

## DS75325 Memory Drivers

### General Description

The DS75325 is a monolithic memory driver which features high current outputs as well as internal decoding of logic inputs. This circuit is designed for use with magnetic memories.

The circuit contains two 600 mA sink-switch pairs and two 600 mA source-switch pairs. Inputs A and B determine source selection while the source strobe (S1) allows the selected source turn on. In the same manner, inputs C and D determine sink selection while the sink strobe (S2) allows the selected sink turn on.

Sink-output collectors feature an internal pull-up resistor in parallel with a clamping diode connected to  $V_{CC2}$ . This protects the outputs from voltage surges associated with switching inductive loads.

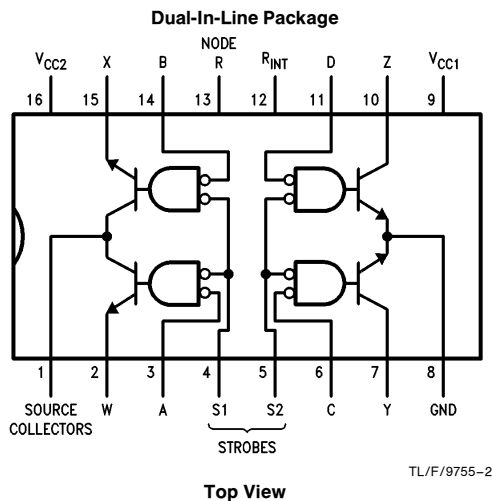
The source stage features Node R which allows extreme flexibility in source current selection by controlling the amount of base drive to each source transistor. This method of setting the base drive brings the power associated with the resistor outside the package thereby allowing the circuit

to operate at higher source currents for a given junction temperature. If this method of source current setting is not desired, then Nodes R and  $R_{INT}$  can be shorted externally, activating an internal resistor connected from  $V_{CC2}$  to Node R. This provides adequate base drive for source currents up to 375 mA with  $V_{CC2} = 15V$  or 600 mA with  $V_{CC2} = 24V$ .

### Features

- 600 mA output capability
- 24V output capability
- Dual sink and dual source outputs
- Fast switching times
- Source base drive externally adjustable
- Input clamping diodes
- TTL compatible

### Connection Diagram



### Truth Table

Address Inputs				Strobe Inputs		Outputs			
Source		Sink		Source	Sink	Source		Sink	
A	B	C	D	S1	S2	W	X	Y	Z
L	H	X	X	L	H	ON	OFF	OFF	OFF
H	L	X	X	L	H	OFF	ON	OFF	OFF
X	X	L	H	H	L	OFF	OFF	ON	OFF
X	X	H	L	H	L	OFF	OFF	OFF	ON
X	X	X	X	H	H	OFF	OFF	OFF	OFF
H	H	H	H	X	X	OFF	OFF	OFF	OFF

H = High Level, L = Low Level, X = Irrelevant

**Note:** Not more than one output is to be on at any one time.

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage $V_{CC1}$ (Note 5)	7V
Supply Voltage $V_{CC2}$ (Note 5)	25V
Input Voltage (Any Address or Strobe Input)	5.5V
Maximum Power Dissipation* at 25°C	
Cavity Package	1509 mW
Molded Package	1476 mW

\*Derate Cavity Package 10.1 mW/°C above 25°C; derate molded package 11.8 mW/°C above 25°C.

Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 seconds)	300°C

## Operating Conditions

	Min	Max	Units
Temperature ( $T_A$ )			
DS75325	0	+70	°C

## Electrical Characteristics (Notes 2 and 3)

Symbol	Parameter	Conditions	Min	Typ	Max	Units		
$V_{IH}$	High Level Input Voltage	(Figures 1 and 2)	2			V		
$V_{IL}$	Low Level Input Voltage	(Figures 3 and 4)			0.8	V		
$V_I$	Input Clamp Voltage	$V_{CC1} = 4.5V, V_{CC2} = 24V, I_{IN} = -12 mA$ $T_A = 25°C$ (Figure 5)		-1.3	-1.7	V		
$I_{OFF}$	Source Collectors Terminal "Off" State Current	$V_{CC1} = 4.5V, V_{CC2} = 24V$ (Figure 1)	Full Range	DS55325		500	$\mu A$	
				DS75325		200	$\mu A$	
		$T_A = 25°C$	DS55325		3	150	$\mu A$	
			DS75325		3	200	$\mu A$	
$V_{OH}$	High Level Sink Output Voltage	$V_{CC1} = 4.5V, V_{CC2} = 24V, I_{OUT} = 0 mA$ (Figure 2)	19	23		V		
$V_{SAT}$	Saturation Voltage Source Outputs	$V_{CC1} = 4.5V, V_{CC2} = 15V,$ $R_L = 24\Omega,$ $I_{SOURCE} \approx -600 mA$ (Figure 3) (Notes 4 and 6)	Full Range			0.9	V	
			$T_A = 25°C$	DS55325		0.43	0.7	V
				DS75325		0.43	0.75	V
$V_{SAT}$	Saturation Voltage Sink Outputs	$V_{CC1} = 4.5V, V_{CC2} = 15V,$ $R_L = 24\Omega,$ $I_{SINK} \approx 600 mA$ (Figure 4) (Notes 4 and 6)	Full Range			0.9	V	
			$T_A = 25°C$	DS55325		0.43	0.7	V
				DS75325		0.43	0.75	V
$I_I$	Input Current at Maximum Input Voltage	$V_{CC1} = 5.5V, V_{CC2} = 24V,$ $V_I = 5.5V$ (Figure 5)	Address Inputs			1	mA	
			Strobe Inputs			2	mA	
$I_{IH}$	High Level Input Current	$V_{CC1} = 5.5V, V_{CC2} = 24V,$ $V_I = 2.4V$ (Figure 5)	Address Inputs		3	40	$\mu A$	
			Strobe Inputs		6	80	$\mu A$	
$I_{IL}$	Low Level Input Current	$V_{CC1} = 5.5V, V_{CC2} = 24V,$ $V_I = 0.4V$ (Figure 5)	Address Inputs		-1	-1.6	mA	
			Strobe Inputs		-2	-3.2	mA	
$I_{CC OFF}$	Supply Current, All Sources and Sinks "Off"	$V_{CC1} = 5.5V, V_{CC2} = 24V,$ $T_A = 25°C$ (Figure 6)	$V_{CC1}$		14	22	mA	
			$V_{CC2}$		7.5	20	mA	
$I_{CC1}$	Supply Current from $V_{CC1}$ , Either Sink "On"	$V_{CC1} = 5.5V, V_{CC2} = 24V, I_{SINK} = 50 mA,$ $T_A = 25°C$ (Figure 7)		55	70	mA		
$I_{CC2}$	Supply Current from $V_{CC2}$ , Either Source "On"	$V_{CC1} = 5.5V, V_{CC2} = 24V, I_{SOURCE} = -50 mA$ $T_A = 25°C$ (Figure 8)		32	50	mA		

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:** Unless otherwise specified min/max limits apply across the -55°C to +125°C temperature range for the DS55325 and across the 0°C to +70°C range for the DS75325. All typical values are at  $T_A = 25°C$ .

**Note 3:** All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

**Note 4:** Only one output at a time should be shorted.

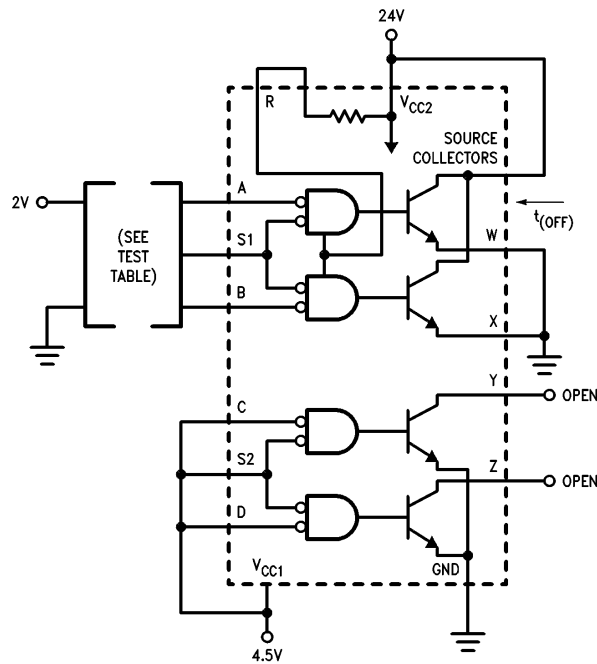
**Note 5:** Voltage values are with respect to network ground terminal.

**Note 6:** These parameters must be measured using pulse techniques.  $t_W = 200 \mu s$ , duty cycle  $\leq 2\%$ .

## Switching Characteristics $V_{CC1} = 5V, T_A = 25^\circ C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
$t_{PLH}$	Propagation Delay Time, Low-to-High Level Output	$V_{CC2} = 15V, R_L = 24\Omega, C_L = 25\text{ pF}$ (Figure 9)	Source Collectors		25	50	ns
			Sink Outputs		20	45	ns
$t_{PHL}$	Propagation Delay Time, High-to-Low Level Output	$V_{CC2} = 15V, R_L = 24\Omega, C_L = 25\text{ pF}$ (Figure 9)	Source Collectors		25	50	ns
			Sink Outputs		20	45	ns
$t_{TLH}$	Transition Time, Low-to-High Level Output	$C_L = 25\text{ pF}$	Source Outputs, $V_{CC2} = 20V, R_L = 1\text{ k}\Omega$ (Figure 10)		55		ns
			Sink Outputs, $V_{CC2} = 15V, R_L = 24\Omega$ (Figure 9)		7	15	ns
$t_{THL}$	Transition Time, High-to-Low Level Output	$C_L = 25\text{ pF}$	Source Outputs, $V_{CC2} = 20V, R_L = 1\text{ k}\Omega$ (Figure 10)		7		ns
			Sink Outputs, $V_{CC2} = 15V, R_L = 24\Omega$ (Figure 9)		9	20	ns
$t_S$	Storage Time, Sink Outputs	$V_{CC2} = 15V, R_L = 24\Omega, C_L = 25\text{ pF}$ (Figure 9)		15	30	ns	

## DC Test Circuits



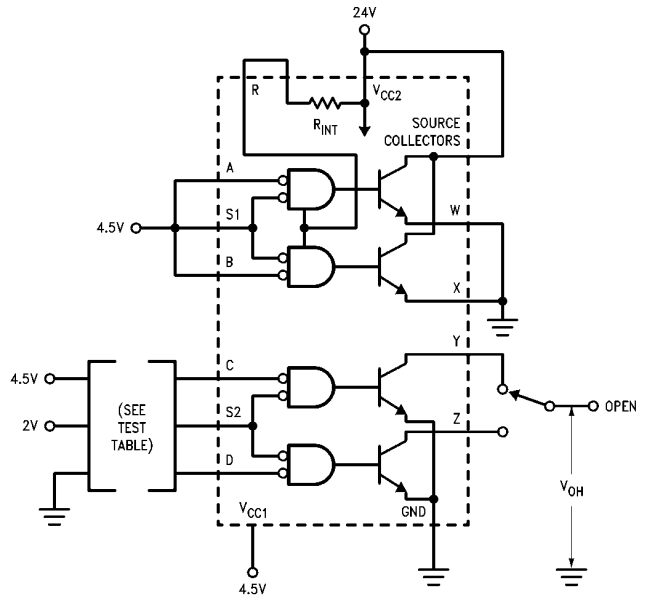
TL/F/9755-3

Test Table

A	B	S1
GND	GND	2V
2V	2V	GND

FIGURE 1.  $t_{off}$

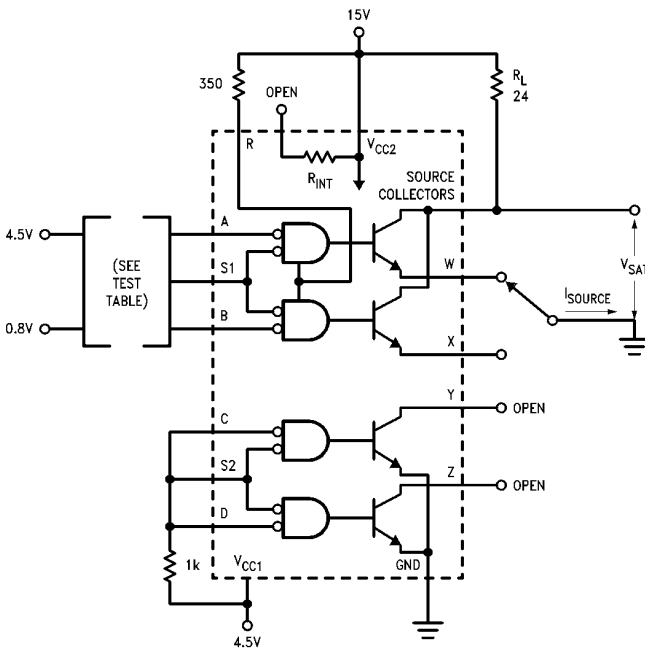
## DC Test Circuits (Continued)



TL/F/9755-4

FIGURE 2.  $V_{IH}$  and  $V_{OH}$

C	D	S2	Y	Z
2V	4.5V	GND	$V_{OH}$	OPEN
GND	4.5V	2V	$V_{OH}$	OPEN
4.5V	2V	GND	OPEN	$V_{OH}$
4.5V	GND	2V	OPEN	$V_{OH}$



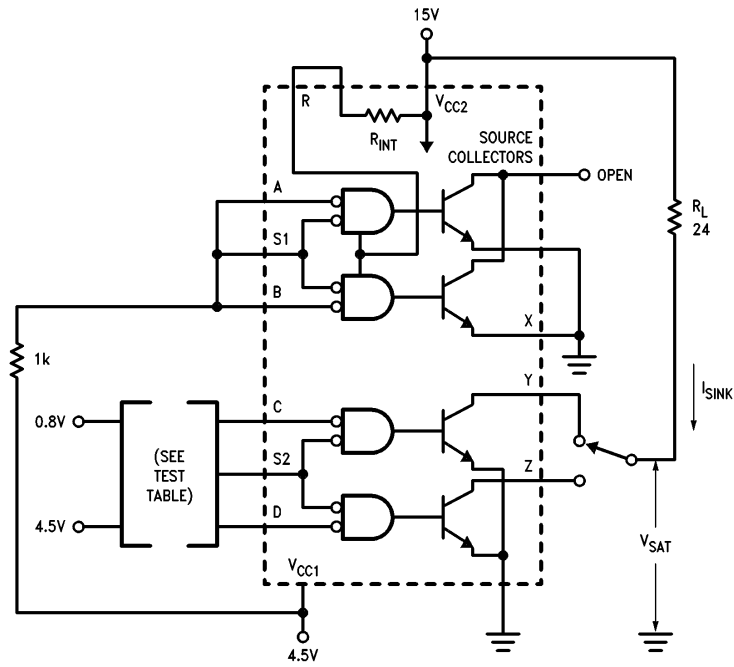
TL/F/9755-5

Note 1: Figure 3 and 4 parameters must be measured using pulse techniques,  $t_W = 200 \mu s$ , duty cycle  $\leq 2\%$ .

FIGURE 3.  $V_{IL}$  and Source  $V_{SAT}$

A	B	S1	W	X
0.8V	4.5V	0.8V	GND	OPEN
4.5V	0.8V	0.8V	OPEN	GND

## DC Test Circuits (Continued)



TL/F/9755-6

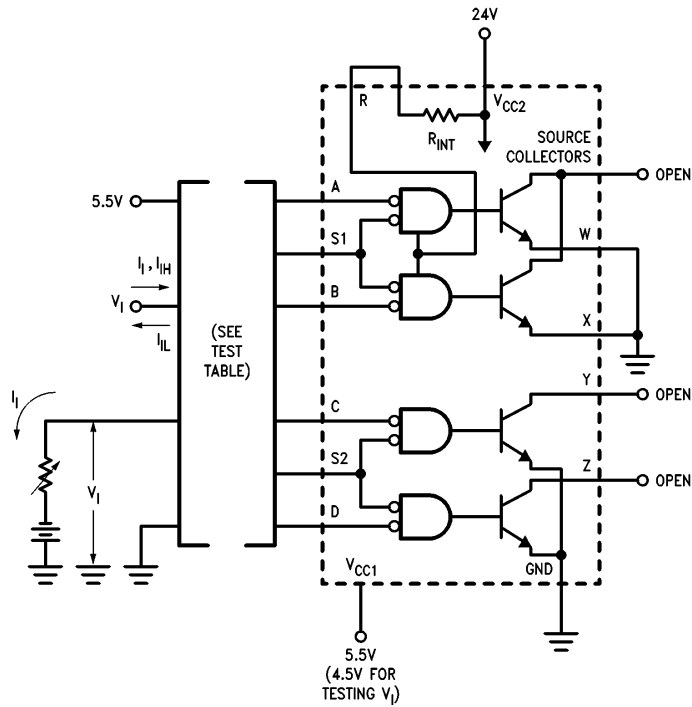
**Note 1:** Figure 3 and 4 parameters must be measured using pulse techniques,  $t_W = 200 \mu s$ , duty cycle  $\leq 2\%$ .

**Test Table**

C	D	S2	Y	Z
0.8V	4.5V	0.8V	$R_L$	OPEN
4.5V	0.8V	0.8V	OPEN	$R_L$

**FIGURE 4.  $V_{IL}$  and Sink  $V_{SAT}$**

## DC Test Circuits (Continued)



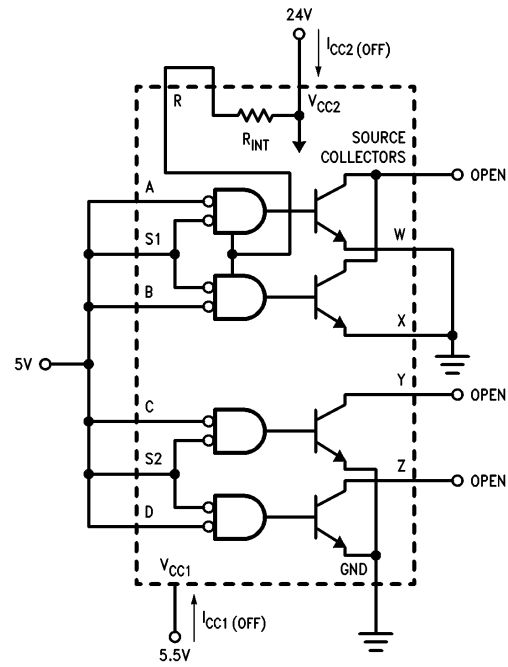
TL/F/9755-7

### Test Tables

$I_I, I_{IH}$			$V_I, I_{IL}$	
Apply $V_I = 5.5V$ Measure $I_I$	Ground	Apply 5.5V	Apply $V_I = 0.4V$ Measure $I_{IL}$	Apply 5.5V
Apply $V_I = 2.4V$ Measure $I_{IH}$			Apply $I_I = -10mA$ Measure $V_I$	
A	S1	B, C, S2, D	A	S1, B, C, S2, D
S1	A, B	C, S2, D	S1	A, B, C, S2, D
B	S1	A, C, S2, D	B	A, S1, C, S2, D
C	S2	A, S1, B, D	C	A, S1, B, S2, D
S2	C, D	A, S1, B	S2	A, S1, B, C, D
D	S2	A, S1, B, C	D	A, S1, B, C, S2

FIGURE 5.  $V_I, I_I, I_{IH}$  and  $I_{IL}$

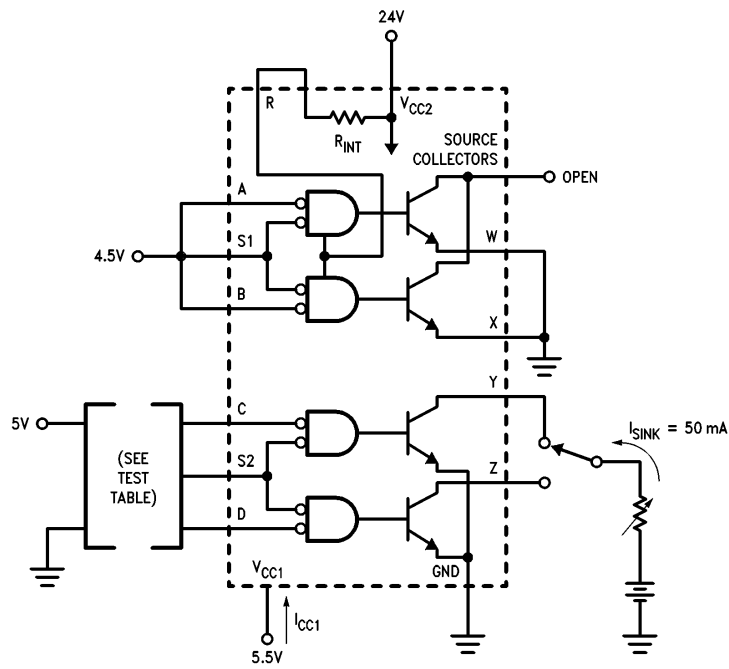
**DC Test Circuits** (Continued)



**FIGURE 6.** I<sub>CC1</sub>(OFF) and I<sub>CC2</sub>(OFF)

TL/F/9755-8

# DC Test Circuits (Continued)



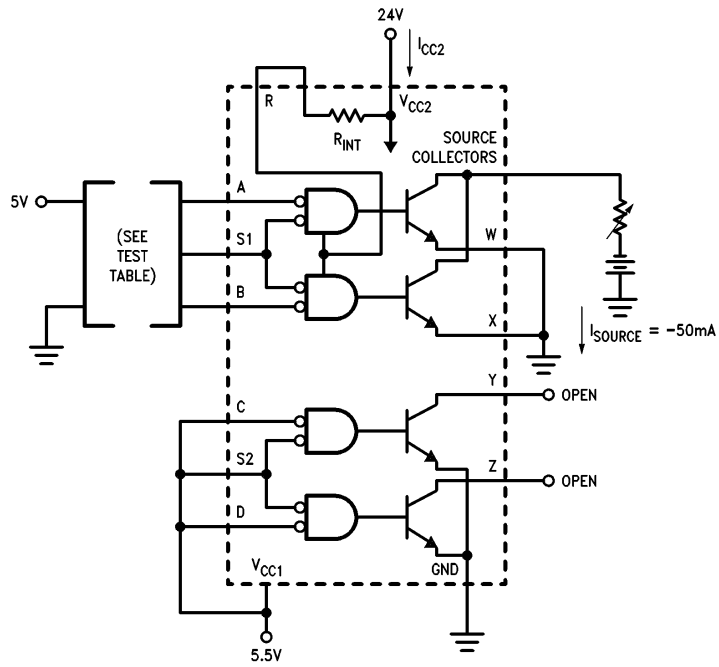
TL/F/9755-9

Test Table

C	D	S2	Y	Z
GND	5V	GND	I <sub>SINK</sub>	OPEN
5V	GND	GND	OPEN	I <sub>SINK</sub>

FIGURE 7. I<sub>CC1</sub>, Either Sink On

## DC Test Circuits (Continued)



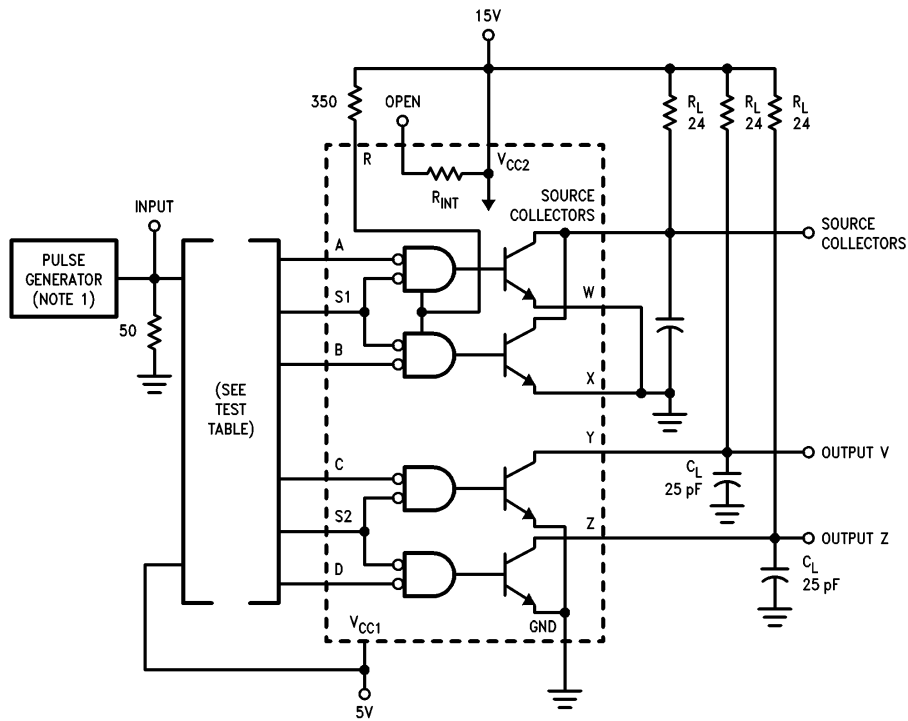
TL/F/9755-10

Test Table

A	B	S1
GND	5V	GND
5V	GND	GND

FIGURE 8. I<sub>CC2</sub>, Either Source On

## DC Test Circuits (Continued)

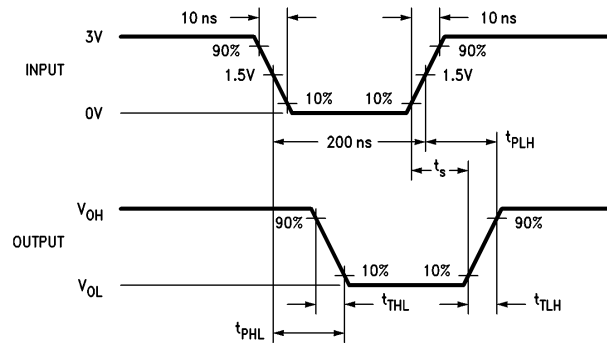


TL/F/9755-11

**Note 1:** The pulse generator has the following characteristics:  $Z_{OUT} = 50\Omega$ , duty cycle  $\leq 1\%$ .

**Note 2:**  $C_L$  includes probe and jig capacitance.

### Voltage Waveforms



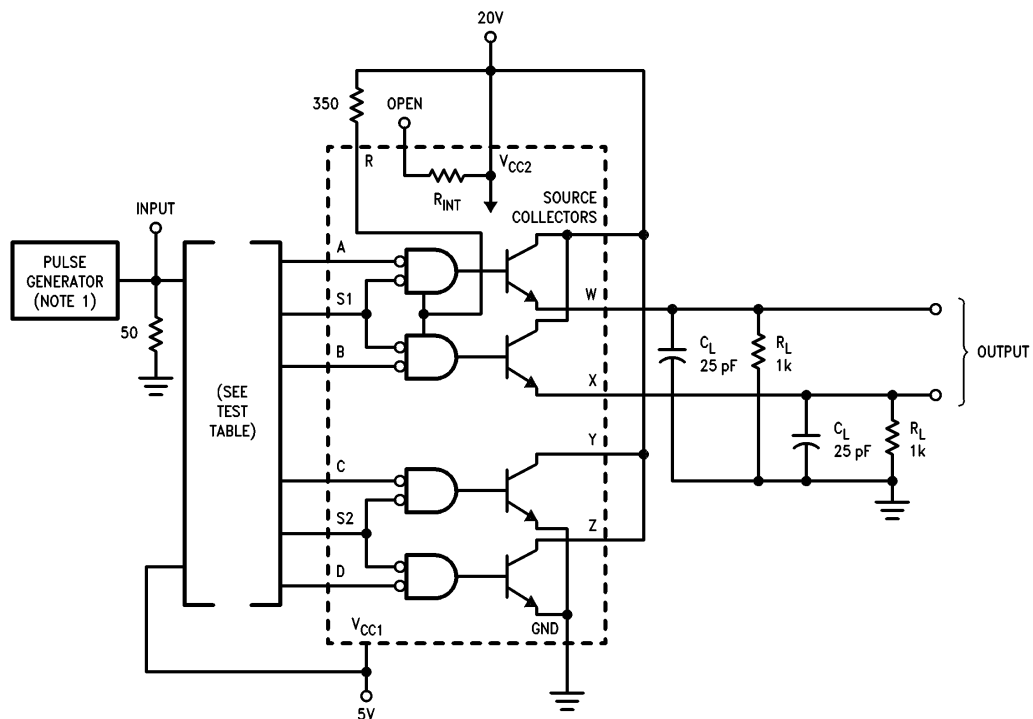
TL/F/9755-12

Test Table

Parameter	Output Under Test	Input	Connect to 5V
$t_{PLH}$ and $t_{PHL}$	Source Collectors	A and S1	B, C, D and S2
		B and S1	A, C, D and S2
$t_{PLH}$ , $t_{PHL}$ , $t_{TLH}$ , $t_{THL}$ and $t_s$	Sink Output Y	C and S2	A, B, D and S1
	Sink Output Z	D and S2	A, B, C and S1

FIGURE 9. Switching Times

## DC Test Circuits (Continued)

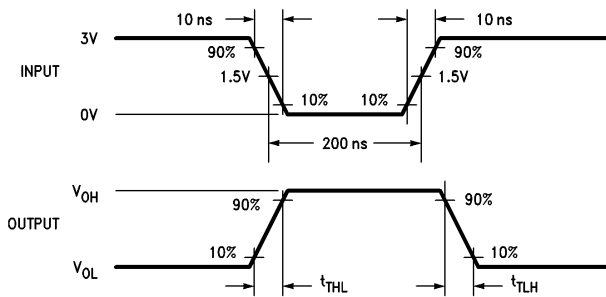


TL/F/9755-13

**Note 1:** The pulse generator has the following characteristics:  $Z_{OUT} = 50\Omega$ , duty cycle  $\leq 1\%$ .

**Note 2:**  $C_L$  includes probe and jig capacitance.

### Voltage Waveforms



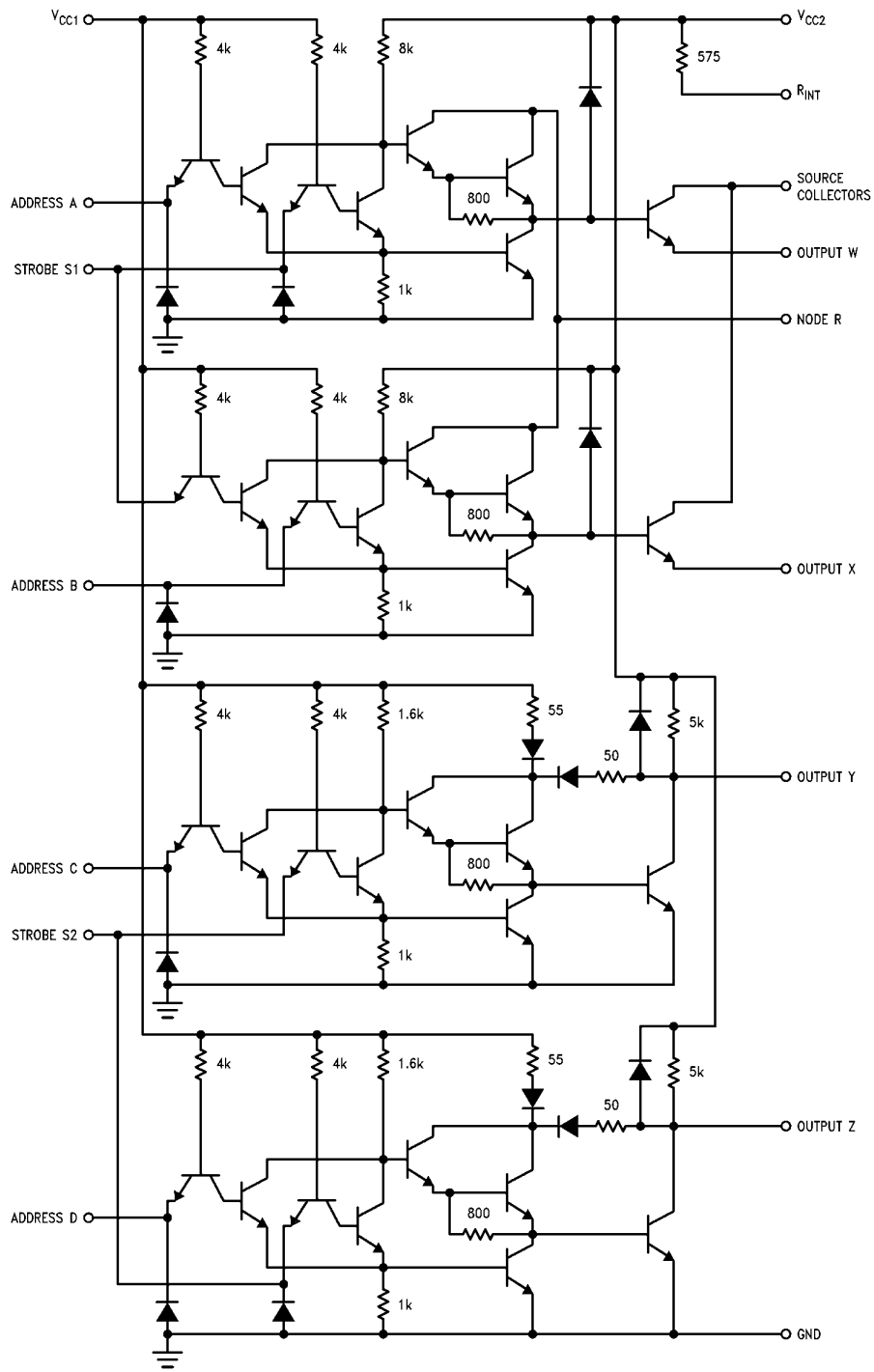
TL/F/9755-14

Test Table

Parameter	Output Under Test	Input	Connect to 5V
$t_{TLH}$ and $t_{THL}$	Source Output W	A and S1	B, C, D and S2
	Source Output X	B and S1	A, C, D and S2

**FIGURE 10. Transition Times of Source Outputs**

# Schematic Diagram



TL/F/9755-1

## Applications

### EXTERNAL RESISTOR CALCULATION

A typical magnetic-memory word drive requirement is shown in Figure 11. A source-output transistor of one DS75325 delivers load current ( $I_L$ ). The sink-output transistor of another DS75325 sinks this current.

The value of the external pull-up resistor ( $R_{ext}$ ) for a particular memory application may be determined using the following equation:

$$R_{ext} = \frac{16 [V_{CC2(\text{Min})} - V_S - 2.2]}{I_L - 1.6 [V_{CC2(\text{Min})} - V_S - 2.9]} \quad (1)$$

where:  $R_{ext}$  is in  $k\Omega$ ,

$V_{CC2(\text{Min})}$  is the lowest expected value of  $V_{CC2}$  in volts,  $V_S$  is the source output voltage in volts with respect to ground,  $I_L$  is in mA.

The power dissipated in resistor  $R_{ext}$  during the load current pulse duration is calculated using Equation 2.

$$P_{R_{ext}} \approx \frac{I_L}{16} [V_{CC2(\text{Min})} - V_S - 2] \quad (2)$$

where:  $P_{R_{ext}}$  is in mW.

After solving for  $R_{ext}$ , the magnitude of the source collector current ( $I_{CS}$ ) is determined from Equation 3.

$$I_{CS} \approx 0.94 I_L \quad (3)$$

where:  $I_{CS}$  is in mA.

As an example, let  $V_{CC2(\text{Min})} = 20\text{V}$  and  $V_L = 3\text{V}$  while  $I_L$  of 500 mA flows. Using Equation 1:

$$R_{ext} = \frac{16 (20 - 3 - 2.2)}{500 - 1.6 (20 - 3 - 2.9)} = 0.5 k\Omega$$

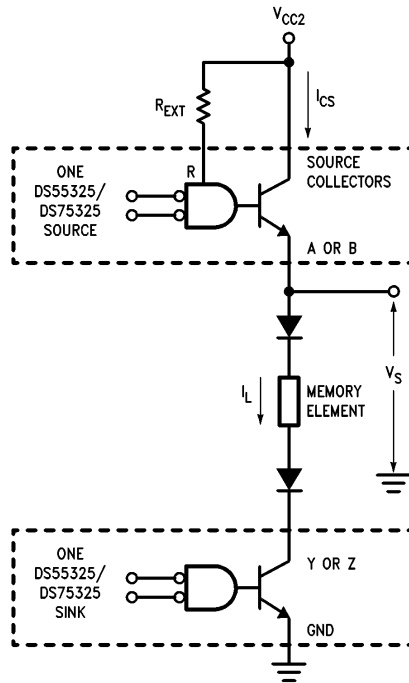
and from Equation 2:

$$P_{R_{ext}} \approx \frac{500}{16} [20 - 3 - 2] \approx 470 \text{ mW}$$

The amount of the memory system current source ( $I_{CS}$ ) from Equation 3 is:

$$I_{CS} \approx 0.94 (500) \approx 470 \text{ mA}$$

In this example the regulated source-output transistor base current through the external pull-up resistor ( $R_{ext}$ ) and the source gate is approximately 30 mA. This current and  $I_{CS}$  comprise  $I_L$ .



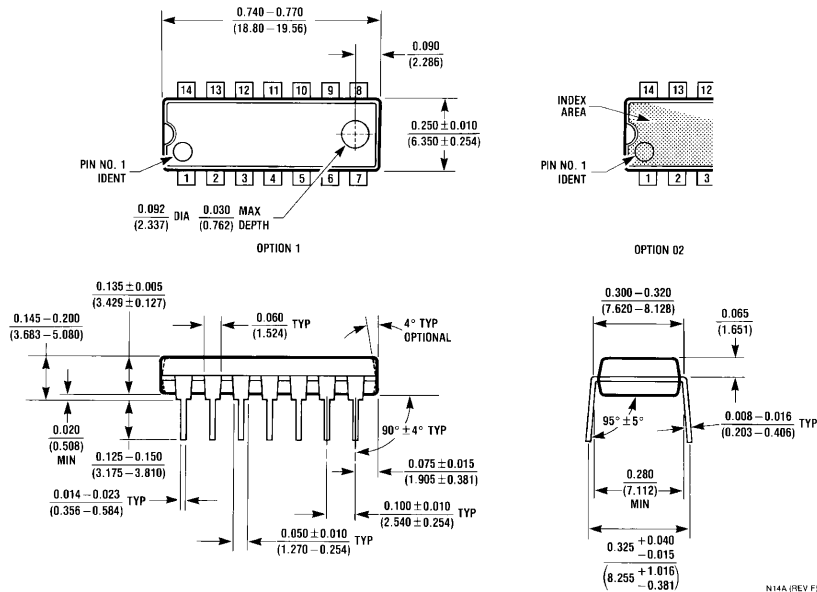
TL/F/9755-15

**Note 1:** For clarity, partial logic diagrams of two DS55325s are shown.

**Note 2:** Source and sink shown are in different packages.

**FIGURE 11. Typical Application Data**

**Physical Dimensions** inches (millimeters) (Continued)



**Molded Dual-In-Line Package (N)**  
**Order Number DS75325N**  
**NS Package Number N14A**

N14A (REV F)

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



**National Semiconductor Corporation**  
 1111 West Bardin Road  
 Arlington, TX 76017  
 Tel: 1(800) 272-9959  
 Fax: 1(800) 737-7018

**National Semiconductor Europe**  
 Fax: (+49) 0-180-530 85 86  
 Email: cnjwge@tevm2.nsc.com  
 Deutsch Tel: (+49) 0-180-530 85 85  
 English Tel: (+49) 0-180-532 78 32  
 Français Tel: (+49) 0-180-532 93 58  
 Italiano Tel: (+49) 0-180-534 16 80

**National Semiconductor Hong Kong Ltd.**  
 19th Floor, Straight Block,  
 Ocean Centre, 5 Canton Rd.  
 Tsimshatsui, Kowloon  
 Hong Kong  
 Tel: (852) 2737-1600  
 Fax: (852) 2736-9960

**National Semiconductor Japan Ltd.**  
 Tel: 81-043-299-2309  
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

This datasheet has been downloaded from:

[www.DatasheetCatalog.com](http://www.DatasheetCatalog.com)

Datasheets for electronic components.

# National Semiconductor was acquired by Texas Instruments.

[http://www.ti.com/corp/docs/investor\\_relations/pr\\_09\\_23\\_2011\\_national\\_semiconductor.html](http://www.ti.com/corp/docs/investor_relations/pr_09_23_2011_national_semiconductor.html)

This file is the datasheet for the following electronic components:

DS75325N - <http://www.ti.com/product/ds75325n?HQS=TI-null-null-dscatalog-df-pf-null-ww>



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

[LittleDiode.com](http://LittleDiode.com)

Looking forward to providing you with the best possible service.