

**Advance**

03.05.27

**◆ Features**

- Up to 10.0 Gb/s high speed operation
- 3.3V single Voltage Supply operation
- Differential CML compatible interface
- Disable function of modulation current
- Modulation current monitoring
- Up to 65 mAp-p RF modulation current at an external 25Ω load  
or Up to 75 mAp-p RF modulation current at an external 15Ω load
- Up to 100 mA DC bias current
- On-chip 50Ω input terminations
- Internal voltage reference for AC coupling

**F0539951Q**

10.0Gb/s NRZ Data Rate

Laser Diode Driver

**◆ Applications**

- Laser diode driver of an optical transmitter circuit up to 10.0 Gb/s

**◆ Functional Description**

The F0539951Q is a high performance GaAs laser diode driver IC applicable in an optical transmitter circuit up to 10.0 Gb/s NRZ data rate (especially suitable for STM-64 / OC-192).

The F0539951Q specifies the rise time and the fall time of 35 ps (20 % - 80 %, 25Ω load) typically. It features the single 3.3V supply operation, the modulation current between 10 mAp-p and 65 mAp-p, and the bias current between 3 mA and 100 mA.

### ◆ Absolute Maximum Ratings

Ta=25°C, unless specified.

Parameter	Symbol	Value	Units
Supply Voltage (VSS)	VDD - VSS	-0.5 to +4.0	V
Supply Voltage (VSSM)	VDD - VSSM	-0.5 to +4.0	V
Supply Voltage (VSSB)	VDD - VSSB	-0.5 to +6.0	V
Supply Current*1	ISS	180	mA
Supply Current (VSSM)	ISSM	150	mA
Supply Current (VSSB)	ISSB	150	mA
Output Current (OUT, OUTB, BIAS)	IOUT	150	mA
Input Voltage (DIN, DINB)	VIN	VDD - 2.5 to VDD	V
Input Voltage (DIS)	VINC1	VSS - 0.5 to VDD + 0.5	V
Input Voltage (VM)	VINC2	VSS to VSS + 1.5	V
Input Voltage (VB)	VINC3	VSS to VSS + 2.0	V
Output Voltage (OUT, OUTB)	VOUT	VDD - 1.5 to VDD + 1.5	V
Output Voltage (BIAS)	VBIAS	VSSB to VSSB + 3.5V	V
Output Voltage (MODSEN)	VOUTM	VSS to VDD	V
Storage Temperature	Tstg	-55 to + 125	°C

NOTE: \*1. Excluding the input current, the modulation current and the bias current.

### ◆ Recommended Operating Conditions

Parameter	Symbol	Value			Unit
		MIN.	TYP.	MAX.	
Supply Voltage	VDD - VSS	3.1	3.3	3.5	V
Output Voltage	VOUT -VDD	-1.0	0	1.0	V
BIAS Output Voltage	VBIAS - VSSB	1.3	1.5	3.0	V
Ambient Operating Temperature	Ta	0	25	70	°C

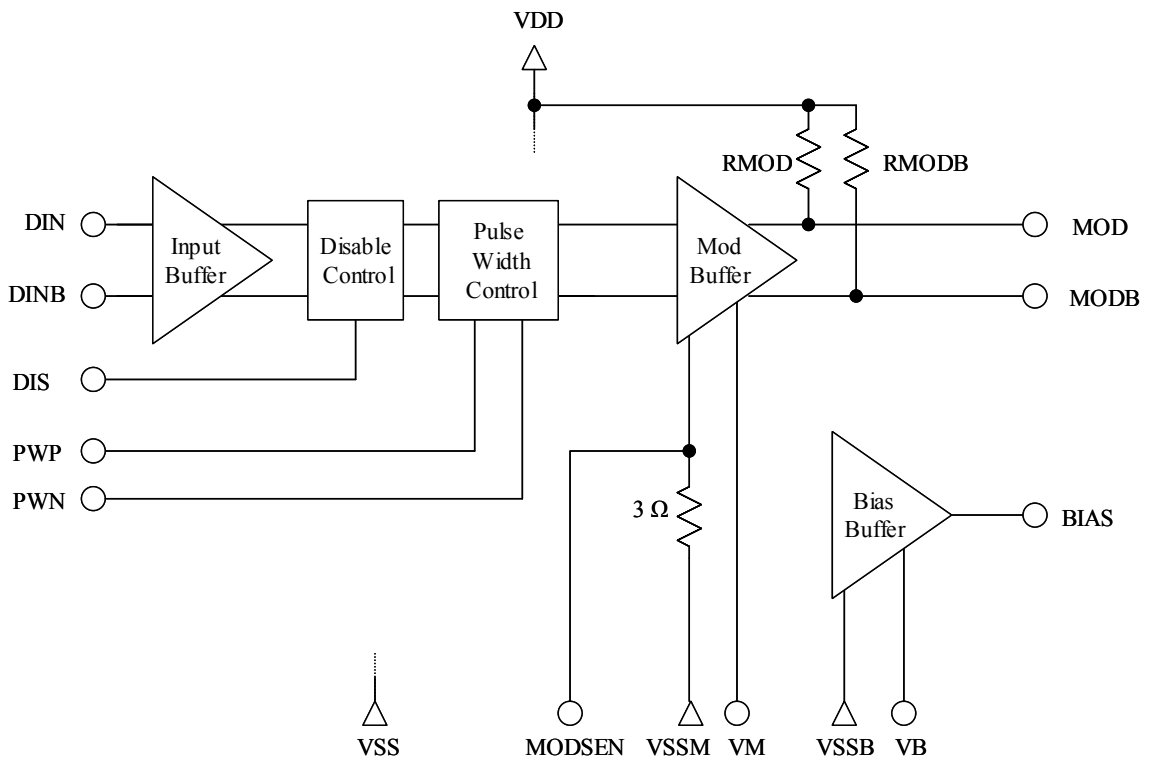
### ◆ Electrical Characteristics

Ta=25°C,  $V_{DD} - V_{SS} = V_{DD} - V_{SSM} = V_{DD} - V_{SSB} = 3.3V$ , unless specified

Parameters	Symbol	Test Conditions	Value			Units
			MIN.	TYP.	MAX	
Circuit Current *1	ISS	VM - VSS=0[V] VB - VSS=0[V]	-	95	-	mA
Input Voltage (AC coupled interface)	VIN	Differential Input	0.4	0.8	1.6	Vp-p
Input Resistor	RIN	Differential	-	100	-	Ω
Modulation Peak Current	IMmax	25Ω load	-	65	-	mAp-p
	IMmin	25Ω load, VM=VSS	-	10	-	mAp-p
	IMdis	VDIS=VDD - 0.2V	-	2	-	mA
Output Resistor	RMOD		-	50	-	Ω
Bias Current	IBmax	VBIAS-VSSB =1.3V	100	-	-	mA
	IBmin	VBIAS-VSSB =1.3V VB =VSS	-	3	-	mA
Input Voltage of DIS pin	VDISih	Disable operation	VDD - 0.2	-	VDD	V
	VDISil	Enable operation	VSS	OPEN	VSS+0.2	V
Modulation Monitor Resistor	RMM		-	3	-	Ω
Rise Time	Tr	RL = 25Ω, 20% - 80%	-	35	-	ps
Fall Time	Tf	RL = 25Ω, 20% - 80%	-	35	-	ps
Maximum Data Rate	fopr		10.0	-	-	Gb/s

NOTE: \*1. Excluding the input current, the modulation current and the bias current.

◆ **Block Diagram**



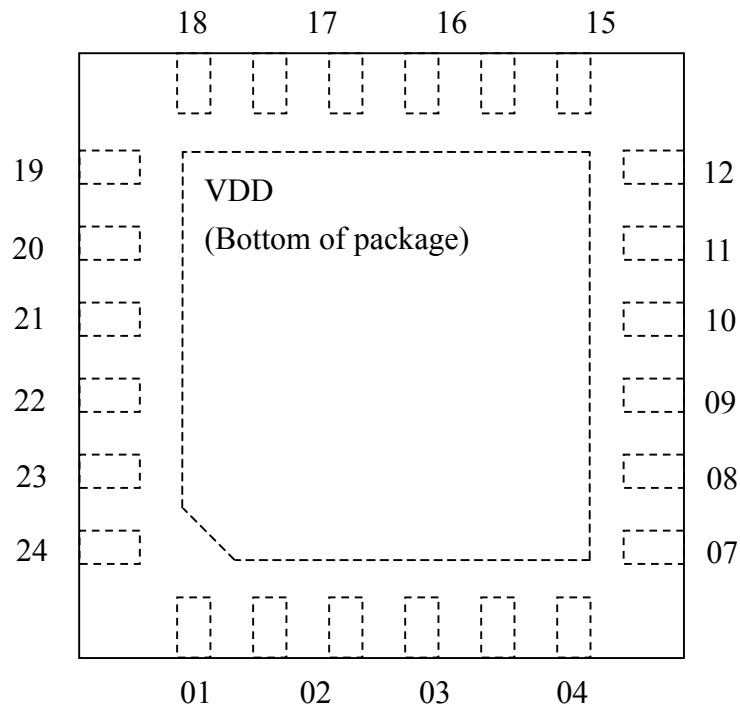
◆ **PAD Descriptions**

Symbol	Description
VDD	Supply Voltage
VSS, VSSM, VSSB	Supply Voltage. VSS, VSSM and VSSB are not connected internally.
DIN	Positive data input
DINB	Negative data input
MOD	Positive modulation output (LD should be connected to this pin.)
MODB	Negative modulation output
BIAS	Bias current output
VM	Voltage input that sets the LD modulation peak current
VB	Voltage input that sets the bias current
DIS	Voltage input that controls turning on/off modulation current
PWP, PWN	Pulse Width Control
MODSEN	Modulation current monitor output

◆ **Function Table**

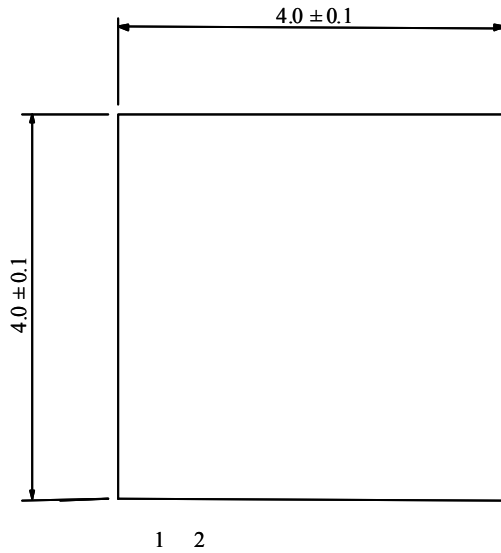
INPUT	OUTPUT	
DIN	Current at MOD	Current at MODB
H	ON	OFF
L	OFF	ON

## ◆ Package Pin Assignments (Top View)

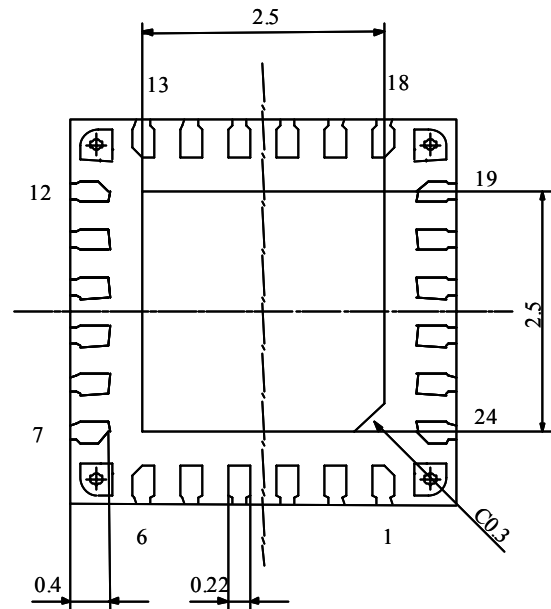


Pin No.	Symbol	Pin No.	Symbol
01	VDD	13	VDD
02	DIN	14	VDD
03	VDD	15	MODB
04	DINB	16	VDD
05	VDD	17	MOD
06	VDD	18	VDD
07	DIS	19	BIAS
08	MODSEN	20	VSSB
09	VM	21	VSS
10	VSS	22	VB
11	VSSM	23	PWP
12	NC	24	PWN

◆ Package Drawings



Top View



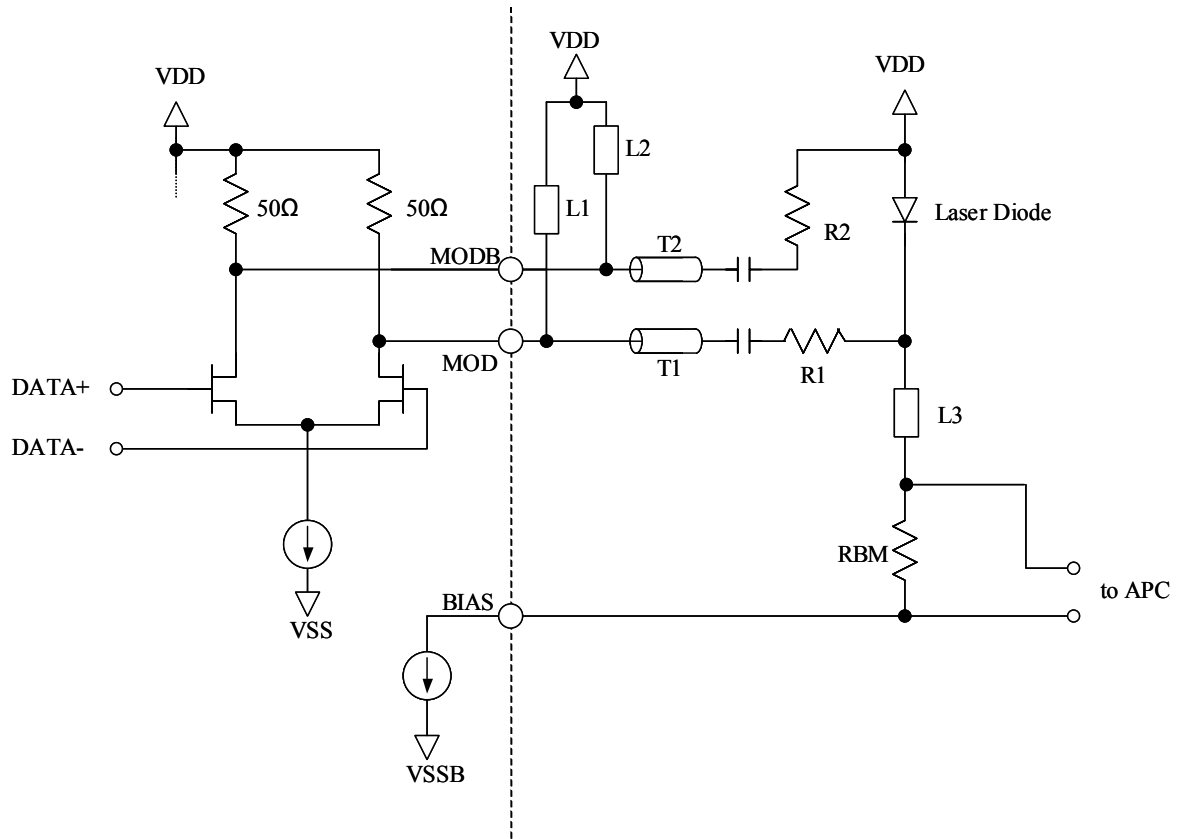
Bottom View

Dimension: millimeters

Package Format : 24-pin QFN  
 Package Size : 4 mm x 4 mm x 0.7 mm  
 Pin Pitch : 0.5mm

◆ **Typical Connection**

## 1) Output Stage



## NOTE:

L1, L2, L3	RF Choke Inductor
R1, R2	5 to 20Ω Damping Resistor
T1, T2	50Ω or 25Ω transmission lines
RBM	3 to 5Ω Bias Monitor Resistor



2) Pulse Width control

