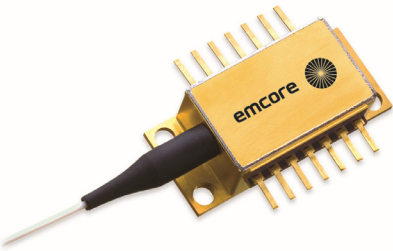


Model 1790 1550 nm High Power CW Source DFB Laser for LiDAR

emcore®

PRELIMINARY DATASHEET | DECEMBER 2020

OPTICAL SENSING



Applications

- LiDAR
- Optical Sensing
- Frequency Modulated Continuous Wavelength Sensing
- Autonomous Vehicles
- Free Space Optics

Features

- 18 dBm Optical Output Power
- OC-48 Pinout Compatible
- Telcordia Technologies® GR-468 Compliant
- Double Optical Isolator
- PM Fiber
- -20 °C to +65 °C Operating Temperature Range
- Monitor Photodiode
- RoHS

EMCORE's 1790 laser module is characterized for use as a CW coherent optical source DFB laser operated in the 1550 nm wavelength band for LiDAR technology. EMCORE's design provides a compact, robust solution for Frequency Modulation Continuous Wavelength (FMCW) sensing for autonomous vehicles and wide variety of other optical sensing applications.

The 1790 is DC-coupled with a built-in TEC, thermistor, and monitor photodiode. The device is in a 14-pin, OC-48 pinout compatible hermetic butterfly package with double optical isolator mounted on the TEC. It is highly immune to mode or optical frequency hopping typically found with single isolator, external cavity designs. Mode or optical frequency hopping causes false readings in FMCW LiDAR, whereas EMCORE's laser technology maintains optical frequency stability over temperature suppressing false readings. The 1790 incorporates a high-efficiency coupling scheme to deliver 18 dBm of CW optical output power.

Performance Highlights

Parameter	Min	Typ	Max	Units
Operating Case Temperature	-20	25	+65	°C
Wavelength	1550 +/- 10			nm
Optical Output Power	17	18	-	dBm
Threshold Current	-	-	30	mA
Operating Current	-	-	500	mA
Linewidth ¹	-	-	100	KHz
Optical Isolation	-	50	-	dB
SMSR ²	50	-	-	dB
Polarization Extinction Ratio (PMF pigtail)	17	-	-	dB
Optical Return Loss	40	-	-	dB

1. Linewidth defined as Pi times the single-sided spectral density of the frequency noise at 100 KHz measurement frequency with 10µs integration time.

2. @ operating current

Electrical/Optical Characteristics

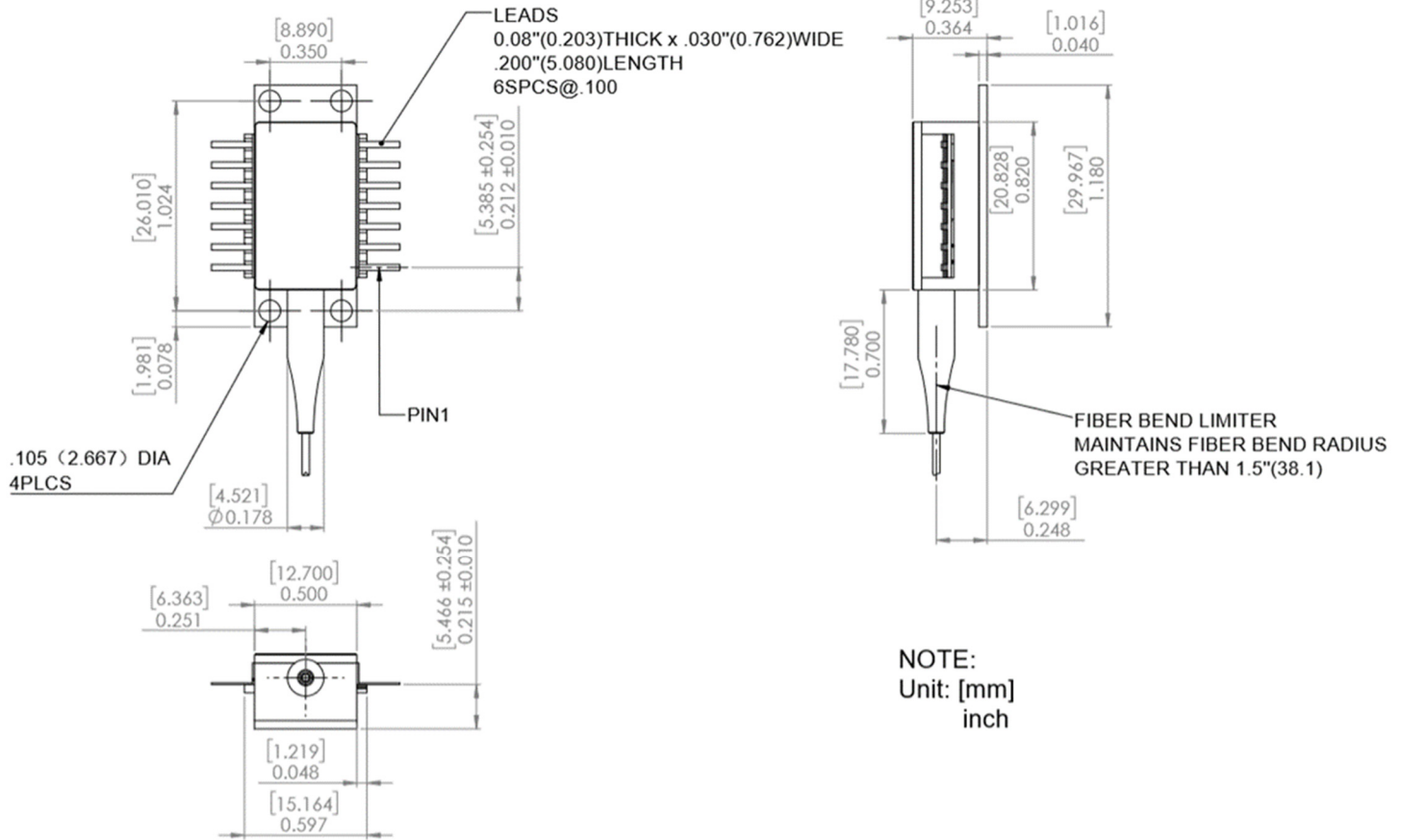
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating Case Temperature	T_c	-	-20	25	65	°C
Storage Temperature	T_{STG}		-40		+85	°C
Optical Output Power	P_O	$T = T_{OP}, I_F = I_{OP}$	17	18	-	dBm
Threshold Current	I_{TH}				30	mA
Operating Current	I_{OP}	$T = T_{OP}, @ 18 \text{ dBm}$	-	-	500	mA
Operating Laser Temperature	T_{OP}		18	25	35	°C
Laser Bias Forward Voltage	V_{OP}	$I_F = I_{OP}$	-	-	2.5	V
Wavelength	λ_{OP}	$T = T_{OP}, I_F = I_{OP}$	1550 ± 10			nm
Linewidth ¹	$\Delta\nu$	$T = T_{OP}, I_F = I_{OP}$	-	-	100	KHz
Optical Isolation	ISO	-	-	50	-	dB
Sidemode Suppression Ratio	SMSR	-	50	-	-	dB
Polarization Extinction Ratio	PER	$I_F = I_{OP}$	17	-	-	dB
Wavelength tuning with current		Measured with triangle wave @ 100 kHz modulation rate	100	-	400	MHz/mA
Monitor PD Current	I_{MPD}	$I_F = I_{OP}, V_{MPD} = -5 \text{ V}$	100	-	2500	μA
Monitor PD Dark Current	I_D	$I_{OP} = 0 \text{ mA}, V_{MPD} = -5 \text{ V}$	-	-	0.2	μA
Thermistor Resistance ²	R_{TH}	$T_{OP} = 25 \text{ °C}$	9.5	10.0	10.5	KΩ
Thermistor Temp. Coefficients	TC_{TH}	$T_{OP} = 25 \text{ °C}$	-	-4.4	-	%/°C
TEC Current	I_{TEC}	$-10 \text{ °C} < T_c < +65 \text{ °C}$	-1.0	-	+1.5	A
TEC Voltage	V_{TEC}	$-10 \text{ °C} < T_c < +65 \text{ °C}$	-2.0	-	+3.0	V
ESD	-	HBM: $R = 1500 \text{ } \Omega, C = 100 \text{ pF}$	-500		500	V
Fiber pigtail ³ length	L_f		1.0			m

1. Linewidth defined as Pi times the single-sided spectral density of the frequency noise at 100 KHz measurement frequency with 10μs integration time.
2. Thermistor temperature-resistance formula: $1/T = A + B \cdot \ln(R) + C \cdot (\ln(R))^3$ where T is temperature in Kelvin, R is resistance in Ohm, $A=1.129 \times 10^{-3}$, $B=2.341 \times 10^{-4}$, $C=8.775 \times 10^{-8}$.
3. PANDA 1550 nm polarization maintaining fiber or compatible, 400 μm buffer. Light is aligned to the slow axis of the PM fiber.

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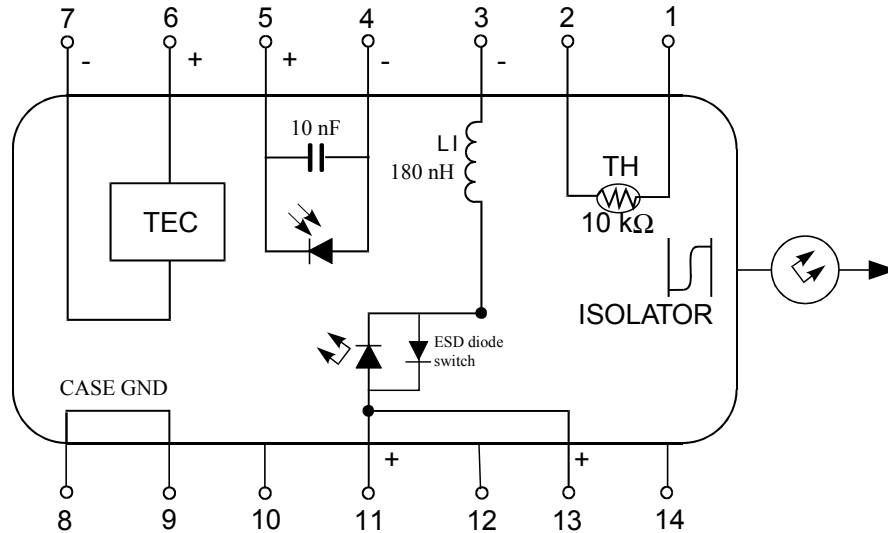
Outline Drawing



Note:

- [1] The global common tolerance for measurements is 0.005"[0.127 mm]
- [2] The module base plane metal finish structure: Au(0.7 μm)/Ni(1.0 μm)/CuW. Base flatness specification = 0.003"[0.0762 mm]

Electrical Schematics

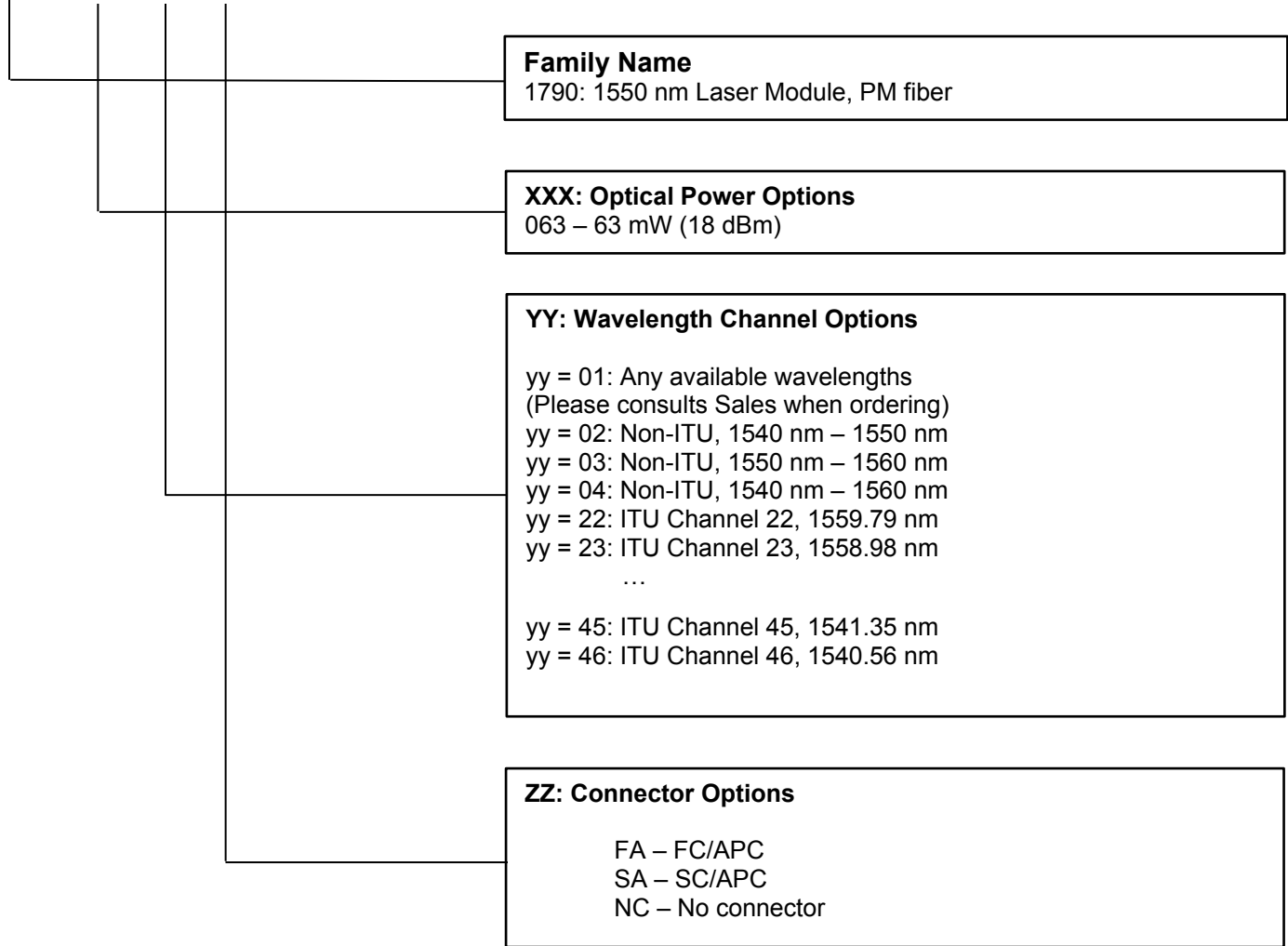


Pin Assignment

Pin	Description
1	Thermistor
2	Thermistor
3	Laser Cathode (-)
4	MPD Anode (-)
5	MPD Cathode (+)
6	Thermo-electric Cooler (+)
7	Thermo-electric Cooler (-)
8	Case Ground
9	Case Ground
10	NC
11	Laser Anode (+)
12	NC
13	Laser Anode (+)
14	NC

Ordering Code Definitions

1790A- XXX - YY - ZZ - PM



Family Name
1790: 1550 nm Laser Module, PM fiber

XXX: Optical Power Options
063 – 63 mW (18 dBm)

YY: Wavelength Channel Options

yy = 01: Any available wavelengths
(Please consult Sales when ordering)
yy = 02: Non-ITU, 1540 nm – 1550 nm
yy = 03: Non-ITU, 1550 nm – 1560 nm
yy = 04: Non-ITU, 1540 nm – 1560 nm
yy = 22: ITU Channel 22, 1559.79 nm
yy = 23: ITU Channel 23, 1558.98 nm
...

yy = 45: ITU Channel 45, 1541.35 nm
yy = 46: ITU Channel 46, 1540.56 nm

ZZ: Connector Options

FA – FC/APC
SA – SC/APC
NC – No connector

Example

1790A-1550-063-02-FA: 1550 nm Laser Module, PM fiber, 18 dBm optical power, Non-ITU 1540 nm – 1550 nm, FC/APC optical connector