

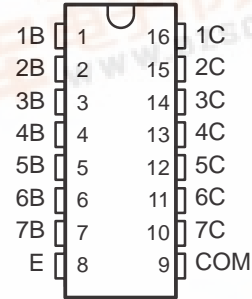
DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

HIGH-VOLTAGE HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS

- 500-mA Rated Collector Current (Single Output)
- High-Voltage Outputs . . . 100 V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- Relay Driver Applications
- Higher-Voltage Versions of ULN2003A and ULN2004A, for Commercial Temperature Range

D OR N PACKAGE
(TOP VIEW)

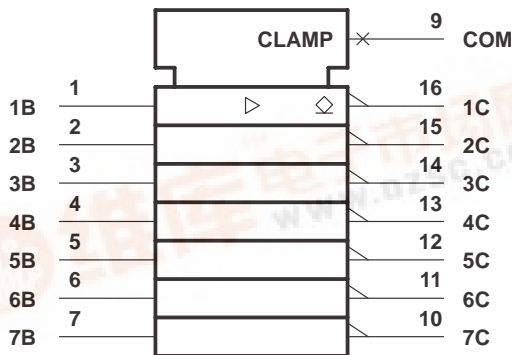


description

The SN75468 and SN75469 are monolithic high-voltage, high-current Darlington transistor arrays. Each consists of seven npn Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each Darlington pair is 500 mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers.

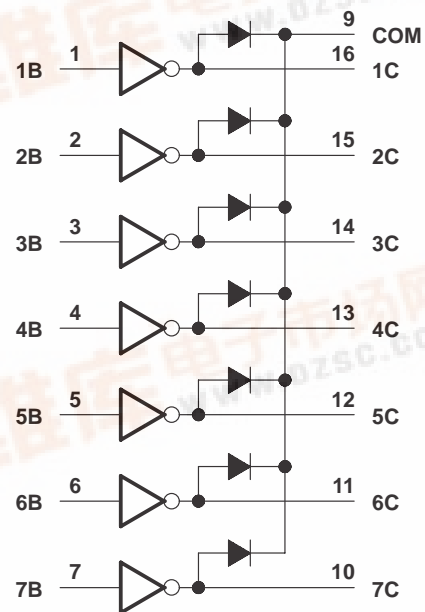
The SN75468 has a 2700- Ω series base resistor for each Darlington pair for operation directly with TTL or 5-V CMOS. The SN75469 has a 10.5-k Ω series base resistor to allow its operation directly with CMOS or PMOS that use supply voltages of 6 to 15 V. The required input current is below that of the SN75468.

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std91-1984 and IEC publication 617-12.

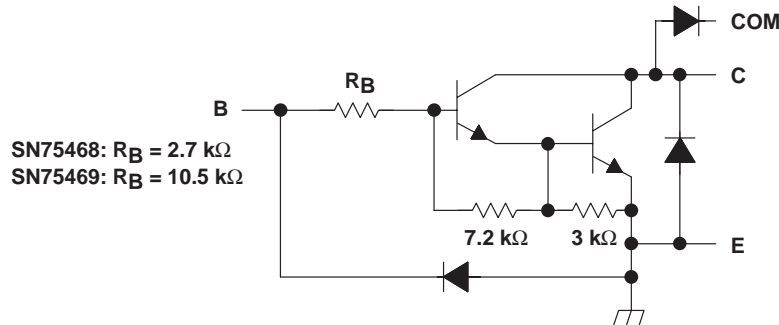
logic diagram



SN75468, SN75469 DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

schematic (each Darlington pair)



All resistor values shown are nominal.

absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Collector-emitter voltage, V_{CE}	100 V
Input voltage, V_I (see Note 1)	30 V
Peak collector current (see Figures 14 and 15)	500 mA
Output clamp current, I_{OK}	500 mA
Total emitter-terminal current	-2.5 A
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	0°C to 70°C
Storage temperature range, T_{stg}	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: All voltage values are with respect to the emitter/substrate terminal E, unless otherwise noted.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW
N	1150 mW	9.2 mW/°C	736 mW

SN75468, SN75469 DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

electrical characteristics, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST FIGURE	TEST CONDITIONS	SN75468			SN75469			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
$V_{I(\text{on})}$ On-state input voltage	5	$V_{CE} = 2\text{ V}$	$I_C = 125\text{ mA}$					5	V
			$I_C = 200\text{ mA}$			2.4		6	
			$I_C = 250\text{ mA}$			2.7			
			$I_C = 275\text{ mA}$					7	
			$I_C = 300\text{ mA}$			3			
			$I_C = 350\text{ mA}$					8	
$V_{CE(\text{sat})}$ Collector-emitter saturation voltage	6	$I_I = 250\ \mu\text{A}$, $I_C = 100\text{ mA}$	0.9	1.1		0.9	1.1	V	
		$I_I = 350\ \mu\text{A}$, $I_C = 200\text{ mA}$	1	1.3		1	1.3		
		$I_I = 500\ \mu\text{A}$, $I_C = 350\text{ mA}$	1.2	1.6		1.2	1.6		
V_F Clamp-diode forward voltage	8	$I_F = 350\text{ mA}$	1.7	2		1.7	2	V	
I_{CEX} Collector cutoff current	1	$V_{CE} = 100\text{ V}$, $I_I = 0$			50		50	μA	
	2	$V_{CE} = 100\text{ V}$, $T_A = 70^\circ\text{C}$, $V_I = 1\text{ V}$			100		100		
$I_{I(\text{off})}$ Off-state input current	3	$V_{CE} = 50\text{ V}$, $T_A = 70^\circ\text{C}$, $I_C = 500\ \mu\text{A}$	50	65		50	65	μA	
I_I Input current	4	$V_I = 3.85\text{ V}$	0.93	1.35				mA	
		$V_I = 5\text{ V}$				0.35	0.5		
		$V_I = 12\text{ V}$				1	1.45		
I_R Clamp-diode reverse current	7	$V_R = 100\text{ V}$			50		50	μA	
		$V_R = 100\text{ V}$, $T_A = 70^\circ\text{C}$			100		100		
C_i Input capacitance		$V_I = 0$, $f = 1\text{ MHz}$	15	25		15	25	pF	

switching characteristics, $T_A = 25^\circ\text{C}$ free-air temperature

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	$V_S = 50\text{ V}$, $R_L = 163\ \Omega$, $C_L = 15\text{ pF}$, See Figure 9		0.25	1	μs
t_{PHL} Propagation delay time, high-to-low-level output				0.25	1
V_{OH} High-level output voltage after switching	$V_S = 50\text{ V}$, $I_O \approx 300\text{ mA}$, See Figure 10	$V_S - 20$			mV

SN75468, SN75469 DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

PARAMETER MEASUREMENT INFORMATION

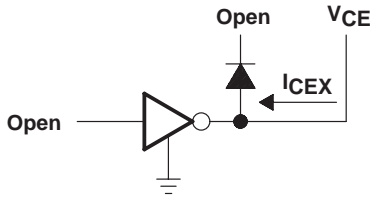


Figure 1. I_{cEX}

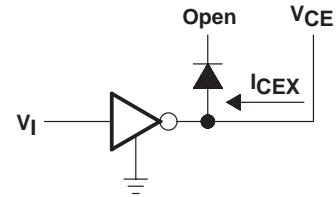


Figure 2. I_{cEX}

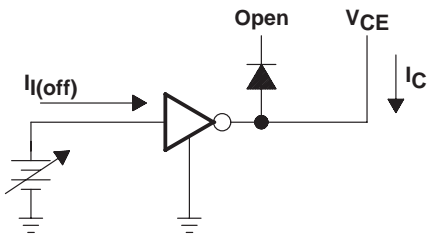


Figure 3. $I_{i(off)}$

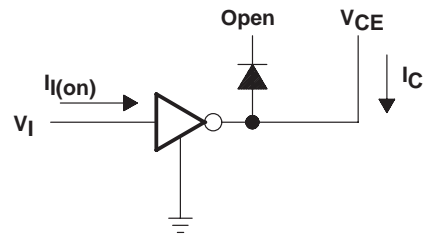


Figure 4. I_i

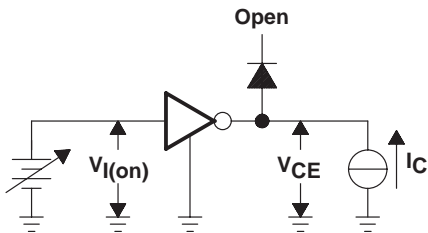
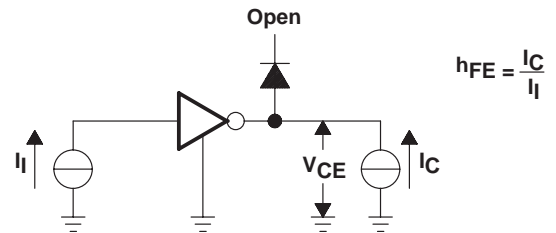


Figure 5. $V_{i(on)}$



NOTE: I_i is fixed for measuring $V_{CE(sat)}$, variable for measuring h_{FE} .

Figure 6. h_{FE} , $V_{CE(sat)}$

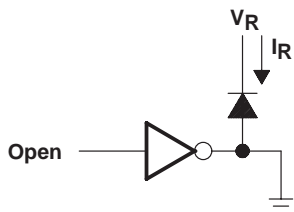


Figure 7. I_R

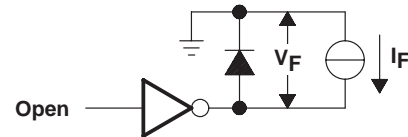


Figure 8. V_F

PARAMETER MEASUREMENT INFORMATION

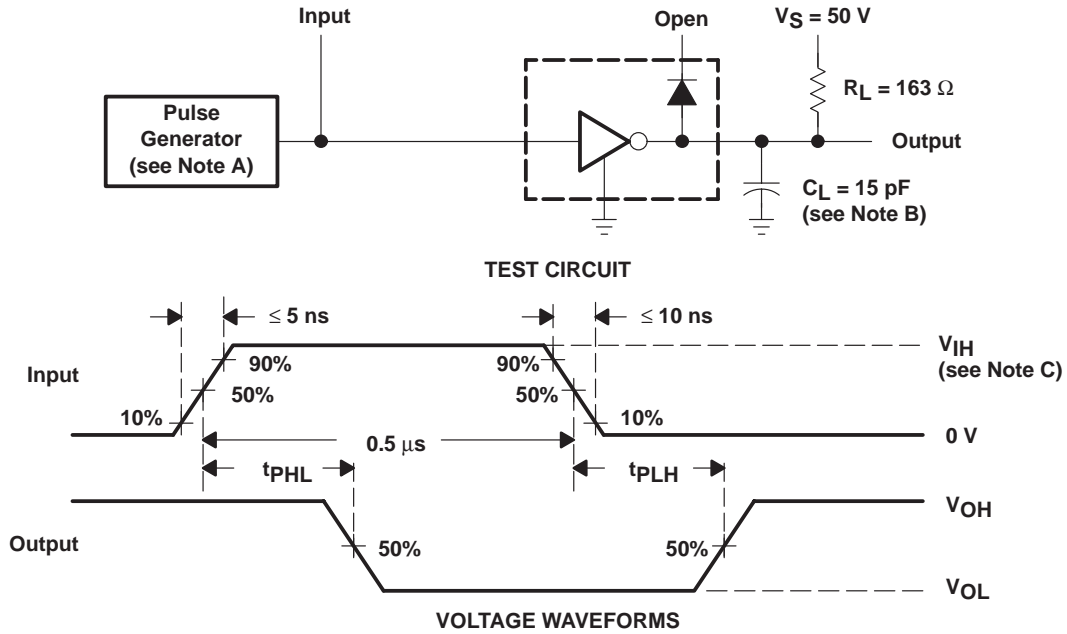


Figure 9. Test Circuit and Voltage Waveforms

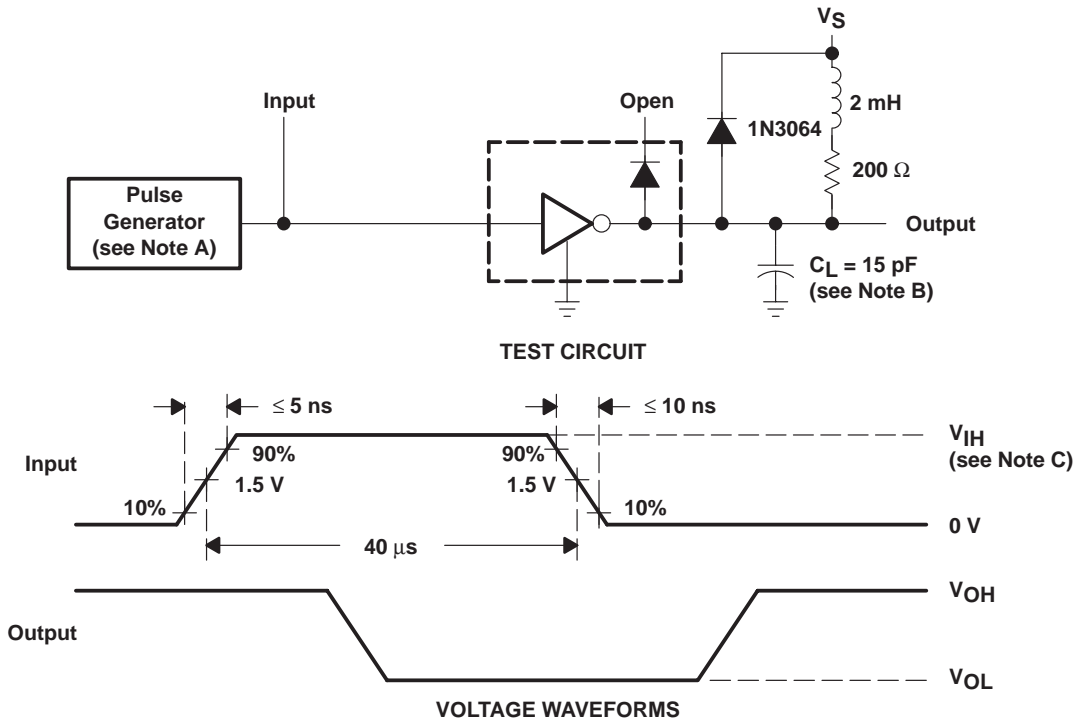


Figure 10. Latch-Up Test Circuit and Voltage Waveforms

- NOTES: A. The pulse generator has the following characteristics: PRR = 12.5 kHz, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.
 C. For testing the '468, $V_{IH} = 3 \text{ V}$; for the '469, $V_{IH} = 8 \text{ V}$.

SN75468, SN75469 DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

TYPICAL CHARACTERISTICS

COLLECTOR-EMITTER
SATURATION VOLTAGE
VS
COLLECTOR CURRENT
(ONE DARLINGTON)

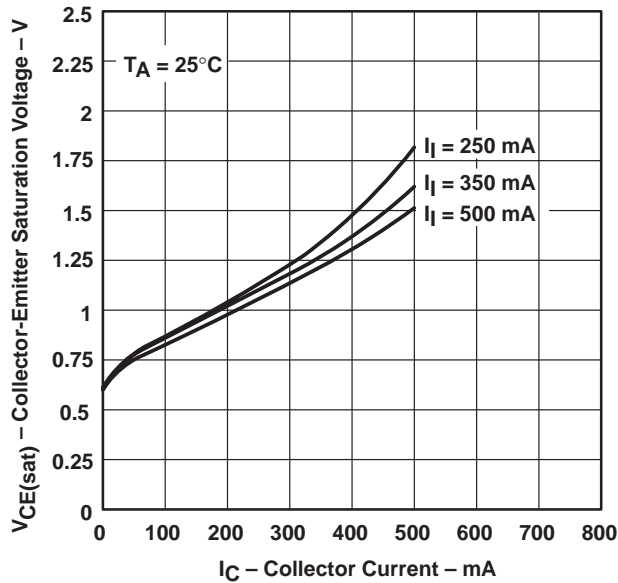


Figure 11

COLLECTOR-EMITTER
SATURATION VOLTAGE
VS
COLLECTOR CURRENT
(TWO DARLINGTONS PARALLELED)

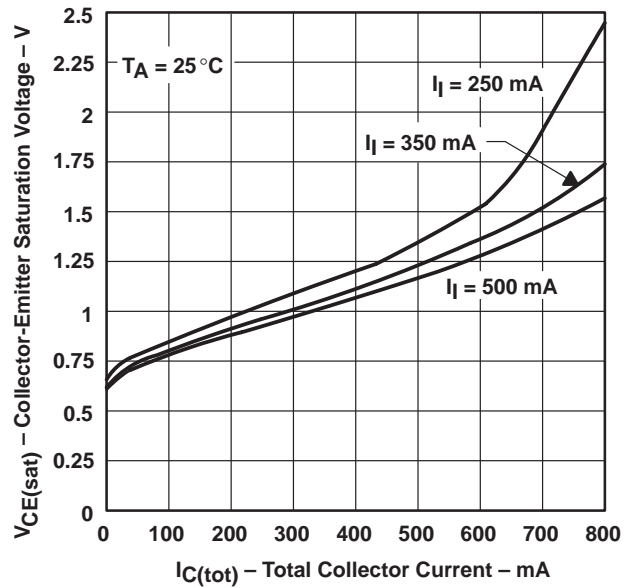


Figure 12

COLLECTOR CURRENT
VS
INPUT CURRENT

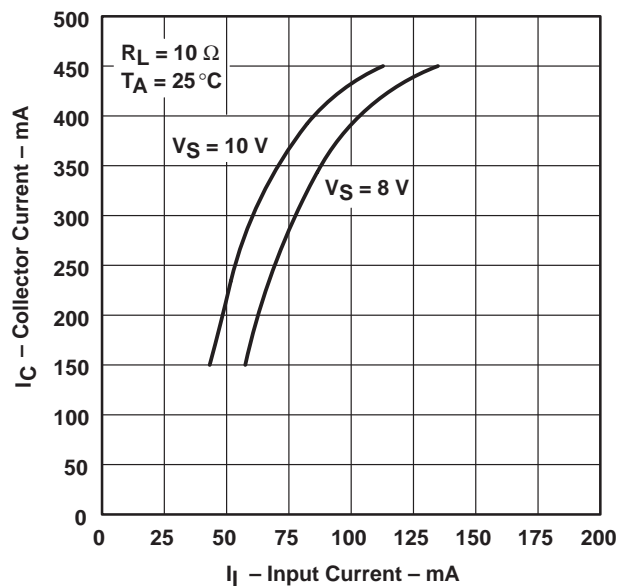


Figure 13

SN75468, SN75469 DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

THERMAL INFORMATION

**D PACKAGE
MAXIMUM COLLECTOR CURRENT
VS
DUTY CYCLE**

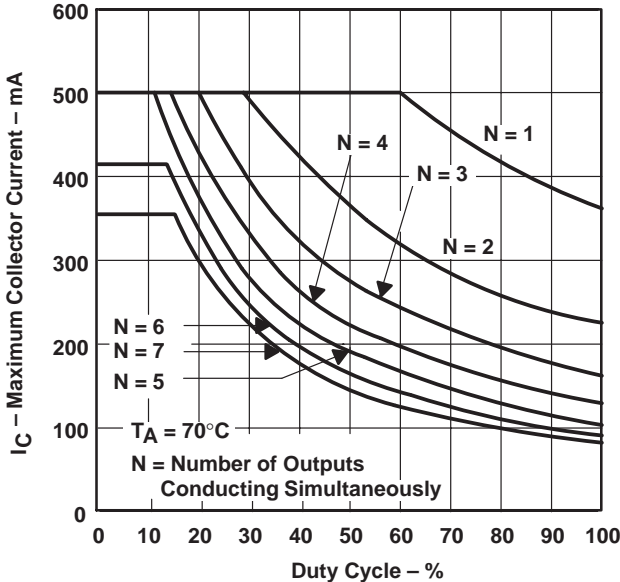


Figure 14

**N PACKAGE
MAXIMUM COLLECTOR CURRENT
VS
DUTY CYCLE**

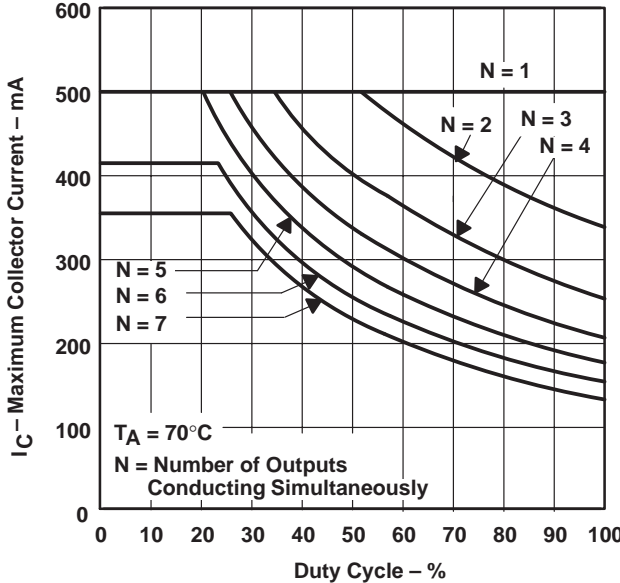


Figure 15

SN75468, SN75469 DARLINGTON TRANSISTOR ARRAYS

SLRS023B – DECEMBER 1976 – REVISED SEPTEMBER 1995

APPLICATION INFORMATION

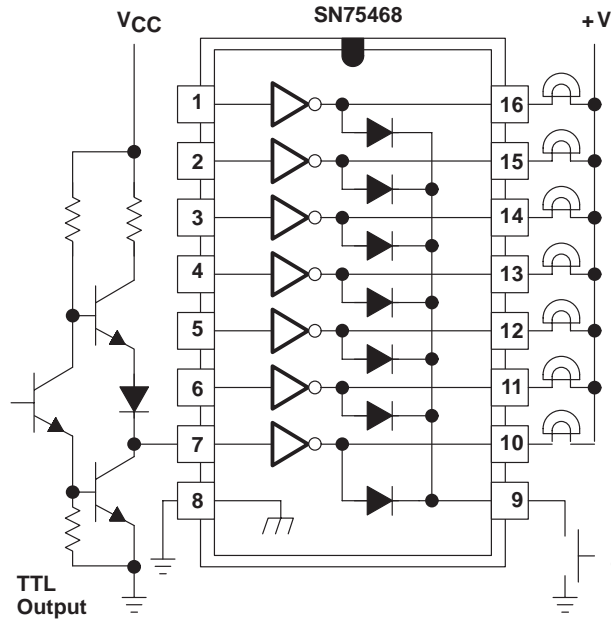


Figure 16. TTL to Load

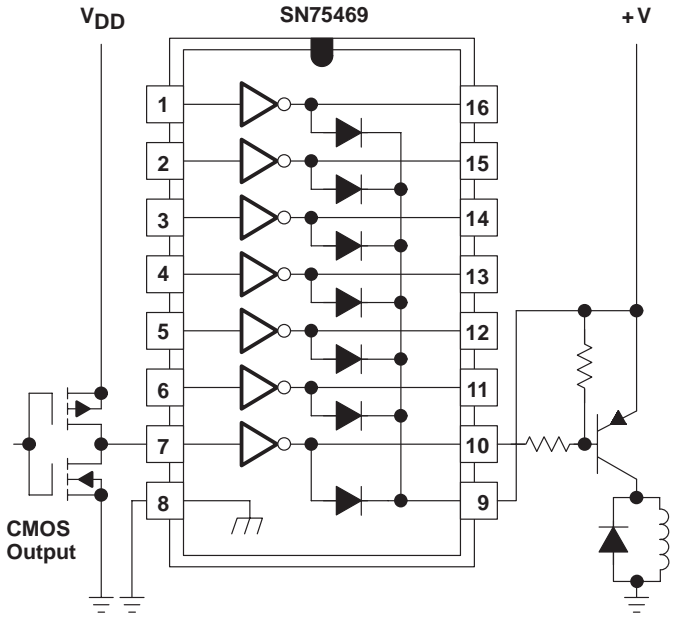


Figure 17. Buffer for Higher Current Loads

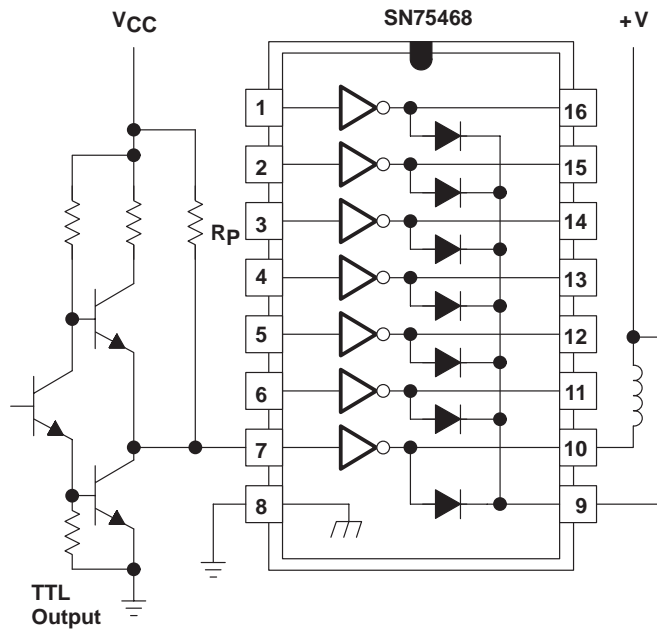


Figure 18. Use of Pullup Resistors to Increase Drive Current

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