APCT

Passion | Commitment | Trust

The Most Extensive Value Proposition In The Industry

An APCT Guide For Design

APCT Passion | Commitment | Trust

ADVANCED CIRCUITS A Division of APCT

One Company | One Team

APCT.com | 4PCB.com

Printed Circuit Board Solutions

Corporate Overview

Annual Revenue:	$200+ Million
Facility:	390,000 Sq. Ft.
Employees:	900+
U.S. Manufacturing Sites:	7 Sites
Global Distribution Sites:	6 Sites
Working Shifts:	3 Shifts - 24 Hrs/Day

President / CEO:	Steve Robinson
Chief Technology Officer:	Eric Schmidt
Chief Operating Officer:	Ruben Zepeda
Chief Sales Officer:	Bruce McMaster
Chief Financial Officer:	Joe Gisch

- ISO 9001 Certified
- AS9100D Certified
- MIL-PRF-31032 Certified
- MIL-P-55110 Certified
- MIL-P-50884 Certified
- ITAR Registered At All Sites
- IPC 6012 Class 3 & 3A/ES
- IPC 6013 Class 3 & 3A/ES
- IPC 1791 Trusted Electronics Qualified Manufacturers Listing*

**APCT Anaheim & Orange County Only*

RIGID THROUGH-HOLE

Standard:	1-28 Layers
Advanced:	30-38 Layers
Development (NPI only):	40+ Layers

HDI; BLIND/BURIED/STACKED VIA

Lam Cycles:	Up to 8x
Micro BGA Pitch:	0.2 Millimeters

FLEX / RIGID-FLEX

Standard Flex:	1-6 Layers
Rigid Flex:	4-22 Layers
Rigid Flex HDI Lam Cycles:	Up to 2x

RIGID THROUGH-HOLE

1-6 Layers:	Same Day
8-10 Layers:	24 Hours
12-24 Layers:	48 Hours

HDI; BLIND/BURIED/STACKED VIA

HDI	5-12 Working Days
Via-in-Pad:	3 Working Days

FLEX / RIGID-FLEX

Flex 1-6 Layers:	5-15 Working Days
Rigid Flex 4-22 Layers:	20+ Working Days
Rigid Flex HDI 2x Lam Cycles:	30 Working Days

Printed Circuit Board Solutions

Corporate Overview

Oversized Boards: 37" x 120"
Heavy Copper: Up to 20oz.
Cavity Boards
Buried Resistor Capability
Heat Sink Bonding Capability
RF & Microwave Technology

NPI & Prototypes
Mid to Full-Ramp Domestic Production
High Volume Manufacturing Management of Offshore Programs

APCT Global is a complete solution provider for Offshore printed circuit board sourcing, with domestic manufacturing infrastructure and domestic quality inspection.

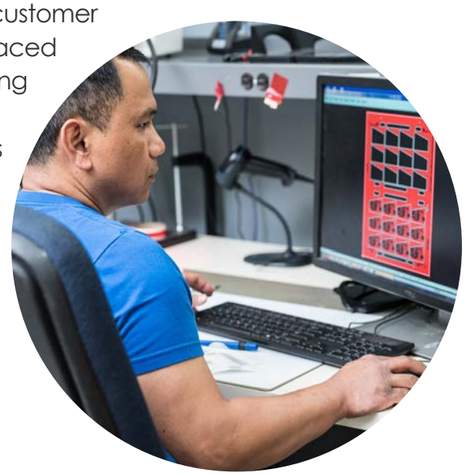
APCT Global offers custom program management by PCB experts, who are dedicated to meeting your specific needs.

Design at APCT is viewed as a "Value Add" to our customer base only. A corporate culture of accuracy, commitment to schedule, knowledge, and quality will lead to the reliable manufacturing of the robust designs of the future.

Assembly at APCT is viewed as a "Value Add" to our customer base only. We offer both through-hole and surface mount capabilities, supporting prototype quantities of standard technology.

Guide For Design

Design at APCT is viewed as a "Value Add" to our customer base only. The reliability of a PCB can always be traced to its design. APCT is not alone in always encouraging our customers to have us involved early in design strategy. We are now proud to offer design services that will support superior execution in fabrication.



- Defense and Aerospace
- Computing & Networking
- Telecommunications
- Industrial / Automotive
- Medical

- **High Density Interconnect (HDI)**
  As PCB form factors decrease and functionality increases, the result is a very dense packaging challenge that often must incorporate blind and buried vias, laser microvias, via-in-pad and complex stack-ups. The potential for electromagnetic interference (EMI) impacting design performance is high.

  At the APCT Design Center, our designers have strong working knowledge of EMI principles and work closely with product engineers to ensure that packaging complexity does not translate to issues in signal or power integrity.

- **Signal/Power Integrity Design**
  There is more than one way to layout a PCB. However, there may only be one way that meets a design team's goal for price and performance. Working with a layout team that provides a range of options, ensures the best layout and fabrication strategy is pursued.

  At the APCT Design Center, our designers recognize that its customers want to understand their options and trade-offs as part of the layout and fabrication strategy development process.

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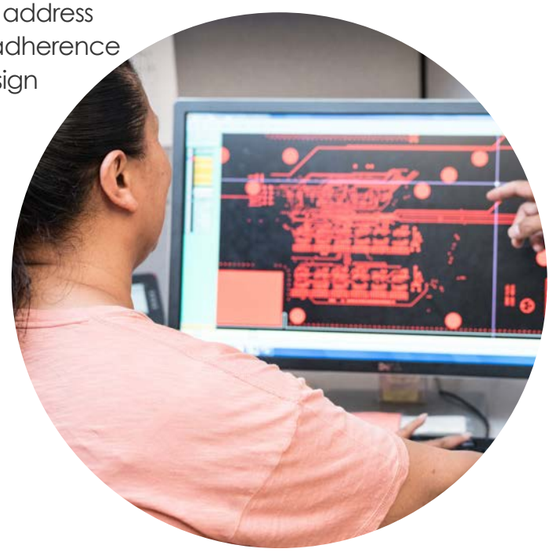
Guide For Design

- **Dense High-Speed Digital**
  As data rates increase, so does the need for transmission speed. This can drive signal integrity quality issues such as crosstalk, reflection, and signal loss. Products incorporating dense high-speed digital circuitry normally have rapid product development cycles. The need for experienced designers is critical.

  At the APCT Design Center, our designers have significant experience dealing with the common challenges inherent in this technology.

- **RF and Rigid Flex**
  Normally, products that use RF technology also use rigid flex circuitry. From a design standpoint, that drives a host of challenges in the stack-up. Bend areas must be designed to minimize stress on component solder joints, while considering the signal integrity implications of a design that bends.

  At the APCT Design Center, our designers address these challenges with a combination of adherence to the most current industry- standard design rules and the expertise developed over decades of design experience.



- Altium Designer / PDN
- Allegro
- PADS PCB
- Xpedition PCB

- Altium Schematic
- ORCAD Capture
- PADS Logic
- xDX Designer

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Design For Manufacturability (DFM)

The core competency of the company is detailed engineering support enabling superior execution. Our highly skilled DFM Engineers are available to work directly with your PCB designers or product development staff, supporting the implementation of a cost efficient, high reliability design. This early support will result in reduced cycle times, improved yields and increased product development success. Early involvement of APCT Engineering can save your company both time and money.

Manufacturing
Pre ECO Design Review
Comprehensive Tooling Review

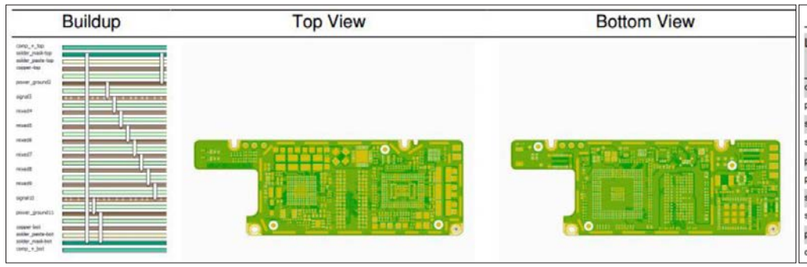
Design Review & Analysis
Process Capabilities
Material Selections
Finish Requirements

Impedance Calculation
Single Ended
Horizontal Differential
Broadside Differential

Panel Utilization & Array Drawings
Maximize Array for Assembly
Optimize Panel Utilization

Developing New Technologies
Engineering Development
to meet future Requirements

Central Corporate Contacts
Knowledgeable Staff
Field Support

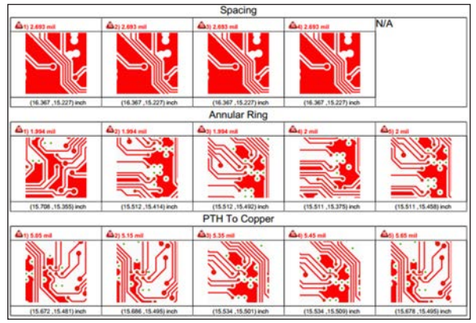


DFM Analysis (Cont.)

Layer	Min PTH To Cu (mil)	Typ PTH To Cu (mil)
copper-top	9.8 (# 8)	10.1 (# 434)
power_ground2n	4.7 (# 5)	7.1 (# 1050)
signal3	7 (# 2)	10.1 (# 386)
signal4	7 (# 2)	10.1 (# 440)
power_ground5n	4.7 (# 6)	7.1 (# 1189)
power_ground6n	4.7 (# 6)	7.1 (# 1246)
signal7	7 (# 2)	10.1 (# 379)
signal8	7 (# 2)	10.1 (# 434)
power_ground9n	4.7 (# 5)	7.1 (# 1053)
copper-bot	7 (# 2)	10.1 (# 387)

DFM Analysis

Layer	Minimal Spacing (mil)	Typical Spacing (mil)	Minimal AR (mil)	Typical AR (mil)	Minimal Line Width (mil)	Typical Line Width (mil)
copper-top	0.3 (# 2)	5 (# 897)	5 (# 2)	5.1 (# 1284)	1 (# 320)	8 (# 1087)
power_ground2n	1 (# 1)	1 (# 1)	0 (# 8)	12 (# 24)	N/A	N/A
signal3	2 (# 1)	5 (# 642)	5 (# 2)	5.1 (# 1380)	5 (# 770)	5 (# 770)
signal4	2 (# 1)	5 (# 700)	5 (# 2)	5.1 (# 1379)	5 (# 779)	5 (# 779)
power_ground5n	12 (# 2)	12 (# 2)	0 (# 7)	6.1 (# 29)	N/A	N/A
power_ground6n	12 (# 7)	12 (# 7)	0 (# 7)	6.1 (# 28)	N/A	N/A
signal7	2 (# 1)	5 (# 486)	5 (# 2)	5.1 (# 1385)	5 (# 632)	5 (# 632)
signal8	2 (# 1)	5 (# 707)	5 (# 2)	5.1 (# 1385)	5 (# 804)	5 (# 804)
power_ground9n	1 (# 1)	1 (# 1)	0 (# 8)	12 (# 24)	N/A	N/A
copper-bot	0.3 (# 2)	11.7 (# 553)	5 (# 1)	5.1 (# 1270)	1 (# 320)	5 (# 1032)
Summary	0.3		0		1	



If you have any further questions you may contact
DFM Support at

Printed Circuit Board Solutions

Corporate Manufacturing Capabilities

ATTRIBUTES	Standard	Advanced	Development (NPI Only)
Panel Sizes	12 x 18, 18 x 24, 21 x 24	20 x 26	21 x 27
Layer Counts	2 - 28	30 - 42	44 +
Flex Layer Counts	2 - 6	8 - 10	12 +
Rigid Flex Layer Counts	4 - 14	16 - 24	26 +
Cavity Sizes	1.0" x 1.0"	.750" x .750"	< .500" x .500"
LAMINATES - MATERIALS	**Standard**	**Advanced**	**Development (NPI Only)**
Pb Free RoHs - 170+ Tg FR4	Yes	Yes	Yes
Med Loss - FR408HR,MEG 4, -13EP	Yes	Yes	Yes
Low Loss - MEG 6, I-Speed, IteraMT40	Yes	Yes	Yes
Ultra Low Loss - Tachyon100G, EM890K, MEG 7	Yes	Yes	Yes
Polyimide	Yes	Yes	Yes
Rogers Laminates	Yes	Yes	Yes
Flex - Dupont AP	Yes	Yes	Yes
Flex - Dupont LF	Yes	Yes	Yes
Flex - Dupont FR	Yes	Yes	Yes
Halogen Free	Yes	Yes	Yes
IMAGED TRACE / SPACE / PAD	**Standard**	**Advanced**	**Development (NPI Only)**
Internal Line Width	.003"	.002"	.0015"
Internal Spacing	.003"	.002"	.0015"
External Line Width	.003"	.002"	.0015"
External Spacing	.003"	.002"	.0015"
Minimum pad	.015"	.008"	.006"
Impedance Tolerance	10%	5%	<5%
SMT Pitch	.010"	.008"	.006"
VIA - PTH TOLERANCES	**Standard**	**Advanced**	**Development (NPI Only)**
Smallest Drilled Via	.0079"	.005"	.004"
Aspect Ratio	10:1	16:1	20:1
Minimum Cu Clearance to Hole	.008"	.006"	.0045"
PTH Tolerance [+/-]	.003"	.002"	.0015"
NPTH Tolerance	.001"	.001"	.001"
Back Drill Depth Tolerance	.005"	.003"	.002"
HDI CAPABILITIES	**Standard**	**Advanced**	**Development (NPI Only)**
Sequential Lamination	3x Lam Cycles	7x Lam Cycles	8x Lam Cycles
Laser Micro Vias	.004"	.003"	.0025"
Blind Apsect Ratio	.75:1	1:1	1.2:1
Blind/Buried Vias	.005"	.004"	.003"
Via in Pad	Epoxy or Copper Filled	-	-
Laser Routing Board Thickness	<.040 "	.040"-.062"	.062" +
SOLDER MASK-NOMENCLATURE	**Standard**	**Advanced**	**Development (NPI Only)**
LPI Soldermask	Green, Blue, Red, Clear	Black, White, Purple	All Colors
Minimum Clearance	.002"	.001"	.0005"
Minimum Web	.004"	.003"	.002"
Legend Color	White	Black, Yellow, Orange	All Colors
TEST & MEASUREMENT	**Standard**	**Advanced**	**Development (NPI Only)**
Flying Probe Test	Yes	Yes	Yes
Fixture Test	Yes	Yes	Yes
TDR	Yes	Yes	Yes
Ionics	Yes	Yes	Yes
CMI XRF	Yes	Yes	Yes
D Coupon	Yes	Yes	Yes
IST	Yes	Yes	Yes
HI-POT	Yes	Yes	Yes

APCT

Passion I Commitment I Trust

Passion

To Provide Ultimate Customer Satisfaction

Commitment

To Service and Execute with High Reliability

Trust

To Be Earned By Our Actions

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ADVANCED CIRCUITS
A Division of APCT

One Company | One Team

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