SN54L43, SN54L44, SN74L42, SN74L43, SN74L44

4-LINE-TO-16-LINE DECODERS (1-OF-10)

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: SN54L' Circuits	-55°C to 125°C
SN74L' Circuits	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

	SN54L42 SN54L43 SN54L44			SN74L42 SN74L43 SN74L44			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}			-400			-400	μ A
Low-level output current, I_{OL}			8			8	mA
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	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -400 \mu\text{A}$	2.4	3.4		V	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = 8 \text{ mA}$		0.2	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	$V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$			20	μ A	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			-0.8	mA	
I_{OS} Short-circuit output current [§]	$V_{CC} = \text{MAX}$	-9		-28	mA	
I_{CC} Supply Current	$V_{CC} = \text{MAX}$, See Note 2			14	22	mA
				14	28	

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

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

[§] Not more than one output should be shorted at a time.

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

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, B, C, or D through 2 levels of logic	$C_L = 15 \text{ pF}$, $R_L = 800 \Omega$, See Note 3	10	44	60	ns
t_{PHL} Propagation delay time, high-to-low-level output from A, B, C, or D through 3 levels of logic		46	70		ns
t_{PLH} Propagation delay time, low-to-high-level output from A, B, C, and D through 2 levels of logic		10	34	50	ns
t_{PLH} Propagation delay time, low-to-high-level output from A, B, C, and D through 3 levels of logic		52	70		ns

NOTE 3: Load circuit and voltage waveforms are shown on page 3-10.

TYPES SN54LS42, SN74LS42 4-LINE-TO-10-LINE DECODERS (1-OF-10)

REVISED OCTOBER 1976

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: SN54LS42	-55°C to 125°C
SN74LS42	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

	SN54LS42			SN74LS42			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}	-400			-400			μ A
Low-level output current, I_{OL}	4			8			mA
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†	SN54LS42		SN74LS42		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	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = -400 \mu\text{A}$	2.5	3.5	2.7	3.5	V
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	0.25 0.4		0.25 0.4		V
	$I_{OL} = 4 \text{ mA}$			0.35 0.5		
	$I_{OL} = 8 \text{ mA}$					
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		μ A
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-0.4		-0.4		mA
I_{OS} Short-circuit output current‡	$V_{CC} = \text{MAX}$	-20	-100	-20	-100	mA
I_{CC} Supply current	$V_{CC} = \text{MAX}, \text{ See Note 2}$	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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

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

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, B, C, or D through 2 levels of logic	$C_L = 15 \text{ pF}, R_L = 2 \text{ k}\Omega, \text{ See Note 4}$	15		25	ns
t_{PHL} Propagation delay time, high-to-low-level output from A, B, C, or D through 3 levels of logic		20		30	ns
t_{PLH} Propagation delay time, low-to-high-level output from A, B, C, and D through 2 levels of logic		15		25	ns
t_{PLH} Propagation delay time, low-to-high-level output from A, B, C, and D through 3 levels of logic		20		30	ns

NOTE 4: Load circuit and voltage waveforms are shown on page 3-11.