# Complex Method to Control the Quality of Construction and Performance Reliability of Thermoelectric Modules in Optoelectronic Devices

## Introduction

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**Scopes of the Studies**

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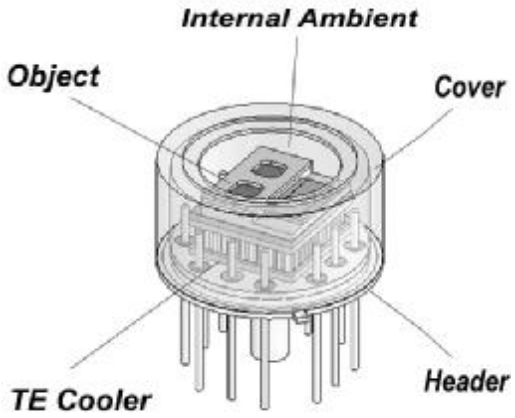
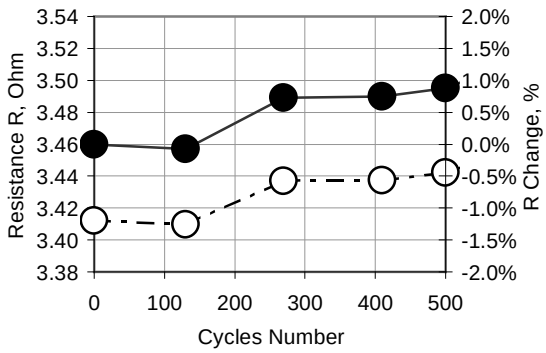
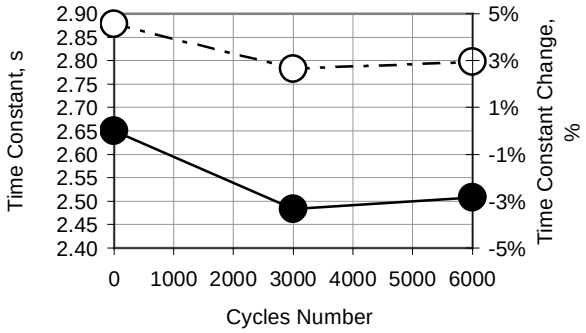


## TE Module Performance Reliability



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**Integrating of a TE Module into the Package**

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$= \frac{\Delta}{} \frac{\alpha}{}$

$\Delta$

&

$\Delta$ &

$\Delta$ &

$$\Delta \quad = \frac{\alpha}{} \left( \quad + \frac{}{\&} \right) - \frac{}{} \qquad \text{а}$$

$$= \quad \left( \quad + \frac{\alpha}{} \right) + \frac{}{} \left( \quad + \frac{}{} \right) \qquad \text{б}$$

$\&$ $\Delta$

$$\tau = \frac{\quad}{\kappa}$$

"

$$\tau = \frac{\quad}{\left( \quad + \quad \right)\kappa}$$

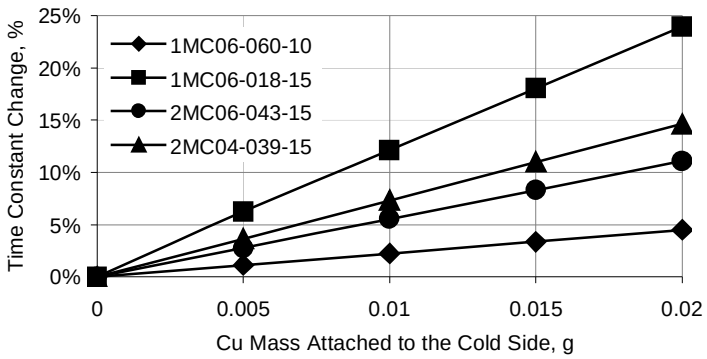
$\approx$

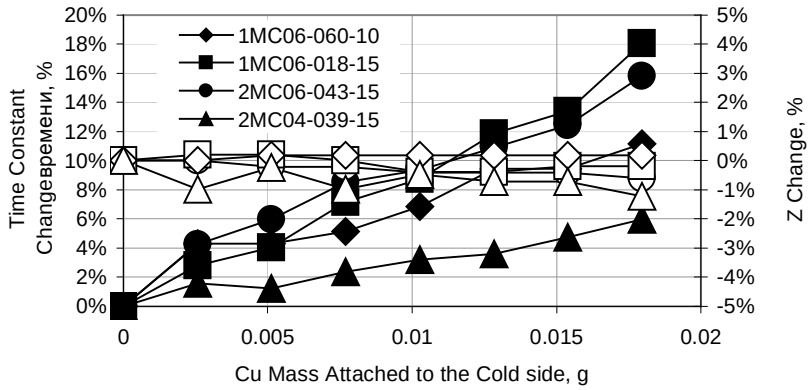
$$\tau \cong -\tau$$

$\tau$

MC

**Mounting of a cooled object onto the TE module**


Time Constant Change, %
25%
20%
15%
10%
5%
0%
1MC06-060-10
1MC06-018-15
2MC06-043-15
2MC04-039-15
0
0.005
0.01
0.015
0.02
Cu Mass Attached to the Cold Side, g


Time Constant
Changeвремени, %
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
1MC06-060-10
1MC06-018-15
2MC06-043-15
2MC04-039-15
5%
4%
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2%
1%
0%
-1%
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-3%
-4%
-5%
Z Change, %
0
0.005
0.01
0.015
0.02
Cu Mass Attached to the Cold side, g

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**Control of a TE module Environment**

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а $\tau$

б

$$' = \left( + \frac{\kappa}{\kappa} \left( \overline{\beta} - \right) \right)$$

$'$

$\kappa$ $\kappa$ $\beta$

= K MC

MC $\beta$ K ′ = K

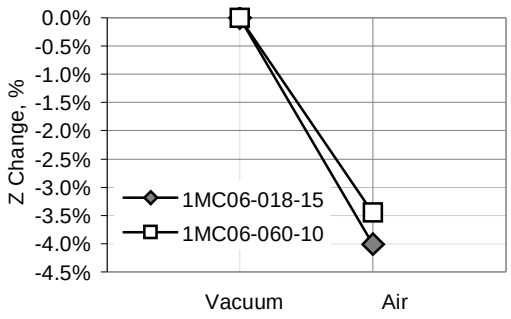
MC xx MC xx

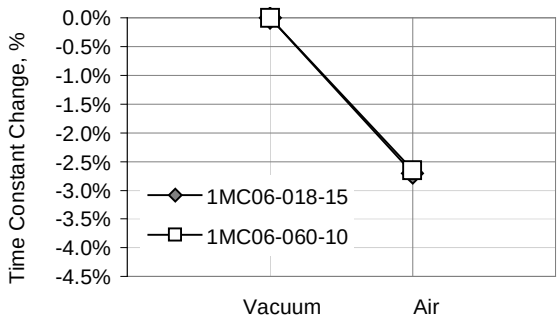
K

K

| | $\alpha$ K | $\alpha$ K | $\alpha$ |
|---|---|---|---|
| MC | | | |
| MC | | | |

a

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## Conclusion

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## Literature

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