



# SecurityCore Family

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**SD-SecurityCore5.0-V2.9**

## Spec. Draft of SecurityCore5.0

### System Copy Protection

V2.9

2014. 06

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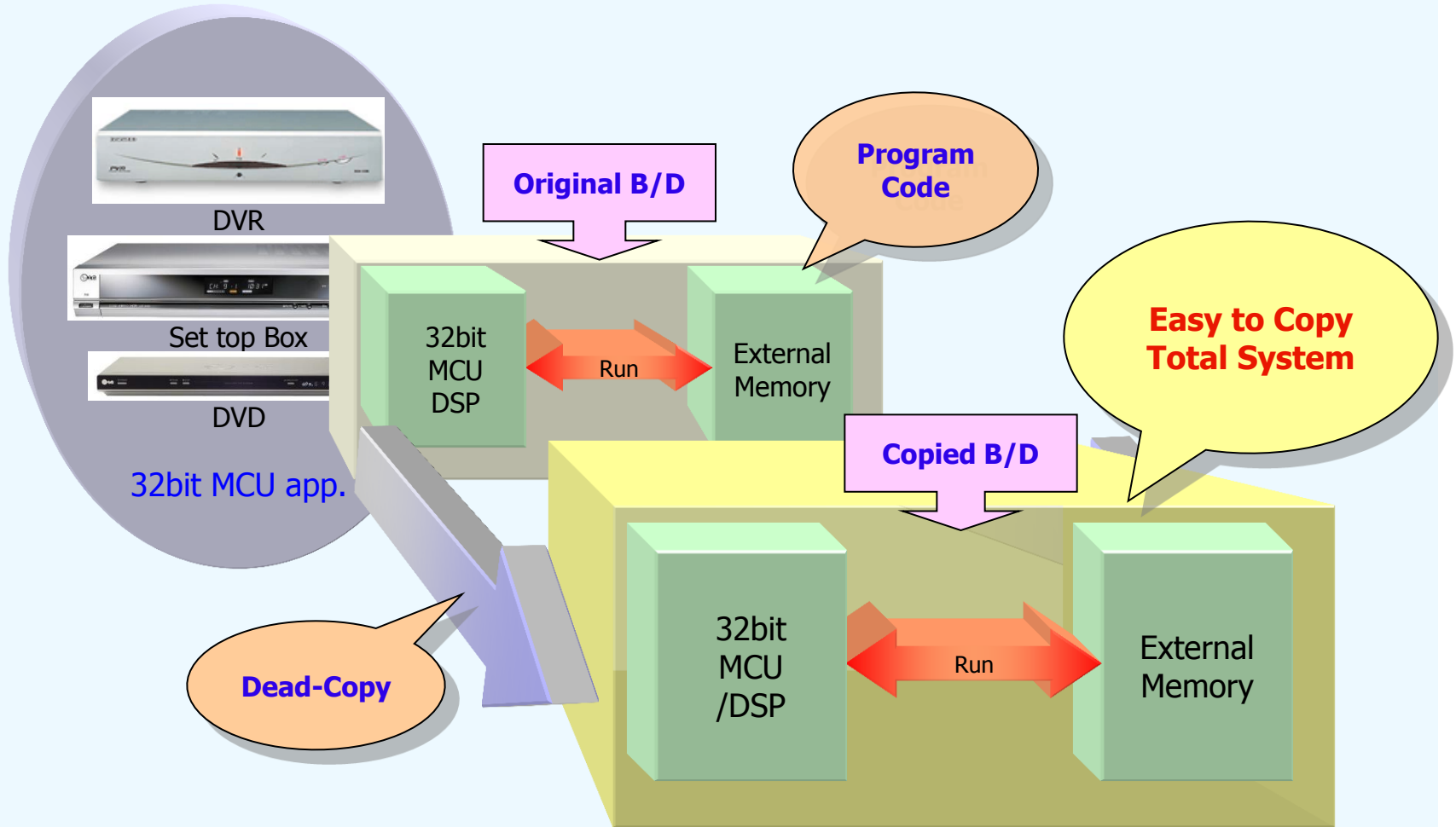
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# 1. What's Copy Protection?

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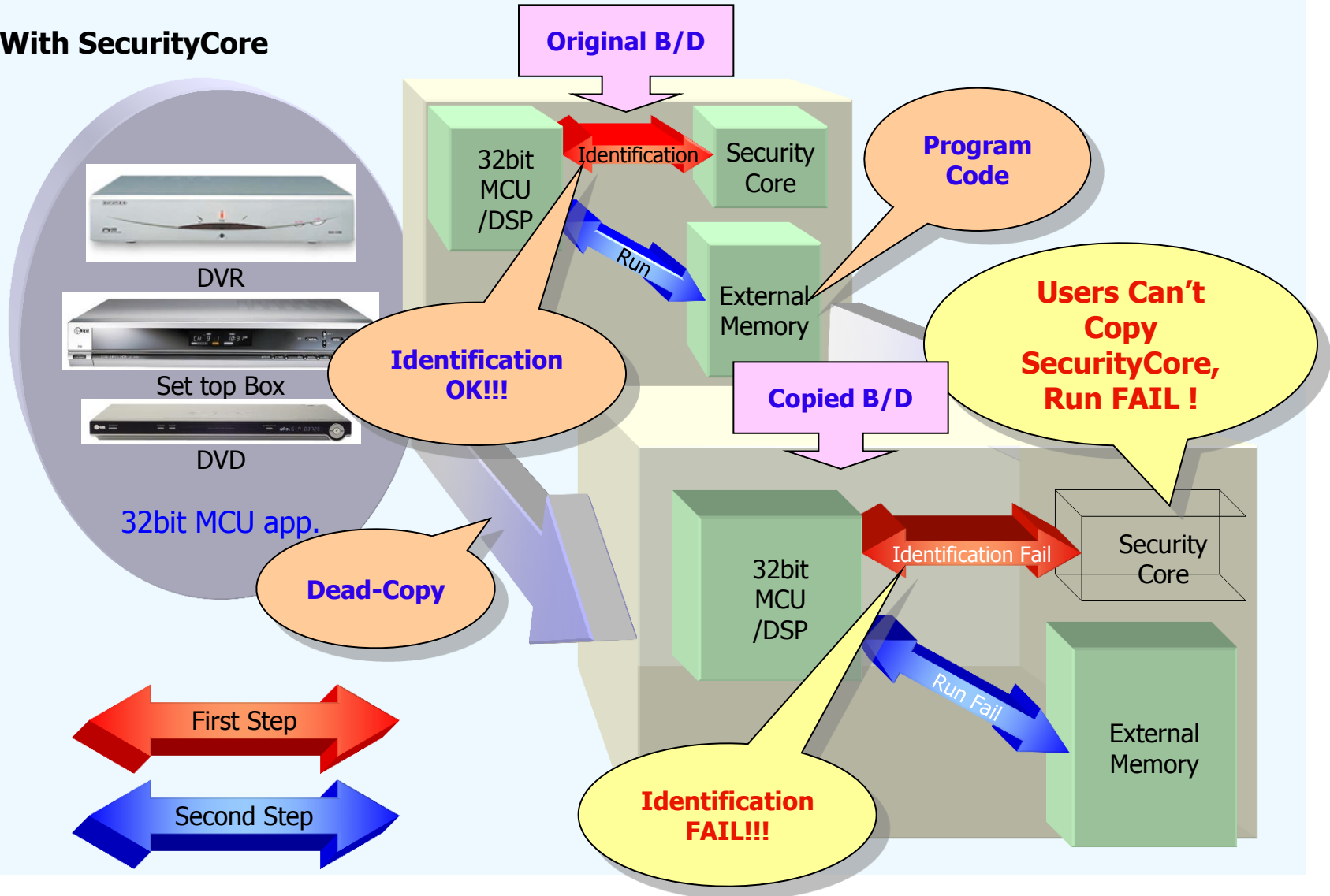
## ◆ Without SecurityCore



# 1. What's Copy Protection? (Cont'd)

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## ◆ With SecurityCore



## 2. Product Overview

- ◆ The solution of System Copy Protection.
- ◆ Support a unique identification number
- ◆ Inventory Tracking
- ◆ Customizing Unique Algorithm

## 3. Features

### ◆ Security

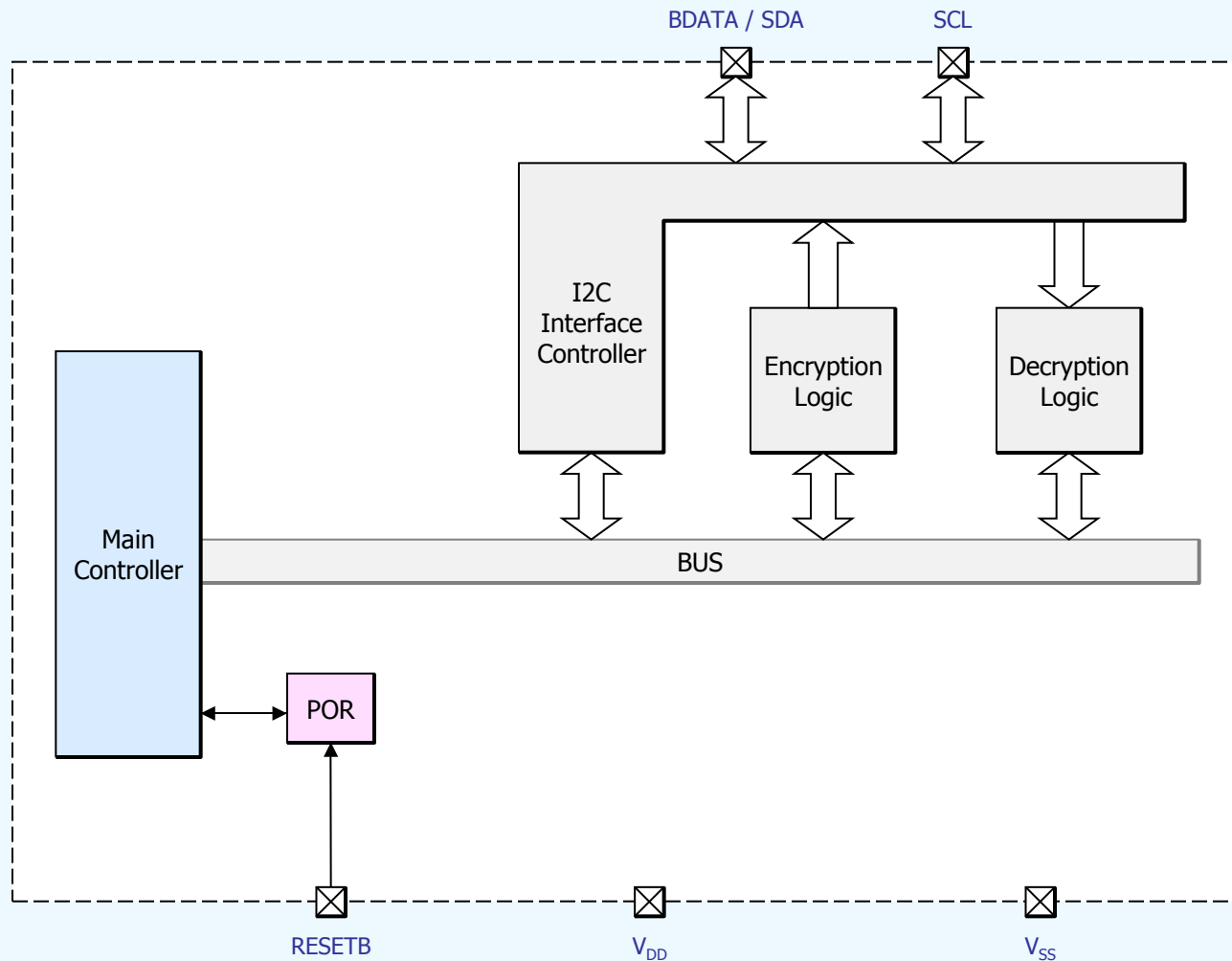
- ✓ Support Random Number Generation
- ✓ Encoder Read Protect
- ✓ Unique Algorithm : 96 Bit Encryption
- ✓ Provide Unique SEED Key

### ◆ Operation

- ✓ 2.2 ~ 5.5 Volts Operation
- ✓ Enhanced Power noise immunity
- ✓ -40 °C to 85 °C operating temperature
- ✓ Active current : Max. 2mA @3.3V, 2MHz
- ✓ Stop current : Max. 1uA (All Clock Off)
- ✓ Program Interface : I2C Interface
- ✓ E.S.D. protection up to 2,000V
- ✓ Package : 8-SOIC

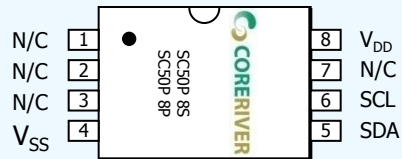
# 4. Block Diagram

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## ◆ SecurityCore5.0

### ✓ I2C interface



[ 8-SOIC ]



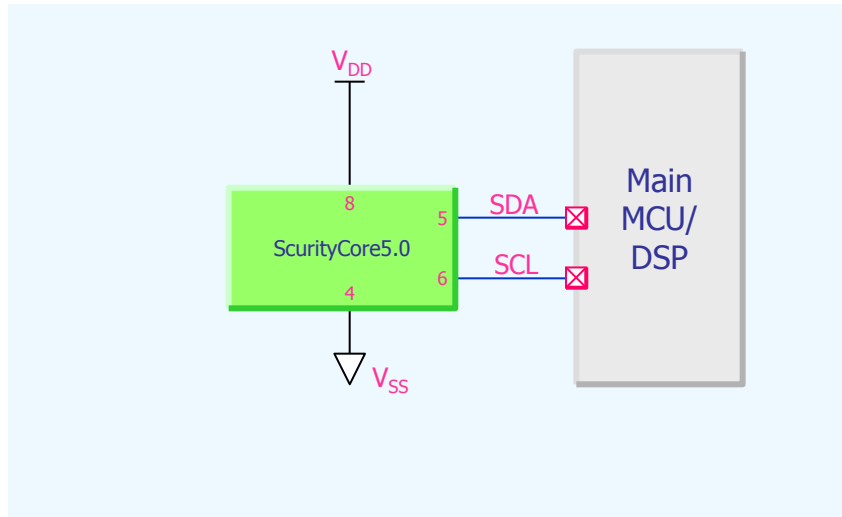
## 6. Pin Descriptions

### ◆ SecurityCore5.0

Symbol	Direction	Description	Share Pins
$V_{DD}$	Input	Voltage Power Source	-
$V_{SS}$	Input	Voltage Power Ground	-
SDA	Input/Output	▪ Data I/O	-
SCL	Input/Output	▪ Clock I/O	-
OTHERS		▪ Data I/O	-

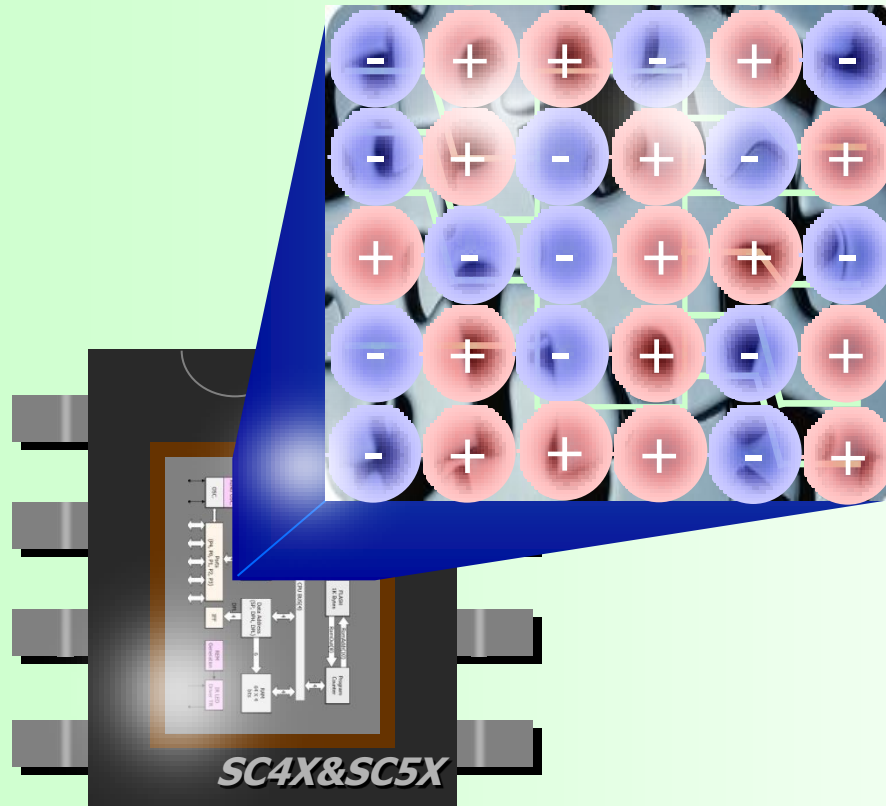
# 7. Application Circuit

◆ I2C Interface



## 8. Strong Point of CORERIVER SC50 (1/2)

- ◆ SC50 stores a security algorithm as extremely small electric charges.

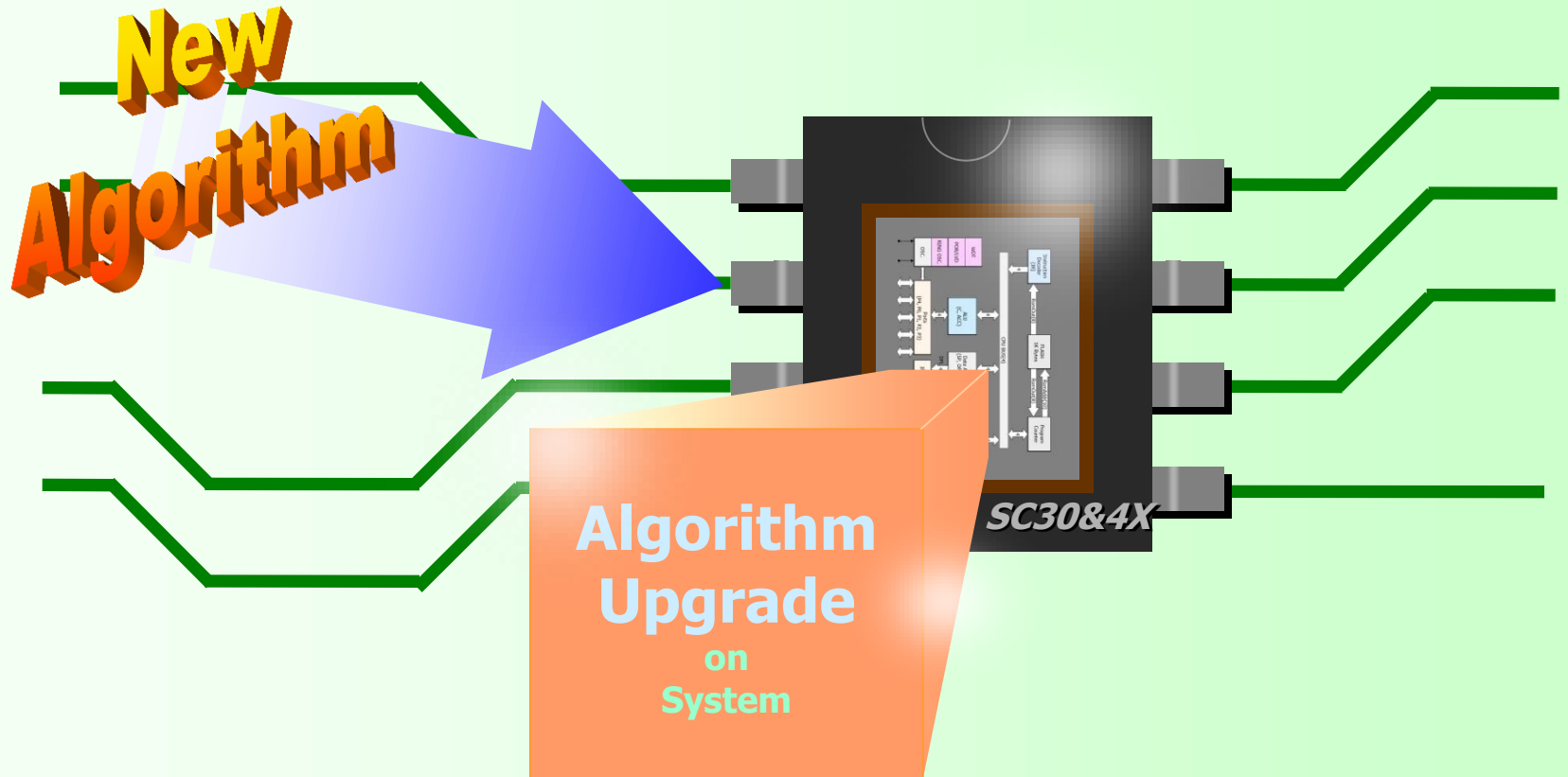


- ✓ The security algorithm is not hard-wired.
- ✓ It is really impossible to find it by de-cap.

## 8. Strong Point of CORERIVER SC50 (2/2)

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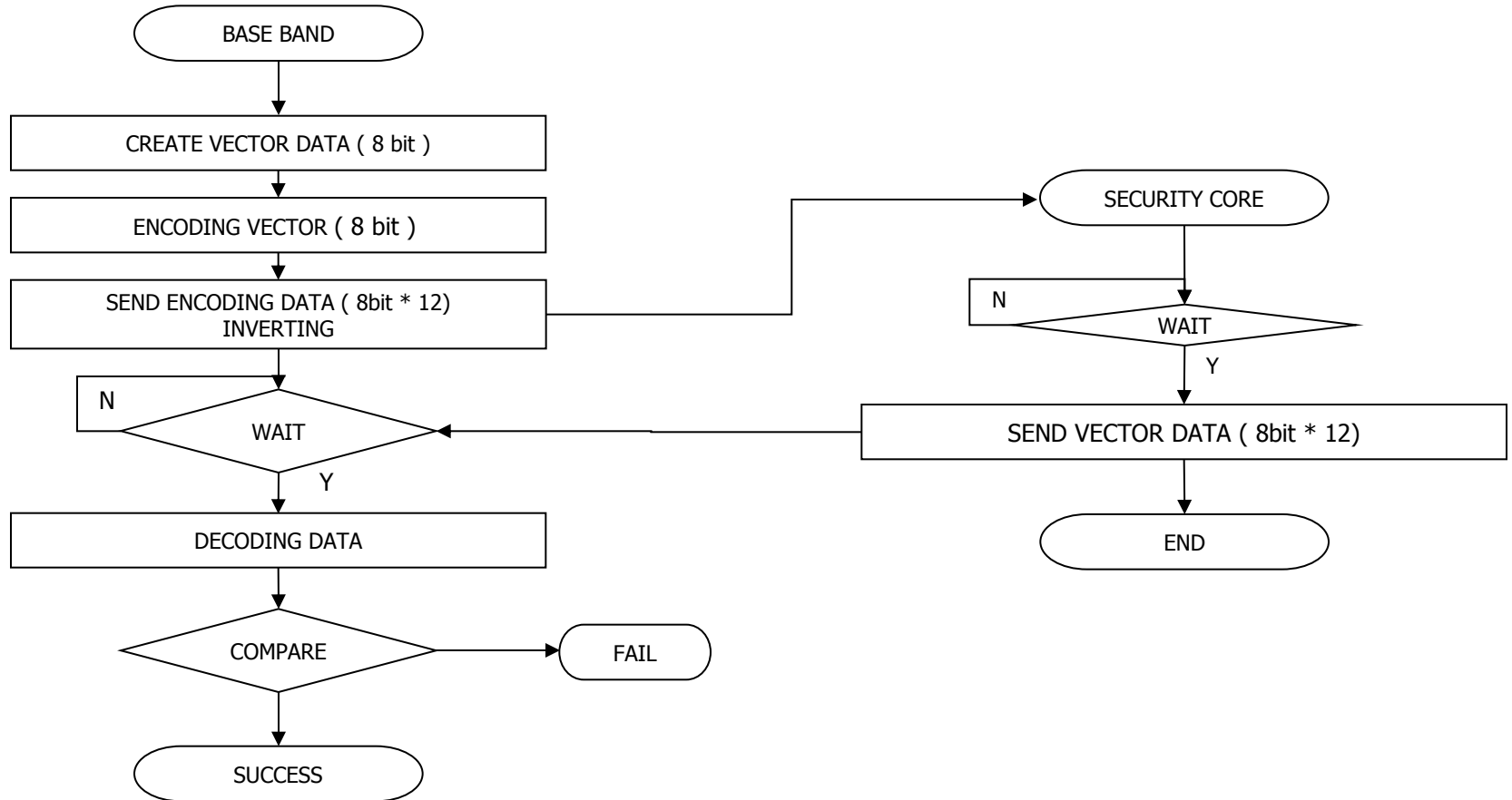
### ◆ Upgrade function in the field.



- ✓ CORERIVER SC50 can upgrade the security algorithm on a used system.
- ✓ To prevent the security algorithm from being cracked, you can replace it by a new one.

# 9. Security Flow

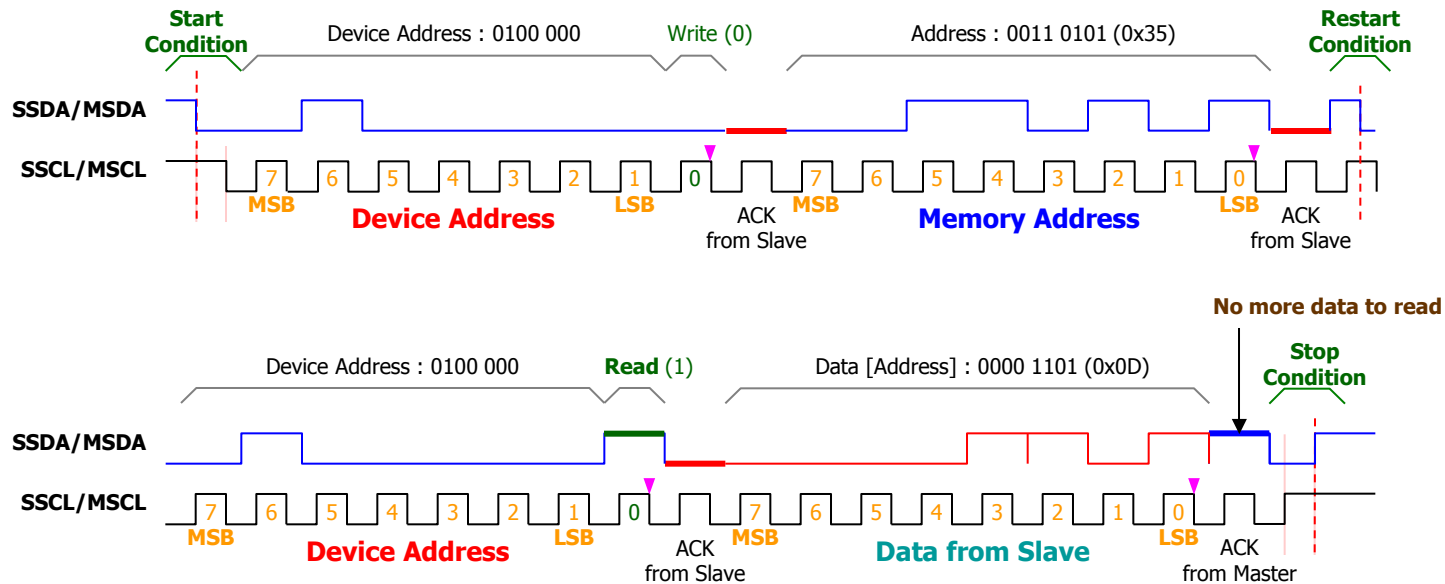
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# 10.1 I2C Interface : 10-bit Addressing (Slave)

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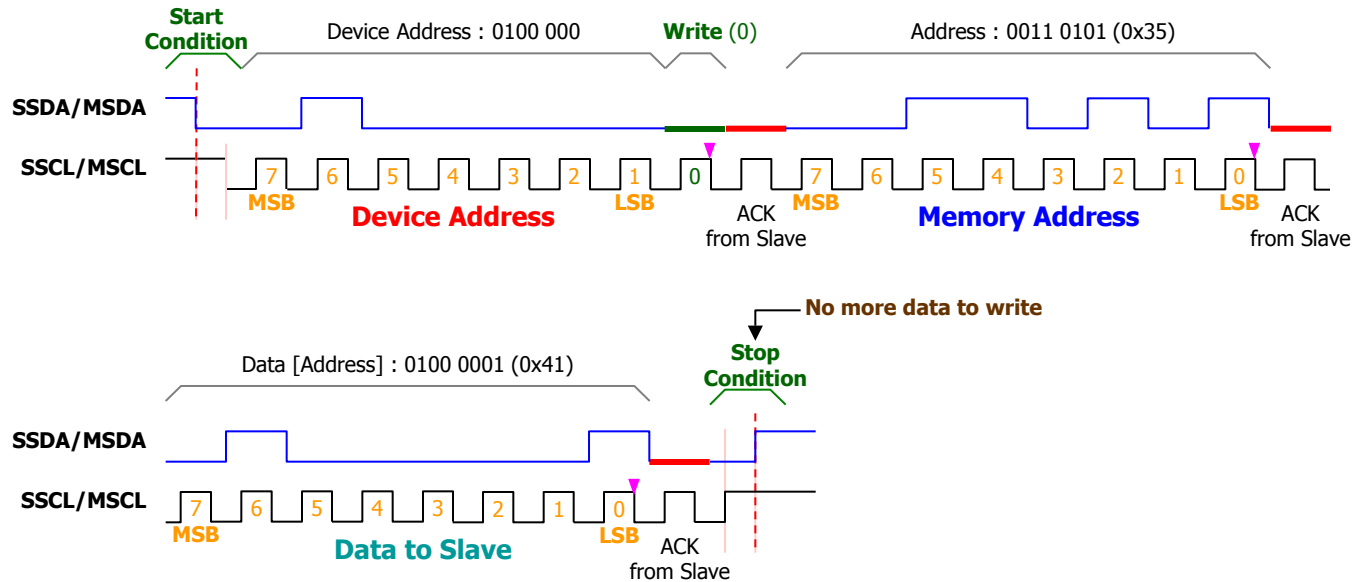
## ◆ Single Byte Read with Memory Address



# 10.2 I2C Interface : 10-bit Addressing (Slave)

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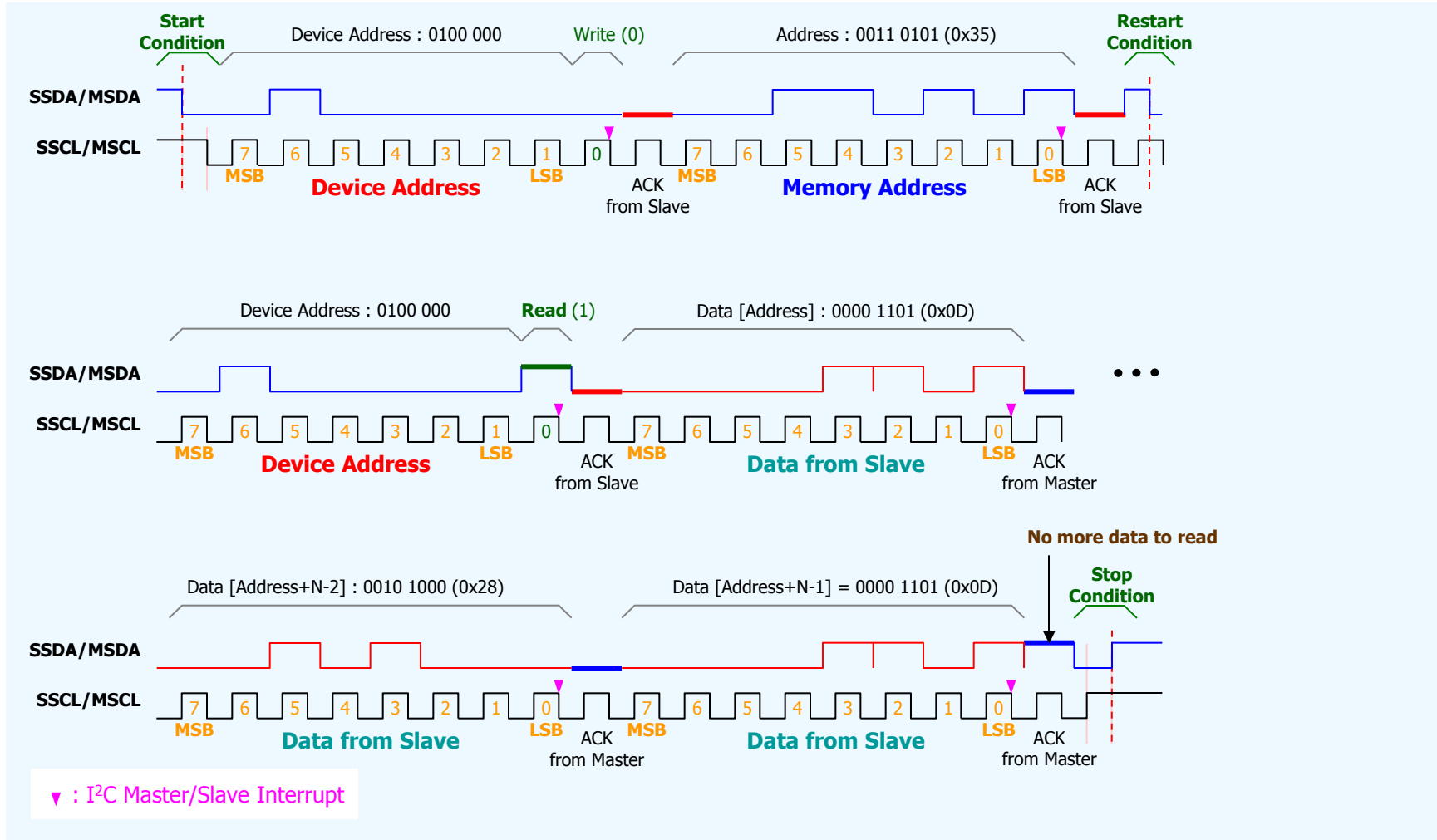
## ◆ Single Byte Write with Memory Address



# 10.3 I2C Interface : 10-bit Addressing (Slave)

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## ◆ Multi (N) Bytes Read with Memory Address

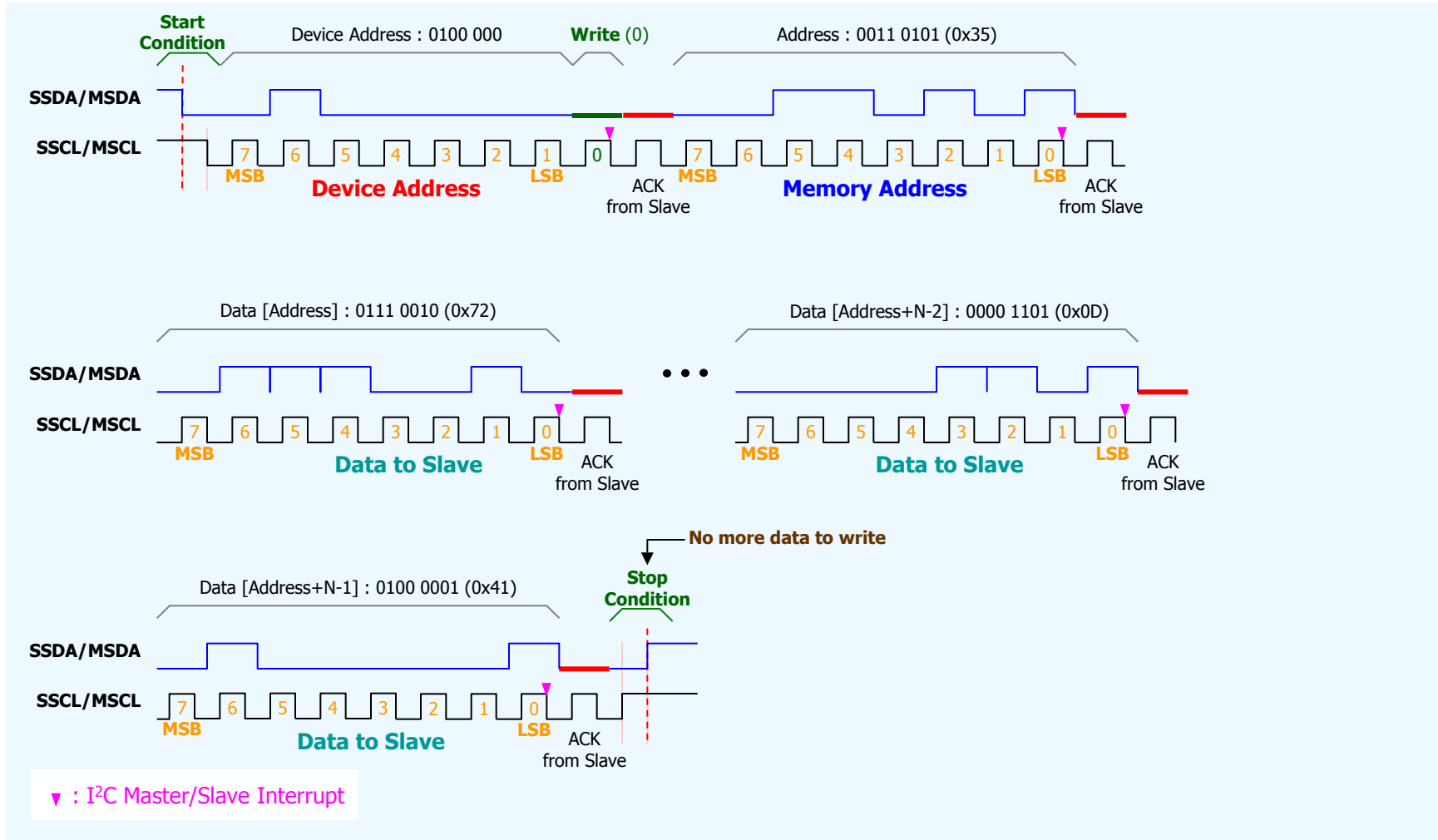




# 10.4 I2C Interface : 10-bit Addressing (Slave)

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## ◆ Multi (N) Bytes Write with Memory Address



## 10.5 I2C Interface : Processing Time (5/5)

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### ◆ I2C Interface - Delay

No	Process	Time
1	Chip Address – Data Delay	20us
2	Data – Stop Delay	20us
3	Write – Read Delay (Algorithm processing time)	100ms

## 11. I2C Speed

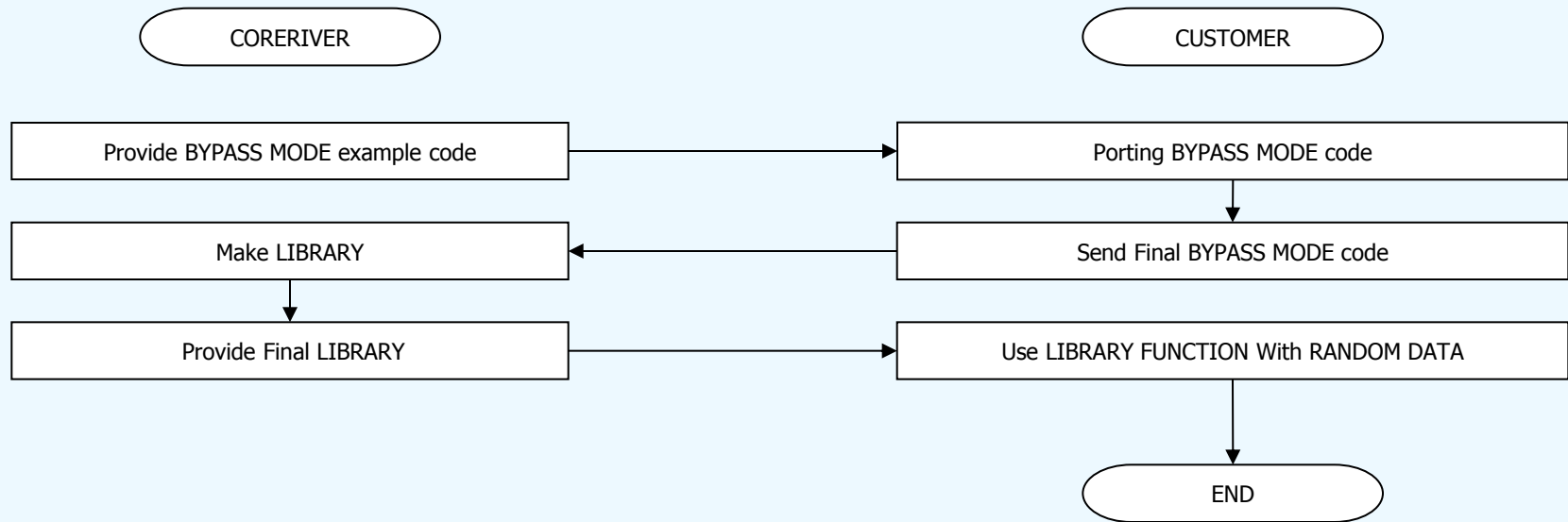
*Confidential*

Device	I2C Min Speed	I2C Max Speed
SecurityCore 5.0	3KHz	400KHz

\* Recommended I2C Speed : 30KHz ~ 100KHz.

## 12. How to support Library

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**NOTE : If CORERIVER don't have customer's development environment, we can borrow customer's IDE or visit customer's company to make library.**

## 13. Absolute Maximum Ratings

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Items	Conditions	Ranges
Voltage on any pin relative to Ground	-	-0.5V to ( $V_{DD}+0.5V$ )
Voltage in $V_{DD}$ relative to Ground	-	-0.5V to 6.5V
Output Voltage	-	-0.5V to ( $V_{DD}+0.5V$ )
Output Current High	One I/O pin active	-25mA
	All I/O pin active	-100mA
Output Current Low	One I/O pin active	+30mA
	All I/O pin active	+150mA
Operating Temperature	-	-40 °C to 85 °C
Storage Temperature	-	-65 °C to +150 °C
Soldering Temperature	-	Peak 260 °C for 10 seconds

# 14 DC Characteristics

*Confidential*

\* TA = -40 °C ~ +85 °C, V<sub>DD</sub> = 2.7V ~ 5.5V unless otherwise specified.

Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Input Low Voltage	V <sub>IL1</sub>	RESETB ,P0, P1, P2	V <sub>DD</sub> = 2.2V~5.5V	-0.5	-	0.2V <sub>DD</sub> -0.1	V
	V <sub>IL2</sub>	XTAL1, XTAL2		-0.5	-	0.3V <sub>DD</sub>	
Input high Voltage	V <sub>IH1</sub>	RESETB, P0, P1 ,P2	V <sub>DD</sub> = 2.2V~5.5V	0.2V <sub>DD</sub> +1.0	-	V <sub>DD</sub> +0.5	V
	V <sub>IH2</sub>	XTAL1, XTAL2		0.7V <sub>DD</sub>	-	V <sub>DD</sub> +0.5	
Output Low Voltage	V <sub>OL</sub>	All Pins	I <sub>OL</sub> = 17mA @V <sub>DD</sub> =5V I <sub>OL</sub> = 7mA @V <sub>DD</sub> =3V I <sub>OL</sub> = 4mA @V <sub>DD</sub> =2.4V	-	-	0.3V <sub>DD</sub>	V
	V <sub>OL2</sub>	P0[3:0] when high drive is enabled	I <sub>OL</sub> = 50mA @V <sub>DD</sub> =5V I <sub>OL</sub> = 20mA @V <sub>DD</sub> =3V I <sub>OL</sub> = 12mA @V <sub>DD</sub> =2.4V	-	-	0.3V <sub>DD</sub>	V
Output High Voltage	V <sub>OH</sub>	All Pins	I <sub>OH</sub> = -18mA @V <sub>DD</sub> =5V I <sub>OH</sub> = -6mA @V <sub>DD</sub> =3V I <sub>OH</sub> = -3mA @V <sub>DD</sub> =2.4V	0.7V <sub>DD</sub>	-	-	V
	V <sub>OH2</sub>	P0[3:0] when high drive is enabled	I <sub>OH</sub> = -26mA @V <sub>DD</sub> =5V I <sub>OH</sub> = -8mA @V <sub>DD</sub> =3V I <sub>OH</sub> = -4mA @V <sub>DD</sub> =2.4V	0.7V <sub>DD</sub>	-	-	V
	V <sub>OHP</sub>	ALL Pins (Pull-up Resistor Only)	I <sub>OHP</sub> = -49uA @V <sub>DD</sub> =5V I <sub>OHP</sub> = -28uA @V <sub>DD</sub> =3V I <sub>OHP</sub> = -22uA @V <sub>DD</sub> =2.4V	0.7V <sub>DD</sub>	-	-	V
Input Leakage Current	I <sub>IL</sub>	All Pins Except of XTAL1, XTAL2	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	-	-	±1	μA
Pin Capacitance	C <sub>I0</sub>	All Pins	V <sub>DD</sub> = 5V	-	10	-	pF

# 14 DC Characteristics

*Confidential*

\* TA = -40 °C ~ +85 °C, V<sub>DD</sub> = 2.7V ~ 5.5V unless otherwise specified.

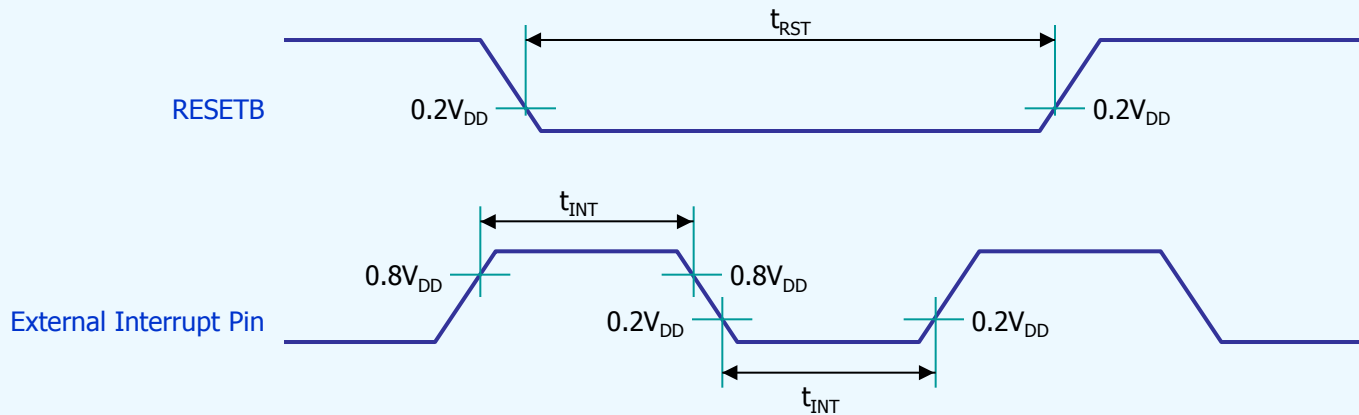
Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Input Low Voltage	V <sub>IL1</sub>	RESETB ,P0, P1, P2	V <sub>DD</sub> = 2.2V~5.5V	-0.5	-	0.2V <sub>DD</sub> -0.1	V
	V <sub>IL2</sub>	XTAL1, XTAL2		-0.5	-	0.3V <sub>DD</sub>	
Input high Voltage	V <sub>IH1</sub>	RESETB, P0, P1 ,P2	V <sub>DD</sub> = 2.2V~5.5V	0.2V <sub>DD</sub> +1.0	-	V <sub>DD</sub> +0.5	V
	V <sub>IH2</sub>	XTAL1, XTAL2		0.7V <sub>DD</sub>	-	V <sub>DD</sub> +0.5	
Output Low Voltage	V <sub>OL</sub>	All Pins	I <sub>OL</sub> = 17mA @V <sub>DD</sub> =5V I <sub>OL</sub> = 7mA @V <sub>DD</sub> =3V I <sub>OL</sub> = 4mA @V <sub>DD</sub> =2.4V	-	-	0.3V <sub>DD</sub>	V
	V <sub>OL2</sub>	P0[3:0] when high drive is enabled	I <sub>OL</sub> = 50mA @V <sub>DD</sub> =5V I <sub>OL</sub> = 20mA @V <sub>DD</sub> =3V I <sub>OL</sub> = 12mA @V <sub>DD</sub> =2.4V	-	-	0.3V <sub>DD</sub>	V
Output High Voltage	V <sub>OH</sub>	All Pins	I <sub>OH</sub> = -18mA @V <sub>DD</sub> =5V I <sub>OH</sub> = -6mA @V <sub>DD</sub> =3V I <sub>OH</sub> = -3mA @V <sub>DD</sub> =2.4V	0.7V <sub>DD</sub>	-	-	V
	V <sub>OH2</sub>	P0[3:0] when high drive is enabled	I <sub>OH</sub> = -26mA @V <sub>DD</sub> =5V I <sub>OH</sub> = -8mA @V <sub>DD</sub> =3V I <sub>OH</sub> = -4mA @V <sub>DD</sub> =2.4V	0.7V <sub>DD</sub>	-	-	V
	V <sub>OHP</sub>	ALL Pins (Pull-up Resistor Only)	I <sub>OHP</sub> = -49uA @V <sub>DD</sub> =5V I <sub>OHP</sub> = -28uA @V <sub>DD</sub> =3V I <sub>OHP</sub> = -22uA @V <sub>DD</sub> =2.4V	0.7V <sub>DD</sub>	-	-	V
Input Leakage Current	I <sub>IL</sub>	All Pins Except of XTAL1, XTAL2	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	-	-	±1	μA
Pin Capacitance	C <sub>I0</sub>	All Pins	V <sub>DD</sub> = 5V	-	10	-	pF

# 15. AC Characteristics

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\* TA = -40 °C ~ +85 °C unless otherwise specified.

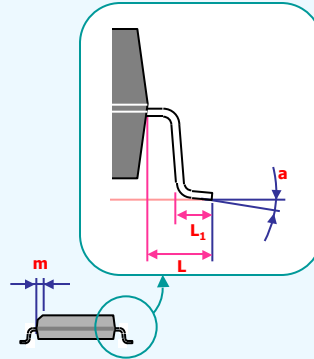
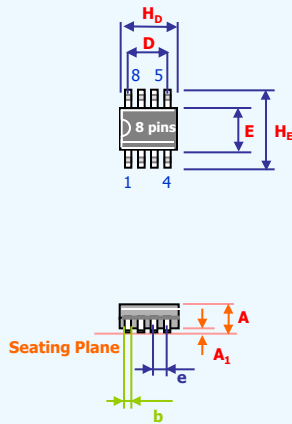
Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Operating Frequency	F <sub>SYS</sub>	Internal Oscillator XTAL1, XTAL2	V <sub>DD</sub> = 5V ± 10%	-	-	24	MHz
			V <sub>DD</sub> = 3V ± 10%	-	-	12	
RESETB Input Width	t <sub>RST</sub>	RESETB	V <sub>DD</sub> = 5V ± 10%	20	-	-	us
			V <sub>DD</sub> = 3V ± 10%	20	-	-	
External Interrupt Input Width	t <sub>INT</sub>	External Interrupt	V <sub>DD</sub> = 5V ± 10%	4	-	-	F <sub>SYS</sub>
			V <sub>DD</sub> = 3V ± 10%	4	-	-	





# 16. Package Dimensions : 8-SOIC

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[8-SOIC]

Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.093	0.099	0.104	2.35	2.45	2.65
A <sub>1</sub>	0.004	0.008	0.012	0.10	0.20	0.30
b	0.014	0.016	0.019	0.35	0.42	0.49
D	-	0.150	-	-	3.81	-
E	0.150	0.153	0.157	3.80	3.90	4.00
H <sub>b</sub>	0.189	0.193	0.197	4.80	4.90	5.00
H <sub>E</sub>	0.234	0.239	0.244	5.95	6.07	6.20
L	0.038	0.043	0.048	0.97	1.08	1.2
L <sub>1</sub>	0.022	0.027	0.032	0.58	0.70	0.82
a	0°	-	8°	0°	-	8°
e	0.050 BSC			1.27 BSC		
m	0.010	0.015	0.020	0.25	0.37	0.50

**Notes:**

1. Dimension D & E include mold mismatch and are determined at the mold parting line.
2. General appearance spec. should be based on final visual inspection spec.

## Appendix : Update History

- ◆ V1.0
  - ✓ spec draft
- ◆ V1.1
  - ✓ What's copy protection Image.
- ◆ V1.2
  - ✓ I2C Interface.
- ◆ V1.3
  - ✓ Package Dimensions.
- ◆ V1.4
  - ✓ SecurityCore3.0 Addition.
- ◆ V1.5
  - ✓ SecurityCore3.0 Strong Point Addition.
- ◆ V1.6
  - ✓ SecurityCore3.0 power slop Addition
- ◆ V1.7
  - ✓ SecurityCore4.0 Addition
- ◆ V1.8
  - ✓ SecurityCore4.1 Addition
- ◆ V1.9
  - ✓ SecurityCore412 Addition
- ◆ V2.0
  - ✓ SecurityCore412 strong point Addition
- ◆ V2.1 ~ V2.6
  - ✓ SecurityCore412 Addition
- ◆ V2.7
  - ✓ SecurityCore3.0 remove.
  - ✓ Algorithm & etc modify.
- ◆ V2.8
  - ✓ Power Characteristics remove.
  - ✓ I2C Speed change (10KHz -> 100KHz)
- ◆ V2.9
  - ✓ SS of SecurityCore5.0 only
  - ✓ Update I2C single byte Read/Write
  - ✓ Title changing : SecurityCore5.0