

## TDMA-Based 3-Player Remote Controller

### Features

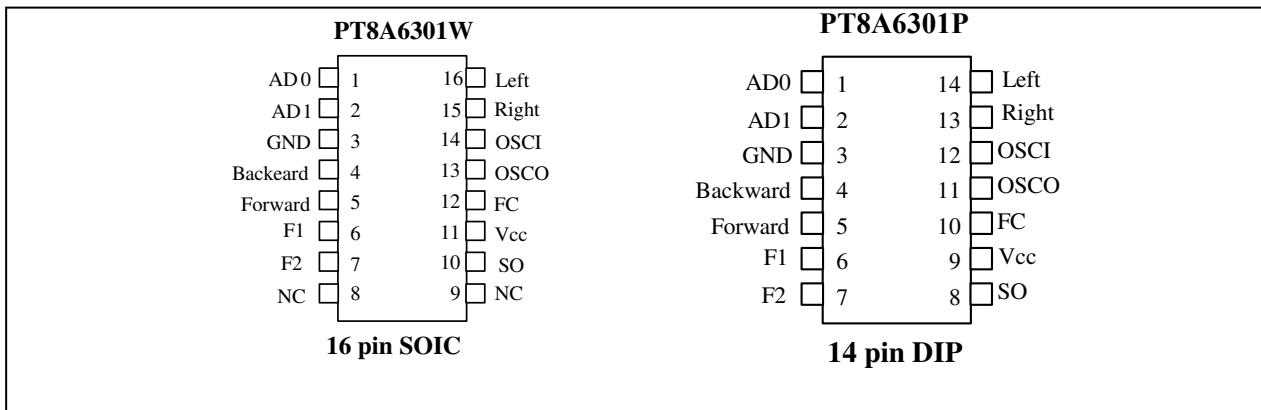
- The PT8A6301 works as the encoder and the PT8A6311 works as the decoder
- Supports three players in the same RF frequency
- CRC check
- On-chip oscillator with external ceramic crystal (6301) and external RC (6311)
- Provide clock output 125kHz
- Internal pull-up resistors for functional input pins
- Very low power supply voltage: 1.0V to 2.6V for PT8A6311
- Few external components needed

### Description

The PT8A6301/PT8A6311 provides a simple solution for three transmitters controlling three RC cars in TDMA mode. When 3 controllers transmit code signals, signal occurrence of the 3 players are interlaced in most time because space of adjacent 2 frames is different in 3 transmitters. In Rx section, each PT8A6311 can distinguish its own code signal according to channel ID. Finally the effective codes will be decoded and FORWARD, BACKWARD, RIGHT, LEFT, F1, F2 signals are sent out to drive external device. Additionally the PT8A6311 provides clock output for DC/DC or other function.

### Pin Information

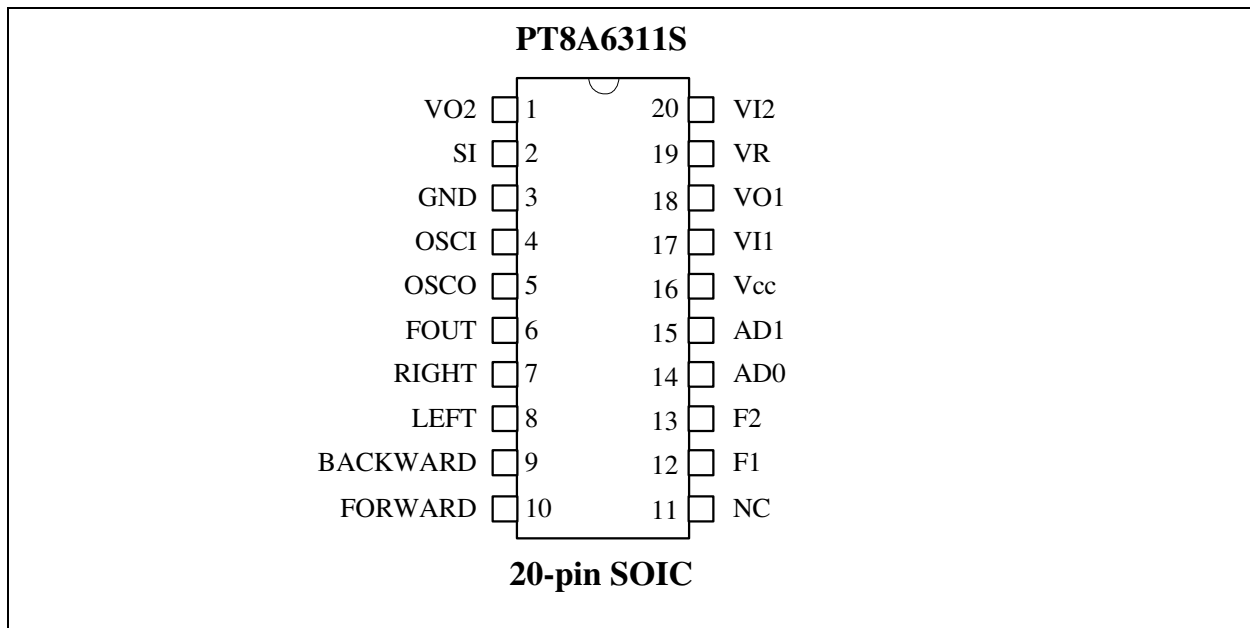
#### Pin configuration of PT8A6301



**Pin Description of PT8A6301**

| Name     | Type | Description  |
|----------|------|--|
| AD0, AD1 | I    | Address pins: the two pins decide which channel will be selected, they are internally pulled down. |
| GND      | GND  | Ground   |
| Backward | I    | Backward function input, low active  |
| Forward  | I    | Forward function input, low active   |
| F1       | I    | Function 1 input, low active   |
| F2       | I    | Function 2 input, low active   |
| SO       | O    | Output pin of the encoding signal  |
| Vcc      | P    | Power supply   |
| FC       | O    | Turn on/off 27MHz OSC  |
| OSCO     | O    | Oscillator output pin  |
| OSCI     | I    | Oscillator input pin   |
| Right    | I    | Right function input, low active   |
| Left     | I    | Left function input, low active  |
| NC       | -    | No connection  |

**Pin configuration of PT8A6311**

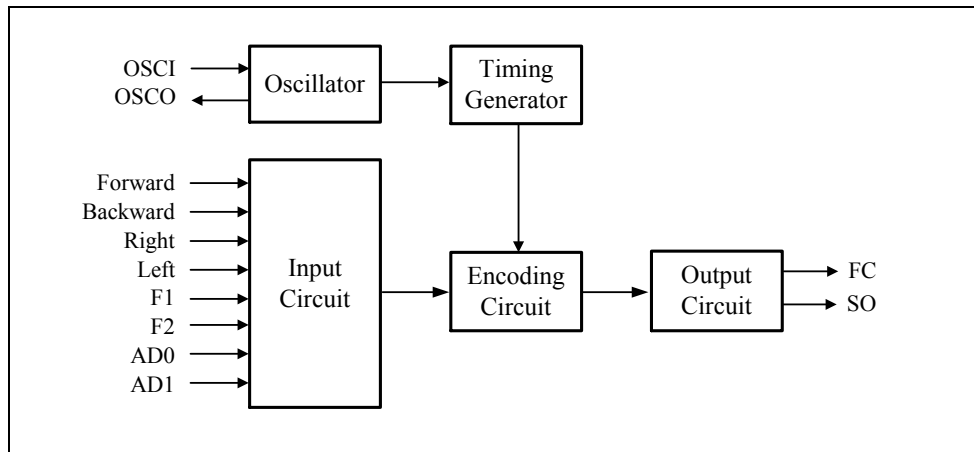


**Pin configuration of PT8A6311**

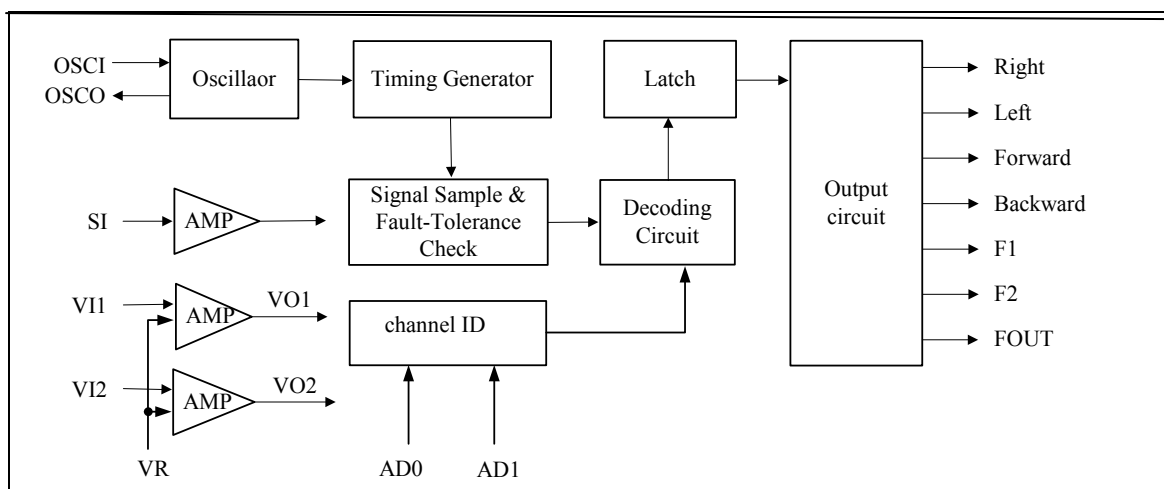
| Pin No. | Name     | Type | Description  |
|---------|----------|------|--|
| 1       | VO2      | O    | Output pins for the amplifier 2  |
| 2       | SI       | I    | Input pin for encoded signal   |
| 3       | GND      | GND  | Ground, bonded together  |
| 4       | OSCI     | I    | Oscillator input pin   |
| 5       | OSCO     | O    | Oscillator output pin  |
| 6       | FOUT     | O    | Clock output, 125kHz square-wave output, 50% duty cycle  |
| 7       | Right    | O    | Rightward output pin, active high  |
| 8       | Left     | O    | Leftward output pin, active high   |
| 9       | Backward | O    | Backward output pin, active low  |
| 10      | Forward  | O    | Forward output pin, active low   |
| 11      | NC       | -    | No connection  |
| 12      | F1       | O    | F1 function output pin, active high  |
| 13      | F2       | O    | F2 function output pin, active high  |
| 14, 15  | AD0, AD1 | I    | Address pins: the two pins decide which channel will be selected, they are internally pulled up. |
| 16      | Vcc      | P    | Power supply, bonded together  |
| 17      | VI1      | I    | Input pins of amplifiers 1   |
| 18      | VO1      | O    | Output pins for the amplifier 1  |
| 19      | VR       | I    | DC offset input of input terminal for amplifier 1 and amplifier 2                                |
| 20      | VI2      | I    | Input pins of amplifiers 2   |

**Block Diagram**

**Block diagram of PT8A6301**

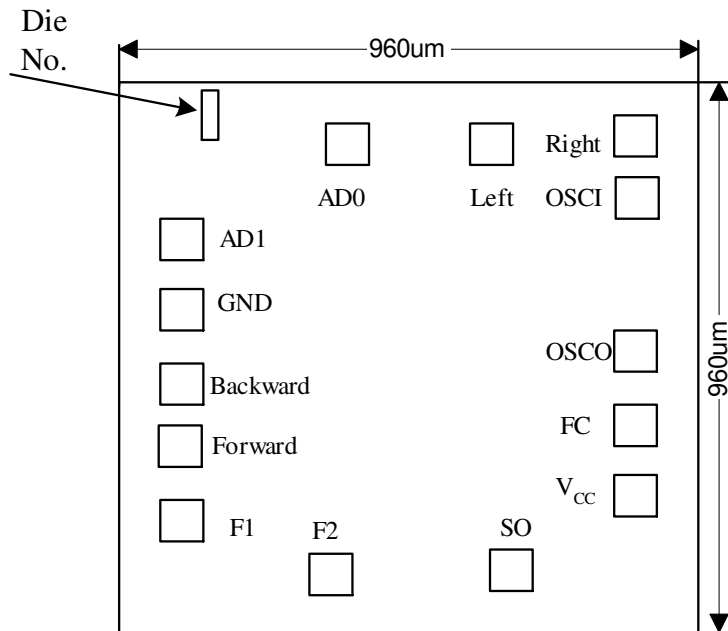


**Block diagram of PT8A6301**



## Pad Location

### Pad Location of PT8A6301

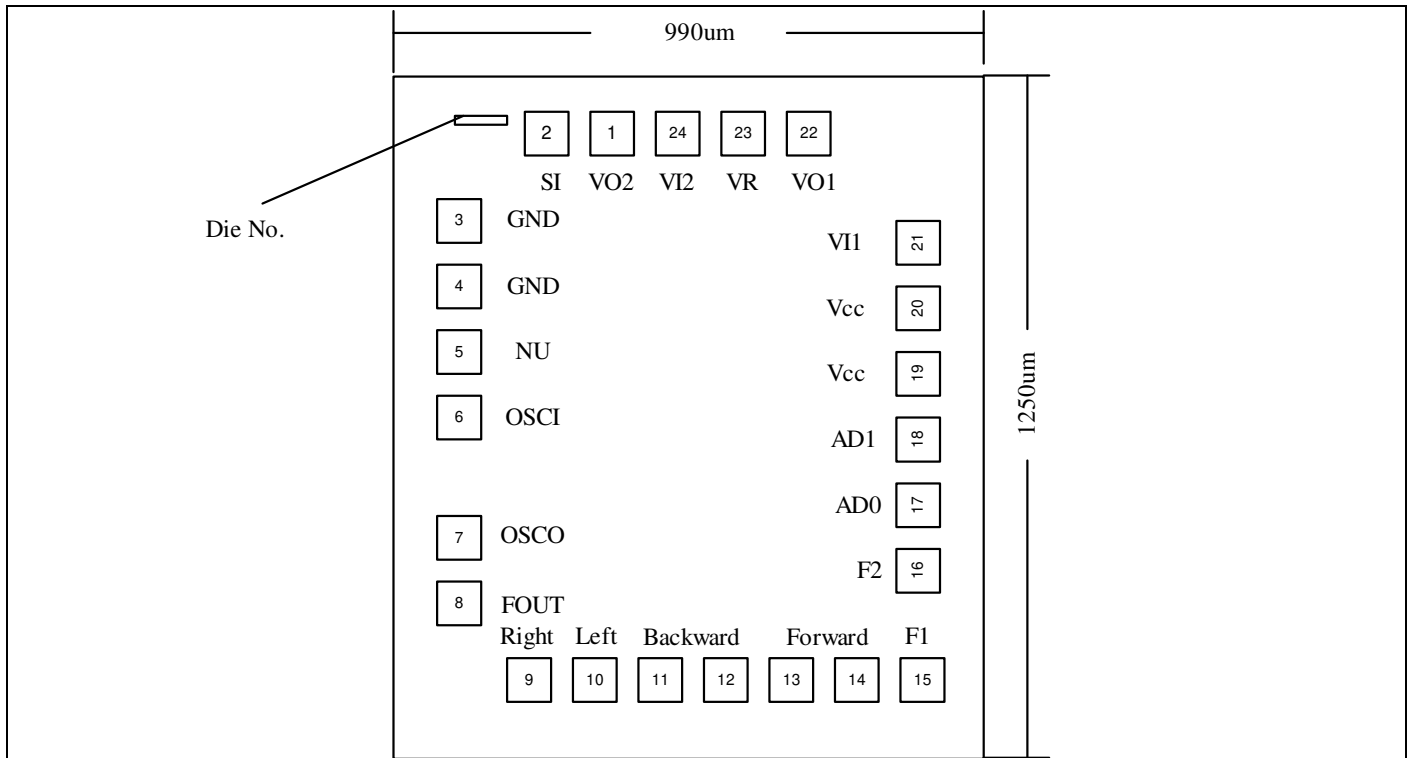


**Pad Coordinate**

| Pad Name | X Coordinate | Y Coordinate | Pad Name        | X Coordinate | Y Coordinate |
|----------|--------------|--------------|-----------------|--------------|--------------|
| AD0      | -168.8       | 360.7        | SO              | 150.8        | -360.7       |
| AD1      | -331.8       | 201.7        | V <sub>cc</sub> | 331.8        | -225.4       |
| GND      | -331.8       | 101.7        | FC              | 331.8        | -121.6       |
| Backward | -331.8       | 0.3          | OSCO            | 331.8        | -21.6        |
| Forward  | -331.8       | -103.5       | OSCI            | 331.8        | 256.5        |
| F1       | -331.8       | -203.5       | Right           | 331.8        | 360.7        |
| F2       | -86.6        | -360.7       | Left            | 68.6         | 360.7        |

Note: Substrate is connected to GND

**Pad Location of PT8A6311**



| Pad Coordinate |          |              |              |         |          |              |              |
|----------------|----------|--------------|--------------|---------|----------|--------------|--------------|
| Pad No.        | Pad Name | X Coordinate | Y Coordinate | Pad No. | Pad Name | X Coordinate | Y Coordinate |
| 1              | VO2      | -90.2        | 480.5        | 13      | Forward  | 151.8        | -480.5       |
| 2              | SI       | -193.6       | 480.5        | 14      | Forward  | 251.8        | -480.5       |
| 3              | GND      | -348.5       | 389.2        | 15      | F1       | 355.6        | -480.5       |
| 4              | GND      | -348.5       | 289.2        | 16      | F2       | 348.5        | -261.2       |
| 5              | NU       | -348.5       | 186.5        | 17      | AD0      | 348.5        | -157         |
| 6              | OSCI     | -348.5       | 86.5         | 18      | AD1      | 348.5        | -57          |
| 7              | OSCO     | -348.5       | -174         | 19      | Vcc      | 348.5        | 46.4         |
| 8              | FOUT     | -348.5       | -274         | 20      | Vcc      | 348.5        | 146.4        |
| 9              | Right    | -255.8       | -480.5       | 21      | VI1      | 348.5        | 250.2        |
| 10             | Left     | -155.8       | -480.5       | 22      | VO1      | 217.4        | 480.5        |
| 11             | Backward | -52          | -480.5       | 23      | VR       | 113.6        | 480.5        |
| 12             | Backward | 48           | -480.5       | 24      | VI2      | 13.6         | 480.5        |

Note: Substrate is connected to GND

## Maximum Ratings

|   |                |
|---|----------------|
| Storage Temperature.....  | -25°C to +85°C |
| Ambient Temperature with Power Applied.....                             | 0°C to +70°C   |
| Supply Voltage to Ground Potential (Inputs & V <sub>CC</sub> Only)..... | -0.5 to +5.5V  |
| Supply Voltage to Ground Potential (Outputs & D/O Only).....            | -0.5 to +5.5V  |
| DC Input Voltage.....   | -0.5 to +5.5V  |
| DC Output Current .....   | 30mA           |
| Power Dissipation .....   | 500mW          |

**Note:**

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Recommended operation conditions

| Sym              | Parameter                       | Min                | Typ | Max                | Unit |
|------------------|---------------------------------|--------------------|-----|--------------------|------|
| V <sub>CC</sub>  | Supply Voltage for PT8A6301     | 2.0                | 3.0 | 5.0                | V    |
|                  | Supply Voltage for PT8A6311     | 1.0                | 1.2 | 2.6                | V    |
| V <sub>IH</sub>  | Input HIGH Voltage              | 0.7V <sub>CC</sub> | -   | -                  | V    |
| V <sub>IL</sub>  | Input LOW Voltage               | -                  | -   | 0.3V <sub>CC</sub> | V    |
| f <sub>OSC</sub> | Oscillator Frequency (PT8A6301) | -                  | 1   | -                  | MHz  |
|                  | Oscillator Frequency (PT8A6311) | -                  | 125 | -                  | MHz  |
| T <sub>A</sub>   | Operating temperature           | 0                  | -   | 70                 | °C   |

## DC Electrical Characteristics

### DC Electrical Characteristics of PT8A6301

| Sym              | Description                              | Test Conditions  | Min | Typ | Max | Unit |
|------------------|--|--|-----|-----|-----|------|
| V <sub>CC</sub>  | Supply Voltage                           | -  | 2.0 | 3.0 | 5.0 | V    |
| I <sub>CC</sub>  | Supply current                           | Oscillator work, No load                                     | -   | 400 | 500 | μA   |
| I <sub>OH</sub>  | Output HIGH Current – SO, FC             | V <sub>CC</sub> =2V, V <sub>OUT</sub> =V <sub>CC</sub> -0.5V | -3  | -5  | -   | mA   |
| I <sub>OL</sub>  | Output LOW Current – SO, FC              | V <sub>CC</sub> =2V, V <sub>OUT</sub> = 0.5V                 | 2   | 3   | -   | mA   |
| I <sub>IH</sub>  | Input HIGH Current – Function Input Pins | V <sub>IN</sub> =V <sub>CC</sub>                             | -   | -   | 1   | μA   |
| I <sub>IL</sub>  | Input LOW Current – Function Input Pins  | V <sub>IN</sub> = 0V   | -5  | -15 | -30 | μA   |
| I <sub>IH1</sub> | Input HIGH Current – AD0, AD1            | V <sub>IN</sub> =V <sub>CC</sub>                             | 5   | 15  | 30  | μA   |
| I <sub>IL1</sub> | Input LOW Current – AD0, AD1             | V <sub>IN</sub> = 0V   | -   | -   | -1  | μA   |

**Note:** These specification apply for V<sub>CC</sub>=3.0V and T<sub>A</sub>=0°C to 70°C, unless otherwise specified

**DC Electrical Characteristics of PT8A6311**

| Sym              | Description  | Test Conditions  | Min  | Typ | Max | Unit |
|------------------|--|--|------|-----|-----|------|
| V <sub>CC</sub>  | Supply Voltage                                       | -  | 1.0  | 1.2 | 2.6 | V    |
| I <sub>CC</sub>  | Supply current                                       | Note 2   | -    | 0.3 | 3.0 | mA   |
| I <sub>IL</sub>  | Input Low Current for logic input pins               | V <sub>in</sub> = 0  | -    | -10 |     | μA   |
| I <sub>IH</sub>  | Input High Current for logic input pins              | V <sub>in</sub> = V <sub>CC</sub>                              | -    | -   | 1   | μA   |
| I <sub>OH1</sub> | Output High Current1 for FORWARD and BACKWARD pins   | V <sub>out</sub> =V <sub>CC</sub> -0.2V                        | -150 | -   | -   | μA   |
| I <sub>OL1</sub> | Output Low Current1 for FORWARD and BACKWARD pins    | V <sub>out</sub> =0.2V   | 4    | -   | -   | mA   |
| I <sub>OH2</sub> | Output High Current2 for LEFT ,RIGHT, F1 and F2 pins | V <sub>CC</sub> =1.0V, V <sub>out</sub> =V <sub>CC</sub> -0.2V | -800 | -   | -   | μA   |
| I <sub>OL2</sub> | Output Low Current3 for LEFT ,RIGHT, F1 and F2 pins  | V <sub>out</sub> =0.2V   | 150  | 600 | -   | μA   |
| I <sub>OH3</sub> | Output High Current3 for FOUT                        | V <sub>CC</sub> =1.0V, V <sub>out</sub> =V <sub>CC</sub> -0.2V | -800 | -   | -   | μA   |
| I <sub>OL3</sub> | Output Low Current3 for FOUT                         | V <sub>out</sub> =0.2V   | 800  | -   | -   | μA   |
| V <sub>OFF</sub> | Amplifier input offset voltage                       | V <sub>CC</sub> =1.0v  |      | -   | 20  | mv   |
|                  |  |  |      |     |     |      |

**Note:**

1. Test conditions V<sub>cc</sub>=1.0-2.6V and T<sub>A</sub>=0°C to 70°C, unless otherwise specified
2. Feedback resistors for the two reversing amplifiers is 2.2MW and oscillator frequency is 125kHz.

**AC Electrical Characteristics**

| Sym              | Description                                | Test Conditions               | Min | Typ | Max | Unit |
|------------------|--|-------------------------------|-----|-----|-----|------|
| f <sub>OSC</sub> | Oscillator frequency for PT8A6301          | -                             | -   | 1   | -   | MHz  |
| T <sub>d</sub>   | Oscillator frequency for PT8A6311          | -                             | 118 | 125 | 132 | KHz  |
|                  | The delay time between FC and SO(PT8T6301) | OSC frequency=1MHz            | -   | 6   | -   | ms   |
| T <sub>AS</sub>  | Auto-Stop Time*(PT8T6311)                  | OSC frequency=125kHz          | -   | 800 | -   | ms   |
| V <sub>SI</sub>  | SI Pin Receive Sensitivity(PT8T6311)       | Guaranteed effective decoding | 40  | -   | 100 | mV   |

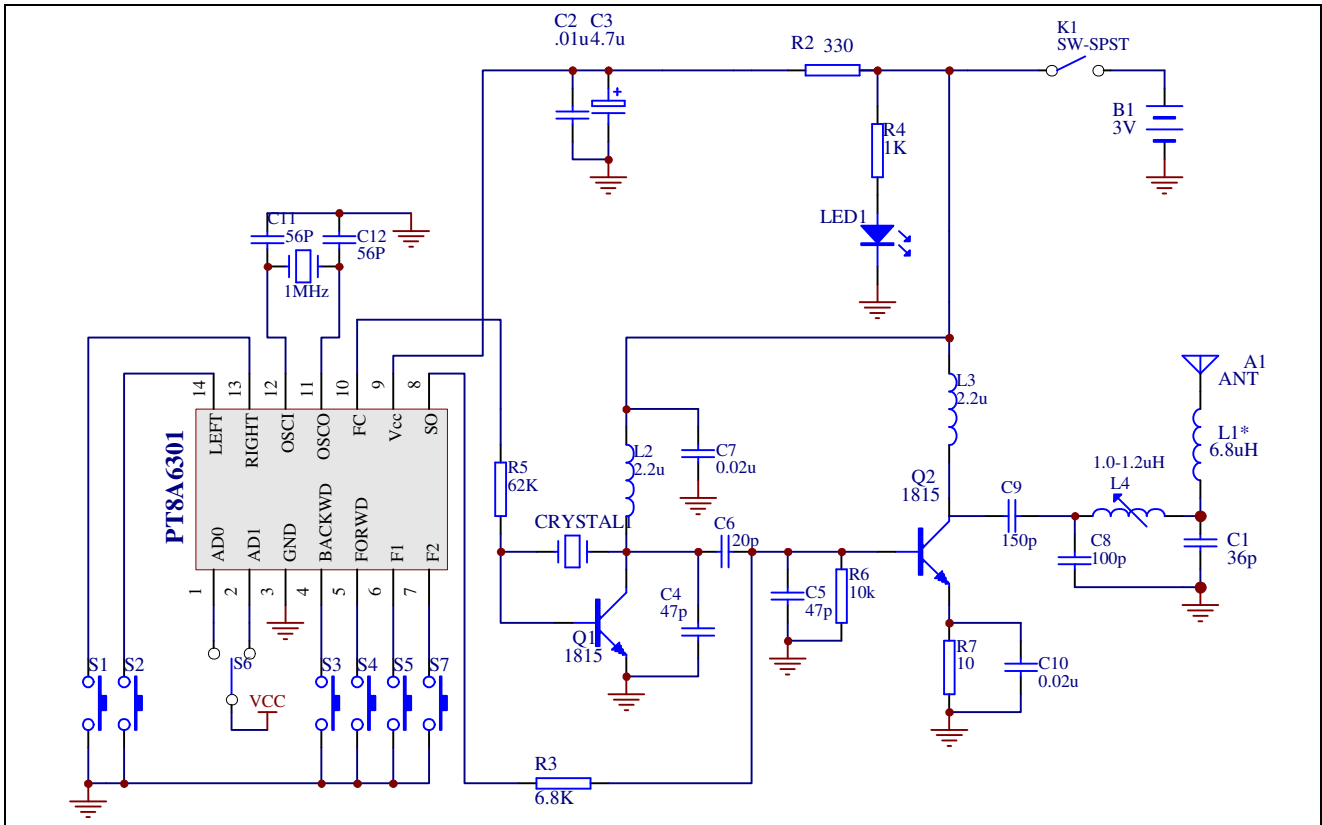
**Note:** These conditions (PT8A6301): V<sub>cc</sub>=3.0V and T<sub>A</sub>=0°C to 70°C, unless otherwise specified

These conditions (PT8A6311): V<sub>cc</sub>=1.0-2.6V and T<sub>A</sub>=0°C to 70°C, unless otherwise specified

\*Auto-stop time: if no effective signal received within the time, system will turn off all outputs automatically.

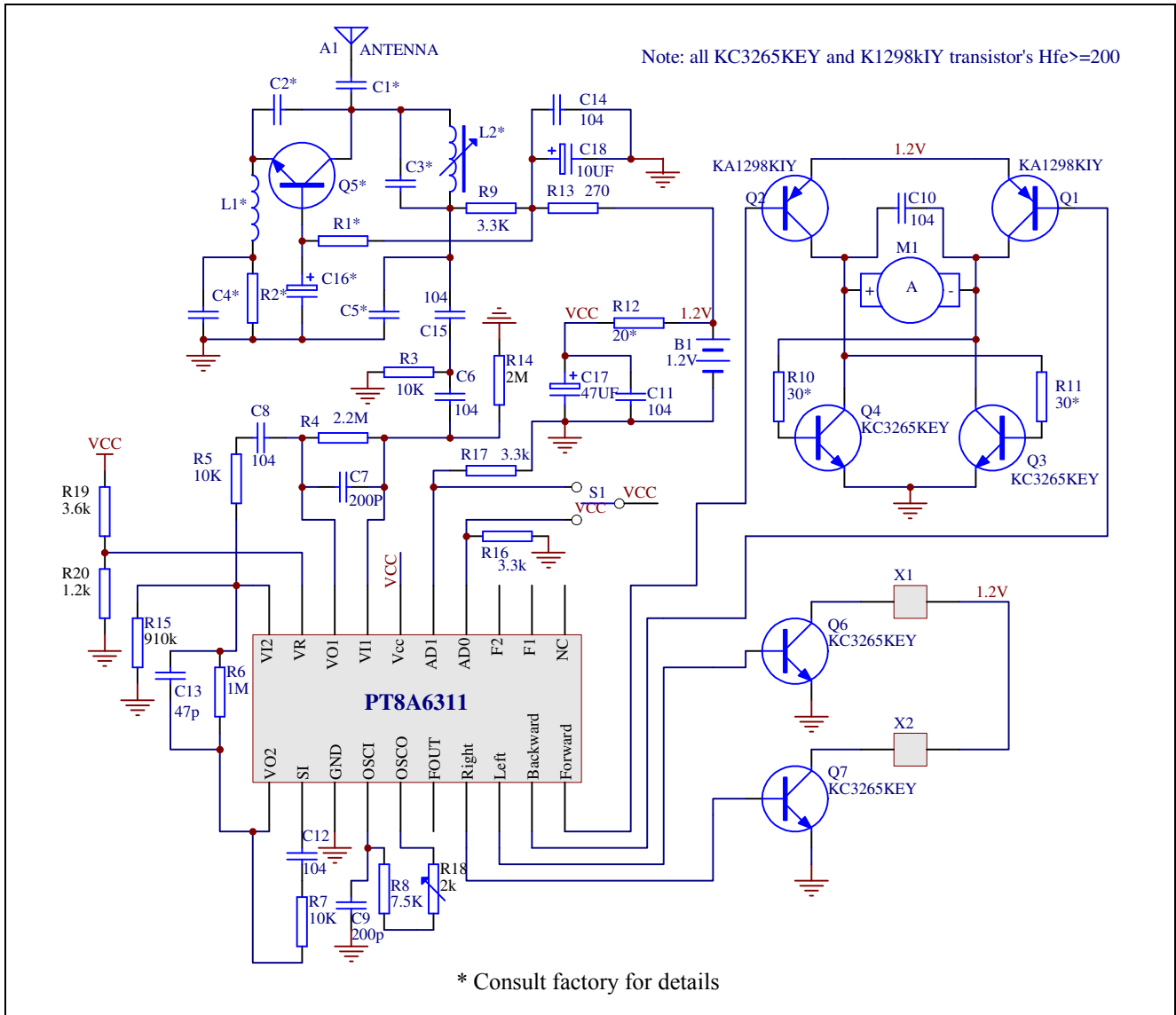
### Typical Application Circuit

PT8A6301 Typical application circuit for

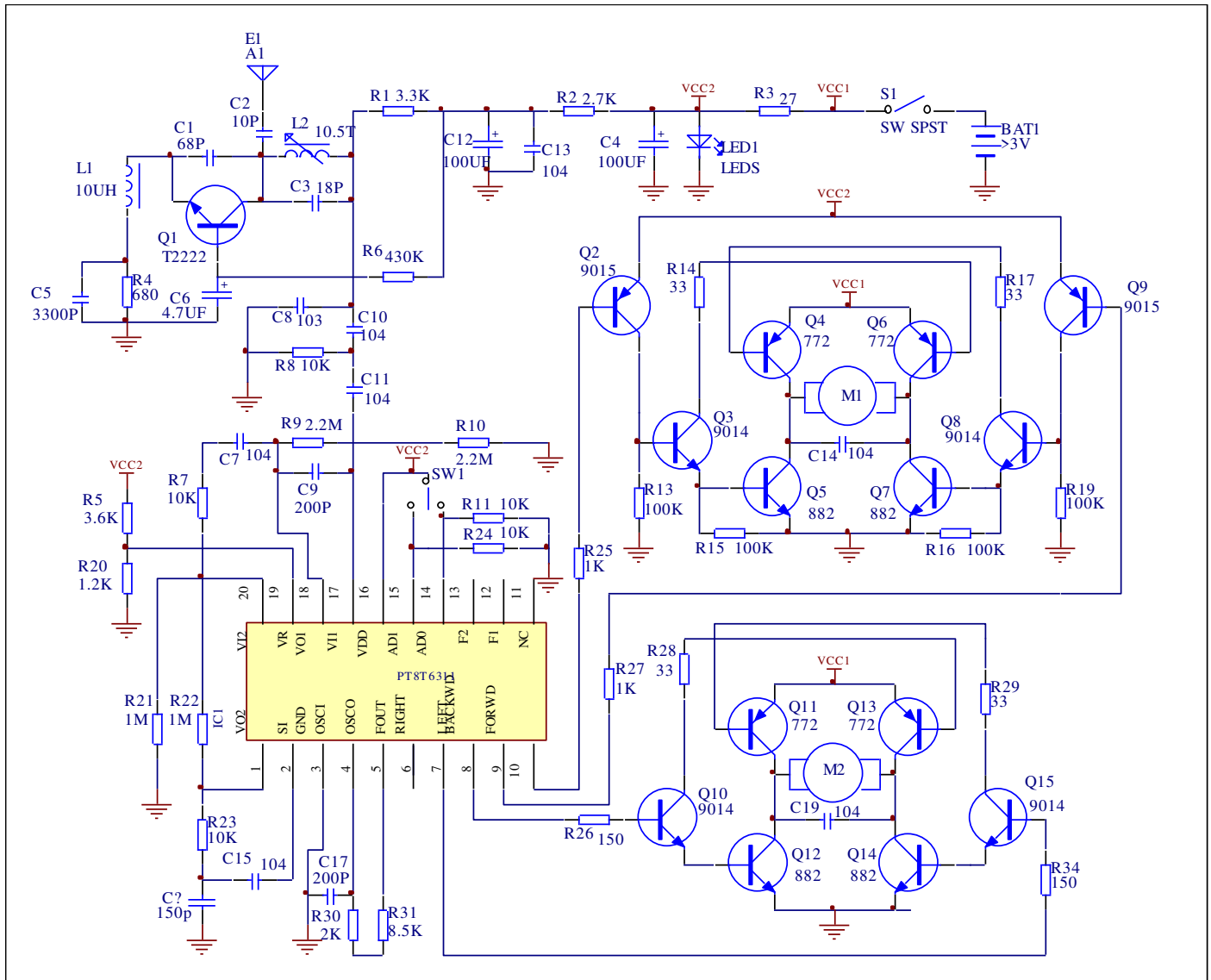




### PT8A6311 Typical Application Circuit for RC car with low voltage supply



PT8A6311 Typical Application Circuit for RC car with high voltage supply



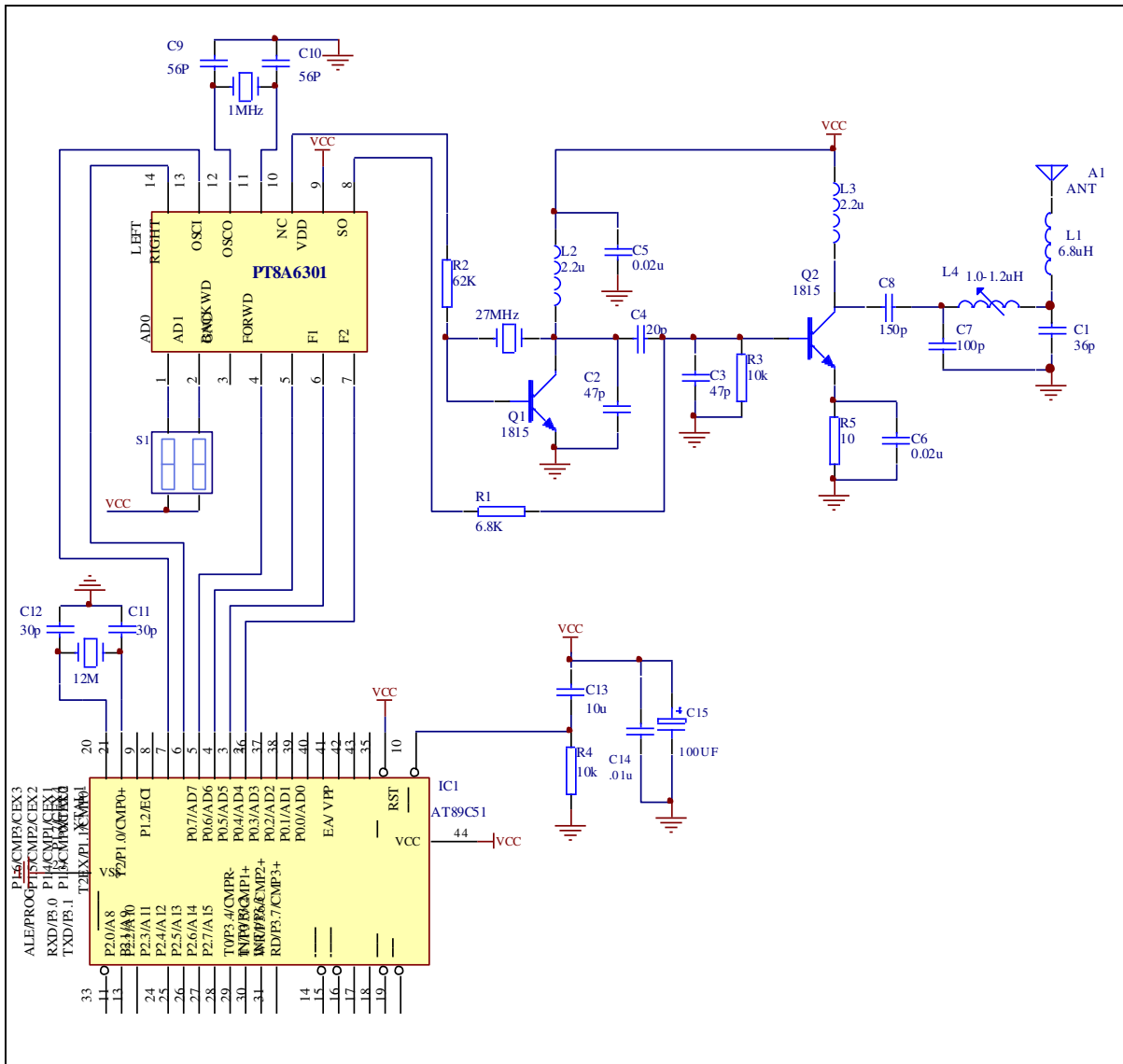
### Application Note

PT8A6301/6311 can also be applied for data communication working with MCU.

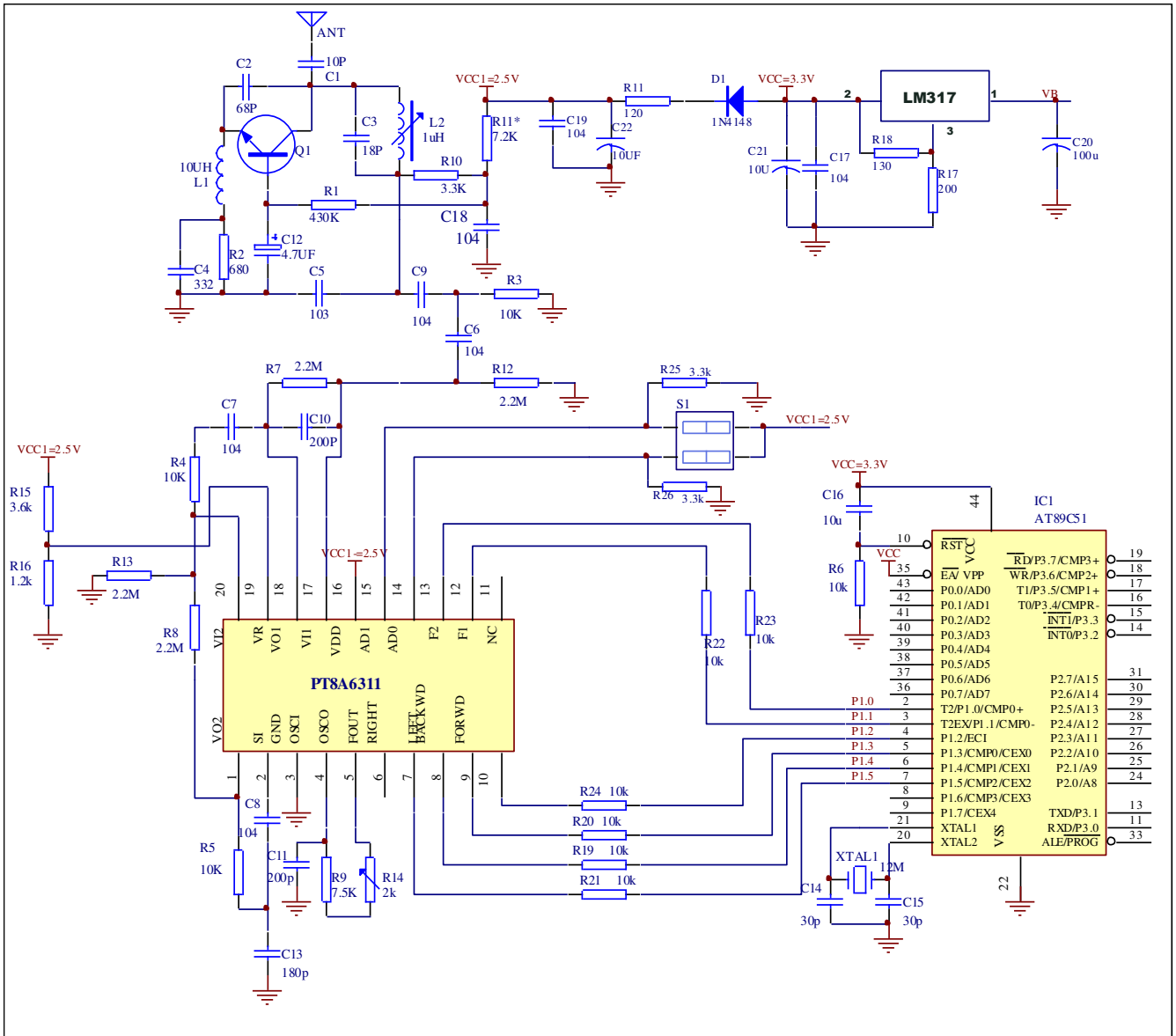
#### Truth table

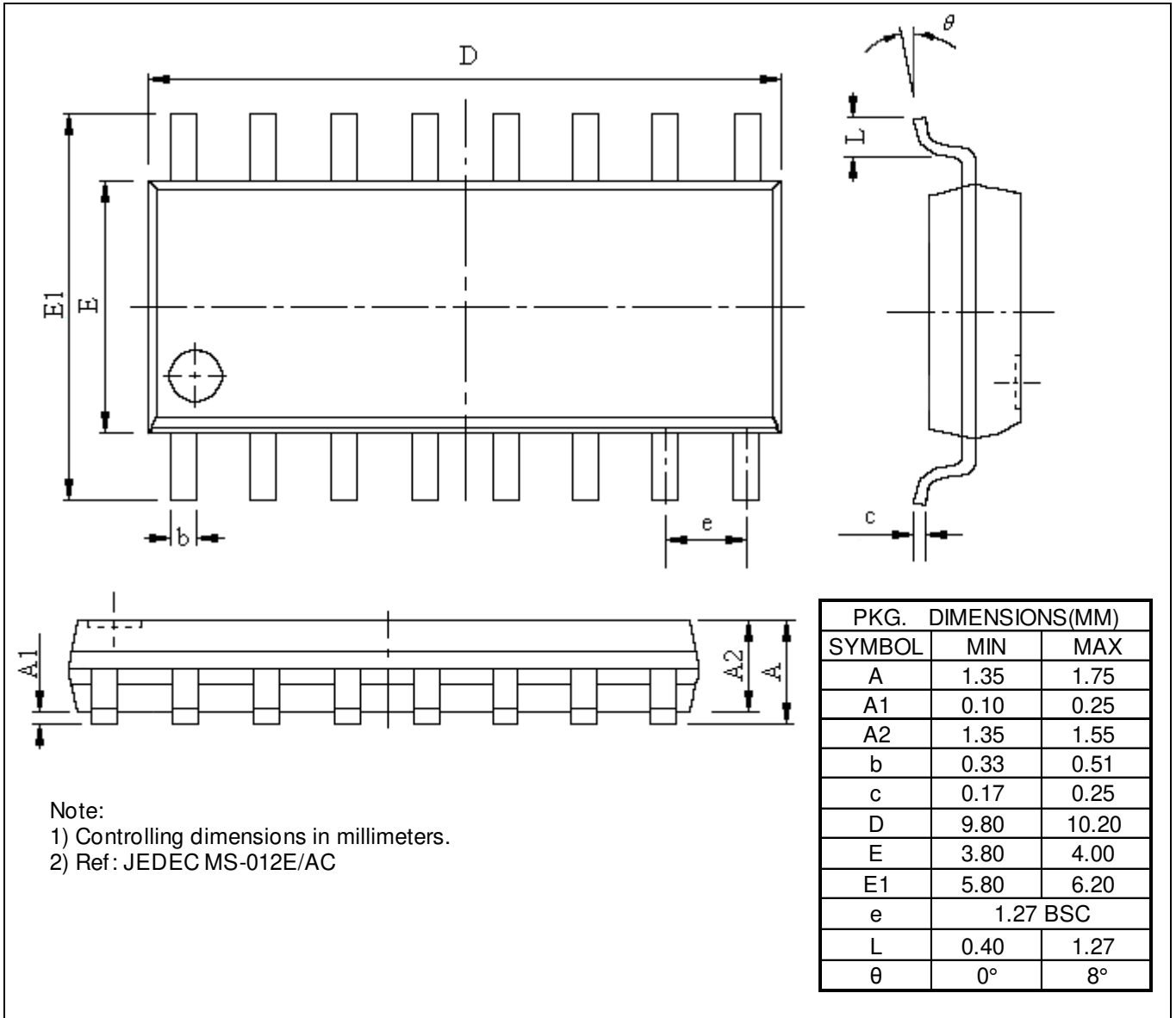
| Input |      | Output |      | Input    |         | Output   |         | Input |    | Output |    |
|-------|------|--------|------|----------|---------|----------|---------|-------|----|--------|----|
| RIGHT | LEFT | RIGHT  | LEFT | BACKWARD | FORWARD | BACKWARD | FORWARD | F1    | F2 | F1     | F2 |
| 0     | 0    | 0      | 0    | 0        | 0       | 1        | 1       | 0     | 0  | 1      | 1  |
| 0     | 1    | 1      | 0    | 0        | 1       | 0        | 1       | 0     | 1  | 1      | 0  |
| 1     | 0    | 0      | 1    | 1        | 0       | 1        | 0       | 1     | 0  | 0      | 1  |
| 1     | 1    | 0      | 0    | 1        | 1       | 1        | 1       | 1     | 1  | 0      | 0  |

PT8A6301 Application Circuit for data communication

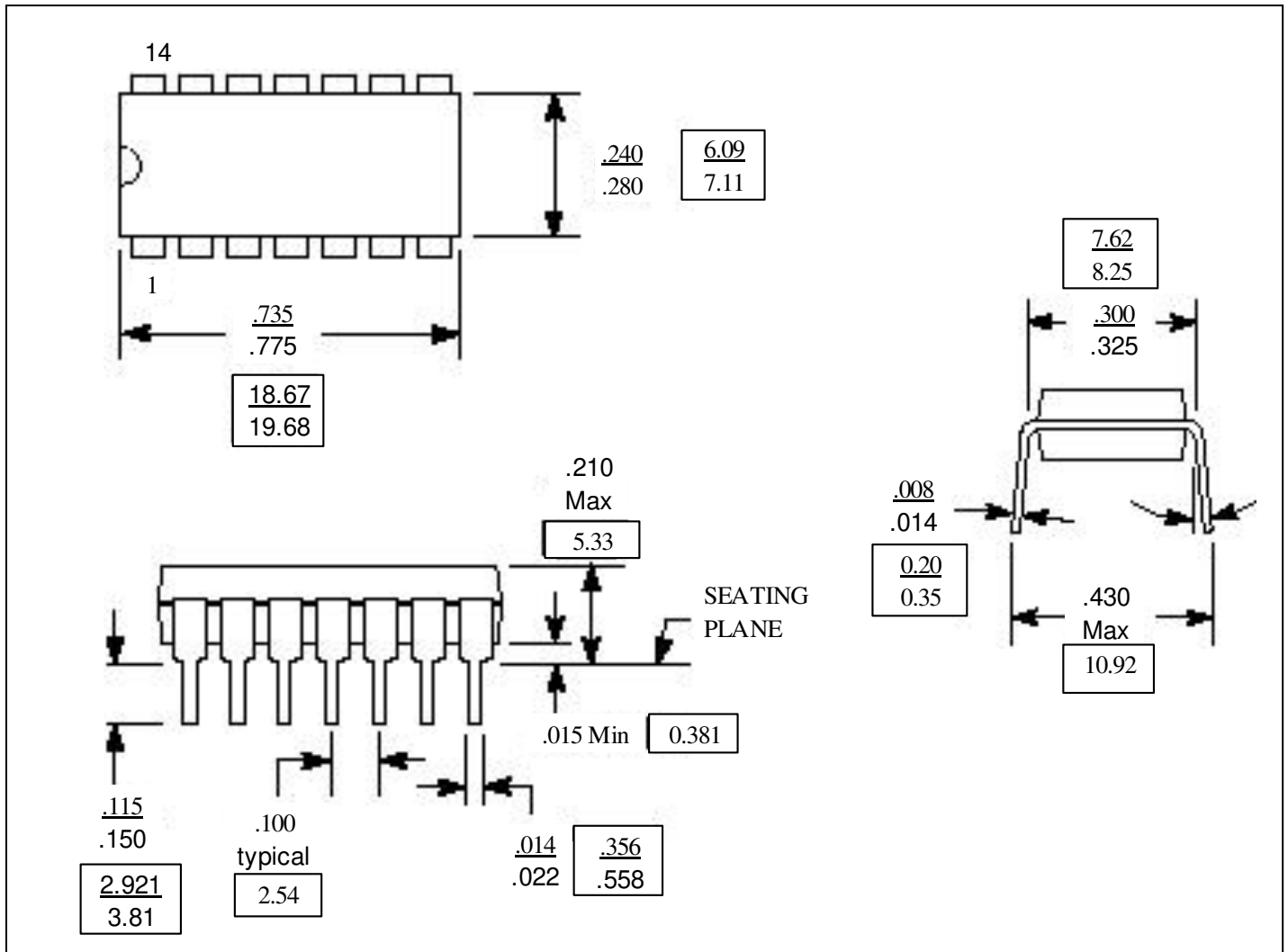


### PT8A6311 Application Circuit for data communication

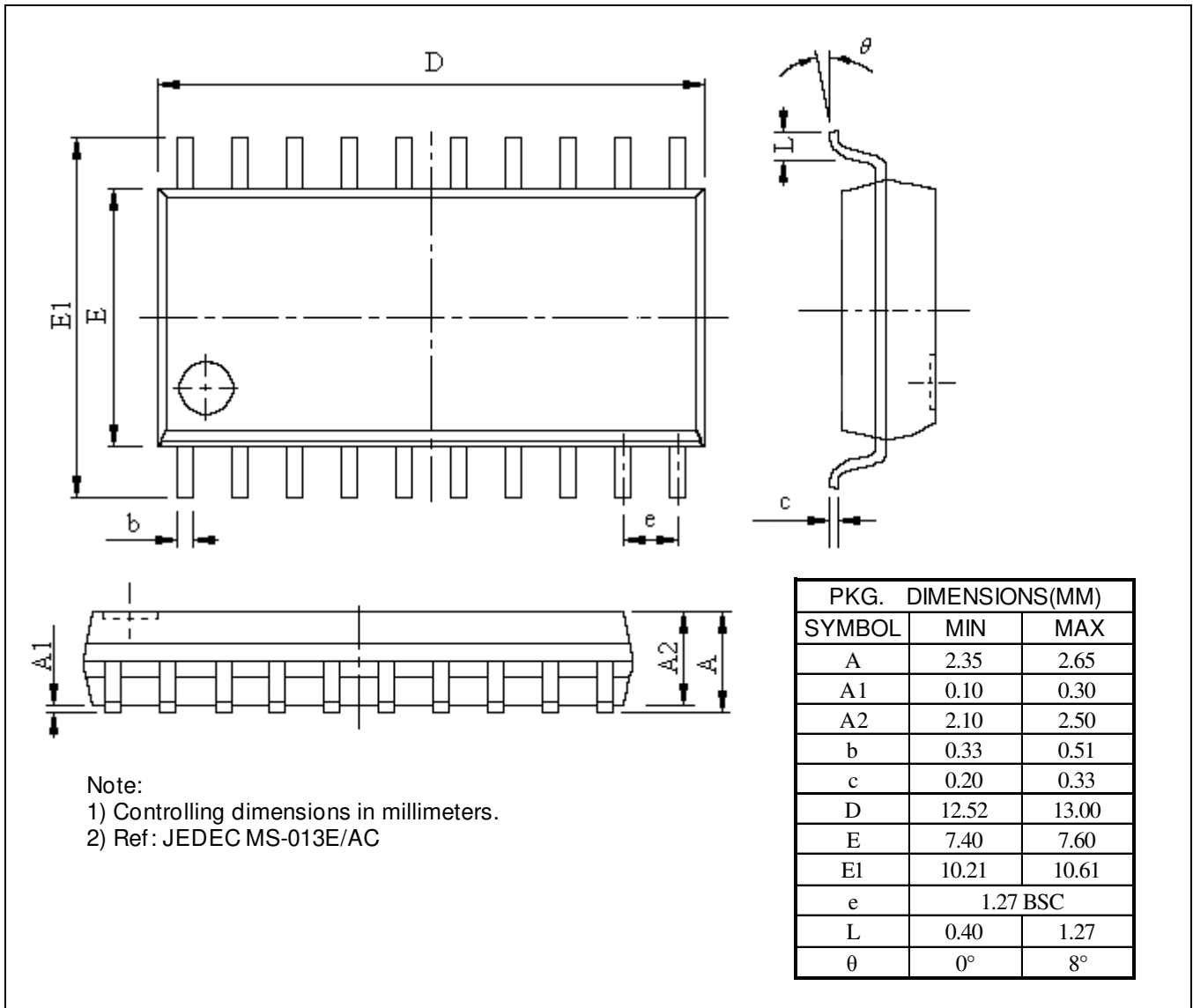


**Mechanical Information**  
W (SOIC-16)


DIP-14



SOIC-20



### Ordering Information

| Part No.   | Package Code | Package               |
|------------|--------------|-----------------------|
| PT8A6301WE | W            | Lead free 16 Pin SOIC |
| PT8A6301PE | P            | Lead free 14 Pin DIP  |
| PT8A6301DE | DE           | Die Form              |
| PT8A6311SE | S            | Lead free 20 Pin SOIC |
| PT8A6311DE | DE           | Die Form              |

**Note:**

- E = Pb-free
- Adding X Suffix= Tape/Reel

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