

Part Variation Analysis for ADC128S102WGRQV

Prepared by Zenode.

This document lets a reviewing engineer who did not run the analysis decide whether to trust each worst-case value for the ADC128S102WGRQV, and see what is still missing.



1 Overview

Part variation file for the Texas Instruments ADC128S102WGRQV, a Radiation-hardened 8-channel, 50 kSPS to 1 MSPS, 12-bit SAR analog-to-digital converter, QML-V, 16-lead ceramic SOIC.

1.1 Summary

Worst-case analysis summary. Five of the eight parameters analyzed here close on three of their four terms and are blocked on one: mission-life drift. The datasheet's burn-in delta table bounds post-operational-life drift for integral non-linearity only, and its footnote states that no deltas are required for any other parameter, which exempts them from delta testing rather than bounding them. Integral non-linearity is therefore the only parameter with a complete worst-case band, at -1.60 to +1.75 LSB as published. Temperature and radiation, which are usually the hard terms on a space part, are both closed here and both by the same mechanism: the guaranteed limits are taken at subgroups 1, 2 and 3, which are 25, 125 and -55 C, so the published band already spans the rated temperature range; and datasheet section 6.6 lists only two parameters, with a footnote stating that every other post-irradiation limit is identical to its pre-irradiation limit. Neither term is unknown and neither is a zero we chose. What fails first is the shutdown supply current under radiation. Its post-irradiation maximum is 100 uA against a pre-irradiation maximum of 1.4 uA, a factor of seventy-one, and that limit is specified at TA = 25 C only, so a program running hot after dose has no published bound at all. Any standby power budget built on the 1.4 uA number will be wrong by two orders of magnitude.

1.2 Component information

Field	Value
MPN	ADC128S102WGRQV
Manufacturer	Texas Instruments
Short description	Radiation-hardened 8-channel, 50 kSPS to 1 MSPS, 12-bit SAR analog-to-digital converter, QML-V, 16-lead ceramic SOIC.

1.3 Scope

The following information is utilized (or needed) for this analysis:

1.3.1 Scope included in analysis

Source	What it provided
Document A TI datasheet SNAS411P Rev. P	Guaranteed limits for six static error parameters and both supply currents
	Post-irradiation limits, and the footnote governing every other parameter

Source	What it provided
	Burn-in delta limits, and the subgroup temperatures the limits are taken at
Document B Aerospace TOR-2013-00297, Appendix A.5	Level 1 extreme value analysis, the method every stack in Section 3 uses

1.3.2 Scope missing from analysis

To complete this report, the following data is required. This is broken down in each calculation section, with per-parameter details and next steps in [Section 6.1](#).

Action	Required
USER INPUTS REQUIRED (confirm in Section 2)	☐ Orderable part number. The part number searched, ADC128S102QML-SP, is a Texas Instruments product-folder name and cannot be ordered. This analysis is for ADC128S102WGRQV. If the board carries ADC128S102WRQV or ADC128S102WGMPR instead, confirm the limits before using any number in this report. The supply rail. Built at VA = VD = 5 V, the widest-band operating point; the datasheet publishes a tighter set at 3 V (Section 2).
NOT IN EXISTING DOCUMENTATION (obtain from the manufacturer)	Post-operational-life delta limits for differential non-linearity, offset error, full scale error, both matching parameters and both supply currents. Blocks Sections 3.2 to 3.8 and Section 4. ELDRS characterization and a single-event upset rate. The datasheet only states the latch-up and functional-interrupt immunity levels.
MISSING DOCUMENTS (the program must supply)	Requirements document with the converter accuracy limit and the standby current limit; Section 4 has nothing to check against until they arrive. Thermal analysis giving this part's operating temperature range on the board (placeholder in Section 2).
CONFIRM WITH MANUFACTURER (guaranteed limits where only typical or reference values exist)	Whether Texas Instruments will release QML-V life-test delta data, or the delta limits on DLA drawing 5962R07227, for the parameters with no published drift bound (Sections 3.2 to 3.8). Whether the minimum supply current is bounded at all. Both supply-current parameters publish a typical and a maximum with no minimum.
NOT COVERED IN THIS RUN (out of scope; re-run to include)	Dynamic performance, the timing set and hi-impedance leakage current. Guaranteed limits are listed in Section 5; no variance decomposition was run on them. No requirements document, thermal analysis or radiation environment was supplied, so no check in Section 4 is a finding. Post-irradiation limits are specified at TA = 25 C only; behavior above 25 C after dose is not published.

1.4 Results

Ti, Tt, Tr and Ta are initial tolerance, temperature, radiation and aging. Every value here is covered in detail in [Section 3](#); N/A means no requirement consumes the band. The published limits that are not decomposed are listed in [Section 5.1](#).

Parameter	Nominal	Unit	Evidence	Min	Max	Ti	Tt	Tr	Ta
Integral non-linearity (INL)	±0.9	LSB	Typical	-1.6	1.75	-1.25 / +1.4	-1.25 / +1.4	-1.25 / +1.4	-0.35 / +0.35
Differential non-linearity (DNL)	-0.5 / +0.9	LSB	Typical	N/A		-0.9 / +1.5	-0.9 / +1.5	-0.9 / +1.5	Unknown
Offset error (VOFF)	1.1	LSB	Typical	Blocked (3.3.5)	Blocked (3.3.5)	-2.3 / +2.3	-2.3 / +2.3	-2.3 / +2.3	Unknown
Full scale error (FSE)	0.3	LSB	Typical	Blocked (3.4.5)	Blocked (3.4.5)	-2 / +2	-2 / +2	-2 / +2	Unknown
Offset error match (OEM)	±0.3	LSB	Typical	N/A		-1.5 / +1.5	-1.5 / +1.5	-1.5 / +1.5	Unknown
Full scale error match (FSEM)	±0.3	LSB	Typical	N/A		-1.5 / +1.5	-1.5 / +1.5	-1.5 / +1.5	Unknown
Total supply current, normal mode (IAID_n)	2.2	mA	Typical	N/A		Unknown / +0.9	Unknown / +0.9	Unknown / +0.9	Unknown
Total supply current, shutdown mode (IAID_s)	0.12	µA	Typical	Blocked (3.8.2, 3.8.4, 3.8.5)	Blocked (3.8.5)	Unknown / +1.28	Unknown / +1.28	Unknown / +98.6	Unknown

1.5 Revision history

To review, edit, and regenerate this on Zenode with the help of the AI agent, please visit the link below. It is recommended that any direct edits to this file be saved and uploaded to the agent between runs, which will preserve those changes in the next iteration.

Rev	Date (Zenode link)	Author	Change
1	2026-09-14	Zenode	First issue from the production research-table run of 2026-09-14.

1.6 Abbreviations and symbols

Term	Meaning
LSB	Least significant bit: the unit Texas Instruments publishes every static error limit in, one part in 4096 of full scale for this 12-bit converter
INL	Integral non-linearity
DNL	Differential non-linearity
TID	Total ionizing dose
SEL	Single-event latch-up
SEFI	Single-event functional interrupt
ELDRS	Enhanced low dose rate sensitivity
QML	Qualified manufacturers list
SMD	Standard microcircuit drawing (DLA)
DLA	Defense Logistics Agency
SAR	Successive approximation register
EOL	End of life
TUE	Total unadjusted error
Ti, Tt, Tr, Ta	Initial tolerance, temperature, radiation and aging: the four variance terms of every parameter.
Snom, Sin, Sip	For a parameter with symbol S: its nominal, and the min-side and max-side contribution of a term (i initial, t temperature, r radiation, a aging).
dSi, Smin, Smax	The band width a term contributes, and the stacked worst-case minimum and maximum, in the parameter's unit.
EVA	Extreme value analysis: every term taken at its limit and summed, per Aerospace TOR-2013-00297 A.5.

1.7 Table of contents

1 Overview	1
1.1 Summary.....	1
1.2 Component information	1
1.3 Scope.....	1
1.4 Results.....	2
1.5 Revision history	3
1.6 Abbreviations and symbols	3
1.7 Table of contents	4
2 Initial inputs.....	5
2.1 Temperature.....	5
2.2 Aging.....	5
2.3 Radiation.....	6
2.4 Circuit, supply.....	6
3 Parameter variation.....	6
3.1 Integral non-linearity (INL), LSB.....	7
3.2 Differential non-linearity (DNL), LSB	9
3.3 Offset error (VOFF), LSB.....	12
3.4 Full scale error (FSE), LSB	14
3.5 Offset error match (OEM), LSB.....	16
3.6 Full scale error match (FSEM), LSB.....	18
3.7 Total supply current, normal mode (IAID_n), mA.....	21
3.8 Total supply current, shutdown mode (IAID_s), μ A.....	24
4 Calculations	27
4.1 REQ-ADC-001 - Blocked	27
4.2 REQ-ADC-002 - Blocked	27
5 Rated limits.....	27
5.1 Limits	27
6 References	28
6.1 Missing references by section.....	28
6.2 Known references by document.....	30
Appendix A Standards and definitions.....	35
A.1 Evidence class definitions	35
A.2 Unknown data definitions	35

2 Initial inputs

These are the inputs required to run the analysis, typically supplied by the user at the beginning of the run.

2.0.1 Missing scope, initial inputs

Action	Required
USER INPUTS REQUIRED (confirm in Section 2)	program temperature range (the part's rated range is used)
	mission life
	design dose (the part's rated dose, radiation design margin of one)

Program values that feed every temperature-, life- and dose-dependent downstream calculation in [Section 3](#) and [Section 4](#). They are grouped the way the variance terms in [Section 3](#) are named, so a reader can find the input a term uses.

2.1 Temperature

	MIN	MAX	UNIT
Operating temperature	-55	125	°C
V _A supply voltage	2.7	5.25	V
V _D supply voltage	2.7	V _A	V
Digital input voltage	0	V _A	V
Analog input voltage	0	V _A	V
Clock frequency	0.8	16	MHz

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Recommended Operating Conditions indicate

A1 A2 A5

Figure 1: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.5, region supporting the temperature inputs below.

(1) Typical figures are at T _J = 25°C, and represent most likely parametric norms.
6 Submit Documentation Feedback Copyright © 20

A3

Figure 2: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature inputs below.

Input	Variable	Value	Unit	Source
Minimum program temperature	T _{min}	-55	°C	[A1] Placeholder ¹
Maximum program temperature	T _{max}	125	°C	[A2] Placeholder
Reference temperature	T _{ref}	25	C	[A3] Guaranteed Limit

Derived inputs:

Quantity	Variable	Value	Unit	Equation
Hot excursion	dTh	100	°C	T _{max} - T _{ref}
Cold excursion	dTc	80	°C	T _{ref} - T _{min}
Worst excursion (larger)	dTworst	100	°C	T _{max} - T _{ref}

2.2 Aging

Input	Variable	Value	Unit	Source
Mission life	Yrs	Unknown	years	Not supplied by the program

¹Program temperature range: the program has not supplied one, so the part's rated operating range is used. Replace it from the WCCA Plan before any result here is treated as a finding.

2.3 Radiation

Features

5962R07227

- Total Ionizing Dose 100 krad(Si)
- Single Event Latch-Up Immune 120 MeV-cm²/mg
- Single Event Functional Interrupt Immune 120 MeV-cm²/mg

(See *Radiation Report*)

Eight Input Channels

A4

Figure 3: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.1, region supporting the radiation inputs below.

Input	Variable	Value	Unit	Source
Design dose	Dkrad	100	krad(Si)	[A4] Placeholder ²

2.4 Circuit, supply

	MIN	MAX	UNIT
Operating temperature	-55	125	°C
V _A supply voltage	2.7	5.25	V
V _D supply voltage	2.7	V _A	V
Digital input voltage	0	V _A	V
Analog input voltage	0	V _A	V
Clock frequency	0.8	16	MHz

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Recommended Operating Conditions indicate

A1
A2
A5

Figure 4: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.5, region supporting the circuit constants below.

Quantity	Variable	Value	Unit	Condition	Source
Analog and digital supply	V _A	5	V	Rail chosen for this analysis; the datasheet publishes a separate set of limits at 3 V	[A5] Placeholder

3 Parameter variation

Each parameter below is decomposed into its nominal value and four variance terms (initial tolerance, temperature, radiation, aging), then stacked into a worst-case minimum and maximum. 8 parameters are analyzed.

²Design dose: the program has not supplied a mission total ionizing dose or a radiation design margin. The part's rated dose is used, which assumes a margin of exactly one and is not a design position.

3.0.1 Missing scope, parameter variation

Action	Required
USER INPUTS REQUIRED (confirm in Section 2)	program temperature range (the part's rated range is used)
	mission life
	design dose (the part's rated dose, radiation design margin of one)
	supply rail (built at $V_A = V_D = 5\text{ V}$, the widest band)

3.1 Integral non-linearity (INL), LSB

3.1.1 Nominal value

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
INL integral non-linearity (one-point method)	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.25	±0.9	1.4	LSB

A6

Figure 5: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the nominal INL.

Quantity	Variable	Value	Unit	Condition	Source
Nominal	INL _{nom}	±0.9	LSB	Typical at $V_A = V_D = 5\text{ V}$, subgroups 1, 2, 3; not added to the stack, the limits are stated about the ideal	[A6] Typical

3.1.2 Initial tolerance

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
INL integral non-linearity (one-point method)	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.25	±0.9	1.4	LSB

A7

Figure 6: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the initial tolerance of INL.

Term	Variable	Value	Unit	Condition	Source
Min side	INL _{lin}	-1.25	LSB	Published as -1.25 to 1.4 LSB, subgroups 1, 2, 3	[A7] Guaranteed Limit
Max side	INL _{lip}	1.4	LSB	Published as -1.25 to 1.4 LSB, subgroups 1, 2, 3	[A7] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance	dINL _i	2.65	LSB	$INL_{lip} - INL_{lin}$	AI derived

3.1.3 Temperature

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
INL integral non-linearity (one-point method)	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.25	±0.9	1.4	LSB

A9

Figure 7: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature of INL.

Table 1. Quality Conformance Inspection⁽¹⁾

SUBGROUP	DESCRIPTION	TEMP (°C)
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55

A8

Figure 8: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.³

Term	Variable	Value	Unit	Condition	Source
Min side	INLtn	-1.25	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.1.2}	[A9] Guaranteed Limit based on [A8]
Max side	INLtp	1.4	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.1.2}	[A9] Guaranteed Limit based on [A8]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature	dINL _t	2.65	LSB	INL _{tp} - INL _{tn}	Same published limit as initial tolerance (3.1.2); not added to the stack a second time

3.1.4 Radiation

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
INL integration linearity (end point method)	V _A = V _D = 5 V	[1, 2, 3]	-1.25	±0.9	1.4	LSB

A11

Figure 9: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the radiation of INL.

(1) Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, T_A = 25°C.

A10

Figure 10: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	INLrn	-1.25	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.1.2}	[A11] Guaranteed Limit based on [A10]
Max side	INLrp	1.4	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.1.2}	[A11] Guaranteed Limit based on [A10]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation	dINL _r	2.65	LSB	INL _{rp} - INL _{rn}	Same published limit as initial tolerance (3.1.2); not added to the stack a second time

³The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

3.1.5 Aging

6.7 Electrical Characteristics: Burn in Delta Parameters - T_A at 25°C

The following specifications apply for $V_A = V_D = 2.7$ V to 5.25 V, AGND = DGND = 0 V, $f_{SCLK} = 0.8$ MHz to 16 MHz, $f_{SAMPLE} = 50$ kSPS to 1 MSPS, and $C_{IN} = 50$ pF.⁽¹⁾

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INL Integral non-linearity	$V_A = V_D = 3$ V	-0.5	0.106	0.5	LSB
	$V_A = V_D = 5$ V	-0.35	0.016	0.35	LSB
IMD Intermodulation distortion, second order terms	$V_A = V_D = 3$ V	-14	1.35	14	dB
	$V_A = V_D = 5$ V	-17	1.67	17	dB
IMD Intermodulation distortion, third order terms	$V_A = V_D = 3$ V	-10	0.47	10	dB
	$V_A = V_D = 5$ V	-10	0.9	10	dB

(1) This is worse case drift, Deltas are performed at room temperature post operational life. All other parameters, no deltas are required.

A12

Figure 11: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the aging of INL.

Term	Variable	Value	Unit	Condition	Source
Min side	INLan	-0.35	LSB	Published as -0.35 to 0.35 LSB, post operational life at $T_A = 25$ C	[A12] Bound
Max side	INLap	0.35	LSB	Published as -0.35 to 0.35 LSB, post operational life at $T_A = 25$ C	[A12] Bound

Output	Variable	Value	Unit	Equation	Source
Band width from aging ⁴	dINLa	0.7	LSB	INLap - INLan	AI derived

3.1.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	INLmin	-1.6	LSB	INLin + INLan	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	INLmax	1.75	LSB	INLip + INLap	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.2 Differential non-linearity (DNL), LSB

3.2.1 Nominal value

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
DNL Differential non-linearity	$V_A = V_D = 5$ V	[1, 2, 3]		0.9	1.5	LSB
		[1, 2, 3]	-0.9	-0.5		LSB

A13

Figure 12: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the nominal DNL.

Quantity	Variable	Value	Unit	Condition	Source
Nominal	DNLnom	-0.5 / +0.9	LSB	Typical at $V_A = V_D = 5$ V, subgroups 1, 2, 3; not added to the stack, the limits are stated about the ideal	[A13] Typical

⁴INL aging: Integral non-linearity aging: the burn-in delta limit, a post-operational-life qualification window measured at room temperature, and the datasheet calls it worst case drift. It is a family test window rather than a commitment on an individual part, and it is not a 15-year mission-life drift model. It is carried as a Bound for that reason.

3.2.2 Initial tolerance

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
DNL Differential non-linearity	$V_A = V_D = 5\text{ V}$	[1, 2, 3]		0.9	1.5	LSB
		[1, 2, 3]	-0.9	-0.5		LSB

A14

Figure 13: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the initial tolerance of DNL.

Term	Variable	Value	Unit	Condition	Source
Min side	DNL _{lin}	-0.9	LSB	Published as -0.9 to 1.5 LSB, subgroups 1, 2, 3	[A14] Guaranteed Limit
Max side	DNL _{lip}	1.5	LSB	Published as -0.9 to 1.5 LSB, subgroups 1, 2, 3	[A14] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance	dDNL _i	2.4	LSB	DNL _{lip} - DNL _{lin}	AI derived

3.2.3 Temperature

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
DNL Differential non-linearity	$V_A = V_D = 5\text{ V}$	[1, 2, 3]		0.9	1.5	LSB
		[1, 2, 3]	-0.9	-0.5		LSB

A16

Figure 14: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature of DNL.

Table 1. Quality Conformance Inspection ⁽¹⁾			
SUBGROUP	DESCRIPTION	TEMP (°C)	
1	Static tests at	25	
2	Static tests at	125	
3	Static tests at	-55	

A15

Figure 15: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.⁵

Term	Variable	Value	Unit	Condition	Source
Min side	DNL _{tn}	-0.9	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.2.2}	[A16] Guaranteed Limit based on [A15]
Max side	DNL _{tp}	1.5	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.2.2}	[A16] Guaranteed Limit based on [A15]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature	dDNL _t	2.4	LSB	DNL _{tp} - DNL _{tn}	Same published limit as initial tolerance (3.2.2); not added to the stack a second time

⁵The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

3.2.4 Radiation

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
DNL Differential non-linearity	$V_A = V_D = 5\text{ V}$	[1, 2, 3]		0.9	1.5	LSB
		[1, 2, 3]	-0.9	-0.5		LSB

A18

Figure 16: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the radiation of DNL.

(1) Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, $T_A = 25^\circ\text{C}$.

A17

Figure 17: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	DNLrn	-0.9	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.2.2}	[A18] Guaranteed Limit based on [A17]
Max side	DNLrp	1.5	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.2.2}	[A18] Guaranteed Limit based on [A17]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation	dDNLr	2.4	LSB	$\text{DNLrp} - \text{DNLrn}$	Same published limit as initial tolerance (3.2.2); not added to the stack a second time

3.2.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	DNLan	Unknown	LSB		[6.1.1] Not Disclosed in data source
Max side	DNLap	Unknown	LSB		[6.1.1] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dDNLa	TBD	LSB	$\text{DNLap} - \text{DNLan}$	AI derived

3.2.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

N/A: no requirement in Section 4 consumes this parameter's worst-case band, so it is not formed. The terms it would need are 3.2.5 (Unknown).

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	DNLmin	N/A	LSB	$\text{DNLin} + \text{DNLan}$	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	DNLmax	N/A	LSB	$\text{DNLip} + \text{DNLap}$	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.3 Offset error (VOFF), LSB

3.3.1 Nominal value

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
V _{OFF} Offset error	V _A = V _D = 5 V	[1, 2, 3]	-2.3	1.1	2.3	LSB

A19

Figure 18: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the nominal V_{OFF}.

Quantity	Variable	Value	Unit	Condition	Source
Nominal	VOFFnom	1.1	LSB	Typical at V _A = V _D = 5 V, subgroups 1, 2, 3; not added to the stack, the limits are stated about the ideal	[A19] Typical

3.3.2 Initial tolerance

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
V _{OFF} Offset error	V _A = V _D = 5 V	[1, 2, 3]	-2.3	1.1	2.3	LSB

A20

Figure 19: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the initial tolerance of V_{OFF}.

Term	Variable	Value	Unit	Condition	Source
Min side	VOFFin	-2.3	LSB	Published as -2.3 to 2.3 LSB, subgroups 1, 2, 3	[A20] Guaranteed Limit
Max side	VOFFip	2.3	LSB	Published as -2.3 to 2.3 LSB, subgroups 1, 2, 3	[A20] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance	dVOFFi	4.6	LSB	VOFFip - VOFFin	AI derived

3.3.3 Temperature

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
V _{OFF} Offset error	V _A = V _D = 5 V	[1, 2, 3]	-2.3	1.1	2.3	LSB

A22

Figure 20: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature of V_{OFF}.

Table 1. Quality Conformance Inspection ⁽¹⁾			
SUBGROUP	DESCRIPTION	TEMP (°C)	
1	Static tests at	25	
2	Static tests at	125	
3	Static tests at	-55	

A21

Figure 21: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.⁶

⁶The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

Term	Variable	Value	Unit	Condition	Source
Min side	V _{OFFtn}	-2.3	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.3.2}	[A22] Guaranteed Limit based on [A21]
Max side	V _{OFFtp}	2.3	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.3.2}	[A22] Guaranteed Limit based on [A21]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature	dV _{OFFt}	4.6	LSB	V _{OFFtp} - V _{OFFtn}	Same published limit as initial tolerance (3.3.2); not added to the stack a second time

3.3.4 Radiation

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
V _{OFF} Offset error	V _A = V _D = 5 V	[1, 2, 3]	-2.3	1.1	2.3	LSB

A24

Figure 22: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the radiation of V_{OFF}.

(1) Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, T _A = 25°C.

A23

Figure 23: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	V _{OFFrn}	-2.3	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.3.2}	[A24] Guaranteed Limit based on [A23]
Max side	V _{OFFrp}	2.3	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.3.2}	[A24] Guaranteed Limit based on [A23]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation	dV _{OFFr}	4.6	LSB	V _{OFFrp} - V _{OFFrn}	Same published limit as initial tolerance (3.3.2); not added to the stack a second time

3.3.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	V _{OFFan}	Unknown	LSB		[6.1.2] Not Disclosed in data source
Max side	V _{OFFap}	Unknown	LSB		[6.1.2] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dV _{OFFa}	TBD	LSB	V _{OFFap} - V _{OFFan}	AI derived

3.3.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

Blocked by 3.3.5.

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	VOFFmin	Blocked (3.3.5)	LSB	$V_{OFFin} + V_{OFFan}$	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	VOFFmax	Blocked (3.3.5)	LSB	$V_{OFFip} + V_{OFFap}$	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.4 Full scale error (FSE), LSB

3.4.1 Nominal value

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSE Full scale error	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-2	0.3	2	LSB

A25

Figure 24: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the nominal FSE.

Quantity	Variable	Value	Unit	Condition	Source
Nominal	FSEnom	0.3	LSB	Typical at $V_A = V_D = 5\text{ V}$, subgroups 1, 2, 3; not added to the stack, the limits are stated about the ideal	[A25] Typical

3.4.2 Initial tolerance

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSE Full scale error	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-2	0.3	2	LSB

A26

Figure 25: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the initial tolerance of FSE.

Term	Variable	Value	Unit	Condition	Source
Min side	FSEin	-2	LSB	Published as -2.0 to 2.0 LSB, subgroups 1, 2, 3	[A26] Guaranteed Limit
Max side	FSEip	2	LSB	Published as -2.0 to 2.0 LSB, subgroups 1, 2, 3	[A26] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance	dFSEi	4	LSB	$FSEip - FSEin$	AI derived

3.4.3 Temperature

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSE Full scale error	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-2	0.3	2	LSB

A28

Figure 26: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature of FSE.

Table 1. Quality Conformance Inspection⁽¹⁾

SUBGROUP	DESCRIPTION	TEMP (°C)
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55

A27

Figure 27: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.⁷

Term	Variable	Value	Unit	Condition	Source
Min side	FSEtn	-2	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.4.2}	[A28] Guaranteed Limit based on [A27]
Max side	FSEtp	2	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.4.2}	[A28] Guaranteed Limit based on [A27]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature	dFSEt	4	LSB	FSEtp - FSEtn	Same published limit as initial tolerance (3.4.2); not added to the stack a second time

3.4.4 Radiation

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSE Full scale error	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-2	0.3	2	LSB

A30

Figure 28: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the radiation of FSE.

(1) Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, $T_A = 25^\circ\text{C}$.

A29

Figure 29: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	FSErn	-2	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.4.2}	[A30] Guaranteed Limit based on [A29]
Max side	FSErp	2	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.4.2}	[A30] Guaranteed Limit based on [A29]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation	dFSEr	4	LSB	FSErp - FSErn	Same published limit as initial tolerance (3.4.2); not added to the stack a second time

⁷The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

3.4.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	FSEan	Unknown	LSB		[6.1.3] Not Disclosed in data source
Max side	FSEap	Unknown	LSB		[6.1.3] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dFSEa	TBD	LSB	$FSEap - FSEan$	AI derived

3.4.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

Blocked by 3.4.5.

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	FSEmin	Blocked (3.4.5)	LSB	$FSEin + FSEan$	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	FSEmax	Blocked (3.4.5)	LSB	$FSEip + FSEap$	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.5 Offset error match (OEM), LSB

3.5.1 Nominal value

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
OEM Offset error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A31

Figure 30: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the nominal OEM.

Quantity	Variable	Value	Unit	Condition	Source
Nominal	OEMnom	±0.3	LSB	Typical at $V_A = V_D = 5\text{ V}$, subgroups 1, 2, 3; not added to the stack, the limits are stated about the ideal	[A31] Typical

3.5.2 Initial tolerance

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
OEM Offset error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A32

Figure 31: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the initial tolerance of OEM.

Term	Variable	Value	Unit	Condition	Source
Min side	OEMin	-1.5	LSB	Published as -1.5 to 1.5 LSB, subgroups 1, 2, 3	[A32] Guaranteed Limit
Max side	OEMip	1.5	LSB	Published as -1.5 to 1.5 LSB, subgroups 1, 2, 3	[A32] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance	dOEMi	3	LSB	$OEMip - OEMin$	AI derived

3.5.3 Temperature

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
OEM Offset error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A34

Figure 32: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature of OEM.

Table 1. Quality Conformance Inspection ⁽¹⁾		
SUBGROUP	DESCRIPTION	TEMP (°C)
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55

A33

Figure 33: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.⁸

Term	Variable	Value	Unit	Condition	Source
Min side	OEMtn	-1.5	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.5.2}	[A34] Guaranteed Limit based on [A33]
Max side	OEMtp	1.5	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.5.2}	[A34] Guaranteed Limit based on [A33]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature	dOEMt	3	LSB	$\text{OEMtp} - \text{OEMtn}$	Same published limit as initial tolerance (3.5.2); not added to the stack a second time

3.5.4 Radiation

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
OEM Offset error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A36

Figure 34: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the radiation of OEM.

(1) Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, $T_A = 25^\circ\text{C}$.

A35

Figure 35: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	OEMrn	-1.5	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.5.2}	[A36] Guaranteed Limit based on [A35]

⁸The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

Term	Variable	Value	Unit	Condition	Source
Max side	OEMrp	1.5	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.5.2}	[A36] Guaranteed Limit based on [A35]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation	dOEMr	3	LSB	$OEMrp - OEMrn$	Same published limit as initial tolerance (3.5.2); not added to the stack a second time

3.5.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	OEMan	Unknown	LSB		[6.1.4] Not Disclosed in data source
Max side	OEMap	Unknown	LSB		[6.1.4] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dOEMa	TBD	LSB	$OEMap - OEMan$	AI derived

3.5.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

N/A: no requirement in Section 4 consumes this parameter's worst-case band, so it is not formed. The terms it would need are 3.5.5 (Unknown).

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	OEMmin	N/A	LSB	$OEMin + OEMan$	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	OEMmax	N/A	LSB	$OEMip + OEMap$	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.6 Full scale error match (FSEM), LSB

3.6.1 Nominal value

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSEM Full scale error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A37

Figure 36: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the nominal FSEM.

Quantity	Variable	Value	Unit	Condition	Source
Nominal	FSEMnom	±0.3	LSB	Typical at $V_A = V_D = 5\text{ V}$, subgroups 1, 2, 3; not added to the stack, the limits are stated about the ideal	[A37] Typical

3.6.2 Initial tolerance

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSEM Full scale error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A38

Figure 37: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the initial tolerance of FSEM.

Term	Variable	Value	Unit	Condition	Source
Min side	FSEMin	-1.5	LSB	Published as -1.5 to 1.5 LSB, subgroups 1, 2, 3	[A38] Guaranteed Limit
Max side	FSEMip	1.5	LSB	Published as -1.5 to 1.5 LSB, subgroups 1, 2, 3	[A38] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance	dFSEMi	3	LSB	FSEMip - FSEMin	AI derived

3.6.3 Temperature

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSEM Full scale error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A40

Figure 38: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the temperature of FSEM.

Table 1. Quality Conformance Inspection ⁽¹⁾		
SUBGROUP	DESCRIPTION	TEMP (°C)
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55

A39

Figure 39: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.⁹

Term	Variable	Value	Unit	Condition	Source
Min side	FSEMtn	-1.5	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.6.2}	[A40] Guaranteed Limit based on [A39]
Max side	FSEMtp	1.5	LSB	The static limit is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.6.2}	[A40] Guaranteed Limit based on [A39]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature	dFSEMt	3	LSB	FSEMtp - FSEMtn	Same published limit as initial tolerance (3.6.2); not added to the stack a second time

3.6.4 Radiation

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP ⁽¹⁾	MAX	UNIT
FSEM Full scale error match	$V_A = V_D = 5\text{ V}$	[1, 2, 3]	-1.5	±0.3	1.5	LSB

A42

Figure 40: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.6, region supporting the radiation of FSEM.

⁹The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

(1) Pre and post irradiation limits are identical to those listed in the *DC Parameters* and *AC and Timing Characteristics*, except as listed in *Electrical Characteristics: Radiation*. When performing post irradiation electrical measurements for any RHA level, $T_A = 25^\circ\text{C}$.

A41

Figure 41: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	FSEMrn	-1.5	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.6.2}	[A42] Guaranteed Limit based on [A41]
Max side	FSEMrp	1.5	LSB	Post-irradiation limits identical to pre-irradiation (datasheet section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.6.2}	[A42] Guaranteed Limit based on [A41]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation	dFSEMr	3	LSB	$FSEMrp - FSEMrn$	Same published limit as initial tolerance (3.6.2); not added to the stack a second time

3.6.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	FSEMan	Unknown	LSB		[6.1.5] Not Disclosed in data source
Max side	FSEMap	Unknown	LSB		[6.1.5] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dFSEMa	TBD	LSB	$FSEMap - FSEMan$	AI derived

3.6.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

N/A: no requirement in Section 4 consumes this parameter's worst-case band, so it is not formed. The terms it would need are 3.6.5 (Unknown).

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	FSEMin	N/A	LSB	$FSEMin + FSEMan$	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	FSEMmax	N/A	LSB	$FSEMap + FSEMap$	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.7 Total supply current, normal mode (IAID_n), mA

3.7.1 Nominal value

POWER SUPPLY CHARACTERISTICS (C _L = 10 pF)					
V _A , V _D	Analog and digital supply voltages	V _A ≥ V _D	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
I _A + I _D	Total supply current, normal mode (CS low)	V _A = V _D = 2.7 V to 3.6 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	0.9	1.5 mA
		V _A = V _D = 4.75 V to 5.25 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	V _A = V _D = 2.7 V to 3.6 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.11	1 μA
		V _A = V _D = 4.75 V to 5.25 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.12	1.4 μA

A43

Figure 42: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the nominal IAID_n.

Quantity	Variable	Value	Unit	Condition	Source
Nominal ¹⁰	IAIDnnom	2.2	mA	V _A = V _D = 4.75 V to 5.25 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz, CS low	[A43] Typical

3.7.2 Initial tolerance

POWER SUPPLY CHARACTERISTICS (C _L = 10 pF)					
V _A , V _D	Analog and digital supply voltages	V _A ≥ V _D	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
I _A + I _D	Total supply current, normal mode (CS low)	V _A = V _D = 2.7 V to 3.6 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	0.9	1.5 mA
		V _A = V _D = 4.75 V to 5.25 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	V _A = V _D = 2.7 V to 3.6 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.11	1 μA
		V _A = V _D = 4.75 V to 5.25 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.12	1.4 μA

A44

Figure 43: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the initial tolerance of IAID_n.

Term	Variable	Value	Unit	Condition	Source
Min side	IAIDnin	Unknown	mA	Not published	[6.1.6] Not Disclosed in data source
Max side	IAIDnip	0.9	mA	V _A = V _D = 4.75 V to 5.25 V, subgroups 1, 2, 3	[A44] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance ¹¹	dIAIDni	TBD	mA	IAIDnip - IAIDnin	AI derived

¹⁰Total supply current, normal mode: the nominal is the datasheet typical, which footnote (1) on page 6 states is a value at T_J = 25 °C representing the most likely parametric norm rather than a guaranteed center.

¹¹IAID_n initial tolerance: one-sided. Total supply current, normal mode: the datasheet publishes a maximum of 3.1 mA and a typical of 2.2 mA and no minimum. The upper side is the increment from the typical to the published maximum; no lower side is published, so the worst-case minimum is blocked on this term.

3.7.3 Temperature

POWER SUPPLY CHARACTERISTICS (C _L = 10 pF)					
V _A , V _D	Analog and digital supply voltages	V _A ≥ V _D	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
I _A + I _D	Total supply current, normal mode (CS low)	V _A = V _D = 2.7 V to 3.6 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	0.9	1.5 mA
		V _A = V _D = 4.75 V to 5.25 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	V _A = V _D = 2.7 V to 3.6 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.11	1 μA
		V _A = V _D = 4.75 V to 5.25 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.12	1.4 μA

A46

Figure 44: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the temperature of IAID_n.

Table 1. Quality Conformance Inspection ⁽¹⁾			
SUBGROUP	DESCRIPTION	TEMP (°C)	
1	Static tests at	25	
2	Static tests at	125	
3	Static tests at	-55	

A45

Figure 45: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.¹²

Term	Variable	Value	Unit	Condition	Source
Min side	IAIDntn	Unknown	mA	Not published	[6.1.7] Not Disclosed in data source
Max side	IAIDntp	0.9	mA	The published maximum is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.7.2}	[A46] Guaranteed Limit based on [A45]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature ¹³	dIAIDnt	TBD	mA	IAIDntp - IAIDntn	Same published limit as initial tolerance (3.7.2); not added to the stack a second time

¹²The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

¹³IAID_n temperature: one-sided. Total supply current, normal mode temperature: the same published maximum, no minimum, counted once in the stack.

3.7.4 Radiation

POWER SUPPLY CHARACTERISTICS (C _L = 10 pF)					
V _A , V _D	Analog and digital supply voltages	V _A ≥ V _D	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
I _A + I _D	Total supply current, normal mode (CS low)	V _A = V _D = 2.7 V to 3.6 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	0.9	1.5 mA
		V _A = V _D = 4.75 V to 5.25 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	V _A = V _D = 2.7 V to 3.6 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.11	1 μA
		V _A = V _D = 4.75 V to 5.25 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.12	1.4 μA

A48

Figure 46: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the radiation of IAID_n.

(1) Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, T _A = 25°C.

A47

Figure 47: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the footnote that makes the post-irradiation limit the pre-irradiation limit.

Term	Variable	Value	Unit	Condition	Source
Min side	IAID _{nrn}	Unknown	mA	Not published	[6.1.8] Not Disclosed in data source
Max side	IAID _{nrp}	0.9	mA	Post-irradiation limits identical to pre-irradiation (section 6.6 footnote); at the design dose in Section {2}; same published limit as the initial tolerance in {3.7.2}	[A48] Guaranteed Limit based on [A47]

Output	Variable	Value	Unit	Equation	Source
Band width from radiation ¹⁴	dIAID _{nr}	TBD	mA	IAID _{nrp} - IAID _{nrn}	Same published limit as initial tolerance (3.7.2); not added to the stack a second time

3.7.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	IAID _{nan}	Unknown	mA		[6.1.9] Not Disclosed in data source
Max side	IAID _{nap}	Unknown	mA		[6.1.9] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dIAID _{na}	TBD	mA	IAID _{nap} - IAID _{nan}	AI derived

3.7.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit; The radiation limit is the same published limit as the initial tolerance limit, so it is counted once.

N/A: no requirement in Section 4 consumes this parameter's worst-case band, so it is not formed. The terms it would need are 3.7.2, 3.7.5 (Unknown).

¹⁴IAID_n radiation: one-sided. Total supply current, normal mode radiation: the same published maximum, no minimum, counted once in the stack.

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	IAIDnmin	N/A	mA	IAIDnnom + IAIDnmin + IAIDnan	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	IAIDnmax	N/A	mA	IAIDnnom + IAIDnmax + IAIDnap	Level 1 EVA, Aerospace TOR-2013-00297 A.5

3.8 Total supply current, shutdown mode (IAID_s), μA

3.8.1 Nominal value

POWER SUPPLY CHARACTERISTICS ($C_L = 10 \text{ pF}$)					
V_A, V_D	Analog and digital supply voltages	$V_A \geq V_D$	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
$I_A + I_D$	Total supply current, normal mode (CS low)	$V_A = V_D = 2.7 \text{ V to } 3.6 \text{ V}, f_{\text{SAMPLE}} = 1 \text{ MSPS}, f_{\text{IN}} = 40 \text{ kHz}$	[1, 2, 3]	0.9	1.5 mA
		$V_A = V_D = 4.75 \text{ V to } 5.25 \text{ V}, f_{\text{SAMPLE}} = 1 \text{ MSPS}, f_{\text{IN}} = 40 \text{ kHz}$	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	$V_A = V_D = 2.7 \text{ V to } 3.6 \text{ V}, f_{\text{SCLK}} = 0 \text{ kSPS}$	[1, 2, 3]	0.11	1 μA
		$V_A = V_D = 4.75 \text{ V to } 5.25 \text{ V}, f_{\text{SCLK}} = 0 \text{ kSPS}$	[1, 2, 3]	0.12	1.4 μA

A49

Figure 48: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the nominal IAID_s.

Quantity	Variable	Value	Unit	Condition	Source
Nominal ¹⁵	IAIDsnom	0.12	μA	$V_A = V_D = 4.75 \text{ V to } 5.25 \text{ V}, f_{\text{SCLK}} = 0 \text{ kSPS}, \text{CS high}$	[A49] Typical

3.8.2 Initial tolerance

POWER SUPPLY CHARACTERISTICS ($C_L = 10 \text{ pF}$)					
V_A, V_D	Analog and digital supply voltages	$V_A \geq V_D$	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
$I_A + I_D$	Total supply current, normal mode (CS low)	$V_A = V_D = 2.7 \text{ V to } 3.6 \text{ V}, f_{\text{SAMPLE}} = 1 \text{ MSPS}, f_{\text{IN}} = 40 \text{ kHz}$	[1, 2, 3]	0.9	1.5 mA
		$V_A = V_D = 4.75 \text{ V to } 5.25 \text{ V}, f_{\text{SAMPLE}} = 1 \text{ MSPS}, f_{\text{IN}} = 40 \text{ kHz}$	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	$V_A = V_D = 2.7 \text{ V to } 3.6 \text{ V}, f_{\text{SCLK}} = 0 \text{ kSPS}$	[1, 2, 3]	0.11	1 μA
		$V_A = V_D = 4.75 \text{ V to } 5.25 \text{ V}, f_{\text{SCLK}} = 0 \text{ kSPS}$	[1, 2, 3]	0.12	1.4 μA

A50

Figure 49: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the initial tolerance of IAID_s.

Term	Variable	Value	Unit	Condition	Source
Min side	IAIDsin	Unknown	μA	Not published	[6.1.10] Not Disclosed in data source
Max side	IAIDsip	1.28	μA	$V_A = V_D = 4.75 \text{ V to } 5.25 \text{ V}, \text{subgroups } 1, 2, 3$	[A50] Guaranteed Limit

¹⁵Total supply current, shutdown mode: the nominal is the datasheet typical, which footnote (1) on page 6 states is a value at $T_J = 25 \text{ C}$ representing the most likely parametric norm rather than a guaranteed center.

Output	Variable	Value	Unit	Equation	Source
Band width from initial tolerance ¹⁶	dIAIDsi	TBD	μA	IAIDsip - IAIDsin	AI derived

3.8.3 Temperature

POWER SUPPLY CHARACTERISTICS (C _L = 10 pF)					
V _A , V _D	Analog and digital supply voltages	V _A ≥ V _D	[1, 2, 3]	2.7	V
			[1, 2, 3]	5.25	V
I _A + I _D	Total supply current, normal mode (CS low)	V _A = V _D = 2.7 V to 3.6 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	0.9	1.5 mA
		V _A = V _D = 4.75 V to 5.25 V, f _{SAMPLE} = 1 MSPS, f _{IN} = 40 kHz	[1, 2, 3]	2.2	3.1 mA
	Total supply current, shutdown mode (CS high)	V _A = V _D = 2.7 V to 3.6 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.11	1 μA
		V _A = V _D = 4.75 V to 5.25 V, f _{SCLK} = 0 kSPS	[1, 2, 3]	0.12	1.4 μA

A52

Figure 50: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.7, region supporting the temperature of IAID_s.

Table 1. Quality Conformance Inspection ⁽¹⁾		
SUBGROUP	DESCRIPTION	TEMP (°C)
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55

A51

Figure 51: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.9, region supporting the temperatures the subgroups are tested at.¹⁷

Term	Variable	Value	Unit	Condition	Source
Min side	IAIDstn	Unknown	μA	Not published	[6.1.11] Not Disclosed in data source
Max side	IAIDstp	1.28	μA	The published maximum is guaranteed at subgroups 1, 2, 3 (25, 125, -55 °C); same published limit as the initial tolerance in {3.8.2}	[A52] Guaranteed Limit based on [A51]

Output	Variable	Value	Unit	Equation	Source
Band width from temperature ¹⁸	dIAIDst	TBD	μA	IAIDstp - IAIDstn	Same published limit as initial tolerance (3.8.2); not added to the stack a second time

¹⁶IAID_s initial tolerance: one-sided. Total supply current, shutdown mode: the datasheet publishes a maximum of 1.4 uA and a typical of 0.12 uA and no minimum. The upper side is the increment from the typical to the published maximum; no lower side is published, so the worst-case minimum is blocked on this term.

¹⁷The boxed values are the three static-test temperatures. They are the evidence that the guaranteed limit already spans the rated range, so temperature is included in the initial-tolerance limit and has no separate published value.

¹⁸IAID_s temperature: one-sided. Total supply current, shutdown mode temperature: the same published maximum, no minimum, counted once in the stack.

3.8.4 Radiation

6.6 Electrical Characteristics: Radiation

The following specifications apply for $V_A = V_D = 2.7 \text{ V}$ to 5.25 V , $AGND = DGND = 0 \text{ V}$, $f_{SCLK} = 0.8 \text{ MHz}$ to 16 MHz , $f_{SAMPLE} = 50 \text{ kSPS}$ to 1 MSPS , and $C_L = 50 \text{ pF}$.⁽¹⁾

PARAMETER	TEST CONDITIONS	SUBGROUP	MIN	TYP	MAX	UNIT
$I_A + I_D$ Total supply current shutdown mode (CS high)	$V_A = V_D = 2.7 \text{ V}$ to 3.6 V , $f_{SCLK} = 0 \text{ kSPS}$	[1]			30	μA
	$V_A = V_D = 4.75 \text{ V}$ to 5.25 V , $f_{SCLK} = 0 \text{ kSPS}$	[1]			100	μA
I_{OZH}, I_{OZL} Hi-impedance output leakage current	$V_A = V_D = 2.7 \text{ V}$ to 5.25 V	[1]			± 10	μA

(1) Pre and post irradiation limits are identical to those listed in the *DC Parameters* and *AC and Timing Characteristics*, except as listed in *Electrical Characteristics: Radiation*. When performing post irradiation electrical measurements for any RHA level, $T_A = 25^\circ\text{C}$.

A53

Figure 52: ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P), p.8, region supporting the radiation of IAID_s.

Term	Variable	Value	Unit	Condition	Source
Min side	IAIDsrn	Unknown	μA	Not published	[6.1.12] Not Disclosed in data source
Max side	IAIDsrp	98.6	μA	$V_A = V_D = 4.75 \text{ V}$ to 5.25 V , $f_{SCLK} = 0 \text{ kSPS}$, subgroup 1, TID 100 krad(Si)	[A53] Guaranteed Limit

Output	Variable	Value	Unit	Equation	Source
Band width from radiation ¹⁹	dIAIDsr	TBD	μA	$IAIDsrp - IAIDsrn$	AI derived

3.8.5 Aging

Evidence class: **Unknown**, Not Disclosed in data source

Term	Variable	Value	Unit	Condition	Source
Min side	IAIDsan	Unknown	μA		[6.1.13] Not Disclosed in data source
Max side	IAIDsap	Unknown	μA		[6.1.13] Not Disclosed in data source

Output	Variable	Value	Unit	Equation	Source
Band width from aging	dIAIDsa	TBD	μA	$IAIDsap - IAIDsan$	AI derived

3.8.6 Stack (Level 1 EVA, absolute sum of error terms)

The temperature limit is the same published limit as the initial tolerance limit, so it is counted once.

Blocked by 3.8.2, 3.8.4, 3.8.5.

Output	Variable	Value	Unit	Equation	Source
Worst-case minimum	IAIDsmn	Blocked (3.8.2, 3.8.4, 3.8.5)	μA	$IAIDsnom + IAIDsin + IAIDsrn + IAIDsan$	Level 1 EVA, Aerospace TOR-2013-00297 A.5
Worst-case maximum	IAIDsmx	Blocked (3.8.5)	μA	$IAIDsnom + IAIDsip + IAIDsrp + IAIDsap$	Level 1 EVA, Aerospace TOR-2013-00297 A.5

¹⁹IAID_s radiation: one-sided. Total supply current, shutdown mode radiation: datasheet section 6.6 publishes a post-irradiation maximum of 100 μA against the pre-irradiation maximum of 1.4 μA , so the radiation term is carried as the increment between the two published maxima. No post-irradiation minimum is published, so the worst-case minimum is blocked on this term. Post-irradiation measurements are made at $T_A = 25^\circ\text{C}$ only, so this limit is not guaranteed over the program temperature range.

4 Calculations

The verdict on each check is generated by Zenode's AI Agent and is shown in grey italic as a starting point for the reviewing engineer.

Requirement	Check	Result	Verdict (generated)
REQ-ADC-001	Not supplied by the program	Unknown	BLOCKED
REQ-ADC-002	Not supplied by the program	Unknown	BLOCKED

4.1 REQ-ADC-001 - Blocked

Field	Value
Requirement	Worst-case static transfer error at VA = VD = 5 V, end of life, after 100 krad(Si).
Limit	Not supplied by the program
Equation	$TUE = \max(VOFF_{min} , VOFF_{max}) + \max(FSE_{min} , FSE_{max}) + \max(INL_{min} , INL_{max})$
Equation source	AI derived
Substitution	Blocked: offset error and full scale error have no mission-life drift term.
Result	Unknown
Blocked by	Sections 3.3, 3.4
AI GENERATED VERDICT BLOCKED. Offset error and full scale error are each missing their aging term, so neither worst-case band closes and the sum cannot be formed. Integral non-linearity alone reaches 1.75 LSB. No accuracy limit has been supplied by the program, so there is nothing to check against.	

4.2 REQ-ADC-002 - Blocked

Field	Value
Requirement	Post-irradiation standby current at TID 100 krad(Si), VA = VD = 5 V.
Limit	Not supplied by the program
Equation	$IAID_{s_max} = IAID_{s_nom} + initial_max + radiation_max$
Equation source	Level 1 EVA, absolute sum of error terms
Substitution	Blocked: shutdown supply current has no mission-life drift term.
Result	Unknown
Blocked by	Sections 3.8
AI GENERATED VERDICT BLOCKED. The sourced terms alone reach 100 uA, which reconstructs the datasheet's published post-irradiation maximum exactly. No standby current limit has been supplied by the program. The band does not close because the aging term is not published.	

5 Rated limits

Every rating the documents publish for this part, each with the condition it is stated at; the rows that are decomposed in Section 3 link to their block, the rest are carried as published.

5.1 Limits

Rated rows are taken from the datasheet sections named beside each one, not from a research table.

Parameter	Value	Unit	Condition	Source	Scope
Resolution with no missing codes	12	Bits	No test conditions stated	[A54] Guaranteed Limit	Rated limit only. A device class, not a parameter with a variance band.

Parameter	Value	Unit	Condition	Source	Scope
Throughput rate (fS)	50 to 1000	kSPS	VA = VD = 2.7 V to 5.25 V	[A55] Guaranteed Limit	Rated limit only. A rated operating range set by the clock, not a part characteristic that drifts.
Conversion and acquisition time	13 / 3	SCLK cycles	VA = VD = 2.7 V to 5.25 V; conversion maximum, acquisition maximum	[A56] Guaranteed Limit	Rated limit only. Specified in SCLK cycles, so it follows the clock the design supplies rather than varying with the part.
Aperture delay and jitter	4	ns	VA = VD = 2.7 V to 5.25 V; typical only	[A57] Typical	Rated limit only. Typical only, and out of scope for a static accuracy analysis.
Dynamic performance (SNR, SINAD, THD, SFDR, ENOB)	72 / 72 / -74 / 90 / 11.6	dB, dB, dB, dB, Bits	VA = VD = 5 V, fIN = 40.2 kHz, -0.02 dBFS, subgroups 4, 5, 6	[A58] Guaranteed Limit	Rated limit only. Out of scope for this run, which covers the static error set. The datasheet publishes guaranteed limits for these at subgroups 4, 5, 6.
Channel-to-channel isolation	85	dB	VA = VD = 5 V, fIN = 20 kHz, -0.02 dBFS; typical only	[A59] Typical	Rated limit only. Typical only, and out of scope for a static accuracy analysis.
Hi-impedance output leakage current (IOZH, IOZL)	±10	µA	VA = VD = 2.7 V to 5.25 V, subgroup 1, post-irradiation	[A60] Guaranteed Limit	Rated limit only. Carries a post-irradiation limit of plus or minus 10 microamps but no pre-irradiation typical, so it is out of scope for this run.
Storage temperature	-65 to 150	°C	Absolute maximum rating	[A61] Guaranteed Limit	Rated limit only. An absolute maximum rating, not an operating parameter.
Soldering temperature	260	°C	10 seconds; absolute maximum rating	[A62] Guaranteed Limit	Rated limit only. A process limit, not an operating parameter.
Total ionizing dose	100	krad(Si)	Radiation hardness assurance level	[A63] Guaranteed Limit	Analyzed in Section 3
Single event latch-up immunity	120	MeV-cm ² /mg	Radiation hardness assurance level	[A64] Guaranteed Limit	Analyzed in Section 3
Single event functional interrupt immunity	120	MeV-cm ² /mg	Radiation hardness assurance level	[A65] Guaranteed Limit	Analyzed in Section 3

6 References

Everything the analysis used, what was present, what was not, and what is next.

6.1 Missing references by section

Reference	Unknown because	What Agent looked for	Next step
6.1.1 DNL - Aging (3.2.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on Differential non-linearity. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.

Reference	Unknown because	What Agent looked for	Next step
6.1.2 VOFF - Aging (3.3.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on Offset error. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.
6.1.3 FSE - Aging (3.4.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on Full scale error. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.
6.1.4 OEM - Aging (3.5.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on Offset error match. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.
6.1.5 FSEM - Aging (3.6.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on Full scale error match. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.
6.1.6 IAID_n - Initial tolerance (lower side) (3.7.2) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; the power supply characteristics table publishes a typical and a maximum only.	Searched the power supply characteristics (page 7) and the quality conformance table for a minimum normal-mode supply current. None is published.	Ask Texas Instruments for a minimum, or the program accepts that the minimum-side band is unbounded (a user decision).
6.1.7 IAID_n - Temperature (lower side) (3.7.3) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; publishes a maximum only.	No minimum normal-mode supply current is published at any temperature.	As for 3.7.2.
6.1.8 IAID_n - Radiation (lower side) (3.7.4) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; publishes a maximum only.	No minimum normal-mode supply current is published after irradiation.	As for 3.7.2.
6.1.9 IAID_n - Aging (3.7.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on total supply current in normal mode. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.

Reference	Unknown because	What Agent looked for	Next step
6.1.10 IAID_s - Initial tolerance (lower side) (3.8.2) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; the power supply characteristics table publishes a typical and a maximum only.	Searched the power supply characteristics (page 7) and the quality conformance table for a minimum shutdown-mode supply current. None is published.	Ask Texas Instruments for a minimum, or the program accepts that the minimum-side band is unbounded (a user decision).
6.1.11 IAID_s - Temperature (lower side) (3.8.3) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; publishes a maximum only.	No minimum shutdown-mode supply current is published at any temperature.	As for 3.8.2.
6.1.12 IAID_s - Radiation (lower side) (3.8.4) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; datasheet section 6.6 publishes a post-irradiation maximum only.	Searched datasheet section 6.6 and its footnote for a post-irradiation minimum or typical shutdown current. Only the 100 uA maximum at TA = 25 C is published.	Ask Texas Instruments for post-irradiation characterisation data, or the program accepts that the minimum-side radiation term is unbounded.
6.1.13 IAID_s - Aging (3.8.5) NOT DISCLOSED IN DATA SOURCE	Expected in: Document A (SNAS411P Rev. P). Available; its burn-in delta table (section 6.7) publishes a post-operational-life drift limit for integral non-linearity and intermodulation distortion only, and its footnote states that no deltas are required for any other parameter.	Searched the datasheet electrical characteristics, the burn-in delta table (6.7), the radiation section (6.6) and the quality conformance table for a life drift or end-of-life limit on total supply current in shutdown mode. The datasheet exempts this parameter from delta testing rather than bounding its drift, so no mission-life figure is published. No QML life-test report, SMD delta limits or manufacturer reliability report was available to this run.	Request the QML-V life-test delta data or the delta limits on DLA drawing 5962R07227 from Texas Instruments. Failing that, the program must accept a MIL-STD-1547B family bound as a labeled Proxy, which is a user decision and not something this analysis can make.

6.2 Known references by document

6.2.1 Document A - ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P)

Doc	Document	Used for
A	ADC128S102QML-SP Radiation Hardened 8-Channel, 50 kSPS to 1 MSPS, 12-Bit A/D Converter datasheet (Rev. P) Texas Instruments, 2017	Document number SNAS411P, August 2008, revised April 2017. Supplies every guaranteed limit in this analysis: the static converter characteristics at 3 V and 5 V, the power supply characteristics, the radiation datasheet section 6.6, the burn-in delta table 6.7 and the quality conformance subgroup temperatures. It is silent on mission-life drift for every parameter except integral non-linearity and intermodulation distortion, and it publishes no temperature coefficient for any parameter. (datasheet)

Ref	Page	Used in	Value pulled	Section	In-situ sentence
A1	p.5	2	Tmin = -55 C	6.3 Recommended Operating Conditions	"Operating temperature MIN -55 MAX 125 °C"
A2	p.5	2	Tmax = 125 C	6.3 Recommended Operating Conditions	"Operating temperature MIN -55 MAX 125 °C"
A3	p.6	2	Tref = 25 C	6.5 Electrical Characteristics, footnote (1)	"Typical figures are at TJ = 25°C, and represent most likely parametric norms."
A4	p.1	2	Dkrad = 100 krad(Si)	1 Features	"Total Ionizing Dose 100 krad(Si)"
A5	p.5	2 (Fig 4)	VA = 5 V	6.3 Recommended Operating Conditions	"VA supply voltage 2.7 5.25 V"
A6	p.6	3.1.1 (Fig 5)	INLnom = 0.9 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"INL Integral non-linearity (end point method) VA = VD = 5 V [1, 2, 3] -1.25 ±0.9 1.4 LSB"
A7	p.6	3.1.2 (Fig 6)	INL initial tolerance min side = -1.25 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"INL Integral non-linearity (end point method) VA = VD = 5 V [1, 2, 3] -1.25 ±0.9 1.4 LSB"
A8	p.9	3.1.3 (Fig 8)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A9	p.6	3.1.3 (Fig 7)	INL temperature min side = -1.25 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"INL Integral non-linearity (end point method) VA = VD = 5 V [1, 2, 3] -1.25 ±0.9 1.4 LSB"

Ref	Page	Used in	Value pulled	Section	In-situ sentence
A10	p.8	3.1.4 (Fig 10)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A11	p.6	3.1.4 (Fig 9)	INL radiation min side = -1.25 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"INL Integral non-linearity (end point method) VA = VD = 5 V [1, 2, 3] -1.25 ±0.9 1.4 LSB"
A12	p.9	3.1.5 (Fig 11)	INL aging min side = -0.35 LSB	6.7 Electrical Characteristics: Burn in Delta Parameters - TA at 25°C	"VA = VD = 5 V -0.35 0.016 0.35 LSB"
A13	p.6	3.2.1 (Fig 12)	DNLnom = 0.9 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"DNL Differential non-linearity VA = VD = 5 V [1, 2, 3] 0.9 1.5 LSB; VA = VD = 5 V [1, 2, 3] -0.9 -0.5 LSB"
A14	p.6	3.2.2 (Fig 13)	DNL initial tolerance min side = -0.9 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"DNL Differential non-linearity VA = VD = 5 V [1, 2, 3] 0.9 1.5 LSB; VA = VD = 5 V [1, 2, 3] -0.9 -0.5 LSB"
A15	p.9	3.2.3 (Fig 15)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A16	p.6	3.2.3 (Fig 14)	DNL temperature min side = -0.9 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"DNL Differential non-linearity VA = VD = 5 V [1, 2, 3] 0.9 1.5 LSB; VA = VD = 5 V [1, 2, 3] -0.9 -0.5 LSB"
A17	p.8	3.2.4 (Fig 17)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A18	p.6	3.2.4 (Fig 16)	DNL radiation min side = -0.9 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"DNL Differential non-linearity VA = VD = 5 V [1, 2, 3] 0.9 1.5 LSB; VA = VD = 5 V [1, 2, 3] -0.9 -0.5 LSB"
A19	p.6	3.3.1 (Fig 18)	VOFFnom = 1.1 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"VOFF Offset error VA = VD = 5 V [1, 2, 3] -2.3 1.1 2.3 LSB"
A20	p.6	3.3.2 (Fig 19)	VOFF initial tolerance min side = -2.3 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"VOFF Offset error VA = VD = 5 V [1, 2, 3] -2.3 1.1 2.3 LSB"
A21	p.9	3.3.3 (Fig 21)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A22	p.6	3.3.3 (Fig 20)	VOFF temperature min side = -2.3 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"VOFF Offset error VA = VD = 5 V [1, 2, 3] -2.3 1.1 2.3 LSB"
A23	p.8	3.3.4 (Fig 23)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A24	p.6	3.3.4 (Fig 22)	VOFF radiation min side = -2.3 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"VOFF Offset error VA = VD = 5 V [1, 2, 3] -2.3 1.1 2.3 LSB"
A25	p.6	3.4.1 (Fig 24)	FSEnom = 0.3 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSE Full scale error VA = VD = 5 V [1, 2, 3] -2 0.3 2 LSB"
A26	p.6	3.4.2 (Fig 25)	FSE initial tolerance min side = -2 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSE Full scale error VA = VD = 5 V [1, 2, 3] -2 0.3 2 LSB"

Ref	Page	Used in	Value pulled	Section	In-situ sentence
A27	p.9	3.4.3 (Fig 27)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A28	p.6	3.4.3 (Fig 26)	FSE temperature min side = -2 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSE Full scale error VA = VD = 5 V [1, 2, 3] -2 0.3 2 LSB"
A29	p.8	3.4.4 (Fig 29)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A30	p.6	3.4.4 (Fig 28)	FSE radiation min side = -2 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSE Full scale error VA = VD = 5 V [1, 2, 3] -2 0.3 2 LSB"
A31	p.6	3.5.1 (Fig 30)	OEMnom = 0.3 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"OEM Offset error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A32	p.6	3.5.2 (Fig 31)	OEM initial tolerance min side = -1.5 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"OEM Offset error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A33	p.9	3.5.3 (Fig 33)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A34	p.6	3.5.3 (Fig 32)	OEM temperature min side = -1.5 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"OEM Offset error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A35	p.8	3.5.4 (Fig 35)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A36	p.6	3.5.4 (Fig 34)	OEM radiation min side = -1.5 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"OEM Offset error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A37	p.6	3.6.1 (Fig 36)	FSEMnom = 0.3 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSEM Full scale error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A38	p.6	3.6.2 (Fig 37)	FSEM initial tolerance min side = -1.5 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSEM Full scale error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A39	p.9	3.6.3 (Fig 39)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A40	p.6	3.6.3 (Fig 38)	FSEM temperature min side = -1.5 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSEM Full scale error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A41	p.8	3.6.4 (Fig 41)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A42	p.6	3.6.4 (Fig 40)	FSEM radiation min side = -1.5 LSB	6.5 Electrical Characteristics: ADC128S102QML-SP Converter, static converter characteristics	"FSEM Full scale error match VA = VD = 5 V [1, 2, 3] -1.5 ±0.3 1.5 LSB"
A43	p.7	3.7.1 (Fig 42)	IAIDnom = 2.2 mA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSAMPLE = 1 MSPS, fIN = 40 kHz [1, 2, 3] 2.2 3.1 mA"

Ref	Page	Used in	Value pulled	Section	In-situ sentence
A44	p.7	3.7.2 (Fig 43)	IAID_n initial tolerance max side = 0.9 mA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSAMPLE = 1 MSPS, fIN = 40 kHz [1, 2, 3] 2.2 3.1 mA"
A45	p.9	3.7.3 (Fig 45)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A46	p.7	3.7.3 (Fig 44)	IAID_n temperature max side = 0.9 mA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSAMPLE = 1 MSPS, fIN = 40 kHz [1, 2, 3] 2.2 3.1 mA"
A47	p.8	3.7.4 (Fig 47)	Post-irradiation limits identical to pre-irradiation	6.6 Electrical Characteristics: Radiation, footnote (1)	"Pre and post irradiation limits are identical to those listed in the DC Parameters and AC and Timing Characteristics, except as listed in Electrical Characteristics: Radiation. When performing post irradiation electrical measurements for any RHA level, TA = 25°C."
A48	p.7	3.7.4 (Fig 46)	IAID_n radiation max side = 0.9 mA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSAMPLE = 1 MSPS, fIN = 40 kHz [1, 2, 3] 2.2 3.1 mA"
A49	p.7	3.8.1 (Fig 48)	IAIDsnom = 0.12 uA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSCLK = 0 kSPS [1, 2, 3] 0.12 1.4 µA"
A50	p.7	3.8.2 (Fig 49)	IAID_s initial tolerance max side = 1.28 uA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSCLK = 0 kSPS [1, 2, 3] 0.12 1.4 µA"
A51	p.9	3.8.3 (Fig 51)	Subgroups 1, 2, 3 = static tests at 25, 125, -55 C	Table 1. Quality Conformance Inspection (MIL-STD-883, Method 5005, Group A)	"SUBGROUP DESCRIPTION TEMP (°C) 1 Static tests at 25 2 Static tests at 125 3 Static tests at -55"
A52	p.7	3.8.3 (Fig 50)	IAID_s temperature max side = 1.28 uA	6.5 Electrical Characteristics (continued), power supply characteristics	"fSCLK = 0 kSPS [1, 2, 3] 0.12 1.4 µA"
A53	p.8	3.8.4 (Fig 52)	IAID_s radiation max side = 98.6 uA	6.6 Electrical Characteristics: Radiation	"fSCLK = 0 kSPS [1] 100 µA"
A54	p.6	5	Resolution with no missing codes = 12	6.5 Static converter characteristics	"Resolution with no missing codes 12 Bits"
A55	p.8	5	Throughput rate (fS) = 50 to 1000	6.5 AC electrical characteristics	"fS Sample rate continuous mode VA = VD = 2.7 V to 5.25 V [9, 10, 11] 50 kSPS"
A56	p.8	5	Conversion and acquisition time = 13 / 3	6.5 AC electrical characteristics	"tCONVERT Conversion (hold) time VA = VD = 2.7 V to 5.25 V [9, 10, 11] 13 SCLK cycles"
A57	p.8	5	Aperture delay and jitter = 4	6.5 AC electrical characteristics	"tAD Aperture delay VA = VD = 2.7 V to 5.25 V 4 ns"
A58	p.6	5	Dynamic performance (SNR, SINAD, THD, SFDR, ENOB) = 72 / 72 / -74 / 90 / 11.6	6.5 Dynamic converter characteristics	"SNR Signal-to-noise ratio VA = VD = 5 V, fIN = 40.2 kHz, -0.02 dBFS [4, 5, 6] 68.5 72 dB"
A59	p.7	5	Channel-to-channel isolation = 85	6.5 Electrical characteristics (continued)	"ISO Channel-to-channel isolation VA = VD = 5 V, fIN = 20 kHz, -0.02 dBFS 85 dB"
A60	p.8	5	Hi-impedance output leakage current (IOZH, IOZL) = ±10	6.6 Electrical Characteristics: Radiation	"IOZH, IOZL Hi-impedance output leakage current VA = VD = 2.7 V to 5.25 V [1] ±10 µA"
A61	p.5	5	Storage temperature = -65 to 150	6.1 Absolute Maximum Ratings	"Tstg Storage temperature -65 150 °C"
A62	p.5	5	Soldering temperature = 260	6.1 Absolute Maximum Ratings	"Soldering temperature, 10 seconds 260 °C"
A63	p.3	5	Total ionizing dose = 100	1 Features	"Total Ionizing Dose 100 krad(Si)"
A64	p.3	5	Single event latch-up immunity = 120	1 Features	"Single Event Latch-Up Immune 120 MeV-cm2/mg"
A65	p.3	5	Single event functional interrupt immunity = 120	1 Features	"Single Event Functional Interrupt Immune 120 MeV-cm2/mg"

6.2.2 Document B - Aerospace Report TOR-2013-00297, Worst Case Circuit Analysis Guidelines, Appendix A.5

Doc	Document	Used for
B	Error! Hyperlink reference not valid. <i>The Aerospace Corporation, 2013</i>	Supplies the method, not the data: the Level 1 extreme value analysis that every worst-case band in Section 3 is stacked with, and the ordering that puts extreme value analysis before root-sum-square. No parameter value in this file comes from it. (standard)

No value in this report is cited to this document.

Appendix A Standards and definitions

The vocabulary every Source column and every empty cell in this document uses: the evidence classes (A.1), the reasons a cell has no number (A.2).

A.1 Evidence class definitions

What kind of source a value came from. Every value in Sections 2, 3, 4 and 5 carries one of these labels in its Source column. The label tells a reviewer whether a number is a supplier commitment, a measurement on real parts, a conservative envelope, or something the program supplied. Classes are listed strongest first; where two sources offer the same value, the stronger class is used.

Evidence class	Description
User Override	A value the reviewing engineer entered, replacing what the documents say. It outranks everything below because it is a decision rather than a finding. The source snippet is left as it is, so the document shows both the document's number and the engineer's; a footnote carries the original value and the agent's position on it.
Measured	Test data on this part or lot: radiation lot acceptance test (RLAT) data, a program or manufacturer test report with measured values, a life test with measured drift.
Guaranteed Limit	A minimum or maximum the supplier commits to for THIS part: the datasheet electrical characteristics table, a DLA slash sheet or SMD, a Source Control Drawing, or a rad-hard datasheet's post-irradiation columns. It stays a guaranteed limit even when the same figure is printed once for a whole series, because the commitment is still per part number.
Bound	A ceiling that describes a family, style or test window rather than a commitment on this part: MIL-STD-1547B end-of-life limits, a qualified products list (QPL) life-test window, a reliability report's acceptance criterion, a drift envelope extrapolated from a sample. Conservative by design, and the part could sit anywhere inside it. The test against Guaranteed Limit is not how many parts the number is printed for; it is whether the supplier commits to it for the one in front of you.
Typical	A typ value. Real characterization data, but the supplier does not commit to it and an individual part may sit outside it.
Program Input	A value supplied by the program rather than found in a document about the part: temperature range, mission life, design dose, requirement limits, derating factors.
Reference Only	Published for information and stated not to be a rating, usually because it depends on the user's conditions (layout, airflow, test board).
Placeholder	A default standing in for a program value that has not been issued yet. Always visible, never silent.
AI derived	An equation or value the agent composed for this analysis. It comes from no standard and no source document, and it must be checked before use.

A.2 Unknown data definitions

Explanations as to why a particular value has no number. As a rule, unknown terms are never carried or guessed at.

Unknown, because	Description
N/A	No requirement in this run consumes the parameter's worst-case band, so the band is not formed and its absence blocks nothing. The terms are still reported. Blocked is reserved for a band a requirement needs that cannot be formed because a term is absent.
Explicitly Disclaimed	The document explicitly refuses the claim (for example "not subject to radiation-proof design"). Citable; closes the search; the term needs a program disposition.
Not Disclosed in data source	The document that would normally carry the value is available, and no information was found by the agent during review.
No Data Source	The document that would normally carry the value (a life-test report, a radiation test report, a slash sheet) was not available during the agent's generation run.
Rated limit only	The row carries a published value that is used as-is and has no variance band: a rated limit, a qualification class, or a parameter no requirement in this run decomposes. The value is real and cited; only the four-term decomposition is absent. Not a gap, and not listed in Section 6.1.
Same published limit	A term whose published value is the same limit as another term's, guaranteed over the wider condition (one static limit tagged for every temperature subgroup; post-irradiation limits identical to pre-irradiation). It is shown with its value and both figures, and it is counted once in the stack.

