

Advance Product Information

VSC7926

SDH/SONET 2.5Gbits/sec
Laser Diode Driver

Features

- Rise Times Less Than 100ps
- High Speed Operation
(Up to 2.5Gb/s NRZ Data)
- Differential Inputs
- Single Supply
- Direct Access to Modulation and Bias FET's
- Data Density Monitors
- On-chip Reclocking Register

Introduction

The VSC7926 is a single 5V supply, 2.5Gb/s laser diode driver with direct access to the laser modulation and bias FET's. 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 50 Ohms.

Applications

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

VSC7926 Block Diagram

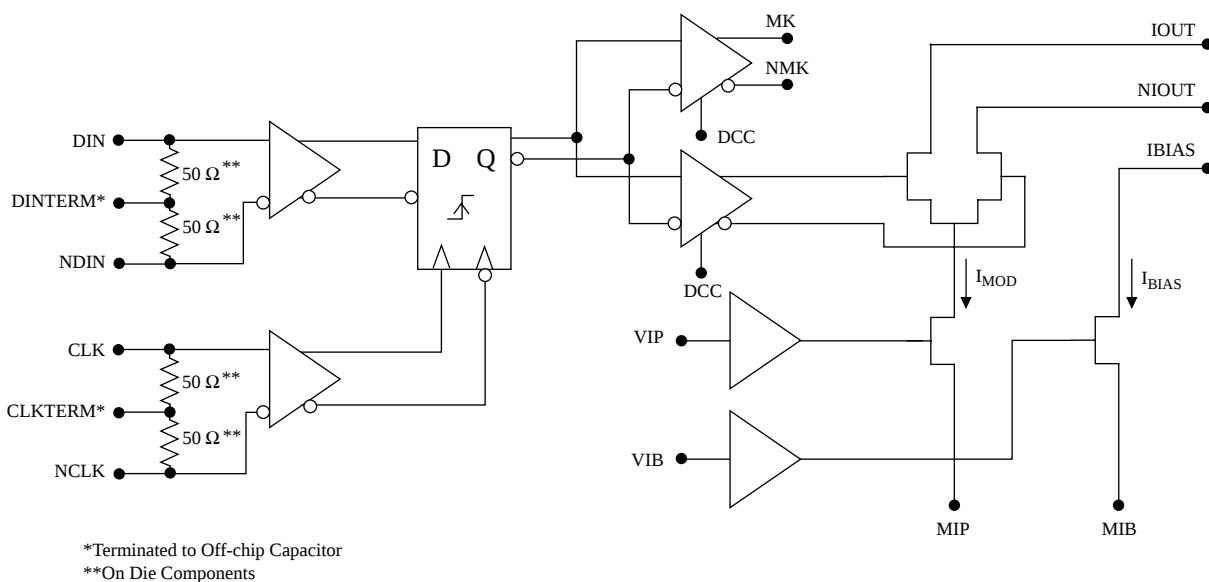


Table 1: Signal Pin Reference

Signal	Type	Level	# Pins	Description
DIN, NDIN	In		2	Data Input and Data Reference
DINTERM	Ref	DC	1	Data Termination
CLKTERM	Ref	DC	1	Clock 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	3	Negative Voltage Rail
GND	Pwr	Pwr	5	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		2	Clock Input and Clock Reference
DCC	In	DC	1	Duty Cycle Control, Leave Floating
Total Pins			24	

Table 2: Absolute Maximum Ratings

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

Table 3: High Speed Inputs and ECL Outputs

Symbol	Parameter	Min	Max	Units	Conditions
V _{IN}	Differential Input Voltage Swing	500	1000	mV	
V _{CM}	Differential Input Common Mode Range	-2.3	-1.3	V	V _{SS} = -5.2V
V _{OH}	ECL Output High Voltage	-1200		mV	50 Ohms to -2.0V
V _{OL}	ECL Output Low Voltage		-1600	mV	50 Ohms to -2.0V

Advance Product Information

VSC7926

SDH/SONET 2.5Gbits/sec
Laser Diode Driver

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 _C	*Operational Temperature	-40		85**	C	Power dissipation = 1.25W
T _J	Junction Temperature			125	C	

*Lower limit of specification is ambient temperature and upper limit is case temperature.

**See section "Calculation of the Maximum Case Temperature" for detailed maximum temperature calculations.

Table 5: Power Dissipation

Symbol	Parameter	Min	Typ	Max	Units	Conditions
I _{VSS}	Power Supply Current (VSS)	-	-	220	mA	V _{SS} = -5.5, I _{MOD} = I _{BIAS} = 0 mA
P _d	Total Power Dissipation	-	-	1210	mW	V _{SS} = -5.5, I _{MOD} = I _{BIAS} = 0 mA, R _{load} = 25 Ohms to GND
P _{dmax}	Maximum Power Dissipation	-	-	1815	mW	V _{SS} = -5.5, I _{MOD} = 60mA, I _{BIAS} = 50 mA, I _{OUT} = 0 Volts

Table 6: Laser Driver DC Electrical Specifications

Symbol	Parameter	Min	Typ	Max	Units	Conditions
I _{BIAS}	Programmable Laser Bias Current	2		50	mA	-
I _{MOD}	Programmable Modulation Current	2	-	60	mA	
V _{IB}	Laser Bias Control Voltage			V _{SS} + 2.1	V	I _{BIAS} = 50 mA
V _{IP}	Laser Modulation Control Voltage			V _{SS} + 2.1	V	I _{MOD} = 60 mA
V _{OCM}	Output Voltage Compliance	GND -2.5V			V	V _{SS} = -5.2V

Table 7: Laser Driver AC Electrical Specifications

Symbol	Parameter	Min	Typ	Max	Units	Conditions
t _r t _f	Output Rise and Fall Times			100	ps	25 Ohm load, 20%-80%, 15mA < I _{MOD} < 60 mA, I _{BIAS} = 40 mA
t _{su}	t Setup Data to Clock		50		ps	
t _h	t Hold		50		ps	

Table 8: Package Thermal Specifications

Symbol	Parameter	Min	Typ	Max	Units	Conditions
θ _{JCC}	Thermal Resistance from Junction to Case		25		°C/W	Ceramic Package
θ _{JCMG}	Thermal Resistance from Junction to Case		32		°C/W	Metal Glass Package

Calculation of the Maximum Case Temperature

The VSC7926 is designed to operate with a maximum junction temperature of 125°C. The rise from the case to junction is determined by the power dissipation of the device. The power dissipation is determined by the V_{SS} current plus the operating I_{MOD} and I_{BIAS} currents.

The power of the chip is determined by the following formula:

$$P_D = (-V_{SS} * I_{SS}) + ((V_{IOUT} - V_{SS}) * I_{MOD}) + ((V_{IBIAS} - V_{SS}) * I_{BIAS})$$

For example with:

$$\begin{aligned} V_{SS} &= -5.2V \\ I_{MOD} &= 40mA \\ I_{BIAS} &= 20mA \\ V_{IBIAS} &= -2.0V \\ V_{IOUT} &= -2.0V \end{aligned}$$

$$P_D = (-5.2 * 220mA) + ((5.2 - 2.0) * 40mA) + ((5.2 - 2.0) * 20mA)$$

$$P_D = 1144mW + 128mW + 64mW = 1.336W$$

The thermal rise from junction to case is $\theta_{JC} * P_D$. For the metal glass package, $\theta_{JC} = 32^\circ C/W$. Thus the thermal rise is:

$$32^\circ C/W * 1.336W = 42.7^\circ C$$

The maximum case temperature is:

$$125^\circ C - 42.7^\circ C = 82.3^\circ C$$

The absolute maximum power dissipation of the device is at:

$$\begin{aligned} V_{SS} &= -5.5V \\ I_{MOD} &= 60mA \\ I_{BIAS} &= 50mA \\ V_{IBIAS} &= 0V \\ V_{IOUT} &= 0V \end{aligned}$$

$$P_D = (5.5 * 220mA) + (5.5 * 60mA) + (5.5mA * 50mA) \quad P_D = 1.815W$$

This will net a maximum junction to case thermal rise of: $1.815W * 32^\circ C/W = 58^\circ C$

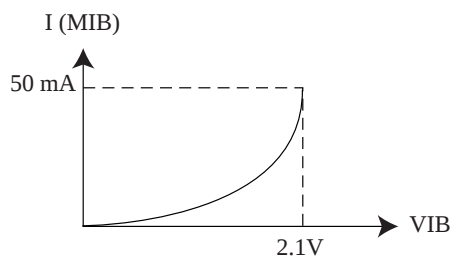
This situation will allow maximum case temperature of: $125^\circ C - 58^\circ C = 67^\circ C$

Advance Product Information

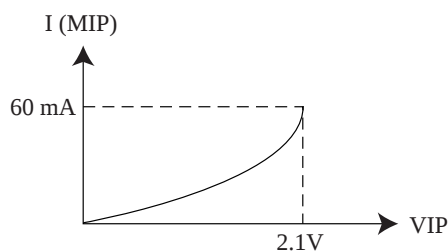
VSC7926

SDH/SONET 2.5Gbits/sec
Laser Diode Driver

Figure 1: Control Signals VIP and VIB

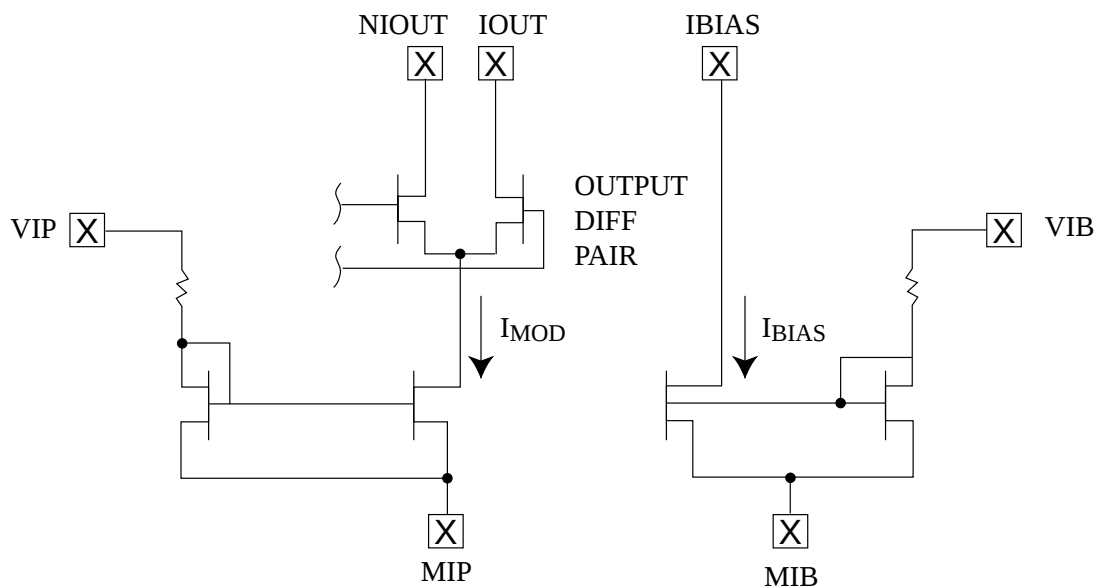


Typical Bias Current v.s. Bias Voltage

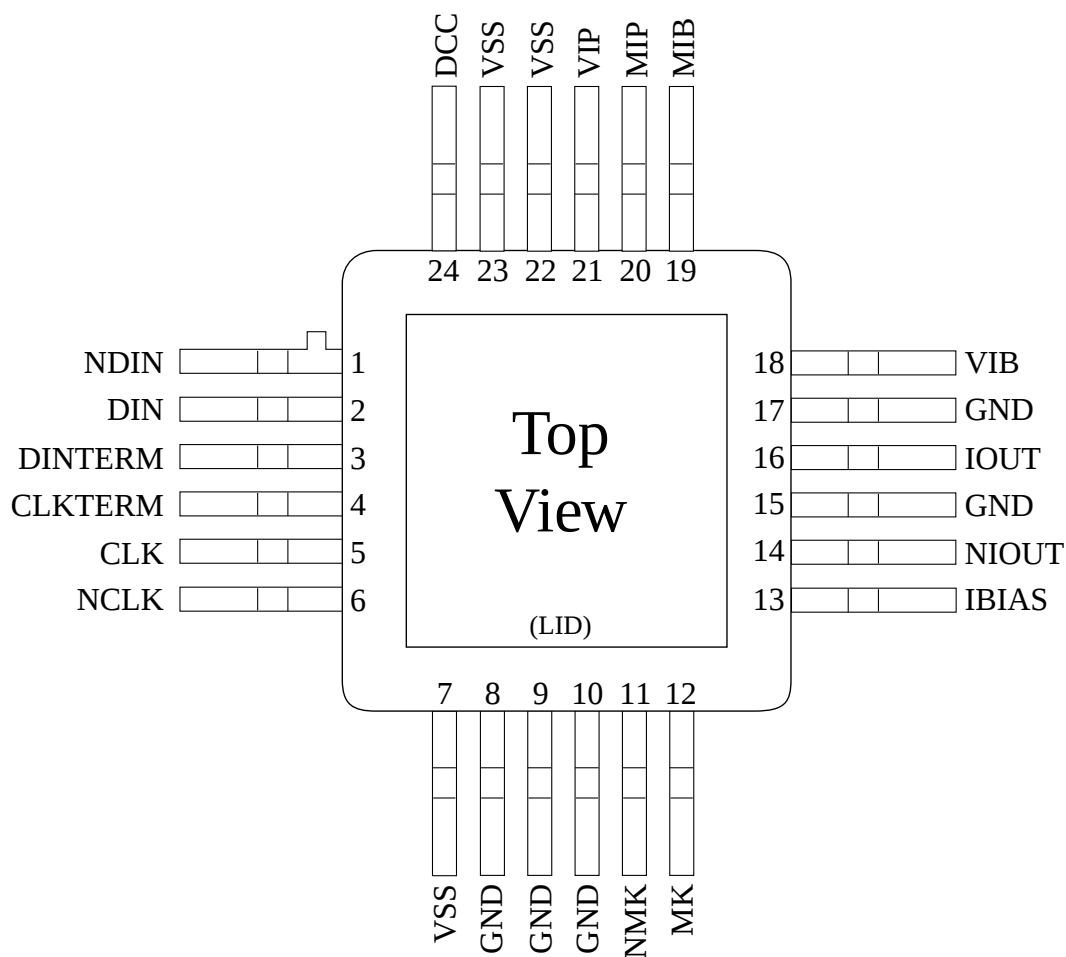


Typical Modulation Current v.s. Modulation Voltage

Figure 2: Simplified Output Structure



Pin Diagram for 24 Pin Metal-Glass Package



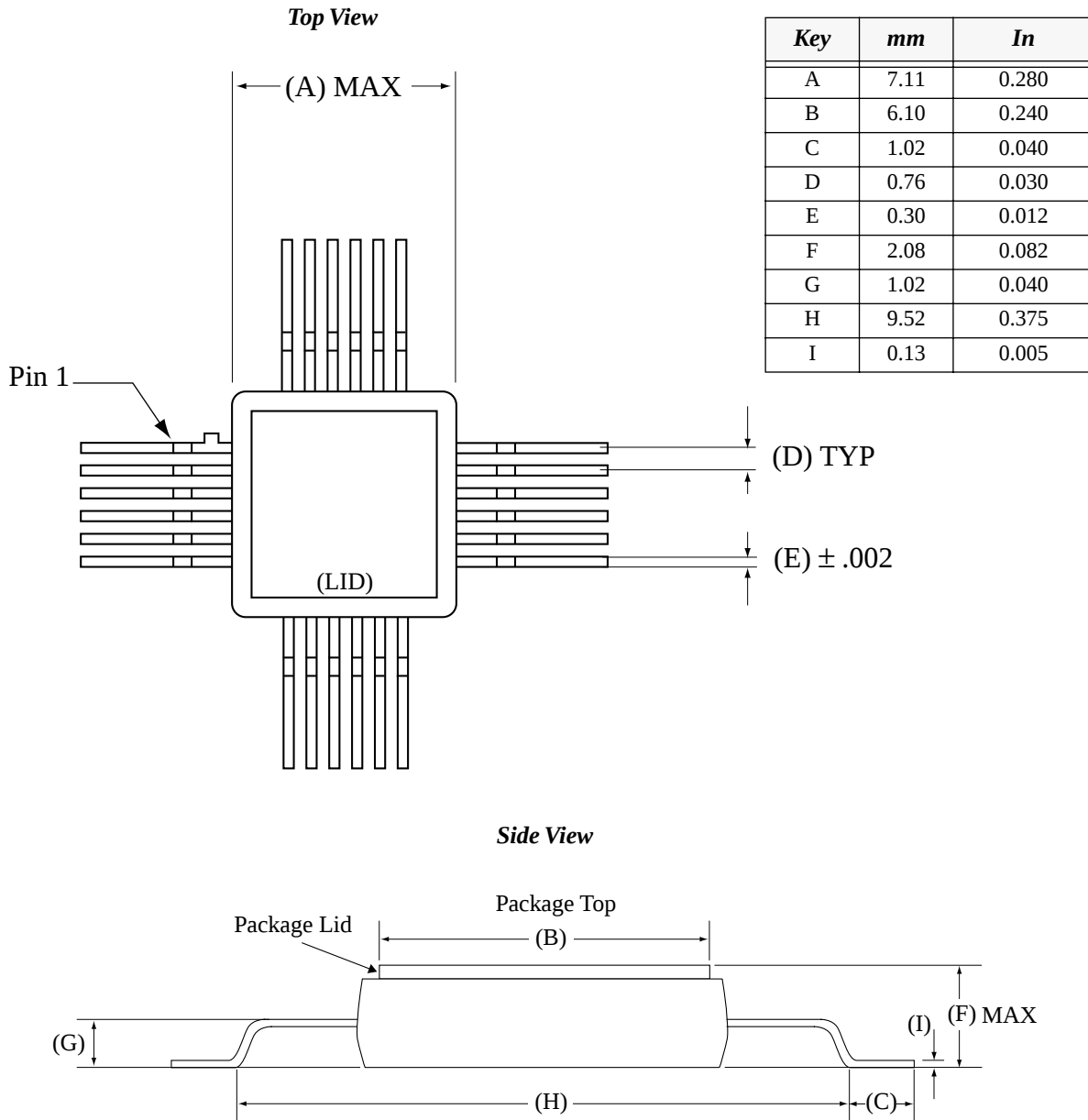
Note: Package bottom plate is connected to GND within the package.
Package lid is electrically unconnected.

Advance Product Information

VSC7926

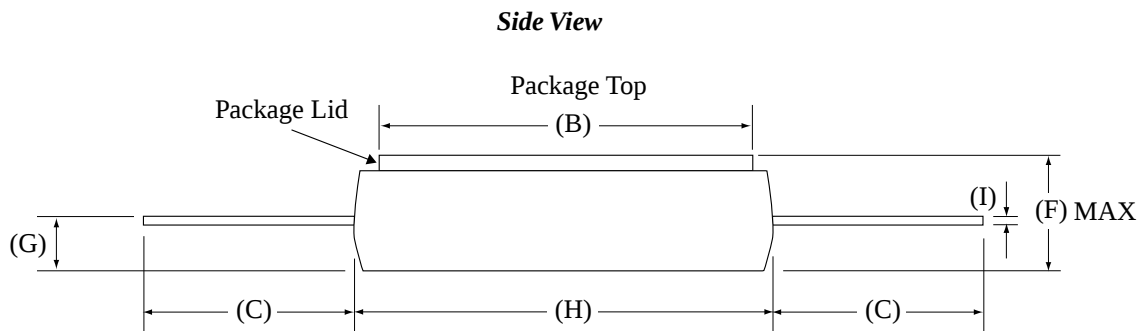
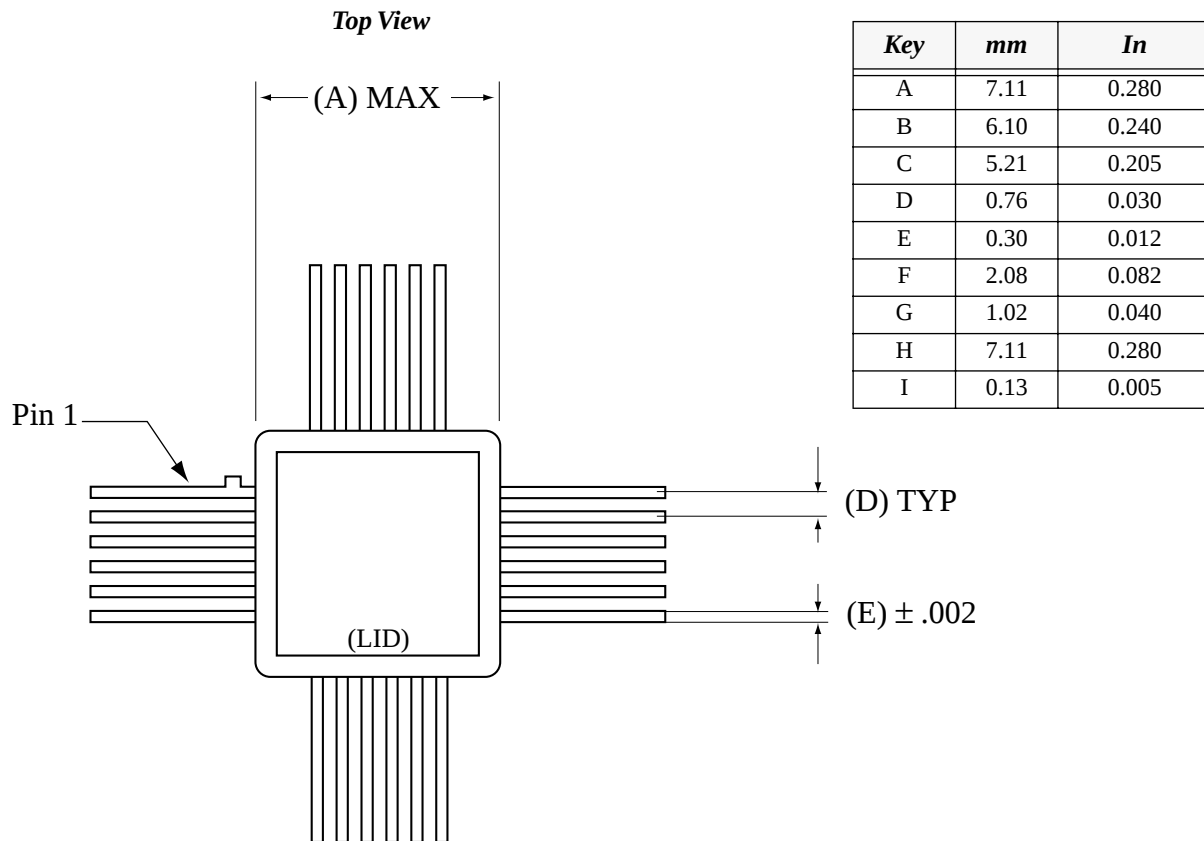
SDH/SONET 2.5Gbits/sec
Laser Diode Driver

Package Information - 24 Pin Metal-Glass Package (Formed Leads)



NOTES: Drawing not to scale.
Package #: 101-291-8 Issue #:1
Lid #: 101-292-3

Package Information - 24 Pin Metal-Glass Package (Straight Leads)



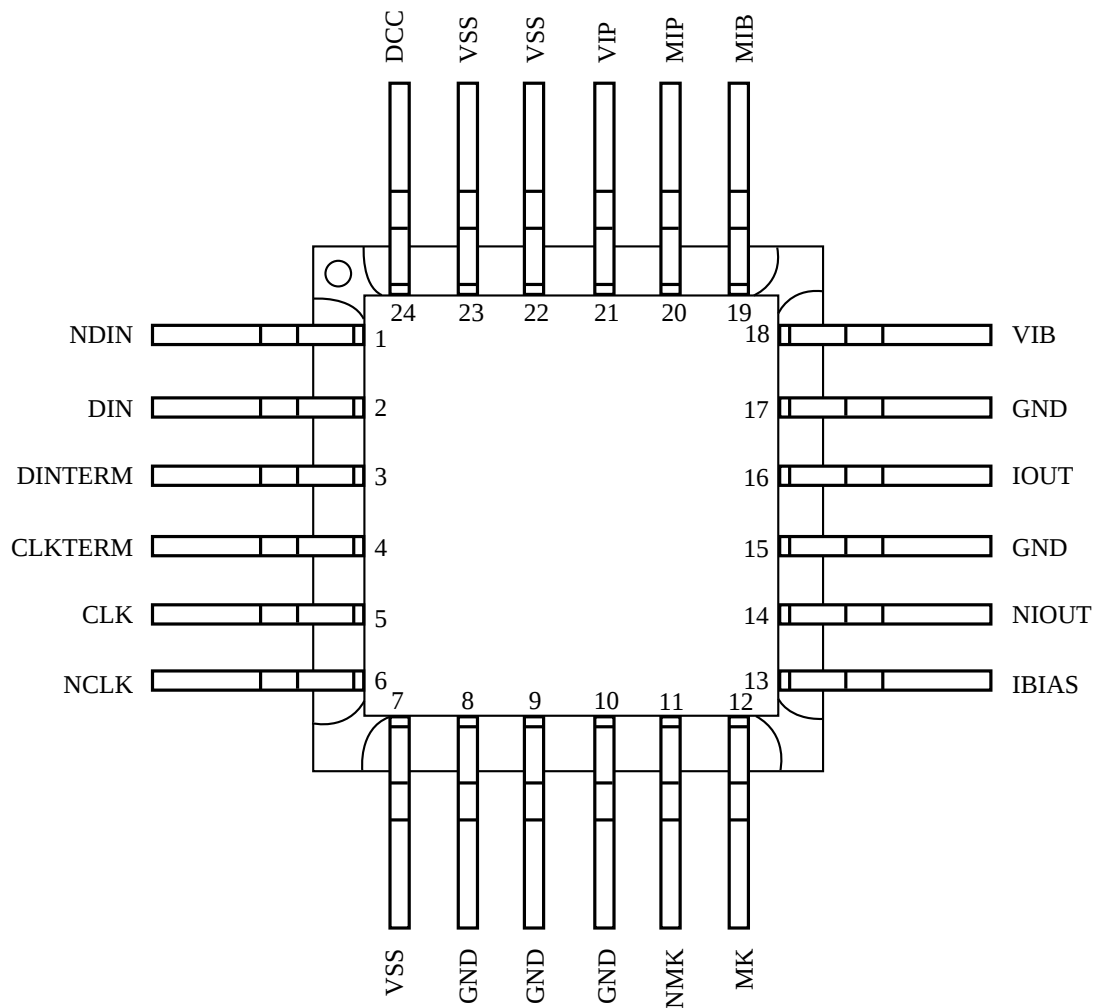
NOTES: Drawing not to scale.
Package #: 101-000-0 Issue #:1

Advance Product Information

VSC7926

SDH/SONET 2.5Gbits/sec
Laser Diode Driver

Pin Diagram for 24 Pin Ceramic Package



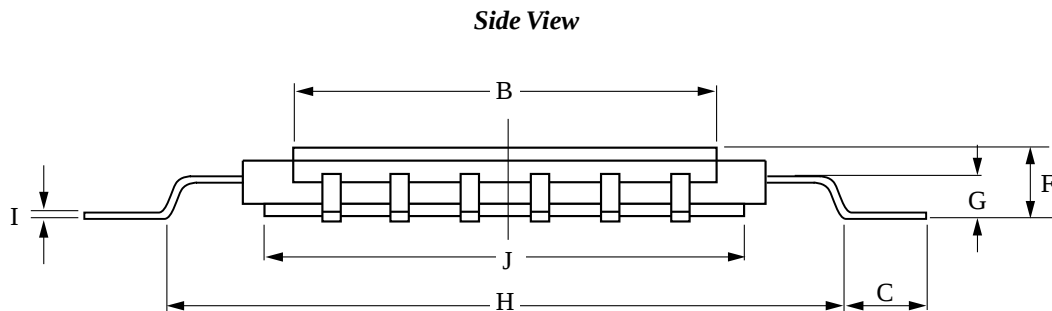
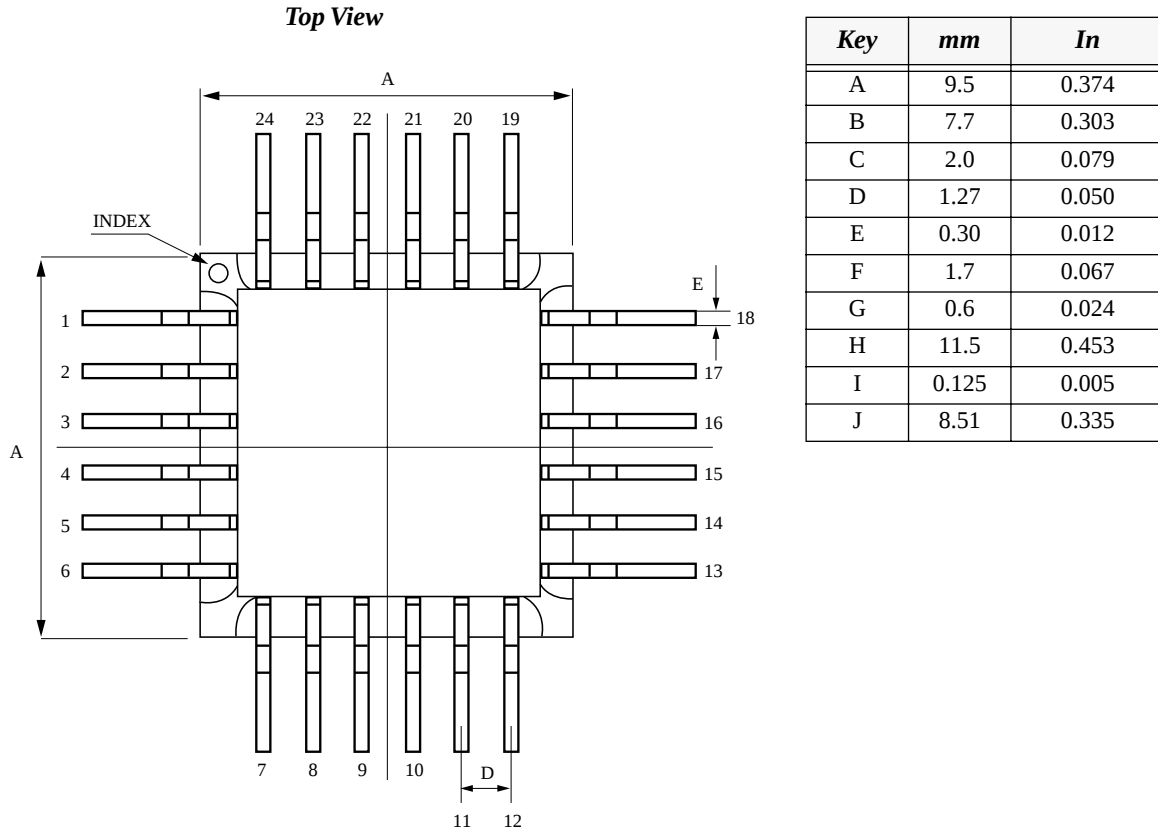
Note: Package lid and bottom heat spreader are electrically connected to GND within the package.

SDH/SONET 2.5Gbits/sec
Laser Diode Driver

Advance Product Information

VSC7926

Package Information - 24 Pin Ceramic Package (Formed Leads)



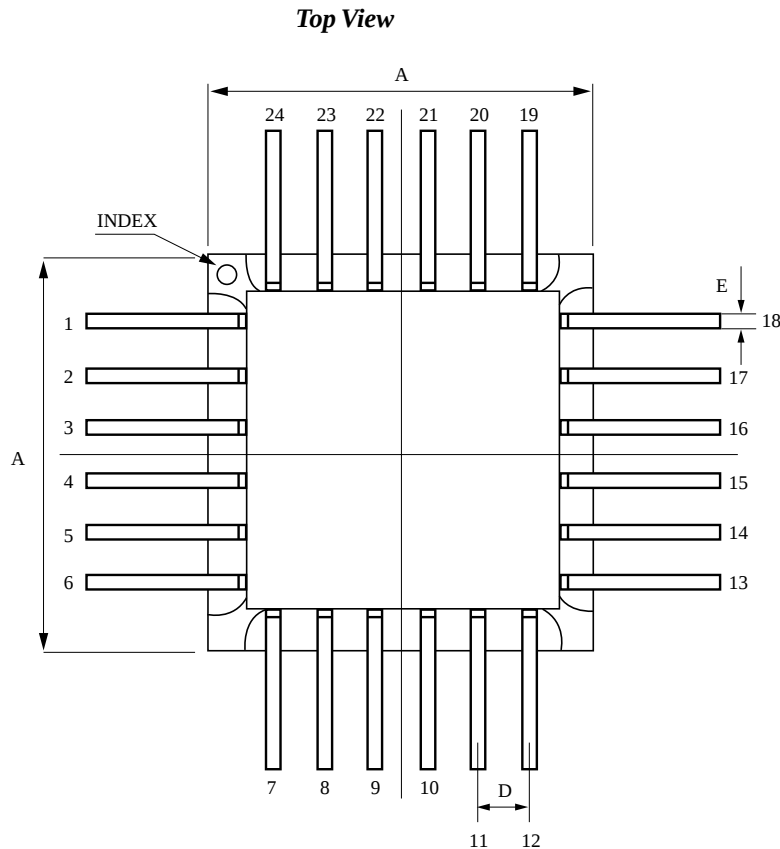
NOTES: Drawing not to scale.
Package #: 101-300-7, Issue #:1
Lid #: 101-303-1, Issue #:1

Advance Product Information

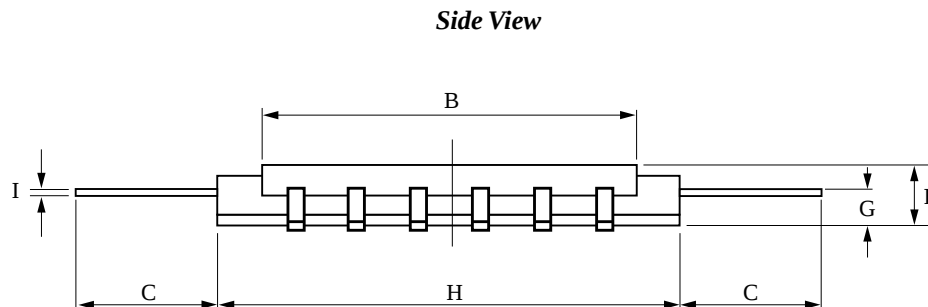
VSC7926

SDH/SONET 2.5Gbits/sec
Laser Diode Driver

Package Information - 24 Pin Ceramic Package (Straight Leads)



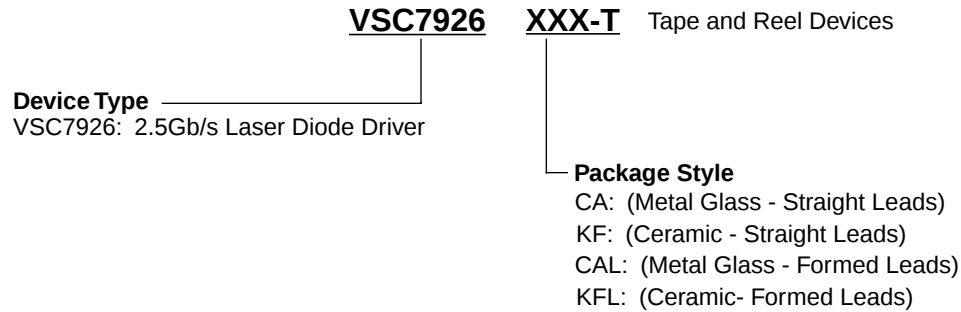
Key	mm	In
A	9.5	0.374
B	7.7	0.303
C	5.8	.230
D	1.27	0.050
E	0.30	0.012
F	1.7	0.067
G	0.6	0.024
H	9.53	0.375
I	0.125	0.005
J	8.51	0.335



NOTES: Drawing not to scale.
Package #: 101-000-0 Issue #:1

Ordering Information

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



Notice

This document contains information about a new product during its fabrication or early sampling phase of development. The information in this document is based on design targets, simulation results or early prototype test results. Characteristic data and other specifications are subject to change without notice. Therefore the reader is cautioned to confirm that this datasheet is current prior to design or order placement.

Warning

Vitesse Semiconductor Corporation's products are not intended for use in life support appliances, devices or systems. Use of a Vitesse product in such applications without the written consent is prohibited.