

HD3SS3412 4チャンネルの高性能差動スイッチ

1 特長

- PCI Express Gen IIIおよびUSB 3.0を含む、最高12Gbpsの複数のインターフェイス標準と互換
- 8GHzを超える広い-3dB差動BW
- 優れた動的特性(4GHz時)
 - クロストーク=-35dB
 - オフ絶縁=-19dB
 - 挿入損失=-1.5dB
 - 反射損失=-11dB
- 双方向「マルチプレクサ/デマルチプレクサ」型差動スイッチ
- VDD動作範囲: 3.3V±10%
- 小型の3.5mm×9.0mm、42ピンWQFNパッケージ
- 共通の業界標準ピン配置
- XAUIおよびSGMIIのサポート

2 アプリケーション

- デスクトップPCおよびノートPC
- サーバーおよびストレージ・エリア・ネットワーク
- PCI Expressバックプレーン
- 共有I/Oポート

3 概要

HD3SS3412デバイスは、PCまたはサーバーで1つのソースから2つのターゲットのいずれかに接続するために2つのフルPCI Express x1レーンを使用するアプリケーションなど、4つの差動チャンネルのスイッチングに対応した高速パッシブ・スイッチです。HD3SS3412は双方向型なので、2つのプラットフォーム間で共有するペリフェラルなど、1つのターゲット・デバイスと2つのソース・デバイスとの接続を可能にするアプリケーションもサポートしています。HD3SS3412には1つの制御線(SELピン)があり、これを使用してポートAと、ポートBまたはポートCとの間の信号経路を制御できます。

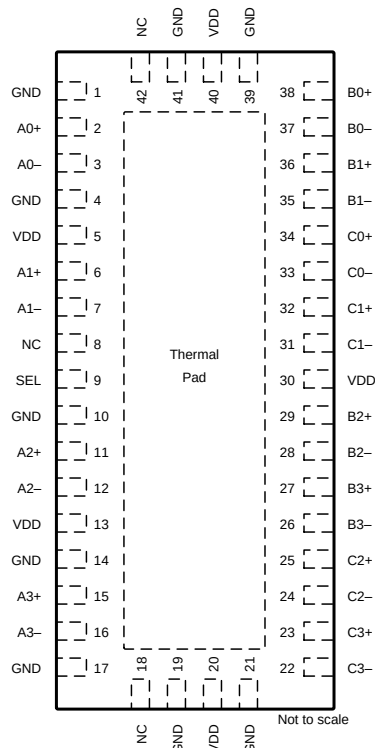
HD3SS3412は、他の複数のベンダと共通の実装サイズを持つ、業界標準の42ピンWQFNパッケージで供給されます。このデバイスは、-40℃～85℃の温度範囲全体にわたって、3.3Vの単一電源で動作が規定されています。

製品情報⁽¹⁾

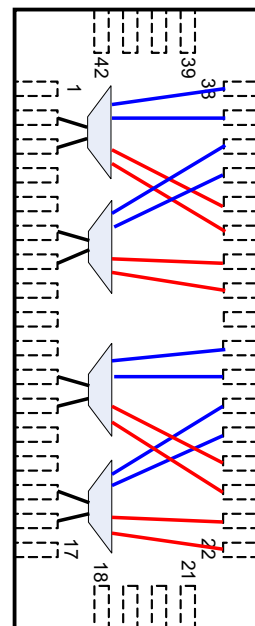
型番	パッケージ	本体サイズ(公称)
HD3SS3412	WQFN (42)	9.00mm×3.50mm

(1) 利用可能なすべてのパッケージについては、このデータシートの末尾にある注文情報を参照してください。

HD3SS3412のピン配置



HD3SS3412スイッチのフロースルー配線



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4 改訂履歴

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Revision E (January 2015) から Revision F に変更 Page

•	温度範囲を「0°C～70°C」から「-40°C～85°C」に変更	1
•	Changed T _A To: -40°C MIN and 85°C MAX From: 0°C MIN and 70°C MAX in the <i>Recommended Operating Conditions</i> table	7
•	Changed the P _D values From: MIN = 15.5, MAX = 21.6 To: MIN = 2.8, MAX = 4.4 in the <i>Dissipation Ratings</i> table	8

Revision D (December 2015) から Revision E に変更 Page

•	Changed "over the full industrial temperature range of -40°C to 70°C" To: "over the commercial temperature range of 0°C to 70°C" in the <i>Overview</i> section	13
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Revision C (July 2015) から Revision D に変更 Page

•	Changed "full industrial temperature range of -40°C to 85°C" To: "full industrial temperature range of 0°C to 70°C" in the <i>Overview</i> section	13
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Revision B (November 2013) から Revision C に変更 Page

•	「ピン構成および機能」セクション、「ESD定格」表、「機能説明」セクション、「デバイスの機能モード」セクション、「アプリケーションと実装」セクション、「電源に関する推奨事項」セクション、「レイアウト」セクション、「デバイスおよびドキュメントのサポート」セクション、「メカニカル、パッケージ、および注文情報」セクション 追加	1
•	「注文情報」表を削除	1

Revision A (February 2012) から Revision B に変更 Page

•	追加機能: 双方向「マルチプレクサ/デマルチプレクサ」型差動スイッチ 追加	1
•	デバイスがXAUIおよびSGMIIをサポートすることを追記	1
•	「概要」セクションで「産業用」を削除し、温度範囲を「-40°C～85°C」から「0°C～70°C」に変更	1
•	Changed pin description of NC From: Electrically not connected. To: Electrically not connected. May connect to	

VDD or GND, or leave unconnected	6
• Added the <i>Application Information</i> section	15

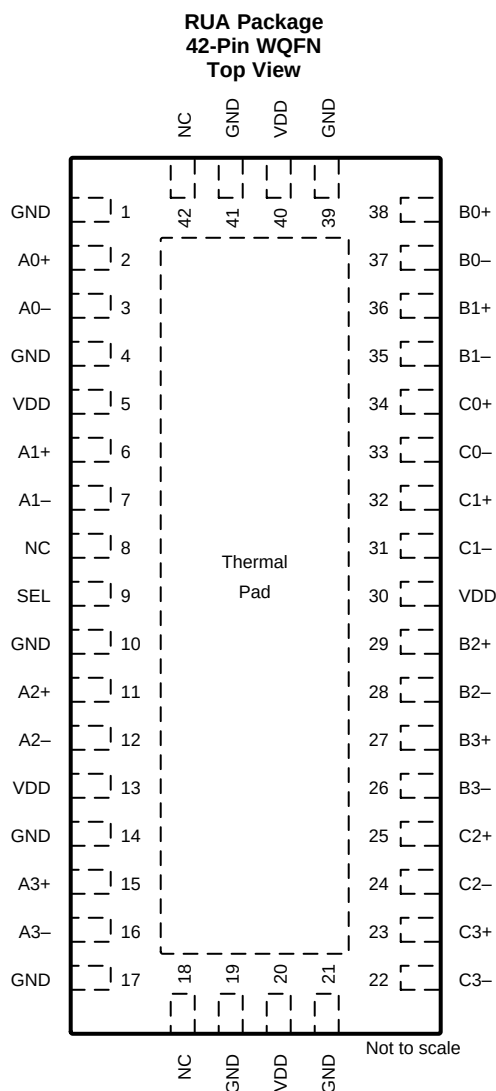
2012年1月発行のものから更新
Page

• 差動BWの簡条書き項目を「7.5GHz」から「8GHz」に変更	1
• 「特長」の動的特性についての簡条書き副項目を「絶縁」から「オフ絶縁」に変更	1
• 動的特性についての簡条書き副項目の反射損失を「-9dB」から「-11dB」に変更	1
• 動的特性についての簡条書き副項目「最大ペア内(ビット-ビット)スキュー」を削除	1
• Changed ESD, Human body model, MAX voltage from "±2000" to "±4,000" in Absolute Maximum Ratings table	7
• Changed I_{LK} spec (Diff I/O pins) MAX value from "4 μ A" to "130 μ A" and added [Ports B and C] and [Port A] to Conditions statements.	8
• Changed t_{PD} spec MAX delay from "50" ps to "85" ps in Device Parameters table	8
• Changed SEL-to-switch T_{on} and T_{off} spec TYP values from "175" ns to "70" ns; in the Device Parameters table	8
• Changed T_{SKEW_Inter} and T_{SKEW_Intra} spec MAX values from "5 ps" and "4 ps" respectively, to "20 ps" and "8 ps" respectively, in Electrical Characteristics table	8
• Changed R_L spec TYP value from "-25" and "-9" dB to "-28" and "-11" dB for $f=0.3$ MHz and $f=4000$ MHz, respectively, in Electrical Characteristics table.	8
• Changed O_{IRR} spec TYP value from "-70" to "-75" dB for $f=0.3$ MHz, in Electrical Characteristics table.	8
• Changed BW spec TYP value from "7.5" GHz to "8" GHz in Electrical Characteristics table.	8
• Changed graphic image for Figure 3	10
• Changed graphic image for Figure 4	10

5 概要（続き）

HD3SS3412は、回路基板における2点間の高速信号のルーティングに使用可能な、汎用4チャンネル高速マルチプレクサ/デマルチプレクサ型スイッチです。PCI Express Gen IIIアプリケーション専用には設計されていますが、ほかにもUSB 3.0やDisplayPort 1.2など、差動振幅1800mVpp未満、同相電圧2V未満のいくつかの高速データ・プロトコルをサポートしています。このデバイスにある1つのセレクト(SEL)入力ピンは、システム内で利用可能なGPIOピンにより、またはマイクロコントローラから簡単に制御できます。

6 Pin Configuration and Functions



Pin Functions

PIN		I/O	DESCRIPTION
NAME	NO.		
SWITCH PORT A			
A0+	2	I/O	Port A, Channel 0, High-Speed Positive Signal
A0−	3	I/O	Port A, Channel 0, High-Speed Negative Signal
A1+	6	I/O	Port A, Channel 1, High-Speed Positive Signal
A1−	7	I/O	Port A, Channel 1, High-Speed Negative Signal
A2+	11	I/O	Port A, Channel 2, High-Speed Positive Signal
A2−	12	I/O	Port A, Channel 2, High-Speed Negative Signal
A3+	15	I/O	Port A, Channel 3, High-Speed Positive Signal
A3−	16	I/O	Port A, Channel 3, High-Speed Negative Signal
SWITCH PORT B			
B0+	38	I/O	Port B, Channel 0, High-Speed Positive Signal
B0−	37	I/O	Port B, Channel 0, High-Speed Negative Signal

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Pin Functions (continued)

PIN		I/O	DESCRIPTION
NAME	NO.		
B1+	36	I/O	Port B, Channel 1, High-Speed Positive Signal
B1–	35	I/O	Port B, Channel 1, High-Speed Negative Signal
B2+	29	I/O	Port B, Channel 2, High-Speed Positive Signal
B2–	28	I/O	Port B, Channel 2, High-Speed Negative Signal
B3+	27	I/O	Port B, Channel 3, High-Speed Positive Signal
B3–	26	I/O	Port B, Channel 3, High-Speed Negative Signal
SWITCH PORT C			
C0+	34	I/O	Port C, Channel 0, High-Speed Positive Signal
C0–	33	I/O	Port C, Channel 0, High-Speed Negative Signal
C1+	32	I/O	Port C, Channel 1, High-Speed Positive Signal
C1–	31	I/O	Port C, Channel 1, High-Speed Negative Signal
C2+	25	I/O	Port C, Channel 2, High-Speed Positive Signal
C2–	24	I/O	Port C, Channel 2, High-Speed Negative Signal
C3+	23	I/O	Port C, Channel 3, High-Speed Positive Signal
C3–	22	I/O	Port C, Channel 3, High-Speed Negative Signal
CONTROL, SUPPLY, AND NO CONNECT			
NC	8	—	Electrically not connected. May connect to VDD or GND, or leave unconnected.
	18		
	42		
GND	1	Supply	Negative power supply voltage
	4		
	10		
	14		
	17		
	19		
	21		
	39		
	41		
	Center Pad		
SEL	9	I	Select between port B or port C. Internally tied to GND through a 100-k Ω resistor
VDD	5	Supply	Positive power supply voltage
	13		
	20		
	30		
	40		

7 Specifications

7.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)⁽¹⁾⁽²⁾

		MIN	MAX	UNIT
Supply voltage (V_{DD})	Absolute minimum/maximum supply voltage	−0.5	4	V
Voltage	Differential I/O	−0.5	4	V
	Control pin (SEL)	−0.5	$V_{DD} + 0.5$	
Storage temperature, T_{stg}		−65	150	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values, except differential voltages, are with respect to network ground terminal.

7.2 ESD Ratings

		VALUE	UNIT
$V_{(ESD)}$ Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±4000	V
	Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	±1500	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

Typical values for all parameters are at $V_{DD} = 3.3$ V and $T_A = 25^\circ\text{C}$. (Temperature limits are specified by design)

			MIN	NOM	MAX	UNIT
V_{DD}	Supply voltage		3	3.3	3.6	V
V_{IH}	Input high voltage (SEL pin)		2		V_{DD}	V
V_{IL}	Input low voltage (SEL pin)		−0.1		0.8	V
V_{I/O_Diff}	Differential voltage (differential pins)	Switch I/O diff voltage	0		1.8	VPP
V_{I/O_CM}	Common voltage (differential pins)	Switch I/O common-mode voltage	0		2	V
T_A	Operating free-air temperature	Ambient temperature	−40		85	°C

7.4 Thermal Information

THERMAL METRIC ⁽¹⁾		HD3SS3412	UNIT
		RUA (WQFN)	
		42 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	53.8	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	38.2	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	21.9	°C/W
ψ_{JT}	Junction-to-top characterization parameter	27.4	°C/W
ψ_{JB}	Junction-to-board characterization parameter	5.6	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	27.3	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

7.5 Electrical Characteristics

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
DEVICE PARAMETERS						
I_{IH}	Input High Voltage (SEL)	$V_{DD} = 3.6 \text{ V}; V_{IN} = V_{DD}$			95	μA
I_{IL}	Input Low Voltage (SEL)	$V_{DD} = 3.6 \text{ V}; V_{IN} = \text{GND}$			1	μA
I_{LK}	Leakage Current (Differential I/O pins)	$V_{DD} = 3.6 \text{ V}; V_{IN} = 0 \text{ V}; V_{OUT} = 2 \text{ V}$ (I_{LK} On OPEN outputs) [Ports B and C]			130	μA
		$V_{DD} = 3.6 \text{ V}; V_{IN} = 2 \text{ V}; V_{OUT} = 0 \text{ V}$ (I_{LK} On OPEN outputs) [Port A]			4	
I_{DD}	Supply Current	$V_{DD} = 3.6 \text{ V}; \text{SEL} = V_{DD}/\text{GND}; \text{Outputs Floating}$		4.7	6	mA
C_{ON}	Outputs ON Capacitance	$V_{IN} = 0 \text{ V}; \text{Outputs Open}; \text{Switch ON}$		1.5		pF
C_{OFF}	Outputs OFF Capacitance	$V_{IN} = 0 \text{ V}; \text{Outputs Open}, \text{Switch OFF}$		1		pF
R_{ON}	Output ON resistance	$V_{DD} = 3.3 \text{ V}; V_{CM} = 0.5 \text{ V to } 1.5 \text{ V}; I_O = -8 \text{ mA}$		5	8	Ω
ΔR_{ON}	ON-resistance match between channels	$V_{DD} = 3.3 \text{ V}; -0.35 \text{ V} \leq V_{IN} \leq 1.2 \text{ V}; I_O = -8 \text{ mA}$			2	Ω
	ON-resistance match between pairs of the same channel	$V_{DD} = 3.3 \text{ V}; -0.35 \text{ V} \leq V_{IN} \leq 1.2 \text{ V}; I_O = -8 \text{ mA}$			0.7	Ω
R_{FLAT_ON}	ON-resistance flatness ($R_{ON(MAX)} - R_{ON(MIN)}$)	$V_{DD} = 3.3 \text{ V}; -0.35 \text{ V} \leq V_{IN} \leq 1.2 \text{ V}$			1.15	Ω
t_{PD}	Switch propagation delay	R_{sc} and $R_{LOAD} = 50 \Omega$			85	ps
	SEL-to-switch T_{ON}	R_{sc} and $R_{LOAD} = 50 \Omega$		70	250	ns
	SEL-to-switch T_{OFF}			70	250	
T_{SKEW_Inter}	Inter-pair output skew (CH-CH)	R_{sc} and $R_{LOAD} = 50 \Omega$			20	ps
T_{SKEW_Intra}	Intra-pair output skew (bit-bit)	R_{sc} and $R_{LOAD} = 50 \Omega$			8	ps
R_L	Differential return loss (VCM = 0 V) Also see Typical Characteristics	$f = 0.3 \text{ MHz}$		-28		dB
		$f = 2500 \text{ MHz}$		-12		
		$f = 4000 \text{ MHz}$		-11		
X_{TALK}	Differential Crosstalk (VCM = 0 V) Also see Typical Characteristics	$f = 0.3 \text{ MHz}$		-90		dB
		$f = 2500 \text{ MHz}$		-39		
		$f = 4000 \text{ MHz}$		-35		
O_{IRR}	Differential Off-Isolation (VCM = 0 V) Also see Typical Characteristics	$f = 0.3 \text{ MHz}$		-75		dB
		$f = 2500 \text{ MHz}$		-22		
		$f = 4000 \text{ MHz}$		-19		
I_L	Differential Insertion Loss (VCM = 0 V) Also see Typical Characteristics	$f = 0.3 \text{ MHz}$		-0.5		dB
		$f = 2500 \text{ MHz}$		-1.1		
		$f = 4000 \text{ MHz}$		-1.5		
BW	Bandwidth	At -3 dB		8		GHz

7.6 Dissipation Ratings

		MIN	MAX	UNIT
P_D	Power Dissipation	2.8	4.4	mW

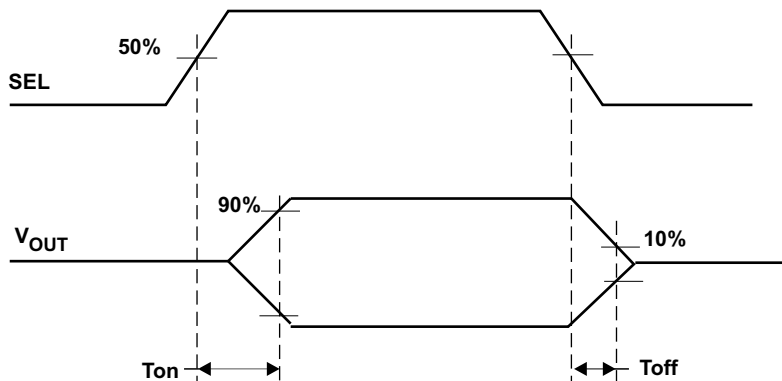
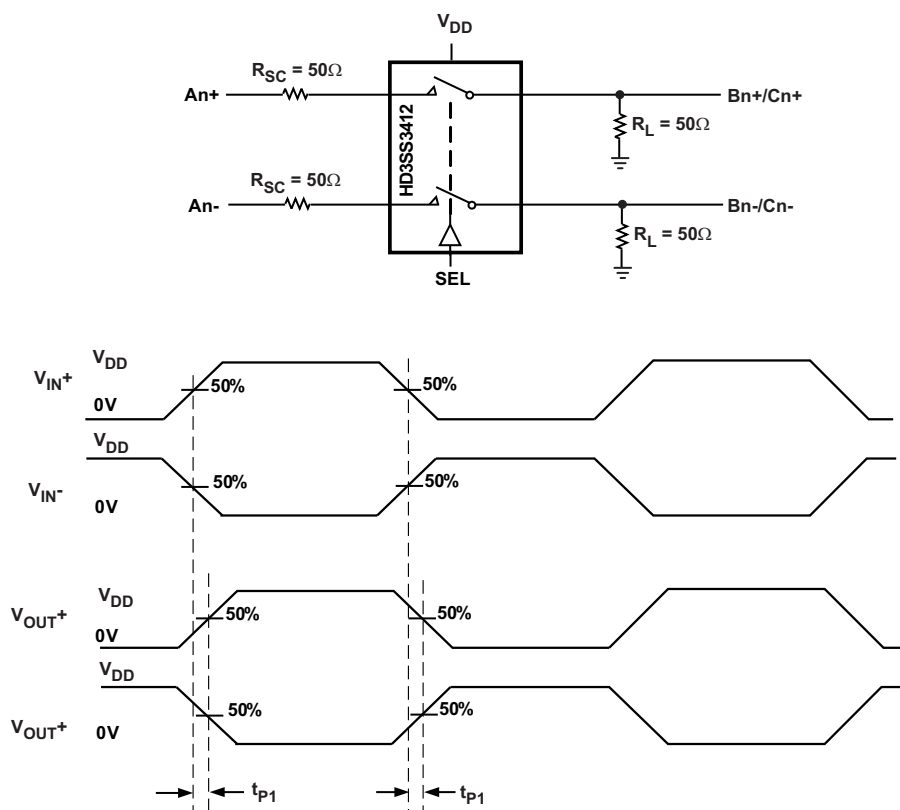


Figure 1. Switch ON and OFF Timing Diagram



$T_{\text{SKEWInter}}$ = Difference between t_{PD} for any two pairs of outputs

$T_{\text{SKEWIntra}}$ = Difference between t_{P1} and t_{P2} of same pair

Figure 2. Propagation Delay Timing Diagram and Test Setup

7.7 Typical Characteristics

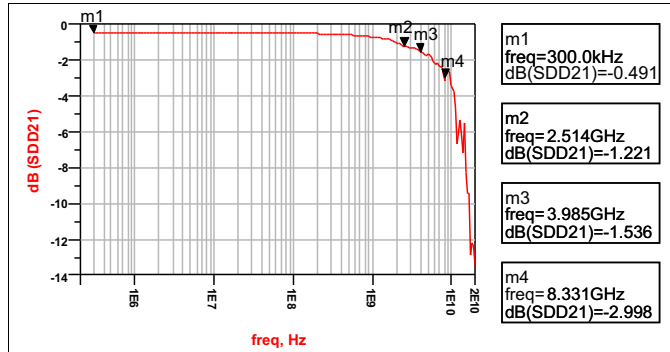


Figure 3. Differential Insertion Loss

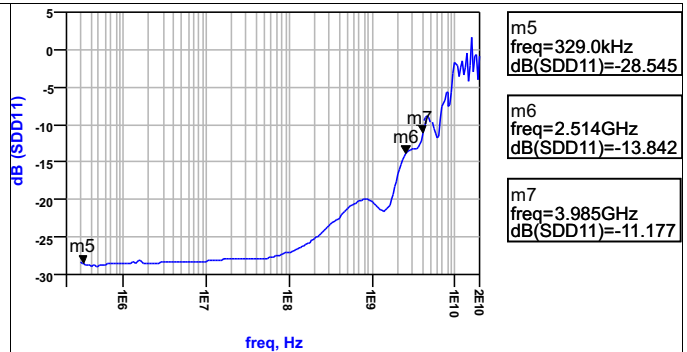


Figure 4. Differential Return Loss

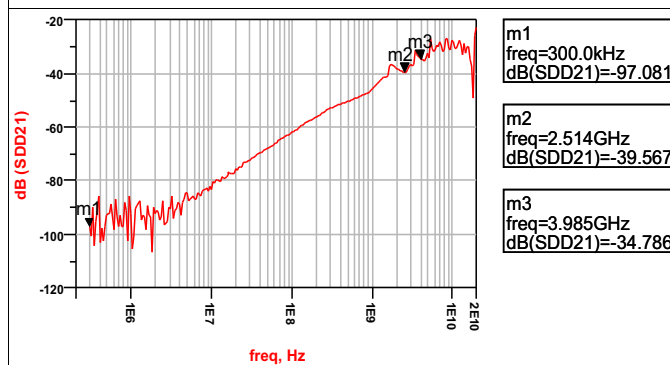


Figure 5. Differential Crosstalk

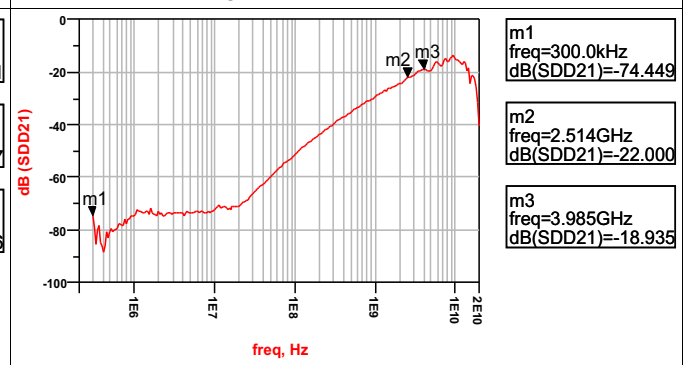


Figure 6. Differential Off Isolation

8 Parameter Measurement Information

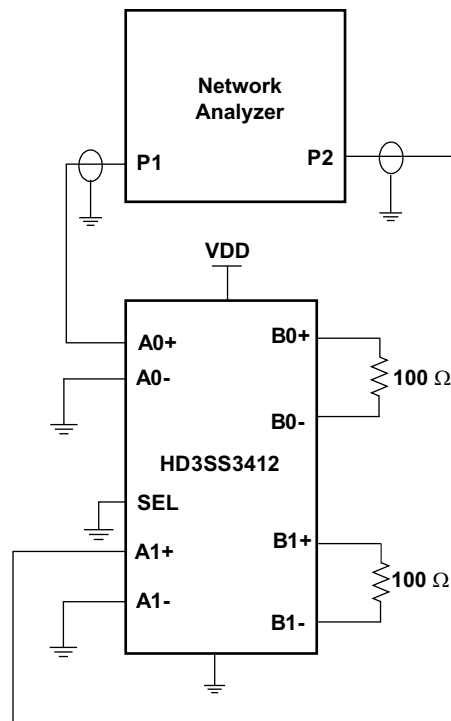


Figure 7. Cross Talk Measurement Setup

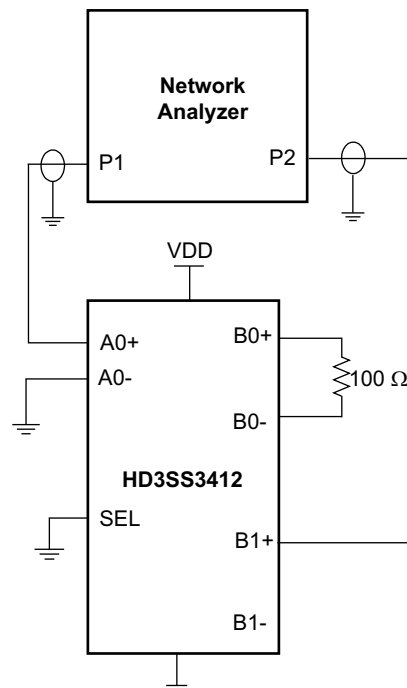


Figure 8. Off Isolation Measurement Setup

Parameter Measurement Information (continued)

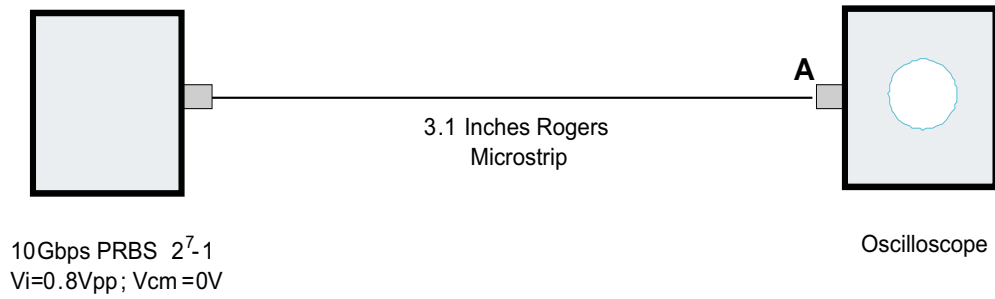


Figure 9. Source Eye Diagram Test Setup

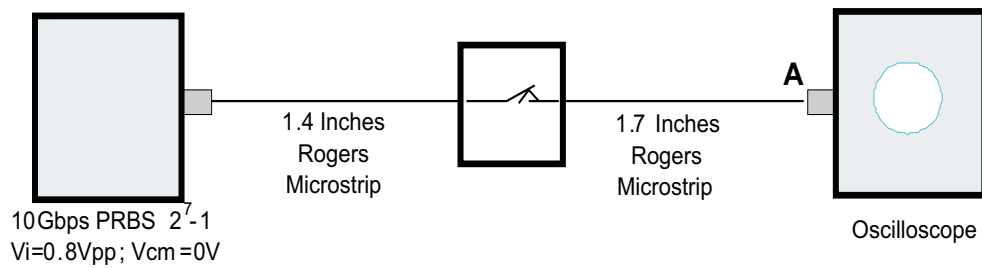


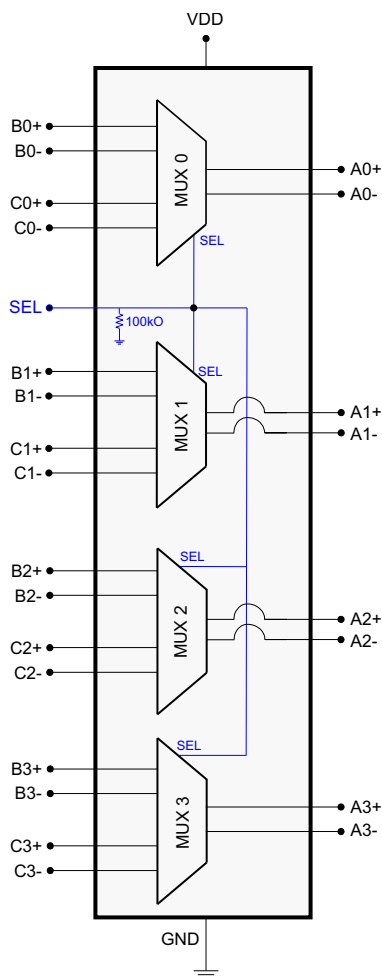
Figure 10. Output Eye Diagram Test Setup

9 Detailed Description

9.1 Overview

The HD3SS3412 is a high-speed passive switch offered in an industry standard 42-pin WQFN package available in a common footprint shared by several other vendors. The device is specified to operate from a single supply voltage of 3.3 V over the commercial temperature range of 0°C to 70°C. The HD3SS3412 is a generic 4-CH high-speed mux/demux type of switch that can be used for routing high-speed signals between two different locations on a circuit board. Although it was designed specifically to address PCI Express Gen III applications, the HD3SS3412 will also support several other high-speed data protocols with a differential amplitude of < 1800 mVpp and a common-mode voltage of < 2.0 V, as with USB 3.0 and DisplayPort 1.2. The device's one select input (SEL) pin can easily be controlled by an available GPIO pin within a system or from a microcontroller.

9.2 Functional Block Diagram



9.3 Feature Description

The HD3SS3412 has a single control line (SEL Pin) which can be used to control the signal path between Port A and either Port B or Port C. The one select input (SEL) pin of the device can easily be controlled by an available GPIO pin within a system or from a microcontroller. The input signal is selected using the SEL pin.

Table 1. Mux Pin Connections⁽¹⁾

PORT A CHANNEL	PORT B OR PORT C CHANNEL CONNECTED TO PORT A CHANNEL	
	SEL = L	SEL = H
A0+	B0+	C0+
A0–	B0–	C0–
A1+	B1+	C1+
A1–	B1–	C1–
A2+	B2+	C2+
A2–	B2–	C2–
A3+	B3+	C3+
A3–	B3–	C3–

(1) The HD3SS3412 can tolerate polarity inversions for all differential signals on Ports A, B, and C. Take care to ensure the same polarity is maintained on Port A versus Port B/C.

9.4 Device Functional Modes

[Table 2](#) lists the functional modes for the HD3SS3412.

Table 2. HD3SS3412 Control Logic

CONTROL PIN (SEL)	PORT A TO PORT B CONNECTION STATUS	PORT A TO PORT C CONNECTION STATUS
L (Default State)	Connected	Disconnected
H	Disconnected	Connected

10 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

10.1 Application Information

10.1.1 AC Coupling Caps

Many interfaces require AC coupling between the transmitter and receiver. The 0402 capacitors are the preferred option to provide AC coupling, and the 0603 size capacitors also work. The 0805 size capacitors and C-packs should be avoided. When placing AC coupling capacitors symmetric placement is best. A capacitor value of 0.1 μ F is best and the value should be match for the $\pm$ signal pair. The placement should be along the TX pairs on the system board, which are usually routed on the top layer of the board.

There are several placement options for the AC coupling capacitors. Because the switch requires a bias voltage, the capacitors must only be placed on one side of the switch. If they are placed on both sides of the switch, a biasing voltage should be provided. A few placement options are shown below. In [Figure 11](#), the coupling capacitors are placed between the switch and endpoint. In this situation, the switch is biased by the system/host controller.

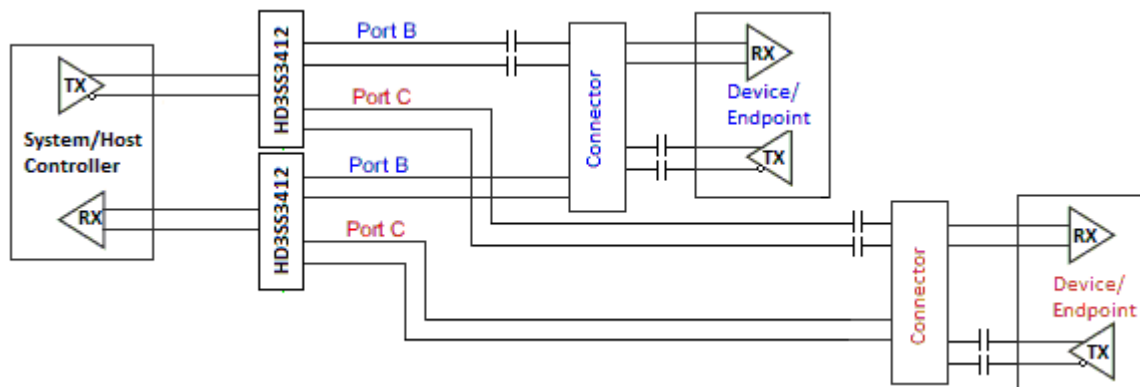


Figure 11. AC Coupling Capacitors Between Switch Tx and Endpoint Tx

In [Figure 12](#), the coupling capacitors are placed on the host transmit pair and endpoint transmit pair. In this situation, the switch on the top is biased by the endpoint and the lower switch is biased by the host controller.

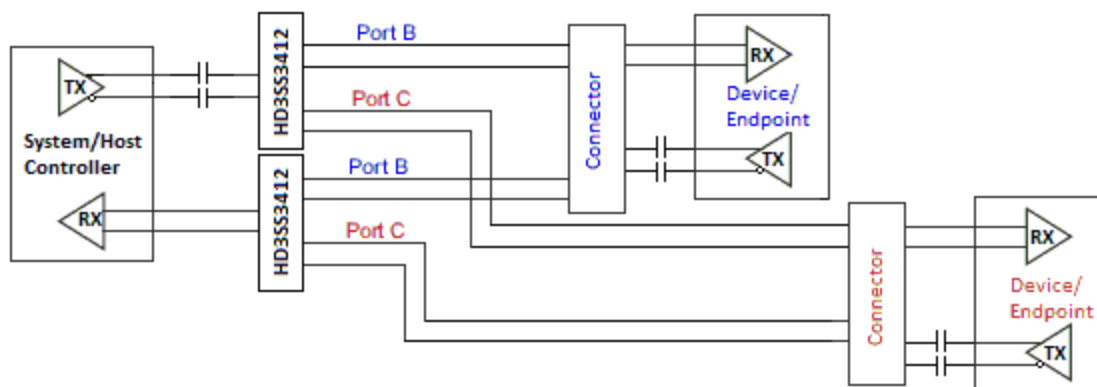


Figure 12. AC Coupling Capacitors on Host Tx and Endpoint Tx

Application Information (continued)

If the common-mode voltage in the system is higher than 2 V, the coupling capacitors are placed on both sides of the switch (shown in Figure 13). A biasing voltage of less than 2 V is required in this case.

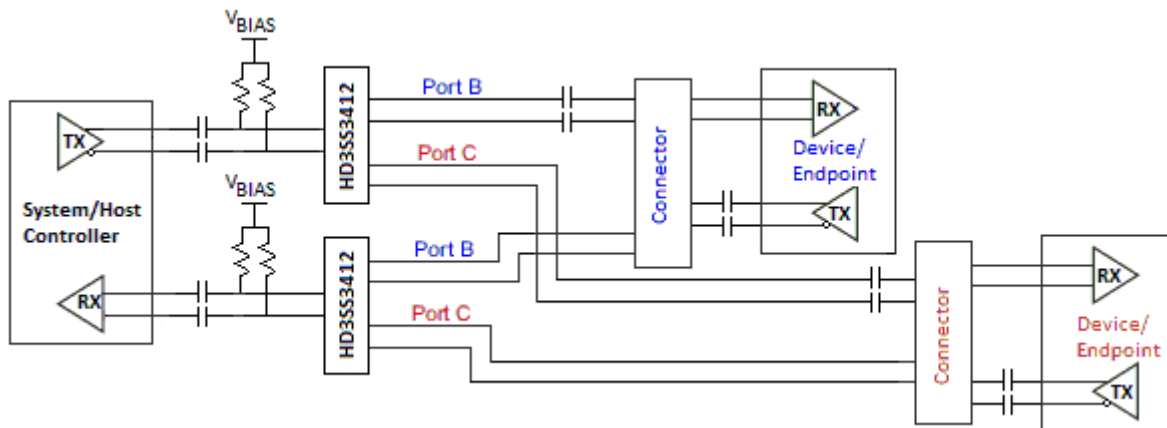


Figure 13. AC Coupling Capacitors on Both Sides of Switch

10.2 Typical Application

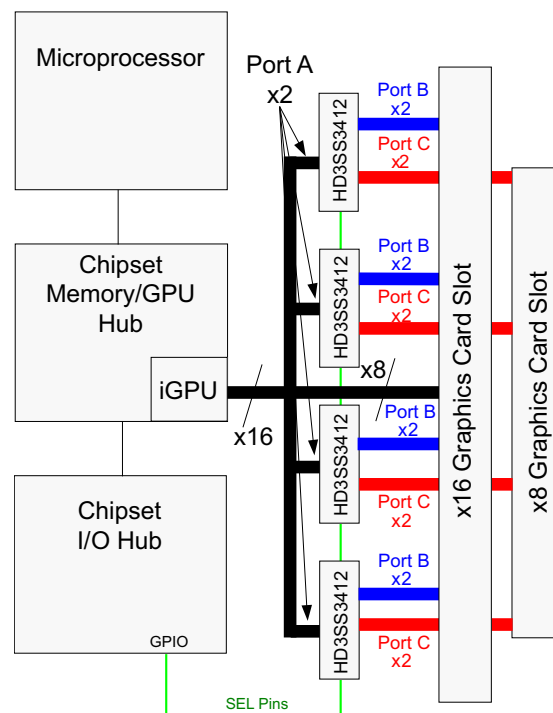


Figure 14. Typical Application Block Diagram

Typical Application (continued)

10.2.1 Design Requirements

Table 3 lists the design parameters of this example.

Table 3. Design Parameters

DESIGN PARAMETERS	EXAMPLE VALUE
Input voltage range	3.3 V
Decoupling capacitors	0.1 μ F
AC capacitors	75 nF – 200 nF (100 nF shown) USBAA TX p and n lines require AC capacitors. Alternate mode signals may or may not require AC capacitors

10.2.2 Detailed Design Procedure

- Connect VDD and GND pins to the power and ground planes of the printed circuit board, with 0.1-uF bypass capacitor
- Use +3.3-V TTL/CMOS logic level at SEL
- Use controlled-impedance transmission media for all the differential signals
- Ensure the received complimentary signals are with a differential amplitude of <1800 mVpp and a common-mode voltage of <2 V

10.2.3 Application Curves

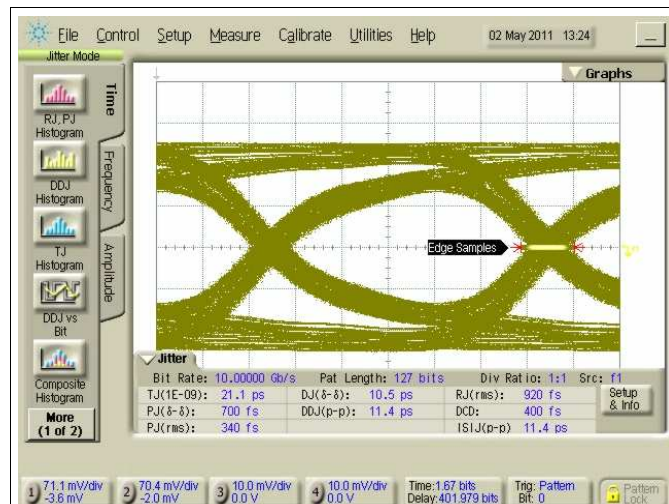


Figure 15. 10-gbps Source Eye Diagram at a: $V_{ID} = 800$ Mvpp; 2^7-1 Prbs; $V_{CM} = 0$ V

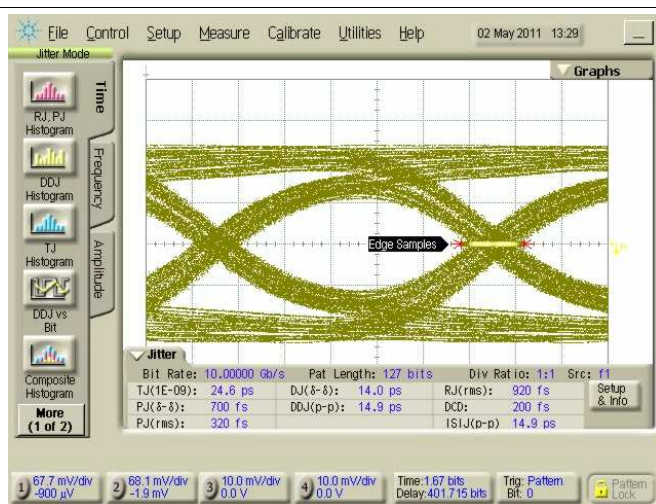


Figure 16. 10-gbps Output Eye Diagram at a: $V_{ID} = 800$ Mvpp; 2^7-1 Prbs; $V_{CM} = 0$ V; $V_{DD} = 3.3$ V; Sel= 0 V

11 Power Supply Recommendations

The HD3SS3412 requires +3.3-V digital power sources. VDD 3.3 supply must have 0.1- μ F bypass capacitors to VSS (ground) in order for proper operation. The recommendation is one capacitor for each power terminal. Place the capacitor as close as possible to the terminal on the device and keep trace length to a minimum. Smaller value capacitors like 0.01- μ F are also recommended on the digital supply terminals.

12 Layout

12.1 Layout Guidelines

- Decoupling caps should be placed next to each power terminal on the HD3SS3412. Take care to minimize the stub length of the trace connecting the capacitor to the power pin.
- Avoid sharing vias between multiple decoupling caps
- Place vias as close as possible to the decoupling cap solder pad
- Widen VDD/GND planes to reduce effect of static and dynamic IR drop
- The VBUS traces/planes must be wide enough to carry maximum of 2-A current

12.2 Layout Example

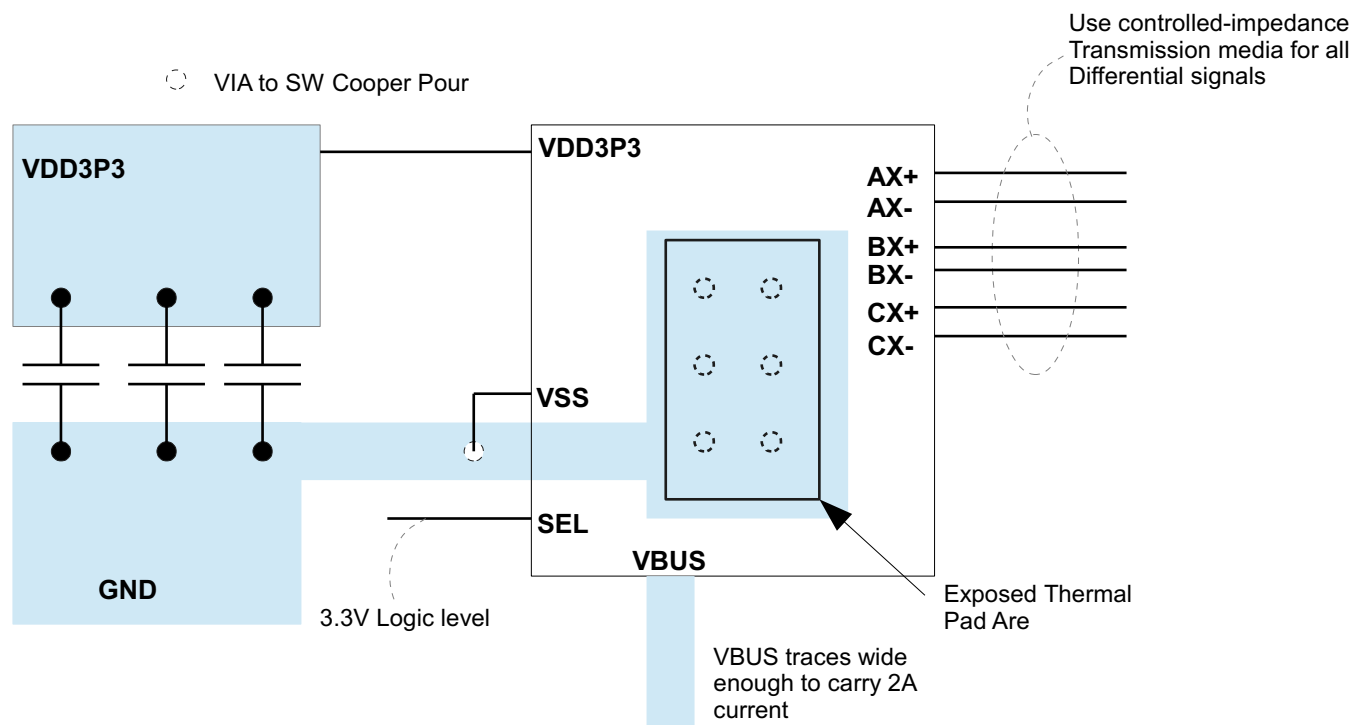


Figure 17. Layout Example

13 デバイスおよびドキュメントのサポート

13.1 ドキュメントの更新通知を受け取る方法

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13.2 コミュニティ・リソース

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13.5 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

14 メカニカル、パッケージ、および注文情報

以降のページには、メカニカル、パッケージ、および注文に関する情報が記載されています。この情報は、そのデバイスについて利用可能な最新のデータです。このデータは予告なく変更されることがあり、ドキュメントが改訂される場合もあります。本データシートのブラウザ版を使用されている場合は、画面左側の説明をご覧ください。

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
HD3SS3412RUAR	Active	Production	WQFN (RUA) 42	3000 LARGE T&R	Yes	FULL NIPDAU	Level-2-260C-1 YEAR	0 to 70	HD3SS3412
HD3SS3412RUAR.B	Active	Production	WQFN (RUA) 42	3000 LARGE T&R	-	Call TI	Call TI	0 to 70	
HD3SS3412RUAT	Active	Production	WQFN (RUA) 42	250 SMALL T&R	Yes	FULL NIPDAU	Level-2-260C-1 YEAR	0 to 70	XHD3SS3412 HD3SS3412
HD3SS3412RUAT.B	Active	Production	WQFN (RUA) 42	250 SMALL T&R	-	Call TI	Call TI	0 to 70	

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

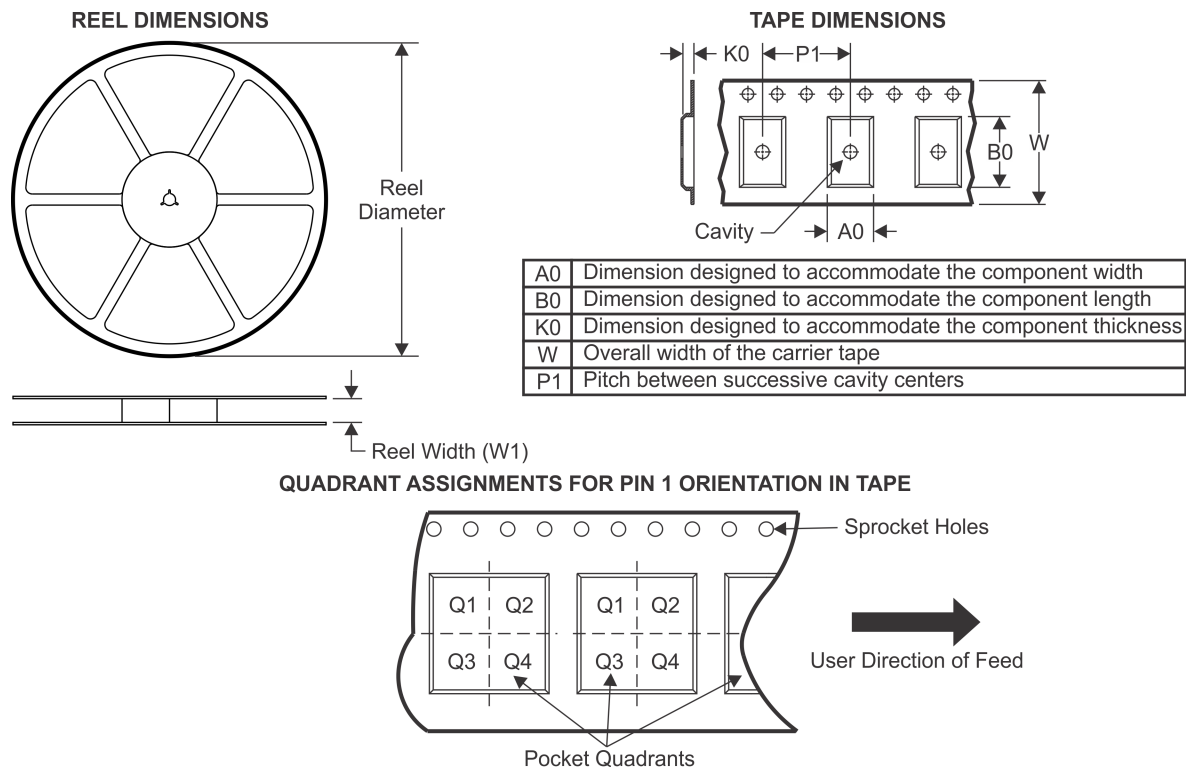
⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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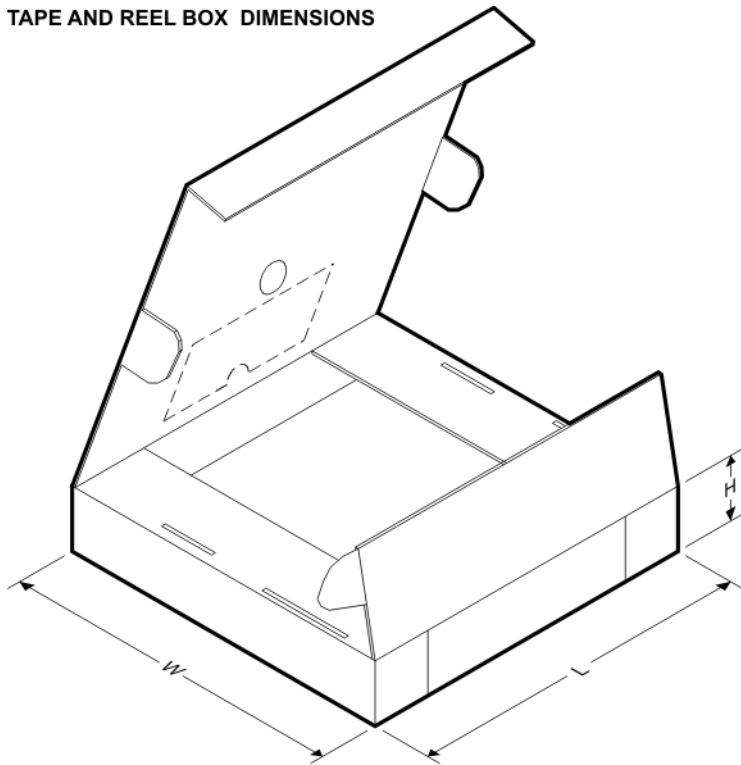
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TAPE AND REEL INFORMATION


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
HD3SS3412RUAR	WQFN	RUA	42	3000	330.0	16.4	3.8	9.3	1.0	8.0	16.0	Q1
HD3SS3412RUAT	WQFN	RUA	42	250	180.0	16.4	3.8	9.3	1.0	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
HD3SS3412RUAR	WQFN	RUA	42	3000	367.0	367.0	38.0
HD3SS3412RUAT	WQFN	RUA	42	250	210.0	185.0	35.0

GENERIC PACKAGE VIEW

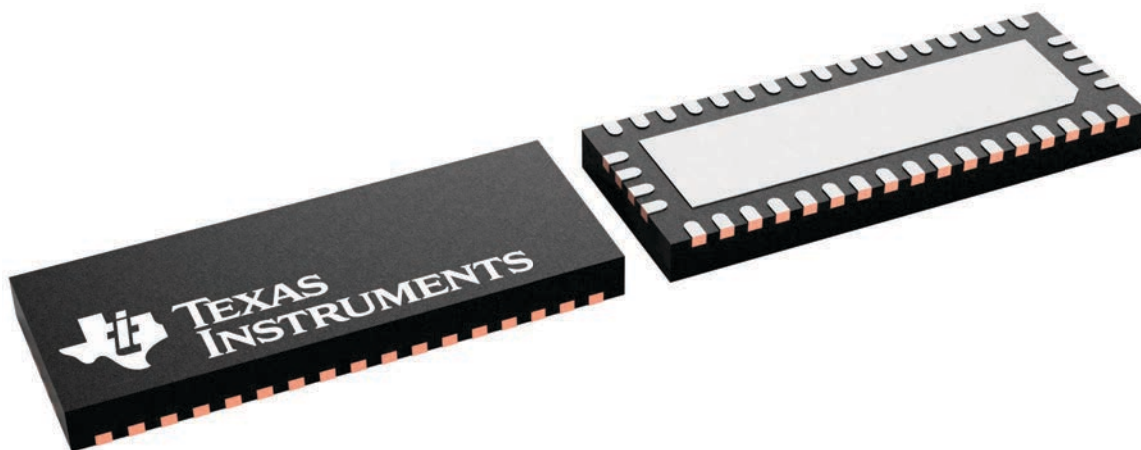
RUA 42

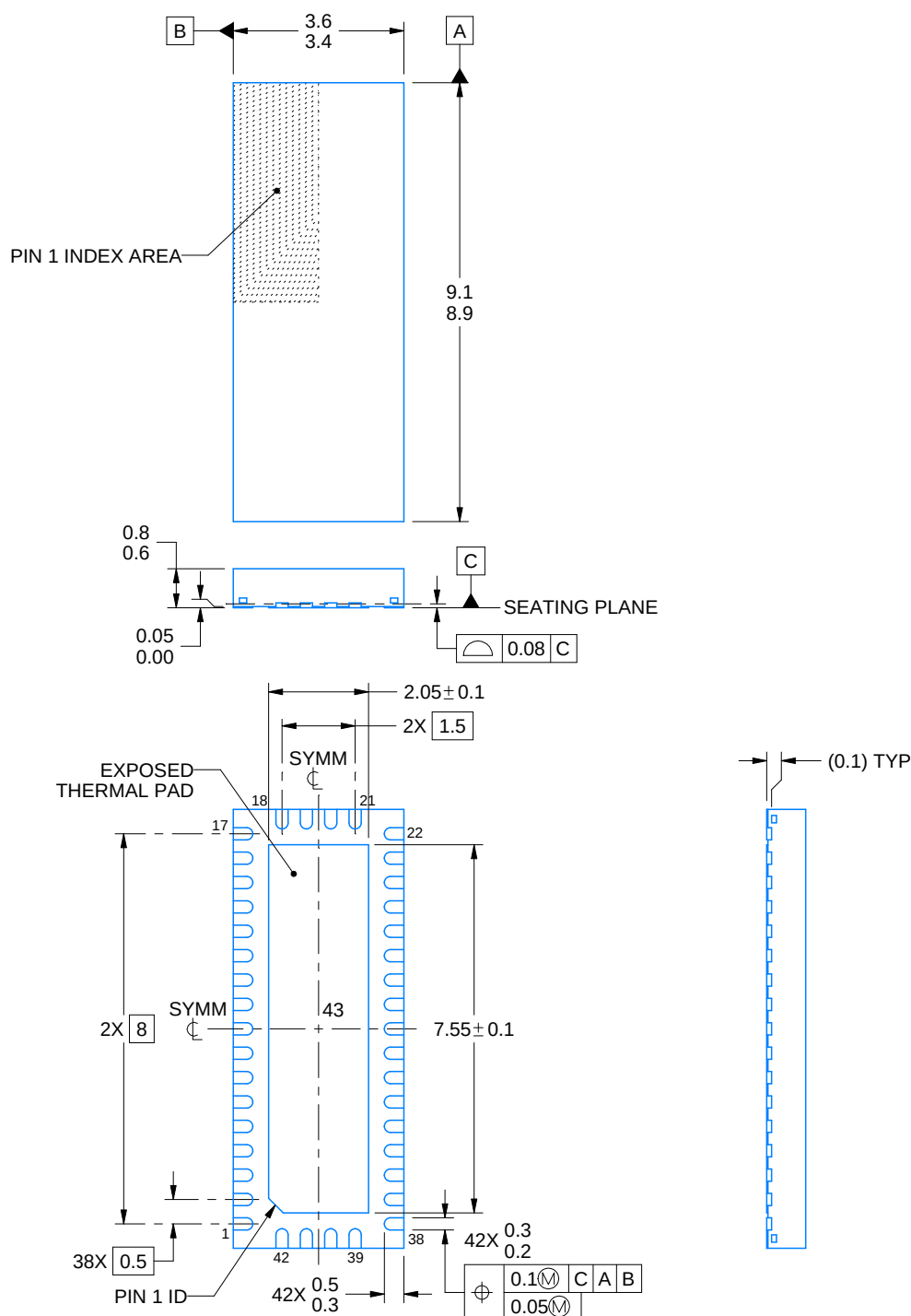
WQFN - 0.8 mm max height

9 x 3.5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.





4219139/A 03/2020

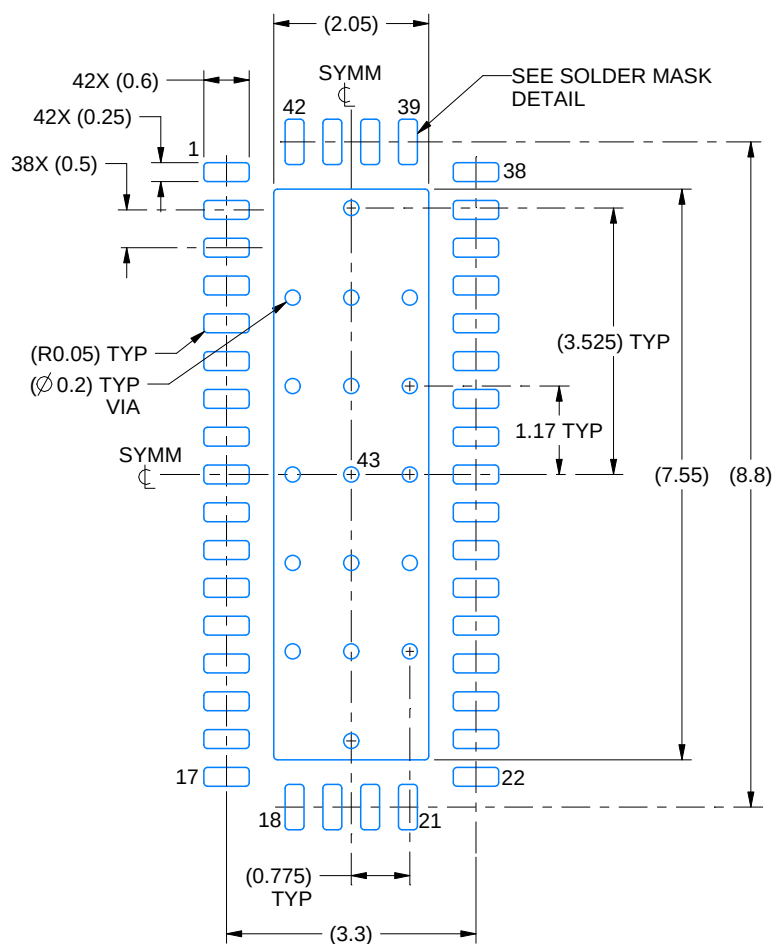
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

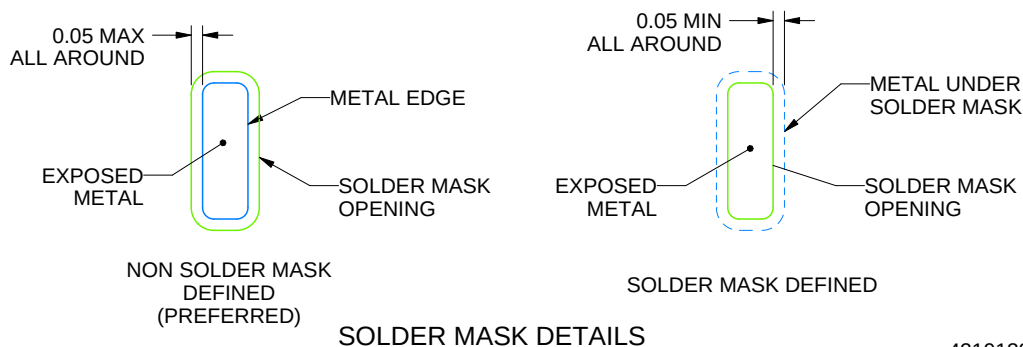
RUA0042A

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4219139/A 03/2020

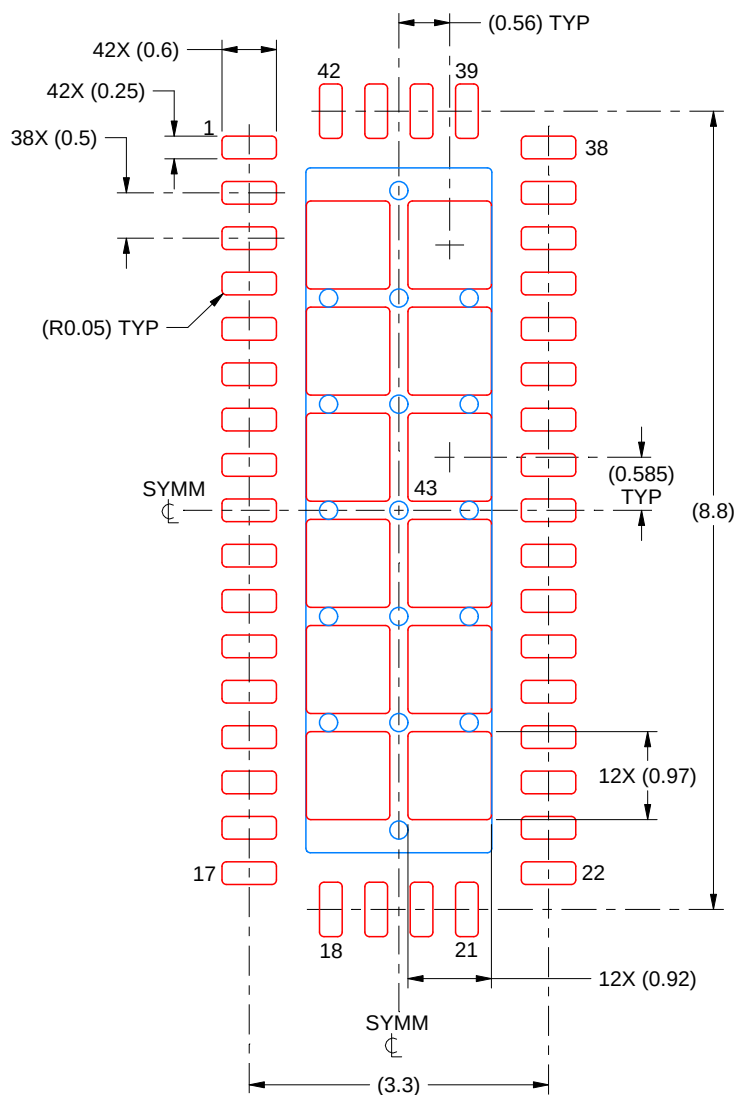
NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

RUA0042A

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 12X

EXPOSED PAD 43
69% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

4219139/A 03/2020

NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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