

Radiation Report

INA951-SEP Total Ionizing Dose (TID) Report



ABSTRACT

This report discusses the radiation characterization results of the INA951-SEP current-sense amplifier. The study was done to determine Total Ionizing Dose (TID) effects under high dose rate (HDR) up to 30krad(Si). The results show that all samples passed within the specified limits up to 30krad(Si). To specify the following results, the Radiation Lot Acceptance Testing (RLAT) was performed using five units at a dose level of 30krad(Si) that are required for future wafer lots. Furthermore, the INA951 is packaged in a space enhanced plastic for low outgassing characteristics and is Single Event Latch-Up (SEL) immune up to 47MeV-cm2 /mg making the device designed for low Earth orbit space applications.

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1 Device Information

The INA951-SEP is a radiation-tolerant, ultra-precise current-sense amplifier that measures voltage drops across shunt resistors over a common-mode range of -4 to $80V$. The INA951-SEP operates from a single $2.7V$ to $10V$ supply drawing $1.5mA$ of a supply current.

1.1 Device Details

[Table 1-1](#) lists the device information used for TID HDR characterization and qualification.

Table 1-1. Device and Exposure Details

TID HDR Details: Up to 30krad (Si)	
TI Device Number	INA951-SEP
Package	8-pin PW
Technology	LBCSOI2
Die Lot Number	5217124
A/T Lot Number / Lot Trace Code	5640552 / 5CA7KEW
Quantity Tested	15 irradiated devices and 2 control devices
Lot Accept/Reject	Devices passed 30krad (Si)
HDR Radiation Facility	Texas Instruments CLAB, Dallas, TX
HDR Dose Level	30krad (Si)
HDR Dose Rate	260rad(Si)
HDR Radiation Source	Gammacell (GR420) Co-60
Irradiation Temperature	Ambient, room temperature
VID	V62/26605



Figure 1-1. INA951-SEP Device

2 Total Dose Test Setup

2.1 Test Overview

HDR Testing

The INA951-SEP samples were irradiated at a high dose rate of 50-300 rad(Si)/s up to 30krad(Si) and then put through full electrical parametric testing on the production Automated Test Equipment (ATE). The samples were functional and passed all electrical parametric tests with readings within datasheet electrical specification limits.

Low dose rate (LDR) and enhanced low dose rate sensitivity (ELDRS) characterization was performed during the process qualification of LBCSOI2 technology using INA950-SEP as qualification driver. It was proven that this process was free of any ELDRS sensitivity. INA951-SEP uses the same process level components as INA950-SEP and INA951-SEP is considered to be ELDRS-free.

2.2 Test Description and Facilities

The INA951-SEP HDR exposure was performed on biased devices in a Co60 gamma cell at TI CLAB facility in Dallas, Texas. The unattenuated dose rate of this cell is 50-300rad(Si)/s. After exposure, the devices completed a full post irradiation electrical evaluation using Texas Instruments ATE. The ATE guard band test limits are set within the electrical specifications in the datasheet to ensure a minimum Cpk and test error margin based on initial qualification and characterization data. Post-irradiation measurements were taken within 30 minutes of radiation.

2.3 Test Setup Details

The devices were tested in biased conditions as shown in the following sections.

2.3.1 Biased

Figure 2-1 shows the bias conditions for each pin during irradiation.

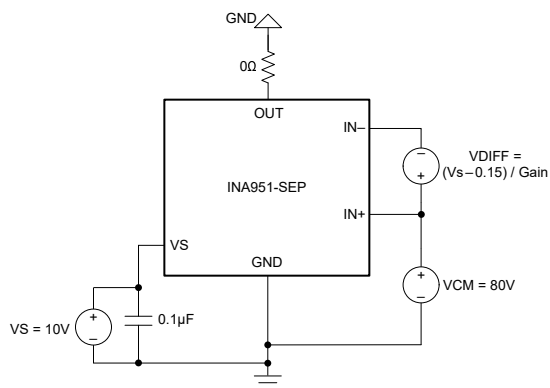


Figure 2-1. INA951-SEP Biased Diagram

2.4 Test Configuration and Condition

Devices at HDR were stressed at 30krad(Si) for biased and unbiased conditions.

End point electrical test is performed on irradiated devices to verify they are within specified SMD electrical test limits. MIL-STD-883, Test Method 1019.9, Condition D is used in this case.

[Table 2-1](#) shows the serialized samples used for HDR RHA characterization.

Table 2-1. HDR = 260rad(Si)/s Device Information

HDR = 260rad(Si)/s	
Total Samples: 10	
Exposure Levels	
30krad (Si)	30krad (Si)
Biased	Unbiased
1, 2, 3, 4, 5	6, 7, 8, 9, 10

3 Total Ionizing Dose (RHA) Characterization Test Results

3.1 Total Ionizing Dose RHA Characterization Summary Results

The parametric data for the INA951-SEP is within datasheet limits up to 30krad(Si) for biased setup conditions.

3.2 Specification Compliance Matrix

Table 3-1. Electrical Parameters Table

Parameter		Test Conditions	MIN	TYP	MAX	Unit	Test Name/Number
INPUT							
V _{CM}	Common-mode input range	T _A = -55°C to +125°C	-4		80	V	
CMRR	Common-mode rejection ratio, input referred	-4V ≤ V _{CM} ≤ 80V, T _A = -55°C to 125°C	-99		-99	nV/V	80.10, 80.11
		F = 50kHz	-99	8	99		
V _{OS}	Offset voltage, input referred			±30	±150	μV	61.0
dV _{OS} /dT	Offset voltage drift	T _A = -55°C to +125°C		±0.05		μV/°C	
PSRR	Power supply rejection ratio, input referred	2.7V ≤ V _S ≤ 10V, T _A = -55°C to +125°C		±1	±8	μV/V	71.4
I _B	Input bias current	I _{B+} , V _{SENSE} = 0V	10	20	30	μA	20.1, 20.2
		I _{B-} , V _{SENSE} = 0V	10	20	30		
OUTPUT							
G	Gain			20		V/V	51.4
G _{ERR}	Gain error	GND + 50mV ≤ V _{OUT} ≤ V _S - 200mV		±0.02	±0.15	%	51.5
		T _A = -55°C to +125°C		±0.01		ppm/°C	
NL _{ERR}	Nonlinearity error			0.01		%	
	Maximum capacative load	No sustained oscillations, no isolation resistor		500		pF	
VOLTAGE OUTPUT							
	Swing to Vs (Power supply rail)	R _{LOAD} = 10kΩ, T _A = -55°C to +125°C		V _S - 0.07	V _S - 0.05	V	110.0, 120.0, 130.0
	Swing to ground	R _{LOAD} = 10kΩ, V _{SENSE} = 0V, T _A = -55°C to +125°C		0.005	0.02	V	90.0
FREQUENCY RESPONSE							
BW	Bandwidth	C _{LOAD} = 5pF, V _{SENSE} = 200mV		1300		kHz	
SR	Slew rate	Rising edge		2.5		V/μS	
	Settling time	V _{OUT} = 4V ± 0.1 step, Output settles to 0.5%		10		μS	
		V _{OUT} = 4V ± 0.1 step, Output settles to 1%		5			
		V _{OUT} = 4V ± 0.1 step, Output settles to 5%		1			
NOISE							

Table 3-1. Electrical Parameters Table (continued)

Parameter		Test Conditions	MIN	TYP	MAX	Unit	Test Name/Number
V_{EN}	Voltage noise density			50		nV/ $\sqrt{\text{Hz}}$	
POWER SUPPLY							
V_S	Supply voltage	$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$	2.7		10	V	
I_Q	Quiescent current			1.5	2	mA	30.0, 30.1, 30.2
		$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$			2.25		

A Total Ionizing Dose Report

This appendix provides the INA951-SEP TID HDR report. The reports show the variation for each parameter up to 30krad(Si).

Delta Threshold 10.00%

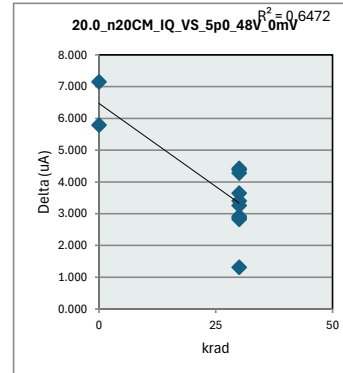
TID Report INA951-SEP

TID Report

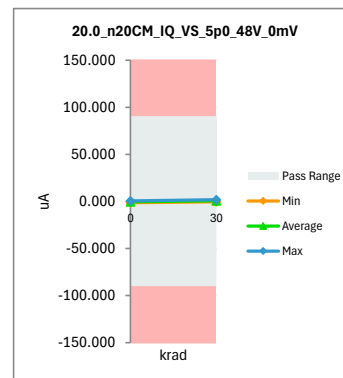
INA951-SEP

20.0_n20CM_IQ_VS_5p0_48V_0		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	90	90
Min Limit	-90	-90

krad	Serial #	pre	Post.log	Delta
0	1	6.374	0.584	5.790
0	2	5.790	-1.362	7.152
30	3	4.671	1.751	2.920
30	4	4.622	0.243	4.379
30	5	3.211	1.897	1.314
30	6	4.574	1.702	2.872
30	7	4.038	-0.389	4.427
30	8	3.941	-0.340	4.281
30	9	3.746	0.924	2.822
30	10	3.552	-0.097	3.649
30	11	3.552	0.292	3.260
30	12	4.038	0.632	3.406
Max		6.374	1.897	7.152
Average		4.342	0.486	3.856
Min		3.211	-1.362	1.314
Std Dev		0.939	0.981	1.518



20.0_n20CM_IQ_VS_5p0_48V_0		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	90	uA
Min Limit	-90	uA
krad	0	30
LL	-90.000	-90.000
Min	-1.362	-0.389
Average	-0.389	0.662
Max	0.584	1.897
UL	90.000	90.000

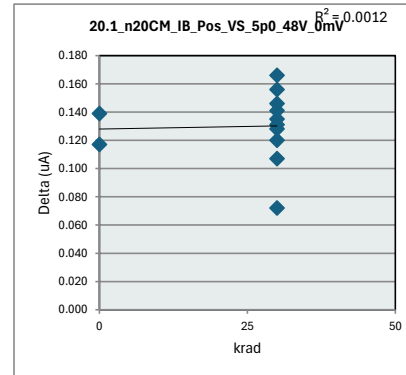


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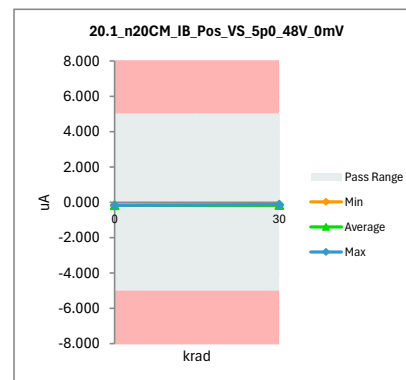
INA951-SEP

20.1_n20CM_IB_Pos_VS_5p0_48V_0mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	5	5
Min Limit	-5	-5

krad	Serial #	pre	Post.log	Delta
0	1	-0.033	-0.172	0.139
0	2	-0.054	-0.171	0.117
30	3	-0.042	-0.162	0.120
30	4	-0.025	-0.171	0.146
30	5	-0.044	-0.172	0.128
30	6	-0.058	-0.130	0.072
30	7	-0.036	-0.171	0.135
30	8	-0.014	-0.180	0.166
30	9	-0.028	-0.159	0.131
30	10	-0.052	-0.159	0.107
30	11	-0.021	-0.162	0.141
30	12	0.001	-0.155	0.156
Max		0.001	-0.130	0.166
Average		-0.034	-0.164	0.130
Min		-0.058	-0.180	0.072
Std Dev		0.018	0.013	0.025



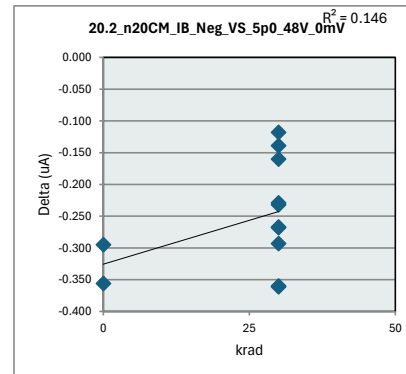
20.1_n20CM_IB_Pos_VS_5p0		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	5	uA
Min Limit	-5	uA
krad	0	30
LL	-5.000	-5.000
Min	-0.172	-0.180
Average	-0.172	-0.162
Max	-0.171	-0.130
UL	5.000	5.000



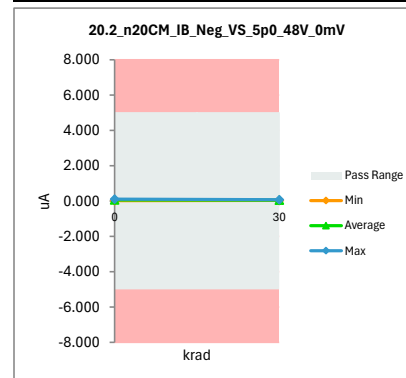
TID Report

INA951-SEP

20.2_n20CM_IB_Neg_VS_5p0_4				
Test Site	J2S	J2S		
Tester	FETS36401	FETS36417		
Test Number	EE213301	EE213301		
Unit	uA	uA		
Max Limit	5	5		
Min Limit	-5	-5		
krad	Serial #	pre	Post.log	Delta
0	1	-0.247	0.109	-0.356
0	2	-0.272	0.023	-0.295
30	3	-0.113	0.047	-0.160
30	4	-0.187	0.045	-0.232
30	5	-0.218	0.075	-0.293
30	6	-0.077	0.041	-0.118
30	7	-0.101	0.038	-0.139
30	8	-0.290	0.071	-0.361
30	9	-0.190	0.077	-0.267
30	10	-0.177	0.052	-0.229
30	11	-0.222	0.046	-0.268
30	12	-0.304	0.056	-0.360
Max		-0.077	0.109	-0.118
Average		-0.200	0.057	-0.256
Min		-0.304	0.023	-0.361
Std Dev		0.074	0.023	0.084



20.2_n20CM_IB_Neg_VS_5p0_		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	5	uA
Min Limit	-5	uA
krad	0	30
LL	-5.000	-5.000
Min	0.023	0.038
Average	0.066	0.055
Max	0.109	0.077
UL	5.000	5.000

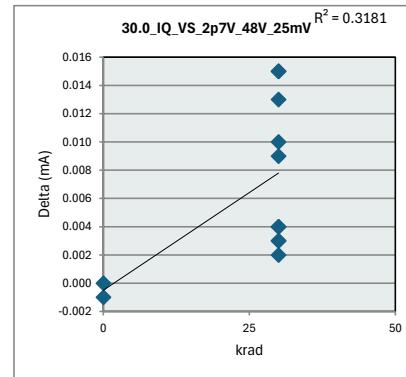


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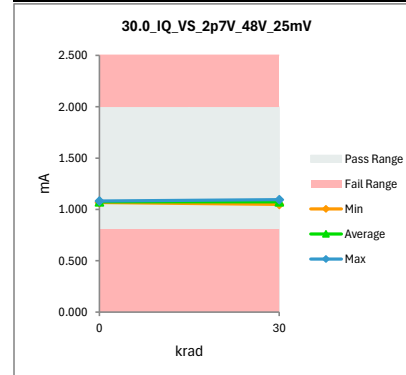
INA951-SEP

30.0_IQ_VS_2p7V_48V_25mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mA	mA
Max Limit	1.99	1.99
Min Limit	0.81	0.81

krad	Serial #	pre	Post.log	Delta
0	1	1.067	1.067	0.000
0	2	1.081	1.082	-0.001
30	3	1.077	1.073	0.004
30	4	1.099	1.089	0.010
30	5	1.089	1.074	0.015
30	6	1.062	1.049	0.013
30	7	1.097	1.095	0.002
30	8	1.078	1.075	0.003
30	9	1.097	1.094	0.003
30	10	1.085	1.070	0.015
30	11	1.070	1.061	0.009
30	12	1.061	1.057	0.004
Max		1.099	1.095	0.015
Average		1.080	1.074	0.006
Min		1.061	1.049	-0.001
Std Dev		0.014	0.014	0.006



30.0_IQ_VS_2p7V_48V_25mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	1.99	mA
Min Limit	0.81	mA
krad	0	30
LL	0.810	0.810
Min	1.067	1.049
Average	1.075	1.074
Max	1.082	1.095
UL	1.990	1.990

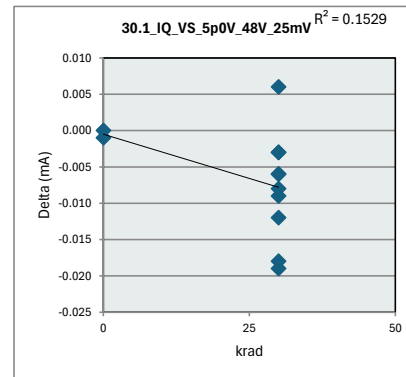


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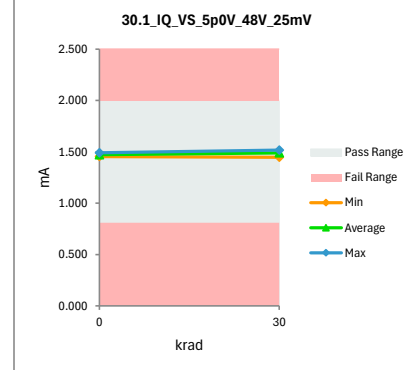
INA951-SEP

30.1_IQ_VS_5p0V_48V_25mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mA	mA
Max Limit	1.99	1.99
Min Limit	0.81	0.81

krad	Serial #	pre	Post.log	Delta
0	1	1.453	1.454	-0.001
0	2	1.491	1.491	0.000
30	3	1.484	1.496	-0.012
30	4	1.499	1.517	-0.018
30	5	1.507	1.516	-0.009
30	6	1.452	1.460	-0.008
30	7	1.469	1.488	-0.019
30	8	1.497	1.503	-0.006
30	9	1.508	1.511	-0.003
30	10	1.453	1.447	0.006
30	11	1.502	1.505	-0.003
30	12	1.446	1.452	-0.006
Max		1.508	1.517	0.006
Average		1.480	1.487	-0.007
Min		1.446	1.447	-0.019
Std Dev		0.024	0.026	0.007



30.1_IQ_VS_5p0V_48V_25mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	1.99	mA
Min Limit	0.81	mA
krad	0	30
LL	0.810	0.810
Min	1.454	1.447
Average	1.473	1.490
Max	1.491	1.517
UL	1.990	1.990

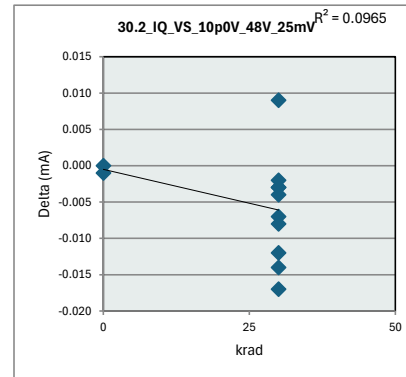


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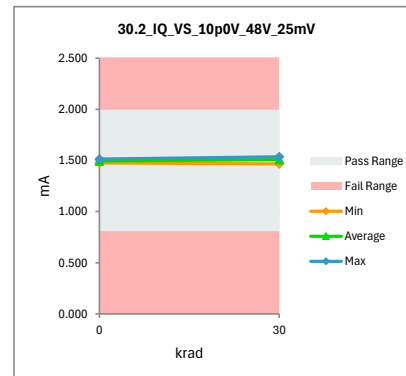
INA951-SEP

30.2_IQ_VS_10p0V_48V_25mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mA	mA
Max Limit	1.99	1.99
Min Limit	0.81	0.81

krad	Serial #	pre	Post.log	Delta
0	1	1.475	1.476	-0.001
0	2	1.514	1.514	0.000
30	3	1.500	1.512	-0.012
30	4	1.522	1.536	-0.014
30	5	1.527	1.534	-0.007
30	6	1.474	1.478	-0.004
30	7	1.491	1.508	-0.017
30	8	1.516	1.524	-0.008
30	9	1.529	1.532	-0.003
30	10	1.475	1.466	0.009
30	11	1.520	1.522	-0.002
30	12	1.466	1.469	-0.003
Max		1.529	1.536	0.009
Average		1.501	1.506	-0.005
Min		1.466	1.466	-0.017
Std Dev		0.023	0.026	0.007



30.2_IQ_VS_10p0V_48V_25mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	1.99	mA
Min Limit	0.81	mA
krad	0	30
LL	0.810	0.810
Min	1.476	1.466
Average	1.495	1.508
Max	1.514	1.536
UL	1.990	1.990

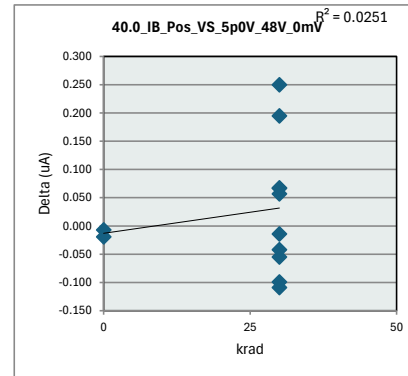


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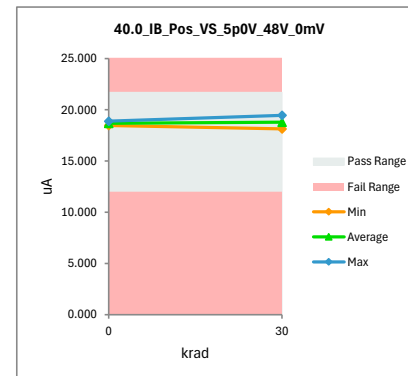
INA951-SEP

40.0_IB_Pos_VS_5p0V_48V_0mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	21.7	21.7
Min Limit	12	12

krad	Serial #	pre	Post.log	Delta
0	1	18.449	18.468	-0.019
0	2	18.887	18.894	-0.007
30	3	18.694	18.803	-0.109
30	4	19.526	19.459	0.067
30	5	18.863	18.668	0.195
30	6	18.816	18.566	0.250
30	7	19.218	19.317	-0.099
30	8	18.814	18.828	-0.014
30	9	19.146	19.201	-0.055
30	10	18.633	18.566	0.067
30	11	18.429	18.372	0.057
30	12	18.097	18.139	-0.042
Max		19.526	19.459	0.250
Average		18.798	18.773	0.024
Min		18.097	18.139	-0.109
Std Dev		0.385	0.396	0.110



40.0_IB_Pos_VS_5p0V_48V_0mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	21.7	uA
Min Limit	12	uA
krad	0	30
LL	12.000	12.000
Min	18.468	18.139
Average	18.681	18.792
Max	18.894	19.459
UL	21.700	21.700

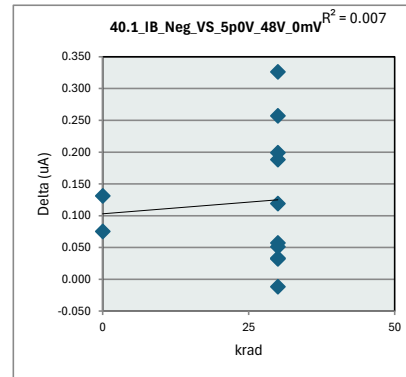


TID Report

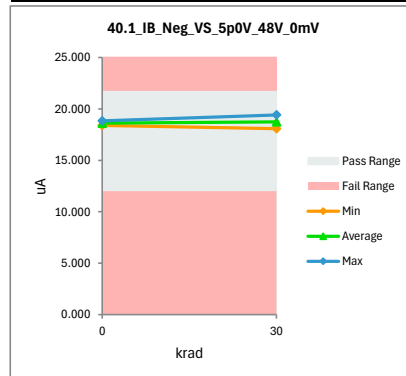
INA951-SEP

40.1_IB_Neg_VS_5p0V_48V_0mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	21.7	21.7
Min Limit	12	12

krad	Serial #	pre	Post.log	Delta
0	1	18.527	18.396	0.131
0	2	18.915	18.840	0.075
30	3	18.784	18.796	-0.012
30	4	19.598	19.410	0.188
30	5	18.858	18.601	0.257
30	6	18.838	18.512	0.326
30	7	19.296	19.245	0.051
30	8	18.821	18.789	0.032
30	9	19.196	19.163	0.033
30	10	18.632	18.513	0.119
30	11	18.478	18.279	0.199
30	12	18.134	18.077	0.057
Max		19.598	19.410	0.326
Average		18.840	18.718	0.121
Min		18.134	18.077	-0.012
Std Dev		0.392	0.403	0.103



40.1_IB_Neg_VS_5p0V_48V_0mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	21.7	uA
Min Limit	12	uA
krad	0	30
LL	12.000	12.000
Min	18.396	18.077
Average	18.618	18.739
Max	18.840	19.410
UL	21.700	21.700

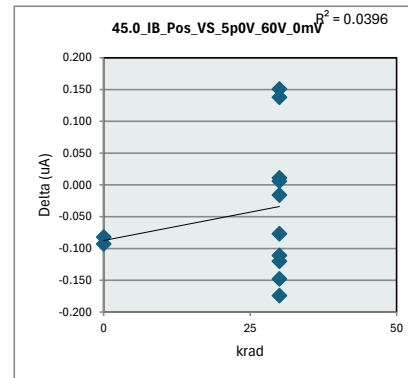


TID Report

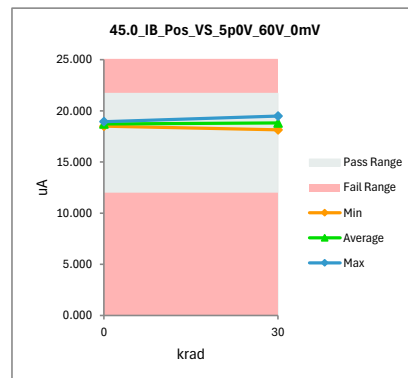
INA951-SEP

45.0_IB_Pos_VS_5p0V_60V_0mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	21.7	21.7
Min Limit	12	12

krad	Serial #	pre	Post.log	Delta
0	1	18.408	18.501	-0.093
0	2	18.855	18.937	-0.082
30	3	18.654	18.828	-0.174
30	4	19.500	19.489	0.011
30	5	18.828	18.690	0.138
30	6	18.758	18.607	0.151
30	7	19.185	19.333	-0.148
30	8	18.757	18.868	-0.111
30	9	19.113	19.233	-0.120
30	10	18.590	18.584	0.006
30	11	18.378	18.394	-0.016
30	12	18.067	18.144	-0.077
Max		19.500	19.489	0.151
Average		18.758	18.801	-0.043
Min		18.067	18.144	-0.174
Std Dev		0.388	0.399	0.105



45.0_IB_Pos_VS_5p0V_60V_0mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	21.7	uA
Min Limit	12	uA
krad	0	30
LL	12.000	12.000
Min	18.501	18.144
Average	18.719	18.817
Max	18.937	19.489
UL	21.700	21.700

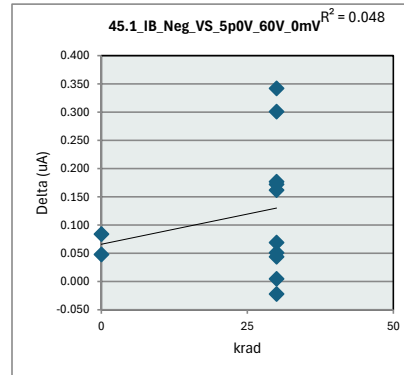


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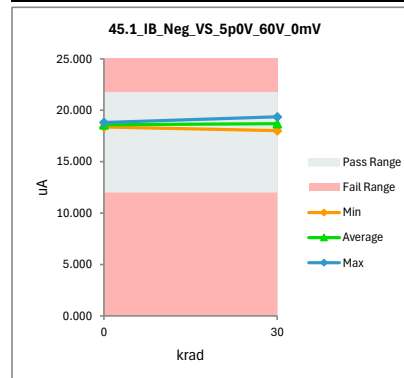
INA951-SEP

45.1 IB_Neg_VS_5p0V_60V_0mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	21.7	21.7
Min Limit	12	12

krad	Serial #	pre	Post.log	Delta
0	1	18.455	18.371	0.084
0	2	18.857	18.809	0.048
30	3	18.689	18.711	-0.022
30	4	19.541	19.364	0.177
30	5	18.876	18.575	0.301
30	6	18.836	18.494	0.342
30	7	19.229	19.224	0.005
30	8	18.817	18.748	0.069
30	9	19.143	19.099	0.044
30	10	18.636	18.464	0.172
30	11	18.431	18.269	0.162
30	12	18.070	18.019	0.051
Max		19.541	19.364	0.342
Average		18.798	18.679	0.119
Min		18.070	18.019	-0.022
Std Dev		0.392	0.399	0.114



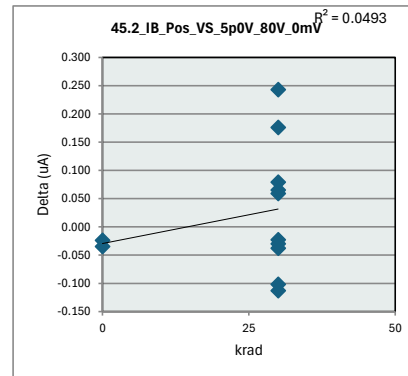
45.1 IB_Neg_VS_5p0V_60V_0mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	21.7	uA
Min Limit	12	uA
krad	0	30
LL	12.000	12.000
Min	18.371	18.019
Average	18.590	18.697
Max	18.809	19.364
UL	21.700	21.700



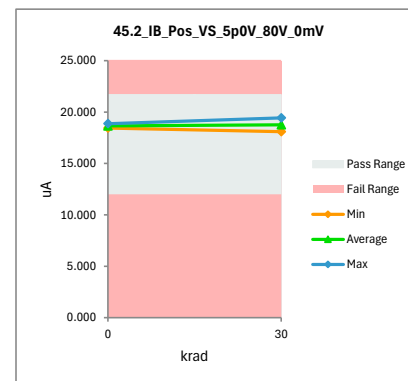
TID Report

INA951-SEP

45.2_IB_Pos_VS_5p0V_80V_0mV				
Test Site	J2S	J2S		
Tester	FETS36401	FETS36417		
Test Number	EE213301	EE213301		
Unit	uA	uA		
Max Limit	21.7	21.7		
Min Limit	12	12		
krad	Serial #	pre	Post.log	Delta
0	1	18.409	18.444	-0.035
0	2	18.841	18.865	-0.024
30	3	18.658	18.771	-0.113
30	4	19.500	19.435	0.065
30	5	18.818	18.642	0.176
30	6	18.783	18.540	0.243
30	7	19.192	19.294	-0.102
30	8	18.781	18.804	-0.023
30	9	19.128	19.158	-0.030
30	10	18.602	18.523	0.079
30	11	18.391	18.332	0.059
30	12	18.054	18.092	-0.038
Max		19.500	19.435	0.243
Average		18.763	18.742	0.021
Min		18.054	18.092	-0.113
Std Dev		0.390	0.400	0.107



45.2_IB_Pos_VS_5p0V_80V_0mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	21.7	uA
Min Limit	12	uA
krad	0	30
LL	12.000	12.000
Min	18.444	18.092
Average	18.655	18.759
Max	18.865	19.435
UL	21.700	21.700

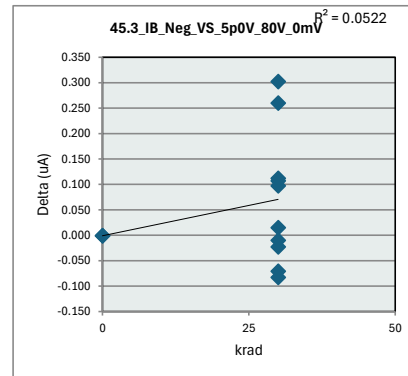


TID Report

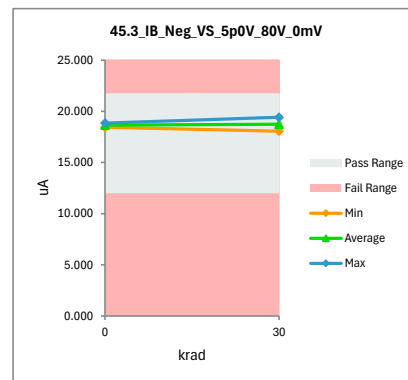
INA951-SEP

45.3_IB_Neg_VS_5p0V_80V_0mV		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uA	uA
Max Limit	21.7	21.7
Min Limit	12	12

krad	Serial #	pre	Post.log	Delta
0	1	18.445	18.446	-0.001
0	2	18.849	18.850	-0.001
30	3	18.684	18.755	-0.071
30	4	19.529	19.422	0.107
30	5	18.867	18.607	0.260
30	6	18.826	18.524	0.302
30	7	19.199	19.282	-0.083
30	8	18.805	18.790	0.015
30	9	19.122	19.145	-0.023
30	10	18.622	18.525	0.097
30	11	18.420	18.308	0.112
30	12	18.047	18.057	-0.010
Max		19.529	19.422	0.302
Average		18.785	18.726	0.059
Min		18.047	18.057	-0.083
Std Dev		0.391	0.403	0.122



45.3_IB_Neg_VS_5p0V_80V_0mV		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	21.7	uA
Min Limit	12	uA
krad	0	30
LL	12.000	12.000
Min	18.446	18.057
Average	18.648	18.742
Max	18.850	19.422
UL	21.700	21.700

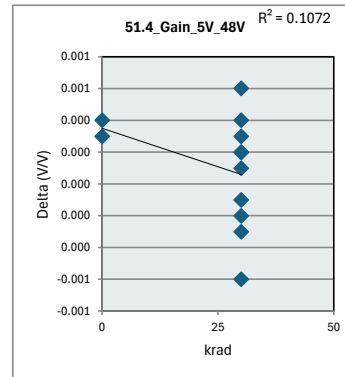


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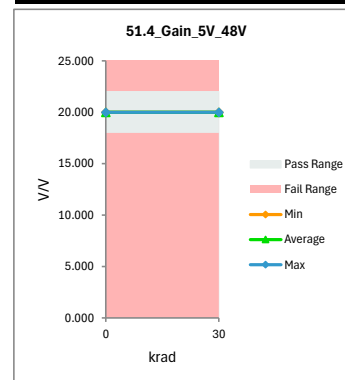
INA951-SEP

51.4_Gain_5V_48V		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	V/V	V/V
Max Limit	22	22
Min Limit	18	18

krad	Serial #	pre	Post.log	Delta
0	1	19.999	19.998	0.000
0	2	19.998	19.998	0.000
30	3	19.998	19.998	0.000
30	4	19.998	19.998	0.000
30	5	19.999	19.999	-0.001
30	6	19.998	19.998	0.000
30	7	19.997	19.997	0.000
30	8	19.997	19.996	0.001
30	9	19.997	19.997	0.000
30	10	19.998	19.997	0.000
30	11	19.998	19.998	0.000
30	12	19.997	19.996	0.000
Max		19.999	19.999	0.001
Average		19.998	19.998	0.000
Min		19.997	19.996	-0.001
Std Dev		0.001	0.001	0.000



51.4_Gain_5V_48V		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	22	V/V
Min Limit	18	V/V
krad	0	30
LL	18.000	18.000
Min	19.998	19.996
Average	19.998	19.998
Max	19.998	19.999
UL	22.000	22.000

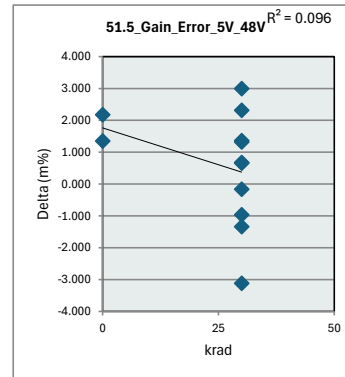


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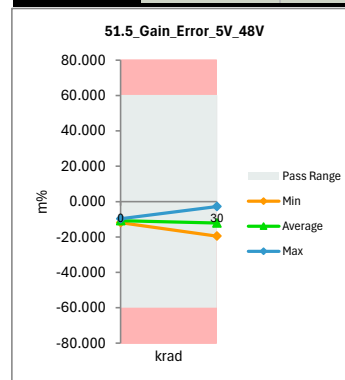
INA951-SEP

51.5_Gain_Error_5V_48V		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	m%	m%
Max Limit	60	60
Min Limit	-60	-60

krad	Serial #	pre	Post.log	Delta
0	1	-7.492	-9.670	2.177
0	2	-10.544	-11.894	1.349
30	3	-10.905	-12.228	1.323
30	4	-8.782	-8.618	-0.164
30	5	-5.894	-2.781	-3.113
30	6	-8.764	-9.421	0.657
30	7	-13.332	-12.367	-0.965
30	8	-16.509	-19.507	2.998
30	9	-14.269	-16.585	2.316
30	10	-11.525	-12.888	1.363
30	11	-9.999	-8.660	-1.339
30	12	-17.111	-17.787	0.677
Max		-5.894	-2.781	2.998
Average		-11.260	-11.867	0.607
Min		-17.111	-19.507	-3.113
Std Dev		3.474	4.586	1.744



51.5_Gain_Error_5V_48V		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	60	m%
Min Limit	-60	m%
krad	0	30
LL	-60.000	-60.000
Min	-11.894	-19.507
Average	-10.782	-12.084
Max	-9.670	-2.781
UL	60.000	60.000

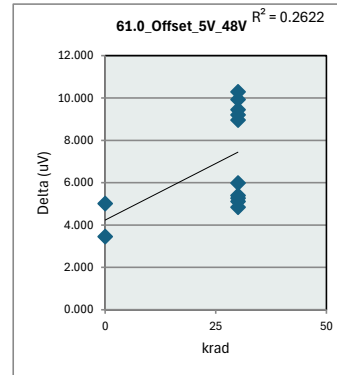


TID Report

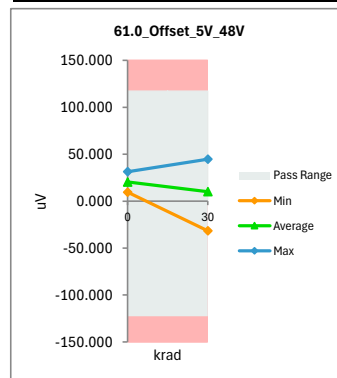
INA951-SEP

61.0_Offset_5V_48V		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	uV	uV
Max Limit	117.27	117.27
Min Limit	-122.62	-122.62

krad	Serial #	pre	Post.log	Delta
0	1	34.767	31.309	3.458
0	2	14.599	9.586	5.012
30	3	8.642	-1.283	9.925
30	4	45.298	36.097	9.201
30	5	44.286	33.997	10.289
30	6	24.891	15.442	9.449
30	7	28.476	19.515	8.962
30	8	-5.216	-10.608	5.393
30	9	-9.172	-14.009	4.837
30	10	13.821	8.557	5.264
30	11	50.662	44.682	5.980
30	12	-26.505	-31.617	5.112
Max		50.662	44.682	10.289
Average		18.712	11.806	6.907
Min		-26.505	-31.617	3.458
Std Dev		23.950	23.076	2.437



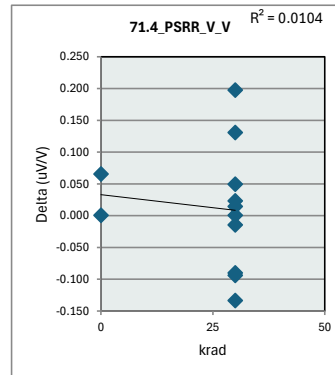
61.0_Offset_5V_48V		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	117.27	uV
Min Limit	-122.62	uV
krad	0	30
LL	-122.620	-122.620
Min	9.586	-31.617
Average	20.448	10.077
Max	31.309	44.682
UL	117.270	117.270



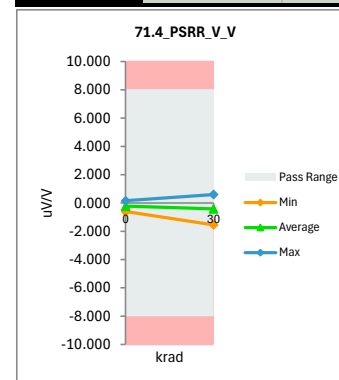
TID Report

INA951-SEP

71.4_PSRR_V_V				
Test Site	J2S	J2S		
Tester	FETS36401	FETS36417		
Test Number	EE213301	EE213301		
Unit	uV/V	uV/V		
Max Limit	8	8		
Min Limit	-8	-8		
krad	Serial #	pre	Post.log	Delta
0	1	0.227	0.161	0.066
0	2	-0.600	-0.600	0.001
30	3	-0.607	-0.631	0.023
30	4	0.327	0.278	0.050
30	5	0.491	0.506	-0.015
30	6	-0.158	-0.064	-0.094
30	7	-0.071	-0.202	0.131
30	8	-1.076	-1.274	0.198
30	9	-1.467	-1.377	-0.090
30	10	-0.446	-0.460	0.015
30	11	0.598	0.597	0.001
30	12	-1.682	-1.548	-0.133
Max		0.598	0.597	0.198
Average		-0.372	-0.385	0.013
Min		-1.682	-1.548	-0.133
Std Dev		0.750	0.731	0.094



71.4_PSRR_V_V		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	8	uV/V
Min Limit	-8	uV/V
krad	0	30
LL	-8.000	-8.000
Min	-0.601	-1.548
Average	-0.220	-0.418
Max	0.161	0.597
UL	8.000	8.000



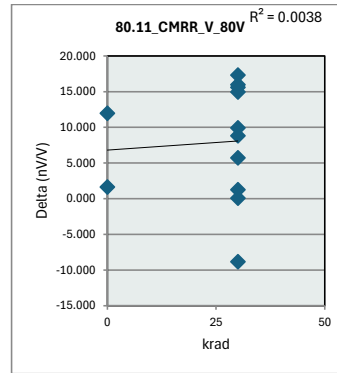
TID Report

INA951-SEP

80.11_CMRR_V_80V

Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	nV/V	nV/V
Max Limit	99	99
Min Limit	-99	-99

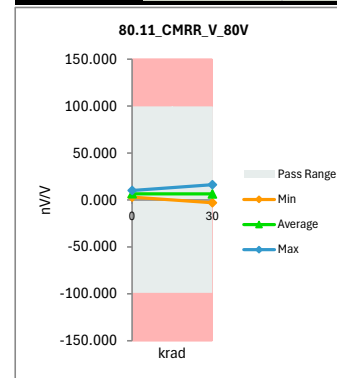
krad	Serial #	pre	Post.log	Delta
0	1	11.735	10.087	1.649
0	2	14.965	2.995	11.971
30	3	7.404	16.233	-8.830
30	4	5.907	-2.916	8.823
30	5	7.325	7.249	0.075
30	6	18.430	8.511	9.920
30	7	11.342	10.087	1.255
30	8	21.819	16.077	5.742
30	9	17.407	1.419	15.989
30	10	18.510	3.546	14.964
30	11	18.982	1.655	17.327
30	12	18.589	2.995	15.595
Max		21.819	16.233	17.327
Average		14.368	6.495	7.873
Min		5.907	-2.916	-8.830
Std Dev		5.424	5.939	8.056



80.11_CMRR_V_80V

Test Site	J2S
Tester	FETS36401
Test Number	EE213301
Max Limit	99 nV/V
Min Limit	-99 nV/V

krad	0	30
LL	-99.000	-99.000
Min	2.995	-2.916
Average	6.541	6.486
Max	10.087	16.233
UL	99.000	99.000

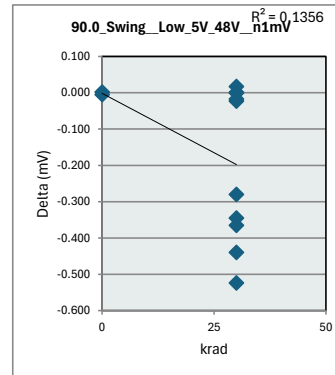


TID Report

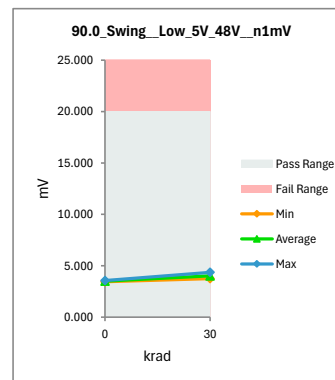
INA951-SEP

90.0_Swing_Low_5V_48V_n1		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mV	mV
Max Limit	20	20
Min Limit	0	0

krad	Serial #	pre	Post.log	Delta
0	1	3.556	3.561	-0.005
0	2	3.446	3.444	0.002
30	3	3.782	4.127	-0.345
30	4	3.804	4.084	-0.280
30	5	3.772	4.137	-0.365
30	6	3.637	4.161	-0.524
30	7	3.918	4.358	-0.440
30	8	3.867	3.868	-0.001
30	9	3.848	3.871	-0.023
30	10	4.073	4.056	0.017
30	11	3.742	3.759	-0.017
30	12	3.748	3.747	0.001
Max		4.073	4.358	0.017
Average		3.766	3.931	-0.165
Min		3.446	3.444	-0.524
Std Dev		0.165	0.270	0.207



90.0_Swing_Low_5V_48V_n1		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	20	mV
Min Limit	0	mV
krad	0	30
LL	0.000	0.000
Min	3.444	3.747
Average	3.503	4.017
Max	3.561	4.358
UL	20.000	20.000

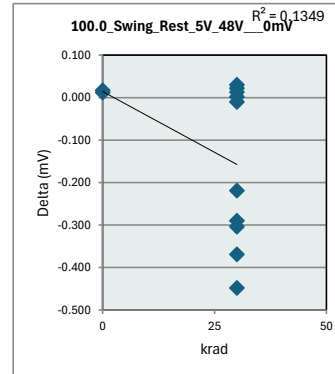


TID Report

INA951-SEP

100.0_Swing_Rest_5V_48V_0		
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mV	mV
Max Limit	20	20
Min Limit	0	0

krad	Serial #	pre	Post.log	Delta
0	1	3.608	3.596	0.012
0	2	3.498	3.481	0.017
30	3	3.835	4.125	-0.290
30	4	3.854	4.073	-0.219
30	5	3.831	4.135	-0.304
30	6	3.688	4.136	-0.448
30	7	3.975	4.344	-0.369
30	8	3.922	3.909	0.013
30	9	3.897	3.907	-0.010
30	10	4.126	4.096	0.030
30	11	3.801	3.799	0.002
30	12	3.810	3.788	0.022
Max		4.126	4.344	0.030
Average		3.820	3.949	-0.129
Min		3.498	3.481	-0.448
Std Dev		0.166	0.250	0.182



100.0_Swing_Rest_5V_48V		
Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	20	mV
Min Limit	0	mV
krad	0	30
LL	0.000	0.000
Min	3.481	3.788
Average	3.539	4.031
Max	3.596	4.344
UL	20.000	20.000



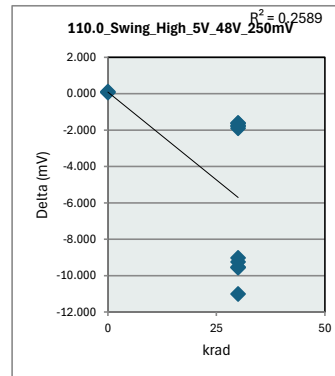
TID Report

INA951-SEP

110.0_Swing_High_5V_48V_250

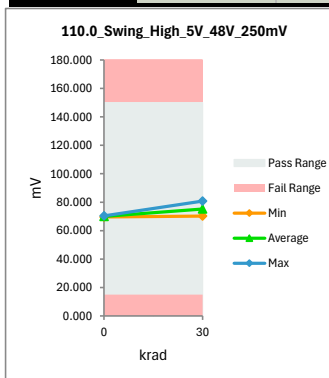
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mV	mV
Max Limit	150	150
Min Limit	15	15

krad	Serial #	pre	Post.log	Delta
0	1	70.491	70.376	0.115
0	2	69.658	69.597	0.061
30	3	69.945	79.191	-9.246
30	4	69.471	79.031	-9.560
30	5	69.517	78.539	-9.022
30	6	69.763	80.772	-11.009
30	7	69.454	78.979	-9.525
30	8	68.593	70.224	-1.631
30	9	69.071	70.859	-1.788
30	10	69.726	71.332	-1.606
30	11	69.199	70.950	-1.751
30	12	70.154	72.053	-1.899
Max		70.491	80.772	0.115
Average		69.587	74.325	-4.738
Min		68.593	69.597	-11.009
Std Dev		0.501	4.463	4.430



110.0_Swing_High_5V_48V_2

Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	150	mV
Min Limit	15	mV
krad	0	30
LL	15.000	15.000
Min	69.597	70.224
Average	69.987	75.193
Max	70.376	80.772
UL	150.000	150.000



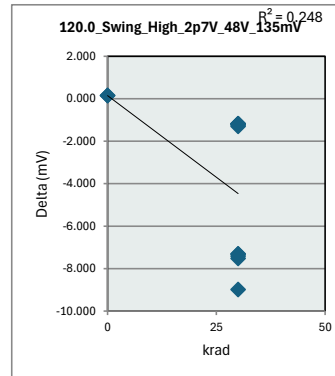
TID Report

INA951-SEP

120.0_Swing_High_2p7V_48V_1

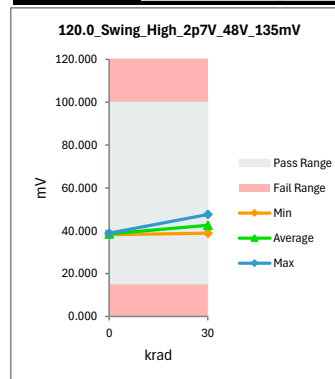
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mV	mV
Max Limit	100	100
Min Limit	15	15

krad	Serial #	pre	Post.log	Delta
0	1	39.017	38.874	0.143
0	2	38.290	38.138	0.152
30	3	38.289	45.592	-7.303
30	4	37.819	45.143	-7.324
30	5	37.864	45.280	-7.416
30	6	38.591	47.576	-8.985
30	7	37.776	45.300	-7.524
30	8	37.686	38.868	-1.182
30	9	37.872	39.066	-1.194
30	10	38.241	39.419	-1.178
30	11	38.163	39.464	-1.301
30	12	38.549	39.783	-1.234
	Max	39.017	47.576	0.152
	Average	38.180	41.875	-3.696
	Min	37.686	38.138	-8.985
	Std Dev	0.401	3.522	3.604



120.0_Swing_High_2p7V_48V

Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	100	mV
Min Limit	15	mV
krad	0	30
LL	15.000	15.000
Min	38.138	38.868
Average	38.506	42.549
Max	38.874	47.576
UL	100.000	100.000



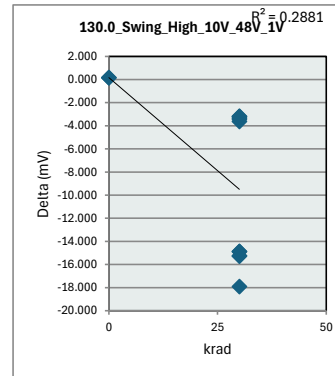
TID Report

INA951-SEP

130.0_Swing_High_10V_48V_1V

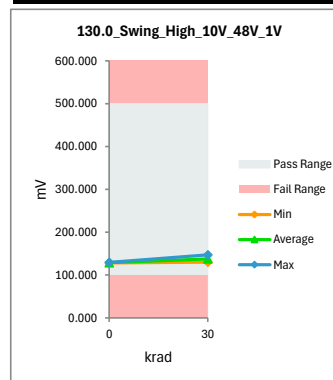
Test Site	J2S	J2S
Tester	FETS36401	FETS36417
Test Number	EE213301	EE213301
Unit	mV	mV
Max Limit	500	500
Min Limit	100	100

krad	Serial #	pre	Post.log	Delta
0	1	129.756	129.585	0.171
0	2	128.510	128.347	0.163
30	3	128.321	143.192	-14.871
30	4	128.098	143.353	-15.255
30	5	127.674	142.565	-14.891
30	6	129.287	147.200	-17.913
30	7	127.674	142.944	-15.270
30	8	127.055	130.229	-3.174
30	9	127.924	131.245	-3.321
30	10	128.612	131.822	-3.210
30	11	127.691	131.116	-3.425
30	12	129.414	133.028	-3.614
Max		129.756	147.200	0.171
Average		128.335	136.219	-7.884
Min		127.055	128.347	-17.913
Std Dev		0.817	6.927	7.006



130.0_Swing_High_10V_48V

Test Site	J2S	
Tester	FETS36401	
Test Number	EE213301	
Max Limit	500	mV
Min Limit	100	mV
krad	0	30
LL	100.000	100.000
Min	128.347	130.229
Average	128.966	137.669
Max	129.585	147.200
UL	500.000	500.000



6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision A (September 2026) to Revision B (September 2026)	Page
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| • Updated Test Overview, HDR Testing section..... | 3 |
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Changes from Revision * (June 2026) to Revision A (September 2026)	Page
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|--|-------------------|
| • Changed VID from V62/25635 to V62/26605..... | 2 |
| • Updated Test Overview section..... | 3 |

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