FAIRCHILD
A Schlumberger Company

μA75154
RS-232C
Quad Line Receiver

Interface Products

Description

The 75154 is a monolithic Quad Line Receiver designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by EIA Standard RS-232C. 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 and DTL circuits when either supply voltage is used.

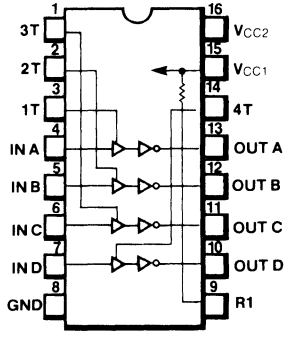
In normal operation, the threshold control terminals are connected to the V_{CC1} terminal, pin 15, even if power is being supplied via the alternate V_{CC2} terminal, pin 16. This provides a wide hysteresis loop which is the difference between the positive-going and negative-going threshold voltages. In this mode of operation, if the input voltage goes to zero, the output voltage will remain LOW or HIGH 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 HIGH regardless of the previous input condition.

The 75154 is characterized for operation from 0° C to 70° C.

- **INPUT RESISTANCE—3 kΩ TO 7 kΩ OVER FULL RS-232C 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 DTL OR TTL**
- **OUTPUT WITH ACTIVE PULL-UP FOR SYMMETRICAL SWITCHING SPEEDS**
- **STANDARD SUPPLY VOLTAGES—5 V OR 12 V**

Connection Diagram
16-Pin DIP



(Top View)

Order Information

Type	Package	Code	Part No.
μA75154	Ceramic DIP	6B	μA75154DC
μA75154	Molded DIP	9B	μA75154PC

Absolute Maximum Ratings

Normal Supply Voltage (Pin 15), V_{CC1} (Note 1)	7 V
Alternate Supply Voltage (Pin 16), V_{CC2} (Note 1)	14 V
Input Voltage (Note 1)	±25 V
Continuous Total Power Dissipation (Note 2)	800 mW
Operating Temperature Range	0°C to 70°C
Storage Temperature Range	−65°C to 150°C
Pin Temperatures	
Molded DIP (Soldering, 10 s)	260°C
Ceramic DIP (Soldering, 60 s)	300°C

Recommended Operating Conditions

	Min	Typ	Max	Unit
Normal Supply Voltage (Pin 15), V_{CC1}	4.5	5	5.5	V
Alternate Supply Voltage (Pin 16), V_{CC2}	10.8	12	13.2	V
Input Voltage			±15	V
Normalized Fan Out from Each Output, N			10	
Operating Ambient Temperature Range	0		70	°C

Notes

1. Voltage values are with respect to the network ground terminal.
2. Above 60°C ambient temperature, derate linearly at 8.3 mW/°C.

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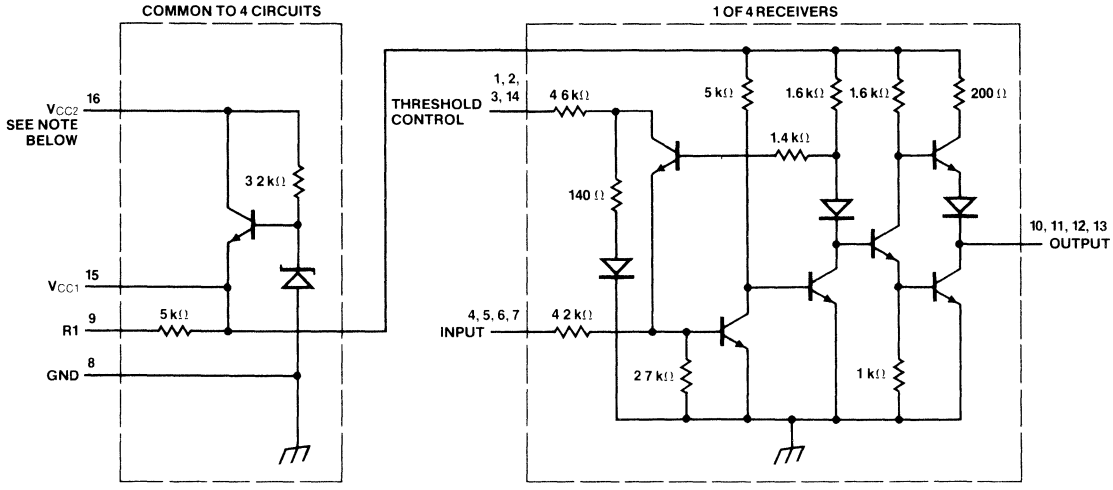
Equivalent Circuit



Notes

Component values shown are normal.

When using V_{CC1} (pin 15), V_{CC2} (pin 16) may be left open or shorted to V_{CC1}. When using V_{CC2}, V_{CC1} must be left open or connected to the threshold control pins.

DC Characteristics T_A = 0 to 70°C unless otherwise specified (Note 5)

Symbol	Characteristic		Test Figure	Condition	Min	Typ(4)	Max	Unit
V_{IH}	Input HIGH Voltage		1		3.0			V
V_{IL}	Input LOW Voltage		1				−3.0	V
V_{T+}	Positive-Going Threshold Voltage	Normal Operation	1		0.8	2.2	3.0	V
		Fail-Safe Operation			0.8	2.2	3.0	
V_{T-}	Negative-Going Threshold Voltage	Normal Operation	1		−3.0	−1.1	0	V
		Fail-Safe Operation			0.8	1.4	3.0	
$V_{T+} - V_{T-}$	Hysteresis	Normal Operation	1		0.8	3.3	6.0	V
		Fail-Safe Operation			0	0.8	2.2	
V_{OH}	Output HIGH Voltage		1	I_{OH} = −400 μA	2.4	3.5		V
V_{OL}	Output LOW Voltage		1	I_{OL} = 16 mA		0.23	0.4	V
R_I	Input Resistance		2	ΔV_I = −25 V to −14 V	3.0	5.0	7.0	k Ω
				ΔV_I = −14 V to −3 V	3.0	5.0	7.0	
				ΔV_I = −3 V to 3 V	3.0	6.0		
				ΔV_I = 3 V to 14 V	3.0	5.0	7.0	
				ΔV_I = 14 V to 25 V	3.0	5.0	7.0	
$V_{I\ (open)}$	Open-Circuit Input Voltage		3	I_I = 0	0	0.2	2.0	V
I_{OS}	Short-Circuit Output Current (Note 3)		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	

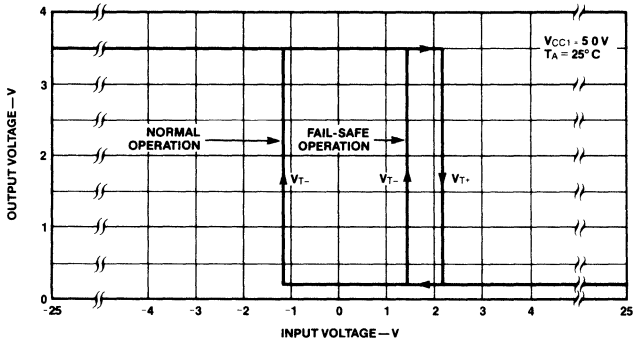
Notes on following pages.

AC Characteristics V_{CC1} = 5.0 V, T_A = 25°C, n = 10

Symbol	Characteristic	Test Figure	Condition	Min	Typ	Max	Unit
t_{PLH}	Propagation Delay Time, LOW-to-HIGH	6	C_L = 50 pF, R_L = 390 Ω		22		ns
t_{PHL}	Propagation Delay Time, HIGH-to-LOW				20		ns
t_{TLH}	Transition Time, LOW-to-HIGH				9.0		ns
t_{THL}	Transition Time, HIGH-to-LOW				6.0		ns

Typical Characteristics

Output Voltage Versus Input Voltage



Note
For normal operation, the threshold controls are connected to V_{CC1}, pin 15. For fail-safe operation, the threshold controls are open

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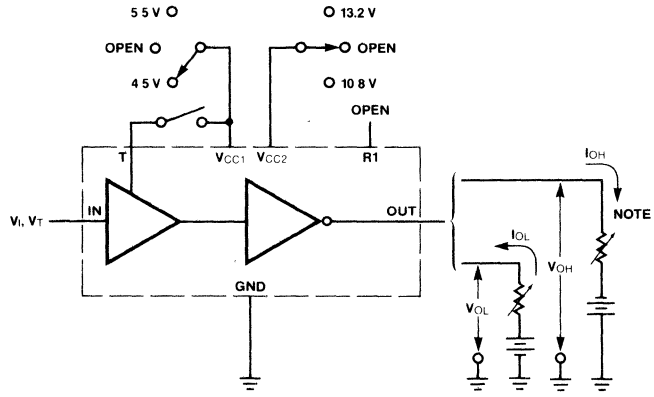
Notes
3. Not more than one output should be shorted at a time.
4. All typical values are at V_{CC1} = 5 V, T_A = 25°C.
5. The algebraic convention where the most-positive (least-negative) limit is designated as maximum is used in this data sheet for logic and threshold levels only, e.g., when −3 V is the maximum, the minimum limit is a more-negative voltage.

DC Test Circuits

Fig. 1 V_{IH}, V_{IL}, V_{T+}, V_{T-}, V_{OH}, V_{OL}



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

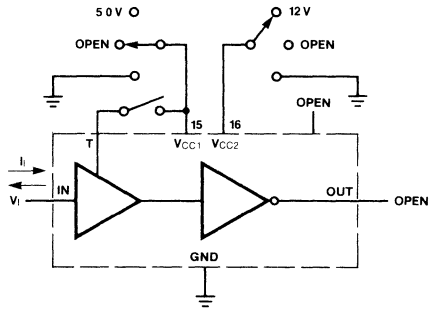
Test Table

Test	Measure	In	T	Out	V_{CC1} (Pin 15)	V_{CC2} (Pin 16)
Open-circuit input	V_{OH}	Open	Open	I_{OH}	4.5 V	Open
(fail safe)	V_{OH}	Open	Open	I_{OH}	Open	10.8 V
V_{T+} min,	V_{OH}	0.8 V	Open	I_{OH}	5.5 V	Open
V_{T-} min (fail safe)	V_{OH}	0.8 V	Open	I_{OH}	Open	13.2 V
V_{T+} min (normal)	V_{OH}	Note 6	Pin 15	I_{OH}	5.5 V and T	Open
	V_{OH}	Note 6	Pin 15	I_{OH}	T	13.2 V
V_{IL} max,	V_{OH}	−3 V	Pin 15	I_{OH}	5.5 V and T	Open
V_{T-} min (normal)	V_{OH}	−3 V	Pin 15	I_{OH}	T	13.2 V
V_{IH} min, V_{T+} max,	V_{OL}	3 V	Open	I_{OL}	4.5 V	Open
V_{T-} max (fail safe)	V_{OL}	3 V	Open	I_{OL}	Open	10.8 V
V_{IH} min, V_{T+} max	V_{OL}	3 V	Pin 15	I_{OL}	4.5 V and T	Open
(normal)	V_{OL}	3 V	Pin 15	I_{OL}	T	10.8 V
V_{T-} max (normal)	V_{OL}	Note 7	Pin 15	I_{OL}	5.5 V and T	Open
	V_{OL}	Note 7	Pin 15	I_{OL}	T	13.2 V

Notes
6. Momentarily apply −5 V, then 0.8 V.
7. Momentarily apply 5 V, then ground.

DC Test Circuits (Cont.)

Fig. 2 R_I

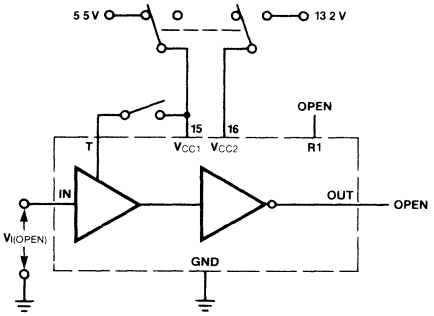


$$R_I = \frac{\Delta V_I}{\Delta I_I}$$

Test Table

T	V_{CC1} (Pin 15)	V_{CC2} (Pin 16)
Open	5 V	Open
Open	GND	Open
Open	Open	Open
Pin 15	T and 5 V	Open
GND	GND	Open
Open	Open	12 V
Open	Open	GND
Pin 15	T	12 V
Pin 15	T	GND
Pin 15	T	Open

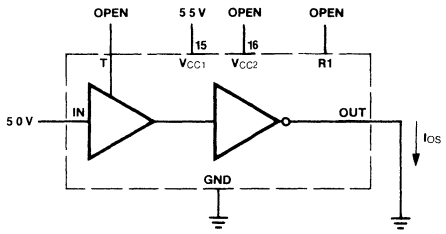
Fig. 3 $V_{I(open)}$



Test Table

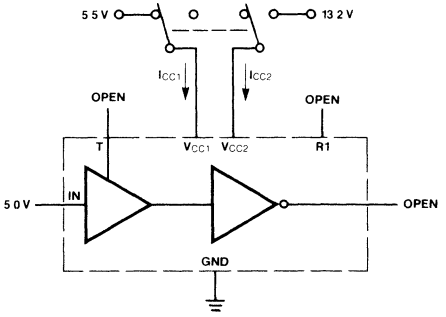
T	V_{CC1} (Pin 15)	V_{CC2} (Pin 16)
Open	5.5 V	Open
Pin 15	5.5 V	Open
Open	Open	13.2 V
Pin 15	T	13.2 V

Fig. 4 I_{OS}



Note
Each output is tested separately

Fig. 5 I_{CC}



Notes
All four line receivers are tested simultaneously.
Arrows indicate actual direction of current flow. Current into a terminal is a positive value

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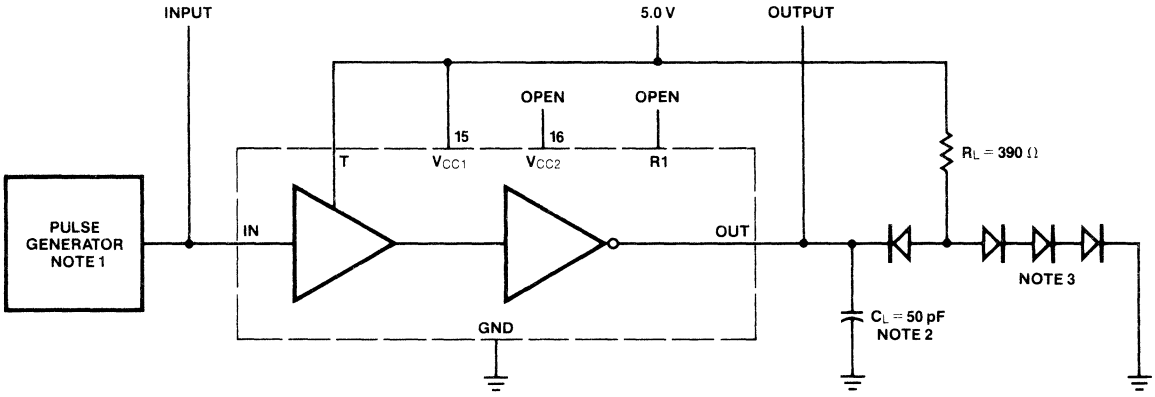
AC Characteristics

Test Circuit



Notes

1 The pulse generator has the following characteristics:
Z_{OUT} = 50 Ω, t_W = 200 ns, duty cycle ≤ 20%

2 C_L includes probe and jig capacitance.

3 All diodes are 1N3064.

Voltage Waveforms