National Semiconductor

May 1998

DS75150
Dual Line Driver

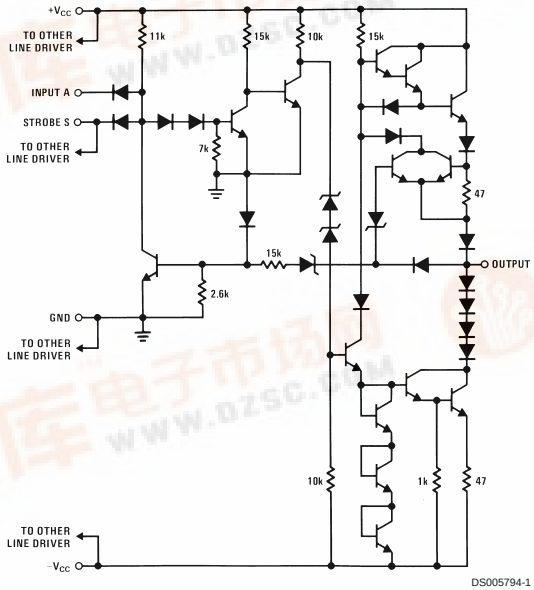
General Description

The DS75150 is a dual monolithic line driver designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by EIA Standard RS-232-C. A rate of 20,000 bits per second can be transmitted with a full 2500 pF load. Other applications are in data-transmission systems using relatively short single lines, in level translators, and for driving MOS devices. The logic input is compatible with most TTL and LS families. Operation is from −12V and +12V power supplies.

Features

- Withstands sustained output short-circuit to any low impedance voltage between −25V and +25V
- 2 µs max transition time through the −3V to +3V transition region under full 2500 pF load
- Inputs compatible with most TTL and LS families
- Common strobe input
- Inverting output
- Slew rate can be controlled with an external capacitor at the output
- Standard supply voltages: ±12V

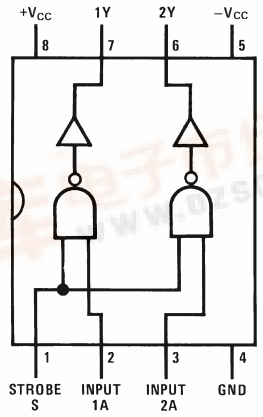
Schematic and Connection Diagrams



DS005794-1

Component values shown are nominal.
1/2 of circuit shown

Dual-In-Line Package



DS005794-2

Positive Logic C = $\overline{AS}$

Top View
Order Number DS75150M
See NS Package Number M08A

Absolute Maximum Ratings (Note 2)

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

Supply Voltage $+V_{CC}$	15V
Supply Voltage $-V_{CC}$	15V
Input Voltage	15V
Applied Output Voltage	+25V
Storage Temperature Range	−65˚C to +150˚C
Maximum Power Dissipation (Note 1) at 25˚C	
SO Package	655 mW
Lead Temperature (Soldering, 4 sec.)	260˚C

Operating Conditions

	Min	Max	Units
Supply Voltage ($+V_{CC}$)	10.8	13.2	V
Supply Voltage ($-V_{CC}$)	−10.8	−13.2	V
Input Voltage (V_I)	0	+5.5	V
Output Voltage (V_O)		±15	V
Operating Ambient Temperature Range (T_A)	0	+70	˚C

Note 1: Derate SO package 8.01 mW/˚C above 25˚C.

DC Electrical Characteristics (Notes 3, 4, 5, 6)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{IH}	High-Level Input Voltage	*(Figure 1)*		2			V
V_{IL}	Low-Level Input Voltage	(*Figure 2*)				0.8	V
V_{OH}	High-Level Output Voltage	$+V_{CC}$ = 10.8V,$-V_{CC}$ = −13.2V, V_{IL} = 0.8V, R_L = 3 kΩ to 7 kΩ (*Figure 2*)		5	8		V
V_{OL}	Low-Level Output Voltage	$+V_{CC}$ = 10.8V,$-V_{CC}$ = −10.8V, V_{IH} = 2V, R_L = 3 kΩ to 7 kΩ (*Figure 1*)			−8	−5	V
I_{IH}	High-Level Input Current	$+V_{CC}$ = 13.2V,$-V_{CC}$ = −13.2V, V_I = 2.4V, (*Figure 3*)	Data Input		1	10	µA
		$+V_{CC}$ = 13.2V, $-V_{CC}$ = −13.2V, V_I = 2.4V, (*Figure 3*)	Strobe Input		2	20	µA
I_{IL}	Low-Level Input Current	$+V_{CC}$ = 13.2V,$-V_{CC}$ = −13.2V, V_I = 0.4V, (*Figure 3*)	Data Input		−1	−1.6	mA
		$+V_{CC}$ = 13.2V, $-V_{CC}$ = −13.2V, V_I = 0.4V, (*Figure 3*)	Strobe Input		−2	−3.2	mA
I_{OS}	Short-Circuit Output Current	$+V_{CC}$ = 13.2V,$-V_{CC}$ = −13.2V, (*Figure 4*), (Note 5)	V_O = 25V		2	5	mA
			V_O = −25V		−3	−6	mA
			V_O = 0V, V_I = 3V		15	30	mA
			V_O = 0V, V_I = 0V		−15	−30	mA
$+I_{CCH}$	Supply Current From $+V_{CC}$, High-Level Output	$+V_{CC}$ = 13.2V, $-V_{CC}$ = −13.2V, V_I = 0V, R_L = 3 kΩ, T_A = 25˚C, (*Figure 5*)			10	22	mA
$-I_{CCH}$	Supply Current From $-V_{CC}$, High-Level Output	$+V_{CC}$ = 13.2V, $-V_{CC}$ = −13.2V, V_I = 0V, R_L = 3 kΩ, T_A = 25˚C, (*Figure 5*)			−1	−10	mA
$+I_{CCL}$	Supply Current From $+V_{CC}$, Low-Level Output	$+V_{CC}$ = 13.2V, $-V_{CC}$ = −13.2V, V_I = 3V, R_L = 3 kΩ, T_A = 25˚C, (*Figure 5*)			8	17	mA
$-I_{CCL}$	Supply Current From $-V_{CC}$, Low-Level Output	$+V_{CC}$ = 13.2V, $-V_{CC}$ = −13.2V, V_I = 3V, R_L = 3 kΩ, T_A = 25˚C, (*Figure 5*)			−9	−20	mA

Note 2: "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 3: Unless otherwise specified min/max limits apply across the 0˚C to +70˚C range for the DS75150. All typical values are T_A = 25˚C and $+V_{CC}$ = 12V, $-V_{CC}$ = −12V.

Note 4: All current 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 5: Only one output at a time should be shorted.

Note 6: The algebraic convention where the most-positive (least-negative) limit is designated as maximum is used in this data sheet for logic levels only, e.g., when −5V is the maximum, the typical value is more-negative voltage.

AC Electrical Characteristics

($+V_{CC}$ = 12V, $-V_{CC}$ = −12V, T_A = 25˚C)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{TLH}	Transition Time, Low-to-High Level Output	C_L = 2500 pF, R_L = 3 kΩ to 7 kΩ, (*Figure 6*)	0.2	1.4	2	µs
t_{THL}	Transition Time, High-to-Low Level Output	C_L = 2500 pF, R_L = 3 kΩ to 7 kΩ, (*Figure 6*)	0.2	1.5	2	µs
t_{TLH}	Transition Time, Low-to-High Level Output	C_L = 15 pF, R_L = 7 kΩ, (*Figure 6*)		40		ns
t_{THL}	Transition Time, High-to-Low Level Output	C_L = 15 pF, R_L = 7 kΩ, (*Figure 6*)		20		ns
t_{PLH}	Propagation Delay Time Low-to-High Level Output	C_L = 15 pF, R_L = 7 kΩ, (*Figure 6*)		60		ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output	C_L = 15 pF, R_L = 7 kΩ, (*Figure 6*)		45		ns

DC Test Circuits

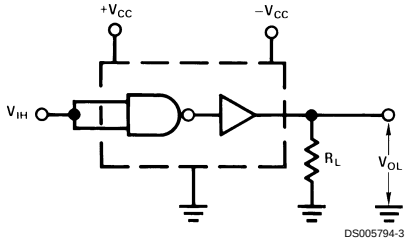
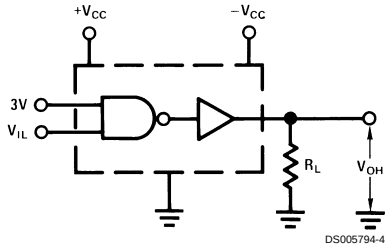
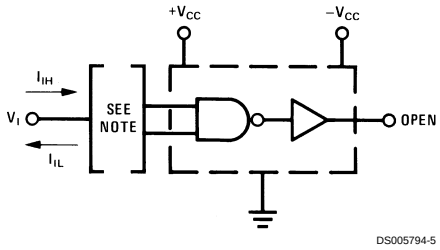


FIGURE 1. V_{IH}, V_{OL}



Each input is tested separately.

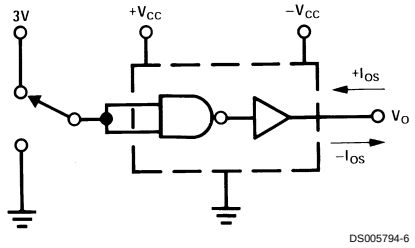
FIGURE 2. V_{IL}, V_{OH}



When testing I_{IH}, the other input is at 3V; when testing I_{IL}, the other input is open.

FIGURE 3. I_{IH}, I_{IL}

DC Test Circuits (Continued)



I_{OS} is tested for both input conditions at each of the specified output conditions.

FIGURE 4. I_{OS}

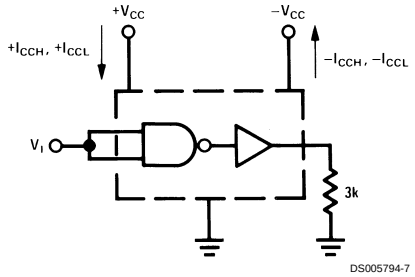
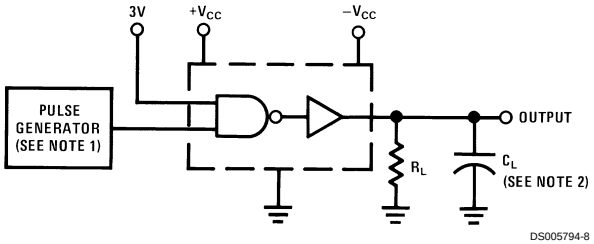
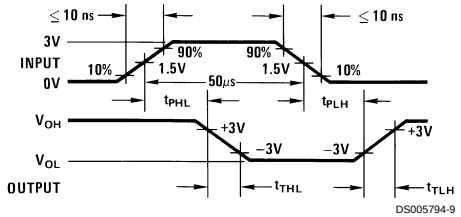


FIGURE 5. I_{CCH+}, I_{CCH-}, I_{CCL+}, I_{CCL-}

AC Test Circuit and Switching Waveforms





Note 7: The pulse generator has the following characterstics: duty cycle ≤ 50%, $Z_{OUT} \cong 50\Omega$.

Note 8: C_L includes probe and jig capacitance.

FIGURE 6.

Typical Performance Characteristics

Output Current vs Applied Output Voltage

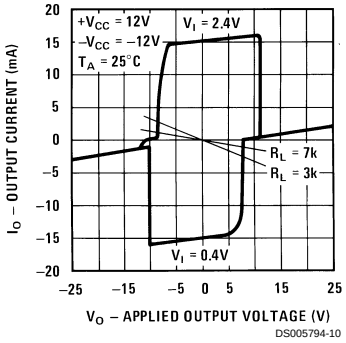
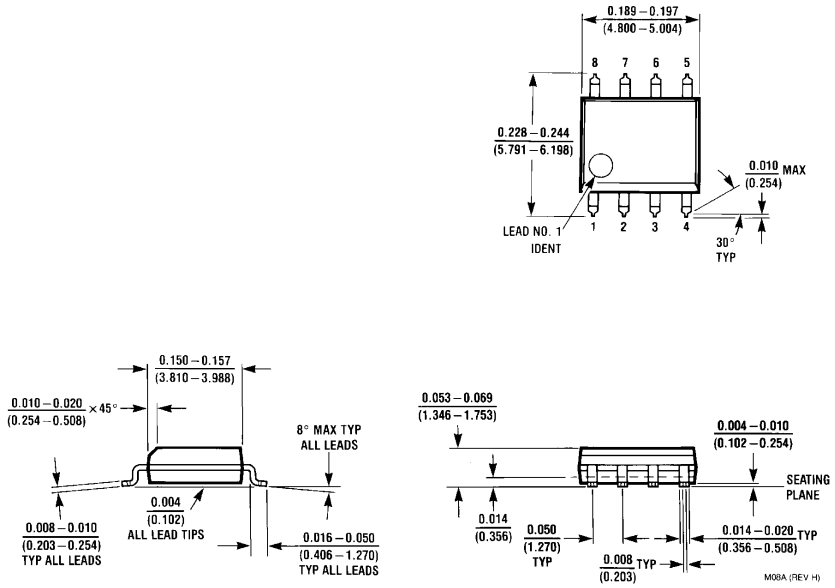


FIGURE 7.

Physical Dimensions inches (millimeters) unless otherwise noted



SO Package (M)
Order Number DS75150M
NS Package Number M08A

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