Standard Characteristics Example

Standard characteristics described below are just examples of the 7548/7549 Group's characteristics and are not guaranteed.
For rated values, refer to "7548 Group Data sheet" and "7549 Group Data sheet".

(1) Power Supply Current Standard Characteristics Example (Vcc-Icc)

Double-speed mode (A/D conversion not executed)
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

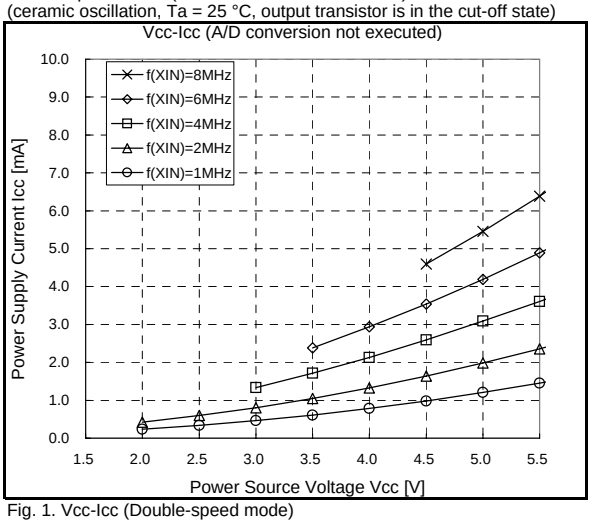

Fig. 1. Vcc-Icc (Double-speed mode)

High-speed mode (A/D conversion not executed)
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

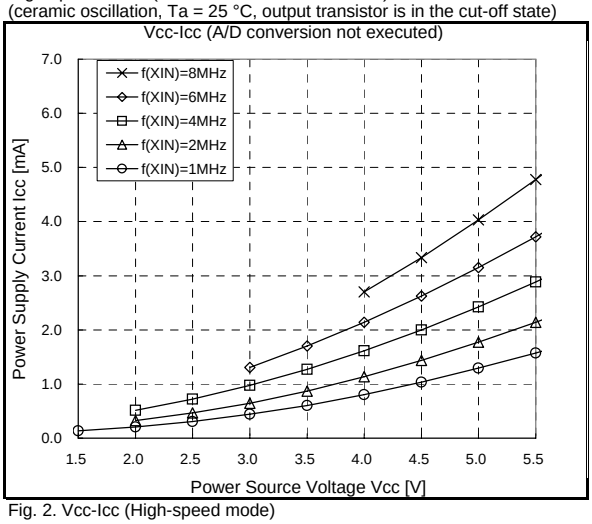

Fig. 2. Vcc-Icc (High-speed mode)

Middle-speed mode (A/D conversion not executed)
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

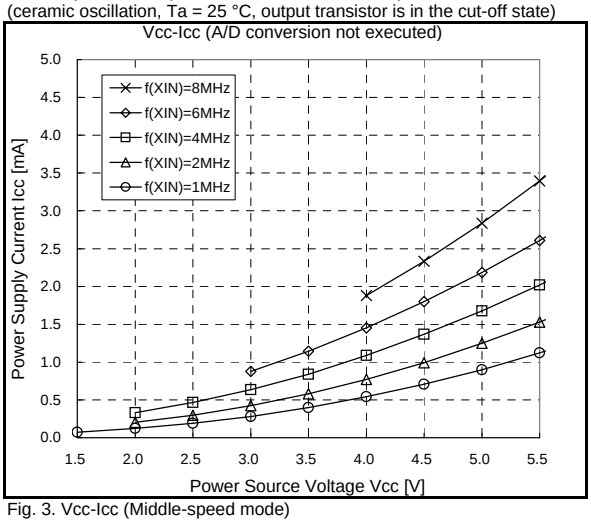

Fig. 3. Vcc-Icc (Middle-speed mode)

Low-speed mode (A/D conversion not executed)
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

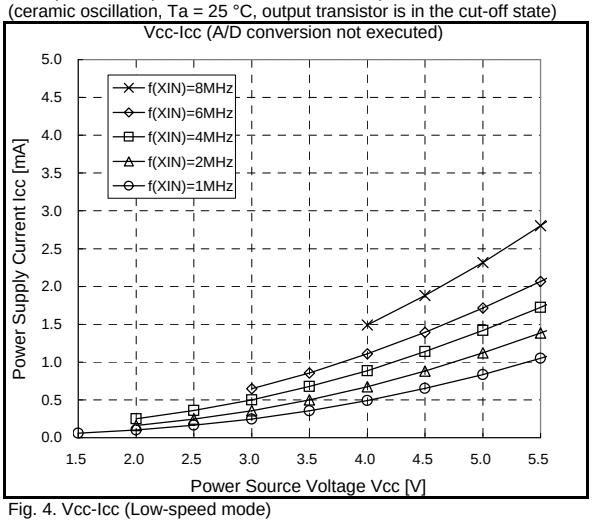

Fig. 4. Vcc-Icc (Low-speed mode)

At WIT instruction executed
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

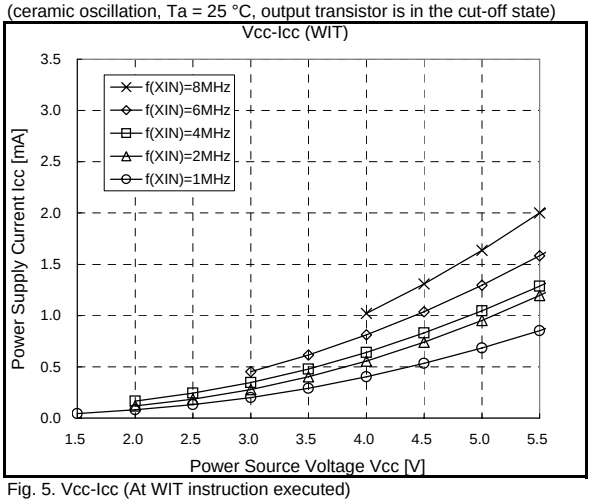

Fig. 5. Vcc-Icc (At WIT instruction executed)

At STP instruction executed
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

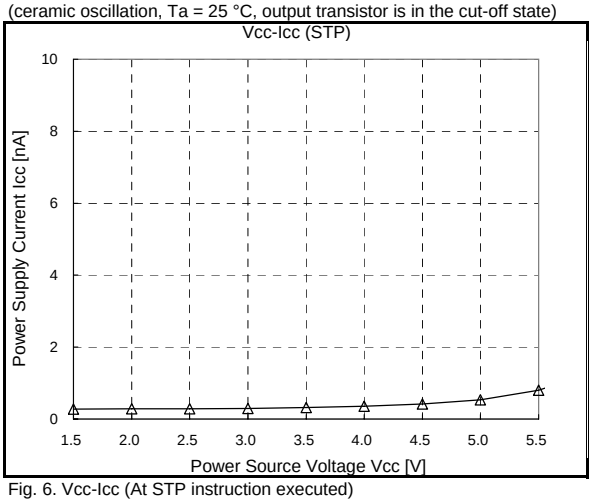

Fig. 6. Vcc-Icc (At STP instruction executed)

At 8 MHz double-speed mode, increment at A/D conversion executed
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

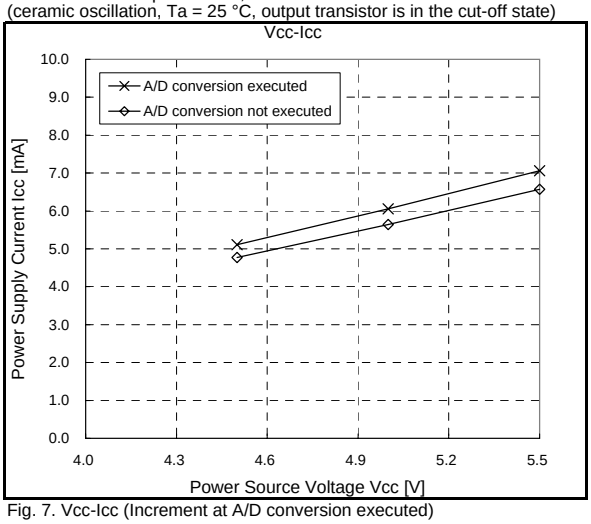

Fig. 7. Vcc-Icc (Increment at A/D conversion executed)

At 8 MHz high-speed mode, increment at A/D conversion executed
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

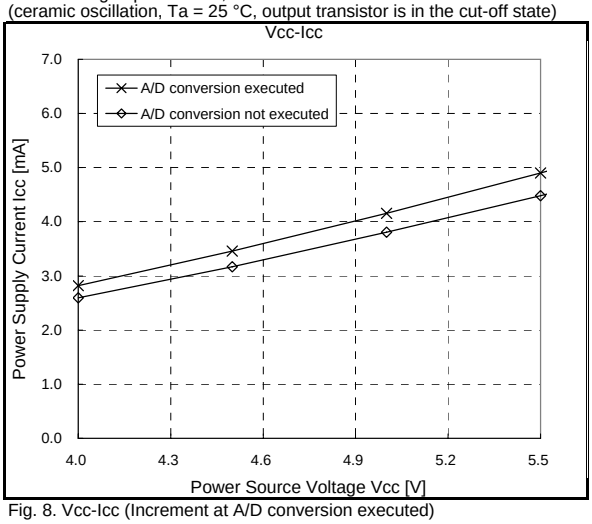

Fig. 8. Vcc-Icc (Increment at A/D conversion executed)

When system is operating in High-speed on-chip oscillator double-speed mode
(external oscillation stop, output transistor is in the cut-off state)

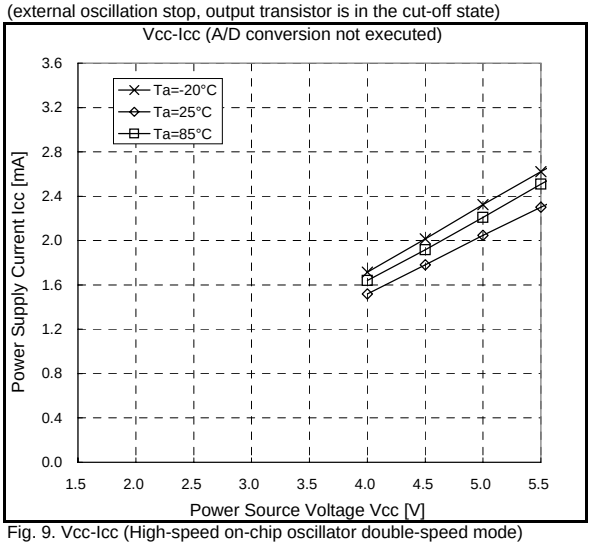

Fig. 9. Vcc-Icc (High-speed on-chip oscillator double-speed mode)

When system is operating in High-speed on-chip oscillator high-speed mode
(external oscillation stop, output transistor is in the cut-off state)

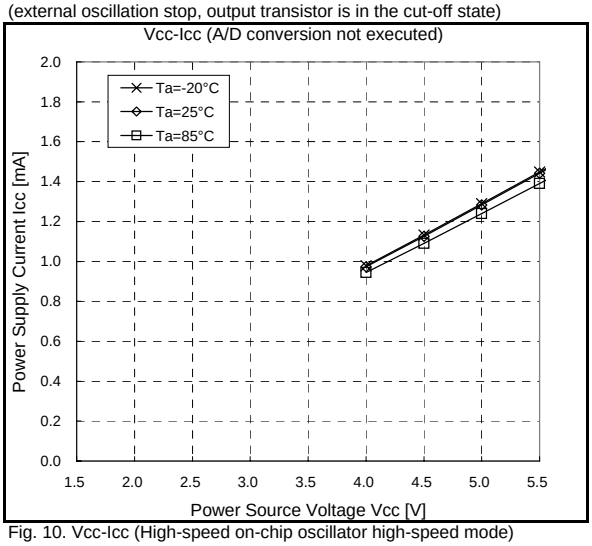

Fig. 10. Vcc-Icc (High-speed on-chip oscillator high-speed mode)

When system is operating in High-speed on-chip oscillator middle-speed mode
(external oscillation stop, output transistor is in the cut-off state)

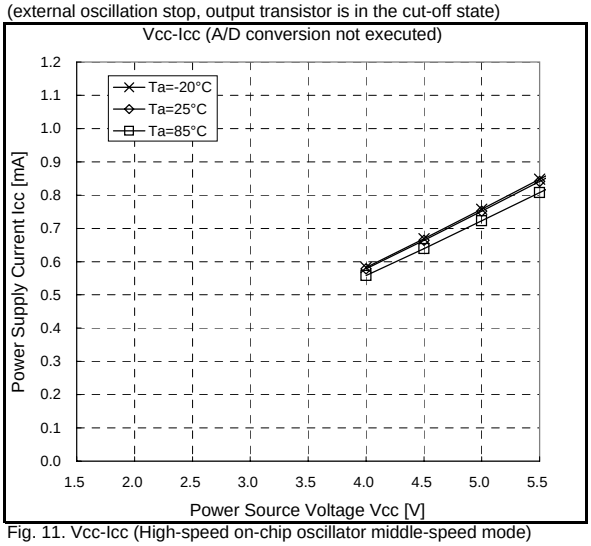

Fig. 11. Vcc-Icc (High-speed on-chip oscillator middle-speed mode)

When system is operating in High-speed on-chip oscillator low-speed mode
(external oscillation stop, output transistor is in the cut-off state)

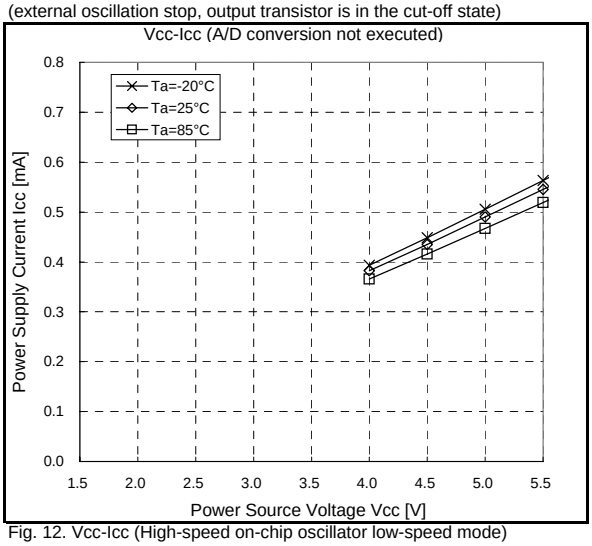

Fig. 12. Vcc-Icc (High-speed on-chip oscillator low-speed mode)

High-speed on-chip oscillator operating mode, at WIT instruction executed
(external oscillation stop, output transistor is in the cut-off state)

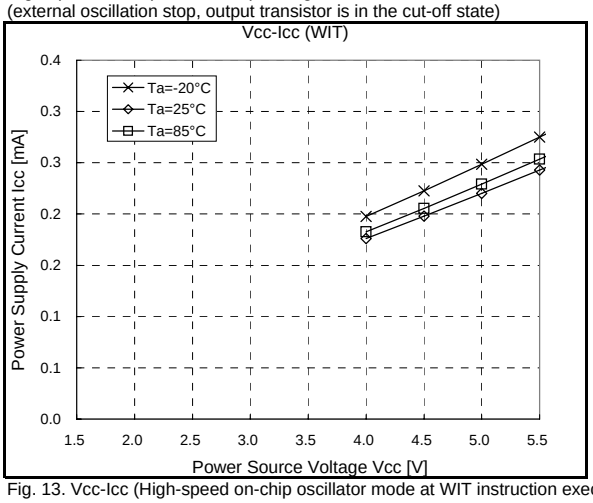

Fig. 13. Vcc-Icc (High-speed on-chip oscillator mode at WIT instruction executed)

When system is operating in Low-speed on-chip oscillator double-speed mode
(external oscillation stop, output transistor is in the cut-off state)

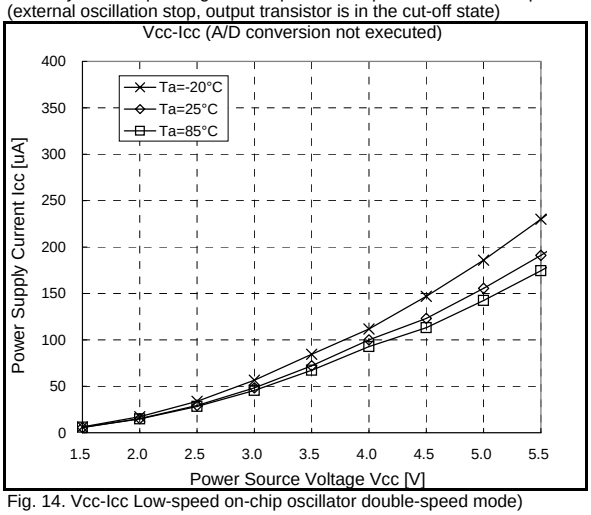

Fig. 14. Vcc-Icc Low-speed on-chip oscillator double-speed mode)

When system is operating in Low-speed on-chip oscillator high-speed mode
(external oscillation stop, output transistor is in the cut-off state)

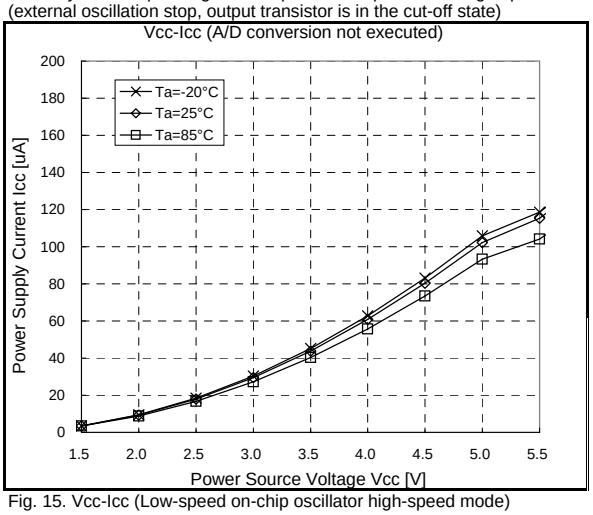

Fig. 15. Vcc-Icc (Low-speed on-chip oscillator high-speed mode)

When system is operating in Low-speed on-chip oscillator middle-speed mode
(external oscillation stop, output transistor is in the cut-off state)

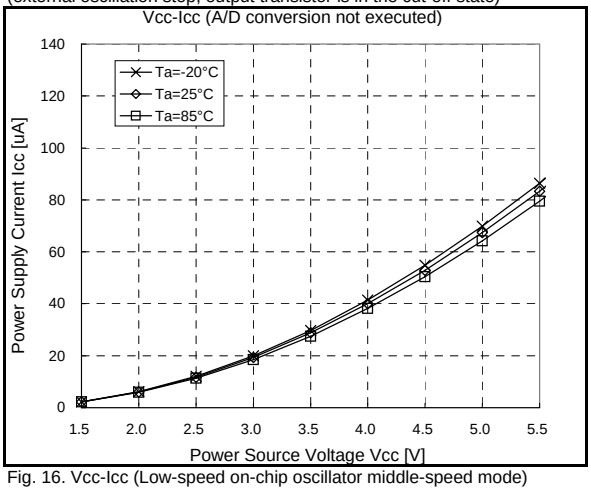

Fig. 16. Vcc-Icc (Low-speed on-chip oscillator middle-speed mode)

When system is operating in Low-speed on-chip oscillator low-speed mode
(external oscillation stop, output transistor is in the cut-off state)

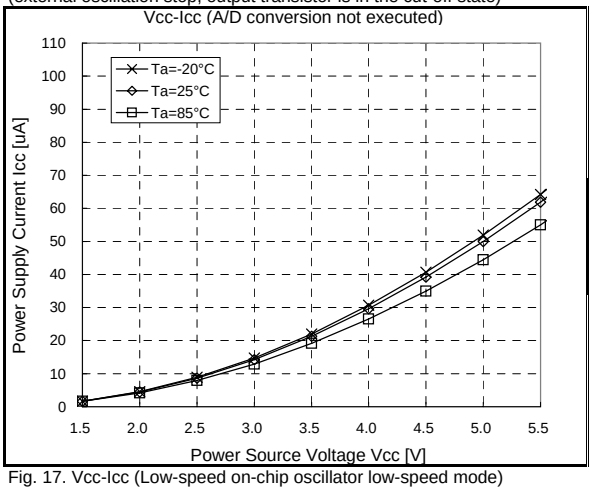

Fig. 17. Vcc-Icc (Low-speed on-chip oscillator low-speed mode)

Low-speed on-chip oscillator operating mode, at WIT instruction executed
(external oscillation stop, output transistor is in the cut-off state)

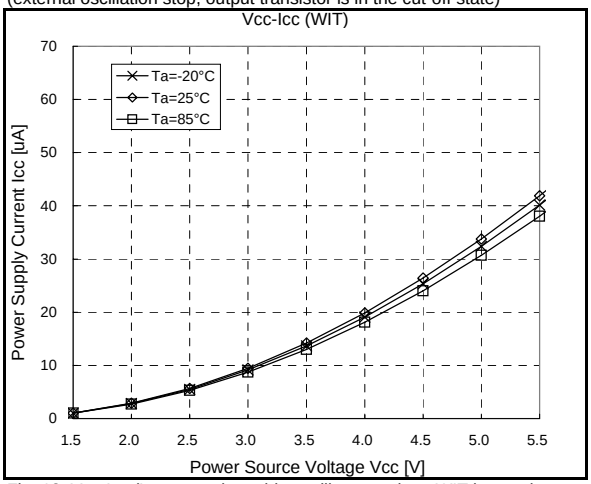

Fig. 18. Vcc-Icc (Low-speed on-chip oscillator mode at WIT instruction executed)

When system is operating in 32kHz quartz-crystal oscillator double-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

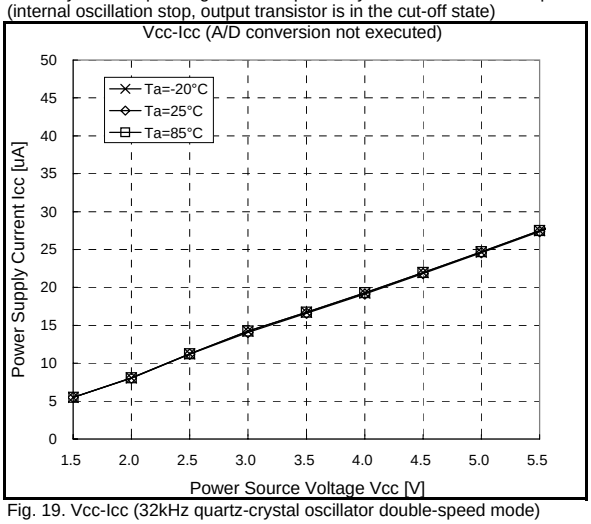

Fig. 19. Vcc-Icc (32kHz quartz-crystal oscillator double-speed mode)

When system is operating in 32kHz quartz-crystal oscillator high-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

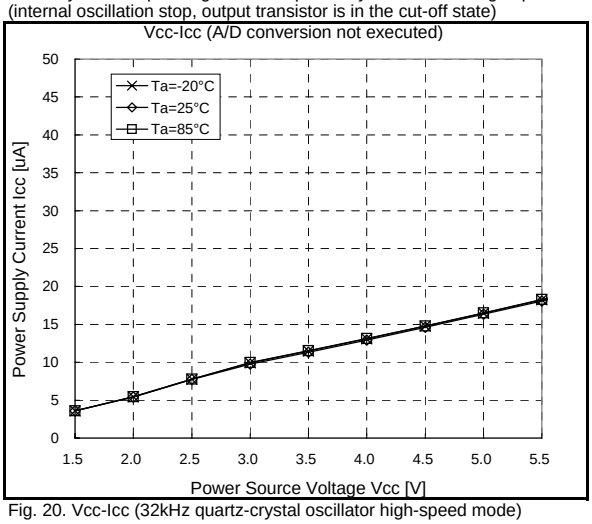

Fig. 20. Vcc-Icc (32kHz quartz-crystal oscillator high-speed mode)

When system is operating in 32kHz quartz-crystal oscillator middle-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

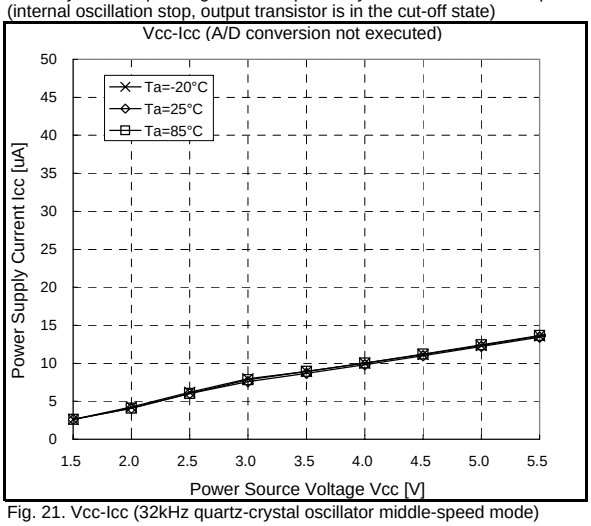

Fig. 21. Vcc-Icc (32kHz quartz-crystal oscillator middle-speed mode)

When system is operating in 32kHz quartz-crystal oscillator low-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

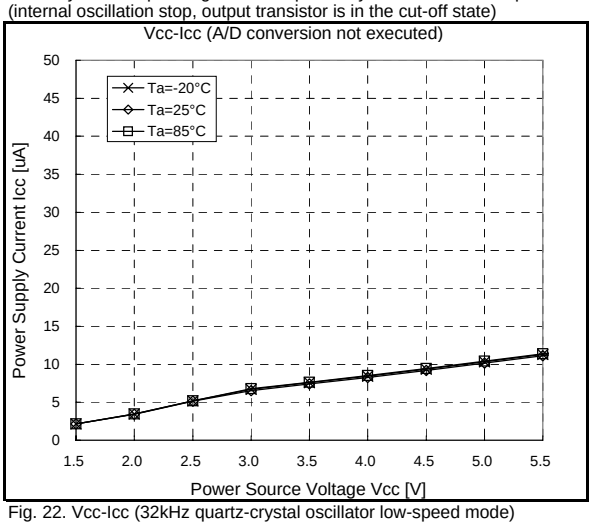

Fig. 22. Vcc-Icc (32kHz quartz-crystal oscillator low-speed mode)

32kHz quartz-crystal oscillator operating mode, at WIT instruction executed
(internal oscillation stop, output transistor is in the cut-off state)

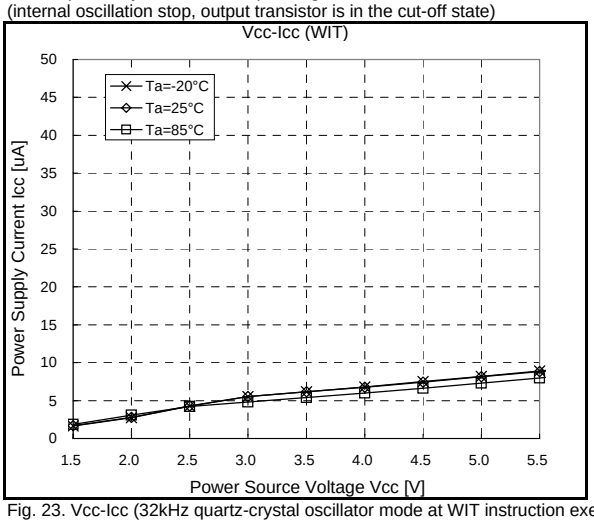

Fig. 23. Vcc-Icc (32kHz quartz-crystal oscillator mode at WIT instruction executed)

(2) Power Supply Current Standard Characteristics Example (f(XIN) -Icc)

When system is operating in double-speed mode
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

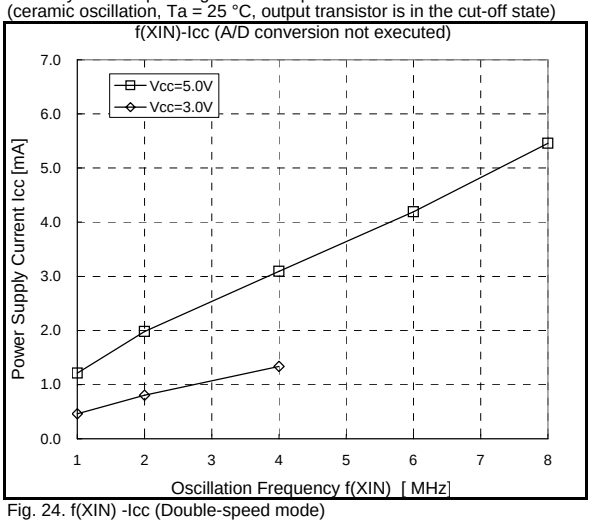

Fig. 24. f(XIN) -Icc (Double-speed mode)

When system is operating in high-speed mode
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

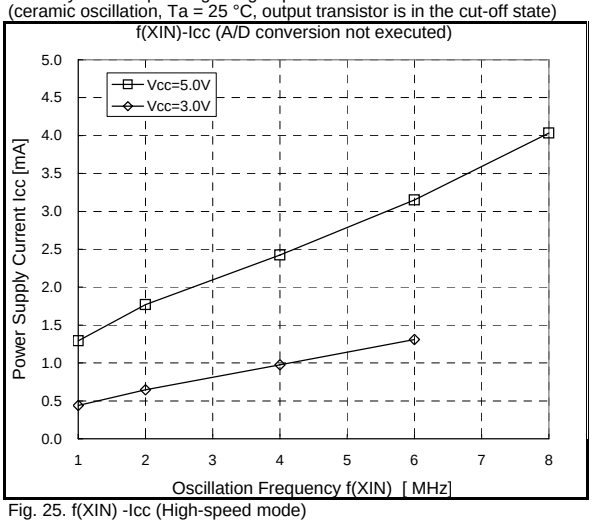

Fig. 25. f(XIN) -Icc (High-speed mode)

When system is operating in middle-speed mode
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

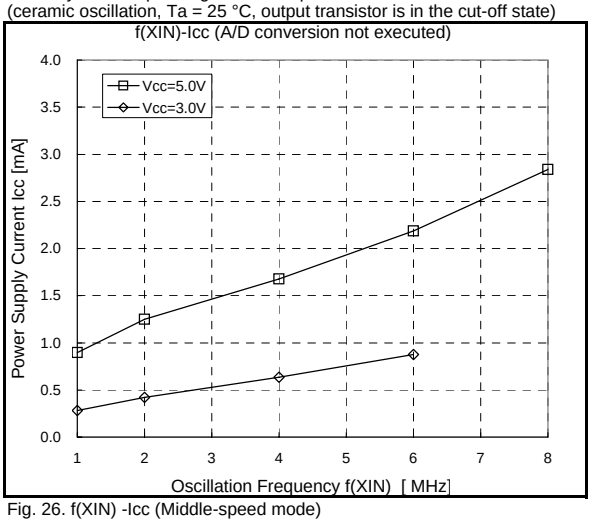

Fig. 26. f(XIN) -Icc (Middle-speed mode)

When system is operating in low-speed mode
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

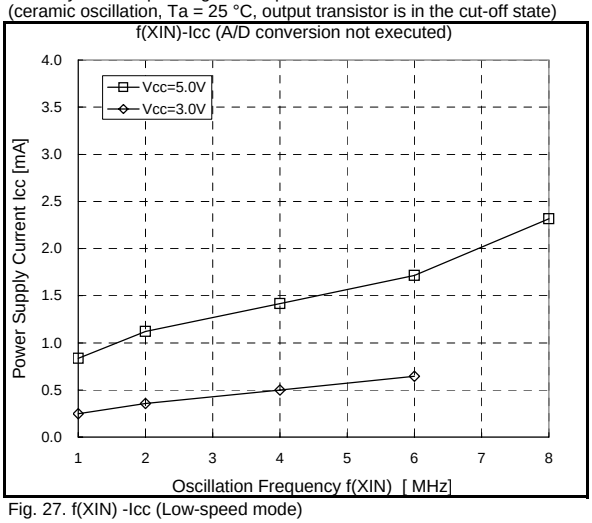

Fig. 27. f(XIN) -Icc (Low-speed mode)

At WIT instruction executed
(ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

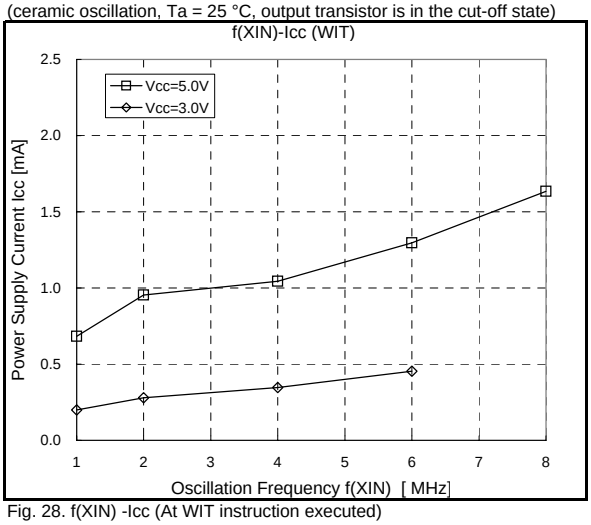

Fig. 28. f(XIN) -Icc (At WIT instruction executed)

(3) Power Supply Current Standard Characteristics Example (Ta-Icc)

When system is operating in High-speed on-chip oscillator double-speed mode
(external oscillation stop, output transistor is in the cut-off state)

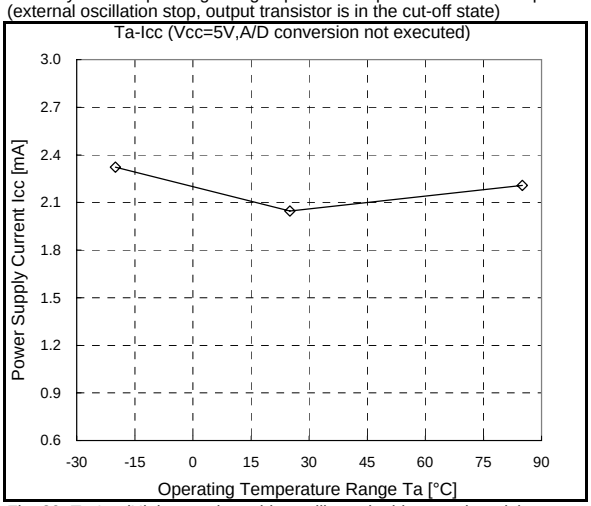

Fig. 29. Ta-Icc (High-speed on-chip oscillator double-speed mode)

When system is operating in High-speed on-chip oscillator high-speed mode
(external oscillation stop, output transistor is in the cut-off state)

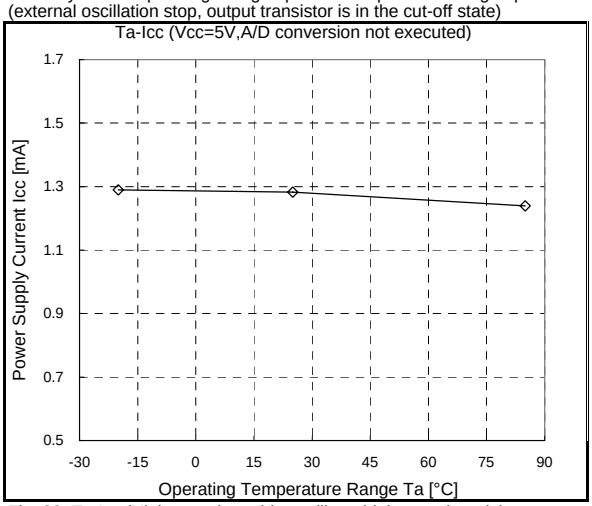

Fig. 30. Ta-Icc (High-speed on-chip oscillator high-speed mode)

When system is operating in High-speed on-chip oscillator middle-speed mode
(external oscillation stop, output transistor is in the cut-off state)

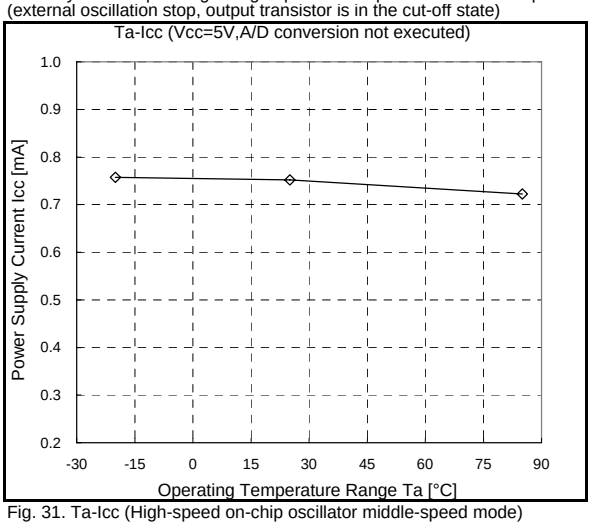

Fig. 31. Ta-Icc (High-speed on-chip oscillator middle-speed mode)

When system is operating in High-speed on-chip oscillator low-speed mode
(external oscillation stop, output transistor is in the cut-off state)

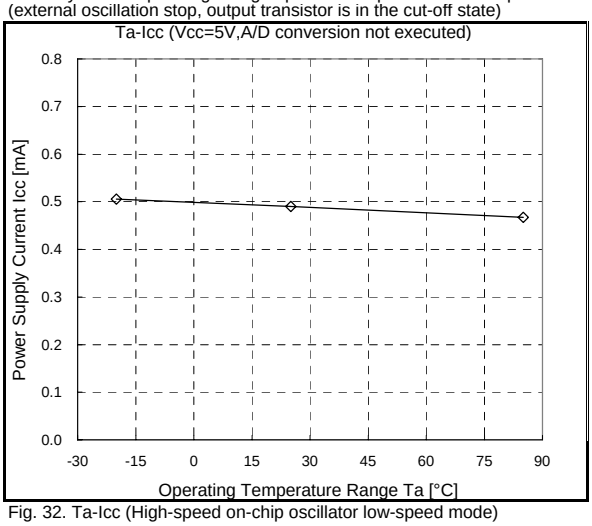

Fig. 32. Ta-Icc (High-speed on-chip oscillator low-speed mode)

High-speed on-chip oscillator operating mode at WIT instruction executed
(external oscillation stop, output transistor is in the cut-off state)

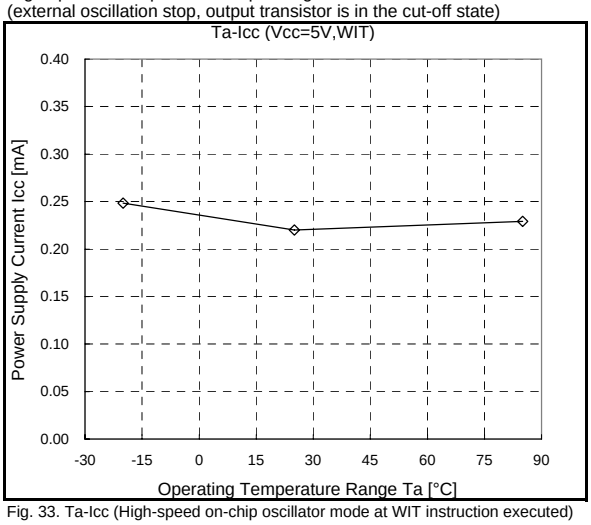

Fig. 33. Ta-Icc (High-speed on-chip oscillator mode at WIT instruction executed)

When system is operating in Low-speed on-chip oscillator double-speed mode
(external oscillation stop, output transistor is in the cut-off state)

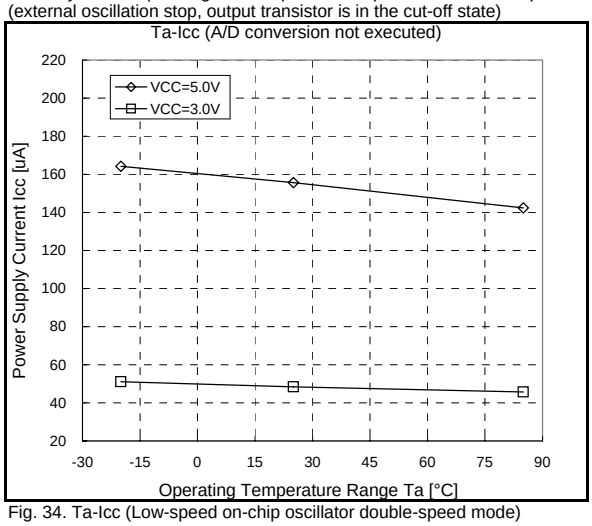

Fig. 34. Ta-Icc (Low-speed on-chip oscillator double-speed mode)

When system is operating in Low-speed on-chip oscillator high-speed mode
(external oscillation stop, output transistor is in the cut-off state)

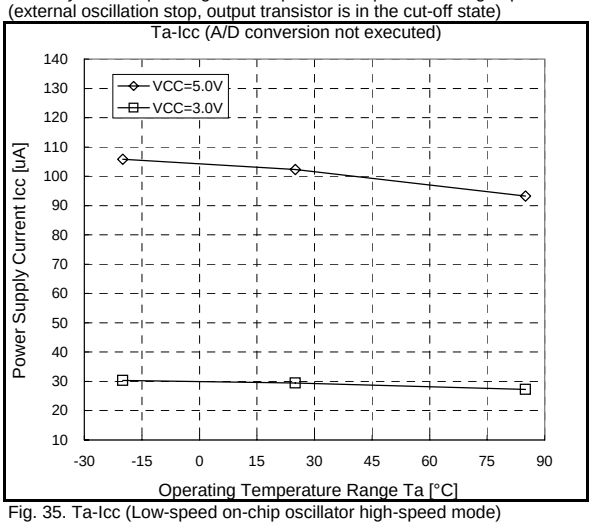

Fig. 35. Ta-Icc (Low-speed on-chip oscillator high-speed mode)

When system is operating in Low-speed on-chip oscillator middle-speed mode
(external oscillation stop, output transistor is in the cut-off state)

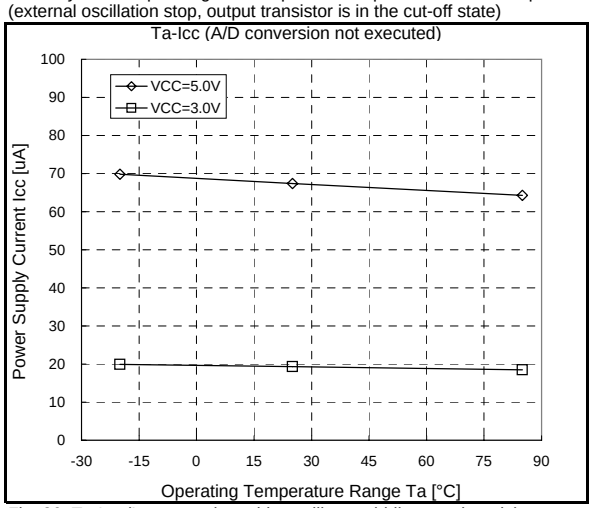

Fig. 36. Ta-Icc (Low-speed on-chip oscillator middle-speed mode)

When system is operating in Low-speed on-chip oscillator low-speed mode
(external oscillation stop, output transistor is in the cut-off state)

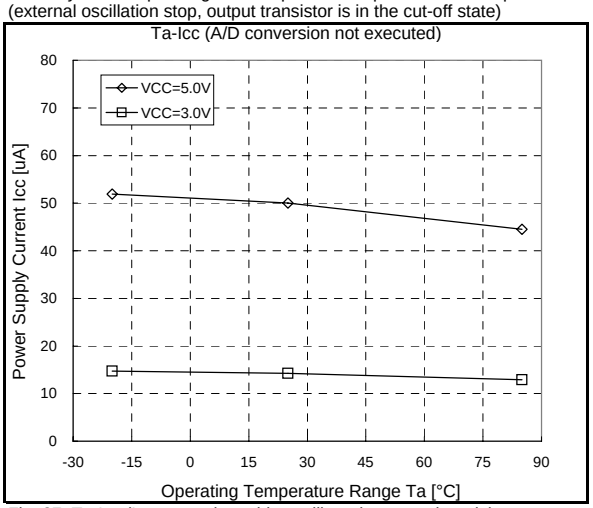

Fig. 37. Ta-Icc (Low-speed on-chip oscillator low-speed mode)

low-speed on-chip oscillator operating mode at WIT instruction executed
(external oscillation stop, output transistor is in the cut-off state)

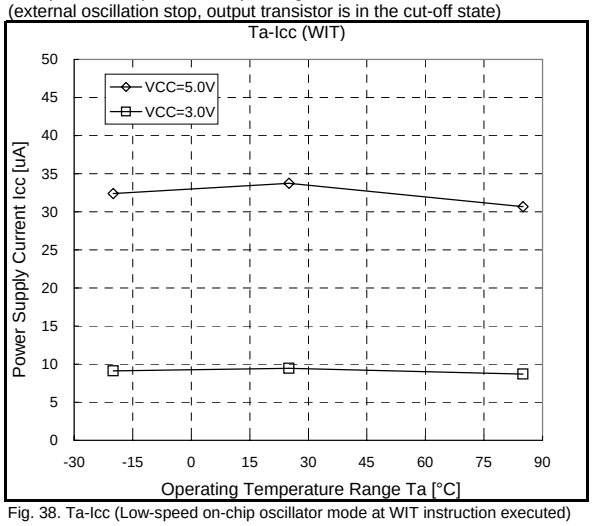

Fig. 38. Ta-Icc (Low-speed on-chip oscillator mode at WIT instruction executed)

When system is operating in 32kHz quartz-crystal oscillator double-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

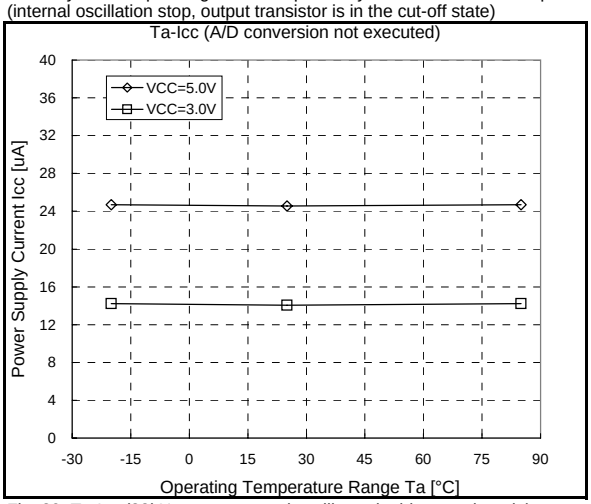

Fig. 39. Ta-Icc (32kHz quartz-crystal oscillator double-speed mode)

When system is operating in 32kHz quartz-crystal oscillator high-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

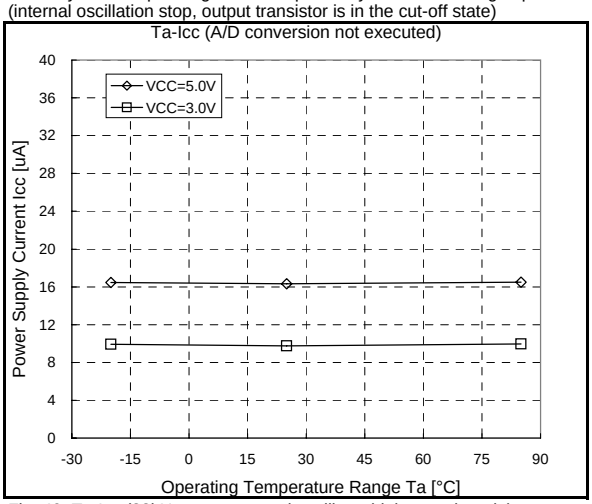

Fig. 40. Ta-Icc (32kHz quartz-crystal oscillator high-speed mode)

When system is operating in 32kHz quartz-crystal oscillator middle-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

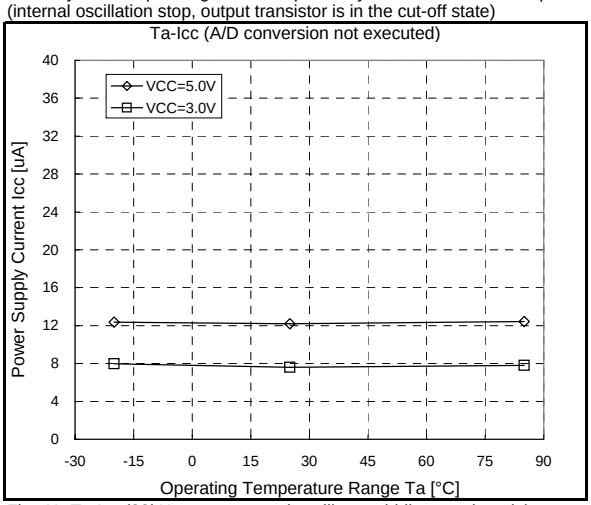

Fig. 41. Ta-Icc (32kHz quartz-crystal oscillator middle-speed mode)

When system is operating in 32kHz quartz-crystal oscillator low-speed mode
(internal oscillation stop, output transistor is in the cut-off state)

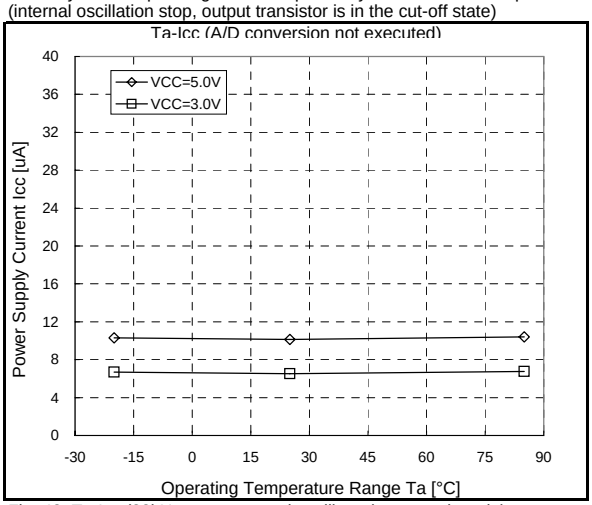

Fig. 42. Ta-Icc (32kHz quartz-crystal oscillator low-speed mode)

32kHz quartz-crystal oscillator operating mode at WIT instruction executed
(internal oscillation stop, output transistor is in the cut-off state)

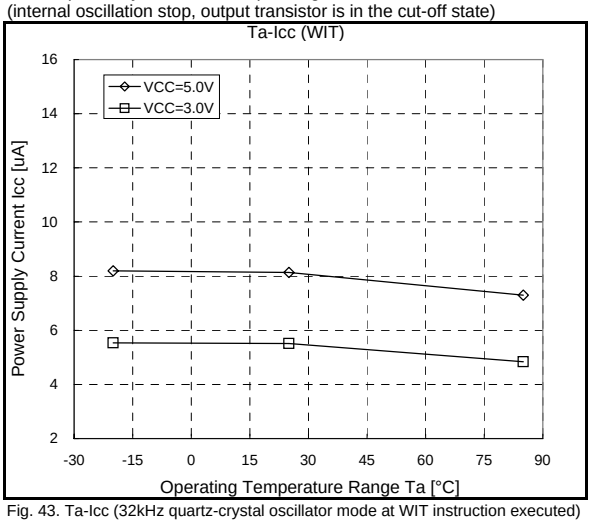

Fig. 43. Ta-Icc (32kHz quartz-crystal oscillator mode at WIT instruction executed)

(4) Port Standard characteristics Example (VOH-IOH)

VOH-IOH (Vcc = 3.0 V, Ports P0, P1, P2, P3)

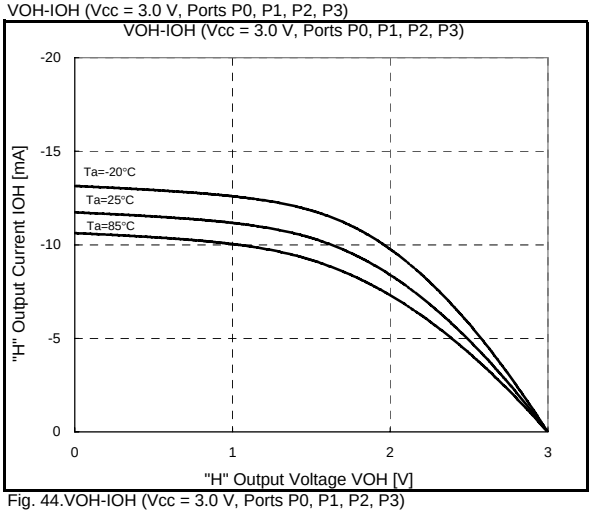

Fig. 44.VOH-IOH (Vcc = 3.0 V, Ports P0, P1, P2, P3)

VOH-IOH (Vcc = 5.0 V, Ports P0, P1, P2, P3)

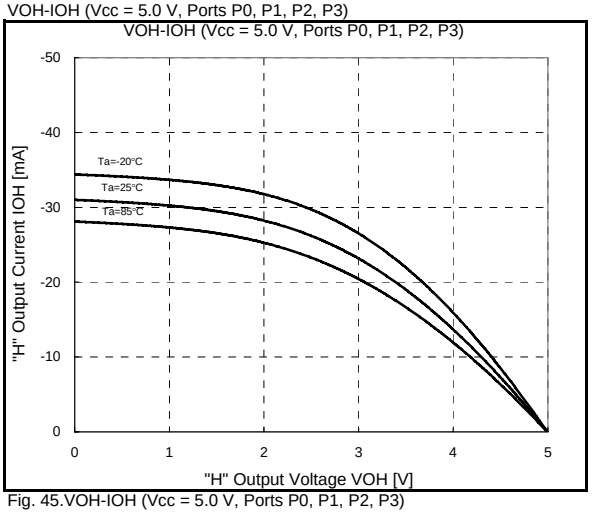

Fig. 45.VOH-IOH (Vcc = 5.0 V, Ports P0, P1, P2, P3)

(5) Port Standard Characteristics Example (VOL-IOL)

VOL-IOL (Vcc = 3.0 V, Ports P0, "Drivability = High")

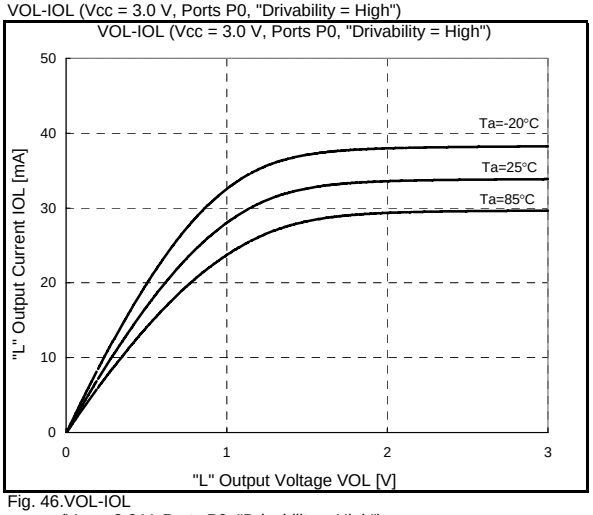

Fig. 46.VOL-IOL
(Vcc = 3.0 V, Ports P0, "Drivability = High")

VOL-IOL (Vcc = 5.0 V, Ports P0, "Drivability = High")

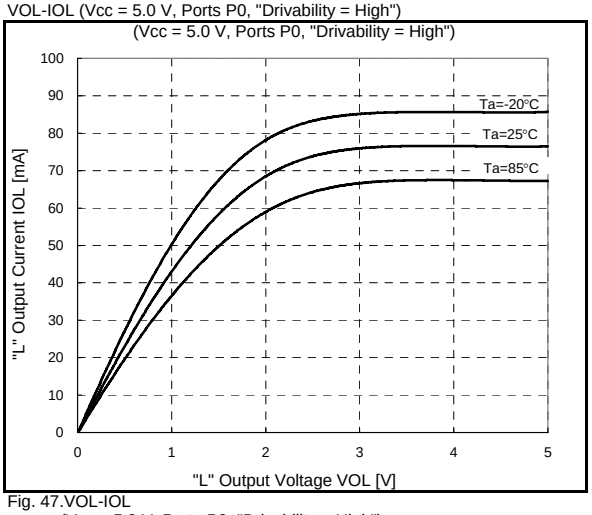

Fig. 47.VOL-IOL
(Vcc = 5.0 V, Ports P0, "Drivability = High")

VOL-IOL (Vcc = 3.0 V, Ports P0, "Drivability = Low",
and Ports P1, P2, P3)

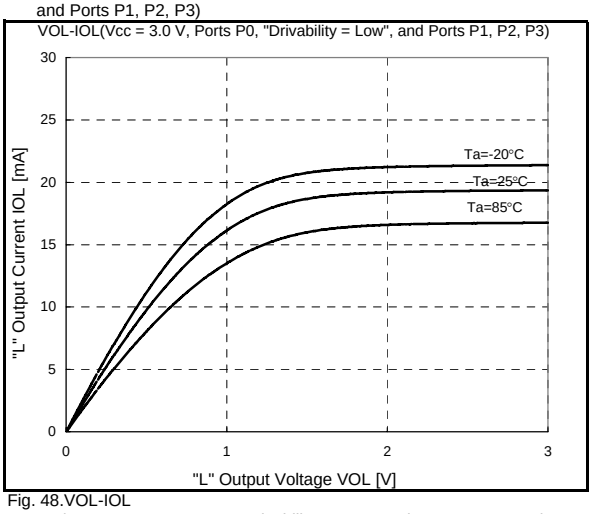

Fig. 48.VOL-IOL
(Vcc = 3.0 V, Ports P0, "Drivability = Low", and Ports P1, P2, P3)

VOL-IOL (Vcc = 5.0 V, Ports P0, "Drivability = Low",
and Ports P1, P2, P3)

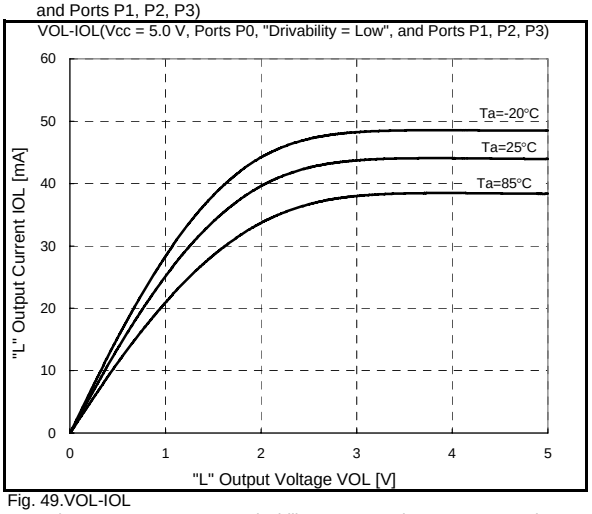

Fig. 49.VOL-IOL
(Vcc = 5.0 V, Ports P0, "Drivability = Low", and Ports P1, P2, P3)

(6) Port Standard Characteristics Example (Vcc-IIL)

Vcc-IIL (Ports P0, P1 when connecting pull-up transistor)

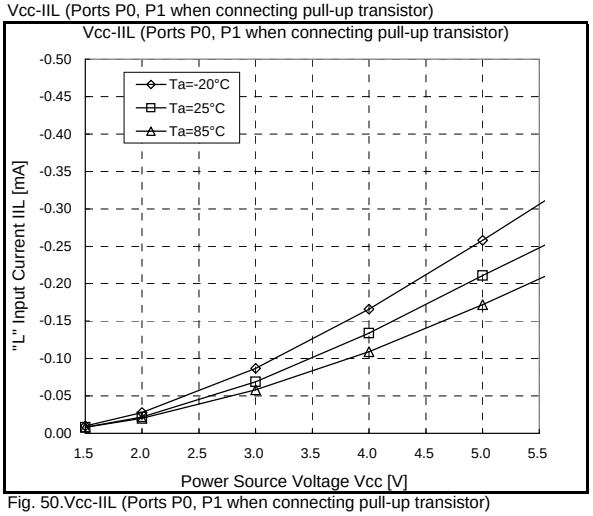

Fig. 50.Vcc-IIL (Ports P0, P1 when connecting pull-up transistor)

(7) Port Standard Characteristics Example (Vcc-VIHL)

Vcc-VIHL (I/O Ports (CMOS) , Ta = 25°C, Ports P0, P1, P2, P3)

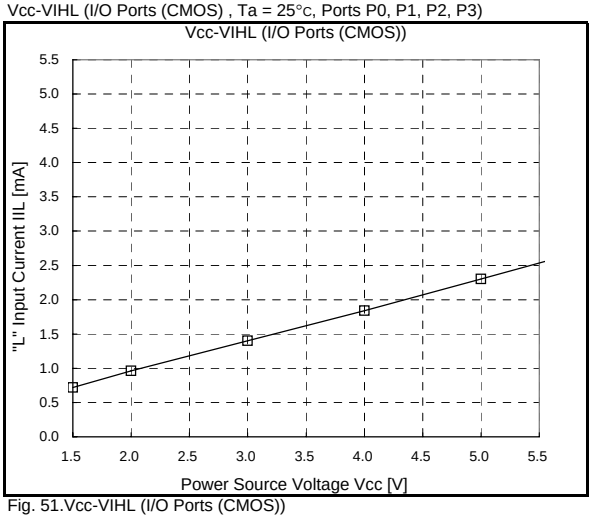

Fig. 51.Vcc-VIHL (I/O Ports (CMOS))

Vcc-VIHL (RESET pin, Ta = 25°C)

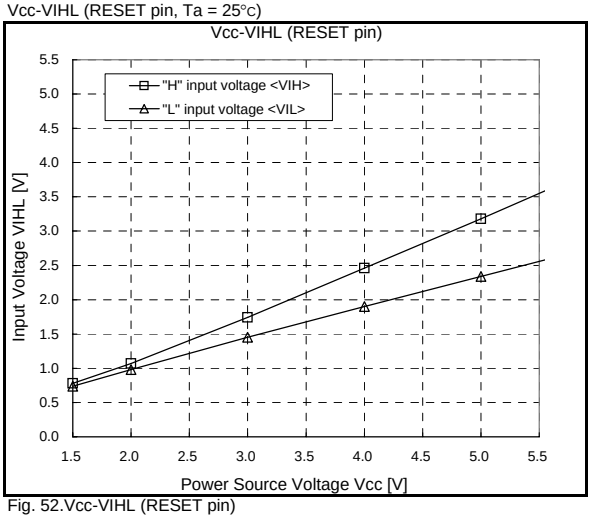

Fig. 52.Vcc-VIHL (RESET pin)

Vcc-VIHL(INT • Capture • Serial I/O Function Pir
(INT0,INT1,CAP0,RXD,SCLK), Ta=25°C)

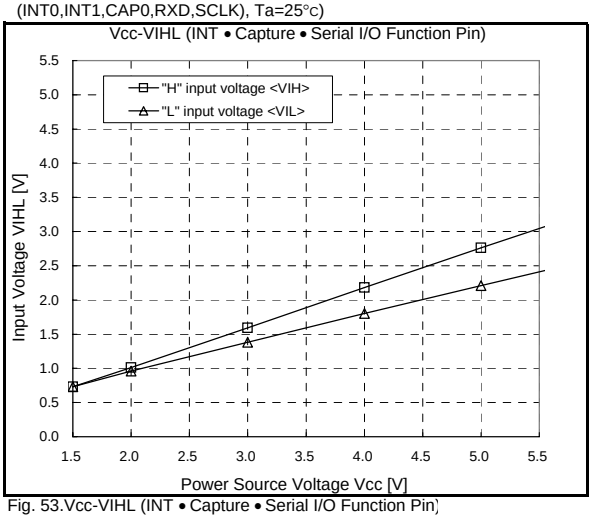

Fig. 53.Vcc-VIHL (INT • Capture • Serial I/O Function Pin)

Vcc-VIHL (CNVss pin,Ta=25°C)

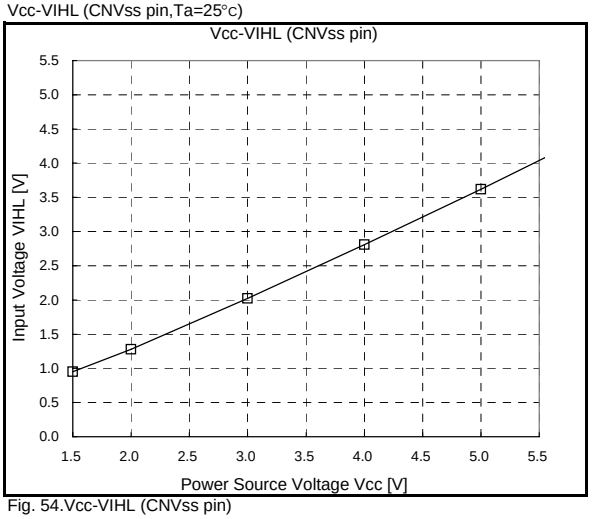

Fig. 54.Vcc-VIHL (CNVss pin)

Vcc-HYS (RESET pin, Ta=25°c)

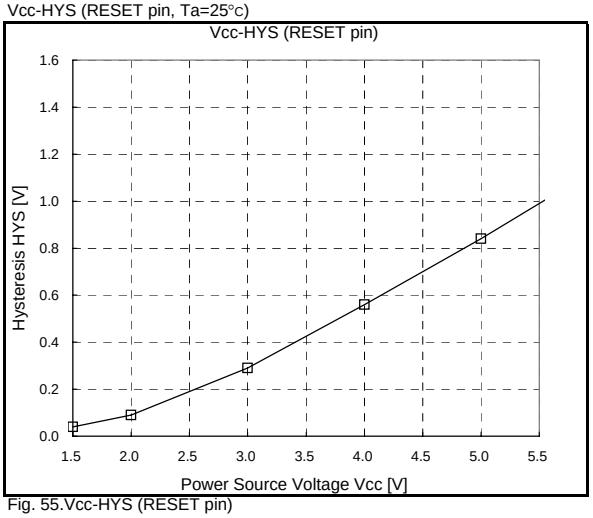

Fig. 55.Vcc-HYS (RESET pin)

Vcc-HYS (INT • Capture • Serial I/O Function Pin
(INT0,INT1,CAP0,RXD,SCLK), Ta=25°c)

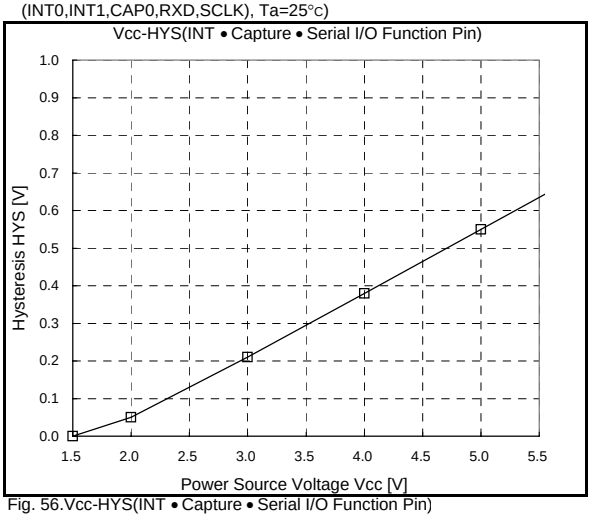

Fig. 56.Vcc-HYS(INT • Capture • Serial I/O Function Pin)

Vcc-HYS(Key-Input(key-on wake up interrupt input pin), Ta=25°c)

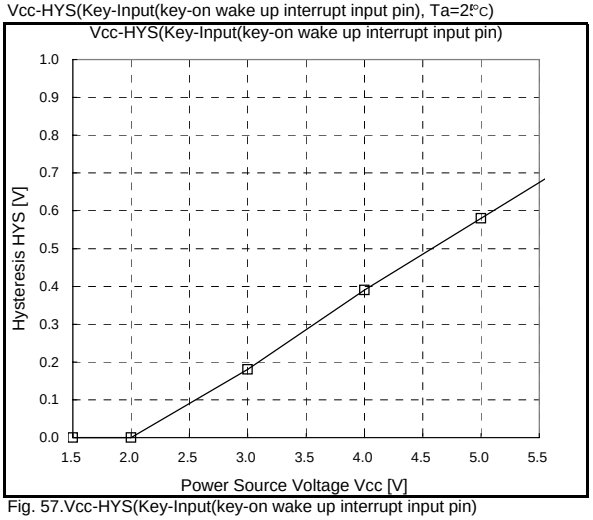

Fig. 57.Vcc-HYS(Key-Input(key-on wake up interrupt input pin)

(8) Port Standard Characteristics Example (VIN-II (AD))

VIN-II (AD) (A/D converter operation, f(Xin) = 8 MHz, Double-speed mode
Vcc = 5.0 V, Ta = 25°c)

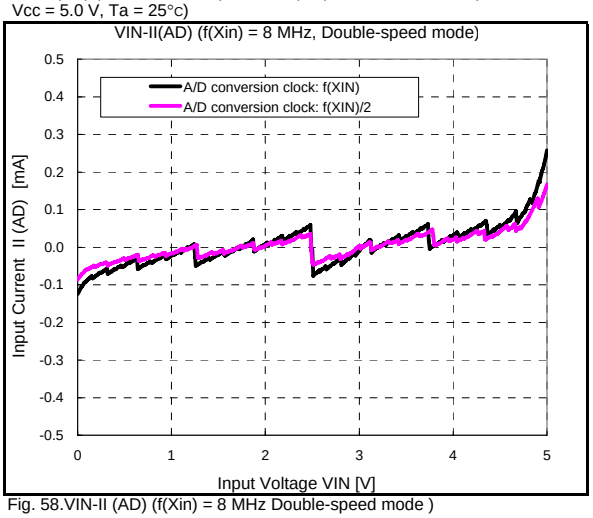

Fig. 58.VIN-II (AD) (f(Xin) = 8 MHz Double-speed mode)

VIN-II (AD) (A/D converter operation, f(Xin) = 6 MHz, Double-speed mode,
Vcc = 5.0 V, Ta = 25°c)

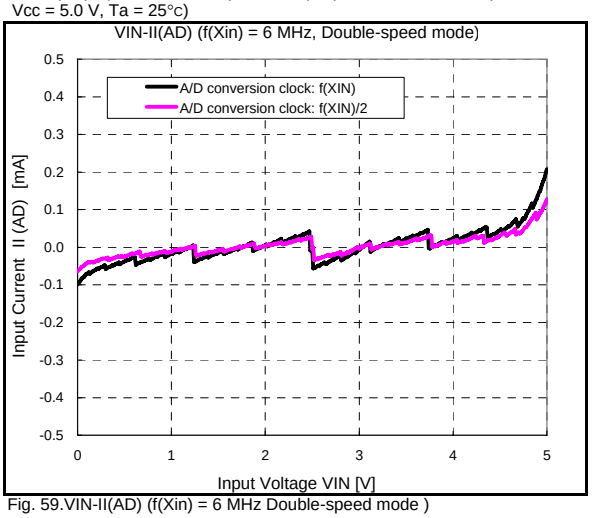

Fig. 59.VIN-II(AD) (f(Xin) = 6 MHz Double-speed mode)

VIN-II (AD) (A/D converter operation, f(Xin) = 4 MHz, Double-speed mode,
Vcc = 5.0 V, Ta = 25°c)

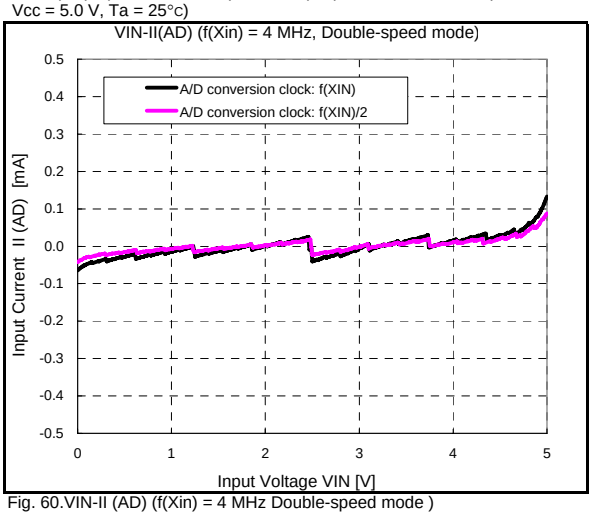

Fig. 60.VIN-II (AD) (f(Xin) = 4 MHz Double-speed mode)

(9) High-speed on-chip Oscillator Frequency Characteristics Example

High-speed on-chip oscillator frequency characteristics(Vcc-R_{HSOCO})

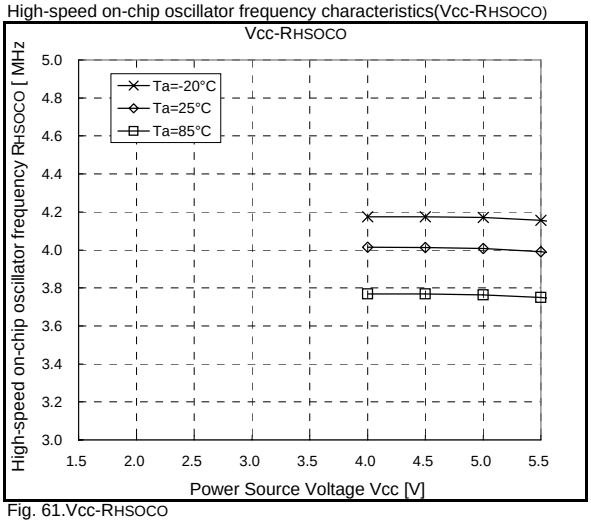

Fig. 61.Vcc-R_{HSOCO}

High-speed on-chip oscillator frequency characteristics(Ta-R_{HSOCO})

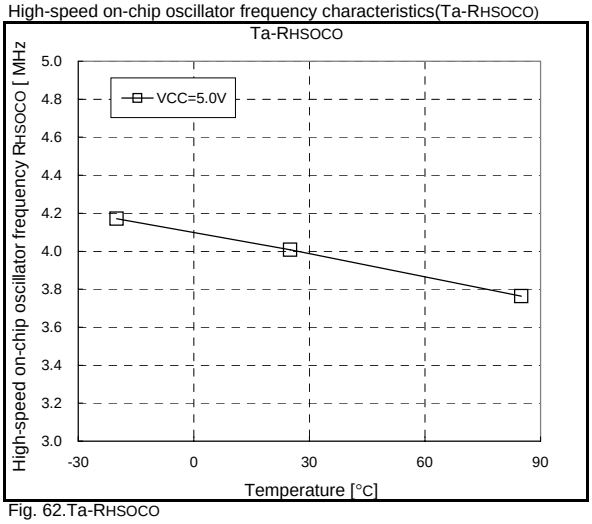

Fig. 62.Ta-R_{HSOCO}

(10) Low-speed on-chip Oscillator Frequency Characteristics Example

Low-speed on-chip oscillator frequency characteristics(Vcc-R_{LSOCO})

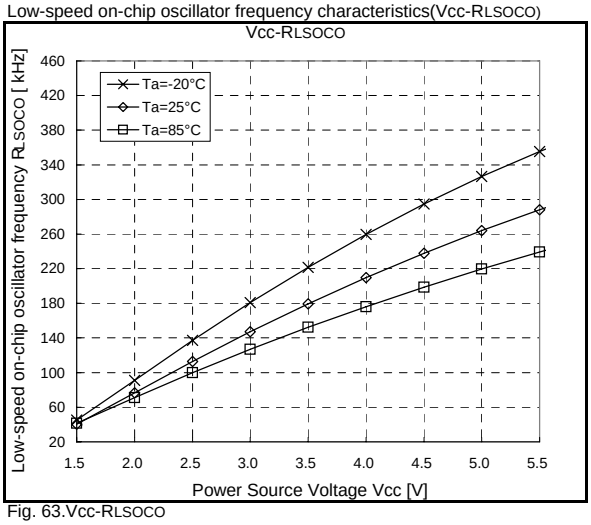

Fig. 63.Vcc-R_{LSOCO}

Low-speed on-chip oscillator frequency characteristics(Ta-R_{LSOCO})

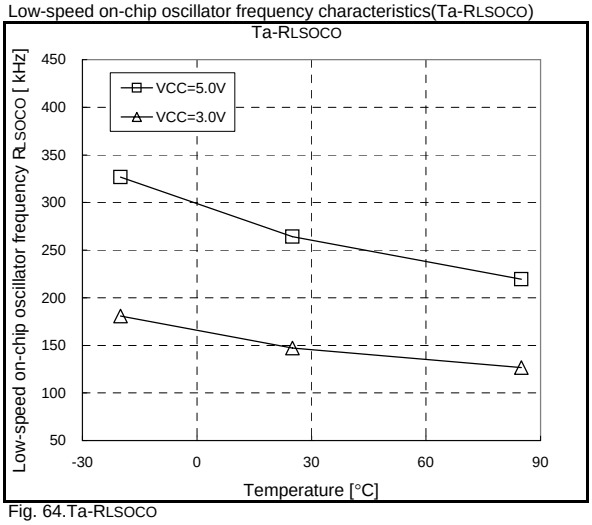

Fig. 64.Ta-R_{LSOCO}

(11) A/D Conversion Accuracy Characteristics

A/D conversion accuracy standard characteristics example-1

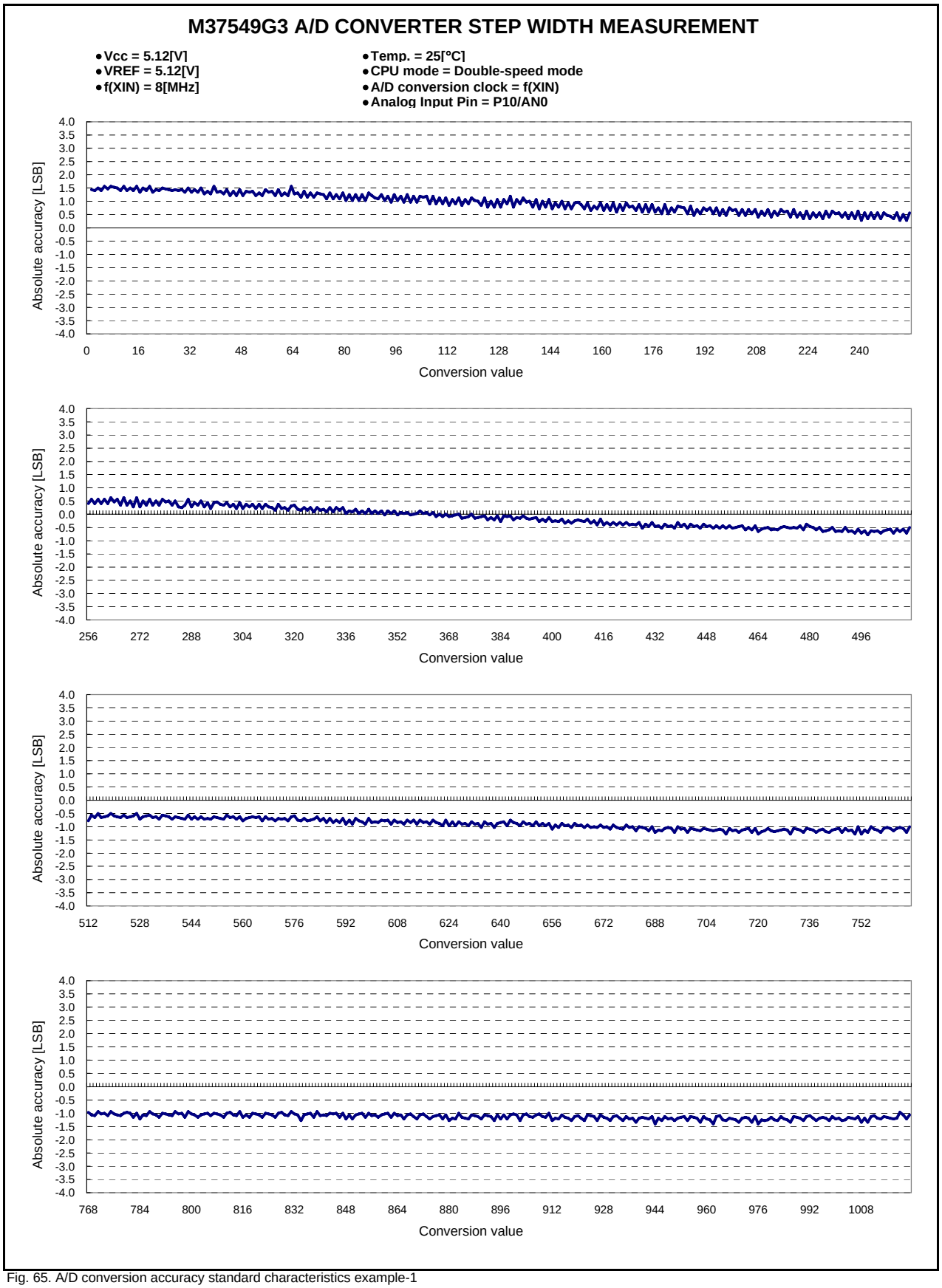

Fig. 65. A/D conversion accuracy standard characteristics example-1

A/D conversion accuracy standard characteristics example-2

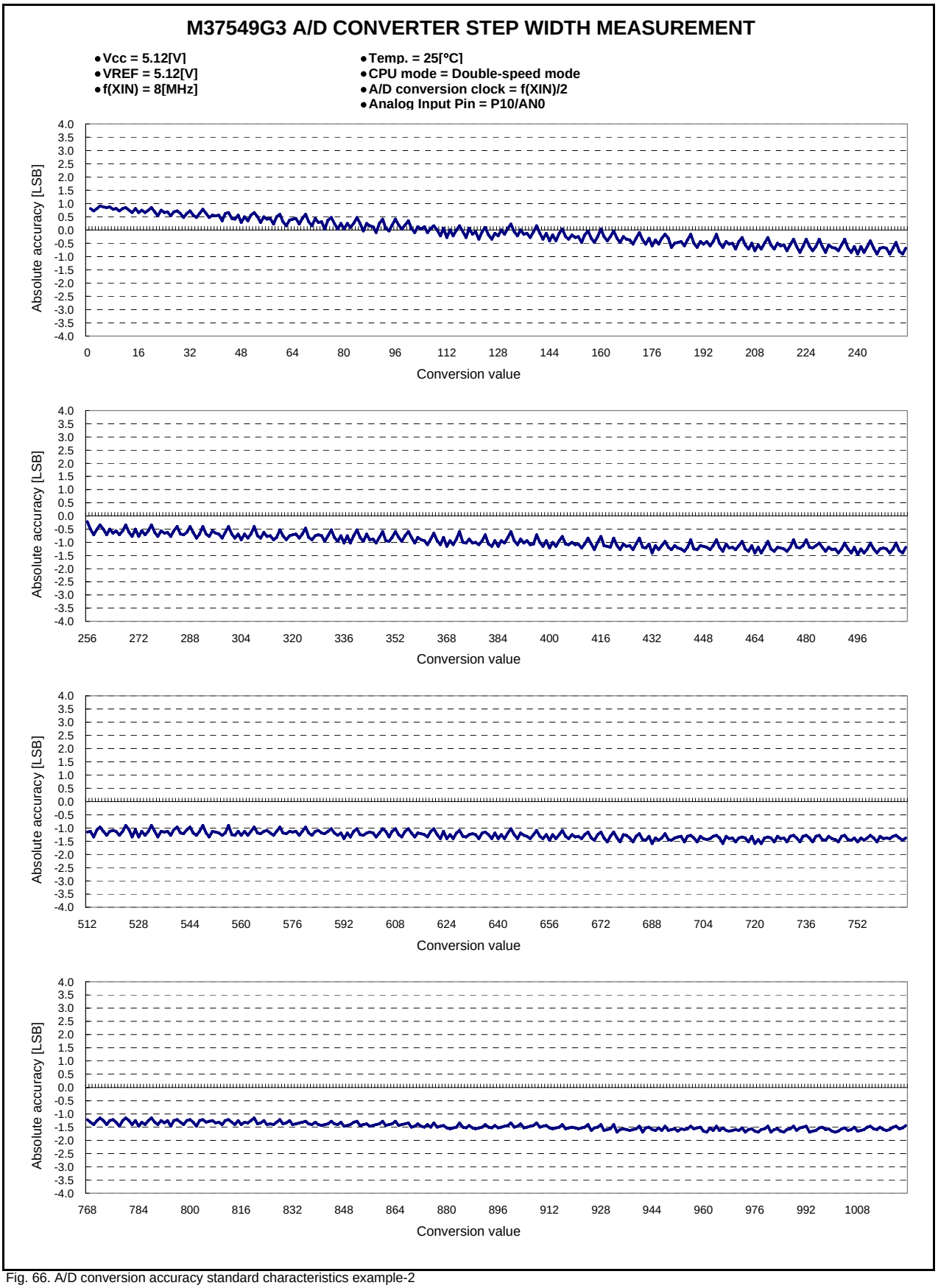

Fig. 66. A/D conversion accuracy standard characteristics example-2

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