QD-1011Lite
Product Highlights

High Speed, High Resolution Digital I_{DDQ} Measurement Instrument

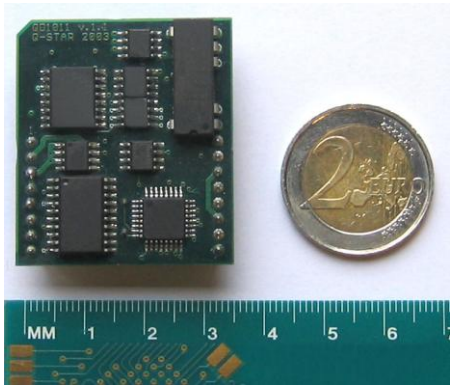
FEATURES

- Wide DUT Supply range: V_{DUT} = 0.5V to 7V
- Wide measurement range: I_{DDQ} = 0 – 10mA
- Typical measurement time: 150 µs
- High capacitive driving capability: up to 10µF
- High single sample resolution: 50nA$_{RMS}$
- 16-bits I_{DDQ} Value Read Out
- 3-Wire Serial Configuration/Read out Interface

APPLICATIONS

- ATE Probe Card Applications
- ATE Interface Board Applications
- I_{DDQ} Pass/Fail Measurements
- I_{DDQ} Read Out Measurements

DESCRIPTION



The QD-1011Lite is a member of the QD-10xx product family offering basic measurement functionality and serving both probe and final test. The QD-1011Lite is designed for probe card and interface board applications and offers high speed highly repeatable I_{DDQ} measurements. The instrument provides 16-bit digital measurement values as well as a pass/fail output signal. In contrast with the full-featured family members, the QD-1011Lite has no on-board memory and data processing capabilities that support advanced measurement strategies.

The QD-1011Lite operates according to the Stabilised Voltage Drop principle and is designed for insertion 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. Its unique design ensures transparency to both the ATE and DUT under all conditions. The unit can drive high capacitive loads (up to several µF).

The QD-1011Lite offers the capability to perform accurate (better than 50nA @ 6.7kHz) and highly repeatable high speed (up to 6.7kHz) quiescent supply current measurements.

The instrument has a wide measurement range (0-10mA). The serial output provides the Pass/Fail flag and/or the measured I_{DDQ} value with a 16-bit resolution. The QD-1011Lite requires only a single positive supply, and provides, under all conditions, a stable, guaranteed and user programmable (0.5 to 7V) DUT supply level.

The QD-1011Lite has an on-board compensated bypass switch, which minimises charge transfers. Its switch is capable of transferring large transient currents. To assure DUT supply stability, the bypass switch is automatically activated when the measured current is out of the instrument's measurement range.

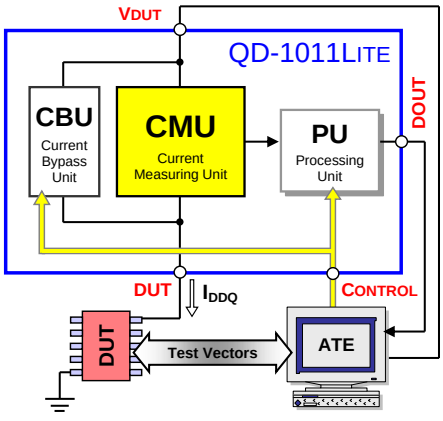


Figure 1. QD-1011Lite Application Diagram

By default the QD-1011Lite's Current Measurement Unit (CMU) is optimised to perform an I_{DDQ} measurement in 150µs for a 100nF to 10µF capacitive load. The default measurement range of the QD-1011Lite is set to 0-1mA with a measurement resolution of 90nA$_{RMS}$. Other possible fixed measurement ranges are 0-100µA, 0-10mA, with a measurement resolution of 20nA$_{RMS}$ and 360nA$_{RMS}$.

In addition to the digital readout capabilities, the QD-1011Lite also provides an analogue output *VIDDQ* that can be measured by the ATE.

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

OPERATING MODES

The QD-1011Lite has two main operating modes, namely ***bypass mode*** and ***measurement mode***. During bypass mode the instrument provides a low resistance path between ATE supply and DUT. During measurement mode the actual measurement takes place. When operating in bypass, the desired pass/fail level can be set using a simple programming protocol.

The measurement operation takes 150µs. At the end of the measurement period, a pass/fail flag at the PF/DOUT output indicates the pass/fail result of the measurement (logic '1' = pass, measurement below reference; logic '0' = fail, measurement above reference). When in measurement mode the instrument is acting as DUT power supply. When during measurement mode the measured current is out of the instrument's measurement range, then the QD-1011Lite 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.

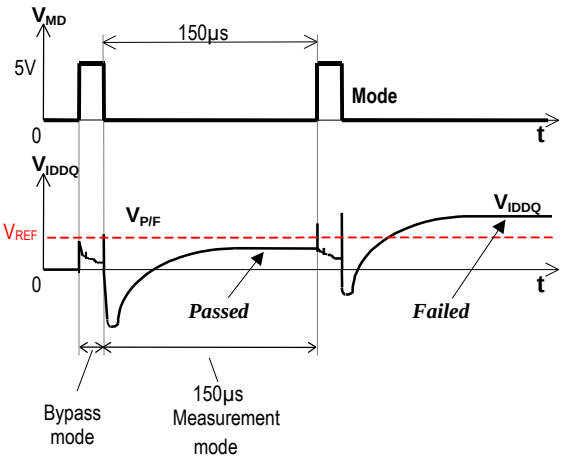
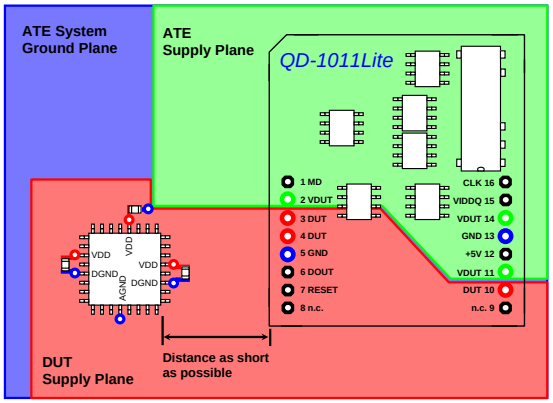


Figure 2. QD-1011Lite Typical Measurement Cycle

TYPICAL APPLICATIONS



- The QD-1011Lite can be used as a pass/fail (P/F) instrument,
- The QD-1011Lite can be used as a measurement device to determine the exact value of the measured current. The instrument digitises the measured value with a 16-bit resolution. This value can be read out using the serial interface.

The QD-1011Lite should be placed as close as possible to the DUT. The recommended orientation of the instrument is so that pin 3 is located as close as possible to the DUT. Preferably this pin is connected using a plane.

ELECTRICAL SPECIFICATIONS

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
V_{CC}	Positive Supply Voltage	+4.5	+5.0	+5.5	V
CMR	Current Measurement Range	0.1	1	10	mA
V_{DUT}	DUT Supply Voltage	0.5	3 - 5	7	V
$t_{MEASURE}$	Measurement Time	(2)	150		µs
ΔIDDQ	Measurement Resolution (1)	20	50	350	nA_{RMS}
C_L	External loading capacitance	0	1	10	µF
VI_{VIDDQ}	V/I Conversion Ratio	0.5	5	50	mV/µA
I_{DDT}	Transient Current			30	A
R_{ON}	On Resistance		20		mΩ

(1) Configuration dependant and @ CL=0.5µF.
(2) The QD-1011Lite can be used to perform static measurements