- **Converts TTL Voltage Levels to MOS Levels**

- **High Sink-Current Capability**

- **Input Clamping Diodes Simplify System Design**

- **Open-Collector Driver for Indicator Lamps and Relays**

- **Inputs Fully Compatible with Most TTL Circuits**

- **Package Options Include Standard Plastic (N) and Ceramic (J) 300-mil Dual-In-Line Packages and Plastic Small Outline (D) Packages.**

SN5406, SN5416 . . . J PACKAGE
SN7406. SN7416 . . . D OR N PACKAGE
(TOP VIEW)

```
     1A [ 1   U  14 ] VCC
     1Y [ 2      13 ] 6A
     2A [ 3      12 ] 6Y
     2Y [ 4      11 ] 5A
     3A [ 5      10 ] 5Y
     3Y [ 6       9 ] 4A
    GND [ 7       8 ] 4Y
```
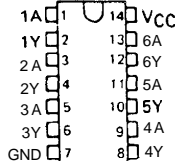
description

These monolithic TTL hex inverter buffers/drivers feature high-voltage open-collector outputs for interfacing with high-level circuits (such as MOS), or for driving high-current loads (such as lamps or relays), and are also characterized for use as inverter buffers for driving TTL inputs. The SN5406 and SN7406 have minimum breakdown voltages of 30 volts and the SN5416 and SN7416 have minimum breakdown voltages of 15 volts. The maximum sink current is 30 milliamperes for the SN5406 and SN5416, and 40 milliamperes for the SN7406 and SN7416.

logic symbol[†]

```
1A (1) ──▷── Ω (2) 1Y
2A (3) ──────── (4) 2Y
3A (5) ──────── (6) 3Y
4A (9) ──────── (8) 4Y
5A (11) ──────── (10) 5Y
6A (13) ──────── (12) 6Y
```

This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)

```
1A ──▷o── 1Y

2A ──▷o── 2Y

3A ──▷o── 3Y

4A ──▷o── 4Y

5A ──▷o── 5Y

6A ──▷o── 6Y
```

$Y = \overline{A}$
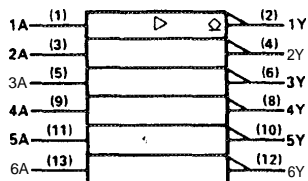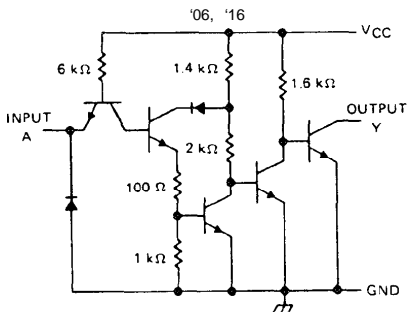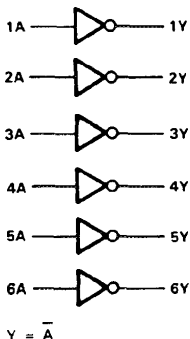
schematic

'06, '16

Resistor values shown are nominal.

TEXAS
INSTRUMENTS

TYPES SN7406, SN7416, SN5406, SN541 6
HEX INVERTER BUFFERS/DRIVERS WITH
OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

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

Supply voltage, V_{CC} (see Note 1) . . . . 7 v-

Input voltage (see Note 1) . . . . 5.5 v

Output voltage (see Notes 1 and 2): SN5406. SN7406 Circuits . . . . **30 v**

SN5416, SN7416 Circuits **15v**

Operating free-air temperature range: SN5406, SN5416 Circuits . -55°C to 125°C

SN7406. SN7416 Circuits . . . 0°C to 70°C

Storage temperature range . . . . -65°C to 150°C

NOTES 1. Voltage values are with respect to network ground terminal.
This is the maximum voltage which should be applied to any output when it is in the off state.

recommended operating conditions

			SN5406 SN5416			SN7406 SN7416			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage			4.5	5	5.5	4.75	5	5.25	V
V_{IH} High-level input voltage			2			2			V
V_{IL} Low-level input voltage					0.8			0.8	V
V_{OH} High-level output voltage		'06			30			30	v
		'16			15			15	
I_{OL} Low-level output current					30			40	mA
T_A Operating free-air temperature			-55		125	0		70	C

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

PARAMETER	TEST CONDITIONS[†]			SN5406 SN5416			SN7406 SN7416			UNIT
				MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = $-$ 12 mA				-1.5			-1.5	V
I_{OH}	V_{CC} = MIN,	V_{IL} = 0.8 V,	V_{OH} = §			0.25			0.25	mA
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V	I_{OL} = 16 mA			0.4			0.4	V
			I_{OL} = ¶			0.7			0.7	
I_I	V_{CC} = MAX,	V_I = 5.5 V				1			1	mA
I_{IH}	V_{CC} = MAX,	V_{IH} = 2.4 V				40			40	µA
I_{IL}	V_{CC} = MAX,	V_{IL} = 0.4 V				-1.6			-1.6	mA
I_{CCH}	V_{CC} = MAX				30	48		30	48	mA
I_{CCL}	V_{CC} = MAX				32	51		32	51	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.
§ V_{OH} = 30 V for '06 and 15 V for '16.
¶ I_{OL} = 30 mA for SN54' and 40 mA for SN74'.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
'PLH	A	Y	R_L = 110 Ω C_L = 15 pF		10	15	ns
'PHL					15	23	ns

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

TEXAS
INSTRUMENTS

- **Converts TTL Voltage Levels to MOS Levels**
- **High Sink-Current Capability**
- **Input Clamping Diodes Simplify System Design**
- **Open-Collector Driver for Indicator Lamps and Relays**
- **Package Options Include Standard Plastic (N) and Ceramic (J) 300-mil Dual-In-Line Packages, Plastic Small Outline (D) and Ceramic Chip Carrier (FK) Package**

SN54LS06 ... J PACKAGE
SN74LS06 ... D OR N PACKAGE
(TOP VIEW)

1A	1	14 V_{CC}
1Y	2	13 6A
2A	3	12 6Y
2Y	4	11 5A
3A	5	10 5Y
3Y	6	9 4A
GND	7	8 4Y

SN54LS06 . . . FK PACKAGE
(TOP VIEW)

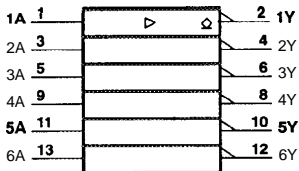NC — No internal connection

description

These monolithic hex inverter buffers/drivers feature high-voltage open-collector outputs to interface with high-level circuits (such as MOS), or for driving high-current loads, and are also characterized for use as inverter buffers for driving TTL inputs. The 'LS06 has a rated output voltage of 30 V. The maximum sink current for the SN54LS06 is 30 mA and for the SN74LS06 it is 40 mA.

These circuits are compatible with most TTL families. Input are diode-clamped to minimize transmission-effects, which simplifies design. Typical power dissipation is 175 mW and average propagation delay time is 8 ns.

The SN54LS06 is characterized over the full military temperature range of -55°C to 125°C. The SN74LS06 is characterized for Operation from 0°C to 70°C.
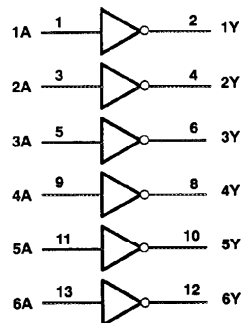
logic symbol†

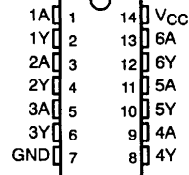|		
1A 1	▷ ◇	2 1Y
2A 3		4 2Y
3A 5		6 3Y
4A 9		8 4Y
5A 11		10 5Y
6A 13		12 6Y

† This symbol is in accordance with ANSI/IEEE Std 91-1964 and IEC Publication 617-12.

Pin numbers shown are for D, J, and N packages.

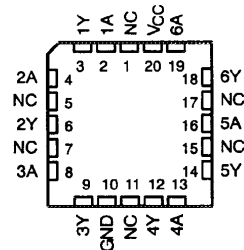## logic diagram (positive logic)

1A 1	2 1Y
2A 3	4 2Y
3A 5	6 3Y
4A 9	8 4Y
5A 11	10 5Y
6A 13	12 6Y

TEXAS INSTRUMENTS

schematic (each gate)

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

Supply voltage, V_{CC} .... 7 v

Input voltage, V_I (see Note 1) .... 5.5 v

Output voltage, V_O (see Notes 1 and 2): SN54LS06, SN74LS06 .... 30 V

Operating free-air temperature range: SN54LS06 ....,,,,,......, – 55°C to 125°C

SN74LS06 ....,,,,,, 0°C to 70°C

Storage temperature range .... – 65°C to 150°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. This 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. Voltage values are with respect to network ground terminal.

2. This is the maximum voltage that should be applied to any output when it is in the off state.

recommended operating conditions

			SN54LS06			SN74LS06			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage		2			2			V
V_{IL}	Low-level input voltage				0.8			0.8	V
V_{OH}	High-level output voltage	'LS06			30			30	V
I_{OL}	Low-level output current				30			40	mA
T_A	Operating free-air temperature		– 55		125	0		70	°C

TEXAS INSTRUMENTS

electrical characteristlcs over recommended operating free-alr temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		SN54LS06			SN74LS06			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = – 12 mA			– 1.5			– 1.5	V
I_{OH}	V_{CC} – MIN,	V_{IL} = 0.8 V	'LS06, V_{OH} = 30 V		0.25			0.25	mA
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V	I_{OL} = 16 mA	0.25	0.4	0.25	0.4	V
			I_{OL} = 30 mA		0.7			
			I_{OL} = 40 mA					0.7
I_I	V_{CC} = MAX,	V_I = 7 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.4 V			20			20	μA
I_{IL}	V_{CC} =MAX,	V_I = 0.4 V			– 0.2			– 0.2	mA
I_{CCH}	V_{CC} = MAX				18			18	mA
I_{CCL}	V_{CC} = MAX				60			60	mA

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
[‡] All typical values are at VCC = 5 V, and TA = 25°C.

switching characteristics, VCC = 5 V, T_A = 25°C (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A	Y	R_L = 110 Ω, C_L = 15 pF		7	15	ns
t_{PHL}					10	20	

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

TEXAS
INSTRUMENTS