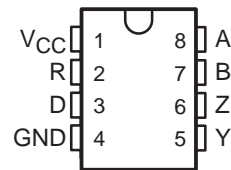


SN75179B DIFFERENTIAL DRIVER AND RECEIVER PAIR

SLLS003E – OCTOBER 1985 – REVISED JUNE 1998

- 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 k Ω 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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

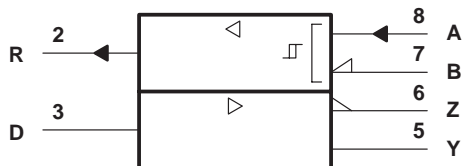
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1998, Texas Instruments Incorporated

SN75179B DIFFERENTIAL DRIVER AND RECEIVER PAIR

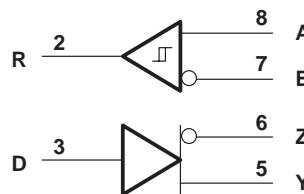
SLLS003E – OCTOBER 1985 – REVISED JUNE 1998

logic symbol†

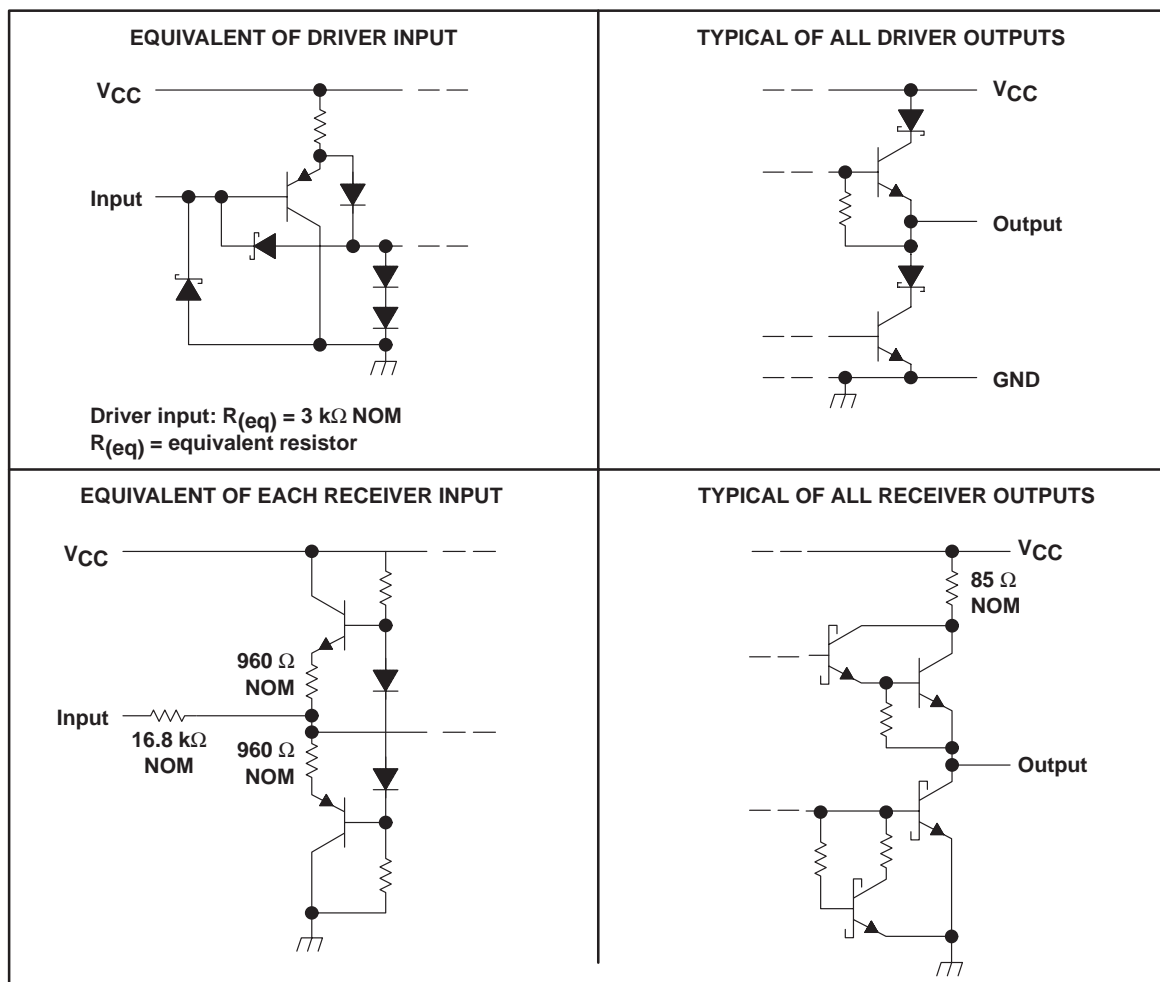


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



schematics of inputs and outputs



SN75179B DIFFERENTIAL DRIVER AND RECEIVER PAIR

SLLS003E – OCTOBER 1985 – REVISED JUNE 1998

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 |
| | P package |
| 197°C/W | |
| 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.



SN75179B

DIFFERENTIAL DRIVER AND RECEIVER PAIR

SLLS003E – OCTOBER 1985 – REVISED JUNE 1998

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 | $I_I = -18 \text{ mA}$ | | | -1.5 | V |
| V_O Output voltage | $I_O = 0$ | 0 | | 6 | V |
| $ V_{OD1} $ Differential output voltage | $I_O = 0$ | 1.5 | | 6 | V |
| $ V_{OD2} $ Differential output voltage | $R_L = 100 \Omega$, See Figure 1 | | | $1/2 V_{OD1}$ or $2\ddagger$ | V |
| | $R_L = 54 \Omega$, See Figure 1 | 1.5 | 2.5 | 5 | V |
| $ V_{OD3} $ Differential output voltage | See Note 4 | 1.5 | | 5 | V |
| $\Delta V_{OD} $ Change in magnitude of common-mode output voltage§ | | | | ± 0.2 | V |
| V_{OC} Common-mode output voltage | $R_L = 54 \Omega$ or 100Ω , See Figure 1 | | | 3 -1 | V |
| $\Delta V_{OC} $ Change in magnitude of common-mode output voltage§ | | | | ± 0.2 | V |
| I_O Output current | $V_{CC} = 0$, $V_O = -7 \text{ V to } 12 \text{ V}$ | | | ± 100 | μA |
| I_{IH} High-level input current | $V_I = 2.4 \text{ V}$ | | | 20 | μA |
| I_{IL} Low-level input current | $V_I = 0.4 \text{ V}$ | | | -200 | μA |
| I_{OS} Short-circuit output current | $V_O = -7 \text{ V}$ | | | -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 $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$.

‡ The minimum V_{OD2} with $100\text{-}\Omega$ load is either $1/2 V_{OD2}$ or 2 V , whichever is greater.

§ $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ 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, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|----------------------------------|-----|-----|-----|------|
| $t_{d(OD)}$ Differential output delay time | $R_L = 54 \Omega$, 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} |
| $ V_{OD1} $ | V_o | V_o |
| $ V_{OD2} $ | $V_t (R_L = 100 \Omega)$ | $V_t (R_L = 54 \Omega)$ |
| $ V_{OD3} $ | | V_t (Test Termination Measurement 2) |
| $\Delta V_{OD} $ | $ V_t - \bar{V}_t $ | $ V_t - \bar{V}_t $ |
| V_{OC} | $ V_{os} $ | $ V_{os} $ |
| $\Delta V_{OC} $ | $ V_{os} - \bar{V}_{os} $ | $ V_{os} - \bar{V}_{os} $ |
| I_{OS} | $ I_{sa} , I_{sb} $ | |
| I_O | $ I_{xa} , I_{xb} $ | 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 | $V_O = 2.7\text{ V}$, $I_O = -0.4\text{ mA}$ | | | 0.2 | V |
| V_{IT-} Negative-going input threshold voltage | $V_O = 0.5\text{ V}$, $I_O = 8\text{ mA}$ | -0.2‡ | | | V |
| V_{hys} Hysteresis voltage ($V_{IT+} - V_{IT-}$) | | | 50 | | mV |
| V_{OH} High-level output voltage | $V_{ID} = 200\text{ mV}$, $I_{OH} = -400\text{ }\mu\text{A}$, See Figure 2 | | 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 5 | | | | mA |
| | $V_I = 12\text{ V}$ | | | 1 | |
| | $V_I = -7\text{ V}$ | | | -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 | | 57 | 70 | 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 5: Refer to TIA/EIA-422-B 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 V , | | 19 | 35 | ns |
| t_{PHL} Propagation delay time, high- to low-level output | $C_L = 15\text{ pF}$, See Figure 4 | | 30 | 40 | ns |

PARAMETER MEASUREMENT INFORMATION

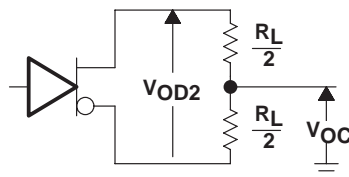


Figure 1. Driver V_{DD} and V_{OC}

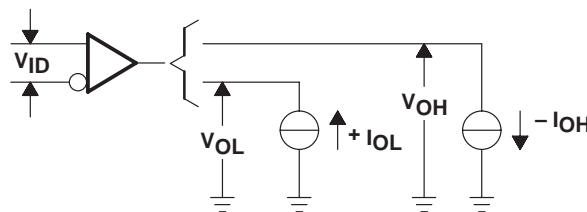
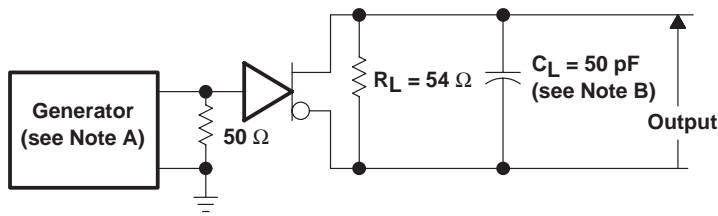


Figure 2. Receiver V_{OH} and V_{OL}

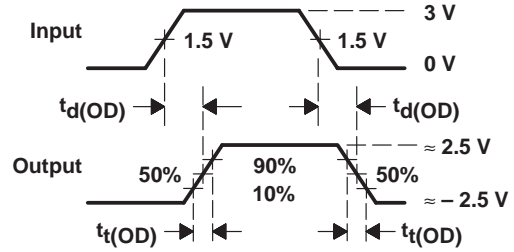
SN75179B DIFFERENTIAL DRIVER AND RECEIVER PAIR

SLLS003E – OCTOBER 1985 – REVISED JUNE 1998

PARAMETER MEASUREMENT INFORMATION (CONTINUED)



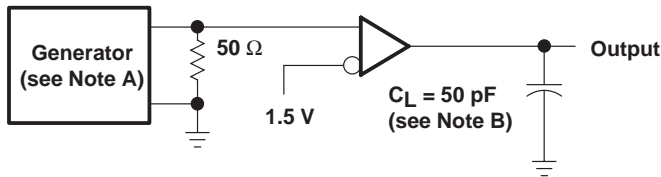
TEST CIRCUIT



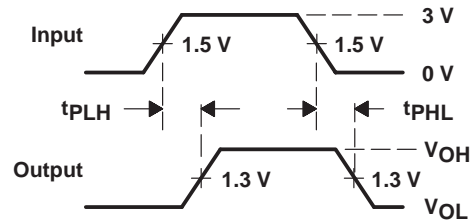
VOLTAGE WAVEFORMS

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

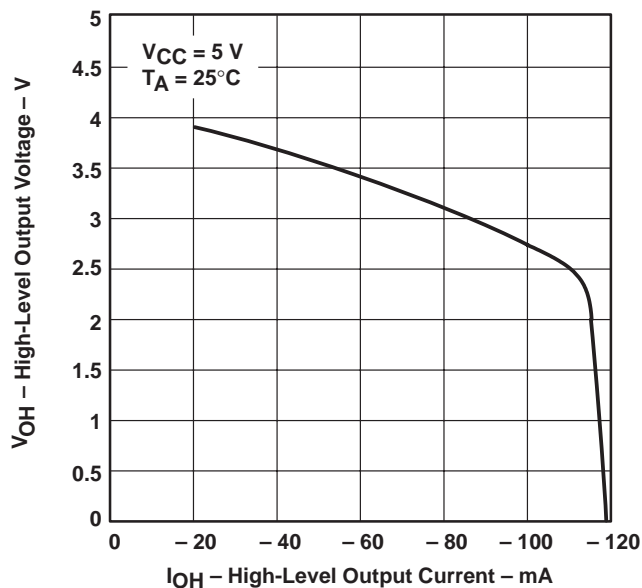


Figure 5

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

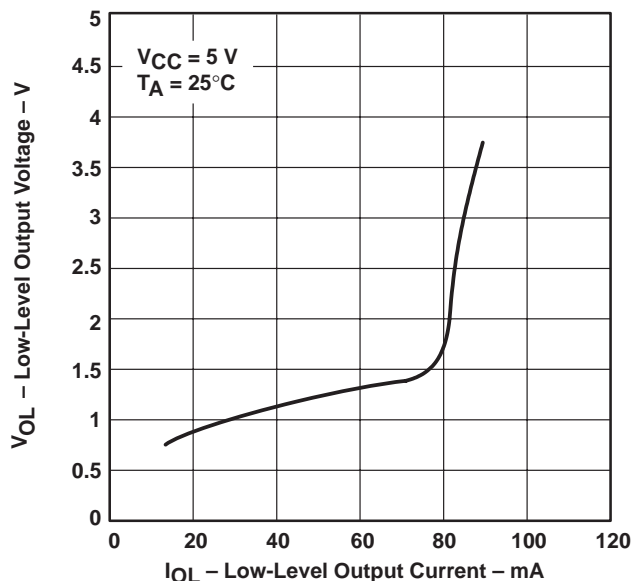


Figure 6

DRIVER
DIFFERENTIAL OUTPUT VOLTAGE
vs
OUTPUT CURRENT

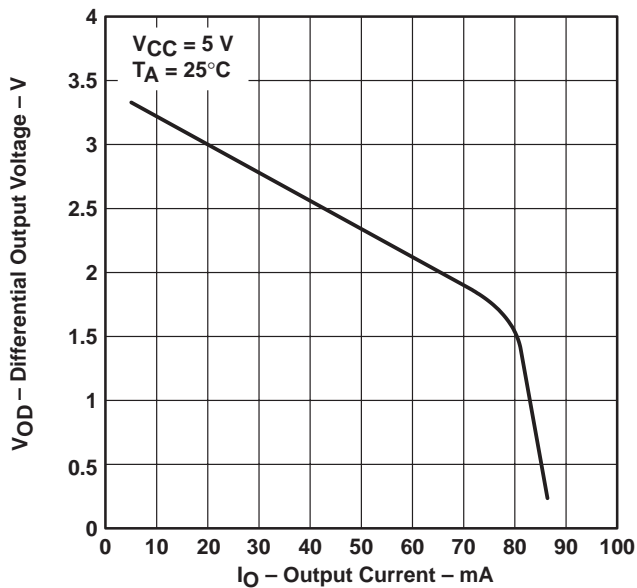


Figure 7

RECEIVER
OUTPUT VOLTAGE
vs
DIFFERENTIAL INPUT VOLTAGE

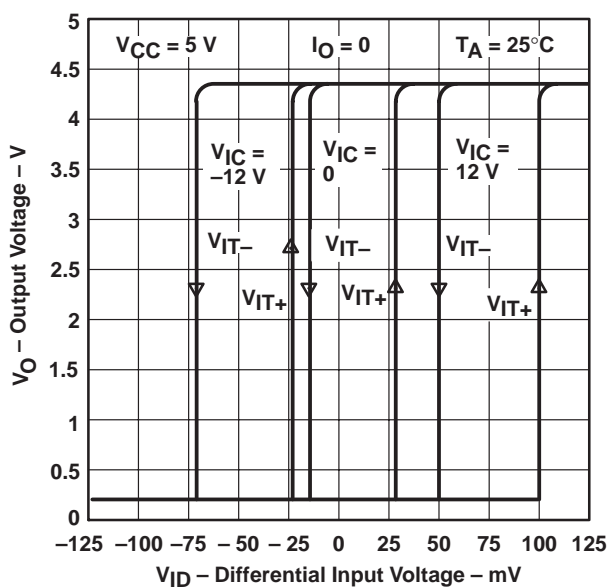


Figure 8

SN75179B DIFFERENTIAL DRIVER AND RECEIVER PAIR

SLLS003E – OCTOBER 1985 – REVISED JUNE 1998

TYPICAL CHARACTERISTICS

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

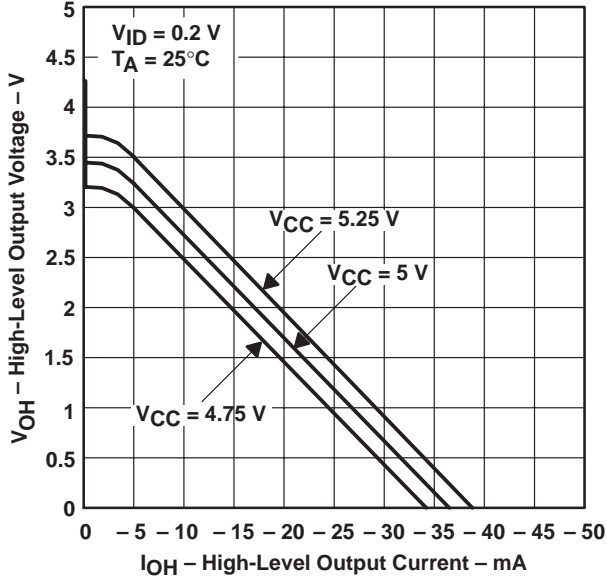


Figure 9

HIGH-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

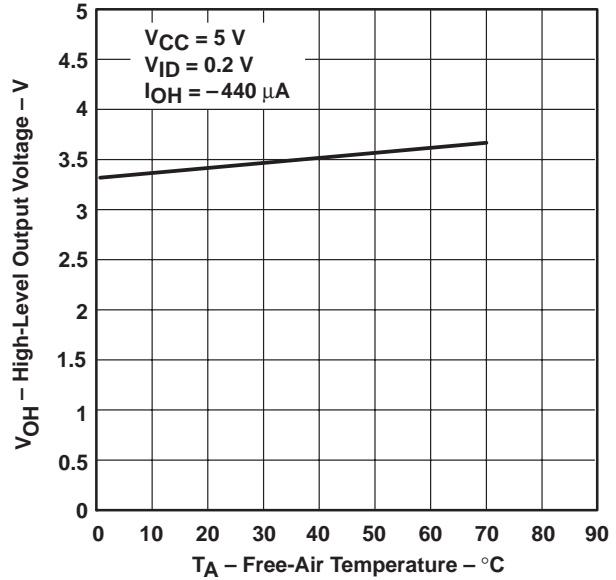


Figure 10

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

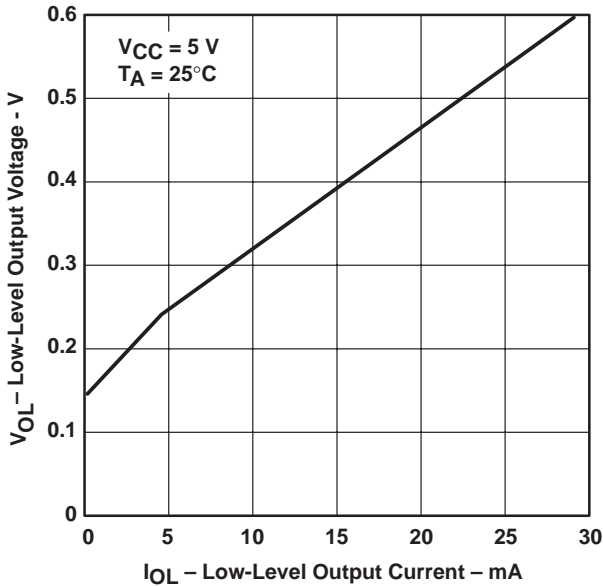


Figure 11

RECEIVER
LOW-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

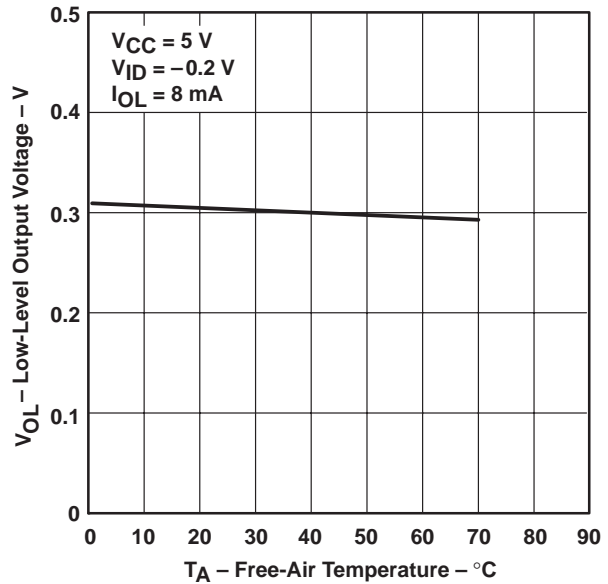


Figure 12