KIKUSUI


LXI

# 50 MHz Arbitrary Waveform Generator

## The LXI interface makes easier for the test system!

**Function Generator**

# FGA5050

- **FGA5050**
- **FGA5050GC** (with GPIB)

The FGA5050 is a function generator that equips with the arbitrary waveform function. In addition to Sine waveform, Square waveform, Ramp waveform of those custom waveform generation function, the FGA5050 offers to realize high precision waveform with 1 µHz of resolution and 50 MHz of wideband frequency. The FGA5050 can be used in wide application such as "Voltage variation test for Automotive Electronic Components", "ECU false signal source", "Charge-Discharge test for the rechargeable battery", "Ripple super-impose test" and it can be used as the trigger signal for the various type of test system. Further more, three types of interface, LAN / USB / GPIB* are equipped with the FGA5050 as standard feature, it applies for automated test along with manual operation.

- Wide band frequency
  Sine waveform : 1 µHz to 50 MHz, Square waveform : 1 µHz to 25 MHz
- Sine waveform, Square waveform, Ramp waveform, Triangle waveform, Pulse waveform, Noise waveform, DC, Arbitrary waveform output
- Waveform editor application software "WAVEPATT" is included as standard
- Various modulation types
  AM, FM, PM, FSK, PWM, Frequency sweep, Burst, External Modulation Input
- 16 bits / up to 50 MHz pattern out
- 14 bits / 256 k-point, 125 MSs/s
- 10 MHz clock in and out
- Trigger Input and Trigger output (TTL compatible)
- Interface : LAN / USB / GPIB* standard

*Only available in Model FGA5050GC

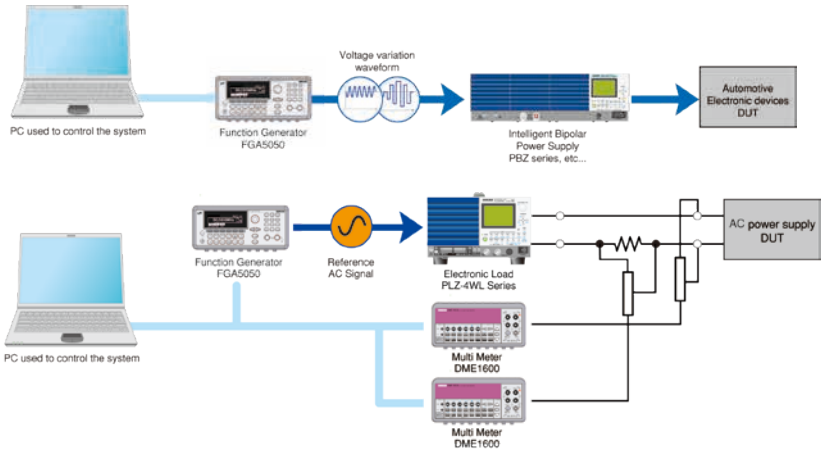
## Application

### Voltage variation test for Automotive Electronic devices

The system combined with the FGA5050 and the Bipolar power supply, it can be used as the "Signal Source" for the "Voltage variation test of the automotive electronic components" complied to the ISO standard and other manufacturer's standard.

### Measurement of the output impedance of the power supply

The system combined with the FGA5050, electronic load, and multi-meter, it can be used as the "Reference AC Signal" for the "Impedance measurement of power supply output".



## Specifications

| Waveform characteristics | | | | |
|---|---|---|---|---|
| Waveforms | Standard waveforms | Sine, square, ramp, triangle, pulse, noise, and DC | | |
| | Arbitrary waveforms | Exponential rising wave, exponential falling wave, reverse ramp wave, sinc wave, and cardiac wave (cardiac electrogram wave) | | |
| Sine waves | Frequency | 1 µHz to 50 MHz | | |
| | Amplitude flatness *1 *2 (relative to 1 kHz) | Less than 100 kHz | | 0.1 dB |
| | | Less than 5 MHz | | 0.15 dB |
| | | Less than 20 MHz | | 0.3 dB |
| | | Less than 50 MHz | | 0.5 dB |
| | Harmonic distortion *2 *3 | DC to 20 kHz | Less than 1 Vpp | -70 dBc |
| | | | 1 Vpp or more | -70 dBc |
| | | 20 kHz to 100 kHz | Less than 1 Vpp | -65 dBc |
| | | | 1 Vpp or more | -60 dBc |
| | | 100 kHz to 1 MHz | Less than 1 Vpp | -50 dBc |
| | | | 1 Vpp or more | -45 dBc |
| | | 1 MHz to 20 MHz | Less than 1 Vpp | -40 dBc |
| | | | 1 Vpp or more | -35 dBc |
| | | 20 MHz to 50 MHz | Less than 1 Vpp | -35 dBc |
| | | | 1 Vpp or more | -30 dBc |
| | Total harmonic distortion | DC to 20 kHz | 0.5 Vpp or more | 0.06 % or less |
| | Spurious *2 *4 (non-harmonic) | DC to 1 MHz | | -70 dBc |
| | | 1 MHz to 50 MHz | | -70 dBc + 6 dB/octave |
| | Phase noise (10 kHz offset) | 0.1 Vpp or more, 1 MHz or more | | Typically -115 dBc/Hz |
| Square waves | Frequency | 1 µHz to 25 MHz | | |
| | Rising, falling time | Less than 10 ns | | |
| | Overshoot | Less than 2 % | | |
| | Variable duty cycle | Less than 10 MHz | | 20 % to 80 % |
| | | Less than 25 MHz | | 40 % to 60 % |
| | Asymmetry | 50 % duty cycle | | 1 % of period + 5 ns |
| | Jitter (RMS) | 0.1 Vpp or more, 1 MHz or more | | 200 ps |
| Ramp and triangle waves | Frequency | 1 µHz to 200 kHz | | |
| | Linearity | Less than 0.1 % of the peak output | | |
| | Symmetry | 0.0 % to 100.0 % | | |
| Pulse wave | Frequency | 500 µHz to 10 MHz | | |
| | Pulse width | 20 ns minimum | | |
| | | Resolution (period ≤ 10 s) | | 10 ns |
| | Variable edge time | Less than 10 ns to 100 ns | | |
| | Overshoot | Less than 2 % | | |
| | Jitter (RMS) | 0.1 Vpp or more, 50 kHz or more | | 200 ps |
| Noise waves | Bandwidth | Typically 20 MHz | | |
| Arbitrary waveforms | Frequency | 1 µHz to 10 MHz | | |
| | Wavelength | 2 to 256 K points | | |
| | Resolution | 14 bits (including the sign) | | |
| | Sampling rate | 125 megasamples per second | | |
| | Minimum rising or falling time | Typically 30 ns | | |
| | Linearity | Less than 0.1 % of the peak output | | |
| | Settling time | Up to 0.5 % of the final value | | Less than 250 ns |
| | Jitter (RMS) | 6 ns + 30 ppm | | |
| | Non-volatile memory | 4 waveforms, 256 K points per waveform | | |
| **Common waveform characteristics** | | | | |
| Frequency | Resolution | 1 µHz | | |
| Amplitude | Range | 50 Ω termination | | 10 mVpp to 10 Vpp |
| | | No termination | | 20 mVpp to 20 Vpp |
| | Accuracy *2 *5 | At 1 kHz | | ±1 % of setting ± 1 mVpp |
| | Units | Vpp, Vrms, and dBm | | |
| | Resolution | 4 digits | | |
| DC offset | Range (peak AC + DC) | 50 Ω termination | | ±5 V |
| | | No termination | | ±10 V |
| | Accuracy *2 *5 | ±2 % of offset setting ±0.5 % of amplitude setting ±2 mV | | |
| | Resolution | 4 digits | | |
| Main Output | Impedance | Typically 50 Ω | | |
| | Isolation | From earth | | Up to 42 Vpk |
| | Protection | Short-circuit protection, overload automatically stops output | | |
| Internal frequency reference | Accuracy *5 | 90 days | | ±10 ppm |
| | | 1 year | | ±20 ppm |
| External frequency reference input | Lock range | 10 MHz ± 500 Hz | | |
| | Level | 100 mVpp to 5 Vpp | | |
| | Impedance | AC coupled | | Typically 1 kΩ |
| | Lock time | Less than 2 s | | |
| Frequency reference output | Lock range | 10 MHz | | |
| | Level | Typically 632 mVpp (0 dBm) | | |
| | Impedance | AC coupled | | Typically 50 Ω |
| Phase offset | Range | -360 ° to +360 ° | | |
| | Resolution | 0.001 ° | | |
| | Accuracy | 8 ns | | |

*1 Add 1/10th to the output amplitude and DC offset specifications per 1 °C for operations out-side the range of 18 °C to 28 °C.
*2 When autoranging is enabled
*3 DC offset set to 0 V
*4 Spurious output at low amplitudes is typically -75 dBm.
*5 Add 1 ppm/1 °C (average) for operations outside the range of 18 °C to 28 °C.
*6 FSK modulation uses the Trig In/Out, FSK/Burst connector (the maximum frequency is 1 MHz).
*7 Sine and square waveforms above 10 MHz are can only be used with an infinite burst count.

| Modulation | | |
|---|---|---|
| Modulation | AM, FM, PM, FSK, PWM, sweep, and burst | |
| AM | Carrier wave | Sine, square, ramp, or arbitrary |
| | Modulation signal | Internal or external |
| | Internal modulation signal | Sine, square, ramp, triangle, noise, or arbitrary |
| | Internal modulation signal frequency range | 2 mHz to 20 kHz |
| | Modulation depth | 0.0 % to 120.0 % |
| FM | Carrier wave | Sine, square, ramp, or arbitrary |
| | Modulation signal | Internal or external |
| | Internal modulation signal | Sine, square, ramp, triangle, noise, or arbitrary |
| | Internal modulation signal frequency range | 2 mHz to 20 kHz |
| | Deviation | DC to 25 MHz |
| PM | Carrier wave | Sine, square, ramp, or arbitrary |
| | Modulation signal | Internal or external |
| | Internal modulation signal | Sine, square, ramp, triangle, noise, or arbitrary |
| | Internal modulation signal frequency range | 2 mHz to 20 kHz |
| | Deviation | 0.0 ° to 360 ° |
| PWM | Carrier wave | Pulse wave |
| | Modulation signal | Internal or external |
| | Internal modulation signal | Sine, square, ramp, triangle, noise, or arbitrary |
| | Internal modulation signal frequency range | 2 mHz to 20 kHz |
| | Deviation | 0 % to 100 % of the pulse width |
| FSK | Carrier wave | Sine, square, ramp, or arbitrary |
| | Modulation signal | Internal or external |
| | Internal modulation signal | Square wave signal with a 50 % duty cycle |
| | Internal modulation signal frequency range | 2 mHz to 100 kHz |
| External Modulation Input *6 | Input voltage range | ±5 V full scale |
| | Input resistance | Typically 8.7 kΩ |
| | Bandwidth | DC to 20 kHz |
| Sweep | Waveforms | Sine, square, ramp, or arbitrary |
| | Method | Linear and logarithmic |
| | Direction | Up, down |
| | Sweep time | 1 ms to 500 s |
| | Trigger | Internal, external, or manual |
| | Marker | The falling edge of the sync output signal |
| Burst | Waveforms *7 | Sine, square, ramp, triangle, noise, or arbitrary |
| | Method | Internal or external |
| | Starting and ending phases | -360 ° to +360 ° |
| | Internal period | 1 µs to 500 s |
| | Gate signal | External |
| | Trigger signal | Internal, external, or manual |
| Trigger input | Input level | TTL compatible |
| | Slope | Select rising or falling |
| | Pulse width | Greater than 100 ns |
| | Impedance | Greater than 10 kΩ (DC coupling) |
| | Latency | Less than 500 ns |
| Trigger output | Output Level | TTL equivalent (load of 1 kΩ or more) |
| | Pulse width | Greater than 400 ns |
| | Impedance | Typically 50 Ω |
| | Maximum speed | 1 MHz |
| | Fan-out | Up to 4 FGA5050s |
| **Pattern Mode Characteristic** | | |
| Output | Maximum clock speed | 50 MHz |
| | Output Level | TTL equivalent (load of 2 kΩ or more) |
| | Output Impedance | Typically 110 Ω |
| | Pattern Length | 2 to 256 K points |

| General | |
|---|---|
| Input voltage range | Single-phase 100 Vac to 240 Vac, 50 Hz to 60 Hz<br>Single-phase 100 Vac to 120 Vac, 400 Hz |
| Input frequency range | 50 Hz/60 Hz, 400 Hz |
| Power consumption | 80 VA max |
| Operating temperature range | 0 °C to 55 °C (80 %rh or less, no condensation) |
| Storage temperature range | -30 °C to 70 °C (80 %rh or less, no condensation) |
| Operating altitude | Up to 2000 m |
| Dimensions (mm)/ Weight | 253W × 107H × 381D mm (9.96W × 4.21H × 15.0D inch)/ Approx. 4 kg(8.8 lb) |
| Interfaces | LAN, USB, GPIB (factory option) |
| Accessories | "Power cord" 1 pc. (with three-pronged plug), "Pattern generator cable" 1pc., "USB cable" 1pc., "CD-R"* 1pc., "Packing list,safety precautions" 1 English, 1 Japanese, "China RoHS disclosure report" 1pc. |
| Electromagnetic compatibility (EMC) | Complies with the requirements of the following directive and standard.<br>EMC Directive 2014/30/EU, EN 61326-1(Class A), EN 55011(Class A, Group 1), EN 61000-3-2, EN 61000-3-3 |
| Safety | Complies with the requirements of the following directive and standard.<br>Low Voltage Directive 2014/35/EU, EN 61010-1(Class I, Pollution degree 2) |

*including the "Operation Manual" and "Communication Interface Manual".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