

# **PATENT Activities at BUTE**



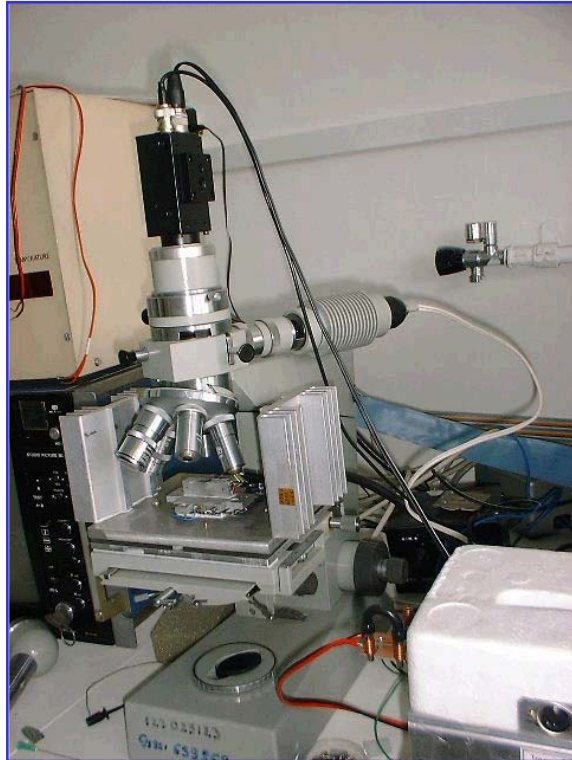
Budapest University of Technology and Economics,  
Department of Electron Devices

**<http://www.eet.bme.hu>**

# PATENT WP3 tasks of BUTE

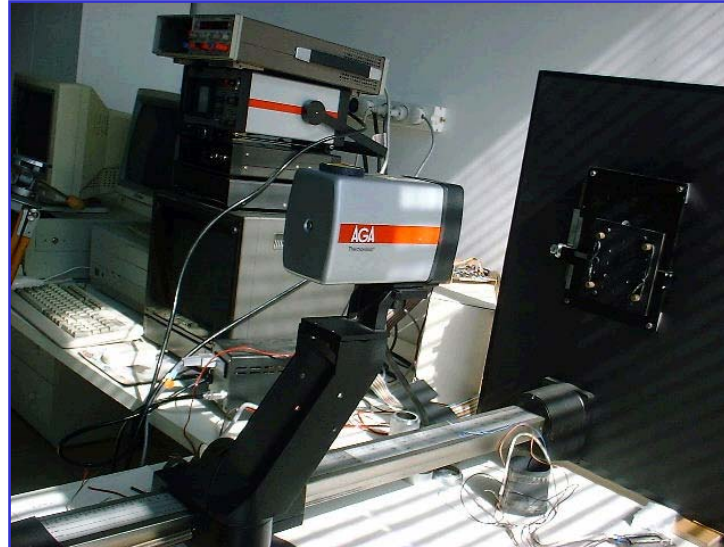
- Collection of missing material parameters (Si, SiO<sub>2</sub>, W, Ti)
- Testing of movable MEMS structures (using Talystep, SEM and laser diffraction)
- MEMS investigations in harsh environment (liquid crystal based and other thermal measurements)

# Thermal laboratory



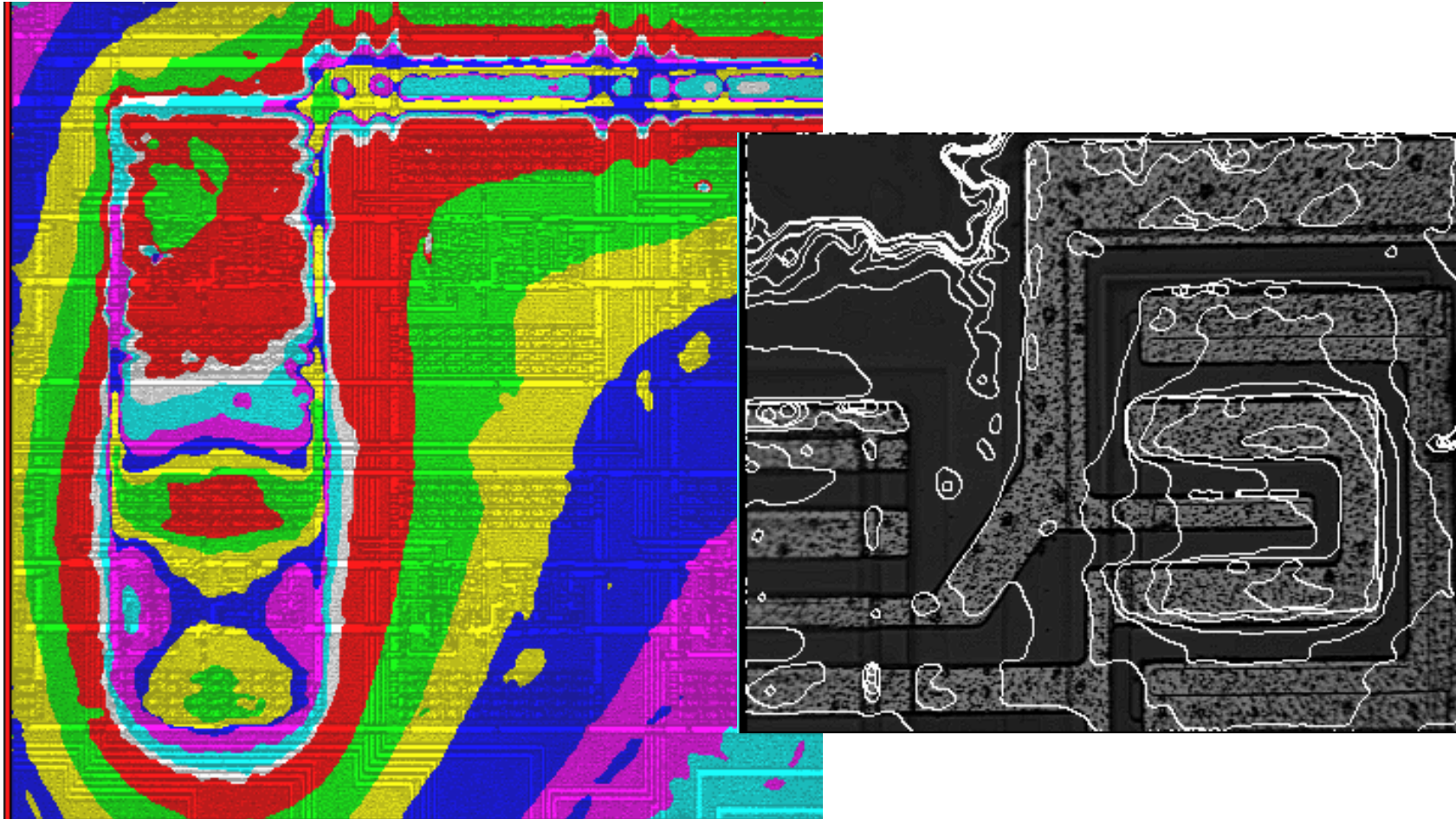
LC based thermal imaging system

Aga 780 IR camera with PC interface



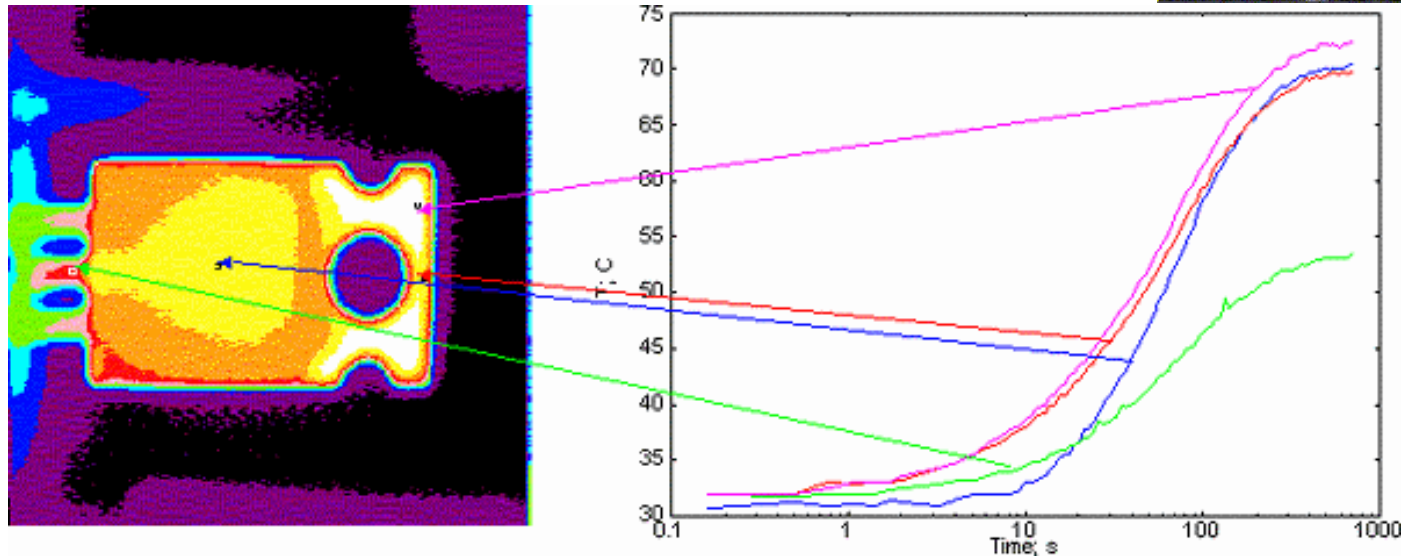
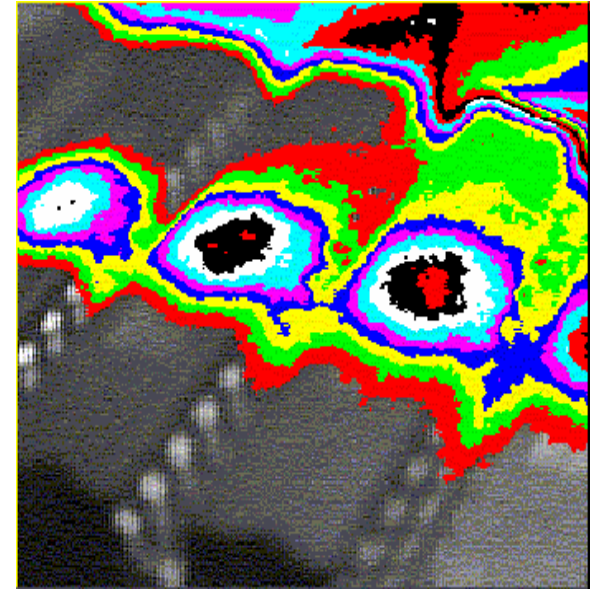
T3Ster thermal transient tester from MicReD

# Earlier results: liquid crystal thermal imaging of ICs



# Thermal imaging of encapsulated circuits

Sophisticated post-processing of IR images



Thermal transients extracted from IR movie

# Summary of activities

Number of task	Name of task	Deadline	Sum in kEur	Researchers	Status	Problems to be solved	Time sheeting	Purchase
WP2/1	Collection of missing data for MEMS simulations	2004.nov.30.	3	Rencz, Perlaky, Timárné				
WP2/2	Modeling and measurements of microcoolers	2004.dec.15.	10	Kohári, Bognár Rencz, Székely Horváth				
WP3/1	Collection of missing material parameters: Si, SiO <sub>2</sub> , W, Ti	2005.march.3	1.5	Timárné, Szűcs	collected data for Si and SiO <sub>2</sub> are sent /disseminated/	Collection of more parameters for W and Ti		MEMS handbook
WP3/2	Testing of movable MEMS structures (Talystep, SEM and laser diff. measurements)	2005.march.3	5	Mizsei, Perlaky, Szűcs Bognár, Rész				
WP3/3	MEMS investigations in harsh environments (liquid crystal and thermal measurements)	2005.march.3	5.5	Végh, Hajás	reconstruction of former measurements	improvement of measuring setup for T>150 C		Liquid crystals
WP4	Collection of missing material parameters for encapsulation	2004.nov. 30.	2	Rencz, Perlaky Timárné				
WP7	Dissemination of results in MEMS testing using thermal transients	2004.dec.15.	6.2	Rencz, Szabó, Kollár Székely				

# Achievements as to date

- Measurement of micro-cooler has started using the ***T3Ster*** equipment, first structure functions obtained
  - Problems:
    - so far there are too many uncertainties
    - thermal steady-state is to be reached
    - would be nice to see the nature of flow (laminar/turbulent)
    - etc.
- The LC based imaging system is operational again but a crystal with higher clearing point is to be used
  - Does anyone have experience in depositing such (initially solid) crystals?
  - Isn't there any danger of destroying bonding wires?

*Micro hotplates will be qualified in cooperation with MFA*

# Other PATENT activities

- Collection of material parameters for MEMS simulation (WP 2)
- Modeling and measurements of microcoolers (WP 2)
- Collection of material parameters for packaging (WP 4 )
- Problems:
  - hard to get response from the partners