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Express DFM: Copper Weight

Copper weight and line width/spacing design rule check (DRC) violations are two of the most common reason jobs go on hold in our CAM department. This type of hold cannot be resolved without assistance from our customers. The following is a breakdown of achievable copper weight and line width/spacing combinations:

Inner Layer Copper	Min. Line Width	Min. Space
2oz Copper (.0028" +/- .0003")	.008"	.008"
3oz Copper (.0042" +/- .0004")	.010"	.010"
4oz Copper (.0056" +/- .00055")	.012"	.012"

Finished Outer Layer Copper	Min. Line Width	Min. Space
2oz Copper (.0028" +/- .0003")	.006"	.006"
3oz Copper (.0042" +/- .0004")	.008"	.008"
4oz Copper (.0056" +/- .00055")	.012"	.012"

These guidelines yield excellent results without the need for increased overage and reduced manufacturability but they are not design limitations in all cases. If your design exceeds these limitations please contact us to discuss the manufacturability of your design.



CIRCUIT EXPRESS, INC.

304 S. Rockford Drive, Tempe, Arizona 85281

ISO 9001/AS9100 CERTIFIED

- 24, 48, and 72 Hour Turns

- 5 Day Standard Delivery for 2 to 10 Layer Prototypes

- 3 mil Trace/Space, Blind/Buried Vias, Advanced Controlled Impedance

- RoHS Materials, Rogers, Polyimide, Duroid & More!

The CIRCUIT EXPRESSION

The Circuit Express Company Newsletter

Tempe, Arizona, USA

Volume XXV, 2nd Quarter 2010

2010 is certainly off to an exciting beginning for CEI!!! We were very excited to announce that Circuit Express, Inc. was acquired by Advanced Circuits, Inc. (Aurora, Colorado) as of March 11, 2010. This is definitely a case where two very successful entities were able to come together to create a bigger and better whole. Advanced Circuits and CEI complement each other very well, and we are excited about the benefits and expanded capabilities that each organization brings to the other. Please see further details inside this newsletter edition about the recent acquisition.

We also have entered this first part of the year very excited about our microvia capability, and have a dedicated section in this newsletter to this advanced technology. Through our consistent capital expenditures, highly skilled workforce, and our strong quality systems, we have continued to increase our capabilities. Today CEI is consistently producing very advanced technologies including: .003/.003 trace/space, .006 mechanical drilling, via-in-pad, blind and buried vias, extensive controlled impedance, high copper weights, etc. Our website www.circuitexpress.com does a good job of outlining our capabilities and technology road map. Please enter our website and click on the Technical Info tab. In addition, if you have any questions about our capabilities or any other PCB related question please email askus@circuitexpress.com and you'll receive a quick reply from a member of our team.

We hope you enjoy this issue. Thank you for your continued support and business.

-Travis Bice, May 2010



CIRCUIT EXPRESS, INC.
ISO 9001/AS9100 CERTIFIED

"Time Critical PCB Solutions"

Advanced Circuits Acquires CEI

On Thursday, March 11, 2010, Advanced Circuits acquired Circuit Express. We have issued press releases, called and visited customers, and have issued notices that were attached to all of our quotes and order confirmations to make everyone aware of the acquisition. Unlike many buyouts that have occurred in the PCB industry, the ACI/CEI acquisition is very different in that both companies are very profitable, and each company specializes in different service offerings with very little overlap.

Also important is that the combined companies can now plan a future with expanded capabilities and product offerings never before available to our combined customer bases. Over the next 6-18 months Circuit Express will also see new and improved technology/capability offerings brought about by new equipment purchases. This will further CEI along its course for being known as one of the fastest and high tech PCB manufacturers in the North American PCB industry.

The combined 2009 revenues of Advanced Circuits and Circuit Express were over \$65M placing us in the top five largest PCB manufacturers in North America. 2010 will be a record year for shipments and our strong customer relations, profitable operations, and strong financial backing from Compass Diversified Holdings will ensure further growth into new advanced technologies and service offerings.

Please contact your CEI direct sales representative, Chris King, or Travis Bice with any questions regarding our acquisition.

Employee Spotlight

This newsletter's employee spotlight is on John Eggerling. John works in the Customer Service Department and celebrated his one year anniversary with the company on April 20th. John joined Circuit Express with experience in creating and editing PCB parts libraries using many design/layout software platforms. John has completed over 4,500 quotes in the past year that have resulted in over 2,100 orders and over \$3M in revenue for CEI!

John is married to Jamie and they have an 18 month old son named Ryan. John grew up in Chicago but moved to Phoenix and has since become a die-hard Arizona Cardinals fan. He enjoys all sports but football is his favorite sport to watch from his sofa!

When football season is over, or the Cardinals aren't playing, John enjoys shooting digital photography with Jamie's camera. Both John and Jamie take a lot of photos and most of them are of Ryan!

Circuit Express' strength comes from the dedication and hard work from employees like John Eggerling! Thanks John! He can be reached at x224, and je@circuitexpress.com.

Useless Knowledge

- Camel's milk does not curdle.
- Reindeer like to eat bananas.
- "I am." is the shortest complete sentence in the English language.
- The world's smallest mammal is the bumblebee bat of Thailand, weighing less than a penny.
- The Sanskrit word for "war" means "desire for more cows."

Employees of the Quarter

Congratulations to Larry Watson from our Deer Valley factory and Ramila Patel from our Tempe factory for being voted by their peers as Employees of the Quarter!

Larry Watson has been with CEI for over 5 years and is our lead over lamination, drill, and rout in our Deer Valley factory.

In Tempe, Ramila Patel has been with us for 6 years and works in the Artwork Department where she performs all aspects of phototool production.

Both employees are well known for their dedication, work ethic, and excellence attendance. Congratulations to Larry and Ramila for this honor.

Each will receive a \$250.00 bonus!

Quotable Quotes

"Some people are born on 3rd base and go through life thinking they hit a triple." -Barry Switzer

"The worst thing about new books is that they keep you from reading the old ones." -John Wooden

"When you play, play hard; when you work, don't play at all." -Theodore Roosevelt

"In matters of style, swim with the current, in matters of principle, stand like a rock." -Thomas Jefferson

"Baseball is ninety percent mental and the other half is physical." -Yogi Berra

Employee Anniversaries

The following employees celebrated anniversaries with Circuit Express during the last several months. Their contributions to the success of our company are greatly appreciated!

Over 15 Years	Years	Over 3 Years	Years
Phil Gallegos	25	Tu Thi Bui	3
Ton Ngo	17	Sixto Gomez Lopez	3
Over 10 Years		Crystal Hardy	3
David Baker	14	Maria Hernandez	3
Mark Balderas	11	San Ho	3
Juana Juszyk	14	Tara Jewell	3
Quang Quach	10	Kham Onpeng	3
Cecilla Turner	10	Debbie Talucci	3
Over 5 Years		Todd Ward	3
Mary Black	8	Teri Lynn White	3
Cuoi Chin Tran	6	Jeff Williams	3
Bruce Clark	8	Over 1 Year	
Lueann Gillett	6	Will Benner	1
Vojsava Golemi	8	Juanito Buan	1
Wink Horst	8	Bobbi Callaway	1
Jacob Lopez	7	Miguel Dominguez	1
Joan O'Leary	6	John Eggerling	1
Tracy Scott	7	Rhiannon Protuck	1
Doug Skree	8	Maria Villasaez	1

Tech Talk: Microvias

Circuit Express now offers high quality microvia boards and is currently providing quotes for IPC/JPCA-2315 (Design Guidelines) Type I and Type II HDI constructions built and certified to IPC-6016. As a supplier of high reliability blind and buried vias for over 15 years for commercial and military/aerospace/defense customers, microvia technology logically makes Circuit Express an option for advanced technology PCB designs.

Currently, Circuit Express is building both Type I and Type II microvia structures. Type I microvias describe an HDI in which there are laser-drilled blind vias through a single layer on either or both sides of an outer layer core as well as through vias. Type II microvias include laser-drilled microvias with buried vias and can accommodate the use of buried and blind vias sharing a layer directly below the outer core(s) from one or both sides.

CEI plates all microvia holes using the MacDermid MacuSpec VF100 electrolytic copper metallization plating chemistry to achieve world-class microvia-in-pad PCBs. This vertical, direct current (DC) acid copper bath produces excellent results and will be necessary to achieve the next level of HDI (Type III stacked) vias as well as ever increasing aspect ratios that can't be achieved with conventional copper plating.

The following is a summary of Circuit Express' current microvia capabilities:

Laser-Drilled Microvia Capability	Standard	Advanced
Smallest Laser Microvia Hole Size	0.005	0.004
Via Aspect Ratio	0.5:1	0.8:1
Capture Pad	.005 Via / .012 Pad	.004 Via / .010 Pad
Landing Pad	.005 Via / .012 Pad	.004 Via / .010 Pad
BBV Mechanical Drill (Type II)	0.008	0.006
Stacked Via	No	No
Type I Capabilities	Yes	Yes
Type II Capabilities	Yes	Yes
Type III Capabilities	No	No
Copper Filled Microvia	Yes	Yes
Smallest Copper Filled Microvia	0.005	0.004
Copper Filled Microvia Aspect Ratio	0.5:1	0.8:1

The need for extreme miniaturization and improved electrical performance required shorter pathways and has created complex routing problems for our customers. Over the last 24 months we have invested over \$600,000 in plating technologies and automated optical inspection (AOI) equipment required to build microvias. We commonly see .004" laser vias drilled into .010" pads with down to .008" soldermask-defined pads! To learn more about this service offering please contact your CEI salesperson or send in your design for review and quotation.

We look forward to working with you on your next microvia PCB!