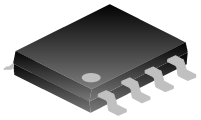
LOW VOLTAGE LOW POWER DISSIPATION I/O TYPE MCU WITH E²PROM and BUILT-IN HIGH ACCURACY OSCILLATOR

DESCRIPTION

SC51P03A05 is 3V I/O type 8-bit MCU with low power dissipation. It uses SC51 core with built-in 4K-byte OTP, 128-byte RAM and 256-byte E^2PROM. It features 1.8V~3.6V operating voltage range, super-low Stop current, and low operating current under low frequency, which makes it well suitable for the battery-powered systems. The 4K-byte OTP, optimized anti-interference ability, 8mA pin driving ability, rich timer function and carrier generator equivalent to 8-bit PWM make the SC51P03A05 suitable for various small home appliances control.



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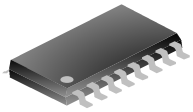


SOP-16-225-1.27

APPLICATION

- Remote control
- Motor control
- Small home appliances control
- Power management

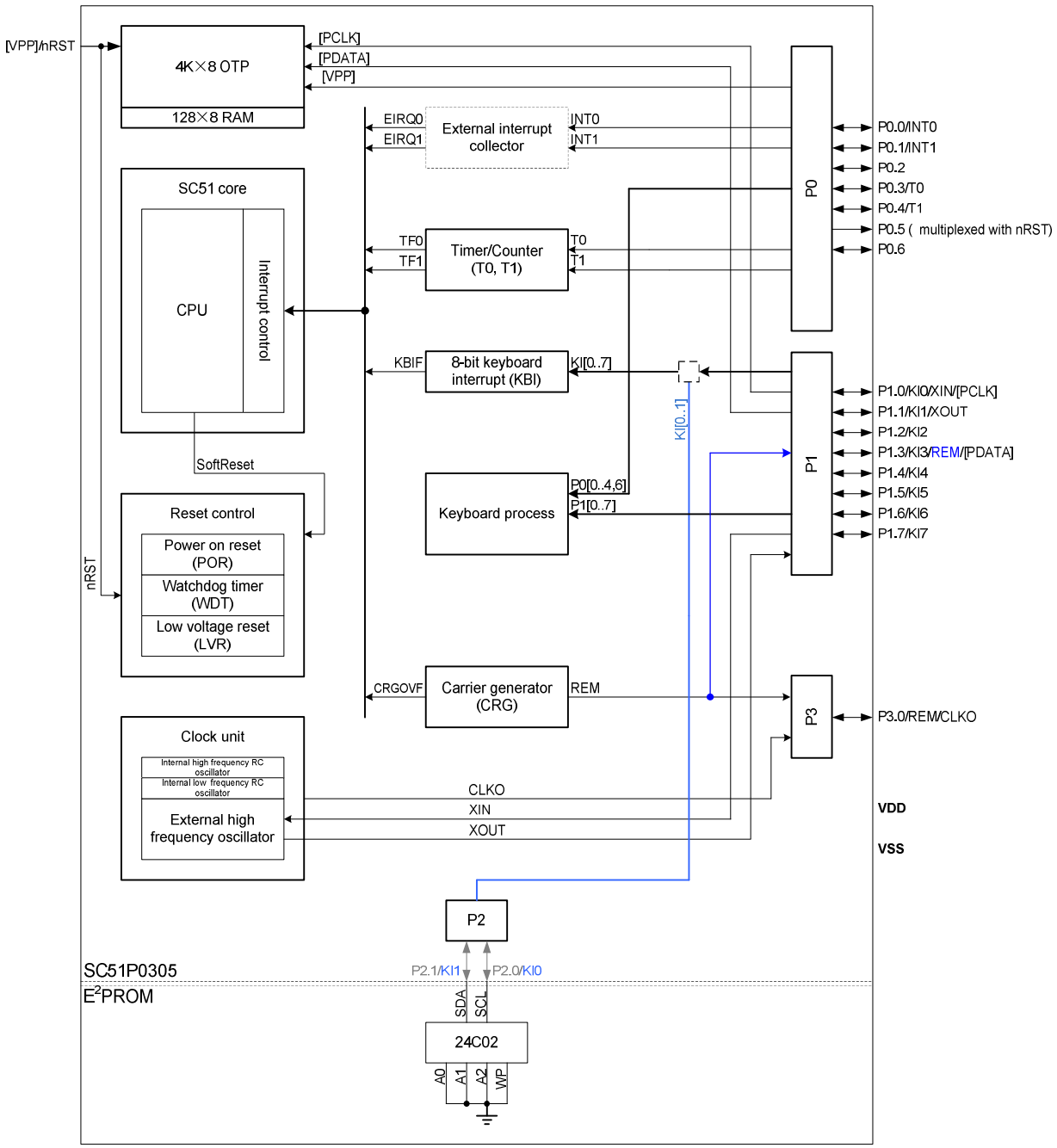
FEATURES

- Compatible with MCS51 instruction set; dual DPTR; add software reset instructions.
- Improved instruction structure, the execution time of 90% instructions is two to four clock cycles.
- 4K-byte OTP, 4×1K MTP, data holding>10 years.
- 128-byte RAM.
- 256-byte E^2PROM.
- Support In-System Programming (ISP) with only five pins.
- Built-in power on reset (POR)
- Bulid-in low voltage reset (LVR):1.63V, 1.7V.
- Build-in low voltage detect(LVD):2.0V, 2.1V, 2.2V, 2.3V, 2.4V, 2.5V, 2.7V, 3.0V.
- Up to 13 I/O ports and one open-drain output.
- 8 pins have keyboard interrupt awake function with settable interrupt polarity.
- Two external interrupt inputs with settable interrupt polarity.
- Built-in dynamic keyboard wakeup (DKW) module supporting trapezoidal keyboard connection.
- Built-in watchdog timer (WDT).
- Two 16-bit standard timers.
- Built-in carrier generator (CRG) for carrier modulation.
- Built-in high current open-drain output transistor, I_{OL}=180/250mA@V_{OL}=0.3V, V_{DD}=3V.
- Built-in 4MHz high accuracy oscillator (RCH), with error of not more than ±1% under -10~50°C/1.8~3.6V condition.
- Built-in 20KHz low frequency oscillator (RCL).
- External 1~8MHz high frequency oscillator.
- Prescale setting for system clock with factors: 1/2/8/64.
- IDLE mode and Stop mode.
- Operating voltage: 1.8V~3.6V; typical operating current: 1mA@4MHz; stop current is less than 1.0μA;
- 8/16-pin SOP package.

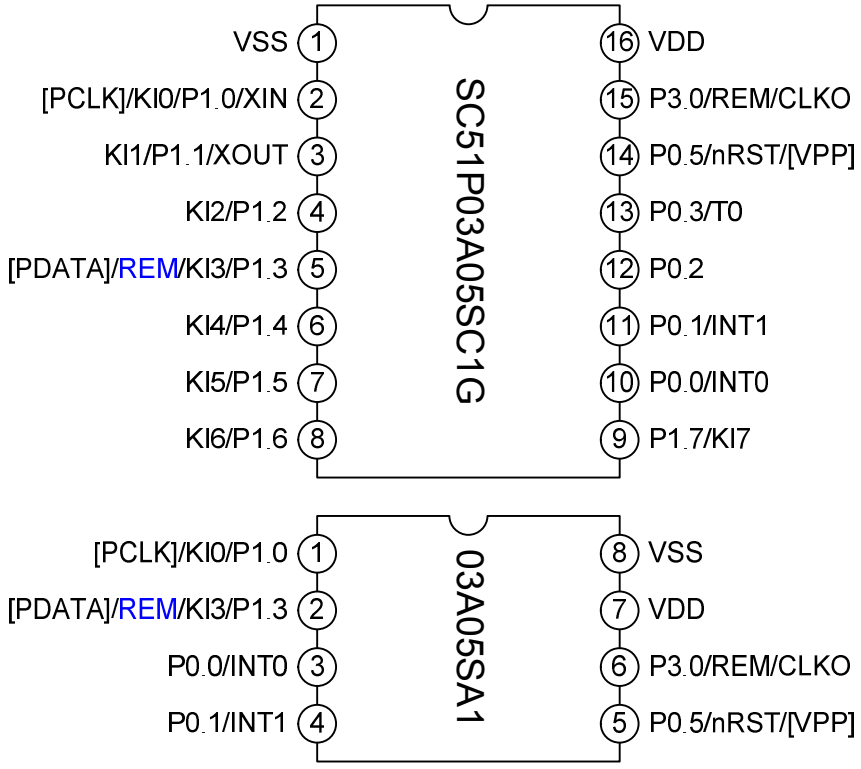
ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing
SC51P03A05SC1G	SOP-16-225-1.27	03A05SC1G	Halogen free	Tube
SC51P03A05SC1GTR		03A05SC1G	Halogen free	Tape&Reel
SC51P03A05SA1G	SOP-8-225-1.27	03A05SA1	Halogen free	Tube
SC51P03A05SA1GTR		03A05SA1	Halogen free	Tape&Reel

BLOCK DIAGRAM



PIN CONFIGURATION



Note 1: The pin with the name in blue font means it can be realized by remapping through software.

Note 2: The pin with the name in [ ] means it is used for programming.

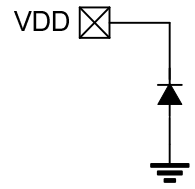
PIN DESCRIPTION

-SC1G	-SA1G	Pin Name	Pin Type	Pin Structure	Pin description
16	7	V_{DD}	P	P1	Power supply
1	8	V_{SS}	P	P0	Ground
2	-	X_{IN}	I	B&	External oscillator input pin.
3	-	X_{OUT}	O	B&	External oscillator output pin.
14	5	nRST	I	A	External reset pin (active low).
10	3	P0.0	I/O	B	I/O ports, bit operation available.
11	4	P0.1	I/O	B	
12	-	P0.2	I/O	B	
13	-	P0.3	I/O	B	
14	5	P0.5	O	A	Open-drain output port, bit operation available.
2	1	P1.0	I/O	B&	I/O ports, bit operation available.
3	-	P1.1	I/O	B&	
4	-	P1.2	I/O	B	
5	2	P1.3	I/O	B	
6	-	P1.4	I/O	B	

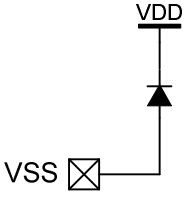
-SC1G	-SA1G	Pin Name	Pin Type	Pin Structure	Pin description
7	-	P1.5	I/O	B	
8	-	P1.6	I/O	B	
9	-	P1.7	I/O	B	
15	6	P3.0	I/O	C	I/O ports, bit operation available.
2	1	KI0	I	*	Keyboard input pins can generate interrupt to awake the MCU.
3	-	KI1	I	*	
4	-	KI2	I	B	
5	2	KI3	I	B	
6	-	KI4	I	B	
7	-	KI5	I	B	
8	-	KI6	I	B	
9	-	KI7	I	B	
10	3	INT0	I	B	Input pin of external interrupt0.
11	4	INT1	I	B	Input pin of external interrupt1.
13	-	T0	I	B	External counting trigger input of timer/counter 0~1.
15,5	6	REM	O	*	Carrier generator output pin.
15	6	CLKO	O	C	Test clock output.
14	5	[VPP]	P	A	High voltage power supply for OTP programming.
2	1	[PCLK]	I	B	Programming clock input pin.
5	2	[PDATA]	I/O	B	Programming data I/O pin.

Note: In column “pin type” of above table, P denotes the power supply pin; I/O denotes common input/output pins; I denotes the input pins; O denotes the output pins; In column “pin structure”, B& means the pin structure is similar to the pin structure B; * means the pin structure is relative to the mapping pin position.

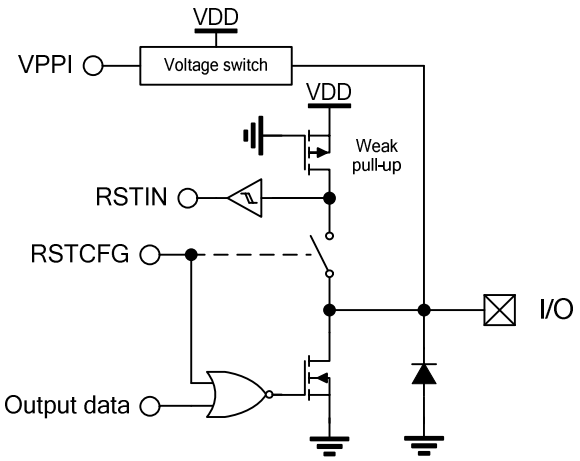
PIN STRUCTURE



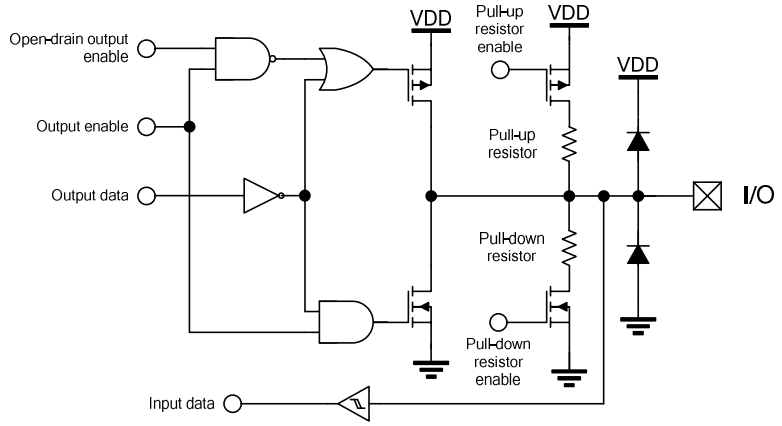
Pin structure P1



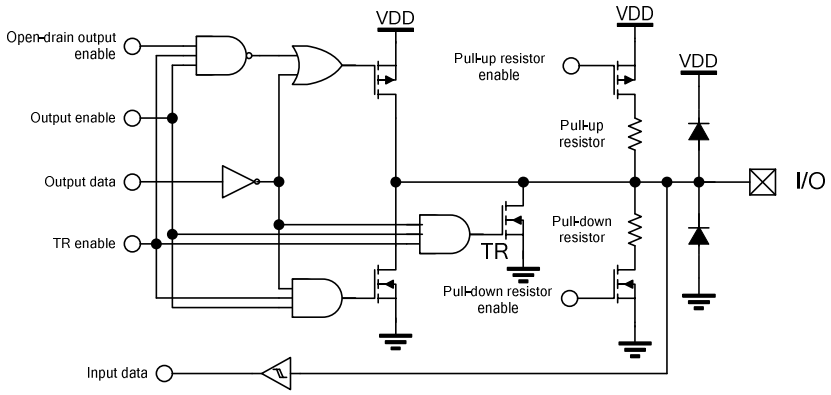
Pin structure P0



Pin structure A



Pin structure B



Pin structure C

Note: the internal logic control will make sure that the pull-up/down resistor will not enable at the same time.

ABSOLUTE MAXIMUM RATINGS

Characteristics	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	-0.3 ~ +5.5	V
Input Voltage	V_I	-0.3 ~ V_{DD}+0.3	V
Storage Temperature Range	T_{STG}	-55 ~ +125	°C
Operating Temperature Range	T_{OPR}	-40 ~ +85	°C

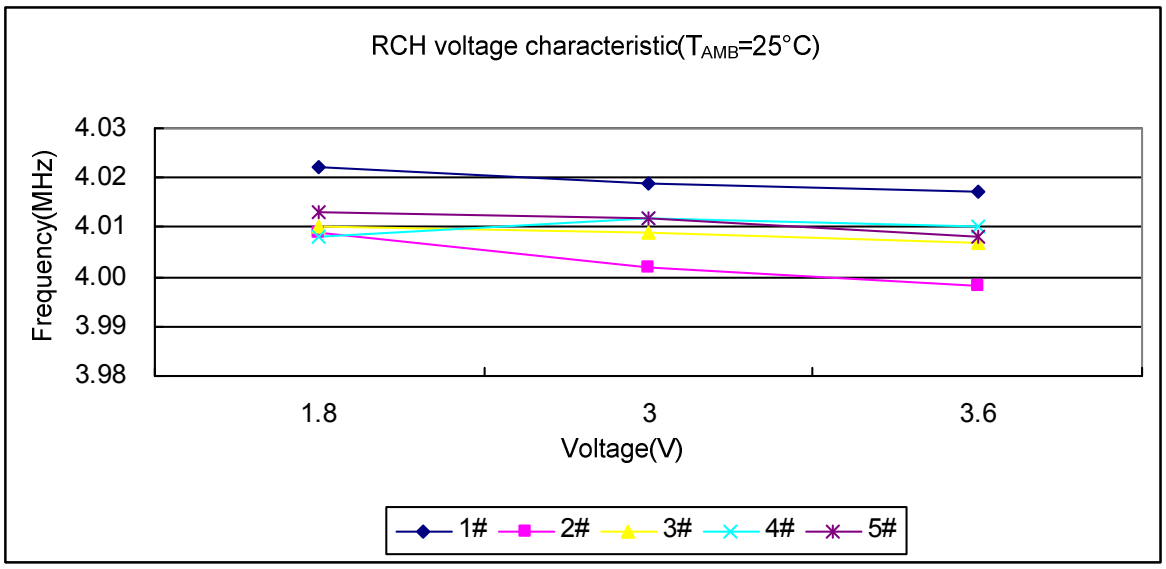
DC ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{DD}=3V, T_{AMB}=25°C)

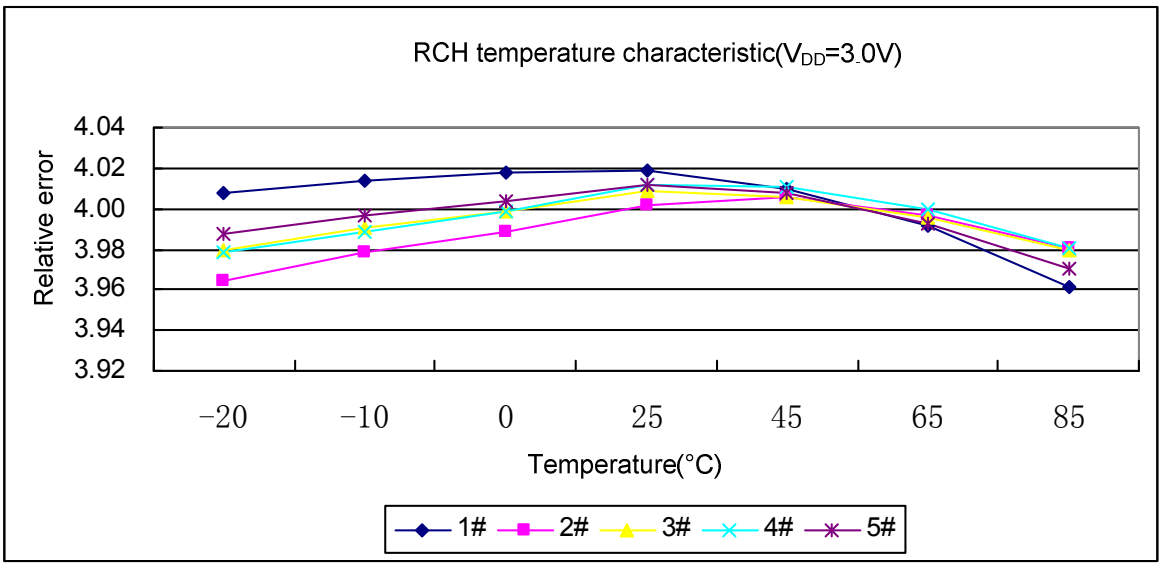
Characteristics	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}	-		1.8	-	3.6	V
Operating Current	I_{DD}	Operating mode	Internal high accuracy RC, F_{MCLK}= 4MHz	-	1.32	1.6	mA
			Internal high accuracy RC, F_{MCLK}= 500KHz	-	0.4	0.6	
			External 4MHz oscillator,F_{MCLK}= 4MHz	-	1.4	1.7	
		Standby mode ①(IDLE)	Internal high accuracy RC, F_{MCLK}=4MHz	-	300	400	μA
			Internal high accuracy RC, F_{MCLK}=62.5KHz	-	170	250	
			External 4MHz oscillator,F_{MCLK}=4MHz	-	470	600	
		Stop mode (STOP)	Open RCL	-	2	3	μA
			Close RCL	-	0.8	1.5	
External high frequency oscillation	F_{OSC}	-		1	-	8	MHz
Internal high frequency RC oscillation	F_{RC}	V_{DD}=1.8~3.6V, T_{AMB}=-10~50°C		3.96	-	4.04	MHz
		V_{DD}=1.8~3.6V, T_{AMB}=-20~60°C		3.94	-	4.06	
		V_{DD}=1.8~3.6V, T_{AMB}=-40~85°C		3.90	-	4.10	
Internal low frequency RC oscillation	F_{TRC}	V_{DD}=1.8~3.6V, T_{AMB}=-40~85°C (Typical condition: V_{DD}=3V, T_{AMB}=25°C)		6	20	40	KHz
Input high voltage	V_{IH}	P0/P1/P3.0/nRST		0.7V_{DD}	-	V_{DD}	V
Input low voltage	V_{IL}	P0/P1/P3.0/nRST		0	-	0.3V_{DD}	V
Ouput high current	I_{OH}	V_{OH}=2.4V	P3.0	-	10	-	mA
		V_{OH}=2.7V	P0[1..4], P0.6/P1	-	4	-	
Output low current	I_{OL}	V_{OL}=0.3V	P0/P1/P3.0	-	8	-	mA
			REM	-	180/250	-	
Pull-up resistor of theport	R_{PU}	V_{IN}=0V	-	100	135	180	kΩ
Pull-down resistor of the port	R_{PD}	V_{IN}=V_{DD}	除 P0.5 外的所有 IO	30	70	100	kΩ
LVR voltage	V_{LVR}	LVRS=0		1.55	1.63	1.75	V
		LVRS=1		1.6	1.7	1.8	
LVR hysteresis*	$V_{HYS\ (LVR)}$	-		-	10	-	mV
LVR module current*	I_{LVR}	-		-	3.5	-	μA
LVD voltage	V_{LVD}	LVDS=000	T_A=-40~85°C	1.95	2.0	2.05	V
		LVDS=001		2.05	2.1	2.15	

Characteristics	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
		LVDS=010		2.15	2.2	2.25	
		LVDS=011		2.25	2.3	2.35	
		LVDS=100		2.35	2.4	2.45	
		LVDS=101		2.45	2.5	2.55	
		LVDS=110		2.62	2.7	2.78	
		LVDS=111		2.92	3.0	3.08	
LVD hysteresis*	$V_{HYS\ (LVD)}$	-		-	40	-	mV
LVD module current*	I_{LVD}	Including VBG module current	T_A=-40~85°C	-	23	40	μA

Note：* and the typical value is based on characteristic results, not tested in production。

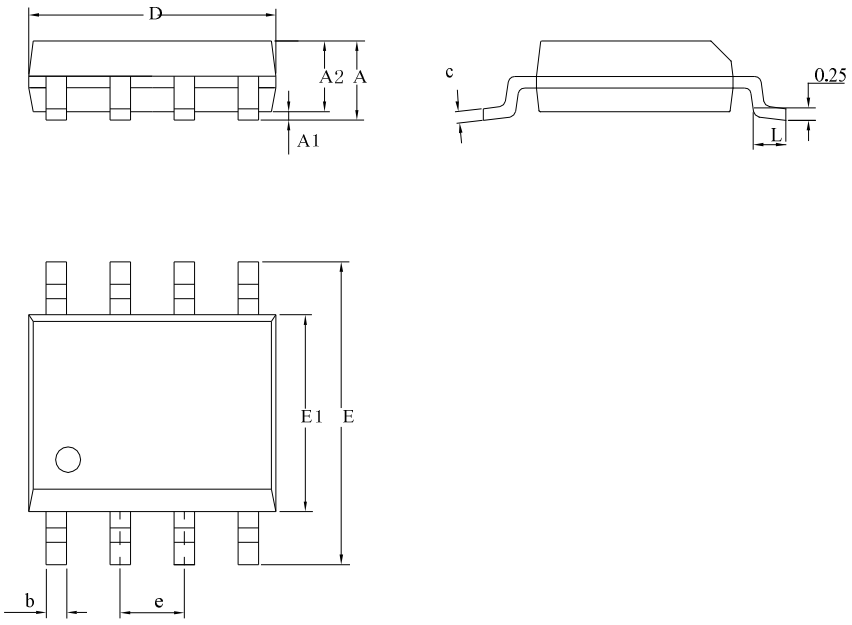
BUILT-IN HIGH ACCURACY RCH CHARACTERISTIC CURVE (five samples for reference only)





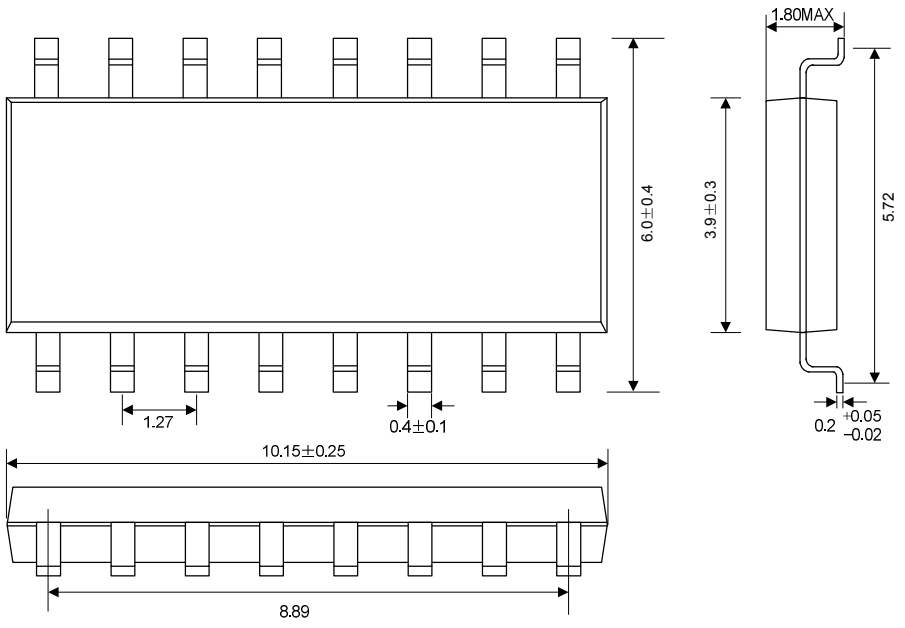
PACKAGE OUTLINE

SOP-8-225-1.27 **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.05	0.15	0.25
A2	1.25	--	1.65
b	0.32	0.42	0.52
c	0.15	0.2	0.26
D	4.70	4.90	5.30
E	5.60	6.00	6.40
E1	3.60	3.90	4.20
e	1.27BSC		
L	0.30	—	1.27

SOP-16-225-1.27 **UNIT: mm**



MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

Part No.:	SC51P03A05	Document Type:	Datasheet
Copyright:	HANGZHOU SILAN MICROELECTRONICS CO.,LTD	Website:	http: //www.silan.com.cn

Rev.: 1.1

Revision History:

1. Add SOP package.
2. Modify some DC characteristics

Rev.: 1.0

Revision History:

1. First release