

24 PIN 10Gb/s Long Reach DWDM Serial Transmitter Module

MT10EW

The Bookham MT10EW 10Gb/s LR Transmitter Module is a 1550nm, low power, small footprint 24-pin module enabling high port density. It is designed to support a SONET / SDH or 10GE interface between the photonics layer and the electrical layer for applications with reach requirements of 80km or more. The Transmitter allows convenient direct connection to system card electrical MUX ASICs, using un-clocked mode of data transfer.

The transmitter has been designed for Dense Wavelength Division Multiplexed (DWDM) operation for applications up to 11.1GB/s.

Low power dissipation coupled with small footprint significantly simplifies high speed card design. This results in significant savings in card space and development time, and greatly improved time to market.


The module provides wavelengths on the 50GHz ITU-T grid in the C band. It is also available for non-WDM applications that use a single wavelength. Multi functional hardware alarms and monitors are also available for systems card and network management.

The MT10EW LR 24 pin Transmitter Module can be used in existing OC192 and OC192c ports as well as emerging IEEE 802.3ae 10 Gigabit Ethernet WAN / LAN ports.

The MT10EW LR Transmitter Module is optimised for optical link spans of 80km+ (based on GR-253, ITU G.691 and IEEE 802/3ae system architectures). Reaches in excess of 80km may be achieved in proprietary networks.

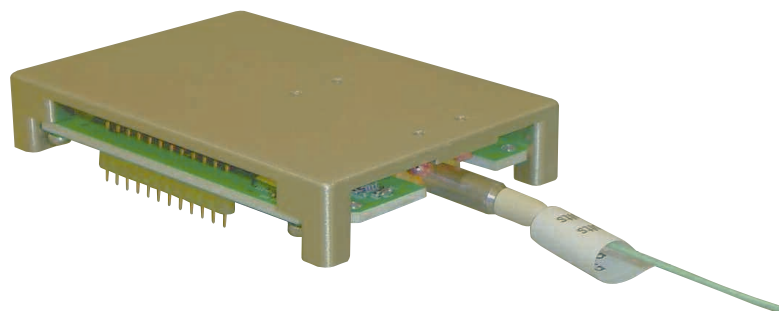
The compact size, low power Transmitter Module is 24 pin connectorised for convenient surface mount assembly. The module comprises a hermetically packaged laser device and Bookham's InP Mach-Zehnder modulator Technology with optical isolation and wavelength stabilisation. This ensures that the optical source remains within optical power and wavelength limits over variations in temperature and over life. A microprocessor coupled with internal circuitry and a Thermo-Electric Cooler (TEC) controls the operation of the module and ensures the correct laser temperature to achieve constant wavelength.

Features:

- Incorporates Bookham InP MZ Technology enabling superior systems performance.
- +3.5 to +7dBm start of life, over temperature optical output power window
- Internal microcontroller for TX wavelength, power & optical performance control
- Multi functional hardware alarms and monitors for systems card and network management
- 2 x 12 way 0.1" x 1.5" pitch electrical interface
- 73.4 x 50.0 x 12.7mm MSA compliant outline
- 24pin MSA compliant
- +3.3V / +5V external power supply rails
- Typical power dissipation 3W
- IEC/EN 60825 Class 1M laser safety classification
- Case operating temperature range -5 to +75C
- RoHS 5/6 compliant 

Applications:

- 10Gbps fixed wavelength, Long Reach DWDM serial transmitter module suitable for 80km+ reach applications
- Suitable for use in 1550nm Long Reach applications based on Telcordia GR-253, ITU-T G.691 and IEEE 802.3ae system architectures
- Multi bit rate performance 9.953 Gb/s (OC192, 10GE WAN), 10.3125 Gb/s (10 GE LAN), 10.664 10.709 11.1 Gb/s (FEC),



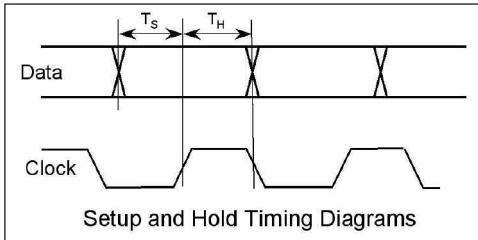
Characteristics

Unless otherwise stated the following parameters and performances are required over the full range of operating conditions defined below, from beginning to end of life. The typical values are referenced to case temperature of +25°C, nominal power supplies, beginning of life (BOL).

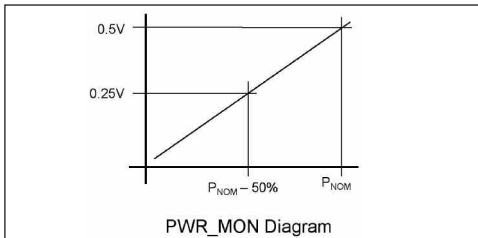
Parameter	Symbol	Measurement Conditions	Min	Typ	Max	Unit
Positive supply voltage		V_{CC}	4.75	5.0	5.25	V
Positive supply current		I_{VCC}	-		750	mA
TEC supply voltage		V_{TEC}	3.1	3.3	3.5	V
TEC supply current		I_{TEC}			1.2	A
Tolerable module power supply voltage ripple	Sinewave 1Hz-1MHz. Note [10]	V_{NM}	50			mVpp
Total power dissipation		P_{DIS}		3	5.5	W
Differential input sensitivity data voltage	for each input Note [1]	V_{DIFF}	250	400	500	mVpp
Differential input sensitivity clock voltage	AC coupled, for each input Note [1]	V_{DIFF}	200	250	500	mVpp
Data/clock input impedance	Differential driven	Z_{IN} (differential)		100		V
Set-up Hold time	Note [2] Note [2]	T_{SU} T_H Refer to Set-up and Hold time definition diagram	11 25			ps ps
TXEN, CSEL, logic high level input voltage	$I_{source}=200\mu A$	V_{IH}	2		VCC	V
TXEN, CSEL, logic low level input voltage	$I_{sink} = 10\mu A$ Note [3]	V_{IL}	0		0.8	V
LDA, LTDA logic high level output voltage	$I_{out}<7mA$	V_{OH}	2.7		VCC	V
LDA, LTDA logic low level output voltage	$I_{out}>-0.5mA$	V_{OL}	0		0.5	V
LDA LTDA		T_{LDA} T_{LTDA}			50 150	ms ms
TXDIS activation time	Note [4]	T_{ACT}			2	ms
TXDIS deactivation time	Note [5]	T_{DEACT}			50	ms
Wavelength stabilization time after TXDIS deactivation	Note [6]	T_{WARM}			1	s
Cold start wavelength stabilization time	Note [7]	T_{COLD_START}			5	s
Normalized back-facet monitor voltage	TXDIS = OFF Note [8]	V_{BF}	-	500	-	mV
Back-facet monitor accuracy	Note [9]		-37		+25	%
Back-facet monitor voltage	TXDIS = ON				20	mV

Notes:

- [1] Two complementary signals of equal amplitude on each input.
- [2] Referred to data level 20% or 80%, see diagram below for definitions.



- [3] When not connected the TXDIS, CSEL inputs are considered in a low state, (internal pull-down resistor).
Clocked mode, CSEL=low is presently unsupported for the MT10EW.
- [4] Time measured from rising edge of shutdown signal until optical output has turned off (<-40dBm).
- [5] Time measured from falling edge of shutdown signal until optical output power is over 0dBm and emitted wavelength is at nominal value +/- 200 pm. The unit is assumed to be powered on for at least 30s.
- [6] Time measured from falling edge of shutdown signal until optical output power is within the specified range and wavelength within +/-30pm.
The unit is assumed to be powered on for at least 30 seconds.
- [7] Time measured from enabling laser until optical output power is within the specified range and wavelength within +/-120pm.
Module powered for 5 seconds minimum prior to enabling laser.
For any initial case temperature within the specified operational range and with TXDIS = off.
- [8] Back facet monitor voltage is measured from pin 2 to GND and normalized at the beginning of life relative to the initial optical output power ($T_{case} = 25^{\circ}C$, nominal power supply). The relationship is approximately linear, as represented by the equation:
Back-facet voltage = V_{BF} . (measured optical output power/initial BOL optical output power), power measured in mW.
For example, a 50% variation of this voltage means a 50% drift of the optical output power.



- [9] Total relative variation of the mean modulated optical fibre output power over the operating case temperature and supply voltage ranges for a constant back facet voltage.
- [10] A sinewave is superposed to the DC supply voltage. The device must still meet the optical and electrical specifications when the magnitude of the sinewave measured at any VCC pin (pin 13 and 24) is up to the specified value V_{NM}

Optical

Parameter	Symbol	Measurement Conditions	Min	Typ	Max	Unit
Mean modulated optical output power	P_{NOM}	BOL Note [1] EOL Note [1]	3.5 3		7 7.5	dBm
Mean modulated optical output power with module disabled	P_{SDC}				-40	dBm
Operational central wavelength range	–		1528.77		1568.57	nm
Spectral width	$\Delta_{\text{}}$	Note [2]		0.3	0.5	nm
Side mode suppression ratio	SMSR	Note [3]	30	dB		
BOL central wavelength deviation	Δ_{BOL}	Note [4]	-20		+20	pm
EOL central wavelength deviation	Δ_{EOL}	Note [4]	-30		+30	pm
Optical return loss	ORL	Average polarisation state	20			dB
Optical extinction ratio (unfiltered)	ER	10.709Gb/s 2 ³¹ -1 NRZ PRBS data	10			dB
Receiver dispersion power penalty	DP	10.709Gb/s 2 ³¹ -1 NRZ PRBS data, 1600ps/nm dispersion, OSNR _{0,1} >36dB, RX threshold optimised, BER 1e-8.			2	dB
Optical rise/fall times	$T_{\text{R}}/T_{\text{F}}$	20%-80%			35	ps
Output Jitter		10.709Gb/s 2 ³¹ -1 NRZ PRBS data, Note [5]	Telcordia GR-253-compliant for SONET OC-192 / SDH STM-64-ITU-T G.82511 compliant for SONET OC-192 / SDH STM-64 with FEC			

Notes:

- [1] Mean power measured at optical fibre output. When there is no modulation signal at the data input the average power shall be less than +7.5dBm.
- [2] Full spectral width measured 20 dB down from the maximum of center wavelength peak under full modulation condition.
- [3] Ratio of the average output power in the dominant longitudinal mode to the power in the most significant side mode peak under full modulation condition.
- [4] Deviation referenced to the ITU standardized wavelength.
- [5] Output optical jitter measured through an electrically filtered reference receiver.

Absolute Maximum Ratings

Maximum and/or minimum values of critical parameters which will not permanently damage the device, but for which the spec may not hold. Typical headings are:

Parameter	Description	Min	Max	Unit
	Storage temperature ^[1]	-40	+85	°C
R _H	Storage relative humidity ^[2]	5	95	%
	Minimum fiber bend radius	30		mm
V _{CC}	Positive supply voltage	-0.3	+6	V
V _{TEC}	TEC supply voltage	-0.3	+6	V
V _{RFDC}	Input data and clock DC voltage	-0.3	VCC	V
TXEN	TX disable input	-0.3	VCC	
ESD	ESD resistance ^[3]	Class 2 precautions ^[4]	400	V

Notes:

- [1] Non operational.
- [2] Non condensing.
- [3] Human body model.
- [4] In accordance with Telcordia TR-NWT-000870, ESD class 2.

Applications Support

The following documents are available to support customers using this product:

Component Mounting Recommendations For the 24 pin Long Reach Serial Transmitter Module. AN0145

Characterisation of the 24 pin Long Reach Serial Transmitter Module in typical optical system. ANxxxx

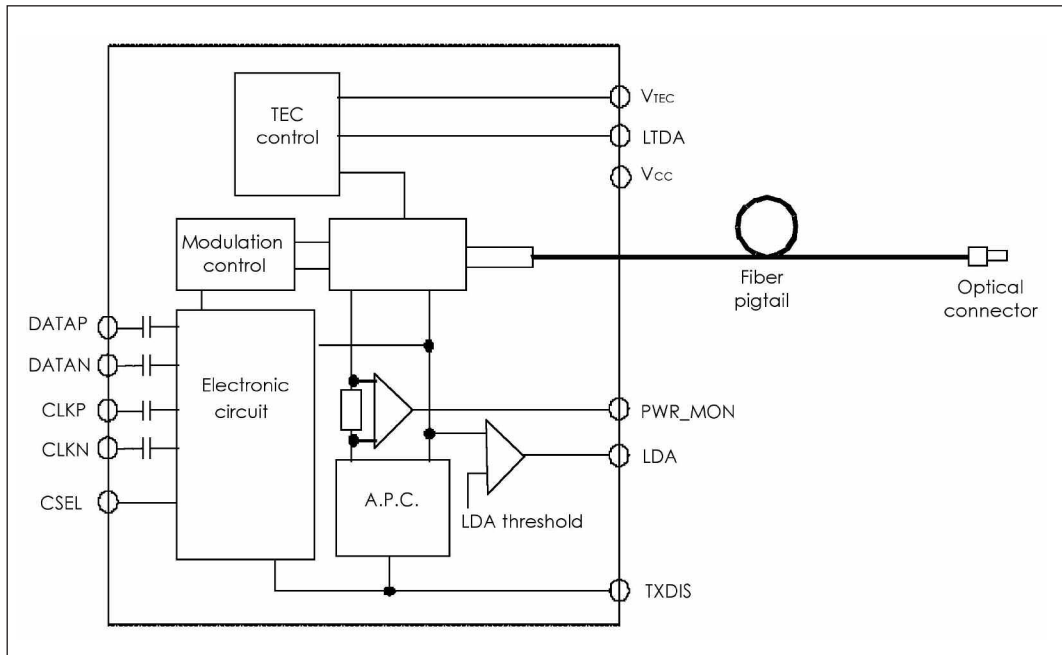
Evaluation platform for the 24 pin Long Reach Serial Transmitter Module AN0144

Optical component evaluation platforms are available for all Bookham optical components. Contact your regional sales representative for further information.

Power Supply Filtering Recommendations

Care should be taken when placing PCB power transmission tracks and adding additional filtering components as these may affect module operation. It is recommended that any series inductance integrated within external power supply filters are limited to 4.7uH max.

Schematic Diagram



Pinout Table

Pin #	Symbol	Pin Assignment	Pin #	Symbol	Pin Assignment
1	GND_TEC	TEC ground	24	V _{CC}	Positive power supply (+5V)
2	PWR_MON	Optical power monitor	23	GND	Ground
3	LDA	Laser degraded alarm	22	CLKN	Clock input (-)
4	TXDIS	Module TX disable input	21	GND	Ground
5	CSEL	Clocked/Non-clocked mode select ^[1]	20	CLKP	Clock input (+)
6	GND	Ground	19	GND	Ground
7	LTDA	Laser temperature degraded alarm	18	DATAN	Data input (-)
8	I ² C CLK	I ² C Clock bus	17	GND	Ground
9	I ² C DATA	I ² C Data bus	16	DATAP	Data input (+)
10	NUC	No user connection	15	GND	Ground
11	NUC	No user connection	14	V _{TEC}	TEC supply Voltage (+3.3V)
12	GND	Ground	13	V _{CC}	Positive power supply (+5V)

Refer to module outline drawing for pin identification.

Note: [1] Only non-clocked mode is presently supported with the MT10EW module.

Instructions for use

- GND / GND-TEC:

Ground reference pin and package potential. All voltages are referred to this node.

- V_{CC}:

General positive power supply of the module. Typical value : + 5.0 V.

- V_{TEC}:

TEC (Thermo-Electrical Cooler) supply. Typical value + 3.3 V.

- DATAP / DATAN (Data inputs):

NRZ data input, internally AC coupled with 50 ohm internal termination. A logical "1" of D is related to a light on state on the optical fibre. Data line is retimed at the input of the module by the input clock signal when the function is selected.

In case of operation in the transparent mode of the transmitter no internal signal regeneration function is provided.

Input impedance: 50 V typical.

- CLKP / CLKN (Clock inputs):

Clock inputs internally AC coupled with 50 ohm internal termination. The rising edge of the clock+ signal must be central to the steady state of the data pattern.

Input impedance: 50 V typical.

- TXDIS (TX disable input):

Under shutdown condition the output power should be low enough so that any receiver, in minimum span condition, will generate an LPA (Loss of Power Alarm).

When TXDIS is high the TX module is disabled (no optical output power).

When TXDIS is low (or open) the TX module is in the operating condition.

TTL compatible input. Input includes pull down resistance of 100 kV typical.

- CSEL (Selection of data input clocking mode - future enhanced feature):

When CSEL is high the module operates in the non clocked mode, this is the supported operational mode for the MT10EW.

TLL compatible input. Pull down resistance of 100 kV typically.

- LDA (Laser degradation alarm):

Digital alarm indicating that the laser is degraded. LDA activation $I_{SOL} \pm 20\%$, hysteresis $\pm 10mA$

The active level is a low level.

The alarm shall not be activated in shutdown condition.

TTL compatible output.

- LTDA (Laser temperature degraded alarm):

Alarm indicating when the laser temperature exceeds the recommended operational limits. LTDA activation $T_{SOL} \pm 2^{\circ}C$, hysteresis $\pm 0.5^{\circ}C$.

The active level is a high level.

TTL compatible output.

- PWR_MON (Back Facet Monitor):

Laser back facet monitor derived voltage. This monitor produces a scaled varying analogue voltage that tracks the transmitted optical output power.

Output impedance < 10 V typically.

- NUC:

No user connection, this pin can be tied to any static potential within the operating supply range.

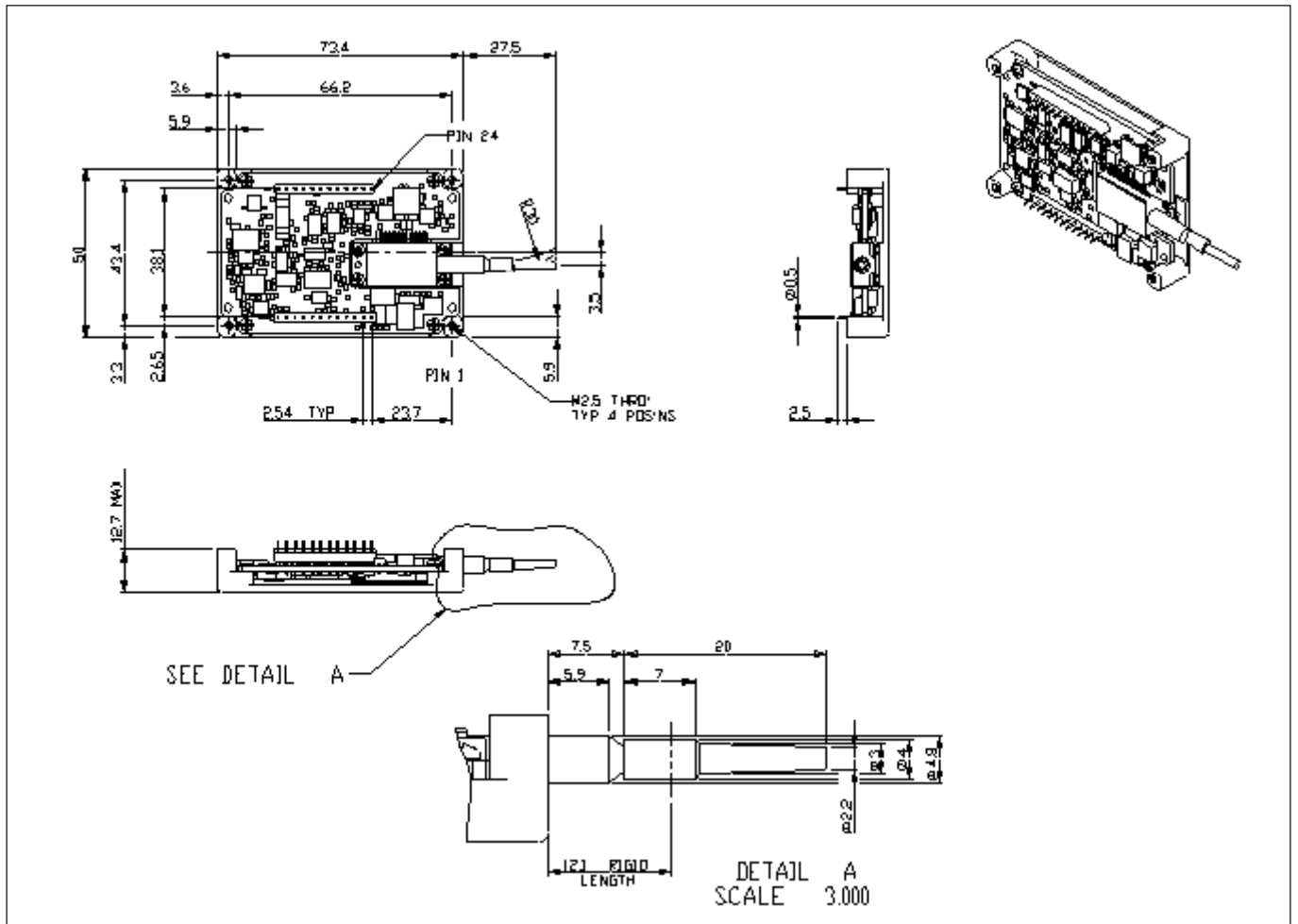
- I2C & GUI interface (future enhanced feature):

The module includes an I2C interface bus which enables the user to interrogate the module alarms and monitors using a host controller.

- Wavelength drift alarm (future enhanced feature):

An option exist to provide a wavelength drift alarm using the LTDA alarm port, which activates when the laser wavelength exceeds $\pm 30pm$ of the SOL (start of life) value.

Outline Drawing



Ordering Information

MT10EW (Wavelength) AAA- (Connector)
 #####
 J28 = SC/PC
 J33 = FC/PC
 J57 = LC
 J59 = MU

= Last four digits of wavelength value E.g. for $\lambda = 1545.32 \text{ nm}$ #### = 4532
 e.g. MT10EW4532AAA-J28 is a 1545.32 nm 24 pin module with an SC connector.
 Refer to table below for wavelength selection.

Wavelength code	Wavelength (nm)	ITU-T Frequency (THz)
2722	1527.216	196.3
2760	1527.605	196.25
2799	1527.994	196.20
2838	1528.384	196.15
2877	1528.773	196.10
2916	1529.163	196.05
2955	1529.553	196.00
2994	1529.944	195.95
3033	1530.334	195.90
3072	1530.725	195.85
3112	1531.116	195.80
3151	1531.507	195.75
3199	1531.898	195.70
3229	1532.290	195.65
3268	1532.681	195.60
3307	1533.073	195.55
3347	1533.465	195.50
3386	1533.858	195.45
3425	1534.250	195.40
3464	1534.643	195.35
3504	1535.036	195.30
3543	1535.429	195.25
3582	1535.822	195.20
3621	1536.216	195.15
3661	1536.609	195.10
3700	1537.003	195.05
3740	1537.397	195.00
3779	1537.792	194.95
3819	1538.186	194.90
3858	1538.581	194.85
3898	1538.976	194.80
3937	1539.371	194.75
3977	1539.766	194.70
4016	1540.162	194.65
4056	1540.557	194.60
4095	1540.953	194.55
4135	1541.349	194.50
4175	1541.746	194.45
4214	1542.142	194.40
4254	1542.539	194.35
4294	1542.936	194.30
4333	1543.333	194.25
4373	1543.730	194.20
4413	1544.128	194.15
4453	1544.526	194.10
4492	1544.924	194.05

Wavelength code	Wavelength (nm)	ITU-T Frequency (THz)
4532	1545.322	194.00
4572	1545.720	193.95
4612	1546.119	193.90
4652	1546.518	193.85
4692	1546.917	193.80
4732	1547.316	193.75
4772	1547.715	193.70
4812	1548.115	193.65
4851	1548.515	193.60
4891	1548.915	193.55
4932	1549.315	193.50
4971	1549.715	193.45
5011	1550.116	193.40
5052	1550.517	193.35
5092	1550.918	193.30
5132	1551.319	193.25
5172	1551.721	193.20
5212	1552.122	193.15
5252	1552.524	193.10
5293	1552.926	193.05
5333	1553.329	193.00
5373	1553.731	192.95
5413	1554.134	192.90
5454	1554.537	192.85
5494	1554.940	192.80
5534	1555.343	192.75
5575	1555.747	192.70
5615	1556.151	192.65
5655	1556.555	192.60
5696	1556.959	192.55
5736	1557.363	192.50
5777	1557.768	192.45
5817	1558.173	192.40
5858	1558.578	192.35
5898	1558.983	192.30
5939	1559.389	192.25
5979	1559.794	192.20
6020	1560.200	192.15
6061	1560.606	192.10
6101	1561.013	192.05
6142	1561.419	192.00
6183	1561.826	191.95
6223	1562.233	191.90
6264	1562.640	191.85
6305	1563.047	191.80

RoHS Compliance



Bookham is fully committed to environment protection and sustainable development and has set in place a comprehensive program for removing polluting and hazardous substances from all of its products. The relevant evidence of RoHS compliance is held as part of our controlled documentation for each of our compliant products. RoHS compliance parts are available to order, please refer to the ordering information section for further details.

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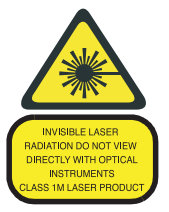
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