
HA12187FP

Bus Interface Driver/Receiver IC

REJ03F0131-0200
(Previous: ADE-207-174A)
Rev.2.00
Jun 15, 2005

Description

The HA12187FP was developed to be used as a bus interface driver/receiver IC in automotive audio equipment controllers. It implements a two-wire serial bus.

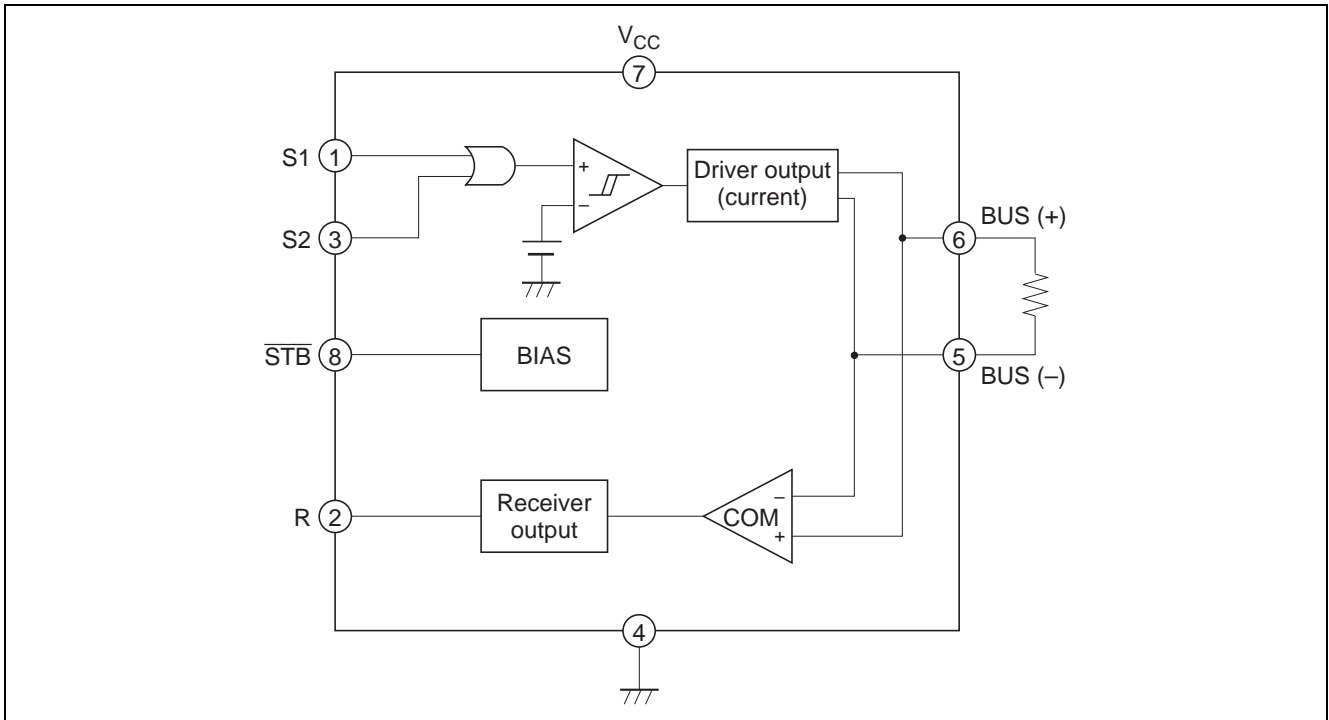
Functions

- Two-input OR circuit
- Input comparator circuit
- Current output driver circuit
- Receiver input comparator circuit
- Receiver output circuit
- Standby circuit

Features

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

Block Diagram



Pin Functions

Pin No.	Symbol	Function	Equivalent Circuit
1	S1	Data input	
2	R out	Receiver output	
3	S2	Data input	
4	GND	GND	
5	BUS (-)	Bus output (-) Receiver input (-)	
6	BUS (+)	Bus output (+) Receiver input (+)	
7	V _{CC}	Power supply	
8	STB	Standby control input	

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit	Notes
Power-supply voltage	V _{CC}	7	V	
Allowable power dissipation	P _d	400	mW	Ta ≤ 85°C
Operating temperature	T _{opr}	-40 to 85	°C	
Storage temperature	T _{stg}	-55 to 125	°C	
Input voltage	V _{in}	-1.0 to 6.7	V	
Bus input voltage	Bus	18	V	

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}	3.5	—	—	V	V1 = 0 V → 5 V, V3 = 0 V With the potential difference between pin 5 and pin 6 120 mV or more	1	Figure 1
	Low-level input voltage	V _{ILS1}	—	—	1.5	V	V1 = 5 V → 0 V, V3 = 0 V With the potential difference between pin5 and pin 6 20 mV or less	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}	3.5	—	—	V	V3 = 0 V → 5 V, V1 = 0 V With the potential difference between pin 5 and pin 6 120 mV or more	3	Figure 1
	Low-level input voltage	V _{ILS2}	—	—	1.5	V	V3 = 5 V → 0 V, V1 = 0 V With the potential difference between 5 and pin 6 20 mV or less	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 current	I _{OH}	3.0	3.8	4.8	mA	I _{OH} = V _{OHD+} - V _{OHD-} / 62 Ω	5, 6	Figure 1
	Low-level output leakage current	I _{OL}	—	—	1	μA	Pin 5 voltage = V _{OP-} 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	
	Reference operating voltage (-)	V _{OP-}	2.3	2.5	2.7	V	V1 = 0 V, V3 = 0 V	5	
Current drain 1	I _{CCH}	5.5	7.3	9.5	mA	V1 = 5 V, V3 = 0 V	7	Figure 1	
Current drain 2	I _{CCL}	1.7	2.2	2.7	mA	V1 = 0 V, V3 = 0 V	7	Figure 1	

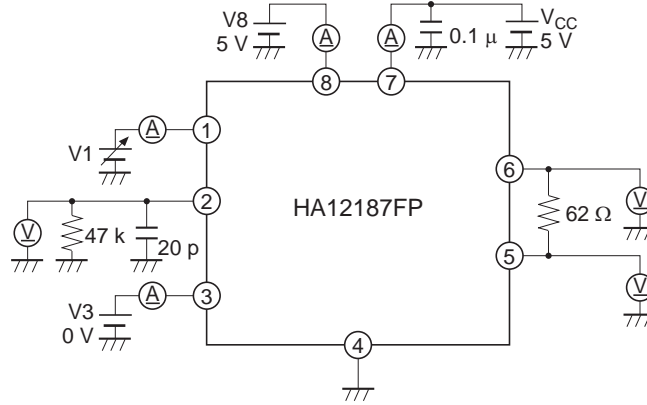
Electrical Characteristics (cont.)

(V_{CC} = 5.0 V, Ta = 25°C)

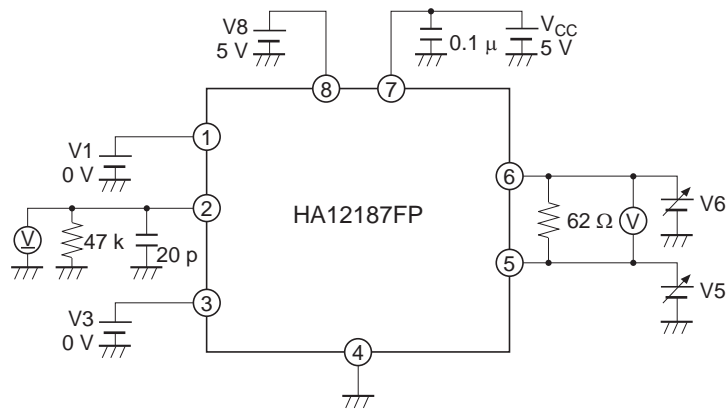
Item		Symbol	Min	Typ	Max	Unit	Test Condition	Test Pin	Test Circuit
Receiver	High-level input voltage (1)	V _{IH1}	—	80	120	mV	V ₆ = 0 → 5 V, pin 2 = 4 V or more, V ₁ = 0 V, V ₃ = 0 V, V ₅ = V _{OP-} , V _{IH1} = V ₆ - V ₅	2	Figure 2
	Low-level input voltage (1)	V _{IL1}	20	45	—	mV	V ₆ = 5 → 0 V, pin 2 = 1 V or less, V ₁ = 0 V, V ₃ = 0 V, V ₅ = V _{OP-} , V _{IL1} = V ₆ - V ₅	2	Figure 2
	Input hysteresis voltage (1)	V _{IHYS1}	10	35	60	mV	V _{IHYS1} = V _{IH1} - V _{IL1}		
	High-level common-mode input voltage	V _{IHCOM}	4.5	—	—	V	V ₅ = 0 → 5 V, pin 2 = 4 V or more, V ₁ = 0 V, V ₃ = 0 V, V ₆ - V ₅ = 120 mV	5	Figure 2
	Low-level common-mode input voltage	V _{ILCOM}	5	—	—	V	V ₅ = 0 → 5 V, pin 2 = 1 V or less, V ₁ = 0 V, V ₃ = 0 V, V ₆ - V ₅ = 20 mV	5	Figure 2
	Receiver input resistance* ¹	R _I	25	35	45	kΩ	V ₁ = 0 V, $R_I = \frac{0.6V}{I_1 - I_2}$	5, 6	Figure 3
	High-level output voltage	V _{OH}	4.5	—	—	V	V ₁ = 5 V, V ₃ = 0 V	2	Figure 1
	Low-level output voltage	V _{OL}	—	—	1.0	V	V ₁ = 0 V, V ₃ = 0 V	2	Figure 1
Power supply off output leakage current	I _{OLEAK}	—	—	1	μA	V _{CC} off, V ₈ = 0 V, V ₆ = 5 V, V ₁ = 0 V, V ₃ = 0 V, SW1 on	5, 6	Figure 4	
STB on voltage	V _{STBon}	—	—	1.5	V	V ₈ = 5 → 0 V, V ₁ = 5 V, V ₈ when I _{CC} ≤ 20 μA	7	Figure 4	
STB off voltage	V _{STBoff}	3.5	—	—	V	V ₈ = 0 → 5 V, V ₁ = 5 V, V ₈ when I _{CC} ≥ 4.5 mA	7	Figure 4	
Standby mode current drain	I _{CCstb}	—	10	20	μA	V ₁ = 5 V, V ₃ = 0 V, V ₈ = 0 V	7	Figure 4	
Standby mode leakage current	I _{stb-Leak}	—	—	1	μA	V ₁ = 5 V, V ₃ = 0 V, V ₈ = 0 V, V ₆ = 5 V, SW1 on	5, 6	Figure 4	
Delay time (L → H)	DLY1	—	600	800	nS	See the operating waveform figure	2	Figure 5	
Delay time (H → L)	DLY2	—	450	800	nS	See the operating waveform figure	2	Figure 5	

Note: 1. I₁ is the measured current when V₆ = (V_{OP+}) + 0.3 V, and I₂ is the measured current when V₆ = (V_{OP+}) - 0.3 V.

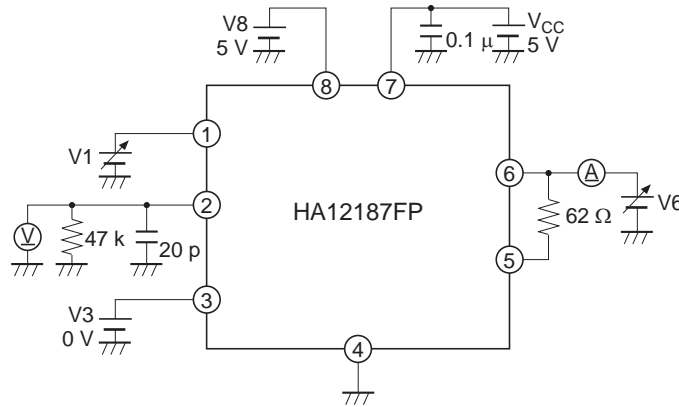
Test Circuits



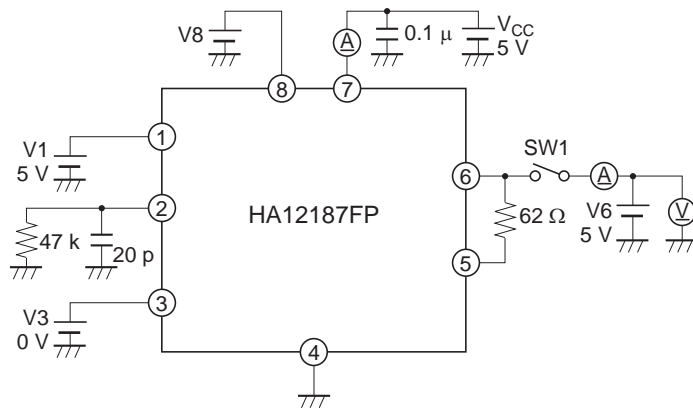
Test Circuit 1



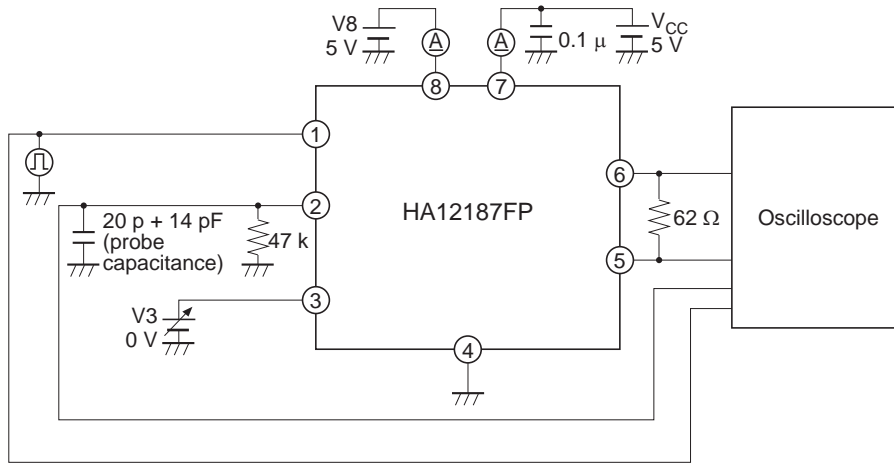
Test Circuit 2



Test Circuit 3

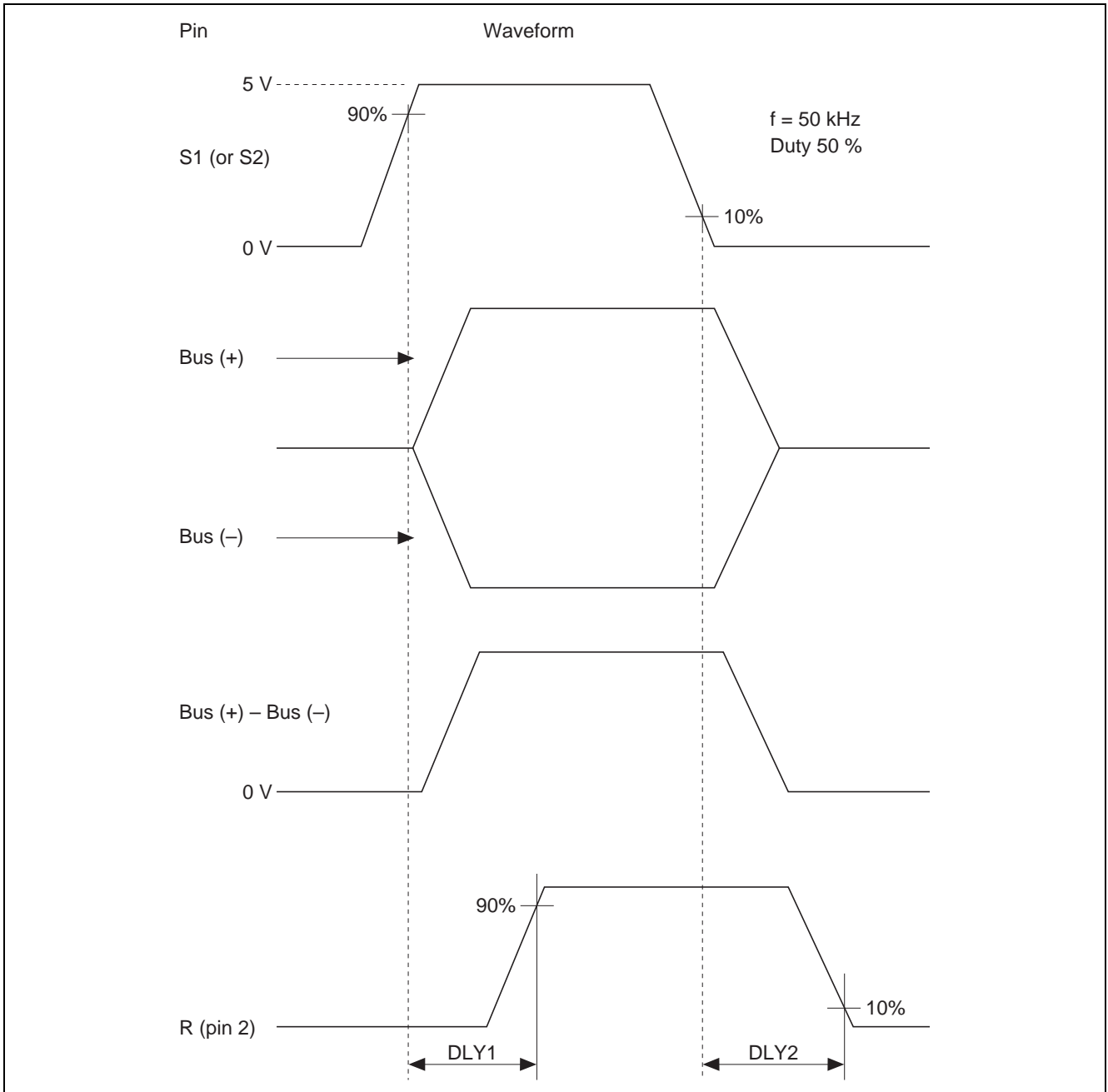


Test Circuit 4

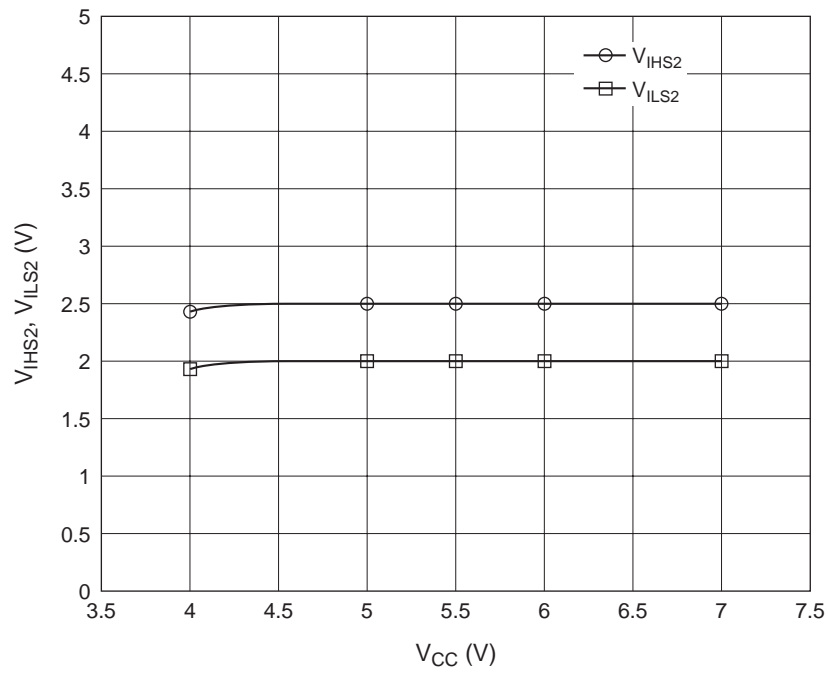
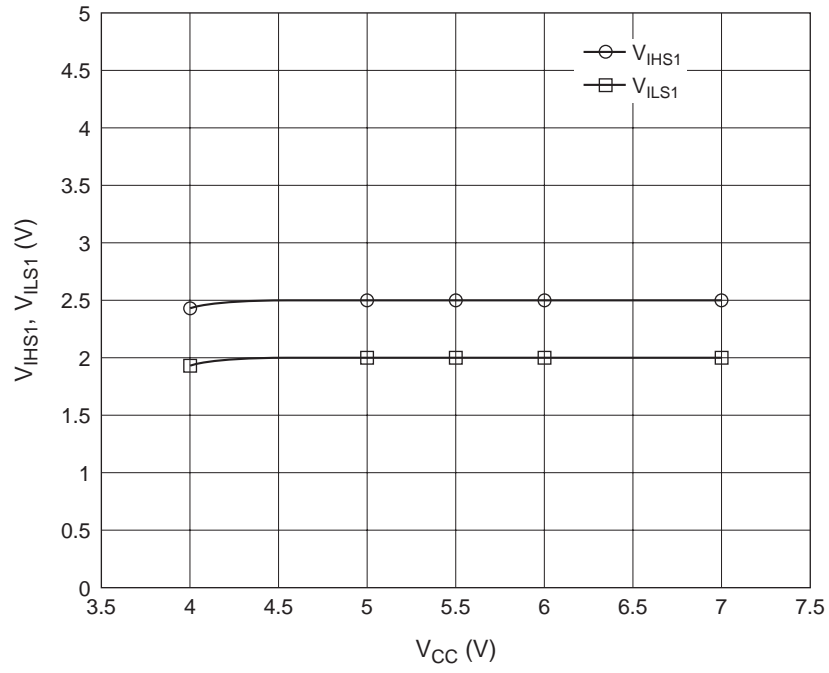


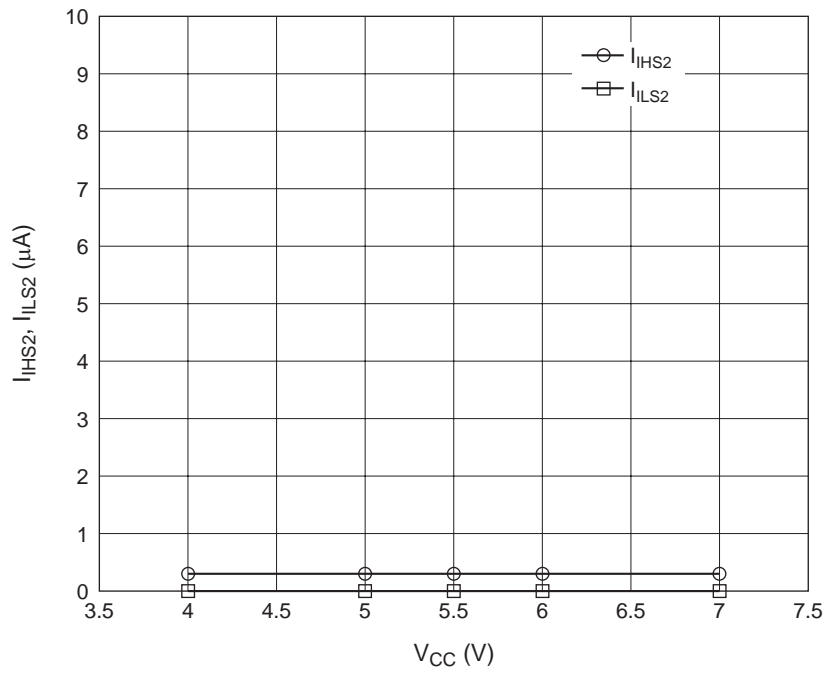
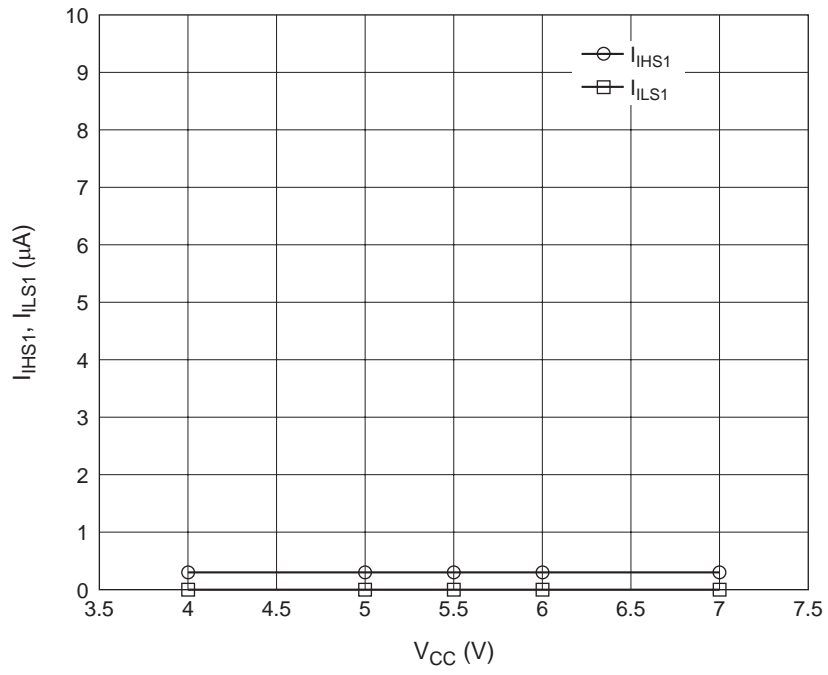
Test Circuit 5

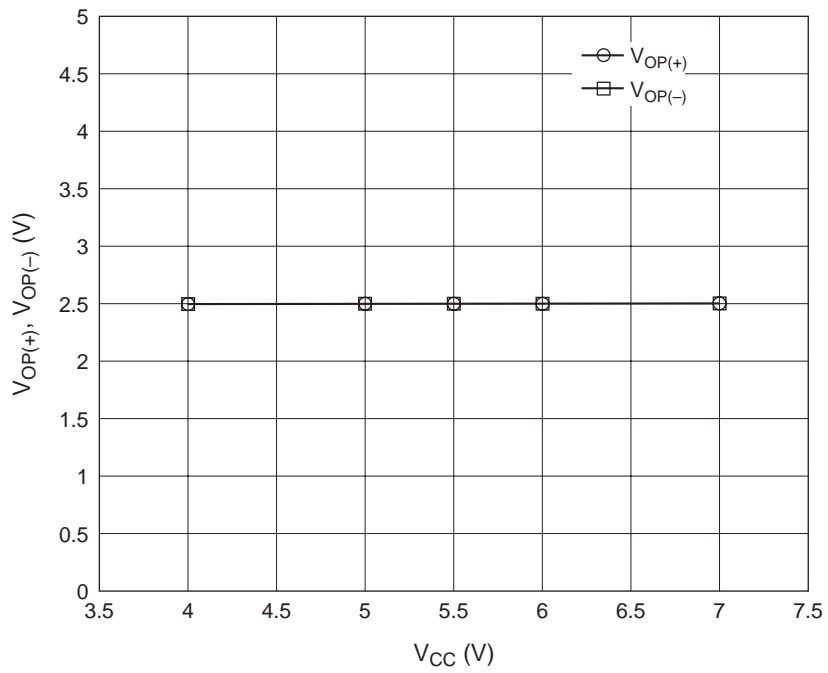
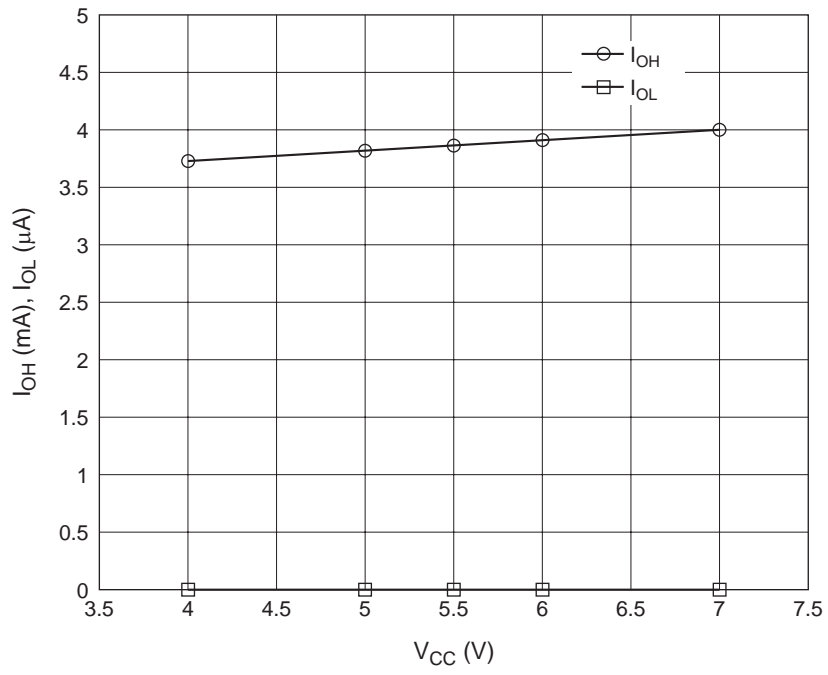
Operating Waveforms

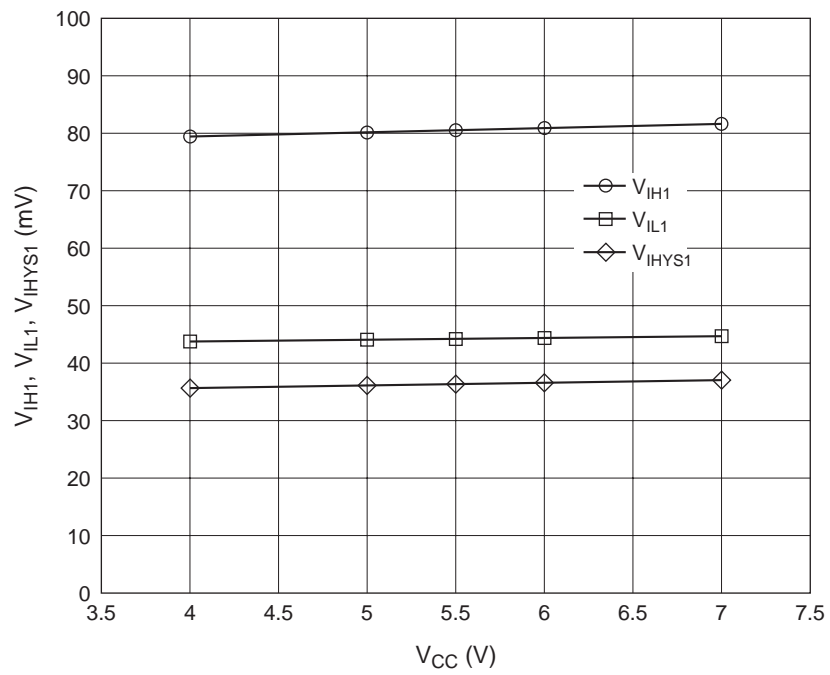
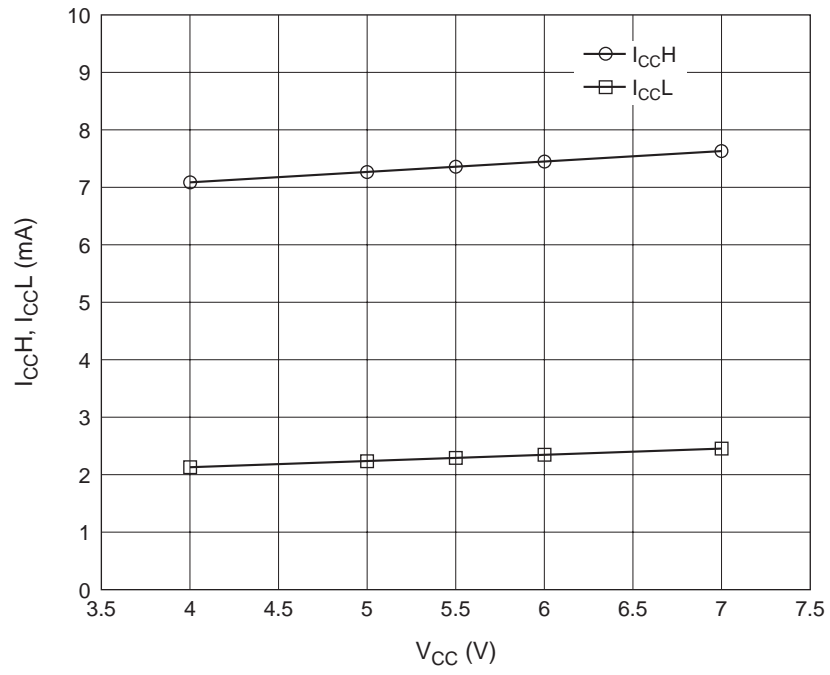


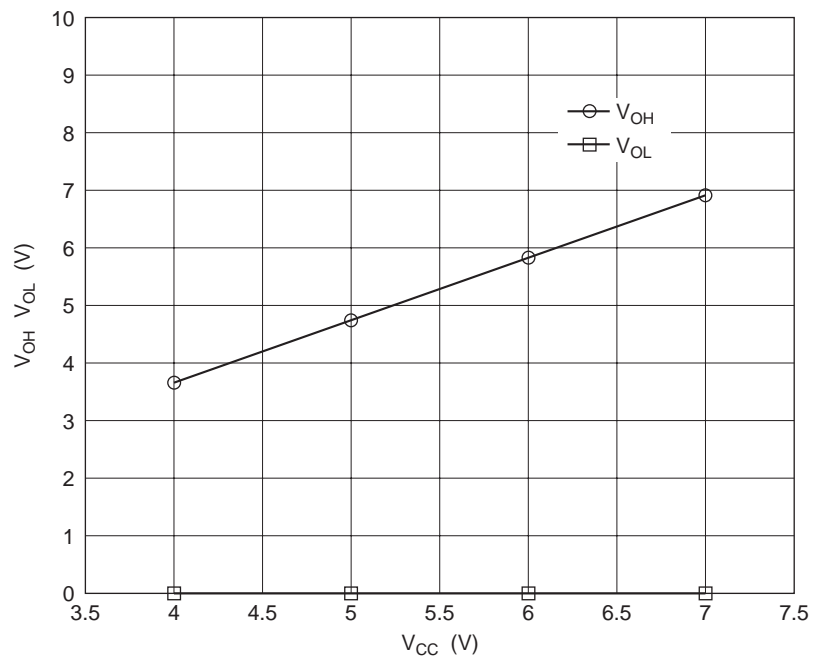
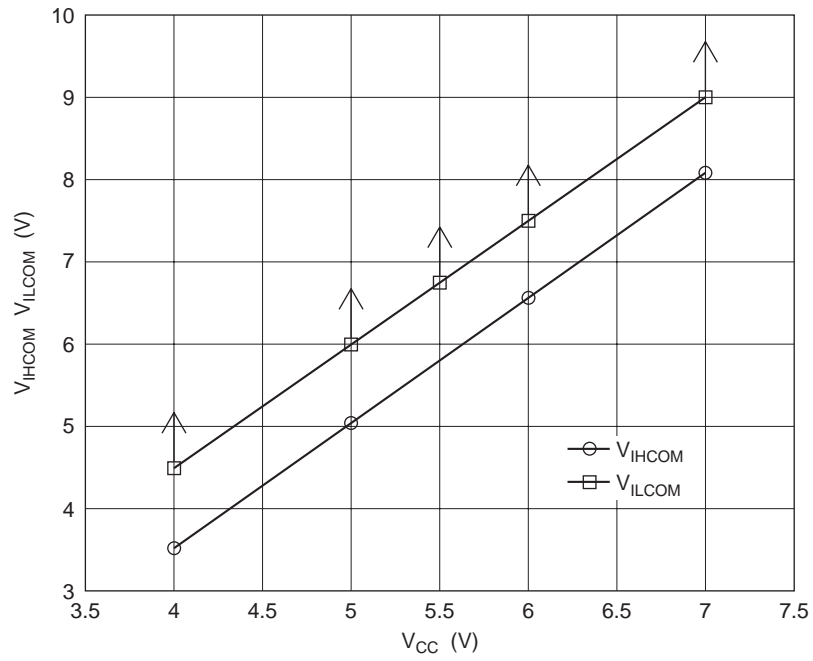
Main Characteristics

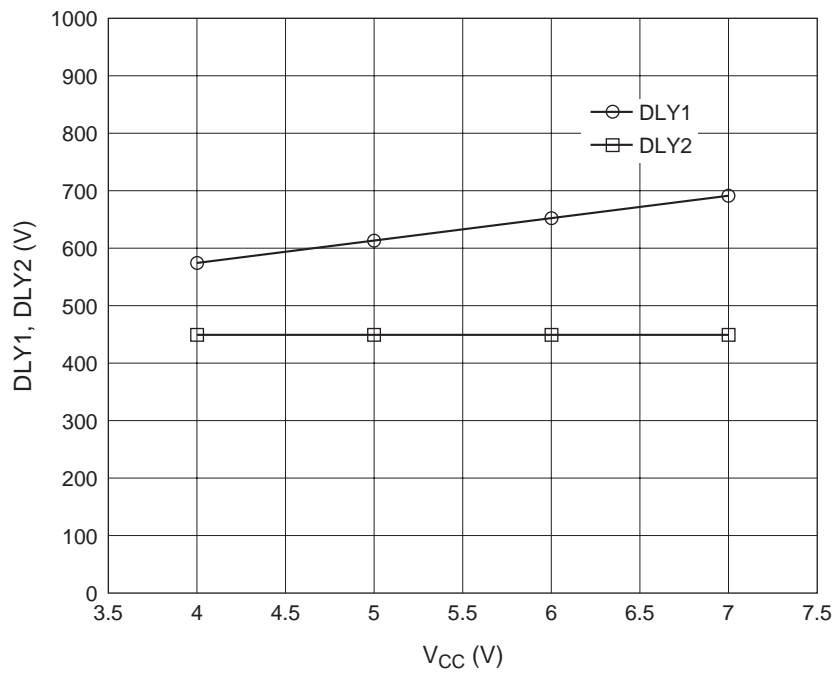
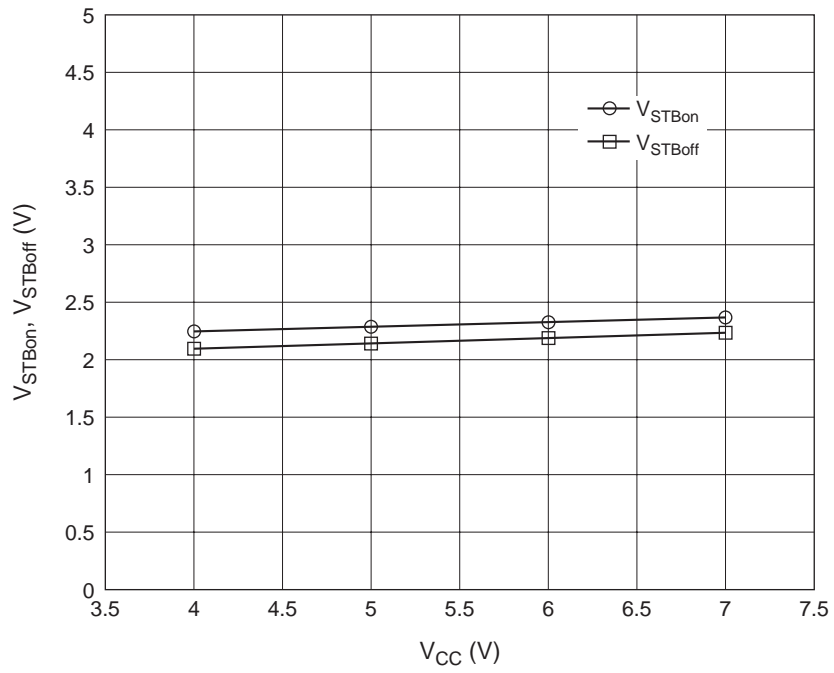


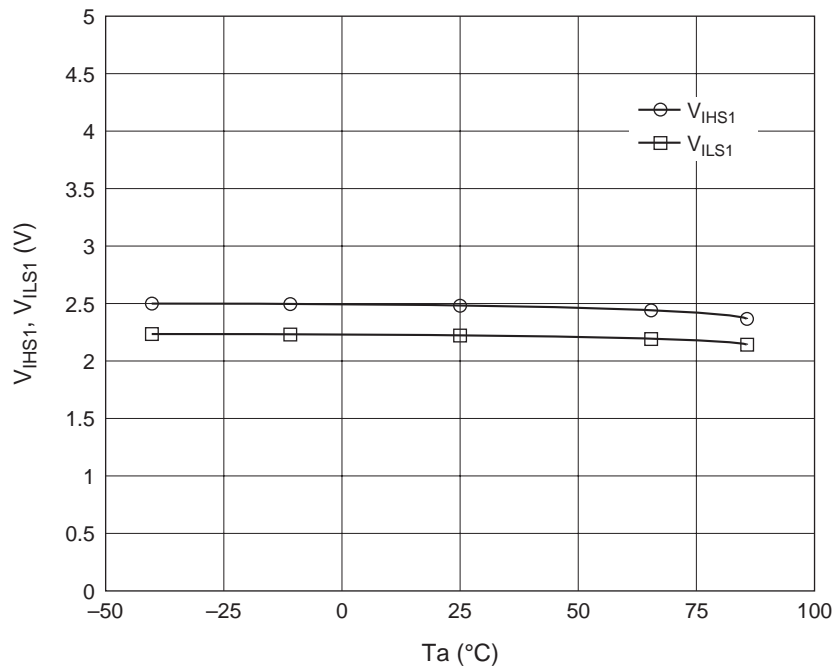
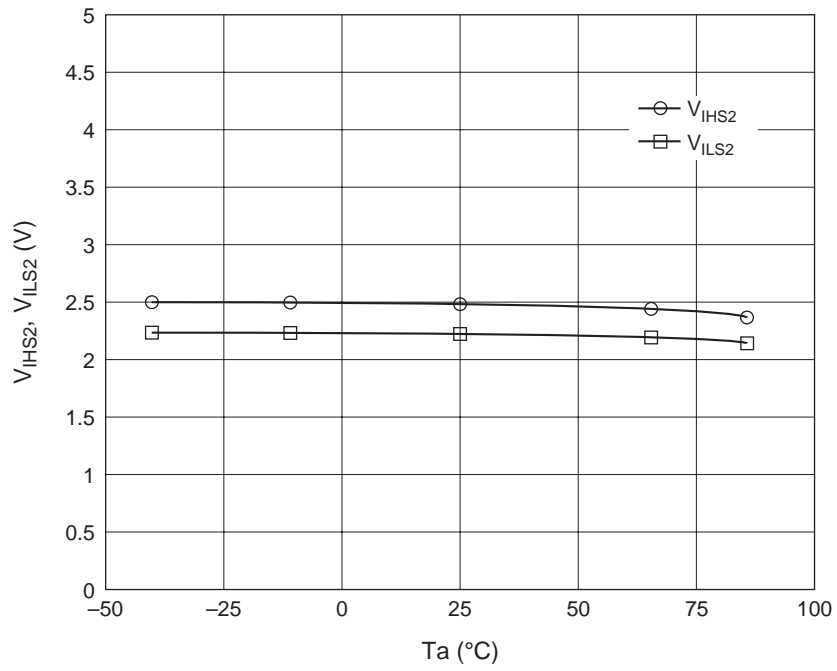


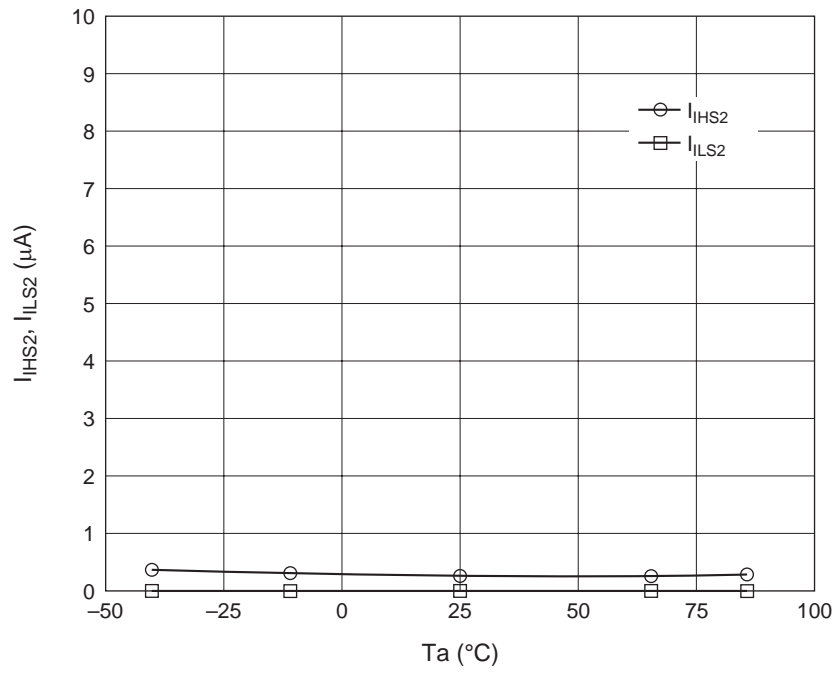
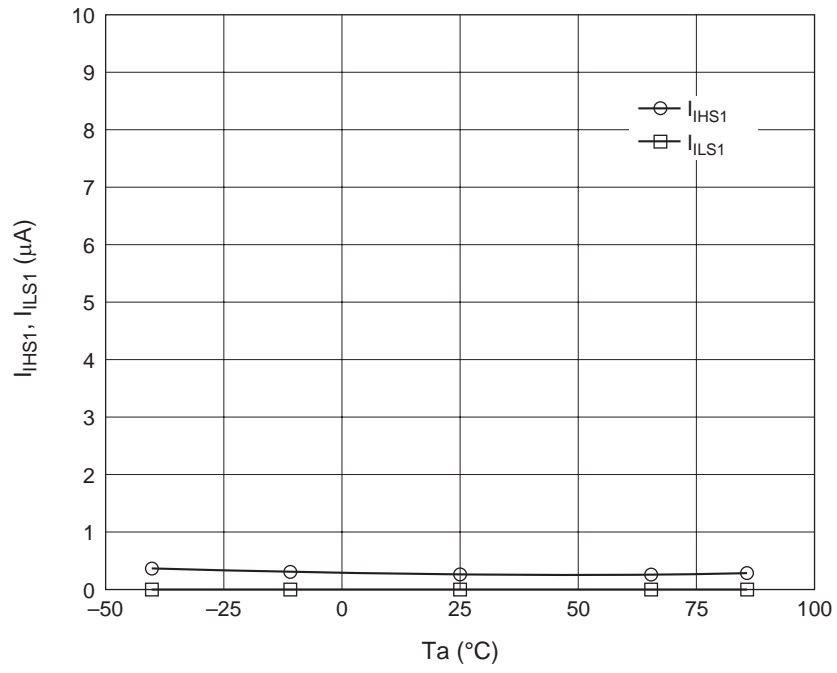


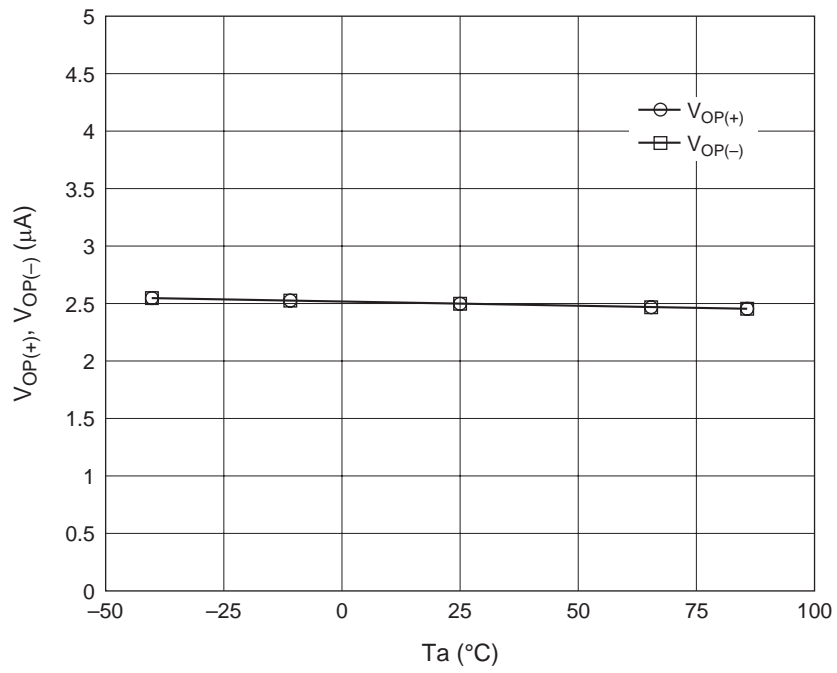
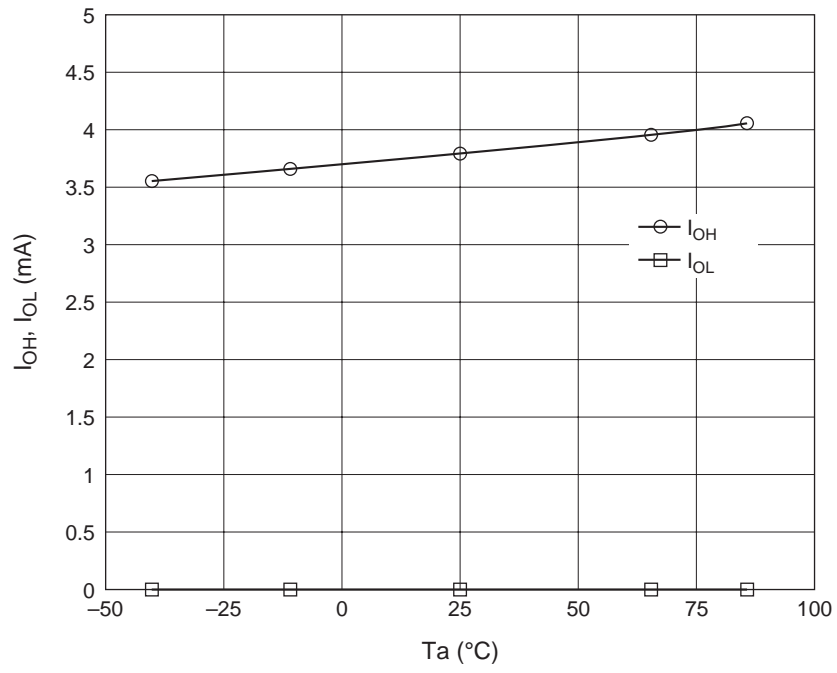


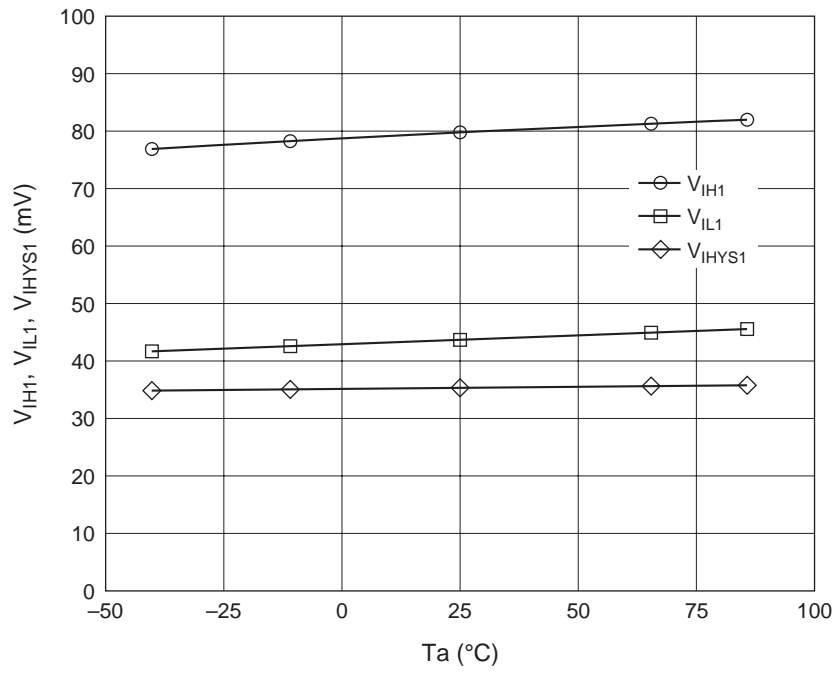
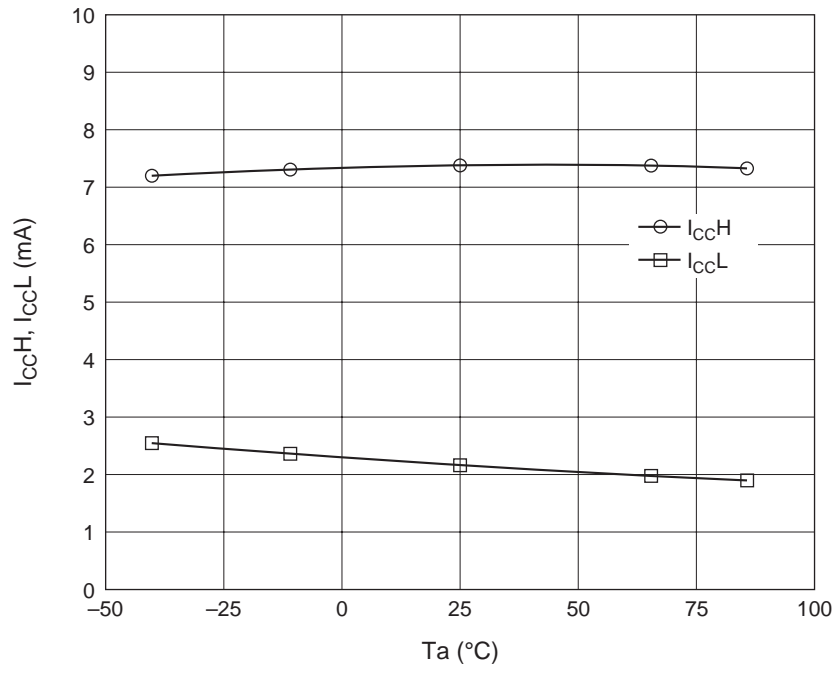


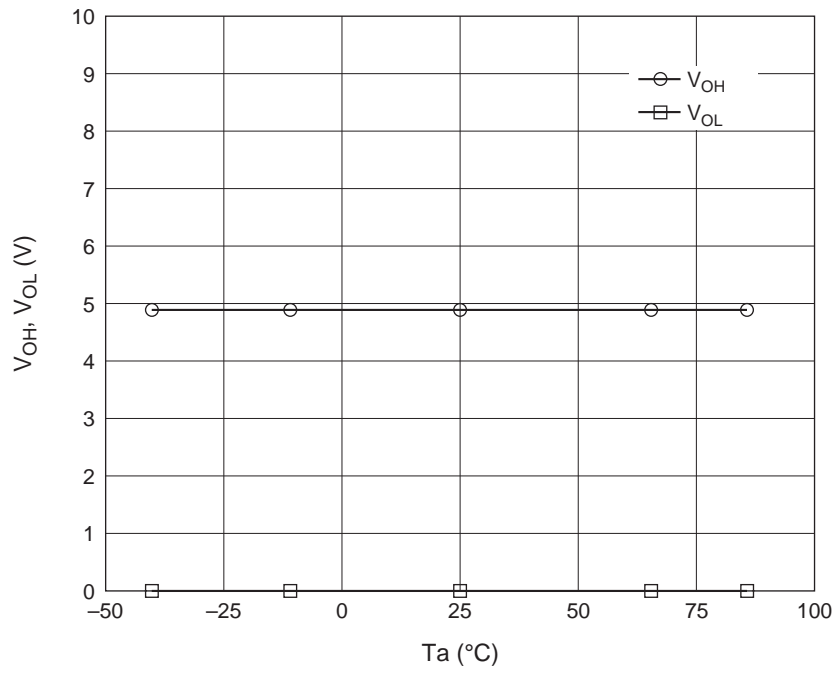
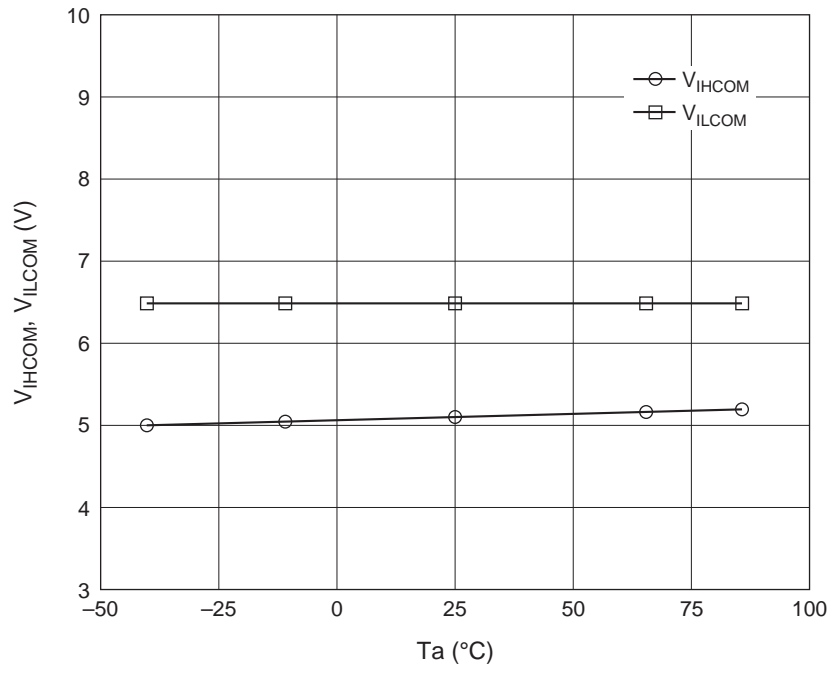


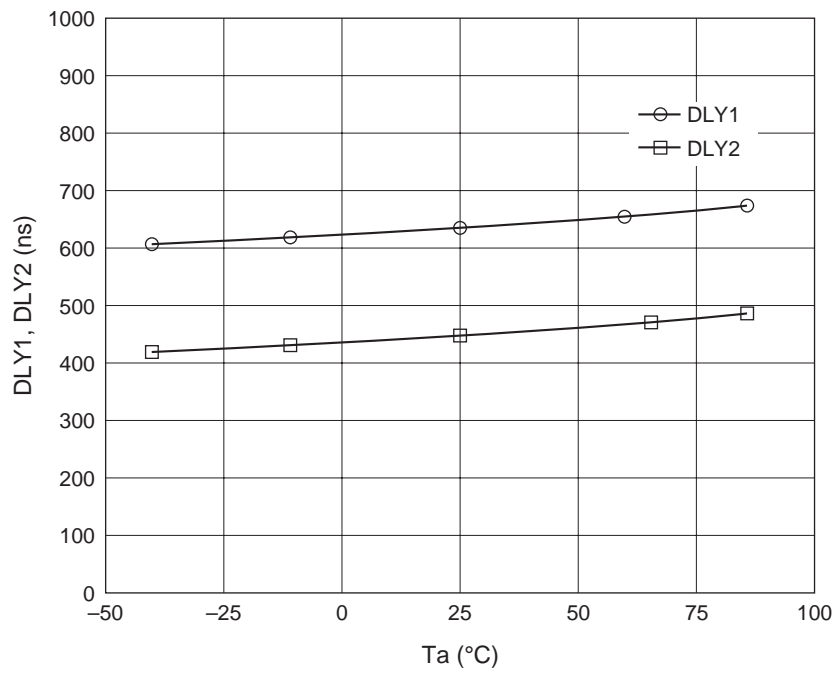
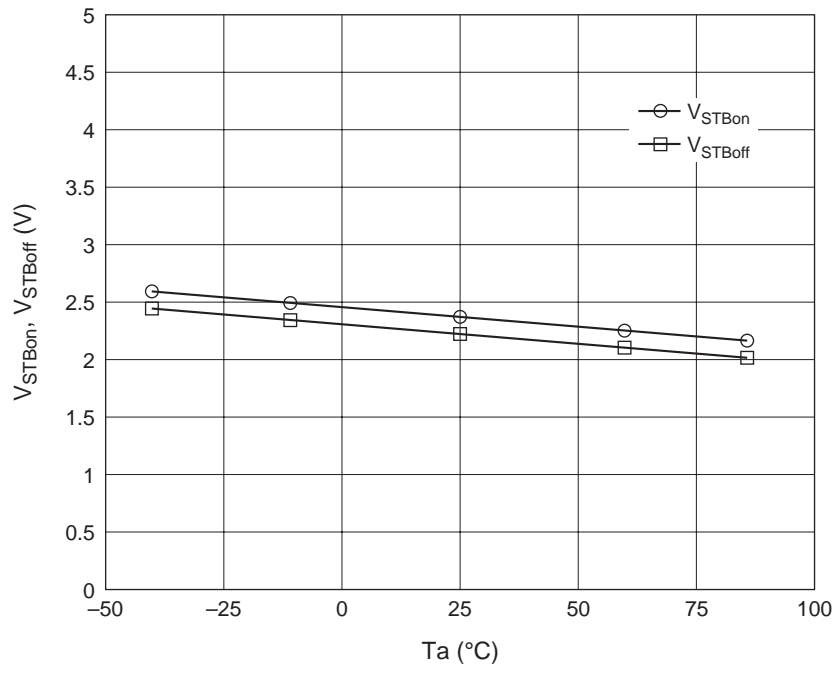






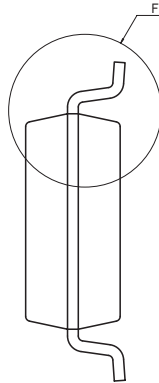
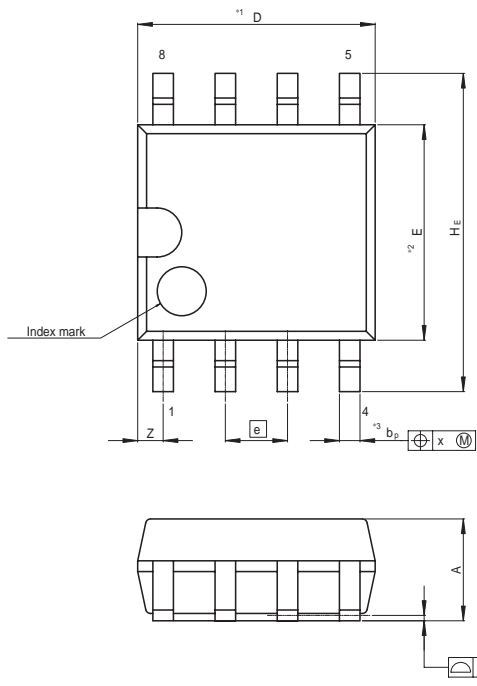




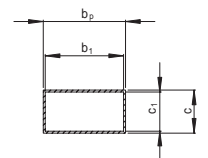


Package Dimensions

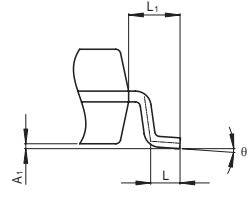
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NOTE)
 1. DIMENSIONS* 1 1 (Nom)*AND* 2 2
 DO NOT INCLUDE MOLD FLASH.
 2. DIMENSION* 3 3*DOES NOT
 INCLUDE TRIM OFFSET.



Terminal cross section



Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.85	5.25
E	—	4.4	—
A ₂	—	—	—
A ₁	0.00	0.10	0.20
A	—	—	2.03
b _p	0.34	0.42	0.50
b ₁	—	0.40	—
c	0.17	0.22	0.27
c ₁	—	0.20	—
θ	0°	—	8°
H _E	6.35	6.50	6.75
e	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.75
L	0.42	0.60	0.85
L ₁	—	1.05	—

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