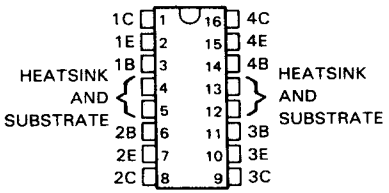
D2580, MAY 1980—REVISED SEPTEMBER 1986

- **Output Collector Current . . . 1.5 A Max**
- **2-W Dissipation Rating**
- **High Output-Voltage Capability**
- **Output Sink- or Source-Current Capabilities**
- **Input Compatible with TTL or 5-V CMOS**
- **Designed for Interchangeability with Sprague ULN2074 and ULN2075**

NE PACKAGE
(TOP VIEW)



description

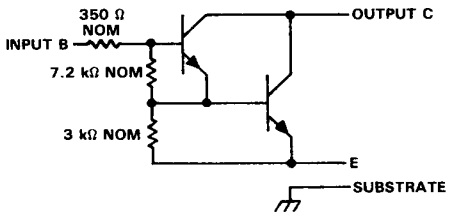
The ULN2074 and ULN2075 are monolithic, quadruple, high-voltage, high-current n-p-n darlington-transistor amplifier devices. They feature high-voltage outputs with collector-current ratings of 1.5 A for each Darlington pair.

The ULN2074 and ULN2075 are unique general-purpose devices, each featuring uncommitted collectors and emitters to allow for either sinking or sourcing the output current. These devices offer the system designer the flexibility of tailoring the circuit to the application. Typical applications include logic buffers, relay drivers, lamp drivers, and hammer drivers.

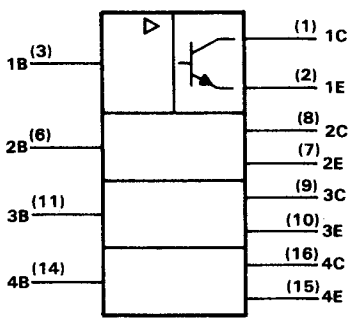
For proper operation, the substrate must be connected to the most negative voltage.

The ULN2074 and ULN2075 are characterized for operation from −20°C to 85°C.

schematic (each switch)



logic symbol†



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

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

	ULN2074	ULN2075	UNIT
Collector-emitter voltage	50	80	V
Input voltage with respect to substrate	30	60	V
Peak collector current (see Figures 9, 10, and 11)	1.5	1.5	A
Input current	25	25	mA
Total power dissipation at (or below) 25°C free-air temperature (see Note 1)	2075	2075	mW
Operating free-air temperature range	−20 to 85	−20 to 85	°C
Storage temperature range	−55 to 150	−55 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from the case for 10 seconds	260	260	°C

NOTE 1: For operation above 25°C free-air temperature, derate total power linearly to 1079 mW at 85°C at the rate of 16.6 mW/°C.

electrical characteristics at 25°C free-air temperature (unless otherwise noted)

PARAMETER		TEST FIGURE	TEST CONDITIONS	ULN2074		ULN2075		UNIT
				MIN	MAX	MIN	MAX	
$V_{CEX(sus)}$	Collector sustaining voltage	1	V_I = 0.4 V, I_C = 100 mA	35		50		V
I_{CEX}	Collector output cutoff current	2	V_{CE} = 50 V		100			μA
			V_{CE} = 50 V, T_A = 70°C		500			
			V_{CE} = 80 V				100	
			V_{CE} = 80 V, T_A = 70°C				500	
$I_{I(on)}$	On-state input current	3	V_I = 2.4 V	2	4.3	2	4.3	mA
			V_I = 3.75 V	4.5	9.6	4.5	9.6	
$V_{I(on)}$	On-state input voltage	4	V_{CE} = 2 V, I_C = 1 A		2		2	V
			V_{CE} = 2 V, I_C = 1.5 A, See Note 2		2.5		2.5	
$V_{CE(sat)}$	Collector-emitter saturation voltage	5	I_I = 625 μA, I_C = 500 mA		1.1		1.1	V
			I_I = 935 μA, I_C = 750 mA		1.2		1.2	
			I_I = 1.25 mA, I_C = 1 A		1.3		1.3	
			I_I = 2 mA, I_C = 1.25 A, See Note 2		1.4			
			I_I = 2.25 mA, I_C = 1.5 A, See Note 2				1.5	

NOTE 2: These parameters must be measured on one output at a time using pulse techniques, t_W = 10 ms, duty cycle ≤ 10%.

switching characteristics at 25°C free-air temperature, V_{CC} = 5 V

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	See Figure 6			1	μs
t_{PHL}	Propagation delay time, high-to-low-level output				1.5	μs

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PARAMETER MEASUREMENT INFORMATION

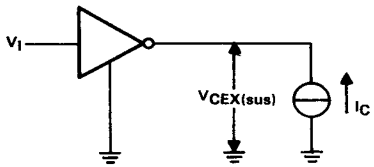


FIGURE 1. $V_{CEX(sus)}$

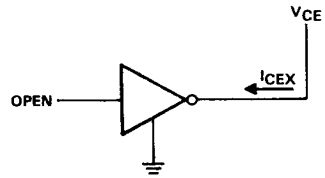


FIGURE 2. I_{CEX}

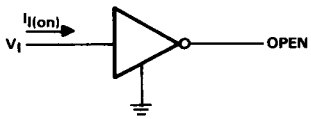


FIGURE 3. $I_{I(on)}$

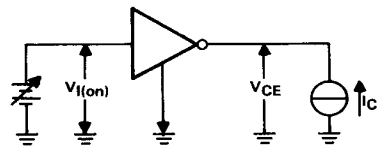


FIGURE 4. $V_{I(on)}$

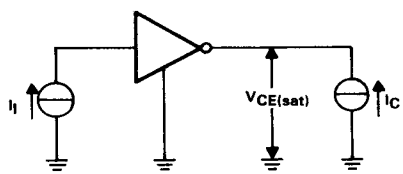
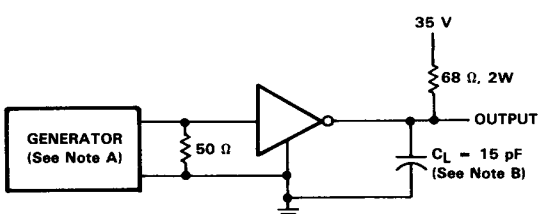
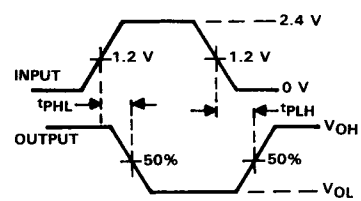


FIGURE 5. $V_{CE(sat)}$



TEST CIRCUITS



VOLTAGE WAVEFORMS

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 50 kHz, duty cycle = 10%, Z_O = 50 Ω.
B. C_L includes all probe and stray capacitance.

FIGURE 6. SWITCHING CHARACTERISTICS

ELECTRICAL CHARACTERISTICS

INPUT CURRENT
vs
INPUT VOLTAGE

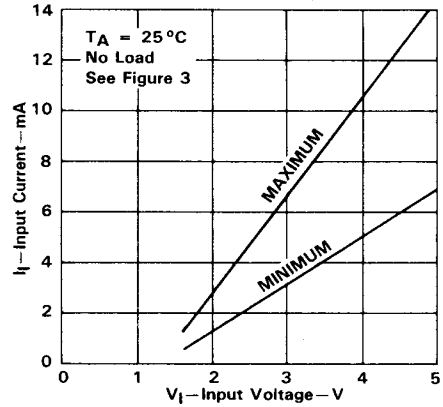


FIGURE 7

COLLECTOR CURRENT
vs
BASE CURRENT

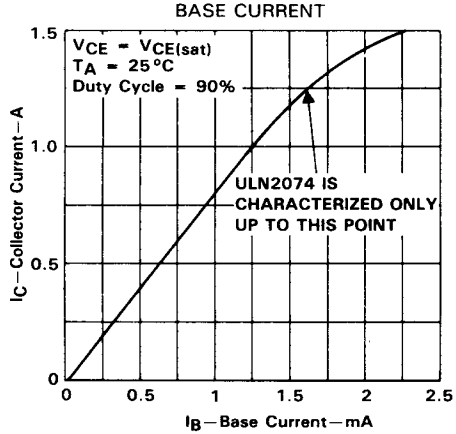


FIGURE 8

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

THERMAL INFORMATION

MAXIMUM COLLECTOR CURRENT
vs
DUTY CYCLE

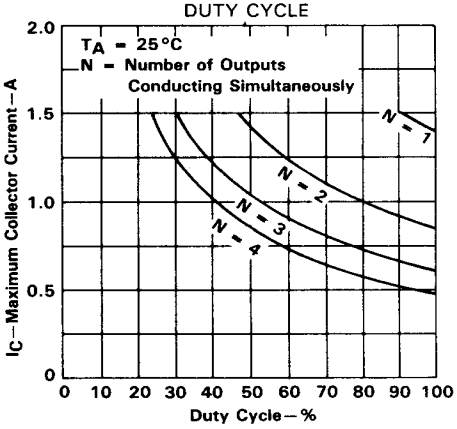


FIGURE 9

MAXIMUM COLLECTOR CURRENT
vs
DUTY CYCLE

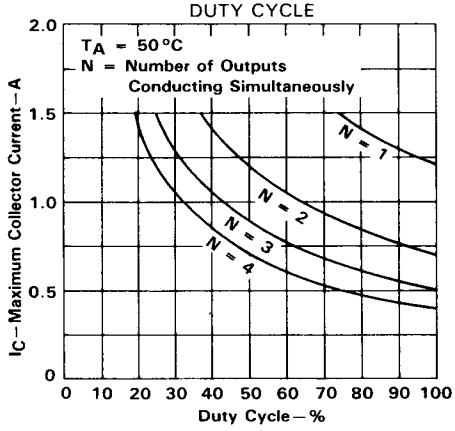


FIGURE 10

MAXIMUM COLLECTOR CURRENT
vs
DUTY CYCLE

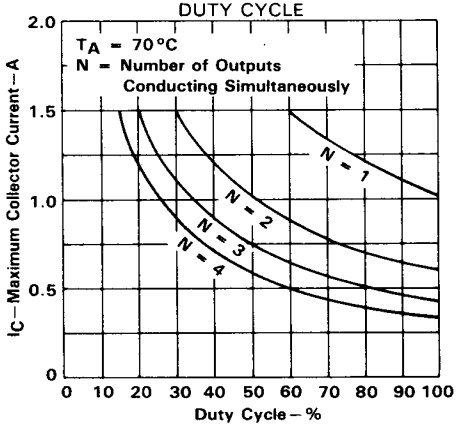


FIGURE 11

APPLICATION INFORMATION

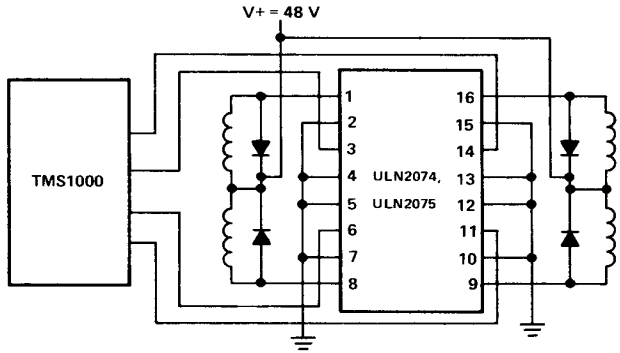


FIGURE 12. RELAY DRIVER INTERFACE WITH EXTERNAL CLAMP DIODES