Finite Element Analysis of the Microisolation Valve

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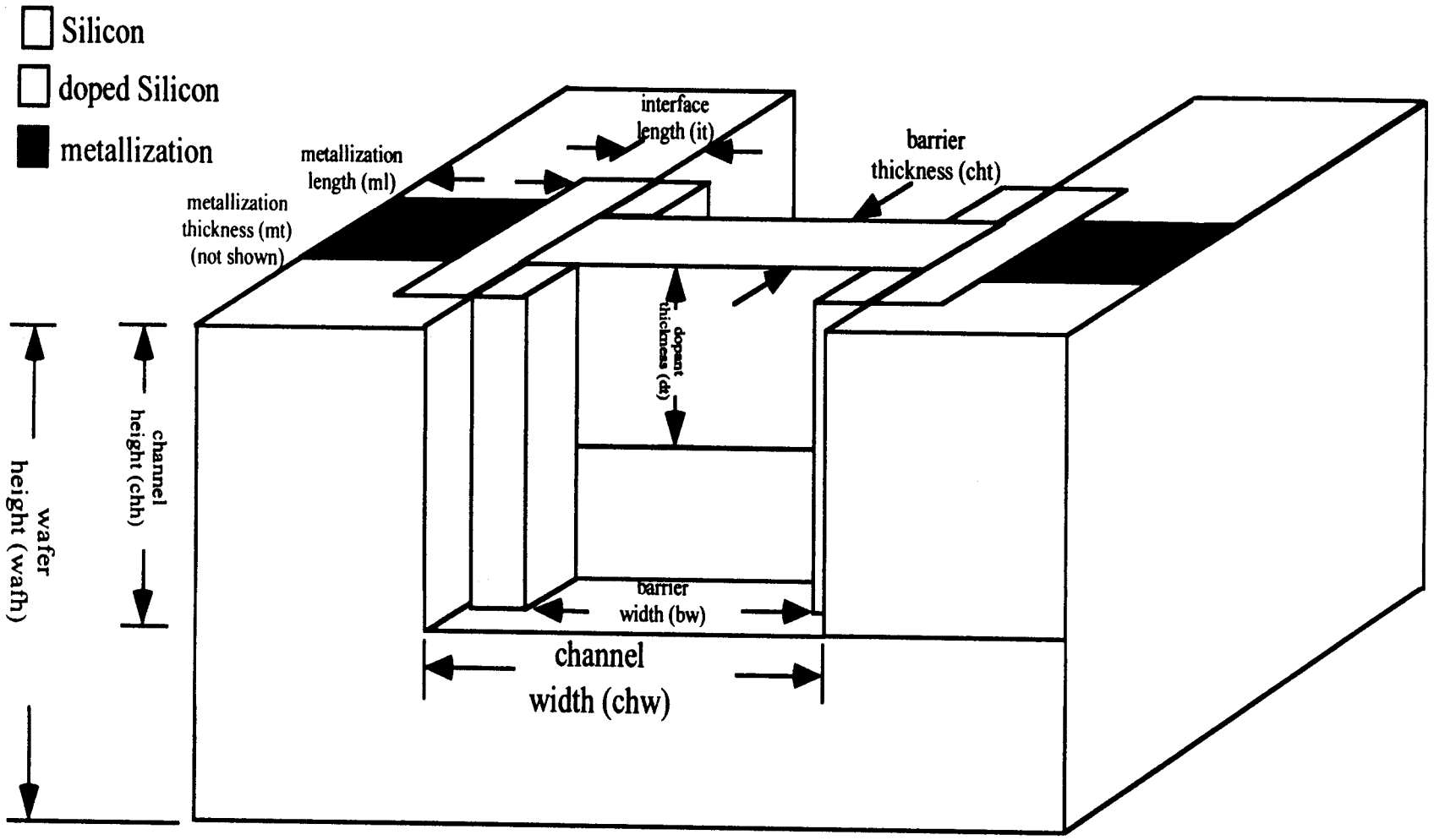
August 4, 1998

Agenda

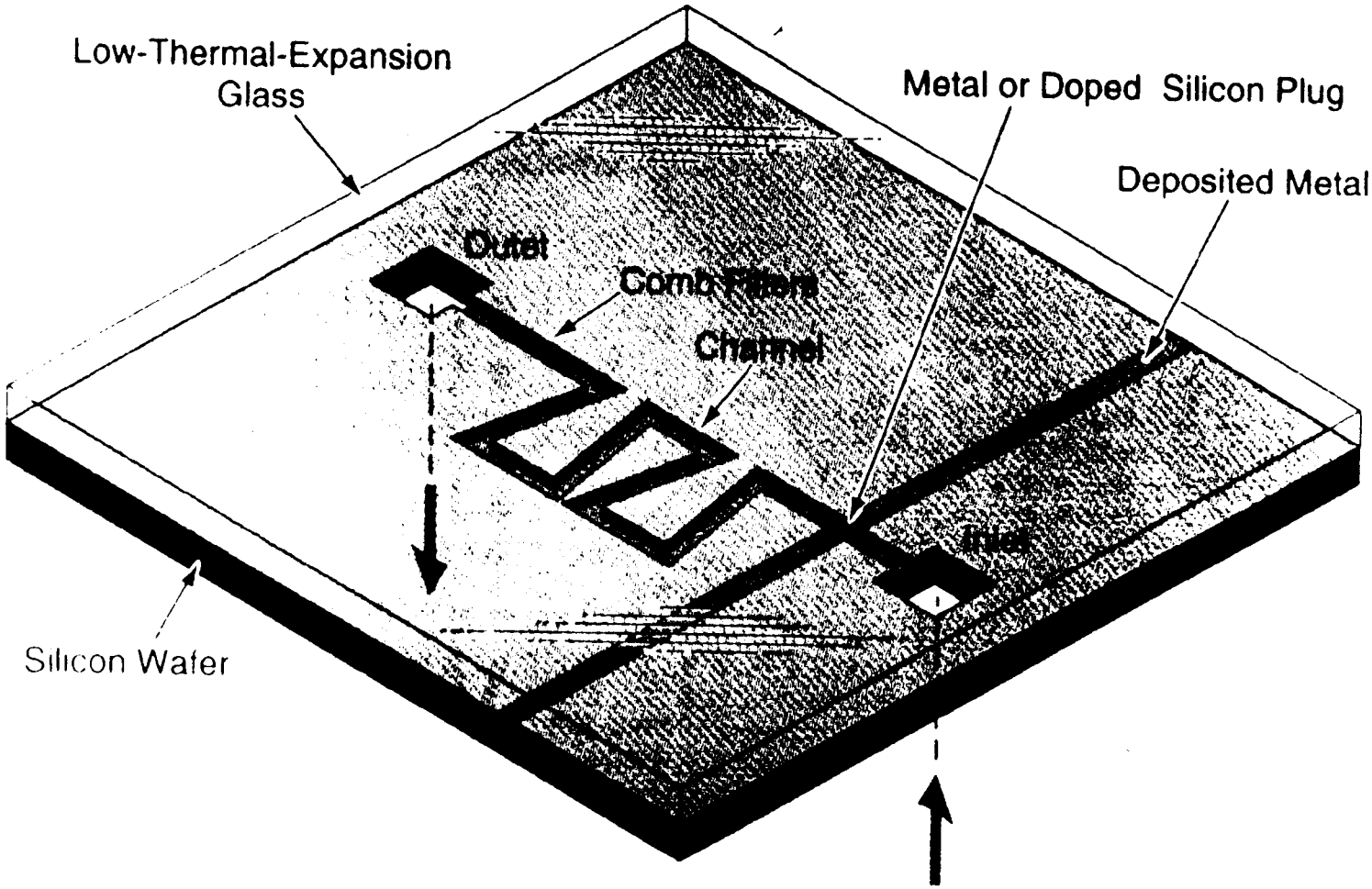
- Design and Use of the Microisolation Valve
- Geometry of the Microisolation Valve
- FEA Model Objectives
- Results of the 10 and 50 microns Thick Wall Models
- Results of the Thermally-Induced Stresses

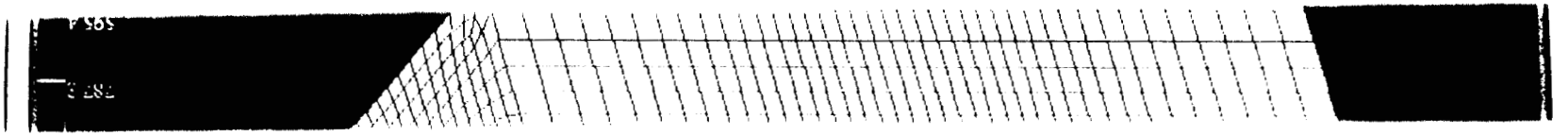
Geometry of the Valve



A Typical Geometry of the Valve

Valve Integrated into a Chip





Model Setup

File Edit Remote Window
7:41 AM
uisol100by300.db - default_viewport - default_group - Entity

FEA Model Objectives

- Determine power required to melt barrier of valve.
    - Wattage and time required.
- Determine temperature distribution over time.
- Calculate thermally-induced stresses.
- Determine effects of heating on surrounding structures.
- Optimize initial design parameters.

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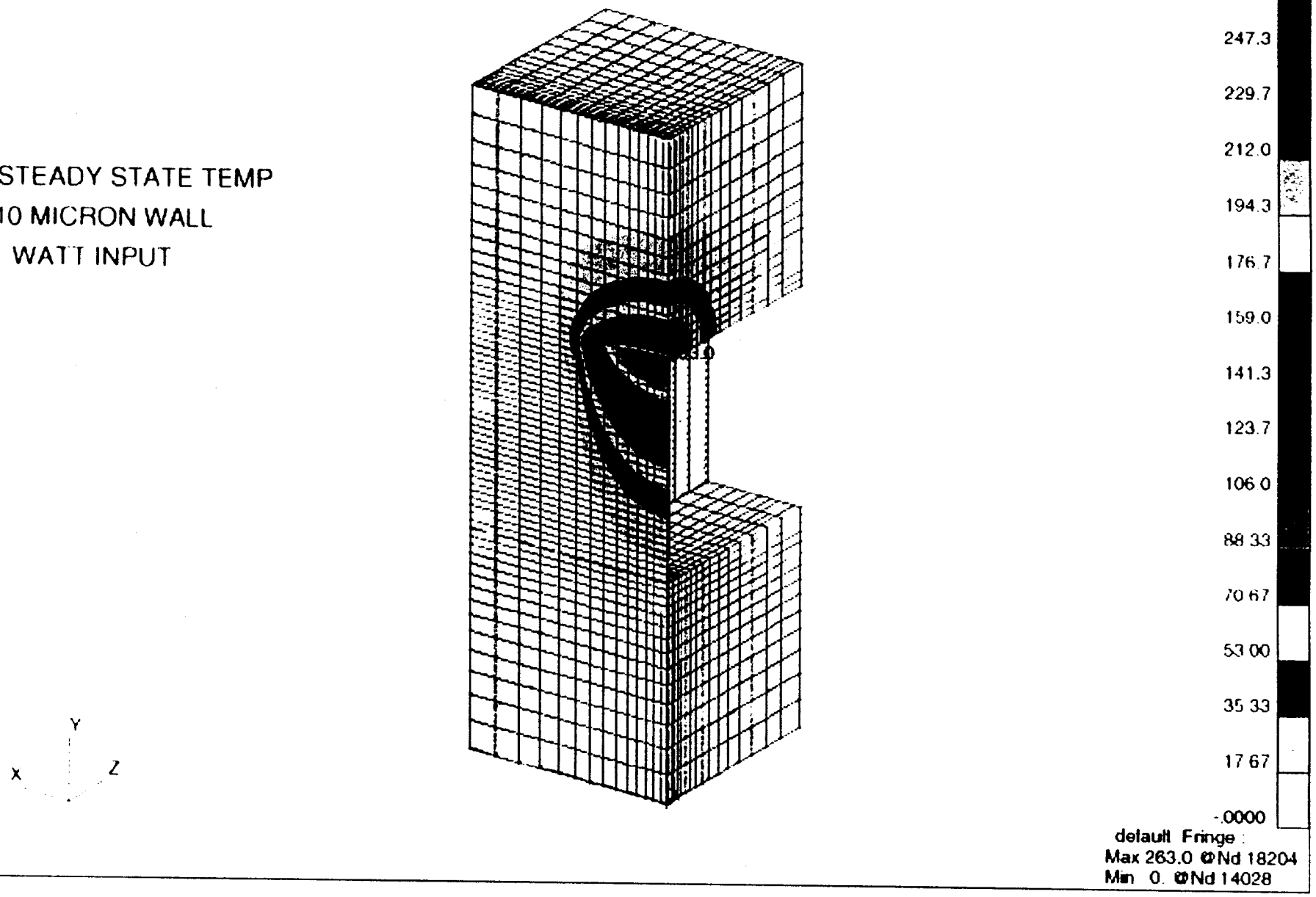
Fringe: Default, Step1, TotalTime=2.., Temperature (Nodal), Layer or Section Points-0 of 1 layers ()

STEADY STATE TEMP

10 MICRON WALL

1 WATT INPUT



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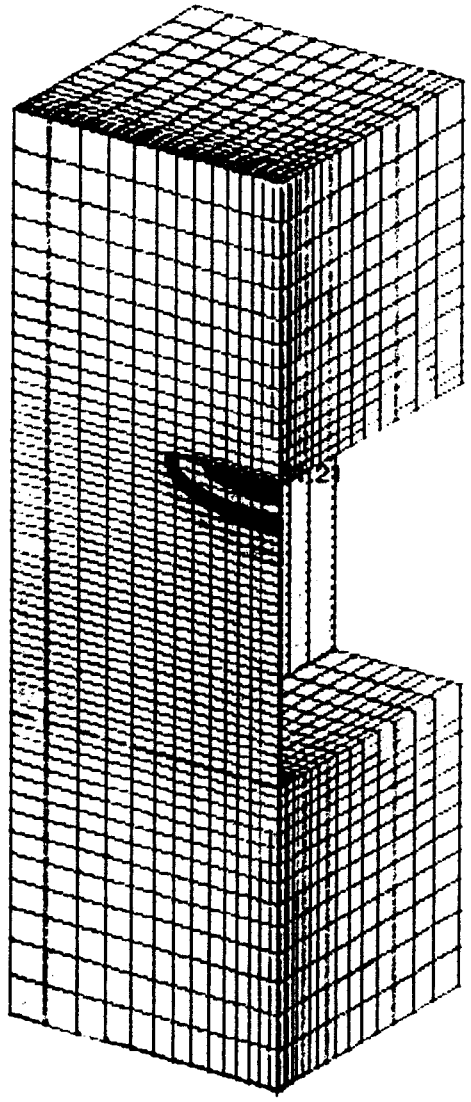
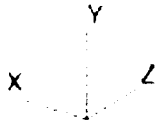
Fringe: Default, Step1, TotalTime=3.E-5, 2: Temperature (Nodal), Layer or Section Points-0 of 1 layers ()

TEMP AFTER 0.00003 SEC

10 MICRON WALL

1 WATT INPUT





default Fringe :
Max 81.21 @Nd 18204
Min .0267 @Nd 18353

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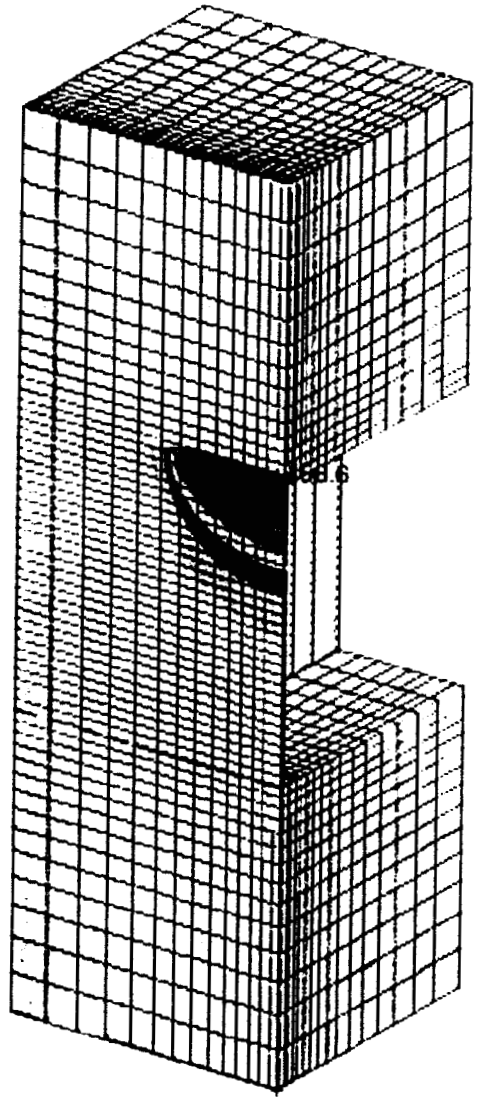
Fringe: Default, Step1, Total Time=9.E-5, 2: Temperature (Nodal), Layer or Section Points-0 of 1 layers ()

TEMP AFTER 0.00009 SEC

10 MICRON WALL

1 WATT INPUT



265.0
247.3
229.7
212.0
194.3
176.7
159.0
141.3
123.7
106.0
88.33
70.67
53.00
35.33
17.67
-.0000

default Fringe :
Max 158.6 @Nd 18204
Min -.0683 @Nd 18354

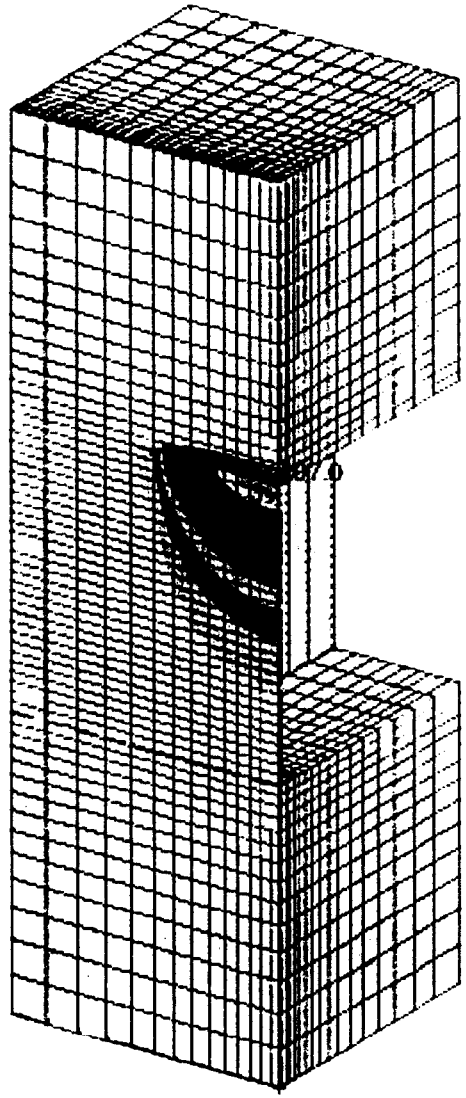
MSC/PATRAN Version 7 5 30-Jun-98 16 50 12

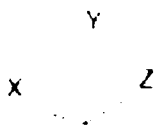
Fringe Default Step1 TotalTime=0.00018 Temperature (Nodal), Layer or Section Points 0 of 1 layers ()

TEMP AFTER 0.00018 SEC

10 MICRON WALL

1 WATT INPUT





265.0
247.3
229.7
212.0
194.3
176.7
159.0
141.3
123.7
106.0
88.33
70.67
53.00
35.33
17.67
-.0000

default Fringe :
Max 207.0 @Nd 18204
Min -.0474 @Nd 18355

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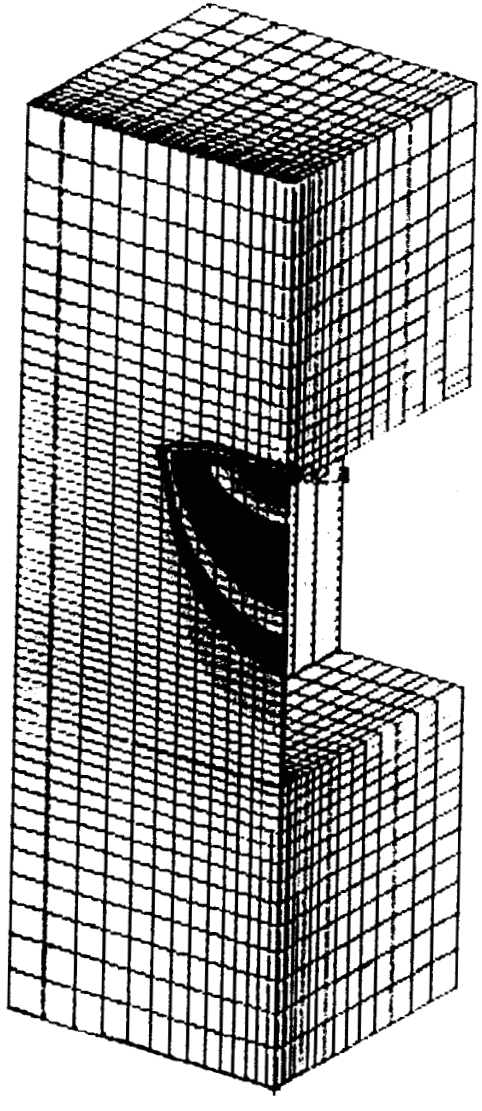
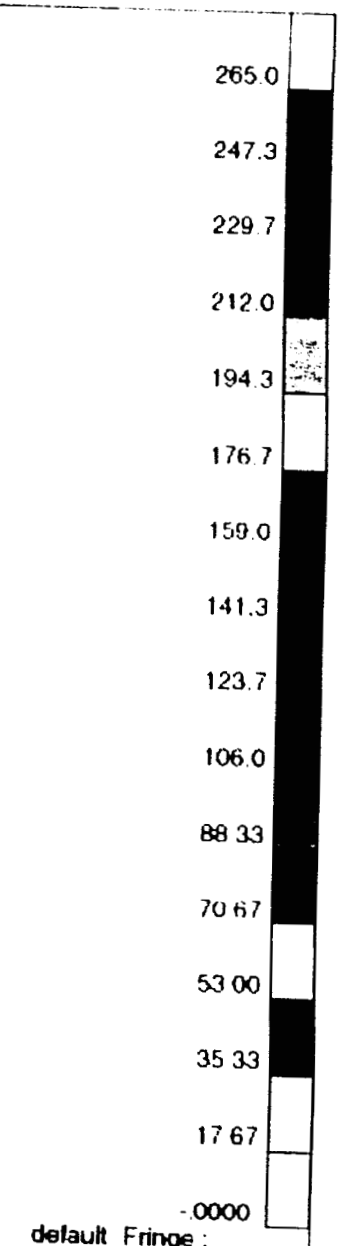
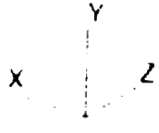
Fringe Default Step1.TotalTime=0.0003: Temperature (Nodal), Layer or Section Points-0 of 1 layers ()

TEMP AFTER 0.00030 SEC
10 MICRON WALL
1 WATT INPUT





default Fringe :
Max 232.4 @Nd 18204
Min -.0036 @Nd 18362



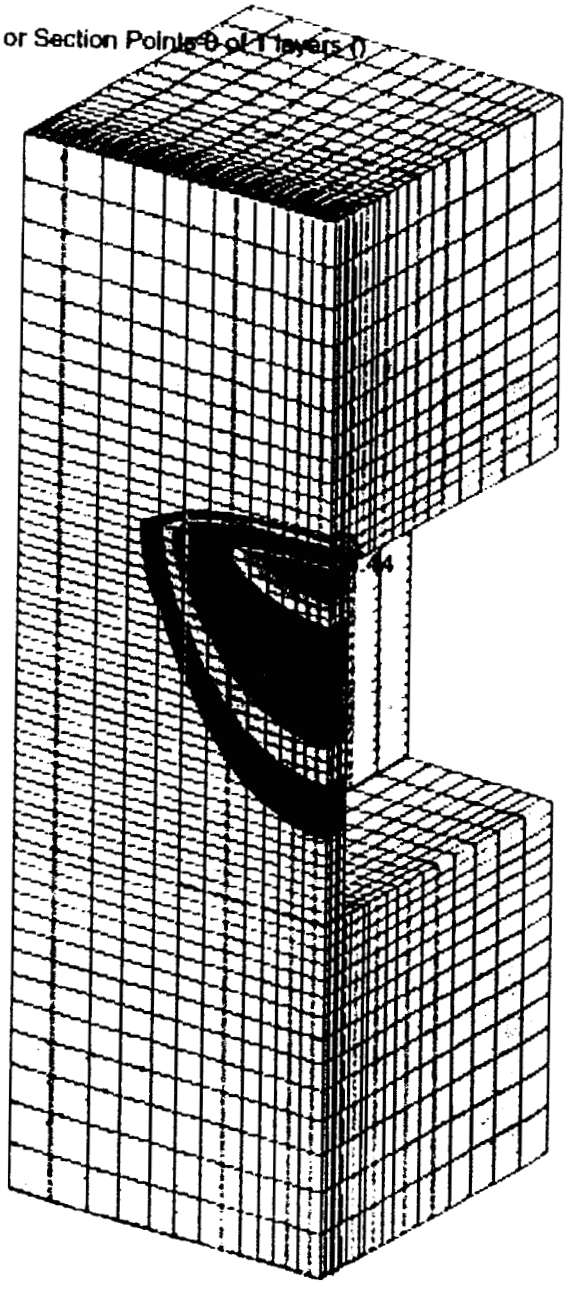
MSC/PATRAN Version 7 5 30-Jun-98 14 33 46

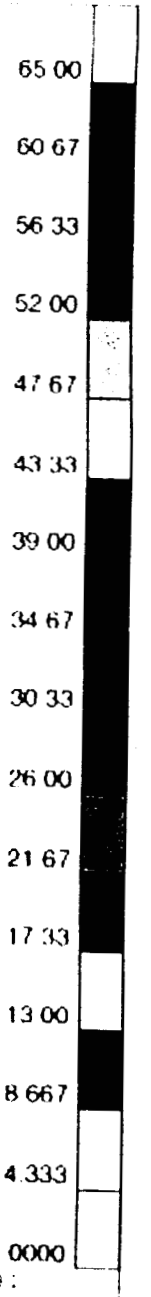
Fringe Default Step1 TotalTime=0 0005: Temperature (Nodal), Layer or Section Points=0 of 1 layers 1)

TEMP AT .0005 SEC (DEG C)

1 WATT HEAT INPUT

50 MICRON THICK WALL





default Fringe :
Max 58.44 @Nd 28834
Min -.0000 @Nd 18472

Y

X Z

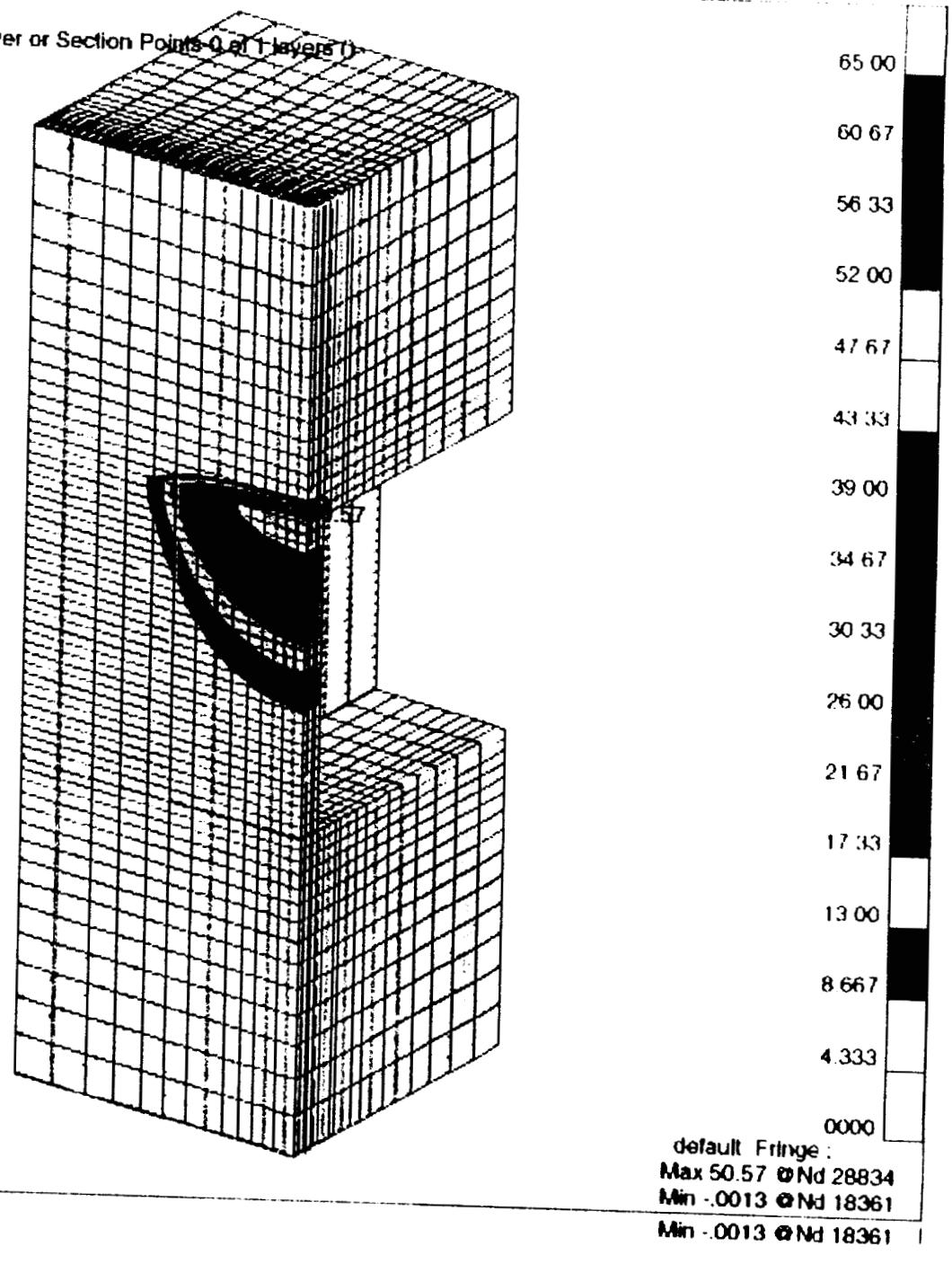
MSC/PATRAN Version 7 5 30-Jun-98 14 36 02

Fringe Default Step1 TotalTime=0.00025 Temperature (Nodal), Layer or Section Points 0 of 1 layers ()

TEMP AT .00025 SEC (DEG C)

1 WATT HEAT INPUT

50 MICRON THICK WALL



Y

X Z

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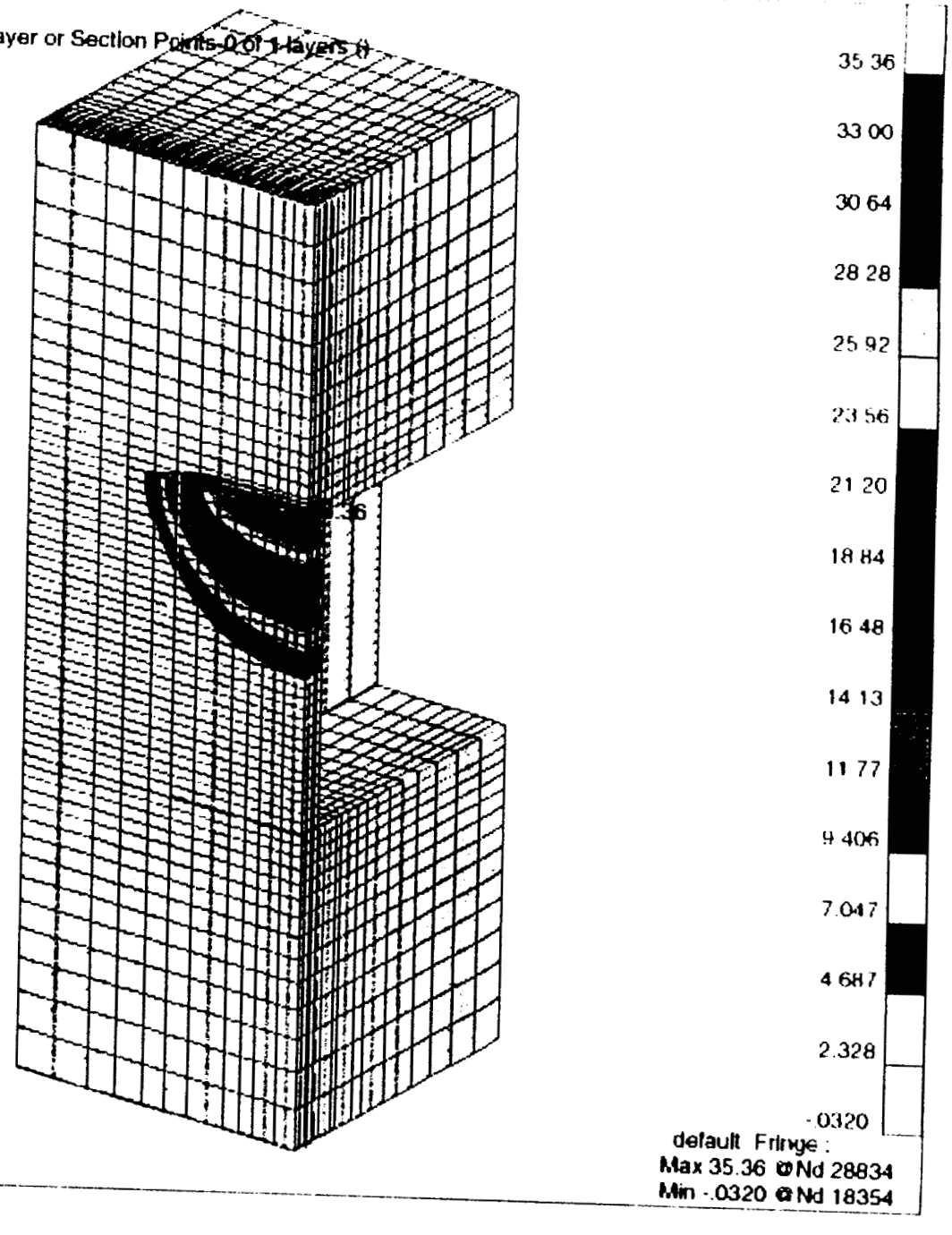
Fringe Default Step1 TotalTime=0 0001 2: Temperature (Nodal), Layer or Section Points 0 of 1 layers ()

TEMP AT .0001 SEC (DEG C)

1 WATT HEAT INPUT

50 MICRON THICK WALL



Y

X Z

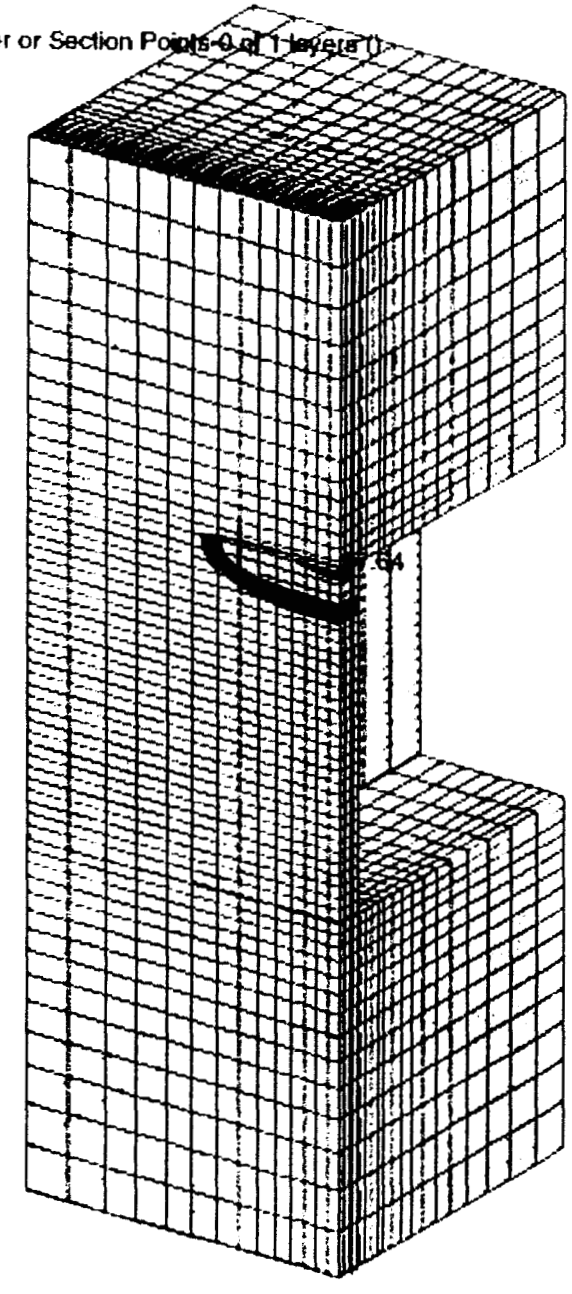
MSC/PATRAN Version 7 5 30-Jun-98 14:42:48

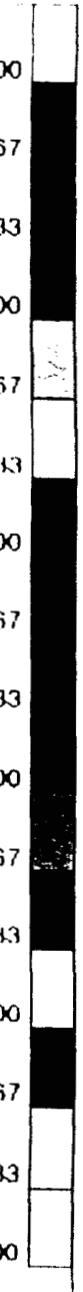
Fringe Default Step1 TotalTime=3 E-5 3: Temperature (Nodal), Layer or Section Points=0 of 1 layers ()

TEMP AT .00003 SEC (DEG C)

1 WATT HEAT INPUT

50 MICRON THICK WALL





default Fringe :
Max 17 64 @Nd 28834
Min -.0131 @Nd 18353

Y

X Z

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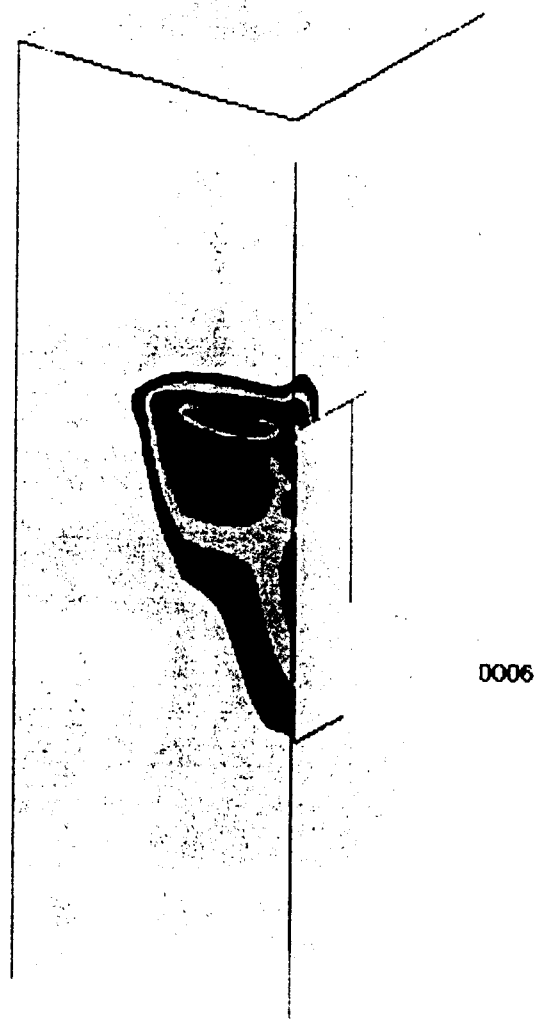
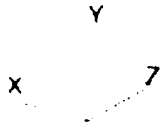
Fringe Default Step1.TotalTime=1. 3: Stress. Components-(NON-LAYERED) (VONM)

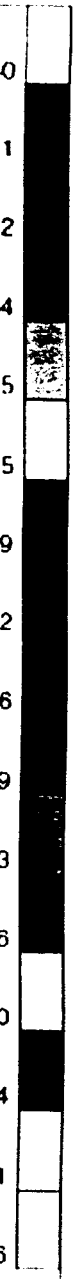
STRESS (MPa) AT STEADY STATE TEMP.

10 MICRON WALL

1 WATT INPUT



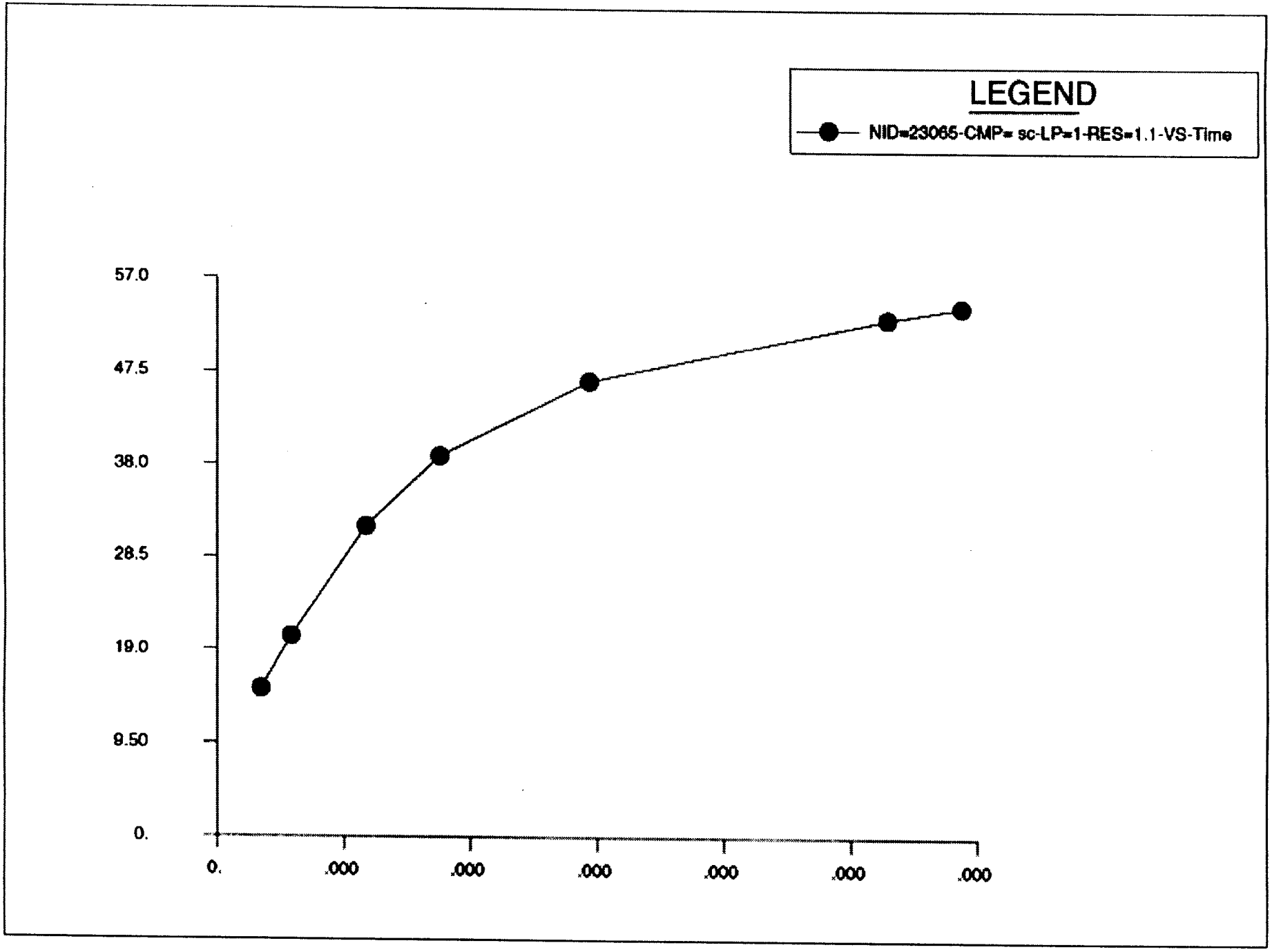




default_Fringe

Max 14.80 @Nd 23104

Min .0006 @Nd 16762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28.5
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9.50
0.
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