Semiconductor Research Corporation

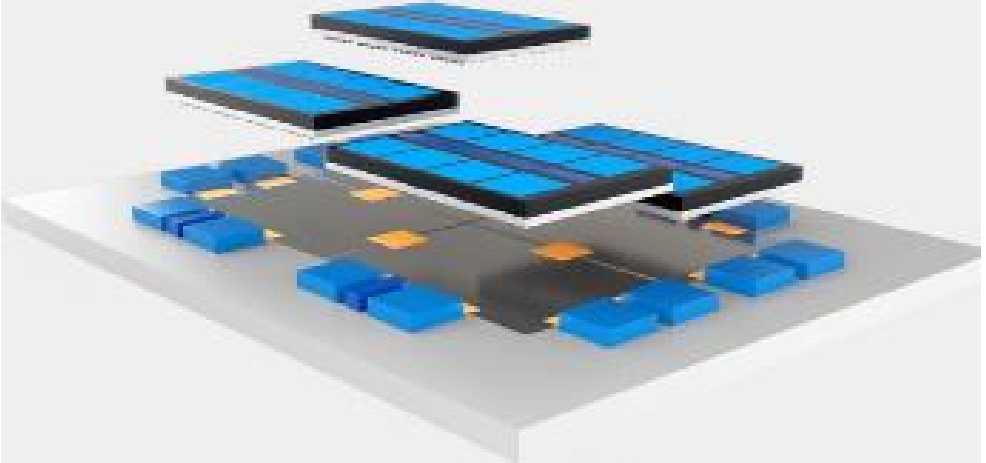
Because the future can't wait, we bring the best minds together to achieve the unimaginable

Packaging Research Program e-Kickoff

March 22-23, 2023, virtual

John Oakley, Science Director

LaDonya Dooley, Research Program Coordinator



Day 1 : https://www.src.org/calendar/e007775/

Day 2 : https://www.src.org/calendar/e007776/

Thank you!

On Behalf of the SRC,

Thank You!

- To all the industry members for their sponsorship and mentorship
- To all the Principal Investigators & their Students for the great research effort
- To LaDonya Dooley at SRC for the logistical support
- To all of you for being in-person with us!

e-kickoff Reminders

Everyone will be participating virtually

Presenters should remember to speak clearly and keep within the allotted time.

Timing: 15 min
(10 min talk + 5 min Q/A)

Presentations and Q&A will be live. Please be mindful, so watch the time!!!

Informal Presentations

Please indicate if you want the audience to interrupt with questions. Q/A will occur at the end.

Reminder: Invoicing and Deliverables

Regular invoicing

Invoice on regular basis: monthly is preferred

Excess money (calendar year) is considered profit and taxable!

Spending must occur within contract period

Invoicing expected to be at or above 95% invoiced at end of each contract period

Final invoice within 60 days after project ends

Submit deliverables on time: even 1 day is too late!

System will flag delinquencies

Late deliverables will stop invoices being paid and can jeopardize future funding

Contact SRC if there are issues with getting deliverables on time

All submissions will be done in Pillar Science

Pre-publication drafts must be deposited at SRC > 60 days before published

Best practice: deposit draft to SRC website when submitting to journal/conference (also thesis)

Update the draft on the SRC website with final paper after acceptance (select submit a new version)

Acknowledgement of SRC funding must be added to all publications

At minimum, the acknowledgement should read: “This work was supported in part by Semiconductor Research Corporation (SRC).”

Resources that Help Academics Evaluate, Adopt, and Amplify Emerging Member Solutions

Member Resources

- SRC has collected information members provide for the academic community, including education, design, and prototyping
- SRC researchers and students are encouraged to take advantage of these resources in their research and education activities

INFORMATION
About SRC
News
Contact
FAQs
Privacy Policy
Members & Partners
Contracts & IP
Management Charts
Corporate Annual Reports

FOR MEMBERS
My Company @ SRC
Liaisons

SRC VALUE
Awards Programs
Patents
Recruiter Guide
SRC Timeline

ACADEMIA
Researcher Resources
Funding Opportunities
Career Opportunities
Participating Universities
Education Alliance

4819 Emperor Blvd, Suite 300 Durham, NC 27703

Voice: (919) 941-9400 Fax: (919) 941-9450

Member Resources

SRC has collected information members provide for the academic community, including education, design, and prototyping. SRC researchers and students are encouraged to take advantage of these resources in their research and education activities

Intel

- Intel Open Data Center Diagnostic Project
- Intel Academic Compute Resource Environment (ACE)
- Intel Academic Program for oneAPI

Analog Devices

- Active Learning Program
- ADALM-SR1 Hardware
- ADALM-SR1 Switching Regulator Active Learning Module

ARM

ARM Academic Access
ARM Education

- ARM University Program Education Kits
- ARM Education Online Courses
- ARM Education Textbooks and Reference Books

Texas Instruments
Specific tutorial and curriculum for universities include:

- Texas Instruments University Program
- TI Robotics System Learning Kit
- TI Power Management Lab Kit
- TI Experimental Power Electronics Reference and Curriculum
- TI Precision Labs

IBM

- IBM tutorial and curriculum for universities
- IBM Skills Academy
- IBM + Coursera
- IBM PhD Fellowship Program
- IBM Quantum Computing - student opportunities
- IBM AI Hardware

NXP

- Rapid IoT Prototyping Kit

Siemens

- EDA Academic Products

Qualcomm

- University Relations Program

https://www.src.org/program/grc/guide/researcher/guidelines/

Reminder: Send News Items to SRC

- Send noteworthy events and announcements that you and your team are involved in to SRC

- Send this information on a monthly basis. We use what we can in our SRC newsletter and monthly emails to the Advisory Board and liaisons
  - Best Paper Awards (who, award, title of piece, where, when and photos of students/faculty)
  - Papers, posters presentations, and/or conference talks
  - Professional Recognition Awards: IEEE, teaching awards, etc.
  - Professional activities such as workshops, tutorials, and invited talks

More Than 17,000 subscribers!!

- All submissions must have a web link (URL) to the award, paper, etc.
  - If you have your own website that contains information pertaining to your research, share the link with SRC as well

SRC

https://www.src.org/newsroom/newsletter/

SRC Student Platform on LinkedIn

- What is the **SRC Research Scholars Program**?
  - SRC provides undergrads, graduate students, and postdoctoral researchers with a unique education consisting of traditional course work, cutting-edge research, and direct interaction with the semiconductor industry
  - These Research Scholars work on industry-relevant research with SRC-funded faculty who are recognized experts in their fields
  - Through our extensive community of academics and industry personnel, we nurture the evaluation of the talent pipeline for our industry and beyond
  - Our alumni have become industry leaders and renowned faculty researchers, creating a virtuous cycle where mojo begets mojo

SRC encourages all undergrads, graduate students, and postdoctoral researchers to join this program!!!

https://www.src.org/student-center/handbook/linkedin/

Join Now!

Get LinkedIn with SRC

SRC uses a special LinkedIn Affiliate page for the SRC Research Scholars Program. Undergrad, graduate students, and postdoctoral researchers participating on SRC research add their SRC Research Scholars experience to their LinkedIn profile. This allows Scholars a way to professionally showcase their talent and experience. It also simplifies how recruiters, engineers, and even other Scholars can find SRC Research Scholars, using either the LinkedIn Search* or LinkedIn Recruiter*.

SRC Research Scholars Program*

By being part of our community, Research Scholars will have a unique opportunity to get to know professionals with careers in the semiconductor industry or government, top researchers in their fields, and other students with similar interests.

Pillar Science Common Issues & Links for Academics

- There are lots of help articles in Pillar Science which can help answer these questions.

- Here's an article about logging into Pillar Science
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/11198322803099-How-To-Login-to-Pillar-with-SRC-org-Credentials
- Here's an article about update your profile in Pillar Science
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/10330492961563-How-to-Edit-Your-Profile
- Here's an article about adding students, administrators, or other academics to your project
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/10330872380187-How-to-add-Students-Admins-or-other-Academics-to-Your-Project
- Here's an article about submitting projects results and deliverables
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/11213311626139-How-to-Submit-Project-Results-previously-known-as-publications-
- SRC hosted a live demonstration for academics on January 31, 2023, and the recording is available
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/12543067480091-Pillar-Science-Demonstration-for-Academics-Video-Recording-

SRC

https://www.src.org/pillar/ https://app.pillar.science/news

Guidance for Depositing Supporting Code and Data with Pre-Publications

As part of our move to Pillar Science, there is the ability to collect not just the pre-publications PDF's but also arbitrary file formats (.mp4, .ppt, etc.) as well. This new capability enables a new way for SRC programs to facilitate technology transfer to our sponsors.

Going forward, we will be requiring that all code and supporting data below a certain size threshold to reproduce a pre-publication also be uploaded to Pillar Science.

- SRC's reasons for doing this are:

1. **To more fully document the research output of our programs to demonstrate to our sponsors the breadth and depth of the funded work**
2. The full value of code and data is not often found with its original author but when used across a wider scientific community like our sponsors
3. By having better data and code visibility in our programs, our sponsors will have a better understanding how to connect with researchers

Historically, there has been concern amongst researchers that the code and the data are not "camera ready" for distribution at the pre-publication state. **While these concerns are valid, perfect is the *enemy* of accomplishment.**

- SRC seeks to obtain a snapshot of your code at the state it was in when you submitted your publication to the SRC repository.
- If your code and data are not in a state that you would want to post on an open code repository like GitHub, that is acceptable. Our sponsors employ trained professionals who have the experience to handle and interpret idiosyncratic legacy code and documentation.
- SRC would also like the data collected and used to generate publications to be submitted to Pillar Science as well.
- **Preferably in a single compressed file in an open format marked with the publication's name followed by data so that it read like this, "[Publication Name]_data.ZIP".**

The submission of data to SRC is a direct ask, although it is a right granted by terms of the sponsored research agreement.

- **Contained within that compressed file should be the data used to generate figures, any code developed for that publication as well as any experimental data acquired if the file size is below 10 Mb.**
- If the data file is in a proprietary file format as often happens with analytical instruments, please convert it to an open format before uploading
- If you are not able to convert from proprietary file format to an open file format, please include it in the compressed data file anyway.
- If the data was acquired from an open depository like the UCI Machine Learning Repository, a notification of that along with a dated weblink in a .txt file should be included.

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https://www.src.org/pillar/ https://app.pillar.science/news

Pillar Science Common Issues & Links for Industry

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- Here's an article about update your profile in Pillar Science
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/10330492961563-How-to-Edit-Your-Profile
- Here's an article about adding yourself as a liaison
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/10092535189403-How-To-Add-Yourself-As-A-Liaison
- Here's an article about how to find research projects of interest
  - https://semiconductorresearchcorporation.zendesk.com/hc/en-us/articles/9194403647131-Using-Projects-Page
- There was 2 industry demonstrations for industry on February 14 and 21
  - The recordings can be found on the SRC.org website at : https://www.src.org/pillar/

Key Performance Indicators (KPI) Process Flow

SRC will be moving the KPI process to Pillar Science later in Q1'23
SRC will upload a XLS to edit within Pillar Science, PI will update throughout the year

KPIs sent to the PIs + Instructions* → PI fills out the KPI → SRC Quality Control → TTs + Vetting presentation** sent to members → Verified TTs reported to the master count → End of the year → Year-end report sent to SRC Members

- KPI instruction video is available: https://www.src.org/src/guide/kpi/

KPIs/TTs are part of annual review process

*TT = "meaningful" Technology Transfers

Because of well-defined KPI process flow, SRC members can maximize their research experiences with meaningful Technology Transfers.

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https://www.src.org/src/guide/kpi/

Intellectual Property Statement

- The information provided by researchers during this annual review
  - Is the property of the university and of the researchers presenting this information
  - May include research results sponsored by and provided to the funding members
  - May include intellectual property rights belonging to the university and SRC, to which sponsors may have license rights

- By attending or viewing this review, you are agreeing
  - Not to use this information for purposes unrelated to the review unless and until approved by SRC
  - To keep this information in confidence until the university and SRC have evaluated and secured any applicable intellectual property rights

- After any intellectual property rights have been secured, the SRC encourages the University and researchers to publish and freely disseminate this information and results of the sponsored research program.
  - Worldwide patent rights are waived if publication or public dissemination occurs prior to filing a corresponding U.S. provisional or utility patent application

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https://www.src.org/about/contracts-ip/#ip

General Data Protection Regulation

- Applies to SRC
- Personal data regulations
- Involves privacy notices, consent, and security
- SRC Privacy Policy

https://www.src.org/app/account/guide/privacy-policy/

E-Kickoff Agenda – Day 1

- 9 projects
- 10-minute presentations with 5-minute Q&A (live)
- Will be recorded to shared/reviewed after the event

Virtual Event
All Times in ET

SRC

https://www.src.org/calendar/e007775/

PKG e-Kickoff of New Projects: DAY 1 Wednesday, March 22, 2023		
Time (EST)	Title	Speaker
1:30 - 1:45 pm	Welcome & Introduction	John Oakley / SRC
New Projects		
1:45 - 2:00 pm	Task 3196.001: Developing Nanogranular Laminates: An Efficient Soft-magnetic Material for Sub-GHz Power Inductors	Ranajit Sai / Tyndall National Institute
2:00 – 2:15 pm	Task 2878.022: Interactions Between Electromigration and Fatigue of Regular and Low Temperature Solder Joints	Peter Borgesen / Binghamton - SUNY
2:15 – 2:30 pm	Task 2878.028: Optimizing Reliability of Solder Joints Reflowed at Temperatures Below 140C	Peter Borgesen / Binghamton - SUNY
2:30 – 2:45 pm	Task 2878.023: Interfacial Adhesion and Strength of Ultrathin Films Using Organic Monolayer Induced Surface Stress	Srinivasan Chandrasekar/ Purdue University
2:45 – 3:00 pm	Task 2878.024: Electromigration Failure in Sn Solder Joints	Marisol Koslowski / Purdue University
3:00 – 3:15 pm	Task 2878.025: Thermomechanical Reliability Investigation of Barrier/Liner/Seed Layer Options for Nanoscale TSV (< 1 µm)	Tiwei Wei / Purdue University
3:15 – 3:30 pm	Task 2878.026: Co-design Scheme for Thermal Management with Backside Power Delivery for High-Power 3D Packages	Liang Pan / Purdue University
3:30 – 3:45 pm	Task 2878.027: Experimental Characterization of Thermal Shadowing Effect and AI Driven (deep learning) Optimization of Boiling Enhancement Coatings for Single- and Two-phase Immersion Cooling	Bahgat Sammakia / Binghamton - SUNY
3:45 – 4:00 pm	Task 3179.001: Enabling Electromigration Solver for Solder Joint with Various Packaging Structures and Alloys	Choong-Un Kim / University of Texas - Arlington

E-Kickoff Agenda – Day 2

- 10 projects
- 10-minute presentations with 5-minute Q&A (live)
- Will be recorded to shared/reviewed after the event

Virtual Event
All Times in ET

PKG e-Kickoff of New Projects: DAY 2 Thursday, March 23, 2023		
Time *(EST)*	**Title**	**Speaker**
New Projects		
1:30 – 1:45 pm	Task 3180.001: AI-Assisted Design-on-Simulation Technology for Advanced Packaging	Kuo-Ning Chiang / National Tsing Hua University
1:45 – 2:00 pm	Task 3181.001: Electromigration Research for Flip-Chip, Hybrid, and 3-D Packaging	Dryver Huston / University of Vermont
2:00 – 2:15 pm	Task 3182.001: Tunable Thermal Conductivity, Dielectric Strength Biobased Molding Compounds and Die-Attach Adhesives	Nandika A. D'Souza / University of North Texas
2:15 – 2:30 pm	Task 3183.001: Characterization of Interfacial Adhesion over Small Surface Areas	Kenneth Liechti / University of Texas - Austin
2:30 – 2:45 pm	Task 3184.001: High-Capacity, Low-Cost, 100-250GHz Wireless and Waveguide Interface Packages	Mark Rodwell / UC – Santa Barbara
2:45 – 3:00 pm	Task 3185.001: Electrodeposition of High Moment-High Resistivity CoFeX (X=P, O) Alloys for Inductor Application	Stanko R. Brankovic / University of Houston
3:00 – 3:15 pm	Task 3186.001: Socketable BGAs by Surface-Modification of Solder Spheres with Bi-Based Coatings	Vanessa Smet / Georgia Tech
3:15 – 3:30 pm	Task 3187.001: Optical DAC-based 64QAM Transmitters in a Silicon-Interconnect-Fabric 3D Package	Sajjad Moazeni / University of Washington
3:30 – 3:45 pm	Task 3188.001: Integrated Power Delivery Methodology for 3D ICs	Boris Vaisband / McGill University
3:45 – 4:00 pm	Task 3195.001: Physics Informed Active Learning for Electrical Analysis of Second Level Interconnects	Ahmet Durgun / Middle East Technical University

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https://www.src.org/calendar/e007776/

Thank You!

Opens?

John Oakley
Science Director
John.Oakley@src.org

Packaging Research Program

PKG

The application drivers for Packaging technologies have evolved significantly as computing devices continue to evolve along a few emerging market vectors:

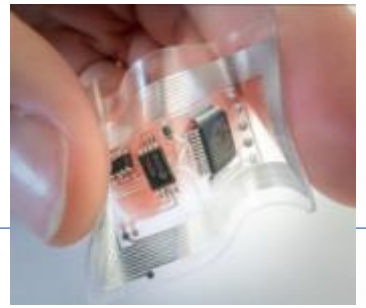
- Small, flexible, light, easy-to-use interconnected consumer devices
- Cloud based computing (high compute density in data centers and servers)
- Embedded computing offering greater degree of control (automotive, commercial, space)
- Green, high performance in ergonomic and small form factor mobile applications (IoT)

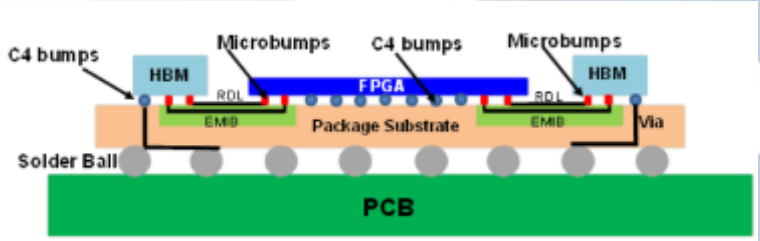
Current Research focused on:

- Global interconnects, including optical
- Power delivery and Thermal management
- Metrology, modeling, and test
- Reliability including electro migration
- Solder joint, under bump metallization, and ball grid array
- Advanced wire bond packaging for low-cost packaging

Future Research Directions

- New Research focus areas will include:
  - Heterogeneous Integration (HI) is a Product Differentiator
  - Packaging for automotive and extreme environments
  - Flexible packages
  - Advanced Sensor Packaging
- **Additionally, SRC is partnering in road-mapping efforts for HI (IEEE HIR)**





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https://www.src.org/program/grc/pkg/

SRC Liaison Program

Maximizing the Value of Participation

Move Yourself, Your Company and the Next Generation Forward

Expectation to have regular PI-Liaisons calls at least one every 4-8 weeks

Develop the Workforce

- Provide relevant guidance for industry challenges
- Prepare students to enter industry or pursue future academics

Contribute to Research

- Encourage technology exchange between university and industry
- Bridge the conventional gap between academia and industry

Academia Contributes to Industry

- Provide an out of the box approach to current problems which enhance industry research and development enables a differentiated product for the marketplace
- Provide an outside perspective adding diversity to the thought process of how best to attack a challenge

Access New Technology

- Gain valuable insights into problems and solutions that will ultimately impact industry competitiveness
- Provide an effective way to deliver actionable research results directly into their companies

Identify the Best

- Identify the most compelling research from current and recent research

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https://www.src.org/liaison/

SRC's Amazing Community

Academics solving meaningful problems
Increase of tech transfer to industry
Clear investment Return Of Investments

SRC Program Manager

- Runs Advisory Board and aligns research
- Educates PI about requirements and responsibilities
- Encourages Liaison participation
- Finds opportunities for further engagement

University Principal Investigator

- Pursues ambitious, ground-breaking research
- Schedules regular calls, every 4-8 weeks
- Arranges meet-ups at conferences
- Presents research at annual reviews

Research Scholar

- Leads meetings
- Presents findings
- Aims to present at TECHCON
- Is knowledgeable about SRC members

Industry Liaison

- Provides industry perspective to PI
- Transfers technology & people into company
- Advocates for SRC research
- Coordinates with Advisory Board

SRC