

DockPort Controller

Check for Samples: [HD3SS2521](#)

FEATURES

- **Ideal for DockPort Applications**
 - Bi-Directional 2:1 Switch for USB 2.0 (HS/FS/LS) and HPD Signals
 - Bi-Directional 2:1 Switch for SuperSpeed USB and DisplayPort Signals
 - Integrated DockPort Controller Manages DockPort Detection, Signal Switching and Power Switching
- Supports Host-and Dock-side Applications
- VCC Operating Range 3.3V ± 10%
- SuperSpeed USB I/O Supports Common Mode Voltage from 0V to 2.2V
- USB 2.0 I/O Supports Signal Up to 3.6V
- Wide –3dB Differential BW on High-bandwidth Path of over 6 GHz
- Excellent High-bandwidth Path Dynamic Characteristics on (at 2.5GHz)
 - Crosstalk = –39dB
 - Isolation = –22dB
 - Insertion Loss = –1.2dB
 - Return Loss = 12 dB
 - Max Bit-Bit Skew = 8 ps
- 5mm x11mm, 56-Pin WQFN Package (RHU)

- **ESD**
 - HBM: 2000V
 - CDM: 500V

APPLICATIONS

- Desktop PCs
- Notebook PCs
- Tablets
- Docking Station

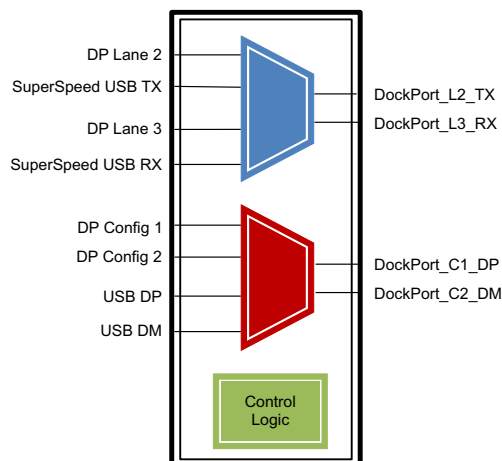


Figure 1. DockPort Functional Diagram

DESCRIPTION

The HD3SS2521 is an integrated DockPort switch solution. It provides independent 2:1 passive switching for the SuperSpeed USB and Display Port signals as well as for the USB 2.0 (HS/FS/LS) and I2C necessary to support DockPort applications. In addition, a firmware upgradable integrated DockPort controller is provided to manage host and dock side DockPort detection, signal switch and power configuration.

The HD3SS2521 is offered in 56-pin WQFN package and is specified to operate from a single supply voltage of 3.3V over the temperature range of 0°C to 70°C .



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This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

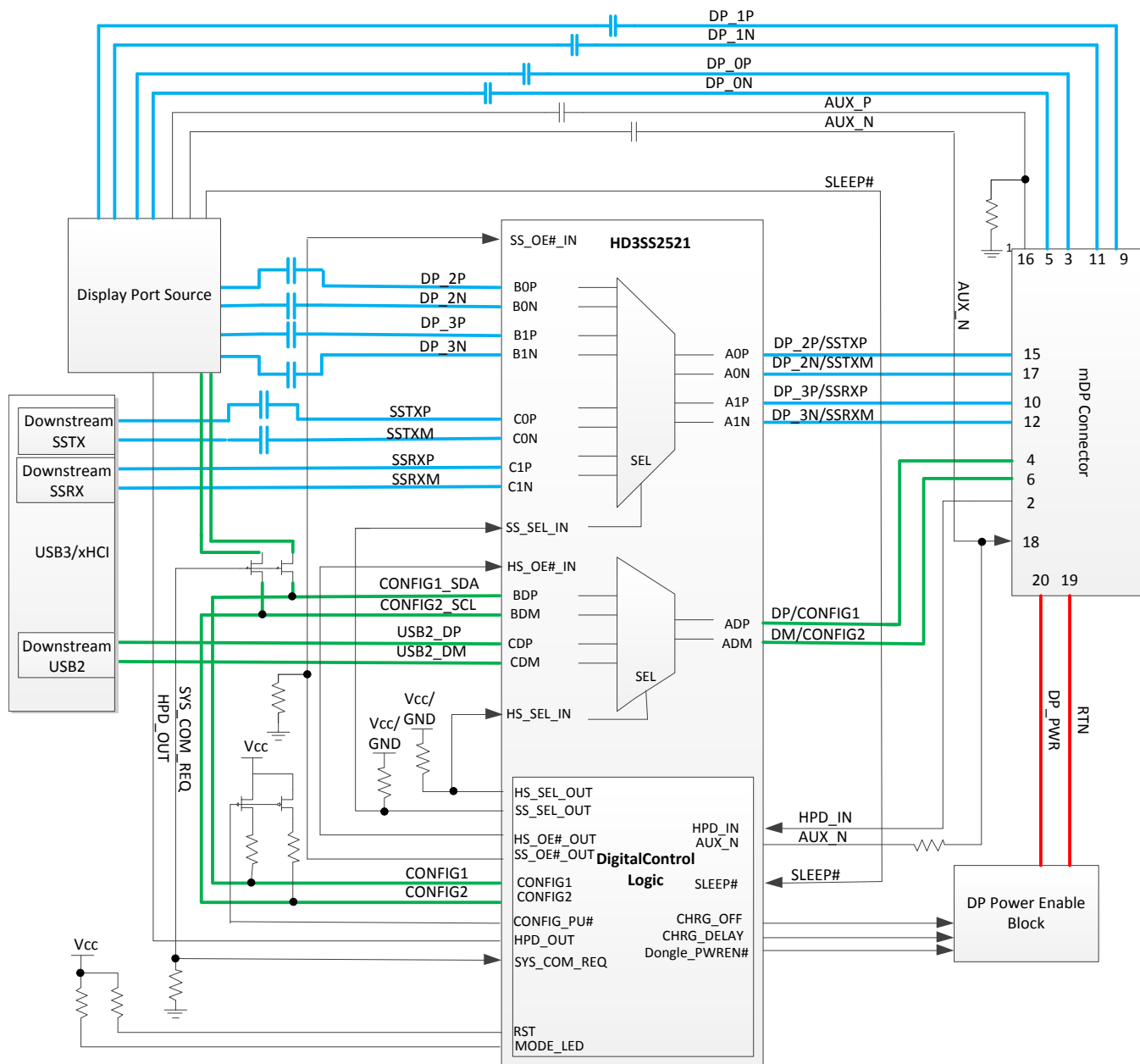
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ORDERING INFORMATION

PART NUMBER	PART MARKING	PACKAGE
HD3SS2521RHUR	HD3S2521	56-Pin WQFN (Reel Large)
HD3SS2521RHUT	HD3S2521	56-Pin WQFN (Reel Small)

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TYPICAL APPLICATION



NOTE: Refer to the implementation guide for details on design considerations and configuration options

Figure 2. DockPort Host Implementation

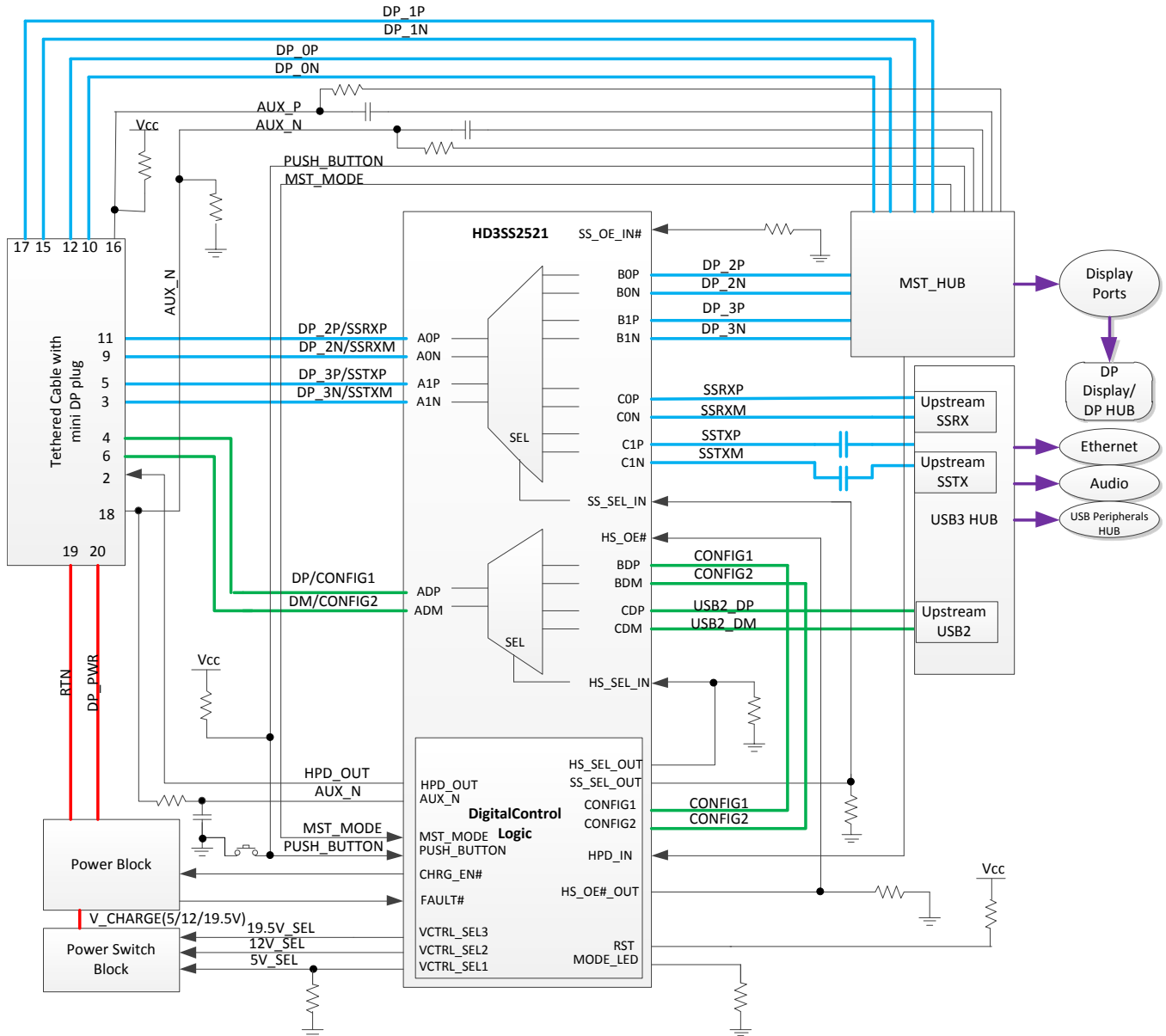
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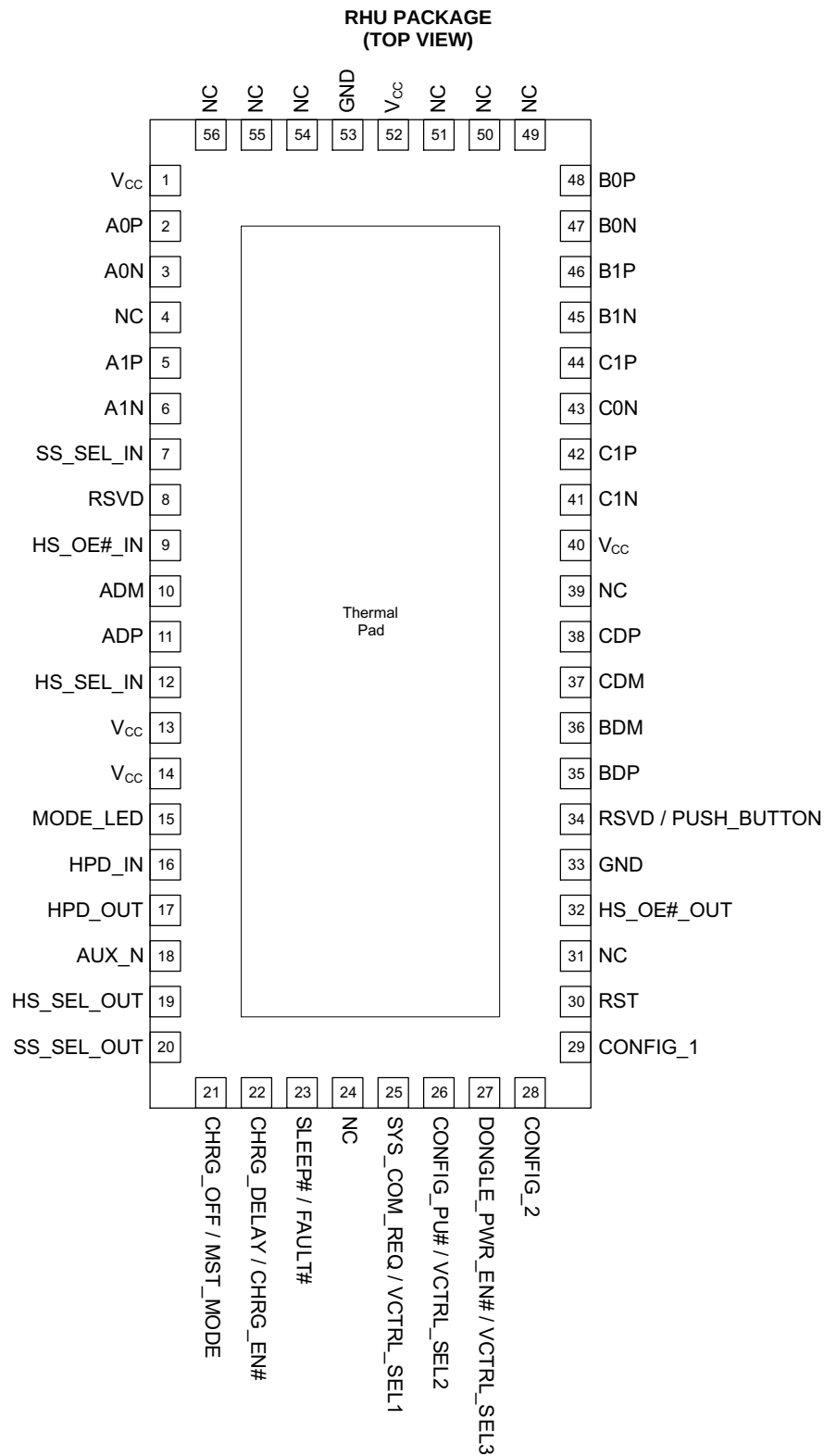
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NOTE: Refer to the implementation guide for details on design considerations and configuration options

Figure 3. DockPort Hub Implementation



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PIN FUNCTIONS

PIN	I/O	PIN NAME	DockPort HOST (SIGNAL MUX)	DockPort DEVICE (SIGNAL DE-MUX)	SIGNAL SPEED (MAX)	
2	I/O	A0P	DockPort Lane 2, Positive Signal (DockPort cable between DockPort host and DockPort device)		Fast Lane (Up to 5.4Gbps)	
3	I/O	A0N				DockPort Lane 2, Negative Signal (DockPort cable between DockPort host and DockPort device)
5	I/O	A1P				DockPort Lane 3, Positive Signal (DockPort cable between DockPort host and DockPort device)
6	I/O	A1N				DockPort Lane 3, Negative Signal (DockPort cable between DockPort host and DockPort device)
48	I/O	B0P	DisplayPort Lane 2, Positive Signal		Fast Lane (Up to 5.4Gbps)	
47	I/O	B0N	DisplayPort Lane 2, Negative Signal			
46	I/O	B1P	DisplayPort Lane 3, Positive Signal			
45	I/O	B1N	DisplayPort Lane 3, Negative Signal			
44	I/O	C0P	SuperSpeed USB TX, Positive Signal	SuperSpeed USB RX, Positive Signal	Fast Lane (Up to 5.4Gbps)	
43	I/O	C0N	SuperSpeed USB TX, Negative Signal	SuperSpeed USB RX, Negative Signal		
42	I/O	C1P	SuperSpeed USB RX, Positive Signal	SuperSpeed USB TX, Positive Signal		
41	I/O	C1N	SuperSpeed USB RX, Negative Signal	SuperSpeed USB TX, Negative Signal		
11	I/O	ADP	DockPort Config1 (DockPort cable between DockPort host and DockPort device)		Supports High-speed USB	
10	I/O	ADM	DockPort Config2 (DockPort cable between DockPort host and DockPort device)			
35	I/O	BDP	CONFIG 1			
36	I/O	BDM	CONFIG 2			
37	I/O	CDP	High-speed USB D+			
38	I/O	CDM	High-speed USB D-			
7	I	SS_SEL_IN	DisplayPort / SuperSpeed USB Mux Select (Connect to SS_SEL_OUT - Pin 20)			
12	I	HS_SEL_IN	DisplayPort / HighSpeed USB Mux Select (Connect to HS_SEL_OUT - Pin 19)			
8	I	RSVD (SS_OE#_IN)	N/C For future compatibility (Connect to RSVD [SS_OE#_OUT] signal - Pin 34)	N/C Requires external 10 kΩ Pull-down.		
9	I	HS_OE#_IN	DisplayPort / HighSpeed USB Mux Enable (Connect to HS_OE#_OUT - Pin 32)			
15	I/O	MODE_LED	This signal is sampled at power on or reset to determine the mode of operation: Pulled High for DockPort host operation. (Optionally through LED for debug purposes)	This signal is sampled at power on or reset to determine the mode of operation: Pulled Low for DockPort hub (dock/dongle) operation. (Optionally through LED for debug purposes)		
16	I	HPD_IN	Hot Plug Detect from DockPort device	Hot Plug Detect from MST Hub/DP Device		
17	O	HPD_OUT	Hot Plug Detect to System Graphics	Hot Plug Detect to DockPort host.		
18	I/O	AUX_N	AUX Negative Pull-Up to DockPort device (Output) This signal indicates a connection event to a DockPort device.	AUX Negative from DockPort host (Input) This signal is used to detect a connection event from a DockPort host.		

PIN FUNCTIONS (continued)

PIN	I/O	PIN NAME	DockPort HOST (SIGNAL MUX)	DockPort DEVICE (SIGNAL DE-MUX)	SIGNAL SPEED (MAX)
19	O	HS_SEL_OUT	DisplayPort / High-speed USB Mux Select (Connect to HS_SEL_IN - Pin 12) This signal in conjunction with SS_SEL_OUT is sampled at power-on or reset to determine the voltage level supplied to a DockPort host and must be strapped to correct logic level for the corresponding voltage level: 5 V, 12 V or 19 V. Refer to the Power Delivery Voltage Selection table for strapping options. After power-on/reset, this signal is driven by DockPort host to select the device operation between DisplayPort and High-speed USB. 0 = DisplayPort 1 = High-speed USB		
20	O	SS_SEL_OUT	DisplayPort / SuperSpeed USB Mux Select (Connect to SS_SEL_IN - Pin 7) This signal in conjunction with HS_SEL_OUT is sampled at power-on or reset to determine the voltage level to be supplied to a DockPort host and must be strapped to correct logic level for the corresponding voltage level: 5 V, 12 V or 19 V. Refer to the Power Delivery Voltage Selection table for strapping options. After power-on/reset, this signal is driven by DockPort host to select the device operation between DisplayPort and SuperSpeed USB. 0 = DisplayPort 1 = SuperSpeed USB		
28	I/O	CONFIG_2	DisplayPort CONFIG2/CEC		
29	I/O	CONFIG_1	DisplayPort CONFIG1/CAD		
21	O	CHRG_OFF	This signal controls the power delivery circuit.	—	
		MST_MODE	—	MST Mode Input from MST HUB which indicates 2/4 DisplayPort lane switch. 0 = 2-lane (external 10 kΩ Pull-down) 1 = 4-lane (external 10 kΩ Pull-up)	
22	O	CHRG_DELAY	This signal controls the power delivery circuit.	—	
		CHRG_EN#	—	This signal is the power delivery enable for a DockPort hub.	
23	I	SLEEP#	Connect to the DockPort host sleep state signal.	—	
		FAULT#	—	Connect to the fault indicator of the power management circuit	
25	I	SYS_COM_REQ	External 100K Pull-down required. This signal is a sampled at power on or reset to determine if the system is in a FW update mode. After power on reset, the signal is used for communication request via a GPIO in a DockPort host for communication request		
	O	VCTRL_SEL1	—	Power enable for 5 V power delivery In addition, this signal is sampled at power on or reset to determine the mode of operation: 0 = DockPort hub (external 10 kΩ Pull-down) 1 = DockPort dongle (external 10 kΩ Pull-up)	

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PIN FUNCTIONS (continued)

PIN	I/O	PIN NAME	DockPort HOST (SIGNAL MUX)	DockPort DEVICE (SIGNAL DE-MUX)	SIGNAL SPEED (MAX)
26	O	CONFIG_PU#	Connect to FET switch to control pull-up option on DisplayPort CONFIG1/CONFIG2 for DockPort communication.	—	
		VCTRL_SEL2	—	Power enable for 12 V power delivery	
27	O	Dongle_PWREN#	Power enable for 5 V DockPort dongle power circuitry	—	
		VCTRL_SEL3	—	Power enable for 19 V power delivery	
34	O	RSVD (SS_OE#_OUT)	N/C For future compatibility (Connect to RSVD [SS_OE#_IN] signal - Pin 8)	—	
	I	PUSH_BUTTON	—	External 5.6 kΩ Pull-up required. Push button input to DockPort hub and MST HUB for 2-lane/4-lane switching	
32	O	HS_OE#_OUT	DisplayPort / High-speed USB Mux Enable. (Connect to HS_OE#_IN - Pin 9) An external 10 kΩ Pull-down to ground is required.		
30	I/O	RST	Reset		
33 39 53	GND	GND	Connect to Supply Ground		
24 31 49 50 51 54 55 56	NC	NC	No Connect		
1 4 13 14 40 52	Supply	VCC	3.3V Positive power supply voltage		

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Table 1. Power Delivery Voltage Selection

VOLTAGE	HS_SEL_OUT	SS_SEL_OUT
0 V	0	0
12 V	0	1
19 V	1	0
5 V	1	1

ABSOLUTE MAXIMUM RATINGS^{(1) (2)}

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

		MIN	MAX	UNIT
Supply Voltage Range ⁽²⁾	VCC	–0.3	4	V
Voltage Range	Differential I/O (High bandwidth signal path, AxP/N, BxP/N, CxP/N)	–0.5	4	V
	Differential I/O (Low bandwidth signal path, ADP/M, BDP/M, CDP/M)	–0.5	7	V
	Control Pin and Single Ended I/O	–0.3	$V_{CC} + 0.3$	V
Electrostatic discharge	Human body model ⁽³⁾		±2000	V
	Charged-device model ⁽⁴⁾		±500	V
Continuous power dissipation		See Thermal Table		

(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.

(3) Tested in accordance with JEDEC Standard 22, Test Method A114-B

(4) Tested in accordance with JEDEC Standard 22, Test Method C101-A

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THERMAL INFORMATION

THERMAL METRIC ⁽¹⁾		HD3SS2521	UNITS
		RHU (56 PIN)	
θ_{JA}	Junction-to-ambient thermal resistance	31.6	°C/W
θ_{JCTop}	Junction-to-case (top) thermal resistance	15.9	
θ_{JB}	Junction-to-board thermal resistance	8.5	
Ψ_{JT}	Junction-to-top characterization parameter	0.5	
Ψ_{JB}	Junction-to-board characterization parameter	8.5	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).

RECOMMENDED OPERATING CONDITIONS

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

			MIN	TYP	MAX	UNITS
V_{CC}	Supply voltage		3	3.3	3.6	V
V_{IH}	Input high voltage	Control/Status Pins	2		V_{CC}	V
V_{IL}	Input low voltage	Control/Status Pins	-0.1		0.8	V
V_{I/O_Diff}	Differential voltage	Switch I/O diff voltage (High-bandwidth path AxP/N, BxP/N, CxP/N)	0		1.8	V _{pp}
V_{I/O_CM}	Common voltage	Switch I/O common mode voltage (High-bandwidth path AxP/N, BxP/N, CxP/N)	0		2	V
$V_{I/O}$	Input/output voltage	Data input/output voltage (Low-bandwidth path ADP/M, BDP/M, CDP/M)	0		5.5	V
T_A	Operating free-air temperature		0		70	°C

ELECTRICAL CHARACTERISTICS – DEVICE PARAMETERS

(under recommended operating conditions)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
I _{CC}	Supply Current	V _{CC} = 3.6V, HS_SEL_IN/SS_SEL_IN = V _{CC} /GND; HS_OE#_IN = GND; Outputs Floating		4.5		mA
AUX_N, CONFIG_1, CONFIG_2, FAULT#, HPD_IN, MODE_LED, PUSH_BUTTON, RST, SLEEP#, SYS_COM_REQ, TEST						
V _{IT+}	Positive-going input threshold voltage		0.45 V _{CC}	0.75 V _{CC}		V
V _{IT-}	Negative-going input threshold voltage		0.25 V _{CC}	0.55 V _{CC}		V
V _{hys}	Input voltage hysteresis (V _{IT+} – V _{IT-})	V _{CC} = 3V	0.3		1	V
R _{PULL}	Pullup/pulldown resistor	Pullup: V _{IN} = GND, Pulldown: V _{IN} = V _{CC} , V _{CC} = 3V	20	35	50	kΩ
C _I	Input capacitance	V _{IN} = GND or V _{CC}		5		pF
I _{LK}	High-impedance leakage current	V _{IN} = GND or V _{CC} , V _{CC} = 3V, Pullup/Pulldown disabled			±50	nA
AUX_N, CHRG_DELAY, CHRG_EN, CHRG_OFF, CONFIG_1, CONFIG_2, CONFIG_PU#, Dongle_PWREN#, HPD_OUT, HS_OE#_OUT, HS_SEL_OUT, MODE_LED, MST_MODE, SS_SEL_OUT, RST, TEST, VCTRL_SEL1, VCTRL_SEL2, VCTRL_SEL3						
V _{OH}	High-level outptut voltage	I _{OHmax} = –6 mA ⁽¹⁾		V _{CC} – 0.3		V
V _{OL}	Low-level outptut voltage	I _{OLmax} = 6 mA ⁽¹⁾		GND + 0.3		V
SS_SEL_IN						
I _{IH}	Input High Current	V _{CC} = 3.6V, V _{IN} = V _{CC}			95	μA
I _{IL}	Input Low Current	V _{CC} = 3.6V, V _{IN} = GND			1	

(1) The maximum total current, I_{OHmax} and I_{OLmax} , for all outputs combined should not exceed $\pm 48\text{ mA}$ to hold the maximum voltage drop specified.

ELECTRICAL CHARACTERISTICS – DEVICE PARAMETERS (continued)

(under recommended operating conditions)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
HS_OE#_IN , HS_SEL_IN						
I _{IH}	Input High Current	V _{CC} = 3.6V, V _{IN} = V _{CC}			1	μA
I _{IL}	Input Low Current	V _{CC} = 3.6V, V _{IN} = GND			1	μA
AxP/N, BxP/N, CxP/N						
I _{LK}	High-impedance leakage current	V _{CC} = 3.6V, V _{IN} = 0V, V _{OUT} = 2V (I _{LK} on open outputs Port B and C)			130	μA
		V _{CC} = 3.6V, V _{IN} = 0V, V _{OUT} = 2V (I _{LK} on open outputs Port A)			4	
ADP/DM, BDP/DM, CDP/DM						
I _{LK}	High-impedance leakage current	V _{CC} = 3.6V, V _{IN} = 0V, V _{OUT} = 0V to 4V, HS_OE#_IN = GND			1	μA

ELECTRICAL CHARACTERISTICS – SIGNAL SWITCH PARAMETERS

(under recommended operating conditions; $R_L, R_{sc} = 50\Omega, C_L = 10pF$ unless otherwise noted)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
AxP/N, BxP/N, CxP/N HIGH-BANDWIDTH SIGNAL PATH						
t_{PD}	Switch Propagation Delay	R_{sc} and $R_L = 50\Omega$, See Figure 5			85	ps
T_{on}	SS_SEL_IN -to-Switch T_{on}	R_{sc} and $R_L = 50\Omega$, See Figure 4		70	250	ns
T_{off}	SS_SEL_IN -to-Switch T_{off}			70	250	
$T_{SK(O)}$	Inter-Pair Output Skew (CH-CH)	R_{sc} and $R_L = 50\Omega$, See Figure 5			20	ps
$T_{SK(b-b)}$	Intra-Pair Output Skew (bit-bit)				8	ps
C_{ON}	Outputs ON Capacitance	$V_{IN} = 0V$, Outputs Open, Switch ON		1.5		pF
C_{OFF}	Outputs OFF Capacitance	$V_{IN} = 0V$, Outputs Open, Switch OFF		1		pF
R_{ON}	Output ON resistance	$V_{CC} = 3.3V, V_{CM} = 0.5V - 1.5V,$ $I_O = -8mA$		5	8	Ω
ΔR_{ON}	On resistance match between channels	$V_{CC} = 3.3V; -0.35V \leq V_{IN} \leq 1.2V;$ $I_O = -8mA$			2	Ω
	On resistance match between pairs of the same channel				0.7	
R_{FLAT_ON}	On resistance flatness [$R_{ON(MAX)} - R_{ON(MIN)}$]	$V_{CC} = 3.3V; -0.35V \leq V_{IN} \leq 1.2V$			1.15	Ω
R_L	Differential Return Loss ($V_{CM} = 0V$)	$f = 2.5GHz$		-12		dB
		$f = 4.0GHz$		-11		
X_{TALK}	Differential Crosstalk ($V_{CM} = 0V$)	$f = 2.5GHz$		-39		dB
		$f = 4.0GHz$		-35		
O_{IRR}	Differential Off-Isolation ($V_{CM} = 0V$)	$f = 2.5GHz$		-22		dB
		$f = 4.0GHz$		-19		
I_L	Differential Insertion Loss ($V_{CM} = 0V$)	$f = 2.5GHz$		-1.1		dB
		$f = 4.0GHz$		-1.5		
BW	Bandwidth	At -3 dB		6		GHz
ADP/DM, BDP/DM, CDP/DM SIGNAL PATH						
t_{PD}	Switch Propagation Delay	R_{sc} and $R_L = 50\Omega$, See Figure 5		250		ps
T_{on}	HS_SEL_IN -to-Switch T_{on}	R_{sc} and $R_L = 50\Omega$, See Figure 4			30	
	HS_OE#_IN -to-Switch T_{on}				17	ns
T_{off}	HS_SEL_IN Toff	R_{sc} and $R_L = 50\Omega$, See Figure 4			12	
	HS_OE#_IN -to-Switch Toff				10	
$T_{SK(O)}$	Inter-Pair Output Skew (CH-CH)	R_{sc} and $R_L = 50\Omega$, See Figure 5		10	20	ps
$T_{SK(b-b)}$	Intra-Pair Output Skew (bit-bit)			10	20	ps
C_{ON}	Outputs ON Capacitance	$V_{IN} = V_{CC}$ or 0V, Outputs Open, Switch ON		6	7.5	pF

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ELECTRICAL CHARACTERISTICS – SIGNAL SWITCH PARAMETERS (continued)

(under recommended operating conditions; R_L , $R_{sc} = 50\Omega$, $C_L = 10\text{pF}$ unless otherwise noted)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
C_{OFF}	Outputs OFF Capacitance	$V_{IN} = V_{CC}$ or $0V$, Outputs Open, Switch OFF		3.5	6	pF
R_{ON}	Output ON resistance	$V_{CC} = 3V$, $V_{IN} = 0V$, $I_O = 30\text{ mA}$		3	6	Ω
		$V_{CC} = 3V$, $V_{IN} = 2.4V$, $I_O = -15\text{ mA}$		3.4	6	
ΔR_{ON}	On resistance match	$V_{CC} = 3V$, $V_{IN} = 0V$, $I_O = 30\text{ mA}$		0.2		Ω
		$V_{CC} = 3V$, $V_{IN} = 1.7V$, $I_O = -15\text{ mA}$		0.2		
R_{FLAT_ON}	On resistance flatness [$R_{ON(MAX)} - R_{ON(MIN)}$]	$V_{CC} = 3V$, $V_{IN} = 0V$, $I_O = 30\text{ mA}$		1		W
		$V_{CC} = 3V$, $V_{IN} = 1.7V$, $I_O = -15\text{ mA}$		1		
X_{TALK}	Differential Crosstalk (VCM = 0V)	$R_L = 50\text{ W}$, $f = 250\text{ MHz}$		-40		dB
O_{IRR}	Differential Off-Isolation (VCM = 0V)	$R_L = 50\text{ W}$, $f = 250\text{ MHz}$		-41		dB
BW	Bandwidth	$R_L = 50\text{ W}$		0.9		GHz

TEST TIMING DIAGRAMS

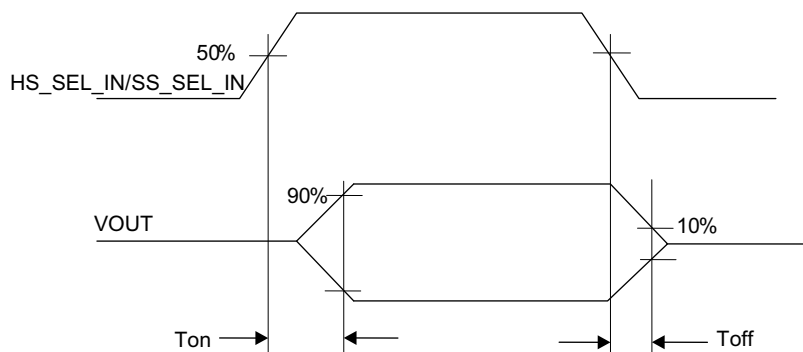
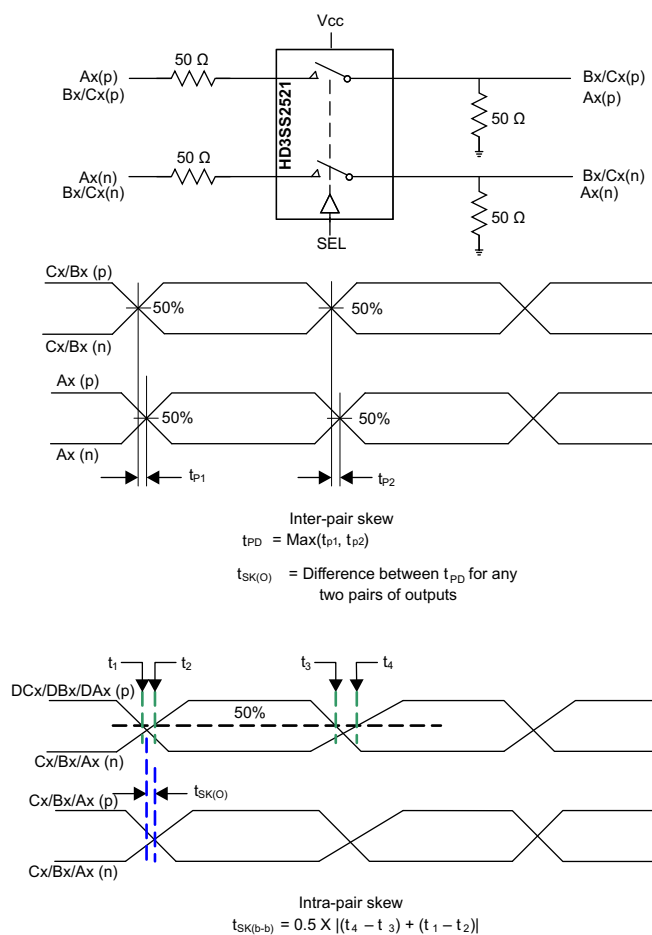


Figure 4. Select to Switch T_{on} and T_{off}



NOTES:

1. Measurements based on an ideal input with zero intra-pair skew on the input, i.e. the input at A to B/C or the input at B/C to A
2. Inter-pair skew is measured from lane to lane on the same channel, e.g. C0 to C1
3. Intra-pair skew is defined as the relative difference from the p and n signals of a single lane

Figure 5. Propagation Delay and Skew

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)
HD3SS2521RHUR	Active	Production	WQFN (RHU) 56	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	0 to 70	HD3S2521
HD3SS2521RHUR.A	Active	Production	WQFN (RHU) 56	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	0 to 70	HD3S2521
HD3SS2521RHUR.B	Active	Production	WQFN (RHU) 56	2000 LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	0 to 70	HD3S2521
HD3SS2521RHUT	Preview	Production	WQFN (RHU) 56	250 null	-	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.

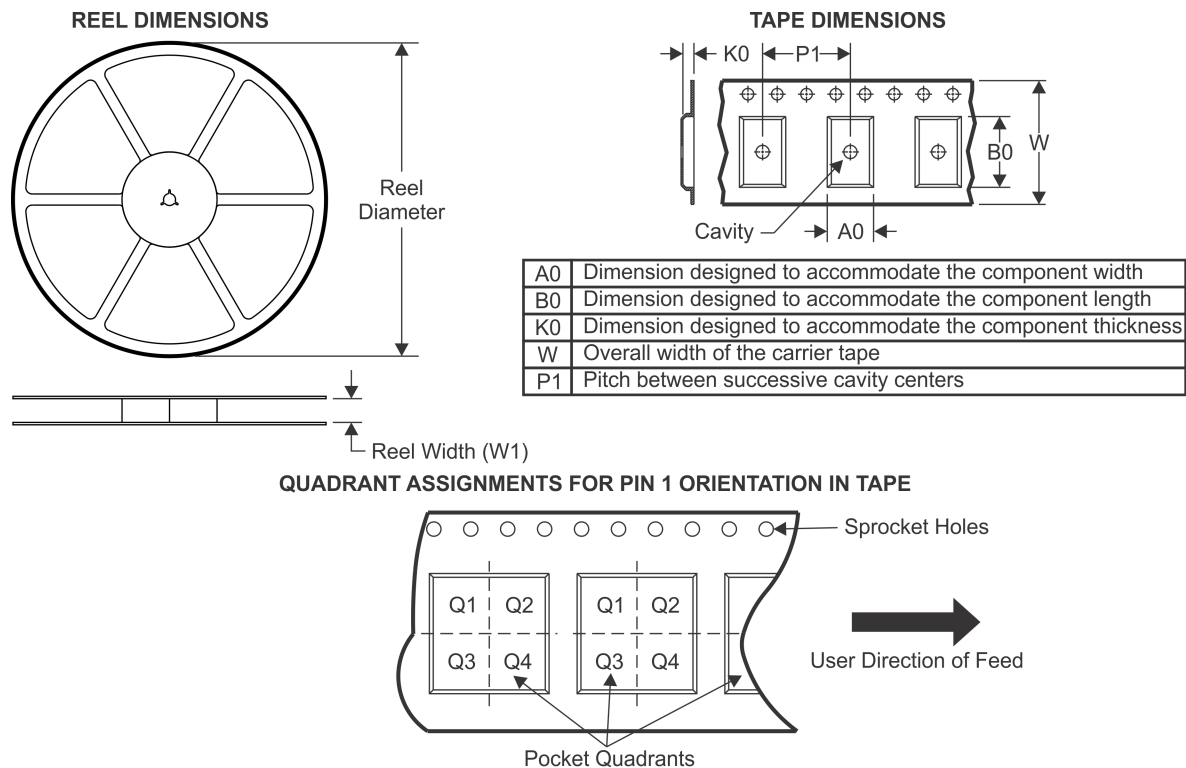
⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will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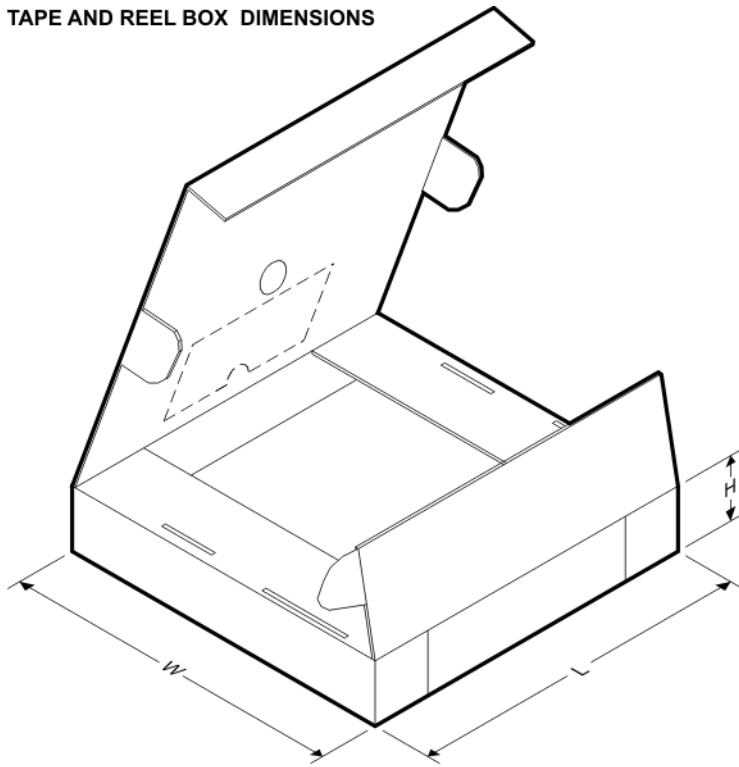
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TAPE AND REEL INFORMATION


*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
HD3SS2521RHUR	WQFN	RHU	56	2000	330.0	24.4	5.3	11.3	1.0	8.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

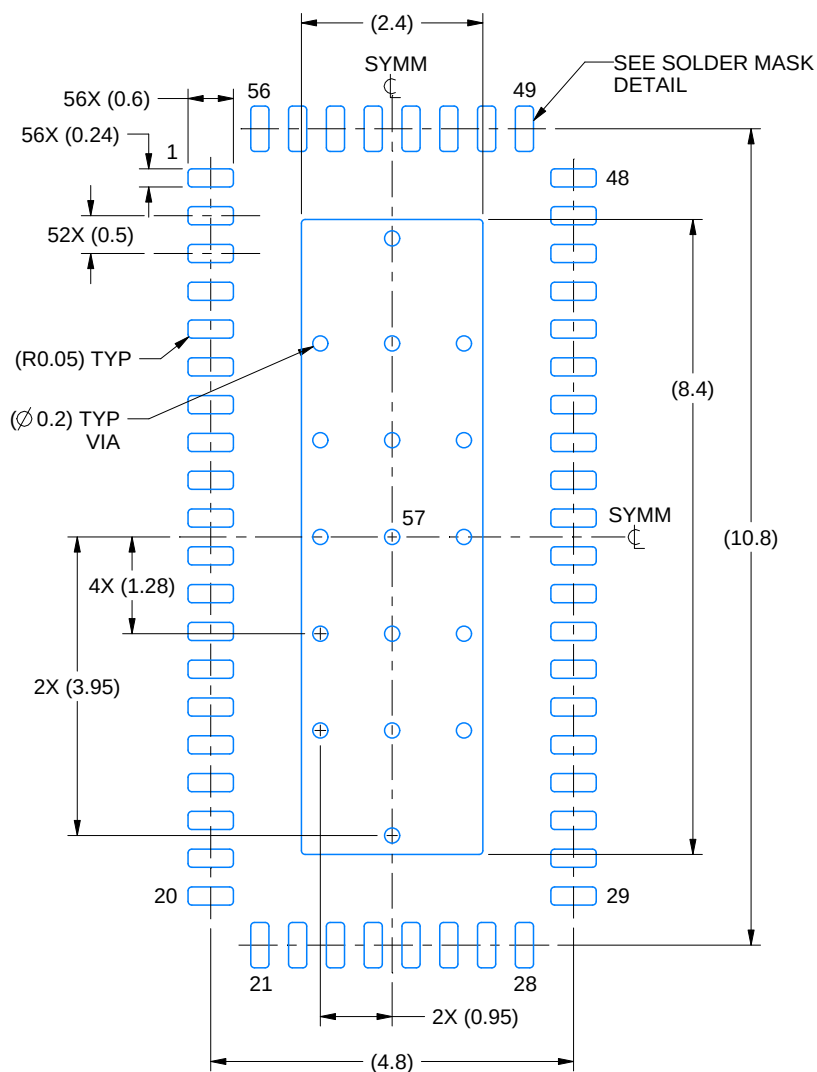
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
HD3SS2521RHUR	WQFN	RHU	56	2000	367.0	367.0	45.0

EXAMPLE BOARD LAYOUT

RHU0056A

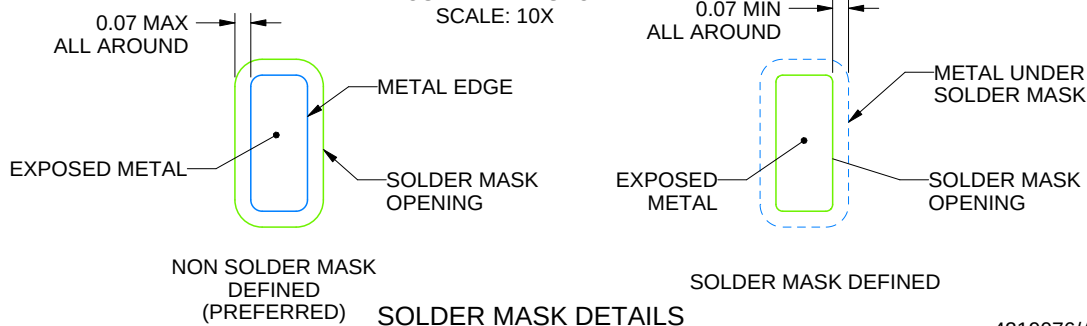
WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE

EXPOSED METAL SHOWN
SCALE: 10X



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NOTES: (continued)

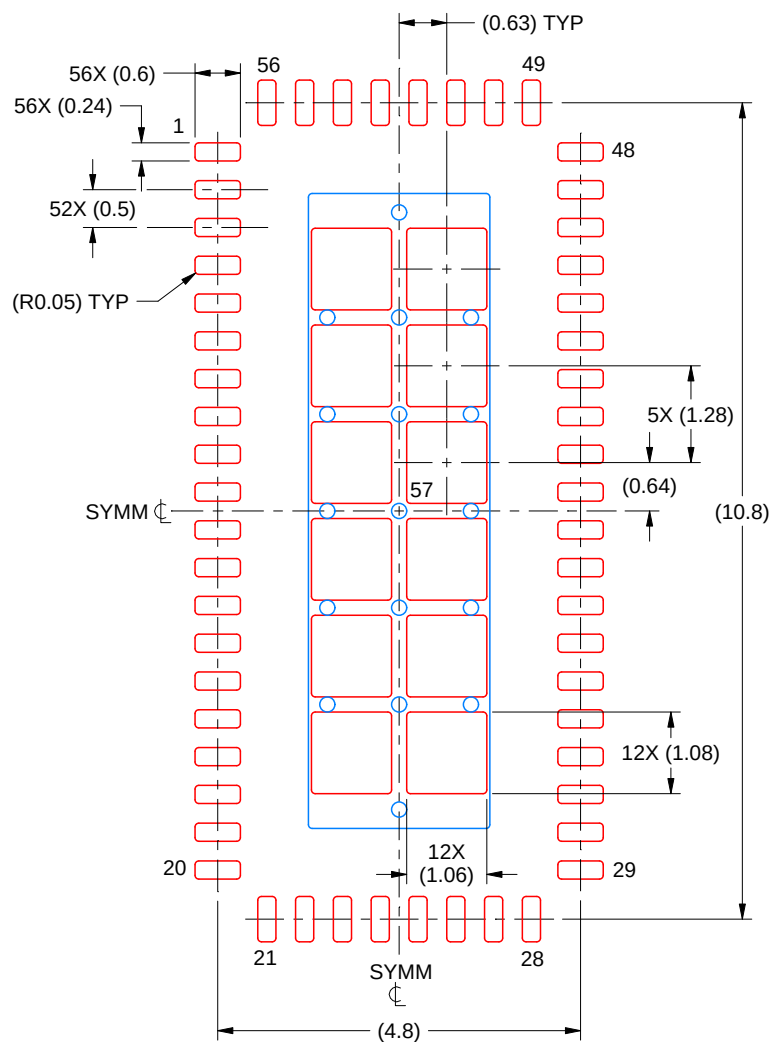
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

RHU0056A

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 10X

EXPOSED PAD 57
68% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

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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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