

Advance Product Information

VSC7990

SONET/SDH 10.7Gb/s
Laser Diode Driver

Features

- 100mA Available Modulation Current
- 100mA Available Bias Current
- 10.7Gb/s Operation
- Duty Cycle Control
- Single Power Supply
- Direct Access to Modulation and Bias FETs
- On-chip Reclocking Register
- On-chip MUX for Selectable Clocked or Unclocked Applications
- On-chip 50Ω Input Termination for Clock and Data
- Available in Tested Bare Die

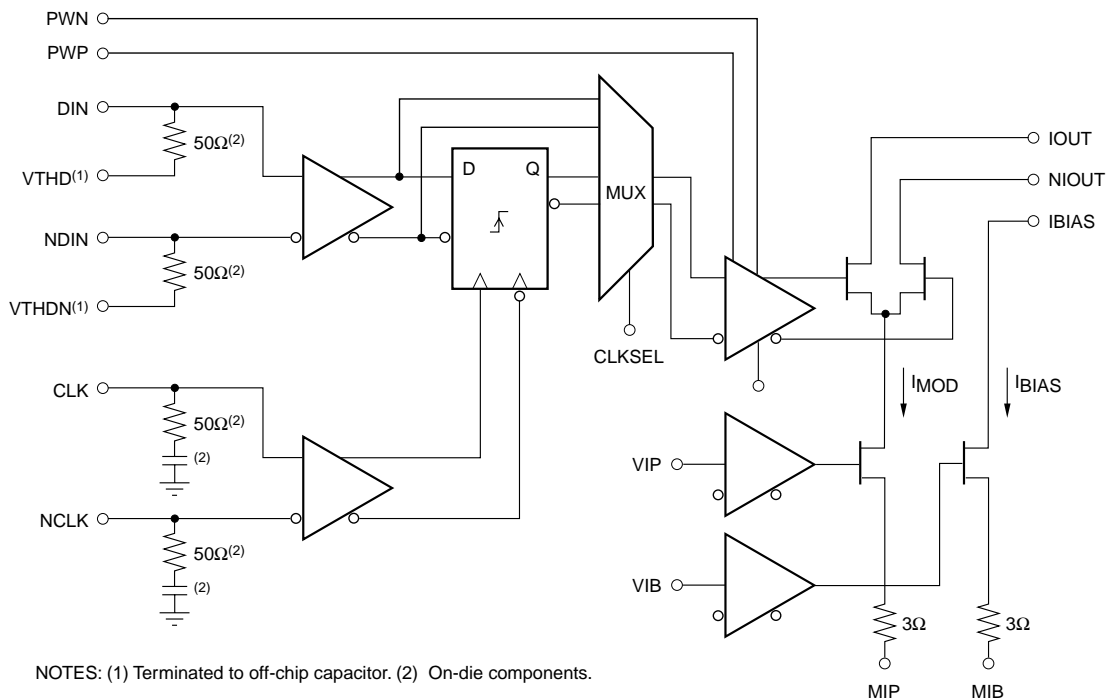
General Description

The VSC7990 is a single +5V or -5.2V supply, 10.7Gb/s laser diode driver with direct access to the laser modulation and bias FETs. Laser bias and modulation currents are set by external components allowing precision monitoring and setting of the current levels. Clock and data inputs are differentially terminated to 50Ω and must be AC-coupled. The superlative edge-rate and drive current of the VSC7990 enables efficient design of an OC-192/STM-64 transmitter using directly modulated laser diodes. A two-chip OC-12 to OC-192 optical transmitter can be easily implemented using the VSC7990 and the VSC8171 10Gb/s MUX/CRU.

Applications

- OC-192/STM-64 @ 2.488Gb/s to 10.7Gb/s
- 10Gb/s Serial Ethernet

VSC7990 Block Diagram



AC Characteristics (Over recommended operating conditions)

Table 1: High-Speed Inputs and ECL Outputs

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|-----------------|----------------------------------|-----|-----|------|-------|-------------------------|
| V _{IN} | Single-ended Input Voltage Swing | 400 | | 1000 | mVp-p | V _{CM} = -3.7V |
| V _{IN} | On-Chip Terminations | 35 | | 65 | Ω | |

Table 2: Laser Driver AC Electrical Specifications

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|---------------------------------|----------------------------|-----|-----|-----|-------|--|
| t _R , t _F | Output Rise and Fall Times | | | 35 | ps | R _L = 25Ω, 20% to 80%, 20mA < I _{MOD} < 100mA |
| t _{SU} | Data to Clock Setup Time | | TBD | | ps | |
| t _H | Hold Time | | TBD | | ps | |

DC Characteristics (Over recommended operating conditions)

Table 3: Power Dissipation

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|------------------|---|-----|-----|-----|-------|---|
| I _{VSS} | Power Supply Current (V _{SS}) | — | — | 150 | mA | V _{SS} = -5.5V, I _{MOD} = I _{BIAS} = 0mA |
| P _D | Total Power Dissipation | — | — | 800 | mW | V _{SS} = -5.5V, I _{MOD} = I _{BIAS} = 0mA |

Table 4: Laser Driver DC Electrical Specifications

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|-------------------|----------------------------------|-----|---------|-----------------------|-------|--------------------------|
| I _{BIAS} | Programmable Laser Bias Current | 2 | — | 100 | mA | — |
| I _{MOD} | Programmable Modulation Current | 1 | — | 100 | mA | — |
| V _{IB} | Laser Bias Control Voltage | — | — | V _{SS} +2.1V | V | I _{BIAS} = 60mA |
| V _{IP} | Laser Modulation Control Voltage | — | — | V _{SS} +2.1V | V | I _{MOD} = 100mA |
| V _{OCM} | Output Voltage Compliance | — | GND -3V | — | V | V _{SS} = -5.2V |

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Table 5: MUX Select Logic Table

| <i>SEL</i> | <i>Mode Select</i> |
|------------------------|--------------------|
| V _{SS} | Clocked Data In |
| GND (V _{DD}) | Unclocked Data In |
| N/C | Unclocked Data In |

Table 6: MOD_EN Logic Table

| <i>SEL</i> | <i>Mode Select</i> |
|------------------------|-----------------------------|
| V _{SS} | Modulation Current Enabled |
| GND (V _{DD}) | Modulation Current Disabled |

Absolute Maximum Ratings⁽¹⁾

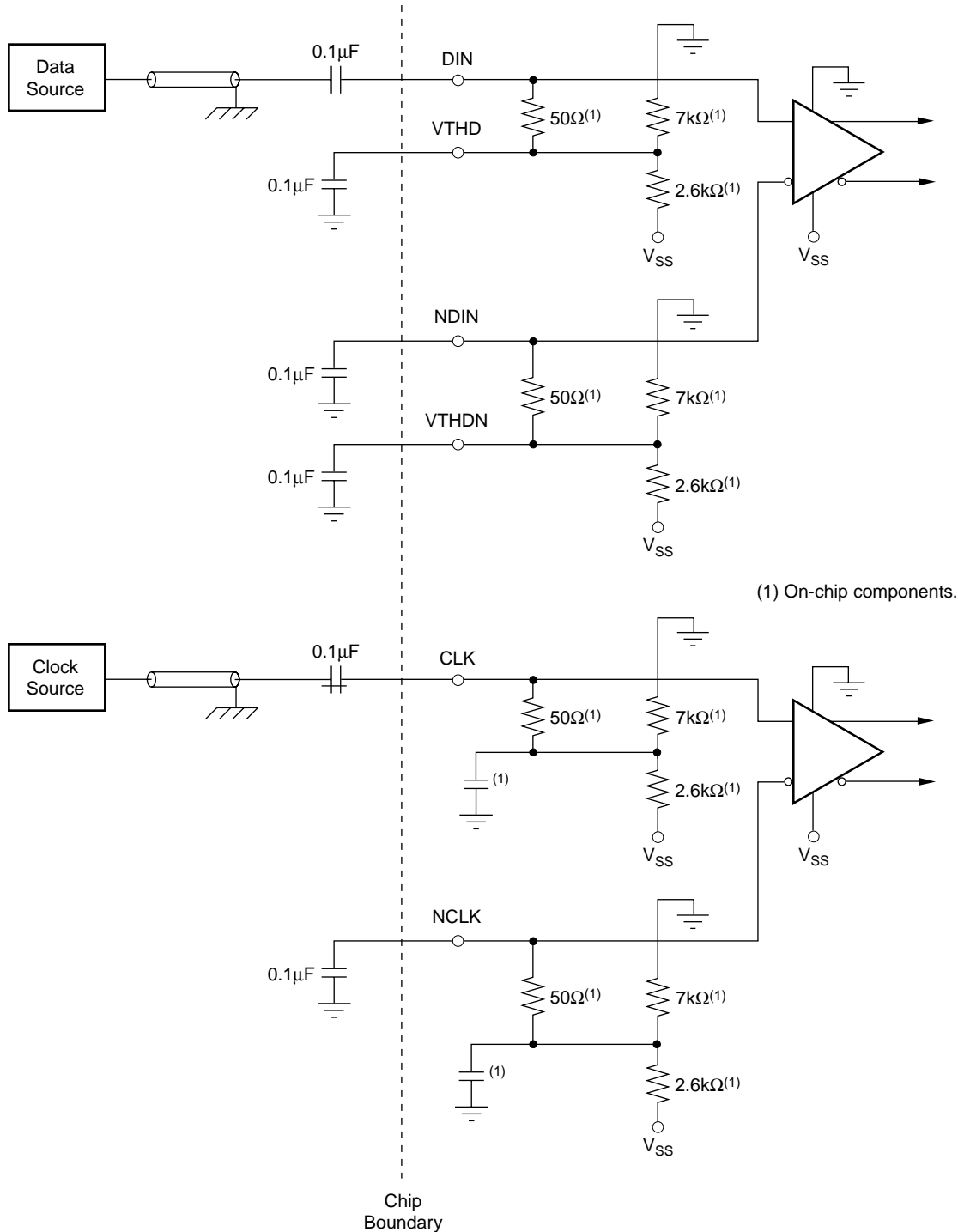
| | |
|---|--------------------------|
| Negative Power Supply Voltage (V _{SS})..... | -6.0V |
| All Pins | V _{SS} to +0.5V |
| Supply Voltage (V _{SS}) | -6.0V |
| Supply Current (I _{SS})..... | 300mA |
| Input Voltage (V _{IN})..... | V _{SS} to +0.5V |
| Modulation Control Voltage (V _{IP})..... | V _{SS} to +0.5V |
| Maximum Junction Temperature Range | -55°C to +125°C |
| Storage Temperature Range | -65°C to +150°C |

NOTE: (1) CAUTION: Stresses listed under “Absolute Maximum Ratings” may be applied to devices one at a time without causing permanent damage. Functionality at or above the values listed is not implied. Exposure to these values for extended periods may affect device reliability.

Recommended Operating Conditions

| | |
|---|----------------|
| Positive Voltage Rail (GND, V _{DD})..... | 0V |
| Negative Voltage Rail (V _{SS})..... | -5.5V to -4.9V |
| Junction Temperature Operating Range (T _J)..... | 0°C to +125°C |

Figure 1: Single-Ended AC-Coupled



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Figure 2: Differential AC-Coupled

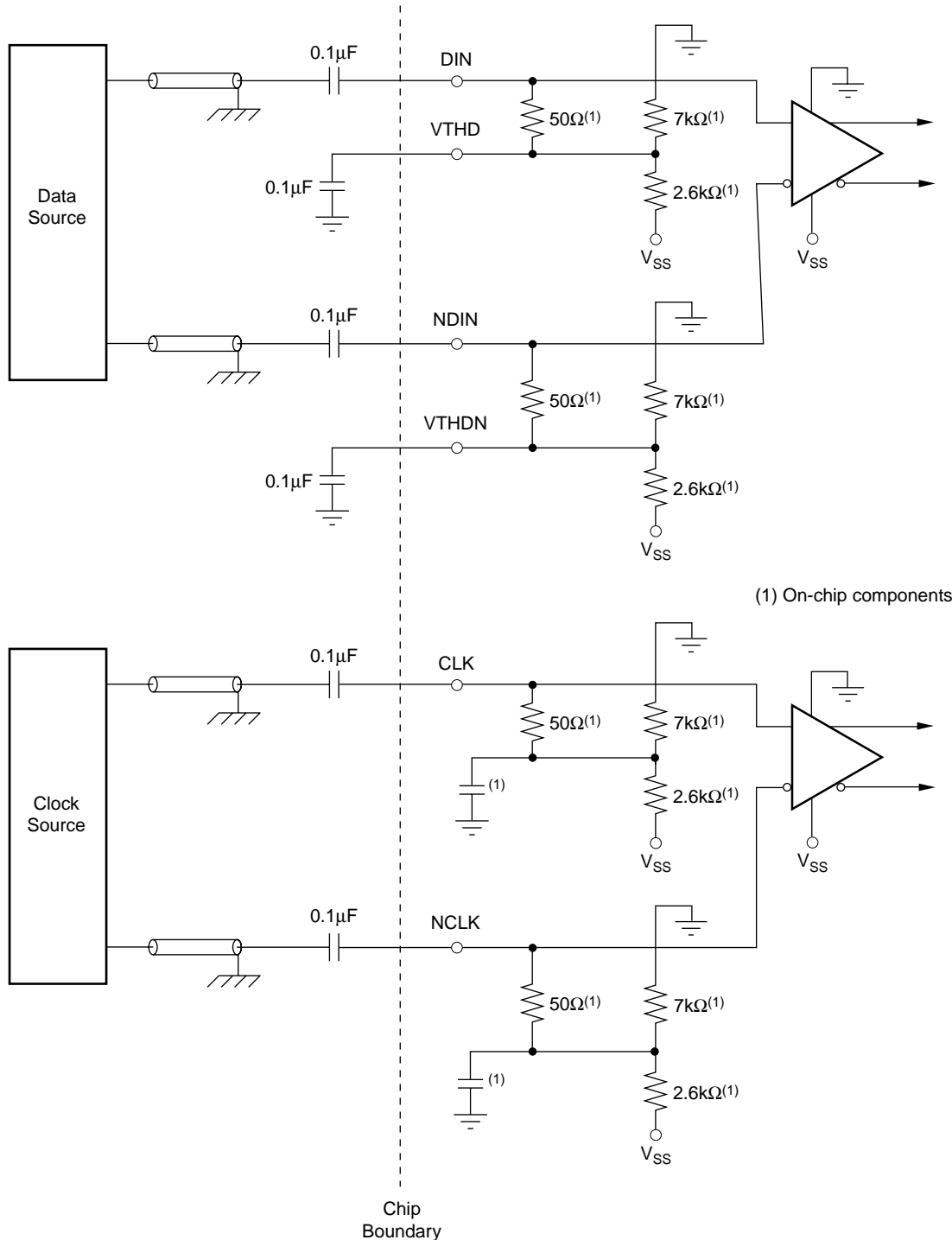


Figure 3: Control Signals VIP and VIB

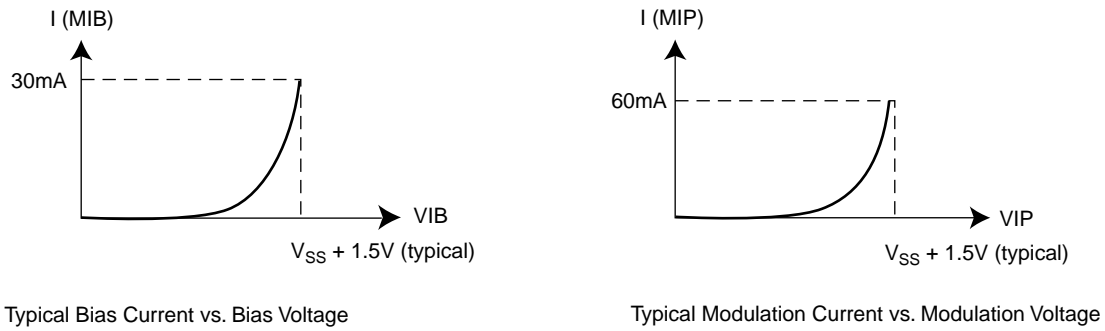
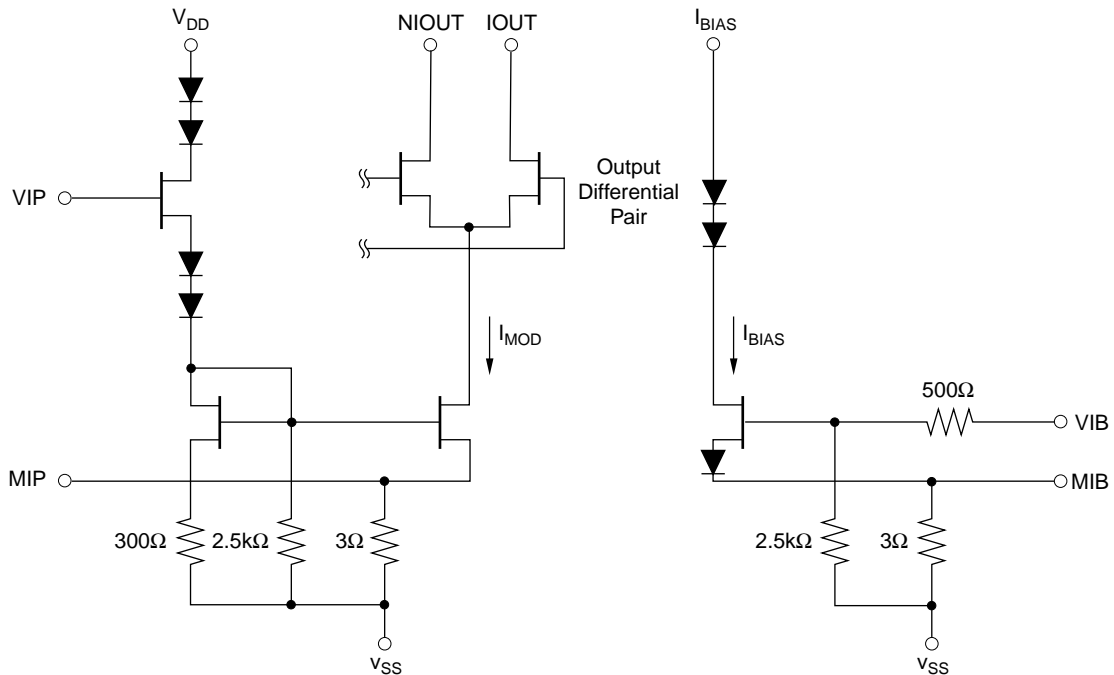


Figure 4: Simplified Output Structure



Package Pin Descriptions

Figure 5: Pad Assignments

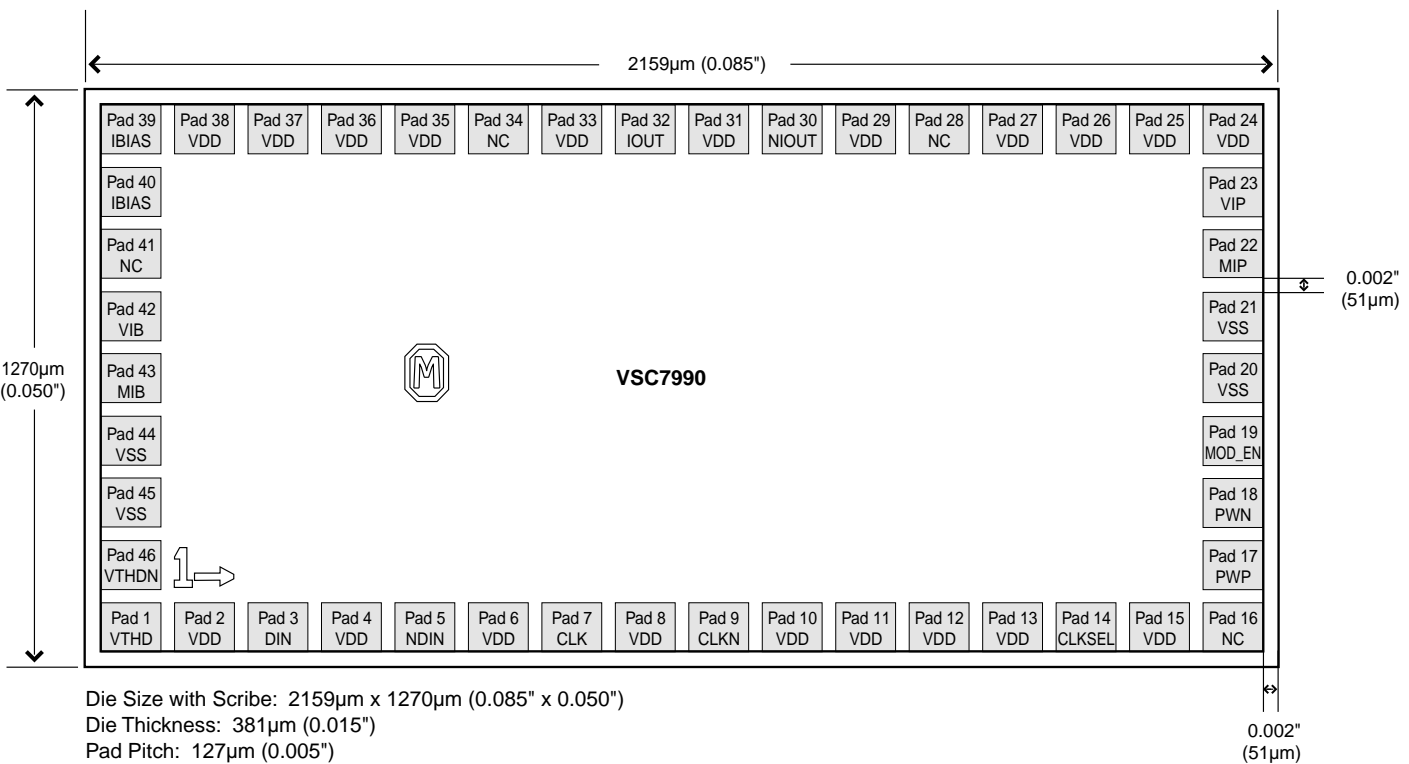


Table 7: Pad Locations for VSC7990 Die

| <i>Pin #</i> | <i>Signal Name</i> | <i>Signal Type</i> | <i>Levels</i> | <i>Description</i> |
|--------------|--------------------|--------------------|--------------------|------------------------------------|
| 1 | VTHD | — | — | Input Bias Threshold Adjust, True |
| 2 | VDD | — | 0V | Ground |
| 3 | DIN | I | ECL ⁽¹⁾ | Data Input, True |
| 4 | VDD | — | 0V | Ground |
| 5 | NDIN | I | ECL ⁽¹⁾ | Data Input, Complement |
| 6 | VDD | — | 0V | Ground |
| 7 | CLK | I | ECL ⁽¹⁾ | Clock Input, True |
| 8 | VDD | — | 0V | Ground |
| 9 | CLKN | I | ECL ⁽¹⁾ | Clock Input, Complement |
| 10 | VDD | — | 0V | Ground |
| 11 | VDD | — | 0V | Ground |
| 12 | VDD | — | 0V | Ground |
| 13 | VDD | — | 0V | Ground |
| 14 | CLKSEL | I | — | Clock Select (see Table 5) |
| 15 | VDD | — | 0V | Ground |
| 16 | NC | — | — | No Connection |
| 17 | PWP | I | — | Duty Cycle Control, Positive |
| 18 | PWN | I | — | Duty Cycle Control, Negative |
| 19 | MOD_EN | I | ECL | Modulation Output Enable |
| 20 | VSS | — | -5.2V | Power Supply |
| 21 | VSS | — | -5.2V | Power Supply |
| 22 | MIP | O | — | Modulation Current Monitor |
| 23 | VIP | I | — | Modulation Set Voltage |
| 24 | VDD | — | 0V | Ground |
| 25 | VDD | — | 0V | Ground |
| 26 | VDD | — | 0V | Ground |
| 27 | VDD | — | 0V | Ground |
| 28 | NC | — | — | No Connection |
| 29 | VDD | — | 0V | Ground |
| 30 | NIOUT | O | — | Modulation Current Out, Complement |
| 31 | VDD | — | 0V | Ground |
| 32 | IOOUT | O | — | Modulation Current Out, True |
| 33 | VDD | — | 0V | Ground |
| 34 | NC | — | — | No Connection |
| 35 | VDD | — | 0V | Ground |
| 36 | VDD | — | 0V | Ground |
| 37 | VDD | — | 0V | Ground |

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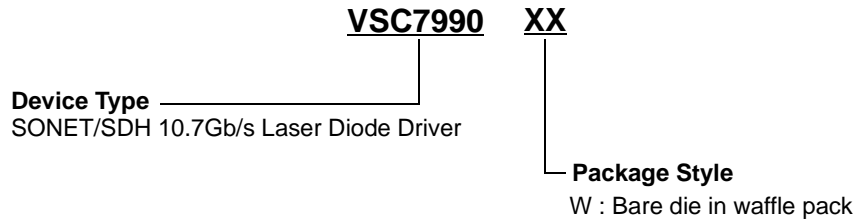
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| <i>Pin #</i> | <i>Signal Name</i> | <i>Signal Type</i> | <i>Levels</i> | <i>Description</i> |
|--------------|--------------------|--------------------|---------------|--|
| 38 | VDD | — | 0V | Ground |
| 39 | IBIAS | O | — | Bias Current Output |
| 40 | IBIAS | O | — | Bias Current Output |
| 41 | NC | — | — | No Connection |
| 42 | VIB | I | — | Bias Output Adjust |
| 43 | MIB | O | — | Bias Current Monitor |
| 44 | VSS | — | -5.2V | Power Supply |
| 45 | VSS | — | -5.2V | Power Supply |
| 46 | VTHDN | — | — | Input Bias Threshold Adjust for Data, Complement |

NOTE: (1) Data and clock inputs are ECL-swing but not ECL level. Inputs must be AC-coupled as shown in Figures 2 and 3 of this data sheet.

Ordering Information

The order number for this product is formed by a combination of the device type and package style.



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