Excelpoint™

BC6888 Bluetooth Application Note

Excelpoint FA

Nov. 2009

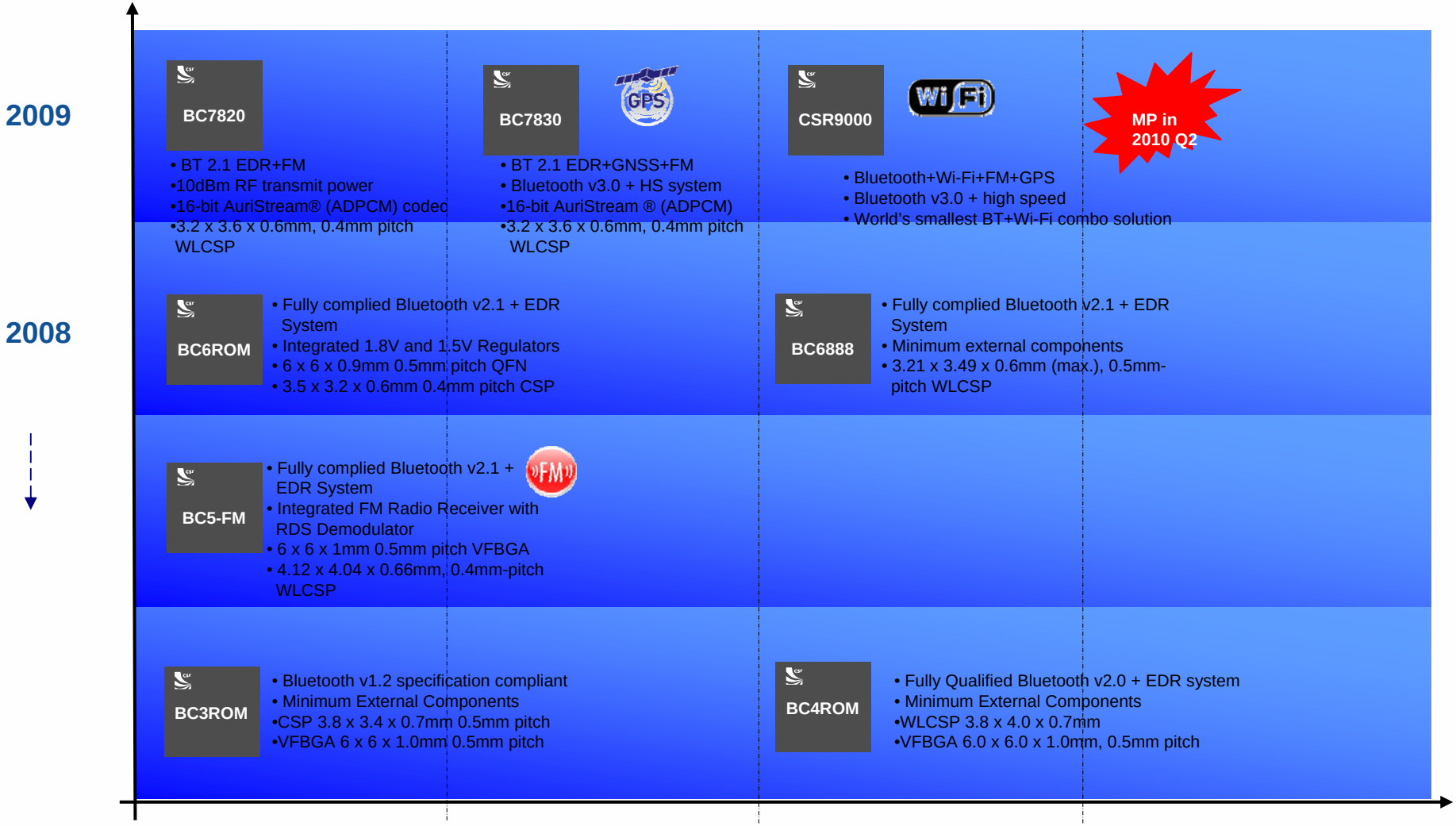
Agenda

- **BC6888 Overview**
  - CSR Roadmap
  - Features
  - Functional Block
- **BC6888 Bluetooth Reference Design**
  - Schematic Design Guideline
  - Layout Guideline
- **Bluetooth Performance**
  - Power Consumption
  - Migrate from BC3A18 to BC6888
- **Summary**

Excelpoint™

BC6888 Overview

CSR Bluetooth ROM Chip Road Map



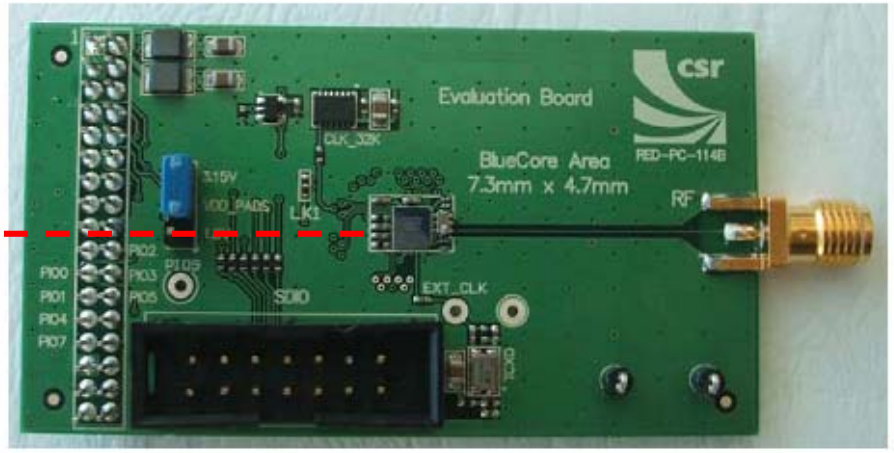
CSR BC6888 Features

Bluetooth Radio

- Bluetooth v2.1 + EDR Specification compliant
- +9dBm maximum RF transmit power
- Receiver sensitivity of -90dBm
- Support for 802.11 coexistence
- Class1 Performance without external PA/LNA

3.21 x 3.49 x 0.6mm (max.)

0.5mm-pitch WLCSP



CSR BC6888 Features

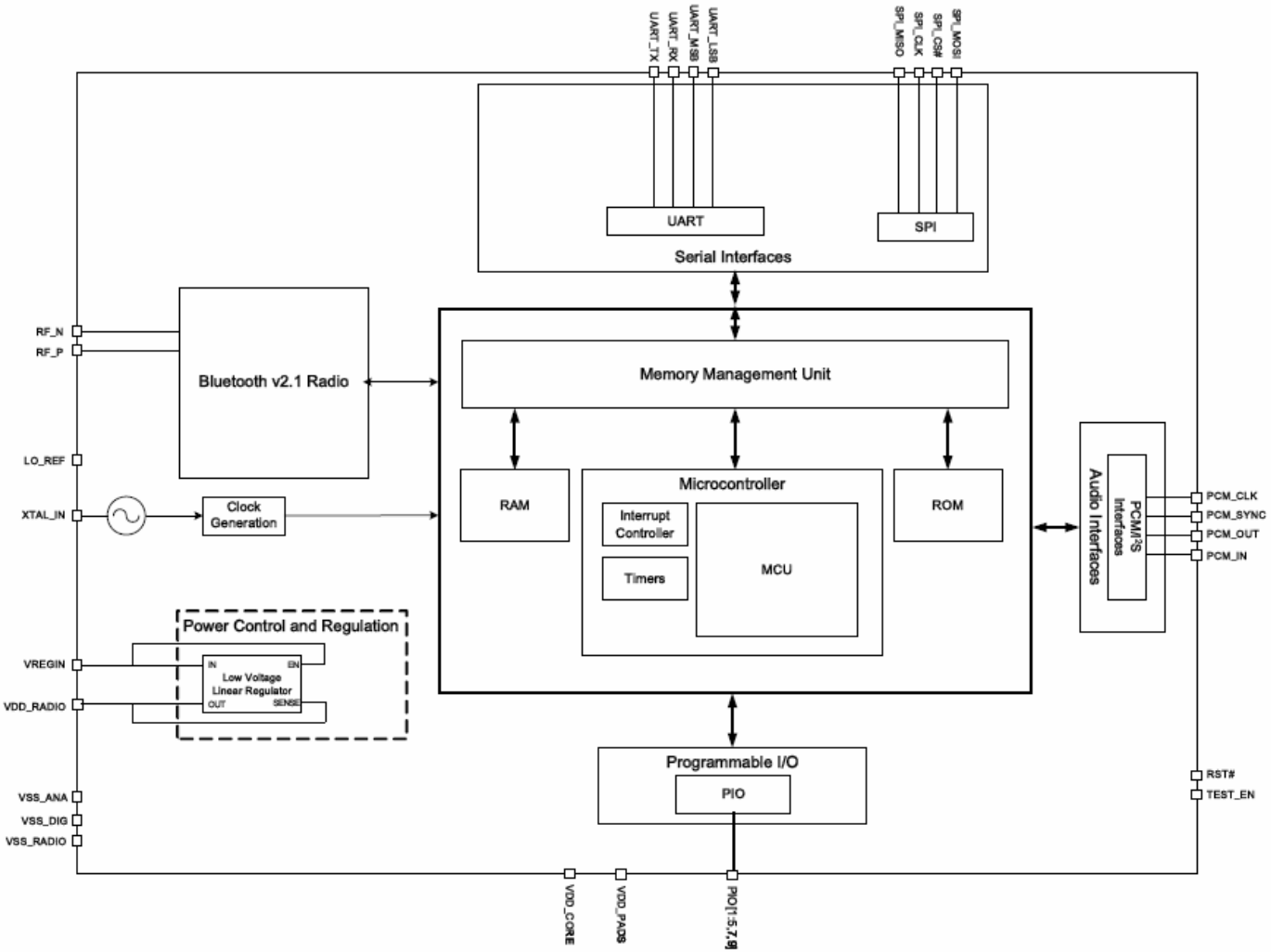
Baseband and Software

- AuriStream (16, 24, 32, 40 kbps) codec
- Internal 48kbyte RAM, allows full speed data transfer
- SPI interface up to 4Mbits/s for system debugging
- UART interface with programmable data rate up to 4Mbaud
- Bi-directional serial programmable audio interface supporting PCM and I2S formats

Auxiliary Features

- Clock request output to control an external clock
- On-chip low dropout linear regulator producing 1.5V core voltage from 1.8V
- Standard HCI over UART

Functional Block



Excelpoint™

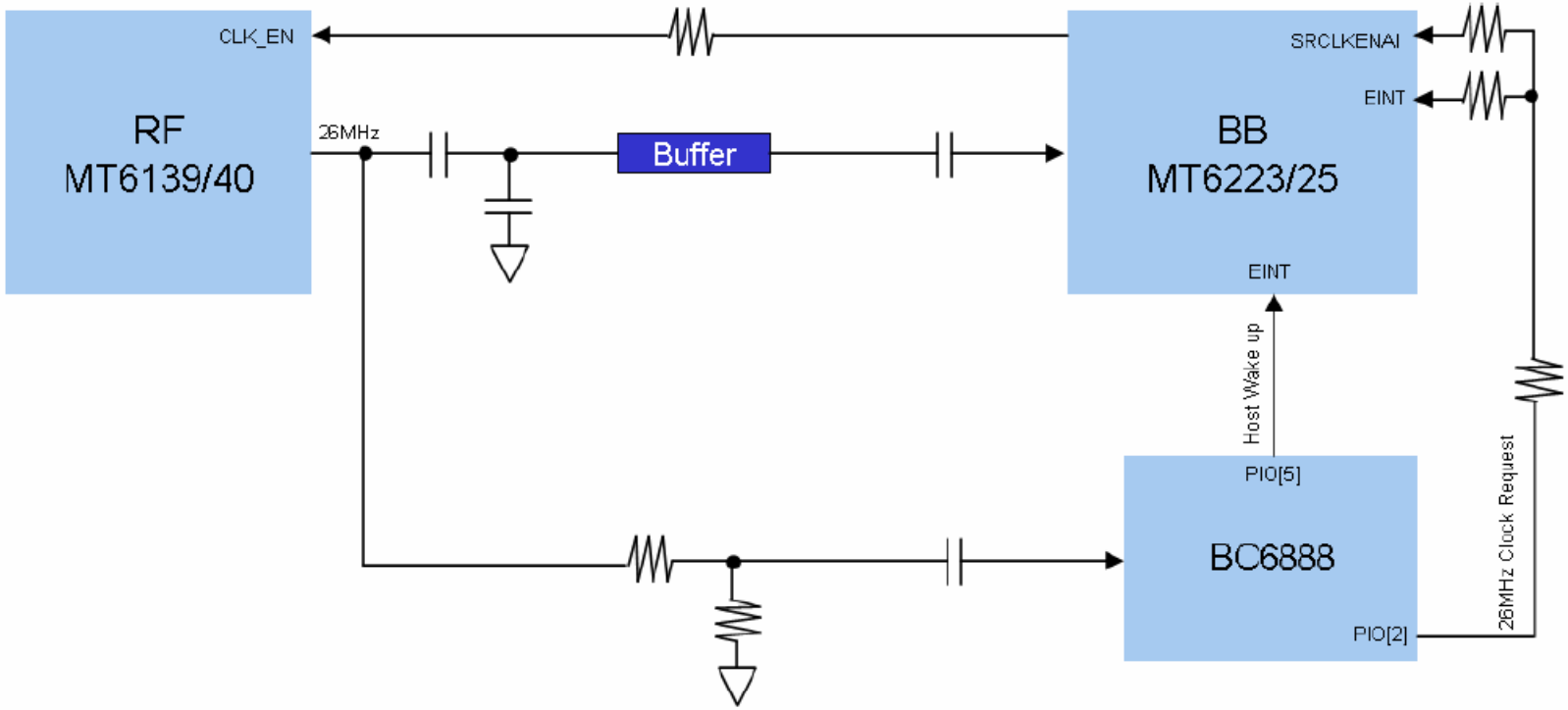
BC6888 Reference Design

CSR Design Review Process

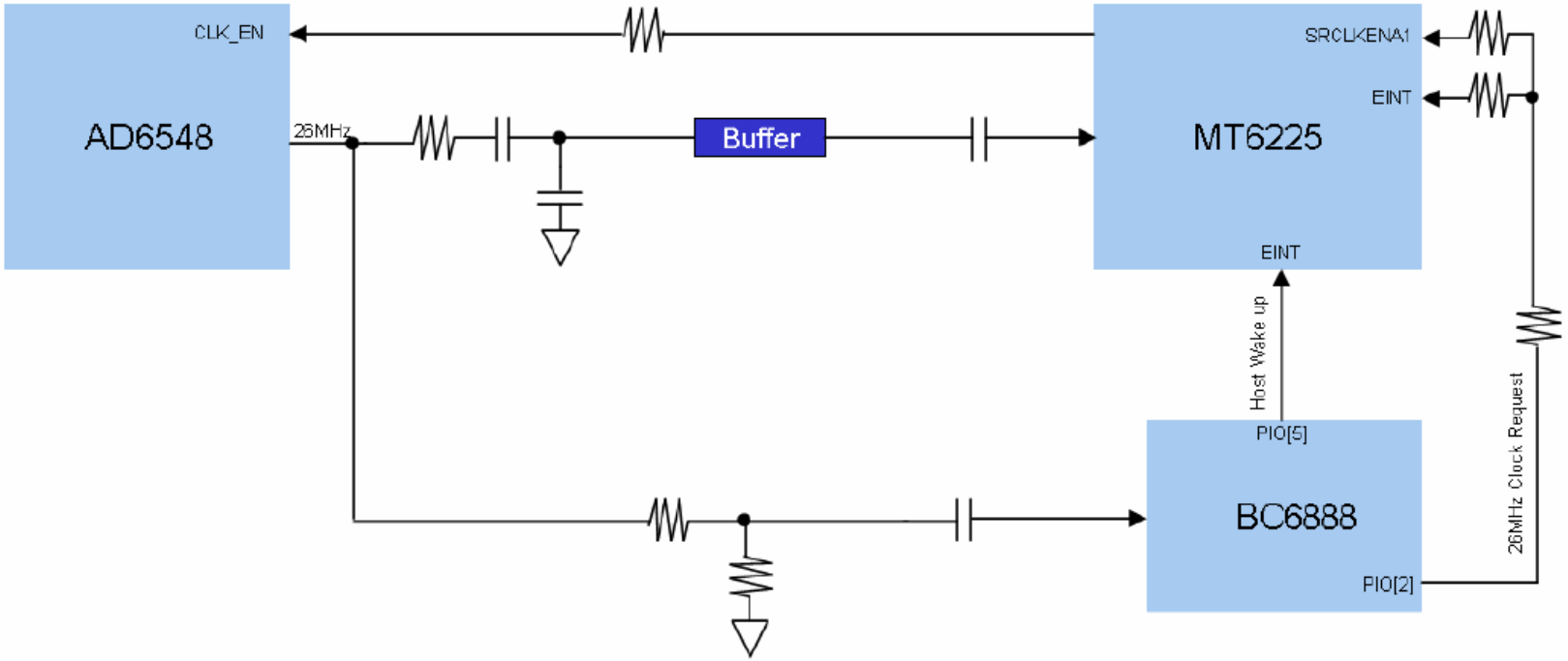
CSR have successfully supported many customers when it comes to implementation. Regarding RF design,we normally help customers' development with Design Review Process which includes:

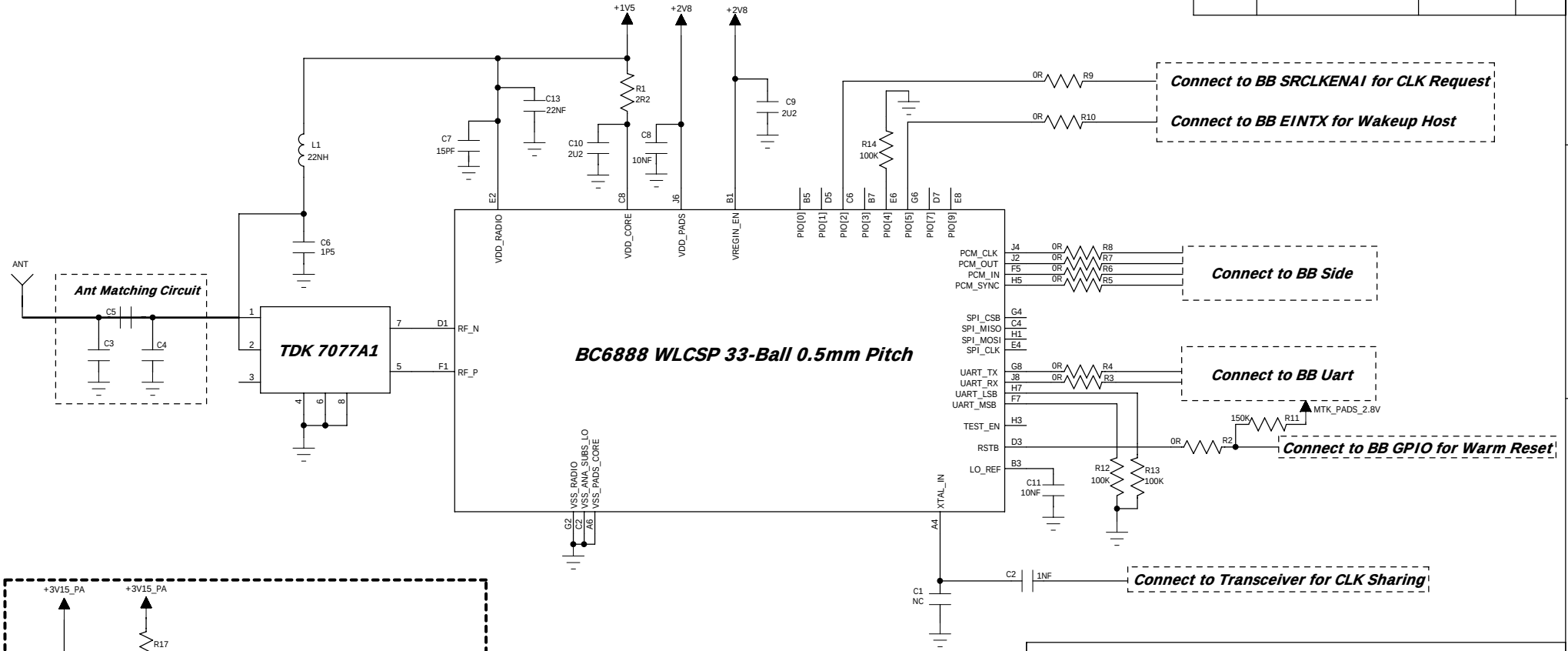
- Provide CSR Reference Design
- Review Schematic/Gerbers
- Perform RF Evaluation on customer's prototype

Schematic Design Guide



Schematic Design Guide





REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

DRAWN: EXCELPOINT	DATED: 2009/9/24
CHECKED: EXCELPOINT	DATED: 2009/9/24
QUALITY CONTROL: EXCELPOINT	DATED: 2009/9/24
RELEASED: EXCELPOINT	DATED: 2009/9/24

COMPANY: **CSR**

TITLE: **BC6888_CSP MTK SOLUTION**

CODE:	SIZE:	DRAWING NO:	REV:

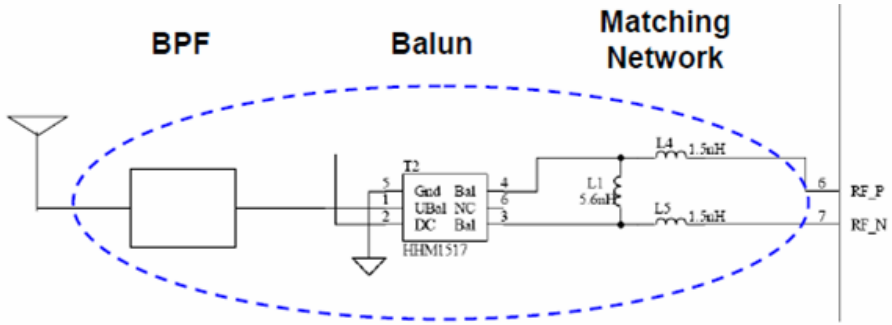
SCALE: SHEET: OF

Schematic Design Guide- Radio

CSR recommend TDK7077A1 Combo-Balun solution for Mobile Application. This solution should give the following benefits; area, easy implementation, component count and cheaper cost.

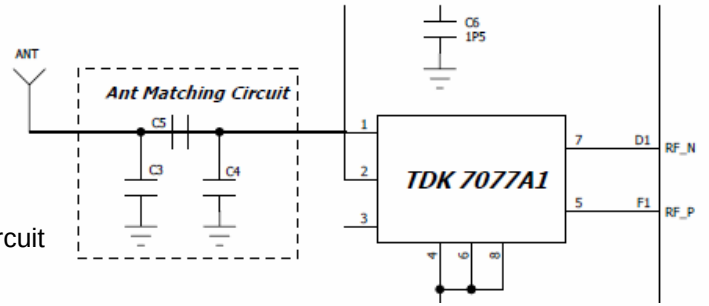
Discrete Balun

(5 components)



Combo Balun

(1 component)



TDK7077A1 contains:
BPF + Balun + matching circuit

Schematic Design Guide – Host Interface Select

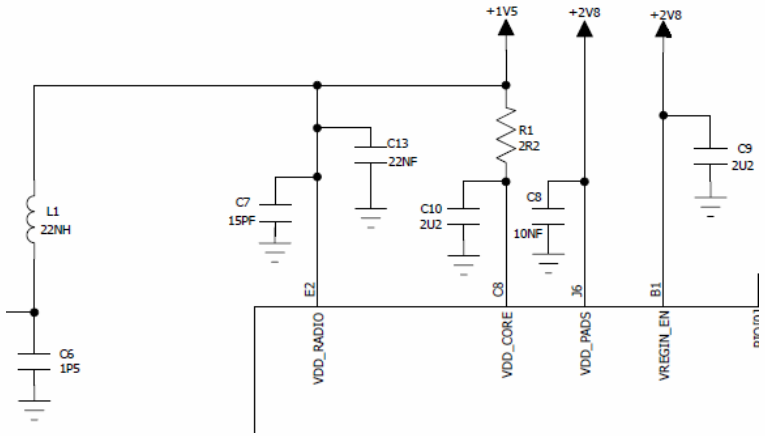
Pull PIO[4] low to select the UART.

To select BCSP, connect 100KR pull-downs to both UART_MSB and UART_LSB.

UART_MSB	UART_LSB	UART Protocol
0	0	BCSP
0	1	H4
1	0	H4DS
1	1	H5

Schematic Design Guide- Power

1. R-C filtering is required on VDD_CORE to prevent high frequency clock edges fro contaminating the 1.5V supply rail. This is essential to prevent 4MHz, 16MHz and 32MHz spurs from being generated on the VCO due to microprocessor.
2. The DC feed to the balun (hence to TX_A and TX_B) is via a 22NH inductor and 1P5F RF decoupling capacitor. This helps to prevent RF energy from contaminating the 1.5V rail.
3. In MTK platform, BC6888 is supplied with 2.8V. When supplying 2.8V directly to VREGIN_EN, ensure that a 2.2 µ F capacitor to ground is connected.



Schematic Design Guide- Clock

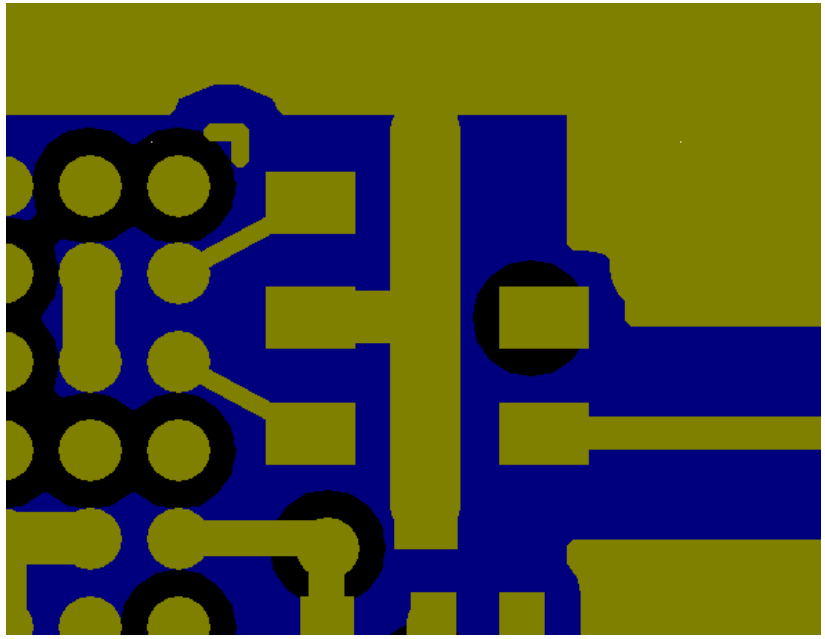
BC6888 only support external clock.

Clock Source	Min	Typ	Max	Unit
External Clock				
Input frequency[(a)]	12	26	52	MHz
Clock input level[(b)]	0.4	-	VDD_RADIO	V pk-pk
Edge jitter (allowable jitter), at zero crossing	-	-	15	ps rms
XTAL_IN input impedance	-	≥10	-	kΩ
XTAL_IN input capacitance	-	≤4	-	pF

Layout Design Guide

Keep RF traces short in length

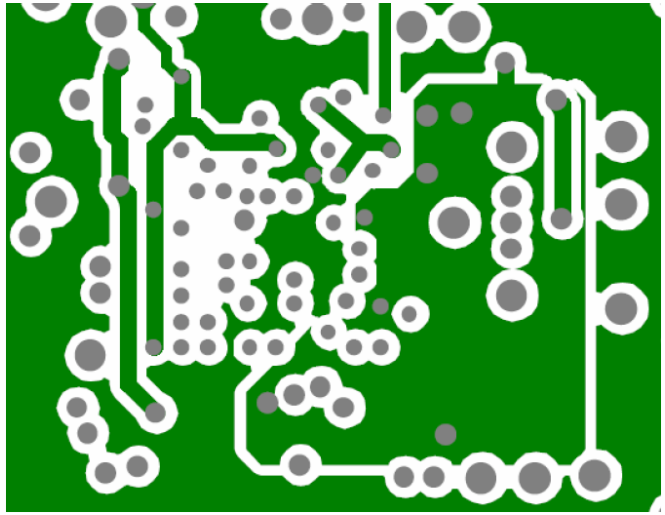
Use 50Ω tracks for RF traces. Differential signal lines TX_A and TX_B should be of identical length. CSR qualified balance band-pass filter has been integrated with RX matching network so customers don't make any effort to do matching. A solid ground plane is required, particularly underneath the RF front-end section.



Layout Design Guide

Keep power traces as width as possible to reduce impedance

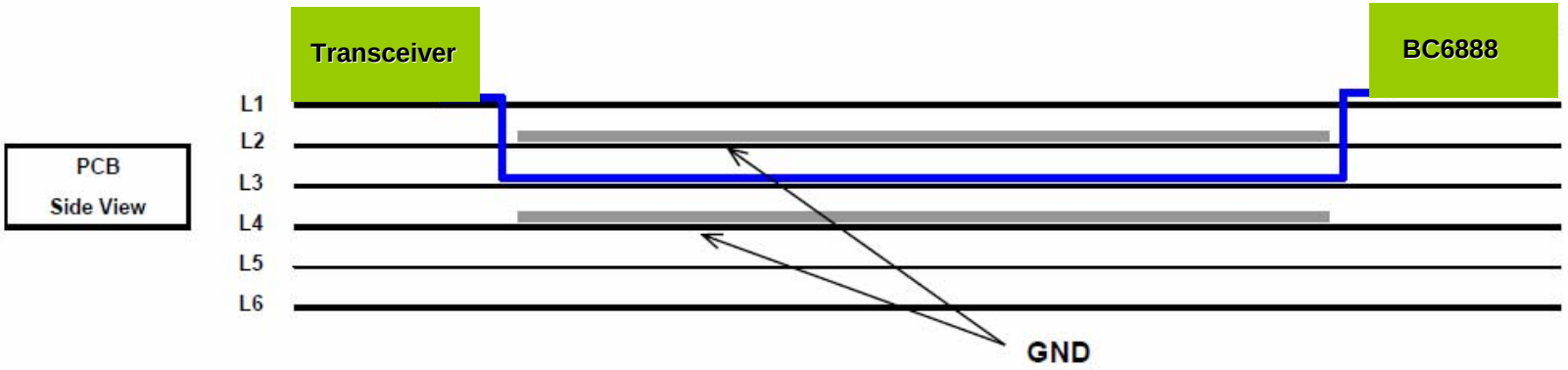
Place specific supply decoupling capacitors close to the corresponding BGA pin, with power trace running directly from BGA pin to decoupling capacitor to power net. The Radio supply, and balun supply are susceptible to RF pickup, hence, tracks for these supplies should be kept short and away from RF traces and components. Ground fill can assist in increasing isolation between these sections The decoupling capacitor for VDD_Radio should be placed close to the chip. Routing the power line around the chip in internal layer, as routing under the chip is forbidden.



Layout Design Guide

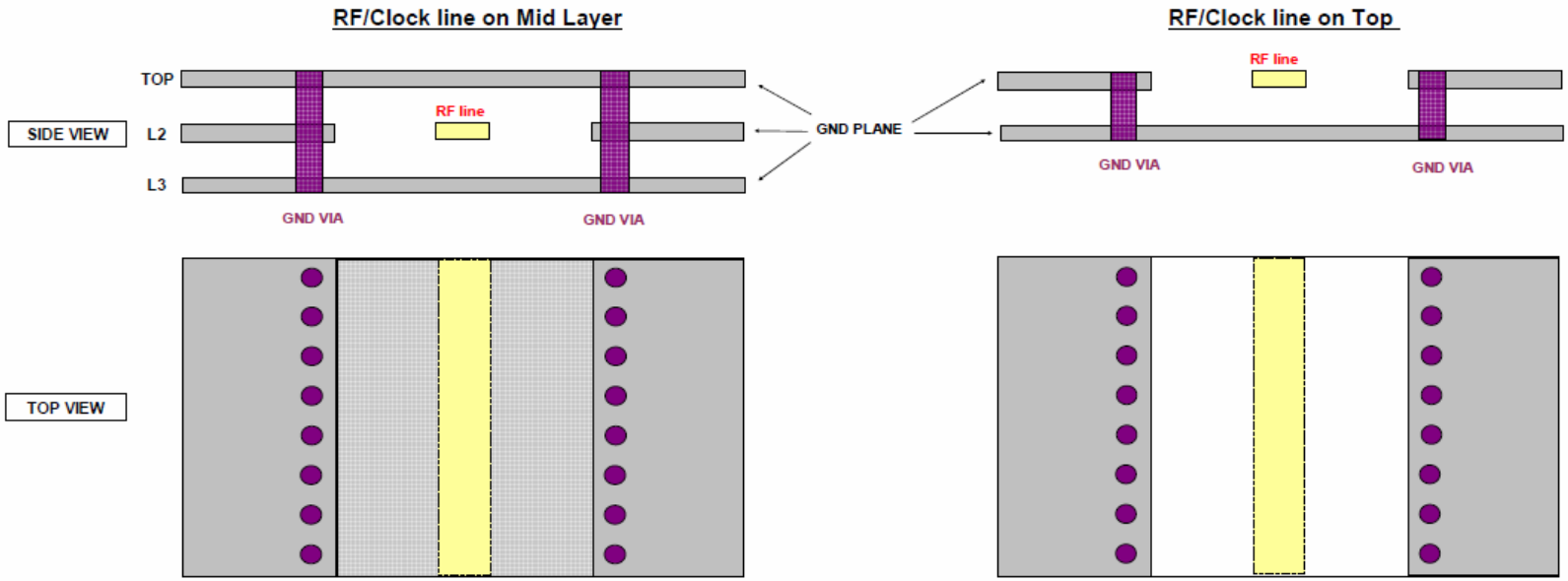
Protect clock lines well

Keep clock lines well protected from other signal noise. Do not run I/O traces parallel to clock traces (unless separated by a ground layer). Place a solid ground plane directly below (or above) clock lines that extends the full length of the clock tracks.



Layout Design Guide

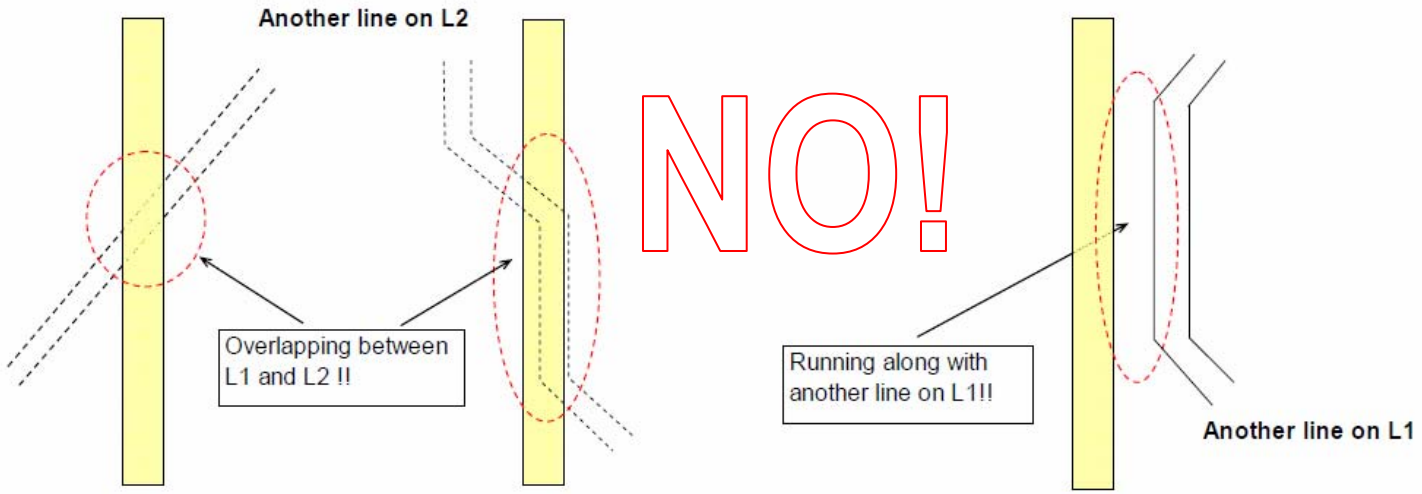
Protect clock lines well



Layout Design Guide

Protect clock lines well

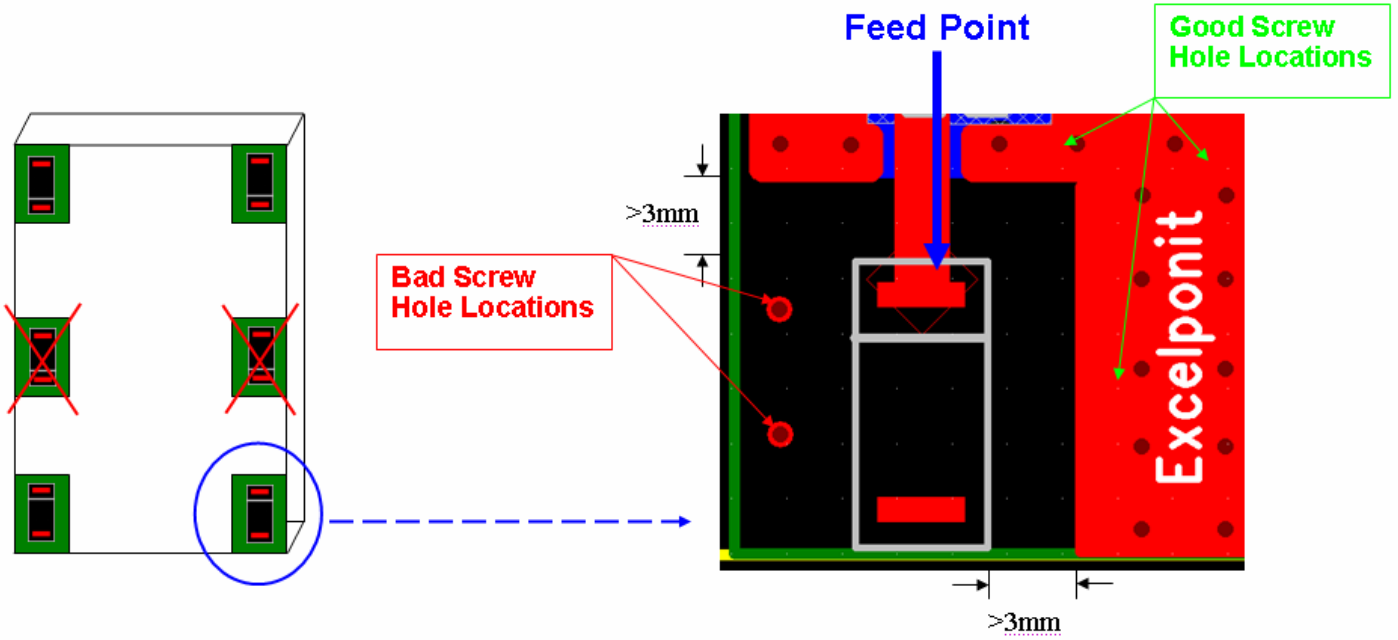
- No other lines run right underneath RF/Clock lines
- No other lines closely run along with RF/Clock lines on the same layer



Layout Design Guide

Antenna Placement

- Place the BT antenna in the corner of the PCB.
- Reserve enough distance between the antenna, ground and the shielding case.



Excelpoint™

CSR Bluetooth Performance

Power Consumption

HCI Power Consumption

Operation Mode	Connection Type	Average	Unit
Page scan, time interval 1.28s	-	0.4	mA
Inquiry and page scan, time interval 1.28s	-	0.8	mA
ACL no traffic	Master	4	mA
ACL with file transfer	Master	9	mA
ACL 40ms sniff	Master	2	mA
ACL 1.28s sniff	Master	0.2	mA
eSCO EV5	Master	12	mA
eSCO EV3	Master	18	mA
eSCO EV3 - hands-free - setting S1	Master	18.5	mA
SCO HV1	Master	37	mA

Power Consumption

HCI Power Consumption

SCO HV3	Master	17	mA
SCO HV3 30ms sniff	Master	17	mA
ACL no traffic	Slave	14	mA
ACL with file transfer	Slave	17	mA
ACL 40ms sniff	Slave	1.6	mA
ACL 1.28s sniff	Slave	0.2	mA
eSCO EV5	Slave	19	mA
eSCO EV3	Slave	23	mA
eSCO EV3 - hands-free - setting S1	Slave	23	mA
SCO HV1	Slave	37	mA
SCO HV3	Slave	23	mA

Power Consumption

HCI Power Consumption

SCO HV3 30ms sniff	Slave	16	mA
Standby host connection (Deep-Sleep)	-	40	µA
Reset (active low)	-	39	µA

Note:

Conditions: 20°C, VREGIN 1.8V

VDD_PADS: 3.15V

UART BAUD rate: 115.2kbps

Migrate from BC3A18 to BC6888

Easily migration from BC3ROM design to BC6888

Hardware

- Reference schematic
- PCB layout guidance
- HW review

Software

- Protocol (Update lib and Add patch)
- Configuration

Excelpoint™

Thank You!

射 频 和 天 线 设 计 培 训 课 程 推 荐

易迪拓培训(www.edatop.com)由数名来自于研发第一线的资深工程师发起成立，致力并专注于微波、射频、天线设计研发人才的培养；我们于 2006 年整合合并微波 EDA 网(www.mweda.com)，现已发展成为国内最大的微波射频和天线设计人才培养基地，成功推出多套微波射频以及天线设计经典培训课程和 ADS、HFSS 等专业软件使用培训课程，广受客户好评；并先后与人民邮电出版社、电子工业出版社合作出版了多本专业图书，帮助数万名工程师提升了专业技术能力。客户遍布中兴通讯、研通高频、埃威航电、国人通信等多家国内知名公司，以及台湾工业技术研究院、永业科技、全一电子等多家台湾地区企业。

易迪拓培训推荐课程列表： http://www.edatop.com/peixun/tuijian/

射频工程师养成培训课程套装

该套装精选了射频专业基础培训课程、射频仿真设计培训课程和射频电路测量培训课程三个类别共 30 门视频培训课程和 3 本图书教材；旨在引领学员全面学习一个射频工程师需要熟悉、理解和掌握的专业知识和研发设计能力。通过套装的学习，能够让学员完全达到和胜任一个合格的射频工程师的要求…

课程网址：http://www.edatop.com/peixun/rfe/110.html

手机天线设计培训视频课程

该套课程全面讲授了当前手机天线相关设计技术，内容涵盖了早期的外置螺旋手机天线设计，最常用的几种手机内置天线类型——如 monopole 天线、PIFA 天线、Loop 天线和 FICA 天线的设计，以及当前高端智能手机中较常用的金属边框和全金属外壳手机天线的设计；通过该套课程的学习，可以帮助您快速、全面、系统地学习、了解和掌握各种类型的手机天线设计，以及天线及其匹配电路的设计和调试...

课程网址： http://www.edatop.com/peixun/antenna/133.html

WiFi 和蓝牙天线设计培训课程

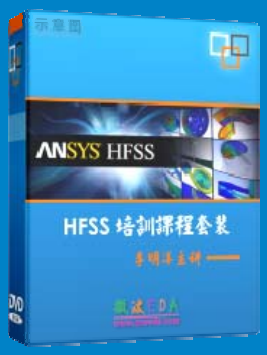
该套课程是李明洋老师应邀给惠普 (HP)公司工程师讲授的 3 天员工内训课程录像，课程内容是李明洋老师十多年工作经验积累和总结，主要讲解了 WiFi 天线设计、HFSS 天线设计软件的使用，匹配电路设计调试、矢量网络分析仪的使用操作、WiFi 射频电路和 PCB Layout 知识，以及 EMC 问题的分析解决思路等内容。对于正在从事射频设计和天线设计领域工作的您，绝对值得拥有和学习！…

课程网址：http://www.edatop.com/peixun/antenna/134.html

CST 学习培训课程套装

该培训套装由易迪拓培训联合微波 EDA 网共同推出，是最全面、系统、专业的 CST 微波工作室培训课程套装，所有课程都由经验丰富的专家授课，视频教学，可以帮助您从零开始，全面系统地学习 CST 微波工作的各项功能及其在微波射频、天线设计等领域的设计应用。且购买该套装，还可超值赠送 3 个月免费学习答疑…

课程网址：http://www.edatop.com/peixun/cst/24.html

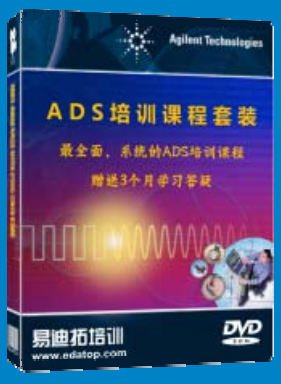


HFSS 学习培训课程套装

该套课程套装包含了本站全部 HFSS 培训课程，是迄今国内最全面、最专业的 HFSS 培训教程套装，可以帮助您从零开始，全面深入学习 HFSS 的各项功能和在多个方面的工程应用。购买套装，更可超值赠送 3 个月免费学习答疑，随时解答您学习过程中遇到的棘手问题，让您的 HFSS 学习更加轻松顺畅…

课程网址：http://www.edatop.com/peixun/hfss/11.html

ADS 学习培训课程套装



该套装是迄今国内最全面、最权威的 ADS 培训教程，共包含 10 门 ADS 学习培训课程。课程是由具有多年 ADS 使用经验的微波射频与通信系统设计领域资深专家讲解，并多结合设计实例，由浅入深、详细而又全面地讲解了 ADS 在微波射频电路设计、通信系统设计和电磁仿真设计方面的内容。能让您在最短的时间内学会使用 ADS，迅速提升个人技术能力，把 ADS 真正应用到实际研发工作中去，成为 ADS 设计专家...

课程网址： http://www.edatop.com/peixun/ads/13.html

我们的课程优势：

※ 成立于 2004 年，10 多年丰富的行业经验，

※ 一直致力并专注于微波射频和天线设计工程师的培养，更了解该行业对人才的要求

※ 经验丰富的一线资深工程师讲授，结合实际工程案例，直观、实用、易学

联系我们：

※ 易迪拓培训官网：http://www.edatop.com

※ 微波 EDA 网：http://www.mweda.com

※ 官方淘宝店：http://shop36920890.taobao.com