



ICS Radiation Test Results

**IRH7250 N-CHANNEL POWER MOSFET**

**INTERNATIONAL RECTIFIER CORPORATION**

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DEVICE TYPE: IRH7250 N-CHANNEL POWER MOSFET (IRC)  
RADIATION SOURCE: TRIGA Reactor (MRRC), 1.00MeV Equiv.

D/C CIRC 01 || PACKAGE TO-3 || LOT# KER413993  
LOG# 970 || TEST DATE 04/26/01 || RTP# 384

Test Conductor: Michael K. Gauthier  
Test Administrator: Michael K. Gauthier

.....

**ICS RADIATION TECHNOLOGIES, INC.**  
8416 Florence Ave, Suite 207  
Downey, CA 90240-3949

TEL: 800-297-8688  
TEL: 562-923-1837  
FAX: 562-923-3609

INTERNET e-mail: [support@icsrad.com](mailto:support@icsrad.com)  
[www.icsrad.com](http://www.icsrad.com)

**ICS RADIATION TECHNOLOGIES, INC.**

8416 Florence Avenue, Suite 207  
Downey, CA 90240-3949

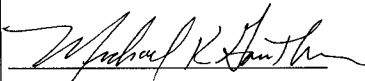
TEL: 562.923.1837 FAX: 562.923.3609

WEB: [www.icsrad.com](http://www.icsrad.com)

**CERTIFICATE OF CONFORMANCE**

This document certifies that the task requirements of Line Item Number 1 of Purchase Order Number G0193570, dated 6/28/01 have been completed and meet the requirements of the above Purchase Order.

Our Quality Assurance procedures are in conformance to MIL-I-45208A and MIL-Q9858A. A government subcontractor has inspected our facilities.

  
\_\_\_\_\_  
Quality Assurance Officer

June 30, 2001  
\_\_\_\_\_  
Date



(seal)



5335 PRICE AVENUE  
BUILDING 258  
McCLELLAN, CA 95652  
PHONE: (916) 614-6200  
FAX: (916) 614-6250  
WEB: <http://www.ucdavis.edu/mnrc>

29 June 2001

MEMORANDUM FOR ICS, Inc.

FROM: UCD/MNRC

SUBJECT: Dosimetry for <sup>137</sup>Cs Irradiations 6/27/01-6/28/01

1. The following 1 MeV Equivalent Fluence (1 MeV neutrons/cm<sup>2</sup>) values were measured during the irradiations performed at the UCD/MNRC 4/2/01-4/4/01.

Date	1 Mev Equivalent Fluence (Exposure)	1 Mev Equivalent Fluence (Accumulated)
6/27/01	9.40E11	9.40E11
6/28/01	8.10E12	9.04E12

2. Attached please find additional data you may require. If you have any questions please call.

Daniel L. Newell  
Nuclear Engineer, UCD/MNRC

IN COLLABORATION WITH  
SCIENCE APPLICATIONS  
INTERNATIONAL CORPORATION





I C S Radiation Test Results  
IRH7250 N-CHANNEL POWER MOSFET (IRC)

=====

IGSSF VGS=20V nA

=====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11	4.36E+00	3.08E+00	4.14E+00
	12	4.34E+00	3.08E+00	4.09E+00
	13	4.36E+00	3.08E+00	4.10E+00
	14	4.40E+00	3.11E+00	4.15E+00
	15	4.36E+00	3.10E+00	4.08E+00
	16	4.38E+00	3.10E+00	4.14E+00
	17	4.40E+00	3.09E+00	4.10E+00
	18	4.34E+00	3.11E+00	4.13E+00
	19	4.36E+00	3.11E+00	4.13E+00
	20	4.38E+00	3.14E+00	4.17E+00
	MINIMUM	4.34E+00	3.08E+00	4.08E+00
	MEAN	4.37E+00	3.10E+00	4.12E+00
	MAXIMUM	4.40E+00	3.14E+00	4.17E+00
	+P 50/90	4.38E+00	3.11E+00	4.13E+00
	-P 50/90	4.36E+00	3.09E+00	4.11E+00
	+P 99/90	4.45E+00	3.17E+00	4.23E+00
	-P 99/90	4.29E+00	3.04E+00	4.01E+00
	SIGMA	2.33E-02	1.92E-02	3.12E-02

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IGSSF VGS=20V nA [DELTA]

=====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11		-1.28E+00	-2.20E-01
	12		-1.26E+00	-2.50E-01
	13		-1.28E+00	-2.60E-01
	14		-1.29E+00	-2.50E-01
	15		-1.26E+00	-2.80E-01
	16		-1.28E+00	-2.40E-01
	17		-1.31E+00	-3.00E-01
	18		-1.23E+00	-2.10E-01
	19		-1.25E+00	-2.30E-01
	20		-1.24E+00	-2.10E-01
	MINIMUM		-1.31E+00	-3.00E-01
	MEAN		-1.27E+00	-2.48E-01
	MAXIMUM		-1.23E+00	-2.10E-01

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.  
 . DEVICE TYPE IRH7250 N-MOSFET (IRC) .  
 . RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV. .  
 .  
 . D/C CIRC 01 || PACKAGE TO-3 || LOT# EER413993. .  
 . LOG# 970 || TEST DATE 06/26/01 || RTP# 384 .

.....  
 I C S RADIATION TECHNOLOGIES, INC.

06-29-01

PAGE 2 OF 6

I C S Radiation Test Results  
 IRH7250 N-CHANNEL POWER MOSFET (IRC)

=====

IGSSR VGS=-20V nA

=====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11	-4.16E+00	-3.12E+00	-4.11E+00
	12	-4.16E+00	-3.14E+00	-4.19E+00
	13	-4.14E+00	-3.17E+00	-4.15E+00
	14	-4.12E+00	-3.12E+00	-4.17E+00
	15	-4.18E+00	-3.12E+00	-4.17E+00
	16	-4.14E+00	-3.13E+00	-4.18E+00
	17	-4.14E+00	-3.11E+00	-4.21E+00
	18	-4.18E+00	-3.14E+00	-4.18E+00
	19	-4.22E+00	-3.16E+00	-4.18E+00
	20	-4.23E+00	-3.15E+00	-4.19E+00
	MINIMUM	-4.23E+00	-3.17E+00	-4.21E+00
	MEAN	-4.17E+00	-3.14E+00	-4.18E+00
	MAXIMUM	-4.12E+00	-3.11E+00	-4.15E+00
	+P 50/90	-4.15E+00	-3.13E+00	-4.17E+00
	-P 50/90	-4.18E+00	-3.15E+00	-4.19E+00
	+P 99/90	-4.03E+00	-3.07E+00	-4.12E+00
	-P 99/90	-4.30E+00	-3.21E+00	-4.24E+00
	SIGMA	3.92E-02	2.05E-02	1.71E-02

.....  
 IGSSR VGS=-20V nA [DELTA]

=====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11		1.04E+00	5.00E-02
	12		1.02E+00	-3.00E-02
	13		9.70E-01	-1.00E-02
	14		1.00E+00	-5.00E-02
	15		1.06E+00	1.00E-02
	16		1.01E+00	-4.00E-02
	17		1.03E+00	-7.00E-02
	18		1.04E+00	0.00E+00
	19		1.06E+00	4.00E-02
	20		1.08E+00	4.00E-02
	MINIMUM		9.70E-01	-7.00E-02
	MEAN		1.03E+00	-1.22E-02
	MAXIMUM		1.08E+00	4.00E-02

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.         DEVICE TYPE      IRH7250 N-MOSFET (IRC)      .
.         RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV.
.
.   D/C  CIRC 01 || PACKAGE   TO-3      || LOT#  EER413993.
.   LOG# 970   || TEST DATE 06/26/01 || RTP#  384      .
.
.....
I C S RADIATION TECHNOLOGIES, INC.

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06-29-01

PAGE 3 OF 6

I C S Radiation Test Results  
 IRH7250 N-CHANNEL POWER MOSFET (IRC)  
 =====

IDSS VDS=160V VGS=0V nA  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11	9.80E+00	9.68E+00	9.36E+00
	12	9.70E+00	1.03E+02	9.67E+02
	13	1.19E+01	1.09E+02	9.71E+03
	14	1.19E+01	1.08E+02	9.03E+02
	15	1.01E+01	1.06E+02	9.04E+02
	16	9.80E+00	1.05E+02	8.72E+02
	17	9.90E+00	1.02E+02	8.65E+02
	18	9.90E+00	1.06E+02	9.09E+02
	19	9.70E+00	1.03E+02	8.95E+02
	20	9.90E+00	1.10E+02	9.14E+02
	MINIMUM	9.70E+00	1.02E+02	8.65E+02
	MEAN	1.03E+01	1.06E+02	1.88E+03
	MAXIMUM	1.19E+01	1.10E+02	9.71E+03
	+P 50/90	1.07E+01	1.07E+02	3.20E+03
	-P 50/90	9.90E+00	1.05E+02	5.60E+02
	+P 99/90	1.35E+01	1.16E+02	1.23E+04
	-P 99/90	7.09E+00	9.58E+01	-8.51E+03
	SIGMA	9.38E-01	2.91E+00	3.03E+03

.....

IDSS VDS=160V VGS=0V nA [DELTA]  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11		-1.20E-01	-4.40E-01
	12		9.33E+01	9.57E+02
	13		9.71E+01	9.70E+03
	14		9.61E+01	8.91E+02
	15		9.59E+01	8.94E+02
	16		9.52E+01	8.62E+02
	17		9.21E+01	8.55E+02
	18		9.61E+01	8.99E+02
	19		9.33E+01	8.85E+02
	20		1.00E+02	9.04E+02

MINIMUM	9.21E+01	8.55E+02
MEAN	9.55E+01	1.87E+03
MAXIMUM	1.00E+02	9.70E+03

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.....
.
.   DEVICE TYPE      IRH7250 N-MOSFET (IRC)      .
.   RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV.
.
.   D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  EER413993.
.   LOG# 970   || TEST DATE 06/26/01 || RTP#  384
.
.....
I C S RADIATION TECHNOLOGIES, INC.
    
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I C S Radiation Test Results  
 IRH7250 N-CHANNEL POWER MOSFET (IRC)  
 =====

VGS(th) ID=1mA VDS=VGS V  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11	3.26E+00	3.25E+00	3.27E+00
	12	3.36E+00	3.34E+00	3.32E+00
	13	3.24E+00	3.25E+00	3.21E+00
	14	3.30E+00	3.29E+00	3.26E+00
	15	3.18E+00	3.20E+00	3.16E+00
	16	3.19E+00	3.19E+00	3.17E+00
	17	3.25E+00	3.26E+00	3.23E+00
	18	3.19E+00	3.21E+00	3.17E+00
	19	3.31E+00	3.32E+00	3.29E+00
	20	3.19E+00	3.19E+00	3.16E+00
	MINIMUM	3.18E+00	3.19E+00	3.16E+00
	MEAN	3.25E+00	3.25E+00	3.22E+00
	MAXIMUM	3.36E+00	3.34E+00	3.32E+00
	+P 50/90	3.27E+00	3.28E+00	3.25E+00
	-P 50/90	3.22E+00	3.22E+00	3.19E+00
	+P 99/90	3.48E+00	3.45E+00	3.43E+00
	-P 99/90	3.02E+00	3.05E+00	3.01E+00
	SIGMA	6.71E-02	5.88E-02	6.20E-02

VGS(th) ID=1mA VDS=VGS V [DELTA]  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
CONTROL	11		-1.00E-02	1.00E-02
	12		-2.00E-02	-4.00E-02
	13		1.00E-02	-3.00E-02
	14		-1.00E-02	-4.00E-02
	15		2.00E-02	-2.00E-02
	16		0.00E+00	-2.00E-02



17	1.00E-02	-2.00E-02
18	2.00E-02	-2.00E-02
19	1.00E-02	-2.00E-02
20	0.00E+00	-3.00E-02
MINIMUM	-2.00E-02	-4.00E-02
MEAN	4.44E-03	-2.67E-02
MAXIMUM	2.00E-02	-2.00E-02

```

.....
.
.   DEVICE TYPE      IRH7250 N-MOSFET (IRC)   .
.   RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV.
.
.   D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  EER413993.
.   LOG# 970   || TEST DATE 06/26/01 || RTP#  384
.
.....
I C S RADIATION TECHNOLOGIES, INC.

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06-29-01

PAGE 5 OF 6

I C S Radiation Test Results  
 IRH7250 N-CHANNEL POWER MOSFET (IRC)  
 =====

BVDSS ID=1mA VGS=0V V

```

=====
FLUENCE  neutrons/cm2  INITIAL      9.40E+11  8.10E+12
-----  S/N  -----
CONTROL  11
          12
          13
          14
          15
          16
          17
          18
          19
          20
          MINIMUM
          MEAN
          MAXIMUM
          +P 50/90
          -P 50/90
          +P 99/90
          -P 99/90
          SIGMA

```

BVDSS ID=1mA VGS=0V V [DELTA]

```

=====
FLUENCE  neutrons/cm2  INITIAL      9.40E+11  8.10E+12
-----  S/N  -----
CONTROL  11
          -1.00E+00  -1.00E+00

```

12	0.00E+00	0.00E+00
13	0.00E+00	0.00E+00
14	0.00E+00	-1.00E+00
15	-1.00E+00	0.00E+00
16	-1.00E+00	-1.00E+00
17	0.00E+00	-1.00E+00
18	-1.00E+00	-1.00E+00
19	0.00E+00	0.00E+00
20	0.00E+00	-1.00E+00
MINIMUM	-1.00E+00	-1.00E+00
MEAN	-3.33E-01	-5.56E-01
MAXIMUM	0.00E+00	0.00E+00

```

.....
.
.      DEVICE TYPE      IRH7250 N-MOSFET (IRC)      .
.      RADIATION SOURCE  TRIGA Reactor (MNRC), 1.00MeV. .
.
.      D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  EER413993.
.      LOG#  970   || TEST DATE 06/26/01 || RTP#  384      .
.
.....
I C S RADIATION TECHNOLOGIES, INC.

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06-29-01

PAGE 6 OF 6

I C S Radiation Test Results  
 IRH7250 N-CHANNEL POWER MOSFET (IRC)

RDS(on) VGS=12V ID=16A OHMS

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=====
FLUENCE  neutrons/cm2  INITIAL          9.40E+11    8.10E+12
-----  S/N  -----
CONTROL  11          7.50E-02    7.40E-02    7.10E-02

          12          7.40E-02    7.30E-02    7.50E-02
          13          7.20E-02    7.05E-02    7.20E-02
          14          7.10E-02    7.00E-02    7.10E-02
          15          7.10E-02    7.00E-02    7.10E-02
          16          7.10E-02    7.10E-02    7.20E-02
          17          7.30E-02    7.10E-02    7.10E-02
          18          7.30E-02    7.10E-02    7.10E-02
          19          7.10E-02    7.10E-02    7.10E-02
          20          7.00E-02    7.00E-02    7.10E-02

          MINIMUM    7.00E-02    7.00E-02    7.10E-02
          MEAN      7.18E-02    7.08E-02    7.17E-02
          MAXIMUM    7.40E-02    7.30E-02    7.50E-02
+P 50/90    7.24E-02    7.13E-02    7.23E-02
-P 50/90    7.12E-02    7.04E-02    7.11E-02
+P 99/90    7.64E-02    7.41E-02    7.64E-02
-P 99/90    6.72E-02    6.75E-02    6.70E-02
          SIGMA      1.34E-03    9.65E-04    1.37E-03

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RDS(on) VGS=12V ID=16A OHMS [DELTA]

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
S/N		-----		
CONTROL	11		-1.00E-03	-4.00E-03
	12		-1.00E-03	1.00E-03
	13		-1.50E-03	0.00E+00
	14		-1.00E-03	0.00E+00
	15		-1.00E-03	0.00E+00
	16		0.00E+00	1.00E-03
	17		-2.00E-03	-2.00E-03
	18		-2.00E-03	-2.00E-03
	19		0.00E+00	0.00E+00
	20		0.00E+00	1.00E-03
	MINIMUM		-2.00E-03	-2.00E-03
	MEAN		-9.44E-04	-1.11E-04
	MAXIMUM		0.00E+00	1.00E-03

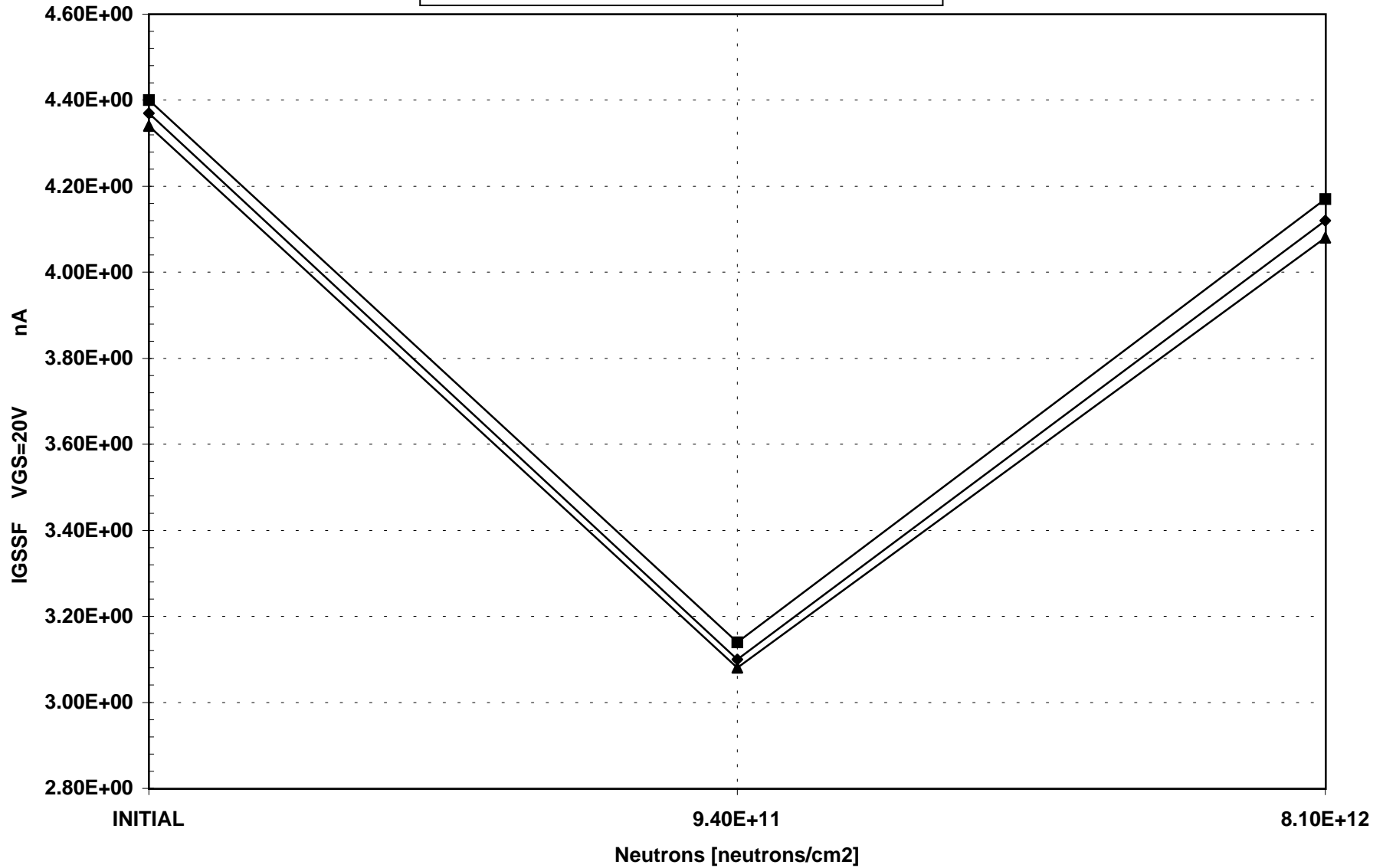
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.
.   DEVICE TYPE      IRH7250 N-MOSFET (IRC)      .
.   RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV.
.
.   D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  EER413993.
.   LOG# 970   || TEST DATE 06/26/01 || RTP#  384
.
.....
I C S RADIATION TECHNOLOGIES, INC.

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IRH7250 N-CHANNEL POWER MOSFET (IRC)  
I C S Radiation Test Results Log # 970 06/26/01

IGSSF VGS=20V nA

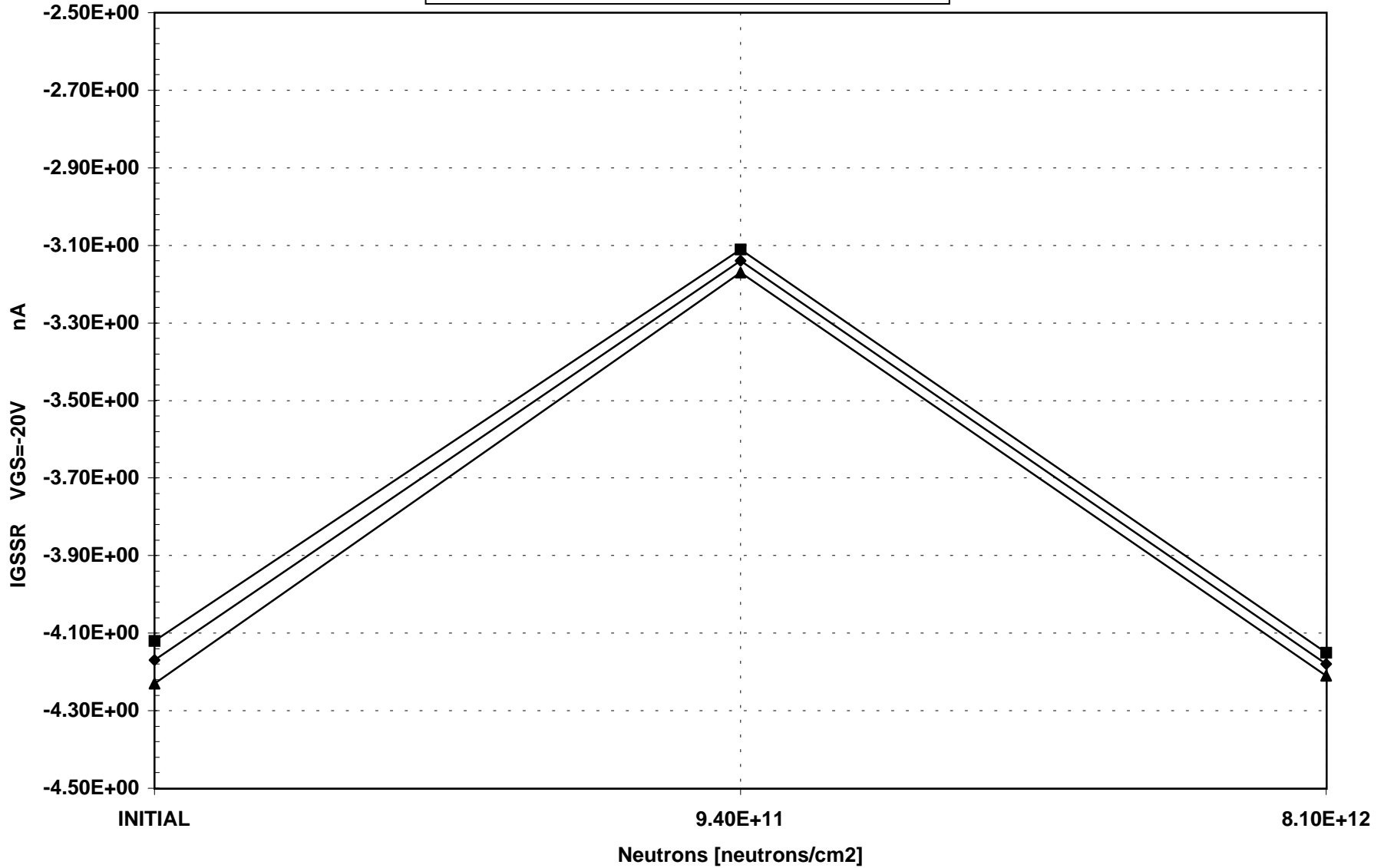


—▲— MINIMUM      —◆— MEAN      —■— MAXIMUM

IRH7250 N-CHANNEL POWER MOSFET (IRC)

IC S Radiation Test Results Log # 970 06/26/01

IGSSR VGS=-20V nA

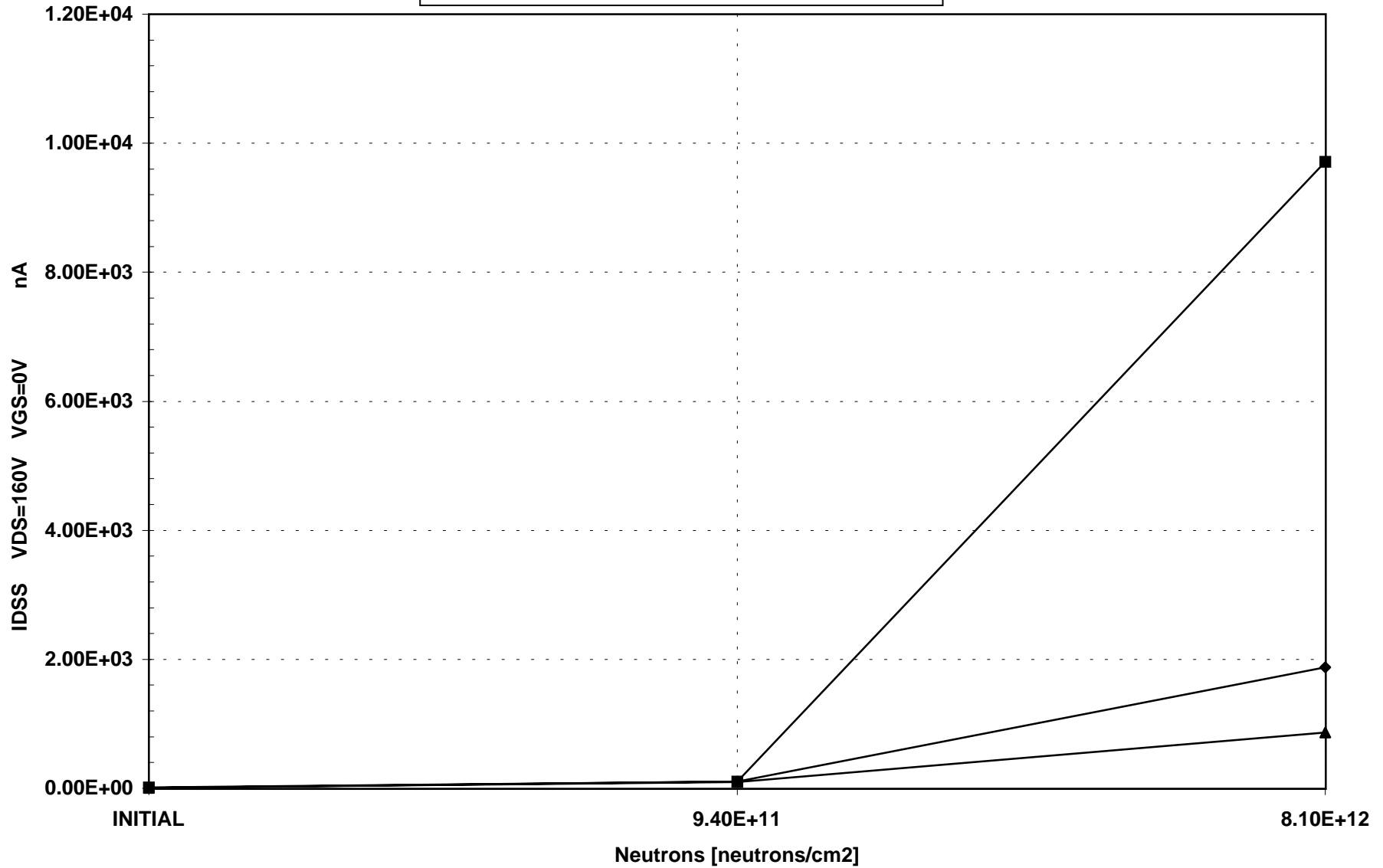


▲ MINIMUM      ◆ MEAN      ■ MAXIMUM

IRH7250 N-CHANNEL POWER MOSFET (IRC)

IC S Radiation Test Results Log # 970 06/26/01

IDSS	VDS=160V	VGS=0V	nA
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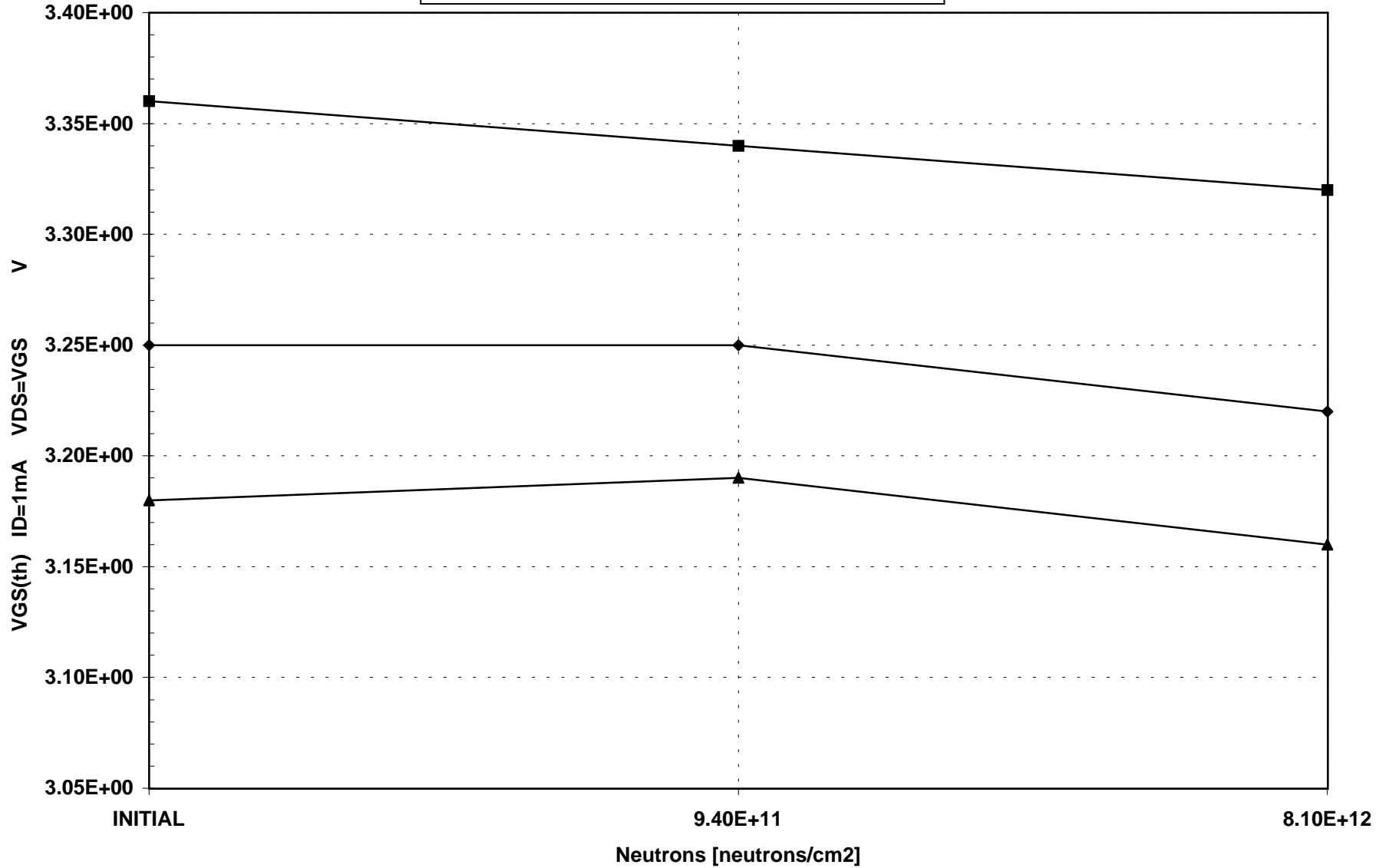


▲ MINIMUM	◆ MEAN	■ MAXIMUM
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IRH7250 N-CHANNEL POWER MOSFET (IRC)

IC S Radiation Test Results Log # 970 06/26/01

VGS(th) ID=1mA VDS=VGS V

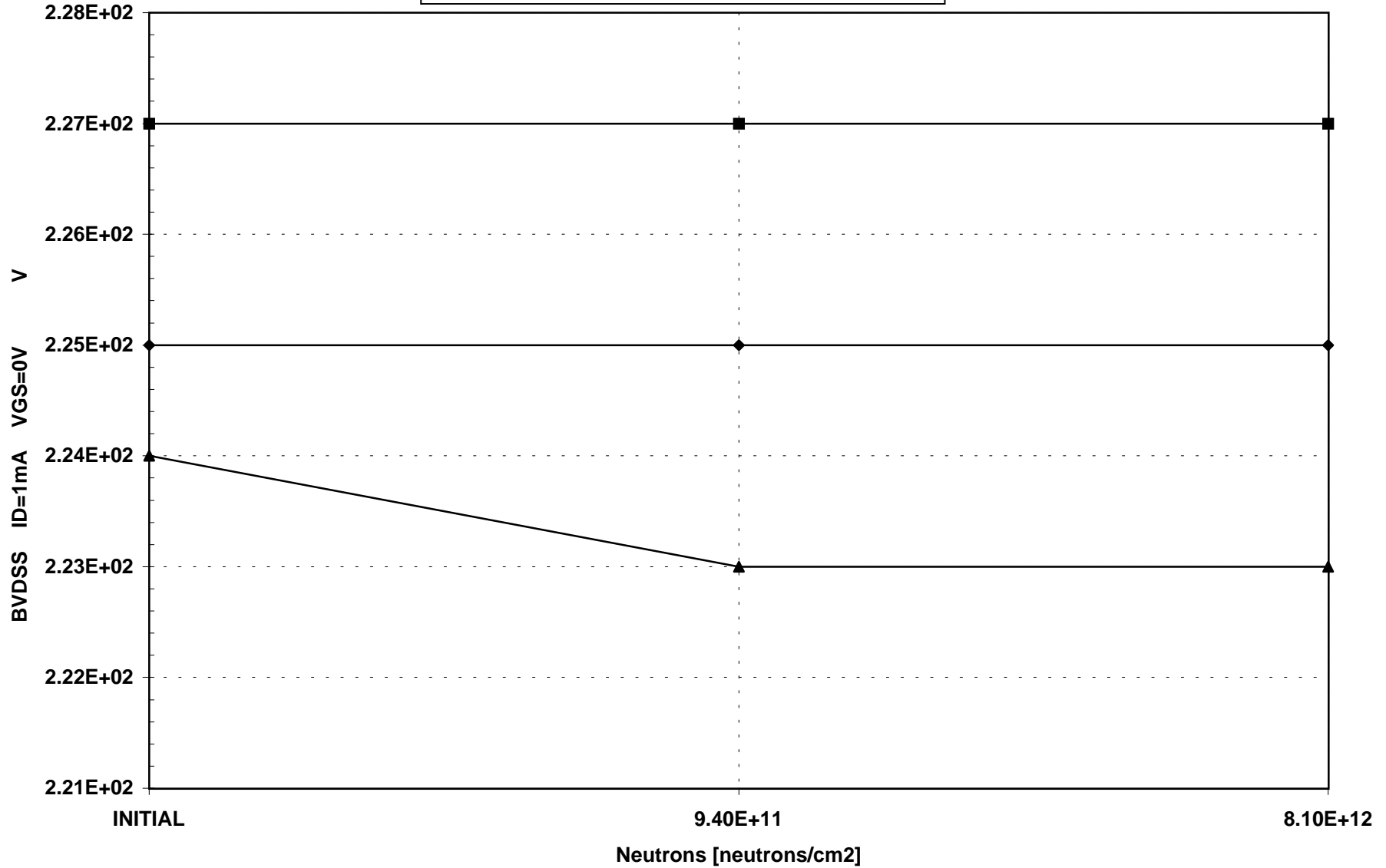


▲ MINIMUM      ◆ MEAN      ■ MAXIMUM

IRH7250 N-CHANNEL POWER MOSFET (IRC)

IC S Radiation Test Results Log # 970 06/26/01

BVDSS	ID=1mA	VGS=0V	V
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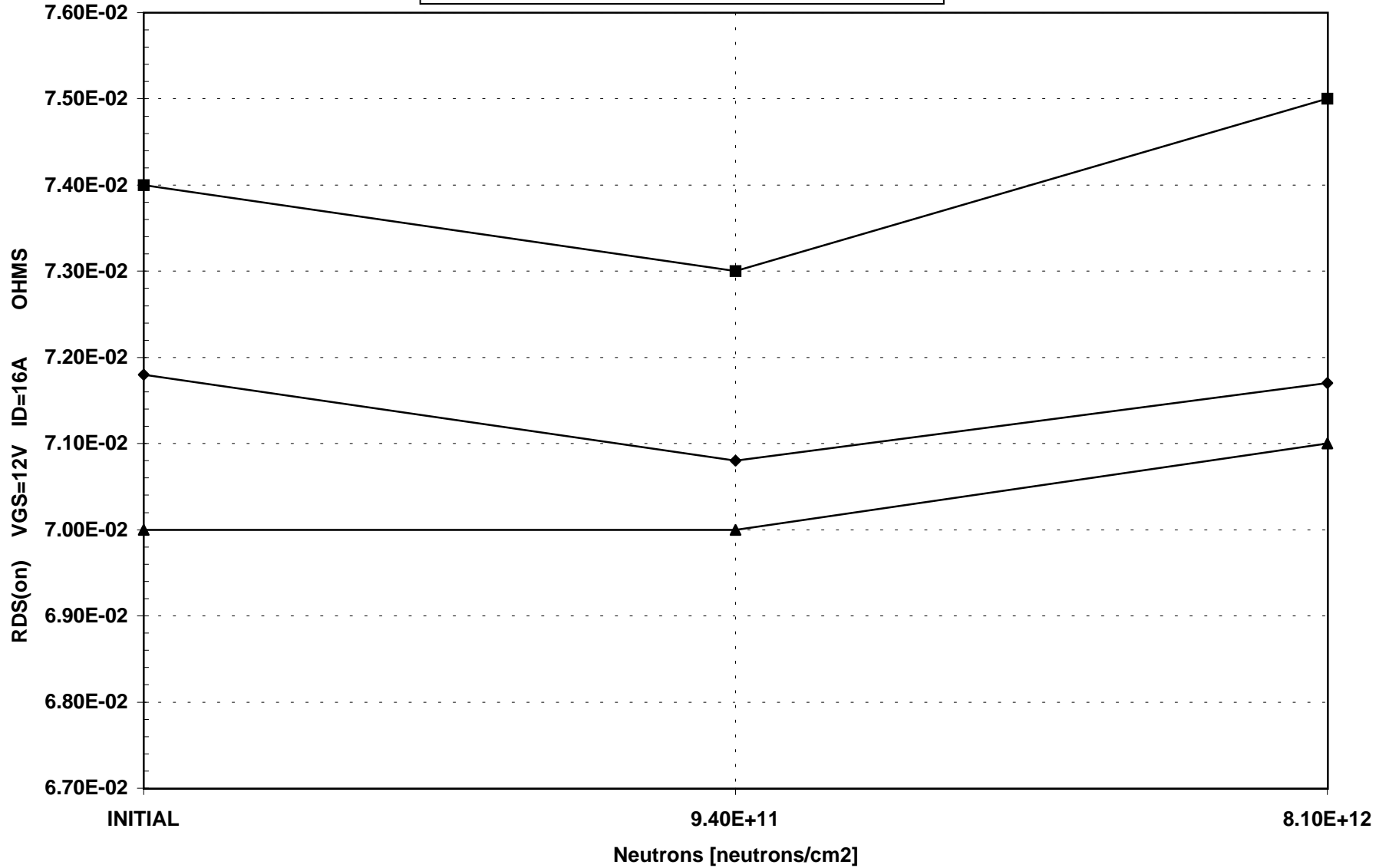
—▲— MINIMUM	—◆— MEAN	—■— MAXIMUM
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IRH7250 N-CHANNEL POWER MOSFET (IRC)

IC S Radiation Test Results Log # 970 06/26/01

RDS(on) VGS=12V ID=16A OHMS



▲ MINIMUM      ◆ MEAN      ■ MAXIMUM

RADIATION TEST PROCEDURE

Device Type: IRH 7250 N-Channel Power MOSFET  
 Manufacturer: International Rectifier Corp.  
 Lot No: EER413993, G-4 Date Code: Circ. 2001  
 Package Type: TO-3 Can  
 No. of Devices Supplied: 10  
 No. of Devices to be tested: 9 + 1 Control

RADIATION CONDITIONS: MIL STD 750D, Test Method 1017

Facility: TRIGA Reactor Energy: 1 MeV Equivalent

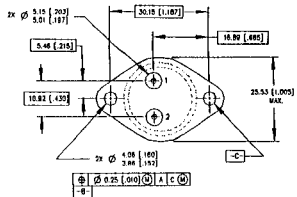
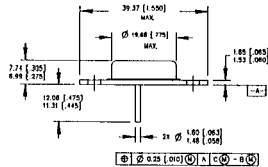
Neutrons/cm <sup>2</sup>	1E12	1E13
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BIAS CONDITIONS DURING IRRADIATION: All leads grounded.

Pin No. Name

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- 1 SOURCE
- 2 GATE
- 3 DRAIN (Case)



RADIATION TEST PROCEDURE

No. 384

Device Type: IRH 7250 N-Channel Power MOSFET

Electrical Parameter Measurement Conditions\*

TEST NUMBER	TEST NAME	TEST CONDITIONS	LIMIT/UNITS
1	IGSSF	VGS=20 V	100 nA
2	IGSSR	VGS=-20 V	-100 nA
3	IDSS	VDS=160 V VGS=0 V	25 $\mu$ A
4	VGSTH	ID=1mA VDS=VGS	2 to 4 V
5	BVDSS	ID=1 mA	200 V
6	RDSON	VGS=12 V ID=16 A*	0.1 $\Omega$

\*Pulsed: Pulse width  $\leq$  300  $\mu$ s; Duty Cycle  $\leq$  2%.

\*Measurements shall be made using a Tektronix 370 Curve Tracer at room ambient temperature.