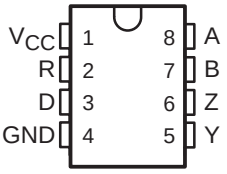
- **Meets or Exceeds the Requirements of TIA/EIA-422-B, TIA/EIA-485-A, and ITU Recommendation V.11**
- **Bus Voltage Range . . . –7 V to 12 V**
- **Positive- and Negative-Current Limiting**
- **Driver Output Capability . . . 60 mA Max**
- **Driver Thermal-Shutdown Protection**
- **Receiver Input Impedance . . . 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)



description

The SN75179B is a differential driver and receiver pair designed for balanced transmission-line applications and meets TIA/EIA-422-B, TIA/EIA-485-A, and ITU Recommendation V.11. It is designed to improve the performance of full-duplex data communications over long bus lines.

The SN75179B driver output provides limiting for both positive and negative currents. 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 –7 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 SN75179B is designed to drive current loads of up to 60 mA maximum.

The SN75179B is characterized for operation from 0°C to 70°C.

Function Tables

DRIVER

INPUT D	OUTPUTS Y	Z
H	H	L
L	L	H

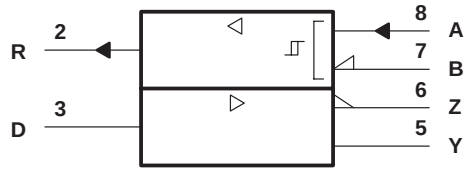
RECEIVER

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
Open	?

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

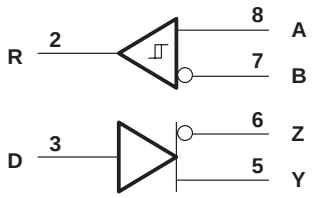
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

logic symbol†



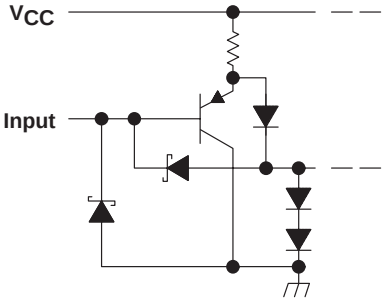
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



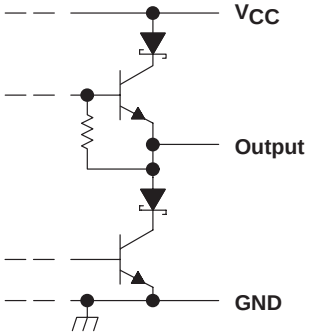
schematics of inputs and outputs

EQUIVALENT OF DRIVER INPUT

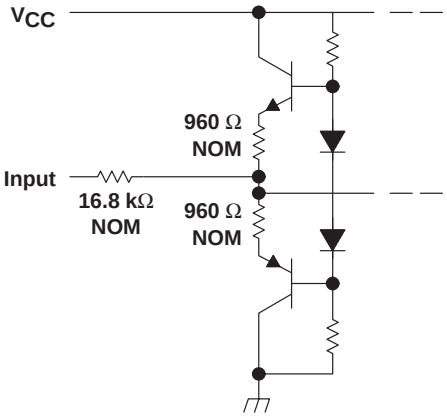


Driver input: $R_{(eq)}$ = 3 kΩ NOM
$R_{(eq)}$ = equivalent resistor

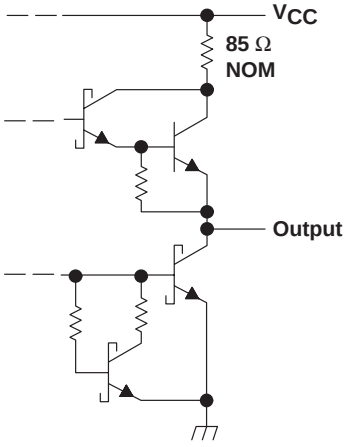
TYPICAL OF ALL DRIVER OUTPUTS



EQUIVALENT OF EACH RECEIVER INPUT



TYPICAL OF ALL RECEIVER 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, V_{ID} (see Note 2) . . . . . ±25 V
Package thermal impedance, θ_{JA} (see Note 3): D package . . . . . 197°C/W
P package . . . . . 104°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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.
3. 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

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	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_O	Output voltage	I_O = 0		0		6	V
$\lvert V_{OD1} \rvert$	Differential output voltage	I_O = 0		1.5		6	V
$\lvert V_{OD2} \rvert$	Differential output voltage	R_L = 100 Ω,	See Figure 1	1/2V_{OD1} or 2‡			V
		R_L = 54 Ω,	See Figure 1	1.5	2.5	5	V
$\lvert V_{OD3} \rvert$	Differential output voltage	See Note 4		1.5		5	V
$\Delta\lvert V_{OD} \rvert$	Change in magnitude of common-mode output voltage§					±0.2	V
V_{OC}	Common-mode output voltage	R_L = 54 Ω or 100 Ω,	See Figure 1			3 –1	V
$\Delta\lvert V_{OC} \rvert$	Change in magnitude of common-mode output voltage§					±0.2	V
I_O	Output current	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				–200	µA
I_{OS}	Short-circuit output current	V_O = –7 V				–250	mA
		V_O = V_{CC} or 12 V				250	
I_{CC}	Supply current (total package)	No load			57	70	mA

† All typical values are at V_{CC} = 5 V and T_A = 25°C.
‡ The minimum V_{OD2} with 100-Ω load is either 1/2 V_{OD2} or 2 V, whichever is greater.
§ $\Delta\lvert V_{OD} \rvert$ and $\Delta\lvert V_{OC} \rvert$ are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input changes from a high level to a low level.
NOTE 4: See TIA/EIA-485-A, Figure 3.5, Test Termination Measurement 2.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
$t_{d(OD)}$	Differential output delay time	R_L = 54 Ω,	See Figure 3		15	22	ns
$t_{t(OD)}$	Differential output transition time				20	30	ns

Symbol Equivalents

DATA-SHEET PARAMETER	TIA/EIA-422-B	TIA/EIA-485-A
V_O	V_{oa}, V_{ob}	V_{oa}, V_{ob}
$\lvert V_{OD1} \rvert$	V_o	V_o
$\lvert V_{OD2} \rvert$	V_t (R_L = 100 Ω)	V_t (R_L = 54 Ω)
$\lvert V_{OD3} \rvert$		V_t (Test Termination Measurement 2)
$\Delta\lvert V_{OD} \rvert$	$\lvert\lvert V_t \rvert - \lvert \overline{V}_t \rvert\rvert$	$\lvert\lvert V_t \rvert - \lvert \overline{V}_t \rvert\rvert$
V_{OC}	$\lvert V_{os} \rvert$	$\lvert V_{os} \rvert$
$\Delta\lvert V_{OC} \rvert$	$\lvert V_{os} - \overline{V}_{os} \rvert$	$\lvert V_{os} - \overline{V}_{os} \rvert$
I_{OS}	$\lvert I_{sa} \rvert$, $\lvert I_{sb} \rvert$	
I_O	$\lvert I_{xa} \rvert$, $\lvert I_{xb} \rvert$	I_{ia}, I_{ib}

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_{IT+}	Positive-going input threshold voltage	V_O = 2.7 V,	I_O = –0.4 mA				0.2	V
V_{IT-}	Negative-going input threshold voltage	V_O = 0.5 V,	I_O = 8 mA		–0.2‡			V
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)					50		mV
V_{OH}	High-level output voltage	V_{ID} = 200 mV,	I_{OH} = –400 μA,	See Figure 2	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 5	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				57	70	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 5: Refer to TIA/EIA-422-B 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 4		19	35	ns
t_{PHL}	Propagation delay time, high- to low-level output			30	40	ns

PARAMETER MEASUREMENT INFORMATION

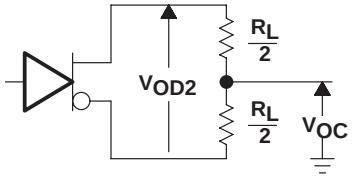


Figure 1. Driver V_{DD} and V_{OC}

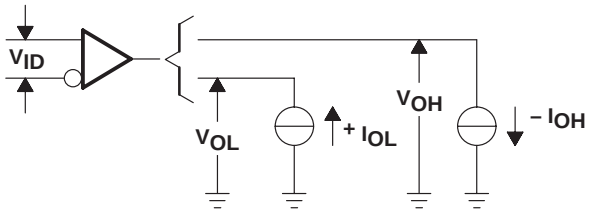
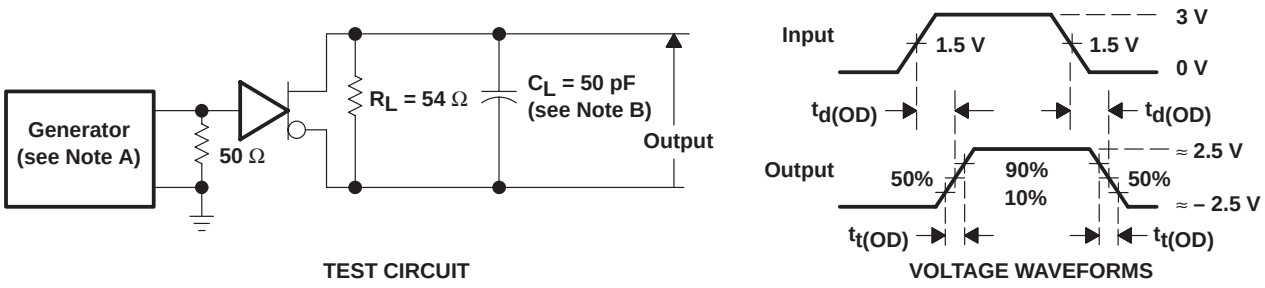


Figure 2. Receiver V_{OH} and V_{OL}

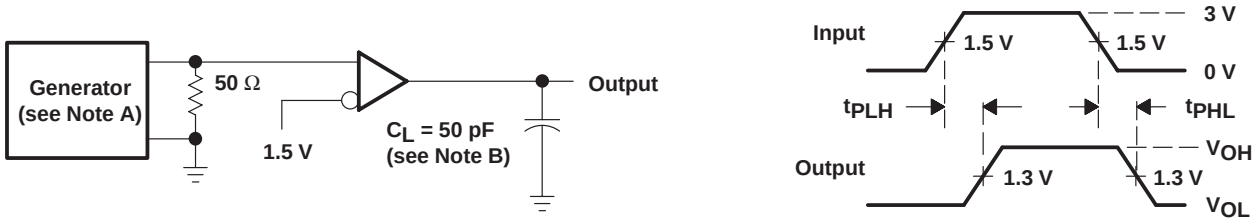
PARAMETER MEASUREMENT INFORMATION (CONTINUED)



TEST CIRCUIT **VOLTAGE WAVEFORMS**

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 1 MHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6 ns, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.

Figure 3. Driver Test Circuit and Voltage Waveforms



TEST CIRCUIT **VOLTAGE WAVEFORMS**

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 1 MHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6 ns, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.

Figure 4. Receiver Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

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

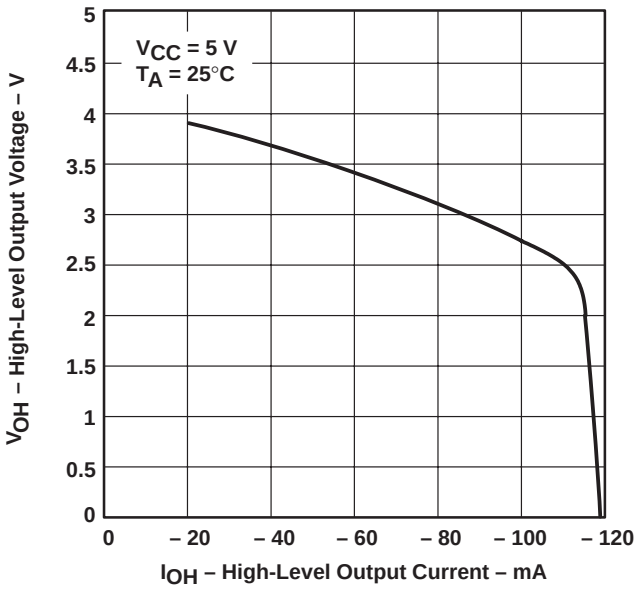


Figure 5

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

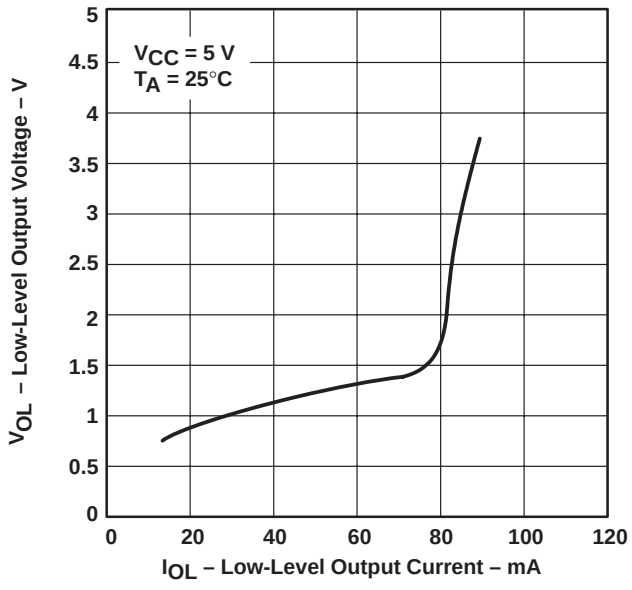


Figure 6

DRIVER
DIFFERENTIAL OUTPUT VOLTAGE
vs
OUTPUT CURRENT

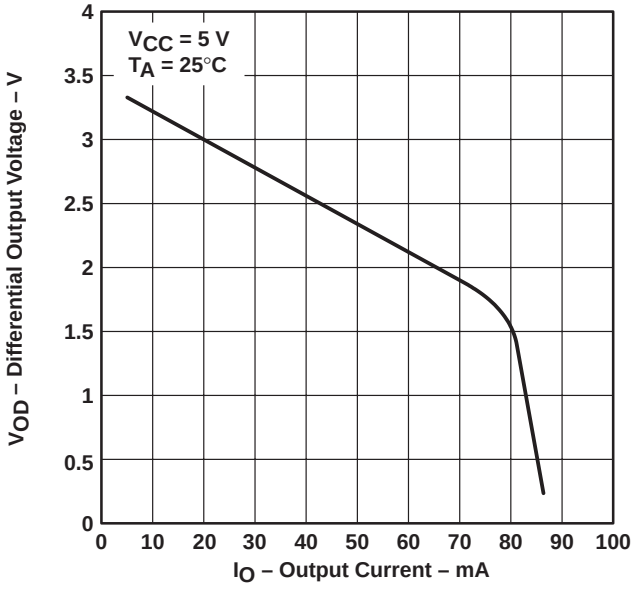


Figure 7

RECEIVER
OUTPUT VOLTAGE
vs
DIFFERENTIAL INPUT VOLTAGE

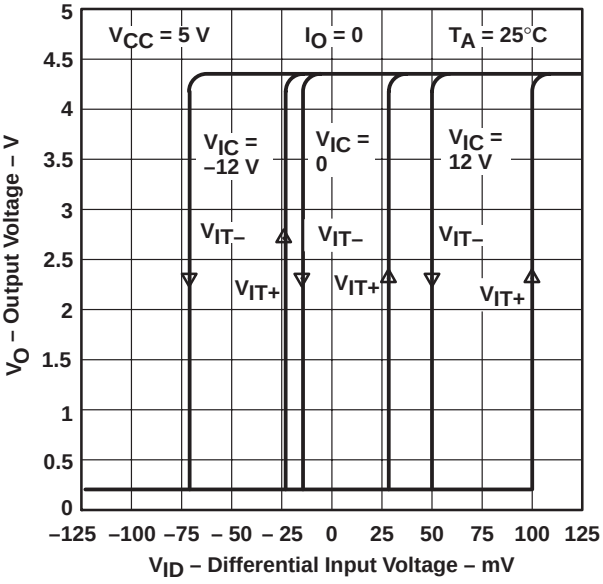


Figure 8

TYPICAL CHARACTERISTICS

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

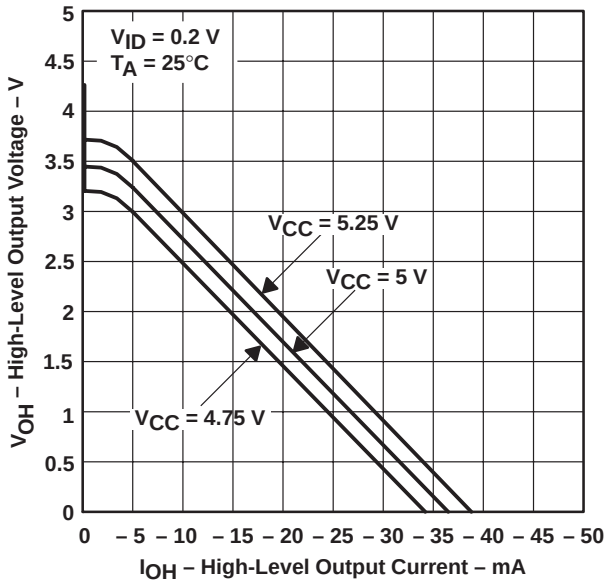


Figure 9

HIGH-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

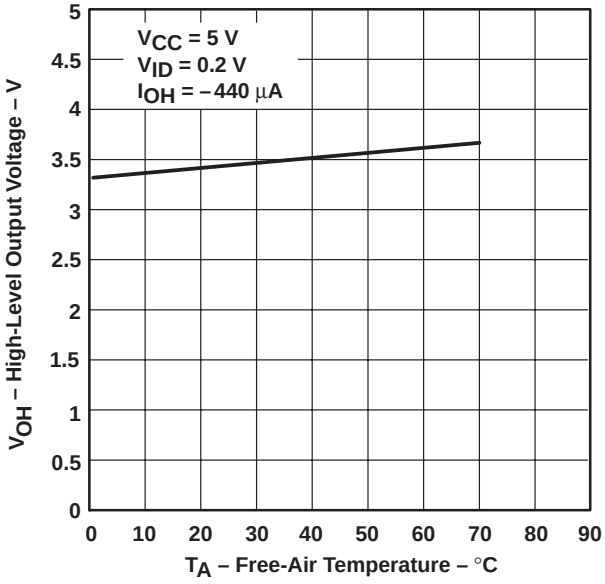


Figure 10

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

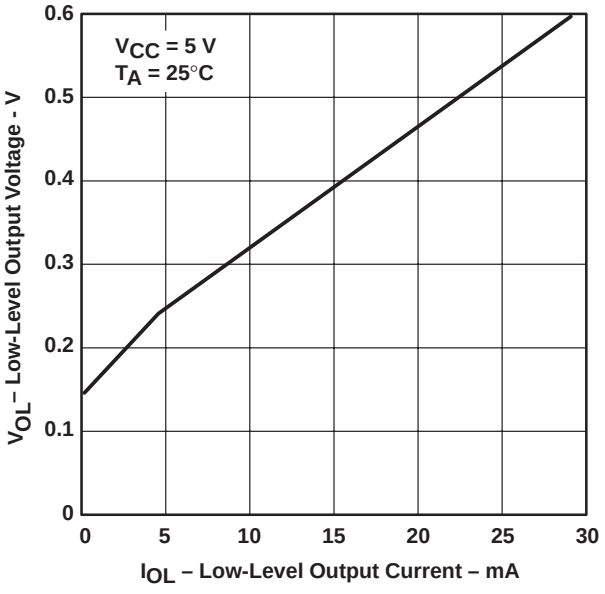


Figure 11

RECEIVER LOW-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

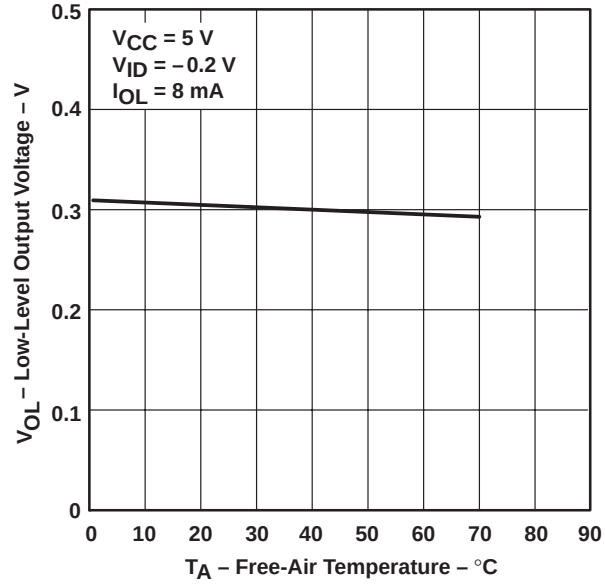


Figure 12

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