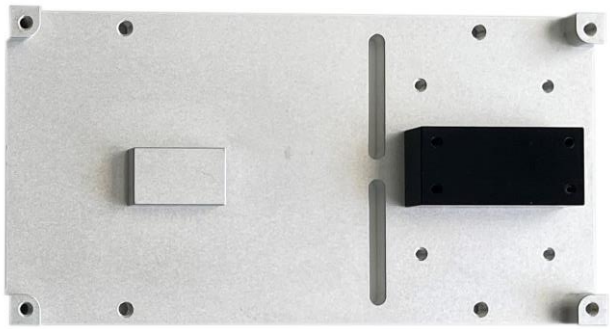
----------Features

- Supports all variants of the MOT TEC controllers
- Versions for laser current of 250mA, 500mA, 1A, 1.5A, and 2A
- Options for high Vf lasers.
- Ultra low noise.
- Ultra low drift.
- Butterfly laser mount with heatsink.
- Integral Precision machined Heat Sink which allows additional Heat Sink to attach to it.
- Built in Bias-T with Micro coaxial RF connector.
- Options for greater than 1GHz modulation.
- Telecom laser pinout (type 2).
- Includes LDO power supply regulations
- Includes supply filtering for low noise applications.
- Standalone or host-controlled
- On-board dummy laser load
- Complete solution for OEM applications.
- Complete evaluation and verification solution.
- Very small foot print, 115mmx60mm.



Introduction

The MOT6723GA _OEM is a small board designed to be used with all variants of MOT TEC controllers.

MOT6723GA_OEM is designed to have the lowest noise and drift suitable for demanding applications.

MOT6723GA_OEM is designed to be configured for lasers with high Vf.

This product incorporates power supply regulation for stable operations. Also, extensive supply filtering ensures low noise operation with little cross talk between the TEC controller and laser driver sections.

MOT6723GA_OEM board uses 2oz copper allowing good heat sinking ability for thermal management of the overall system design.

Please also refer to the appropriate Module datasheets for further description of the module functionality.

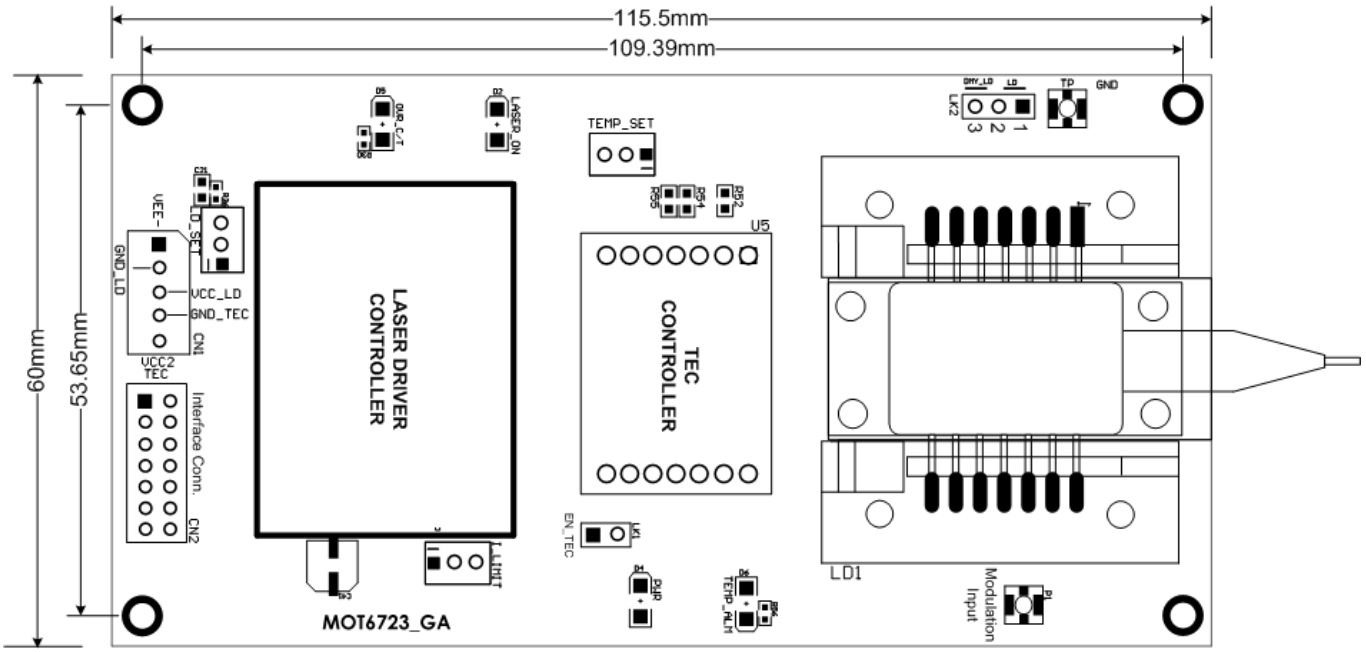
Before applying power to the board please ensure all jumpers are configured correctly! (see following pages)

Standard available Part numbers:

OEM products Part #s	Descriptions
MOT6723GA_2525	±2.5A TEC controller, 250mA Laser driver and Butterfly Laser Mount
MOT6723GA_2550	±2.5A TEC controller, 500mA Laser driver and Butterfly Laser Mount
MOT6723GA_25100	±2.5A TEC controller, 1000mA Laser driver and Butterfly Laser Mount
MOT6723GA_25150	±2.5A TEC controller, 1.5A Laser driver and Butterfly Laser Mount
MOT6723GA_3525	±3A TEC controller, 250mA Laser driver and Butterfly Laser Mount
MOT6723GA_3550	±3A TEC controller, 500mA Laser driver and Butterfly Laser Mount
MOT6723GA_35100	±3A TEC controller, 1000mA Laser driver and Butterfly Laser Mount
MOT6723GA_35150	±3A TEC controller, 1.5A Laser driver and Butterfly Laser Mount

*For 2A laser driver contact us with your detail requirements.

Board Layout & Dimensions:

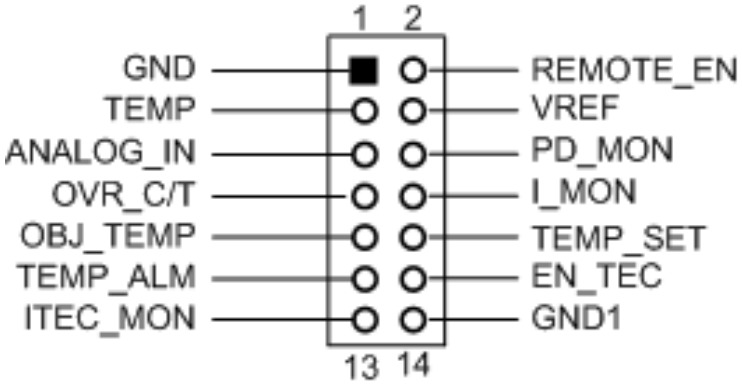


Configuration Links, Connectors, and Potentiometers:

The following table describe, links, Connectors, and potentiometers functions.

Refer to the board layout and components identification picture on page 2.

Component	Function	Default	Alternate
TEC Controller Section			
CN1 (PWR)	Power connector	VEE-, GND_LD, VCC_LD, GND_TEC, VCC2_TEC	
EN_TEC	TEC Enable/disable	Enabled	Insert Link to disable
TEMP_SET	Temperature set	On board TEMP_SET potentiometer	TEMP_SET on CN2 sets temperature using external DAC
R52	Limits TEC voltage	Open for Maximum voltage	
R54	Limits Positive current	Open for maximum current	
R55	Limits Negative current	Open for maximum current	
D4	Power LED	Illuminates when power is connected (using VCC2_TEC) power supply	
D6	Fault LED	Illuminates if the object (laser)temperature is outside ±1.5°C	
D2	LASER_ON	Indicates laser is enabled	
CN2	Interface connector	See drawing below for pin assignments.	



Absolute maximum ratings over operating free-air temperature range: (unless otherwise noted) †

Supply voltage, VCC -0.3 to 6 V @ Peak Output Current 3.1 A
Supply voltage, VEE 0.3 to -6V @ Peak Output current 1.6A
Storage temperature: -55°Cto 125°C
Free-air operating temperature range: -10°C to 85°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the module. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Electrical Specifications TEC Controller:

Parameter	Symbol	Conditions	Min	Typ.	Max	UNITS
Positive Power supply voltage (VCC)	VCC		+4.85	5.00	+5.25	V
Negative Power supply voltage (VEE)	VEE		-5.25	-5.00	-4.85	V
Maximum Supply Current for VCC	I_{CCMAX}	MOT7001-20, $I_{OUT} = I_{MAX}$			2.2	A
		MOT7001-30, $I_{OUT} = I_{MAX}$			3.1	A
Maximum supply current for VEE	I_{EEMAX}	For MOT6723GA_35150			1.6	A
TEC Outputs						
Maximum TEC output current	I_{MAX}	MOT7001-20 MOT7001-30	-2 -3		2 3	A
TEC Differential Output Voltage (TEC+ - TEC-)	V_{OUT}	V_{CC} = 5V, $I_{OUT} = I_{MAX}$,	-4.3		4.3	V
Output Switching Frequency	f_{OUT}	TEC+, TEC-	450		650	kHz
Temperature control range*	T_{OBJ}		5		65	°C
Temperature accuracy	T_{ACC}		-0.002		+0.002	%
Over Temperature Shutdown	T_{SH}			145		°C
Control Inputs						
Temperature Set Voltage	V_{TS}	TEMP_SET pin	0.32		1.04	V
Input Current	I_{TS}	TEMP_SET pin	-1		1	uA
Temperature Sensor Input Voltage	V_{IRTH}	RTH pin	0		1.5	V
Temperature Sensor Input Bias Current	I_{IRTH}	RTH pin	-1		1	uA
VMAX Set Voltage	V_{MS}	VMAX_SET pin	0		1.5	V

* The achievable control range is dependent on multiple factors including ambient temperature, the particular TEC in use and the heat dissipation characteristics of the TEC assembly itself.

Electrical Specifications Laser driver:

Parameter	Symbol	Conditions	Min[1]	Typ	Max	UNITS
Maximum Supply Current	I_{CCMAX}	GA modules. V_{CC} = 5V, I_L = Max			35	mA
	I_{EEMAX}	GA modules. V_{EE}= -5V, I_L = Max			I_{LMAX} - 60	mA
Shutdown Supply Current	I_{CCQ}	V_{CC} = 5V, EN_SS = V_{CC}		30	35	mA
	I_{EEQ}	V_{EE}= -5V, EN_SS = V_{CC}	-2	-1		mA
Laser Drive Output	I_L	MOT6723GA_2525	0	250	260	mA
		MOT6723GA_2550	0	500	515	mA
		MOT6723GA_25100	0	1	1.05	A
		MOT6723GA_25150	0	1.5	1.550	A
Output Compliance Voltage	V_L	I_L = Max, V_{CC}=5V, V_{EE}=-5V			3.2	V
Output Current Stability	ΔI_L	I_L = Max, V_{CC}=5V, V_{EE}=-5V		10	20	ppm
Output current noise				1		nV/√Hz
Over Temperature Shutdown	T_{SH}			120		°C
Control Inputs						
Current Set Voltage	V_{LDSET}		0		3.3	V
Current Set Resolution			Continuous			mA
Low Level Input Voltage	V_{IL}	SHDN_RST, REMOTE_EN			0.1	V
Monitor Outputs						
Reference Voltage Output	V_{REF}			4.096		V
Reference Voltage Output accuracy		I_{REF} = 0 to +/-10mA		0.06		%
Reference Voltage Temperature Stability		-40 to +85°C		1	3	ppm/°C
Output Current Monitor Voltage (IMON)		IMON Output	0		3	V
OVER_C/T Output Current	V_{OL}	V_{OL} = 0.5V			15	mA
Monitor Output Transfer Characteristic	V_{IMON} /I_{LAS}	MOT6723GA_2525		12		mV/mA
		MOT6723GA_2550		6		
		MOT6723GA_25100		3		
		MOT6723GA_25150		2		
Temperature Output Voltage (TEMP)	V_{TEMP}	T_A= 0 °C		744		mV
Temperature Output Voltage Coefficient				11.9		mV/°C

Component	Function	Default	Alternate
Laser Driver Section:			
LK2	Dummy load	Link pins 2 & 3 for dummy load.	Link pins 1 & 2 for laser
TP	Test point to measure the laser current when using dummy load	When LK2 is configured for dummy load, voltage at TP divided by 2 represent the set laser current.	
LD_SET	Use to set laser current (Power)	LD_SET potentiometer	'ANALOG_IN' pin on CN2 sets current using external DAC
D2	LASER_ON	Indicates laser is enabled	
D5	OVR_C/T	Indicates driver temperature or current has exceeded the set limits	

FUNCTIONAL DESCRIPTIONS

Power supplies:

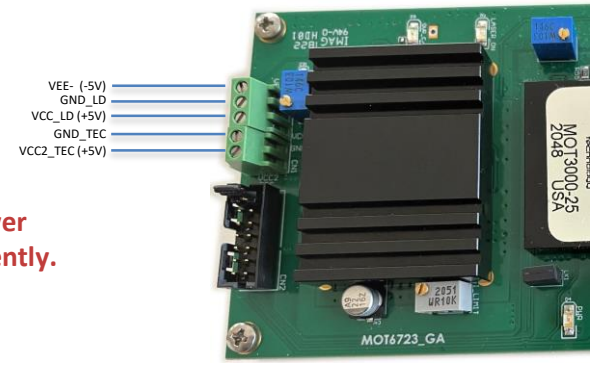
The power supply for TEC and the Laser driver has been separated to effectively remove any cross talk between TEC controller and the laser driver through power supplies.
Each power supply should be capable of sourcing sufficient current for the intended applications.
A 10 to 15% more current should be available for each power supply lines.

Laser driver :

VEE- : -5V
GND_LD: Ground connection LD (the two GNDs are internally connected)
VCC_LD: +5.0V

TEC Controller:

GND_TEC: Ground connection for TEC.
VCC2_TEC: +5.0V



Note:
Wrong power supply voltages and wrong power supply polarity will damage The unit permanently.

Setting laser temperature:

The laser temperature is set either with the on board potentiometer "TEMP_SET" or through an external DAC. A voltage of 0.32V to 1.04V allows a temperature range from +60°C to +5°C. This range can be extended if required.

LK1 (EN_TEC) is used to enable or disable the TEC controller. Insert this link to disable and remove the link to enable the TEC controller.
This link is also duplicated on CN2 for remote enable and disable function.

Maximum Output Voltage

By default the MOT6723GA_OEM ships with R52 being open, resulting in maximum output voltage swing. In some applications it may be desired to reduce the maximum voltage and this can be accomplished by the addition of a single resistor, R52.

The formula for calculating R52 and VMAX is: VMAX = 6 R / (39 + R) , R is in KΩ

Maximum Output positive & negative currents

By default the MOT6723GA_OEM ships with R54 and R55 being open, resulting in maximum output currents. In some applications it may be desired to reduce the maximum currents and this can be accomplished by the addition of resistors, R54 and R55. The values depends on the TEC controller being used. The following equations gives the resistor values in each case.

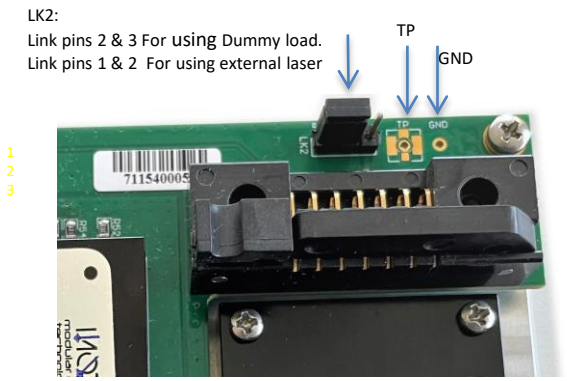
TEC controller Part #	Equation to calculate R54 & R55
MOT7001-20	IMAX =2R/(39 + R), R is in KΩ
MOT3000-25	IMAX =2.5R/(39 + R), R is in KΩ
MOT7001-30	IMAX =3R/(39 + R), R is in KΩ

Laser connection

For quick initial evaluation the on-board dummy load can be used in place of a real laser. The dummy load consists of a diode in series with a 2Ω resistor (diode and resistor are underneath the board).

Link LK2 is used to either connect to the dummy load or the laser.

The voltage at TP divided by 2 represent the laser current.



Current Limit:

MOT6723GA_OEM allows customers to adjust the output current limit to suit their laser maximum current limit.

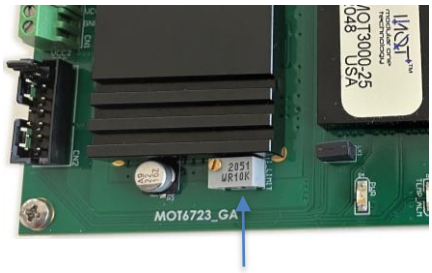
There are two current limit on this product;

1. A current limit which is set internally according to the module being used. That is 250mA, 500mA, 1A, and 1.5A modules. This current limit will be activated if the set current goes beyond these limits. In this case laser current will be shut down and an LED indicator (D5) will be illuminated.

   The laser current will be automatically restored when the setting is within the rage.

1. A second limit can be set by the customer to limit the maximum current according to the laser maximum current. A potentiometer “I_LIMIT” is used to set this current limit. When using this current limit, make sure that the operating current is at least about 15% below this limit.

   The current limit is designed to have a range of 30% to 40% of the maximum internal limit.



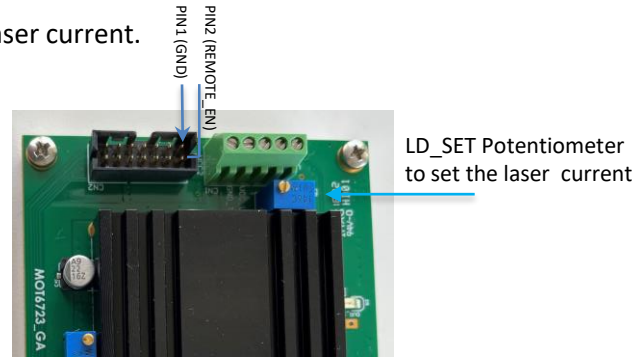
“I_LIMIT” Potentiometer to limit
the maximum current of the laser

Laser Current Setting

Control of the laser output power is accomplished by adjusting potentiometer (LD_SET). This applies a control voltage to the module in the range 0V to ~ 3.3V.

To set the laser current, first it has to be enabled. Pin2 "REMOTE_EN" of CN2 has to be grounded. see the picture below.

A link between pins1 & 2 of CN2 enables laser current.



Shutdown functionality

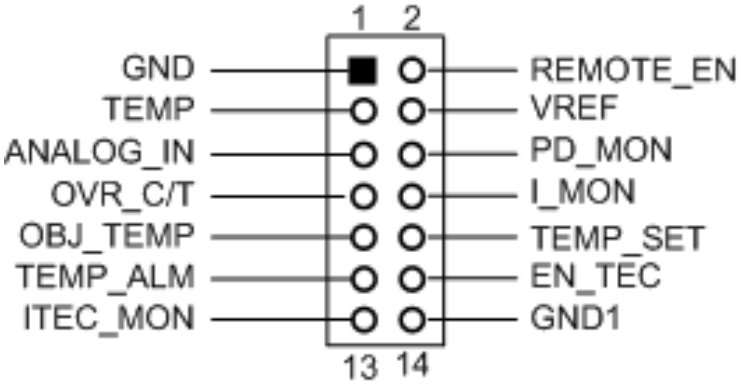
Two conditions causes the laser to shut down;

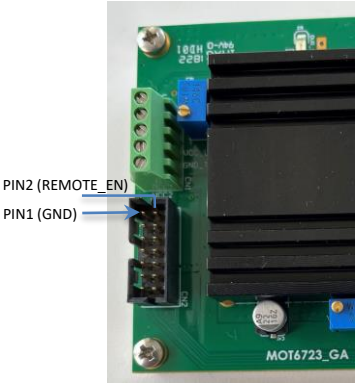
1. If the laser driver current is to be set outside the maximum limit (over-current) or the driver power devices temperature exceeds a maximum of +85°C (over-temperature) an alarm is set "OVR_C/T" D5 will illuminate and the driver output current will shutdown. The module will remain shutdown until the fault condition is removed.
2. If the laser temperature is outside the +/-1.5°C, a temperature alarm is initiated, "TEMP_ALM" LED, D6 will be illuminated and laser current will shut down.

   Laser current automatically restored when temperature reaches its set value and within the +/-1.5°C window.

Monitoring and Control:

A number of system parameters are available for monitoring, along with several control signal inputs, which would be used when the MOT6723GA is connected to an external microcontroller using CN2.





Interface Connector Pin descriptions (CN2):

Pins 1 & 14:	GND & GND1 the two grounds are internally connected.
PIN 2:	"REMOTE_EN" active low, enables laser current.
PIN 3:	"TEMP" Module temperature. An analog voltage representing the internal temperature of laser driver the module. $T = [(V_{TEMP} - 0.744) / 11.9] \times 1000$. in degrees C.
PIN 4:	VREF=4.096V
PIN 5:	"ANOLOG_IN" an analog voltage in the range of 0-3.3 volt will set the laser current/power. Set "LD_SET" on board potentiometer to 0V (fully anti-clockwise)when using external voltage.
PIN 6:	"PD_MON" a voltage at this pin represent the power output of the laser. This function requires calibration with the laser being used.
PIN 7:	"OVR_C/T" active low, an alarm indicating driver out of current range or temperature.
PIN 8:	"I_MON" laser current monitor. An analog voltage representing laser current. Values from 0 to ~ 3V correspond to output current from zero to the specified maximum. The current to voltage ratio (transimpedance) depending on the unit maximum current is given in table 1.
PIN 9:	"OBJ_TEMP" Laser temperature, an analog voltage representing the laser temperature. Contact us for how to convert this voltage to temperature.

PIN 10: "TEMP_SET" Temperature Set Voltage

An analog voltage to set the laser temperature. Values from 0.32V to 1.04V may be applied.

PIN 11: "TEMP_ALM" active low, this pin is pulled low when the temperature falls outside of a +/-1.5˚ C window.

PIN 12: "EN_TEC" High impedance to enable TEC controller. A low level voltage puts the module in standby. When releases the module resumes normal operation.

PIN 13: "ITEC_MON" monitor the current through TEC. See note 1.

PIN 14: GND1, TEC controller ground. It is connected to the laser driver ground internally.

Note1.

The relationship voltage at ITEC_MON and the ITEC (TEC current) for each TEC controller modules are :

MOT7001-30: $(V_{ITEC\_MON} - 1.5)/0.4 = ITEC$

MOT3000-25: $(V_{ITEC\_MON} - 1.5)/ 0.48 = ITEC$

MOT7001-20: $(V_{ITEC\_MON} - 1.5)/ 0.6 = ITEC$

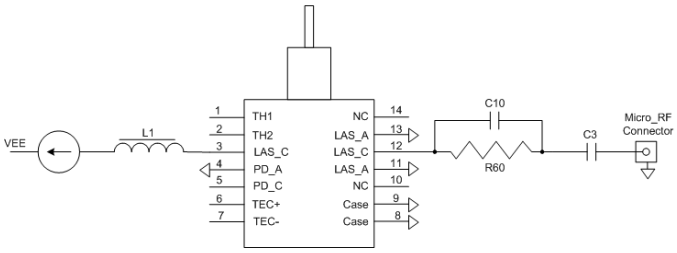
Table 1.

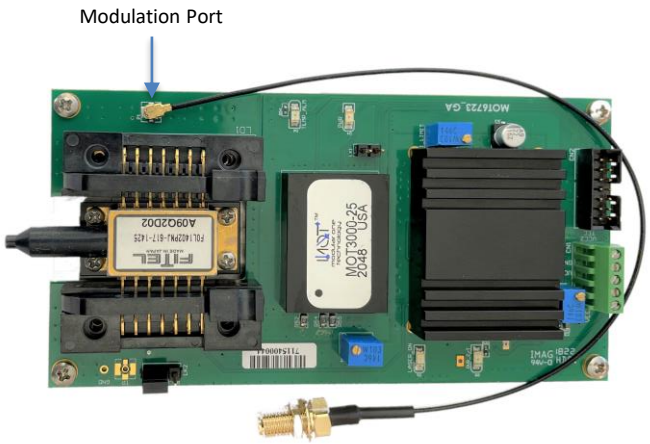
Part #	V_{I_MON}/I_{LASER}	Part #	V_{I_MON}/I_{LASER}
MOT6723GA_2525	12	MOT6723GA_3525	12
MOT6723GA_2550	6	MOT6723GA_3550	6
MOT6723GA_25100	3	MOT6723GA_35100	3
MOT6723GA_25150	2	MOT6723GA_35150	2

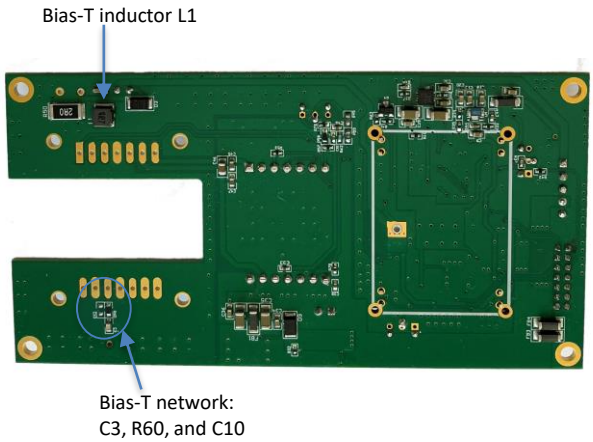
Modulation:

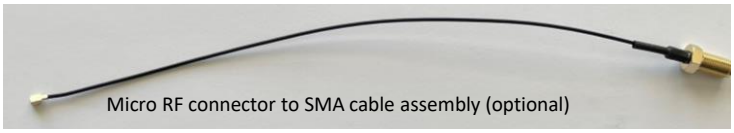
The laser current can be modulated using the RF port on the MOT6723GA. A Micro Coax RF connector is located close to the PIN 12 of the laser. Modulation port has a suitable Bias-T network allowing up to 1GHz modulation frequency. The Bias-T network components are situated underneath of the board and can easily be accessed and modified to match the laser being used.

The schematic of the Bias-T network is shown below, along with pictures of the board for easy identifications of the components.









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