

Description

The 9SBV0802 provides two banks of four 1.05V LVCMOS outputs. Each bank has its own input. There are three OE pins. Two OE pins control two outputs each and one OE pin controls four outputs. One 9SBV0802 allows one PCH to easily support four CPUs with point to point routing of the PM signals. Two 9SBV0802 devices allow one PCH to easily support up to eight CPUs with point-to-point routing of the PM signals.

Features

- 1.8V power supply, 15mW typical power consumption; eliminate thermal concerns
- OE pins; support 1, 2, 3 or 4 socket systems
- 1.05V LVCMOS inputs with VREF pin; input thresholds matched to chipset power supply
- Space saving 4 × 4 mm 20-VFQFPN; minimal board space

Typical Application

Fanout buffer for PM-SYNC and PM_SYNC CLK in Intel Servers

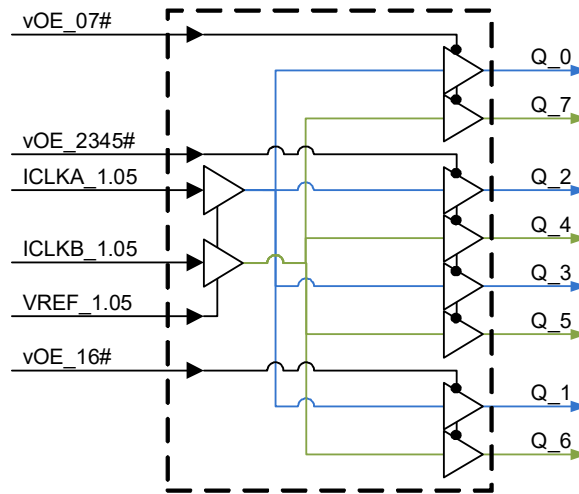
Output Features

- Eight 1–48MHz 1.05V LVCMOS outputs

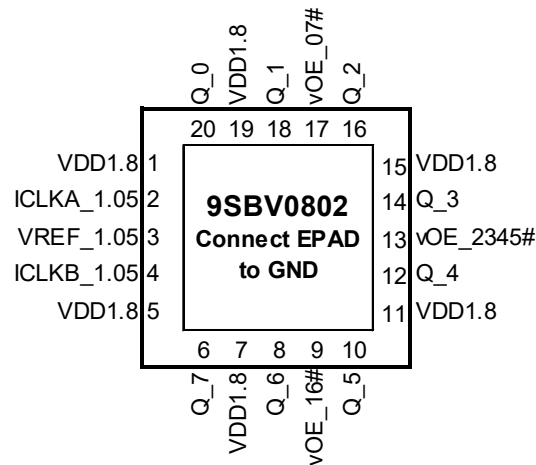
Key Specifications

- Additive cycle-to-cycle jitter < 8ps
- Output-to-output skew within a bank < 50ps
- Output-to-output skew between banks < 100ps

Block Diagram



Pin Configuration



4 × 4 mm 20-VFQFPN, 0.5mm pitch

^ prefix indicates internal 120kOhm pull-up resistor
 v prefix indicates internal 120kOhm pull-down resistor

Output Control Table

| ICLKA_1.05 ICLKB_1.05 | OE_07 | OE_16 | OE_2345 | Q_7 | Q_6 | Q_5 | Q_4 | Q_3 | Q_2 | Q_1 | Q_0 |
|--------------------------|-------|-------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| X | X | X | X | X | X | X | X | X | X | X | X |
| Running | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Running | 1 | 1 | 0 | 0 | 0 | Run | Run | Run | Run | 0 | 0 |
| Running | 1 | 0 | 1 | 0 | Run | 0 | 0 | 0 | 0 | Run | 0 |
| Running | 1 | 0 | 0 | 0 | Run | Run | Run | Run | Run | Run | 0 |
| Running | 0 | 1 | 1 | Run | 0 | 0 | 0 | 0 | 0 | 0 | Run |
| Running | 0 | 1 | 0 | Run | 0 | Run | Run | Run | Run | 0 | Run |
| Running | 0 | 0 | 1 | Run | Run | 0 | 0 | 0 | 0 | Run | Run |
| Running | 0 | 0 | 0 | Run | Run | Run | Run | Run | Run | Run | Run |

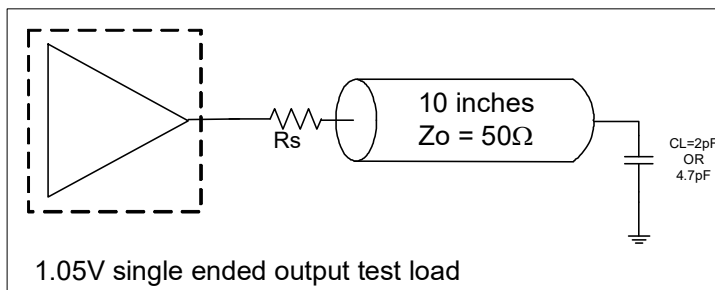
Power Connections

| Description | Pin Number | |
|-----------------|----------------|-----|
| | VDD | GND |
| Input Circuits | 1,5 | 21 |
| 1.05V reference | 3 | 21 |
| Outputs | 7,11, 15,19 | 21 |

Pin Descriptions

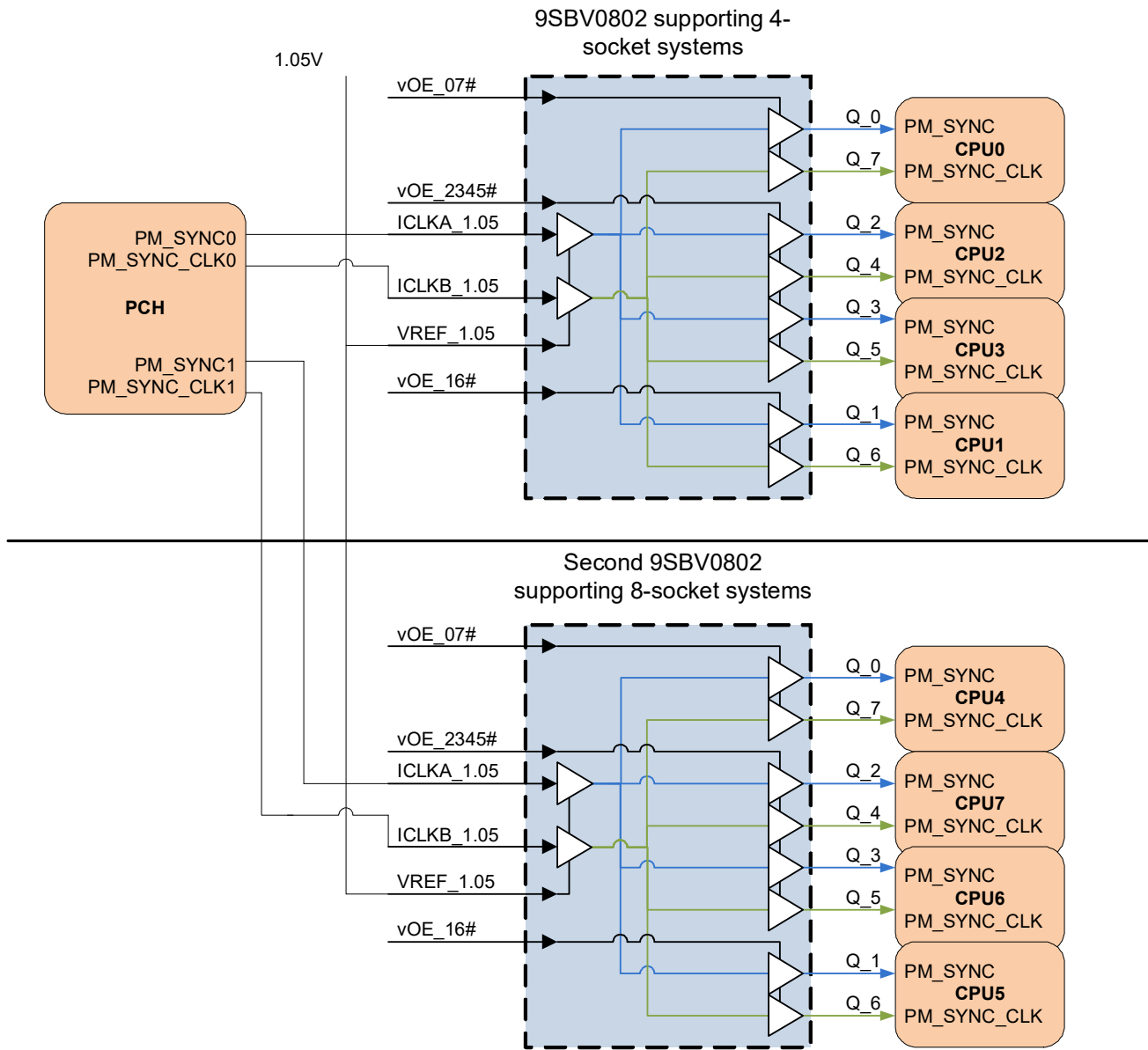
| Pin# | Pin Name | Type | Pin Description |
|------|------------|------|---|
| 1 | VDD1.8 | PWR | Power supply, nominally 1.8V. |
| 2 | ICLKA_1.05 | IN | 1.05V LVCMOS single-ended input clock. Voltage reference is set by the VREF_1.05 pin. |
| 3 | VREF_1.05 | IN | Voltage reference for 1.05V single-ended inputs. Connect the VDDIO 1.05V power rail from chipset to this pin. |
| 4 | ICLKB_1.05 | IN | 1.05V LVCMOS single-ended input clock. Voltage reference is set by the VREF_1.05 pin. |
| 5 | VDD1.8 | PWR | Power supply, nominally 1.8V. |
| 6 | Q_7 | OUT | LVCMOS single-ended output |
| 7 | VDD1.8 | PWR | Power supply, nominally 1.8V. |
| 8 | Q_6 | OUT | LVCMOS single-ended output |
| 9 | vOE_16# | IN | Active low input for enabling outputs 1 and 6. This pin has an internal pull down. 0 = enable outputs, 1 = disable outputs |
| 10 | Q_5 | OUT | LVCMOS single-ended output |
| 11 | VDD1.8 | PWR | Power supply, nominally 1.8V. |
| 12 | Q_4 | OUT | LVCMOS single-ended output |
| 13 | vOE_2345# | IN | Active low input for enabling outputs 2 through 5. This pin has an internal pull down. 0 = enable outputs, 1 = disable outputs |
| 14 | Q_3 | OUT | LVCMOS single-ended output |
| 15 | VDD1.8 | PWR | Power supply, nominally 1.8V. |
| 16 | Q_2 | OUT | LVCMOS single-ended output |
| 17 | vOE_07# | IN | Active low input for enabling outputs 0 and 7. This pin has an internal pull down. 0 = enable outputs, 1 = disable outputs |
| 18 | Q_1 | OUT | LVCMOS single-ended output |
| 19 | VDD1.8 | PWR | Power supply, nominally 1.8V. |
| 20 | Q_0 | OUT | LVCMOS single-ended output |
| 21 | EPAD | GND | Connect to Ground. |

Test Loads



$R_s = 33\Omega$ for $Z_o=50\Omega$

Applications Diagram



Electrical Characteristics–Absolute Maximum Ratings

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|---------------------------|--------------------|---------------------------|------|-----|----------------------|-------|-------|
| Supply Voltage | VDDx | | -0.5 | | 2.5 | V | 1,2 |
| Input Voltage | V _{IN} | | -0.5 | | V _{DD} +0.5 | V | 1,3 |
| Input High Voltage, SMBus | V _{IHSMB} | SMBus clock and data pins | | | 3.6 | V | 1 |
| Storage Temperature | T _s | | -65 | | 150 | °C | 1 |
| Junction Temperature | T _j | | | | 125 | °C | 1 |
| Input ESD protection | ESD prot | Human Body Model | 2000 | | | V | 1 |

¹Guaranteed by design and characterization, not 100% tested in production.

²Operation under these conditions is neither implied nor guaranteed.

³Not to exceed 2.5V.

Electrical Characteristics–Input/Supply/Common Parameters–Normal Operating Conditions

TA = T_{AMB}, Supply Voltages per normal operation conditions, See Test Loads for Loading Conditions

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|--|-----------------------|---|----------------------|------|-----------------------|--------|-------|
| Supply Voltage | VDD1.8 | Supply voltage for core and analog | 1.7 | 1.8 | 1.9 | V | |
| Reference Supply Voltage | VDDREF_1.05 | Reference for 1.05V inputs | 0.8 | 1.05 | 1.1 | V | |
| Ambient Operating Temperature | T _{AMB} | Industrial range | -40 | 25 | 85 | °C | |
| Input High Voltage | V _{IH} | Control Inputs | 0.75 V _{DD} | 1.6 | V _{DD} + 0.3 | V | |
| Input Low Voltage | V _{IL} | Control Inputs | -0.3 | 0.2 | 0.25 V _{DD} | V | |
| Input Current | I _{IN} | Single-ended inputs, V _{IN} = GND, V _{IN} = VDD | -5 | 0.0 | 5 | uA | |
| | I _{INP} | Single-ended inputs V _{IN} = 0 V; Inputs with internal pull-up resistors V _{IN} = VDD; Inputs with internal pull-down resistors | -200 | 0.0 | 200 | uA | |
| Input Frequency | F _{in} | | 1 | 24 | 48 | MHz | |
| Pin Inductance | L _{pin} | | | | 7 | nH | 1 |
| Capacitance | C _{IN} | Logic Inputs, except DIF_IN | 1.5 | | 5 | pF | 1 |
| | C _{INDIF_IN} | DIF_IN differential clock inputs | 1.5 | | 2.7 | pF | 1 |
| | C _{OUT} | Output pin capacitance | | | 6 | pF | 1 |
| Clk Stabilization | T _{STAB} | From V _{DD} Power-Up and after input clock stabilization or de-assertion of PD# to 1st clock | | | 1 | ms | 1,2 |
| Input SS Modulation Frequency non-PCIe | f _{MODIN} | Allowable Frequency for non-PCIe Applications (Triangular Modulation) | 0 | | 66 | kHz | 1 |
| OE Latency | t _{LATOE#} | Output start after OE assertion Output stop after OE deassertion | 1 | | 3 | clocks | 1 |
| T _{fall} | t _F | Fall time of single-ended control inputs | | | 5 | ns | 2 |
| Trise | t _R | Rise time of single-ended control inputs | | | 5 | ns | 2 |

¹Guaranteed by design and characterization, not 100% tested in production.

²Control input must be monotonic from 20% to 80% of input swing.

Electrical Characteristics–Clock Input Parameters

TA = T_{AMB}, Supply Voltages per normal operation conditions, See Test Loads for Loading Conditions

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|-----------------------|-----------------|---|------|-----|-------------------|-------|-------|
| Input High Voltage | V _{IH} | ICLKx_1.05 | 800 | 1.0 | VREF_1.05 + 200mV | mV | 1 |
| Input Low Voltage | V _{IL} | ICLKx_1.05 | -200 | 0 | 200 | mV | 1 |
| Input Slew Rate | dv/dt | Single-ended measurement, between 40% and 60% of VREF | 0.5 | - | 5 | V/ns | 1 |
| Input Leakage Current | I _{IN} | V _{IN} = V _{DD} , V _{IN} = GND | -5 | 0 | 5 | uA | |

¹ Guaranteed by design and characterization, not 100% tested in production.

Electrical Characteristics–Q_x 1.05V Single-ended Outputs

TA = T_{AMB}, Supply Voltages per normal operation conditions, See Test Loads for Loading Conditions

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|--------------|-------------------|---|------|------|------|-------|-------|
| Slew Rate | dV/dt | Scope averaging on, CL = 2pF | 0.8 | 1.5 | 2.5 | V/ns | 1, 2 |
| | | Scope averaging on, CL = 4.7pF | 0.5 | 1 | 1.5 | V/ns | 1, 2 |
| Voltage High | V _{HIGH} | Statistical measurement on single-ended signal using oscilloscope math function. (Scope averaging on) | 875 | 1000 | 1100 | mV | |
| Voltage Low | V _{LOW} | | -150 | 0 | 150 | | |

¹ Guaranteed by design and characterization, not 100% tested in production.

² Measured from 20% to 80% of swing.

Electrical Characteristics–Current Consumption

TA = T_{AMB}, Supply Voltages per normal operation conditions, See Test Loads for Loading Conditions

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|--------------------------|-------------------------|--|-----|------|-----|-------|-------|
| Operating Supply Current | I _{DDVref1.05} | VREF_1.05V pin | | 0.07 | 0.5 | mA | |
| | I _{DD1.8} | VDD, All outputs active at 24MHz, CL = 2pF | | 8.2 | 12 | mA | |
| Powerdown Current | I _{DDAPD} | VREF_1.05V pin | | 0.07 | 0.5 | mA | 1 |
| | I _{DDPD} | VDD, All outputs disabled. | | 3.3 | 5 | mA | 1 |

¹ Input clock stopped.

Electrical Characteristics–Output Duty Cycle, Jitter, and Skew Characteristics

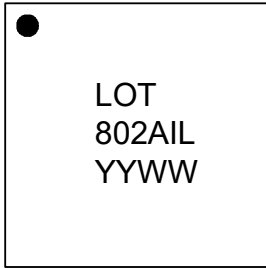
TA = T_{AMB}, Supply Voltages per normal operation conditions, See Test Loads for Loading Conditions

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|------------------------|-----------------------|---|------|-------|------|-------|-------|
| Duty Cycle Distortion | t _{DCD} | At 24MHz | -2 | -0.8% | 0 | % | 1, 2 |
| Skew, Input to Output | t _{I2O} | V _T = 50% | 2000 | 2474 | 3000 | ps | 1 |
| Skew, Output to Output | t _{O2OA} | Within banks Q[3:0] or Q[7:4], V _T = 50% | | 10 | 50 | ps | 1 |
| Skew, Matching | t _{O2OB} | Between banks Q[3:0] and Q[7:4], V _T = 50% | | 47 | 100 | ps | 1 |
| Jitter, Cycle to cycle | t _{Jcyc-cyc} | Additive Jitter, V _T = 50% | | 3.5 | 8 | ps | 1 |

¹ Guaranteed by design and characterization, not 100% tested in production.

² Duty cycle distortion is the difference in duty cycle between the output and the input clock.

Marking Diagram



- Line 1: “LOT” denotes the lot number.
- Line 2: truncated part number.
- Line 3: “YYWW” is the last two digits of the year and week that the part was assembled.

Thermal Characteristics

| PARAMETER | SYMBOL | CONDITIONS | PKG | TYP VALUE | UNITS | NOTES |
|--------------------|----------------|---------------------------------|-------|-----------|-------|-------|
| Thermal Resistance | θ_{JC} | Junction to Case | NLG20 | 42 | °C/W | 1 |
| | θ_{Jb} | Junction to Base | | 2.4 | °C/W | 1 |
| | θ_{JA0} | Junction to Air, still air | | 39 | °C/W | 1 |
| | θ_{JA1} | Junction to Air, 1 m/s air flow | | 33 | °C/W | 1 |
| | θ_{JA3} | Junction to Air, 3 m/s air flow | | 28 | °C/W | 1 |
| | θ_{JA5} | Junction to Air, 5 m/s air flow | | 27 | °C/W | 1 |

¹ePad soldered to board

Package Outline Drawings

The package outline drawings are appended at the end of this document and are accessible from the link below. The package information is the most current data available.

www.renesas.com/us/en/document/psc/package-outline-drawing-package-code-nlg20p1-20-vfqfpn-40-x-40-x-09-mm-body-05-mm-pitch

Ordering Information

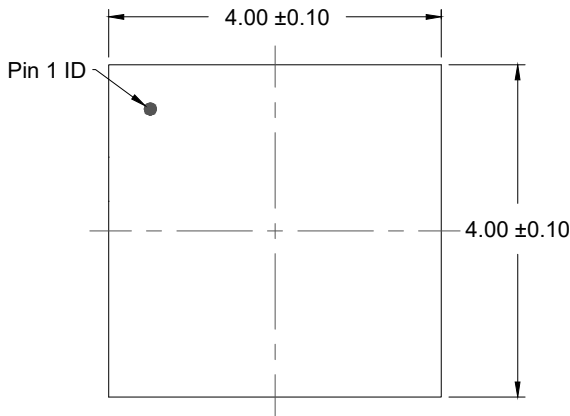
| Part / Order Number | Shipping Packaging | Package | Temperature |
|---------------------|--------------------|---------------|---------------|
| 9SBV0802AKILF | Tubes | 20-pin VFQFPN | -40° to +85°C |
| 9SBV0802AKILFT | Tape and Reel | 20-pin VFQFPN | -40° to +85°C |

“LF” to the suffix denotes Pb-Free configuration, RoHS compliant.

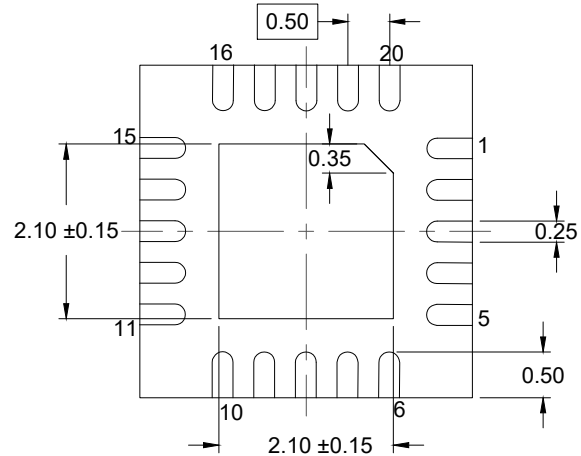
“A” is the device revision designator (will not correlate with the datasheet revision).

Revision History

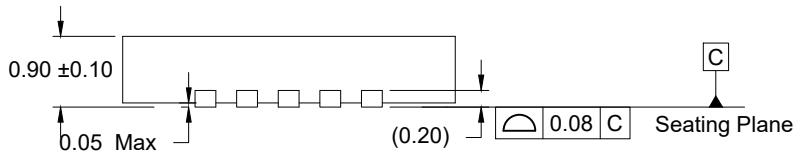
| Revision Date | Description |
|--------------------|---|
| January 31, 2023 | Updated POD link. |
| April 21, 2020 | <ol style="list-style-type: none"> 1. Removed input duty cycle specification, it is not needed. 2. Removed mention of bypass mode from footnote 2 of Output Duty Cycle, Jitter and Skew Characteristics table. |
| October 3, 2019 | <ol style="list-style-type: none"> 1. Updated measurement conditions of input clock slew rate to specify 40% to 60% of VREF. 2. Removed erroneous references to footnote 2 and duplicate footnote 1. |
| December 15, 2016 | Updated POD drawings with latest showing 2.1 mm SQ. EPAD (PSC-4170-01). |
| December 15, 2015 | <ol style="list-style-type: none"> 1. Update front page text. 2. Add Applications Diagram. 3. Update Electrical tables with characterization data. 4. Added "Output Duty Cycle, Jitter, and Skew Characteristics" Table 5. Correct pin description for pin 9. 6. Move to final. |
| September 22, 2015 | <ol style="list-style-type: none"> 1. Corrected polarity of OE inputs to be active low instead of active high. 2. Added 2pF test loads in addition to 4.7pF. 3. Updated electrical tables with preliminary data. 4. Updated block diagram with proper OE polarity. 5. Moved from Advance to Preliminary. |



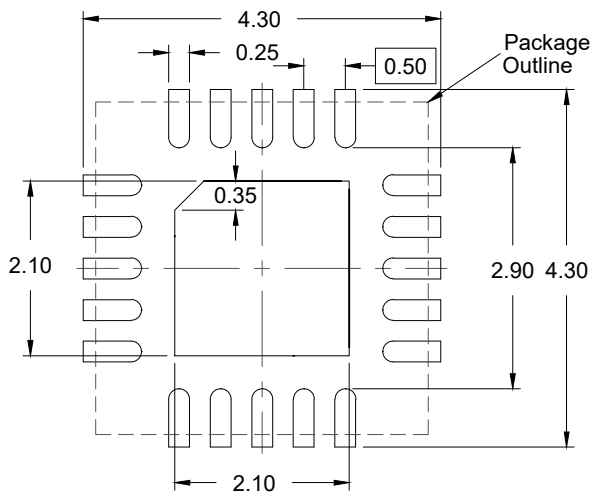
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN
(PCB Top View, NSMD Design)

NOTES:

1. JEDEC compatible.
2. All dimensions are in mm and angles are in degrees.
3. Use ± 0.05 mm for the non-toleranced dimensions.
4. Numbers in () are for references only.

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