

SN75179A DIFFERENTIAL DRIVER AND RECEIVER PAIR

SLLS123B – D2845, JUNE 1984 – REVISED FEBRUARY 1993

- Meets EIA Standards RS-422A, RS423A, and CCITT Recommendations V.11 and X.27
- Bus Voltage Range . . . –7 V to 12 V
- Positive and Negative Current Limiting
- Driver Output Capability . . . 60 mA Max
- Driver Thermal Shutdown Protection
- Receiver Input Impedance . . . 12 k Ω Min
- Receiver Input Sensitivity . . . ± 200 mV
- Receiver Input Hysteresis . . . 50 mV Typ
- Operates From Single 5-V Supply
- Low Power Requirements

description

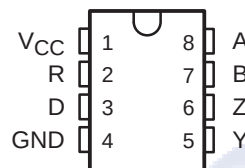
The SN75179A driver and bus receiver circuit is a monolithic integrated device designed for balanced transmission line applications, and meets EIA Standards RS-422A, RS-423A, and CCITT Recommendations V.11 and X.27. It is designed to improve the performance of data communications over long bus lines.

The SN75179A features positive- and negative-current limiting for the driver and receiver. The receiver features high input impedance, input hysteresis for increased noise immunity, and input sensitivity of ± 200 mV over a common-mode input voltage range of –12 V to 12 V.

The driver provides thermal shutdown for protection from line fault conditions. Thermal shutdown is designed to occur at a junction temperature of approximately 150°C. The device is designed to drive current loads of up to 60 mA maximum.

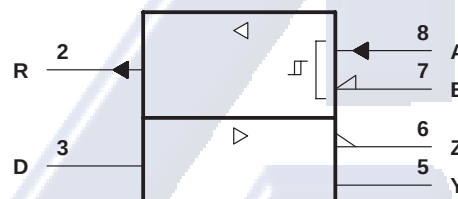
The SN75179A is characterized for operation from 0°C to 70°C.

D OR P PACKAGE
(TOP VIEW)

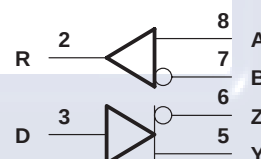


NOT RECOMMENDED FOR NEW DESIGN

logic symbol



logic diagram



Function Tables

DRIVER

INPUT D	OUTPUTS Y Z
H	H L
L	L H

RECEIVER

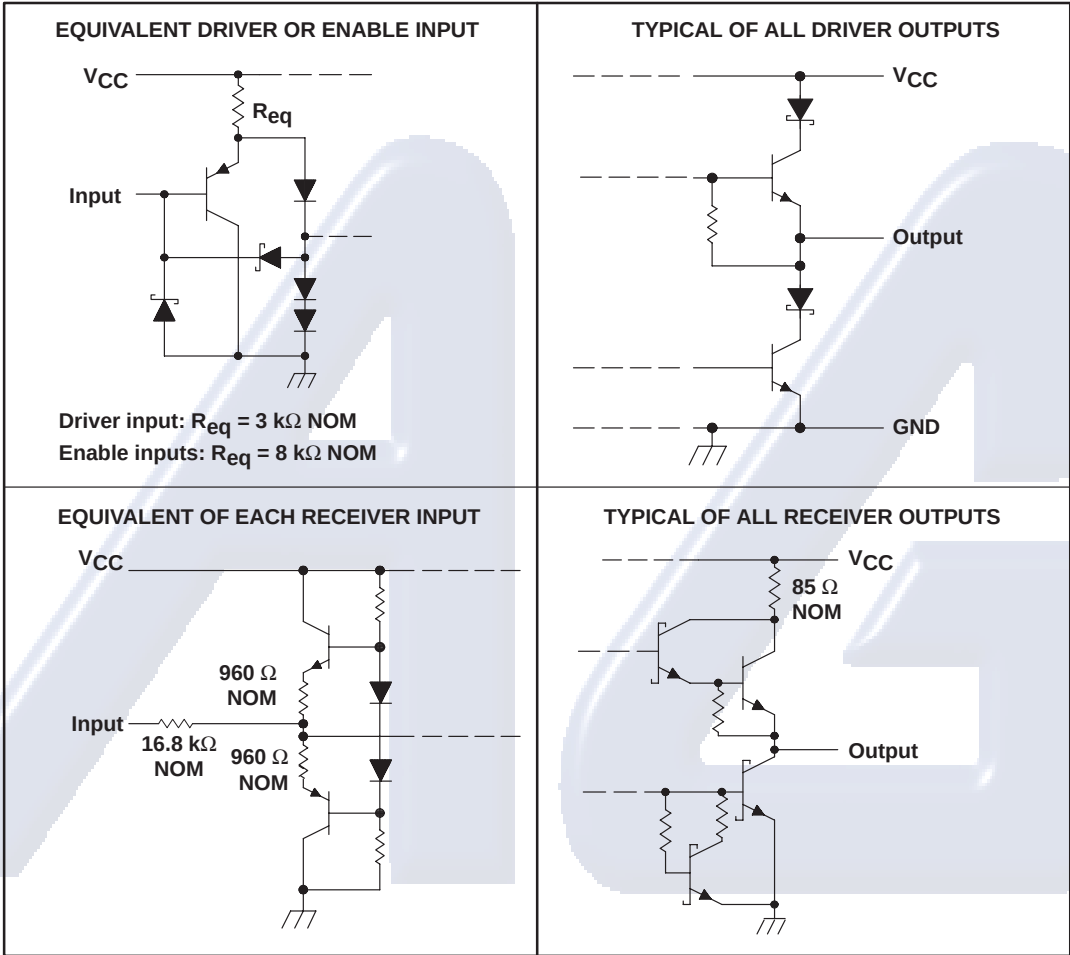
DIFFERENTIAL INPUTS A – B	OUTPUT R
$V_{ID} \geq 0.2$ V	H
-0.2 V $< V_{ID} < 0.2$ V	?
$V_{ID} \leq -0.2$ V	L

H = high level, L = low level, ? = indeterminate

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schematics of inputs and outputs



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

Supply voltage, V_{CC} (see Note 1)	7 V
Voltage range at any bus terminal	–10 V to 15 V
Differential input voltage (see Note 2)	±25 V
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range	0°C to 70°C

NOTES: 1. All voltage values, except differential input voltage, are with respect to network ground terminal.
2. Differential-input voltage is measured at the noninverting input with respect to the corresponding inverting input.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW
P	1000 mW	8.0 mW/°C	640 mW

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recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.5	5	5.25	V
High-level input voltage, V_{IH}	Driver	2			V
Low-level input voltage, V_{IL}	Driver			0.8	V
Common-mode input voltage, V_{IC}		$-7^{\dagger}$		12	V
Differential input voltage, V_{ID}				± 12	V
High-level output current, I_{OH}	Driver			-60	mA
	Receiver			-400	μ A
Low-level output current, I_{OL}	Driver			60	mA
	Receiver			8	mA
Operating free-air temperature, T_A		0		70	$^{\circ}$ C

[†] The algebraic convention, where the less-positive (more-negative) limit is designated minimum, is used in this data sheet for common-mode input voltage and threshold voltage.

DRIVER SECTION

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP [‡]	MAX	UNIT
V_{IK} Input clamp voltage	$I_I = -18$ mA			-1.5	V
V_{OH} High-level output voltage	$V_{IH} = 2$ V, $I_{OH} = -33$ mA $V_{IL} = 0.8$ V,		3.7		V
V_{OL} Low-level output voltage	$V_{IH} = 2$ V, $I_{OH} = 33$ mA $V_{IL} = 0.8$ V,		1.1		V
$ V_{OD1} $ Differential output voltage	$I_O = 0$			$2 V_{OD2}$	V
$ V_{OD2} $ Differential output voltage	$R_L = 100 \Omega$, See Figure 13	2	2.7		V
	$R_L = 54 \Omega$, See Figure 13	1.5	2.4		
$\Delta V_{OD} $ Change in magnitude of differential output voltage [§]				± 0.2	V
V_{OC} Common-mode output voltage [¶]	$R_L = 54 \Omega$ or 100Ω , See Figure 13			3	V
$\Delta V_{OC} $ Change in magnitude of common-mode output voltage [§]				± 0.2	V
I_O Output current with power off	$V_{CC} = 0$, $V_O = -7$ V to 12 V			± 100	μ A
I_{IH} High-level input current	$V_I = 2.4$ V			20	μ A
I_{IL} Low-level input current	$V_I = 0.4$ V			-400	μ A
I_{OS} Short-circuit output current	$V_O = -7$ V			-250	mA
	$V_O = V_{CC}$			250	
	$V_O = 12$ V			500	
I_{CC} Supply current (total package)	No load			50	mA

[‡] All typical values are at $V_{CC} = 5$ V and $T_A = 25^{\circ}$ C.

[§] $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitude of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

[¶] In EIA Standard RS-422A, V_{OC} , which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS} .

switching characteristics, $V_{CC} = 5$ V, $T_A = 25^{\circ}$ C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{dD} Differential-output delay time	$R_L = 60 \Omega$, See Figure 3		40	60	ns
t_{tD} Differential-output transition time			65	95	ns



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RECEIVER SECTION

electrical characteristics over recommended ranges of common-mode input voltage, supply voltage, and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V_{T+} Positive-going threshold voltage	$V_O = 2.7\text{ V}$, $I_O = -0.4\text{ mA}$			0.2	V
V_{T-} Negative-going threshold voltage	$V_O = 0.5\text{ V}$, $I_O = 8\text{ mA}$	-0.2 [‡]			V
V_{hys} Hysteresis ($V_{T+} - V_{T-}$)	See Figure 9		50		mV
V_{OH} High-level output voltage	$V_{ID} = 200\text{ mV}$, See Figure 2 $I_{OH} = -400\text{ }\mu\text{A}$,	2.7			V
V_{OL} Low-level output voltage	$V_{ID} = -200\text{ mV}$, $I_{OL} = 8\text{ mA}$, See Figure 2			0.45	V
I_I Line input current	Other input at 0 V, See Note 3	$V_I = 12\text{ V}$		1	mA
		$V_I = -7\text{ V}$		-0.8	
r_i Input resistance		12			k Ω
I_{OS} Short-circuit output current		-15		-85	mA
I_{CC} Supply current (total package)	No load			50	mA

[†] All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

[‡] The algebraic convention, where the less-positive (more-negative) limit is designated minimum, is used in this data sheet for common-mode input voltage and threshold voltage levels only.

NOTE 3: Refer to EIA Standard RS-422A for exact conditions.

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	$V_{ID} = -1.5\text{ V to }1.5\text{ V}$, $C_L = 15\text{ pF}$, See Figure 5		26	35	ns
t_{PHL} Propagation delay time, high-to-low-level output			27	35	ns

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PARAMETER MEASUREMENT INFORMATION

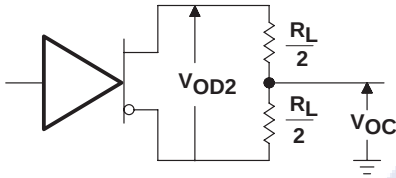
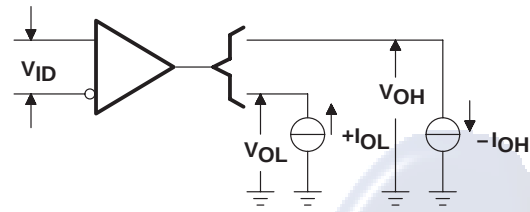
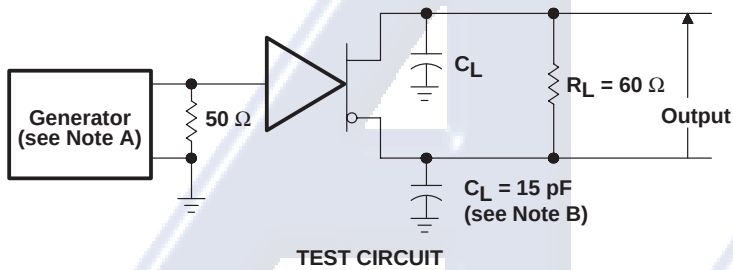
Figure 1. Driver V_{OD} and V_{OC} Figure 2. Receiver V_{OH} and V_{OL} 

Figure 3. Driver Differential-Output Delay and Transition Times

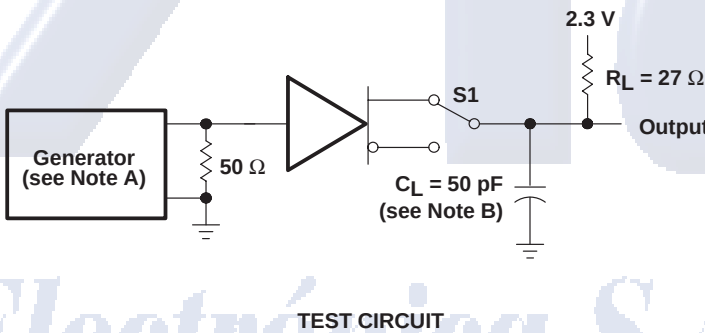
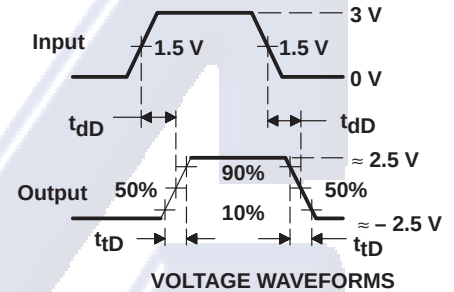


Figure 4. Driver Test Circuit and Voltage Waveforms

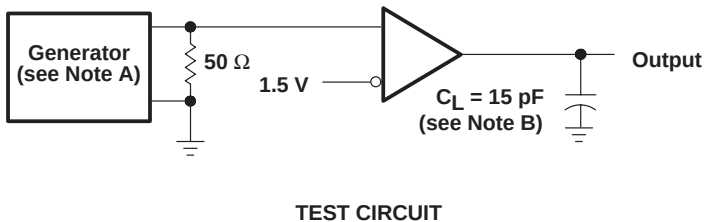
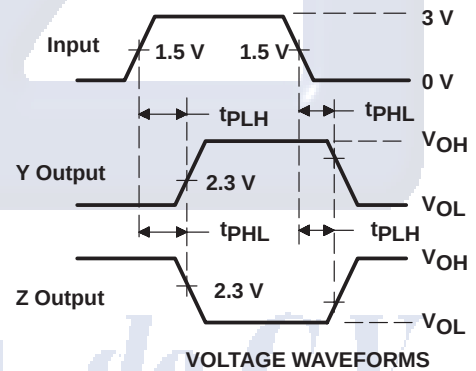
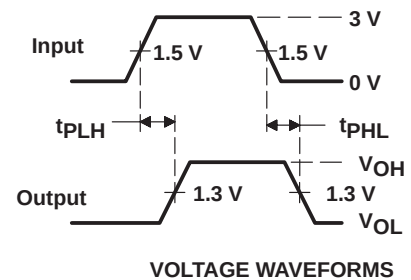


Figure 5. Receiver Test Circuit and Voltage Waveforms



NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_0 = 50 \Omega$.

B. C_L includes probe and jig capacitance.

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TYPICAL CHARACTERISTICS

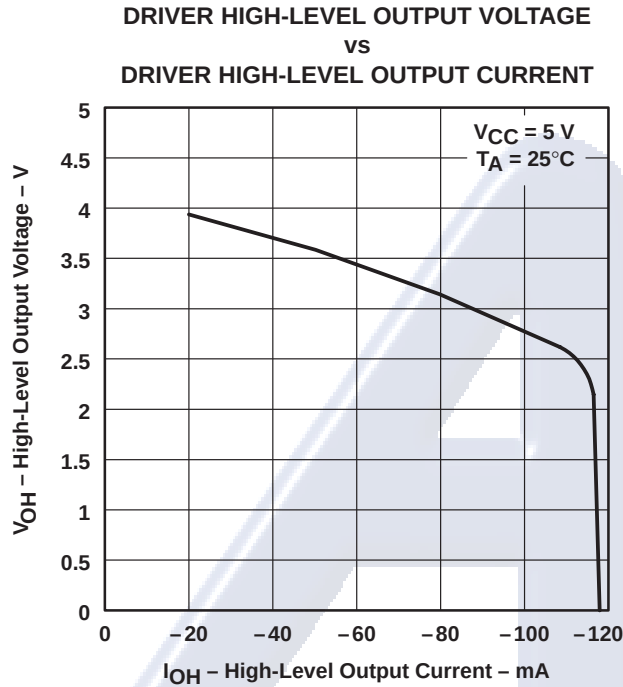


Figure 6

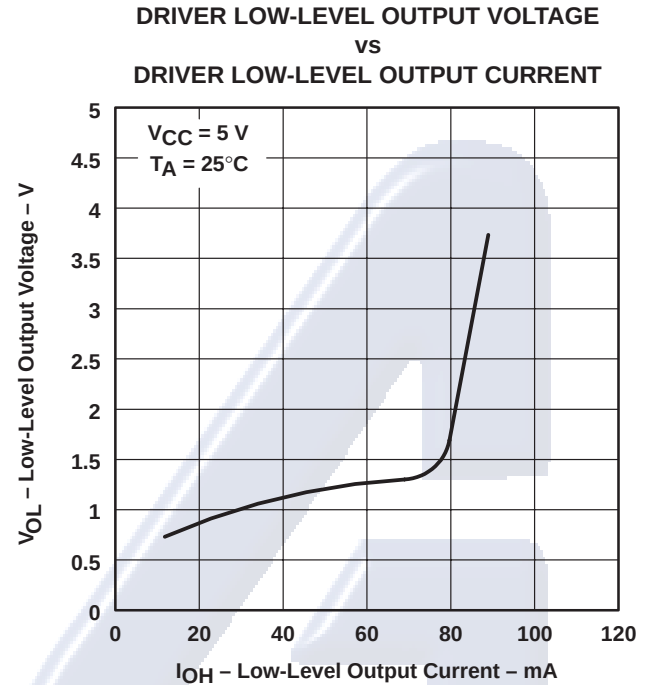


Figure 7

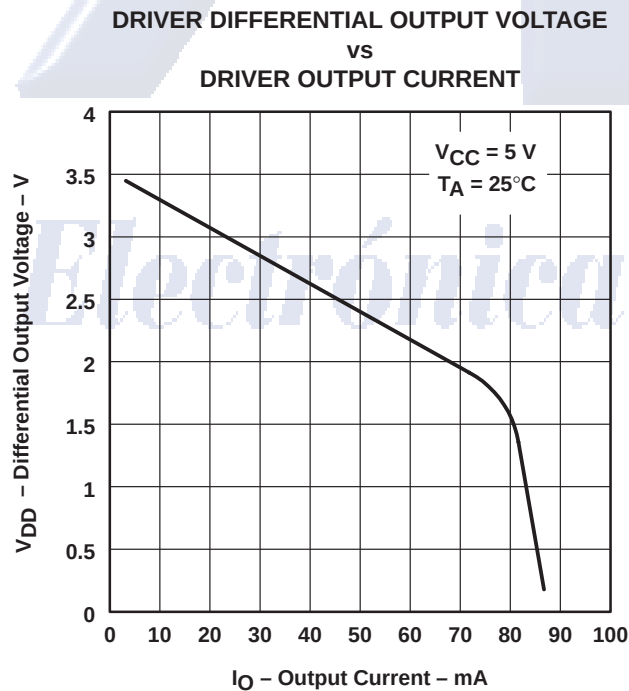


Figure 8

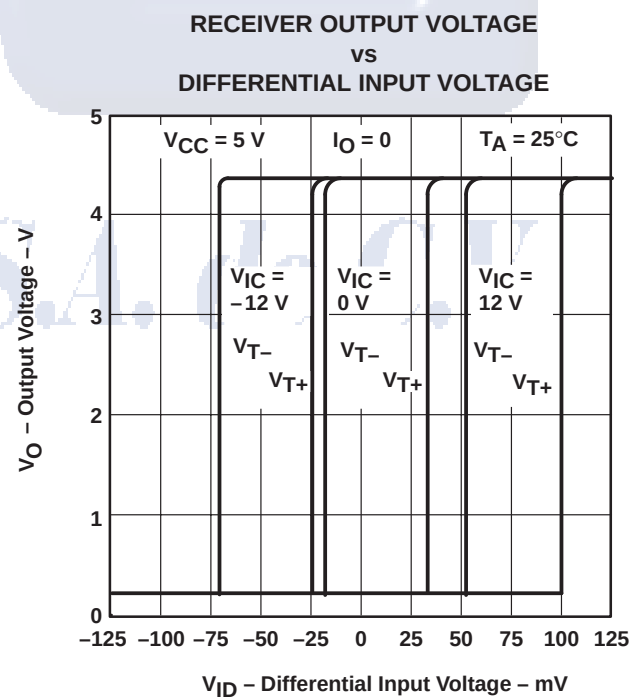


Figure 9

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TYPICAL CHARACTERISTICS

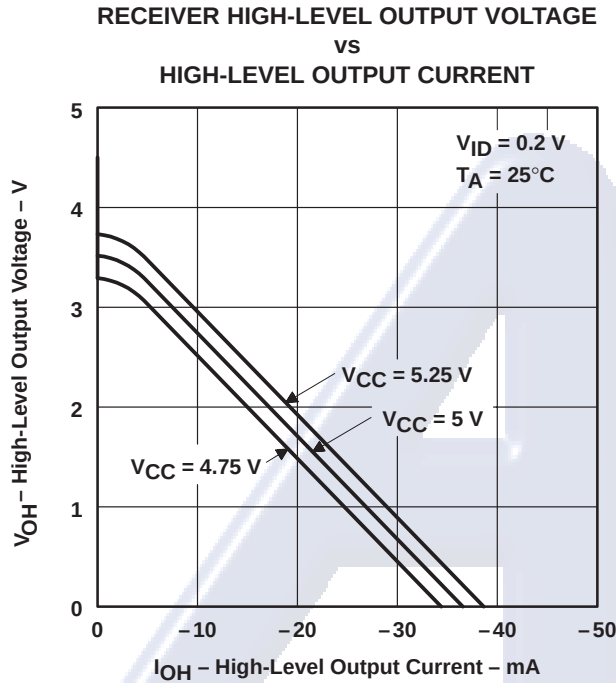


Figure 10

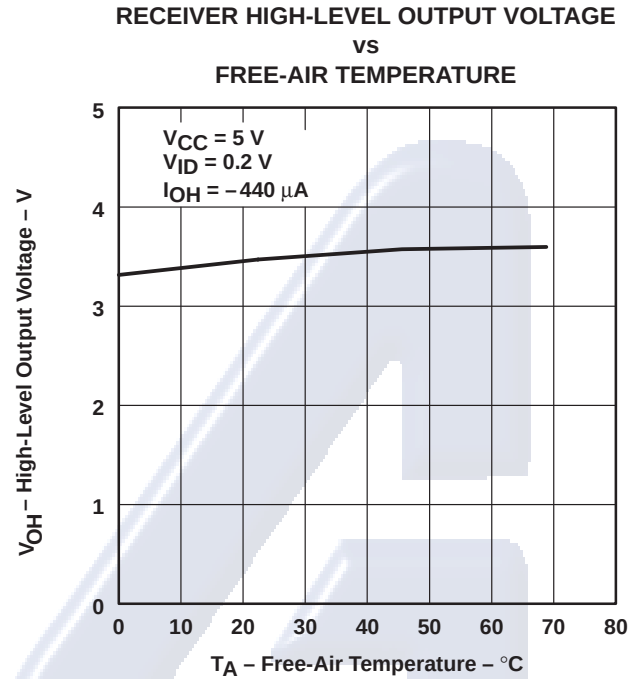


Figure 11

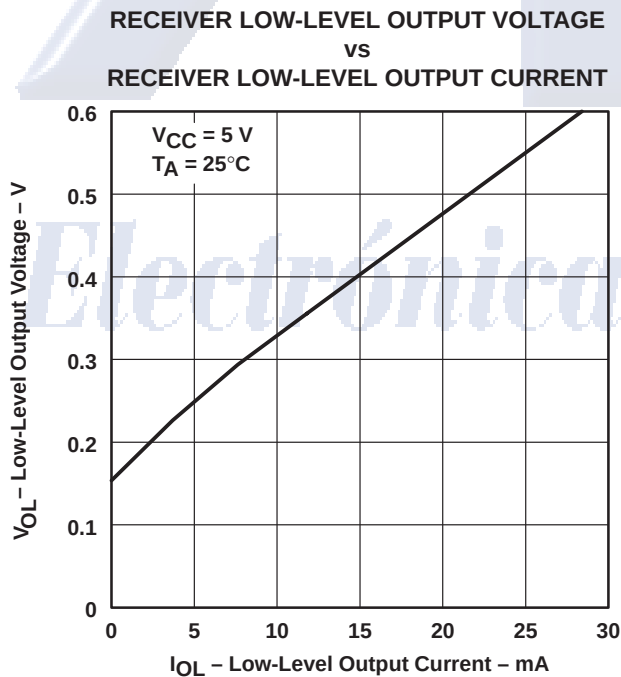


Figure 12

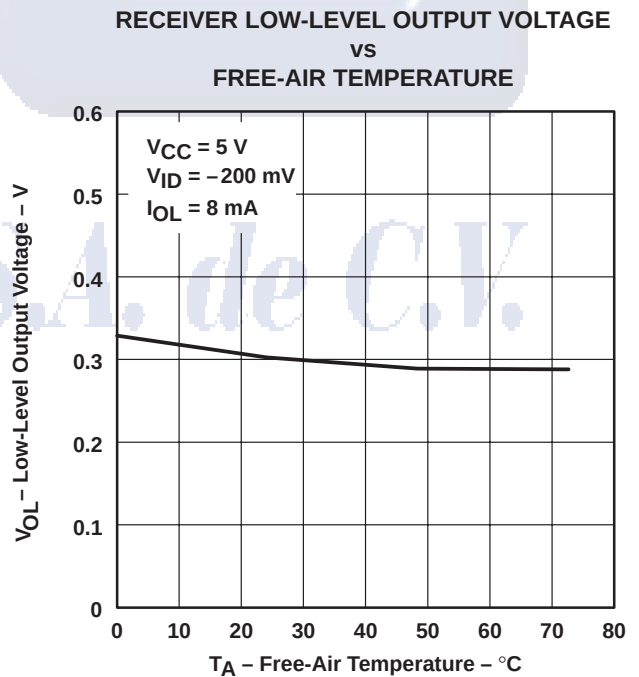


Figure 13



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