

## Wide Range, High Current, High Performance Digital IDDQ Measurement Instrument

### FEATURES

- Wide DUT Supply range:  $V_{DUT} = 0.5V$  to  $7V$
- Wide measurement range:  $IDDQ = 0 - 1A$
- Typical measurement time:  $150 \mu s$
- High capacitive driving capability: up to  $100 \mu F$
- High resolution:  $2 \mu A_{RMS}$
- 16-bits  $IDDQ$  Value Read Out
- 3-Wire Serial Configuration/Read out Interface

### APPLICATIONS

- ATE Probe Card Applications
- ATE Interface Board Applications
- $IDDQ$  Pass/Fail Measurements
- $IDDQ$  Read Out Measurements

### DESCRIPTION

The QD-1011HCLite is a member of the QD-10xxHC product family offering basic high quiescent current measurement functionality and serving both probe and final test. The QD-1011HCLite is designed for probe card and interface board applications and supports high speed highly repeatable  $IDDQ$  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-1011HCLite has no on-board memory and data processing capabilities that support advanced measurement strategies.

The QD-1011HCLite 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, and can drive high capacitive loads (up to several tens of  $\mu F$ ).

The QD-1011HCLite offers the capability to perform accurate and highly repeatable high speed (up to  $6.7kHz$ ) quiescent supply current measurements with  $\mu A$  resolution/repeatability (better than  $2 \mu A$  @  $50mA$  range). The instrument provides digital measurement results and offers in addition an analog output  $V_{IDDQ}$  that can be measured by the ATE.

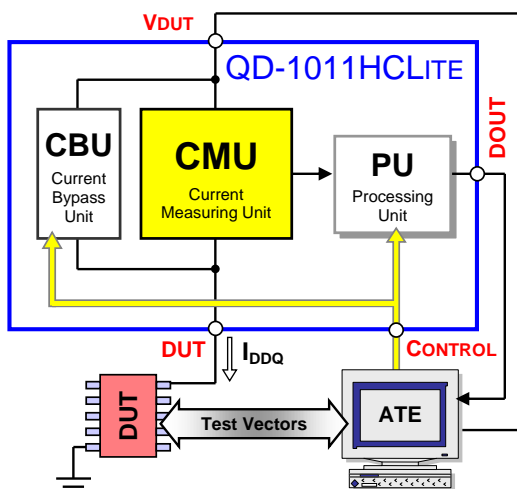
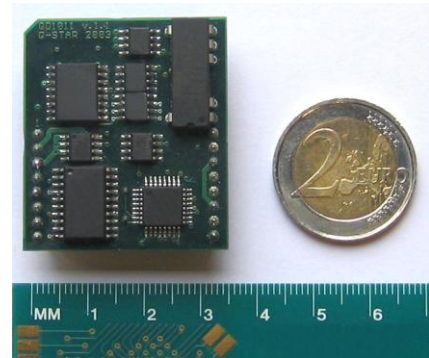


Figure 1. QD-1011HCLite Application Diagram

The instrument has a wide measurement range ( $0-1A$ ). The serial output provides the Pass/Fail flag and the measured  $IDDQ$  value with a 16-bit resolution. The QD-1011HCLite 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-1011HCLite 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.

The QD-1011HCLite's Current Measurement Unit (CMU) is optimised to perform an  $IDDQ$  measurement in  $150 \mu s$  for a  $100nF$  to  $100 \mu F$  capacitive load. The default measurement range of the QD-1011HCLite is set to  $0-500mA$  with a measurement resolution of  $20 \mu A_{RMS}$ . Other possible fixed measurement ranges are  $0-50mA$ ,  $0-250mA$  and  $0-1A$  with measurement resolutions of  $2$ ,  $10$  and  $40 \mu A_{RMS}$  respectively.

## OPERATING MODES

The QD-1011HCLite 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 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). 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-1011HCLite automatically switches back to bypass mode, meanwhile indicating a fail situation. Figures 1 and 2 show a general application diagram and a typical measurement cycle.

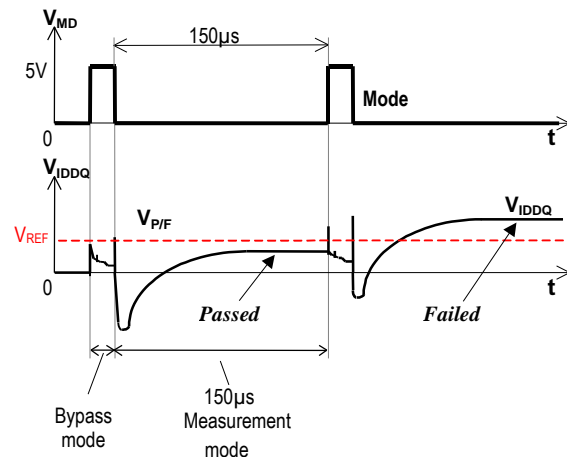


Figure 2. QD-1011HCLite Typical Measurement Cycle

## TYPICAL APPLICATIONS

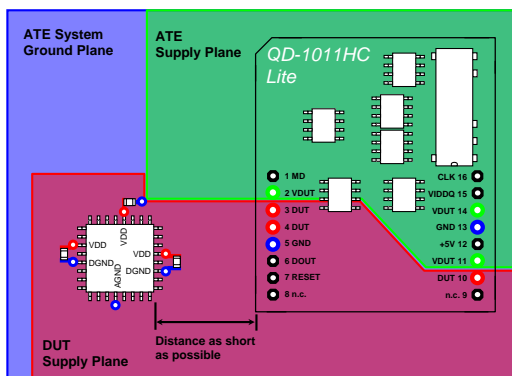


Figure 3. Recommended PCB layout

- The QD-1011HCLite can be used as a pass/fail (P/F) instrument,
- The QD-1011HCLite 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-1011HCLite 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 <sub>CC</sub>	Positive Supply Voltage	+4.5	+5.0	+5.5	V
CMR	Current Measurement Range	50	500	1000	mA
V <sub>DUT</sub>	DUT Supply Voltage	0.5	3 - 5	7	V
t <sub>MEASURE</sub>	Measurement Time	(2)	150		µs
ΔI <sub>DDQ</sub>	Measurement Resolution (1)	2	20	40	µA <sub>RMS</sub>
C <sub>L</sub>	External loading capacitance	0	1	100	µF
V <sub>I</sub> IDDQ	V/I Conversion Ratio	5	10	100	V/A
I <sub>DDT</sub>	Transient Current			30	A
V <sub>INT</sub>	Voltage drop between VDUT and DUT pins			50	mV

(1) Configuration dependant and @ C<sub>L</sub>=1µF.

(2) The QD-1011HCLite can be used to perform static measurements