Panasonic

Specification

Manual Insertion Type Hybrid Card Reader

(for Magnetic Stripe Cards, Smart Cards)

Model #

ZU-98302SEA

Revision 1.00
Feb. 2005

Date:_____

Signature for approval
Read and agreed by _____

Matsushita Electric Industrial Co., Ltd.
Matsushita Industrial Information Equipment Co., Ltd

Revision History

Document No.	Date	Description	Page

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In case there is any contradiction appeared based on technical standard change/update etc., our specifications shall take precedence over such change/update.

Matsushita Industrial Information Equipment Co., Ltd.   *Specification No.:* MIS-DG60C203

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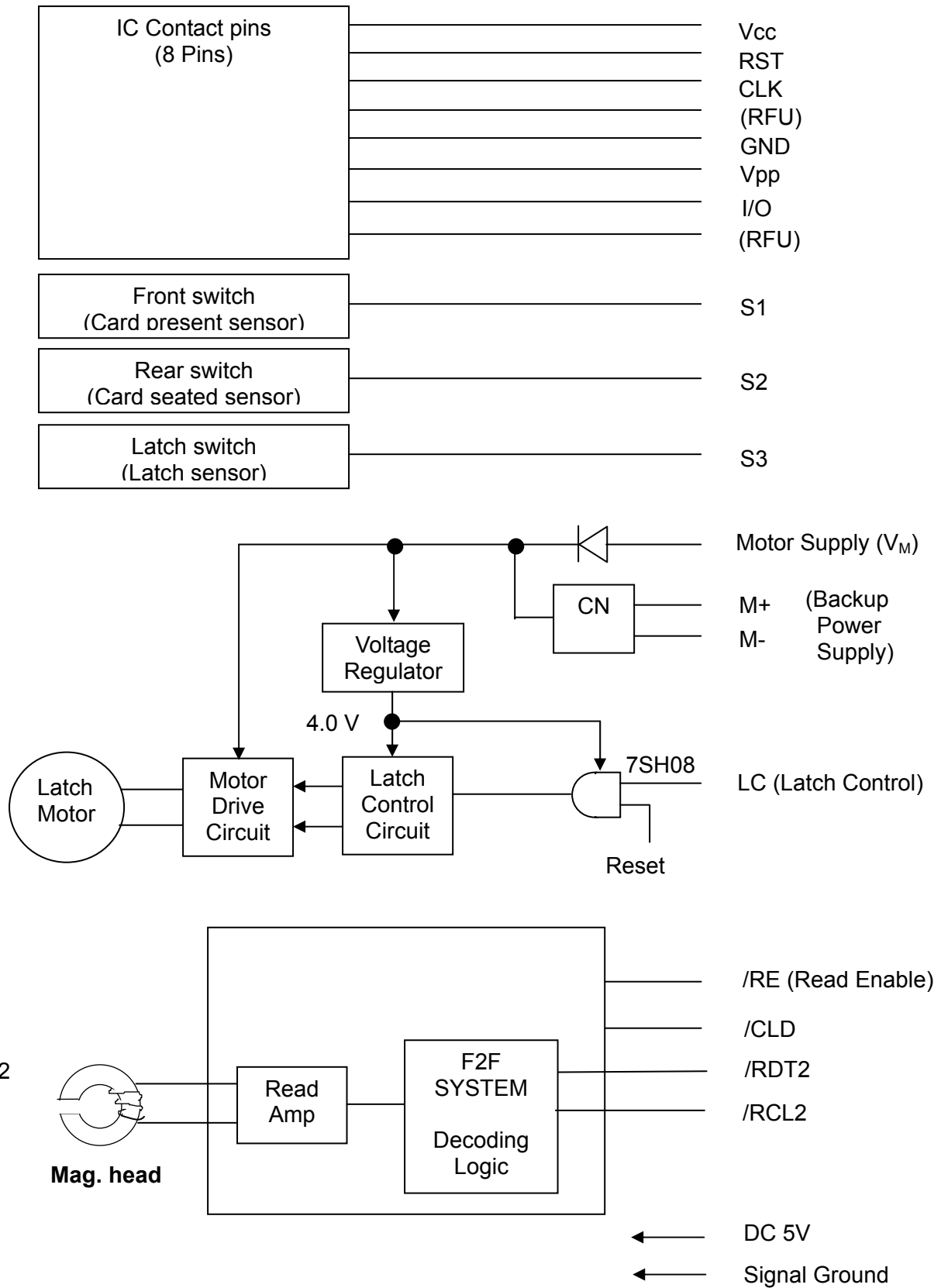
IC Card Reader/Writer with magnetic Reader

1. Abstract

IC Card Reader/Writer (ZU-98302SEA) consists as follows.

(1) Card Reader can access the contacts on smart card and read magnetic stripe.

(2) Card Reader has one decoding circuit for magnetic stripe.

(3) Electro-mechanical latching mechanism. The mechanism shall be used to lock an smart card in place while a transaction in progress.

(4) These mechanical switches detect 3 states the presence of the card within card slot, the state of latch and the card is inserted to the rear end which is placed to the right position.

(5) Card present sensor (front switch) is being operated while detecting card width.

(6) The opening hole which allows alien substances, such as coins or dust to either fall or to be forced out of the card slot.

(7) Location of contacts relative to the face of the card
The contact area shall be on the front face of the card at the location specified in ISO 7816-2 specification.

(8) Magnetic reading when usually pulling out (ejection) the card.

(9) Magnetic card stripe based on ISO 7810, 7811.

Card standard	ISO7810, ISO7811
Track used	Track 2nd
Recording method	F2F
Recording density	75 BPI
Recording capacity	40 characters (5 bit code)

(10) PCB coating for dew condensation-proof.

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2. Constructions

IC Contact pins (8 Pins)	
	Vcc
	RST
	CLK
	(RFU)
	GND
	Vpp
	I/O
	(RFU)

Front switch (Card present sensor)	S1
Rear switch (Card seated sensor)	S2
Latch switch (Latch sensor)	S3

Motor Supply (V$_M$)

CN — M+ (Backup Power Supply)
M-

Voltage Regulator

4.0 V

Latch Motor — Motor Drive Circuit — Latch Control Circuit — 7SH08 — LC (Latch Control)

Reset

F2F SYSTEM Decoding Logic — /RE (Read Enable)
/CLD
/RDT2
/RCL2

ISO2 — Mag. head — Read Amp

DC 5V

Signal Ground

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3. Specifications

3.1 Physical dimensions
Dimensions : (W) 100.8 mm x (H) 31.7 mm x (D) 118 mm
Mass : Approx. 120 g

3.2 Power source
3.2.1 Logic circuit
Voltage : DC 5.0 V (±10%), Ripple 250 mV p-p
Current Stand-by : 1.2 µA Max.
Operation : 15 mA Max.

3.2.2 Motor Supply
Voltage : DC 5.0 V (±10%)
Current Stand-by : 0 µA
Operation : 500 mA Max. (at DC 5V)
(Note): Motor supply
Time of supplying power to the motor is approx. 80 ms and should be taken more than 10 s intervals for testing.

3.3 Card standard
Smart card : ISO 7816-2
Magnetic card : ISO 7810, 7811 (ISO 2)

3.4 Interface
Smart card : Direct to contacts
Magnetic card : CMOS level (0 V – 5 V)
Controls : CMOS level (0 V – 5 V)

3.5 Contact resistance
IC contact pins : 0.5 ohm Max.

3.6 Connector : I/O connector (CN5)
Smart card reader/writer   Box type, 2 mm pitch, Dual line, 0.5 square pin
& Magnetic card reader   (CTEC) MBH26GR3 or equivalent
: Connector for Buck up power supply (CN1)
Molex 7478-02A

3.7 Environments
Operating temperature : -25 °C ~ +70 °C
Storage temperature : -30 °C ~ +75 °C
Operating humidity : 10 % ~ 90 % RH (non condensing)
Storage humidity :   5 % ~ 95 % RH (non condensing)

3.8 Reading speed of magnetic stripe
: 10 cm/s ~ 80 cm/s

3.9 Installation : Horizontally with printed circuit board side upward

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4. Connector and signals

4.1 I/O connector (I/O connector CN5)

No	Signal name	Contents		Direction
1	Vcc *1	For Smart Card	Power supply	In
2	/RST *3		Reset signal supply	In
3	CLK		Clocking signal supply	In
4	(RFU)		(Reserved for future use)	
5	GND		Power and signal ground	In
6	Vpp *2		Programming power supply	In
7	I/O *4		Serial data input / output	In / Out
8	(RFU)		(Reserved for future use)	
9	S1	Card is detected (card detect sensor 1)		Out
10	S2	Card is loaded (rear detect sensor 2)		Out
11	DC 5V	Circuit power supply		In
12	LC	Latch control		In
13	SG	Circuit ground		In
14	--			
15	/RDT2	Magnetic read data 2		Out
16	/RCL2	Magnetic read clock 2		Out
17	MG	Motor ground		In
18	S3	Card latch detect sensor 3		Out
19	$+V_M$	Motor power supply		In
20	/RE	Magnetic read enable		In
21	--			
22	/CLD	Magnetic card is loaded.		Out
23	--			
24	--			
25	--			
26	--			

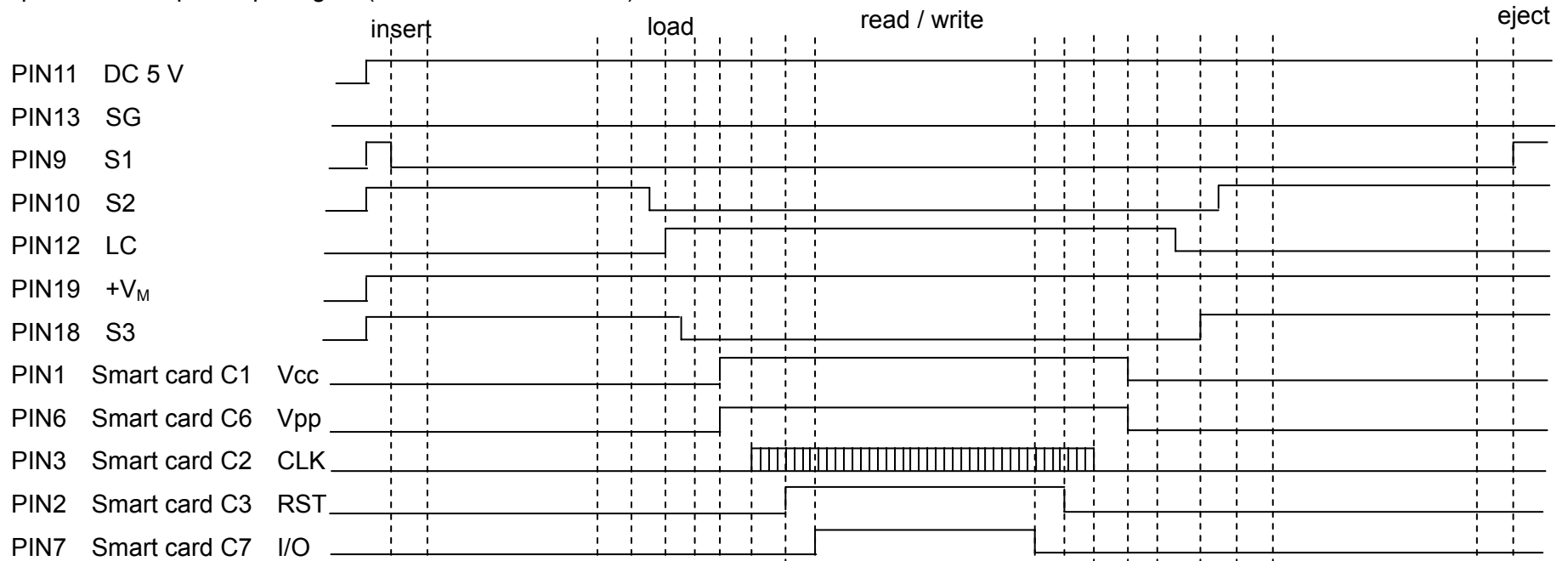*1, *2 : Connected on 0.1 μF ceramic capacitor
*3   : Connected on 1 nF ceramic capacitor
*4   : Connected on 56 pF ceramic capacitor
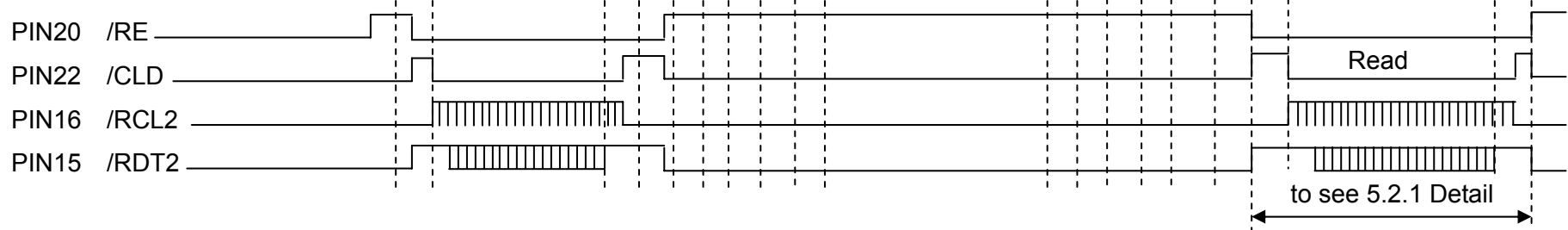
4.2 Buck up power supply connector (CN1)

No	Signal name	Contents	Direction
1	M+	Back-up power supply (ex. Capacitor)	In
2	M-	Ground	In

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5. Timing chart

5.1 Explanation of input/output signal (Smart card read / write)

5.2 Magnetic Card raed

5.2.1 Caution of magnetic reading

(1) Be sure to perform sampling of /RDT2 at the falling edge of /RCL2.
Pulse width of period "L" of /RCL is about 19 µs for the card conformable to ISO2 (75 BPI specification).
If sampling method other than edge sampling (such as a method detecting "L" of /RCL2 by means of polling) is used, please check with us since data may be read depending on polling frequency at the host

(2) In case that /RCL2 is set to read /RDT2 at the interrupt port of CPU, with the interruption action of the software in sampling of /RDT2 using the falling edge of /RCL2, be sure to perform the interruption action within the /RDT2 available time period.For the /RDT2 available time period, please refer to the following figure.

Data available period
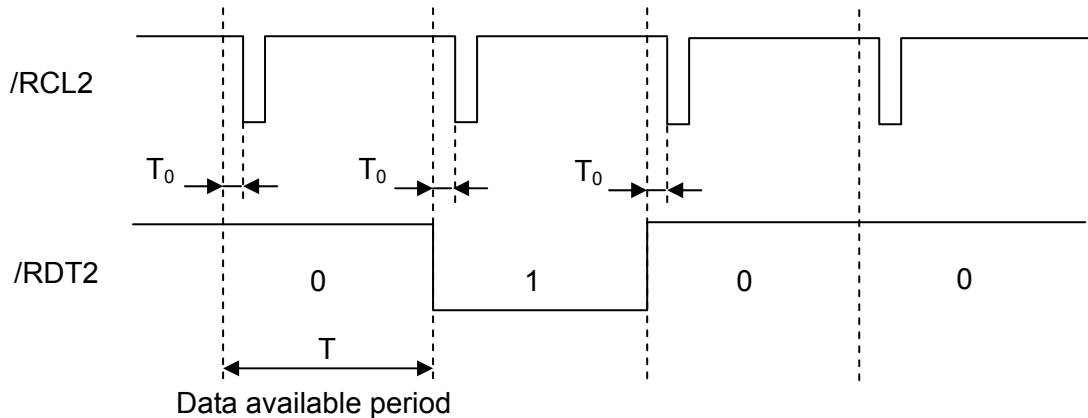
Where, T_0 (fixed) is
  approx. 9 µs in case of ISO2 type card reader.

However, T varies with recording density and running speed.
Refer to the following formula to calculate suitable T value for the applied card recording density and required maximum card running speed. Then set the interruption action time with sufficient margin.

Formula:

$$T\text{ (s)} = \frac{2.54 \text{ cm/inch}}{\text{Recording dencity (BPI)}} \times \frac{1}{\text{Card running speed (cm/s)}}$$

Reference:

Recording density （Jitter = 0）	75 BPI
Card running speed	18 cm/s
T	1.9 ms

6. Input / Output Signals

The input / output signals for this smart card reader / writer with magnetic reader consist of: Vcc, Vpp, RST, CLK, I/O, S1, S2, S3, /RE, LC, /RDT2, /RCL2, /CLD
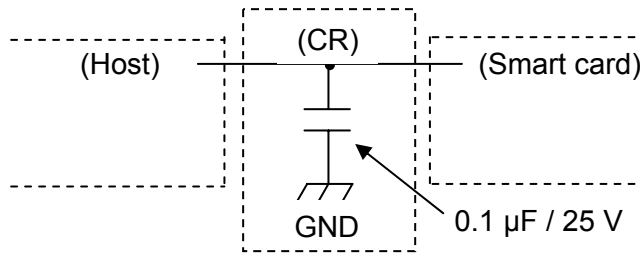
6.1 Signals for smart card

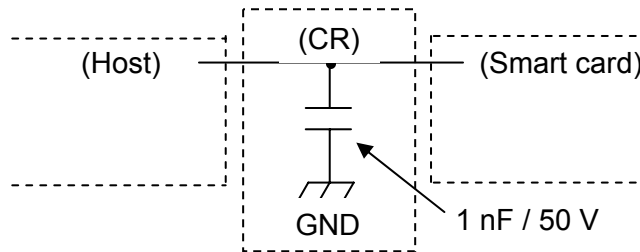Vcc, Vpp, RST, CLK, and I/O are signals for smart card.
Please refer to standard ISO / IEC 7816-3 in detailed specifications.
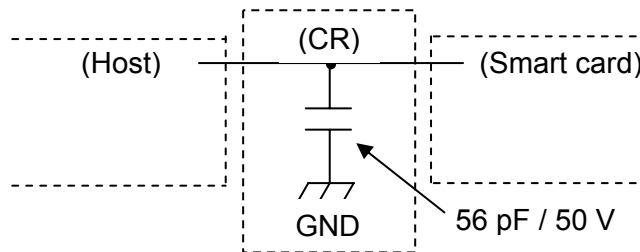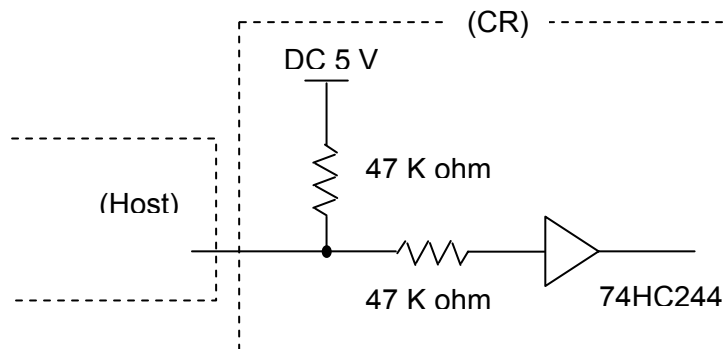
6.1.1 Circuit

(1) Vcc, Vpp

(Host)   (CR)   (Smart card)

GND   0.1 μF / 25 V

(2) RST

(Host)   (CR)   (Smart card)

GND   1 nF / 50 V

(3) I/O

(Host)   (CR)   (Smart card)

GND   56 pF / 50 V

6.2 Signals for card feeding

6.2.1 Input circuit

Input signal: /RE
Equivalent to

(CR)

DC 5 V

47 K ohm

(Host)

47 K ohm   74HC244

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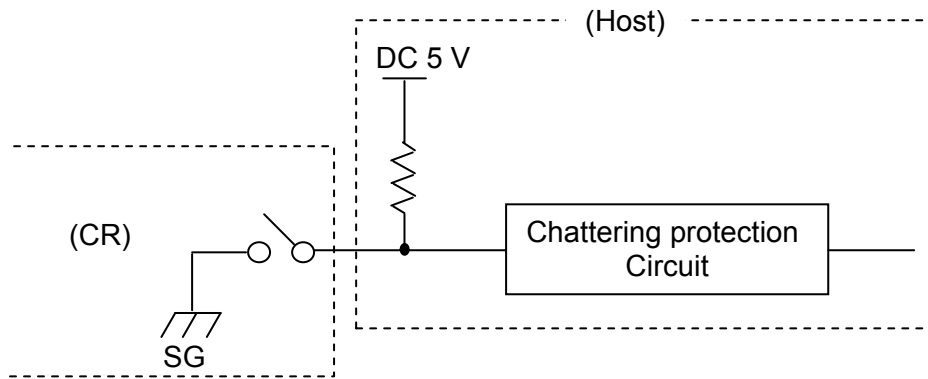
7

6.2.2   Input Circuit
Input signal: LC
Equivalent to
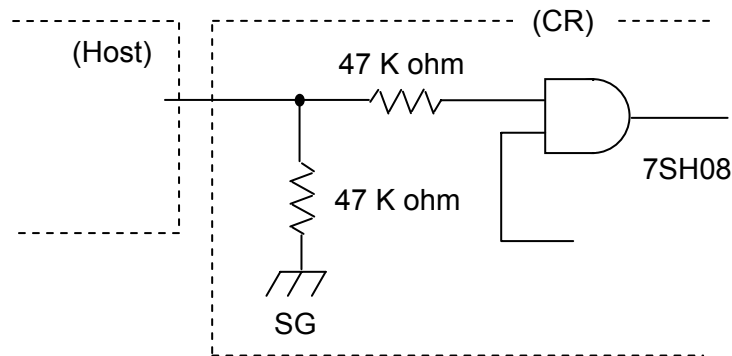
6.2.3   Output circuit
Output signals: S1, S2, S3
Equivalent to

6.3 Input / Output Voltage

		High Level ("0")	Low Level ("1")
Input	/RE, LC	3.5 V min.	1.0 V max.
Output	/RDT2, /RCL2 /CLD	4.6 V min. (I_{OH}= - 4.0 mA)	0.3 V max. (I_{OL}= 4.0 mA)

6.4 Signal description

6.4.1   Signal related with position of card
These sensing switches S1, S2 and S3 are snap action switch.
The sensing switch outputs connect directly I/O connector CN5.
So the interface pull-up resistance and chattering protection circuit are required.
Current range of S1 and S2 switches are defined DC 6 V 5 mA ~ DC 90 V 0.1 A
to insure proper sensing operation with the environmental condition.
Current range of S3 switch is defined DC 5 V 0.04 mA ~ DC 16 V 0.1 A
(recommended operating range DC 5 V 0.1 mA) to insure proper sensing
operation with the environmental condition.
So the interface pull-up resistance should be selected to consider the current
range.

(1) S1

Card present sensor (micro-switch) is positioned at the front of card reader.
The switch is normally open, and it is grounded when the card is inserted in the card reader.

(2) S2

The card seated sensor (micro-switch) is positioned at the rear of card reader.
The switch is normally open, and it is grounded when the card is fully inserted.
When the switch is grounded, IC contact pins of card reader touch the IC chip on the smart card, and the card is at the specified position to read and write IC.

(3) S3

The latch sensor (leaf-switch) indicates that the latching mechanism is activated and in a locked state. The switch is normally open, and it is grounded when the latch mechanism is activated (=card lock status).

6.4.2   Signal related with latch / unlatch of a card

(1) LC

The latch control signal LC should be normally "L".   And the latch mechanism is actuated to lock the card when the signal goes "H" by detecting a signal from host.
The latch mechanism is on unlatched position when the signal goes "L".
The state of the latch mechanism can be determined by the state of the card-latch sensor S3.

Note 1: If power is turned off accidentally during the card is latched and is hold inside of the card reader, the card will be released automatically by unlatch pulse which is generated by card reader itself. Back up power supply is required and connected with the card reader.
Panasonic confirm the performance with 8200 µF capacitor, however, please select right value of capacitor based on actual condition/environment.
In case wrong one is used, unsatisfactory performance may cause.

Note 2: The state of card-latch sensor S3 should be check periodically.
If the latch mechanism is on latch position while it must be on unlatched position originally, latch mechanism must be change to unlatched position by following order ;
1) Change LC signal from "L" to "H" and keep "H" more than 200 ms.
2) Change LC signal from "H" to "L" in order to an activate the latch mechanism. (set the latch mechanism to unlatch position)
3) Re-check the state of card latch sensor S3 and confirm the latch mechanism is set to unlatch position.

6.4.3   Signal related to reading of magnetic stripes

(1) / RDT2 (Read Data)

When the /RCL2 signal changes from "High" level to "Low" level :
"1" is indicated when the /RDT2 signal is at "Low" level.
"0" is indicated when the /RDT2 signal is at "High" level.

(2) / RCL2 (Read Clock)

This is used to sample the /RDT2 signal at its falling edges.

(3) /CLD

The /CLD line will be low when a magnetic card is running in the card reader.
The /CLD line will be high when the card is stopped or not present in the card reader.

7. Appearance

CARD

Panasonic CARD READER
ZU-98302SEA Made in Japan

General Tolerance: ±0.3
unit:mm

8. IC contact location of smart card (ISO type)

[unit : mm]

(Transitional contacts location)

a = 10.25 max	g = 21.77 max
b = 12.25 min	h = 23.47 min
c = 17.87 max	i = 24.31 max
d = 19.87 min	j = 26.01 min
e = 19.23 max	k =26.85 max
f= 20.93 min	l = 28.55 min

Upper edge

C1   C5   e f g h i j k l

Left edge

C2   C6

C3   C7

C4   C8

a
b
c
d
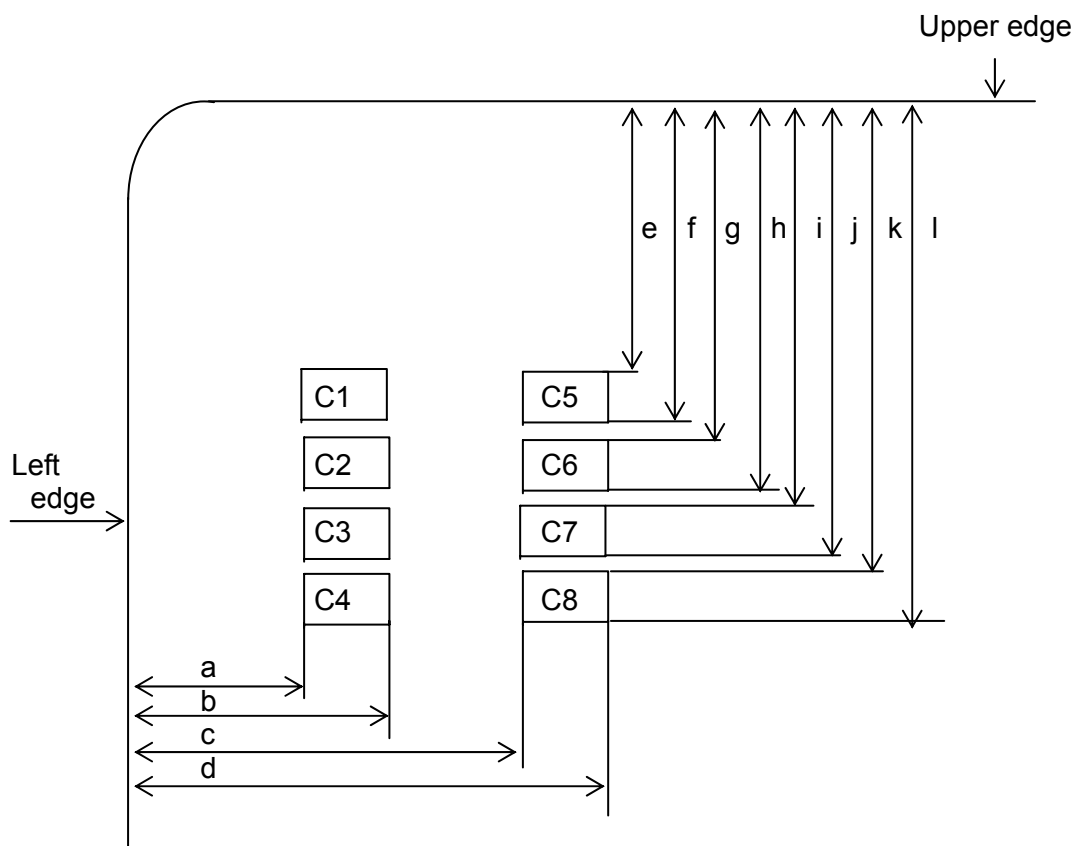
9. Card specification

Materials and dimensions of the card should be submitted to ISO standards.
But defined items in this specification are prior to these standards.

[unit : mm]

5.66 max.
8.46 ～ 8.197
8.97 ～ 8.46
11.76 ～ 12.27
12.52 ～ 12.01
15.32 ～ 15.82

85.47 ～ 85.72

7.44 ± 0.51 (Track1, 2)
7.44 ± 1.0 (Track 3)

Mag stripe
(Back side)

Track1
Track2
Track3

IC contacts
(Front side)

6.93 min.

53.92 ～ 54.18

center line of
first data bit

center line of
last data bit

(Unit : mm)
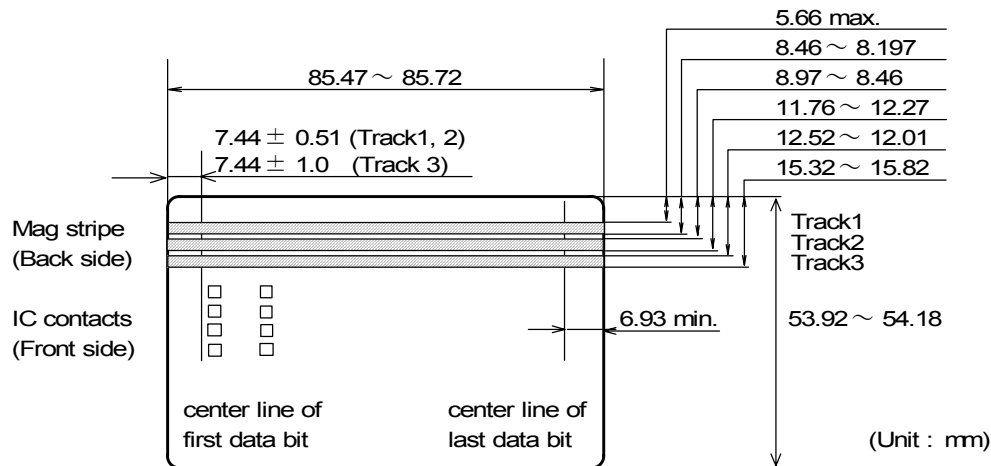
9.1 Physical characteristics

  (1) Thickness   : 0.76 mm (tolerance ± 0.08 mm)
  (2) Warpage   : 2.5 mm max.
                       (include relief height of embossed characters)

9.2 Magnetic characteristics

  (1) Coercive force (Hc)   : 2.4×10^4 A/m ~ 2.4×10^5 A/m
  (2) Residual flux (ϕ r)   : 1.25×10^{-8} Wb/cm (tolerance $\pm 0.15 \times 10^{-8}$ Wb/cm)
  (3) Square ratio (ϕ r/ ϕ m)   : More than 0.70

10. Unit life and reliability

10.1 Life of the magnetic head and IC contact pins

  (1) Magnetic head : 500,000 operations (2 passes / 1 operation)
  (2) IC contact pin : 500,000 operations
     (Condition) In a clean office environment（room）.
          In damp or dusty atmosphere, the life may be 1/3 to 1/5 of the above figure.

Above life cycles are the numbers which are tested in a "clean office environment".
These numbers may be shortened dependent on the actual environment.
Especially in a dusty environment＊, even in the indoor application, dust or sand
may shorten the life against the mechanical parts and most of the card transport
mechanisms.
In these cases, warranty of the card reader may be void unless the proper
protection and countermeasures are performed by the terminal side.

＊Dusty environment : Refer to ex.）IEC 68,EN30721-3-3 class 3S2 or worse.

11. Precautions

Keep the following precautions when using this unit.

11.1 Handling
(1) Do not drop or give excessive shocks to this unit.
(There are a few cases that card lock mechanism will be released when the excessive shock is given.)
(2) Do not disassemble this unit.

11.2 Cautions

11.2.1 Card

(1) Use specified card (ISO).
(2) Store the card carefully so as not to soil, injure or deform it.
In particular, solid deposit on the magnetic stripe surface may result in a trouble.

11.2.2 Cleaning

(1) Clean the magnetic head and IC contact pins by periodically passing a cleaning card.
For example, in a clean office room, pass the cleaning card about once a week. If the magnetic head is heavily stained, clean the head by soaking the felt part of the cleaning card in alcohol properly and pass the card. For example, in the case that the card readers are used in the environment full of dust, please make a cleaning of the card reader with a cleaning card with alcohol everyday.

The exclusive cleaning card shuld be used for IC contacts pins.

(2) If some kind of oil adheres to the parts for transferring cards, card transfer will be unstable. Please remove the oil with a cleaning card with alcohol.

11.2.3 Installation

(1) Do not install the card reader in dusty, hot or damp place, or near magnetic field or object generating inductive noise (printer, LED display unit, CRT, etc.).
Do not use the unit in a dusty place, otherwise the reading and writing accuracy may be deteriorated.
Keeps the unit away from objects generating magnetism, which may cause read errors and may damage the magnetic card data.
(2) Do not touch the printed circuit board with bare hand.
Note particularly static electricity.
(3) Do not supply power from other outlet than connector terminal. Pay special attention to the polarity of power source and wrong connection of connector.
(4) Do not use the unit in a place where it is exposed to sunlight directly or it is splashed by water.
(5) Install the card reader horizontally with printed circuit board side upward.

11.2.4 Others

(1) Check the noise, static electricity, etc., with the card reader being incorporated in the equipment. Noise from the power supply may cause the reading errors. Measures to reduce the noise from power supply should be made for the equipment the card reader is built in. It is especially efficient to put a noise-filter in the AC input line.

(2) The guaranteed temperature for operation range is -25 °C ~ 70 °C, and humidity range is 10 % ~ 90 % RH.
Do not use the unit if condensation gathers on it.
We recommend you to use the card reader under the environmental condition of temperature 10 °C ~ 40 °C which is the best for transferring cards and reading data.
Especially, in the condition of low temperature, provide heating system separately to warm up card reader.

(3) A shutter is not built in this card reader. In the case that the card readers are used in the environment full of dust, the lifetime of the magnetic head, IC contact pins and mechanism for transferring cards will decrease.

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