

METANOia

Product Briefs

CONNECTING LIFE
SMART+GREEN

Metanoia



Metanoia Milestones

- 2004: Founded in Hsinchu, Taiwan
- 2006: First VDSL chip launched
- 2006: Merged with Metanoia US
- 2008: First VDSL2 30a chip launched
- 2011: Joined Homegrid Forum
- 2011: First G.hn chip ready

Metanoia is a fabless communication IC design house which was founded in 2004. The headquarters of Metanoia is located in the center of the Taiwanese IC industry, Hsinchu Science Park. Metanoia also has teams in US consisting of long-experienced engineers originating from USRobotics and 3Com. Metanoia is mainly focusing on ICs using OFDM based communication technologies especially in xDSL broadband access and G.hn in-home communications but is also offering custom SoC solutions in these fields. Metanoia combines *state of the art* system architecture with deep algorithm expertise which make our chips provide solid and feature-rich performance at a competitive price.

Further more, Metanoia is an active member of both ITU-T SG15 -Q4 and Home Grid Forum. Metanoia follows standards and guidelines issued by these organizations and also participate in IOP events in order to ensure thorough interoperability with other major chip vendors throughout our product range.

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Product Brief Collection

-MT2501
-MT3501

G.hn

The Next Generation Home Networking Standard

Cost efficient eHome solution

MT2501 DMT + MT3501 AFE



Applications

- Digital Home networking adapters
- Network Attached Storage (NAS)
- Set Top Boxes (STBs)
- Home Appliances
- Various Consumer Electronics
- Smart Energy Management
- EOC Applications
- Premium Home Gateways & IADs
- PCs

The Metanoia MT2501 and MT3501 are advanced chipsets designed to fulfill the rapidly increasing demands of home networking applications. The chipsets are fully compliant with the G.hn ITU-T G.9960 and G.9961 standards. They allow a wide range of applications to run on all three legacy mediums: phone line, power line and coaxial cable. Using the G.hn 100Mhz bandplans, the devices can reach an astounding PHY rate of 1Gbps on selected medium. Multimedia service quality and network security are ensured using state-of-art, robust QoS features and AES-128bit encryption.

With Metanoia's feature rich G.hn chipsets and superior customer support, customers can achieve fast time-to-market with low risk for a variety of products. The chipsets are suitable for a range of products from a low cost G.hn Power Line Networking Bridge to a premium, fully integrated, Internet Access Device. The chipsets are also appropriate for embedding G.hn networking into home appliances in order to achieve the ultimate Digital Home Living experience.

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Product Brief Collection

-MT2501
-MT3501

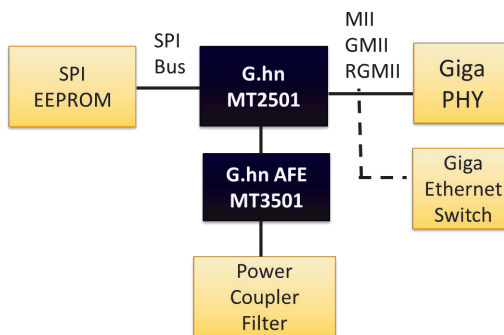
G.hn

The Next Generation Home Networking Standard

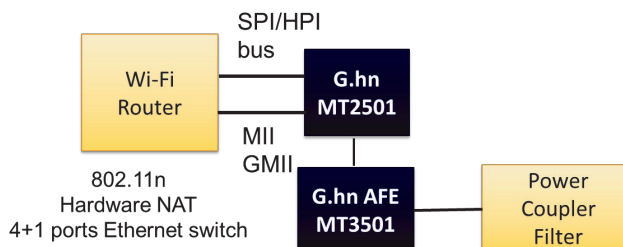
General Features

- Compliant with ITU-T G.9960/G.9961/G.9972 standards
- Power Line, Coaxial Line and Phone Line supported
- 25, 50, and 100Mhz band plans with PHY rates up to 1Gbps supported
- Small memory (all on-chip) and large memory (external DDR) configuration supported
- Robust Communication Mode (RCM)
- Smart Power Management
- IPv4 and IPv6 based traffic support
- AES-128 bit security
- Network Admission
- Channel Estimation
- Connection Management
- Flow Management
- Bandwidth Management
- Routing and Topology Management
- Management - control protocol
- Backup Domain Master
- Domain Master Selection
- Fully MAP supported
- Retransmission and Acknowledgement Protocol
- Multicast binding protocol
- Supports Neighborhood Domain

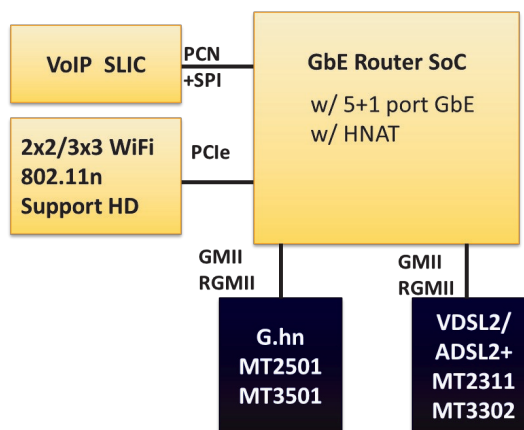
Application Example I: Power Line Network Adapter



Application Example II: Power Line Wi-Fi Extender



Application Example III: Premium IAD



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Product Brief

-MT2301
-MT3301

General Features

Transmission modes

VDSL2 profiles	8a, 8b, 8c, 8d, 12a, 12b, 17a, 30a
Data rate	Up to 100 Mbps upstream / 100 Mbps downstream
Band-plans	Conforms to NA, EUR & Swedish band-plans
Annex	A/B/C
Parameter configurability	997.1 Compliant

Advanced Features from ITU

OLR	Supports bit swapping, SRA and dynamic interleaver depth (D) change
US0	Supported
PBO	Both UPBO and DPBO supported

Unique Features

QoS	Flexible packet sorting based on EtherType, VLAN ID or VLAN priority (supports QinQ).
Bootling	RAM can be booted from EEPROM, Flash or external μ Processor
Legacy compatibility	Compatible with POTS and ISDN

Interfaces

MAC	MII/SMII for data and MDIO for control
Host/master	HPI/SPI
Testing	JTAG

AFE

Power saving	PBO and block power down
I/O rate	35MSPS / 70MSPS
Line driver	Integrated

VDSL2

The Last Mile Broadband Solution

VDSL2 PHY solution

MT2301 DMT + MT3301 AFE



The MT2301 DMT and the MT3301 AFE form the core of Metanoia's VDSL2 solutions. The MT2301 Discrete Multi-Tone (DMT) chip offers a smart and flexible VDSL2 PHY solution which can easily be used with a range of network processors by connecting over standard

interfaces. The MT3301 AFE provides all functions necessary for receiving and transmitting VDSL2 signals according to ITU and ANSI Recommendations. The high level of integration in MT3301 decreases the need for complex and costly external components, reducing the total system cost.

These devices support all T1E1.4 and ITU-T discrete multi-tone VDSL based specifications (e.g.G.993.2), as well as IEEE 802.3 10PASS-TS. This ensures guaranteed interoperability with other chip vendors today and in the future. Furthermore, the MT2301 and MT3301 chips support all profiles described in the VDSL2 standards, which ensure optimal data rates at various distances and for different deployment scenarios.

Standard Compliance

Description	Standards
VDSL2	T1E1.4, ITU-standard G.993.2, G.994.1, G.997.1
10PASS-TS	IEEE 802.3ah
Interfaces	IEEE 802.3 for MII

Product Brief

-MT2301
-MT3301

VDSL2

The Last Mile Broadband Solution

Physical Parameters

MT2301 DMT

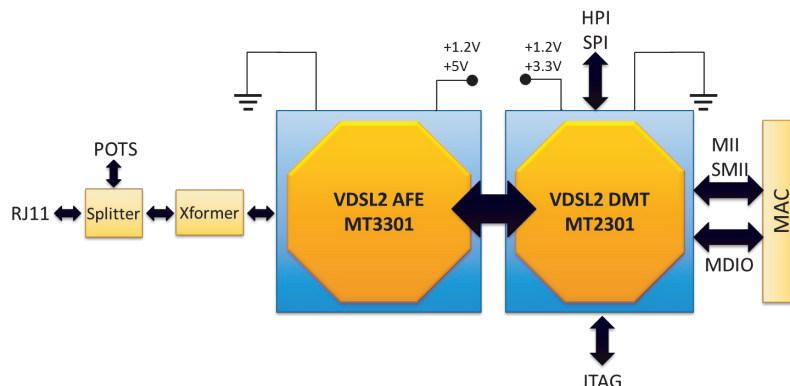
Package	128-LQFP	
Size	14mm x 14mm x 3.2mm	
Supply voltage	1.2V & 3.3V	
Ambient Temp. (C)	Min: 0	Max: +65
ESD class.	2kV	

MT3301 AFE

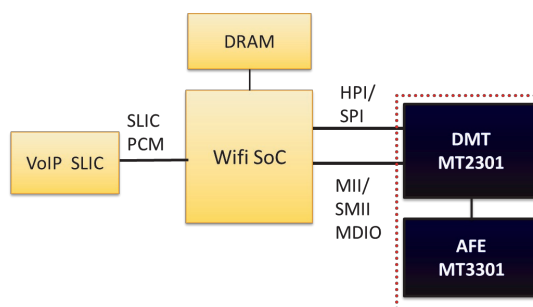
Package	No lead QFN	
Size	9x9x0.8mm	
Supply voltage	2.5V, 3.3V & 5V	
Ambient Temp. (C)	Min: 0	Max: +65
ESD class.	2kV	

*Depend on deployment and settings

Interface block diagram



Application Example I: VDSL2 High-end 2x2 802.11n Wifi and VOIP capable Home Gateway



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VDSL2

The Last Mile Broadband Solution

VDSL2 dual port

MT5302 2x DMT+AFE



Applications

- IP digital Subscriber Loop Access Multiplexer solution
- Multi-Service Access Platforms (MSAP)
- Customer Premise/Located Equipment for Internet Access and VoIP
- Flexible point-to-point solutions

The MT5302 is part of the Metanoia VDSL2 chipset solutions focusing on CO side. The MT5302 can for example be used in DSLAMs for local VDSL2 deployment in big buildings such as hotels or as CO side in a P2P solution. The MT5302 incorporates both two Discrete Multi-Tone (DMT) and two Analog Front End (AFE) on a single chip.

The design supports all committee T1E1.4 and ITU-T G.993.2 DSL discrete multi-tone based specifications, as well as IEEE 802.3 10PASS-TS, this ensures solid interoperability with other chip vendors today and in the future. Further, the MT5302 supports all profiles described in VDSL2 standard which ensures optimal operation regarding distance vs. data rate.

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VDSL2

The Last Mile Broadband Solution

General Features

- VDSL2 profiles: 8a, 8b, 8c, 8d, 12a, 12b, 17a, 30a
- OLR, UPBO, DPBO and US0
- 100/100Mbps payload data rate supported
- Conformance to T1E1, ITU-T standards for VDSL2, and current IEEE 802.3ah draft for 10PASS-TS (EFM)
- Configurable band-plan, conforms to NA, EUR and Swedish Band-plans subject to the 3072/4096 and 8-band/4-passband constraints
- Flexible QoS classification
- Supports SMII dual port
- RAM booted from EEPROM, Flash, or external uP
- Management through MDIO serial
- Optimized to support low latency applications as required for voice
- Annex A/B/C
- Compatible with POTS, ISDN
- Interoperable with major VDSL2 chipset vendors
- 448 LBGA package

Standard compliant and full set of features

The MT5302 complies with all ITU-T's standards for VDSL2 which ensures interoperability with other major chip vendors. In addition, MT5302 includes a wide range of features, such as UPBO, DPBO, US0, SRA, OLR, etc. which together with a full set of profiles, annexes and band plans, ensures smooth and optimal operation.

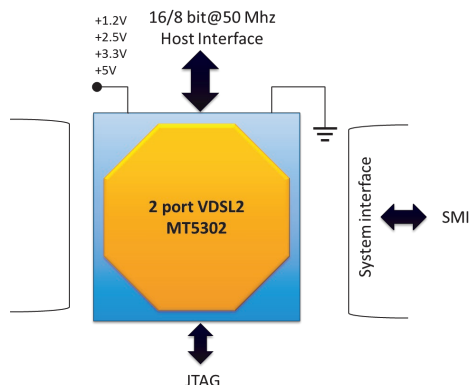
Small and simple design

The MT5302 includes a simple but still powerful and feature rich VDSL2 PHY layer. The integration of 2 port DMT and AFE ends up in a very area efficient design which enables small and cost efficient board designs.

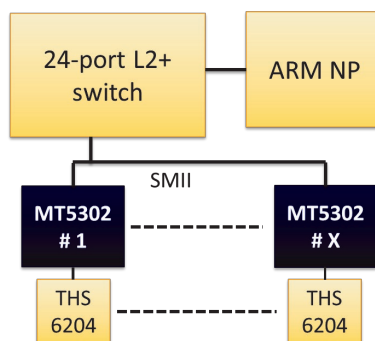
Scalable CO solution

This chip solution is scalable to fit the optimal size of the CO side in customers different product offerings.

MT5302 Interface block diagram



Application Example: X port VDSL2 CO



General Features

Transmission modes

VDSL2 profiles	8a, 8b, 8c, 8d, 12a, 12b, 17a, 30a
Data rate	Up to 100 Mbps upstream / 100 Mbps downstream
Band-plans	Conforms to NA, EUR & Swedish band-plans
Annex	A/B/C
Parameter configurability	997.1 Compliant

Advanced Features from ITU

OLR	Supports bit swapping, SRA and dynamic interleaver depth (D) change
US0	Supported
PBO	Both UPBO and DPBO supported

Unique Features

QoS	Flexible packet sorting based on EtherType, VLAN ID or VLAN priority (supports QinQ).
Legacy compatibility	Compatible with POTS and ISDN

Interfaces

RJ11	RJ11 VDSL2 connector
USB	USB2.0

VDSL2

The last mile broadband solution

VDSL2 USB dongle EVB2301-BL/USB



Applications

- VDSL2 dongle.
- VDSL2 bridge.
- Low cost VDSL2 upgrade for USB supported legacy ADSL gateway.

This is a reference design for a high performance and low cost USB connected VDSL2 bridge based on the MT2301 DMT chip. This is a perfect solution for fast VDSL2 deployment and our area efficient design enables attractive casing possibilities. This extremely cost efficient design is a smart choice for operators and service providers looking for a low CAPEX VDSL2 migration path.

VDSL2

The last mile broadband solution

User friendliness and acceptance with USB

This design provides VDSL2 connectivity through USB connection, a by end-users very familiar interface. This enables products based on this design to easily address any connectivity requirements and issues with current installations, which in turn will both simplify and lower the CAPEX of a VDSL2 migration.

Fully standard-compliance ensures guaranteed interoperability

The MT2301 DMT and 3301 AFE fully comply with the ITU-T standards for VDSL2. In addition to compliance, Metanoia has devoted considerable efforts and resources to ensure complete interoperability with other chip vendors to provide a reliable and seamless VDSL2 experience.

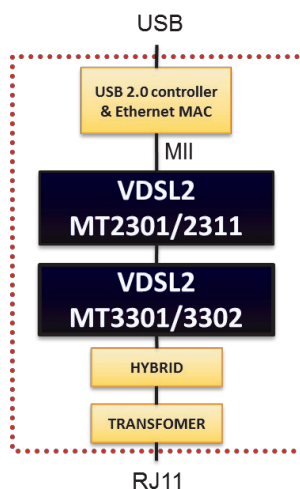
Cost-efficiency enables smooth VDSL2 migration

This extremely cost-efficient design enables a low CAPEX solution for a seamless migration to VDSL2. This can enable a path for operators to upgrade the internet service of existing customers at a very minimal cost.

Small size enables user friendly casing

The small physical form factor of this design enables a customer friendly and attractive casing.

Block diagram for USB VDSL2 dongle :



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VDSL2

The last mile broadband solution

General Features

Transmission modes

VDSL2 profiles	8a, 8b, 8c, 8d, 12a, 12b, 17a, 30a
Data rate	Up to 100 Mbps upstream / 100 Mbps downstream
Band-plans	Conforms to NA, EUR & Swedish band-plans
Annex	A/B/C
Parameter configurability	997.1 Compliant

Advanced Features from ITU

OLR	Supports bit swapping, SRA and dynamic interleaver depth (D) change
US0	Supported
PBO	Both UPBO and DPBO supported

Unique Features

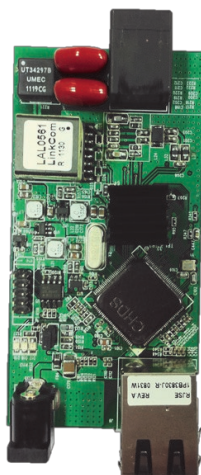
QoS	Flexible packet sorting based on EtherType, VLAN ID or VLAN priority (supports QinQ).
Legacy compatibility	Compatible with POTS and ISDN

Interfaces

RJ-11	RJ-11 VDSL2 connector
RJ-45	RJ-45 Ethernet connector

VDSL2 Ethernet dongle

EVB2301-BL/Eth



Applications

- VDSL2 dongle
- VDSL2 bridge
- Low cost VDSL2 upgrade for current ADSL gateway with WAN port

This is a reference design for a high performance and low cost Ethernet connected VDSL2 bridge based on the MT2301 DMT chip.

This is a perfect solution for fast VDSL2 deployment and our area efficient design enables attractive casing possibilities. This extremely cost efficient design is a smart choice for operators and service providers looking for a low CAPEX VDSL2 migration path.

VDSL2

The last mile broadband solution

Simplicity with Ethernet RJ-45

This design provides VDSL2 connectivity through Ethernet RJ-45 connection, which is by far the most popular and commonly deployed network connection interface. This enables products based on this design to easily address any connectivity requirements and issues with current installations, which in turn will both simplify and lower the CAPEX of a VDSL2 migration.

Fully standard-compliance ensures guaranteed interoperability

The MT2301 DMT and 3301 AFE fully comply with the ITU-T standards for VDSL2. In addition to compliance, Metanoia has devoted considerable efforts and resources to ensure complete interoperability with other chip vendors to provide a reliable and seamless VDSL2 experience.

Cost-efficiency enables smooth VDSL2 migration

This extremely cost-efficient design enables a low CAPEX solution for a seamless migration to VDSL2. This can enable a path for operators to upgrade the internet service of existing customers at a very minimal cost.

Small size enables user friendly casing

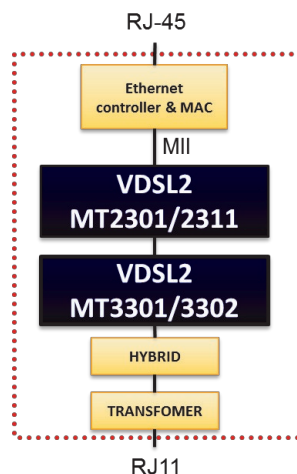
The small physical form factor of this design enables a customer friendly and attractive casing.

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Block diagram for Ethernet VDSL2 :



Product Brief

-MT2311
-MT3302

General Features

VDSL2 Transmission modes

VDSL2 profiles	8a, 8b, 8c, 8d, 12a, 12b, 17a, 30a
Data rate	Up to 100 Mbps upstream / 100 Mbps downstream
Annex	A/B/C
Parameter configurability	997.1 Compliant

ADSL2+ Transmission modes

Annex	A/B/M
Data rate	Up to 24 Mbps
Modes	PTM & ATM (AAL5 and OAM cells)
PVC	Up to 8 PVCs
VC	Up to 65k VCs

Advanced Features from ITU

G.inp	Support G.inp described by ITU
G.vector	Support all CPE features of G.vector
ROC	Robust Overhead Channel lowers BER for control channels
Dual latency	Supported
OLR	Supports bit swapping, SRA, SoS and dynamic interleaver depth (D) change
US0	Supported
PBO	Both UPBO and DPBO supported

Other Unique Features

QoS	Flexible packet sorting based on EtherType, VLAN ID or VLAN priority (supports QinQ).
EBM	Ethernet Boot & Management supported
Bootimg	RAM can be booted from EEPROM, Flash or external µProcessor

Interfaces

MAC	MII/SMII/RGMII & MDIO
Host/master	HPI & SPI

VDSL2

The Last Mile Broadband Solution

VDSL2/ADSL2+ PHY

MT2311 DMT + MT3302 AFE



Metanoia's MT2311 Discrete Multi-Tone (DMT) chip is the second generation VDSL2 chipset. In addition to the rich features inherited from MT2301, the MT2311 also features both VDSL2 and ADSL2/ADSL2+ backwards compatibility which enables it to be deployed in a mixed environment.

Furthermore, the MT2311 DMT chip also includes the latest VDSL2 features like G.inp and G.vector. G.inp provides physical layer retransmission which is critical for delivery of high quality IPTV services. G.vector provides the tools for CO side to cancel crosstalk between adjacent lines in a bundle which leads to a substantial increase in data rates.

The MT2311 and MT3302 also support all T1E1.4 and ITU-T VDSL2 and ADSL2/ADSL2+ discrete multi-tone based specifications, as well as IEEE 802.3 10PASS-TS. This ensures guaranteed interoperability with other chip vendors today and in the future. The MT2311 chip supports all profiles described in the VDSL2 and ADSL2 standards which ensure optimal data rates at various distances and for different deployment scenarios.

Standard Compliance

Description	Standards
VDSL2	T1E1.4, ITU G.993.2 Amd.1-7, G.994.1, G.997.1, G.998.4, G.993.5
ADSL2/2+	ITU G.992.3
10PASS-TS	IEEE 802.3ah
Interfaces	IEEE 802.3 for MII

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Product Brief

-MT2311
-MT3302

VDSL2

The Last Mile Broadband Solution

Physical Parameters

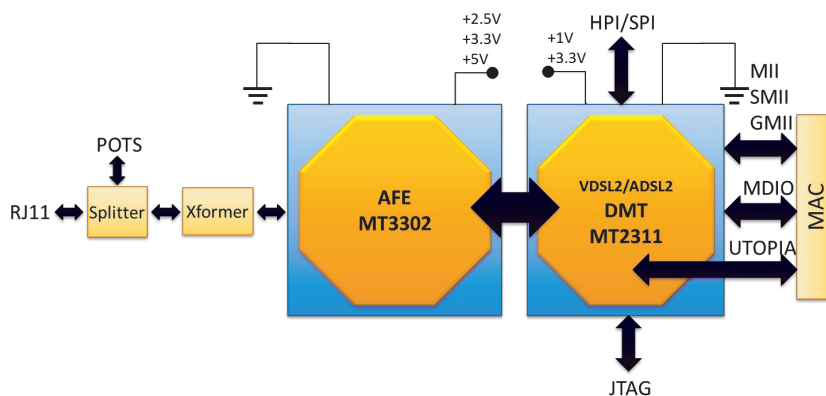
MT2311 DMT

Package	128-LQFP
Size	14mm x 14mm x 3.2mm
Supply voltage	1.0V & 3.3V
Ambient Temp. (C)	Min: 0 Max: +65
ESD class.	2kV

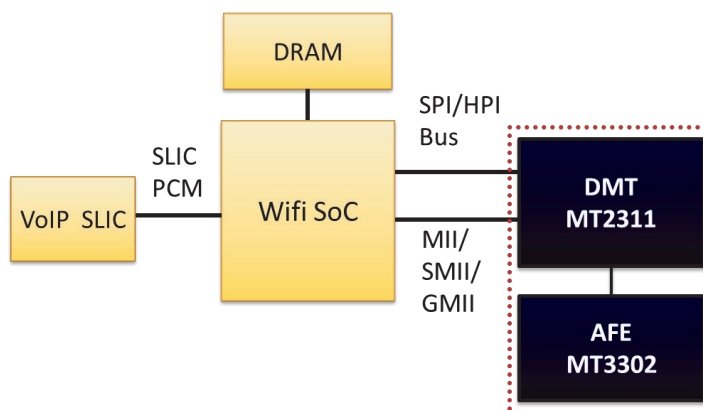
MT3302 AFE

Package	No lead QFN
Size	9x9x0.8mm
Supply voltage	2.5V, 3.3V & 5V
Ambient Temp. (C)	Min: 0 Max: +65
ESD class.	2kV

Interface block diagram



Application Example: VDSL2/ADSL2+ High-end 2x2 802.11n Wifi and VOIP Home Gateway



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Product Brief Collection

-MT2312
-MT3302

VDSL2

The Last Mile Broadband Solution

Available Soon

VDSL2 30a G.bond

MT2312 DMT + MT3302 AFE



Applications

- IP digital Subscriber Loop Access Multiplexer solution
- Multi-Service Access Platforms (MSAP)
- High-end VDSL2 CPE utilizing two RJ-11 for G.bond

Metanoia's MT2312 chipset supporting 30a two port bonding, enabling the highest data rates currently offered by VDSL2 is ready for sampling Q1'2012. The MT2312 Discrete Multi-Tone (DMT) chip will offer a smart and flexible VDSL2/ADSL2 PHY solution that is not only compatible with the MT3302 AFE but can connect to other AFEs over standard interfaces.

These devices also support all committee T1E1.4 and ITU-T G.993.2 DSL discrete multi-tone based specifications, as well as IEEE 802.3 10PASS-TS, this ensures solid interoperability with other chip vendors today and in the future. Further, the MT2312 supports G.bond for all VDSL and ADLS profiles described in the related standards which ensures optimal operation for CPE regarding distance vs. data rate.

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Product Brief Collection

-MT2312
-MT3302

General Features

- **2 port 30a VDSL2 G.bond**
- ADSL2/2+ backward compatibility
- **G.inp, G.vector** and ROC supported
- VDSL2 profiles: 8a, 8b, 8c, 8d, 12a, 12b, 17a, **30a**
- OLR, UPBO, DPBO and USO
- 100/100Mbps payload data rate supported
- Conformance to T1E1, ITU-T standards for VDSL2 and ADSL2+, and current IEEE 802.3ah draft for 10PASS-TS (EFM)
- Configurable band-plan, conforms to NA, EUR and Swedish Band-plans subject to the 3072/4096 and 8-band/4-passband constraints
- Dual latency support
- Flexible QoS classification
- RAM booted from EEPROM, Flash, or external uP
- Annex A/B/C
- Compatible with POTS, ISDN
- Interoperable with major VDSL2 and ADSL2+ chipset vendors

VDSL2

The Last Mile Broadband Solution

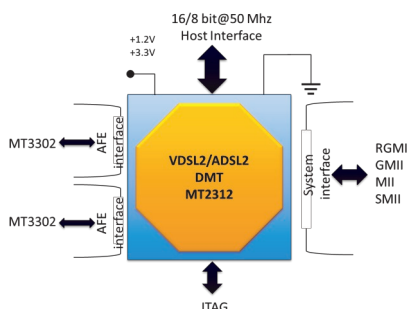
Feature-rich and interoperability

The MT2312 DMT supports 30a G.bond enabling the current maximum data rate offered with VDSL2. In addition it has support for both VDSL2 and ADSL2+, further it includes a wide range of features to provide optimal performance in customers different scenarios, no matter if it is in ADSL2+ or VDSL2 deployments. Both the MT2312 DMT and the MT3302 AFE follow ITU-T's DSL standards regarding VDSL2 and ADSL2+ which ensures solid interoperability with other major chip vendors.

Flexibility and efficient development with smart PHY

The MT2312 DMT and the MT3302 AFE make up a very flexible PHY solution for VDSL2/ADSL2+ because it can be combined with any network processor, whether because our customer needs a processor their engineers are used to or because their project needs a more high-end network processor than provided by other VDSL2 vendors, the MT2312 solution will enables the feature/price flexibility and development pace our customers need in their projects.

MT2312 Interface block diagram



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