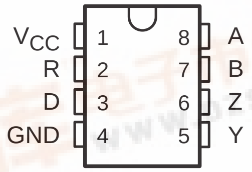
SN75179A
DIFFERENTIAL DRIVER AND RECEIVER PAIR

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 kΩ Min**
- **Receiver Input Sensitivity . . . ±200 mV**
- **Receiver Input Hysteresis . . . 50 mV Typ**
- **Operates From Single 5-V Supply**
- **Low Power Requirements**

D OR P PACKAGE
(TOP VIEW)



NOT RECOMMENDED FOR NEW DESIGN

description

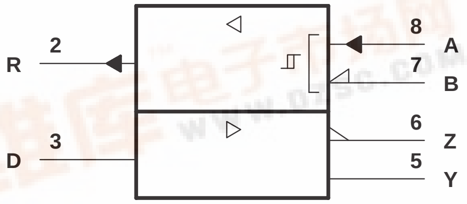
The SN75179A driver and bus receiver circuit is a monolithic integrated device designed for balanced transmission line applications, and meets EIA Standards RS-422A, RS-423A, and CCITT Recommendations V.11 and X.27. It is designed to improve the performance of data communications over long bus lines.

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.

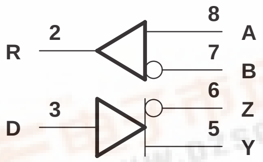
The driver provides thermal shutdown for protection from line fault conditions. Thermal shutdown is designed to occur at a junction temperature of approximately 150°C. The device is designed to drive current loads of up to 60 mA maximum.

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

logic symbol



logic diagram



Function Tables

DRIVER

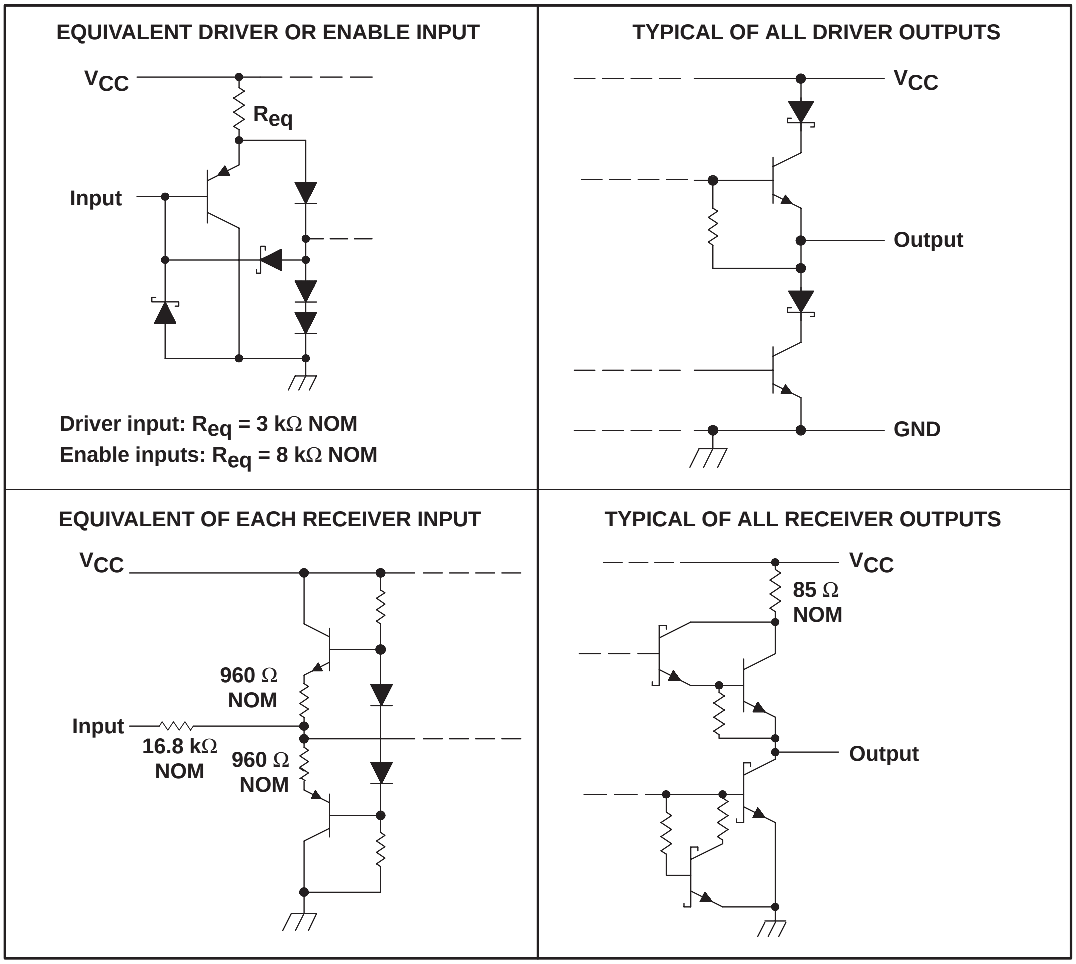
INPUT D	OUTPUTS Y	 Z
H	H	L
L	L	H

RECEIVER

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

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

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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW
P	1000 mW	8.0 mW/°C	640 mW

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[†]		12	V
Differential input voltage, V_{ID}				±12	V
High-level output current, I_{OH}	Driver			–60	mA
	Receiver			–400	μA
Low-level output current, I_{OL}	Driver			60	mA
	Receiver			8	
Operating free-air temperature, T_A		0		70	°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, $V_{IL} = 0.8$ V, $I_{OH} = –33$ mA		3.7		V
V_{OL}	Low-level output voltage	$V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $I_{OH} = 33$ mA		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[§]	$R_L = 54\ \Omega$ or $100\ \Omega$, See FIgure 13			± 0.2	V
V_{OC}	Common-mode output voltage[¶]				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	μA
I_{IH}	High-level input current	$V_I = 2.4$ V			20	μA
I_{IL}	Low-level input current	$V_I = 0.4$ V			–400	μA
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 $T_A = 25°C$.
[§] $\Delta|V_{OD}|$ 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, $T_A = 25°C$

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

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	$V_O = 2.7$ V,	$I_O = -0.4$ mA				0.2	V
V_{T-}	Negative-going threshold voltage	$V_O = 0.5$ V,	$I_O = 8$ mA		–0.2‡			V
V_{hys}	Hysteresis ($V_{T+} - V_{T-}$)	See Figure 9				50		mV
V_{OH}	High-level output voltage	$V_{ID} = 200$ mV, See Figure 2	$I_{OH} = -400$ µA,		2.7			V
V_{OL}	Low-level output voltage	$V_{ID} = -200$ mV,	$I_{OL} = 8$ mA,	See Figure 2			0.45	V
I_I	Line input current	Other input at 0 V, See Note 3	$V_I = 12$ V				1	mA
			$V_I = -7$ V				–0.8	
r_i	Input resistance				12			kΩ
I_{OS}	Short-circuit output current				–15		–85	mA
I_{CC}	Supply current (total package)	No load					50	mA

† All typical values are at $V_{CC} = 5$ V, $T_A = 25°C$.

‡ 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, $V_{CC} = 5$ V, $T_A = 25°C$

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

PARAMETER MEASUREMENT INFORMATION

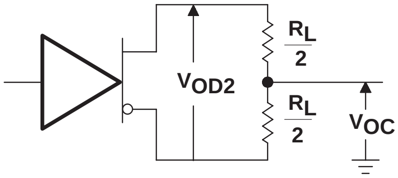


Figure 1. Driver V_{OD} and V_{OC}

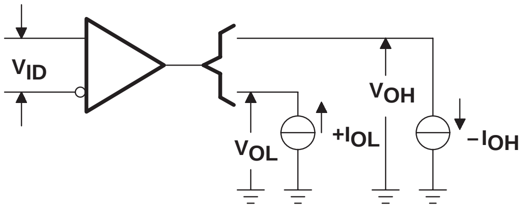
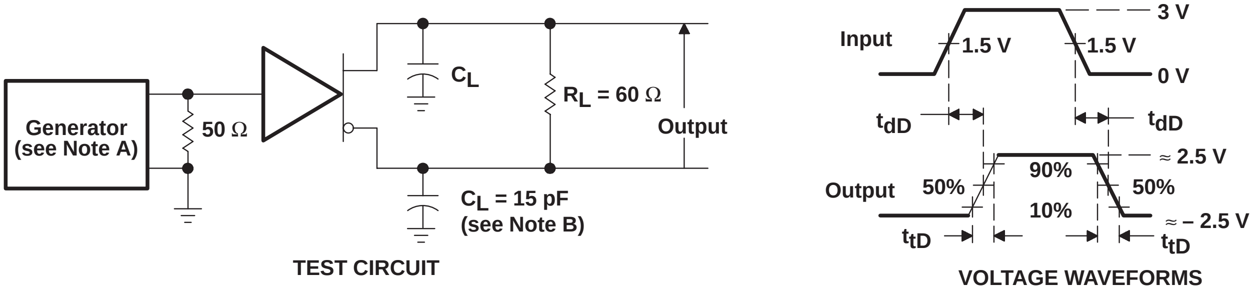


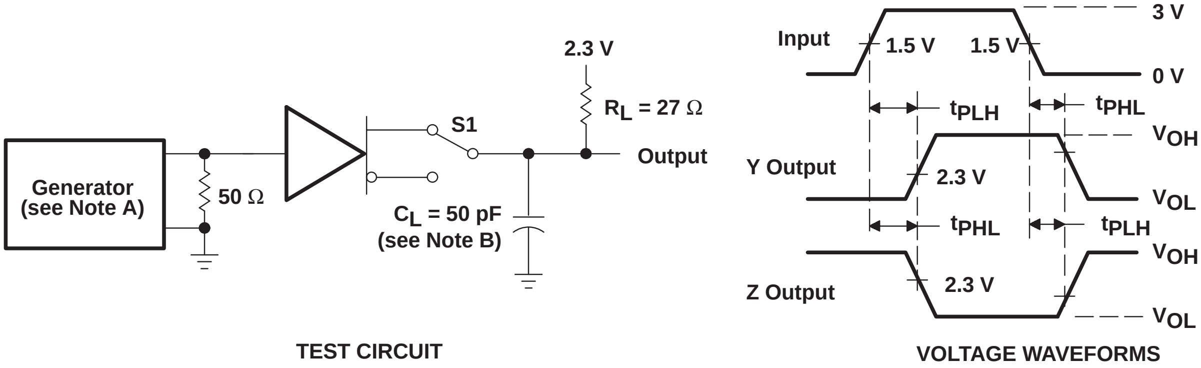
Figure 2. Receiver V_{OH} and V_{OL}



TEST CIRCUIT

VOLTAGE WAVEFORMS

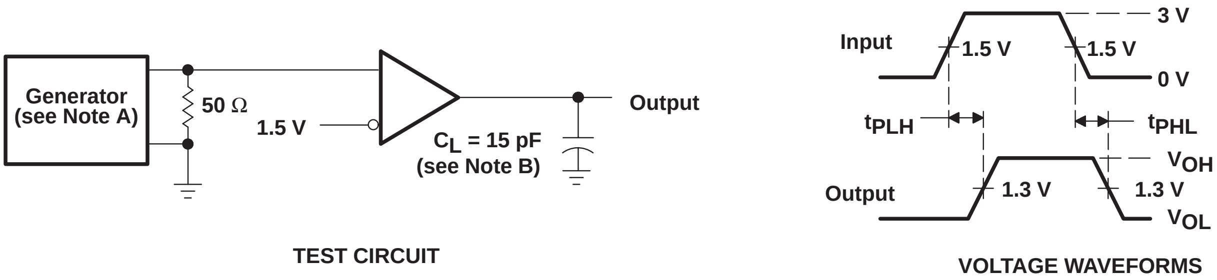
Figure 3. Driver Differential-Output Delay and Transition Times



TEST CIRCUIT

VOLTAGE WAVEFORMS

Figure 4. Driver Test Circuit and Voltage Waveforms



TEST CIRCUIT

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, $Z_O = 50\ \Omega$.

B. C_L includes probe and jig capacitance.

TYPICAL CHARACTERISTICS

**DRIVER HIGH-LEVEL OUTPUT VOLTAGE
vs
DRIVER HIGH-LEVEL OUTPUT CURRENT**

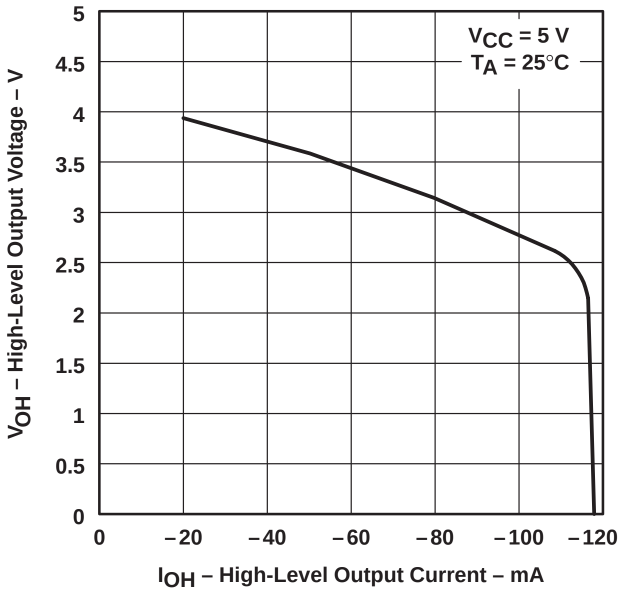


Figure 6

**DRIVER LOW-LEVEL OUTPUT VOLTAGE
vs
DRIVER LOW-LEVEL OUTPUT CURRENT**

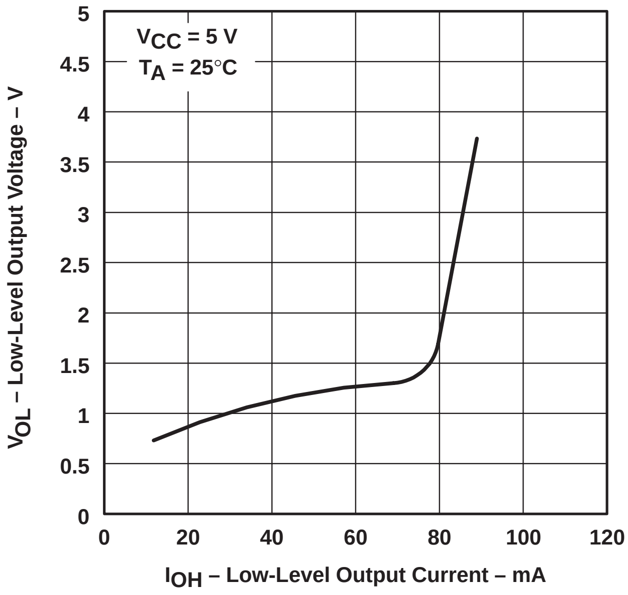


Figure 7

**DRIVER DIFFERENTIAL OUTPUT VOLTAGE
vs
DRIVER OUTPUT CURRENT**

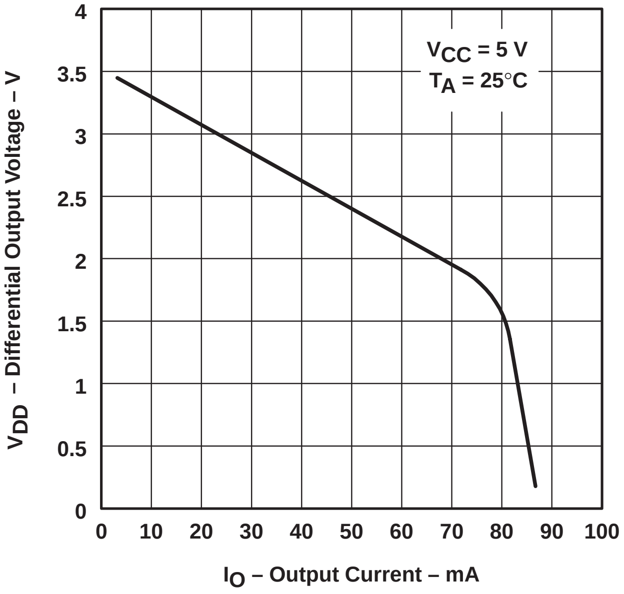


Figure 8

**RECEIVER OUTPUT VOLTAGE
vs
DIFFERENTIAL INPUT VOLTAGE**

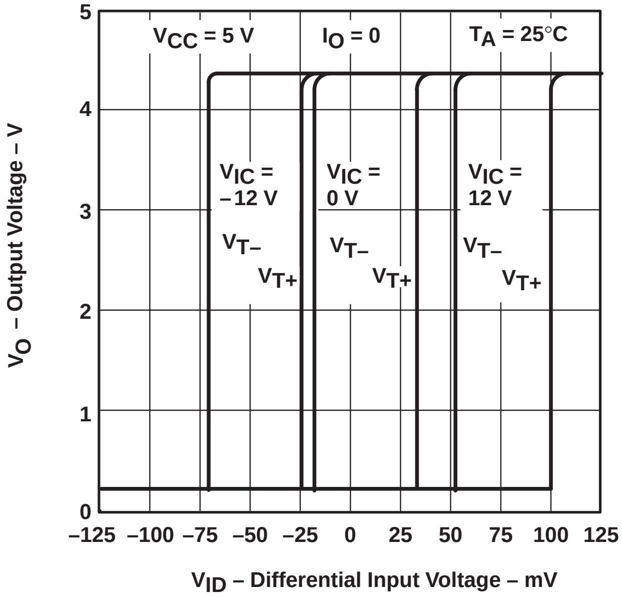


Figure 9

TYPICAL CHARACTERISTICS

RECEIVER HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

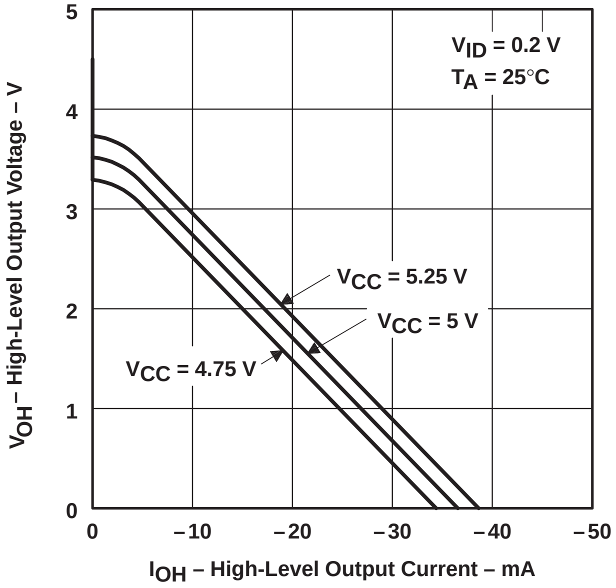


Figure 10

RECEIVER HIGH-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

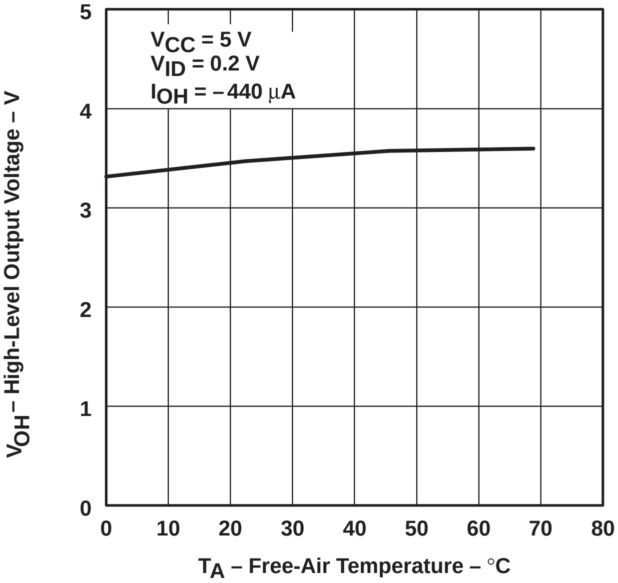


Figure 11

RECEIVER LOW-LEVEL OUTPUT VOLTAGE vs RECEIVER LOW-LEVEL OUTPUT CURRENT

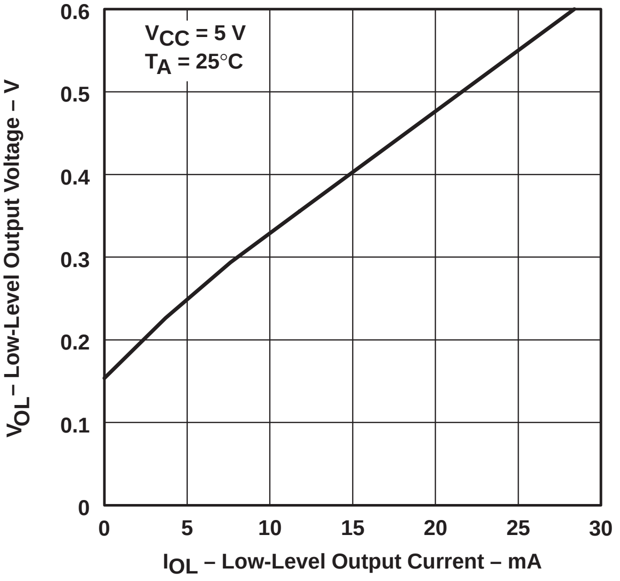


Figure 12

RECEIVER LOW-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

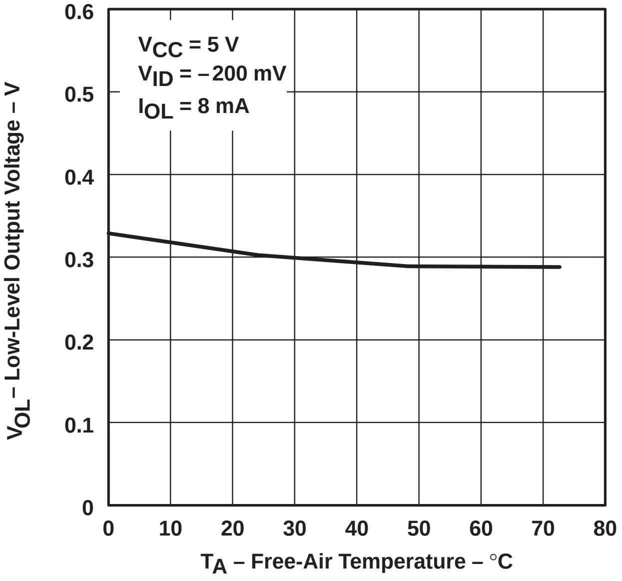


Figure 13

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