# PCIe Asymmetric Breaker Modules

Automate hot-plug, dual redundancy and fault injection testing for PCIe devices

Quarch
Technology

# PCIe Asymmetric Breaker Modules

## Automate hot-plug, dual redundancy and fault injection testing direct from a PCIe slot or HBA



## Highlights

- Supports the full range of PCIe devices
- Removes manual intervention, for fully automated testing
- Minimises adaptors needed, helping with Signal Integrity at Gen5 speeds
- Precise and consistent timing control over hot-swap scenarios
- Completely transparent at the protocol layer
- Supports power analysis (with additional equipment)
- Simple to control with your existing test automation system

## Use Cases

| | |
|---|---|
| **System Qualification** | Run repeated test cycles with bounds testing of all possible hot-swap and lane width scenarios |
| **Regression Testing** | Automated regression tests spot issues earlier during development |
| **RAID Testing** | Force drive rebuilds, single/double RAID faults |
| **Failover Testing** | Test dual redundancy, fault monitoring and performance during a failure |
| **Fault Injection** | Simulate a large number of fault scenarios |

## Hot Swap

PCIe data is switched with advanced high speed RF switches, ensuring that our modules are almost totally transparent to the storage system.  Host/Device connections will appear as if they are directly attached.

Individual control over each pin allows us to create almost any possible hot-swap or fault scenario.  Precise timing ensures that every test can be exactly re-created. Versions are available with inrush current limits, to help high power devices hot-plug on hosts with limited power supply capacity.

The modules can be manually controlled for bench testing, or easily integrated into your existing test automation system as part of a fully automated test solution.

## Module Range

Testing at Gen5 speeds can be difficult, as a single extra adaptor can add enough loss or cross-talk to disrupt the link.  Asymmetric breakers allow for a wide range of tests to be performed direct from a PCIe slot, minimising the losses.

The modules also switch the PCIe lanes and have an additional injection port to allow power margining and measurement from our Programmable Power Module.

All modules support data rates up to 32GT/s.

Active signal driving is support for signals such as PERST, CLKREQ and WAKE.  The exact signals driven varies from module to module

With the '+Triggering' option, sideband monitoring allows you to query the state of a sideband, or even divery the state out of the triggering port, for easy connection to a scope or analyzer

Interface options depend on the controller you chose, but include simple Serial, USB and LAN options.  These can be accessed from almost any scripting language.  You will need to purchase a separate controller to use this module.

Drive modules can be combined with other Torridon modules as part of a full test-automation system.

## Supplied Parts

Each module comes with a 40cm interface cable, for connection to a controller.

## Also Required

**Controller**      - You will require one slot on a Torridon Controller for each Cable Module or direct USB connection

**Downloads**      - Our website contains many useful downloads to help you get started: www.quarch.com

> **USB Drivers**
> **Technical Manuals**
> **Quick Start Guides**
> **Example Scripts**
> **TestMonkey GUI**

## Support

Quarch provides direct support to all customers, regardless of the sales channel you use to purchase our equipment. We are available over email, or by phone during UK office hours. Our regional partners are also trained to handle many of the most common questions you might have.

Our support is normally free, though there may be charges if you require on-site training or significant development work. Please contact us if there is anything we can do to help.

Please see our website for access to drivers, technical manuals, quick-start guides, example scripts and more.

| **Email** | **Phone** | **Web** |
|---|---|---|
| support@quarch.com | +44 1343 508 140 | www.quarch.com/support |

## Ordering

Quarch have a network of specialist partners around the world. Please contact our partner in your region if you require a quote.

We recommend evaluating our products before purchase, so our partners will be happy to arrange a free evaluation unit.

## Regional Contact Details

**North America**
SerialCables LLC
Colorado, California

Web     www.serialcables.com

**China, Hong Kong**
Saniffer
Hong Kong

Web     www.saniffer.com

**India**
ESA Group
Bangalore

Web     www.esaindia.com

**Taiwan**
Reeper Technology
Taipei

Web     www.reeper.com.tw/

**Israel**
EMY-Tech
Misgav

Web     www.emy-tech.com

**Europe and ROW**
Quarch Technology
Scotland, UK

Web     www.quarch.com

**South Korea**
JWill Technology
Seoul

Web     www.jwill.co.kr

**ASEAN Countries**
Gopalam Embedded Systems
Singapore

Web     www.embeddedsingapore.com

## Products Versions

| Product Code | Product Options |
|---|---|
| **QTLXXXX** | Product code, made up from options below |
| | |
| **QTL2804** | Gen5 MCIO x4 to U.2 Breaker |
| **QTL2805** | Gen5 MCIO x4 to U.2 Breaker + Triggering |
| | |
| **QTL2813** | Gen5 AIC x4 to U.2 Breaker |
| **QTL2814** | Gen5 AIC x4 to U.2 Breaker + Triggering |
| | |
| **QTL2826** | Gen5 AIC x16 to EDSFF Breaker |
| **QTL2827** | Gen5 AIC x16 to EDSFF Breaker + Triggering |



AIC to U.2 Breaker Module

## Required Controllers - One port on a controller is required for each module

| Product Code | Description |
| --- | --- |
| QTL1260 | Torridon Interface Kit<br>Simple USB and Serial control options for bench testing |
| QTL1461 | 4 Port Torridon Controller<br>Control up to 4 modules via Serial/LAN/USB connection |
| QTL1079 | 28 Port Torridon Controller<br>Control up to 28 modules via Serial, LAN or USB connection |

## Accessories

| Product Code | Description |
| --- | --- |
| QTL999 | HD Programmable Power Module<br>Power margining any uA range power measurement, ideal for PCIe devices |
| QTL1558 | 40cm Torridon Double Ended Interface Cable (Female to Female)<br>Replacement cable for Card Modules, connects Module to Controller |
| QTL1870 | 100cm Torridon Double Ended Interface Cable (Female to Female)<br>Replacement cable for Card Modules, connects Module to Controller |
| QTL1381 | 100cm Torridon Extension Cable (Male to Female)<br>Extends an existing Double Ended Torridon cable or fixed Drive Module Cable |

## Technical Information

| Connections | QTL2804 | QTL2805 | QTL2813 | QTL2814 | QTL2826 | QTL2827 |
|---|---|---|---|---|---|---|
| Host Side Connector | MCIO | | PCIe x4 | | PCIe x16 | |
| Device Side Connector | U.2 | | | | EDSFF | |
| Max Speed | 32GT/s | | | | | |
| Protocols | PCIe | | | | | |
| Signals Switched | All[1] | | | | | |

[1] All power, high speed data, mated and sideband pins are individually switched. GND pins are directly routed through the module.

| Control | QTL2804 | QTL2805 | QTL2813 | QTL2814 | QTL2826 | QTL2827 |
|---|---|---|---|---|---|---|
| Power Supply | External PSU | | Torridon Controller or external PSU | | | |
| Control Ports | Torridon Connector or direct USB | | | | | |
| Triggering | X | SMA | X | SMA | X | SMA |
| Power Injection Port | √ | √ | √ | √ | X[1] | X[1] |

[1] PAM mezzanine can be optionally fitted to add power analysis

| Dimensions | QTL2804 | QTL2805 | QTL2813 | QTL2814 | QTL2826 | QTL2827 |
|---|---|---|---|---|---|---|
| Offsets Drive By | N/A | | 35.9mm | | 45mm | |
| Length/Width | 133x135mm | | PCIe HHHL | | PCIe HHHL | |
| Height | - | | | | | |
| Compatible Devices | U.2 | | | | E1.x, E3.x | |

| Controllers | All Modules |
|---|---|
| Serial Control | Supported on all Controllers |
| USB Control | Supported on all Controllers and via direct USB cable |
| REST Control | Supported on QTL1079 and QTL1461 |
| Telnet Control | Supported on QTL1079 and QTL1461 |

| Features | QTL2804 | QTL2805 | QTL2813 | QTL2814 | QTL2826 | QTL2827 |
|---|---|---|---|---|---|---|
| **Basic (power) hot/swap** | √ | √ | √ | √ | √ | √ |
| **Full hot-swap** | √ | √ | √ | √ | √ | √ |
| **Pin Bounce Simulation** | 1uS minimum period | | | | | |
| **Signal Glitch** | Single/Cycle/PRBS | | | | | |
| **Voltage Monitoring** | √ | √ | √ | √ | √ | √ |
| **Power Monitoring** | Requires HD Power Module | | | | √[*1] | √[*1] |
| **Active Signal Driving** | PERST, PERSTB, DUALPORTEN, PWR_DIS, HPT0, HPT1 | | PERST, PERSTB, DUALPORTEN, WAKE, PWR_DIS, HPT0, HPT1 | | PERST, PERSTB, PRSNT1, PRSNT2, PWR_DIS, SMBRST, LED, DUALPORTEN | |
| **Signal Monitoring** | All low speed sidebands | | All low speed sidebands | | All low speed sidebands | |

[*1] PAM mezzanine can be optionally fitted to add power analysis

| Features... | QTL2804 | QTL2805 | QTL2813 | QTL2814 | QTL2826 | QTL2827 |
|---|---|---|---|---|---|---|
| **Basic (power) hot/swap** | √ | √ | √ | √ | √ | √ |
| **Full hot-swap** | √ | √ | X | √ | √ | √ |
| **Pin Bounce Simulation** | 1uS minimum period | | X | 1uS minimum period | | |
| **Signal Glitch** | Single/Cycle/PRBS | | X | Single/Cycle/PRBS | | |
| **Voltage Monitoring** | √ | √ | √ | √ | √ | √ |
| **Power Monitoring** | X | X | X | X | X | X |
| **Active Signal Driving** | PERST, DUALPORT, IF_DET, PWR_DIS, PRSNT, HPT0, HPT1 | | PRSNT, PERST, PERSTB, DUALPORTEN, PWRDIS, IFDET, IFDET2, HPT0, HPT1 | | PRSNT0, PERST0, SMBRST, PWRDIS, MFG, DUALPORTEN | |
| **Signal Monitoring** | PERST, PERSTB, SMCLK, SMDAT, DUALPORT, IF_DET, ACTIVITY, WAKE, PWR_DIS, PRSNT, HPT0, HPT1 | | PERST, PERSTB, SMBCLK, SMBDAT, DUALPORT, IF_DET, IFDET2, HPT0, HPT1, PRSNT, WAKE, PWRDIS | | PRSNT0, PERST0, SMBRST, SMBCLK, SMBDAT, PWRDIS, MFG, DUALPORTEN | |