QD-1020
Product Highlights

Advanced Multi-site IDDQ Measurement Instrument Supporting Various Test Applications

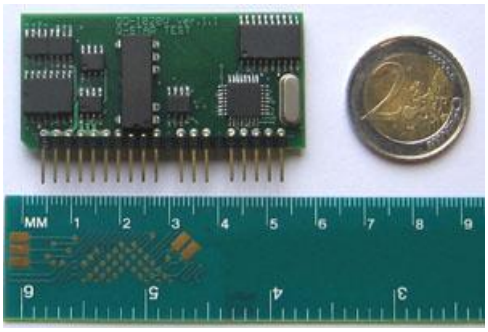
FEATURES

- Wide DUT Supply range: V_{DUT} = 0.5V to 7V
- Wide measurement range: IDDQ = 0 – 30mA
- Typical measurement time: 100 µs
- High capacitive driving capability: up to 10µF
- High single sample resolution: $20nA_{RMS}$
- 16-bits IDDQ Value Read Out
- 3-Wire Serial Configuration/Read out Interface
- On-board data processing capabilities
- Cascadable up to 8 QD-1020 units

APPLICATIONS

- Multi-site Applications
- ATE Probe Card Applications
- ATE Interface Board Applications
- Delta IDDQ Measurements
- Pre & Post Stress Delta IDDQ
- Current Ratios & Relative IDDQ
- IDDQ Pass/Fail Measurements
- IDDQ Read Out Measurements
- IDDQ Window Comparisons

DESCRIPTION



The QD-1020 is a full featured, configurable quiescent supply current (IDDQ) instrument, designed for multi-site applications, serving both probe and final test. Up to 8 QD-1020 units can be cascaded, sharing the same control resources. To save ATE I/O pins, a 3-wire serial control/configuration/read out interface is used to control all instruments. All units can be addressed globally or individually. When sufficient ATE resources are available, instruments can be controlled in parallel as well.

The QD-1020 supports a wide range of basic and advanced IDDQ test and measurement strategies such as, but not limited to, various Delta-IDDQ approaches, Current Ratios and Relative IDDQ schemes. The instrument provides digital measurement values as well as a pass/fail output signal. On-board memory and data processing capabilities allow offloading the IDDQ data processing and decision making from the ATE to the instrument enhancing test applications.

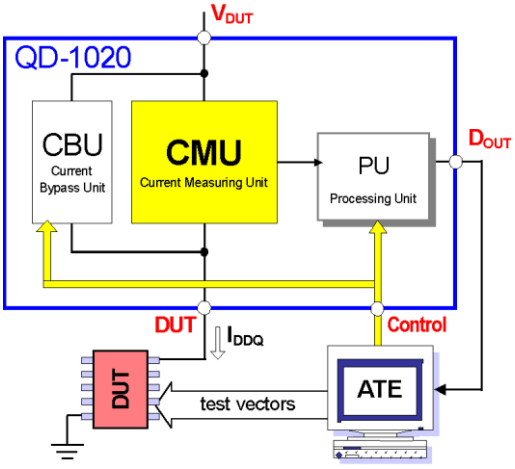


Figure 1. QD-1020 Application

The QD-1020 offers the capability to perform accurate (better than 50nA @ 10kHz) and highly repeatable high speed (up to 10kHz) quiescent supply current measurements. On-board data processing allows improving the accuracy further at the cost of a small speed penalty.

The module has a wide measurement range (up to 30mA). The serial output provides the Pass/Fail flag and/or the measured/processed IDDQ value with a 16-bit resolution. The QD-1020 requires only a single positive supply, and allows a user programmable (0.5 to 7V) DUT supply level.

The QD-1020 standard measurement ranges are 100µA, 1mA, 10mA and 30mA offering a single sample resolution of $90nA_{RMS}$, $50nA_{RMS}$, $400nA_{RMS}$ and $2200\mu A_{RMS}$ respectively.

The unit can drive high capacitive loads (up to several µF). Standard loading ranges are 0-500nF, 0-2µF and 0-10µF. All these parameters can be customised for optimal performance in function of desired measurement speed/resolution and actual loading conditions.

L.Bauwensstraat 20, B-8200 Brugge, Belgium, Tel.: +32 50 319273, Fax: +32 50 312350, http://www.QStar.be

Operating Modes

The QD-1020 has two main operating modes: ***bypass mode*** and ***measurement mode***. During bypass, the instrument provides a low resistance path between ATE supply and DUT. During measurement, the actual measurement(s) take(s) place. The module can be programmed during bypass mode. The programming operation allows selecting the measurement approach and to set the pass/fail level(s). A simple programming protocol is used.

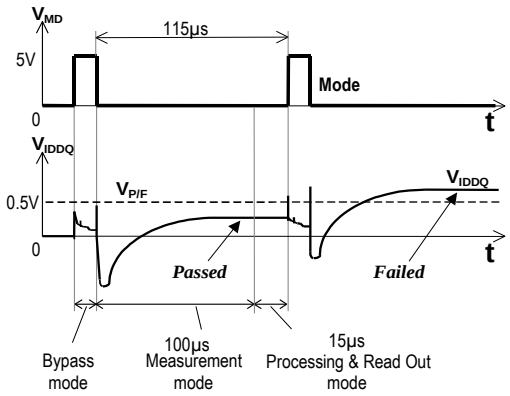


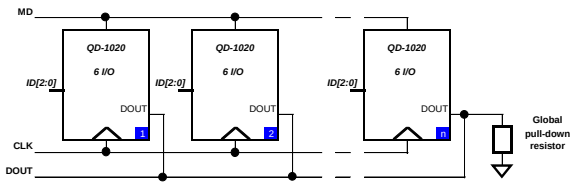
Figure 2. QD-1020 Typical Measurement Cycle

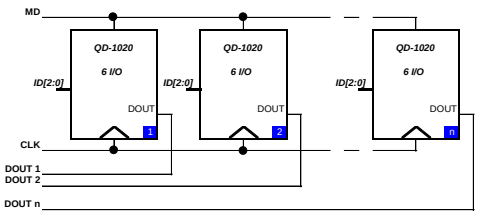
The normal measurement cycle consists of a settling period (typ. 100µs) followed by a capture, processing and read-out period (typ. 15µs). When in measurement mode the module is acting as DUT power supply. When during measurement mode the measured current is out of the instrument's measurement range, then the QD-1020 automatically switches back to bypass mode, meanwhile indicating a fail situation. Figures 1 and 2 show a general application diagram as well as a typical measurement cycle.

Typical Applications

The QD-1020 operates according to the Stabilised Voltage Drop principle and is designed to be inserted between the Automated Test Equipment (ATE) device power supply and the supply pin(s) of the Device Under Test (DUT). There is no need to remove the local decoupling capacitors.

The QD-1020 is designed for multi-site IDDQ instrument applications. Each instrument has a 3-bit hardware address (hardwired on the DUT loadboard) that allows assigning a unique address to each instrument. As such, each instrument can be accessed individually for setting references and for data readout. Up to 8 instruments can be cascaded (connected in parallel) and can all be controlled using one 3-wire serial interface. All control lines are connected in parallel. This application mode saves ATE tester channels but causes additional readout time as the data stream is provided sequentially on the data output line DOUT.





The instrument can also be configured to provide the data of all instruments simultaneously independent of its hardware address. This requires that all instrument data outputs be connected to separate ATE channels.

ELECTRICAL SPECIFICATIONS

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CC}	Positive Supply Voltage	+4.5	+5.0	+5.5	V
CMR	Current Measurement Range	0.1	1	30	mA
V_{DUT}	DUT Supply Voltage	0.5	3 - 5	7	V
$\Delta IDDQ$	Single Sample Resolution (1)	20	50	2200	nA_{RMS}
$t_{MEASURE}$	Measurement Time	(2)	100	(3)	µs
C_L	Loading Capacitance	0.01	1	10	µF
I_{DDT}	Transient Current		30		A
R_{ON}	On Resistance		20		mΩ

(1) Configuration dependant, the values listed are for a C_L=0.5µF optimised unit.
(2) The QD-1030 can be used to perform static measurements
(3) The maximum measurement time is dependent on the number of samples taken. 114µs @ 1 sample, 150µs @ 4 samples, 290µs @ 16 samples.