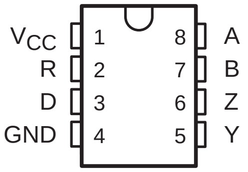
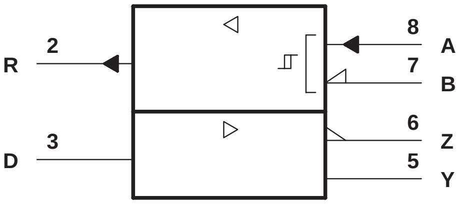
- **Meets EIA Standards RS-422A, RS423A, and CCITT Recommendations V.11 and X.27**
- **Bus Voltage Range . . . –7 V to 12 V**
- **Positive and Negative Current Limiting**
- **Driver Output Capability . . . 60 mA Max**
- **Driver Thermal Shutdown Protection**
- **Receiver Input Impedance . . . 12 kΩ Min**
- **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)**

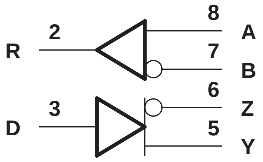


**NOT RECOMMENDED FOR NEW DESIGN**

## logic symbol



## logic diagram



## 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.

### Function Tables

**DRIVER**

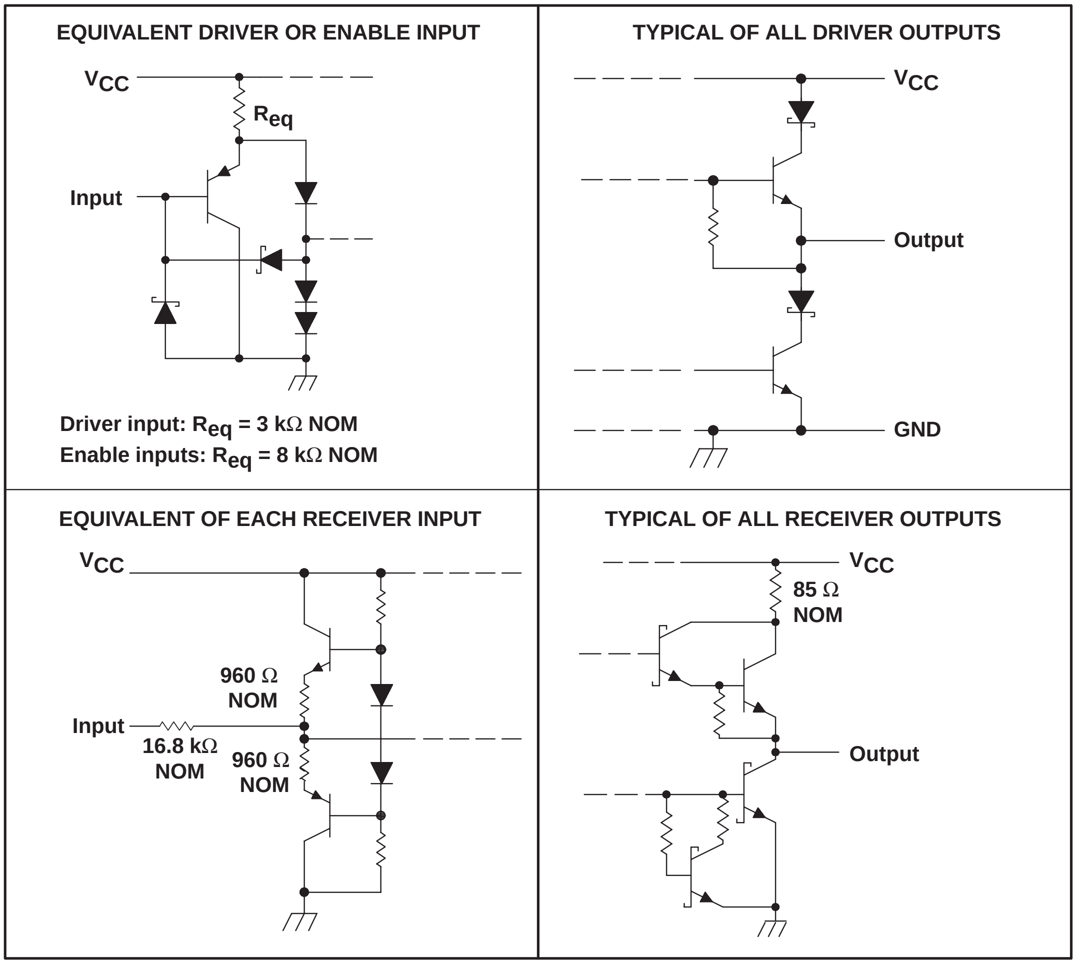
| INPUT<br>D | OUTPUTS<br>Y | <br>Z |
|---|---|---|
| H | H | L |
| L | L | H |

**RECEIVER**

| DIFFERENTIAL INPUTS<br>A – B | OUTPUT<br>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

## schematics of inputs and outputs



EQUIVALENT DRIVER OR ENABLE INPUT

Driver input: $R_{eq}$ = 3 kΩ NOM
Enable inputs: $R_{eq}$ = 8 kΩ NOM

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 (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 | $T_A \leq 25°C$ 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,<br>$I_{OH} = –33$ mA | $V_{IL} = 0.8$ V, | | 3.7 | | V |
| $V_{OL}$ | Low-level output voltage | $V_{IH} = 2$ V,<br>$I_{OH} = 33$ mA | $V_{IL} = 0.8$ V, | | 1.1 | | V |
| $\lvert V_{OD1} \rvert$ | Differential output voltage | $I_O = 0$ | | | | 2 $V_{OD2}$ | V |
| $\lvert V_{OD2} \rvert$ | 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 | | |
| $\Delta\lvert V_{OD} \rvert$ | 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 |
| $\Delta\lvert V_{OC} \rvert$ | 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 $T_A = 25°C$.

[§] $\Delta\lvert V_{OD} \rvert$ and $\Delta\lvert V_{OC} \rvert$ are the changes in magnitude of $V_{OD}$ and $V_{OC}$, respectively, that occur when the input 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,<br>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,<br>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,<br>See Figure 5 | | 26 | 35 | ns |
| $t_{PHL}$ | Propagation delay time, high-to-low-level output | | | 27 | 35 | ns |

## PARAMETER MEASUREMENT INFORMATION

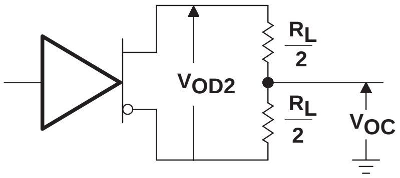


Figure 1. Driver $V_{OD}$ and $V_{OC}$

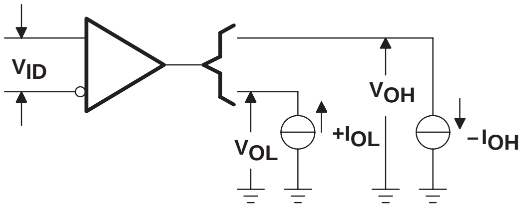
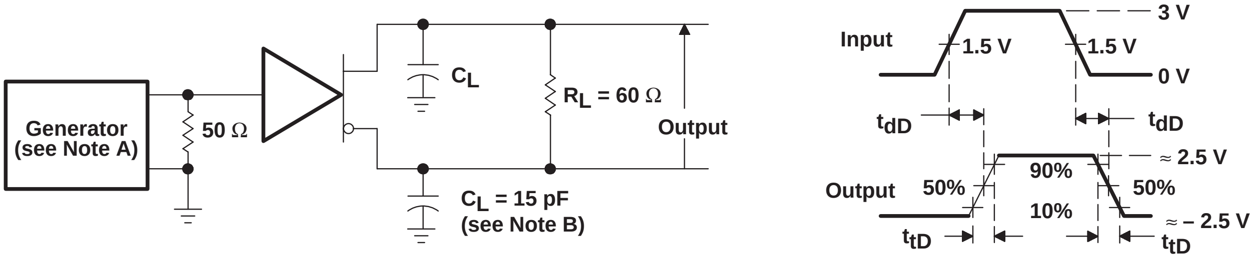


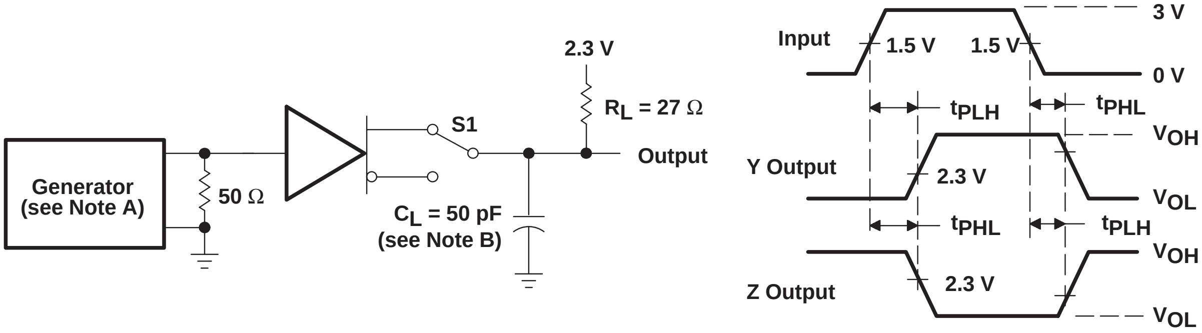
Figure 2. Receiver $V_{OH}$ and $V_{OL}$



TEST CIRCUIT

VOLTAGE WAVEFORMS

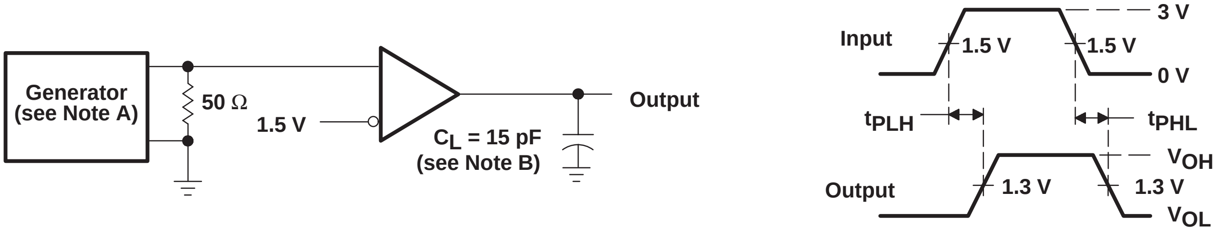
Figure 3. Driver Differential-Output Delay and Transition Times



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, $t_r \le 6$ ns, $t_f \le 6$ 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

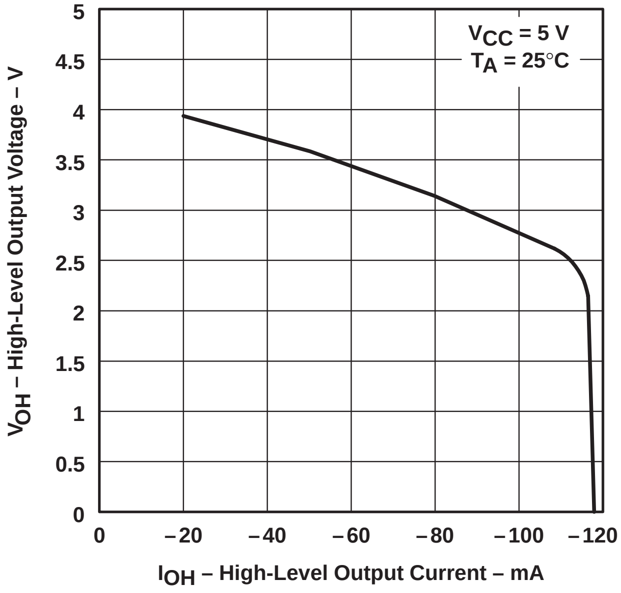


Figure 6

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

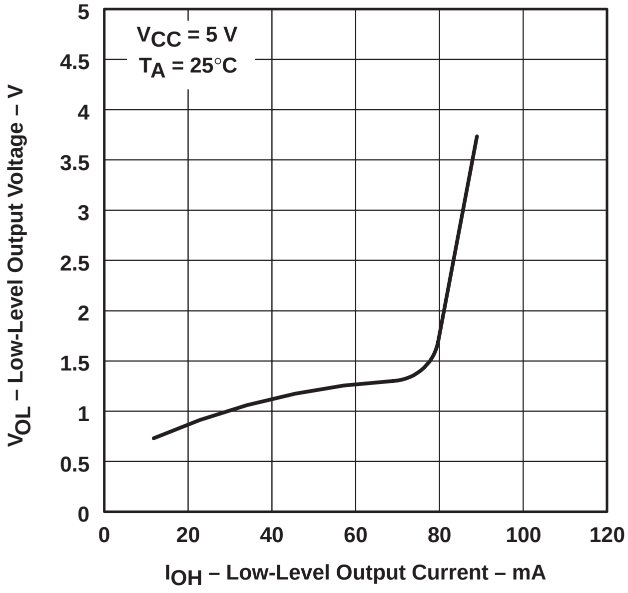


Figure 7

### DRIVER DIFFERENTIAL OUTPUT VOLTAGE vs DRIVER OUTPUT CURRENT

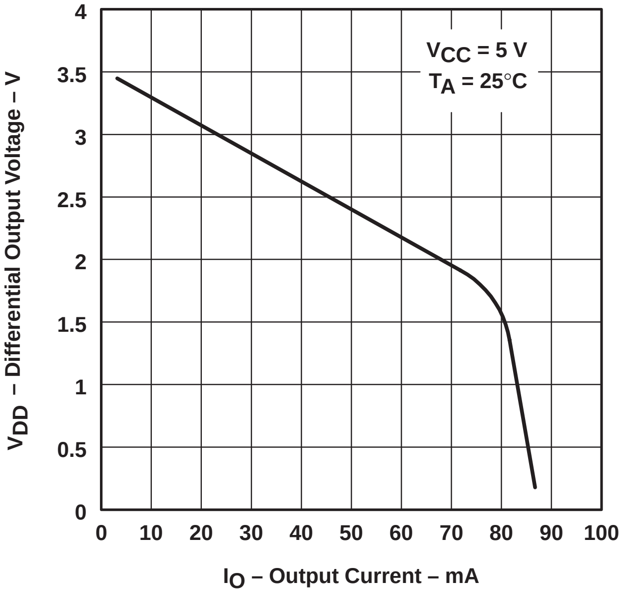


Figure 8

### RECEIVER OUTPUT VOLTAGE vs DIFFERENTIAL INPUT VOLTAGE

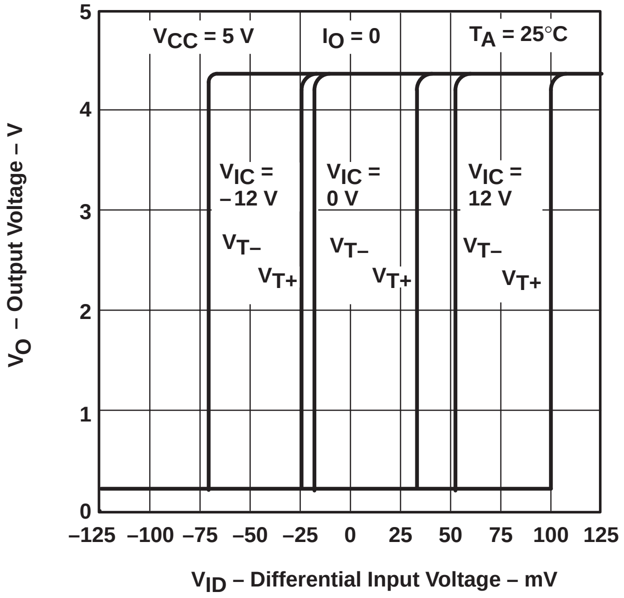


Figure 9

## TYPICAL CHARACTERISTICS

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

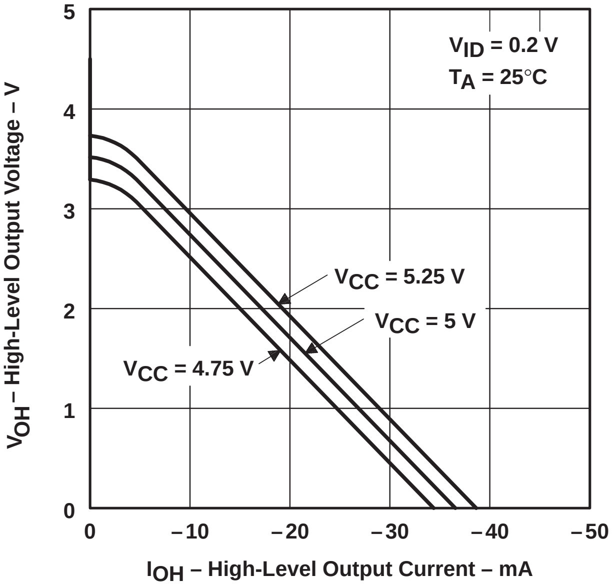


Figure 10

### RECEIVER HIGH-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

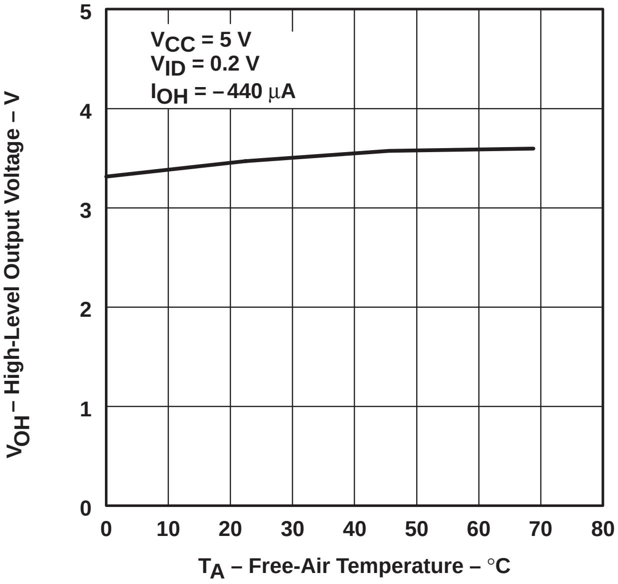


Figure 11

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

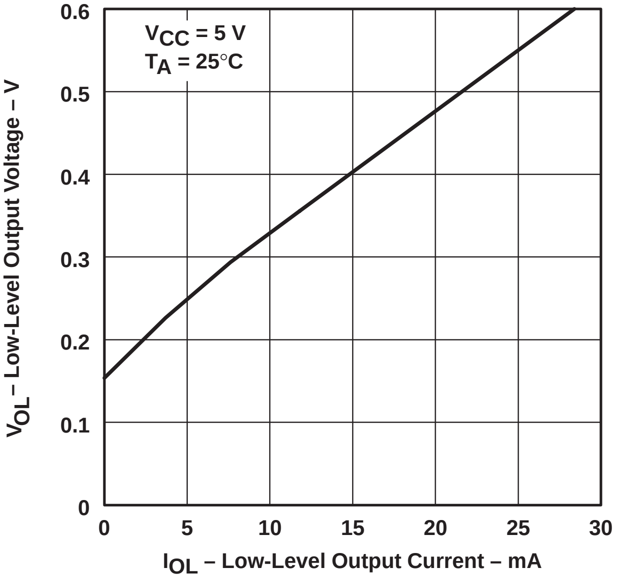


Figure 12

### RECEIVER LOW-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

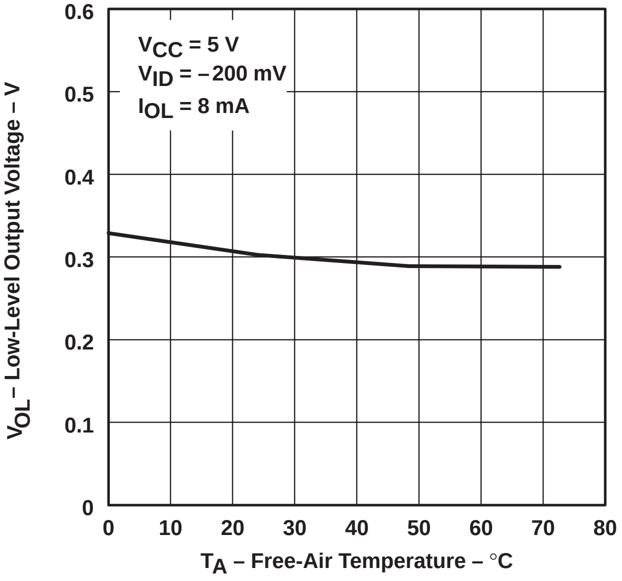


Figure 13

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