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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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R2A11210SP

Bus Interface Driver/Receiver IC

REJ03F0284-0100
 Rev.1.00
 Apr 24, 2008

Description

The R2A11210SP is developed to be used as a bus interface driver/receiver IC in automotive audio equipment controllers. It implements a two-wire serial bus.

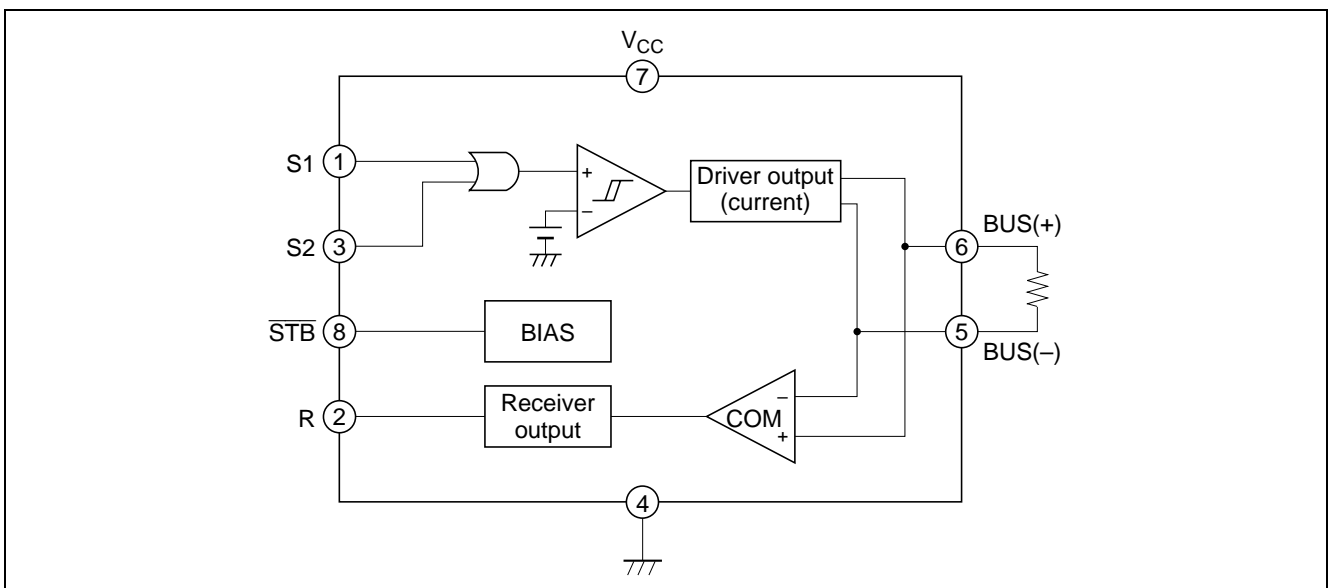
Functions

- Two-input OR circuit
- Input comparator circuit (3.3 V and 5.0 V available)
- Current output driver circuit
- Receiver input comparator circuit
- Receiver output circuit (Open-collector output)
- Standby circuit

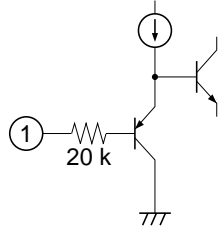
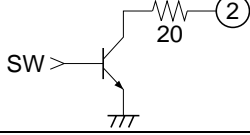
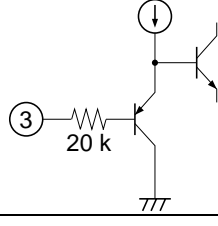
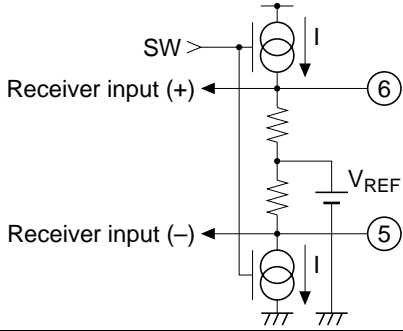
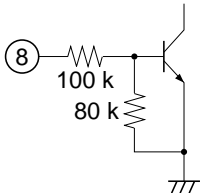
Features

- Supports two data inputs (Pins 1 and 3 are the input pins)
- Comparators with hysteresis characteristics are adopted for the inputs (3.3 V and 5.0 V available)
- Current drive output drivers adopted (Output current: 3.8 mA typical)
- Comparators with hysteresis characteristics are adopted for the receivers
- Wide receiver common-mode input operating range (Common-mode input operating range: 0 to 5 V typical)
- The driver output /the receiver input (pins 5 and 6) can withstand high voltages (Maximum ratings of 18 V)
- Standby functions (standby mode when pin 8 becomes low level)
- Operating power-supply voltage range of 5 V \pm 0.5 V

Block Diagram



Pin Functions

| Pin No. | Symbol | Function | Equivalent Circuit |
|---------|------------------|---|---|
| 1 | S1 | Data input pin 1 |  |
| 2 | R | Receiver output pin |  |
| 3 | S2 | Data input pin 2 |  |
| 4 | GND | GND pin | |
| 5 | BUS(-) | Bus output (-), Receiver input (-) pin |  |
| 6 | BUS(+) | Bus output (+), Receiver input (+) pin | |
| 7 | V _{CC} | Power supply pin | |
| 8 | \overline{STB} | Standby input pin (Lo: ON, Hi: OFF) |  |

Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | Unit | Note |
|-----------------------------|------------------|---------------------------------|------|-----------|
| Power-supply voltage | V _{CC} | 7 | V | |
| Input voltage | V _{IN} | GND-0.3 to V _{CC} +0.3 | V | |
| Bus input voltage | V _{bus} | 18 | V | |
| Allowable power dissipation | P _d | 400 | mW | Ta ≤ 85°C |
| Operating temperature | Topr | -40 to +85 | °C | |
| Storage temperature | Tstg | -55 to +125 | °C | |

Note: Recommended operating power supply voltage range: 5 V ± 0.5 V

Electrical Characteristics

(V_{CC} = 5.0 V, Ta = 25°C)

| Item | | Symbol | Min | Typ | Max | Unit | Test Conditions | Test Pin | Test Circuit |
|---------------------------------|-------------------------------|-------------------|-----|-----|------|------|---|----------|--------------|
| S1 | High-level input voltage | V _{IHS1} | 2.1 | — | — | V | V1 = 0→5 V, V3 = 0 V, V6 - V5 = 110 mV↑ | 1 | Fig. 1 |
| | Low-level input voltage | V _{ILS1} | — | — | 1.65 | V | V1 = 5→0 V, V3 = 0 V, V6 - V5 = 30 mV↓ | 1 | |
| | High-level input current | I _{IHS1} | — | — | 1 | μA | V1 = 5 V, V3 = 0 V | 1 | |
| | Low-level input current | I _{ILS1} | — | — | 1 | μA | V1 = 0 V, V3 = 0 V | 1 | |
| S2 | High-level input voltage | V _{IHS2} | 2.1 | — | — | V | V3 = 0→5 V, V1 = 0 V, V6 - V5 = 110 mV↑ | 3 | Fig. 1 |
| | Low-level input voltage | V _{ILS2} | — | — | 1.65 | V | V3 = 5→0 V, V1 = 0 V, V6 - V5 = 30 mV↓ | 3 | |
| | High-level input current | I _{IHS2} | — | — | 1 | μA | V1 = 0 V, V3 = 5 V | 3 | |
| | Low-level input current | I _{ILS2} | — | — | 1 | μA | V1 = 0 V, V3 = 0 V | 3 | |
| Driver | High-level output voltage (+) | V _{OHD+} | 1.8 | 2.5 | 3.2 | V | V1 = 5 V, V3 = 0 V | 6 | Fig. 1 |
| | High-level output voltage (-) | V _{OHD-} | 1.8 | 2.5 | 3.2 | V | V1 = 5 V, V3 = 0 V | 5 | |
| | High-level output current | I _{OH} | 3.1 | 3.8 | 4.5 | mA | V1 = 5 V, V3 = 0 V, I _{OH} = ((V _{OHD+}) - (V _{OHD-}))/60 | 5, 6 | |
| | Low-level output current | I _{OL} | — | — | 1 | μA | V1 = 0 V, V3 = 0 V, I _{OL} = ((V _{OP+}) - (V _{OP-}))/R _i | 5, 6 | |
| Reference operating voltage (+) | | V _{OP+} | 2.3 | 2.5 | 2.7 | V | V1 = 0 V, V3 = 0 V | 6 | Fig. 1 |
| Reference operating voltage (-) | | V _{OP-} | 2.3 | 2.5 | 2.7 | V | V1 = 0 V, V3 = 0 V | 5 | Fig. 1 |
| Driver output resistance *1 | | R _O | 5 | 10 | 15 | kΩ | V1 = 5 V, V3 = 0 V, V8 = 5 V, R _O = 0.6 V/(I6A - I6B) | | Fig. 3 |

Note: 1. Measure the current when V6 = (V_{OP+}) + 0.3 V to make I6A and measure the current when V6 = (V_{OP+}) - 0.3 V to make I6B.

Electrical Characteristics (cont.)

(V_{CC} = 5.0 V, T_a = 25°C)

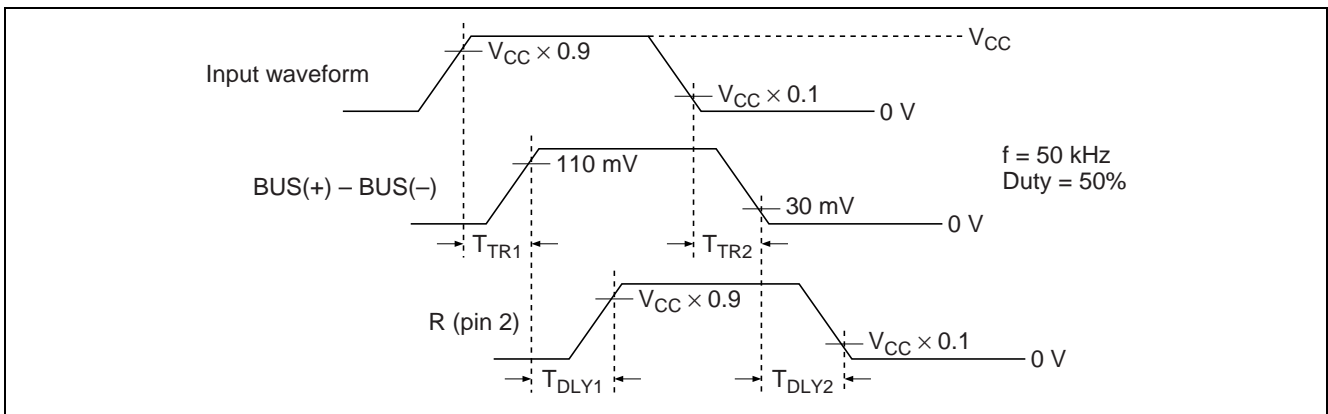
| Item | | Symbol | Min | Typ | Max | Unit | Test Conditions | Test Pin | Test Circuit |
|----------------------------|--------------------------------------|--------------------|------|------|-----|---|--|----------|--------------|
| Receiver | High-level input voltage (1) | V _{IH1} | — | 80 | 110 | mV | V ₆ = 0→5 V, Pin2 = 4 V or more, V ₁ = 0 V, V ₃ = 0 V, V ₅ = 0 V, V _{IH1} = V ₆ - V ₅ | 2 | Fig. 2 |
| | High-level input voltage (2) | V _{IH2} | — | 80 | 110 | mV | V ₆ = 0→5 V, Pin2 = 4 V or more, V ₁ = 0 V, V ₃ = 0 V, V ₅ = 4.5 V, V _{IH2} = V ₆ - V ₅ | 2 | |
| | Low-level input voltage (1) | V _{IL1} | 30 | 50 | — | mV | V ₆ = 5→0 V, Pin2 = 1 V or less, V ₁ = 0 V, V ₃ = 0 V, V ₅ = 0 V, V _{IL1} = V ₆ - V ₅ | 2 | |
| | Low-level input voltage (2) | V _{IL2} | 30 | 50 | — | mV | V ₆ = 5→0 V, Pin2 = 1 V or less, V ₁ = 0 V, V ₃ = 0 V, V ₅ = 4.5 V, V _{IL2} = V ₆ - V ₅ | 2 | |
| | Input hysteresis voltage (1) | V _{IHYS1} | 15 | 30 | 45 | mV | V _{IHYS1} = V _{IH1} - V _{IL1} | | |
| | Input hysteresis voltage (2) | V _{IHYS2} | 15 | 30 | 45 | mV | V _{IHYS2} = V _{IH2} - V _{IL2} | | |
| | High-level common-mode input voltage | V _{IHCOM} | 4.5 | — | — | V | V ₅ = 0→5 V, V ₅ when pin2 = 4 V or less, V ₁ = 0 V, V ₃ = 0 V, V ₆ - V ₅ = 110 mV | 5 | Fig. 2 |
| | Low-level common-mode input voltage | V _{ILCOM} | 5 | — | — | V | V ₅ = 0→5 V, V ₅ when pin2 = 0.3 V or more, V ₁ = 0 V, V ₃ = 0 V, V ₆ - V ₅ = 30 mV | 5 | |
| | Input resistance *1 | R _I | 25 | 35 | 45 | kΩ | V ₁ = 0 V, V ₃ = 0 V, V ₈ = 5 V, R _I = 0.6 V/(I _{6A} - I _{6B}) | 5, 6 | Fig. 3 |
| | High-level output leakage current 1 | I _{OH1} | — | — | 1 | μA | V ₁ = 5 V, V ₃ = 0 V, V ₈ = 5 V | 2 | Fig. 1 |
| | High-level output leakage current 2 | I _{OH2} | — | — | 1 | μA | V _{CC} = 0 V, V ₁ , V ₃ , V ₈ = 0 V | 2 | |
| | High-level output leakage current 3 | I _{OH3} | — | — | 1 | μA | V ₁ , V ₃ , V ₈ = 0 V | 2 | |
| Low-level output voltage 1 | V _{OL1} | — | — | 0.6 | V | V ₁ = 0 V, V ₃ = 0 V, V ₈ = 5 V, Adjust V _{RL} to make apply current = 1.5 mA | 2 | | |
| Low-level output voltage 2 | V _{OL2} | — | — | 0.3 | V | V ₁ = 0 V, V ₃ = 0 V, V ₈ = 5 V, Adjust V _{RL} to make apply current = 200 μA | 2 | | |
| Quiescent current 1 | I _{CCH} | 4.5 | 6.5 | 8.5 | mA | V ₁ = 5 V, V ₃ = 0 V | 7 | Fig. 1 | |
| Quiescent current 2 | I _{CCL} | 1.05 | 1.46 | 1.87 | mA | V ₁ = 0 V, V ₃ = 0 V | 7 | Fig. 1 | |
| Driver delay time (L→H) | T _{TR1} | — | 100 | 300 | ns | See operating waveform figure | 5, 6 | Fig. 5 | |
| Driver delay time (H→L) | T _{TR2} | — | 100 | 300 | ns | See operating waveform figure | 5, 6 | | |
| Receiver delay time (L→H) | T _{DLY1} | — | 600 | 1200 | ns | See operating waveform figure | 2 | | |
| Receiver delay time (H→L) | T _{DLY2} | — | 200 | 600 | ns | See operating waveform figure | 2 | | |

Note: 1. Measure the current when V₆ = (V_{OP+}) + 0.3 V to make I_{6A} and measure the current when V₆ = (V_{OP+}) - 0.3 V to make I_{6B}.

Electrical Characteristics (cont.)

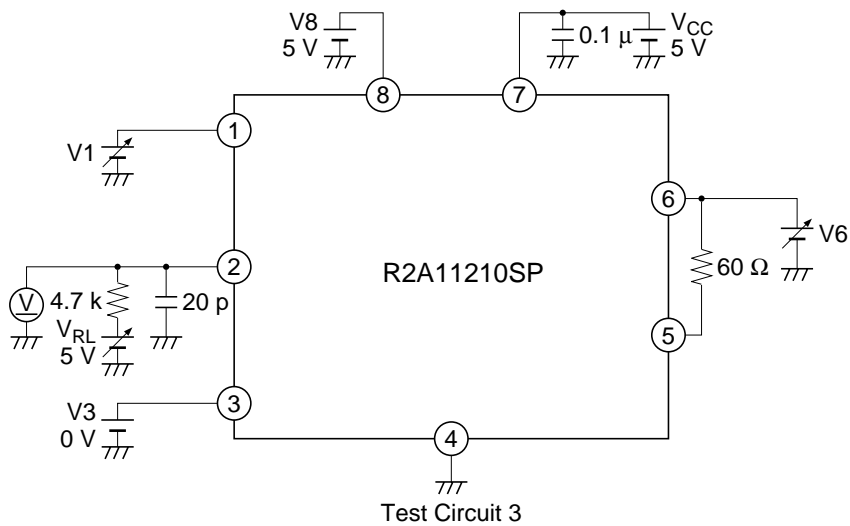
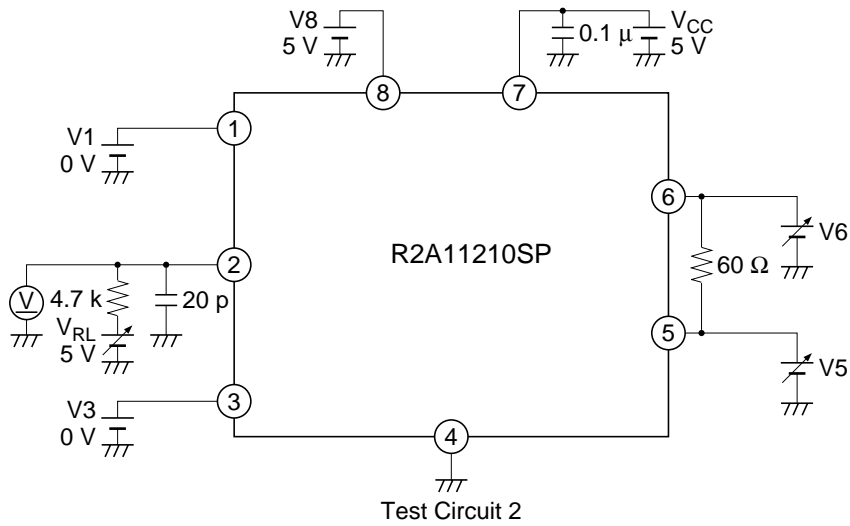
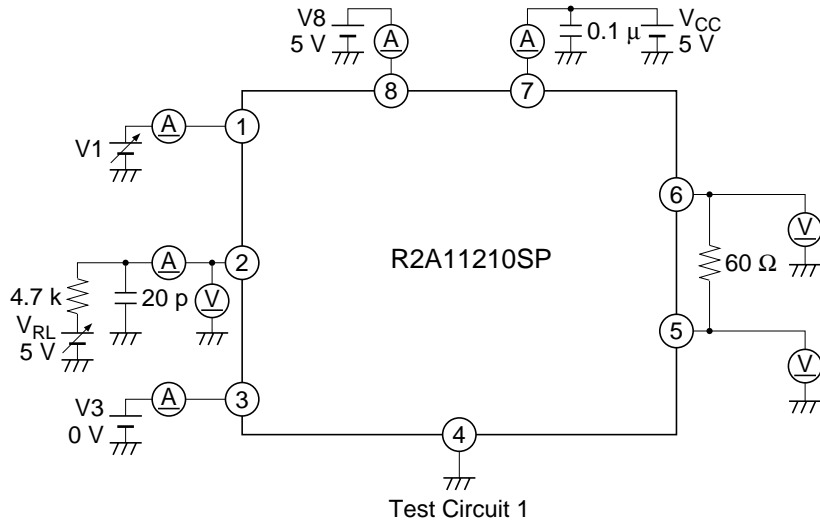
($V_{CC} = 5.0\text{ V}$, $T_a = 25^\circ\text{C}$)

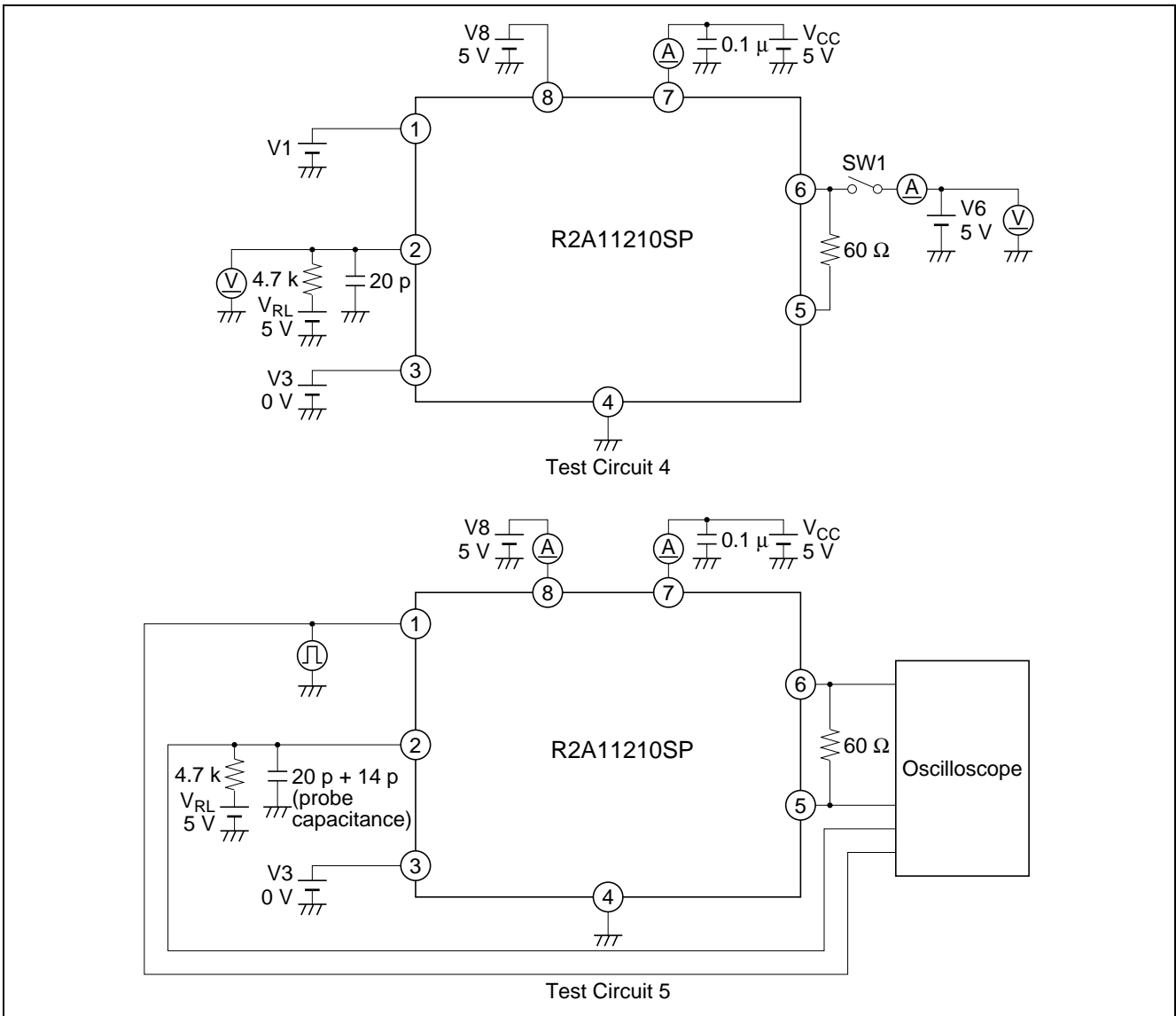
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions | Test Pin | Test Circuit |
|---|----------------|-----|-----|-----|---------------|---|----------|--------------|
| Power-supply off output leakage current | I_{OLEAK} | — | — | 1 | μA | $V_{CC} = 0\text{ V}$, $V_8 = 0\text{ V}$, $V_6 = 5\text{ V}$, $V_1 = 0\text{ V}$, $V_3 = 0\text{ V}$, SW1 ON | 6 | Fig. 4 |
| Standby mode current drain | I_{CCstb} | — | — | 1 | μA | $V_1 = 5\text{ V}$, $V_3 = 0\text{ V}$, $V_8 = 0\text{ V}$ | 7 | Fig. 4 |
| Standby mode output leakage current | $I_{stb-Leak}$ | — | — | 1 | μA | $V_1 = 5\text{ V}$, $V_3 = 0\text{ V}$, $V_8 = 0\text{ V}$, $V_6 = 5\text{ V}$, SW1 ON | 6 | Fig. 4 |
| Standby mode high-level input voltage | V_{stbH} | 2 | — | — | V | $V_8 = 0 \rightarrow 5\text{ V}$, V_8 when pin5,6 = 2.3 V or more, $V_1 = 0\text{ V}$, $V_3 = 0\text{ V}$ | 8 | Fig. 1 |
| Standby mode low-level input voltage | V_{stbL} | — | — | 0.9 | V | $V_8 = 5 \rightarrow 0\text{ V}$, V_8 when current flowing into pin7 = $1\ \mu\text{A}$ or less, $V_1 = 5\text{ V}$, $V_3 = 0\text{ V}$ | 8 | Fig. 1 |
| Standby mode high-level input current | I_{stbH} | — | 50 | 100 | μA | $V_1 = 5\text{ V}$, $V_3 = 0\text{ V}$, $V_8 = 5\text{ V}$ | 8 | Fig. 1 |
| Standby mode low-level input current | I_{stbL} | — | — | 1 | μA | $V_1 = 5\text{ V}$, $V_3 = 0\text{ V}$, $V_8 = 0\text{ V}$ | 8 | Fig. 1 |



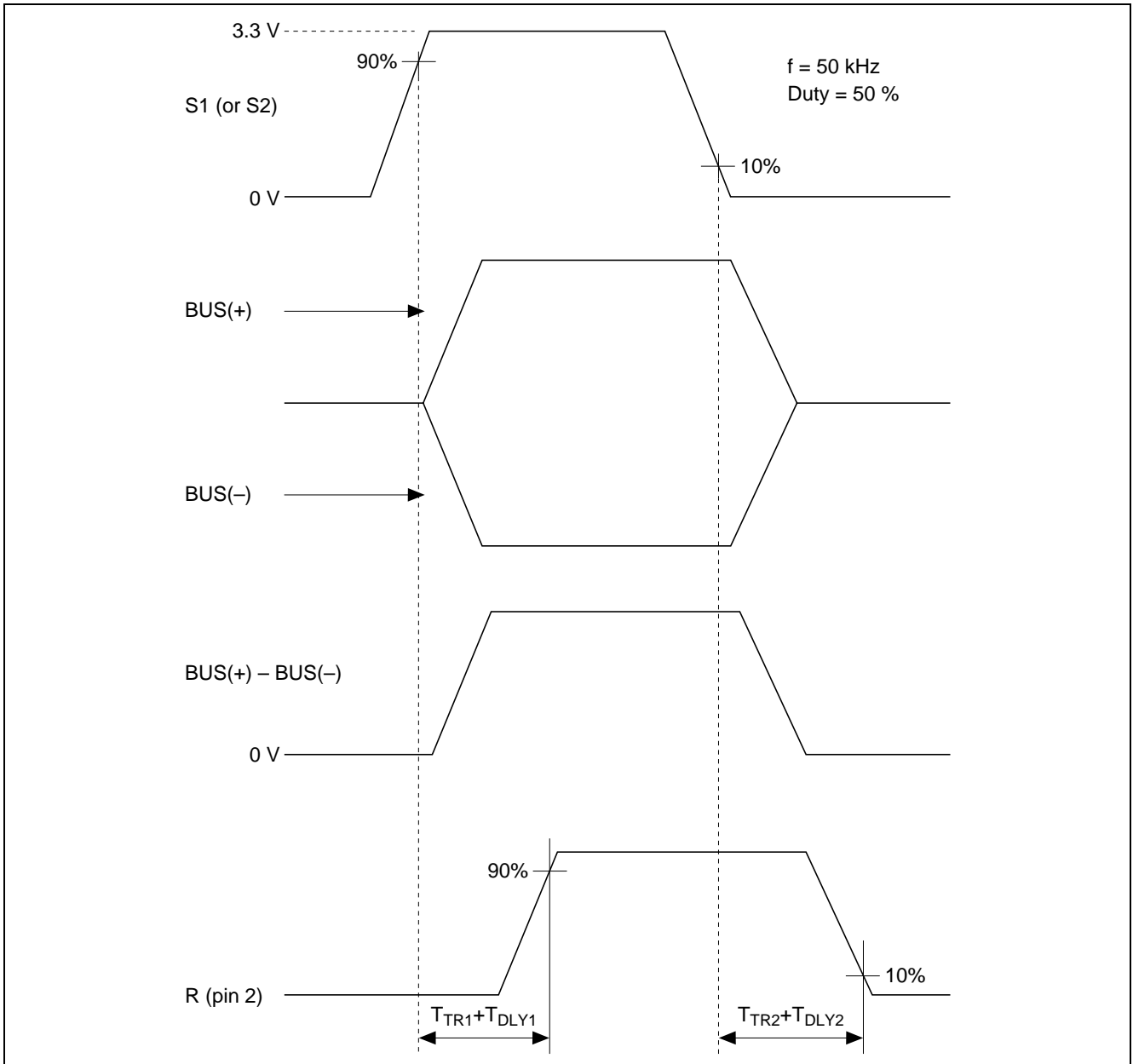
Input/Output Waveform Figure

Test Circuits

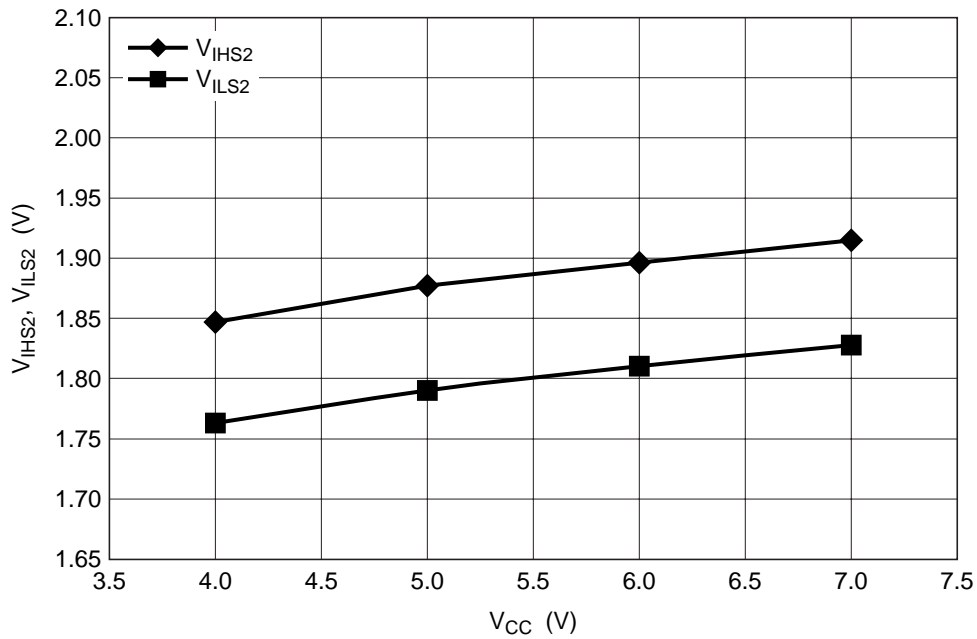
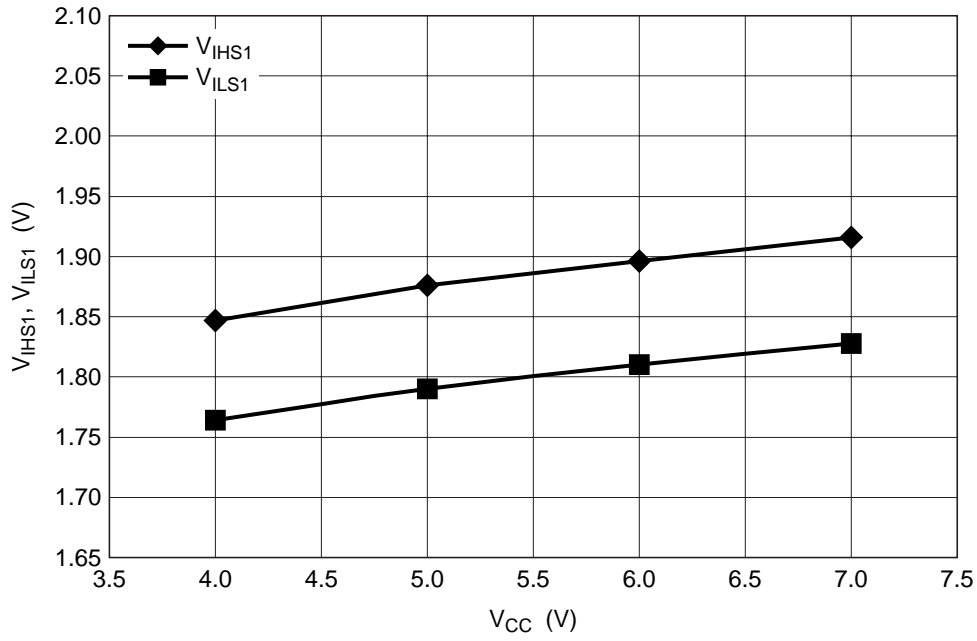


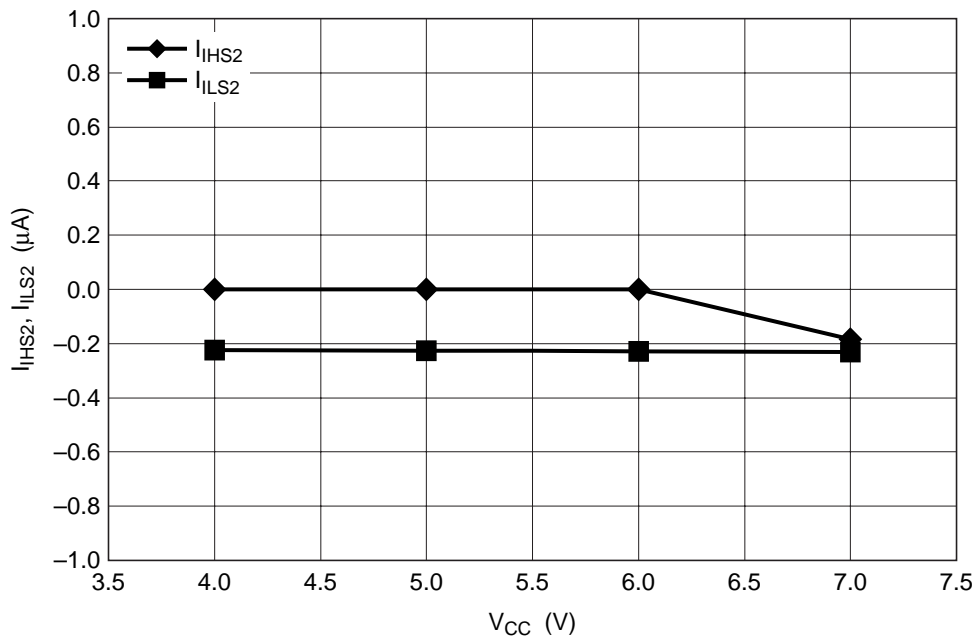
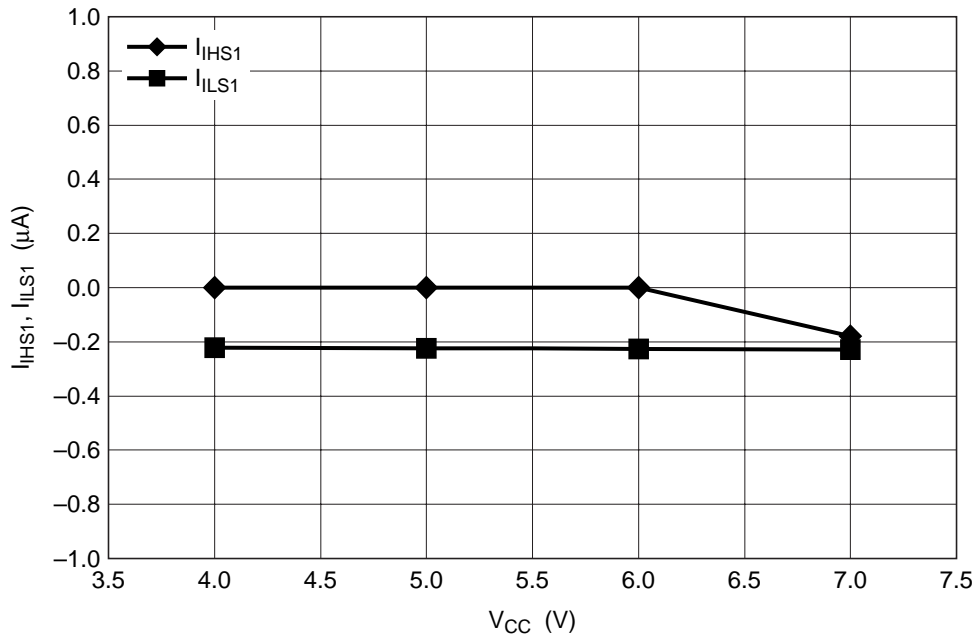


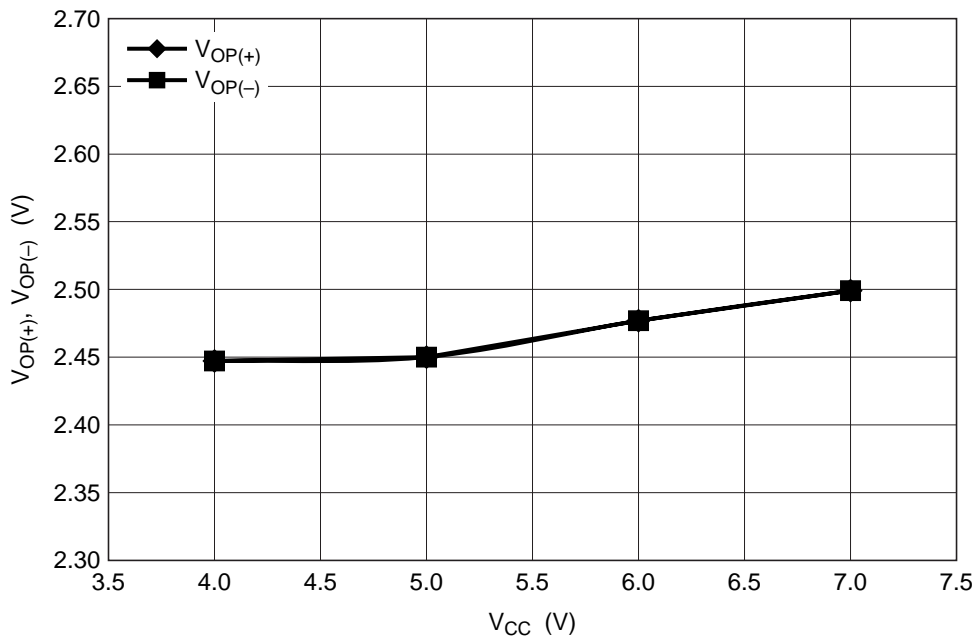
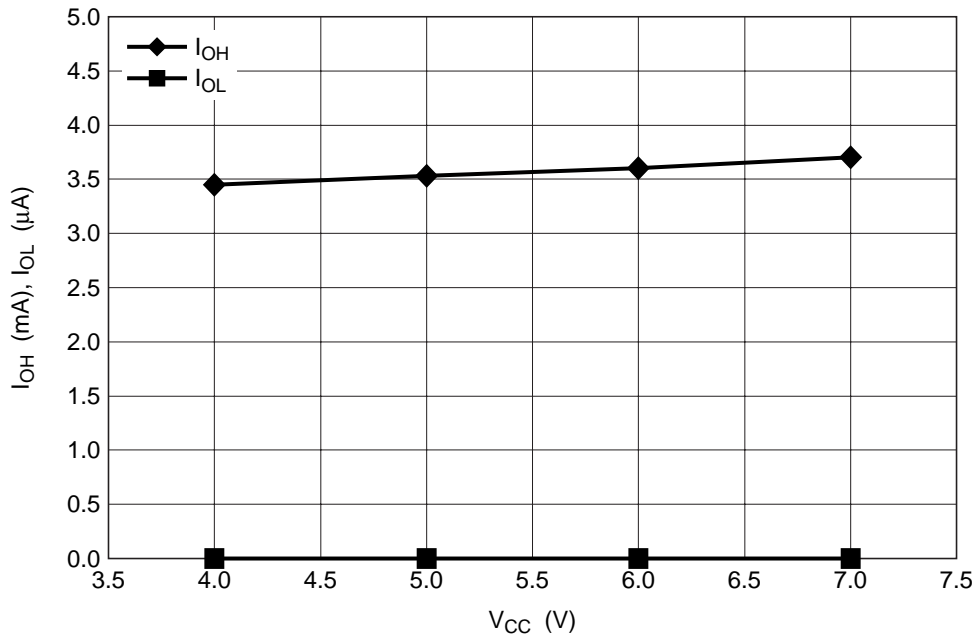
Operating Waveforms

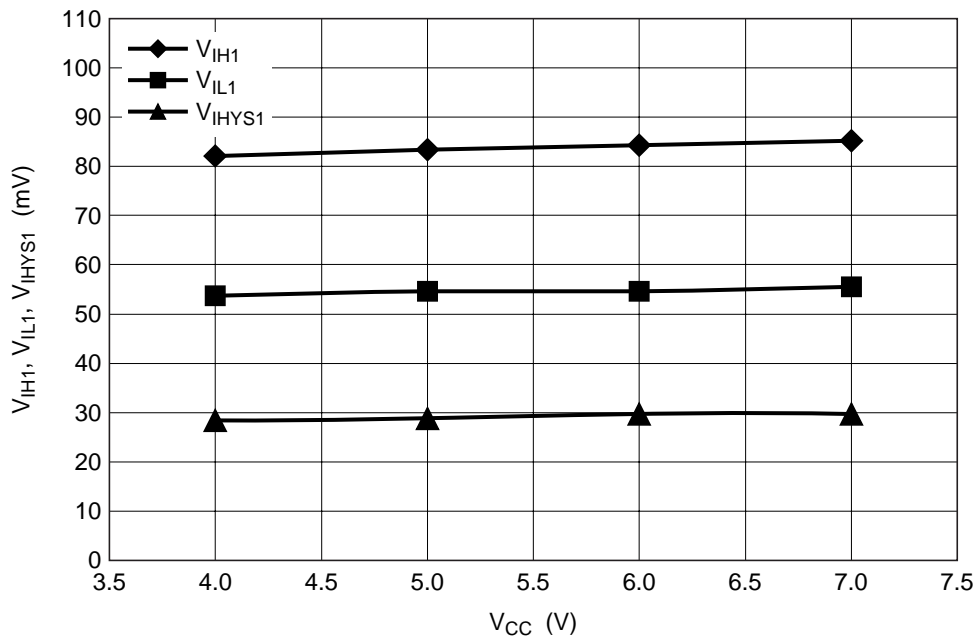
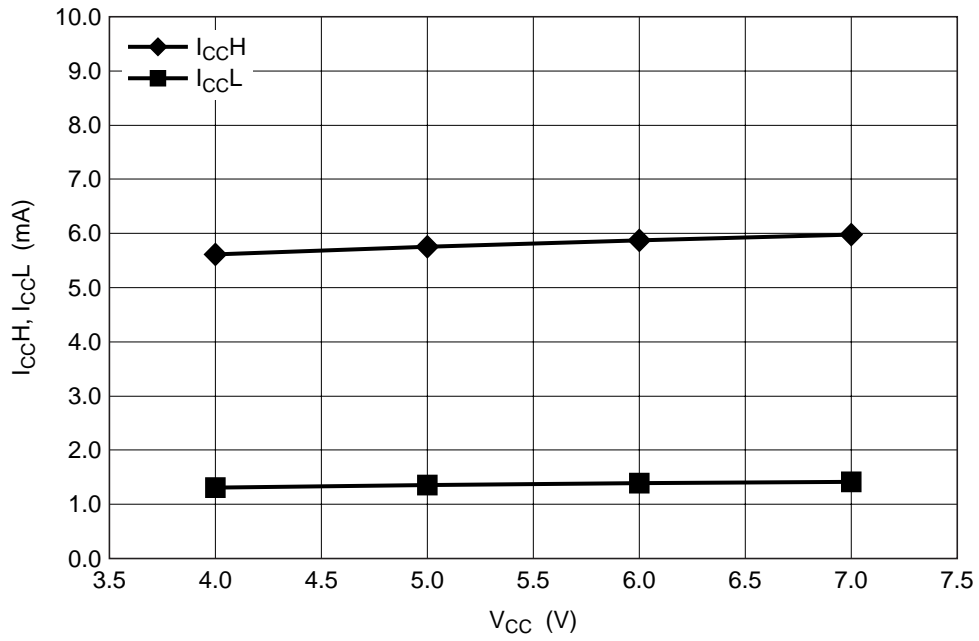


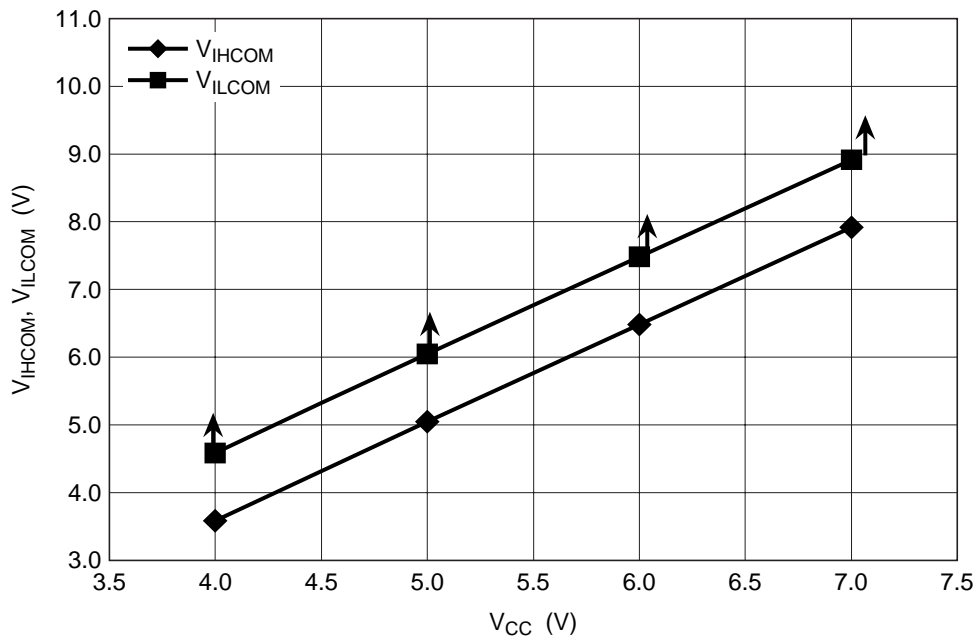
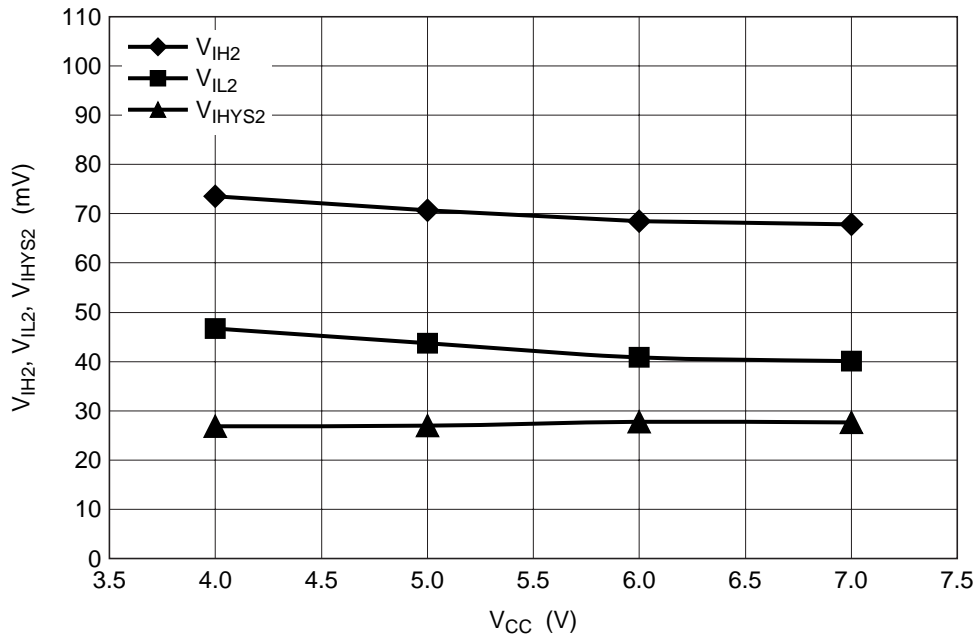
Main Characteristics

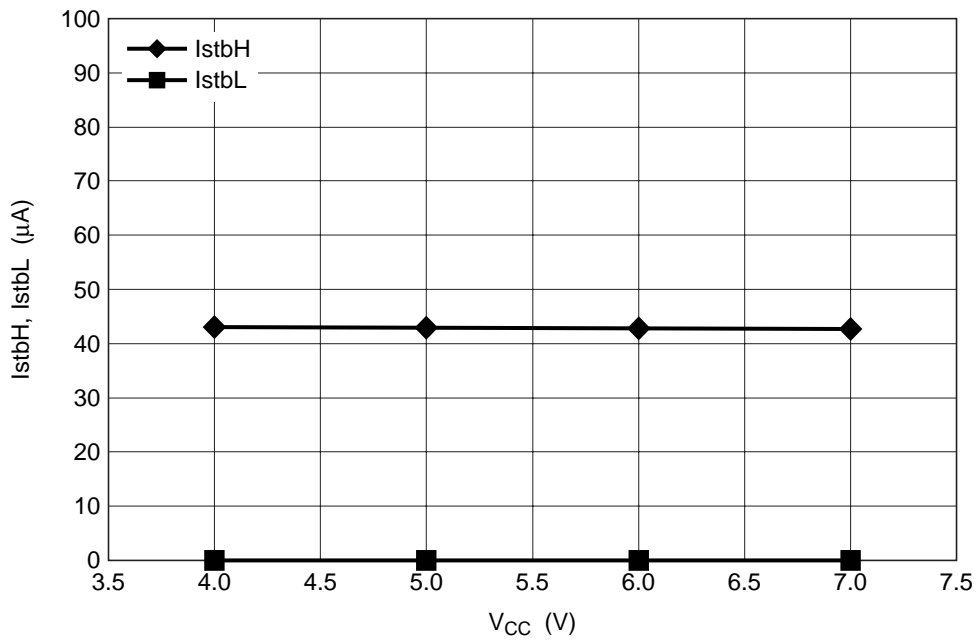
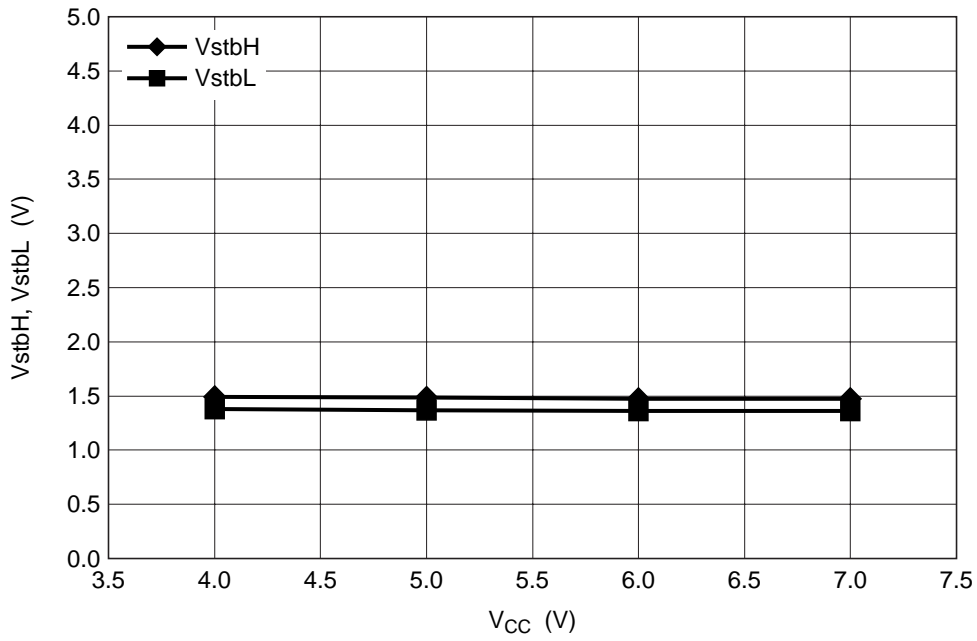


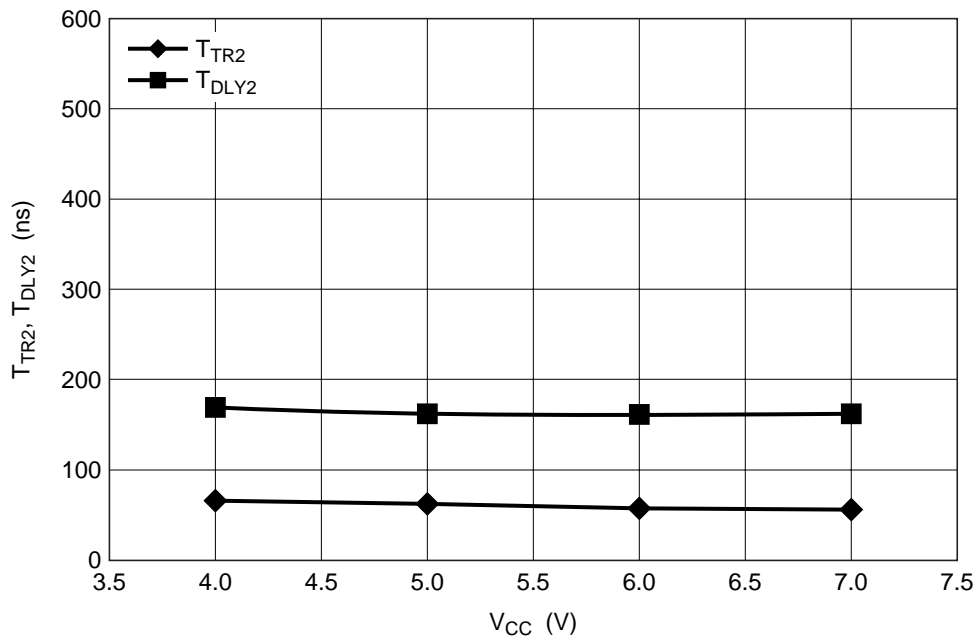
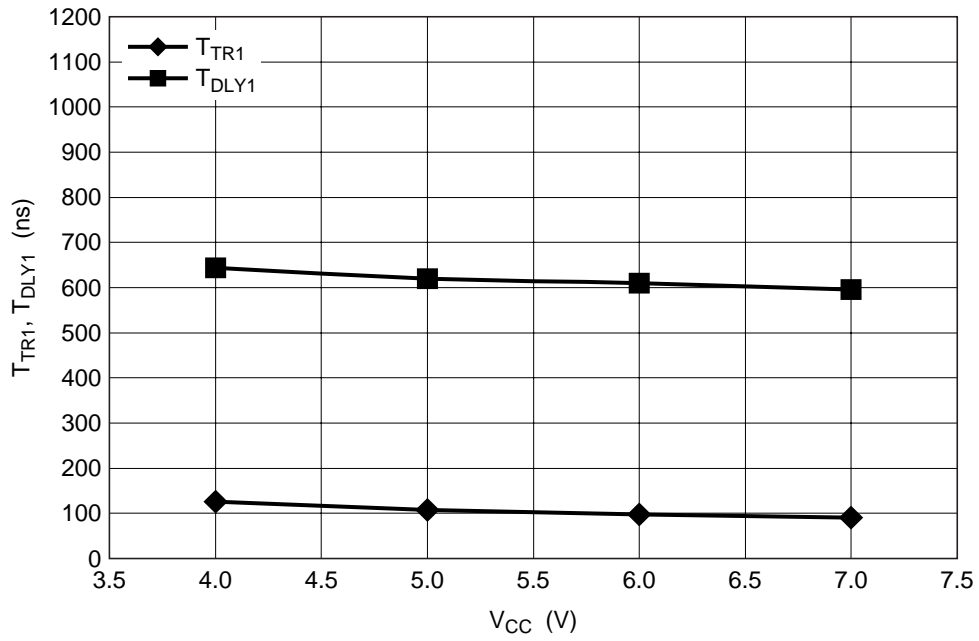


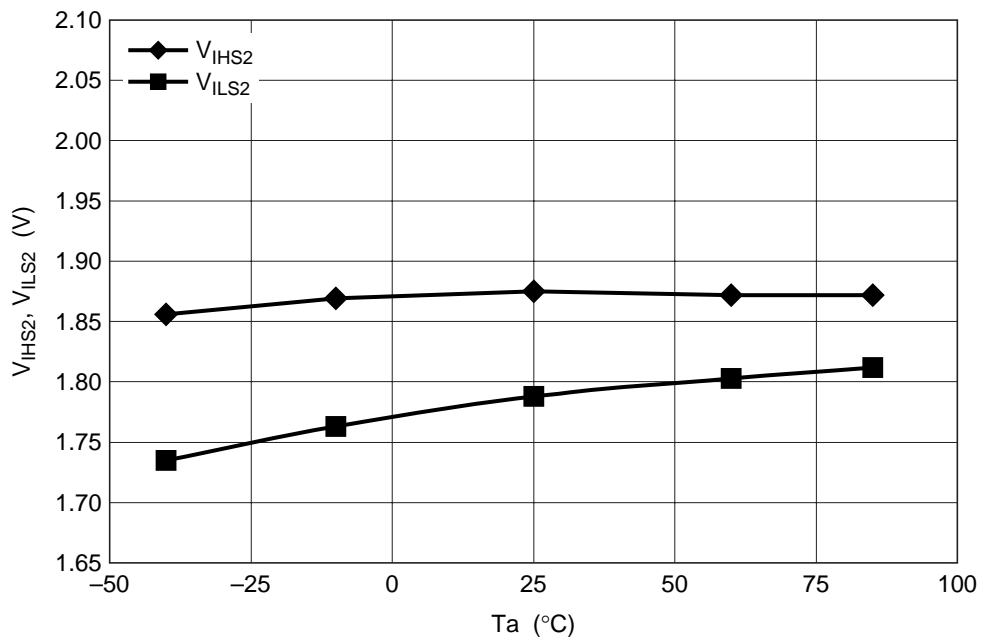
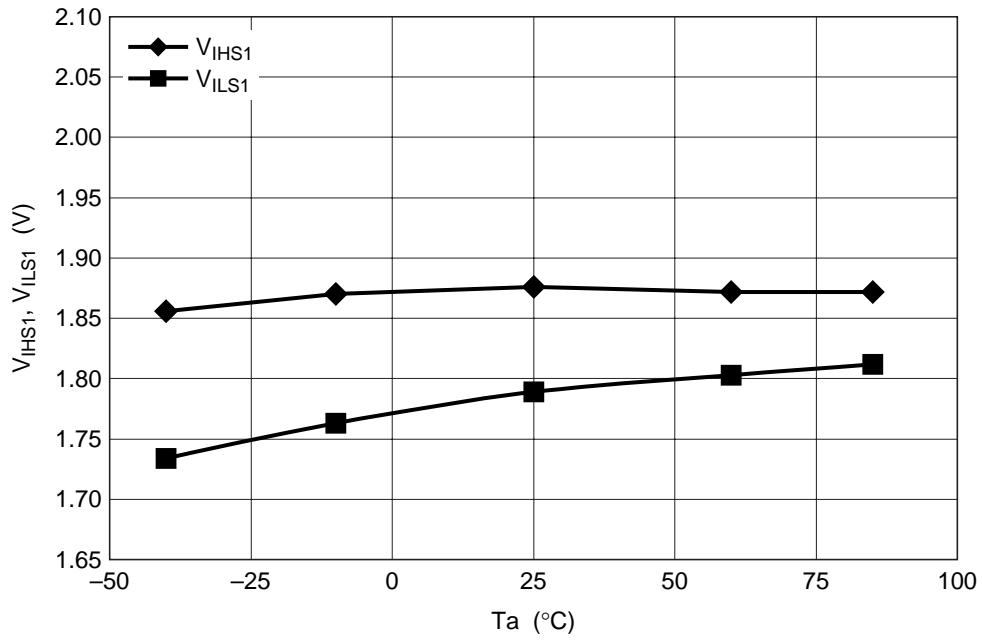


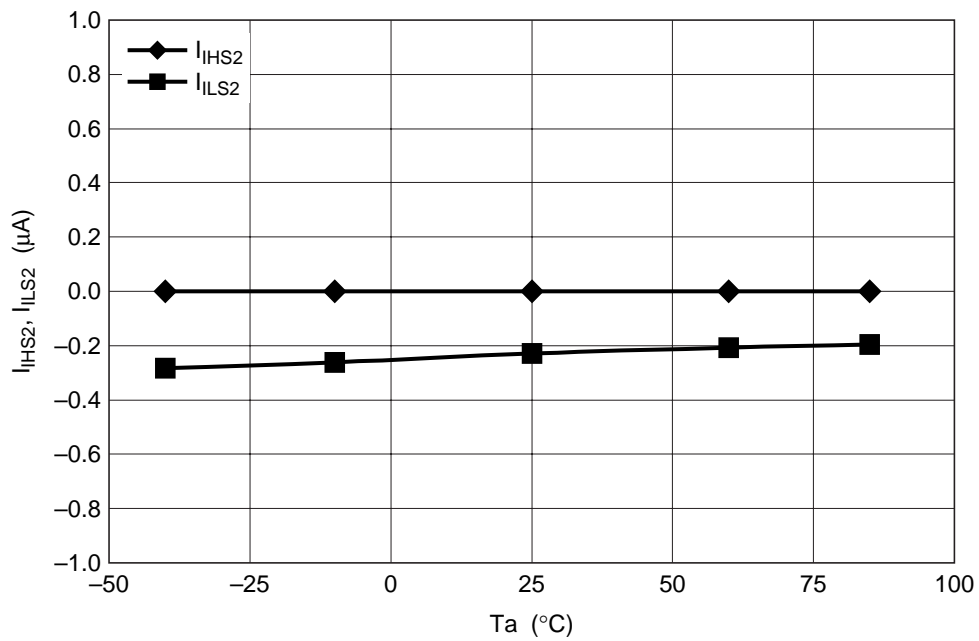
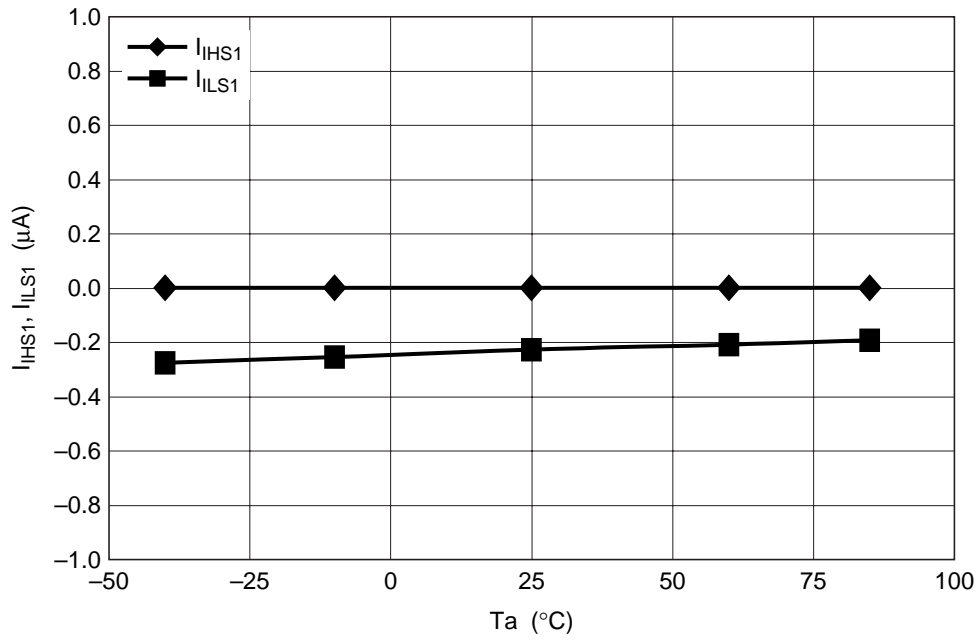


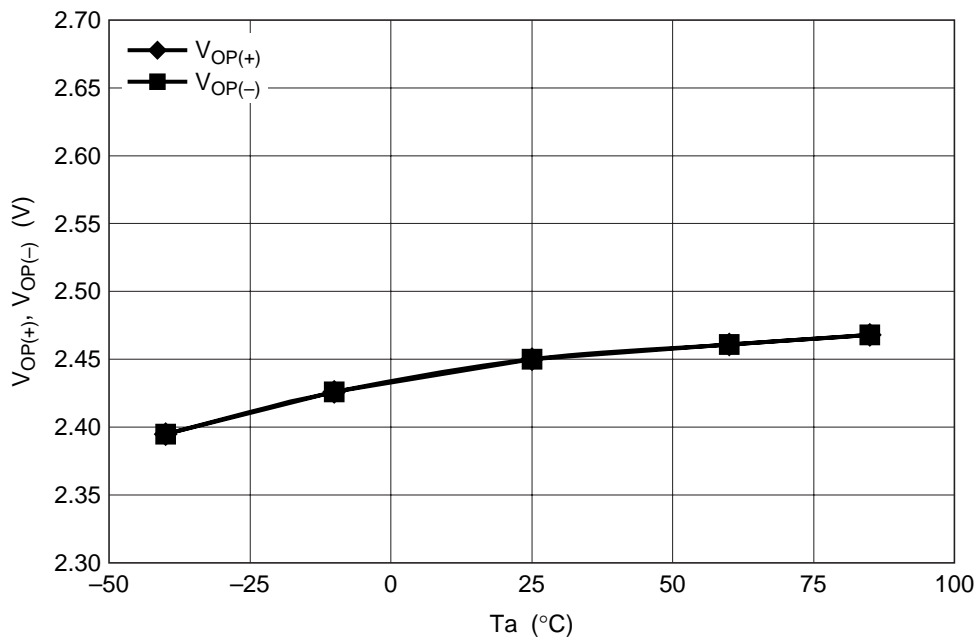
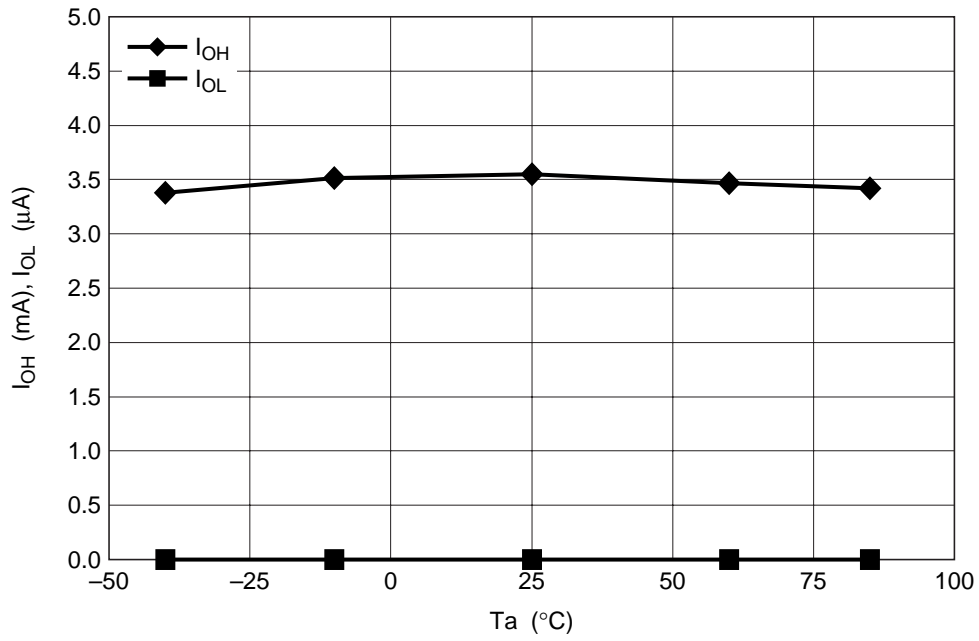


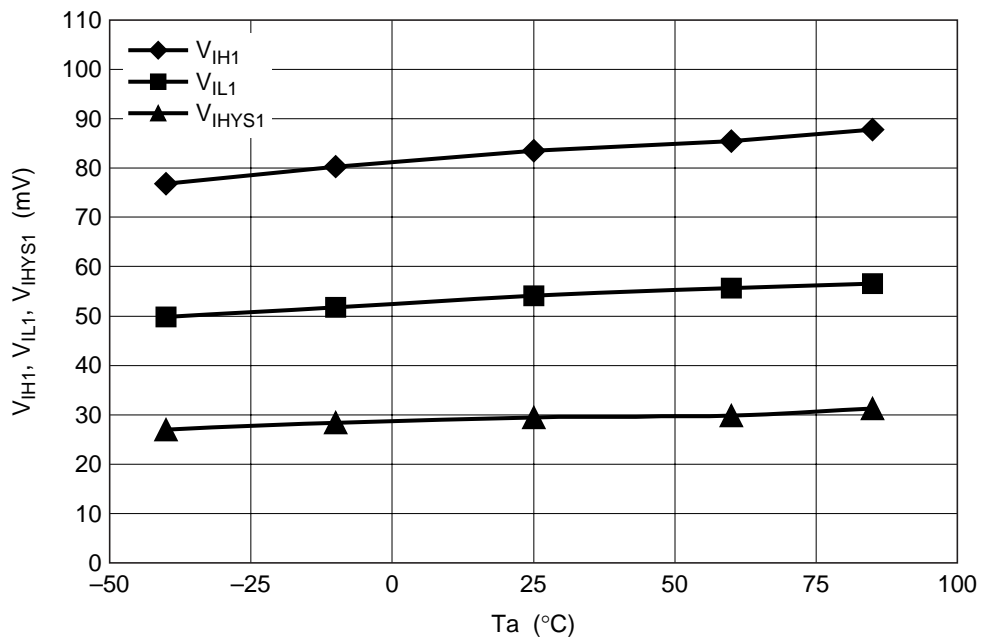
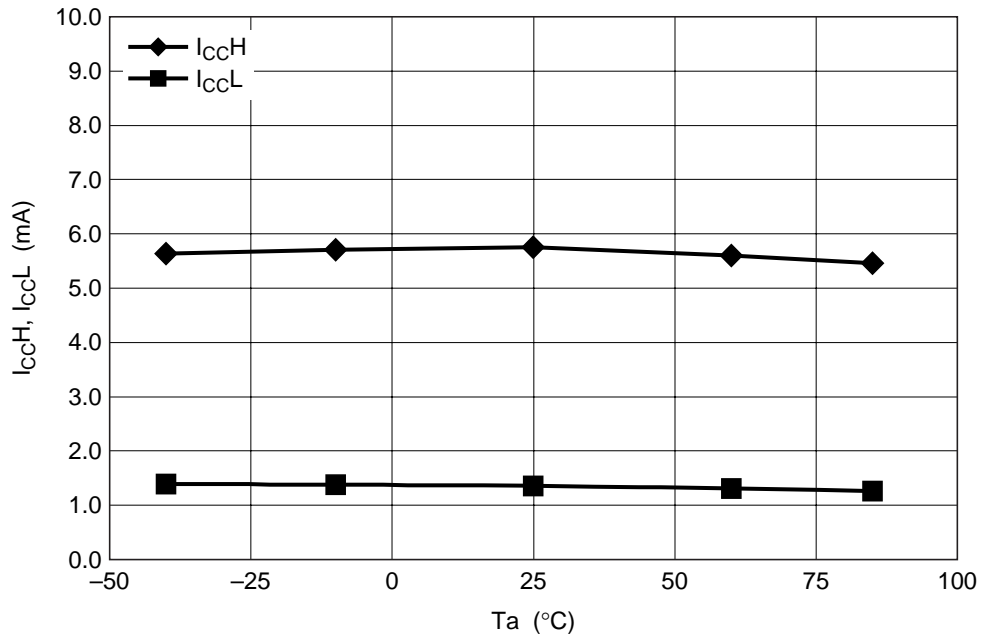


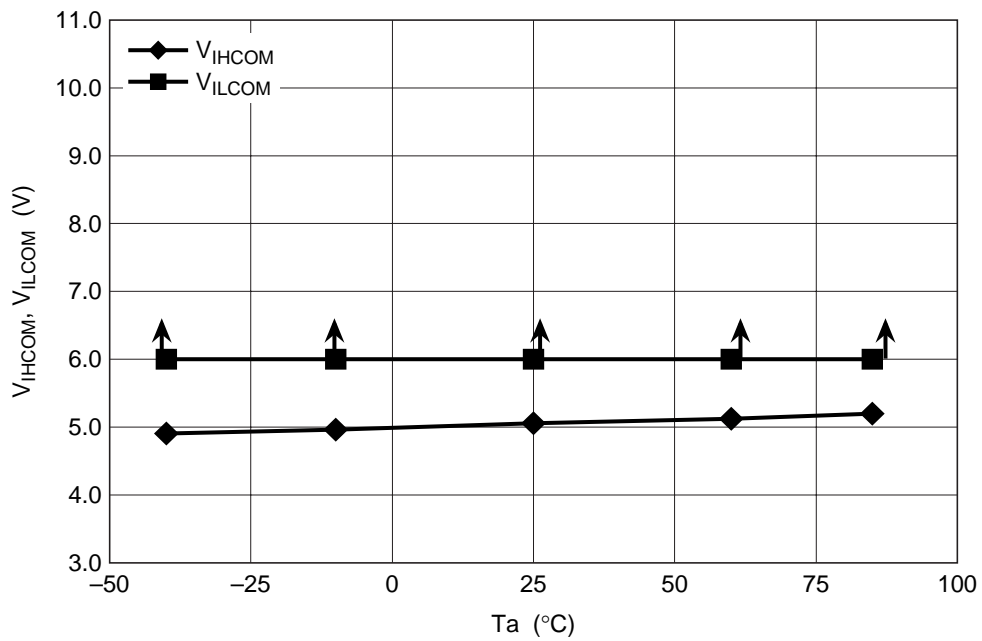
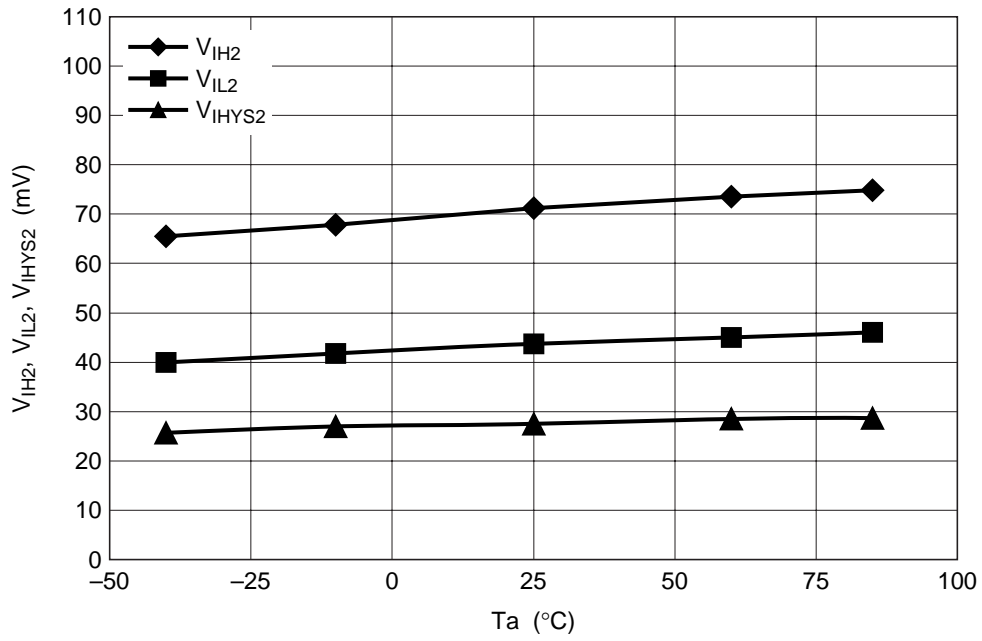


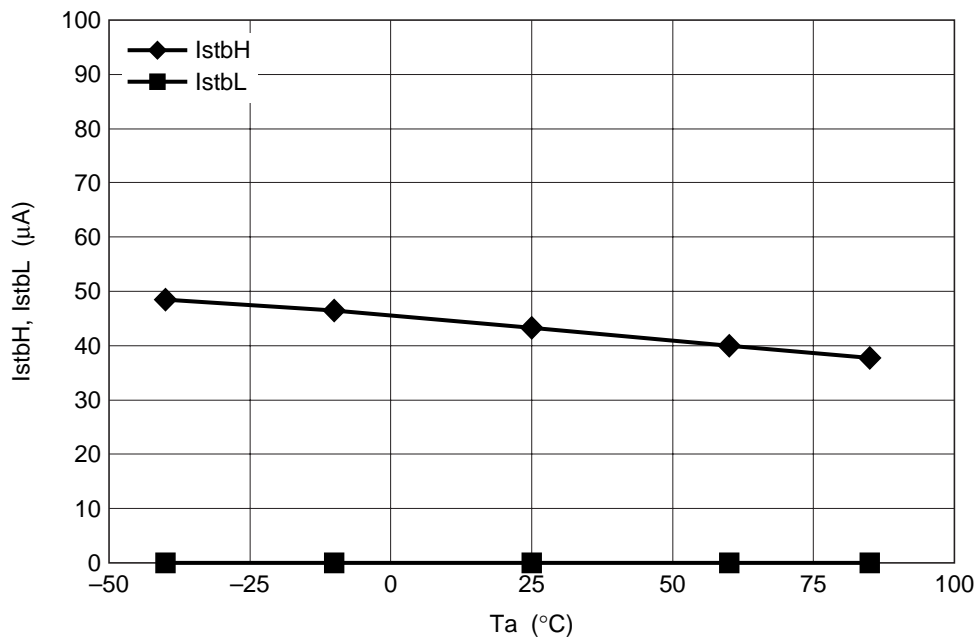
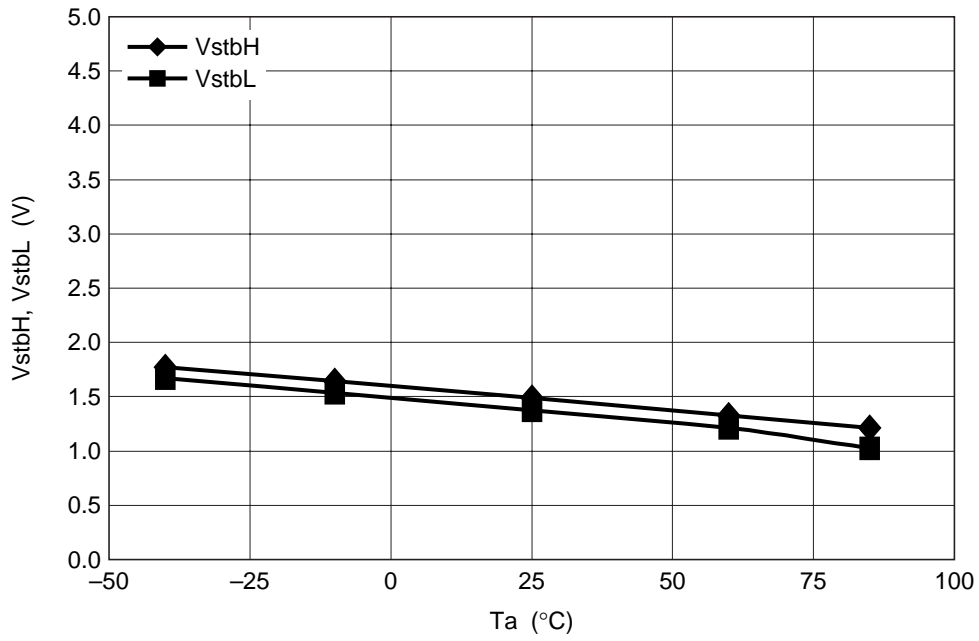


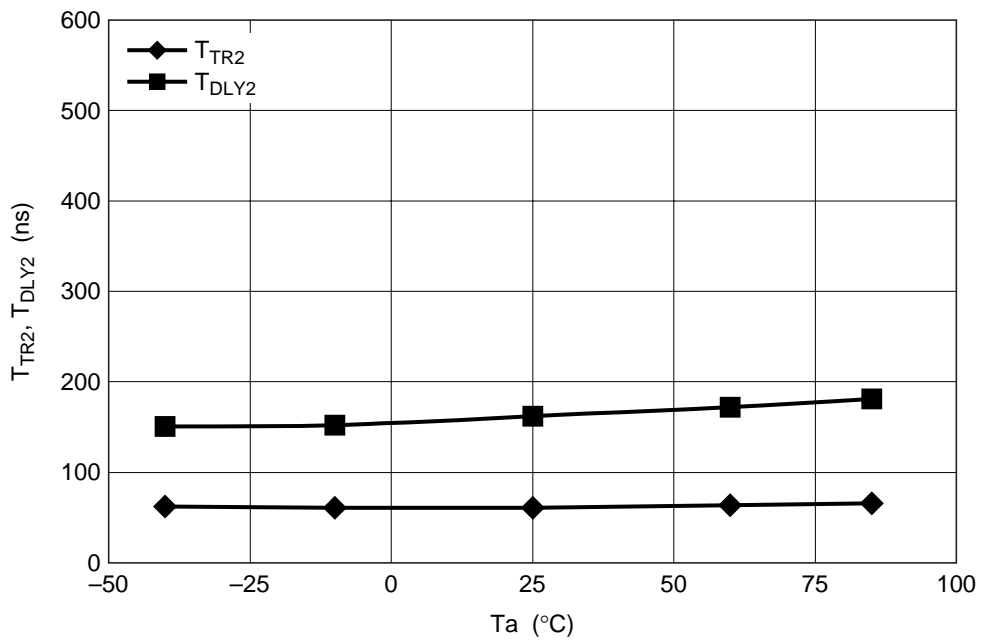
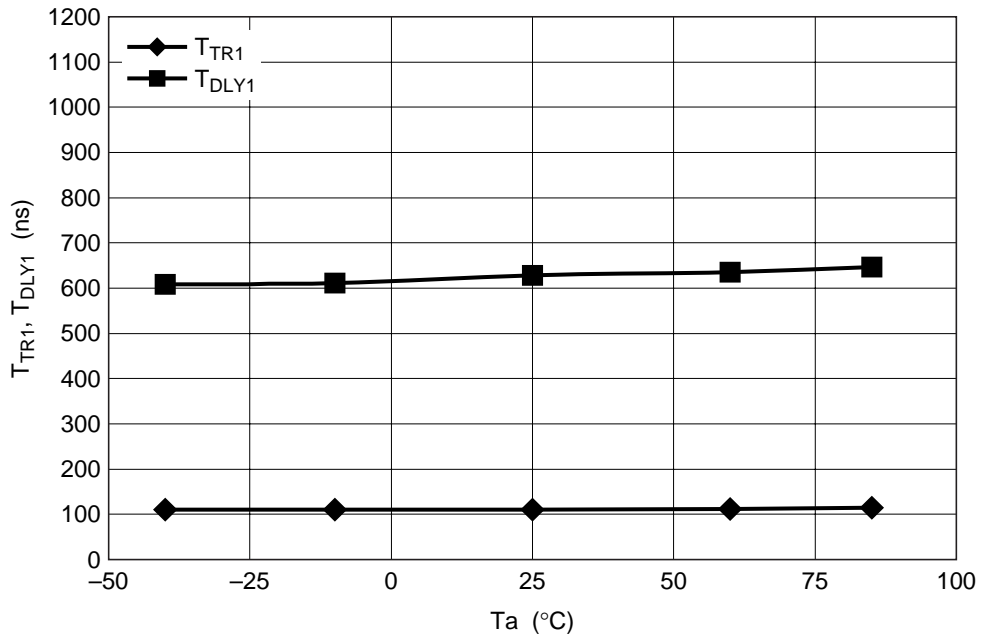






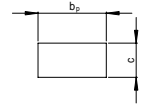
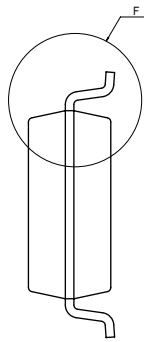
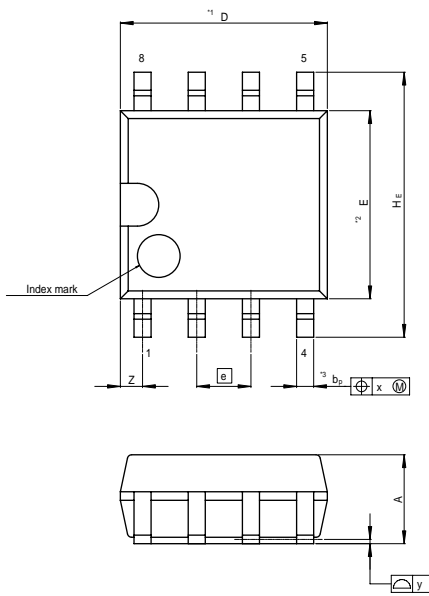




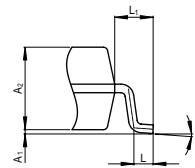


Package Dimensions

| | | | |
|----------------------|--------------|---------------|------------|
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP8-4.4x4.85-1.27 | PRSP0008DE-C | — | 0.1g |



Terminal cross section
(Ni/Pd/Au plating)



Detail F

NOTE)
1. DIMENSIONS**1 (Nom)**AND**2*
DO NOT INCLUDE MOLD FLASH.
2. DIMENSION**3*DOES NOT
INCLUDE TRIM OFFSET.

| Reference Symbol | Dimension in Millimeters | | |
|------------------|--------------------------|------|------|
| | Min | Nom | Max |
| D | 4.65 | 4.85 | 5.05 |
| E | 4.2 | 4.4 | 4.6 |
| A ₂ | — | 1.85 | — |
| A ₁ | 0.00 | 0.1 | 0.20 |
| A | — | — | 2.03 |
| b _p | 0.34 | 0.4 | 0.46 |
| b ₁ | — | — | — |
| c | 0.15 | 0.20 | 0.25 |
| c ₁ | — | — | — |
| θ | 0° | — | 8° |
| H _E | 5.7 | 6.2 | 6.5 |
| ⊕ | 1.12 | 1.27 | 1.42 |
| x | — | — | 0.12 |
| y | — | — | 0.10 |
| Z | — | — | 0.75 |
| L | 0.25 | 0.45 | 0.65 |
| L ₁ | — | 0.90 | — |

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