# ISL74420x

Neutron Test Results of the ISL74420x Quad Clock Fanout ICs

## Introduction

This report documents the results of 1MeV equivalent neutron testing of the ISL74420x, a quad output clock fanout IC. The testing was conducted on samples of the ISL74420M to provide an assessment of the displacement damage (DD) hardness of the parts caused by neutron or proton environments but is applicable to all flows and versions of this part. Neutron fluences ranged from $5\times10^{11}$n/cm$^2$ to $1\times10^{13}$n/cm$^2$.

## Product Description

The ISL74420x is a quad output clock fanout IC with an optional internal oscillator. It provides synchronization clocks for any application and is particularly useful in multiphase power converters. Each of the four outputs can be set to a different frequency division and phase delay.

Multiple ISL74420s can be connected to create more than four synchronized clocks. The division and delay options can be set through selection pins or using an I$^2$C/SMBus interface.

The ISL74420x can accept an external clock up to 50MHz or use its internal 48MHz oscillator that can be tuned ±10% with an external resistor.

The ISL74420M is offered in a 48 Lead TQFP-EP that is fully specified across the temperature range of -55°C to +125°C.

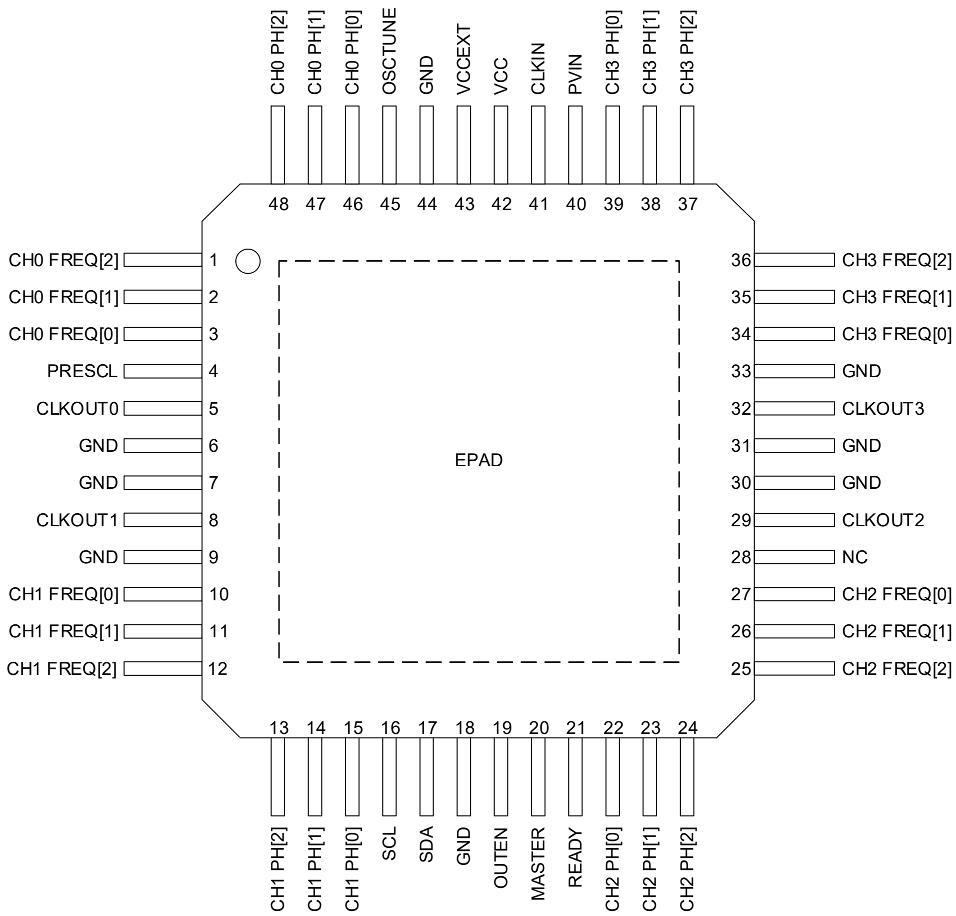


**Figure 1. ISL74420M Pin Assignments**

**Table 1. ISL74420M Pin Descriptions**

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | CH0 FREQ[2] | 3-level (tri-level) logic with 3-bit setting for frequency division selection on Channel 0. |
| 2 | CH0 FREQ[1] | |
| 3 | CH0 FREQ[0] | |
| 4 | PRESCL | 3-level (tri-level) logic prescale selection for all channels. |
| 5 | CLKOUT0 | Clock output pin for Channel 0. |
| 6, 7, 9, 30, 31, 33, 44 | GND | Connect these pins to the PCB ground. |
| 8 | CLKOUT1 | Clock output pin for Channel 1 |
| 10 | CH1 FREQ[0] | 3-level (tri-level) logic with 3-bit setting for frequency division selection on Channel 1 |
| 11 | CH1 FREQ[1] | |
| 12 | CH1 FREQ[2] | |
| 13 | CH1 PH[2] | 3-level (tri-level) logic with 3-bit setting for phase delay selection for Channel 1. |
| 14 | CH1 PH[1] | |
| 15 | CH1 PH[0] | |
| 16 | SCL | $I^2C$/SMBus clock input. SCL requires an external pull-up resistor for proper operation. Tie to VCC through a 4.7kΩ to 100kΩ resistor even if $I^2C$/SMBus is not going to be used. |
| 17 | SDA | $I^2C$/SMBus data input/output. SDA requires an external pull-up resistor for proper operation. Tie to VCC through a 4.7kΩ to 100kΩ resistor even if $I^2C$/SMBus is not going to be used. |
| 18 | GND | Connect this pin to the PCB ground. |
| 19 | OUTEN | Logic level input to enable the CLKOUTx pins. |
| 20 | MASTER | Logic level input to select if the part should use its internal oscillator when no external clock is present. A logic high enables Leader Mode and uses the internal 48MHz oscillator if no CLK-IN signal is present. A logic low enables Follower Mode and the internal oscillator is disabled, relying only on the CLK-IN input. |
| 21 | READY | Open-drain output to indicate if the part is ready to enable the CLKOUTx pins |
| 22 | CH2 PH[0] | 3-level (tri-level) logic with 3-bit setting for phase delay selection for Channel 2. |
| 23 | CH2 PH[1] | |
| 24 | CH2 PH[2] | |
| 25 | CH2 FREQ[2] | 3-level (tri-level) logic with 3-bit setting for frequency division selection on Channel 2. |
| 26 | CH2 FREQ[1] | |
| 27 | CH2 FREQ[0] | |
| 28 | NC | No internal connection. Renesas recommends connecting this pin to GND. |
| 29 | CLKOUT2 | Clock output pin or Channel 2. |
| 32 | CLKOUT3 | Clock output pin or Channel 3. |
| 34 | CH3 FREQ[0] | 3-level (tri-level) logic with 3-bit setting for frequency division selection on Channel 3. |
| 35 | CH3 FREQ[1] | |
| 36 | CH3 FREQ[2] | |
| 37 | CH3 PH[2] | 3-level (tri-level) logic with 3-bit setting for phase delay selection for Channel 3. |
| 38 | CH3 PH[1] | |
| 39 | CH3 PH[0] | |
| 40 | PVIN | The power supply input to the IC. This supplies power to the internal linear regulator. Locally bypass PVIN to GND with a 0.1µF or larger capacitor. |
| 41 | CLKIN | External clock input. Tie this pin to the ISL74420x GND with a short trace if not using CLKIN. |
| 42 | VCC | Output of the 3.3V internal linear regulator. The regulator can by bypassed by providing a 3.0V to 3.6V supply to both PVIN and VCC. Locally bypass VCC to GND with a 1µF capacitor. |

Table 1. ISL74420M Pin Descriptions (Cont.)

| Pin Number | Pin Name | Description |
|---|---|---|
| 43 | VCCEXT | The power supply input for all of the CLKOUTx pins. This can be connected to VCC or supplied externally to level shift them to a different voltage. If supplied externally, locally bypass VCCEXT to GND with a 1µF or larger capacitor. |
| 45 | OSCTUNE | Connect a resistor between this pin and GND to adjust the internal oscillator. |
| 46 | CH0 PH[0] | 3-level (tri-level) logic with 3-bit setting for phase delay selection for Channel 0. |
| 47 | CH0 PH[1] | |
| 48 | CH0 PH[2] | |
| - | EPAD | Connect to the PCB ground. |

## Related Literature

For a full list of related documents, visit our website:

- ISL74420M device page
- ISL74420SLH device page
- MIL-STD-883 Test Method 1017

# Contents

# 1. Test Description

## 1.1 Irradiation Facilities

Neutron fluence irradiations were performed on the test samples on May 27, 2025, at the University of Massachusetts, Lowell (UMASS Lowell) fast neutron irradiator per Mil-STD-883G, Method 1017.2, with each part unpowered during irradiation. The target irradiation levels were $5 \times 10^{11}$n/cm$^2$, $2 \times 10^{12}$n/cm$^2$, and $1 \times 10^{13}$n/cm$^2$. The parts were shipped back to Renesas (Palm Bay, FL) for post-irradiation electrical testing.

## 1.2 Test Fixturing

No formal irradiation test fixturing is involved, as these DD tests are ‘bag tests’ in the sense that the parts are irradiated with all leads unbiased.

## 1.3 Dosimetry

Table 2 shows dosimetry from UMASS Lowell indicating the total accumulated gamma dose and actual neutron fluence exposure levels for each set of samples.

**Table 2. ISL74420x Neutron Fluence Dosimetry Data**

| Irradiation | Requested Fluence (n/cm$^2$) | Reactor Power (kW) | Time (s) | Flux (n/cm$^2$-s)[1][2] | Gamma Dose (rad(Si))[3] | Measured Fluence (n/cm$^2$)[4] |
|---|---|---|---|---|---|---|
| CRF#98191-C | 5.00E+11 | 40 | 262 | 3.06E+09 | 119 | 6.12E+11 |
| CRF#98191-D | 2.00E+12 | 80 | 531 | 6.12E+09 | 484 | 2.38E+12 |
| CRF#98191-E | 1.00E+13 | 800 | 266 | 6.12E+10 | 2424 | 1.19E+13 |

1. Dosimetry method: ASTM E-265.
2. The neutron fluence rate is determined from *Initial Testing of the New Ex-Core Fast Neutron Irradiator at UMass Lowell (6/18/02)*. Validated on 6/07/2011 under the Trident II D5LE neutron facility study by Navy Crane. Re-affirmed 8/1/17 using SACRR transistor transfer calibration based on ASTM E1855 – 15.
3. Based on reactor power at 1000kW, the gamma dose is 41 ±5.3% krad(Si)/hr as mapped by TLD-based dosimetry.
4. Validated by S-32 flux monitors.

## 1.4 Characterization Equipment and Procedures

Electrical testing was performed before and after irradiation using the Renesas production automated test equipment (ATE). All electrical testing was performed at room temperature.

## 1.5 Experimental Matrix

Testing proceeded in general accordance with the guidelines of MIL-STD-883 TM 1017. The experimental matrix consisted of five samples to be irradiated at $5 \times 10^{11}$n/cm$^2$, five to be irradiated at $2 \times 10^{12}$n/cm$^2$, and five to be irradiated at $1 \times 10^{13}$n/cm$^2$. The actual levels achieved (shown in Table 3) were $6.12 \times 10^{11}$n/cm$^2$, $2.38 \times 10^{12}$n/cm$^2$, and $1.19 \times 10^{13}$n/cm$^2$. Three control units were used. The ISL74420M samples were pulled from wafer lot F6X58943.

# 2. Test Results

Neutron testing of the ISL74420x is complete and the results are reported in the balance of this report. It should be understood when interpreting the data that each neutron irradiation was performed on a different set of samples; this is not total dose testing, where the damage is cumulative. Each marker represents a different set of five samples. The line connecting them is for trend visualization only.

## 2.1 Attributes Data

Table 4 shows the ISL74420x attributes data.

**Table 3. Attributes Data**

| 1MeV Fluence, (n/cm$^2$) | | Sample Size | Pass[1] | Fail | Notes |
|---|---|---|---|---|---|
| Planned | Actual | | | | |
| $5 \times 10^{11}$ | 6.12E+11 | 5 | 5 | 0 | All passed |
| $2 \times 10^{12}$ | 2.38E+12 | 5 | 5 | 0 | All passed |
| $1 \times 10^{13}$ | 1.19E+13 | 5 | 5 | 0 | All passed |

1. A Pass indicates a sample that passes all post-irradiation datasheet limits.

## 2.2 Key Parameter Variables Data

The plots in Figure 2 through Figure 37 illustrate the neutron irradiation response of the selected parameters shown in Table 4 in the Appendix. The plots show the average tested values of the parameters as a function of neutron fluence. The plots also include error bars at each down-point, representing the minimum and maximum measured values of the samples, although in some plots the error bars might not be visible due to their values compared to the scale of the graph.

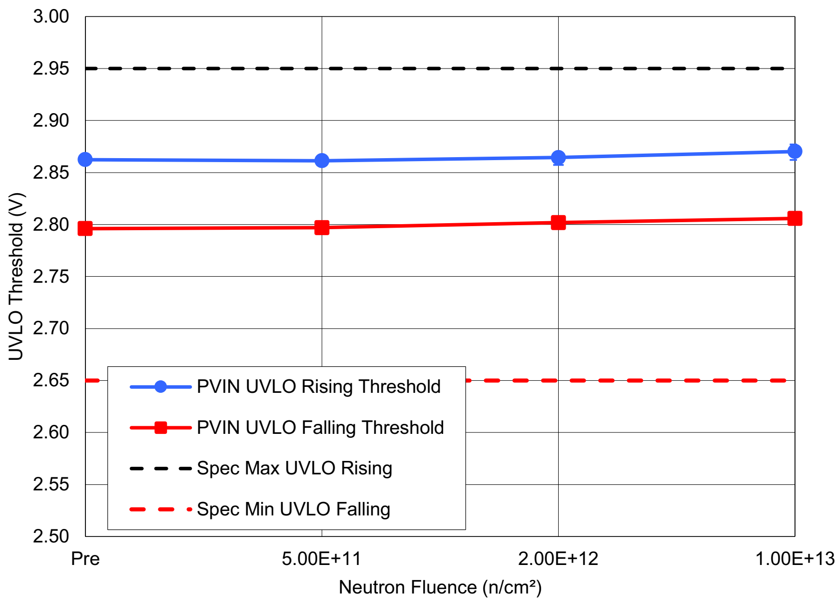


**Figure 2. Average PVIN UVLO rising and falling thresholds ($V_{UVLO}$), as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The datasheet limits are 2.95V maximum rising and 2.65V minimum falling.**

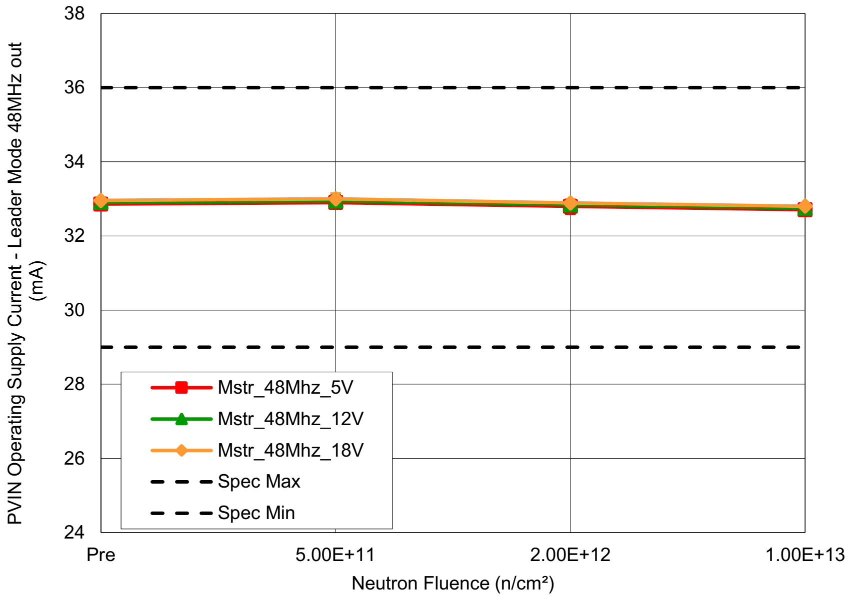


**Figure 3. Average PVIN Operating Supply Current - Leader Mode ($I_{PVIN\_OPER1}$); PVIN = 5V, 12V and 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 29mA minimum and 36mA maximum.**

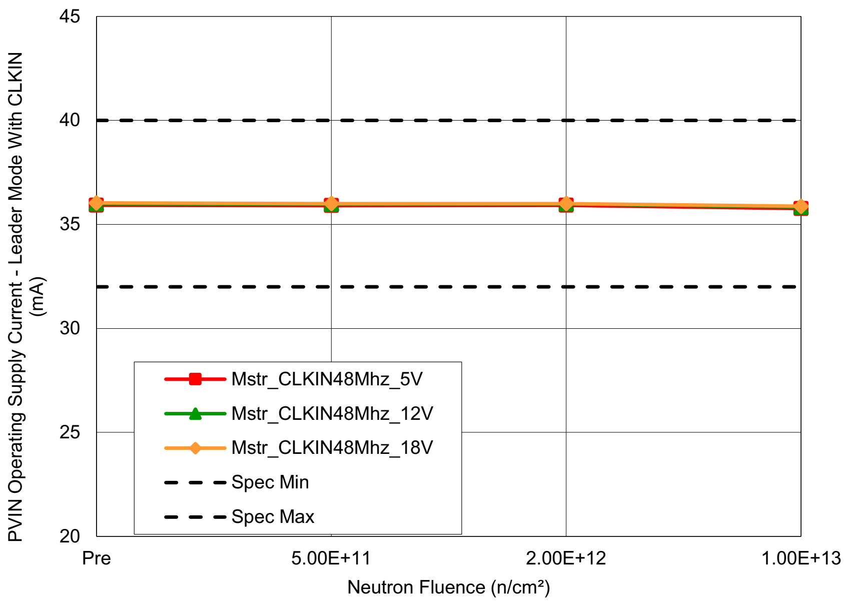


**Figure 4. Average PVIN Operating Supply Current - Leader Mode With CLKIN ($I_{PVIN\_OPER2}$);; PVIN = 5V, 12V and 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 32mA minimum and 40mA maximum.**

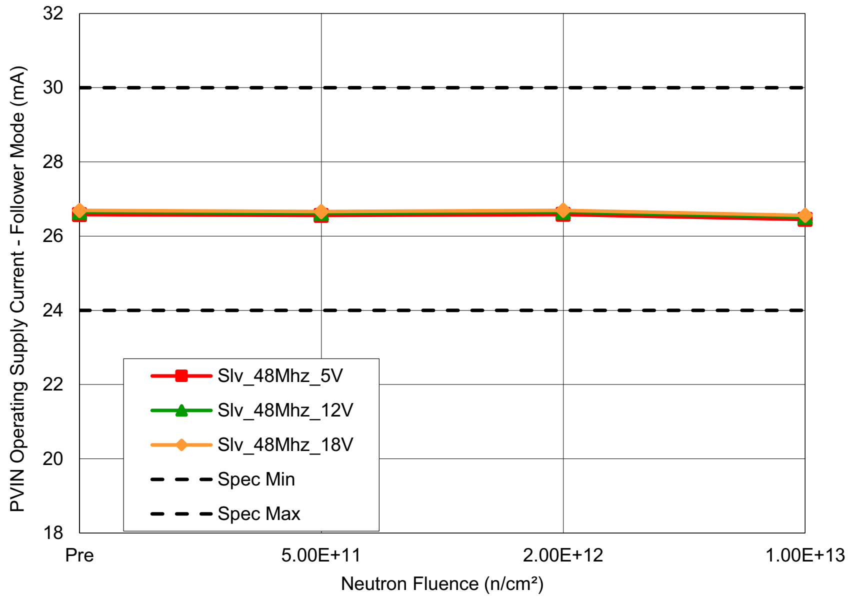


**Figure 5. Average PVIN Operating Supply Current - Follower Mode ($I_{PVIN\_OPER3}$); PVIN = 5V, 12V and 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 24mA minimum and 30mA maximum.**

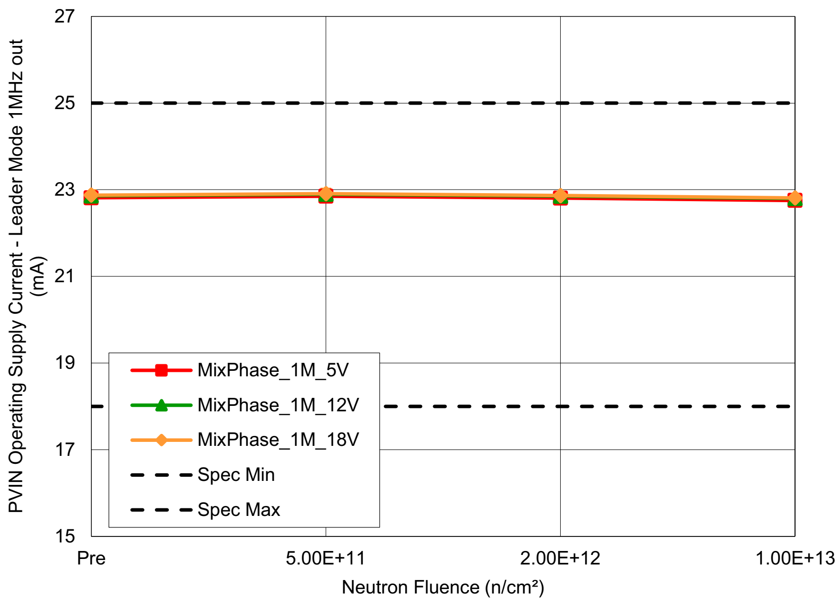


**Figure 6. Average PVIN Operating Supply Current - Leader Mode 1MHz out ($I_{PVIN\_OPER4}$); PVIN = 5V, 12V and 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 18mA minimum and 25mA maximum.**

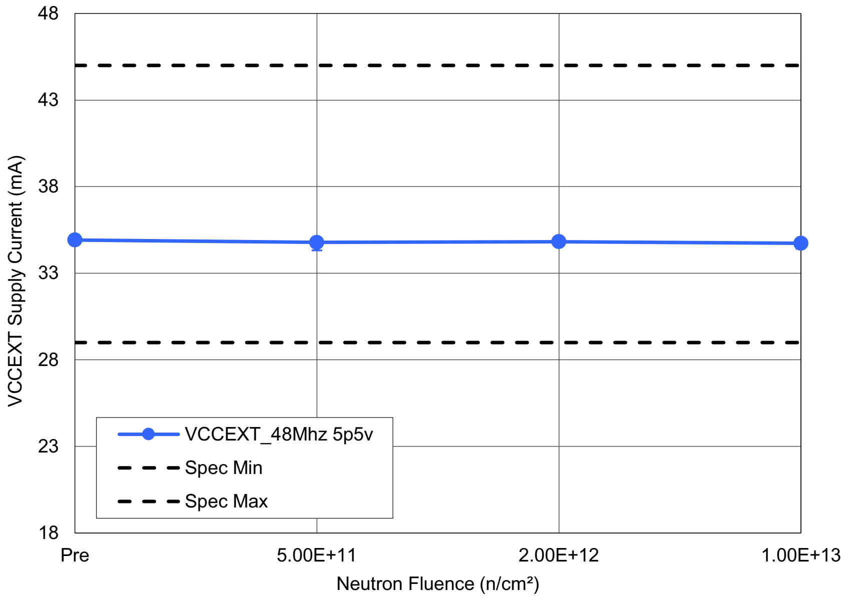


**Figure 7. Average VCCEXT supply current ($I_{VCCEXT\_MAX}$) with PVIN = 12V and VCCEXT = 5.5V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 29mA minimum and 45mA maximum.**

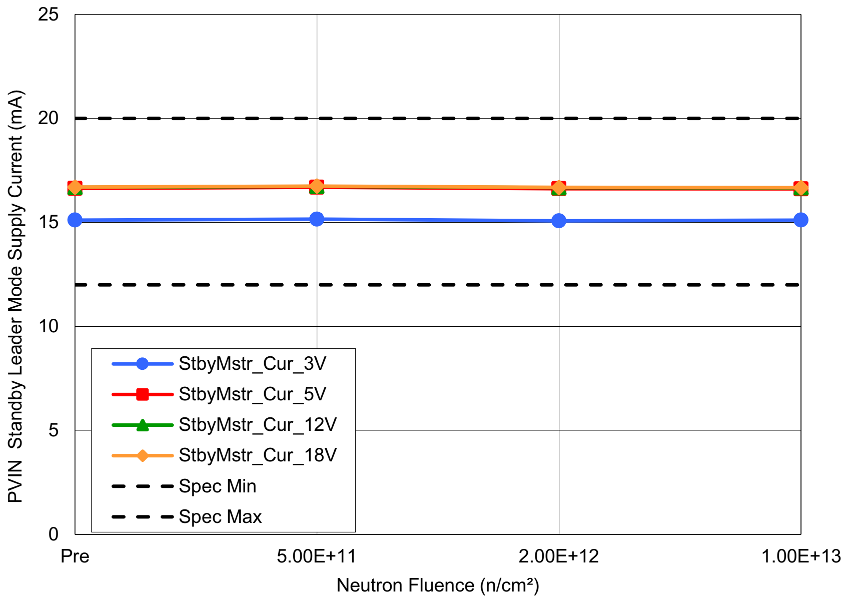


**Figure 8. Average PVIN Standby Leader Mode Supply Current ($I_{PVIN\_SB1}$) with PVIN = 3V, 5V, 12V, 18V, OUTEN = GND and VCCEXT tied to VCC, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 12mA minimum and 20mA maximum.**

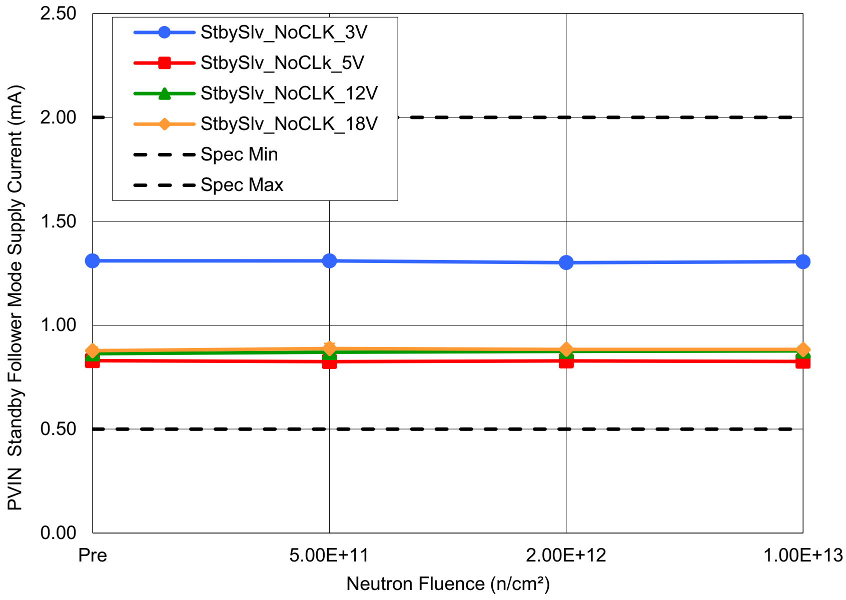


**Figure 9. Average PVIN Standby Follower Mode Supply Current ($I_{PVIN\_SB2}$) with PVIN = 12V, OUTEN = MASTER = CLKIN = GND and VCCEXT tied to VCC, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 0.5mA minimum and 2.0mA maximum.**

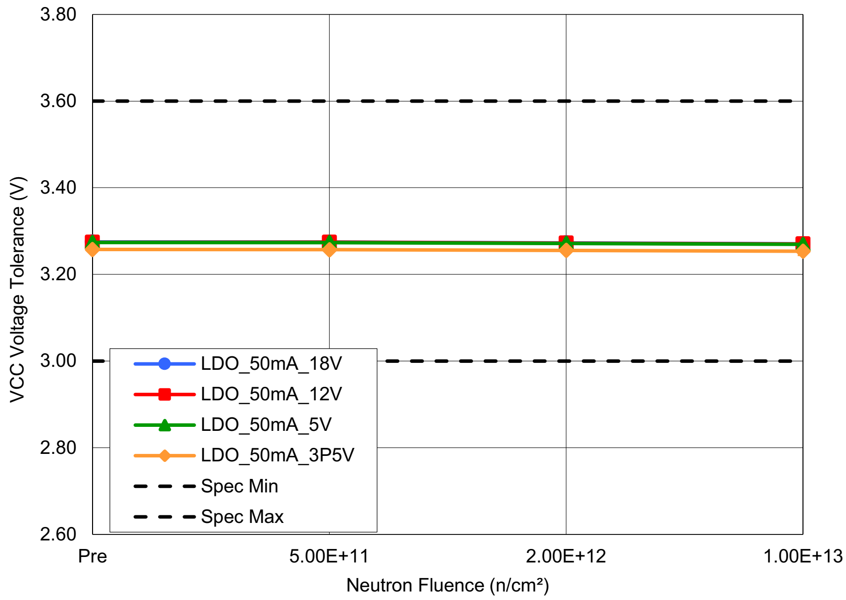


**Figure 10. Average VCC Voltage Tolerance ($V_{VCC}$); PVIN = 3.5V, 5V, 12V and 18V, $I_{LOAD}$ = 50mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 3V minimum and 3.6V maximum.**

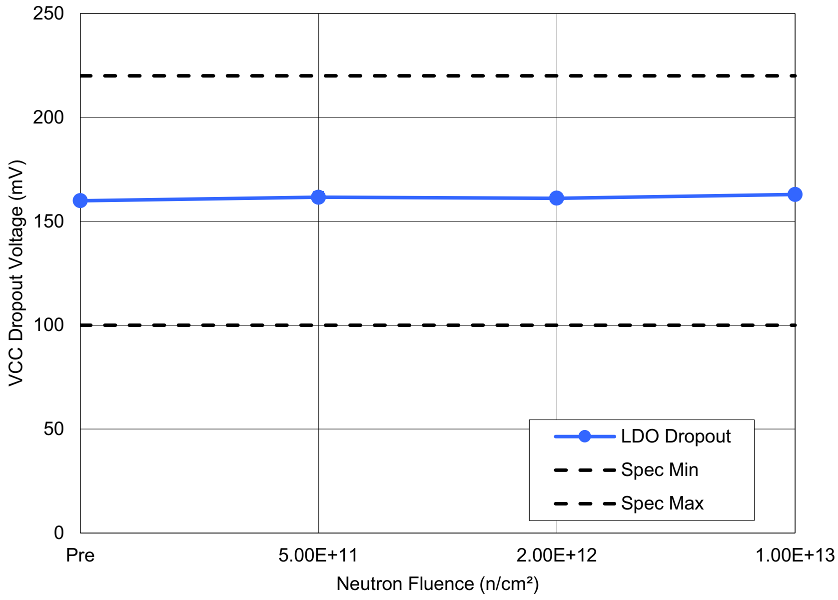


**Figure 11. Average VCC Dropout Voltage ($VCC_{DO}$); PVIN = 3.25V, $I_{LOAD}$ = 50mA, VCCEXT = 3.3V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 100mV minimum and 220mV maximum.**

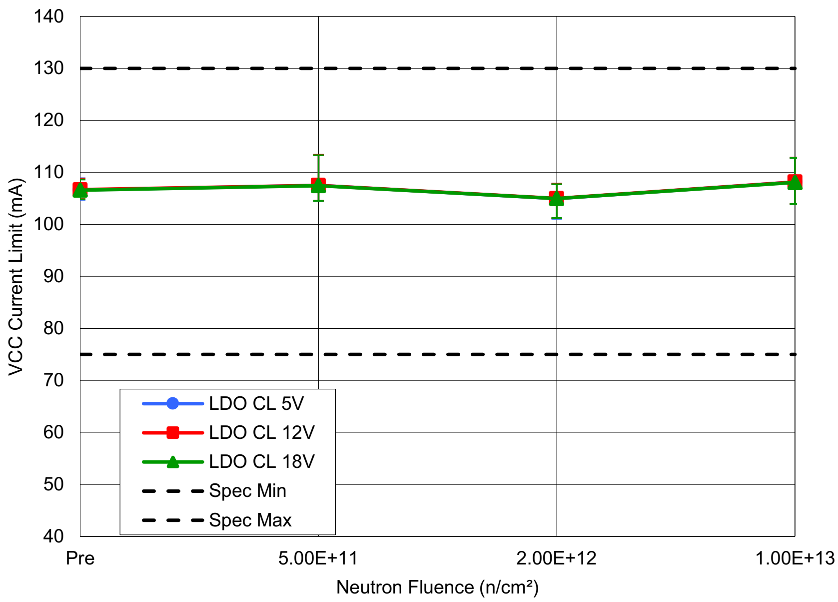


**Figure 12. Average VCC Current Limit ($I_{AVCC-CL}$); PVIN = 5V, 12V and 18V, $V_{CC}$ = 2.9V, VCCEXT = 3.3V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 75mA minimum and 130mA maximum.**

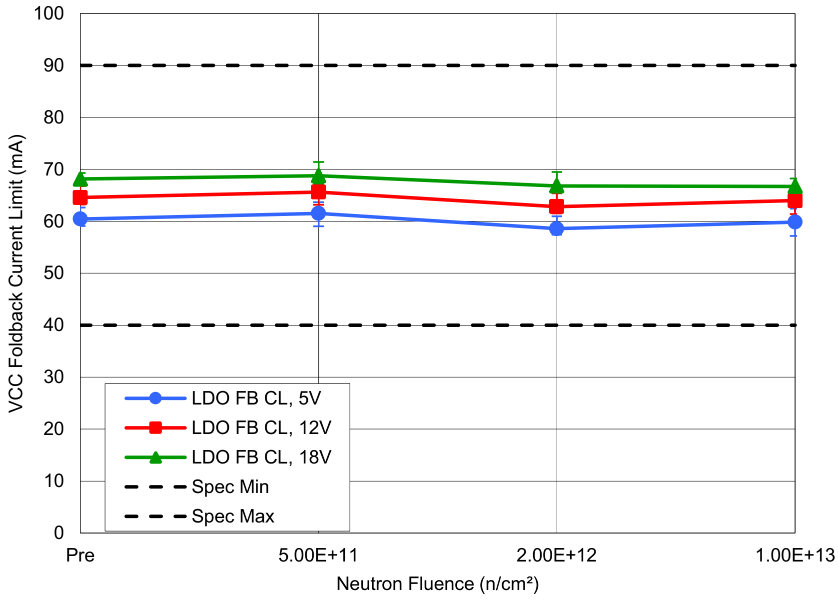


**Figure 13. Average VCC Foldback Current Limit ($I_{AVCC-SC}$); PVIN = 5V, 12V and 18V, $V_{CC}$ = GND, VCCEXT = 3.3V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 40mA minimum and 90mA maximum.**

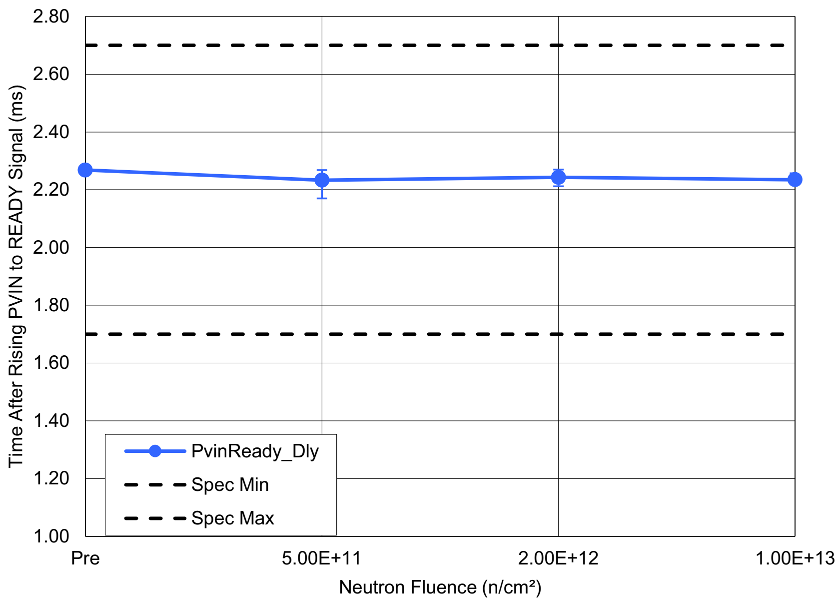


**Figure 14. Average Time After Rising PVIN to READY Signal ($T_{PVIN-READY}$); PVIN = step 2V to 4V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 1.7ms minimum and 2.7ms maximum.**

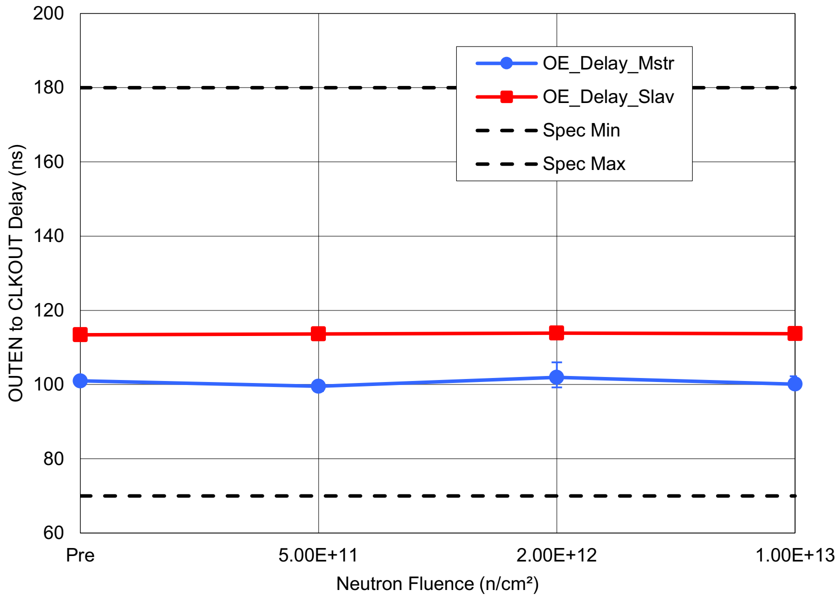


**Figure 15. Average OUTEN to CLKOUT Delay ($T_{OUTEN\text{-}OUT}$); PVIN = 5V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 70ns minimum and 180ns maximum.**

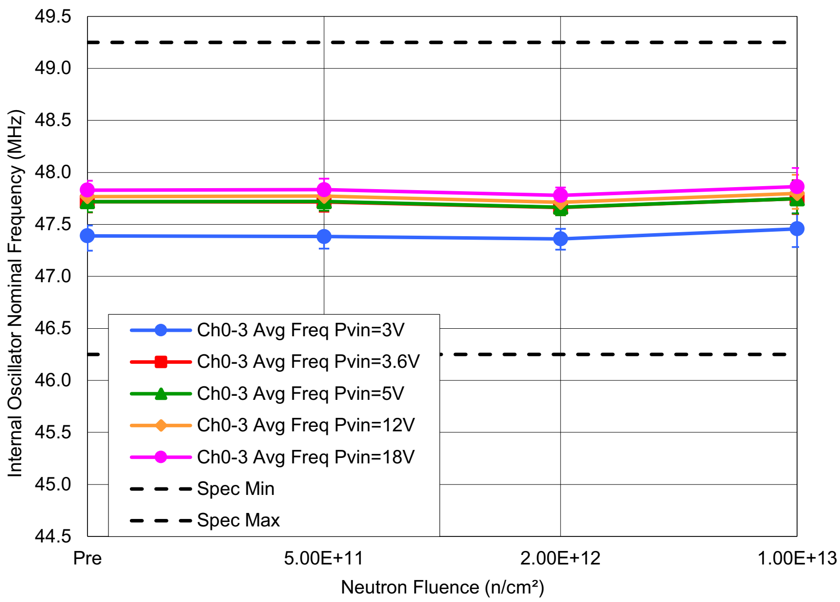


**Figure 16. Average Internal Oscillator Nominal Frequency (InternalOsc_Nom); PVIN = 3V, 3.6V, 5V, 12V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 46.25MHz minimum and 49.25MHz maximum.**

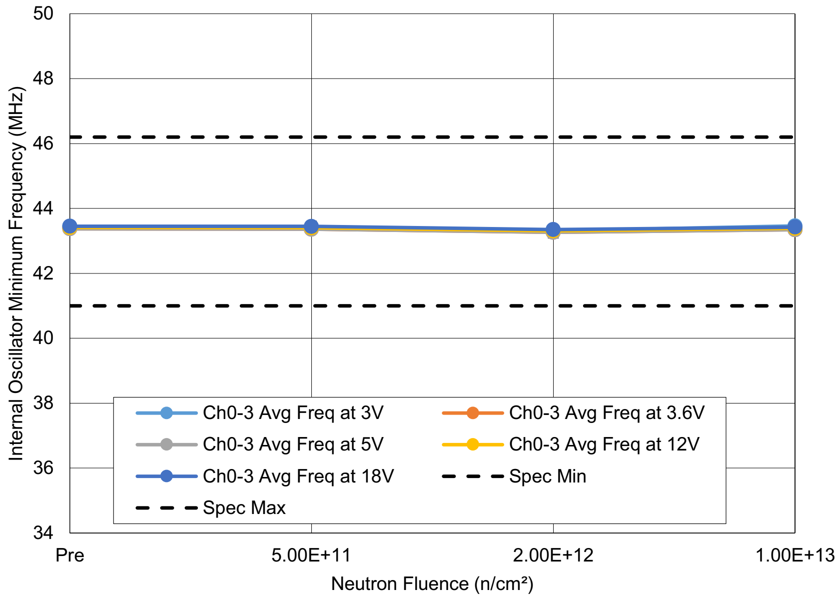


**Figure 17. Average Internal Oscillator Minimum Frequency (InternalOsc_Min); PVIN = 3V, 3.6V, 5V, 12V and 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 41MHz minimum and 46.2MHz maximum.**

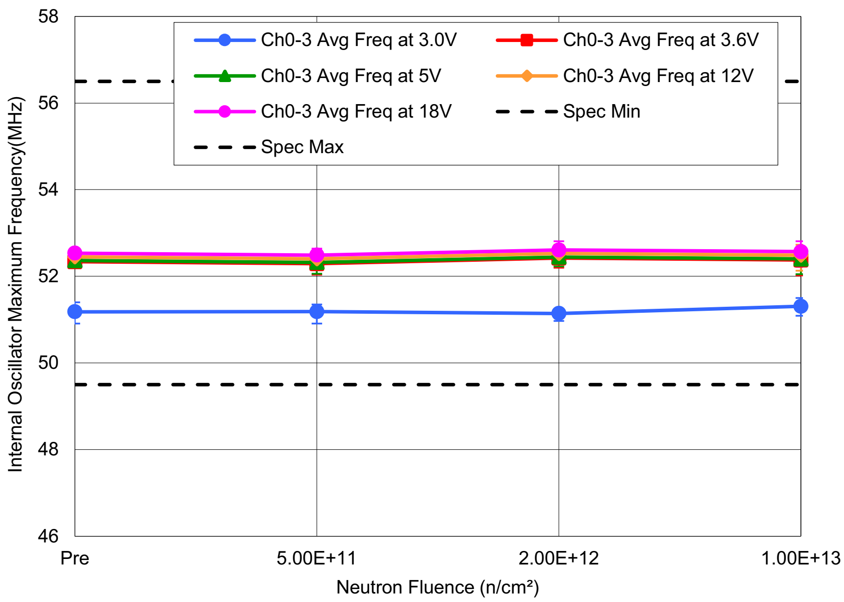


**Figure 18. Average Internal Oscillator Maximum Frequency (InternalOsc_Max); PVIN = 3V, 3.6V, 5V, 12V and 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 48.5MHz minimum and 56.5MHz maximum.**

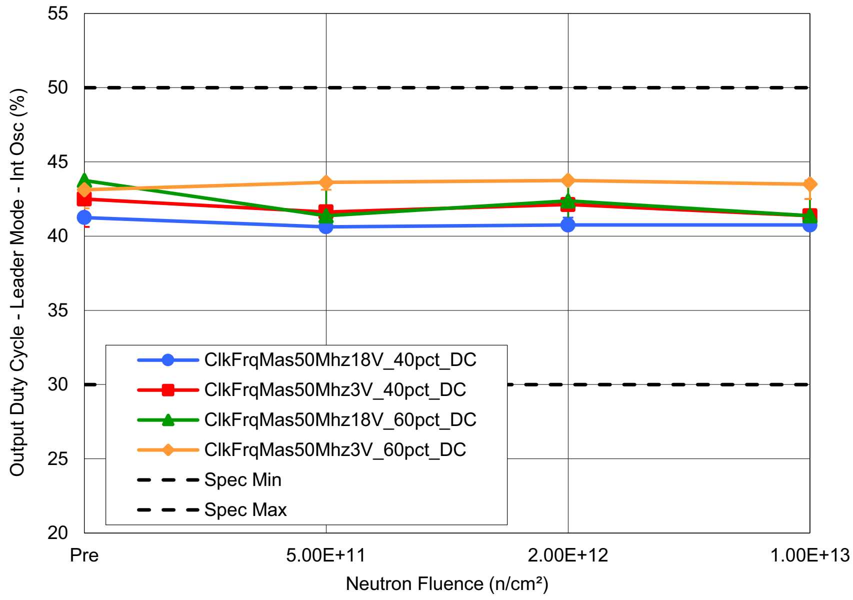


**Figure 19. Average Output Duty Cycle in Leader Mode with Internal Oscillator (M_int_Duty_Cycle); PVIN = 3V, 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 30% minimum and 50% maximum.**

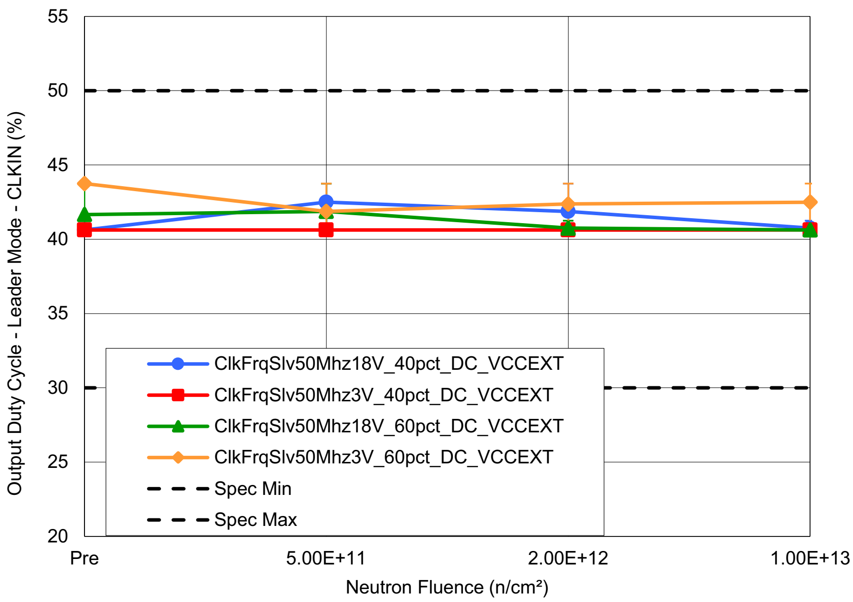


**Figure 20. Average Output Duty Cycle in Leader Mode with CLKIN (M_clkin_Duty_Cycle); PVIN = 3V, 18V as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post'-hirradiation datasheet limits are 30% minimum and 50% maximum.**

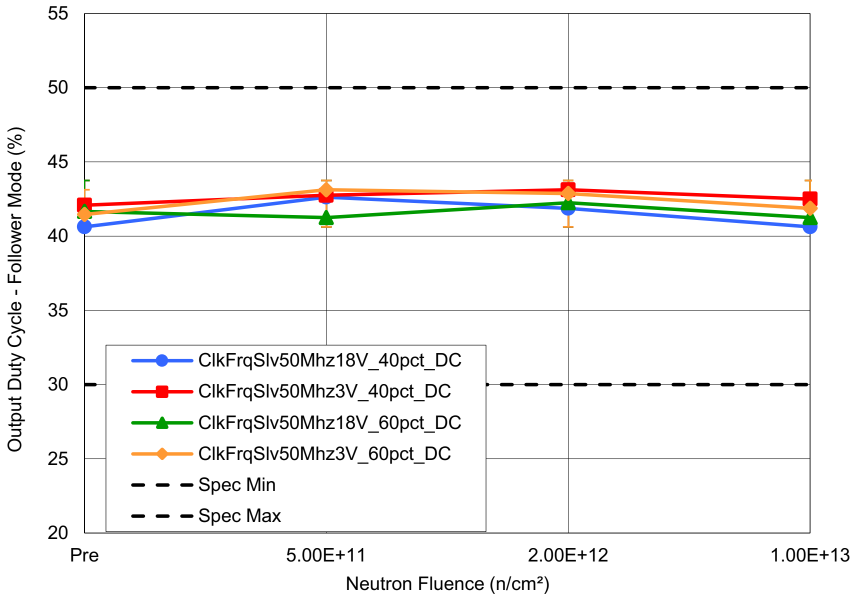


**Figure 21. Average Output Duty Cycle in Follower Mode (S_Duty_Cycle); PVIN = 3V, 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 30% minimum and 50% maximum.**

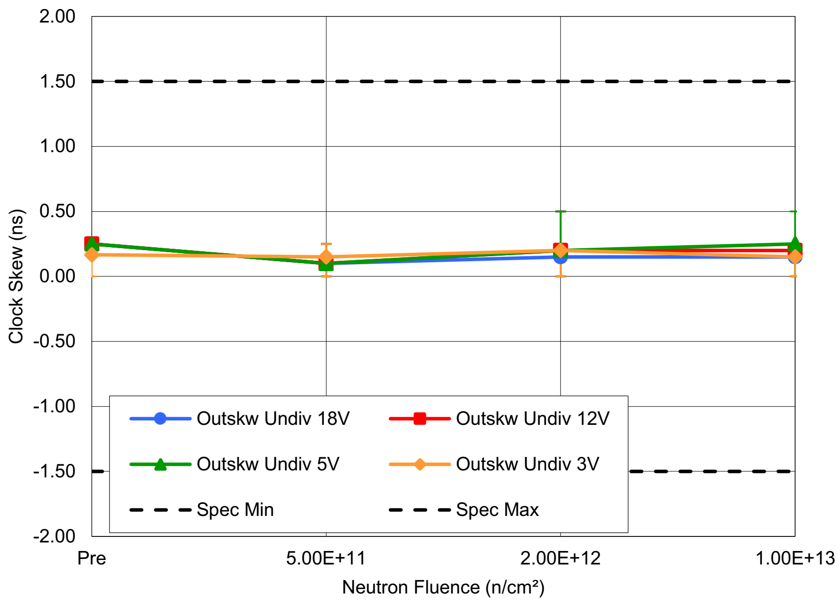


**Figure 22. Average Output-to-Output Skew between CLKOUTx's with Equal Frequency and Phase ($CLKx_{SKEW48M}$) with PVIN = 3V, 5V, 12V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are -1.5ns minimum and 1.5ns maximum.**

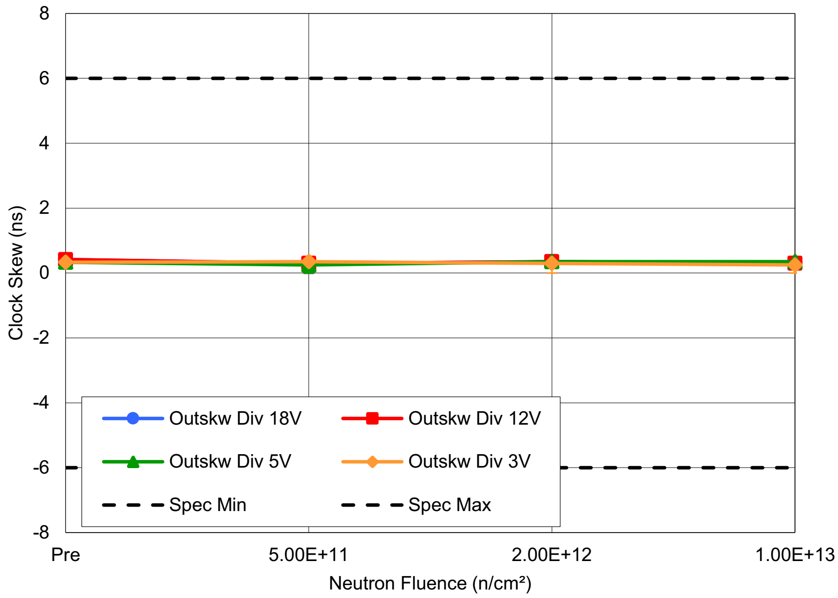


**Figure 23. Average Output-to-Output Skew between CLKOUTx's with Equal Frequency and Phase ($CLKx_{SKEW1M}$) with PVIN = 3V, 5V, 12V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are -6ns minimum and 6ns maximum.**

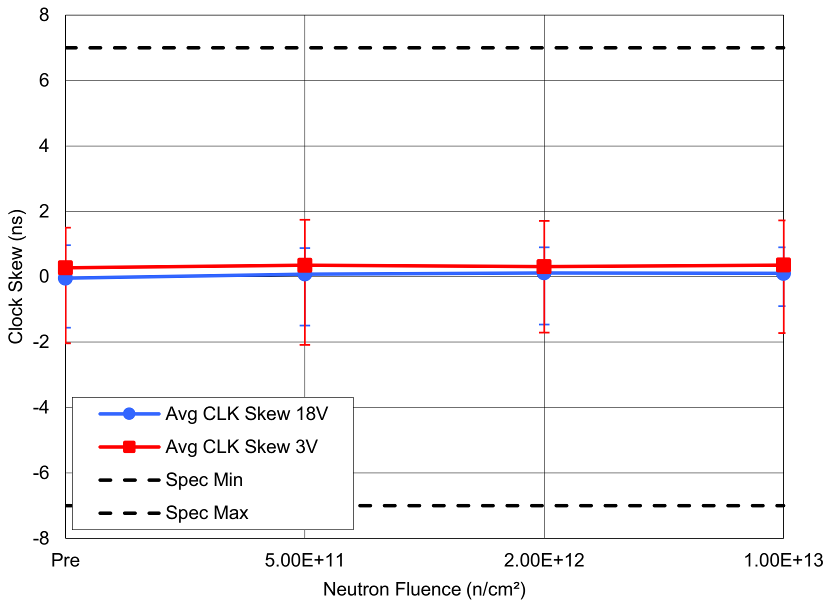


**Figure 24. Average Output-to-Output skew ($CLKx_{SKEW1M4P}$) with PVIN = 3V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are -7ns minimum and 7ns maximum.**

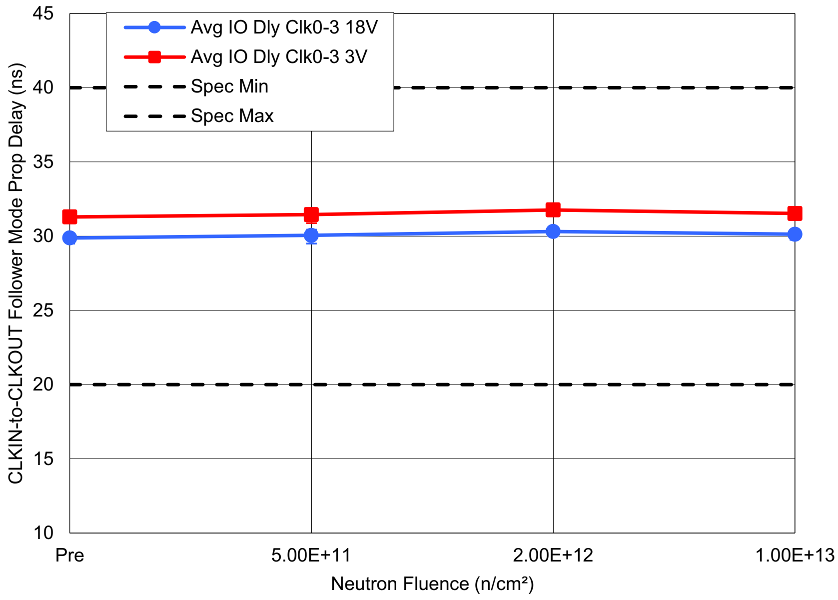


**Figure 25. Average CLKIN-to-CLKOUT Follower Mode Prop Delay ($CLK_{PROPDELAY}$) with PVIN = 3V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 20ns minimum and 40ns maximum.**

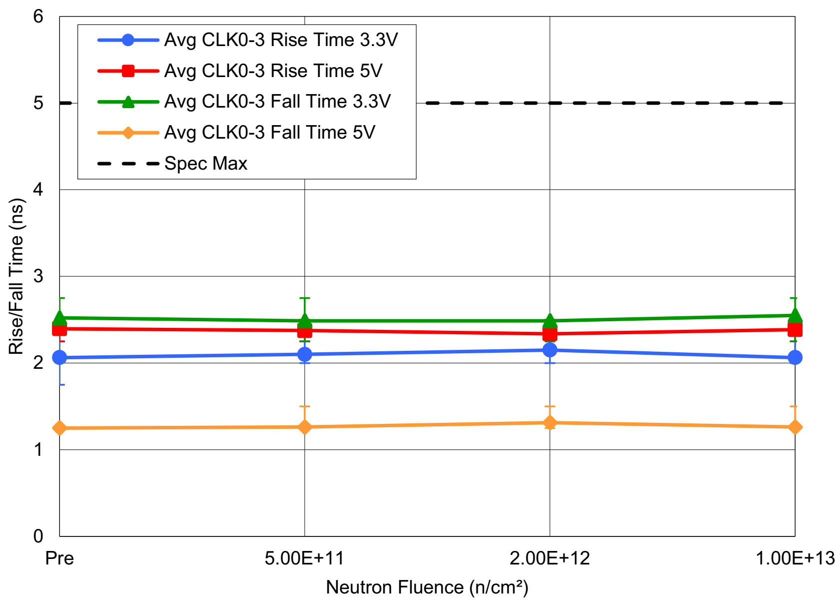


**Figure 26. Average CLKOUT rise and fall times ($T_{OUT}$) with PVIN = 12V and VCCEXT = 3.3V and 5V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 5ns maximum.**

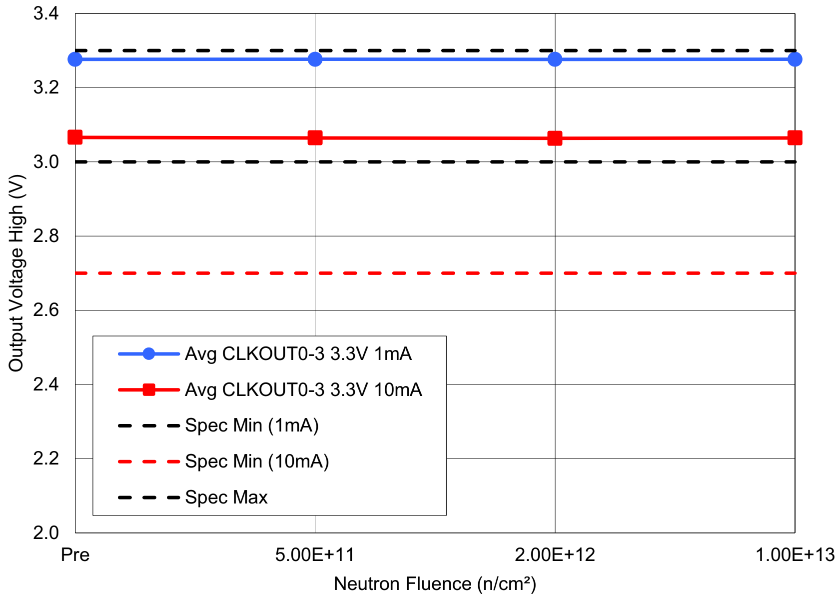


**Figure 27. Average CLKOUT Output Voltage High ($CLKOUTx_{VOH}$) with PVIN = 12V, VCCEXT = 3.3V, $I_{LOAD}$ = 1mA and 10mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits at 1mA are 3V minimum and 3.3V maximum and 2.7V minimum and 3.3V maximum at 10mA.**

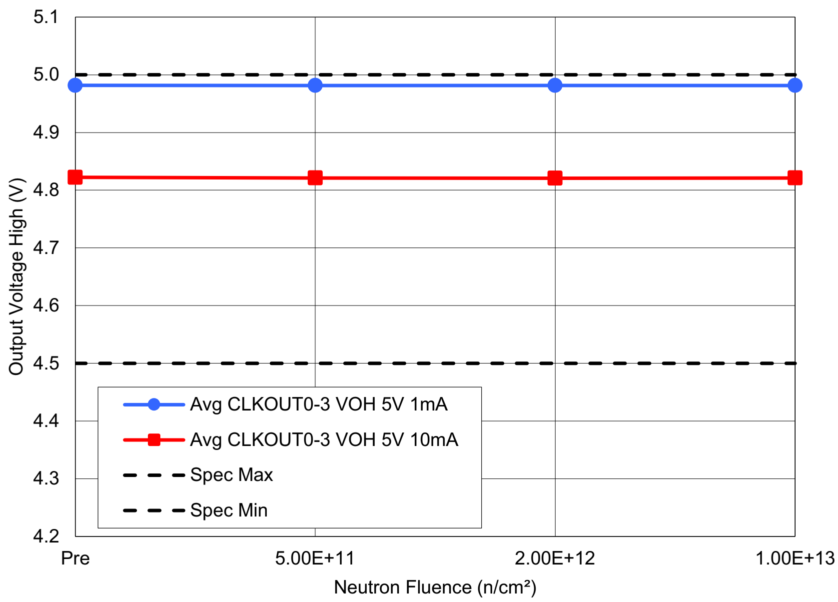


**Figure 28. Average CLKOUT Output Voltage High ($CLKOUTx_{VOH}$) with PVIN = 12V, VCCEXT = 5V, $I_{LOAD}$ = 1mA and 10mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 4.5V minimum and 5.0V maximum.**

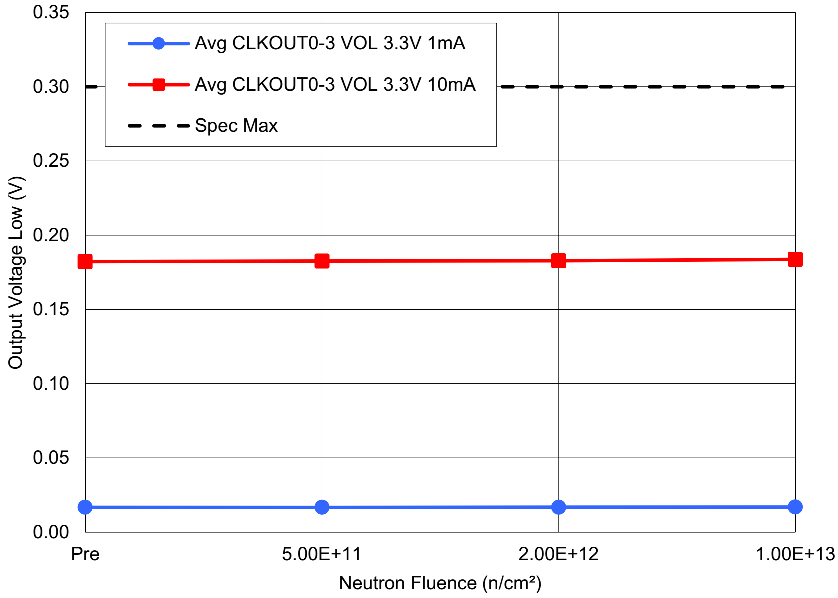


**Figure 29. Average CLKOUT Output Voltage Low ($CLKOUTx_{VOL}$) with PVIN = 12V, VCCEXT = 3.3V, $I_{LOAD}$ = 1mA and 10mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 0.3V maximum.**

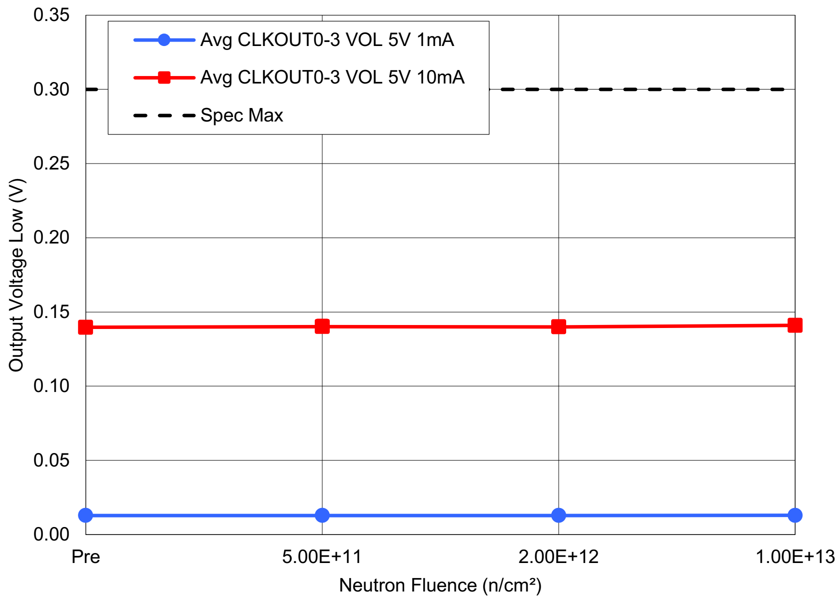


**Figure 30. Average CLKOUT Output Voltage Low ($CLKOUTx_{VOL}$) with PVIN = 12V, VCCEXT = 5V, $I_{LOAD}$ = 1mA and 10mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 0.3V maximum.**

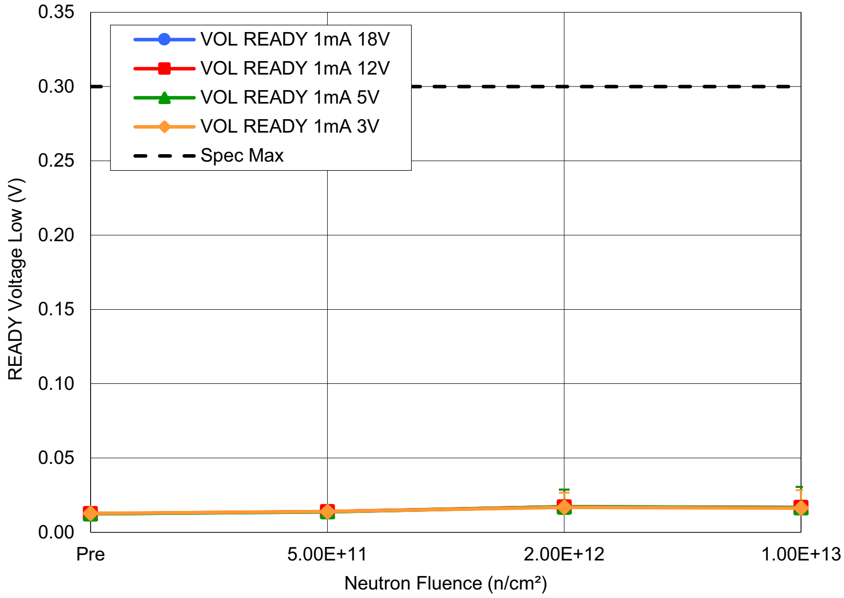


**Figure 31. Average READY Voltage Low ($READY_{VOL}$) with PVIN = 3V, 5V, 12V and 18V and $I_{LOAD}$ = 1mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 0.3V maximum.**

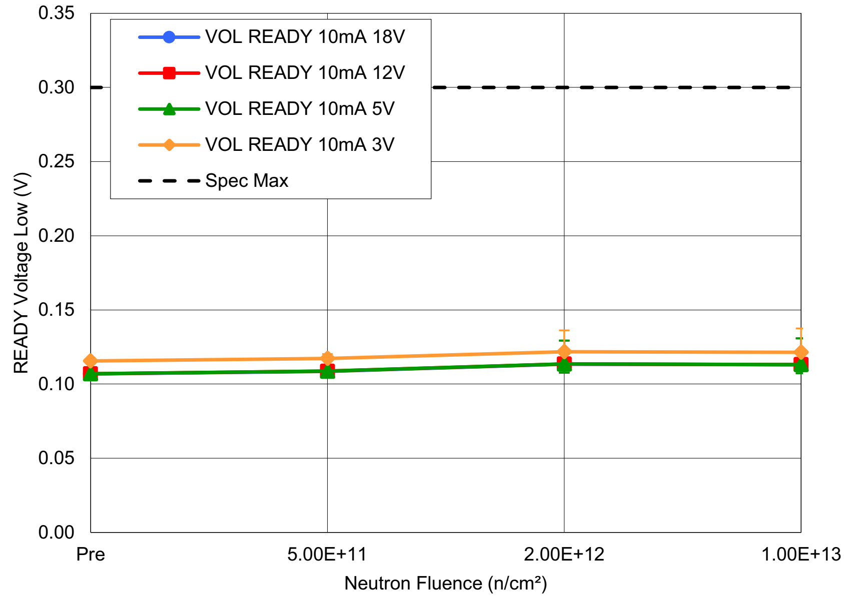


**Figure 32. Average READY Voltage Low ($READY_{VOL}$) with PVIN = 3V, 5V, 12V and 18V and $I_{LOAD}$ = 10mA, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 0.3V maximum.**

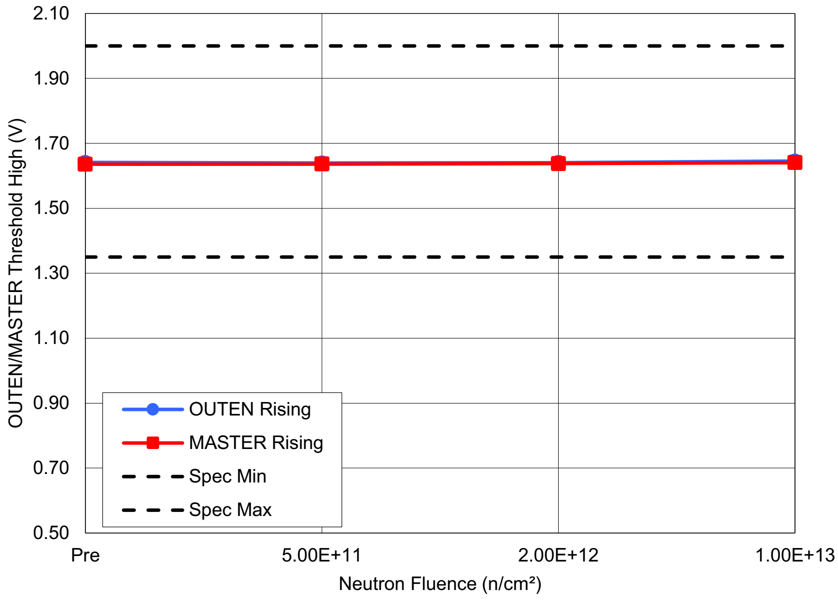


**Figure 33. Average OUTEN/MASTER Threshold High (OUTEN/MASTER$_{VIH}$), as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 1.35V minimum and 2.0V maximum.**

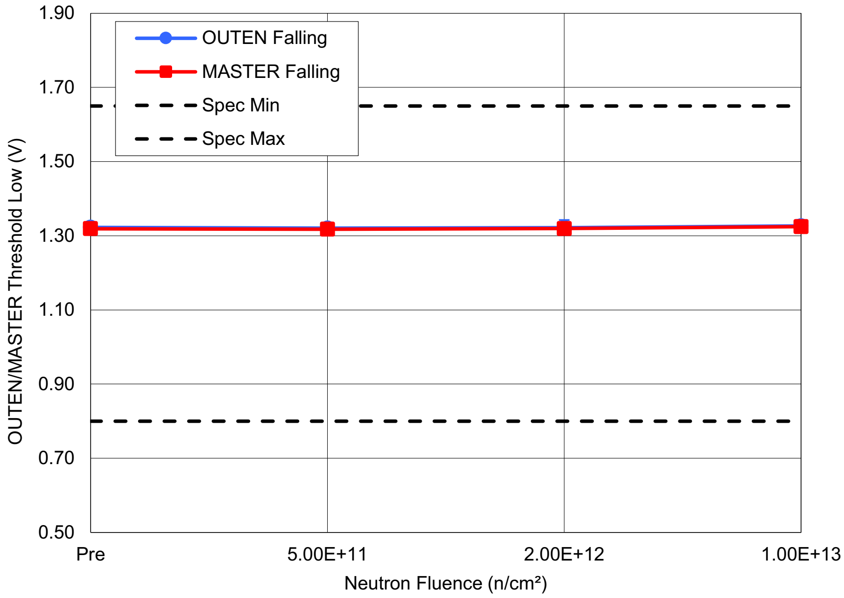


**Figure 34. Average OUTEN/MASTER Threshold Low (OUTEN/MASTER$_{VIL}$), as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 0.8V minimum and 1.65V maximum.**

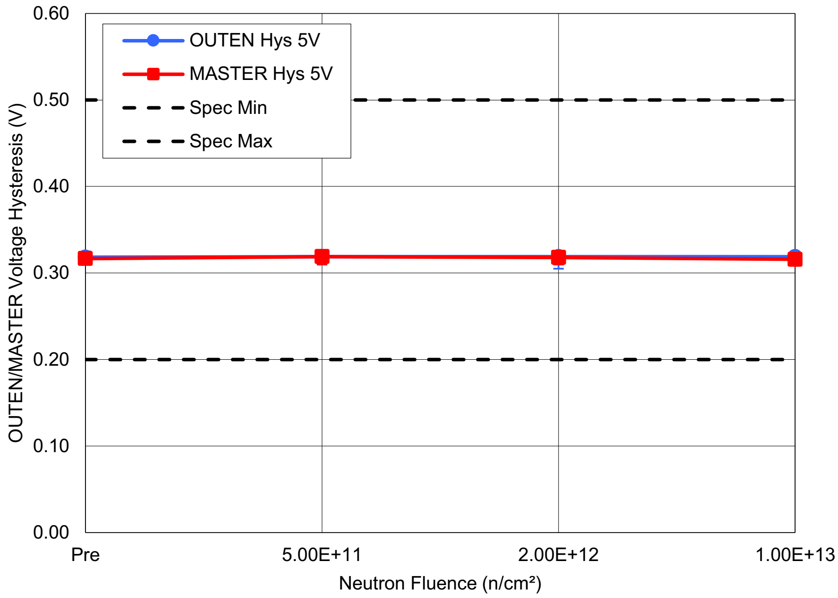


**Figure 35. Average OUTEN/MASTER Voltage Hysteresis ($OUTEN/MASTER_{hyst}$) with PVIN = 5V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limits are 0.2V minimum and 0.5V maximum.**

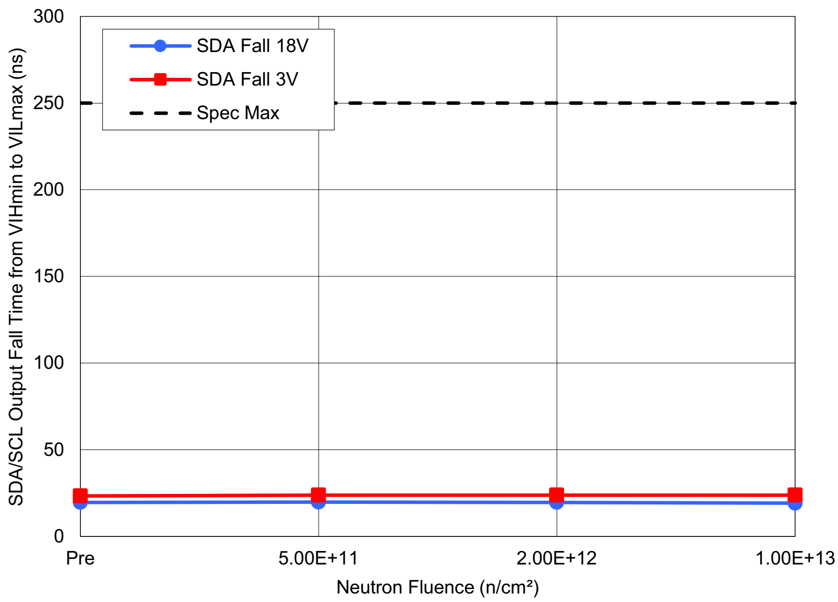


**Figure 36. Average SDA/SCL Output Fall Time from VIHmin to VILmax ($t_F$) with PVIN = 3V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 250ns maximum.**

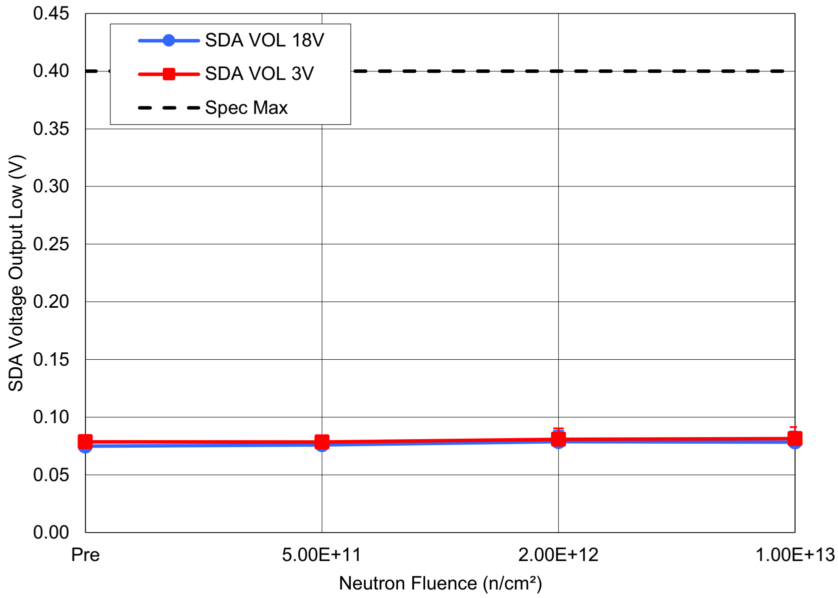


**Figure 37. Average SDA/SCL Voltage Output Low ($V_{OL}$), PVIN = 3.0V and 18V, as a function of neutron fluence. The error bars represent the minimum and maximum measured values. The post-irradiation datasheet limit is 0.4V maximum.**

# 3. Discussion and Conclusion

The results of 1MeV equivalent neutron testing for the ISL74420x (a quad output clock fanout IC) are reported. Parts were tested at actual fluences of $6.12{\times}10^{11}$n/cm$^2$, $2.38{\times}10^{12}$n/cm$^2$, and $1.19{\times}10^{13}$n/cm$^2$. The results of key parameters before and after irradiation to each level are plotted in Figure 2 through Figure 37.

The plots show the mean of each parameter as a function of neutron irradiation with error bars that represent the minimum and maximum measured values. Each marker represents a different set of five samples. The line connecting them is for trend visualization only. The figures also show the applicable electrical limits taken from the datasheet.

All tested datasheet parameters passed at all down-points up to and including $1.19{\times}10^{13}$n/cm$^2$. These results apply to all versions and flows of this part.

# 4. Revision History

| Revision | Date | Description |
|---|---|---|
| 1.01 | Feb 10, 2026 | Updated Related Literature section. |
| 1.00 | Dec 10, 2025 | Initial release. |

# A. Reported Parameters

Table 4 lists the datasheet parameters that are considered indicative of part performance. These parameters are plotted in Figure 2 through Figure 37. All limits are taken from the ISL74420M Datasheet, which has more details about test conditions.

**Table 4. ISL74420x Datasheet Total Dose Parameters ($T_A$ = 25°C)**

| Fig. | Parameter | Symbol | Conditions | Low Limit | High Limit | Unit |
|---|---|---|---|---|---|---|
| 2 | UVLO Rising Threshold | $V_{UVLO-R}$ | PVIN = VCC = VCCEXT | - | 2.95 | V |
| | UVLO Falling Threshold | $V_{UVLO-F}$ | | 2.65 | - | V |
| 3 | PVIN Operating Supply Current - Leader Mode 48MHz Out | $I_{PVIN\_OPER1}$ | PVIN = 5V, 12V, 18V, CH[0:3]FREQ = Option 0 | 29 | 36 | mA |
| 4 | PVIN Operating Supply Current - Leader Mode 48MHz Out with CLKIN | $I_{PVIN\_OPER2}$ | PVIN = 5V 12V, 18V, CH[0:3]FREQ = Option 0, MASTER = VCC, CLKIN = 48MHz | 32 | 40 | mA |
| 5 | PVIN Operating Supply Current - Follower Mode | $I_{PVIN\_OPER3}$ | PVIN = 5V, 12V, 18V, CH[0:3]FREQ = Option 0, MASTER = GND, CLKIN = 48MHz | 24 | 30 | mA |
| 6 | PVIN Operating Supply Current - Leader Mode 1MHz Out | $I_{PVIN\_OPER4}$ | PVIN = 5V, 12V, 18V, CH[0:3]FREQ = Opt. 5, (1MHz), CH[0:3]PH = 0°, 90°, 180°, 270° | 18 | 25 | mA |
| 7 | VCCEXT Supply Current | $I_{VCCEXT\_MAX}$ | PVIN = 12V, VCCEXT = 5.5V, CH[0:3]FREQ = Option 0 | 29 | 45 | mA |
| 8 | PVIN Standby Leader Mode Supply Current | $I_{PVIN\_SB1}$ | PVIN = 3V, 5V, 12V, 18V, OUTEN = GND, VCCEXT tied to VCC | 12 | 20 | mA |
| 9 | PVIN Standby Follower Mode Supply Current | $I_{PVIN\_SB2}$ | PVIN = 12V, OUTEN = GND, MASTER = GND, CLKIN = GND, VCCEXT tied to VCC | 0.5 | 2 | mA |
| 10 | VCC Voltage Tolerance (Accuracy) | $V_{VCC}$ | PVIN = [3.5V, 5V, 12V, 18V], $I_{LOAD}$ = 50mA | 3 | 3.6 | V |
| 11 | VCC Dropout Voltage | $V_{CCDO}$ | PVIN = 3.25V, $I_{LOAD}$ = 50mA, VCCEXT = 3.3V, OUTEN = GND, MASTER = GND, CLKIN = GND | 100 | 220 | mV |
| 12 | VCC Current Limit | $I_{AVCC-CL}$ | PVIN = [5V, 12V, 18V], VCC = 2.9V, VCCEXT = 3.3V, OUTEN = GND, MASTER = GND, CLKIN = GND | 75 | 130 | mA |
| 13 | VCC Foldback Current Limit | $I_{AVCC-SC}$ | PVIN = [5V, 12V, 18V], VCC = GND, VCCEXT = 3.3V | 40 | 90 | mA |
| 14 | Time after Rising PVIN to READY Signal | $T_{PVIN-READY}$ | PVIN = step 2V to 4V, CH3FREQ = non-$I_2$C/SMBus Mode | 1.7 | 2.7 | ms |
| 15 | Time after OUTEN to CLKOUT with Phase = 0° | $T_{OUTEN-OUT}$ | PVIN = 5V, CH[0:3]PH = 0°, OUTEN rising | 70 | 180 | ns |
| | | | PVIN = 5V, MASTER = GND, CLKIN = 48MHz, CH[0:3]PH = 0°, OUTEN rising | 70 | 180 | ns |
| 16 | Internal Oscillator Nominal Frequency | InternalOsc_Nom | OSCTUNE = 12.7kΩ, PVIN = VCC = [3V, 3.6V] VCC regulating and PVIN = [5V, 12V, 18V] | 46.25 | 49.25 | MHz |
| 17 | Internal Oscillator Minimum Frequency | InternalOsc_Min | PVIN = VCC = [3V, 3.6V, 5V, 12V, 18V], OSCTUNE = 26.7kΩ | 41.0 | 46.2 | MHz |
| 18 | Internal Oscillator Maximum Frequency | InternalOsc_Max | PVIN = VCC = [3V, 3.6V, 5V, 12V, 18V], OSCTUNE = 8.2kΩ | 48.5 | 56.5 | MHz |
| 19 | Output Duty Cycle in Leader Mode with Internal Oscillator | M_int_Duty_Cycle | OSCTUNE = 8.2kΩ, CH[0:3]FREQ = Option 1 | 30 | 50 | % |

**Table 4. ISL74420x Datasheet Total Dose Parameters ($T_A$ = 25°C)**

| Fig. | Parameter | Symbol | Conditions | Low Limit | High Limit | Unit |
|---|---|---|---|---|---|---|
| 20 | Output Duty Cycle in Leader Mode with CLKIN | M_clkin_Duty_Cycle | OSCTUNE = 12.7kΩ, MASTER = VCC, CLKINfreq = 50MHz, CLKINduty = [40%, 60%] duty cycle, CH[0:3]FREQ = Option 1 | 30 | 50 | % |
| 21 | Output Duty Cycle in Follower Mode | S_Duty_Cycle | VCCEXT = [VCC, 5.5V] MASTER = GND, CLKINfreq = 50MHz, CLKIN duty = [40, 60% duty cycle, CH[0:3]FREQ = Option 1 | 30 | 50 | % |
| 22 | Output-to-Output Skew between CLKOUTx's with Equal Frequency and Phase | $CLKOUTx_{SKEW48M}$ | MASTER = GND, CLKIN = 48MHz, CH[0:3]FREQ = Option 0 | -1.5 | 1.5 | ns |
| 23 | Output-to-Output Skew between CLKOUTx's with Equal Frequency and Phase | $CLKOUTx_{SKEW1M}$ | MASTER = GND, CLKIN = 48MHz, CH[0:3]FREQ = Opt. 5 (1MHz), equal phase | -6 | 6 | ns |
| 24 | Output-to-Output Skew Between CLKOUTx's with Equal Frequency and Different Phase | $CLKOUTx_{SKEW1M4P}$ | MASTER = GND, CLKIN = 48MHz, CH[0:3]FREQ = Opt. 5 (1MHz), CH[0:3]PH = 0°, 90°, 180°, 270° | -7 | 7 | ns |
| 25 | CLKIN-to-CLKOUT Follower Mode Propagation Delay | $CLK_{PROPDELAY}$ | MASTER = GND, CH[0:3]FREQ = Option 0, CLKIN = 1MHz | 20 | 40 | ns |
| 26 | Rise/Fall Times of the Outputs | $T_{OUT\_RF3p3}$ | PVIN = 12V, MASTER = GND, CLKIN = 1MHz, CH[0:3]FREQ = Option 0, VCCEXT = 3.3V, Measured 80%/20% | - | 5 | ns |
| | | $T_{OUT\_RF5}$ | PVIN = 12V, MASTER = GND, CLKIN = 1MHz, CH[0:3]FREQ = Option 0, VCCEXT = 5.5V, Measured 80%/20% | - | 5 | ns |
| 27 | Output Voltage High | $CLKOUT_{xVOH}$ | PVIN = 12V, MASTER = GND, CLKIN = 3.3V, CH[0:3]FREQ = Option 0, VCCEXT = 3.3V, ILOAD = 1mA | 3 | 3.3 | V |
| | | | PVIN = 12V, MASTER = GND, CLKIN = 3.3V, CH[0:3]FREQ = Option 0, VCCEXT = 3.3V, ILOAD = 10mA | 2.7 | 3.3 | V |
| 28 | | | PVIN = 12V, MASTER = GND, CLKIN = 3.3V, CH[0:3]FREQ = Option 0, VCCEXT = 5V, ILOAD = 1mA | 4.5 | 5 | V |
| | | | PVIN = 12V, MASTER = GND, CLKIN = 3.3V, CH[0:3]FREQ = Option 0, VCCEXT = 5V, ILOAD = 10mA | 4.5 | 5 | V |
| 29 | Output Voltage Low | $CLKOUT_{xVOL}$ | PVIN = 12V, MASTER = GND, CLKIN = GND, CH[0:3]FREQ = Option 0, VCCEXT = 3.3V, ILOAD = 1mA | 0 | 0.3 | V |
| | | | PVIN = 12V, MASTER = GND, CLKIN = GND, CH[0:3]FREQ = Option 0, VCCEXT = 3.3V, ILOAD = 10mA | 0 | 0.3 | V |
| 30 | | | PVIN = 12V, MASTER = GND, CLKIN = GND, CH[0:3]FREQ = Option 0, VCCEXT = 5V, ILOAD = 1mA | 0 | 0.3 | V |
| | | | PVIN = 12V, MASTER = GND, CLKIN = GND, CH[0:3]FREQ = Option 0, VCCEXT = 5V, ILOAD = 10mA | 0 | 0.3 | V |

**Table 4. ISL74420x Datasheet Total Dose Parameters ($T_A$ = 25°C)**

| Fig. | Parameter | Symbol | Conditions | Low Limit | High Limit | Unit |
|---|---|---|---|---|---|---|
| 31 | READY Voltage Low | $READY_{VOL}$ | $I_{LOAD}$ = 1mA | 0 | 0.3 | V |
| 32 | | | $I_{LOAD}$ = 10mA | 0 | 0.3 | V |
| 33 | OUTEN/MASTER Input Threshold High | $OUTEN/MASTER_{VIH}$ | - | 1.35 | 2 | V |
| 34 | OUTEN/MASTER Input Threshold Low | $OUTEN/MASTER_{VIL}$ | - | 0.8 | 1.65 | V |
| 35 | OUTEN/MASTER Input Voltage Hysteresis | $OUTEN/MASTER_{hyst}$ | - | 0.2 | 0.5 | V |
| 36 | SDA/SCL Output Fall Time from VIHmin to VILmax | $t_F$ | From VIHmin to VILmax | - | 250 | ns |
| 37 | SDA/SCL Low-Level Output Voltage | $V_{OL}$ | 4mA Sink into SDA/SCL pin | - | 0.4 | mA |

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