



QT8200

Mixed Signal In-Circuit Functional Tester



APPLICATIONS

PCB Diagnostics and Repair using In-Circuit Functional Test of
Highspeed Devices, Microprocessors and Controllers

Production Testing of PCB Assemblies / Electronic Modules

Inward Goods Inspection (IGI) for Digital/Analog/Mixed Signal ICs

Whole Board testing through card edge for plug-in type modules

Complete Repair Station for Third Party Maintenance

Production test of Flex Cable Assemblies for Hard Disk /Displays/Cameras

Innovative techniques

Qmax, a global leader in Automated Test solutions, designs, develops and manufactures a wide range of test equipment for PCB and semicon test industry.

Setting standards in In-circuit Functional PCB test and diagnostic systems, the high quality **Qmax** testers with a wide range of functions, assure improved fault coverage of almost any type of boards. The highly sophisticated, sequential hardware architecture, blended with the powerful Windows-based software make **Qmax** testers unique in the automated test equipment segment.

Qmax QT8200 is an extremely powerful, PC-based fault finding system, capable of locating faults on a wide range of electronic PCBs and equipment. It is the fastest In-Circuit tester available for service & repair department, production test and for third party maintenance.

Qmax testers are used by several companies across the world, including Defence establishments in eight countries.

Qmax uses a host of innovative techniques including the True Power-On Analog In-Circuit Functional test, ESD test, Super VI, Power-Off Circuit Tracing test and

Features

In-Circuit Functional testing of digital, analog and mixed signal Mixed Logic devices

Actual test speed on the pin of DUT upto 8 MHz (125 nano seconds)

High current rating and five voltage output options for the BUT with latest SMPS module (450 watts)

Qmax Fault Simulation Validated Vast Device Library of 21,200⁺ western ICs with optional Russian library of 1500⁺ ICs.


Windows-based Visual Work Station and TestDirector software

Auto guarding guide using trace links wizard

QSM VI – a unique analytical tool to troubleshoot faults on Hybrids/Custom ICs as well as ESD damaged devices

Powerful IDDE software to further expand the device library
Optional : Fault Simulation Module

- RCV measurement
- Frequency measurement upto 130 MHz
- 3 channel Digital Oscilloscope



General faults in PCBs and the ability of Qmax testers to look 'Inward' and 'Outward'

In general, faults in PCBs are classified into two basic categories; failures due to components (faulty ICs, shorted diodes or open resistors) and mechanical faults (dry soldering, soldering splashes and broken tracks). The ratio of the failures varies according to the usage of the boards.

A newly assembled board/badly reworked board is likely to have mechanical defects whereas a board which has been reliably working for some time may have components failure. A rigorous test of an IC is of no use, if the fault is a broken/open track leading to an IC pin. In such a test, the IC may pass but the board doesn't work. Similarly, if there is an internal fault, continuity test of all the tracks may be successful but the board still doesn't work. Hence, it is imperative that an effective trouble shooting/ diagnostic system understands the type of fault before locating the same.

Qmax testers have the ability to analyse 'Inward' to test the components as well as to look 'Outward' to check the connection to the surrounding circuitry.

the Powerful Clock Terminator test avoids False Alarm and ensures highest possible fault coverage on a wide range of boards.

Advantages

Effective troubleshooting even without circuit diagram or known good board

Enables accurate testing of High Speed Devices like 'F series', 'ACT series', micro processors and controllers which require a minimum of 4 MHz clock

Helps to test bigger boards which require higher current rating

Easy and rapid testing of large number of boards without having to spend time to develop new library

Most user-friendly, comprehensive results on a single screen

Helps in easy troubleshooting of CPU/BUS oriented boards

Ensures enhanced fault coverage

Enables user to add new test programs to the device library and validate it with Fault Simulator

Handy tools for effective measurement

User segments

- Inhouse maintenance wings of PSUs
- Electronic manufacturing units for Board recovery and Production line testing
- Industries in Automobile, Textiles, Engineering, Steel, Cement sectors for CNC, PLC, electronic PCBs troubleshooting
- Hi-tech atomic/space labs and R&D labs for maintenance of sophisticated instrumentation/equipment
- Hospitals for inhouse maintenance of Biomedical equipment
- Electricity generating authorities for maintenance of Control and Instrumentation
- TPM companies
- Central Maintenance Centre of Universities, technical educational institutions, Engineering Colleges and Polytechnics

Highlights



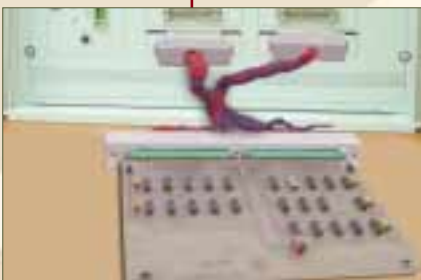
As a production tester for Flex Cables



As a production tester for Modules



As a clip-on tester for Russian PCBs



As a Card-edge Tester for Aircraft PCBs

- High performance, Reliable tester with programmable test speed & test voltages
- Vast Functional Test Library with 20,200+ devices including Digital & Analog ICs
- Library support for Western & Russian (1,500+) technology IC Chips
- Clip-on Analog In-Circuit Functional IC test including Mixed Signal Devices, ICs
- In-Circuit Functional Test for Digital, Analog & Mixed Logic Devices
- ESD test
- TTL, CMOS
- ECL, EIA, LSI, 3V3
- Linear, 12V, Comparator, Regulator
- PECL, Tiny Logic, DTL
- LSIs including processors, controllers and peripheral ICs
- ADC & DAC
- In built Simulator for In-Circuit compensation
- Datalogger facility for device under test
- Dual trace facility for probes and clips
- Auto Guarding
- Automated Clock termination feature for clock sensitive devices
- 3 channel Digital scope facility
- Logic analyzer waveform display for failure confirmation
- Built in Signal generator
- Device data dictionary
- IC Identifier
- Cluster Testing
- Graphical test program generator for Digital, Analog, Mixed signal devices.
- Mixed logic testing through dual palettes
- Open/Short Test
- Board test Programming facility with conditional jumps on pass/fail
- In-Circuit parameter prompt for device failure confirmation
- In built R,C,V & F measurement capability
- Auto/ Manual channel mapping facility for board functional test through card edge/fixtures
- Built in self-diagnostic facility for maintenance
- Modular system design for future upgradation
- Powerful Sequencer based hardware architecture
- Automatic internal pull-up/down for open collector and open emitter devices
- Board Learn/Compare mode results in increased board recovery rate
- Circuit tracing facility between any family/components through clips & probes
- Circuit Tracer software to create net lists for schematic generation/ reverse engineering
- IDDE software for easy test program generation.

In-Circuit Digital Functional Testing



QT8200 can test any Digital device in in-circuit for its functionality using library defined test patterns. The ICFT mode allows interactive testing of the individual devices, as well as wholeboard, comprising various devices. For testing a device in-circuit, the DUT is tested under actual in-circuit conditions, as it is present in the board. In this mode, the system automatically compensates the drive pattern according to the connections of the device.

Clip-On In-Circuit Analog Functional Testing



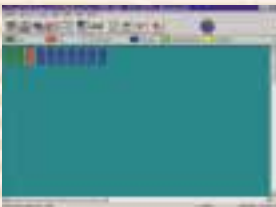
QT8200 can perform an in-circuit clip-on test for analog devices. Using its three built-in true analog channels, QT8200 drives true analog patterns to the input pins and senses the analog voltage at the output pin to give a clear Pass/Fail message. User needs to only clip-on & type in the part number of the device to be tested. QT8200 has a powerful evaluation engine to test linear devices in-circuit, without the need to learn from a known good board.

In-Circuit Compensation with Qmax Simulator

While testing devices in-circuit, QT8200 employs the auto-compensation technique. When any of the inputs are shorted together or connected to the power pins, the drive pattern or Test Vector is modified on the Fly depending upon the In-Circuit links of the device under test. The Qmax simulator simulates the output response on the new modified test vector. This is essential to avoid any clash between the pin drivers driving these pins with different logic levels at the same time.



Board Learn & Board Test Modes



While creating a new board under the Board Learn mode, QT8200 provides the facility to create a visual layout of the board on the screen using the Board View mode. This feature enables the user to

position the devices on the screen as seen in the actual board being learnt/tested. In this window, the devices can be rotated left/right, dragged and positioned anywhere on the screen.



In the Board Test mode, when a device fails, the user is given the option to set the status of each device to 'Failed' or 'Suspected' or 'Manually Passed'. Based on the suggestion, the device is marked accordingly. The results of the board are stored and can be opened any time.

- Pass -> **Green**, Fail -> **Red**
- Suspected -> **Cyan**, Untested -> **Blue**
- Manually Passed -> **Light green**
- Unlearnt -> **Yellow**

QSM VI an advanced tool for failure analysis

QSM VI multiple screen displays waveforms of upto eight pins simultaneously, showing pin failures with reference to the other pins.



Deviation and Occurrence failure analysis tool is a unique feature of Qmax systems.

Deviation failure analysis indicates how badly a pin deviates from that of a known good signature. Occurrence failure analysis indicates frequencies of failures of a pin with reference to all the other pins. The combination of these two reports provides complete information as to the nature of the failed components or ICs.

QSM VI is very effective in detecting failures on custom ICs and components. It is used by IC manufacturers in their Failure Analysis department in Production line, as stuffed PCB Recovery System and to complement the ICFT in normal PCB repair. QSM VI helps detect ESD induced failures.

Auto Guarding using Trace Links Wizard

While testing a BUS device such as Tri-state / bi-directional / O.C. / O.E. device, it is required to guard the device under test by disabling other BUS devices present in the BUT which are on the same BUS. QT8200 has auto guarding facility which lists the IC and the pins of those ICs which may need to be guarded. Trace Links Wizard makes autoguard list correction much simpler.



Oscilloscope mode



*In-built 3 channel
Digital Oscilloscope option*

Specifications

Digital Test Capability

No of pins/channels	:	Basic 48 channels, expandable to 96 in steps of 16 channels, Desk Top Version.
	:	Further expandable with Mux option.
Sink/source	:	650mA per pin/ch sink/source capacity as per IDS-0053/1
RAM behind Pin/Channel	:	8K x 4 bits RAM behind each pin/channel
Pattern Rate	:	8MHz
Test Rate	:	Programmable from 250Hz to 8MHz.
Drive Speed	:	8 MHz Data rate or 4 MHz Clock rate max.
Loops & Conditional Loops	:	32,000 Iterations.
CRC Test	:	Real Data compared bit by bit at all locations.
Drive State	:	Hi, Low and Tristate Hybrid pin drivers detachable by user.
Driver High	:	0 to +10V Programmable in steps of 40mV
Driver Low	:	0 to -10V Programmable in steps of 40mV.
Sense High	:	+/-10V, in steps of 80mV
Sense Low	:	+/-10V, in steps of 80mV
Sensor Threshold	:	Dual
Terminator	:	Programmable 100K to 50 E pull -up/Down. Voltage programmable from +/- 13V.
Guard / Flying channels	:	8 channels programmable. Expandable upto 16 channels
No.of Palettes	:	2 sets of Drive levels and threshold levels
Functional Library	:	TTL, +5V & +12V CMOS, ECL, EIA, LSI, Linear devices; Mixed signal device, + 3.3 volt logic device, user upgradable, >21,200 devices. Optional library support of over 1500 Russian devices.

S/W Features & Functions

Features & Functions	:	<ul style="list-style-type: none">• True Digital/Analog Device power-on In-circuit functional IC test, In-circuit Unknown Device Identify• Loop Test, Board Learn/Compare Test, In-circuit Impedance/Resistance, Capacitance and Voltage Measurement• Automatic Circuit Compensation; Automatic pull-up/down for open collector and ECL ICs• Logic Analyzer display For failure analysis• 3 channels digital scope display, Multiple Test library• Interactive QSM-VI Signature Technique for general purpose PCB repair• Clear Pass/Fail indication for ease of use• On-line Design Rule Checker
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- Circuit Tracer (Option)
- IDDE for test program generation (Option)
- On-Line help function

Operating System : QT8200 Test and Diagnostic Software runs under Windows 95/98/ME.

Failure Data Display : Logic Timing Diagram/Waveform / clip status/Message Window (All four windows on single screen)

BUT Power supply : Software controlled, auto on/off BUT power supply with 5 different voltage options of +5V with a max. of 25 Amps; -5V with a max. of 25 Amps; +12V with a max. of 13 Amps; -12V with a max. of 13Amps; 3.3V with a max. of 25 Amps; subject to a max. output of 450W.

Analog Test Capability

Analog Test Methodology : Clip-on Analog Functional test

Analog Test Frequency : 4 MHz Maximum / 0.03125 Hz minimum.

No of Pins/Channels : Basic 3 channels (expandable to 6 channels) with independent drive, receive and reference for each channel, which can be multiplexed to any of the 48/96 test channels available

DC Voltage : +/- 13 V, in steps of 7mV

Drive output Current : 250mA per pin / ch.

Max Input/output voltage : upto 26V

Pulse Width : 125 nanoseconds to 4 milli seconds.

Programmable Load : 50 Ohms to 100K ohms in 5 steps

DC stimulus : 8, programmable

Resolution : 12 bit ADC/DAC for each channel.

Drive Pattern : User definable and standard waveform include sine, ramp, triangle, square etc or any DC voltage

RAM behind pin : 8K X 24 bit RAM behind each pin/channel.

Amplitude : 0.1V to 13V (Max 26 Vpp, Min Vpp 0.2)

Drive Source Impedance : Programmable in 5 steps

Drive current/voltage : +/- 250mA maximum / +/- 13 volt per Channel.

Composite Voltage : Programmable like a function generator

AC Stimulus & Response : Three Channels

Frequency : 0.03125 Hz to 4 MHz

Offset Voltage : +/- 13V DC

A.C Voltage : 26V Peak-to-Peak

Composite Voltage : Peak AC Components plus DC components

QSM and VI Trace

Test Method : Qmax Signature Method or QSM and Standard VI Trace as universal test technique

Drive pattern : Sine Wave at

0.6V	High @ 6mA	Med @ 1.5mA	Low @ 0.3mA
1.0V	High @ 10mA	Med @ 2.5mA	Low @ 0.5 mA
2.5V	High @ 25mA	Med @ 6.25mA	Low @ 1.25mA
8.0V	High @ 20mA	Med @ 4mA	Low @ 0.4mA
13V	High @ 6.5mA	Med @ 0.65mA	Low @ 0.065mA

Drive Frequency : 40 Hz., 312 Hz., 2.5 KHz

Functions : Test Interpretation 1. Comparison (Pass/Fail) Modes: Linear/Non-Linear 2. Nodewise Percentage error 3. Dual Probe -Direct on-line "live" comparison mode; Configurable for use with Test fixture; able to detect any illegal shorts/ open between any pins/nodes; Deviation and Occurrences failure report for effective failure analysis.

Additional Features

Clock Pin Termination

Terminating voltage within +/-13V

Programmable resistor range: 50 Ohms, 200 Ohms, 1K, 10K and 100K.

Multimeter

Measurement Range:

Resistance : 10 Ohms to 1 M Ohms

Capacitance : 200 pF to 10000 µF

Voltage : +/- 13V

Frequency : Up to 130 MHz

Digital Oscilloscope

No. of channels : 3 (Single or multiple trace)

Resolution : 12 bit resolution

Amplitude : 0 to 13 V (in 5 Ranges)

Time base : 160 ms to 5 µsec (40 samples per time base division)

Trigger : Auto, normal, single, positive or negative

Input Impedence : 50 Ohms to >5 MOhms (50 Ohms, 200 Ohms, 1K, 10K, 100K and Open)

Sampling Rate : 8 MHz to 250 Hz (125 nsec to 4 msec)

Memory : 8K memory per channel.

ESD Damage Test

Drive Frequency : 40 Hz, 312 Hz, 2.5 KHz.

Drive Voltage : 0.6 Min to 13V Max

Drive Current : 0.065mA min @ 13V to 25 mA max@ 2.5V

General

Power Requirement : Auto-switchable with short-circuit protection. UI, VDE, CSA, BABT, CE MARK approved power supply unit. Equipment case is earthed.

Physical Dimension : 560mm (W) X 540mm (D) X 310mm (H); Rittal, RiCase 6 U Cabinet

Weight : 30 Kg. (net)

Standard Configuration : Basic System QT8200 - 4848/3 comes with 48 channels digital; 48 QSM VI channels and 3 analog channels. QT8200 interfaced to a host computer (PC/AT) via a custom interface card and cable. Optional USB Interface.

Manufactured at
ISO Registered Facility



– where standards are set; not matched.



Qmax reserves the right to change system specifications without prior notice; Qmax is the registered trademark of Qmax Technologies Pte. Ltd. QSM is the innovative VI signature method developed by Qmax; Windows is the registered trademark of MicroSoft Corporation.

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