D2355, OCTOBER 1972—REVISED SEPTEMBER 1986

QUAD SEGMENT DRIVER AND HEX DIGIT DRIVER FOR INTERFACING BETWEEN MOS AND LIGHT-EMITTING-DIODE (LED) DISPLAYS

T-52-13-07

- 50-mA Source or Sink Capability ('491, '491A)
- 250-mA Sink Capability ('492, '492A)
- Rated for 10-V Operation ('491, '492)
- Rated for 20-V Operation ('491A, '492A)
- Low Input Current for MOS Compatability
- Low Standby Power
- High-Gain Darlington Circuits

description

The SN75491, SN75491A, SN75492, and SN75492A are monolithic integrated circuits designed to be used together with MOS integrated circuits and common-cathode LED's in serially addressed multi-digit displays. This time-multiplexed system, which uses a segment-address-and-digit-scan method of LED drive, minimizes the number of drivers required.

The SN75491 and SN75491A are quadruple segment drivers. The SN75492 and SN75492A are hex digit drivers. The SN75491 and SN75492 are characterized for operation to 10 volts. The SN75491A and SN75492A are characterized for operation to 20 volts.

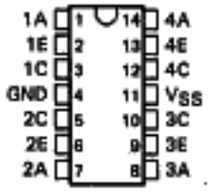
The SN75491, SN75491A, SN75492, and SN75492A are characterized for operation from 0°C to 70°C.

logic diagram (each driver)

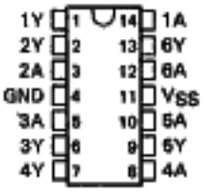
SN75491, SN75491A

SN75492, SN75492A

SN75491, SN75491A
N DUAL-IN-LINE PACKAGE
(TOP VIEW)

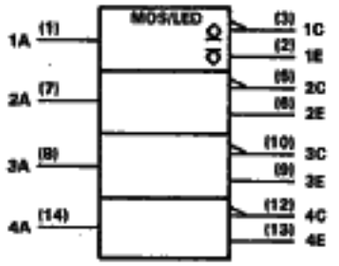


SN75492, SN75492A
N DUAL-IN-LINE PACKAGE
(TOP VIEW)

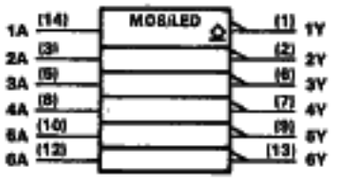


logic symbols†

SN75491, SN75491A



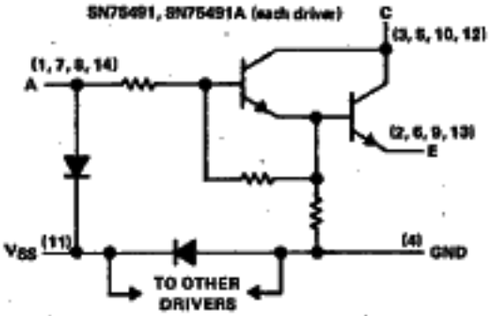
SN75492, SN75492A



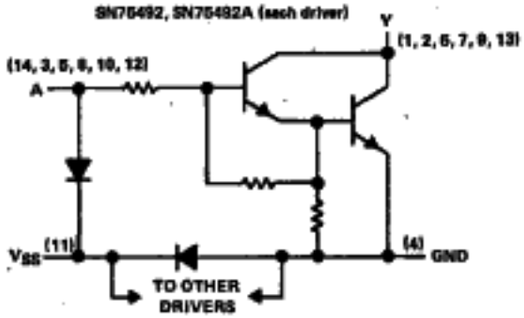
†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

schematics

SN75491, SN75491A (each driver)



SN75492, SN75492A (each driver)



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

		SN75491	SN75491A	SN75492	SN75492A	UNIT
Input voltage range (see Notes 1 and 2)		−5 V to V_{SS}	−5 V to V_{SS}	−5 V to V_{SS}	−5 V to V_{SS}	
Collector (output) voltage, V_C		10	20	10	20	V
Collector (output)-to-input voltage		10	20	10	20	V
Emitter-to-ground voltage ($V_I \geq 5$ V)		10	20			V
Emitter-to-input voltage		5	5			V
Voltage at V_{SS} terminal with respect to any other device terminal		10	20	10	20	V
Collector (output) current, I_C	Each collector (output)	50	50	250	250	mA
	All collectors (outputs)	200	200	600	600	
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 3)		875	875	875	875	mW
Operating free-air temperature range		0 to 70	0 to 70	0 to 70	0 to 70	°C
Storage temperature range		−65 to 150	−65 to 150	−65 to 150	−65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		260	260	260	260	°C

NOTES: 1. All voltage values are with respect to network ground terminal.
2. The input is the only device terminal that may be negative with respect to ground.
3. For operation at 25°C free-air temperature, refer to Dissipation Derating Curves in Appendix A. For these devices in the N package, use the 7-mW/°C curve.

'491, '491A electrical characteristics, V_{SS} = 10 V for SN75491, V_{SS} = 20 V for SN75491A, T_A = 0°C to 70°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{CE(on)}$	On-state collector-emitter voltage	Input = 8.5 V through 1 kΩ, V_E = 5 V, I_C = 50 mA, T_A = 25°C			0.9	1.2	V
		Input = 8.5 V through 1 kΩ, V_E = 5 V, I_C = 50 mA				1.5	
$I_{C(off)}$	Off-state collector current	V_C = V_{SS}, V_E = 0,	I_I = 40 μA			100	μA
		V_C = V_{SS}, V_E = 0,	V_I = 0.7 V			100	
I_I	Input current at maximum input voltage	V_I = V_{SS}, V_E = 0, I_C = 20 mA	'491		2.2	3.3	mA
			'491A		4.7	6.6	
I_E	Emitter reverse current	V_I = 0, V_E = 5 V,	I_C = 0			100	μA
I_{SS}	Current into V_{SS} terminal					1	mA

†All typical values are at T_A = 25°C.

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'492, '492A electrical characteristics, V_{SS} = 10 V for SN75492, V_{SS} = 20 V for SN75492A, T_A = 0°C to 70°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{OL}	Low-level output voltage	Input = 6.5 V through 1 kΩ, I_{OL} = 250 mA, T_A = 25°C			0.9	1.2	V
		Input = 6.5 V through 1 kΩ, I_{OL} = 250 mA,				1.5	
I_{OH}	High-level output current	V_{OH} = V_{SS}, V_I = 40 µA				200	µA
		V_{OH} = V_{SS}, V_I = 0.8 V				200	
I_I	Input current at maximum input voltage	V_I = V_{SS}, I_{OL} = 20 mA	'492		2.2	3.3	mA
			'492A		4.7	6.5	
I_{SS}	Current into V_{SS} terminal					1	mA

†All typical values are at T_A = 25°C.

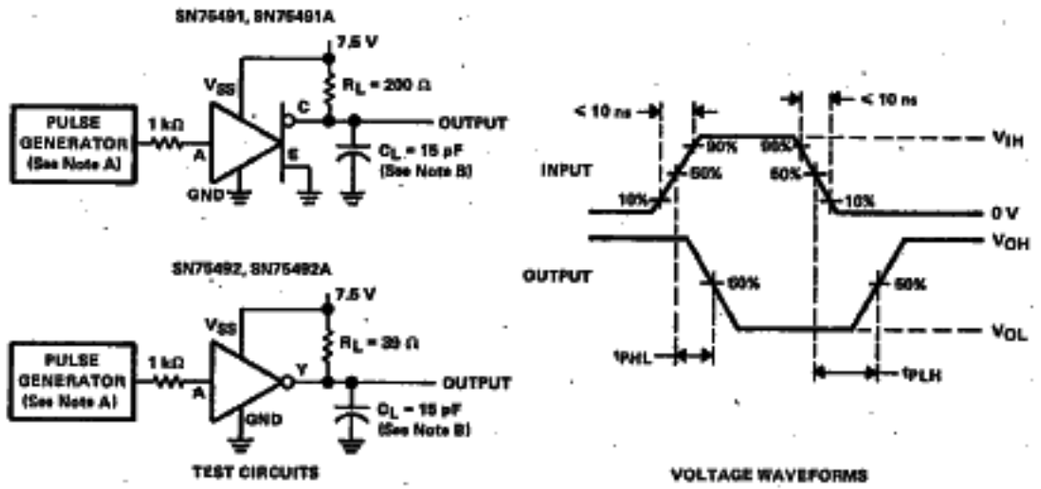
SN75491, SN75491A switching characteristics, V_{SS} = 7.5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output (collector)	V_{IH} = 4.5 V, V_E = 0,		100		ns
t_{PHL}	Propagation delay time, high-to-low-level output (collector)	R_L = 200 Ω, C_L = 15 pF		20		ns

SN75492, SN75492A switching characteristics, V_{SS} = 7.5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	V_{IH} = 7.5 V, R_L = 39 Ω,		300		ns
t_{PHL}	Propagation delay time, high-to-low-level output	C_L = 15 pF		30		ns

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generator has the following characteristics: Z_{out} = 50 Ω, PRR ≤ 100 kHz, t_w = 1 µs.
B. C_L includes probe and jig capacitance.

FIGURE 1. PROPAGATION DELAY TIMES

TYPICAL CHARACTERISITCS

INPUT CURRENT
vs
INPUT VOLTAGE

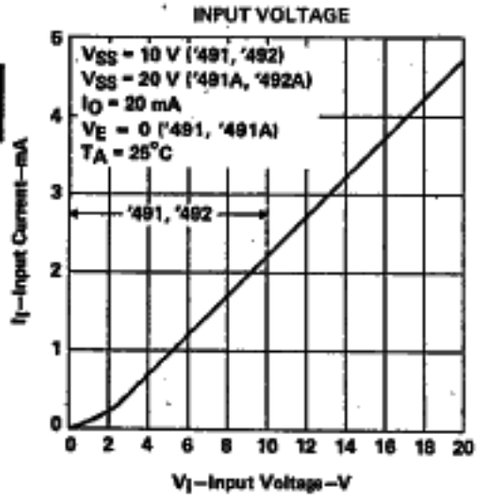


FIGURE 2

SN75491, SN75491A
COLLECTOR CURRENT
vs
INPUT CURRENT

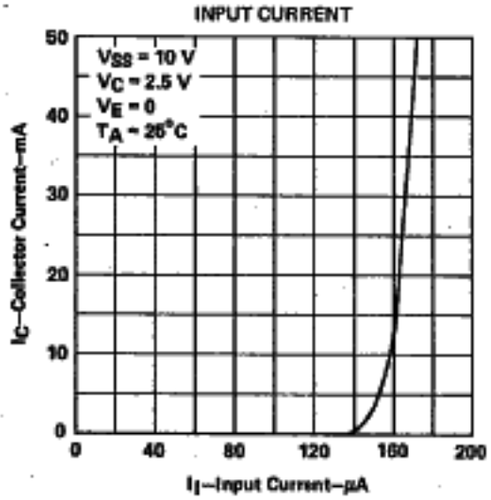


FIGURE 3

SN75491, SN75491A
COLLECTOR CURRENT
vs
INPUT VOLTAGE

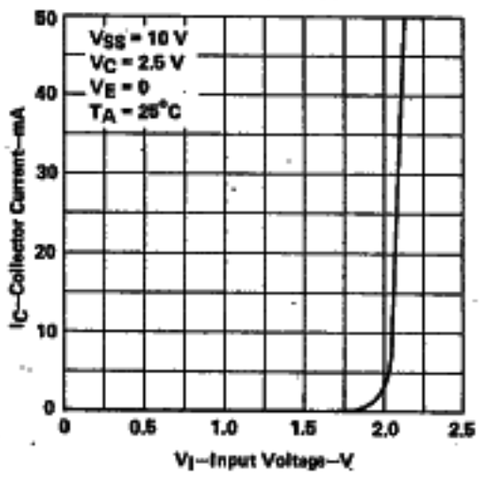


FIGURE 4

SN75491, SN75491A
ON-STATE COLLECTOR-EMITTER VOLTAGE
vs
COLLECTOR CURRENT

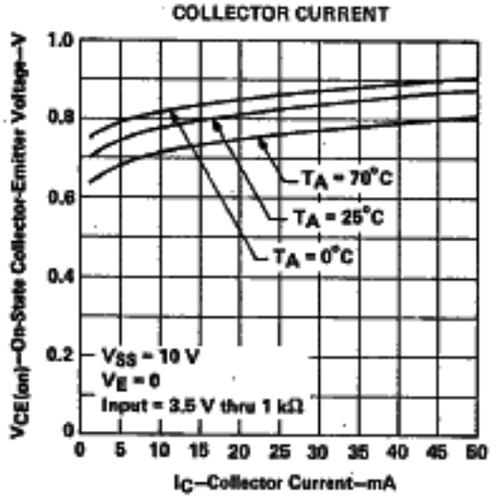


FIGURE 5

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TYPICAL CHARACTERISTICS

SN75492, SN75492A
OUTPUT CURRENT
vs
INPUT CURRENT

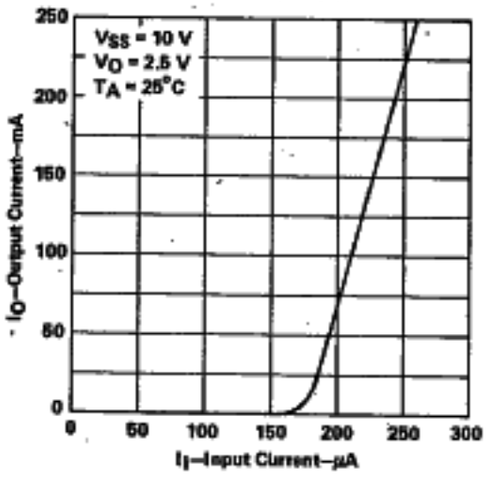

FIGURE 6

SN75492, SN75492A
OUTPUT CURRENT
vs
INPUT VOLTAGE

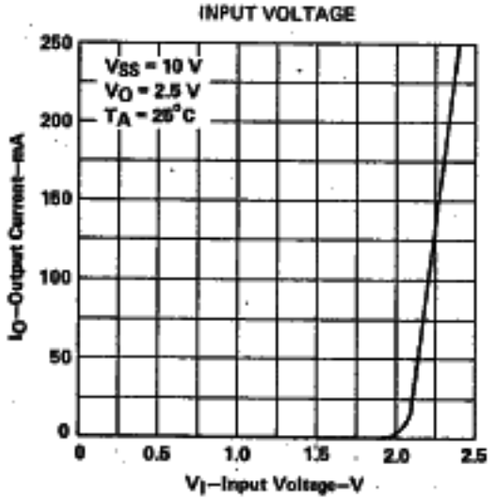

FIGURE 7

SN75492, SN75492A
LOW-LEVEL OUTPUT VOLTAGE
vs
OUTPUT CURRENT

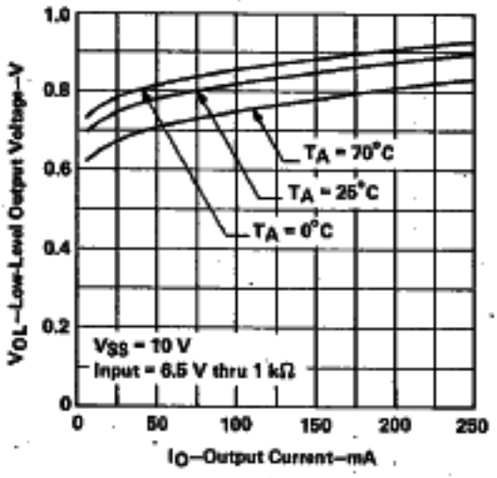

FIGURE 8

TYPICAL APPLICATION DATA

Figure 9 is an example of time multiplexing the individual digits in a display to minimize circuitry. Up to twelve digits, each of which use a seven-segment display with decimal point, may be displayed using only two SN75491 and two SN75492 drivers.

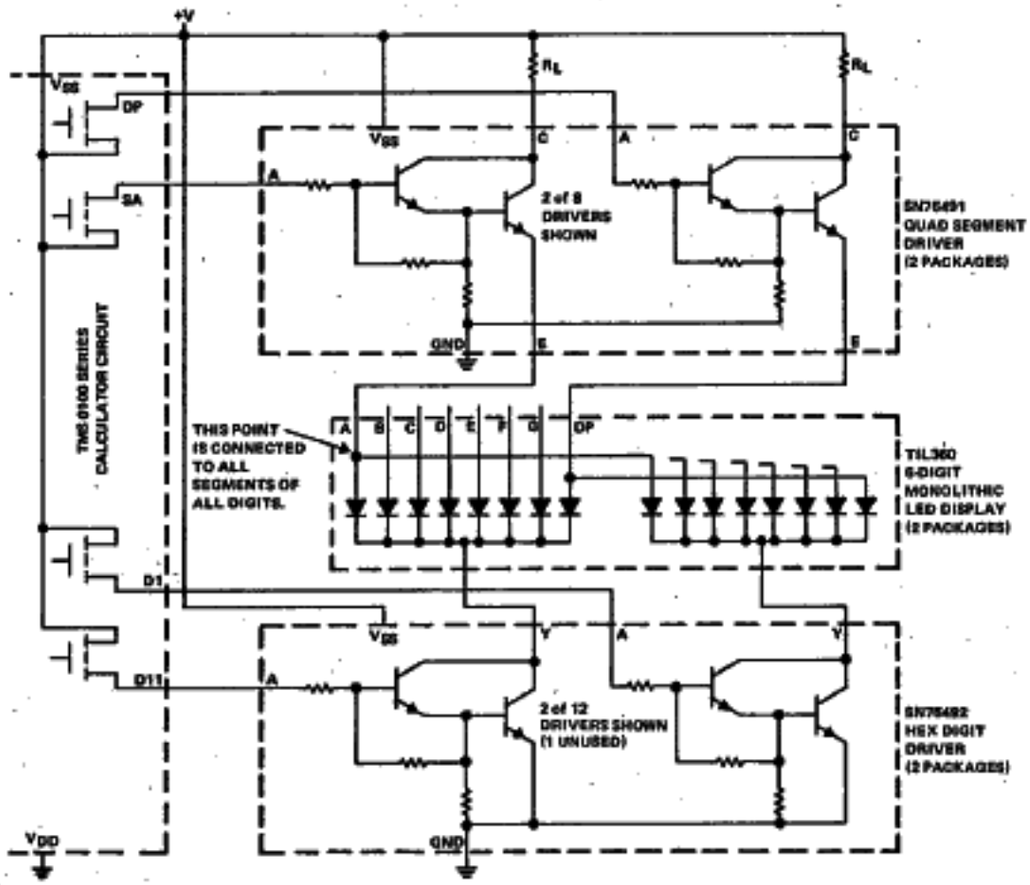

FIGURE 9. INTERFACING BETWEEN MOS CALCULATOR CIRCUIT AND LED MULTI-DIGIT DISPLAY

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TYPICAL APPLICATION DATA

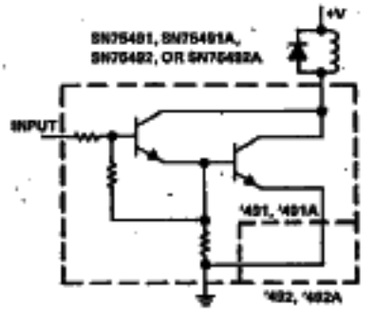


FIGURE 10. QUAD OR HEX RELAY DRIVER

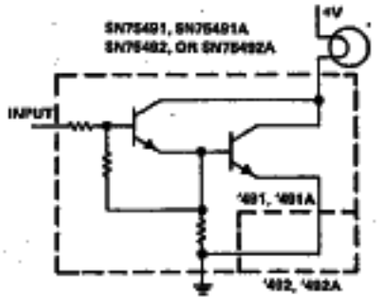


FIGURE 11. QUAD OR HEX LAMP DRIVER

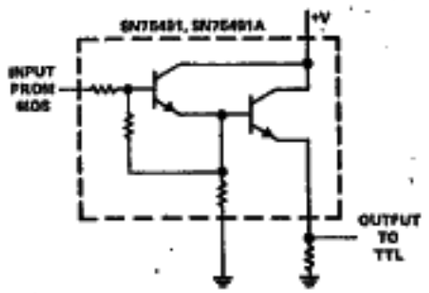


FIGURE 12. MOS-TO-TTL LEVEL SHIFTER

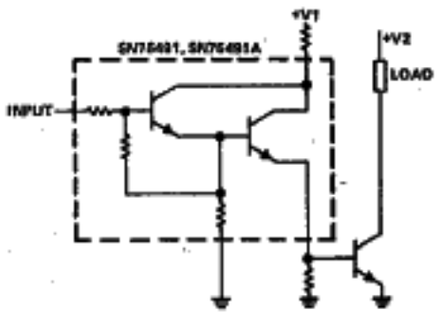
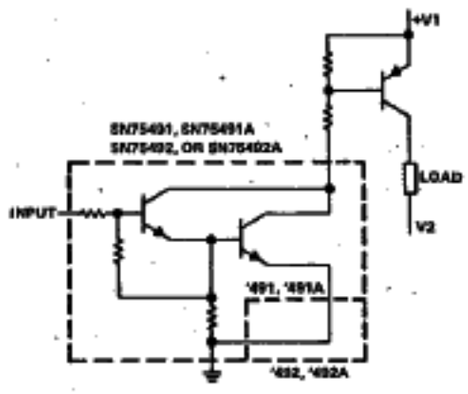


FIGURE 13. QUAD HIGH-CURRENT N-P-N TRANSISTOR DRIVER



NOTE A: This circuit may be used as a digit driver for common-mode LED displays.

FIGURE 14. QUAD OR HEX HIGH-CURRENT P-N-P TRANSISTOR DRIVER

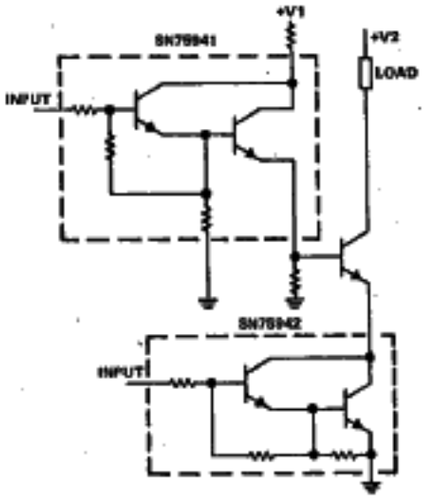


FIGURE 15. BASE/EMITTER SELECT N-P-N TRANSISTOR DRIVER

TYPICAL APPLICATION DATA

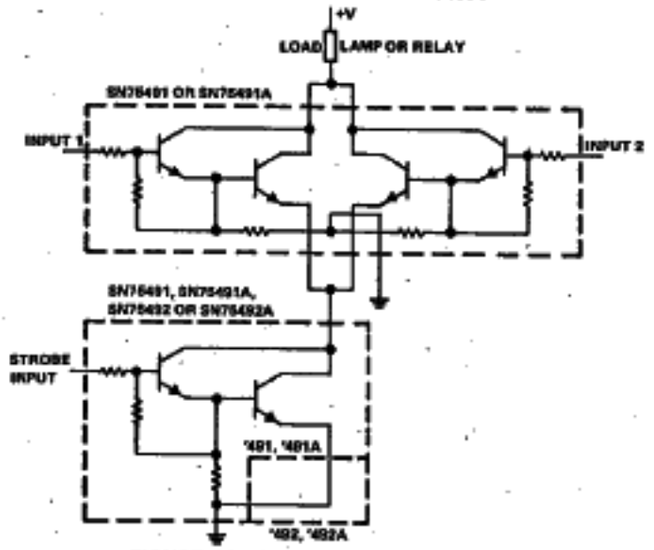


FIGURE 16. STROBED "NOR" DRIVER

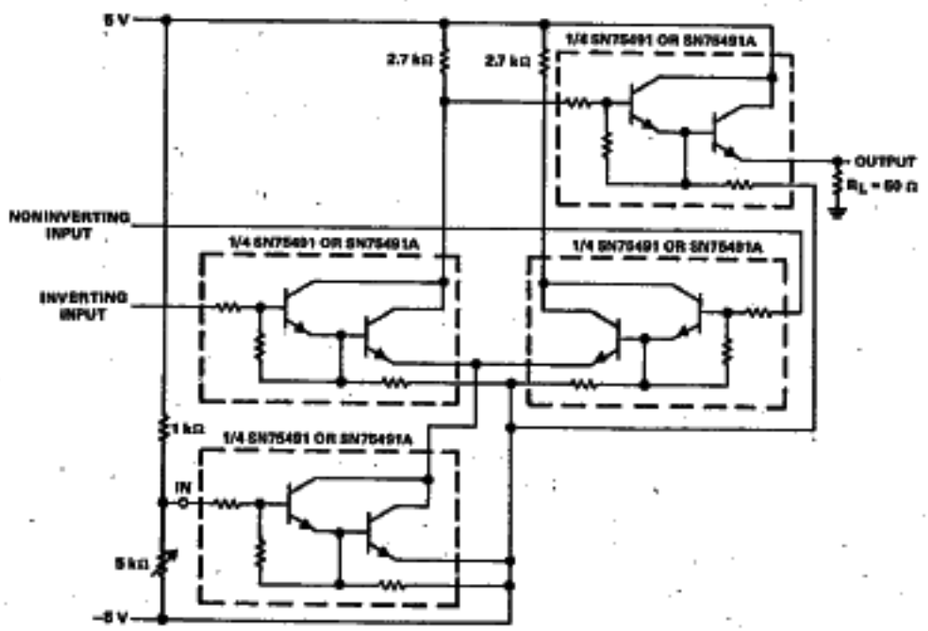


FIGURE 17. SN75491/SN75491A USED AS AN INTERFACE CIRCUIT BETWEEN THE BALANCED 30-MHz OUTPUT OF AN RF AMPLIFIER AND A COAXIAL CABLE

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