Triple Track Magnetic Reader Head Signal Processing IC

Description

The HCM4003 is a triple track magnetic reader head signal processing IC, designed for application in magnetic strip card reader system. The data rates of HCM4003 range from 200 to 15,000 bits per second. Acquisition and tracking of the data within this range is automatically. The amplitude voltage from 10% to 200%, which is meet ISO standard can be read. The SD pin can shut down HCM4003 so that the power consumption will be reduced lower and it provides a convenient way to share BUS with the smart card reader IC HCM8035.

Features

- **Very few external components**
- **CMOS machining**
- **Wide operating power supply: DC 3V ~ 5.5V**
- **Quiescent current: 2mA**
- **Triple track F/2F decoder**

Ordering information

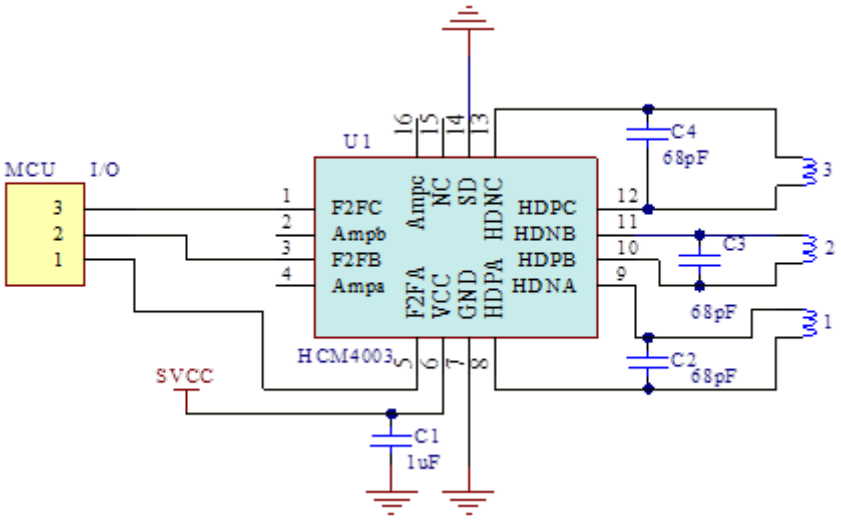
Package	QFN16（3x3x0.75_0.5）
XXYY	Date code
XXXXXX	Wafer batch number

Top view

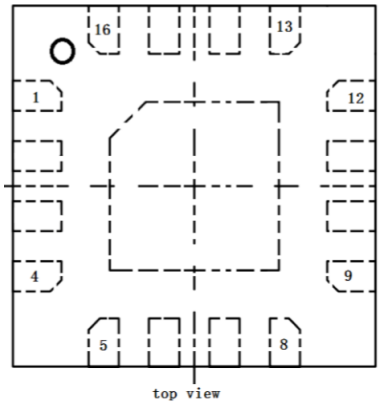
Application

- **POS Terminal Equipment**
- **Magcard Access Control System**

Typical Application



Pin Configuration and Functions



NO.	NAME	TYPE	DESCRIPTION
1	F2FC	O	C Track digital output
2	AMPb	I	B Track amplifier output
3	F2FB	O	B Track digital output
4	AMPa	O	A Track amplifier output
5	F2FA	O	A Track digital output
6	VCC	P	Power Supply
7	GND	P	Ground
8	HDPA	I	A track amplifier input（+）
9	HDNA	I	A track amplifier input（-）
10	HDPB	I	B track amplifier input（+）
11	HDNB	I	B track amplifier input（-）
12	HDPC	I	C track amplifier input（+）
13	HDNC	I	C track amplifier input（-）
14	SD	I	While SD=1,HCM4003 shut down
15	NC		
16	AMPc	O	C Track amplifier output

Absolute Maximum Ratings

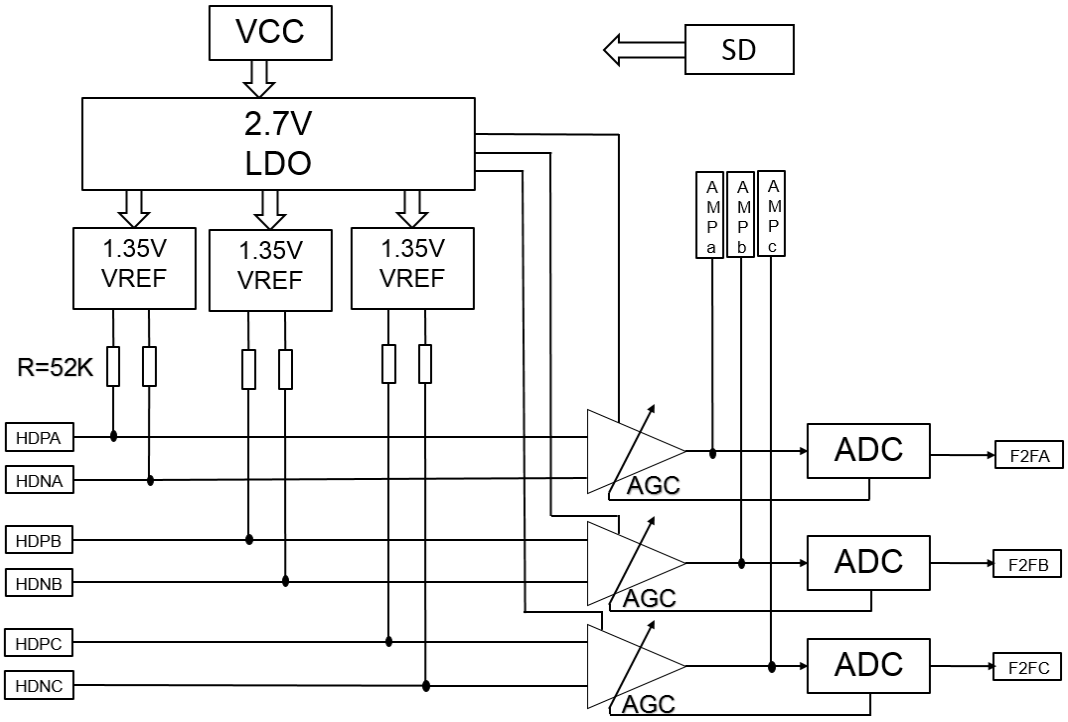
Symbol	Parameter	Value	Unit
VCC	Power	**7**	**V**
Vout	Output voltage	**7**	**V**
Vin	Input voltage	**7**	**V**
Tstg	Storage temperature	**-65 ~ +150**	**℃**
Tj	Junction temperature	**150**	**℃**
ESD	ESD （HBM）	**± 2**	**KV**

Electrical Characteristics

Test condition：T=25ºC，VCC=3.3V,unless otherwise specified.

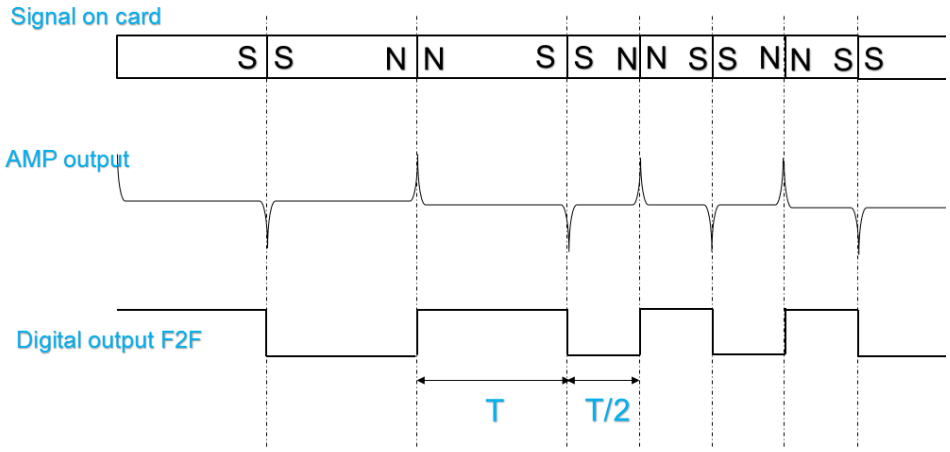
Symbol	Description	Test condition	Value			Unit
			MIN	TYPE	MAX	
Supply						
ICC	Working current	**SD=0**		**2**		**mA**
ISB	Shut down current	**SD=1**			**5**	**uA**
VCC	Power supply voltage		**3**		**5.5**	**V**
Amplifier						
Fc	Cut-off frequency	**0dB gain**		**6**		**MHz**
Vn	Input noise	**1K~20KHz**		**20**		**uV**
VA	Gain （Automatic gain control , default maximum）	**Max**		**50**		**dB**
		Min		**6**		**dB**
		Gain ranger		**54**		**dB**
Rin	Input impedance			**50**		**kΩ**
Vincom	Common mode input voltage		**0.1**		**1.2**	**V**
Vindif	Differential mode input range			**200**		**mV**
Vos	Input Offset Voltage		**-0.4**	**0**	**0.4**	**mV**
Comparator						
VOH	High-level output voltage	**5mA load**		**VCC-0.4**		**V**
VOL	Low-level output voltage	**5mA load**		**0.4**		**V**
Digital output F2FA/B/C						
RF2F	F2F A/B/C Output impedance	**SD=1**		**HIGH Impedance**		

Functional Block Diagram



Functional Descriptions

1. Operation Description



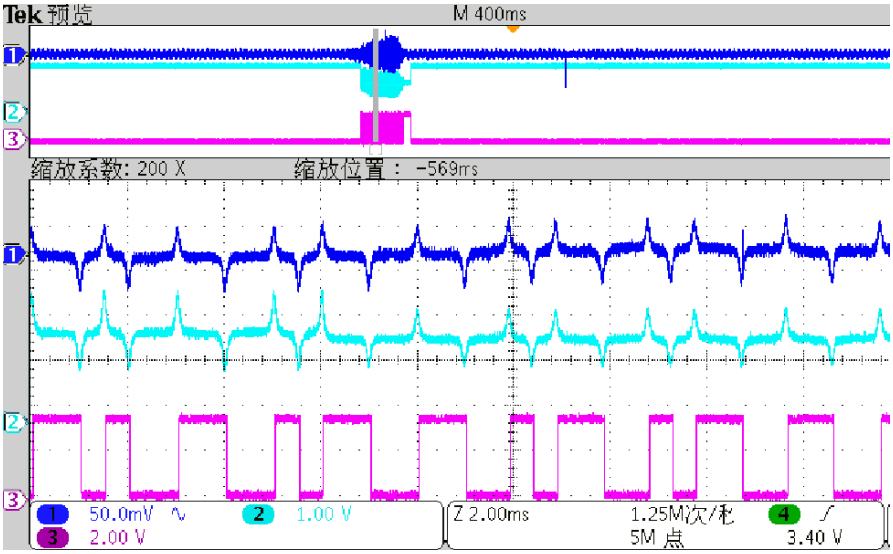
Coded format

The first amplifier includes an **AGC** circuit to amplify and filter out the signal from the magnetic reader head. The common-mode noise are eliminated and the signal peaks are detected. After the **AGC** amplifier,the **AMP** signal is generated and send to the second

amplifier. Then going through this **ADC** circuit, the analog signal will be convert to digital signal.

What is F2F signal: There are couple frequencies in **F2F** signal, F represents **0**, **2F** represents **1**. In terms of time unit, single **T** stands for **0**, double half-T stands for **1**. The **F2F** signal will be send to **MCU** and decoded into bit data by the specific software.

2. The analog output signal and digital output signal from **HCM4003** are shown below.



Channel 1: Input signal come from the magnetic reader head.
Channel 2: AMP signal, come from the **AGC** pre-amplifier，which is the first amplifier.
Channel 3: F2F signal is generated through **ADC**.

3. The data rates of **HCM4003** range from 200 to 15,000 bits per second. Acquisition and tracking of the data within this range is automatically. The amplitude voltage from 10% to 200%, which is meets with **ISO** standard can be read.

Application Notes

1. The pin **SD** voltage is able to turn **HCM4003** on or off. While **SD** is low (**SD**=**0**), **HCM4003** is enabled; when **SD** is high (**SD**=**1**), **HCM4003** will be shut down .The **SD** can be from **MCU** or directly connected to **GND**. If it is floated, **HCM4003** is in shut-down mode.
2. The bottom pad of the package should be connect to **GND**.
3. For the unused track, please shorten **HDP** and **HDN**.
4. A recommended **BOM** is shown below. Cap **C1** is used for bypassing noise for power supply. A cap of 1**uF** is recommended. According to the practical application of the system, capacitor connected between **HDN** and **HDP** is able to adjust the input impedance. For this capacitor, a cap of 68**pF** is recommended. Its exact value can be optimized according to the magnetic reader. By the way, this capacitor can impact on sensitivity of **HCM4003**. The smaller cap, the higher sensitivity.

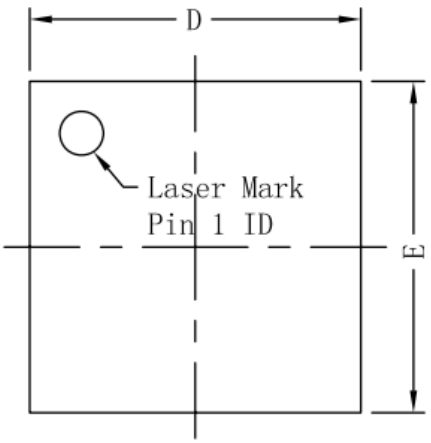
Symbol	Parameter
C1	Capacitor ，**1uF** （Low **ESR**）
C2、**C3**、**C4**	Capacitor，**68pF**

5. On **PCB** layout board，the magnetic strip card reader system should be put far away from the **DC-DC** power and any noisy signal.
6. The **AMP** pins are mainly used for system debugging. It is recommended to lead out on **PCB**.

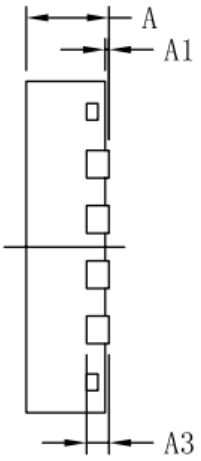
Package Outline

QFN16（3x3x0.75_0.5）

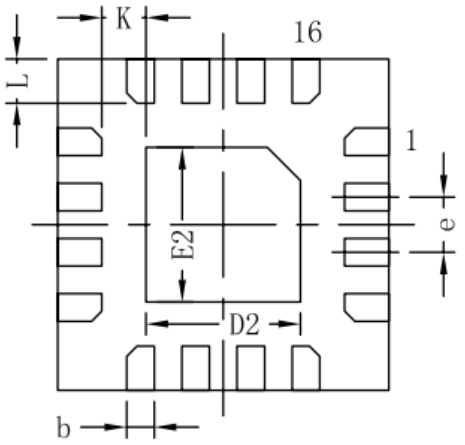
Size / Mark	Min(mm)	Max(mm)	Size / Mark	Min(mm)	Max(mm)
A	0.7	0.8	E2	1.55	1.75
A1	-	0.05	e	0.5 TYPE	
A3	0.203REF		K	0.2	-
b	0.2	0.3	L	0.3	0.5
D	2.9	3.1			
E	2.9	3.1			
D2	1.55	1.75			



Top View



Side View



Bottom View