

Preliminary Data Sheet

VSC7928

SONET/SDH 3.2Gb/s Laser Diode Driver

Features

- Rise Times Less Than 100ps
- High Speed Operation (Up to 3.2Gb/s NRZ Data)
- Differential or Single-Ended Inputs
- Single Supply
- ECL Compatible Clock and Data Inputs
- Direct Access to Modulation and Bias FETs
- Data Density Monitors
- On-chip Reclocking Register
- On-chip Mux for Clocked or Non-clocked Applications
- On-chip 50Ω Input Termination: Clock and Data
- Enhanced Pinout

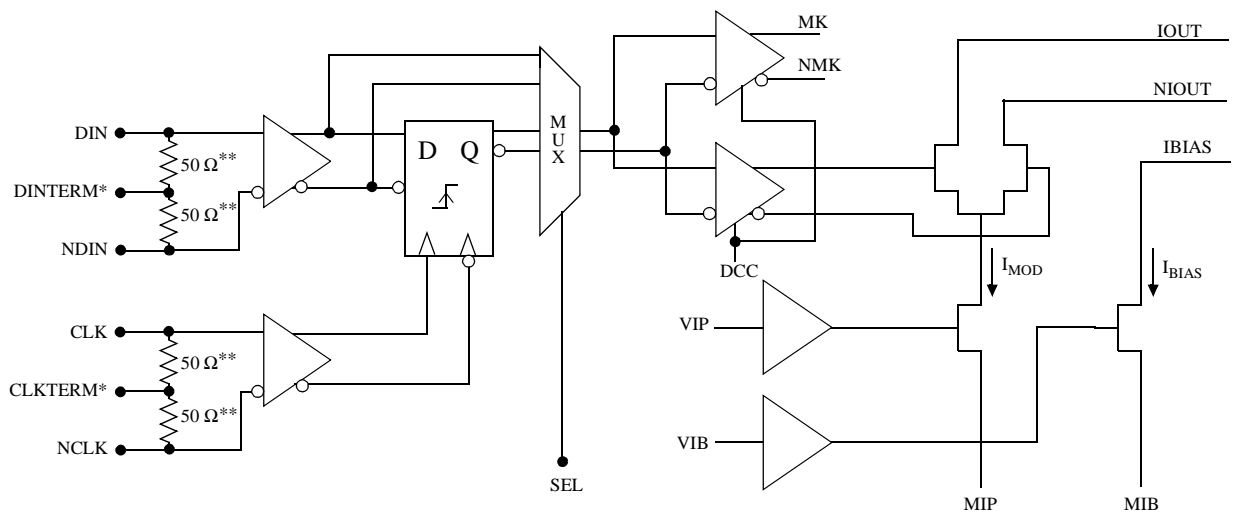
Applications

- SONET/SDH @ 622Mb/s, 1.244Gb/s, 2.488Gb/s, and 3.125Gb/s
- Full Speed Fibre Channel (1.062Gb/s)

General Description

The VSC7928 is a single 5V supply, 3.2Gb/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. Data density outputs are provided to allow the user to adjust the laser bias in high unbalanced data applications. Clock and data inputs are differentially terminated to 50Ω.

VSC7928 Block Diagram



*Terminated to Off-chip Capacitor
 **On Die Components

Table 1: Signal Pin Reference

| Signal | Type | Level | # Pins | Description |
|------------|------|-------|--------------------|--|
| DIN, NDIN | In | ECL | 2 | Data Input and Data Reference, On-chip 50Ω Termination |
| MK, NMK | Out | ECL | 2 | Data Density Differential Outputs |
| NIOUT | Out | — | 1 | Laser Modulation Current Output (Complementary) |
| IOUT | Out | — | 1 | Laser Modulation Current Output (To Laser Cathode) |
| VSS | Pwr | Pwr | 2 | Negative Voltage Rail |
| GND | Pwr | Pwr | 5/6 ⁽¹⁾ | Positive Voltage Rail |
| VIP | In | DC | 1 | Modulation Gate Node |
| MIP | In | DC | 1 | Modulation Source Node |
| VIB | In | DC | 1 | Bias Gate Node |
| MIB | In | DC | 1 | Bias Source Node |
| IBIAS | Out | DC | 1 | Laser Bias Output (To Laser Cathode) |
| CLK, NCLK | In | ECL | 2 | Clock Input and Clock Reference, On-chip 50Ω Termination |
| DINTERM | In | DC | 1 | Data Reference |
| CLKTERM | In | DC | 1 | Clock Reference |
| DCC | In | DC | 1 | Duty Cycle Control, Leave Floating |
| SEL | In | DC | 1 | Clk/Non-clk Data Select |
| GND/NC | Pwr | DC | 7 ⁽¹⁾ | No connection (leave floating or connect to GND) |
| Total Pins | — | — | 24/32* | |

NOTE: (1) Applicable to 32-pin TQFP package only.

Table 2: Mux Select Logic Table

| SEL | Mode Select |
|-----------------|---------------------|
| V _{SS} | Clocked Data In |
| GND | Non-clocked Data In |
| N/C | Non-clocked Data In |

Table 3: Absolute Maximum Ratings

| Symbol | Rating | Limit |
|------------------|-------------------------------|--------------------------|
| V _{SS} | Negative Power Supply Voltage | V _{CC} to -6.0V |
| T _J | Maximum Junction Temperature | -55°C to +125°C |
| T _{STG} | Storage Temperature | -65°C to +150°C |

Table 4: Recommended Operating Conditions

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|-----------------|--|------|------|-------------------|-------|--------------------------|
| GND | Positive Voltage Rail | — | 0 | — | V | |
| VSS | Negative Voltage Rail | -5.5 | -5.2 | -4.9 | V | |
| T _{Cl} | Operational Temperature ⁽¹⁾ | -40 | — | 85 ⁽²⁾ | °C | Power dissipation = 1.3W |
| T _J | Junction Temperature | — | — | 125 | °C | |

NOTES: (1) Lower limit of specification is ambient temperature and upper limit is case temperature. (2) See section "Calculation of the Maximum Case Temperature" for detailed maximum temperature calculations.

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Table 5: High Speed Inputs and ECL Outputs

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|-----------------|--------------------------------------|-------|-----|-------|-------|-------------------------|
| V _{IN} | Single-ended Input Voltage Swing | 300 | — | 1500 | mVp-p | V _{CM} = -2.0V |
| V _{CM} | Differential Input Common Mode Range | -2.3 | — | -1.3 | V | V _{SS} = -5.2V |
| V _{OH} | ECL Output High Voltage | -1200 | — | — | mV | 50Ω to -2.0V |
| V _{OL} | ECL Output Low Voltage | — | — | -1600 | mV | 50Ω to -2.0V |
| V _{IN} | On-Chip Terminations | 35 | — | 65 | Ω | |

Table 6: Power Dissipation

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|------------------|----------------------------|-----|-----|-----|-------|---|
| I _{VSS} | Power Supply Current (VSS) | — | 80 | 120 | mA | V _{SS} = -5.5V, I _{MOD} = I _{BIAS} = 0mA, MK/NMK open circuit |
| P _D | Total Power Dissipation | — | — | 700 | mW | V _{SS} = -5.5V, I _{MOD} = I _{BIAS} = 0mA, R _{LOAD} = 25Ω to GND, MK/NMK terminated 50Ω to -2V |

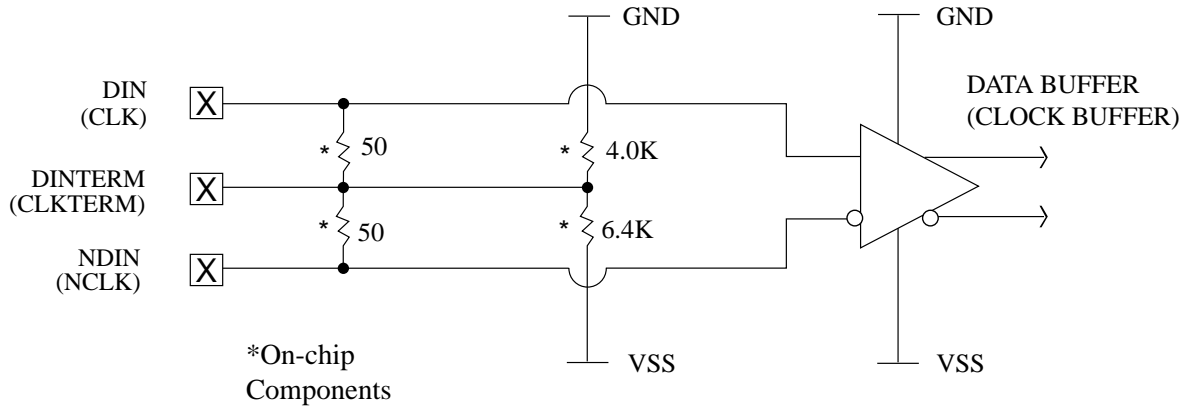
Table 7: Laser Driver DC Electrical Specifications

| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|-------------------|----------------------------------|-----|----------|-----------------------|-------|--------------------------|
| I _{BIAS} | Programmable Laser Bias Current | 2 | — | 100 | mA | |
| I _{MOD} | Programmable Modulation Current | 2 | — | 100 | mA | |
| V _{IB} | Laser Bias Control Voltage | — | — | V _{SS} + 2.1 | V | I _{BIAS} = 50mA |
| V _{IP} | Laser Modulation Control Voltage | — | — | V _{SS} + 2.1 | V | I _{MOD} = 60mA |
| V _{OCM} | Output Voltage Compliance | — | GND - 3V | — | V | V _{SS} = -5.2V |

Table 8: Laser Driver AC Electrical Specifications

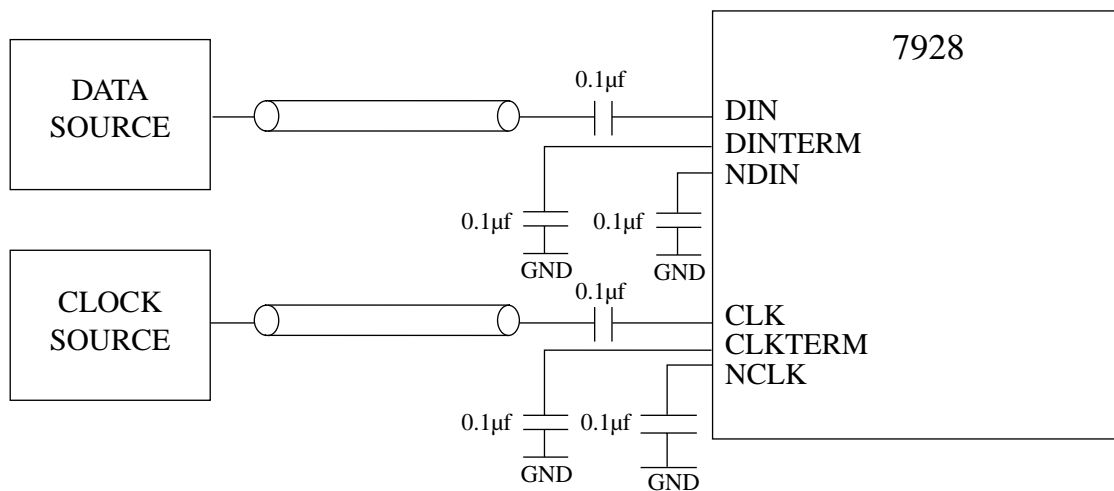
| Symbol | Parameter | Min | Typ | Max | Units | Conditions |
|---------------------------------|----------------------------|-----|-----|-----|-------|---|
| t _R , t _F | Output Rise and Fall Times | — | — | 100 | ps | 25Ω load, 20%-80%, 20mA < I _{MOD} < 60mA, I _{BIAS} = 60mA |
| t _{SU} | Data to Clock Setup Time | — | 50 | 90 | ps | — |
| t _H | Hold Time | 20 | 50 | — | ps | — |

Figure 1: On-Chip Data and Clock Input Configuration



DINTERM to -2.0V for Differential ECL Inputs

Figure 2: Single-Ended Operation



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Figure 3: Single-Ended AC-Coupled

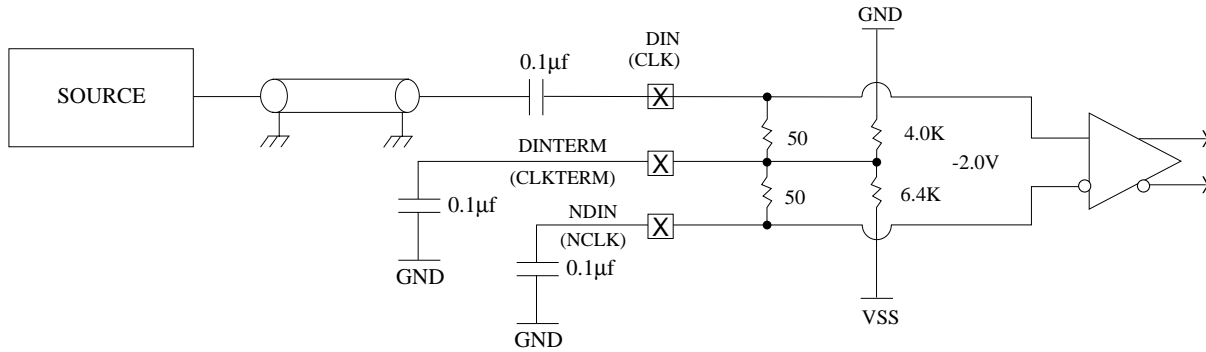


Figure 4: Differential AC-Coupled

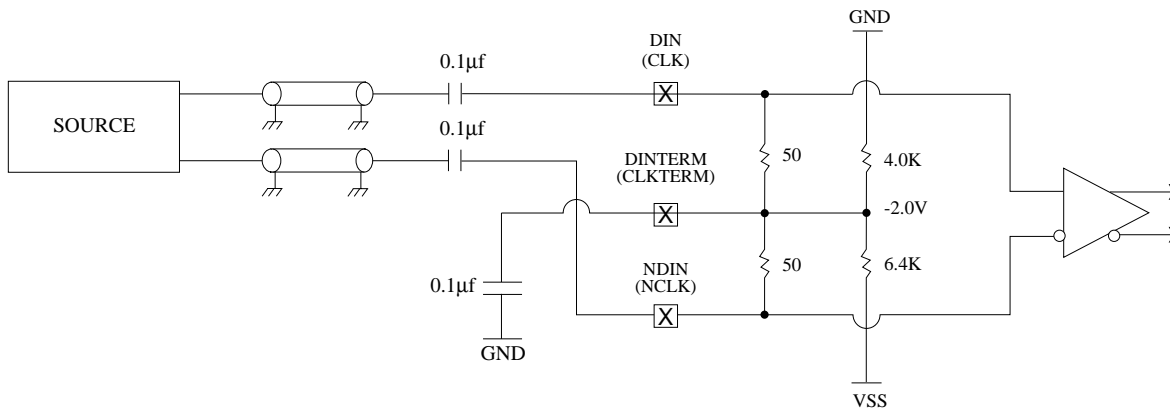


Figure 5: Differential DC-Coupled

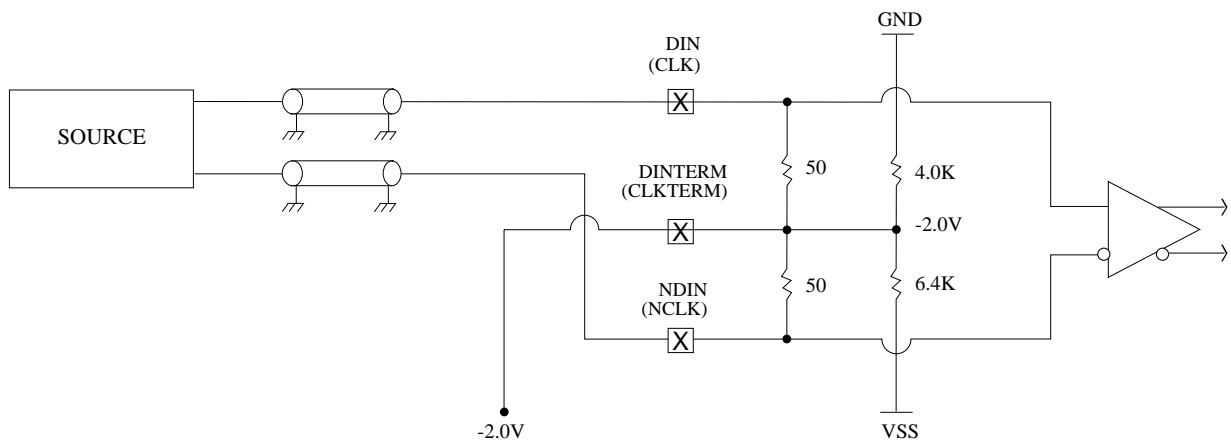
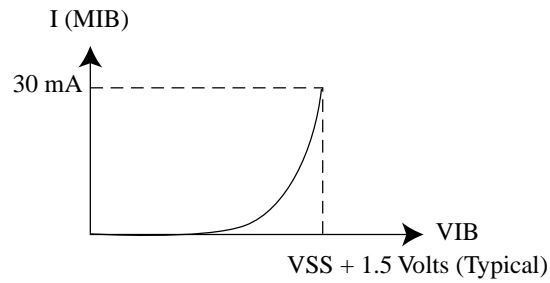
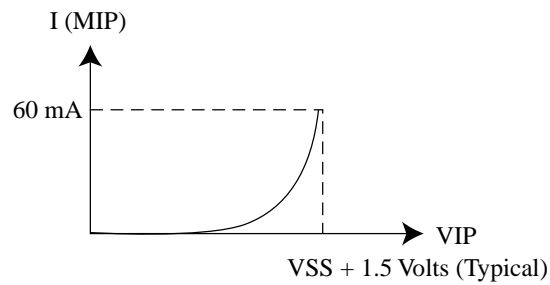


Figure 6: Control Signals VIP and VIB

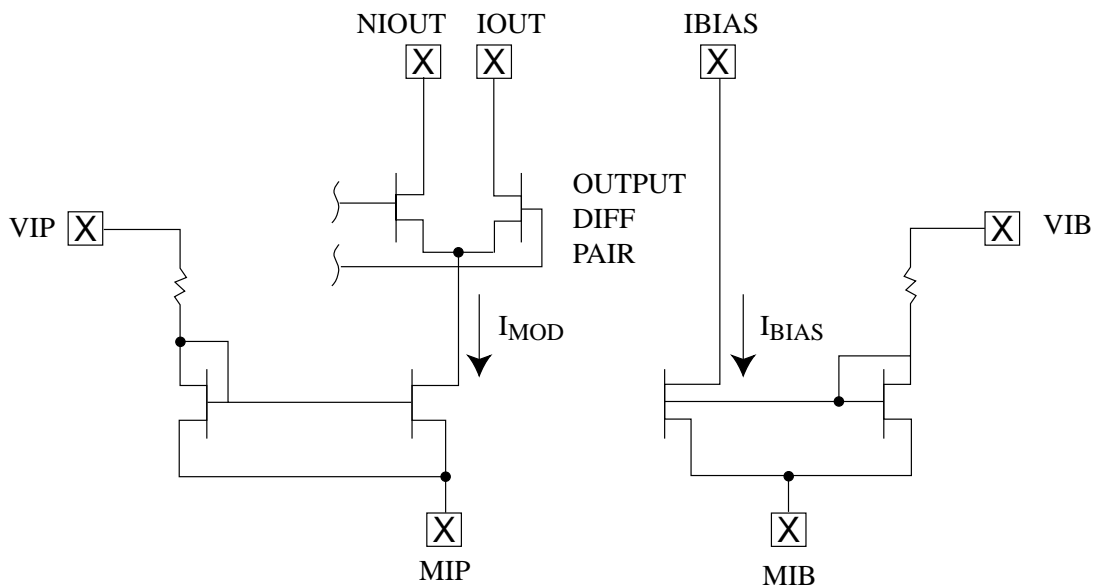


Typical Bias Current v.s. Bias Voltage



Typical Modulation Current v.s. Modulation Voltage

Figure 7: Simplified Output Structure

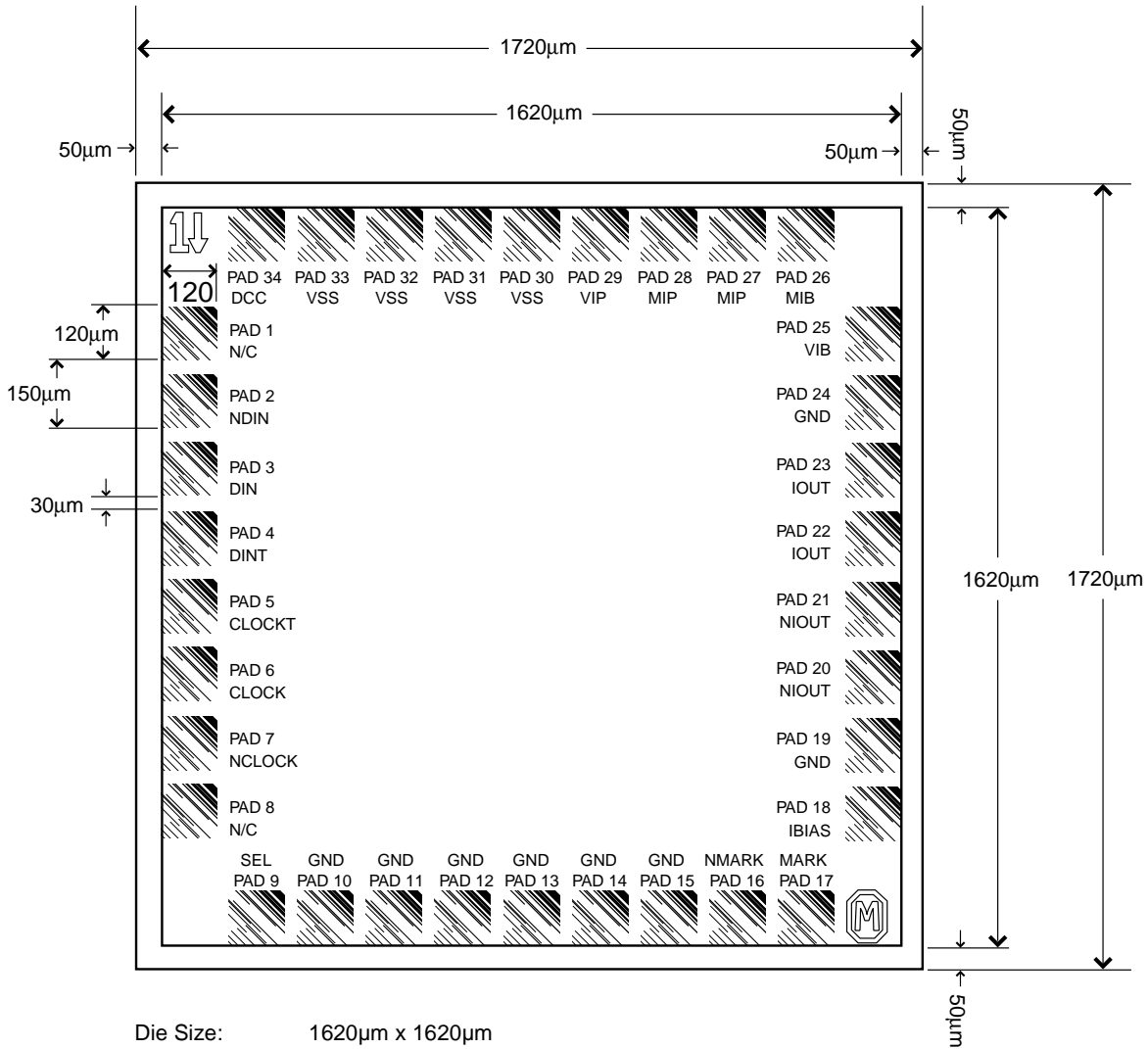


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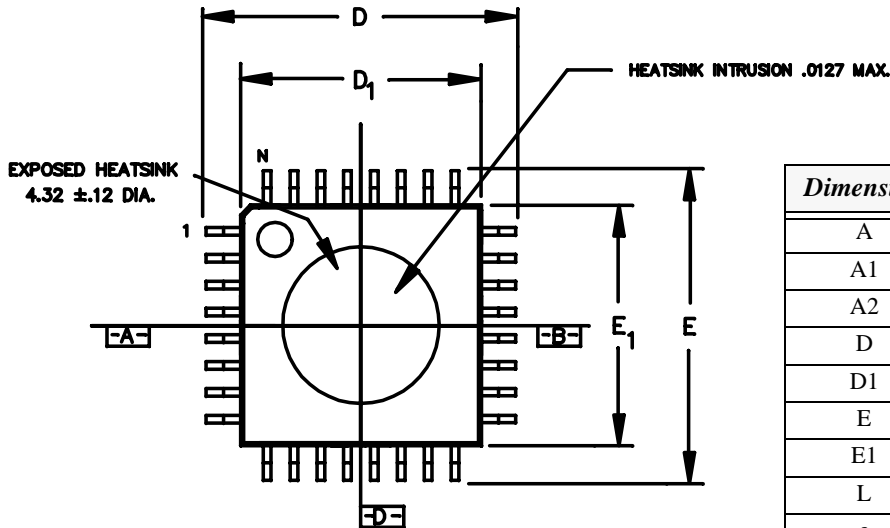
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Figure 8: Pad Assignments for VSC7928 Die

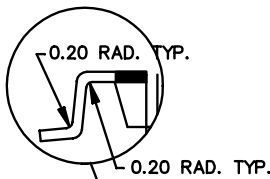
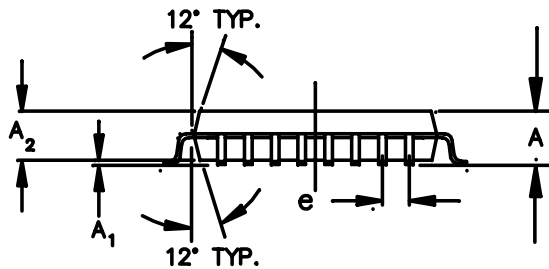


Die Size: 1620µm x 1620µm
 Actual Die Size: 1720µm x 1720µm (after the die are cut up)
 Pad Size: 120µm x 120µm
 Pad Pitch: 150µm
 Space Between Pads: 30µm

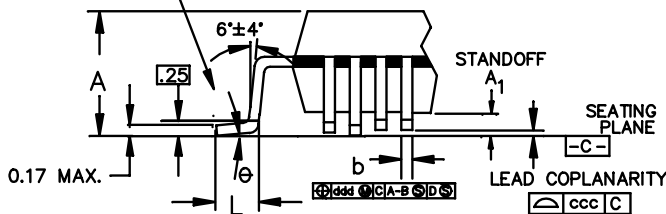
Package Information - 32 Pin Plastic TQFP Package



| Dimension | mm | Tolerance |
|-----------|---------|-----------|
| A | 1.60 | MAX |
| A1 | .10 | ±.05 |
| A2 | 1.40 | ±.05 |
| D | 9.00 | ±.20 |
| D1 | 7.00 | ±.10 |
| E | 9.00 | ±.20 |
| E1 | 7.00 | ±.10 |
| L | .60 | +.15/-.10 |
| e | .80 | BASIC |
| b | .35 | ±.05 |
| θ | 0° - 7° | |
| ddd | .20 | MAX |
| ccc | .10 | MAX |



Note: Package lid and bottom heat spreader are electrically connected to GND within the package.

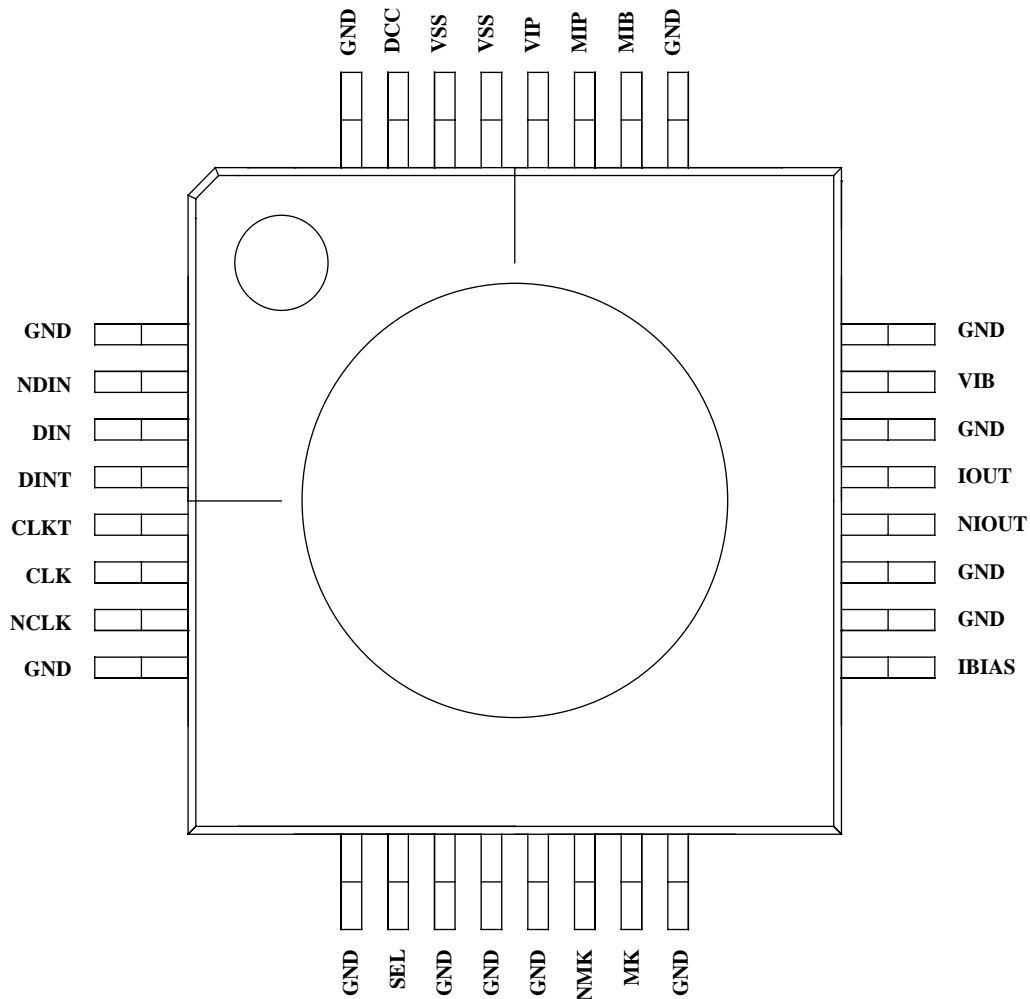


- NOTES: 1) ALL DIMENSIONS IN MM.
 2) DIMENSIONS SHOWN ARE NOMINAL WITH TOL. AS INDICATED
 3) L/F: ETEC 64T COPPER OR EQUIVALENT, 0.127 MM (.005") THICK.
 4) FOOT LENGTH "L" IS MEASURED AT GAGE PLANE, AT 0.25 ABOVE THE SEATING PLANE.

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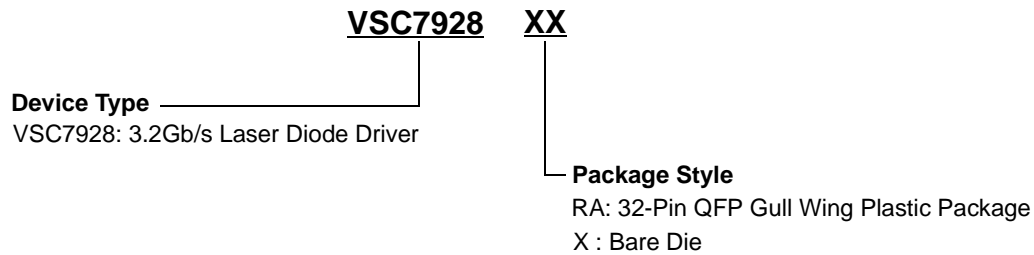
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32-Pin Plastic Package Pin Designation



Ordering Information

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



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