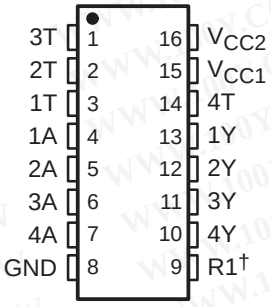
SLLS083B – NOVEMBER 1970 – REVISED MAY 1995

- **Meets or Exceeds the Requirements of ANSI Standard EIA/TIA-232-E and ITU Recommendation V.28**
- **Input Resistance . . . 3 kΩ to 7 kΩ Over Full EIA/TIA-232-E Voltage Range**
- **Input Threshold Adjustable to Meet Fail-Safe Requirements Without Using External Components**
- **Built-In Hysteresis for Increased Noise Immunity**
- **Inverting Output Compatible With TTL**
- **Output With Active Pullup for Symmetrical Switching Speeds**
- **Standard Supply Voltages . . . 5 V or 12 V**

D OR N PACKAGE
(TOP VIEW)



† For function of R1, see schematic

description

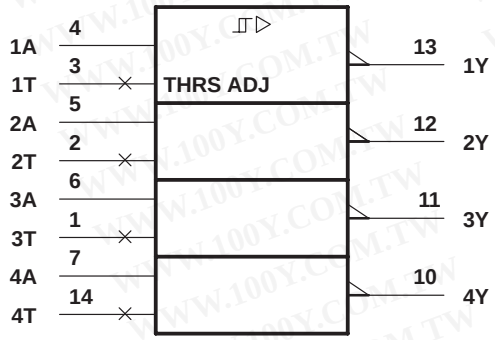
The SN75154 is a monolithic low-power Schottky line receiver designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by ANSI Standard EIA/TIA-232-E. Other applications are for relatively short, single-line, point-to-point data transmission and for level translators. Operation is normally from a single 5-V supply; however, a built-in option allows operation from a 12-V supply without the use of additional components. The output is compatible with most TTL circuits when either supply voltage is used.

In normal operation, the threshold-control terminals are connected to the V_{CC1} terminal, even if power is being supplied via the alternate V_{CC2} terminal. This provides a wide hysteresis loop, which is the difference between the positive-going and negative-going threshold voltages. See typical characteristics. In this mode of operation, if the input voltage goes to zero, the output voltage will remain at the low or high level as determined by the previous input.

For fail-safe operation, the threshold-control terminals are open. This reduces the hysteresis loop by causing the negative-going threshold voltage to be above zero. The positive-going threshold voltage remains above zero as it is unaffected by the disposition of the threshold terminals. In the fail-safe mode, if the input voltage goes to zero or an open-circuit condition, the output will go to the high level regardless of the previous input condition.

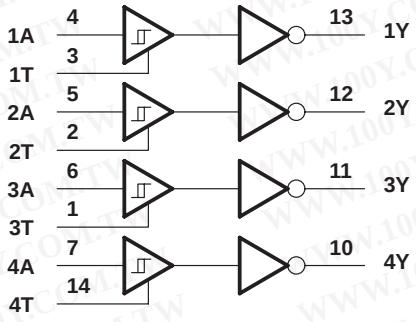
The SN75154 is characterized for operation from 0°C to 70°C.

logic symbol†

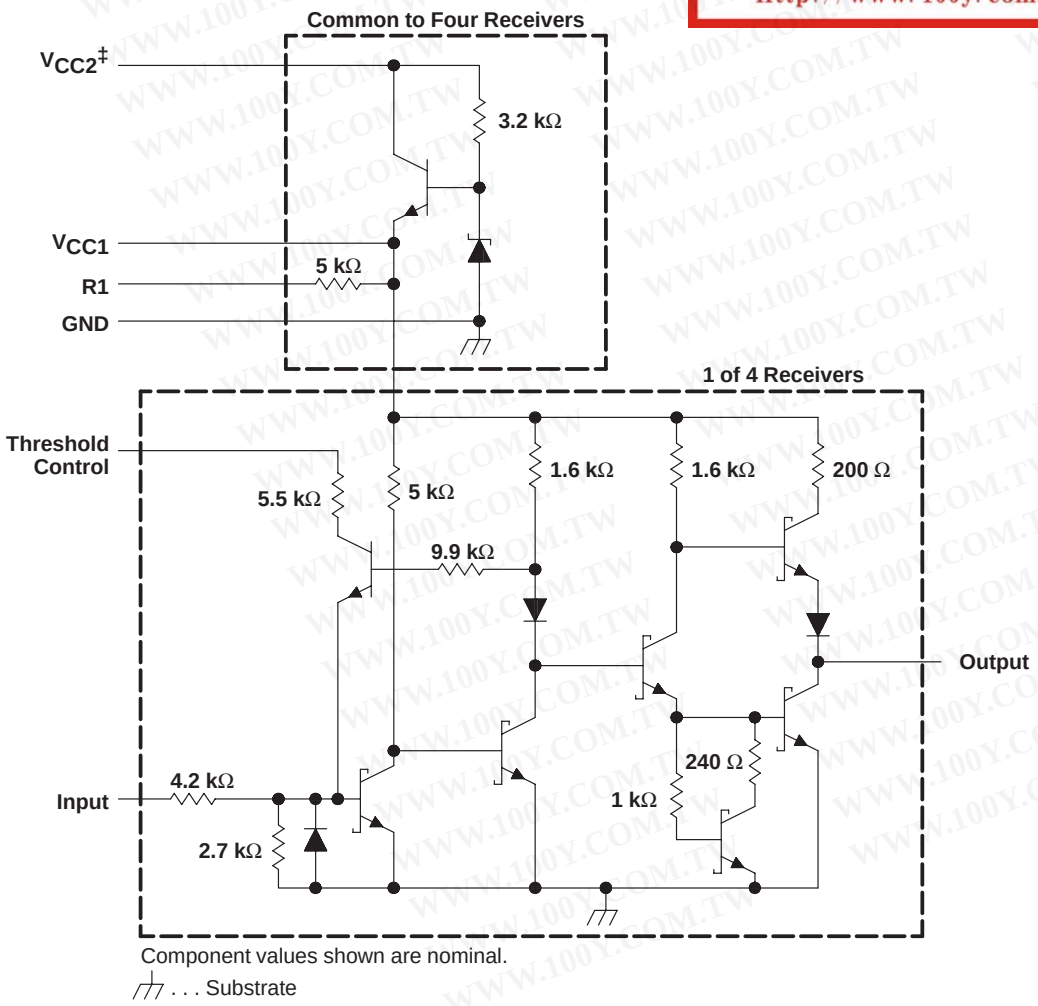


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



schematic



‡ When V_{CC1} is used, V_{CC2} may be left open or shorted to V_{CC1}. When V_{CC2} is used, V_{CC1} must be left open or connected to the threshold control pins.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Normal supply voltage, V_{CC1} (see Note 1) . . . . . 7 V
Alternate supply voltage, V_{CC2} . . . . . 14 V
Input voltage, V_I . . . . . ±25 V
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

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: Voltage values are with respect to network GND terminal.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW
N	1150 mW	9.2 mW/°C	736 mW
NS	625 mW	5.0 mW/°C	400 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Normal supply voltage, V_{CC1}	4.5	5	5.5	V
Alternate supply voltage, V_{CC2}	10.8	12	13.2	V
High-level input voltage, V_{IH} (see Note 2)	3		15	V
Low-level input voltage, V_{IL} (see Note 2)	–15		–3	V
High-level output current, I_{OH}			–400	μA
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A	0		70	°C

NOTE 2: The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for logic and threshold levels only, e.g., when 0 V is the maximum, the minimum limit is a more negative voltage.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

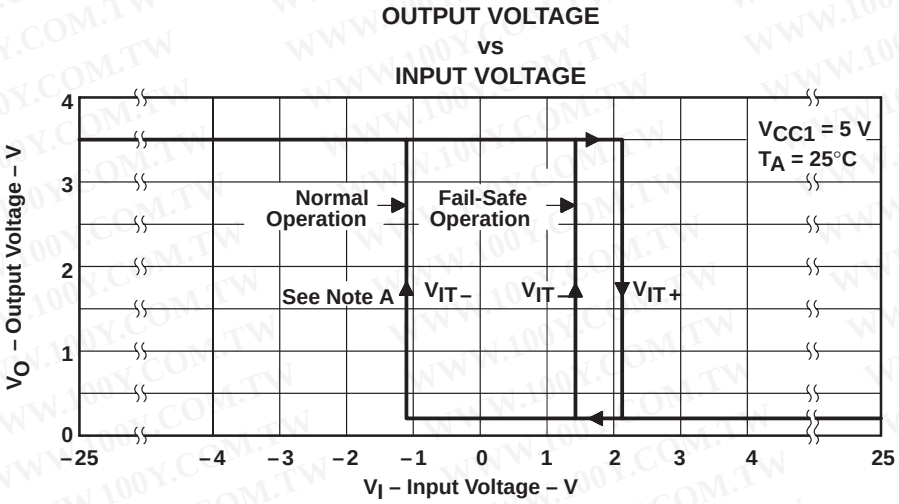
PARAMETER			TEST FIGURE	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage	Normal operation	1		0.8	2.2	3	V
		Fail-safe operation			0.8	2.2	3	
V_{IT-}	Negative-going input threshold voltage	Normal operation	1		–3	–1.1	0	V
		Fail-safe operation			0.8	1.4	3	
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)	Normal operation	1		0.8	3.3	6	V
		Fail-safe operation			0	0.8	2.2	
V_{OH}	High-level output voltage		1	I_{OH} = –400 μA	2.4	3.5		V
V_{OL}	Low-level output voltage		1	I_{OL} = 16 mA		0.29	0.4	V
r_i	Input resistance		2	ΔV_I = –25 V to –14 V	3	5	7	kΩ
				ΔV_I = –14 V to –3 V	3	5	7	
				ΔV_I = –3 V to 3 V	3	6	8	
				ΔV_I = 3 V to 14 V	3	5	7	
				ΔV_I = 14 V to 25 V	3	5	7	
$V_{I(open)}$	Open-circuit input voltage		3	I_I = 0	0	0.2	2	V
I_{OS}	Short-circuit output current‡		4	V_{CC1} = 5.5 V, V_I = –5 V	–10	–20	–40	mA
I_{CC1}	Supply current from V_{CC1}		5	V_{CC1} = 5.5 V, T_A = 25°C		20	35	mA
I_{CC2}	Supply current from V_{CC2}			V_{CC2} = 13.2 V, T_A = 25°C		23	40	

† All typical values are at V_{CC1} = 5 V, T_A = 25°C.
‡ Not more than one output should be shorted at a time.

switching characteristics, V_{CC1} = 5 V, T_A = 25°C, N = 10

PARAMETER		TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	6	C_L = 50 pF, R_L = 390 Ω		11		ns
t_{PHL}	Propagation delay time, high- to low-level output				8		ns
t_{TLH}	Transition time, low- to high-level output				7		ns
t_{THL}	Transition time, high- to low-level output				2.2		ns

TYPICAL CHARACTERISTICS



NOTE A: For normal operation, the threshold controls are connected to V_{CC1}. For fail-safe operation, the threshold controls are open.

Figure 1

PARAMETER MEASUREMENT INFORMATION

dc test circuits†

TEST TABLE

TEST	MEASURE	A	T	Y	V_{CC1}	V_{CC2}
Open-circuit input (fail safe)	V_{OH}	Open	Open	I_{OH}	4.5 V	Open
	V_{OH}	Open	Open	I_{OH}	Open	10.8 V
V_{IT+} min, V_{IT-} min (fail safe)	V_{OH}	0.8 V	Open	I_{OH}	5.5 V	Open
	V_{OH}	0.8 V	Open	I_{OH}	Open	13.2 V
V_{IT+} min (normal)	V_{OH}	Note A	V_{CC1}	I_{OH}	5.5 V and T	Open
	V_{OH}	Note A	V_{CC1}	I_{OH}	T	13.2 V
V_{IL} max, V_{IT+} min (normal)	V_{OH}	–3 V	V_{CC1}	I_{OH}	5.5 V and T	Open
	V_{OH}	–3 V	V_{CC1}	I_{OH}	T	13.2 V
V_{IH} min, V_{IT+} max, V_{IT-} max (fail safe)	V_{OL}	3 V	Open	I_{OL}	4.5 V	Open
	V_{OL}	3 V	Open	I_{OL}	Open	10.8 V
V_{IH} min, V_{IT+} max (normal)	V_{OL}	3 V	V_{CC1}	I_{OL}	4.5 V and T	Open
	V_{OL}	3 V	V_{CC1}	I_{OL}	T	10.8 V
V_{IT-} max (normal)	V_{OL}	Note B	V_{CC1}	I_{OL}	5.5 V and T	Open
	V_{OL}	Note B	V_{CC1}	I_{OL}	T	13.2 V

NOTES: A. Momentarily apply –5 V, then 0.8 V.
B. Momentarily apply 5 V, then GND.

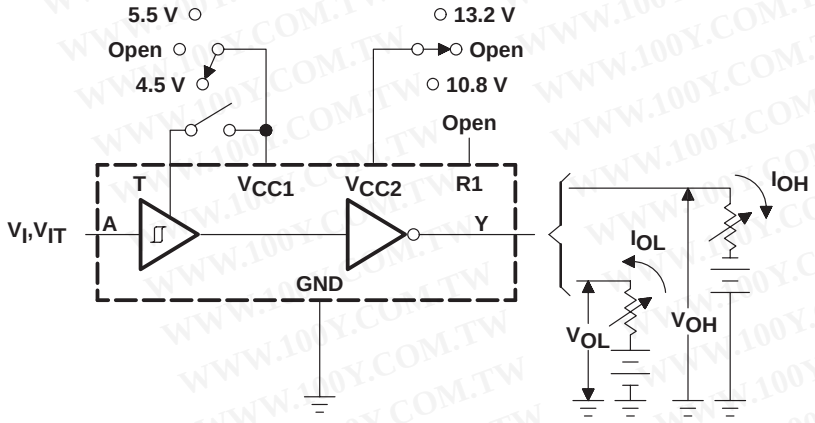
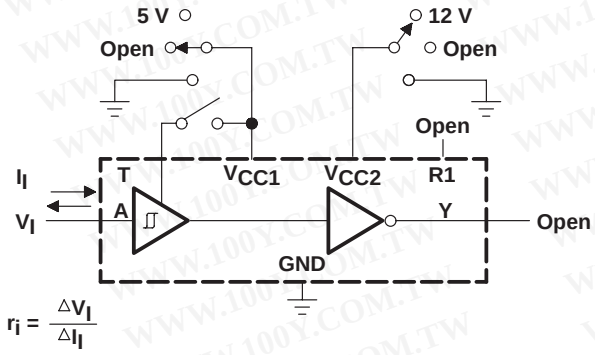


Figure 2. V_{IH}, V_{IL}, V_{IT+}, V_{IT-}, V_{OH}, V_{OL}

† Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

PARAMETER MEASUREMENT INFORMATION

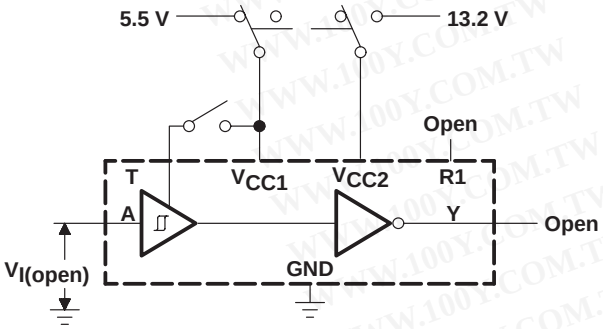
dc test circuits† (continued)



TEST TABLE

T	V_{CC1}	V_{CC2}
Open	5 V	Open
Open	GND	Open
Open	Open	Open
V_{CC1}	T and 5 V	Open
GND	GND	Open
Open	Open	12 V
Open	Open	GND
V_{CC1}	T	12 V
V_{CC1}	T	GND
V_{CC1}	T	Open

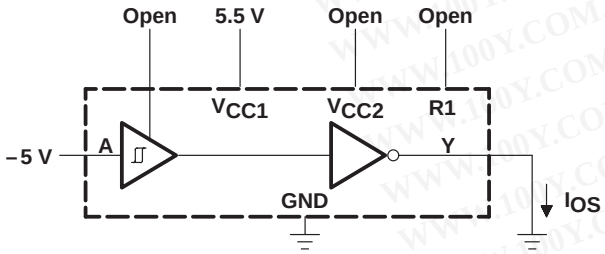
Figure 3. Input Resistance



TEST TABLE

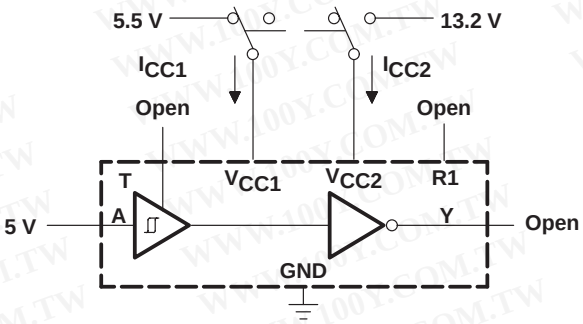
T	V_{CC1}	V_{CC2}
Open	5.5 V	Open
V_{CC1}	5.5 V	Open
Open	Open	13.2 V
V_{CC1}	T	13.2 V

Figure 4. Input Voltage (Open)



Each output is tested separately.

Figure 5. Output Short-Circuit Current

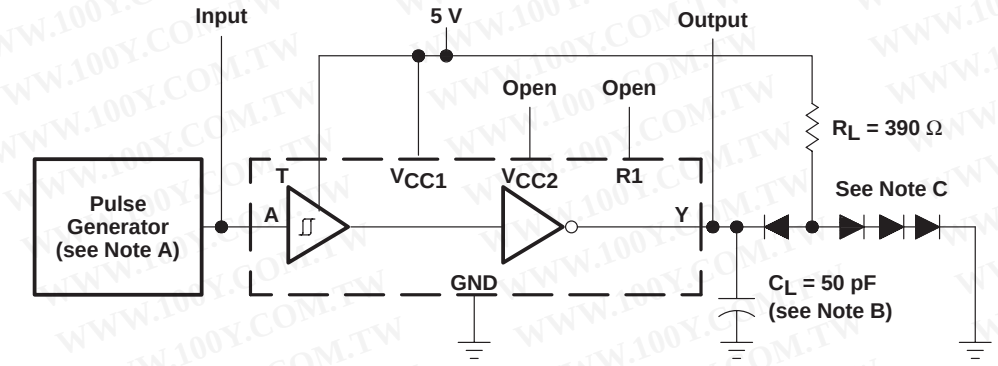


All four line receivers are tested simultaneously.

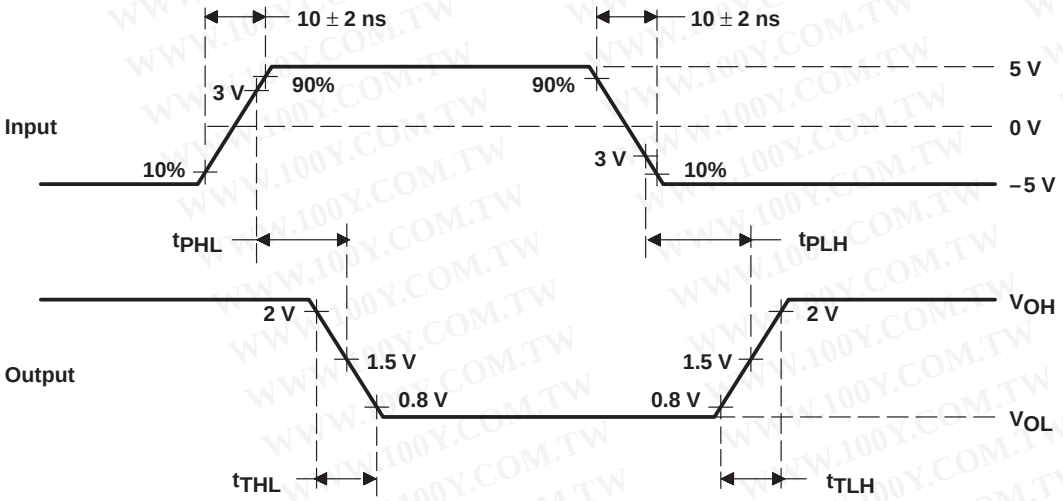
Figure 6. Supply Current

† Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, $t_W \le 200$ ns, duty cycle ≤ 20%.
B. C_L includes probe and jig capacitance.
C. All diodes are 1N3064.

Figure 6. Test Circuit and Voltage Waveforms

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