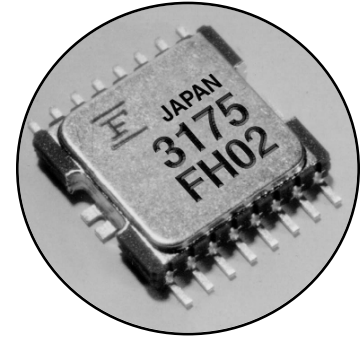# 2.5Gb/s GaAs Laser Driver with Re-Timing Function

FMM3175VI

FEATURES
- Operation Speed Up to 2.5Gb/s, NRZ
- Built in D-FF (Re-timing and Bypass mode: Selectable)
- Peak Modulation Current with 25Ω load: 70mA (Min.)
- Bias Current: 70mA (Min.)
- Peak and Bias Current Adjustment
- ECL Compatible Input
- Single -5.2V Power Supply
- Duty Ratio Adjustment
- Output Shutdown Switch

DESCRIPTION
The FMM3175VI is a 2.5Gb/s(OC-48) laser driver with re-timing function. A D-FF is built in, and the re-timing and bypass mode are selectable using a selector(SEL) signal. The peak modulation currents are 70mA (Min.) with 25Ω load, and the bias current is available up to 70mA (Min.) the FMM3175VI also has a duty control circuit and an output shutdown switch.

ABSOLUTE MAXIMUM RATINGS (V_{DD} = 0V,Ta=25°C)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{SS}	-7.0 to 0	V
Input Voltage	V_{IN}	V_{SS} to 0	V
Power Supply Current	I_{SS}	400	mA
Peak Current Control Voltage	V_{IP}	V_{SS} -2.0 to V_{SS} +1.5	V
Bias Current Control Voltage	V_{IB}	V_{SS} -2.0 to V_{SS} +2.1	V
Storage Temperature	T_{stg}	-55 to 125	°C

## ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Tc=25°C, VSS=-5.2V, RL=25Ω)

Parameter	Symbol	Test Conditions		Limit		Unit
			Min.	Typ.	Max.	
Maximum Data Rate		NRZ	2.5	-	-	Gb/s
Modulation Current	IP	V_{IP} = -4.1V, V_{IB} = -5.2V, HDI = "H"	70	80	-	mA
Modulation Current when Shutdown	IPsd	V_{IP}: Adjusted for 70mA, V_{IB}=-5.2V, HDI="H"	-	1.0	2.0	mA
Bias Current	IB	V_{IB} = -3.4V, V_{IP} = -5.2V, SD = -1.7V	70	-	-	mA
Bias Current when Shutdown	IBsd	V_{IB} = -3.4V, V_{IP} = -5.2V, SD = -0.9V	-	1.0	2.0	mA
Power Supply Current	ISS	V_{IP} = -5.2V, V_{IB} = -5.2V	100	160	260	mA
Rise Time	tr	IP=70mA	-	80	100	ps
Fall Time	tf	20% to 80%	-	80	100	ps
Duty Control Range	Duty	2.5Gb/s, IP=70mA, SEL="H"	90	-	110	%
Setup Time	Ts	SEL="H"	-	60	100	ps
Hold Time	Th	(Re-timing mode)	-	40	60	ps
Mark Density Monitor Output	MK	Rmk=1kΩ Cmk=1nF NRZ Duty=100 %	Mark Density	-	-	-	-
			100%	-1.85	-1.0	-0.80	V
			50%	-0.98	-0.50	-0.40	V
			0%	-0.10	-0.0	-	V

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RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{SS}		-5.46	-5.20	-4.94	V
Input Level High	V_{IH}		-1.05	-0.90	-0.80	V
Input Level Low	V_{IL}		-2.00	-1.70	-1.55	V
Peak Current Control Voltage	V_{IP}		V_{SS}	-	V_{SS} +1.1	V
Bias Current Control Voltage	V_{IB}		V_{SS}	-	V_{SS} +1.8	V
Duty Control Voltage	V_{dut}		-1.80	-	-0.80	V
Case Temperature	T_C		0.0	-	+85	°C

FMM3175VI Block Diagram
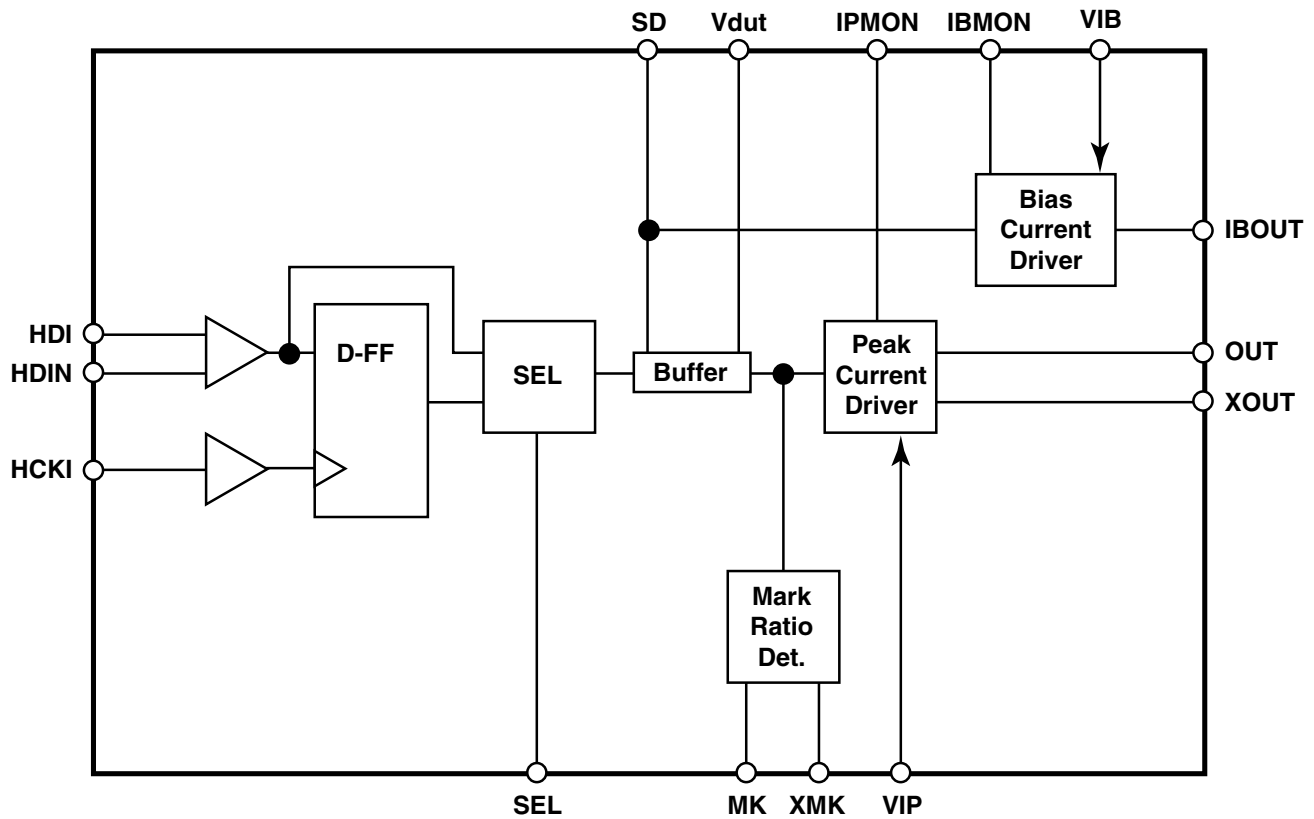
OPERATION MODE

The "SEL" signal determines the operation mode between re-timing and bypass modes.
The truth table is as follows:

SEL	Operation mode
H	Re-timing (D-FF: active)
L	Bypass(D-FF: bypassed)

SHUTDOWN CONTROL

SD	Output Current
H	Disable
L	Enable

FUNCTION (Re-timing mode)

HDI(HDIN)	HCKI	OUT	XOUT
H(L)	↑	ON	OFF
L(H)	↑	OFF	ON
-	↓	Q	XQ

↑ : Positive Edge, ↓ : Negative Edge, Q/XQ: Hold Previous State

FUNCTION (Bypass mode)

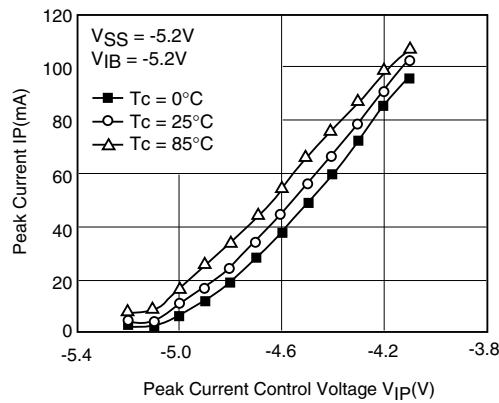| HDI(HDIN)	HCKI	OUT	XOUT
H(L)	-	ON	OFF
L(H)	-	OFF	ON

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Test Circuit
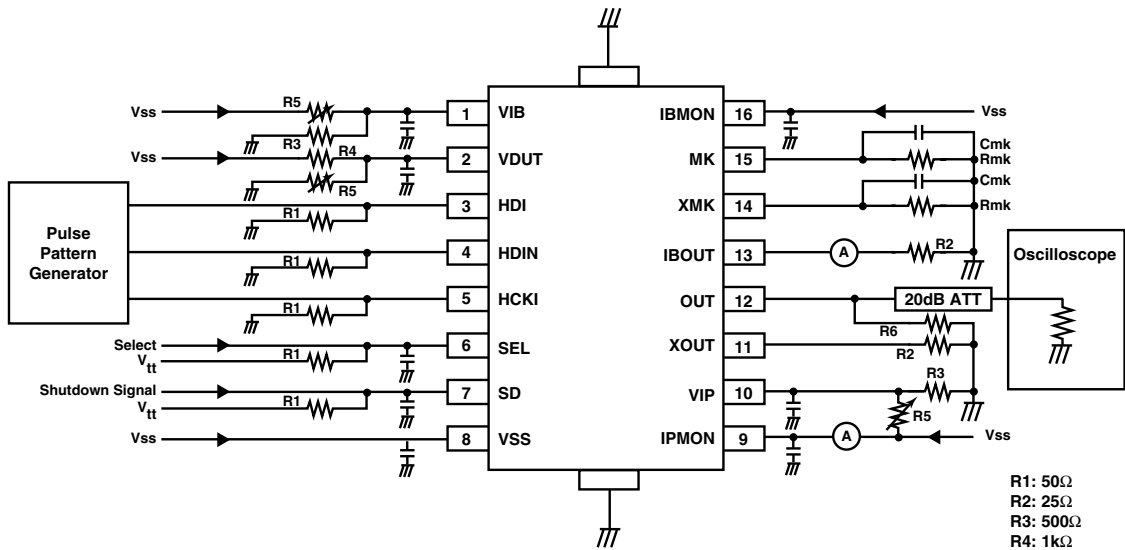
R1: 50Ω
R2: 25Ω
R3: 500Ω
R4: 1kΩ
R5: 0~1kΩ
R6: 50Ω
Rmk: 1kΩ
Cmk: 1000pF
Other Capacitor: 0.068μF
V_{tt}: Termination Voltage

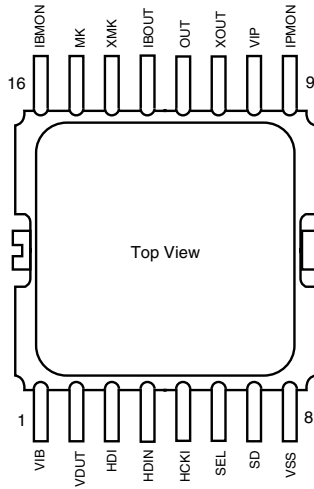**Output Duty Control Characteristics**
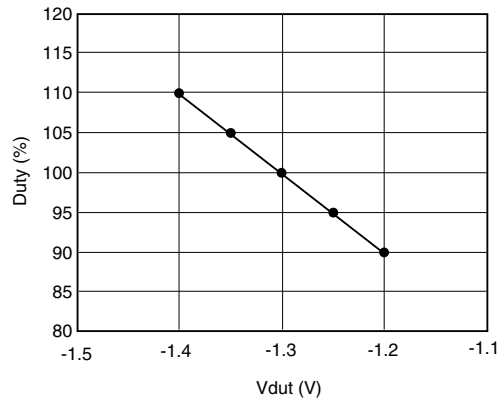
**Peak Current Control Characteristics**

FMM3175VI Pin Assignment

Top View

Pin labels (top, left to right): IBMON, MK, XMK, IBOUT, OUT, XOUT, VIP, IPMON

Pin labels (bottom, left to right): VIB, VDUT, HDI, HDIN, HCKI, SEL, SD, VSS

16 ... 9

1 ... 8

Pin Description

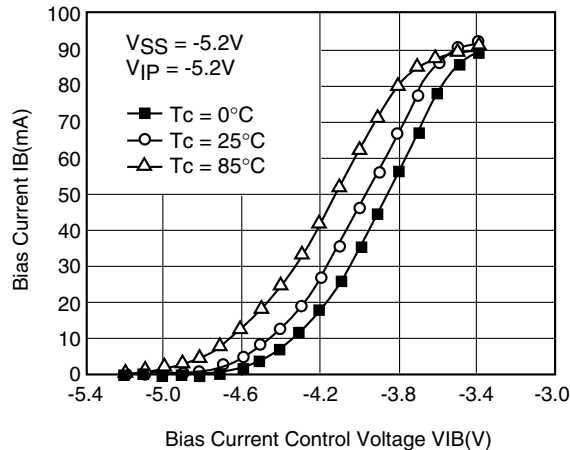| Pin Name	Pin No.	Description	Pin Name	Pin No.	Description
VIB	1	Bias Current Control Voltage	IPMON	9	Modulation Current Monitor (VSS:-5.2V)
VDUT	2	Output Duty Control Voltage	VIP	10	Modulation Current Control Voltage
HDI	3	Data Input (True)	XOUT	11	Modulation Current Output (Invert)
HDIN	4	Data Input (Invert)	OUT	12	Modulation Current Output (True)
HCKI	5	Clock Input	IBOUT	13	Bias Current Output
SEL	6	Operation Mode Selection	XMK	14	Mark Density Monitor Output (Invert)
SD	7	Output Current Shutdown Input	MK	15	Mark Density Monitor Output (True)
VSS	8	Supply Voltage	IBMON	16	Bias Current Monitor (VSS: -5.2V)

Ground Pin - Ground\
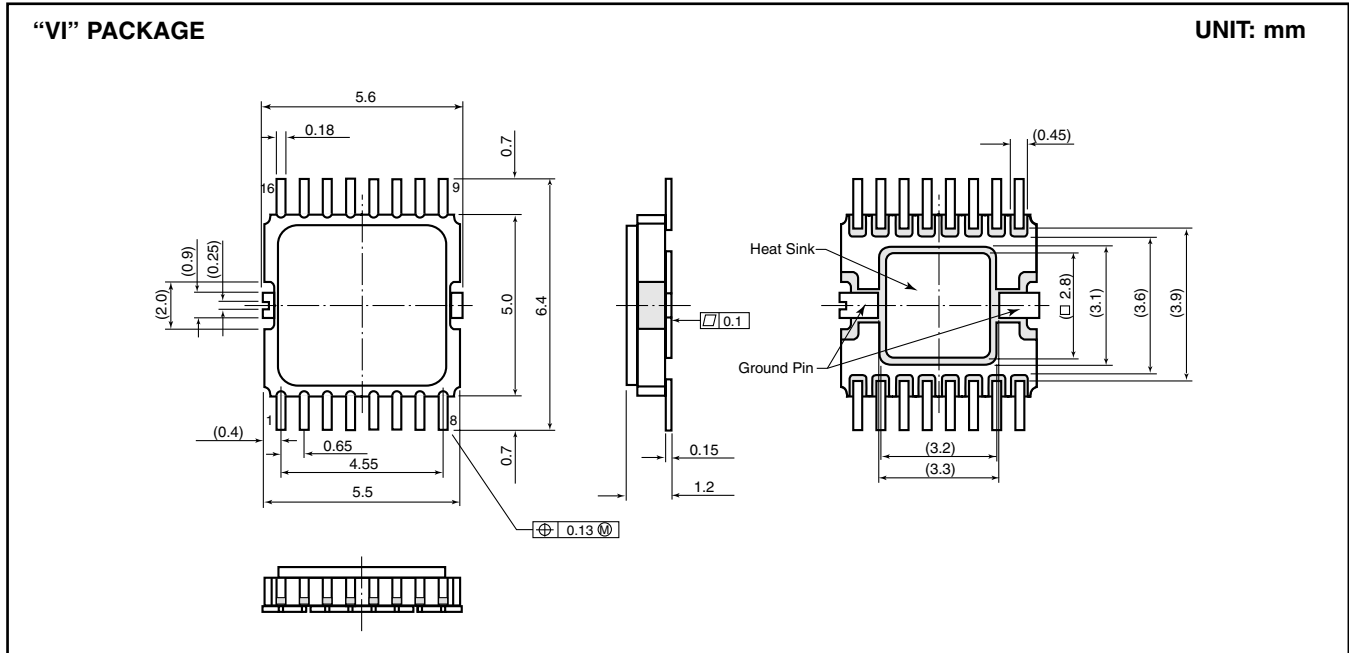Heat Sink(Back Side) - Ground

Output Waveform

V:1.0V/div.
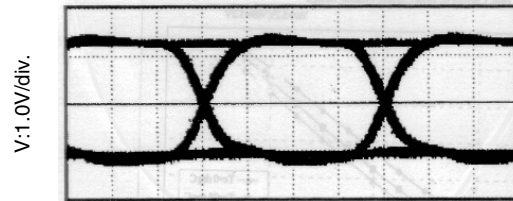
H:100ps/div.

fb = 2.5Gb/s
V_{SS} = -5.2V, Tc = 25°C
RL = 25Ω

Bias Current vs. Bias Current Control Voltage

V_{SS} = -5.2V
V_{IP} = -5.2V

- Tc = 0°C
- Tc = 25°C
- Tc = 85°C

Bias Current IB(mA)

Bias Current Control Voltage VIB(V)

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"VI" PACKAGE **UNIT: mm**

For further information please contact:

FUJITSU COMPOUND SEMICONDUCTOR, INC.
Americas & R.O.W.
2355 Zanker Rd.
San Jose, CA 95131-1138, U.S.A.
Phone: (408) 232-9500
FAX: (408) 428-9111
www.fcsi.fujitsu.com

FUJITSU QUANTUM DEVICES EUROPE LTD.
Network House
Norreys Drive
Maidenhead, Berkshire SL6 4FJ
United Kingdom
TEL: +44 (0) 1628 504800
FAX: +44 (0) 1628 504888

FUJITSU QUANTUM DEVICES SINGAPORE PTE LTD.
Hong Kong Branch
Rm. 1101, Ocean Centre, 5 Canton Rd. Tsim Sha Tsui,
Kowloon, Hong Kong
TEL: +852-23770226
FAX: +852-23763269

CAUTION

Fujitsu Compound Semiconductor Products contain **gallium arsenide (GaAs)** which can be hazardous to the human body and the environment. For safety, observe the following procedures:

• **Do not put this product into the mouth.**

• **Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.**

• **Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.**

FUJITSU QUANTUM DEVICES LIMITED
Business Development Division
11th Floor, Hachioji Daiichi-Seimei Bldg.
3-20-6 Myojin-cho
Hachioji-city, Tokyo 192-0046, Japan
TEL: +81-426-43-5885
FAX: +81-426-43-5582

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