QD-1011HC
Product Highlights

Advanced High Current IDDQ Measurement Instrument Supporting Various Test Applications

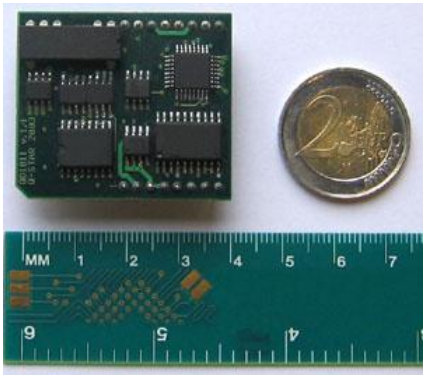
FEATURES

- Wide DUT Supply range: VDUT = 0.5V to 7V
- Measurement ranges up to 200A
- Typical measurement time: 100 µs
- High capacitive driving capability: up to 100µF
- High resolution: 150nARMS
- 16 or 24-bit digital resolution
- 3-Wire Serial Configuration/Read out Interface
- On-board data processing capabilities

APPLICATIONS

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

DESCRIPTION



The QD-1011HC is a full featured, configurable high current quiescent supply (IDDQ) measurement instrument, serving both probe and final test and designed for probe card and interface board applications. The instrument supports a wide range of IDDQ test and measurements applications and provides digital measurement values as well as a pass/fail output signal. On-board memory and data processing capabilities allow implementing a wide range of basic and advanced current based test strategies. The QD-1011HC is offered either with a 16 or 24 bit architecture and related measurement resolution /repeatability, and can have a horizontal or a vertical form factor.

The QD-1011HC 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. Its unique design ensures transparency to both the ATE and DUT, under all conditions. The unit can drive high capacitive loads (up to several tens of µF). The QD-1011HC offers the capability to perform accurate and highly repeatable high-speed (up to 10kHz) quiescent supply current measurements with sub-µA resolution/repeatability.

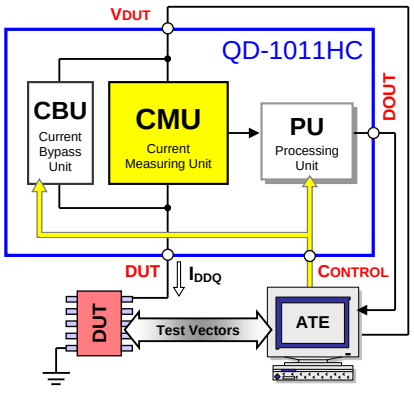


Figure 1. QD1011HC Application Diagram

The instrument can have measurement ranges up to 2A when used without external sense element or up to 200A when used in combination with an external sense element. The serial output provides the Pass/Fail flag and/or the measured or processed IDDQ value with a 16 or 24-bit resolution. The QD-1011HC requires only a single positive supply and assures, under all conditions, a stable and user programmable (0.5 to 7V) DUT supply level.

The QD-1011HC has an on-board compensated bypass switch, which minimises charge transfers and is capable of transferring large transient currents.

By default the QD-1011HC's Current Measurement Unit (CMU) is optimised to perform an IDDQ measurement in 100µs for a 100nF to 100µF capacitive load. The processing and read out time is function of the application and takes typically 20µs.

The default measurement range of the QD-1011HC is set to 0-500mA with a single sample resolution of 20μA_{RMS}. Other possible fixed measurement ranges are 0-50mA, 0-100mA, 0-200mA, 0-1A and 0-2A with a single sample resolution of 2, 4, 8, 40, to 80μA_{RMS} respectively. All these parameters can be customised for optimal performance in function of desired measurement speed/resolution and actual loading conditions.

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Operating Modes

The QD-1011HC has two main operating modes: ***bypass mode*** and ***measurement mode***. During bypass, the instrument provides a low resistive path between the ATE supply and the DUT. During measurement, the actual measurement(s) take(s) place. The instrument can be programmed using a simple protocol during bypass mode. The programming operation allows to select the measurement approach and to set the pass/fail level(s).

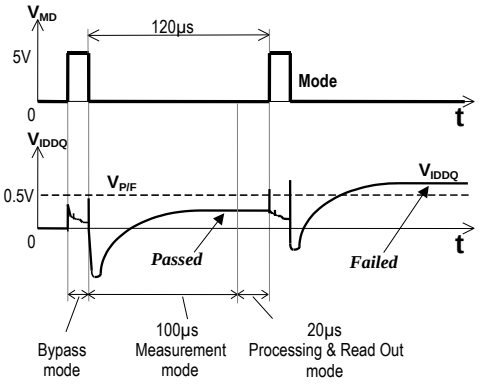

Figure 2. Typical Measurement Cycle

The normal measurement cycle consists of a settling period (typ. 100µs) followed by a capture, processing and read-out period (typ. 20µs). When during measurement mode the measured current is out of the instrument's measurement range, then the QD-1011HC 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-1011HC can be applied in various ways, some of them are listed below:

- The unit can be used as a pass/fail (P/F) instrument,
- The instrument can be used as a measurement device to determine the exact value of the measured current. The QD-1011HC digitises the measured value with a 16 or 24-bit resolution. This value can be read out using the serial interface.
- The QD-1011HC can be used as a delta-I_{DDQ} instrument. Some of the delta approaches currently supported are:
  - Vector-to-vector delta, providing a 16 or 24-bit delta value and/or P/F flag.
  - Vector-to-"reference vector" delta, providing a 16 or 24-bit delta value and/or P/F flag per vector referred to the measured value of the reference vector.
  - Vector-to-"external reference" (provided by the ATE and loaded in the instrument during configuring) delta, providing a 16 or 24-bits delta value and/or P/F flag per vector referred to the external reference. The reference value can be changed on a vector-to-vector basis.
  - Pre-to-post stress delta, providing a 16 or 24-bit delta value and/or P/F flag per vector referred to the pre stress measured value of the same vector.

For all operating modes using a pass/fail flag, the pass/fail flag is generated either as a result of comparing the measurement result (measured value or calculated delta) with a single pass/fail reference value or a pass/fail reference window. The QD-1011HC supports a modification of the pass/fail reference level or window on a vector-to-vector basis, as such it supports the use of current signatures.

ELECTRICAL SPECIFICATIONS

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CC}	Positive Supply Voltage	+4.5	+5.0	+5.5	V
CMR	Current Measurement Range	50	500	2000	mA
V_{DUT}	DUT Supply Voltage	0.5	3 - 5	7	V
ΔI_{DDQ}	Single Sample Resolution (1)	2	20	80	μA_{RMS}
	Measurement Time	(2)	100	(3)	µs
C_L	Loading Capacitance	0	1	100	µF
VI_{VIDDQ}	V/I Conversion Ratio	2.5	10	100	V/A
I_{DDT}	Transient Current in Bypass Mode			30	A
V_{INT}	Voltage drop between VDUT and DUT pins			50	mV

(1) Configuration dependant and @ C_L=1.0µF.
(2) The QD-1011HC can be used to perform static measurements
(3) The maximum measurement time is dependent on the number of samples taken: 116µs @ 1 sample, 151µs @ 4 samples, 290µs @ 16 samples.