

## Question 25

**Q:** What is the symmetric model? What are its advantages and its application range?

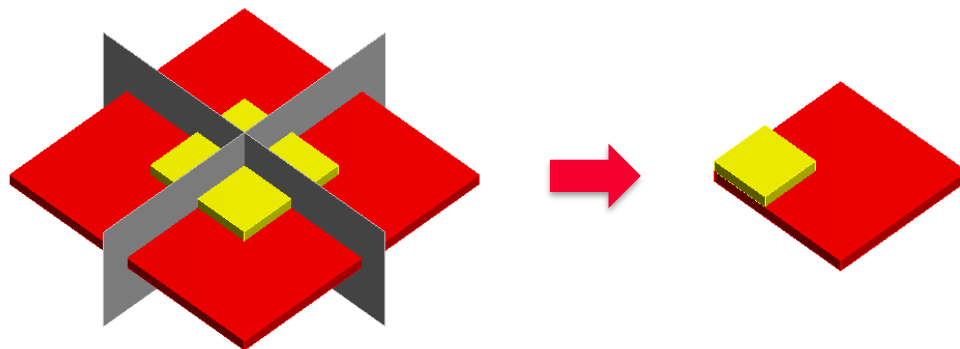
**A:** Please refer to the next slides for more information.

# Symmetric Model

- Advantages of Symmetric Model
- Symmetric boundary condition (Stress analysis)
- Symmetric boundary condition (Thermal analysis)

# Advantages of Symmetric Model

If an analysis model is symmetric \*, you can analyze the symmetric model that is cut by a symmetric plane, instead.



Full Model

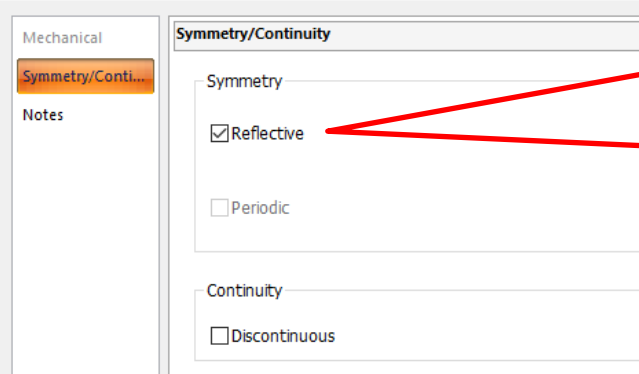
Symmetric Model

Calculation load-calculation time and memory usage- can be extraordinarily reduced.

\* Involving in all types: shape, material setting, boundary condition, and body attributes.

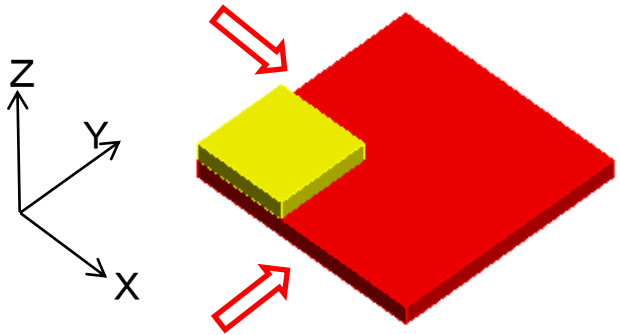
# Symmetric Boundary Condition

Edit Boundary Condition [Boundary\_Condition\_001]



When [Reflective] is set to the boundary condition, proper boundary conditions of symmetry are automatically set.

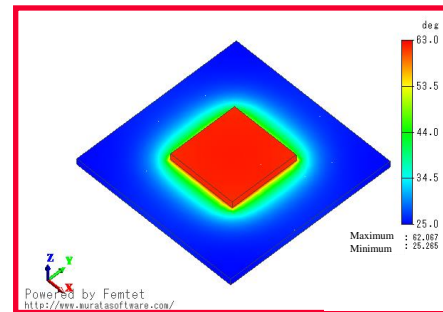
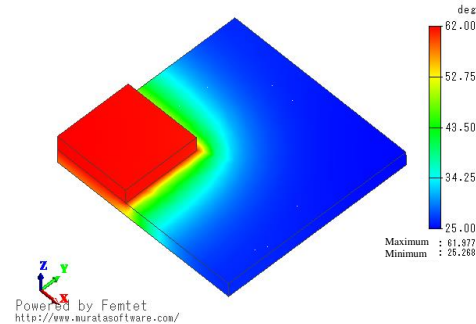
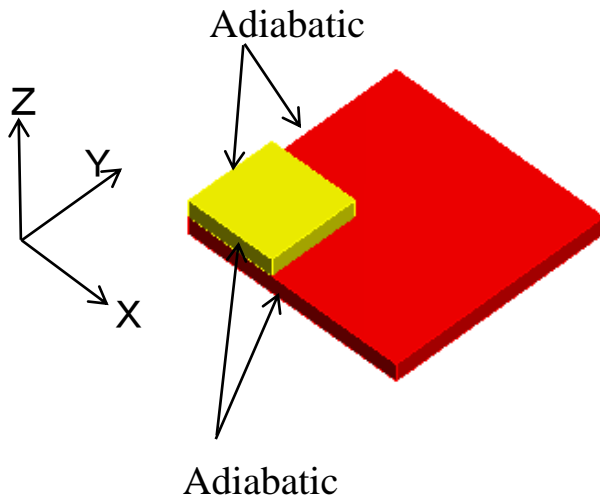
If [Reflective] is selected, the full model can be viewed in the result display.



The symmetric planes perpendicular to the X-axis and Y-axis are each assigned a different name for the symmetric boundary condition.

# Internal Process for Symmetric Boundary Condition

Symmetric planes are treated as **adiabatic** boundaries in the thermal analysis.



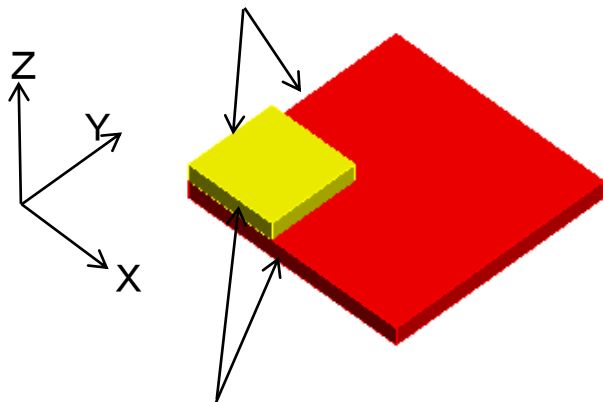
Note: If the heat source body is divided, the heat amount must be changed.

Analysis Result for Full Model

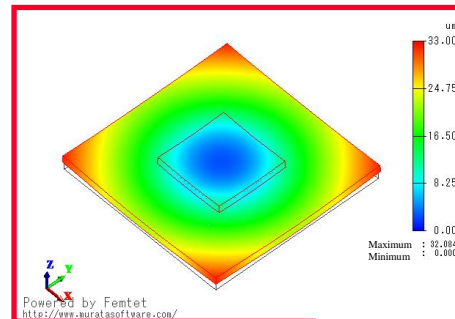
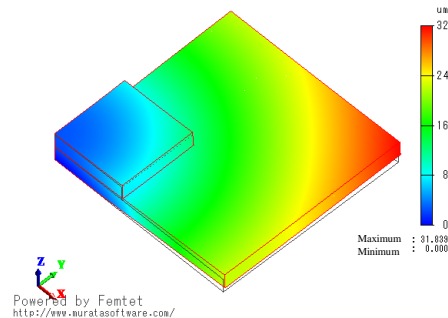
# Internal Process for Symmetric Boundary Condition

The **normal component of the displacement** of the symmetric plane is fixed in the stress analysis.

Fixed displacement in the X direction



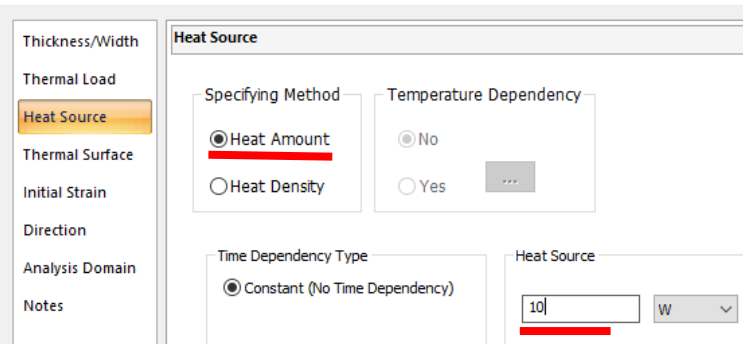
Fixed displacement in the Y direction



Analysis Result for Full Model

# Notes for Symmetric Model

Edit Body Attribute [Body\_Attribute\_001]



Thickness/Width

Thermal Load

**Heat Source**

Thermal Surface

Initial Strain

Direction

Analysis Domain

Notes

**Heat Source**

Specifying Method

Temperature Dependency

Heat Amount

Heat Density

No

Yes

Time Dependency Type

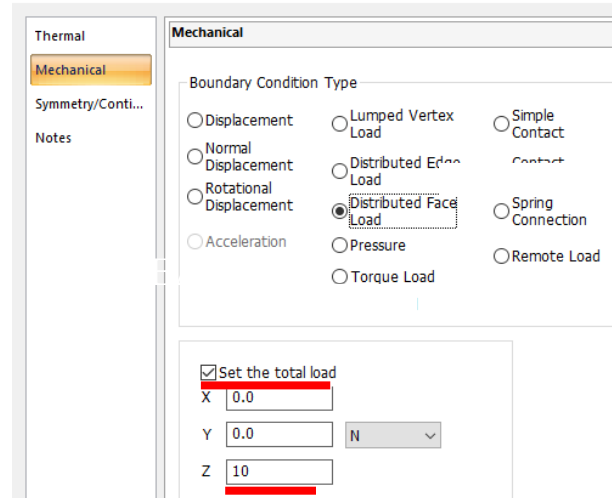
Constant (No Time Dependency)

Heat Source

10

W

Edit Boundary Condition [Boundary\_Condition\_001]



Thermal

**Mechanical**

Symmetry/Conti...

Notes

**Mechanical**

Boundary Condition Type

Displacement

Normal Displacement

Rotational Displacement

Acceleration

Lumped Vertex Load

Distributed Edge Load

Distributed Face Load

Pressure

Torque Load

Simple Contact

Contact

Spring Connection

Remote Load

Set the total load

X 0.0

Y 0.0

Z 10

N

The heat amount or the distributed load or pressure that is defined as the total load must be adjusted as follows:

- Half model: multiply by 0.5,
- Quarter model: multiply by 0.25.

Notes: Any adjustment is not required for the heat density or the distributed load or pressure that is not defined as the total load.