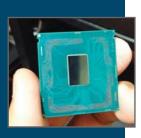
Advanced Packaging Update: Market and Technology Trends

Vol. 2-0819



This issue of the Advanced Packaging Update presents new developments in advanced packaging substrates, including high-density RDL interposers. Intel's packaging announcements are described. A special section examines mobile phone trends, including a comparison of 5G vs. non-5G phones and packages found in feature phones. TechSearch International's annual survey on substrate design rules is highlighted, with special coverage of suppliers of laminate flip chip BGA and CSP substrates worldwide. The design rules include body size, core thickness, via and pad diameter, minimum bump pitch supported, and substrate finish.



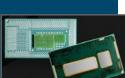






Table of Contents

- 1 Industry and Economic Trends
- 1.1 Economic Trends
- 1.1.1 U.S. Macroeconomic Trends
- 1.2 Trade Friction
- 1.3 OSATs
- 1.4 TSMC's Outlook

2 Mobile Phone Trends

- 2.1 Packaging Trends for 5G Smartphones
- 2.1.1 5G Modem Packages
- 2.1.2 5G RF Transceiver Packages
- 2.1.3 5G Power Management Packages
- 2.1.4 5G RF Front-End Module Packages
- 2.2 Galaxy S10+ and S10 5G Comparison
- 2.3 Feature Phones

3 Advanced Substrate Developments

- 3.1 RDL Interposers
 - 3.1.1 RDL Substrate Developments Samsung, Shinko Electric, Toppan, TSMC, Unimicron
 - 3.1.7 High-Density Substrate Demand
- 3.2 Intel's Strategic Packaging Direction
- 3.2.1 Laptops
- 3.2.2 Thin Core Substrates
- 3.2.3 Embedded Bridge and 3D Configurations
- 3.2.4 Substrate Supplier Developments
- 3.2.5 Test is Key
- 3.2.6 Thermal Development
- 3.3 Glass Substrates
 - AGC Incorporated, Dia Nippon Printing, Unimicron
- 4 Substrate Design Rules
- 4.1 Today's Laminate Feature Size
- 4.2 Company Design Rules ACCESS, ASE Materials, AT&S, Daeduck, Daisho Denshi, Fujitsu Interconnect Technologies, Haesung DS, Ibiden,

i3 Electronics, Kinsus, KCC, Kyocera, LG Innotek, Nan Ya PCB, SEMCO, SCC, Shinko Electric, Simmtech, Toppan, Unimicron

Appendix: Substrate Suppliers

List of Figures

- 1.1. Monthly U.S. housing starts.
- 2.1. Galaxy S10 5G triple-stack design.
- 3.1. Cross-section of i-THOP®.
- 3.2. Organic interposer on build-up substrate.
 - 3.3. Unimicron RDL substrate process.
 - 3.4. Future coreless with embedded bridge.
 - 3.5. Foveros technology.
 - 3.6. Fine-pitch and coarse-pitch Cu-bridge TGVs.

List of Tables

- 1.1. OSAT Revenue Q2 2018 vs. Q2 2019
- 2.1. 5G Smartphones in Mass Production
- 2.2. 5G Modem Specifications
- 2.3. 5G RF Transceiver Specifications
- 2.4. PMIC and ET Specifications
- 2.5. 5G RFFE Module Specifications
- 2.6. Specifications for Galaxy S10+ and S10 5G
- 2.7. Comparison of Galaxy S10+ and S10 5G Chips
- 2.8. Nokia Feature Phone Examples
- 2.9. Alcatel Go Flip Features
- 3.1. High-Density RDL Interposers
- 3.2. Toppan RDL Interposer Design Rules
- 3.3. Market Projections for High-Density Panels
- 3.4. Intel Packaging Trends

Austin, Texas 78759

- 4.1. Build-up FC-PBGA Substrate Suppliers
- 4.2. Build-up FC-CSP Substrate Suppliers
- 4.3. Laminate PBGA/CSP Substrate Suppliers

Tel: 512-372-8887 • Fax: 512-372-8889

tsi@techsearchinc.com • www.techsearchinc.com

4.4. IC Package Design Rules by Company



Annual subscription – \$5,100 (4 issues) Single issue – \$2,500 Corporate license – \$8,750