

May 25, 2001

Approved	Approved	Charged
<i>T.Nambara</i>	<i>H. Masuda</i>	<b>H.Koyanagi</b>

## Specification of uncooled DFB-LD module

Module type: FU-645SDF-x1Mxx  
( Mitsubishi standard product )

A	B	C	D
	x		
Date		Approved	
26.May.'01		T.Nambara	

## MITSUBISHI ELECTRIC CORPORATION

\* Mitsubishi Electric Corp. reserves the right to change product design and specification without notice.

MITSUBISHI (OPTICAL DEVICES)

**FU-645SDF-x1Mxx****1.55 mm UNCOOLED DFB-LD MODULE WITH SINGLEMODE FIBER PIGTAIL  
(BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)****DESCRIPTION**

Module type FU-645SDF-x1Mxx is a 1.55 $\mu$ m Uncooled DFB-LD module with single-mode optical fiber.

This module is suitable to a light source for use in 2.5Gb/s digital optical communication systems.

**FEATURES**

- $\lambda/4$  shifted Multi quantum wells (MQW) DFB Laser Diode module
- Input impedance is 25 $\Omega$
- Emission wavelength is in 1.55 $\mu$ m band
- High-speed response
- Built-in optical isolator
- Built-in thermistor and bias T
- 8-pin Mini-DIL package with Gull wing leads
- With photodiode for optical output monitor

**APPLICATION**

High speed transmission systems (~2.5Gb/s)

**ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub>=25°C)**

Parameter		Symbol	Conditions	Rating	Unit
Laser diode	Optical output power	Pf	CW	6	mW
	Forward current	I <sub>f</sub>	CW	100	mA
	Reverse voltage	V <sub>rl</sub>	-	2	V
Photodiode	Reverse voltage	V <sub>rd</sub>	-	20	V
	Forward current	I <sub>fd</sub>	-	2	mA
Operating case temperature		T <sub>c</sub>	-	-5 ~ +70	°C
Storage temperature		T <sub>stg</sub>	-	-40 ~ +85	°C

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(BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)****ELECTRICAL/OPTICAL CHARACTERISTICS** (Tc=-5~70°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Threshold current	I <sub>th</sub>	CW, T <sub>c</sub> =25°C	-	10	25	mA
		CW	2	-	40	
Optical output power at threshold current	P <sub>th</sub>	CW, I <sub>bias</sub> =I <sub>th</sub>	-	-	50	μW
Operating current	I <sub>op</sub>	CW, P <sub>f</sub> =2mW, T <sub>c</sub> =25°C	-	40	70	mA
		CW, P <sub>f</sub> =2mW, T <sub>c</sub> =70°C	-	60	90	
Operating voltage	V <sub>op</sub>	CW, P <sub>f</sub> =2mW, T <sub>c</sub> =25°C	-	1.2	1.5	V
		CW, P <sub>f</sub> =2mW, T <sub>c</sub> =70°C	-	1.6	1.8	
Input impedance	Z <sub>in</sub>	-	-	25	-	Ω
Optical output power from fiber end	P <sub>f</sub>	CW, nominal	-	2	-	mW
Light-emission central wavelength	λ <sub>c</sub>	CW, P <sub>f</sub> =1mW	1530	1550	1570	nm
Wavelength temperature coefficient	λ <sub>ct</sub>	-	-	0.10	0.12	nm/°C
Spectral width	Δλ	(Note1), -20dB	-	-	0.4	nm
Side mode suppression ratio	S <sub>r</sub>	(Note1)	30	45	-	dB
Cutoff frequency (-1.5dB optical)	f <sub>c</sub>	P <sub>f</sub> =1mW	3.5	-	-	GHz
Rise and fall time (10~90%)	t <sub>r</sub> , t <sub>f</sub>	(Note1)	-	125	150	psec
Dispersion penalty	P <sub>p</sub>	(Note1), +1800ps/nm disp.	-	-	2	dB
Relative intensity noise	N <sub>r</sub>	CW, P <sub>f</sub> =1mW, f=1GHz	-	-150	-140	dB/Hz
Tracking error (Note 2)	E <sub>r</sub>	CW, APC(I <sub>mon</sub> =const.)	-	0.5	1.25	dB
Differential efficiency	η	CW, T <sub>c</sub> =25°C	0.06	-	0.1	mW/ mA
		CW	0.036	-	0.15	
Monitor current	I <sub>mon</sub>	CW, P <sub>f</sub> =1mW, V <sub>rd</sub> =5V	0.05	-	1	mA
Optical isolation	I <sub>so</sub>	-	20	-	-	dB
Dark current (PD)	I <sub>d</sub>	V <sub>rd</sub> =5V	-	-	0.1	μA
Capacitance (PD)	C <sub>t</sub>	V <sub>rd</sub> =5V, f=1MHz	-	-	10	pF
Thermistor resistance	R <sub>th</sub>	T <sub>c</sub> =25°C	9.5	10	10.5	kΩ
B constant of R <sub>th</sub>	B	-	-	3950	-	K

Note 1) 2.48832Gb/s NRZ, 2<sup>23</sup>-1, P<sub>f\_ave</sub>=1mW, Extinction ratio 10dB, optical return loss from the line should be greater than 24dB in order to ensure the specified performance.

Note 2) E<sub>r</sub>=max|10×log(P<sub>f</sub> / P<sub>f</sub>@25°C)|

**FIBER PIGTAIL SPECIFICATIONS**

Parameter	Limits	Unit
Type	SM	-
Mode field diameter	10±1	μm
Cladding diameter	125±2	μm
Secondary coating outer diameter	0.9±0.1	mm
Connector	See Table 1.	-
Optical return loss of connector	40 (min)	dB

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- Threshold current ( $I_{th}$ ) at  $T_c=25, 70^\circ\text{C}$
- Operating current ( $I_{op}$ ) at  $T_c=25, 70^\circ\text{C}$
- Operating voltage ( $V_{op}$ ) at  $T_c=25^\circ\text{C}$
- Light-emission central wavelength ( $\lambda_c$ ) at  $T_c=25^\circ\text{C}$
- Monitor current ( $I_{mon}$ ) at  $T_c=25^\circ\text{C}$
- Optical output power from fiber end ( $P_f$ )

**Table 1.**

Type number	Connector type	L (Note 3)
FU-645SDF-1M1B	None (Note 4)	-
FU-645PDF-V1M1B	FC/PC	28.4
FU-645PDF-W1M1B	SC/PC	34.5
FU-645SDF-1M2C	None (Note 4)	-
FU-645PDF-V1M2C	FC/PC	28.4
FU-645PDF-W1M2C	SC/PC	34.5

Note 3) 'L' is defined in OUTLINE DIAGRAMS.

Note 4) There are some cases where a connector for testing is shipped with the product.  
Then the fiber length not including the connector is more than 1000mm.

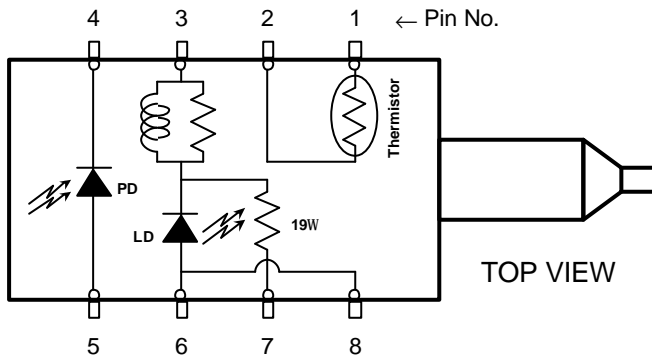
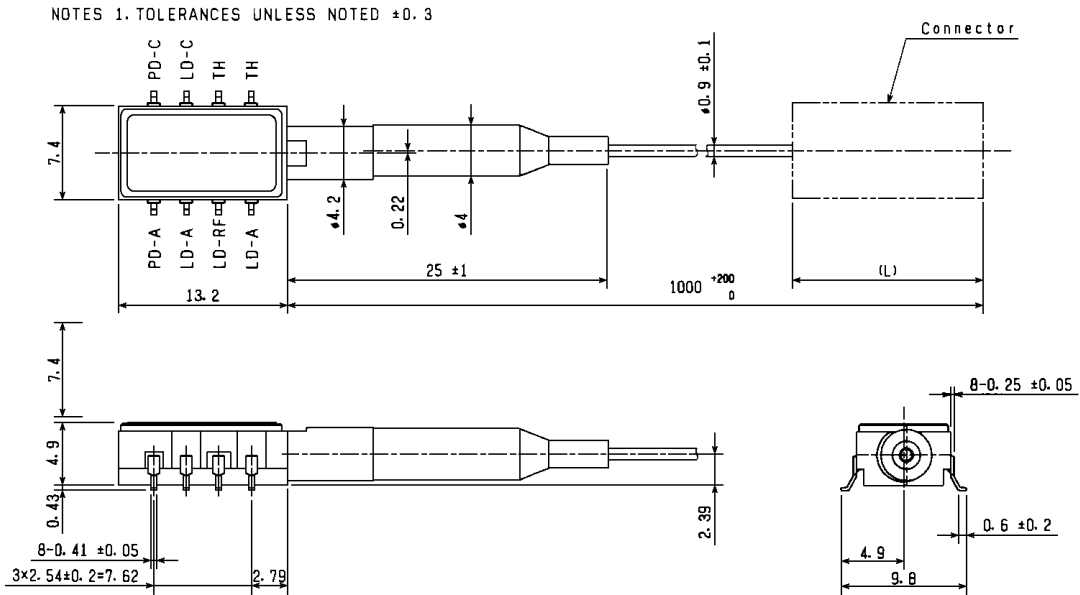
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## OUTLINE DIAGRAM (1)

(Unit : mm)



PIN	FUNCTION
1	THERMISTOR
2	THERMISTOR
3	LD BIAS, CATHODE
4	PD CATHODE
5	PD ANODE
6	LD ANODE
7	LD RF, CATHODE
8	LD ANODE

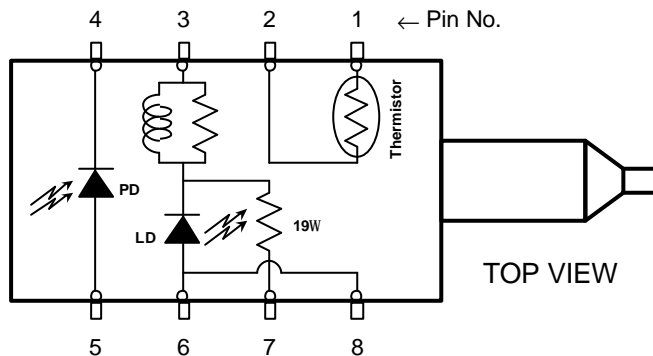
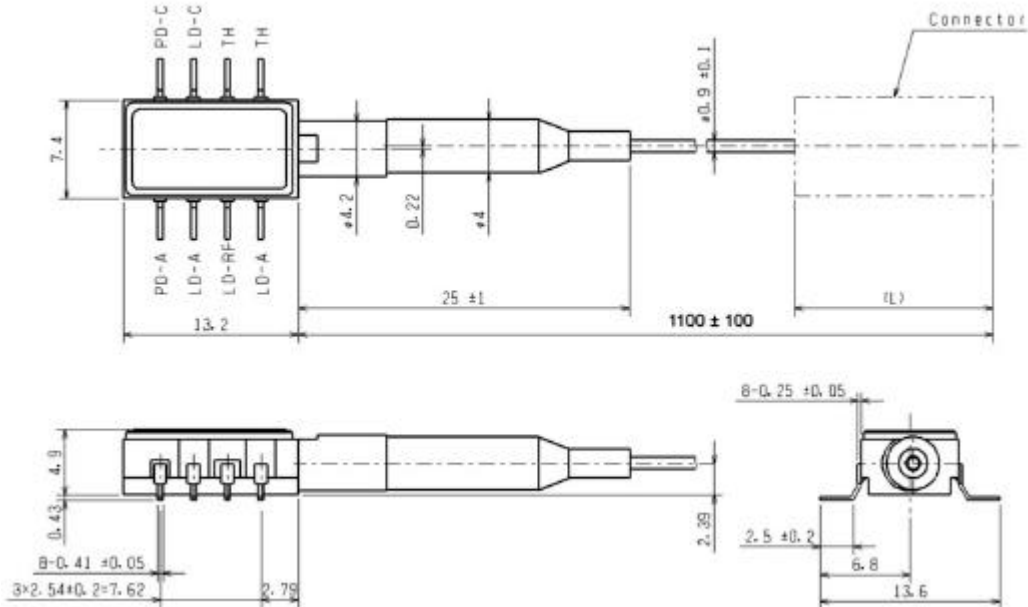
FU-645SDF-x1M1B

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**FU-645SDF-x1Mxx****1.55 mm UNCOOLED DFB-LD MODULE WITH SINGLEMODE FIBER PIGTAIL  
(BIAS CIRCUIT INTEGRATED, DIGITAL APPLICATION)****OUTLINE DIAGRAM (2)**

(Unit : mm)

NOTES 1. TOLERANCES UNLESS NOTED ±0.3



PIN	FUNCTION
1	THERMISTOR
2	THERMISTOR
3	LD BIAS, CATHODE
4	PD CATHODE
5	PD ANODE
6	LD ANODE
7	LD RF, CATHODE
8	LD ANODE

FU-645SDF-x1M2C