GFT1604

Mini Pulse & Delay Generator

Features

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

Applications

- System Laser Timing Control
- ATE Application
- Laser Pulse Piking
- Precision Pulse Application
- Instrument Triggering
- Components Test

Description

The GFT1604 Mini Pulse & Delay Generator provides 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 channel to channel jitter to 5 ps RMS.

SMB outputs deliver 1.5 V to 5 V, 1 ns rise time pulses, into 50 Ω. Pulse amplitude, polarity, width and burst count 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 GFT1604 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 inhibit quickly all selected channel Outputs. This input function can be selected as a second External Trigger.

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).

GFT1604 parameters can be remote controlled via USB to UART or Ethernet (or Bluetooth in option).

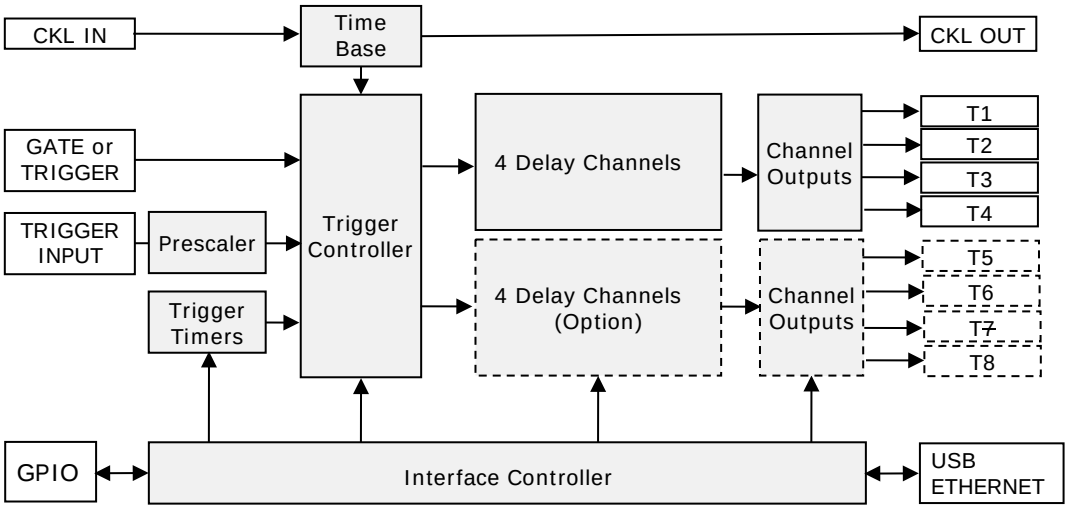
Application example:
The GFT1604 is well suited to synchronize all the device of a Picosecond Laser System with only one compact unit and one GUI. In this application the “clock input” of the delay generator receives a reference signal (80 MHz for example) from a laser oscillator via an O/E (optical to electrical converter) and the delay generator provides single or repetitive pulses (adjusted in delay, amplitude, polarity and width) synchronized on “clock input” with very low jitter. From delay generator 4 GPIO under software control allow command to low frequency device of the Laser System for security or control.

Specifications

Delay channels	
Number	4 independents (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
Accuracy	<500 ps + delay x 10^{-6}
Time base	Internal 100 MHz, ±5 ppm stability
External Trigger Mode	
Input "TRIG"	Rate single or repetitive up to 50 MHz, with prescaler, adjustable threshold, positive slope
Trigger delay	<85 ns (insertion delay)
Internal Trigger Mode	
Rate repetitive	From two Timers with frequency = 0.01 Hz to 50 MHz (in step of 5 ns)
Rate single trigger	From "Input trigger" or soft command
Channel Output pulse T1 to T4 (and T5 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 K Ω)
Rise/Fall Time	1/1 ns into 50 Ω or 2/2 ns into high impedance
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
Connector	SMB
External Clock reference	
Threshold	0 V, internal 50 Ω
Level	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
Gate or second trigger	
Input	Active high, adjustable threshold, positive slope, rate < 10 MHz
Function	Gate or second External Trigger
GPIO	
4 x GPIO	Input or output, 0 or 3V level, SMH-103-02-D Samtec connector
General	
Interface Control	USB to UART, Ethernet 10/100Mb/s, Bluetooth in option
Software tools	Free Drivers for Windows 7/10, Linux
Power consumption	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)
Weight	<1 kg
Size	108 x 58.6 x 129 mm
Options	
Option 1:	Extension to 8 channels (available in Q4 2020)
Option 2:	1 ps delay resolution, and channel to channel jitter < 5 ps, min width of 5 ns (min width of 1ns, with option 2 + 5) (available in Q1 2021)
Option 3:	(Bank of 2 channels) 3 V to 10V channel output, width= 10 ns to 10 ms, rise/fall time = 2/3 ns typ. into 50 Ω (available in Q3 2020)
Option 4:	(Bank of 2 channels) 15 V to 50 V channel output, width = 50 ns to 10 µs, rise/fall time = 3/15 ns under 50 Ω (available in Q1 2021)
Option 5:	(Bank of 2 channels) LVDS outputs 400 mV to 800 mV, width = 5 ns (1 ns, with option 2 + 5) to 1 s, rise/fall time = 0.5/0.5 ns under 50 Ω (available in Q1 2021)
Option 6:	(Bank of 2 channels) pulse output replaced by clock output (LVDS, 1 GHz max.) (available in Q1 2021)
Option 7:	Bluetooth (available in Q1 2021)
Option 8:	Case with mounting flanges
Option 9:	3" SMB to BNC cable

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.

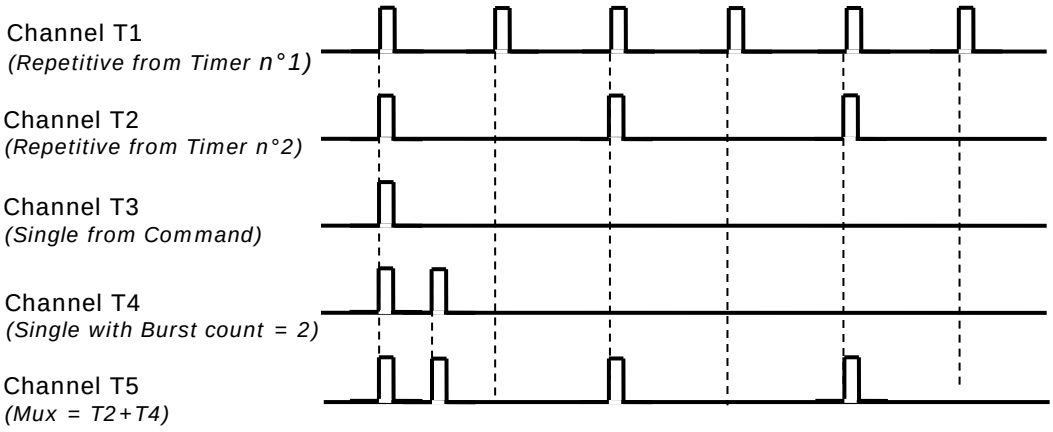
Trigger controller: This function provides 2 Trigger Modes,
-External Trigger Mode: In this mode, a rising edge on input "Trigger input" triggers all delay channel. On every channel trigger rate can be single or repetitive or inhibited.
-Internal Trigger Mode: In this mode delay channels can be triggered from 3 frequency programmable Timers. On every channel trigger rate can be single or repetitive or burst or inhibited.
"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 4 independent delay channels (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 T4 or T5 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 ORed' to all others 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 into 50 Ω or under LVDS standard (ask to the factory for mixed channel output level configuration).

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.
Four "GPIO" lines under software command allow to control other devices.

Example of channel outputs mode



Control and software tools

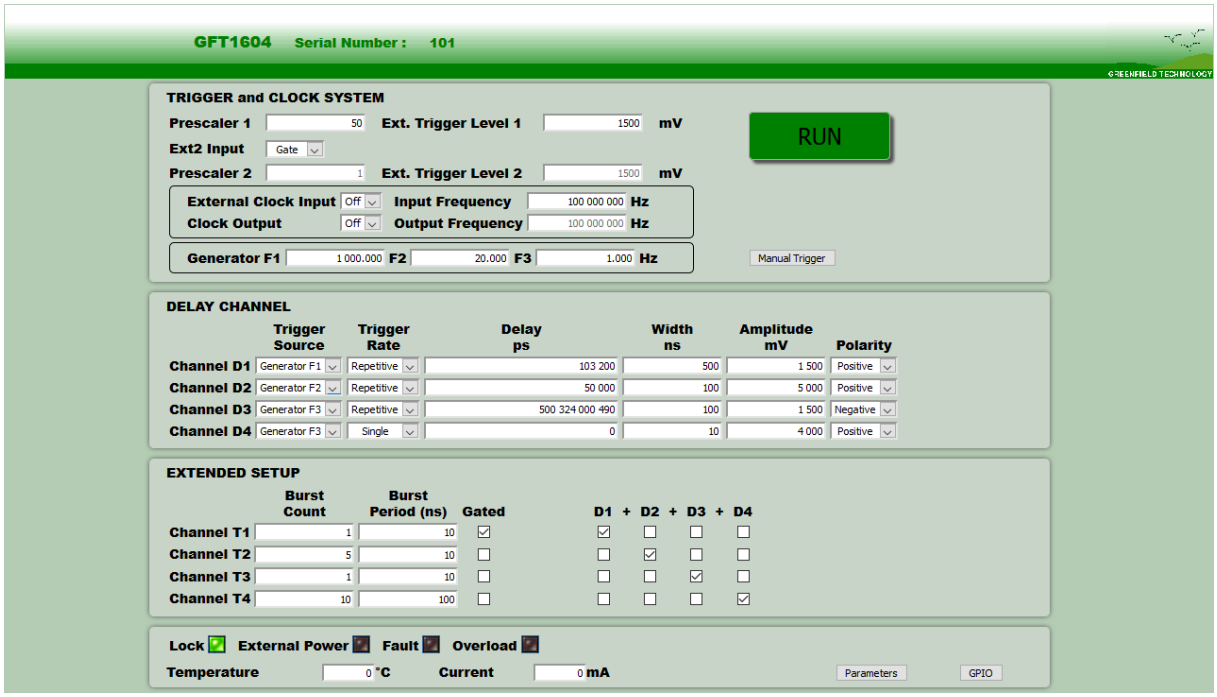
There are two ways to control the generator

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 to F3 and RUN / STOP triggers)
- Delay channel (Trigger source, trigger rate, delay, amplitude / width/polarity of channel output pulse)
- Extended delay channel settings (burst mode, gate and MUX mode)

The configuration information (all the settings) of the instrument is stored and saved in the GFT1604.

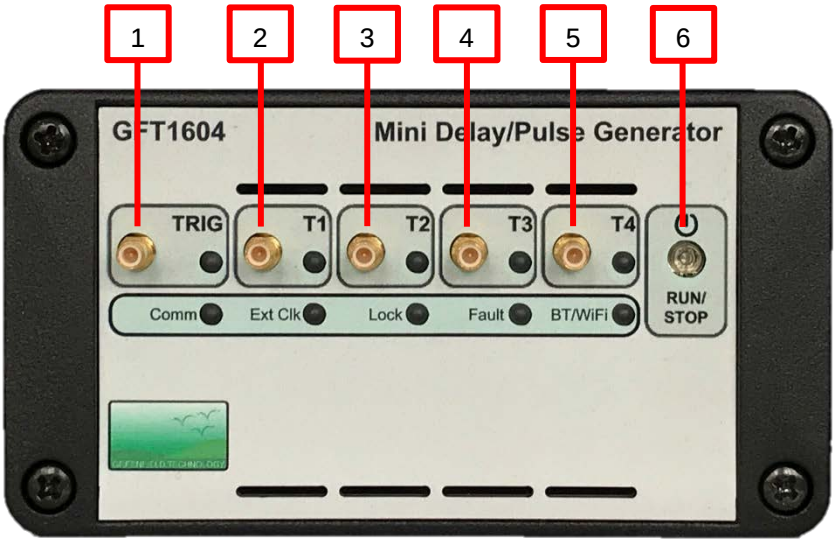
The web page can be opened via Internet Explorer, Mozilla Firefox or Chrome.
After connecting a cable from the GFT1604 Ethernet port to your computer network, enter the GFT1604 IP address into your PC's browser (the IP address can be identified in User's manual). The browser will automatically open the control panel web page on your PC.



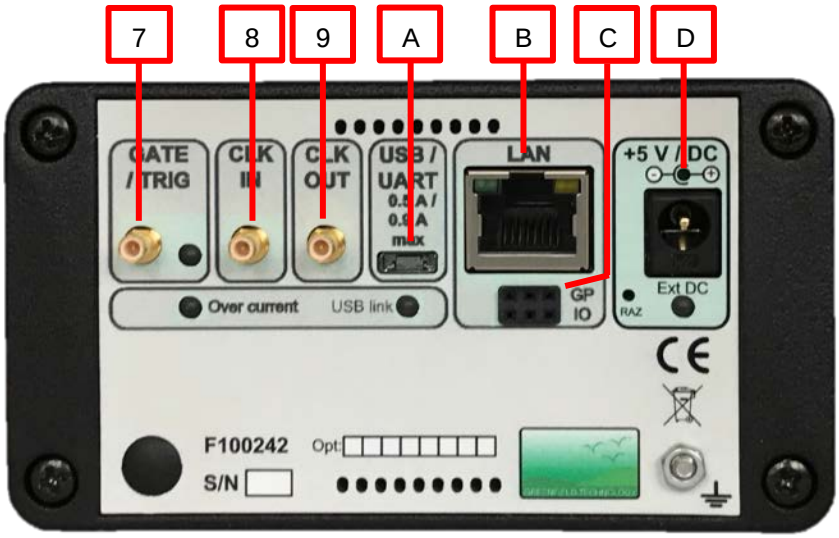
Control panel web page

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

Front and rear panel



Front panel



Rear panel

Connectors, switch

Front panel		Rear panel	
	• Connector		• Connector
1	Trigger input: SMB connector	7	Gate input: SMB connector
2	T1 channel output: SMB connector	8	Clock input: SMB connector
3	T2 channel output: SMB connector	9	Clock output: SMB connector
4	T3 channel output: SMB connector	A	USB connection: micro AB connector
5	T4 channel output: SMB connector	B	LAN connection: RJ45 connector
	• Switch	C	GPIO: SHM-103 Samtec connector
6	Power On/Off or Run/stop triggers	D	+5V DC power plug: Jack 2.10 mm

Ordering information

Generator part number
GFT1604-X-X Where “X” is option number)
Ordering example:
GFT1604-2-3 (GFT1604 with 1 ps delay resolution and 3 V to 10 V channel output amplitude)