PCIe® Mini CEM Updates

Chuck Stancil

Mini WG Chair

HP

Disclaimer

The information in this presentation refers to specifications still in the development process. This presentation reflects the current thinking of various PCI-SIG® workgroups, but all material is subject to change before the specifications are released.

Agenda

- Mini CEM 2.0 and related work
- New “NGFF” specification

Mini CEM 2.0

- Highlights
  - ✓ Published in April 2012
  - ✓ Incorporates PCIe® 2.0 signaling
  - ✓ Adds a 3rd card form factor – Display-Mini Card

Card	Pin Count	PCIe 2.0	USB 2.0	DP 1.1a
Half-Mini	52	✓	✓	
Full-Mini	52	✓	✓	
Display-Mini	76	✓	✓	✓

Mini CEM 2.0 Related Work

- Combined Antenna Tuning/Coexistence Signal ECR
  - ✓ Adds 4 tuneable antenna control signals
    - 2 defined previously as reserved pins
    - 2 replacing 1.5V pins deemed as being unused by cards
  - ✓ Adds a 3rd radio coexistence control signal
    - replacing a 1.5V pin deemed as being unused by cards
  - ✓ Impacts the 52-pin and 76-pin connector pinouts
  - ✓ Neither interface is mandatory to implement
  - ✓ 30 day member review completed in June
  - ✓ Next Step: Approve as an ECN

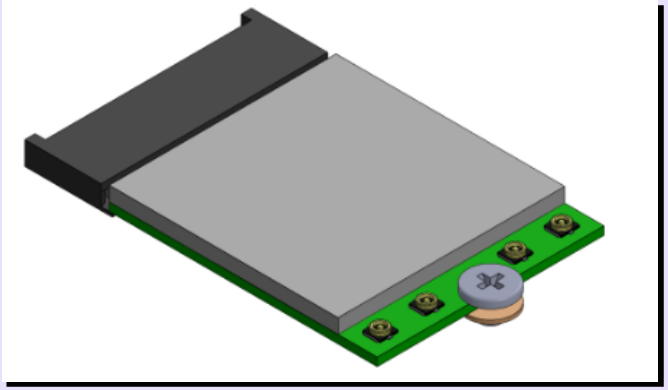
NGFF Executive Summary

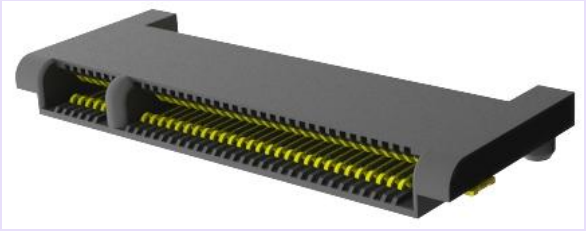
- Enabling ultra thin and light platform designs requires new mobile module solutions
  - ✓ Mini Card has been the predominant standard for several generations of platforms but does not meet the need moving forward: volume, interfaces, flexibility
  - ✓ A new solution for add in cards is required to improve:
    - Area and Z-height
    - Layout
    - Interface support
    - Flexibility
  - ✓ Standardization is needed to reduce cost and design complexity

NGFF is a working name and subject to change!

NGFF Intent

- Develop a new standardized solution for mobile modules to enable the next generation of thin & light platforms
  - ✓ Support multiple technologies
    - Wi-Fi and related combos
    - SSD
    - WWAN
    - And more
  - ✓ Smaller, more flexible form factor
  - ✓ Have broad adoption across multiple module card vendors and OEMs
  - ✓ Ratify with PCI-SIG and SATA-IO



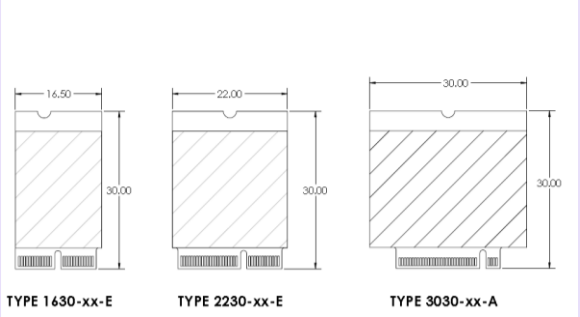


Key Considerations

- System partitioning
  - ✓ Plan to make sockets available for Notebooks & Tablets
    - A Wi-Fi centric socket
    - A SSD cache / WWAN / Other socket
  - ✓ Plan for a future high performance SSD option
- Multiple connector key versions to support:
  - ✓ Socket 1: Wi-Fi centric slot
  - ✓ Socket 2: WWAN / SSD / Other
  - ✓ Socket 3: SSD with x4 PCI Express interface
- Flexibility to be used in multiple system configurations and multiple platforms
  - ✓ Give flexibility to the OEM to support their system design
  - ✓ Support the needs of tablets and ultra thin systems

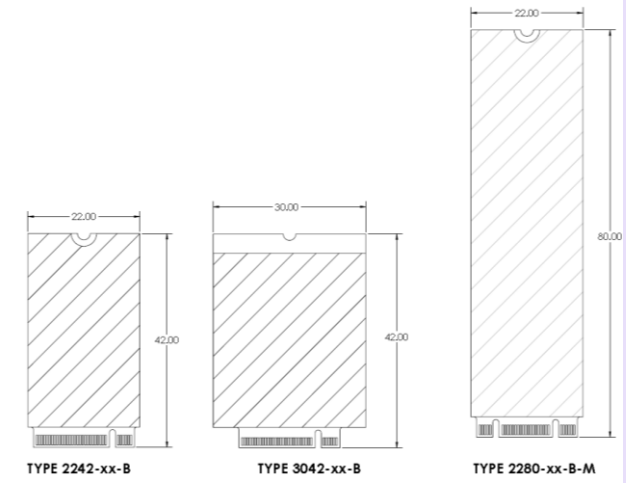
Socket and Card Overview

- Socket 1:
  - ✓ Designed to support Wi-Fi and Wi-Fi based combos
  - ✓ Multiple card sizes to support needed functions
  - ✓ Single connector for any of the sizes



Type 1630 Future size reduction	Type 2230 Standard Wi-Fi + BT	Type 3030 Multi-Comms

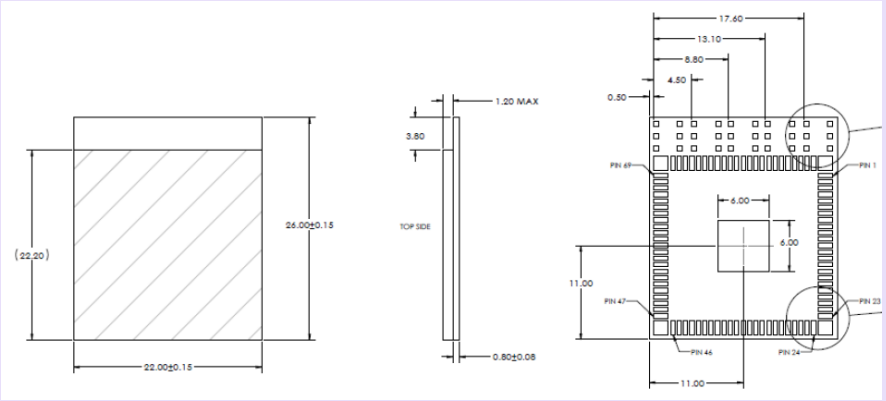
- Socket 2:
  - ✓ Designed to support WWAN / SSD / Other in single pin out
  - ✓ SATA or PCIe for SSD
  - ✓ USB / UIM for WWAN
  - ✓ Other WWAN options available



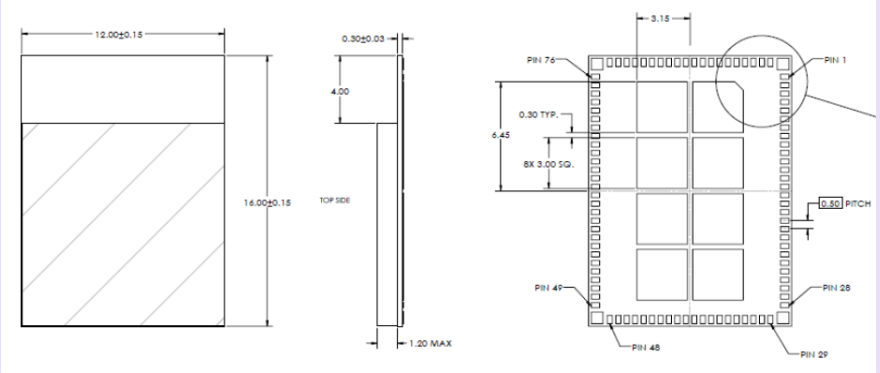
Type 2242 SSD Cache	Type 3042 WWAN (SS)	Type 2280 SSD

LGA Overview

- 2226 board/module
  - ✓ Single-sided
  - ✓ Solder-down version of the 2230 card
  - ✓ Space for 4 antenna connectors



- 1216 board/module
  - ✓ Single-sided
  - ✓ Space for 3 antenna connectors



Functions and Interfaces

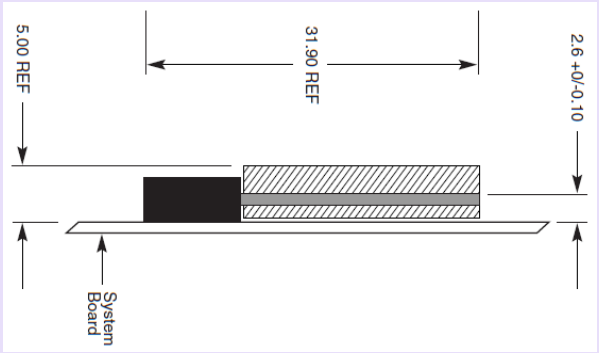
NGFF Designed for future	
• Supports today's features and interfaces • Designed to grow with platforms' needs for new interfaces & features	
Mini Card	**NGFF**
• Features: – WiFi / Bluetooth – WWAN / GPS – SATA-based storage – Others based on PCI Express • Buses – PCI Express x1 – USB – SATA x1	• Features: – WiFi/ Bluetooth / NFC / WiGig / GNSS – WWAN / GPS – SATA- or PCI Express-based Storage – Multi-comms – Others based on PCI Express • Buses – PCI Express x2, PCI Express x4 – Others including: – SDIO / PCM / UART / USB / I2C – SATA x2 – DisplayPort

Wi-Fi Comparison

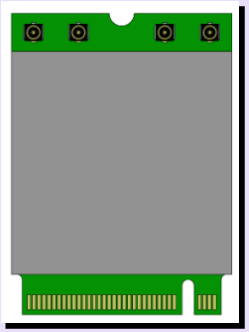
Half Mini Card (HMC)

Card Size:
- ~30 x ~27 mm
- Area: ~ 810mm^2

Single-sided HMC and Double-sided HMC Stack-Up: 5.1mm



NGFF

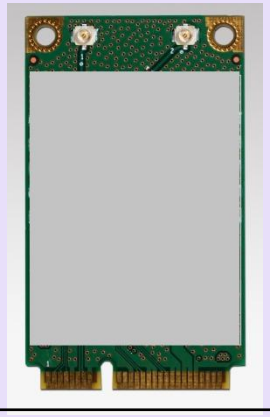
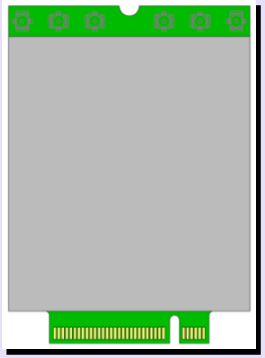
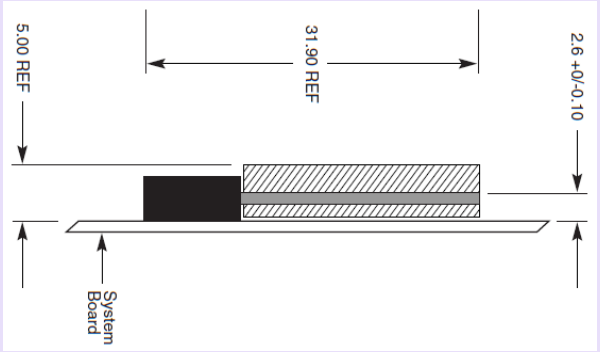


Card Size:
- 22 x 30 mm
- Area: 660 mm^2
  - ~ 20% Reduction

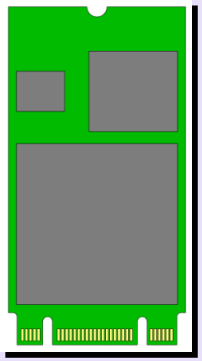
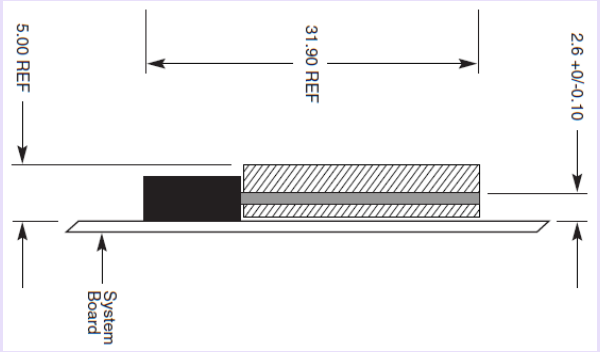
Single-sided NGFF: 2.75mm, 45% reduction

Double-sided NGFF: 3.85mm, 25% reduction

WWAN Comparison

Full Mini Card	NGFF
 Card Size: • ~30 x ~50 mm • Area: ~1500mm^2	 Card Size: • 30 x 42 mm • Area: 1260 mm^2 • ~ 15% Reduction • Including LTE
Single-sided MC and Double-sided MC Stack-Up: 5.1mm 	Single-sided NGFF: 2.75mm, 45% reduction 

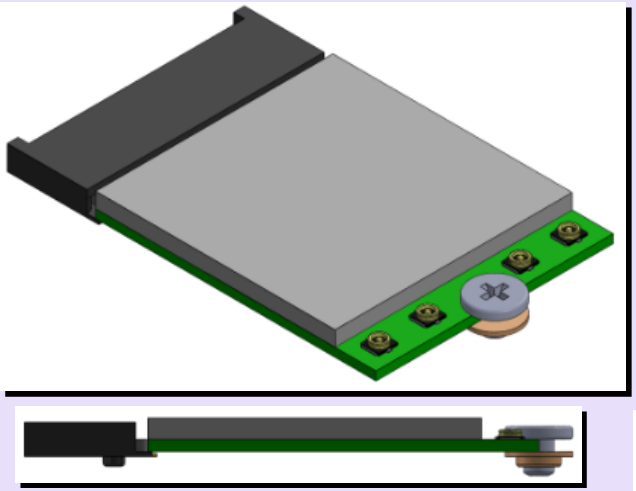
SSD Comparison

Full Mini Card	NGFF
 Card Size: • ~30 x ~50 mm • Area: ~1500mm^2	 Card Size: • 22 x 42 mm • Area: 924mm^2 • ~ 38% Reduction • Efficiently Scalable
Single-sided MC and Double-sided MC Stack-Up: 5.1mm 	Single-sided NGFF: 2.75mm  Double-sided NGFF: 3.85mm 

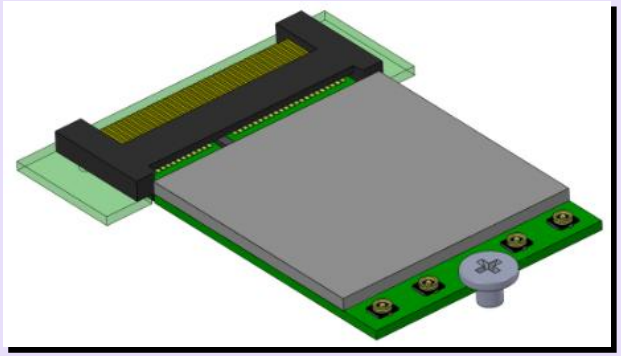
Connector Concepts

- Early concept samples for NGFF connectors

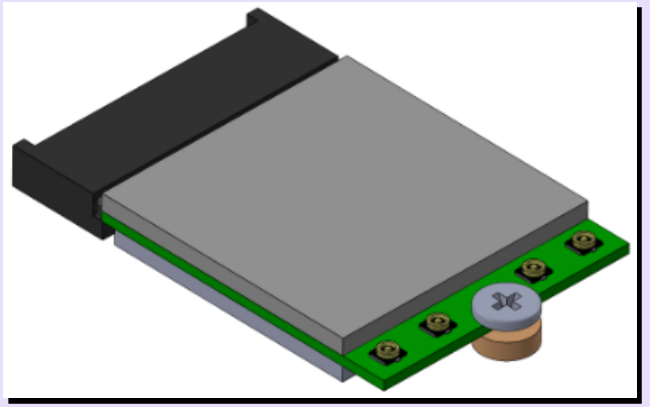
Single-sided above MB



Single-sided inline MB



Double-sided above MB



Advantages Summary

Key Feature	Improvement
Smaller Add-In Card Area	Wi-Fi replacement w/20% less area • Similar reductions for WWAN and SSD
Lower System Stack-Up Z Height	Up to 45% lower height
System Design Flexibility	Multiple connector options for flexible MB layout
Simple attachment to motherboard	Improved system manufacturing, aftermarket configuration
Extensible Form Factor	Support high density SSD and future multi-comms with same solution
Multiple Interface Support	Standards supporting multiple interfaces
Industry Standard	Like Mini Card today

Current Status

- Draft 0.3 Member Review – Near completion
- Draft 0.5 Member Review – August
- Draft 0.7 Member Review – target 3Q2012
- Draft 0.9 Member Review – target late 4Q2012
- Final specification release 1Q2013

Call to Action

- Review the draft specs!
- Get involved in the Mini WG!
  - ✓ http://www.pcisig.com/apps/org/workgroup/pciexpress/miniexpress/
- Plan future products using NGFF

Thank you for attending the
PCI-SIG Developers Conference 2012

For more information please go to
www.pcisig.com