

GFT1804 view

Features

- 2 independent delay channels (or 4 or 8 in option)
- 100 ps delay resolution (or 1ps in option)
- 50 ps channel to channel RMS jitter (5 ps in option)
- Output pulse 1.5 to 5 V / 50 Ω, 1 ns rise time with independent control of width, polarity, amplitude, and MUX mode
- Up to 50 MHz Independent trigger rate (repetitive, single or burst) for every channel
- External trigger mode from two inputs with pre-scaler or internal trigger mode from three synchronous programmable timers or command
- Gate (or second trigger) input
- External clocking up to 240 MHz (user programmable)
- Controlled via USB and Ethernet (Bluetooth in option)
- Ultra-compact packaging and low power
- DC +5 V power supply. An External AC (80 to 230 V) to DC compact power supply is furnished
- Channel output amplitude options: 3 to 10 V or 15 to 50 V or LVDS level

Applications

- System Laser Timing Control
- ATE Application
- Laser Pulse Picking
- Precision Pulse Application
- Instrument Triggering
- Component Testing

Description

The GFT1804 Pulse & Delay Generator provides 2 (or 4 or 8 in option) independent delayed pulses. Delays up to 100 seconds can be programmed with 100 ps resolution and channel to channel jitter less than 50 ps RMS. An option allows to enhance delay resolution to 1 ps, and provide 500 ps precise pulse with 5 ps RMS jitter.

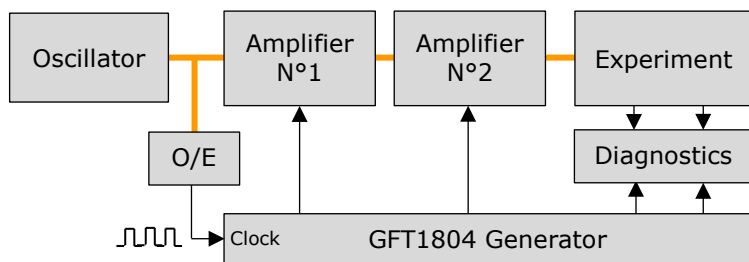
SMB outputs deliver 1.5 V to 5 V, 1 ns rise time pulses, into 50 Ω. Pulse amplitude, polarity and width are adjustable on each output channel. In option, pulse amplitude can be 3 V to 10 V or 15 V to 50 V into 50 Ω or LVDS level.

The model GFT1804 offer two inputs or three internal synchronized timers (adjustable from 0.01 Hz to 50 MHz) or software command for triggering all selected delay channel. Either trigger rate may be set as one-shot or repetitive. Gate input allows to quickly inhibit all selected channel Outputs. This input function can be selected as a second External Trigger. A RUN/STOP command enables/disables the output for all channels.

The generator uses an internal 100 MHz TCXO clock reference, or an external user programmable (from 10 MHz to 240 MHz) clock (sine or square).

GFT1804 parameters can be remote controlled via Ethernet or USB to UART (or Bluetooth in option).

Application example: The GFT1804 is well suited to synchronize all the devices of a Picosecond Laser system with only one compact unit and one GUI. In this application the "Clock reference input" of the pulse and delay generator receives a signal (80 MHz for example) from laser oscillator via an O/E (optical to electrical converter) like an GFT300 module for example.



Picoseconde Laser System

From the GFT1804 Generator each amplifier (Pump-laser, Q-switch, Pockel Cell ...) or diagnostic instruments (Digitizer, Calorimeter, CCD camera ...) can receive repetitive or single pulses (adjusted in rate, delay, amplitude, polarity and width) synchronized on "Clock reference input" with a very low jitter. From generator 4 GPIO (input or output) under software control allow command for security or control to low frequency devices.



Specifications

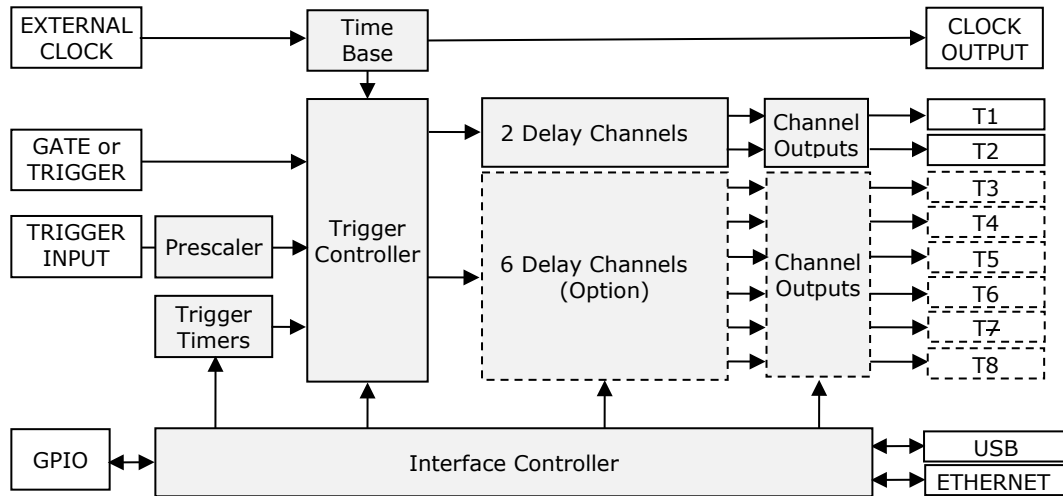
Delay channels	
Number	2 independents (or 4 or 8 in option)
Range	100 seconds
Resolution	100 ps (1ps in option)
RMS jitter	<50 ps + delay x 10 ⁻⁷ , channel to channel (< 5 ps + delay x 10 ⁻⁷ in option) <1 ns , external trigger to any channel <50 ps external clock to any channel
Accuracy	<500 ps + delay x 10 ⁻⁶
Time base	Internal 200 MHz, ±5 ppm stability
External Trigger Mode	
Input "TRIG"	Rate single or repetitive up to 40 MHz, with prescaler, adjustable threshold, positive slope
Trigger delay	<85 ns (insertion delay)
Internal Trigger Mode	
Rate repetitive	From three Timers with frequency = 0.1 Hz to 50 MHz (in step of 5 ns)
Rate single trigger	From " Trigger input" or Soft Command
Channel Output pulse T1 to T2 (and T3 to T8)	
Amplitude	1.5 V to 5 V in step of 10 mV into 50 Ω or 3.0 V to 10 V in step of 20 mV into high impedance (>1 KΩ)
Rise/Fall Time	1/1 ns into 50 Ω or 2/2 ns into high impedance @ full scale
Width	10 ns to 10 s in step of 5 ns
Pulse Polarity	Positive or Negative
Burst Mode	Burst count = 1 to 1 000 000 000, adjustable period in step of 5 ns
MUX Mode	Any channel may be ORed' to all outputs
External Clock reference	
Threshold	0 V, internal 50 Ω
Level / shape	Min -10 dBm, typical 6 dBm
Frequency	10 MHz to 240 MHz, user programmable in steps of 0.25 MHz up to 120 MHz, then user programmable in steps of 0.50 MHz (100 MHz with option 3)
Clock output	
Level /shape	> 500 mV p-p, into 50 Ω, AC coupling / Square
Frequency	100 MHz if internal clocked or same as external clock if external clocked
Gate or second trigger	
Input	Active high, adjustable threshold, positive slope, rate < 10 MHz
Function	Gate or second External Trigger
GPIO :Input or output lines	
4 x GPIO	Input or output, 0 or 3 V level, impedance > 20 kΩ input & 100 Ω output
General	
Interface Control	USB to UART, Ethernet 10/100 Mb/s, Bluetooth in option
Software tools	Free Drivers for Windows 10, Linux
Power Voltage	+5 Volts, 2.5 W to 15 W according to configuration
Power supply	USB or External AC (80 - 264 V/47-63 Hz) to DC (5 V / 4 A)
Size / Weight	150 x 120 x 20 mm / <1 kg
Options	
Option 1:	Extension to 4 channels
Option 2:	Extension to 8 channels (size = 150 x 120 x 40 mm)
Option 3:	1 ps delay resolution, only available with GFT1804-2C or 4C model, channel to channel jitter <10 ps (at short delay), min width of 50 ns (min width of 1ns, with option 6) Narrow pulse mode: it allows min width of 3 ns in step of 1 ps on 2 channels outputs
Option 4:	(bank of 2 channels) 3 V to 10 V channel output, width= 10 ns to 10 ms, rise/fall time = 1/1 ns into 50 Ω
Option 5:	(bank of 2 channels) 15 V to 50 V channel output, width = 50 ns to 5 μs, rise/fall time = 3/15 ns into 50 Ω
Option 6:	(Bank of 1 channel) with a max of 2 differential LVDS or HSTL outputs, 175 mV to 1200 mV, width = 10 ns to 10 s, rise/fall time = <0.5/0.5 ns into 100 Ω differential Narrow pulse mode: it allows min width of 1 ns in step of 100 ps with base version, or 500 ps min width in step of 1 ps with option 2.
Option 7:	(Bank of 1 channel) LVDS differential clock output programmable up to 1 GHz (available in Q2 2022)
Option 8:	Bluetooth (available in Q1 2022)
Option 9:	5" SMB to BNC cable

Ordering information

Model GFT1804-2C	2 channel mini pulse & delay generator (base version)
Model GFT1804-4C	4 channel mini pulse & delay generator (with option 1)
Model GFT1804-8C	8 channel mini pulse & delay generator (with option 2)

Operating Information

Block diagram of the generator



Time base: This function provides a 200 MHz time base from an internal reference or an external 10 MHz to 240 MHz reference. The internal time base is available (Clock out) on SMB connector.

Trigger controller: This function provides 2 Trigger Modes,

-External Trigger Mode: In this mode, a rising edge on "Trigger Input", or "gate input", triggers all selected delay channel. On every channel trigger rate can be single or repetitive or burst or inhibited.

A Prescaler may be used to divide the Trigger Input frequency by integer value from 1 to 1 000 000 000

-Internal Trigger Mode: in this mode delay channels can be triggered from 3 frequency programmable Timers. On every channel trigger rate can be single synchronized on trigger sources (trigger input, Timers, Command) or repetitive or burst or inhibited.

The seven (7) Trigger sources that are possible for each channel are presented in a below chart.

	Trigger sources						
	Trigger input	Gate input	Timer N°1	Timer N°2	Timer N°3	Command	Inhibited
External mode	X	X					
Internal mode			X	X	X	X	X

Trigger sources

"Gate Input" allows to inhibit quickly all selected channel Outputs. This input function can be selected as a second External Trigger.

Delay Channel: They are 2 independent delay channels (or 4 or 8 in option). The delay from selected trigger source is programmable up to 100 seconds in 100 ps increments (1 ps in option).

Channel Output

Each delayed output pulse (T1 to T2 or T3 to T8) can be independently adjustable in level (1.5 V to 5 V in 10 mV steps), width (10 ns to 10 s in 5 ns steps), and polarity, and may be OR' to all other outputs. The outputs are designed to drive 50 Ω load. On "High impedance" load, output level will be twice.

In option every channel output level can be 3 V to 10 V or 15 V to 50 V or under LVDS standard (ask to the factory for mixed channel output level configuration).

Burst mode: On each Channel Output the number of pulses can be adjustable with Burst count and Burst period.

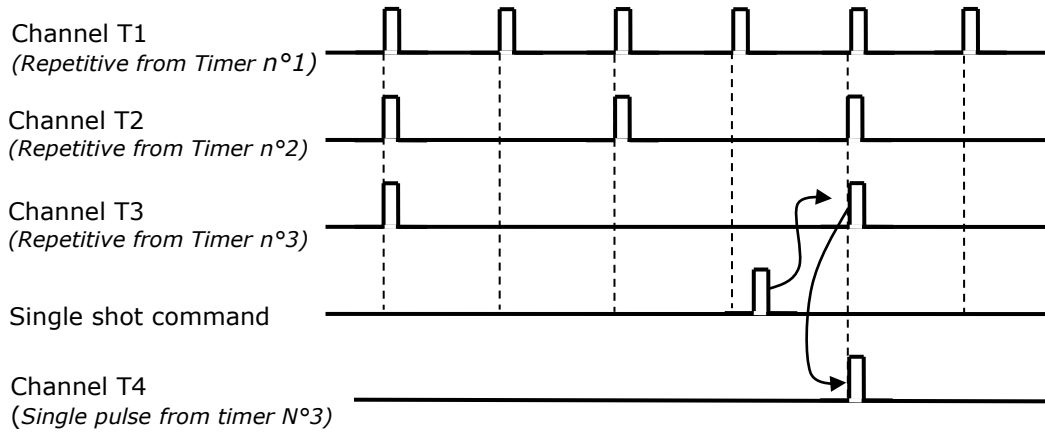
Narrow pulse mode (available with options 3 or 6): this mode uses two delay channels, one to start the output pulse, and the other one to stop the pulse. So, in this mode, the output pulse can be narrower and precisely adjusted in time.

Interface Controller: It manages internal functions and user interface. All the parameters can be remote controlled via USB to UART and Ethernet (10/100 Mb/s). A Bluetooth (v4.1) interface is available in option. All parameters' values are automatically saved.

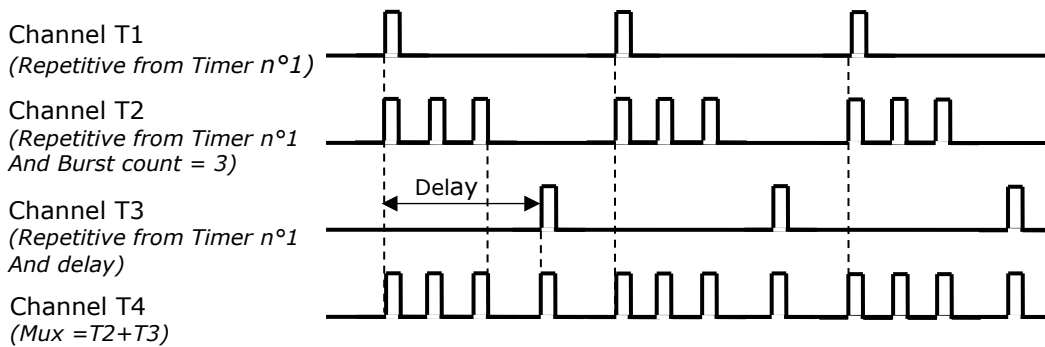
"GPIO": Four lines, input, or output, under software command allows to control other devices.

Example of channel outputs mode

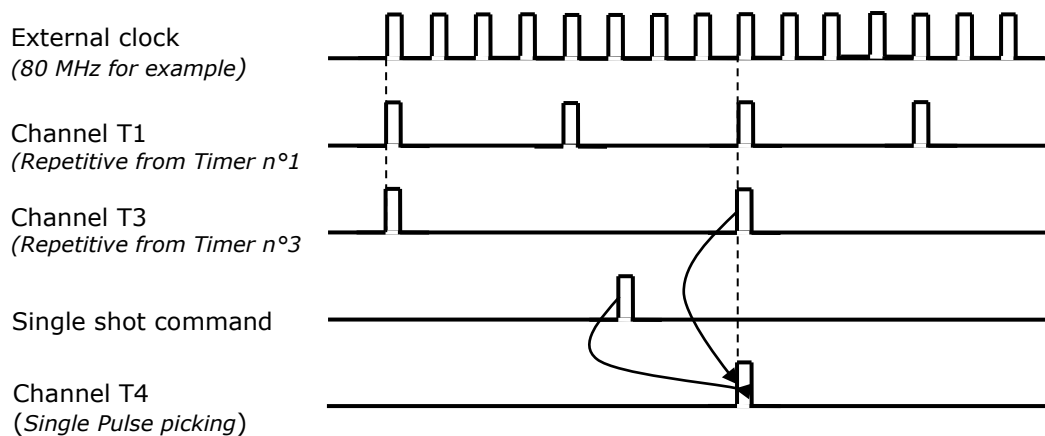
Mode repetitive and single



Mode burst and Mux



Pulse picking (Synchronized on Timer N°3)





Control and software tools

There are two ways to control the generator:

Easy remote way via Internet and control panel web pages.

Web page, from embedded Web server, provides easy method to configure settings.

- A Main menu allows to display and control
 - Trigger and clock system (trigger level, prescaler, clock input/output, trigger generators F1 or F2 or F3)
 - Delay channel (Trigger source, trigger rate, delay, amplitude / width/polarity of channel output pulse)
 - Extended delay channel settings (burst mode, gate and MUX mode)
 - "RUN" button enables the output for all delay channels.
 - "Trigger" button may be used to enable a "single trigger" synchronized with the selected trigger source
- A secondary menu selected with "parameter" button allows to change the IP address and configure specific parameters
- A another secondary menu selected with "GPIO" button allows to configure Input/output lines

The configuration information (all the settings) of the instrument is stored and saved in the GFT1804.

The web page can be opened via standard browser like Internet Explorer, Mozilla Firefox or Chrome.

After connecting a cable from the GFT1804 Ethernet port to your computer network, enter the GFT1804 IP address into your PC's browser (the IP address can be identified in User's manual). The browser will automatically open the control panel web page on your PC.

Model GFT1604 2.2.2.2 Serial Number : 107

TRIGGER and CLOCK SYSTEM

Input	Type	Prescaler	Level	Edge
Ext1	Trigger	50	1250 mV	
Ext2	Gate	1	500 mV	

External Clock: No External Clock Frequency: 80 000 000 Hz
 Clock Output: off Output Frequency: 100 000 000 Hz

Generator F1: 1 000.000 F2: 20.000 F3: 0.500 Hz

DELAY CHANNEL

	Trigger Source	Trigger Rate	Delay ps (step=100ps)	Width ns	Amplitude mV	Polarity
T1 (5V)	Generator F3	Repetitive	105 300	10	5 000	Positive
T2 (5V)	Generator F2	Repetitive	4 300	500	1 500	Negative
T3 (5V)	Generator F3	Repetitive	0	35	4 500	Positive
T4 (5V)	Generator F1	Single	1 500	100 750	3 000	Positive

EXTENDED SETUP

Lock External Power Fault Overload Trig'd 1-4

Temperature: 34.3 °C Current: 465 mA

Buttons: Parameters GPIO

Control panel web page

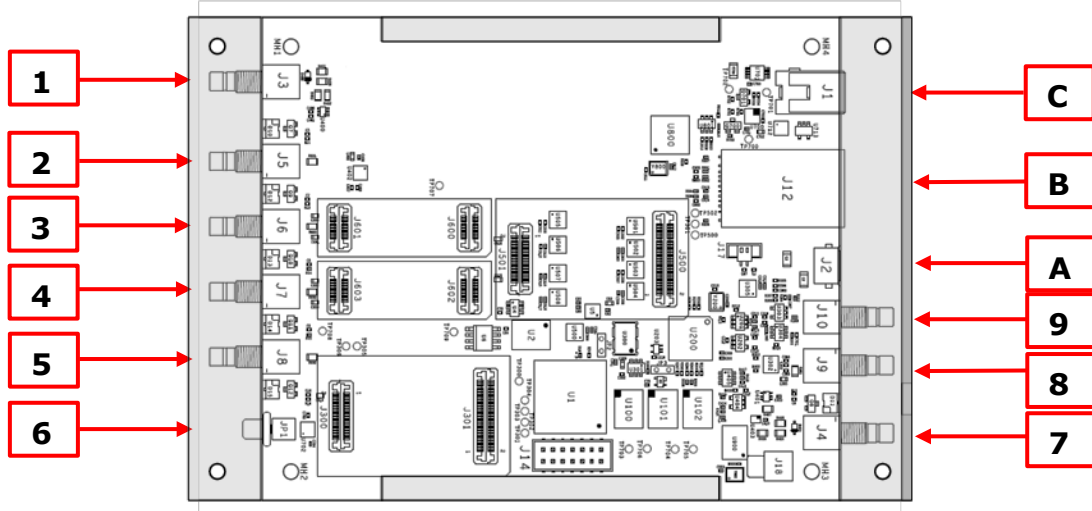
EXTENDED SETUP

	Burst Count	Burst Period (ns)	Gated	T1 +	T2 +	T3 +	T4
T1	10	35	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T2	1	30	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T3	12	25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
T4	1	50	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Extended Setup panel

General remote way via Ethernet or USB and software application (see examples in the User's manual).

Input & Output



GFT1804 Top view

Connectors, switch

• Connector	
1	Trigger input: SMB connector
2	T1 channel output: SMB connector
3	T2 channel output: SMB connector
4	T3 channel output: SMB connector
5	T4 channel output: SMB connector
• Switch	
6	Power ON/OFF and RUN/STOP triggers

• Connector	
7	Gate input: SMB connector
8	External Clock: SMB connector
9	Clock output: SMB connector
A	USB connection: micro AB connector
B	LAN connection: RJ45 connector (B-Top)
	GPIO: SMH-103 Samtec (B- Bottom)
C	+5 V DC power: Jack 2.10 mm

Pulse shaping modules

Model	Description
GFT101	Electrical to optical Pulse Converter
GFT632	15 to 70 V amplitude, <2 ns rise time into 50 Ω, Pulse Generator
GFT644	4 channel, 150 MHz, 50 Ω line Driver Module
GFT614	1 input to 4 channels, 50 Ω line driver Module
GFT300	Sub nanosecond Pulse Stretcher from pick up diode to provide GFT1804 clock reference