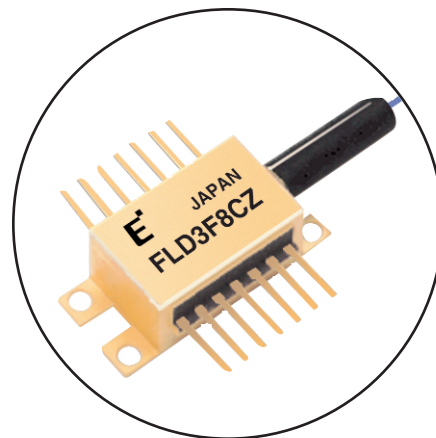


FEATURES

- Direct Modulation DFB Laser
- Built-in TEC, Thermistor and Monitor PD
- Optical Isolator
- 14-Pin Butterfly Type Module
- 78 Channel NTSC Loading
(112 Channel device available)
- Low Residual CSO & CTB
- 5.5 dB Link Budget Available
- Suitable for Narrow Cast Configuration



APPLICATIONS

This DFB laser is intended for application in analog AM, CATV at 1,310nm. Transmission spans of 15 km are possible without amplification.

DESCRIPTION

This DFB laser for analog AM application is a middle power laser capable of carrying 78 channels with excellent CSO, CTB, and CNR performance. It is packaged in a 'butterfly' type module.

The module employs a cost effective optical coupling system, coupling the laser output through a built-in optical isolator into a single mode fiber pigtail. The module also includes a monitor photodiode, a thermoelectric cooler (TEC) and a thermistor.

ABSOLUTE MAXIMUM RATINGS ($T_c=25^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Condition	Ratings		Unit
			Min.	Max.	
Storage Temperature	T_{stg}	-	-40	+70	$^{\circ}\text{C}$
Operating Case Temperature	T_{op}	-	-20	+65	$^{\circ}\text{C}$
Optical Output Power	P_f	CW	-	8	mW
LD Forward Current	I_F	CW	-	150	mA
LD Reverse Voltage	V_R	-	-	2	V
PD Reverse Voltage	V_{DR}	-	-	20	V
PD Forward Current	I_{PD}	-	-	10	mA
TEC Voltage	V_c	Cooling	-	+2.5	V
		Heating	-2.0	-	
TEC Current	I_c	Cooling	-	+1.4	A
		Heating	-0.5	-	
Thermistor Temperature	T_{th}	ATC Operation	-20	+65	$^{\circ}\text{C}$
Lead Soldering Time	T_{sold}	260 $^{\circ}\text{C}$	-	10	sec
Environmental Operating Humidity	X_{op}	Top<30 $^{\circ}\text{C}$	-	95	%
Environmental Storage Humidity	X_{st}	Tstg<30 $^{\circ}\text{C}$	-	95	%

TEC AND THERMISTOR CHARACTERISTICS ($T_L=25\pm1^\circ\text{C}$)

Parameter	Symbol	Test Conditions	Limit		Unit
			Min.	Max.	
TEC Current	I_C	$\Delta T=40^\circ\text{C}$	-	1.0	A
TEC Voltage	V_C	$\Delta T=40^\circ\text{C}$	-	2.0	V
TEC Capacity	ΔT	$I_C=1\text{A}$	40	-	$^\circ\text{C}$
Thermistor Resistance	R_{tr}	-	9.5	10.5	$\text{k}\Omega$
Thermistor B Constant	B	-	typ. 3,900		K

T_C =Case Temperature, T_L =Laser Temperature

OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_L=25\pm1^\circ\text{C}$)

Parameter	Symbol	Test Conditions	Limits		Unit
			Min.	Max.	
Threshold Current	I_{th}	CW	-	20	mA
Operating Current	I_{op}	CW	20	60	mA
Forward Voltage (pin 3-13)	V_F	CW, $I_F=I_{op}$	-	1.5	V
Optical Output Power	P_f	CW, $I_F=I_{op}$	2	4	mW
Slope Efficiency	S	CW, $I_F=I_{op}$	0.08	-	mW/mA
Tracking Error	T_E	Note (1)	-0.5	+0.5	dB
Monitor Current	I_m	CW, $I_F=I_{op}$, $V_{DR}=5\text{V}$	30	900	μA
Photodiode Dark Current	I_d	$V_{DR}=5\text{V}$	-	100	nA
Photodiode Capacitance	C_t	$V_{DR}=5\text{V}$, $f=1\text{MHz}$	-	12	pF
Peak Wavelength	λ_p	CW, $I_F=I_{op}$	1,290	1,330	nm
SideMode Suppression Ratio	SSR	CW, $I_F=I_{op}$	25	-	dB
Bandwidth (-1dB)	f_c	Note (2)	1.5	-	GHz
Isolation	I_s	$T_c=0$ to 65°C	25	-	dB
Relative Intensity Noise	RIN	Note (3)	-	-155	dB/Hz
Composite Second Power	CSO	Note (4)	-	-57	dBc
Composite Triple Beat	CTB		-	-65	dBc
Carrier to Noise Ratio	CNR		50	-	dB

(1) Total change in P_f over -20°C to $+65^\circ\text{C}$, Test conditions: $P_f=4\text{mW}$ at $T_L=T_c=25^\circ\text{C}$. Constant current operation with TEC operating.

(2) Test condition: $P_f=4\text{mW}$, No matching network is used in the measurement.

(3) Test condition: P_f : same power of Note 4, measuring bandwidth: 45-600MHz, Optical reflection=-40dB (no long-haul fiber is used in the measurement.)

(4) Test condition: $P_f=2\text{mW}$ (minimum) to 4mW (maximum), Optical Modulation, Index=3.2%/channel (minimum), 78 unmodulated carriers (55.25 to 547.25 MHz; ch. 2 to 78 plus A-1), Optical link loss=5.5 dB (15 km singlemode fiber), Noise equivalent current of 1st stage of the receiver= $7\text{pA}/\sqrt{\text{Hz}}$, Receiver responsivity=0.86m/W, Optical reflection=-40dB (excluding reflection from long-haul fiber).

Fig. 1 Optical Output Power and Monitor Current vs. Laser Forward Current

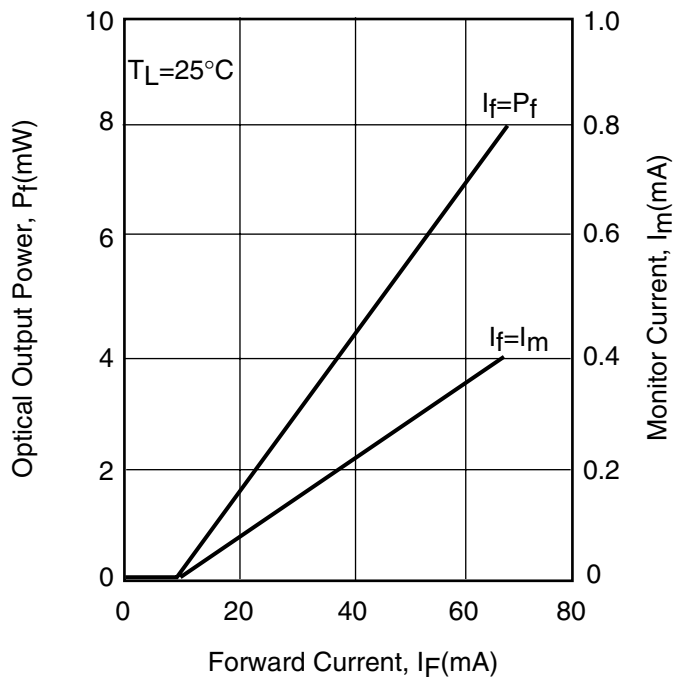


Fig. 2 Forward Current vs. Forward Voltage

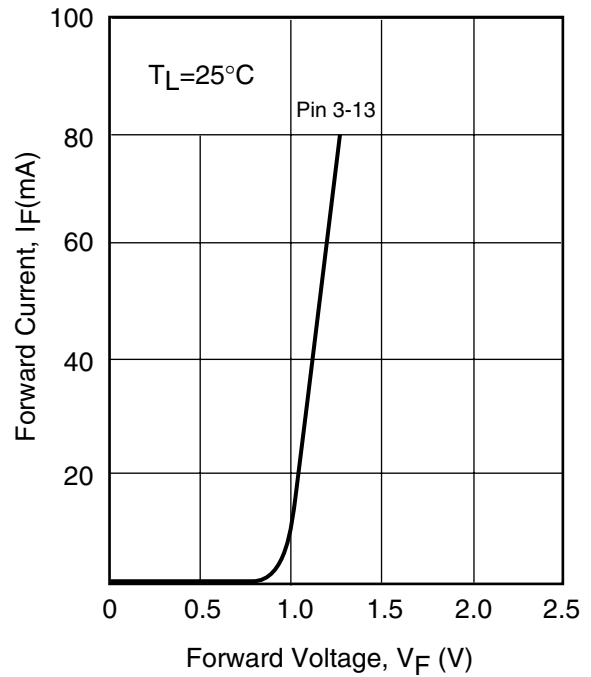


Fig. 3 Temperature Dependence of Threshold Current

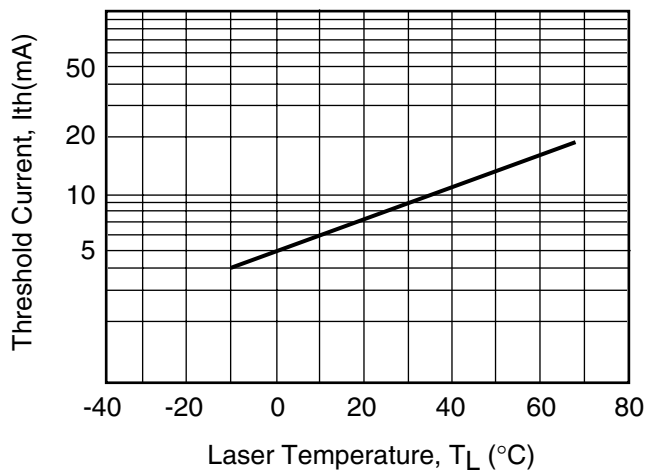


Fig. 4 Lasing Spectrum

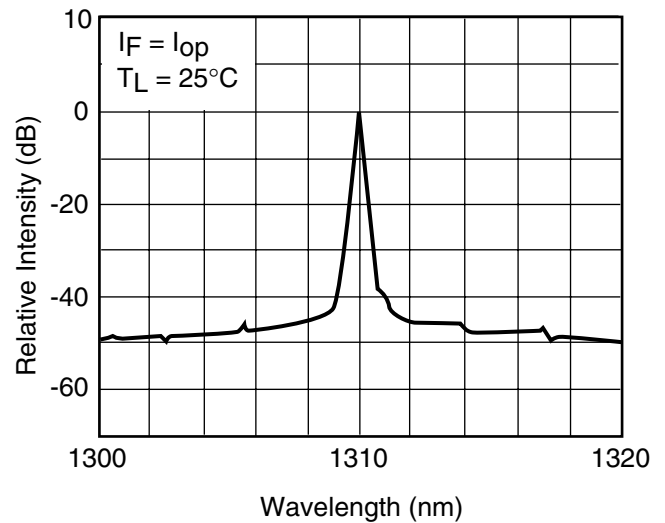


Fig. 5 Tracking Characteristics

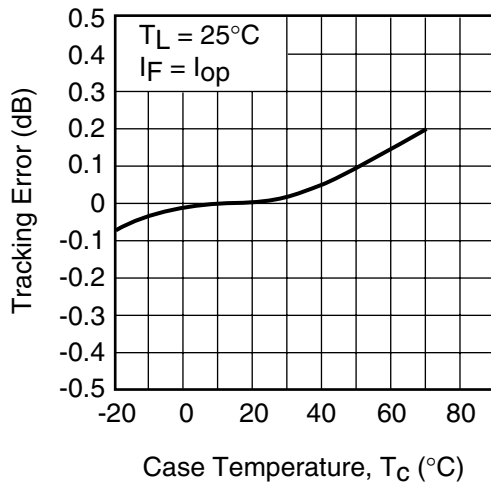


Fig. 6 Frequency Response

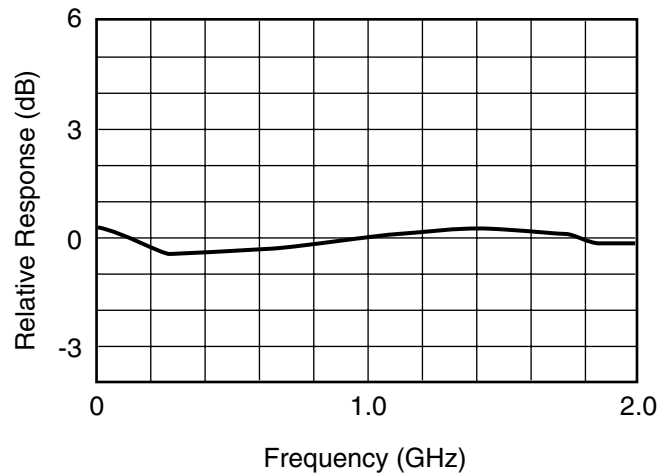


Fig. 7 RIN Characteristics

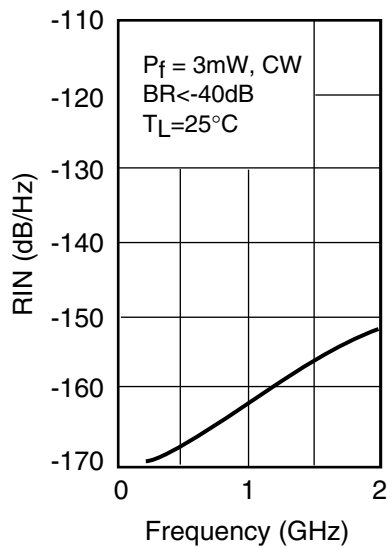
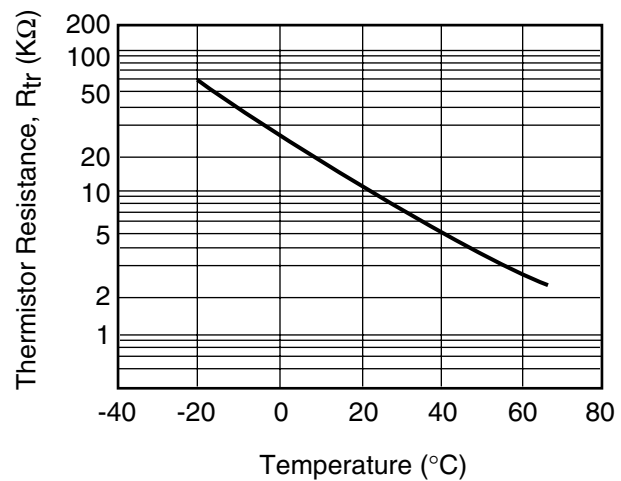


Fig. 8 Thermistor Resistance vs. Temperature



**Fig. 9 Cooler voltage and Cooler Current
vs. Case Temperature**

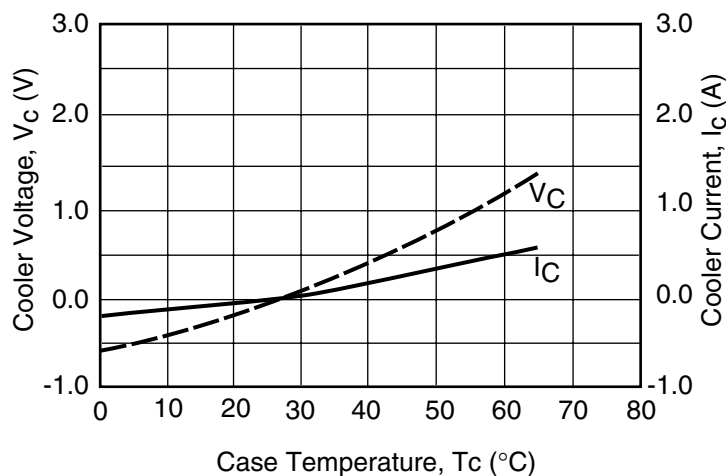
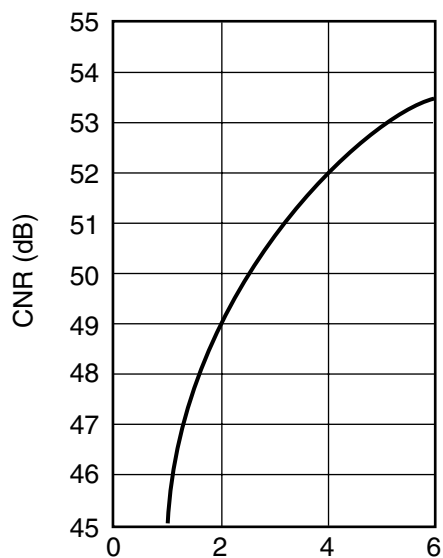


Fig. 10 CNR vs. Output Power



Optical Output Power, P_f (mW)

NTSC-78ch
OMI=4.0%/ch (Typ.)
Link Loss=5.5dB (15km Single Mode Fiber)
Noise Equivalent Current of Receiver, $I_{eq}=7\text{pA}/\sqrt{\text{Hz}}$
Sensitivity of PIN=0.86A/W

Fig. 11 CSO and CTB vs. Output Power

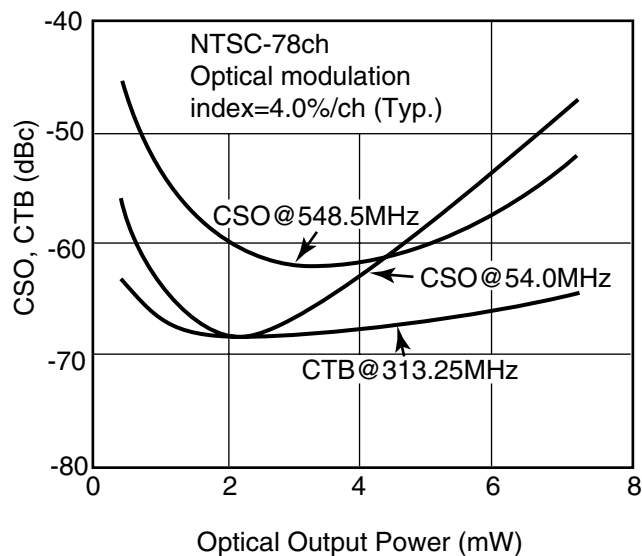
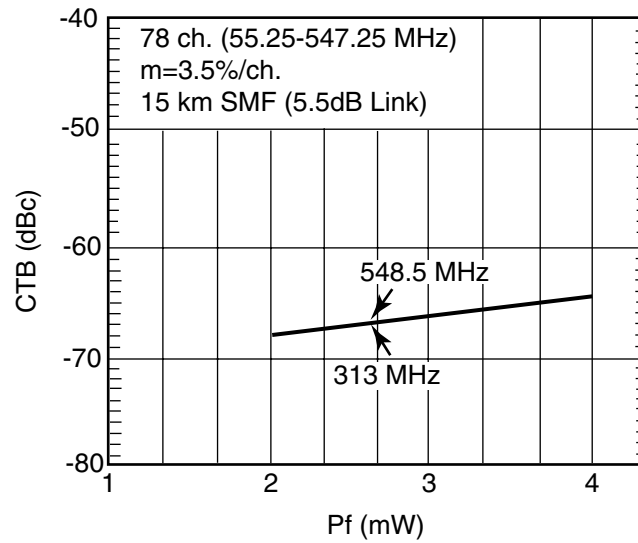
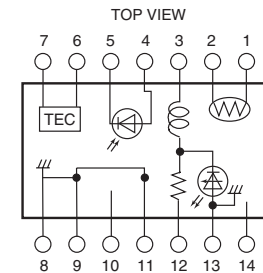
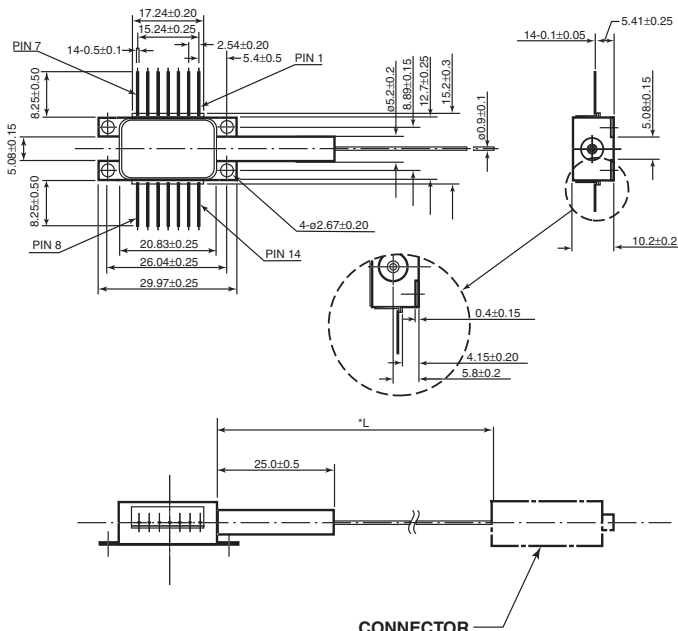


Fig. 12 Output Power vs. CTB



"CZ" PACKAGE

UNIT: mm



#	PIN DESIGNATIONS
1	Thermistor
2	Thermistor
3	LD Cathode
4	Power Monitor Anode
5	Power Monitor Cathode
6	Thermoelectric Cooler (+)
7	Thermoelectric Cooler (-)
8	Case Ground
9	Case Ground
10	NC
11	Case Ground
12	LD Modulation (-)
13	Case Ground
14	NC

Case Ground: LD Anode

* Pigtail length (L) and connector type are specified in the detail (individual) specification.

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