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## **Letter of Intent**

### **Pre-standardisation of incremental FIB micro-milling for intrinsic stress evaluation at the sub-micron scale (ISTRESS)**

Dear Dr. Vogel,

thank you for the invitation to participate in the project team „iSTRESS“.

The project objectives and the planned investigation of technology solutions are very interesting to our company.

Especially the fundamental investigation on residual stresses in metalized surfaces of semiconductors and hereby the resolution of the single metallic layer behavior in a metalized stack is one of the main issues of interest.

The interaction between macroscopic effect influenced by residual stress and its response in nano-scale dimension, e.g. drift of semiconductor characteristics, needs the advancement of semiconductor micro-mechanical analysis.

In detail we are interested in innovative analyzing methods for residual stresses in micro- and nano-scale dimensions:

- Qualifying each process step during production from semiconductor to package  
and
- The question of lifetime prediction of the system under mechanical, electrical, thermal, thermo-mechanical and chemical load



In particular qualification test routines, like high temperature storage (HTS), thermal cycle (TC), high temperature reverse bias (HTRB), high temperature gate stress (HTGS) and high temperature high humidity reverse bias (H<sup>3</sup>TRB), can trigger drifts of semiconductor characteristics, which are correlated with the residual stress in the metallization and packaging.

The systematical analysis of aging- and damaging models of these effects are necessary for the development of high performance semiconductors and MEMS with significantly increased robustness.

The knowledge of the microscopic and macroscopic material degradation is the base for the development of new simulation methods and models. Only on these new simulations models is in the future a virtual design optimization of lifetime prediction possible. Up to now this challenge is only rudimental available.

The planned research activities of the project "iSTRESS" is correlated with the BOSCH developing demands. For this reason, we would take part in the "iSTRESS"-consortium as an associated partner. We could support the consortium by technical discussion and could provide test samples.

This project is interesting to our Corporate Research department CR/APJ and as well for our Business Unit Automotive Electronics. Additional support for the consortium will come from Mrs. Rüschemschmidt (dept. AE/PJ-PSC1).

We wish the project consortium "iSTRESS" a successful approval. For further questions I recommend the consultant to contact Mr. Guyenot (+ 49-711-811-8611 or Michael.Guyenot@de.BOSCH.com)

Yours sincerely

Robert Bosch GmbH  
Corporate Sector Research and  
Advance Engineering  
Laser material processing, electronic  
packaging and interconnection technology

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