

75154

QUAD LINE RECEIVER

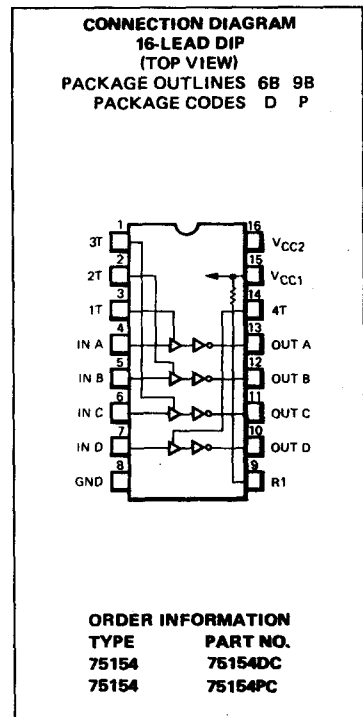
FAIRCHILD INTEGRATED CIRCUIT

GENERAL DESCRIPTION — The 75154 is a monolithic quadruple 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.

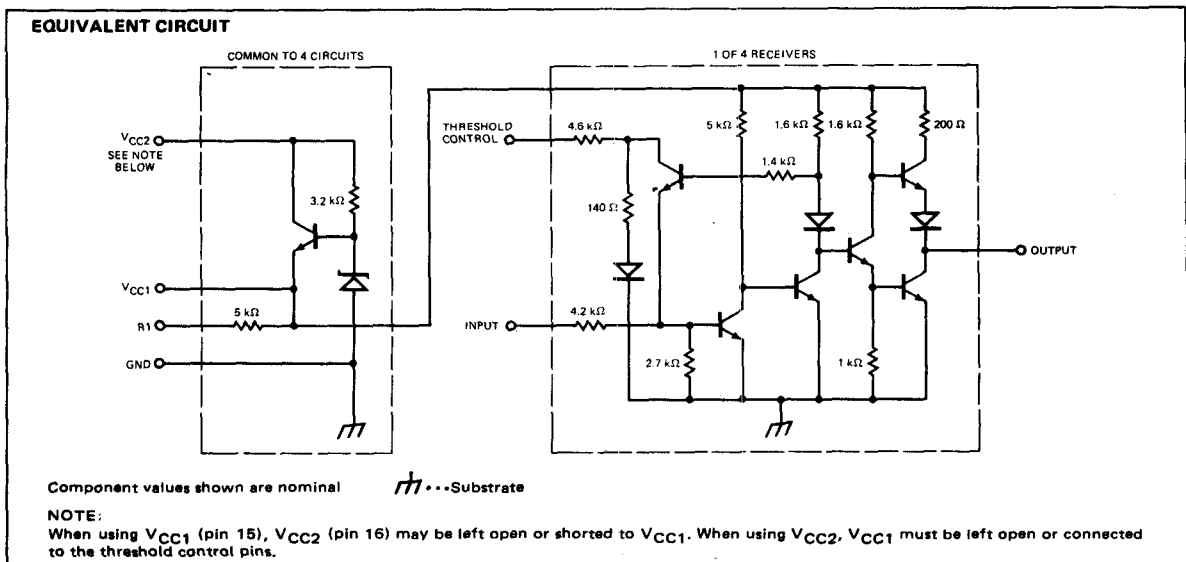
In normal operation, the threshold control terminals are connected to the V_{CC1} terminal, pin 15, even if power is being supplied via the alternate V_{CC2} terminal, pin 16. This provides a wide hysteresis loop which is the difference between the positive-going and negative-going threshold voltages. 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



FAIRCHILD QUAD LINE RECEIVER • 75154

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
Lead Temperatures	
Molded DIP (Soldering, 10 s)	260°C
Hermetic DIP (Soldering, 60 s)	300°C

NOTES:

1. Voltage values are with respect to the network ground terminal.
2. Above 60°C ambient temperature, derate linearly at $8.3\text{ mW}/^{\circ}\text{C}$.

RECOMMENDED OPERATING CONDITIONS

	MIN	TYP	MAX	UNITS
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 Temperature, T_A	0		70	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN (Note 3)	TYP†† (Note 3)	MAX (Note 3)	UNITS
V_{IH}	Input HIGH Voltage	1		3.0			V
V_{IL}	Input LOW Voltage	1				-3.0	V
V_{T+}	Positive-Going Threshold Voltage	1	Normal Operation	0.8	2.2	3.0	V
			Fail-Safe Operation	0.8	2.2	3.0	
V_{T-}	Negative-Going Threshold Voltage	1	Normal Operation	-3.0	-1.1	0	V
			Fail-Safe Operation	0.8	1.4	3.0	
$V_{T+} - V_{T-}$	Hysteresis	1	Normal Operation	0.8	3.3	6.0	V
			Fail-Safe Operation	0	0.8	2.2	
V_{OH}	Output HIGH Voltage	1	$I_{OH} = -400\ \mu\text{A}$	2.4	3.5		V
V_{OL}	Output LOW Voltage	1	$I_{OL} = 16\ \text{mA}$		0.23	0.4	V
R_i	Input Resistance	2	$\Delta V_i = -25\ \text{V}$ to $-14\ \text{V}$	3.0	5.0	7.0	k Ω
			$\Delta V_i = -14\ \text{V}$ to $-3\ \text{V}$	3.0	5.0	7.0	
			$\Delta V_i = -3\ \text{V}$ to $3\ \text{V}$	3.0	6.0		
			$\Delta V_i = 3\ \text{V}$ to $14\ \text{V}$	3.0	5.0	7.0	
			$\Delta V_i = 14\ \text{V}$ to $25\ \text{V}$	3.0	5.0	7.0	
$V_{I(\text{open})}$	Open-Circuit Input Voltage	3	$I_i = 0$	0	0.2	2.0	V
I_{OS}	Short-Circuit Output Current †	4	$V_{CC1} = 5.5\ \text{V}$, $V_i = -5\ \text{V}$	-10	-20	-40	mA
I_{CC1}	Supply Current from V_{CC1}	5	$V_{CC1} = 5.5\ \text{V}$, $T_A = 25^{\circ}\text{C}$		20	35	mA
I_{CC2}	Supply Current from V_{CC2}		$V_{CC2} = 13.2\ \text{V}$, $T_A = 25^{\circ}\text{C}$		23	40	

† Not more than one output should be shorted at a time.

‡ All typical values are at $V_{CC1} = 5\ \text{V}$, $T_A = 25^{\circ}\text{C}$.

NOTE

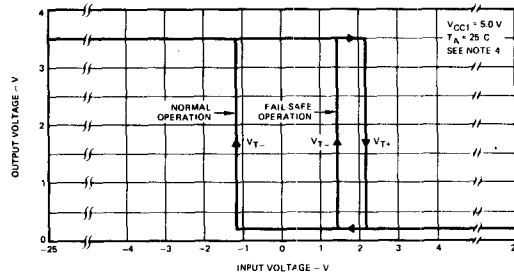
3. The algebraic convention where the most-positive (least-negative) limit is designated as maximum is used in this data sheet for logic and threshold levels only, e.g., when $-3\ \text{V}$ is the maximum, the minimum limit is a more-negative voltage.

AC CHARACTERISTICS ($V_{CC1} = 5.0\ \text{V}$, $T_A = 25^{\circ}\text{C}$, $N = 10$)

SYMBOL	PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNITS
t_{PLH}	Propagation Delay Time, Low-to-High Output	6	$C_L = 50\ \text{pF}$, $R_L = 390\ \Omega$		22		ns
t_{PHL}	Propagation Delay Time, High-to-Low Output				20		ns
t_{TLH}	Transition Time, Low-to-High Output				9.0		ns
t_{THL}	Transition Time, High-to-Low Output				6.0		ns

TYPICAL CHARACTERISTICS

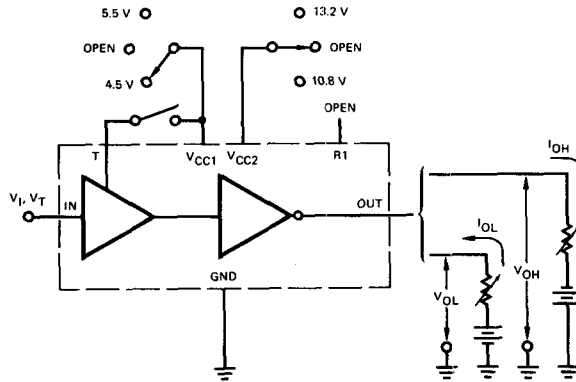
OUTPUT VOLTAGE VERSUS INPUT VOLTAGE



NOTE

4. For normal operation, the threshold controls are connected to VCC1, pin 15. For fail-safe operation, the threshold controls are open.

DC TEST CIRCUIT†



NOTES:

- A. Momentarily apply -5 V, then 0.8 V.
- B. Momentarily apply 5 V, then ground.

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

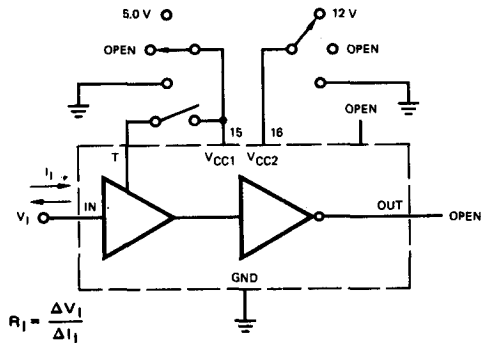
TEST TABLE

TEST	MEASURE	IN	T	OUT	VCC1 (PIN 15)	VCC2 (PIN 16)
Open-circuit input (fail safe)	VOH	Open	Open	IOH	4.5 V	Open
	VOH	Open	Open	IOH	Open	10.8 V
VT+ min,	VOH	0.8 V	Open	IOH	5.5 V	Open
VT- min (fail safe)	VOH	0.8 V	Open	IOH	Open	13.2 V
VT+ min (normal)	VOH	Note A	Pin 15	IOH	5.5 V and T	Open
	VOH	Note A	Pin 15	IOH	T	13.2 V
VIL max, VT- min (normal)	VOH	-3 V	Pin 15	IOH	5.5 V and T	Open
	VOH	-3 V	Pin 15	IOH	T	13.2 V
VIH min, VT+ max, VT- max (fail safe)	VOL	3 V	Open	IOL	4.5 V	Open
	VOL	3 V	Open	IOL	Open	10.8 V
VIH min, VT+ max (normal)	VOL	3 V	Pin 15	IOL	4.5 V and T	Open
	VOL	3 V	Pin 15	IOL	T	10.8 V
VT- max (normal)	VOL	Note B	Pin 15	IOL	5.5 V and T	Open
	VOL	Note B	Pin 15	IOL	T	13.2 V

Fig. 1 VIH, VIL, VT+, VT-, VOH, VOL.

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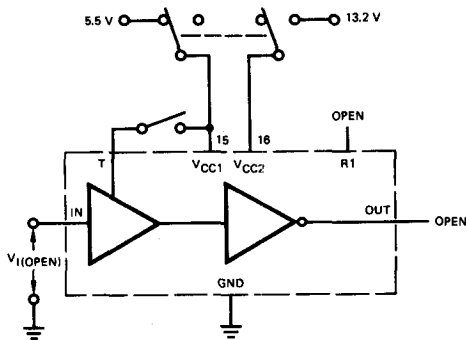
DC TEST CIRCUITS† (Cont'd)



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

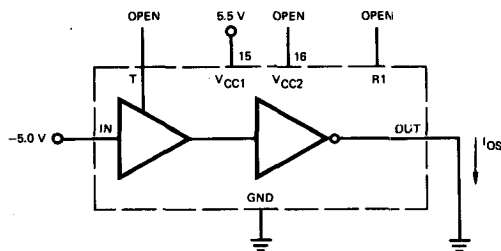
Fig. 2 R₁



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. 3 V_{I(open)}

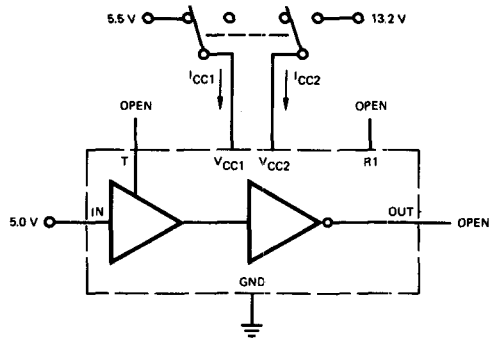


Each output is tested separately.

Fig. 4 I_{OS}

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DC TEST CIRCUITS† (Cont'd)



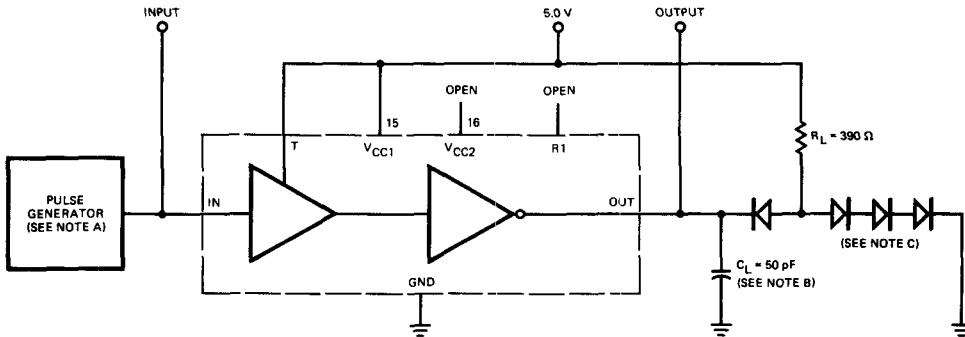
All four line receivers are tested simultaneously.

Fig. 5 I_{CC}

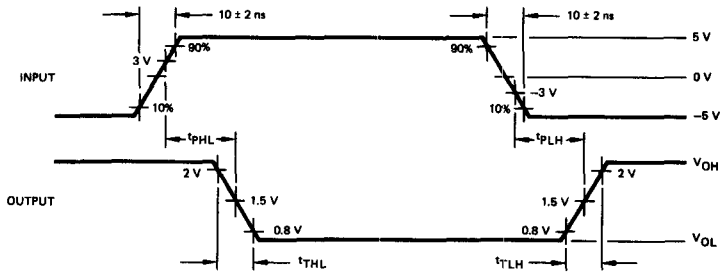
†Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

AC CHARACTERISTICS

TEST CIRCUIT



VOLTAGE WAVEFORMS



NOTES:

- A. The pulse generator has the following characteristics: $Z_{out} = 50 \Omega$, $t_w = 200 \text{ ns}$, duty cycle $\leq 20\%$.
- B. C_L includes probe and jig capacitance.
- C. All diodes are 1N3064