

# SN754410, SN754411 QUADRUPLE HALF-H DRIVERS

SLRS007A – D2942, NOVEMBER 1986 – REVISED APRIL 1993

- 1-A Output Current Capability Per Driver
- Applications Include Half-H and Full-H Solenoid Drivers and Motor Drivers
- Designed for Positive-Supply Applications
- Wide Supply Voltage Range: 4.5 V to 36 V
- TTL- and CMOS-Compatible High-Impedance Diode-Clamped Inputs
- Separate Input-Logic Supply
- Thermal Shutdown
- Internal ESD Protection
- Input Hysteresis Improves Noise Immunity
- 3-State Outputs
- Minimized Power Dissipation
- Sink/Source Interlock Circuitry Prevents Simultaneous Conduction
- No Output Glitch During Power Up or Power Down
- Improved Functional Replacement for the SGS L293

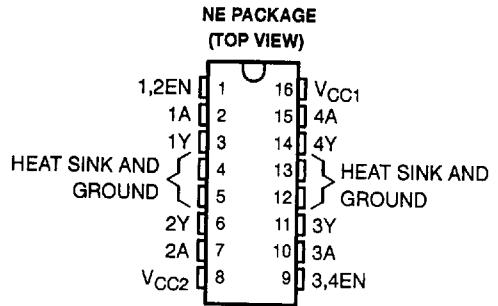
## description

The SN754410 and the SN754411 are quadruple high-current half-H drivers designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. They are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are compatible with TTL and low-level CMOS logic. Each output (Y) is a complete totem-pole driver with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs become active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in a high-impedance state. With the proper data inputs, each pair of drivers form a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

External high-speed output clamp diodes should be used for inductive-transient suppression with the SN754411. A separate supply voltage ( $V_{CC1}$ ) is provided for the logic input circuits to minimize device power dissipation. Supply voltage  $V_{CC2}$  is used for the output circuits.

The SN754410 and SN754411 are designed for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .



FUNCTION TABLE  
(each driver)

INPUTS†		OUTPUT
A	EN	Y
H	H	H
L	H	L
X	L	Z

H = high-level, L = low-level

X = irrelevant

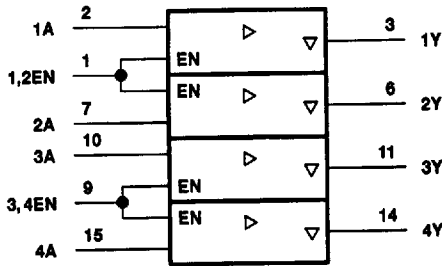
Z = high-impedance (off)

† In the thermal shutdown mode, the output is in a high-impedance state regardless of the input levels.

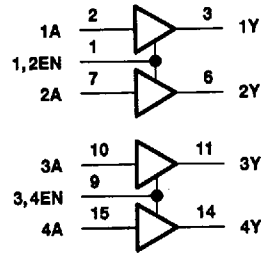
# SN754410, SN754411 QUADRUPLE HALF-H DRIVERS

SLRS007A - D2942, NOVEMBER 1986 - REVISED APRIL 1983

## logic symbol†

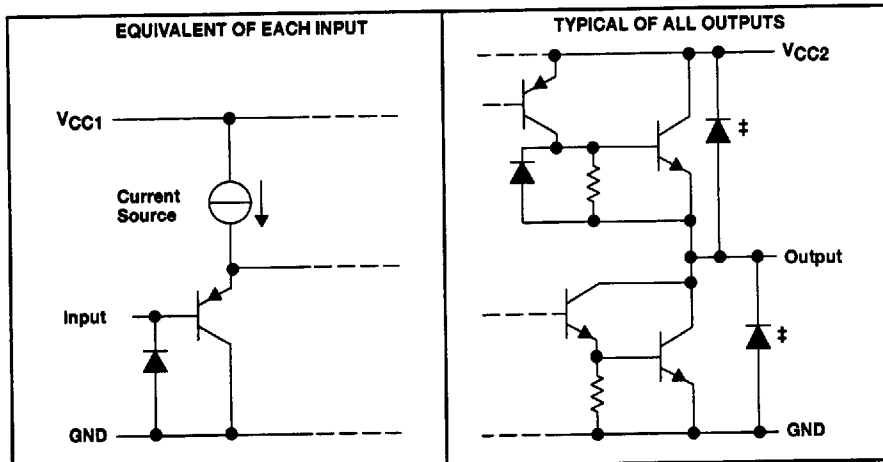


## logic diagram



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

## schematics of inputs and outputs



‡ These diodes are built in on the SN754410 only.

**TEXAS**  
**INSTRUMENTS**

POST OFFICE BOX 655000 • DALLAS, TEXAS 75265

# SN754410, SN754411 QUADRUPLE HALF-H DRIVERS

SLRS007A - D2942, NOVEMBER 1986 - REVISED APRIL 1993

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

Logic supply voltage range, $V_{CC1}$ (see Note 1)	-0.5 V to 36 V
Output supply voltage range, $V_{CC2}$	-0.5 V to 36 V
Input voltage, $V_I$	36 V
Output voltage range, $V_O$	-3 V to $V_{CC2} + 3$ V
Peak output current (nonrepetitive, $t_w \leq 5$ ms)	$\pm 2$ A
Continuous output current, $I_O$	$\pm 1.1$ A
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	2075 mW
Operating free-air temperature range	-40°C to 85°C
Operating case or virtual junction temperature range	-40°C to 150°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTES: 1. All voltage values are with respect to network GND.

2. For operation above 25°C free-air temperature, derate linearly at the rate of 16.6 mW/°C. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection can be activated at power levels slightly above or below the rated dissipation.

## recommended operating conditions

	MIN	MAX	UNIT
Logic supply voltage, $V_{CC1}$	4.5	5.5	V
Output supply voltage, $V_{CC2}$	4.5	36	V
High-level input voltage, $V_{IH}$	2	5.5	V
Low-level input voltage, $V_{IL}$	-0.3†	0.8	V
Operating virtual junction temperature, $T_J$	-40	125	°C
Operating free-air temperature, $T_A$	-40	85	°C

† The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet for logic voltage levels.

# SN754410, SN754411 QUADRUPLE HALF-H DRIVERS

SLRS007A – D2942, NOVEMBER 1986 – REVISED APRIL 1993

**electrical characteristics over recommended ranges of supply voltage and operating virtual junction temperature (unless otherwise noted)**

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT	
$V_{IK}$	Input clamp voltage	$I_I = -12 \text{ mA}$		-0.9	-1.5	V	
$V_{OH}$	High-level output voltage	$I_{OH} = -0.5 \text{ A}$	$V_{CC2} - 1.5$	$V_{CC2} - 1.1$		V	
		$I_{OH} = -1 \text{ A}$		$V_{CC2} - 2$			
		$I_{OH} = -1 \text{ A}, T_J = 25^\circ\text{C}$	$V_{CC2} - 1.8$	$V_{CC2} - 1.4$			
$V_{OL}$	Low-level output voltage	$I_{OL} = 0.5 \text{ A}$		1	1.4	V	
		$I_{OL} = 1 \text{ A}$			2		
		$I_{OL} = 1 \text{ A}, T_J = 25^\circ\text{C}$		1.2	1.8		
$V_{OKH}^\ddagger$	High-level output clamp voltage	$I_{OK} = -0.5 \text{ A}$		$V_{CC2} + 1.4$	$V_{CC2} + 2$	V	
		$I_{OK} = 1 \text{ A}$		$V_{CC2} + 1.9$	$V_{CC2} + 2.5$		
$V_{OKL}^\ddagger$	Low-level output clamp voltage	$I_{OK} = 0.5 \text{ A}$		-1.1	-2	V	
		$I_{OK} = -1 \text{ A}$		-1.3	-2.5		
$I_{OZ}$	Off-state (high-impedance state) output current	$V_O = V_{CC2}$			500	$\mu\text{A}$	
		$V_O = 0$			-500		
$I_{IH}$	High-level input current	$V_I = 5.5 \text{ V}$			10	$\mu\text{A}$	
$I_{IL}$	Low-level input current	$V_I = 0$			-10	$\mu\text{A}$	
$I_{CC1}$	Logic supply current	$I_O = 0$	All outputs at high level			38	mA
			All outputs at low level			70	
			All outputs at high impedance			25	
$I_{CC2}$	Output supply current	$I_O = 0$	All outputs at high level			33	mA
			All outputs at low level			20	
			All outputs at high impedance			5	

† All typical values are at  $V_{CC1} = 5 \text{ V}, V_{CC2} = 24 \text{ V}, T_A = 25^\circ\text{C}$ .

‡ Valid for SN754410 only

**switching characteristics,  $V_{CC1} = 5 \text{ V}, V_{CC2} = 24 \text{ V}, C_L = 30 \text{ pF}, T_A = 25^\circ\text{C}$**

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{DLH}$	Delay time, low-to-high-level output from A input	See Figure 1		800		ns
$t_{DHL}$	Delay time, high-to-low-level output from A input			400		ns
$t_{TLH}$	Transition time, low-to-high-level output			300		ns
$t_{THL}$	Transition time, high-to-low-level output			300		ns
$t_{PZH}$	Enable time to the high level	See Figure 2		700		ns
$t_{PZL}$	Enable time to the low level			400		ns
$t_{PHZ}$	Disable time from the high level			900		ns
$t_{PLZ}$	Disable time from the low level			600		ns

TEXAS  
INSTRUMENTS

PARAMETER MEASUREMENT INFORMATION

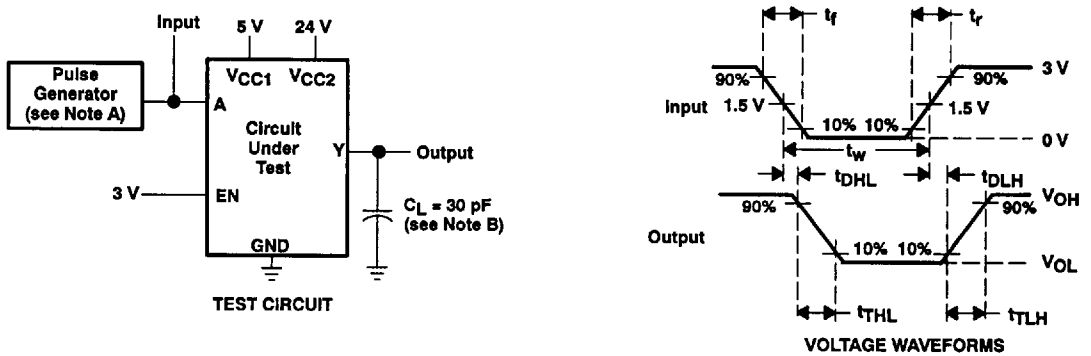


Figure 1. Test Circuit and Switching Times From Data Inputs

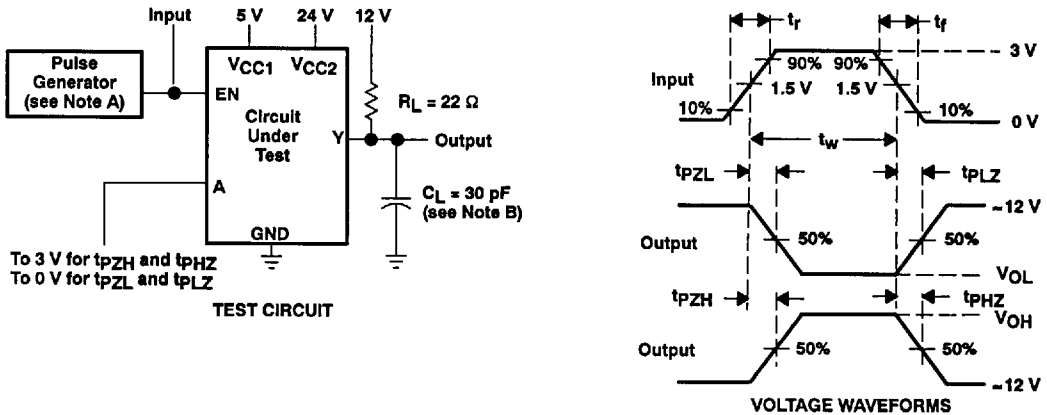


Figure 2. Test Circuit and Switching Times From Enable Inputs

NOTES: A. The pulse generator has the following characteristics:  $t_r \leq 10$  ns,  $t_f \leq 10$  ns,  $t_w = 10$   $\mu$ s, PRR = 5 kHz,  $Z_O = 50$   $\Omega$ .  
 B.  $C_L$  includes probe and jig capacitance.

# SN754410, SN754411 QUADRUPLE HALF-H DRIVERS

SLRS007A - D2942, NOVEMBER 1986 - REVISED APRIL 1993

## APPLICATION INFORMATION

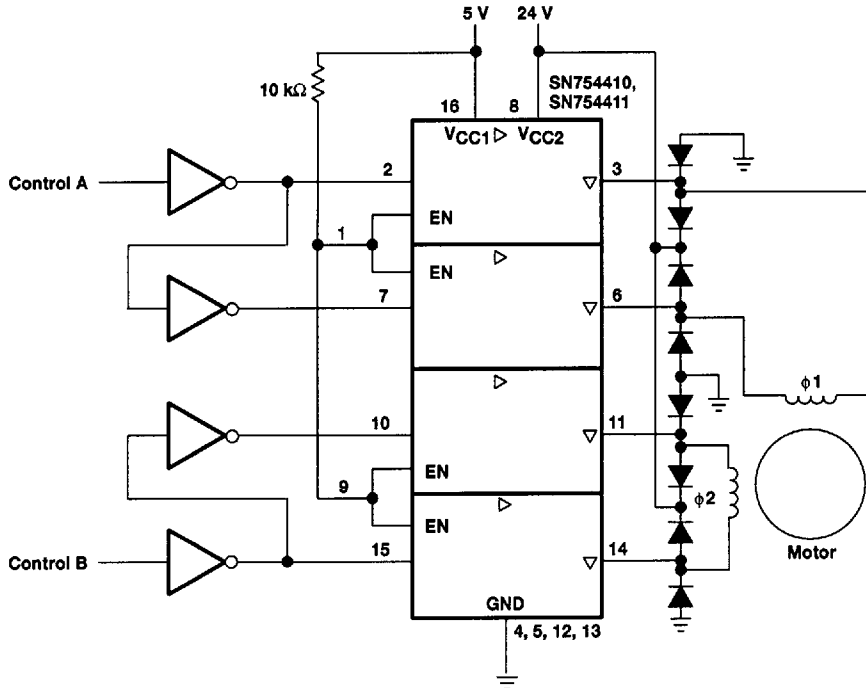


Figure 3. Two-Phase Motor Driver

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265