



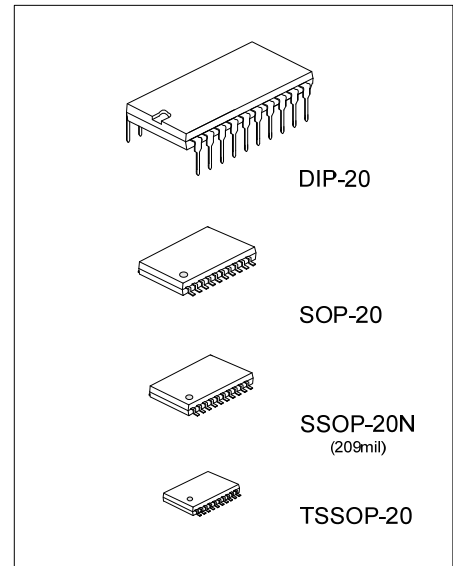
## 75185

## LINEAR INTEGRATED CIRCUIT

### MULTIPLE RS-232 DRIVERS AND RECEIVERS

#### DESCRIPTION

The UTC **75185** complies with the requirements of the TIA/EIA232-F and ITU (formerly CCITT) v.28 standards. These standards are for data interchange between a host computer and peripheral at signaling rates up to 20kbit/s. The switching speeds of the UTC **75185** are fast enough to support rates up to 120kbit/s with lower capacitive loads (shorter cables). Interoperability at the higher signaling rates cannot be assured unless the designer has design control of the cable and the interface circuits at both ends. For interoperability at signaling rates to 120kbit/s, use of ITA/EIA-423-B (ITU v.10) and TIA/EIA-422-B (ITU v.11) standards are recommended.



#### FEATURES

- \*Single Chip with Easy Interface between UART and Serial-Port connector of PC.
- \*Three Drivers and five Receivers Meet or Exceed the Requirements of TIA/EIA-232-F and ITU v.28 Standards.
- \*Designed to Support Data Rates up to 120 kbps

#### ORDERING INFORMATION

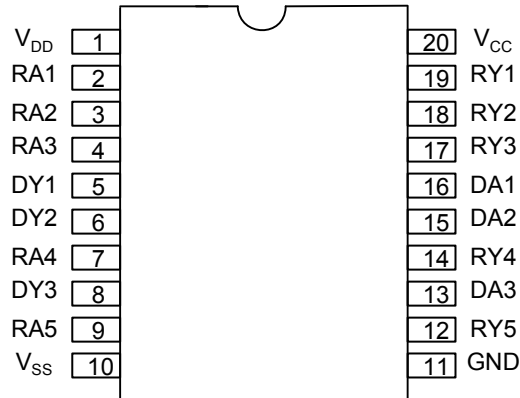
Ordering Number		Package	Packing
Lead Free	Halogen Free		
75185L-D20-T	75185G-D20-T	DIP-20	Tube
75185L-P20-R	75185G-P20-R	TSSOP-20	Tape Reel
75185L-R20N-R	75185G-R20N-R	SSOP-20N	Tape Reel
75185L-S20-R	75185G-S20-R	SOP-20	Tape Reel

<p>75185G-D20-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) D20: DIP-20, P20: TSSOP-20, R20N: SSOP-20N, S20: SOP-20</li> <li>(3) G: Halogen Free and Lead Free, L: Lead Free</li> </ul>
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#### MARKING

DIP-20	TSSOP-20 / SSOP-20N / SOP-20

## ■ PIN CONFIGURATIONS



## ■ PIN DESCRIPTION

PIN NO	SYMBOL	PIN DESCRIPTION
1	V <sub>DD</sub>	Supply Voltage
2	RA1	First Receiver Input
3	RA2	Second Receiver Input
4	RA3	Third Receiver Input
5	DY1	First Driver Output
6	DY2	Second Driver Output
7	RA4	Fourth Receiver Input
8	DY3	Third Driver Output
9	RA5	Fifth Receiver Input
10	V <sub>SS</sub>	Supply Voltage
11	GND	Ground
12	RY5	Fifth Receiver Output
13	DA3	Third Driver Input
14	RY4	Fourth Receiver Output
15	DA2	Second Driver Input
16	DA1	First Driver Input
17	RY3	Third Receiver Output
18	RY2	Second Receiver Output
19	RY1	First Receiver Output
20	V <sub>CC</sub>	Supply Voltage

■ ABSOLUTE MAXIMUM RATINGS OVER OPERATING FREE-AIR TEMPERATURE RANGE (unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage (Note 1)		$V_{DD}$	15	V
		$V_{SS}$	-15	V
		$V_{CC}$	10	V
Input Voltage Range	Drive	$V_{IN}$	-15 ~ 7	V
	Receiver		-30 ~ 30	V
Driver Output Voltage Range		$V_{OUT}$	-15~ 15	V
Receiver Low Level Output Current		$I_{OUT}$	20	mA
Storage Temperature Range		$T_{STG}$	-65 ~ +150	°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	DIP-20	$\theta_{JA}$	70	°C/W
	SOP-20		100	°C/W
	SSOP-20N		115	°C/W
	TSSOP-20		115	°C/W

Notes: 1. All voltage are with respect to the network ground terminal.

2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage		$V_{DD}$	7.5	9	15	V
		$V_{SS}$	-7.5	-9	-15	V
		$V_{CC}$	4.5	5	5.5	V
Input Voltage (Driver Only)	High Level	$V_{IH}$	1.9			V
	Low Level	$V_{IL}$			0.8	V
High Level Output Current	Drive	$I_{OH}$			-6.0	mA
	Receiver				-0.5	
Low Level Output Current	Drive	$I_{OL}$			6	mA
	Receiver				16	
Operating Free-Air Temperature		$T_A$	0		70	°C

■ SUPPLY CURRENTS

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	MAX	UNIT
		$V_{DD}$	$V_{SS}$			
Supply Current From $V_{DD}$	$I_{DD}$	No load. All inputs at 1.9V	9	-9	15	mA
			12	-12	19	
			15	-15	25	
		No load. All inputs at 0.8V	9	-9	4.5	mA
			12	-12	5.5	
			15	-15	9	
Supply Current From $V_{SS}$	$I_{SS}$	No load. All inputs at 1.9V	9	-9	-15	mA
			12	-12	-19	
			15	-15	-25	
		No load. All inputs at 0.8V	9	-9	-3.2	mA
			12	-12	-3.2	
			15	-15	-3.2	
Supply Current From $V_{CC}$	$I_{CC}$	No load. All inputs at 5V, $V_{CC}=5V$			30	mA

- DRIVER ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING FREE-AIR TEMPERATURE RANGE ( $V_{DD}=9V$ ,  $V_{SS}=-9V$ ,  $V_{CC}=5V$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High Level Output Voltage	$V_{OH}$	$V_{IL}=0.8V$ , $R_L=3\text{ k}\Omega$ (Figure 1)	6	7.5		V
Low Level Output Voltage (Note 3)	$V_{OL}$	$V_{IH}=1.9V$ , $R_L=3\text{ k}\Omega$ (Figure 1)		-7.5	-6	V
High Level Input Current	$I_{IH}$	$V_{IN}=5V$ (Figure 2)			10	$\mu\text{A}$
Low Level Input Current	$I_{IL}$	$V_{IN}=0V$ (Figure 2)			-1.6	$\text{mA}$
High Level Short Circuit Output Current (Note 4)	$I_{OS(H)}$	$V_{IL}=0.8V$ , $V_{OUT}=0V$ (Figure 1)	-4.5	-12	-19.5	$\text{mA}$
Low Level Short Circuit Output Current	$I_{OS(L)}$	$V_{IH}=2V$ , $V_{OUT}=0V$ (Figure 1)	4.5	12	19.5	$\text{mA}$
Output Resistance (Note 5)	$R_{OUT}$	$V_{DD}=V_{SS}=V_{CC}=0V$ , $V_{OUT}=-2\text{ to }2V$	300			$\Omega$

Note 3: The algebraic convention, where the more positive (less negative) limit is designated as maximum, is used in this datasheet for logic levels only (e.g. if -10V is a maximum, the typical value is a more negative voltage).

Note 4: Output short circuit conditions must maintain the total power dissipation below absolute maximum ratings.

Note 5: Test conditions are those specified by TIA/EIA232-F and as listed above.

- DRIVER SWITCHING CHARACTERISTICS ( $V_{DD}=12V$ ,  $V_{SS}=-12V$ ,  $V_{CC}=5V$ ,  $T_A=25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Propagation Delay Time Level Output	Low to High	$t_{PLH}$	$R_L=3\text{ to }7\text{ k}\Omega$ , $C_L=15\text{pF}$ (Figure 3)		315	500	ns
	High to Low	$t_{PHL}$	$R_L=3\text{ to }7\text{ k}\Omega$ , $C_L=15\text{pF}$ (Figure 3)		75	175	ns
Transition Time Level Output	Low to High	$t_{TLH}$	$R_L=3\text{ to }7\text{ k}\Omega$ , $C_L=15\text{pF}$ (Figure 3)		60	100	ns
			$R_L=3\text{ to }7\text{ k}\Omega$ , $C_L=2500\text{pF}$ (Note 6, Figure 3)		1.7	2.5	$\mu\text{s}$
Transition Time Level Output	High to Low	$t_{THL}$	$R_L=3\text{ to }7\text{ k}\Omega$ , $C_L=15\text{pF}$ (Figure 3)		40	75	ns
			$R_L=3\text{ to }7\text{ k}\Omega$ , $C_L=2500\text{pF}$ (Note 7, Figure 3)		1.5	2.5	$\mu\text{s}$

Note 6: Measured between -3V and 3V points of the output waveform (TIA/EIA-232-F conditions), all unused inputs are tied.

Note 7: Measured between 3V and -3V points of the output waveform (TIA/EIA-232-F conditions), all unused inputs are tied.

- RECEIVER ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING CONDITIONS ( $T_A=25^\circ\text{C}$ ,  $V_{CC}=5V$ ,  $V_{DD}=9V$ ,  $V_{SS}=-9V$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT		
Positive Going Threshold Voltage	$V_{T+}$	(Figure 5) $T_A=25^\circ\text{C}$ $T_A=0^\circ\text{C to }70^\circ\text{C}$	1.75 1.55	1.9	2.3 2.3	V		
Negative Going Threshold Voltage	$V_{T-}$		0.75	0.97	1.25	V		
Input Hysteresis ( $V_{T+} - V_{T-}$ )	$V_{HYS}$		0.5			V		
Output Voltage	High level	$V_{OH}$	$I_{OH}=-0.5\text{mA}$	$V_{IH}=0.75V$	2.6	4	5	V
	Low level	$V_{OL}$	$V_{IN}=3V$ , $I_{OL}=10\text{mA}$	Inputs Open	2.6			V
Input Current	High level	$I_{IH}$	$V_{IN}=25V$ (Figure 5)		3.6		8.3	$\text{mA}$
			$V_{IN}=3V$ (Figure 5)		0.43			$\text{mA}$
	Low level	$I_{IL}$	$V_{IN}=-25V$ (Figure 5)		-3.6		-8.3	$\text{mA}$
			$V_{IN}=-3V$ (Figure 5)		-0.43			$\text{mA}$
Short-Circuit Output Current	$I_{OS}$	(Figure 4)		-3.4	-12	$\text{mA}$		

- RECEIVER SWITCHING CHARACTERISTICS ( $V_{DD}=12V$ ,  $V_{SS}=-12V$ ,  $V_{CC}=5V$ ,  $T_A=25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Propagation Delay Time Level Output	Low to High	$t_{PLH}$		107	500	ns	
	High to Low	$t_{PHL}$	$R_L=5\text{ k}\Omega$ , $C_L=50\text{pF}$		42	150	ns
Transition Time Level Output	Low to High	$t_{TLH}$	(Figure 6)		175	525	ns
	High to Low	$t_{THL}$			16	60	ns

PARAMETER MEASUREMENT INFORMATION

DRIVER TEST CIRCUITS:

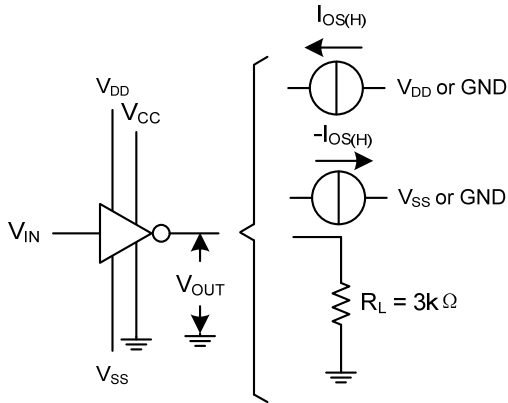


Figure 1. For  $V_{OH}$ ,  $V_{OL}$ ,  $I_{OS(H)}$ ,  $I_{OS(L)}$

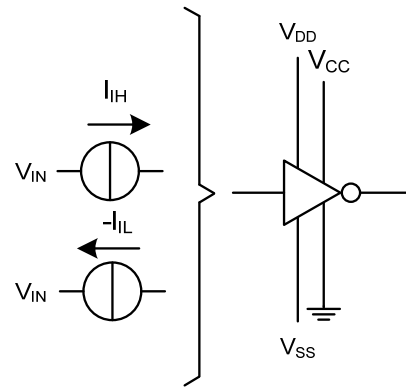


Figure 2. For  $I_{IH}$ ,  $I_{IL}$

DRIVER VOLTAGE WAVEFORMS:

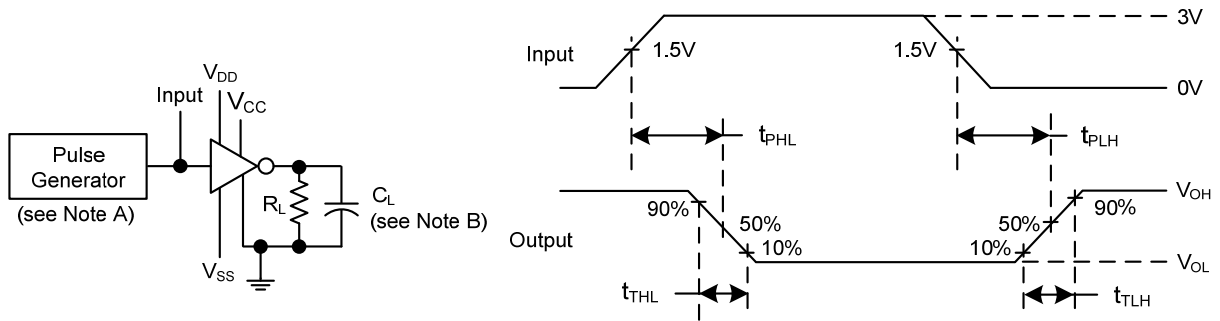


Figure 3.

- Note: 1. The pulse generator has the following characteristics:  $t_w=25\mu s$ ,  $PRR=20kHz$ ,  $Z_o=50\Omega$ ,  $t_r=t_f<50ns$ .
- 2.  $C_L$  includes probe and jig capacitance.

PARAMETER MEASUREMENT INFORMATION (Cont.)

RECEIVER TEST CIRCUITS:

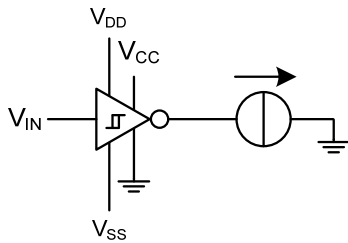


Figure 4. For  $I_{OS}$

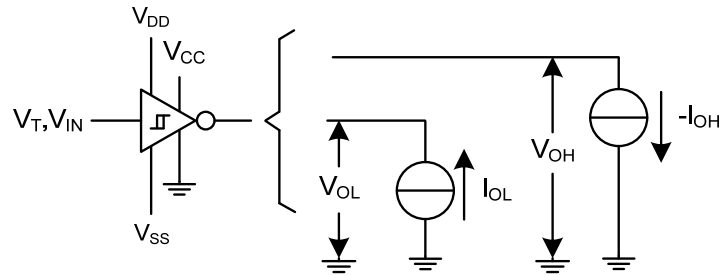


Figure 5. For  $V_T$ ,  $V_{OH}$ ,  $V_{OL}$

RECEIVER PROPAGATION AND TRANSITION TIMES:

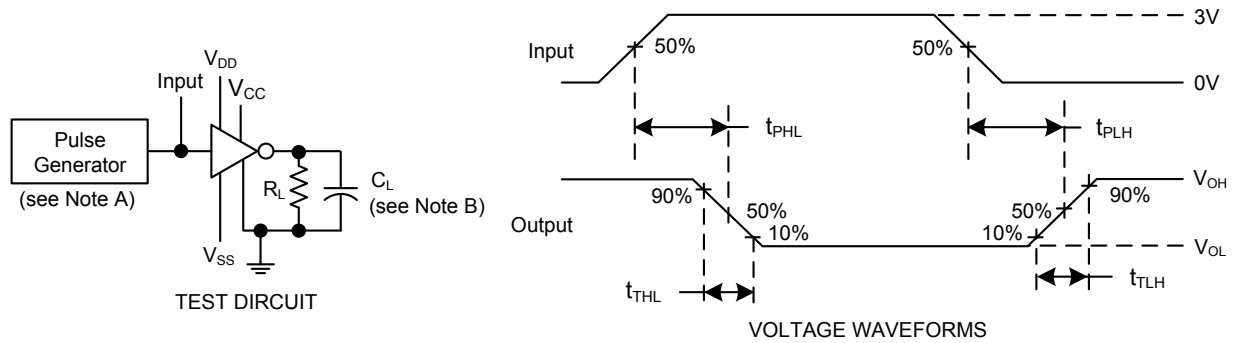


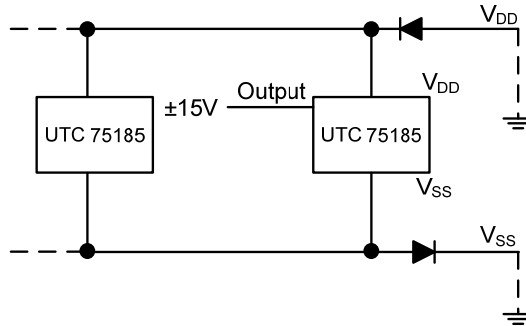
Figure 6.

Note: 1. The pulse generator has the following characteristics:  $t_w = 25\mu s$ ,  $PRR = 20kHz$ ,  $Z_o = 50\Omega$ ,  $t_r = t_f < 50ns$ .  
 2.  $C_L$  includes probe and jig capacitance.

■ APPLICATION INFORMATION

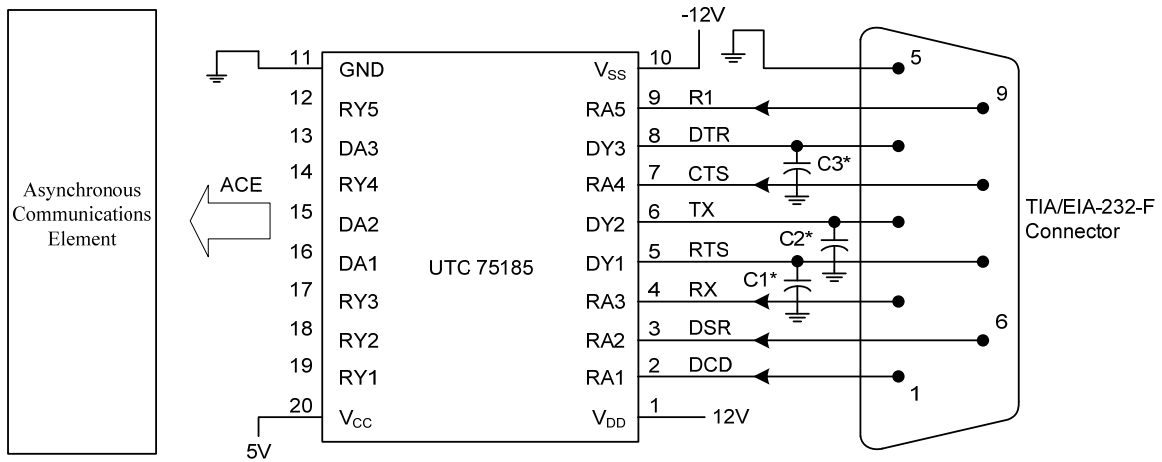
**Power-Supply protection to meet Power-Off fault conditions of TIA/TIA-232-F**

Diodes placed in series with the  $V_{DD}$  and  $V_{SS}$  leads protect the device in the fault condition in which the device outputs are shorted to  $\pm 15V$  and the power supplies are at low and provide low-impedance paths to ground.

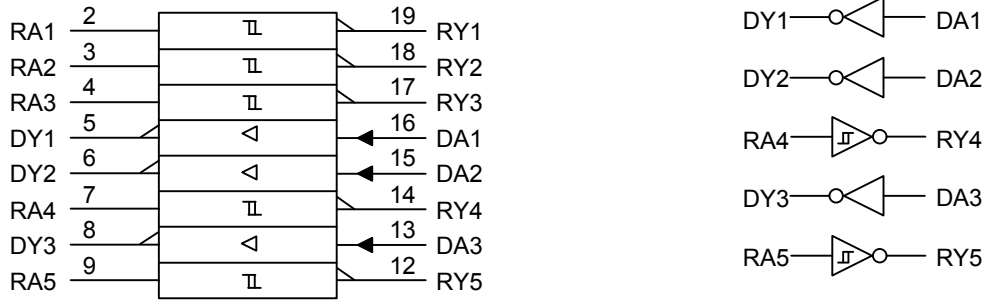


**Typical Connection**

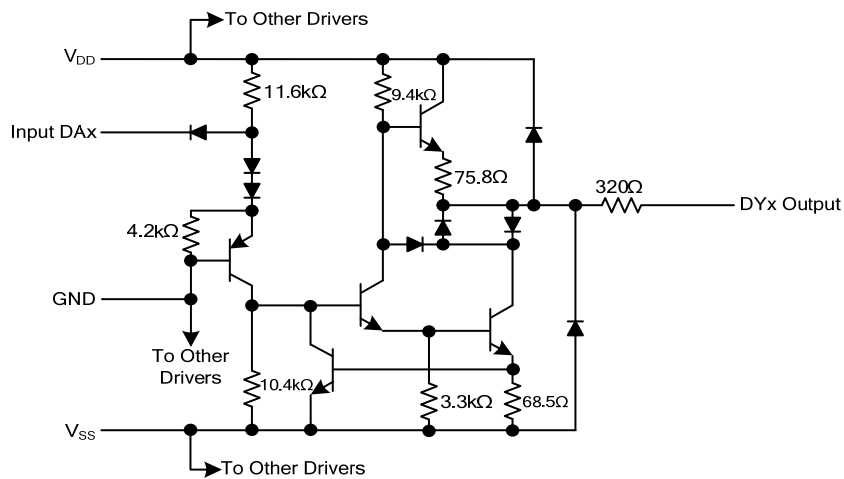
“\*”: Refer Figure 10 to select the correct values for the loading capacitors (C1, C2, and C3), which are required to meet the RS-232 maximum slew-rate requirement of  $30V/\mu s$ . The value of the loading capacitors required depends upon the line length and desired slew rate, but typically is 330 pF.



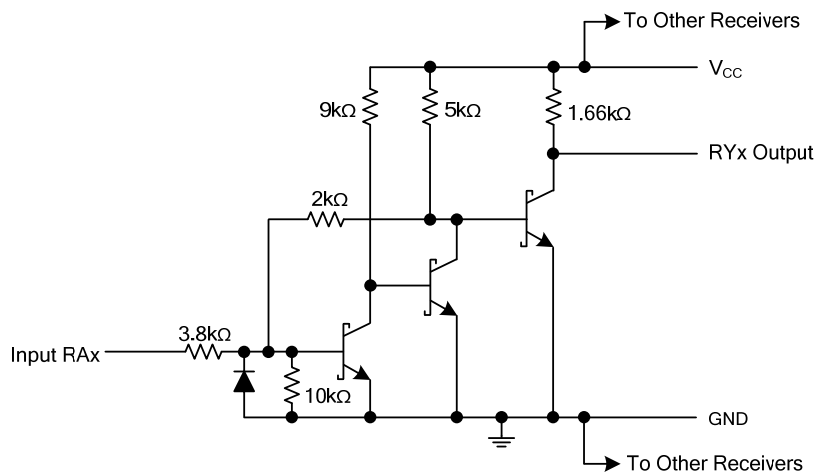
LOGIC SYMBOL AND LOGIC DIAGRAM



CIRCUIT OF DRIVERS (Resistor value shown are nominal.)

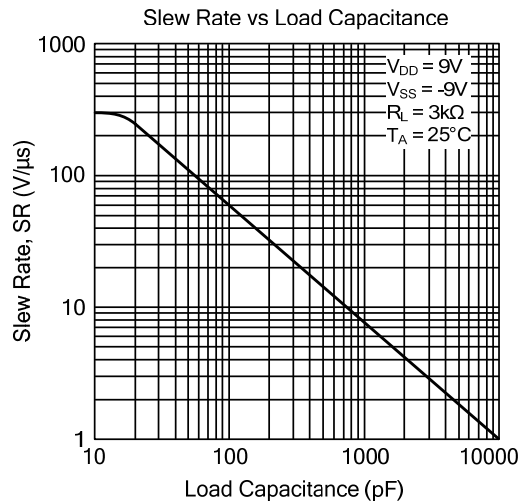
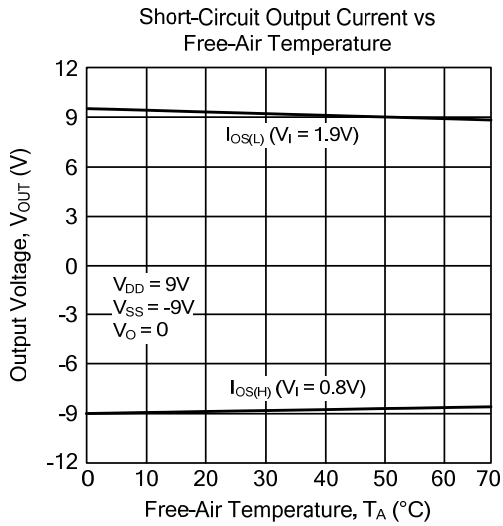
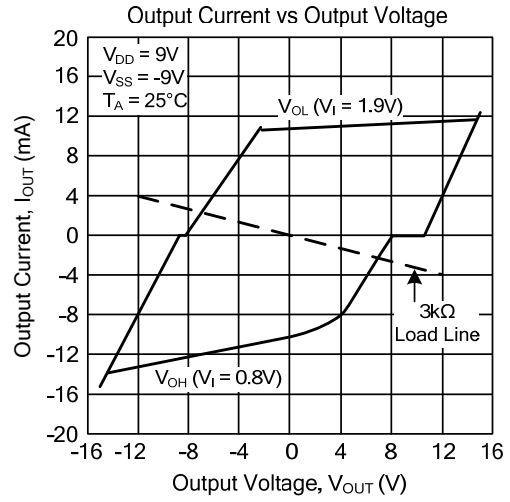
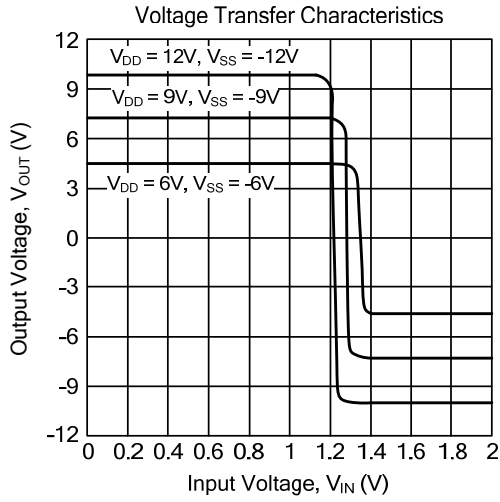


CIRCUIT OF EACH RECEIVER (Resistor value shown are nominal.)

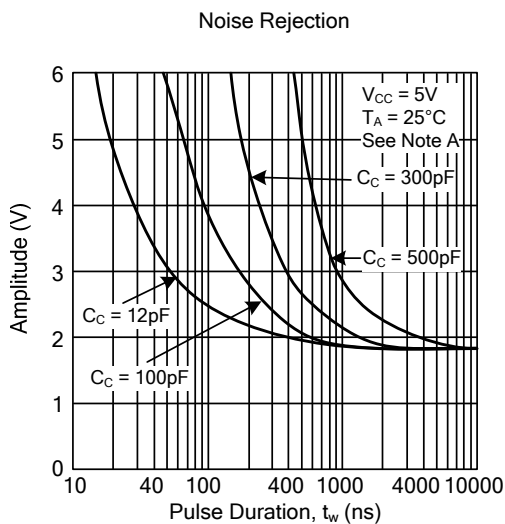
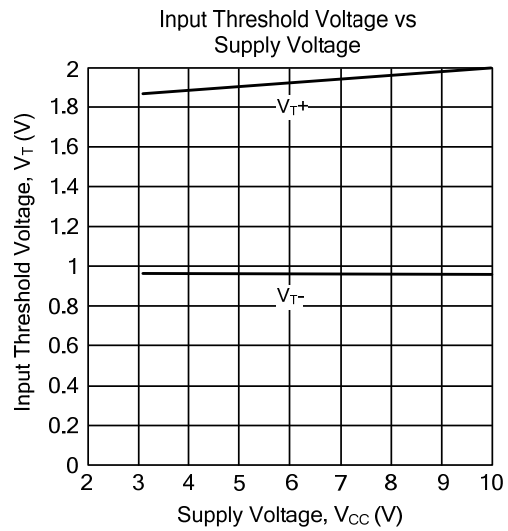
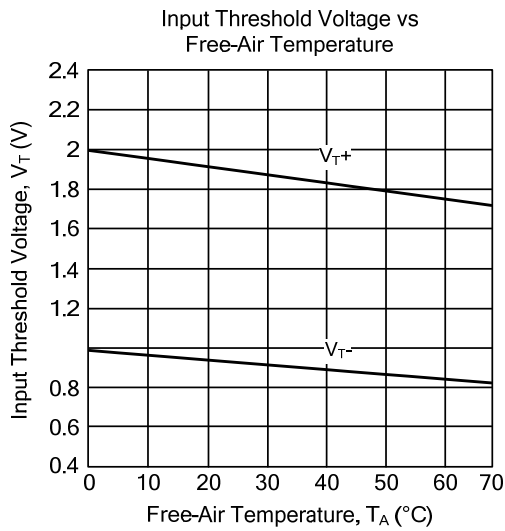




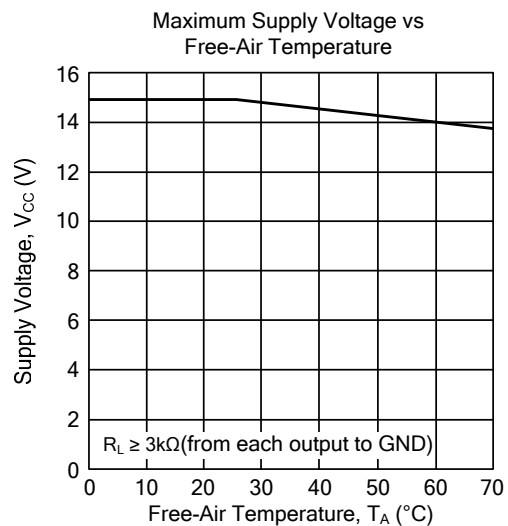
■ TYPICAL CHARACTERISTICS (DRIVER)



■ TYPICAL CHARACTERISTICS (RECEIVER)



The maximum amplitude starting from 0V of a positive-going pulse that will not cause a change in the output level.



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