

***32mm Glass Transponder  
Eco-Line***    *Read Only, Read/Write*

***Reference Guide***

## Edition One - June 2001

This is the first edition of this manual, it describes the following transponders and derivatives of 32mm Eco-Line Glass Transponder:

RI-TRP-RE2B            32 mm Glass Transponder Read Only

RI-TRP-WE2B            32 mm Glass Transponder Read/Write

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# Read This First

## About This Guide

This guide describes the Read Only and Read/Write version of the 32mm Glass Transponder, and gives an overview of the most important specifications.

## Conventions



### WARNING:

**A WARNING IS USED WHERE CARE MUST BE TAKEN OR A CERTAIN PROCEDURE MUST BE FOLLOWED, IN ORDER TO PREVENT INJURY OR HARM TO YOUR HEALTH.**



### CAUTION:

**This indicates information on conditions which must be met, or a procedure which must be followed, which if not heeded could cause permanent damage to the equipment or software.**



### Note:

Indicates conditions which must be met, or procedures which must be followed, to ensure proper functioning of the equipment or software.



### Information:

Indicates information which makes usage of the equipment or software easier.

## If You Need Assistance

For more information, please contact the sales office or distributor nearest you. This contact information can be found on our web side at:

<http://www.ti-rfid.com>

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# Product Description



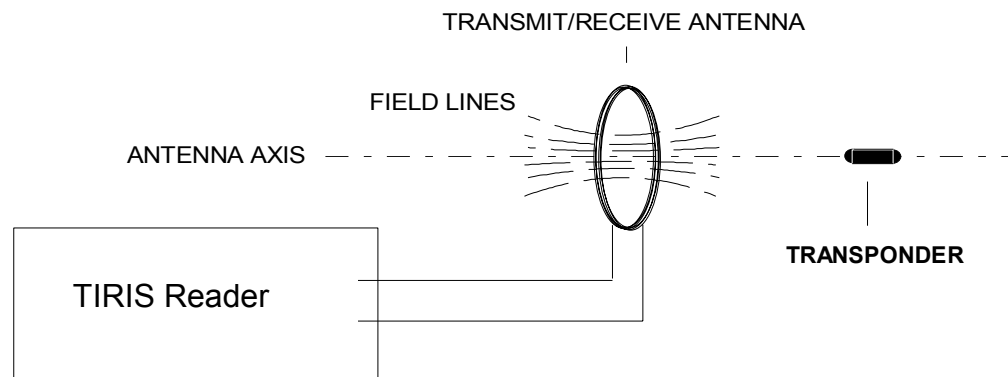
This chapter describes the RFID System and the functions of the 32mm Read Only and Read/Write Glass Transponder.

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## 1.1 General

A RFID system comprises a reader, an antenna and a transponder.

**Figure 1: System Configuration**



The reader and the transponder operate in a sequential mode with timely separated power and data transmission cycles.

## 1.2 Product Codes

<u>Function</u>	<u>Product Code</u>
Read Only	RI-TRP-RE2B-xx
Read Write	RI-TRP-WE2B-xx

Note: 'xx' defines the revision

The Read Only type is factory programmed with a unique number.

The Read/Write version can be programmed by the user.

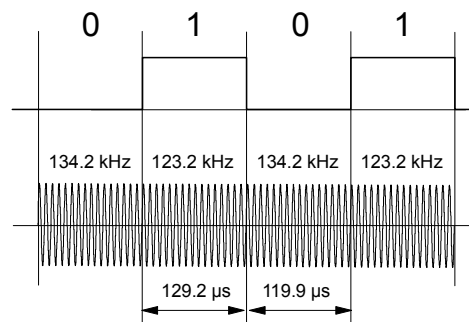
## 1.3 Functions

### 1.3.1 Read (Read Only and Read/Write Transponders)

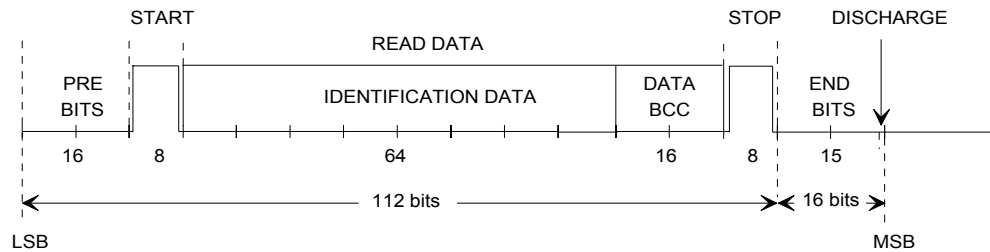
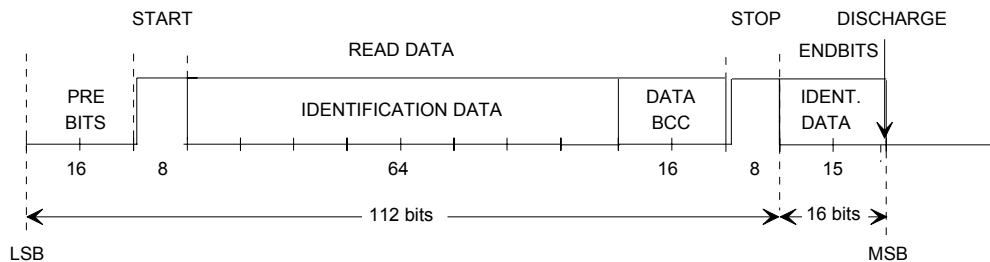
During the charge (or powering phase) of between 15 and typically 50 ms the interrogator generates an electromagnetic field using a frequency of 134.2 kHz. The resonant circuit of the transponder is energized and the induced voltage is rectified by the integrated circuit to charge the capacitor. The transponder detects the end of the charge burst and transmits its data using Frequency Shift Keying (FSK), utilizing the energy stored in the capacitor. The charge phase is followed directly by the read phase (Read mode). After transmission of the data format the capacitor is discharged.

The typical data low bit frequency is 134.2 kHz, the typical data high bit frequency is 123.2 kHz. The low and high bits have different duration, because each bit takes 16 RF cycles to transmit. The high bit has a typical duration of 130  $\mu$ s, the low bit of 119  $\mu$ s. Figure 2 shows the FM principle used. Regardless of the number of low and high bits, the transponder response duration is always less than 20 ms.

**Figure 2: FM principle used for the Read Function of TIRIS Transponders**



The data format consists of 128 bits. Different start/stop bytes and end bits are used, to allow secure distinction between RO and R/W Transponder. Figure 3 and Figure 4 show the format of the received data for RO and R/W transponders.

**Figure 3: Read Data Format of Read Only Transponder****Figure 4: Read Data Format of Read Write Transponder**

### 1.3.2 Write and Program

A new identification number can be written (programmed) into a R/W transponder in the following manner: After the charge phase the R/W transponder enters the write mode providing the reader starts to modulate the field by switching the transmitter on and off. Modulation index of this amplitude modulation is 100%. The duration of the off-phase defines whether a low bit or a high bit is being transmitted (Pulse Width Modulation). Writing means, the transponder shifts the received bits into a shift register. After the write phase the reader's transmitter is switched on for a certain time (programming time) in order to energize the process of programming the shift register data into the EEPROM. All 80 bits are programmed simultaneously into the EEPROM. Once the data is programmed into the EEPROM the transponder automatically sends back the captured data to the reader to allow a security check, this process takes place when the transmitter is switched off.



# Specifications



This chapter lists the operating conditions, electrical and mechanical characteristics and dimensions.

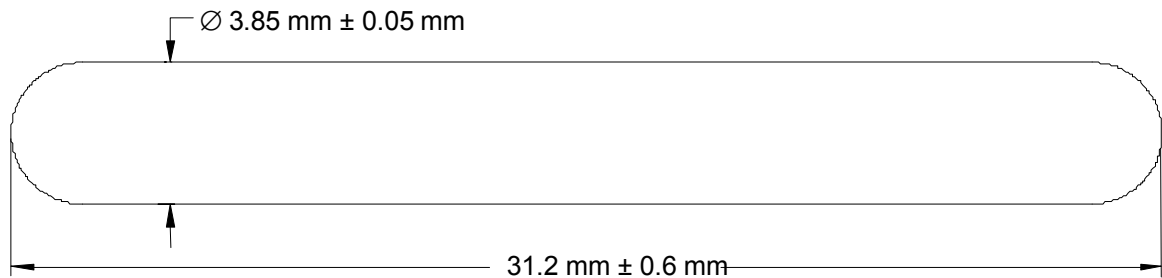
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## 2.1 Mechanical Data

### 2.1.1 Dimensions

	Limits			Unit
	Min.	Typical	Max.	
Length	30.6	31.2	31.8	mm
Diameter	3.8	3.85	3.9	mm
Weight	0.7	0.8	0.9	gr.
Case Material	Glass			
Protection Class	Hermetically sealed			

**Figure 5: Dimensions of the 32 mm Glass Transponder (Read Only, Read/Write)**



### 2.1.2 Vibration

Vibration test according IEC 68-2-6, test Fc.

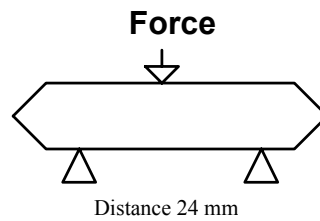
Conditions: Acceleration 10 g  
 Frequency 10-500 Hz  
 4 hours per axis

### 2.1.3 Mechanical Shock

Mechanical shock test according IEC 68-2-27, test Ea.

Conditions: Acceleration 200 g half-sine  
 Time 3 ms per axis

### 2.1.4 Break Force



Minimum force: 30 N  
 Force Built-up speed: 20 mm/min

## 2.2 Electrical Data

### 2.2.1 Memory

Parameter	Data
Memory size	80 bit
Memory organization	1 block
Identification data	64 bit
Error detection (Data BCC)	CRC – CCITT, 16 bit

### 2.2.2 Operating Conditions

Parameter	Limits		
	min.	max.	Unit
Operating Temperature (Read)	-25	+ 70	°C
Operating Temperature (Write)	-25	+ 70	°C
Storage Temperature	- 40	+ 85	°C
Storage Temperature (for total 1000 hours)		+ 125	°C
ESD Susceptibility (IEC 801-2)	15		kV
EM Radiation Immunity 1 – 512 MHz	100		V/m
EM Radiation Immunity 512 – 1000 MHz	50		V/m
X-ray Dose at 110 kV		2000	RAD

Parameters	Limits						Unit
	+ 25°C			- 25°C to +70 °C			
	Min.	typ.	max.	min.	typ.	max.	
Charge duration for read and write				15	50		ms
Charge frequency for read and write				134.16	134.2	134.24	kHz
Activation Field Strength (AFS)	182.0			192.0			dBμV/m
Programming time				15			ms
Programming Field Strength	184.0			194.0			dBμV/m
Operating quality factor				62			
Low Bit Frequency f <sub>L</sub>	132.2		136.2	132.0		138.0	kHz
High Bit Frequency f <sub>H</sub>	121.0		125.0	120.0		127.0	kHz
FSK Modulation index (read); f <sub>L</sub> - f <sub>H</sub>	9.0	11.0	15.0	9.0	11.0	15.0	kHz
Output Field Strength at d = 50 mm and using above AFS				132.0		154.0	dBμV/m
Programming cycles	10k						cycles



## Information:

The charge duration has an influence on the reading range and a reduction from the typical value to the minimum will result in a decrease of reading range.

# Regulatory and Warranty Notices



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## 3.1 Regulatory Notes

### 3.1.1 General

A transponders may be operated only under an experimental license or final approval issued by the relevant approval authority. Before any such device can be marketed, an equipment authorization must be obtained from the relevant approval authority.

## 3.2 Warranty and Liability

The "General Conditions of Sale and Delivery" of Texas Instruments Incorporated or a TI subsidiary apply. Warranty and liability claims for defect products, injuries to persons and property damages are void if they are the result of one or more of the following causes:

- improper use of the transponders
- unauthorized assembly, operation and maintenance of the transponders
- operation of the transponders with defective and/or non-functioning safety and protective equipment
- failure to observe the instructions during transport, storage, assembly, operation, maintenance and setting up of the transponders
- unauthorized changes to the transponders
- insufficient monitoring of the transponders' operation or environmental conditions
- improperly conducted repairs
- catastrophes caused by foreign bodies and acts of God.

# **Terms & Abbreviations**

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The list of the abbreviations and terms used in various TI\*RFID manuals can now be found in a separate manual:

**TIRIS Product Manuals - Terms & Abbreviations**

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