EASY(EZ)-SPEECH/MELODY

General Description

The RTS3100D series are micro-processor based and interrupt input driven controller. By easy-learning development tools, customer can have lots of flexibility in designing products with speech/melody playback, I/O control and LED indication.

Microcontroller Core Features

- Operating voltage range : 2.4V to 5.0V@1MHz
- 512K bytes ROM (maximum): A single ROM contains all program codes, speech and melody notes
- 8 independent flags can store the programming state of the variables and add flexibility to programming.
- Stop mode minimize the power consumption .
- 8 Interrupt trigger sources from input pins. Both edge and level trigger types are supported.

Peripheral Features

- Two sound channels: One for speech or melody and one for melody. One channel speech and one hannel melody or dual channels melody can be simultaneously played out through DAC output
- Supply 4-bit RTHPM
- 60, 80, 120 and 160 seconds speech capacities provided
- Speech sampling rate can be programmed to generate speech-melody or sound effect
- One 8-bit timers: functions as timing melody rhythm, tempo, and speech duration or a general purpose timer
- 13 I/O pads: 8 inputs, 4 outputs and 1 LED output

Special Microcontroller Features

- Provide DAC audio output
- The programmable LED output pin can indicate at 2 Hz and 4 Hz
- Dual tone melody with 21 K notes (maximum)

Application Field

- Sound toy
- IR toy
- Toy with motor

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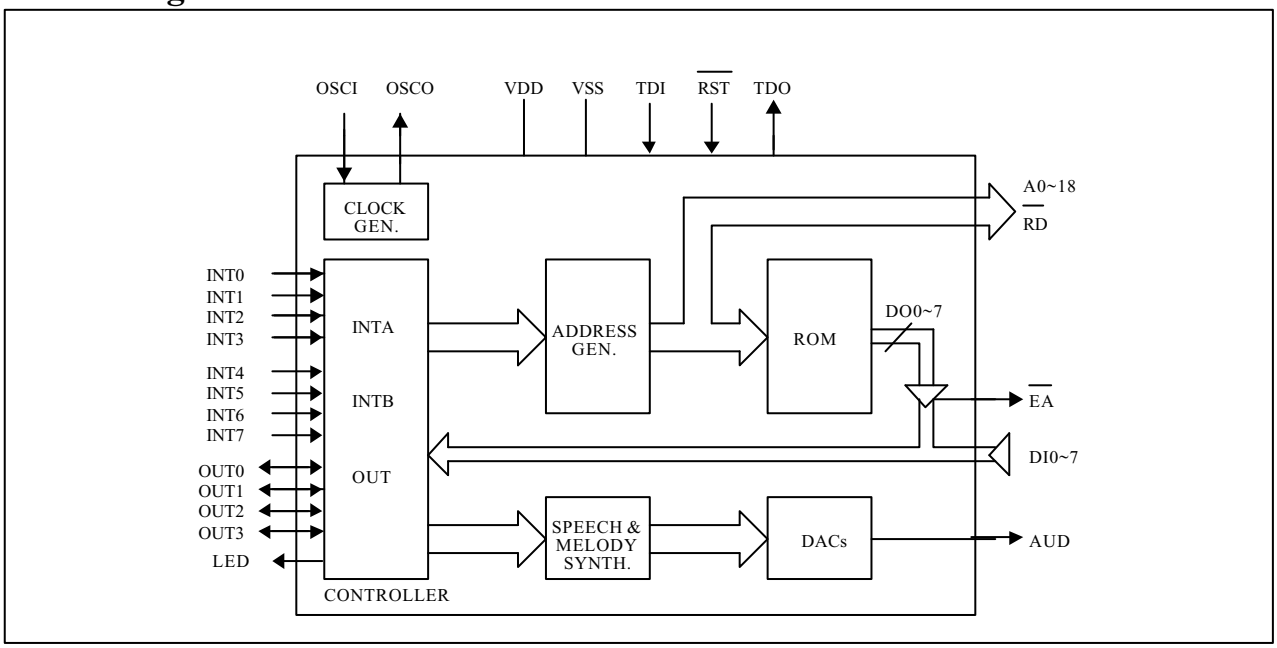
Block Diagram



- Clock Generator: generates the system frequency based on the resistor connected externally to adjust the speed of the system operation.
- The Controller is a micro-processor that can dispatch the program execution based on all the interrupt input signals.
- The Address Generator is used to translate the operand into a specific address to address the proper ROM code (data).
- The program, melody and speech data are stored in the ROM, in which the data length is 8-bit and the memory can be expanded up to 512K Bytes.
- External EPROM can be tied directly to the band-out chip for further developing.
- Digital to Analog Converters (DACs) need to be controlled smoothly for both turning ON and OFF to prevent from the unexpected noise. There are 2 DACs in total to drive the output (AUD); one for both melody 1 and speech, and the other one for melody 2. Thus, the previous DAC's driving capability will be twice in comparison to the latter one.

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Function Description

- INT0 ~ INT7 are the interrupt input pins that will be mapped to the dedicated sector according to the corresponding pin name. These pins are applied with different priority according to the corresponding pin number when more than 2 pins inputting simultaneously.
- OUT0 ~ OUT3 are the general-purpose output signal to either generate the stop signal or to drive the LED device.
- The LED output signal has 3 programming modes: flash mode, DC mode (always ON) , or flash at different frequencies (2 or 4 Hz).
- The address generator generates the proper address to interface with the external EPROM.
- The $\overline{RD}$ signal is normally tied to the $\overline{OE}$ and $\overline{CE}$ of EPROM. This signal can also be tied to $\overline{EA}$ to isolate the internal data bus for reading the external EPROM data.
- The A0~18 bus can decode 512K Bytes of ROM space for maximum speech capacity.
- The DI0~7 will connect to the input data bus of external ROM.
- TDI will only be activated when testing is in progress. Pull down this pin can switch the INTA and $\overline{OUT}$ pins as the data bus to dump the internal test patterns.
- $\overline{RST}$ will be activated to initialize the whole system as a power ON RESET. This must be tied to VDD with a resistor internally.
- The OSCI & OSCO are designed to be connected with a resistor. The operational frequency ranges around 1 MHz.
- VDD can be applied to range from 2.2 to 5.0 V for proper operation.
- VSS is normally tied to the system Ground.

Absolute Maximum Ratings

DC Supply Voltage.....-0.5V to + 6.0V
Input/Output Voltage.....GND -0.5V to VDD + 0.5V
Operating temperature.....-10°C to 60°C
Storage Temperature.....-25°C to 125°C

Comments*
Never allow a stress to exceed the values listed under "Absolute Maximum Ratings", otherwise the device would suffer from a permanent damage. Nor is a stress at the listed value be allowed to persist over a period, since an extended exposure to the absolute maximum rating condition may also affect the reliability of the device, if not causing a damage thereof.

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DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Condition
DC Supply Voltage	VDD	2.4V	3.0V	5.0V	
Operating Current	I_{dd}	-	1mA	-	Unload
Stand-by Current	I_{stb}	-	1uA	-	Full load
Output Driving Current	$I_{driving}$	-	6mA	-	V_{oh} = 1.1V
Output Sinking Current	$I_{sinking}$	-	6mA	-	V_{ol} = 0.7V
LED Drivng Current	$I_{driving}$	-	6mA	-	V_{oh} = 1.1V
LED Sinking Current	$I_{sinking}$	-	6mA	-	V_{ol} = 0.7V
AUD Output Current (full scale)	$I_{driving}$	-	3mA	-	V_{oh} = 0.7V
Input Pull High Resistor	I_{in}	-	1M Ohm	-	When input pin is connected to Ground
Oscillator Frequency Deviation Per Lot	¡µF/F	-	-	¡Ó5%	

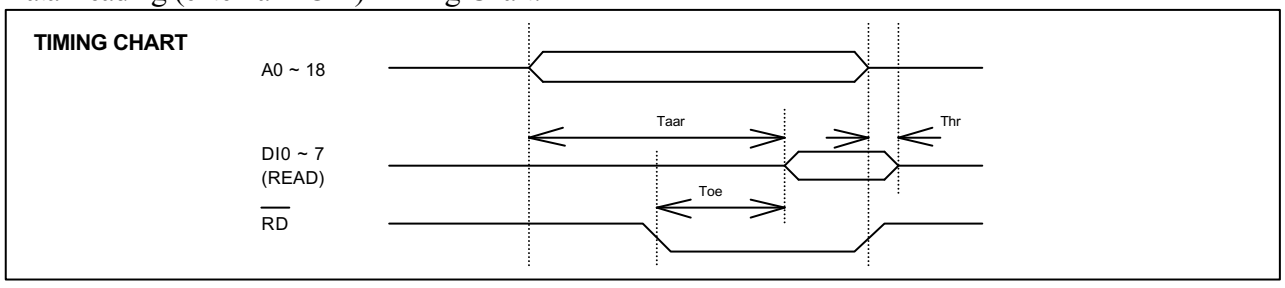
Note: This may require a flexible design to distinguish the input state and apply different resistance to it. This is concerning about both the power consumption and input noise immunity.

AC Electrical Characteristics

Parameter	Symbol	Min.	Typ.
Address to read valid	T_{AAR}	-	350ns
Read strobe to data valid	T_{OE}	-	150ns
Data hold time to read strobe or address invalid	T_{HR}	0	-

Timing Diagram

Data Reading (external ROM) Timing Chart:



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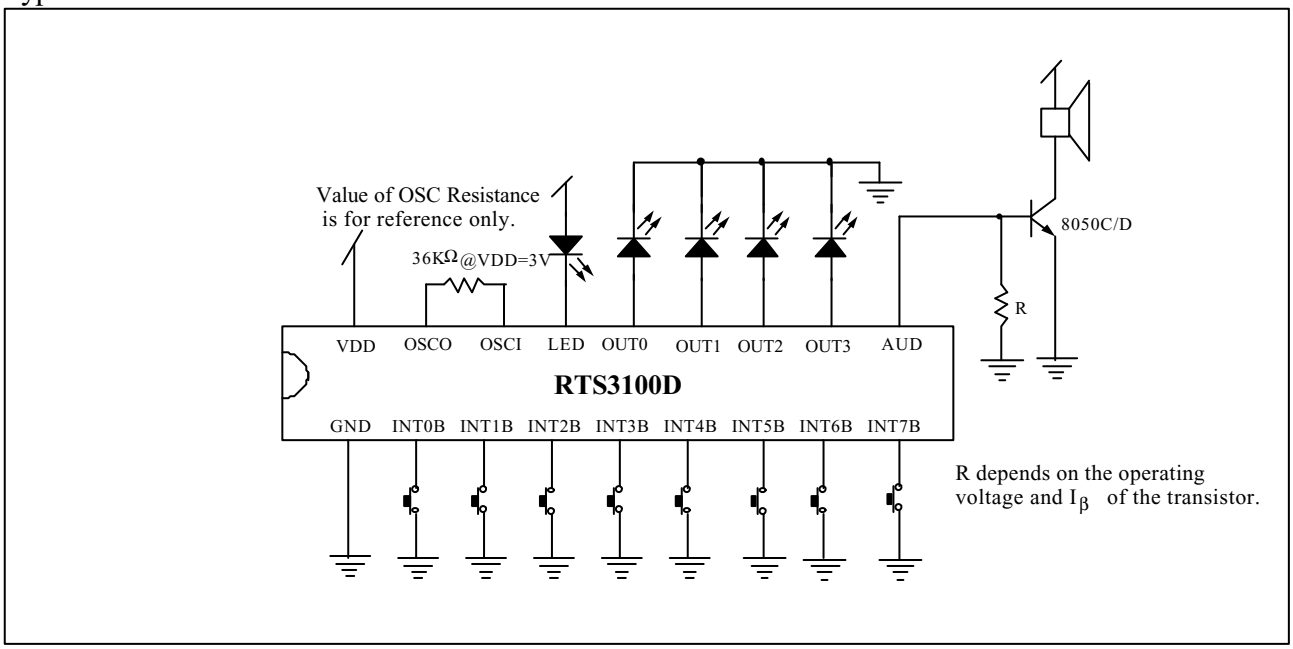
Application Circuit(For reference only)

Typcal



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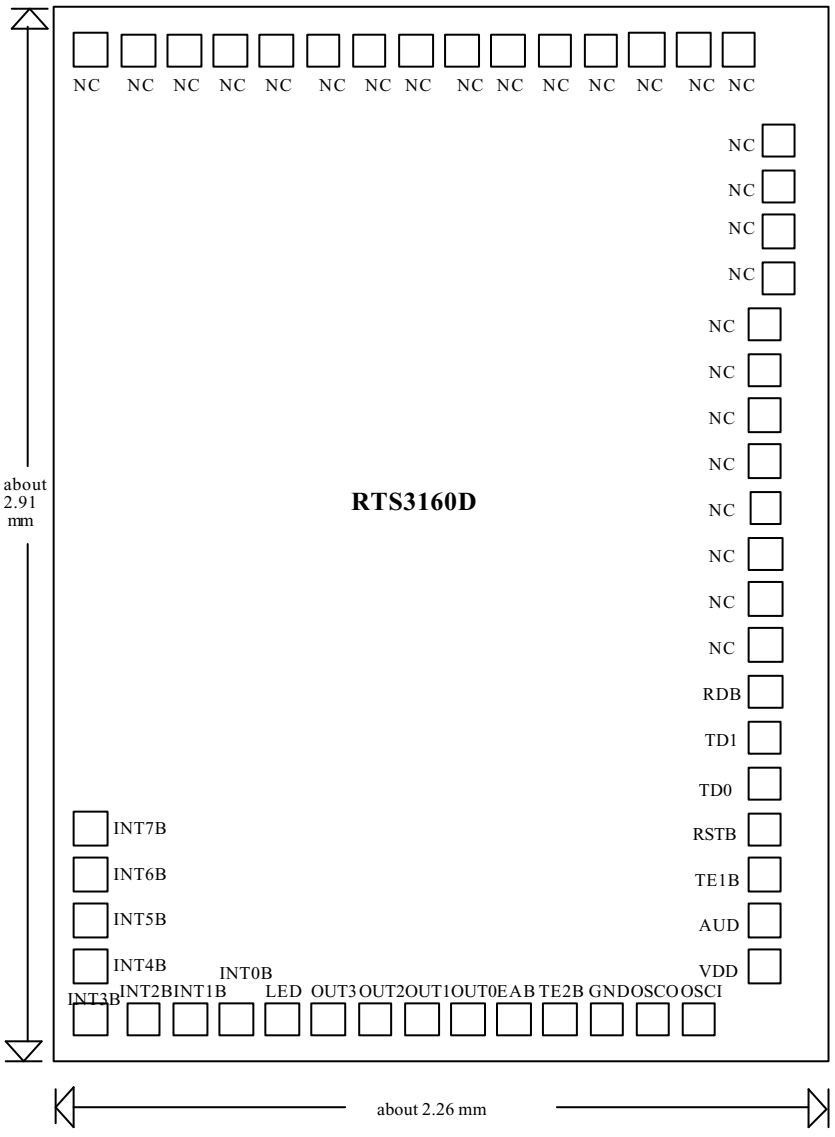
Bonding Diagram



Designation	X	Y
INT7B	139.1	691.15
INT6B	139.1	566.15
INT5B	139.1	441.15
INT4B	139.1	316.15
INT3B	139.1	166.15
INT2B	327.5	151.1
INT1B	452.5	151.1
INT0B	577.5	151.1
LED	702.5	151.1
OUT3	827.5	151.1
OUT2	968.1	151.1
OUT1	1093.1	151.1
OUT0	1218.1	151.1
EAB	1340.9	151.1
TE2B	1463.7	151.1
GND	1588.7	156.1
OSCO	1713.7	151.1
OSCI	1838.7	151.1
VDD	2120.45	299.65
AUD	2120.45	463.8
TE1B	2120.45	591.1
RTSB	2120.45	713.9
TDO	2120.45	838.9
TDI	2120.45	963.9
RDB	2120.45	1086.7

Unit: in um
X: 2260 Y: 2910

Notice: Substrate is connected to GND

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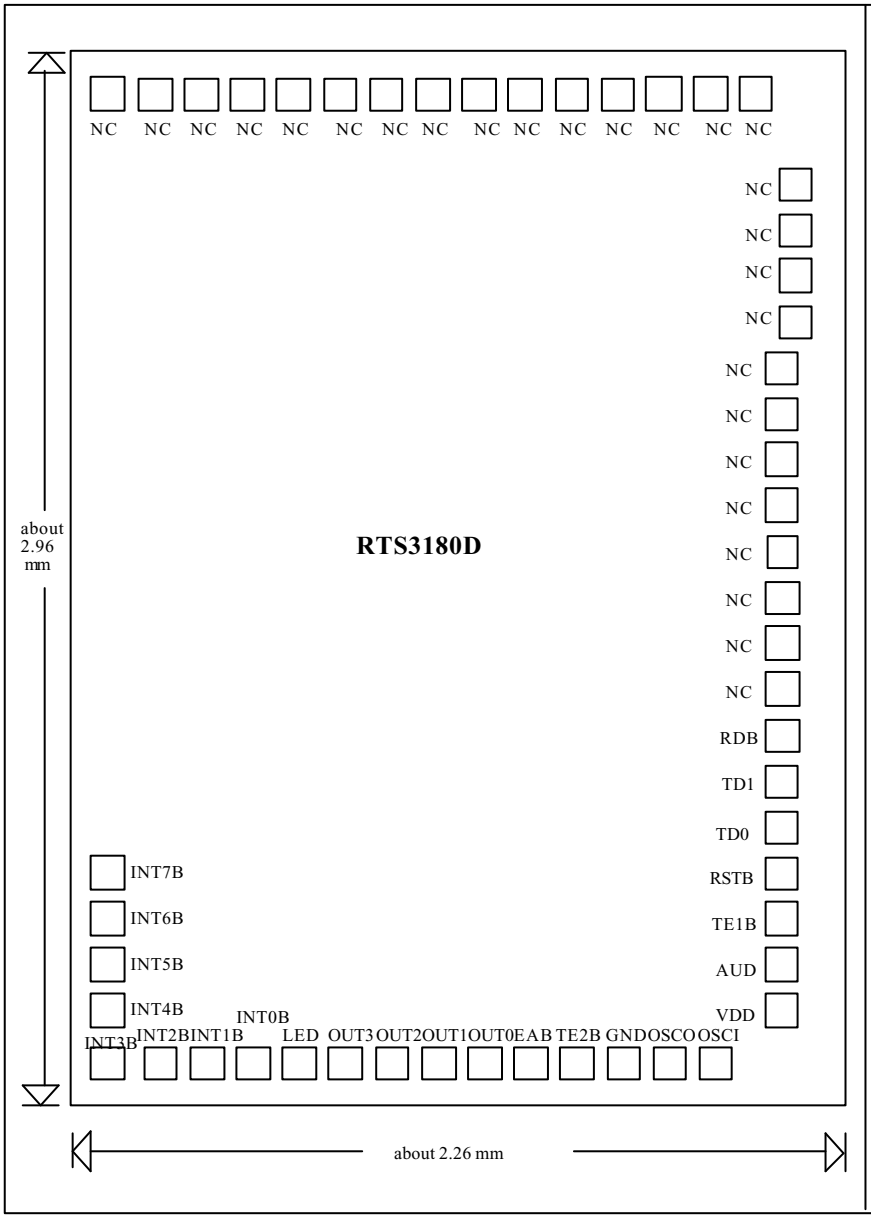

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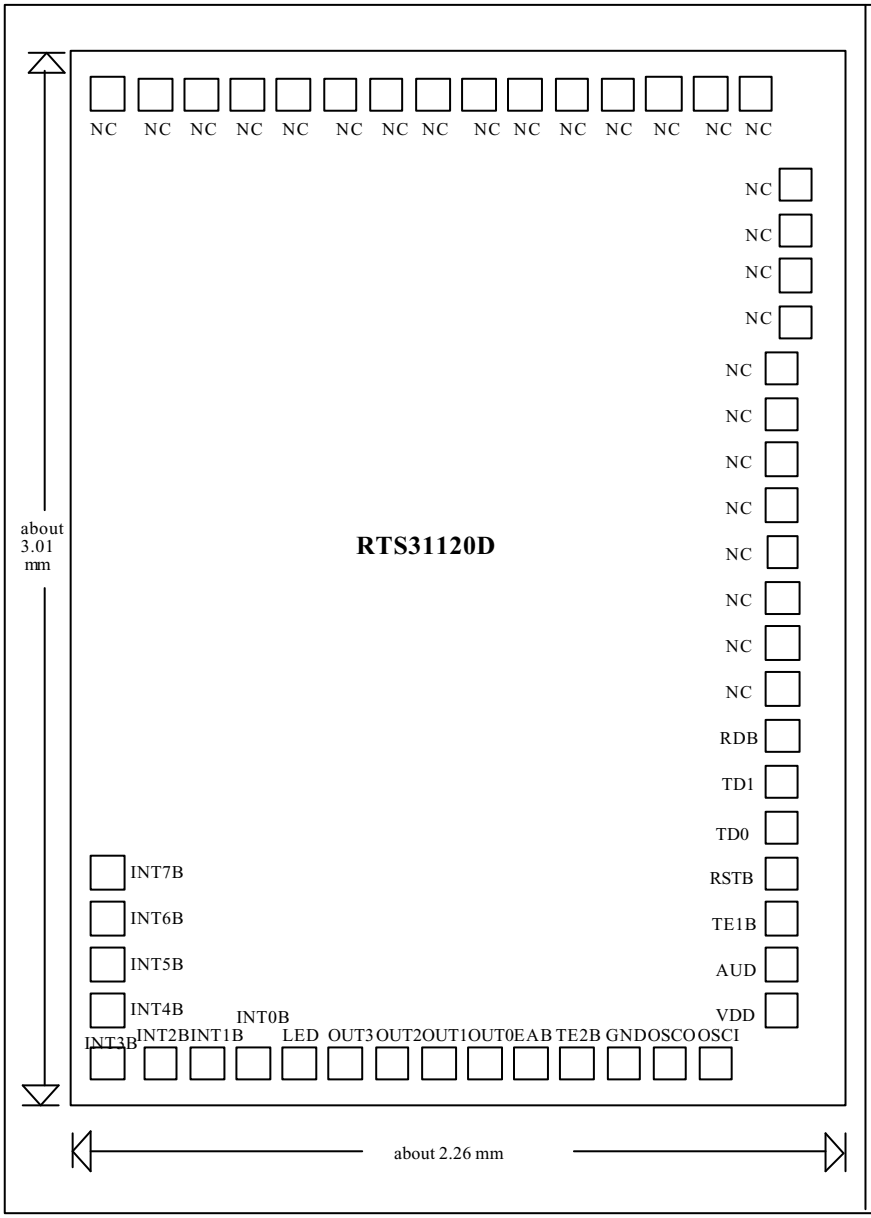

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Unit: in um
X: 2260 Y: 3010

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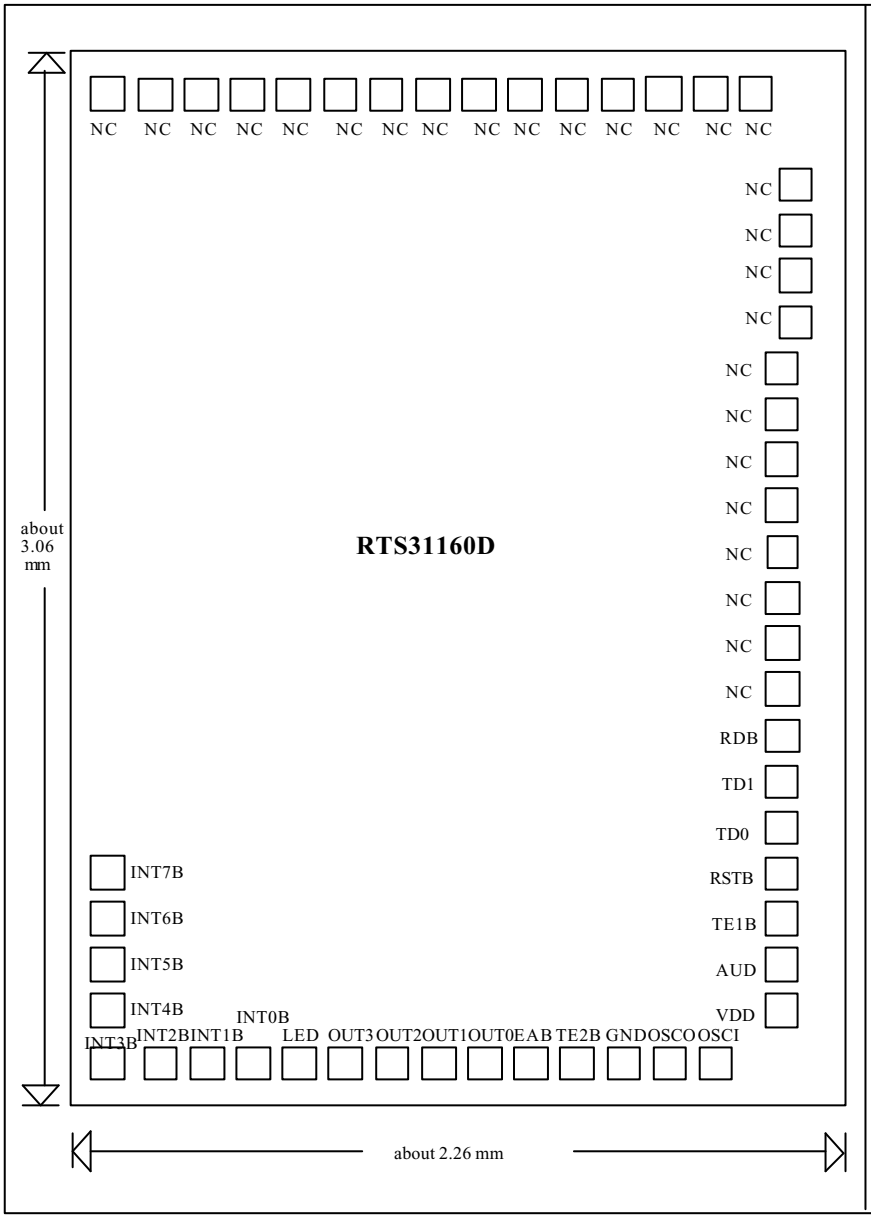

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RDB	2120.45	1086.7

Unit: in um
X: 2260 Y: 3060

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