

## SN75491, SN75491A, SN75492, SN75492A MOS-TO-LED DRIVERS

D2385, OCTOBER 1972—REVISED SEPTEMBER 1986

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

- 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 Compatibility
- Low Standby Power
- High-Gain Darlington Circuits

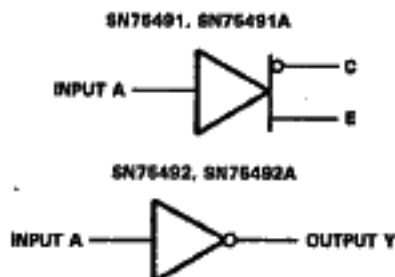
#### description

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.

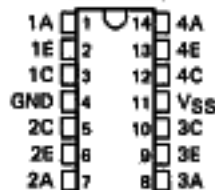
The SN75491 and SN75491A are quadruple segment drivers. The SN75492 and SN75492A are hex digit drivers. The SN75491 and SN75492 are characterized for operation to 10 volts. The SN75491A and SN75492A are characterized for operation to 20 volts.

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

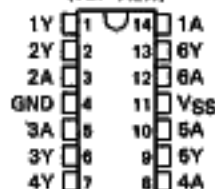
#### logic diagram (each driver)



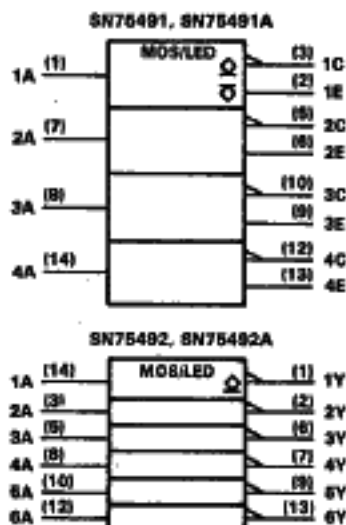
SN75491, SN75491A  
N DUAL-IN-LINE PACKAGE  
(TOP VIEW)



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



#### logic symbols†



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

PRODUCTION DATA does not contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655013 • DALLAS, TEXAS 75265

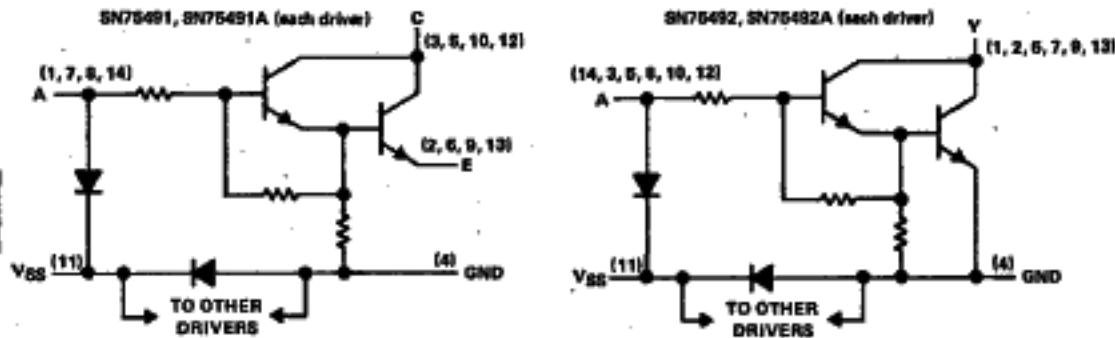
Copyright © 1986, Texas Instruments Incorporated

3  
Display Drivers

**SN75491, SN75491A, SN75492, SN75492A**  
**MOS-TO-LED DRIVERS**

T-52-13-07

**schematics**



Display Drivers

**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 <sub>SS</sub>	-5 V to V <sub>SS</sub>	-5 V to V <sub>SS</sub>	-5 V to V <sub>SS</sub>		
Collector (output) voltage, V <sub>C</sub>	10	20	10	20	V	
Collector (output)-to-input voltage	10	20	10	20	V	
Emitter-to-ground voltage (V <sub>E</sub> ≥ 5 V)	10	20			V	
Emitter-to-input voltage	5	5			V	
Voltage at V <sub>SS</sub> terminal with respect to any other device terminal	10	20	10	20	V	
Collector (output) current, I <sub>C</sub>	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 M package, use the 7-mW/°C curve.

**'491, '491A electrical characteristics, V<sub>SS</sub> = 10 V for SN75491, V<sub>SS</sub> = 20 V for SN75491A, T<sub>A</sub> = 0°C to 70°C (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>†</sup>	MAX	UNIT
V <sub>CE(on)</sub> On-State collector-emitter voltage	Input = 8.5 V through 1 kΩ, V <sub>E</sub> = 5 V, I <sub>C</sub> = 50 mA, T <sub>A</sub> = 25°C		0.8	1.2	V
	Input = 8.5 V through 1 kΩ, V <sub>E</sub> = 5 V, I <sub>C</sub> = 50 mA			1.5	
I <sub>C(off)</sub> Off-state collector current	V <sub>C</sub> = V <sub>SS</sub> , V <sub>E</sub> = 0, I <sub>I</sub> = 40 μA			100	μA
	V <sub>C</sub> = V <sub>SS</sub> , V <sub>E</sub> = 0, V <sub>I</sub> = 0.7 V			100	
I <sub>I</sub> Input current at maximum input voltage	V <sub>I</sub> = V <sub>SS</sub> , V <sub>E</sub> = 0, I <sub>C</sub> = 20 mA	'491	2.2	3.3	mA
		'491A	4.7	6.5	
I <sub>E</sub> Emitter reverse current	V <sub>I</sub> = 0, V <sub>E</sub> = 5 V, I <sub>C</sub> = 0			100	μA
I <sub>SS</sub> Current into V <sub>SS</sub> terminal				1	mA

<sup>†</sup>All typical values are at T<sub>A</sub> = 25°C.

**SN75491, SN75491A, SN75492, SN75492A  
MOS-TO-LED DRIVERS**

T-52-13-07

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

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>†</sup>	MAX	UNIT
$V_{OL}$ Low-level output voltage	Input = 6.5 V through 1 k $\Omega$ , $I_{OL} = 250\text{ mA}$ , $T_A = 25^\circ\text{C}$	0.9	1.2		V
	Input = 6.5 V through 1 k $\Omega$ , $I_{OL} = 250\text{ mA}$		1.5		
$I_{OH}$ High-level output current	$V_{OH} = V_{SS}$ , $V_I = 40\text{ }\mu\text{A}$		200		$\mu\text{A}$
	$V_{OH} = V_{SS}$ , $V_I = 0.5\text{ V}$		200		
$I_I$ Input current at maximum input voltage	$V_I = V_{SS}$ , $I_{OL} = 20\text{ mA}$		2.2	3.3	mA
			4.7	6.5	
$I_{SS}$ Current into $V_{SS}$ terminal				1	mA

<sup>†</sup>All typical values are at  $T_A = 25^\circ\text{C}$ .

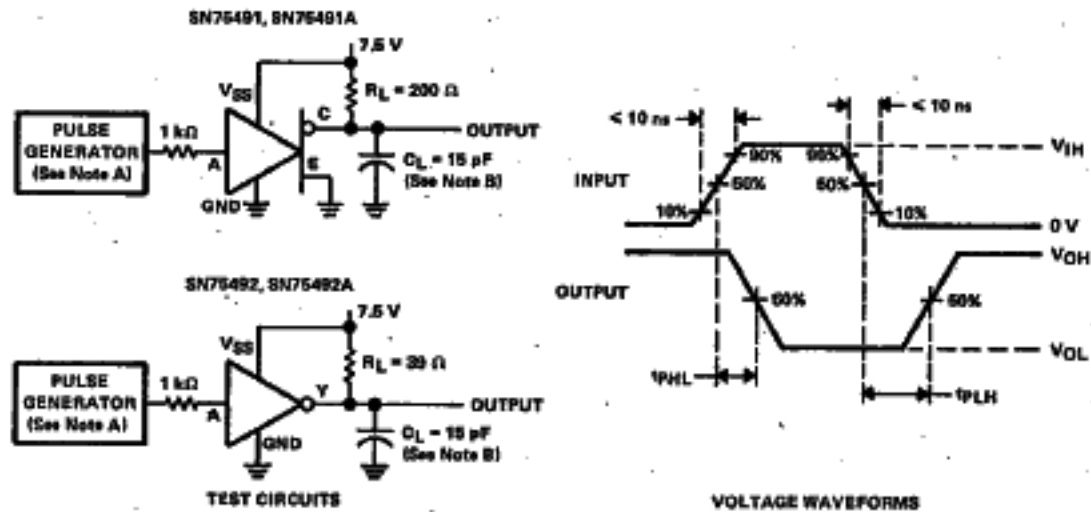
**SN75491, SN75491A switching characteristics,  $V_{SS} = 7.5\text{ V}$ ,  $T_A = 25^\circ\text{C}$**

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

**SN75492, SN75492A switching characteristics,  $V_{SS} = 7.5\text{ V}$ ,  $T_A = 25^\circ\text{C}$**

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

**PARAMETER MEASUREMENT INFORMATION**



NOTES: A. The pulse generator has the following characteristics:  $Z_{out} = 50\text{ }\Omega$ ,  $PRR \leq 100\text{ kHz}$ ,  $t_w = 1\text{ }\mu\text{s}$ .  
B.  $C_L$  includes probe and jig capacitance.

**FIGURE 1. PROPAGATION DELAY TIMES**

  
 Display Drivers

TYPICAL CHARACTERISTICS


  
 Display Drivers

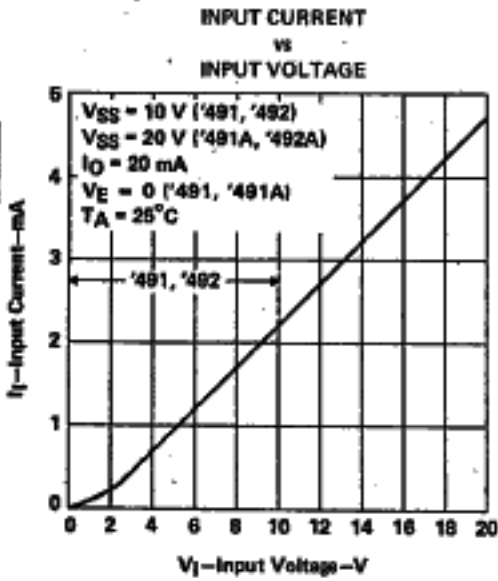


FIGURE 2

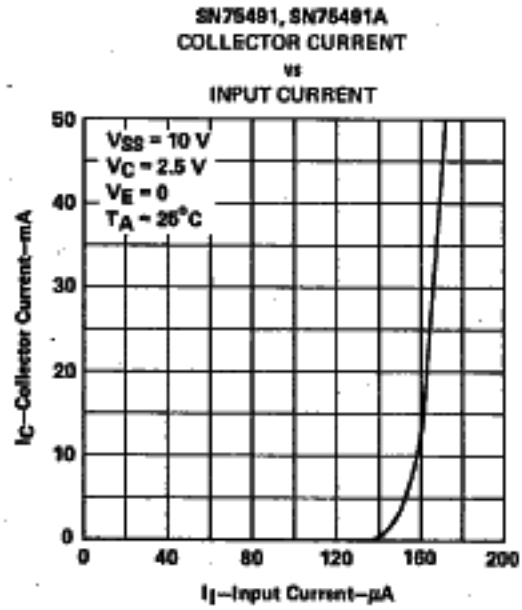


FIGURE 3

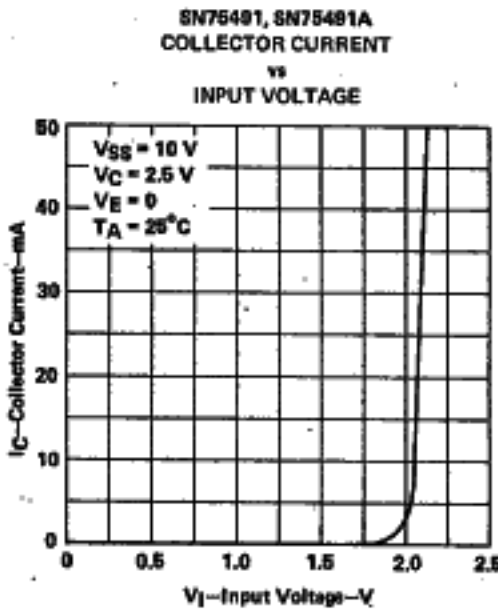


FIGURE 4

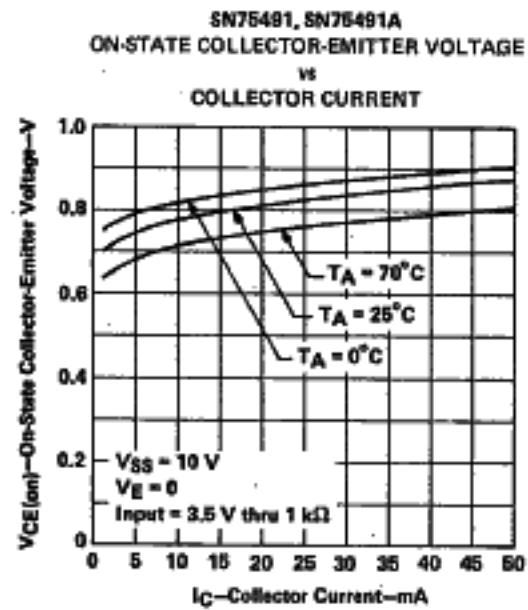


FIGURE 5

SN75491, SN75491A, SN75492, SN75492A  
MOS-TO-LED DRIVERS

T-52-13-07

TYPICAL CHARACTERISTICS

SN75492, SN75492A  
OUTPUT CURRENT  
VS  
INPUT CURRENT

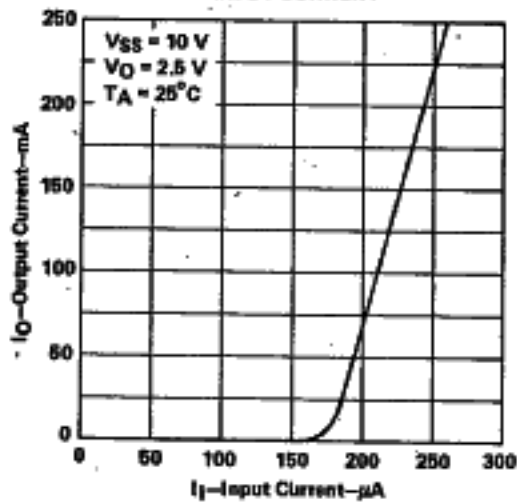


FIGURE 6

SN75492, SN75492A  
OUTPUT CURRENT  
VS  
INPUT VOLTAGE

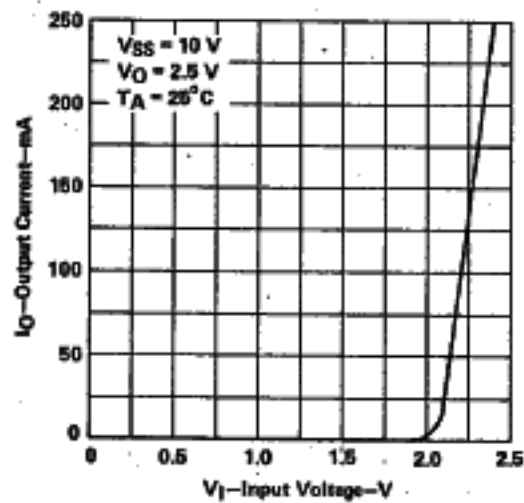


FIGURE 7

SN75492, SN75492A  
LOW-LEVEL OUTPUT VOLTAGE  
VS  
OUTPUT CURRENT

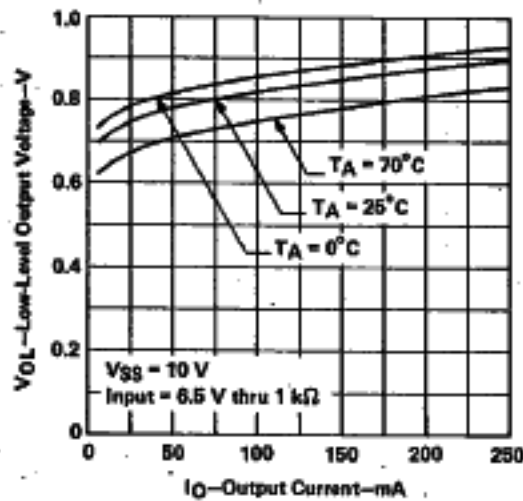


FIGURE 8



Display Drivers

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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.

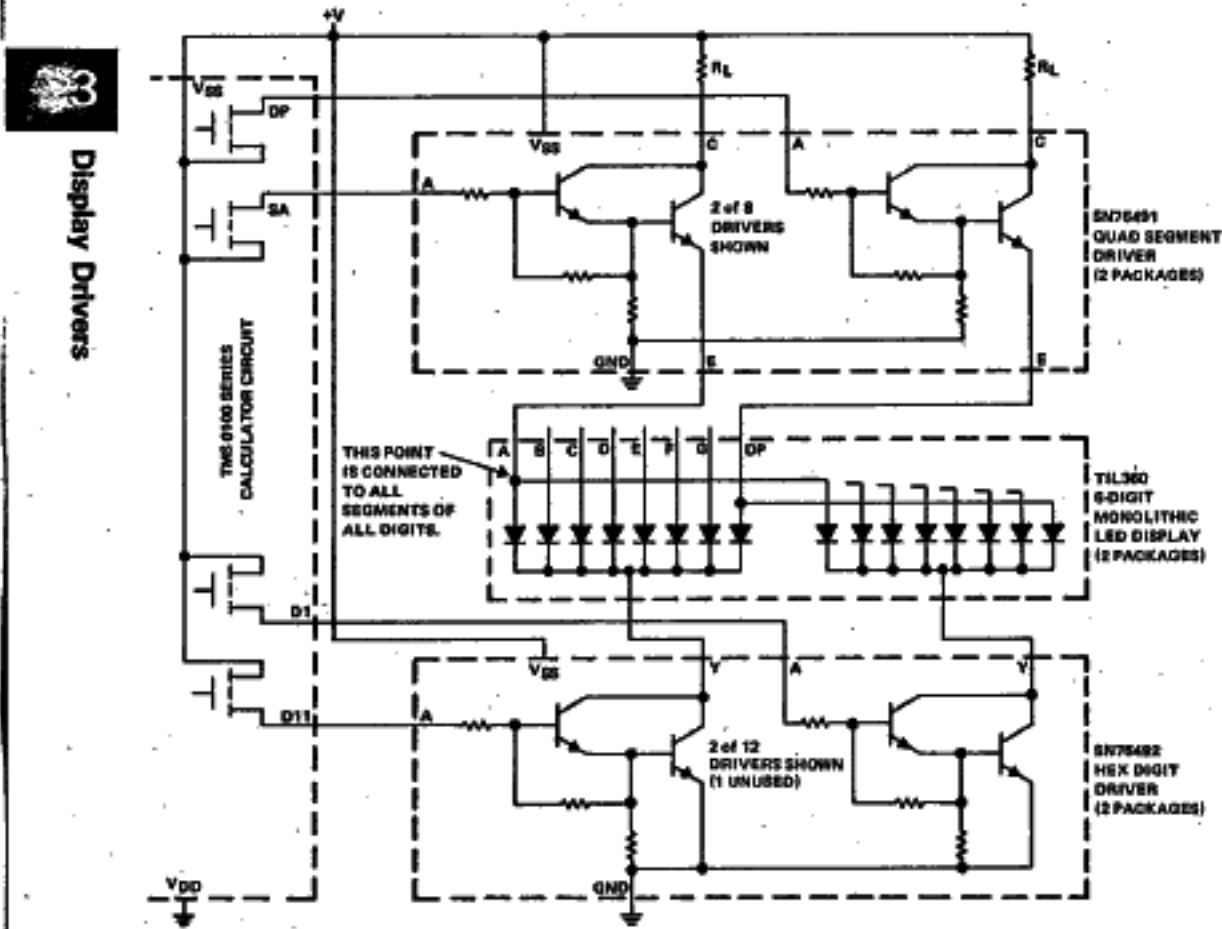


FIGURE 9. INTERFACING BETWEEN MOS CALCULATOR CIRCUIT AND LED MULTI-DIGIT DISPLAY

SN75491, SN75491A, SN75492, SN75492A  
MOS-TO-LED DRIVERS

T-52-13-07

TYPICAL APPLICATION DATA

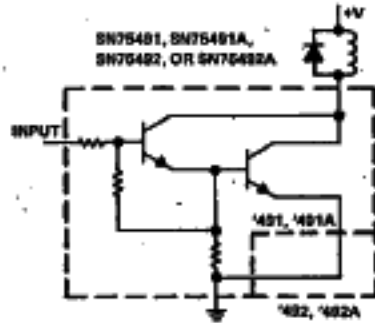


FIGURE 10. QUAD OR HEX RELAY DRIVER

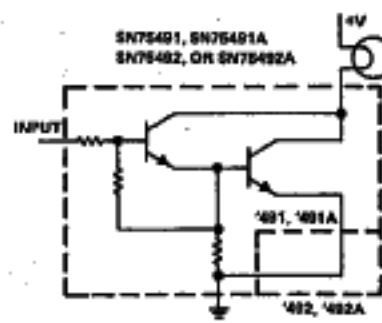


FIGURE 11. QUAD OR HEX LAMP DRIVER

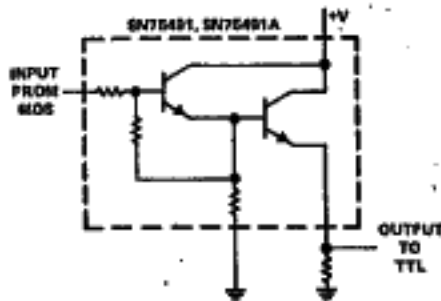


FIGURE 12. MOS-TO-TTL LEVEL SHIFTER

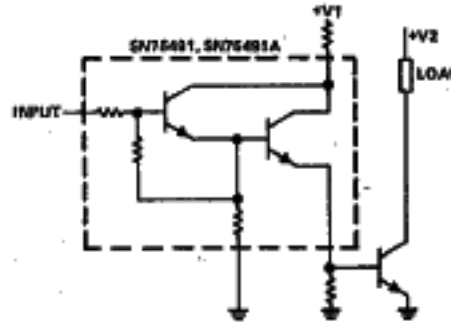
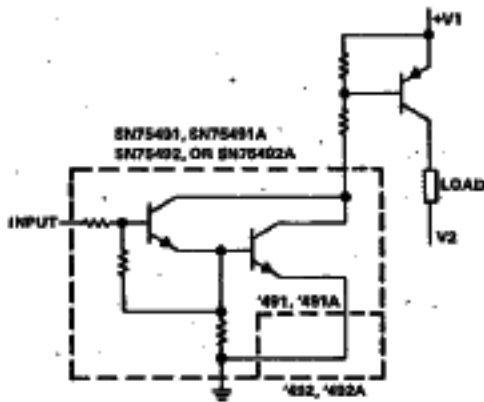


FIGURE 13. QUAD HIGH-CURRENT N-P-N TRANSISTOR DRIVER



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

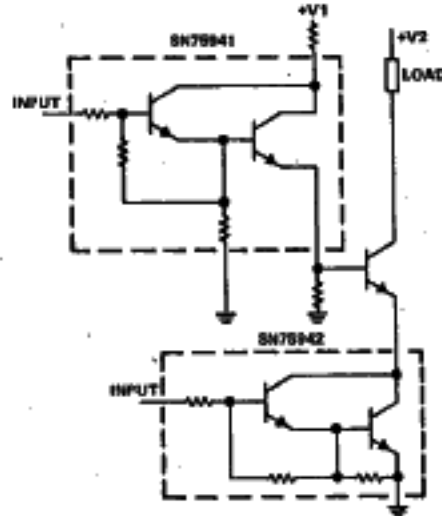


FIGURE 15. BASE/EMITTER SELECT N-P-N TRANSISTOR DRIVER

35  
Display Drivers

TYPICAL APPLICATION DATA

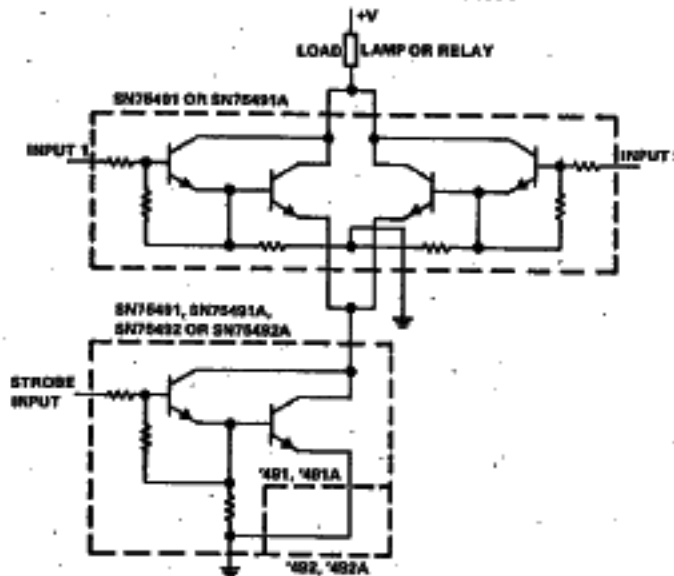


FIGURE 16. STROBED "NOR" DRIVER

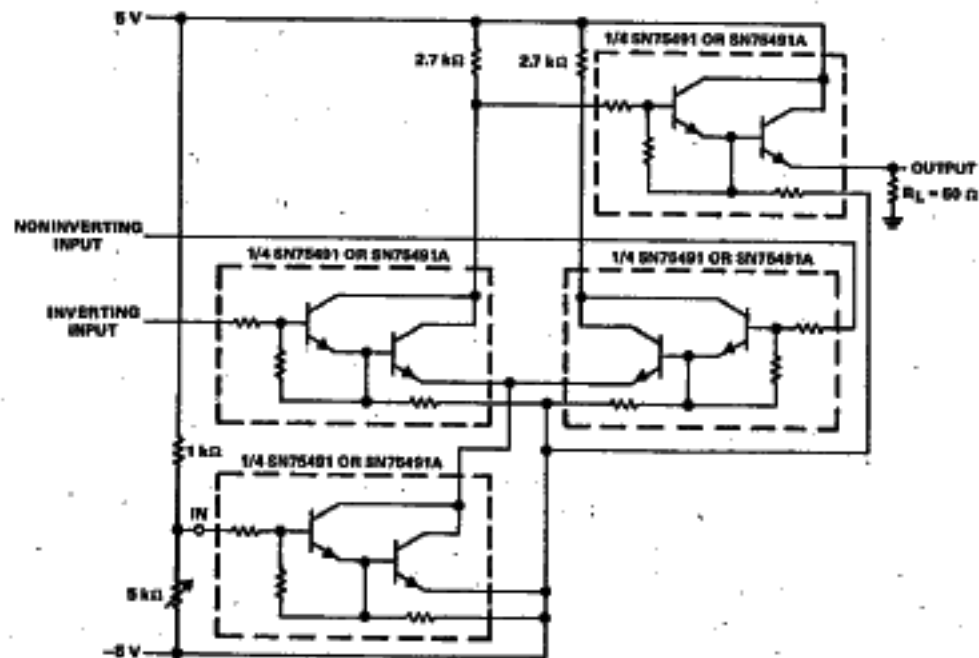


FIGURE 17. SN75491/SN75491A USED AS AN INTERFACE CIRCUIT BETWEEN THE BALANCED 30-MHz OUTPUT OF AN RF AMPLIFIER AND A COAXIAL CABLE