Midas Touch
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MFC-1502 Fingerprint Image Sensor Data Sheet

We are dedicated to developing sensing technology, and providing customers with an innovative and diverse range of sensor products.

Our sensors and state-of-the art fingerprint recognition algorithm technologies provide advanced and convenient fingerprint acquisition and verification.

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[DESCRIPTION]

The MFC-1502 fingerprint image sensor is based on capacitive-touch technology with hardened surface and enhanced ESD strength. The build-in analog and digital circuitries minimize the number of external components, and provide easy-to-use, standard SPI interface to micro-processors.

The operation of MFC-1502 is as following, a fingerprint image captured by pixel array, delivery fingerprint ridge or valley signals to A/D converter and digital processor, then to the serial peripheral interface for data-reading. The image quality of MFC-1502 can be adjusted by setting gain, offset and reference voltage parameters internally. In addition, the internal operation parameters and interface speed can also be configured to meet various finger conditions.

[FEATURES]

- *192 x 192 pixels*
- *Build-in ADC for digitizing image*
- *High speed SPI interface*
- *Data encryption*
- *Short read out time*
- *High sensing capability*
- *Single power supply*
- *IP 67 approved*
- *Support 160-byte on-chip data FIFO*
- *High ESD tolerance*

[APPLICATIONS]

- *Door lock*
- *Security device*
- *Smart card*

[SPECIFICATIONS]

Item	Value
Spatial resolution	508dpi
Sensing area	9.6mm x 9.6mm
Package size	12.8mm x 12.8mm x 0.7mm
Package	RoHS compliant and low-halogen
Supply voltage (Normal operating at 3.3V)	3.0 V ~ 3.6V
Operating temperature	-20 to +70 ^{o}C
Inter face	SPI

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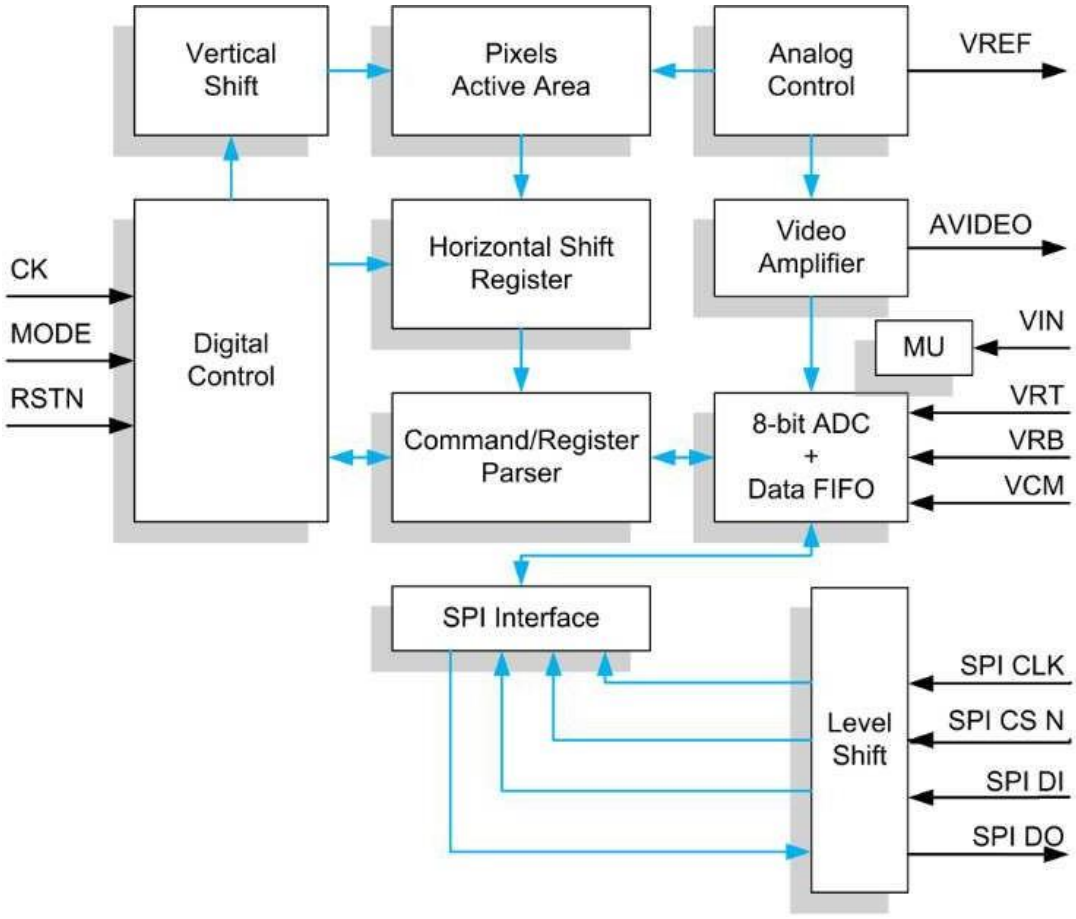
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1 Architecture

1.1 Block Diagram

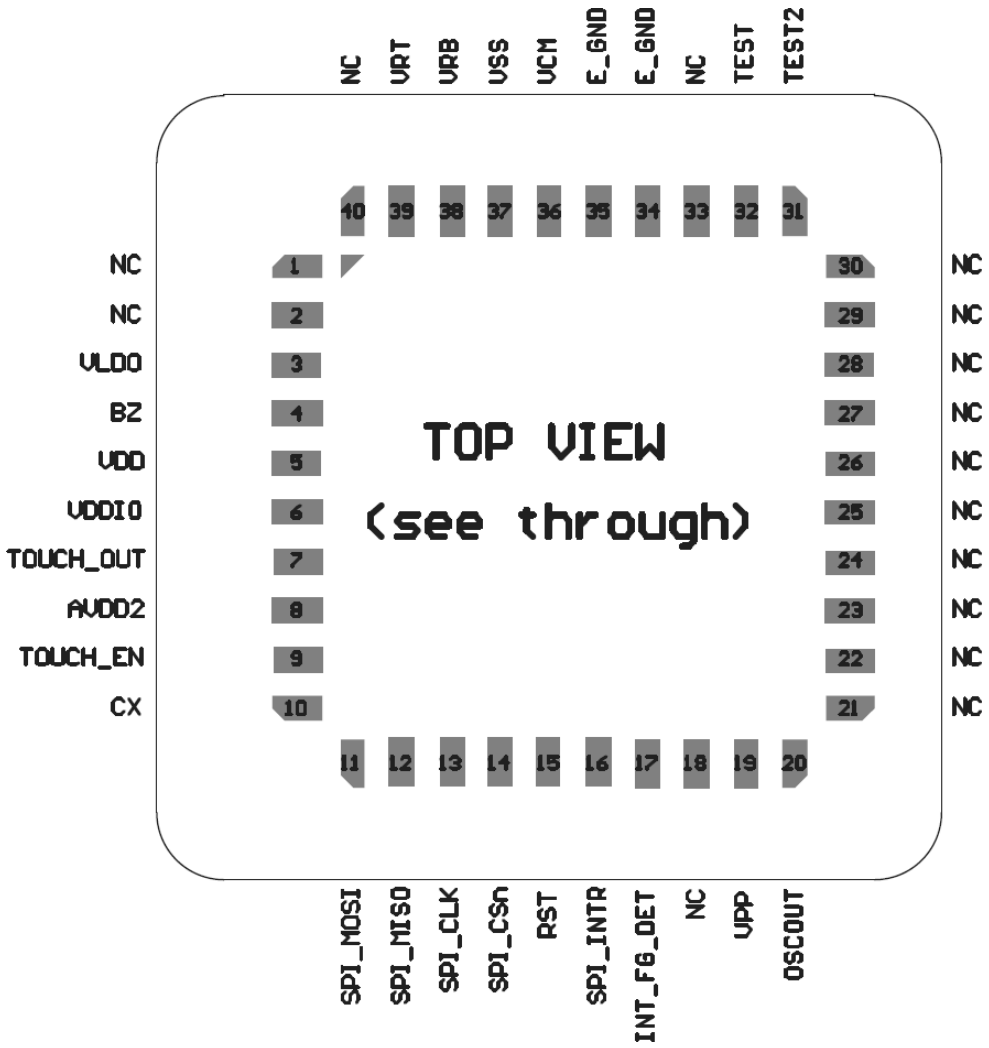
The operation of MFC-1502 is as following, fingerprint image captured by pixel array, pass fingerprint ridge or valley signals to A/D converter, digital processor and to the serial peripheral interface. The image quality of MFC-1502 can be adjusted by setting gain, offset and reference voltage parameters internally. In addition, the internal operation parameters and interface speed can also be configured to meet various finger conditions.



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2 Pin Assignment

2.1 Pin Assignment



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2.2 Pin Description

Pin Name	Type	Pin Description	
NC	1,2,18,21-30,33,40	-	No connection.
VLDO	3	Output	LDO output power, internal use.
BZ	4	I/O	Touch function input pad, connect to external metal ring.
VDD	5	Input	System power. Voltage supply for core operation.
VDDIO	6	Input	System power. This voltage is supplied for IO interface operation. Normally it can be tied to the VDD if the IO operation voltage is 3.3V. If lower IO voltage is needed, providing the right IO voltage to this pin.
TOUCH_OUT	7	Output	Touch function output pin. Active high.
AVDD2	8	Power	Touch function power.
TOUCH_EN	9	Input	Touch function enable control pin, high enable.
CX	10	Output	External touch IC de-noise. If system application would use touch IC, connect this pin to touch input pad with a Resistor.
SPI_MOSI	11	Input	SPI data in pin, master out slave in.
SPI_MISO	12	Output	SPI data out pin, master in slave out.
SPI_CLK	13	Input	The SPI clock rate provided by the master must not exceed 18MHz depend on different application, SPICLK should be adjusted for best image quality.
SPI_CSn	14	Input	Chip select for SPI.
RST	15	Input	A LOW on this pin resets the sensor to take on its default states.
SPI_INTR	16	-	No use.
INT_FG_DET	17	-	No use.
VPP	19	power	Internal reference voltage, connect to 1uF capacitor.
OSCOUT	20	Output	Test pin, internal use.
TEST2	31	Output	Test pin, internal use.
TEST	32	Output	Test pin, internal use.
E_GND	34,35	Power	Connect to Ground.

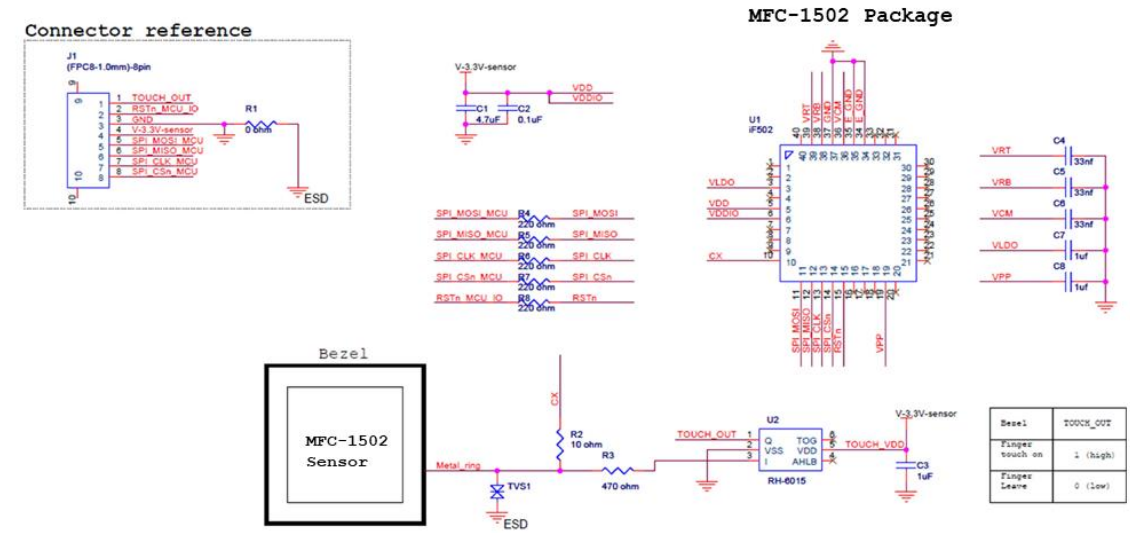
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Pin Name	Type	Pin Description	
VCM	36	Output	Internal Reference voltage output.
VSS	37	Power	Ground.
VRB	38	Output	Internal Reference voltage output.
VRT	39	Output	Internal Reference voltage output.

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2.3 Reference Schematic

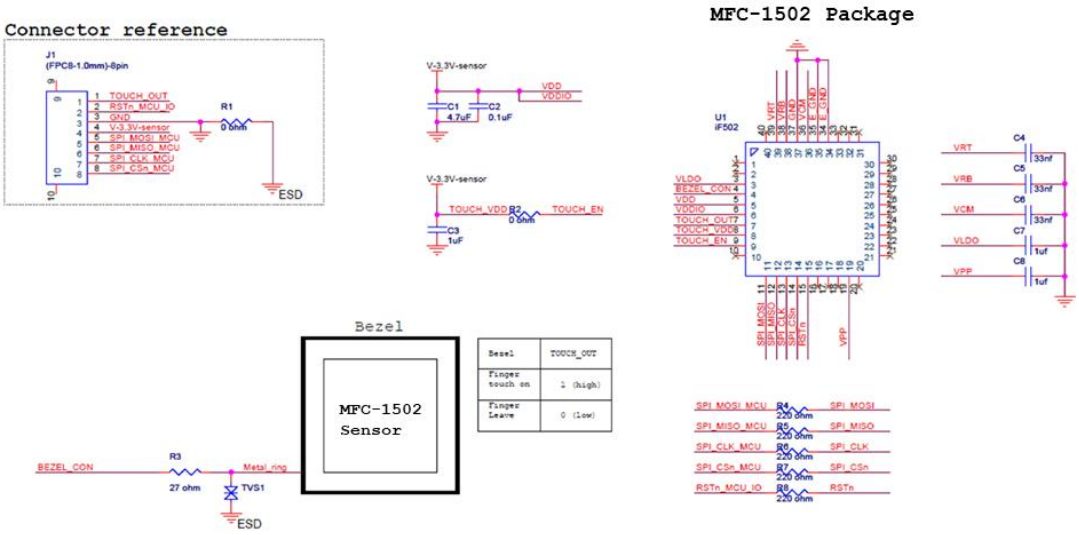
MFC-1502 Reference Circuit with Touch IC



Note:
1. sensor 可下指令關閉內部CLK，達到省電功能，當Host 收到 Touch out 訊號時在開啟sensor Clock 取指紋，可達最省電功能
2. 鐵蓋與PCB版 Metal Ring 走線透過銀膠連接，TVS管擺放位置盡量靠近Metal Ring **貫孔下來的區域，讓靜電導入**ESD GND
3. ESD GND 透過R1 0 歐姆電阻(包裝>0603) 接到connector 的GND，R1 擺放靠近connector，使靜電較不影響sensor GND。
   ESD GND 走線寬度 > 20mil
4. TVS 選擇寄生電容小於 20pF & 操作在3.3V，TVS接到ESD GND

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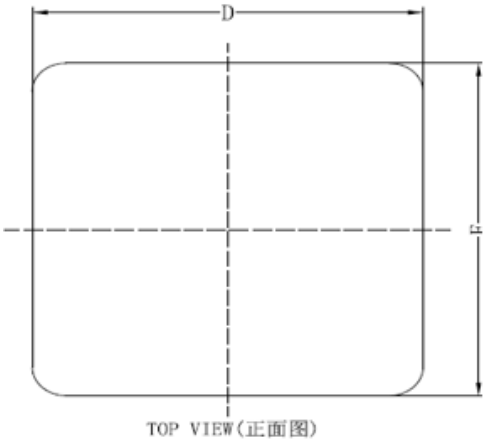
MFC-1502 Reference Circuit with internal Touch

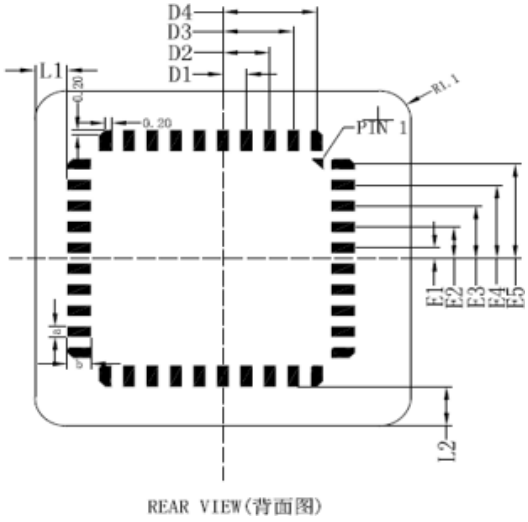


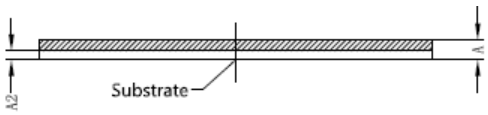
Note:
1. 使用內部touch function, sensor pin 4 接鐵蓋 ，sensor pin9 拉高為enable Touch 功能，當手指觸摸鐵環時pin 7 Touch out 輸出高電平
2. sensor 可下指令關閉內部CLK，達到省電功能，當Host 收到 Touch out 訊號時在開啟sensor Clock 取指紋，可達最省電功能
3. 鐵蓋與PCB版 Metal Ring 走線透過銀膠連接，TVS管擺放位置盡量靠近Metal Ring 貫孔下來的區域，讓靜電導入ESD GND
4. ESD GND 透過R1 0 歐姆電阻(包裝>0603) 接到connector 的GND，R1 擺放靠近connector，使靜電較不影響sensor GND。
   ESD GND 走線寬度 > 20mil
5. 4. TVS 選擇寄生電容小於 20pF & 操作在3.3V，TVS接到ESD GND
6. TOUCH_VDD 及TOUCH_EN 不使用內建touch function 時可不接電源懸空

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3 Package Information







SIDE VIEW(侧面图)

尺寸规格							
SYMBOL	Min.	Nor.	Max.	SYMBOL	Min.	Nor.	Max.
D	12.750	12.800	12.850	E	12.750	12.800	12.850
D1	0.750	0.800	0.850	E1	0.350	0.400	0.450
D2	1.550	1.600	1.650	E2	1.150	1.200	1.250
D3	2.350	2.400	2.450	E3	1.950	2.000	2.050
D4	3.150	3.200	3.250	E4	1.750	2.800	2.850
a	0.350	0.400	0.450	E5	3.550	3.600	3.650
b	0.750	0.800	0.850	A	0.670	0.700	0.730
L1	1.050	1.100	1.150	A2	0.180	0.210	0.240
L2	1.450	1.500	1.550				

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4 Revision history

Version	Date	Changes	Approved	Checked	Author
V0.1	2019/10/15	Initial draft	Colman	PC Yu	Apple Wang
V0.2	2019/10/28	Modify reference circuit	Colman	PC Yu	Apple Wang

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