

μA9616 Triple EIA RS-232-C/ MIL-STD-188C Line Driver

Interface Products

Description

The 9616 is a Triple Line Driver which meets the electrical interface specifications of EIA RS-232-C and CCITT V.24 and/or MIL-STD-188C (by the appropriate device selection). Each driver converts TTL/DTL logic levels to EIA/CCITT and/or MIL-STD-188C logic levels for transmission between data terminal equipment and data communications equipment. The output slew rate is internally limited and can be lowered by an external capacitor; all output currents are short-circuit limited. The outputs are protected against RS-232-C fault conditions. A logic HIGH on the inhibit terminal interrupts signal transfer and forces the output to a V_{OL} (EIA/CCITT MARK) state.

For the complementary function, see the 9617 Triple EIA RS-232-C Line Receiver and the 9627 Dual EIA RS-232-C and MIL-STD-188C Line Receiver.

- INTERNAL SLEW RATE LIMITING
- MEETS EIA RS-232-C AND CCITT V.24 AND/OR MIL-STD-188C
- LOGIC TRUE INHIBIT FUNCTION
- OUTPUT SHORT-CIRCUIT CURRENT LIMITING
- OUTPUT VOLTAGE LEVELS INDEPENDENT OF SUPPLY VOLTAGES

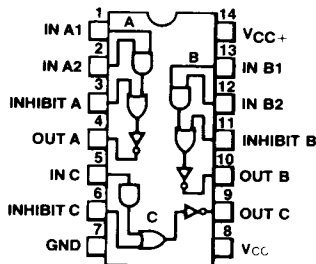
Absolute Maximum Ratings

Supply Voltage	± 15 V
Input or Inhibit Voltage	-1.5 V to +6.0 V
Output Signal Voltage	± 15 V
Internal Power Dissipation (Note 1)	670 mW
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range	
RS-232 MIL-STD-188 (9616)	-55°C to +125°C
RS-232 (9616C)	0°C to 70°C
RS-232 MIL-STD-188 (9616E)	0°C to 70°C
Pin Temperatures	
Ceramic DIP (Soldering, 60 s)	300°C
Molded DIP (Soldering, 10 s)	260°C

Note

1. For Ceramic and Molded DIP above 60°C derate linearly at 8.3 mW/°C.

Connection Diagram 14-Pin



(Top View)

Order Information

Type	Package	Code	Part No.
μA9616	Ceramic DIP	6A	μA9616DM
μA9616C	Ceramic DIP	6A	μA9616DC
μA9616E	Ceramic DIP	6A	μA9616EDC
μA9616C	Molded DIP	9A	μA9616PC
μA9616E	Molded DIP	9A	μA9616EPC

Truth Table Sections A and B

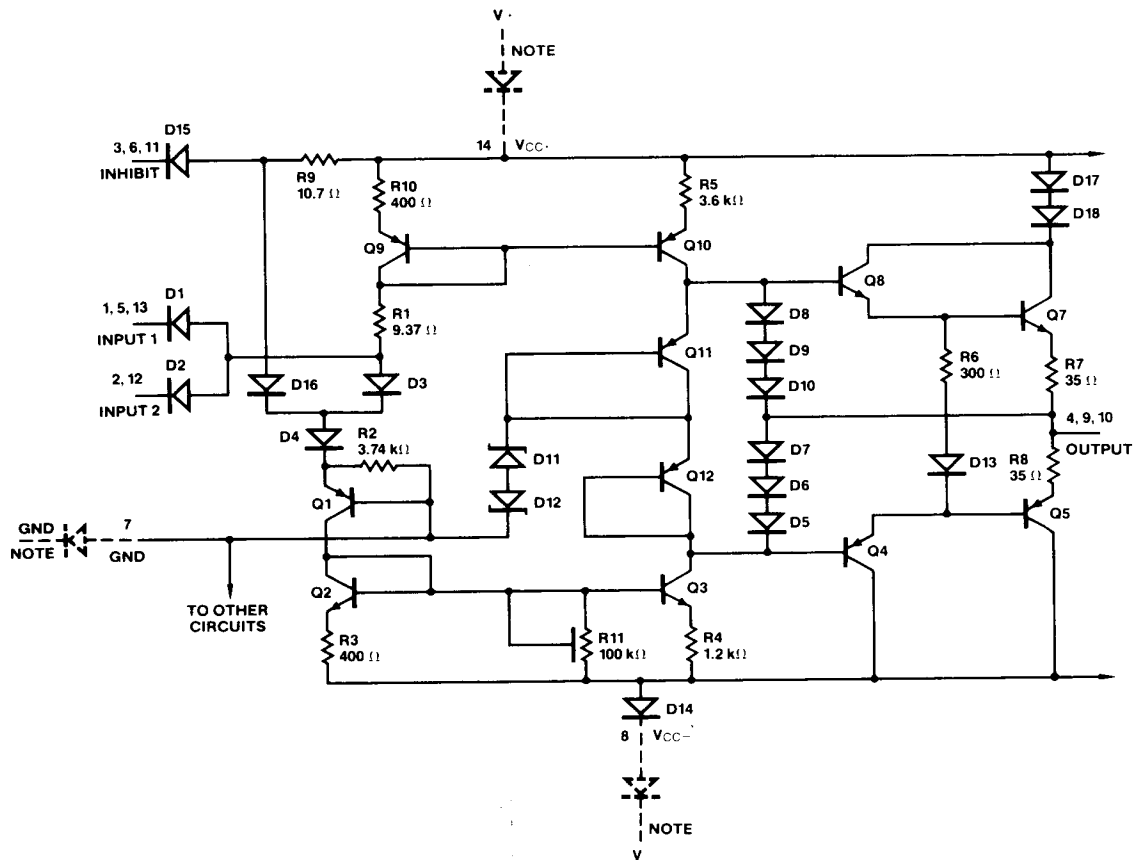
Input		Inhibit	Output
1	2		
L	L	L	H
H	L	L	H
L	H	L	H
H	H	L	L
X	X	H	L

Truth Table Section C

Input	Inhibit	Output
L	L	H
H	L	L
L	H	L
H	H	L

X = Output not dependent on input

Equivalent Circuit (One of three channels)



Note
 Three external diodes in series with VCC+, VCC- and GND are required to meet the ±2.0 V requirement

μA9616

μA9616 AND μA9616E, RS-232-C and MIL-STD-188C

DC Characteristics $V_{CC} = \pm 12\text{ V} \pm 10\%$; $R_L \geq 3\text{ k}\Omega$. See Test Circuit, unless otherwise specified. (Note 2)

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{OH}	Output HIGH Voltage	V_{IN1} and/or $V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$	5.0	6.0	7.0	V
V_{OL}	Output LOW Voltage	$V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$	-7.0	-6.0	-5.0	V
	Ripple Rejection	Power Supply Ripple = 2.4 Vp-p, $f = 400\text{ Hz}$		0.25		% of V_{OUT}
V_{OH} to V_{OL}	Output HIGH Voltage to Output LOW Voltage Magnitude Matching Error				± 10	%
I_{SC+}	Positive Output Short Circuit Current	$R_L = 0\ \Omega$, V_{IN1} and/or $V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$	-45	-25	-12	mA
I_{SC-}	Negative Output Short Circuit Current	$R_L = 0\ \Omega$, $V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$	+12	+25	+45	mA
V_{IH}	Input HIGH Voltage		2.0			V
V_{IL}	Input LOW Voltage				0.8	V
I_{IH}	Input HIGH Current	$V_{IN1} = V_{IN2} = 2.4\text{ V}$			40	μA
		$V_{IN1} = V_{IN2} = 5.5\text{ V}$			1.0	mA
I_{IL}	Input LOW Current	$V_{IN1} = V_{IN2} = 0.4\text{ V}$	-1.6	-1.2		mA
I_+	Positive Supply Current	$V_{IN1} = V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$		15	25	mA
		$V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$		7.5	15	mA
I_-	Negative Supply Current	$V_{IN1} = V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$	-1.0	0		mA
		$V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$	-25	-15		mA
R_{OUT}	Output Resistance, Power On	$R_L = 6\text{ k}\Omega$, $\Delta I_L = 10\text{ mA}$		75		Ω
R_{OUT}	Output Resistance, Power Off	$-2.0\text{ V} \leq V_{OUT} \leq +2.0\text{ V}$ (Notes 4 and 5)	300			Ω

μA9616 AND μA9616E, RS-232-C and MIL-STD-188C

AC Characteristics $0 \leq T_A \leq 70^\circ\text{C}$, (Notes 2 and 3)

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
	Positive Slew Rate	$0\text{ pF} \leq C_L \leq 2500\text{ pF}$, $R_L \geq 3\text{ k}\Omega$	4.0	15	30	$\text{V}/\mu\text{s}$
	Negative Slew Rate	$0\text{ pF} \leq C_L \leq 2500\text{ pF}$, $R_L \geq 3\text{ k}\Omega$	-30	-15	-4.0	$\text{V}/\mu\text{s}$
t_{PLH}	Propagation Delay Time	No Load		740		ns
t_{PHL}	Propagation Delay Time	No Load		740		ns

Notes

- The operating temperature range for the 9616 is -55°C to $+125^\circ\text{C}$ and 9616E is 0°C to $+70^\circ\text{C}$.
- An external capacitor may be needed to meet signal wave shaping requirements of MIL-STD-188C at the applicable modulation rate. No external capacitor is needed to meet RS-232-C over the operating temperature range of 0°C to $+70^\circ\text{C}$.
- All input and supply pins grounded.
- Three external diodes in series with V_{CC+} , V_{CC-} and GND are required to meet the $\pm 2.0\text{ V}$ requirement

9616C, EIA RS-232-C

DC Characteristics $V_{CC} = \pm 12\text{ V} \pm 10\%$, over operating temperature range. See Test Circuit, $R_L = 3\text{ k}\Omega$, unless otherwise specified.

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{OH}	Output HIGH Voltage	V_{IN1} and/or $V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$	5.0	6.0	7.5	V
V_{OL}	Output LOW Voltage	$V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$	-7.5	-6.0	-5.0	V
I_{SC+}	Positive Output Short-Circuit Current	$R_L = 0\ \Omega$, V_{IN1} and/or $V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$		-25		mA
I_{SC-}	Negative Output Short-Circuit Current	$R_L = 0\ \Omega$, $V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$		25		mA
V_{IH}	Input HIGH Voltage		2.0			V
V_{IL}	Input LOW Voltage				0.8	V
I_{IH}	Input HIGH Current	$V_{IN1} = V_{IN2} = 2.4\text{ V}$			40	μA
		$V_{IN1} = V_{IN2} = 5.5\text{ V}$			1.0	mA
I_{IL}	Input LOW Current	$V_{IN1} = V_{IN2} = 0.4\text{ V}$	-1.6	-1.2		mA
I_+	Positive Supply Current	$V_{IN1} = V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$		15	22	mA
		$V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$		7.5	13	
I_-	Negative Supply Current	$V_{IN1} = V_{IN2} = V_{INHIBIT} = 0.8\text{ V}$	-1.0	0		mA
		$V_{IN1} = V_{IN2} = V_{INHIBIT} = 2.0\text{ V}$	-22	-15		
R_{OUT}	Output Resistance, Power Off	$-2.0\text{ V} \leq V_{OUT} \leq +2.0\text{ V}$ (Notes 4 and 5)	300			Ω

9616C, EIA RS-232-C

AC Characteristics $0 \leq T_A \leq 70^\circ\text{C}$, (Note 6)

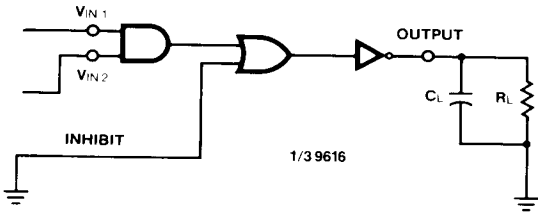
Symbol	Characteristics	Conditions	Min	Typ	Max	Unit
	Positive Slew Rate	$0\text{ pF} \leq C_L \leq 2500\text{ pF}$, $R_L \geq 3\text{ k}\Omega$	4.0	15	30	V/μs
	Negative Slew Rate	$0\text{ pF} \leq C_L \leq 2500\text{ pF}$, $R_L \geq 3\text{ k}\Omega$	-30	-15	-4.0	V/μs
t_{PLH}	Propagation Delay Time	No Load		740		ns
t_{PHL}	Propagation Delay Time	No Load		740		ns

Notes

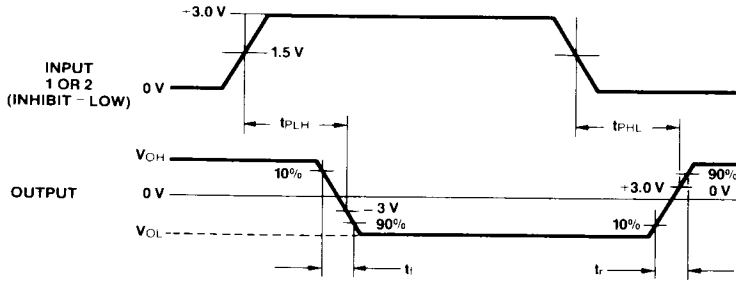
- All input and supply pins grounded.
- Three external diodes in series with V_{CC+} , V_{CC-} and GND are required to meet the $\pm 2.0\text{ V}$ requirement

- The operating temperature range for the 9616 is -55°C to $+125^\circ\text{C}$ and 9616E is 0°C to $+70^\circ\text{C}$.

AC Test Circuit



Voltage Waveforms



Note
Omit V_{IN2} for channel "C".
Input: Frequency = 50 kHz
Pulse Width = 20 μ s
 t_r and t_f = 10 \pm 5 ns