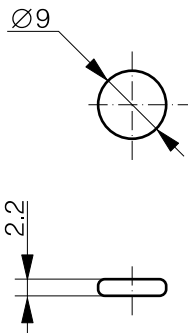
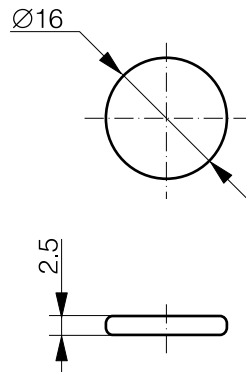


HOUSING	MEMORY SIZE	MOUNTING	✓ Passive components (no battery)	✓ Insensible to dirt
Ø 9 mm	320 Bytes	Non-embeddable	✓ Cylindric smooth housing PPS + Epoxy	✓ Anticollision algorithm
Ø 16 mm			✓ Usable memory: 79 blocks of 32 bits	✓ Various protections by password
				✓ OTP write protection for blocks
				✓ 16-bit counter



RTH-D09RA-NF0



RTH-D16RA-NF0

GENERAL DATA

Type of integrated circuit	NXP I-Code SLI-X2	
Carrier frequency	13.56 MHz	
Compatible standard	ISO 15693	
Maximum transmission speed	53 kbit/s if fast custom commands are used, 26.5 kbit/s otherwise	
Memory type	EEPROM	
Memory size	2560 Bytes	
Read/write distance max. (RSSI ≥ 0)	RTH-D09RA-NF0: 26 mm with C44 RWM	RTH-D16RA-NF0: 44 mm with C44 RWM

MEMORY INFORMATION

Organization	80 blocks × 4 Bytes
User memory (R/W)	79 blocks, 316 Bytes
Configuration memory	1 block, 4 Bytes
Unique identifier	8 Bytes
Data retention period (< 55°C)	> 50 years
Number of "write" cycles	10 ⁵
Number of "read" cycles	unlimited

MECHANICAL DATA

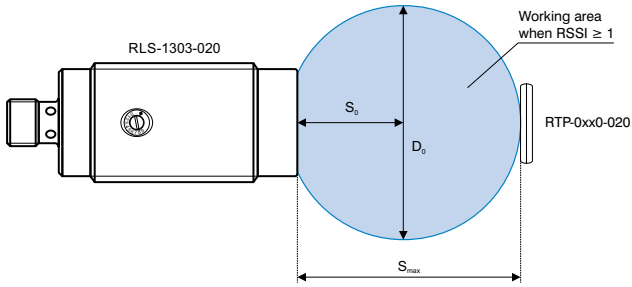
Protection degree	IP67
Ambient temperature range TA*	-20 ... +85°C
Storage temperature range TS**	-20 ... +110°C
Thermal cycling reliability @ 110°C	500 cycles / 500 hours
Housing material	PPS + Epoxy
Weight	See table "Available types" (p. 2)

* Read/write operations possible

** Data retention and mechanical stability limit

OPERATING ZONE

The operating area is highly dependent on the environment.



Typical values @ 25°C:

	RWM	S _{max} [mm]	S ₀ [mm]	D ₀ [mm]
RTH-D09RA-NF0	M18 (RSSI ≥ 0)	12	4	16
	M18 (RSSI ≥ 1)	11	3.5	15
	M30 (RSSI ≥ 0)	19	7	26
	M30 (RSSI ≥ 1)	17	5.5	24
	C44 (RSSI ≥ 0)	26	11	34
	C44 (RSSI ≥ 1)	24	9	32
RTH-D16RA-NF0	M18 (RSSI ≥ 0)	20	9	23
	M18 (RSSI ≥ 1)	19	8.5	22
	M30 (RSSI ≥ 0)	31	14.5	34
	M30 (RSSI ≥ 1)	28	13	31
	C44 (RSSI ≥ 0)	44	23	46
	C44 (RSSI ≥ 1)	40	20	44

UNIQUE IDENTIFICATION NUMBER (UID)

The 64-bits unique identification number (UID) is programmed during the production process according to ISO/IEC 15693-3 and cannot be changed afterwards. The type of TAG and manufacturer code are part of the UID: bytes 5 and 6 respectively.

MSB							LSB	BIT 37	BIT 36	ICODE TYPE	
BIT 64:57	BIT 56:49	BIT 48:14	BIT 40:1								
Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0				
E0	04	01	✓ IC manufacturer serial number (40 bits serialization)						0	0	ICODE SLI
								1	0	ICODE SLI-X	
								0	1	ICODE SLI-X2	

TAG type (01_n; ICODE SLI, SLI-X or SLI-X2)
 Manufacturer code (04_n; NXP Semiconductors)

SECURITY AND PROTECTIONS

Description

- Unique identifier (UID) for each transponder
- Lock mechanism for each user memory block (write protection)
- Lock mechanism for DSFID, AFI and EAS*
- Password (32-bits) protected EAS/AFI functionality*
- Initial state of the EAS/AFI passwords 00000000_h
- Destroy SLI-X2*
- Enable Privacy*
- 32-byte ECC signature*

* Features not available with Contrinex RWMs (RLx-xxxx-xxx)

AVAILABLE TYPES

Part number	Part reference	∅	Mounting	Weight
720-000-152	RTH-D09RA-NF0	9 mm	Non-embeddable	0.25 g
720-300-153	RTH-D16RA-NF0	16 mm	Non-embeddable	0.75 g

MEMORY OF TRANSPONDERS

The EEPROM has a memory capacity of 2560 bits and is divided in two areas. One user area of 79 blocks and one counter block and a system area not stored in EEPROM, that means a total of 80 blocks of 4 bytes each. The block is the smallest unit used to read and write the EEPROM memory.

EEPROM memory configuration

Area	Block No.	Details	Read Access	Write Access
User memory (316 bytes)	00 _h to 4E _h	User memory	✓	✓
User memory (4 bytes)	4F _h	Counter	Special access. See "16-bit counter features".	Special access. See "16-bit counter features".
System memory	N/A	UID (64 bits), Access Control Info. Passwords (AFI, EAS) Write protection Destroy Enable privacy 32-byte ECC sign.	See "List of commands" features for more details	See "List of commands" features for more details

User memory Direct read access to blocks of this memory is always possible. Direct write access to blocks of this memory is possible depending on the value of its corresponding block security status bit.

Structure of a single user memory block

MSB			LSB
Byte 3	Byte 2	Byte 1	Byte 0

System memory Direct read or write access to blocks of this memory area is not possible.

SPECIAL FEATURES

Name	Description
EAS*	Electronic Article Surveillance
AFI	Application Family Identifier
DSFID	Data Storage Format Identifier

* Features not available with Contrinex RWMs (RLx-xxxx-xxx)

LIST OF COMMANDS

	Command Name	Command Code	Description	Rxx-xxxx-		
				x20	320	NIS
Mandatory ISO 15693	Inventory	01 _h	Execute the anti-collision sequence and return UID	✓	✓	×
	Stay Quiet	02 _h	Enter the Quiet state	✓	×	×
Optional ISO 15693	Read Single Block	20 _h	Read the requested 1 block data in the user/system memory	✓	✓	✓
	Write Single Block	21 _h	Write the requested 1 block data in the user memory	✓	✓	✓
	Lock Block	22 _h	Lock permanently the requested 1 block in the user memory	✓	×	×
	Read Multiple Blocks	23 _h	Read the requested multiple block data in the user/system memory	×	×	×
	Select	25 _h	Enter the Select state	✓	×	×
	Reset to ready	26 _h	Enter the Ready state	✓	×	×
	Write AFI	27 _h	Write AFI (Application Family Identifier) value into EEPROM	✓	×	×
	Lock AFI	28 _h	Lock permanently AFI value	✓	×	×
	Write DSFID	29 _h	Write DSFID (Data Storage Format Identifier) value into EEPROM	✓	×	×
	Lock DSFID	2A _h	Lock permanently DSFID value	✓	×	×
	Get System Information	2B _h	Read the system information value (UID, DSFID, AFI, number of bytes per block, etc)	✓	×	✓
	Get Multiple Block Security Status	2C _h	Read the block security status stored in system area	×	×	×
	–	2D _h to 9F _h	Reserved for future use	–	–	–

LIST OF COMMANDS

	Command Name	Command Code	Description	Rxx-xxxx-		
				x20	320	NIS
Custom ISO 15693	Inventory Read	A0 _h	Execute the anti-collision sequence and return the requested n blocks data in the user memory	x	x	x
	Fast Inventory Read	A1 _h	Fast response Inventory Read command	x	x	x
	Set EAS	A2 _h	Set EAS bit to "1"	x	x	x
	Reset EAS	A3 _h	Set EAS bit to "0"	x	x	x
	Lock EAS	A4 _h	Lock permanently the EAS bit to its current value	x	x	x
	EAS Alarm	A5 _h	When EAS bit is "1", reply 13 bytes of data (Flags, EAS, IC Mfg. code, UID and CRC16)	x	x	x
	Write EAS ID	A6 _h	Write a new EAS identifier	x	x	x
	Get NXP System Information	AB _h	Provide information about IC access conditions and supported features	x	x	x
	Password Protect EAS/AFI	A6 _h	EAS/AFI Password has to be transmitted before with a Set Password command	x	x	x
	Get Random Number	B2 _h	Get a random number calculated in the transponder	✓	x	✓
	Set Password	B3 _h	Get access to the different protected functionalities (EAS/AFI) in function of the password identifier used	✓	x	✓
	Write Password	B4 _h	Write a new password (EAS/AFI) into the system memory in function of the password identifier used	✓	x	x
	Lock Password	B5 _h	Lock permanently one password (EAS/AFI) in function of the password identifier used	✓	x	x
	Protect Page	B6 _h	Set the read and write access condition pagewise	✓	x	x
	Lock Page Protection	B7 _h	Lock permanently the read and write access condition pagewise	✓	x	x
	Destroy SLI-X2	B9 _h	Destroy permanently the transponder ISO 15693 air interface	✓	x	x
	Enable Privacy	BA _h	Enable the SLI-S privacy mode	x	x	x
	64 Bit Password Protection	BB _h	If 64-Bit Password Protection is enabled both read + write passwords are required to access read and write protected blocks (pages)	✓	x	x
Stay Quiet Persistent	BB _h	Upon reception, the label IC enters the persistent quiet state and will not send back a response. Stay quiet persists after power-off in case power off time < IC persistence time	x	x	x	
Read signature	BD _h	Return an IC specific, 32-byte ECC signature, to verify NXP Semiconductors as the silicon vendor	x	x	x	

NOTES ON USING I-CODE SLI-X2 – 16-bit counter features

Block 79 of the user memory contains the 16-bit counter. The block can be accessed with the standard READ and WRITE commands but special data considerations are required. The standard password protection mechanisms for the user memory is not valid for block 79.

The 16 bit counter (block 79) can be

- read
- increased by one

The counter can be read with a READ SINGLE BLOCK command to block 79 or a READ MULTIPLE BLOCK command including block 79. The 4 byte data from block 79 provide the following information:

Counter block data structure

Byte	Name	Value	Description
0	C0	0x00 – 0xFF	LSB of the counter value
1	C1	0x00 – 0xFF	MSB of the counter value
2	–	0x00	RFU
3	–	0x00	RFU

To increment the counter, a WRITE SINGLE BLOCK command must be sent to block 79 with the following values: **C0=0x01** and **C1=0x00**.