PROVISIONAL DATA SHEET

ID-3HP-ISO RFID

High Power Reader Module

For ISO11785 FDX tags

With *30 plus cm* Read Range

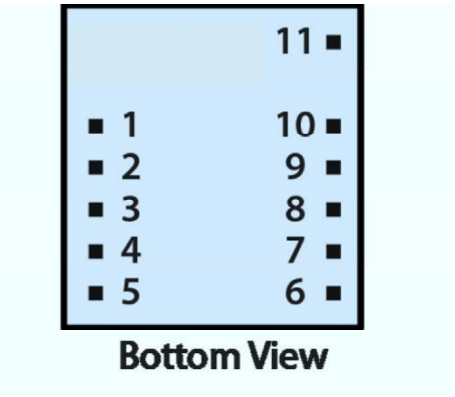
For hand held readers and cat-flaps

Section	Title	Page

1. Overview

The ID-Innovations ID-3HP-ISO is a new HIGH POWER low cost reader RFID module that reads ISO11785 and compatible tags. It has the same footprint and pinout as the ID3-LA-ISO module but delivers much more read range and can read a popular Destron ear tag at over 30cm using our suggested small external coil.

2. Pin Out ID-3HP-ISO



1. GND
2. RES (Reset Bar)
3. Antenna
4. Antenna
5.
6. Tag in Range
7. +/- (Format Selector)
8. D1 (Data Pin 1)
9. D0 (Data Pin 0)
10. Read (LED / Beeper)
11. +5V

3. Device Operational and Physical Characteristics

Parameter	Function
Read Range ID-3HP-ISO	Destron Ear tag 32cm with suggested coil
Card Formats	ISO11785
Encoding and Modulation	Bi-phase 128-bit modulus 32; AM 128bit.
Not-active power requirement	5 VDC @ 19mA = with no antenna connected
Communication	5v CMOS Pseudo RS232 ASCII - 9600 Baud, No Parity, 1 stop bit
Voltage Supply Range	+4.6V through +5.4V

4. ISO11785 and compatible tags

The ISO11785 tag has128 bits. This is comprised of an 11 bit header, 64 data bits, 16 CRC16 bits, 24 Extension bits and 13 framing bits. After the header, a framing bit is sent after every 8 bits. The data is usually split up as follows,

ID	38 bits
Country Code	10 bits
Extra Application bit	1 bit
Animal / Non Animal	1 bit
Reserved B	14 bits

Recently the extension bits have also been used for various purposes giving a total of 88 usable data bits, but it should be noted that the CRC only covers the above specified data bits and not the extension bits. The tags use bi-phase encoding to enable readers to be AC coupled. Biphase is by nature similar to the widely used Manchester encoding. Modulus 32 division is used and this means that the data rate is about 4kbits per sec and this does limit the range by limiting the Q of the receive antenna, although the read range is still acceptable.

5. Output Data Format

STX	64 data bits sent as 16 ASCII Characters	16 bit CRC sent as 4 ASCII characters	24 extension bits sent as 6 ASCII Characters	CR	LF	ETX

The data bits are sent as they are read off the tag (less the header and the framing bits), preceded by an STX character and followed by a CR, and LF and an ETX where :-

STX = Start of transmission character (02h)
CR = Carriage return (0Dh)
LF = Line Feed (0Ah)

The user may check the CRC if required. Note that the 24 extension bits are not included in the checksum.

6. CRC Check

The ISO11785 tag includes a CRC check. The user may verify the CRC using the following method.

Note that the CRC is only for the first 64 data bits.

Generic Assembler Code for CRC calculation

```
;       BCCH and BCCL contain the 16 bit CRC      ; GPR is temporary storage
;       A = Accumulator                                ; BTJZ Bit Test Jump Zero
;       SETC Set Carry Flag                            ;CLRC Clear Carry Flag
;       RRC Rotate Right Through Carry

Loop_start      BTJZ    %RXDAT,DALOW
                SETC
                JMP     BCCGEN
DALOW           CLRC
BCCGEN  RRC     BCCH
                RRC     BCCL
                JNC     Q1L
                XOR     %?10000000,BCCH
Q1L             MOV     BCCH,GPR
                AND     %?10000000,GPR
                JZ      D16L
                XOR     %?00001000,BCCL
                XOR     %?00000100,BCCH
D16L            REPEAT LOOP FOR 64 BITS
```

7. Function Description

The ID-Innovations ID-3HP-ISO is a compact RFID module that can drive an external antenna with enough power to read an ear tag at over 30cm using a small coil just 70x100mm. This is the sort of read range usually associated with much larger and more expensive readers. The antenna is series tuned with an external capacitor although there is also a 1n2 internal tuning capacitor that suits a 1.33mH antenna. The module can drive large or small coils but has a performance sweet spot using a 70x100mm antenna size. Because the antenna coil is driven by a very low source impedance driver it is advised to add a series 2.2R resistor in series with the antenna during initially testing to prevent excessive current in case of an accidental short. The module can drive any antenna value from 100uH through to 1.33mH provided that the RF output current and voltages are not exceeded. The firmware will work with low Q or high Q coils.

In applications where the power consumption is critical the reset pin can be periodically grounded and this inhibits the RF and saves power. Due to the large RF circulating current a solid aluminum polymer capacitor is used for decoupling across the supply pins 1 and 11.

The reader data outputs use 5volt CMOS and transmit serially using 9,6000 baud, no parity and one stop bit, (9600:N,8,1).

Note that the reader does not read ISO11784 tags which use a different system and employ HDX modulation.

8. Pin Description & Output Data Formats

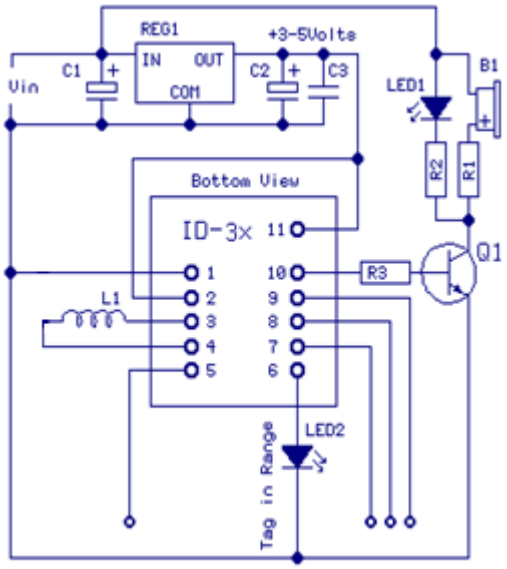
Pin #	Description	ASCII
Pin 1	Zero Volts	GND 0V
Pin 2	Strap to +5V	Reset Bar
Pin 3	External Antenna	Antenna
Pin 4	External Antenna	Antenna
Pin 5		No function
Pin 6	Tag in Range	Tag in Range
Pin 7		No function
Pin 8	Data 1	CMOS
Pin 9	Data 0	TTL Data (inverted)
Pin 10	3 kHz Logic	Beeper / LED
Pin 11	DC Voltage Supply	+5V

9. Absolute Maximum Ratings

Maximum voltage applied to Pin 2	(Vcc)	5.5volt
Maximum Continuous RF current at pin3	RF Drive	+/- 0.25A
Maximum RF Current for 1minute at pin3	RF Drive Output	+/- 0.4A
Maximum RF voltage at pin4	RF Sensing input	+/-200v
Maximum voltage applied to Pin 2	(Reset)	Vcc + 0.7v, -0.7v
Maximum current drawn from Pin 5	No Function	+/- 5Ma
Maximum current drawn from Pin 6	(Tag in Range)	+/- 5mA
Maximum Voltage at Pin 7	No Function	Vcc + 0.7v, -0.7v
Maximum current drawn from Pin 8	(Data1)	+/- 5mA
Maximum current drawn from Pin 9	(Data0)	+/- 5mA
Maximum current drawn from Pin 10	(Beeper)	+/- 10mA
Additionally, Pins 5, 6, 7, 8, 9 & 10 may not have a voltage exceeding		Vcc + 0.7v, -0.7v

These ratings are absolute maximums and operation at or near the maximum may cause stress and eventual damage or unpredictable behavior.

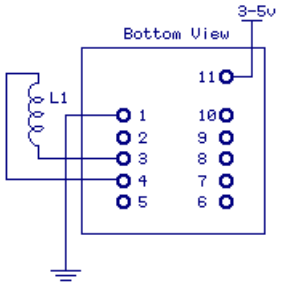
10. Circuit Diagram for ID-3HP-ISO



R1	100R
R2	4K7
R3	430uH
C1	10uF 25v
C2	1000uF 10v
C3	150uF 6.3-10v Aluminium Polymer, Panasonic 6SVPE150M or equivalent. Mount close to pins1,11.
L1	1.33mH
Q1	BC457 or equivalent.
REG1	LF50BDT D-PAK
LED1	Read LED
LED2	Tag in Range LED
B1	2.7khz – 3kHz 5v PKPK AC

11. External Antenna Configurations

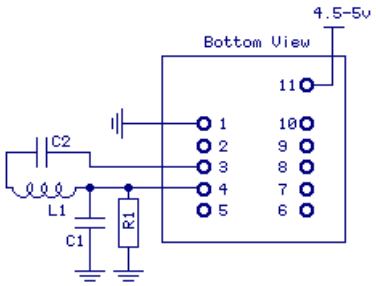
ID-3HP-ISO Low Power with External Coil – Voltage 2.8-5v



L1	1.33mH
Module	ID-3HP-ISO

This simple low power configuration uses the internal tuning capacitor. The ID-3HP-ISO may be used as drop-in replacement for the ID3 or ID2 providing the RF voltage at pin4 is kept below 200v PKPK.

ID-3HP-ISO Medium and High Power with External Antenna



Example 1	
C1	5n6 COG 200VDC
C2	10n COG 200VDC
L1	475uH 50T on 100x70mm former
R1	680K
Module	ID-3HP-ISO

This configuration is good for coils of all sizes and allows for high RF power and yet is simple. Care must be taken to keep the RF voltage at pin4 to below 200v PKPK or instant damage will occur to the module. In appendix1 there is a 'FreeBasic' listing for a simple program to determine C1,C2 and L1.

The example uses an antenna 70x100mm using 50T of 0.46mm copper wire and can read a Destron (trade name) ear tag at a range more than 30cm.
Thicker wire will give more range but it must be remembered that the RF peak to peak voltage at pin4 must not exceed 200PKPK and the DC supply current should not exceed 0.25A in normal use. When testing the power should be ramped up slowly to make sure the parameters are within maximum limits. We recommend adding a 2w 2.2R resistor in series with the coil for test and reducing to zero ohms to increase the power. For short term testing the supply current may be allowed to go as high as 0.4 amperes for no longer than 1minute.
The Q of an antenna coil is, to a first order, proportional to the weight of copper used. There is a popular misconception that the higher inductance the higher the Q, indeed, old 125Khz readers employed very high inductances and some had up to 1000v on the antenna but the fact is there is no need to make the inductance high to get a good Q, in fact lower inductances generally work better. To get the absolute peak performance from your large antenna, Litz wire may be used at a cost. Thicker wire will generally suffice.

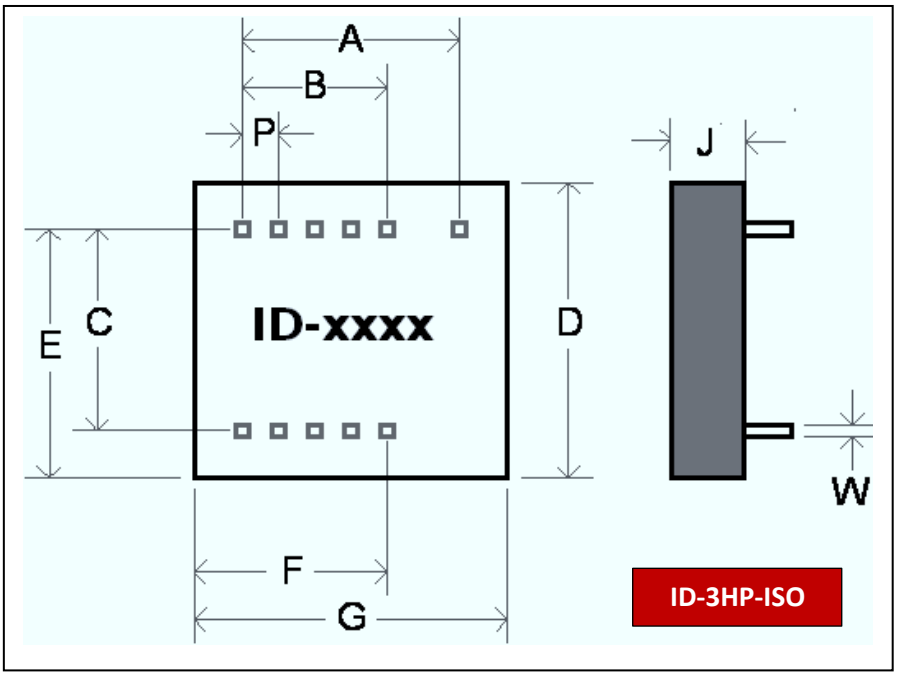
Note. The user must undertake electrical compliance testing of the module with the user antenna attached for the country where the module will be used.

12. Choice of Tuning capacitors

We recommend using COG or MPP capacitors. COG capacitors are considered ideal with very low temperature change. Often the permissible peak to peak RF voltage on a COG capacitor can be 2x the stated DC value but for MPP types it is best to use a much higher voltage rating. MPP types have more temperature drift.

13. Case Dimensions for ID-3HP-ISO

	ID-3HP-ISO (All Dimensions in mm)		
	Nom	**Min**	**Max**
A	12.0	11.6	12.4
B	8.0	7.6	8.4
C	15.0	14.6	15.4
D	20.5	20.0	21.5
E	18.5	18.0	19.2
F	14.0	13.0	14.8
G	22.0	21.6	22.4
P	2.0	1.8	2.2
H	5.92	5.85	6.6
J	9.85	9.0	10.5
W	0.66	0.62	0.67



14. Connection Direct to a Computer

Direct connection to a computer RS232 can be made by connecting Pin8 to a 1k series resistor and connecting the other end of the resistor to the computer RS232 input. The mode is called pseudo RS232. On a standard D9 socket, connect the output of the ID-xx via the series 1k to pin 2 of the D-type. Connect the ground to Pin5 on the D-type. Leave the TX pin3 open. See "Useful Information" below for free terminal download information.

14.1 Connection to a Processor UART

Direct connection can be made to a UART RX input from Pin9 of the ID-xx module. There is no need for a 1k protection resistor, but a 1k resistor will make the circuit safer for testing and reduce EM noise.

14.2 Connecting a Read LED

Sometimes the user may not want to drive a beeper but may still need to drive an LED. In this case a driver transistor may not be necessary because the Beeper Output Pin can supply 5mA continuously. Connect a 1k5 resistor to the Beeper Pin. This will limit the current. Connect the other end of the resistor to the LED anode and connect the cathode to ground.

15. Useful information

For testing we suggest the user downloads a terminal program from the internet. Here is a good free one to consider: http://braypp.googlepages.com/terminal - an excellent terminal.

If you have any technical queries please contact your local distributor, they have all the technical resources to help you and support you. Where no local distributor exists, our technical helpline may be contacted by writing to **help@innovations.com**

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