

TECHNICAL REPORT
HID GLOBAL CORPORATION

iCLASS Rev E Readers

Covering FCC ID's:

**JQ6-ICLASSR10E
JQ6-ICLASSR15E
JQ6-ICLASSR30E
JQ6-ICLASSR40E
JQ6-MCLASSRP10E
JQ6-MCLASSRP15E
JQ6-MCLASSRP30E
JQ6-MCLASSRP40E**

08/21/2012

This report concerns Original Grant of Certification for the Intentional Radiator and Antenna portions of a composite system that includes a computing device.

Equipment Type: RFID Reader/Non-Keypad

Equipment Authorization: Part 15, Subpart C

Frequency of Operation: 13.56 MHz and 0.125 MHz

Equipment Market: Industrial

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Section 0.459 Request that submitted material be withheld from Public Inspection

It is requested that the following material be withheld from public inspection:

Description of Reader Types iCLASS and mCLASS herein, Circuit Functions, how the device operates, Ground System, Antenna, Block Diagram, and Schematic.

These materials are considered HID Global Corporation Proprietary and Confidential.

Revealing the fundamental design for the product to the public and our competition would put us at a competitive disadvantage.

We feel we have a product cost/design advantage over our competition with our Reader designs and therefore ask that the above specified materials be withheld from public inspection.

2.1033(b)(1) Full Name & Mailing Address of the Manufacturer & Applicant for Certification

HID Global Corporation
15730 Barranca Parkway
Irvine, CA 92618

Person to be named on FCC Certification Certificate:

Denis Hebert, President

2.1033(b)(4) Description of the multiClass Reader, Circuit Functions, how the device operates, Ground System, and Antennas

Model Marketed and Sold

Reader Type -iClass

Model: SRD Model: R10E, R15E, R30E, R40E

Reader Type -mClass

Model: SRD Model: RP10E, PR15E, RP30E, RP40E

System Description & How the Device Operates

The HID *iCLASS* Readers communicate with a transponder at distances up to 4". It reads and writes to iCLASS and other smart-card based credentials at 13.56 MHz. It also reads mCLASS Proximity credentials that operate at 125 kHz. The transmitter/receiver antenna, which consists of two separate magnetic loop antennas, emits a 13.56 MHz and a 125 kHz AC magnetic field in an alternating fashion. The field "powers up" a passive tag which is brought into the vicinity of the antenna. The tags, when powered, operate as a Near Field Coupling (NFC) disturbance device and either receives or returns a serial data stream.

The *iCLASS* & *mCLASS* Readers operate in what is called application mode. The reader polls for passive transponders every 100ms by first turning on the 13.56 MHz RF field and transmitting anti-collision commands

defined by ISO specifications. If a transponder is not detected in approximately 20ms the 13.56 MHz field will be shut down and the 125 kHz field will be activated. If a proximity transponder is not detected, the 125 kHz field will be shut down and the process will be repeated after 100ms has elapsed. When a 13.56 MHz transponder is presented, the reader will execute an application that can be as simple as reading a Unique ID or reading and writing data. The length of time the RF field is on when executing an application is entirely dependent on the application and transponder. A 125 kHz transponder operates in read mode only.

Circuit Functions

Please refer to the Block Diagram. For the 13.56 MHz functions, all circuit blocks including the transmitter/receiver and antenna are physically located on the main printed circuit board. The main microprocessor has an operating clock frequency of 27.120 MHz. This signal is divided by 2, which generates the 13.56 MHz and then is fed differentially to the transmitter filtering and antenna matching network. The antenna includes series and parallel tuning capacitors to set the overall impedance, of the antenna circuitry, to 40 Ohms, total (20 Ohms for each leg of the differential feed).

For the 125 kHz functions, the circuitry is contained within the main board. (These components are not stuffed for all iCLASS Readers which only use 13.56 MHz for the RF reader). This circuit includes a microprocessor which runs on an 8 MHz crystal oscillator. The antenna for the 125 kHz subsystem is an air-wound magnet wire coil, which is not contained within the circuit board, but mounted to the surface of the board. The 125 kHz square wave drive is generated by the microprocessor, which drives a series tuned resonant circuit that consists of 2 tuning caps and the air-wound coil antenna. The magnetic loop antenna inductance is approximately 800uH

The two RF drives are generated alternately. When either type of transponder enters the field, it is powered by the appropriate RF field from the reader device. If this causes the transponder to "wake-up", the transponder will now load-modulate the field to send its responses/data back to the reader.

Ground System

For the iCLASS 13.56 MHz portions, the transmitter driver circuitry, analog circuitry and digital circuitry all share a common ground plane. For the mCLASS 125 kHz portion, the transmitter driver circuitry, analog circuitry and digital circuitry all use the same circuit board and the same ground plane along with the iCLASS circuitry. The DC grounding is connected to the drain wire, of the shielded interconnecting cable, between the reader and the controller.

Antennas

13.56 MHz

Reader Type – iClass

Mag Loop Antenna Integral to PWB – 0.0055m²
Gain: 1 dBi

125 kHz

Reader Type – mClass

Mag Loop Antenna Integral to product – 0.0016m²
Gain: 1 dBi