QD-1013
Product Highlights

Advanced High Voltage IDDQ Instrument Supporting Various Test Applications

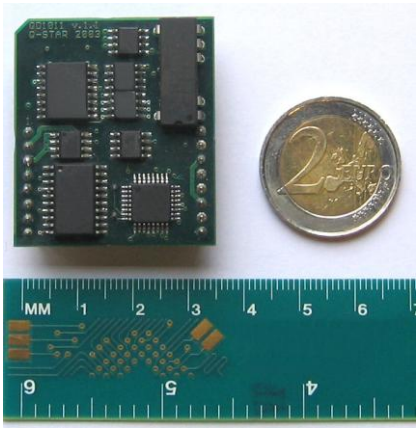
FEATURES

- Wide DUT Supply range: VDUT = 0.5V to 50V
- 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

APPLICATIONS

- High voltage 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-1013 is a full featured, configurable quiescent supply current (IDDQ) measurement instrument, serving both probe and final test, designed for probe card and interface board applications and serving high voltage 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 various advanced current based test strategies including but not limited to a wide range of Delta-IDDQ approaches

The QD-1013 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. 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-1013 offers the capability to perform accurate and highly repeatable high speed (up to 10kHz) quiescent supply current measurements with nA resolution/repeatability.

The instrument has a wide measurement range (0-30mA). The serial output provides the Pass/Fail flag and/or the measured/processed IDDQ value with a 16-bit resolution. The QD-1013 requires only a single 5V positive supply, and allows a user programmable (0.5 to 50V) DUT supply level.

The QD-1013 has an on-board compensated bypass switch, which minimises charge transfers and 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.

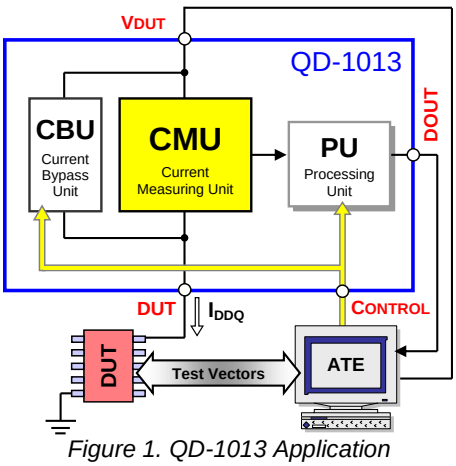


Figure 1. QD-1013 Application

By default the QD-1013's Current Measurement Unit (CMU) is optimised to perform an IDDQ measurement in 100µs for a 100nF to 10µF capacitive load. The processing and read out time is function of the application and takes typically 20µs. The default measurement range of the QD-1013 is set to 0-1mA with a single sample resolution of 90nA$_{RMS}$. Other possible fixed measurement ranges are 0-100µA and 0-10mA with a single sample resolution of 50nA$_{RMS}$ and 400nA$_{RMS}$ 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-1013 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.

The normal measurement cycle consists of a settling period (typ. 100µs) followed by a capture, processing and read-out period (typ. 20µs). 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-1013 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.

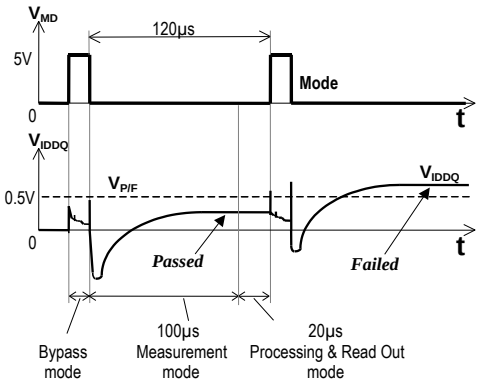

Figure 2. Typical Measurement Cycle

Typical Applications

The QD-1013 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-1013 digitises the measured value with a 16-bit resolution. This value can be read out using the serial interface.
- The QD-1013 can be used as a delta-I_{DDQ} instrument, among the supported delta strategies are:
  - Vector-to-vector delta, providing a 16-bit delta value and/or P/F flag.
  - Vector-to-"reference vector" delta, providing a 16-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 module during configuring) delta, providing a 16-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-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-1013 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
I_{DDQ}	Measurement Range	0.1	1	30	mA
V_{DUT}	DUT Supply Voltage	0.5		50	V
	Single Sample Resolution (1)	20	50	2200	nA_{RMS}
	Measurement Time	(2)	100	(3)	µs
C_L	Loading Capacitance	0.01	1	10	µF
V_{IDDQ}	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, the values listed are for a C_L=0.5µF optimised unit.
(2) The QD-1013 can be used to perform static measurements
(3) The maximum measurement time depends on the number of samples taken: 116µs, 146µs, 260µs and 2.5ms @ 1, 4, 16 and 256 samples.

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Due to continuous pursuit of innovation, the technical specifications listed are subject to change without notice.