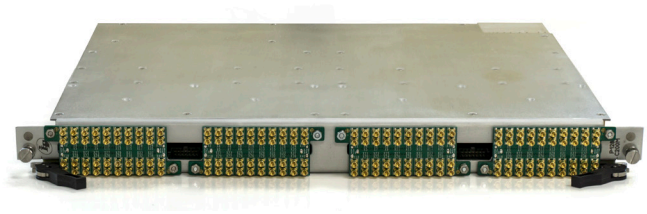
Digital PIN electronics module **P128C200M**

- High number of measurement channels;
- High values of the functional control frequency, data reception/transmission speed, and memory capacity of the test generator;
- Support for syncing a group of modules in the AXIe-1 standard;
- PCIe×4 Gen2 management;
- Ability to work in 4 frequency domains;
- Universal and algorithmic modes of test generators;
- The multiplication for memory resources to scan mode;



Digital module P128C200M, the first Russian PIN electronics device implemented in the open standard AXIe-1.

The P128C200M module provides measurement and control of integrated circuit parameters using parametric measurement methods, as well as functional and algorithmic control. The module implements a synchronization system that ensures the operability of a group of modules when they are installed in the AXIe-1 chassis.

Parametric measurement methods are implemented on the basis of special PPMU meters that provide generation and measurement of parameters of DC electrical signals. Each channel of the module contains its own independent PPMU, which is why parallel (simultaneous) control of DC parameters is provided on all channels of the module.

For parametric measurements on the signal pins of the chips, the module provide

- formation of a programmable constant voltage value and measurement of constant voltage and DC power (FVMV, FVMI modes);
- formation of a programmable value of DC power in 5 ranges and measurement of DC voltage and DC power (FIMV, FIMI modes);
- measurement of DC voltage in the disconnected state (FNMV mode);
- limiting the DC voltage value by two independent programmable levels, in FIMI and FIMV modes;
- limitation of the DC power value, by two independent programmable levels, in each current range, in FVMV, FVMI modes

Functional control methods are implemented on the basis of test generators and PIN-electronics devices that provide formation and control of a vector sequence of pulse signals, as well as measurement of dynamic parameters of chips. Test generators and PIN electronics devices are programmed independently for each channel and can operate in different frequency domains (up to 4 domains per module) and test sequence generation modes (universal and algorithmic modes). Additionally, the test generator provides a scanning mode and increases (multiplies) the maximum length of the vector sequence by redistributing the test memory between channels.

For functional monitoring and measurement of dynamic parameters on the signal pins of the chips, the module provides:

- generation by channel drivers of a vector sequence of pulse signals with programmable voltage levels (lower, middle, upper, and high-voltage levels), the steepness of the front and cutoff of the signal, and timestamps for switching between voltage levels (timestamps D0, D1, D2).
- channel Comparators monitor the state of signals in vectors by comparing the voltage levels of signals in vectors with the programmable voltage levels of Comparators at specified time points (timestamps R0, R1);
- programmable connection for signal monitoring and disconnection for dynamic active load signal generation, with programmable levels of positive current, negative current, and switching voltage;
- programmable connection during signal monitoring and disconnection during signal generation of dynamic voltage limiters on channels with programmable upper and lower voltage levels;

Modular design in accordance with the AXIe-1 standard, a high number of measurement channels and their precision characteristics allow you to measure and control parameters of a sufficiently large area of integrated circuits based on a single module in the AXIe-1 crate. The module synchronization system, based on the signals and functions of the AXIe-1 standard, allows you to create automatic test equipment systems based on a group of modules and air-cooled, for measuring and monitoring chips with a large number of signal pins. The unified software allows for automated diagnostics and calibration of all device parameters, as well as ensures that all measurement and parameter control processes are performed when testing integrated circuits.

The listed functionality and characteristics of the device are superior to domestic analogues and are comparable to foreign products.

Specifications

Number of independent measuring channels: 128	Number of high-voltage channels: 48
Number of frequency domains: 4	Maximum frequency of functional monitoring: 250 MHz
Maximum data rate: 500 Mbit/s	Vector memory capacity per channel: 128M
Response/error memory per channel: 128M	The maximum amount of memory vectors in scan mode: 4G
Discreteness of setting timestamps: 5 ps	Limits of permissible absolute error of the input differential formation time (IEPA): ±125 ps
Limits of permissible absolute error of the output differential monitoring time (OEPA): ±125 ps	Limits of permissible absolute error of the time of formation of input differences and control of output differences (OTA): ±275 ps
PPMU features	
Voltage generation and measurement range: -1.5 V ... +6.5 V	Limits of permissible absolute error of voltage generation and measurement: (±(0.002*U+3) – 2.1*I) mV

Limits of permissible absolute error of current generation and measurement: • ±(0.002·I+5) nA, in the range of ±2 µA, • ±(0.002·I+10) nA, in the range of ±20 µA, • ±(0,002·I+100) in the range ±200 µA • ±(0,002·I+1) µa, ±2 µA • ±(0,002·I+25) µA, ±50 µA	Limits of permissible absolute error of current limitation: • ±(0,005·I+20) nA, in the range of ±2,2 µA • ±(0,005·I+200) nA, in the range of ±22 µA • ±(0,005·I+2) µA ±220 µA • ±(0,005·I+20) µA ±2.2 µA, • ±(0,005·I+500) µA range ±55 µA
Upper and lower limit voltage range: -1.5 V ... +6.5 V	Limits of permissible absolute error of the limiting voltage: ±(0.003*U+25) mV
Characteristics of the driver channels	
The range of voltage levels of the driver: -1,5 V … +6,5 V	Limits of permissible absolute error in forming driver voltage levels: ±(0.002·U+10) mV
Absolute value of DC power at the driver output: at least 60 mA	Nominal value and limits of permissible absolute error of the driver output resistance: (50 ± 2) Ohm
Duration of the driver signal edge (cut-off): • 400 PS, with a signal span of 0.5 V, • 600 PS, with a signal span of 1 V, • 800 PS, with a signal span of 3 V, • 1150 PS, with a signal span of 5 V, • 2050 PS, with a signal span of 8 V.	Minimum driver signal pulse duration: • 1.0 NS, with a signal span of 0.5 V, • 1.1 NS, with a signal span of 1 V, • 1.5 NS, with a signal span of 3 V, • 2.2 NS, with a signal span of 5 V, • 3.8 NS, with a signal span of 8 V.
Programming the steepness of the front (cut) of the signal: from 25 % to 100 %	Driver high-voltage level range: 0 V ... +13 V
Limits of permissible absolute error in forming the high-voltage driver voltage level: ±(0.002·U+35) mV	
Characteristics of the Comparators of channels	
Range of comparator voltage levels: -1.5 V ... +6.5 V	Limits of permissible absolute error in the formation of comparator voltage levels: ±(0.002·U+15) mV
Minimum duration of the signal pulse when monitoring by comparators: no more than 0.75 ns	
Channel active load characteristics	
Range of incoming and outgoing active load current: 0 mA ... 20 mA	Limits of permissible absolute error in forming the incoming and outgoing current of the active load: ±(0.002·I+50) mkA
Active load switching voltage generation range: -1.5 V ... +6.5 V	Limits of permissible absolute error of forming the switching voltage of the active load: ±(0.003·U+30) mV
Characteristics of the voltage limiters of the channels	
Limit voltage range: -2.2 V ... +7.2 V	Limits of permissible absolute error of limiting voltages: ±(0.003·U+30) mV