

Features

- Operating voltage: 2~12V
- Low power consumption
- Up to 5 data pins
- Up to 2²² address codes
- Fully Integrated Oscillator
- Easy interfacing to RF medium
- CMOS technology
- High noise immunity
- 8-Pin SOP package for HT6P20B2, HT6P20D2 and HT6P20F2
- 8-Pin DIP package for HT6P20B2

Application

- Burglar alarm systems
- Smoke and fire alarm systems
- Personal alarm systems
- Car/Garage door controllers
- Home/office/car security systems
- Cordless telephones
- Other remote control systems

General Description

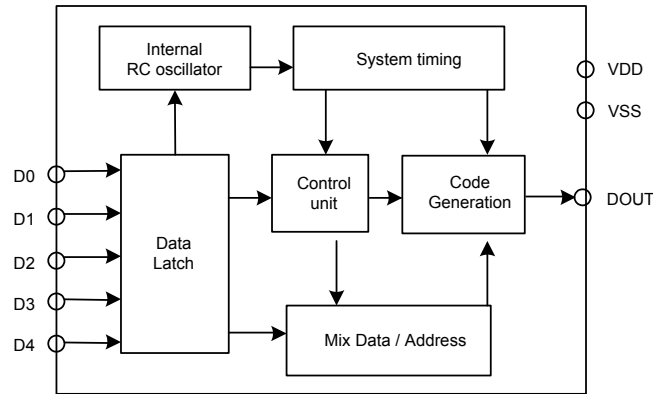
The HT6P20X2 series of devices are signal encoders designed for remote control system applications. The devices are capable of encoding 24 bits of information and then serially transmitting the data on their output pin. A signal transmission is automatically activated when any of the data input lines change from high to low. The device generates a signal on its output pin which is composed of a pilot signal, address codes, data codes and an end code. This can be sent to RF transmitter circuits for wireless transmission. Various configurations of address and data bits can be chosen according to which device is selected. As all functions are integrated into the device, the simple addition of switches and RF module is that is required to implement a full RF encoder function. .

Selection Table

The devices encodes 24-bits of information however the address/data combination is selected according to which part number is selected.

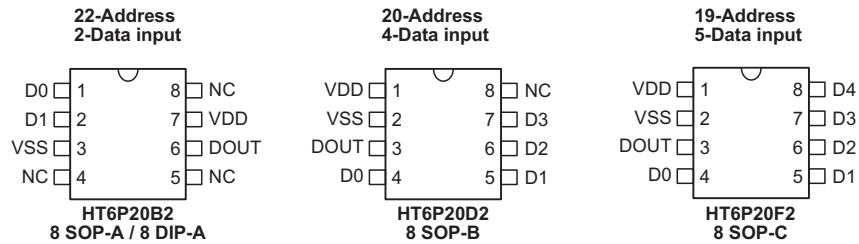
| Part Number | Address | Data |
|-------------|---------|------|
| HT6P20B2 | 22 | 2 |
| HT6P20D2 | 20 | 4 |
| HT6P20F2 | 19 | 5 |

Block Diagram



Note: Address and Data combinations are available in various formats.

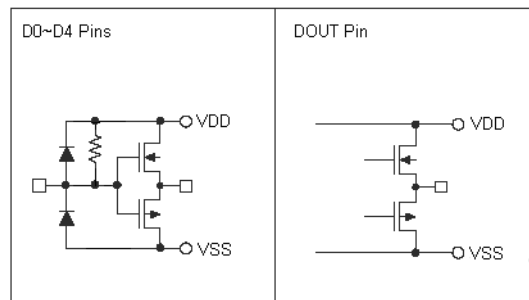
Pin Assignment



Pin Description

| Pin Name | Type | Description |
|----------|------|--|
| VDD | — | Positive power supply |
| VSS | — | Negative power supply |
| D0~D4 | I | Data input and transmission enable - active low Connected to internal pull-high resistor Pins can be pulled low or left open |
| DOUT | O | Data serial transmission output pin Output normally low when not transmitting |

Approximate Internal Equivalent Circuits



Absolute Maximum Ratings

| | |
|-----------------------------|----------------------------------|
| Supply Voltage | $V_{SS}-0.3V$ to $V_{SS}+15V$ |
| Input Voltage | $V_{SS}-0.3V$ to $V_{DD}+0.3V$ |
| Output Voltage..... | $V_{SS}-0.3V$ to $V_{DD}+0.3V$ |
| Storage Temperature | $-55^{\circ}C$ to $150^{\circ}C$ |
| Operating Temperature | $-40^{\circ}C$ to $85^{\circ}C$ |

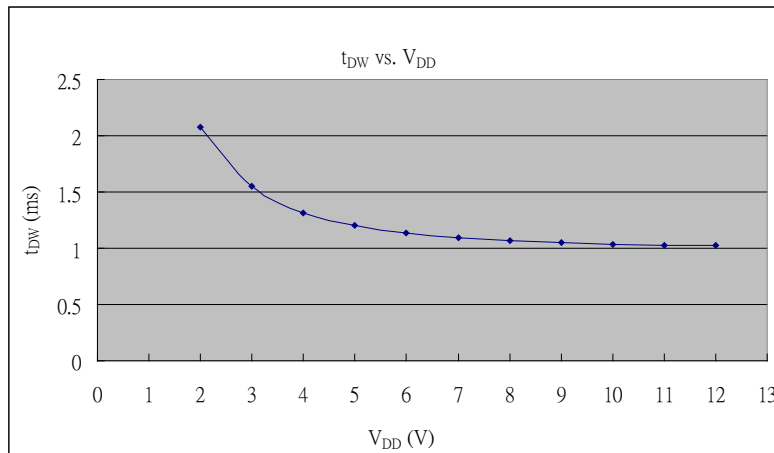
Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

D.C. Characteristics

Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|-----------------|--------------------------|-----------------|--|--------------------|------|--------------------|------|
| | | V _{DD} | Conditions | | | | |
| V _{DD} | Supply Voltage | — | — | 2 | — | 12 | V |
| I _{SB} | Stand-by current | 12 | No load Input pins floating | — | — | 1.0 | μA |
| I _{OP} | Operating current | 5 | No load Single data input pin “low” | — | 30 | 100 | μA |
| | | 12 | | — | 300 | 500 | |
| V _{IH} | “H” Input Voltage | — | — | 0.8V _{DD} | — | — | V |
| V _{IL} | “L” Input Voltage | — | — | — | — | 0.2V _{DD} | V |
| R _{PH} | Pull-high Resistor | 5 | D0~D4 | — | 400 | 800 | KΩ |
| | | 12 | | — | 150 | 300 | |
| I _{OH} | Hi-level output current | 5 | V _{OH} =0.9V _{DD} ; DOUT | -2 | -2.5 | — | mA |
| | | 12 | | -6.5 | -15 | — | mA |
| I _{OL} | Low-level output current | 5 | V _{OL} =0.1V _{DD} ; DOUT | 2 | 2.5 | — | mA |
| | | 12 | | 6.5 | 15 | — | mA |
| t _{DW} | Single bit data width | 5 | — | 1.08 | 1.2 | 1.32 | ms |

Note: Single bit data width (t_{DW}) vs. V_{DD} curve is shown as below:



Functional Description

The HT6P20X2 series of remote control devices provide a means for easy remote control signal encoding. As all functions, including the system oscillator, are integrated within the devices, the addition of external switches and an RF transmitter is all that is required to implement a full remote control transmitter function.

The devices will generate an encoded signal on their output pin, DOUT, composed of pilot code, address code, data code and end code. The signal is automatically generated on the DOUT pin when any of the data input pins, D0~D4, change from high to low. Internal pull-high resistors keep these data input pins in a normally high condition. The output signal can be interfaced to RF modules for wireless signal transmission.

Signal Generation

The devices will encode and transmit pilot code, address/data and end code, upon receipt of a trigger signal. The trigger signal is a high to low transition on any of the data input pins, D0~D4. The pins are normally kept at a high level by internal pull-high resistors.

Code Word

What is known in this datasheet as a code word is a packet of information composed of pilot code, address code, data code and end code. The pilot code and end code is the same for all devices. The address and data combinations are shown in the following signal descriptions.

HT6P20B2

| | | | |
|------------|--------|-------|-----------------|
| Pilot code | A0~A21 | D1~D0 | End code (0101) |
|------------|--------|-------|-----------------|

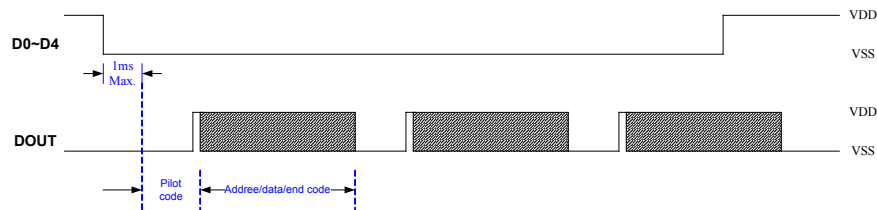
HT6P20D2

| | | | |
|------------|--------|-------|-----------------|
| Pilot code | A0~A19 | D3~D0 | End code (0101) |
|------------|--------|-------|-----------------|

HT6P20F2

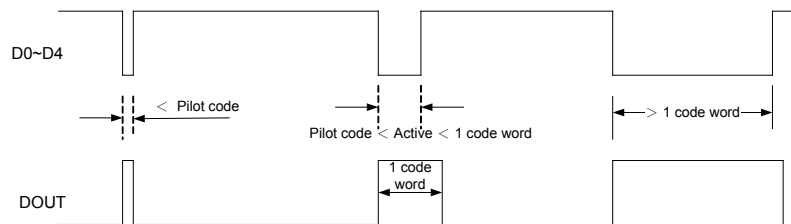
| | | | |
|------------|--------|-------|-----------------|
| Pilot code | A0~A18 | D4~D0 | End code (0101) |
|------------|--------|-------|-----------------|

The following shows a complete code word transmission signal. Note that if the Data lines remain low then the signal will be continuously transmitted.



Signal Trigger

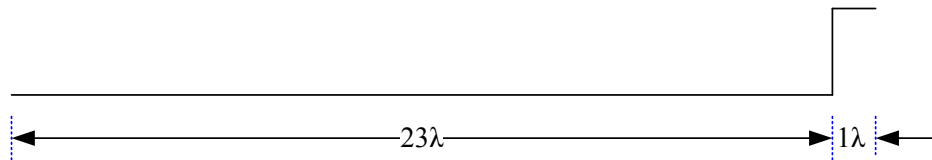
Signal transmission is initiated when any of the data input pins change from high to low. Note that the duration of the data input low signals must be greater than the pilot code length for a full signal transmission to occur. If the input low signal is less than the pilot code length then only the pilot code signal will be transmitted and no address, data or end code will be transmitted.



Pilot Code

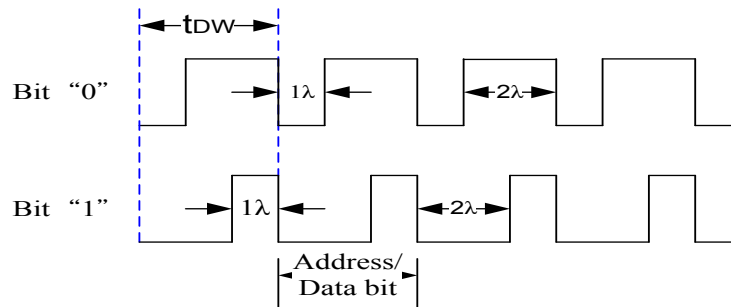
Each transmission has a pilot code preceding the address and data codes. This is to alert the decoder that address and data bits are about to be transmitted. The pilot code waveform is composed of a low pulse of 23λ duration followed by a high pulse of 1λ duration. Note that a 1λ time unit is equal to 32 internal oscillator time periods.

The pilot code is initiated when any of the data input pins change from high to low. Note that the duration of the data input low signals must be greater than the pilot code length for a full signal transmission to occur. If the input low signal is less than the pilot code length then only the pilot code signal will be transmitted and no address, data or end code will be transmitted.



Address/Data Bit Waveform

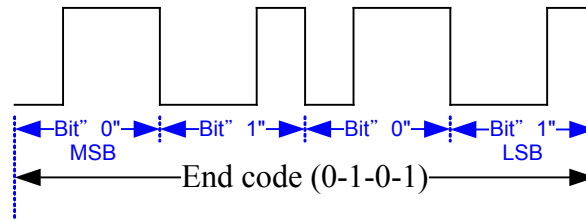
As address/data bits can be designated as either "0" or "1" they must be encoded in a certain way. One bit consists of one pulse cycle and each pulse cycle has a duration of 96 internal oscillator periods.



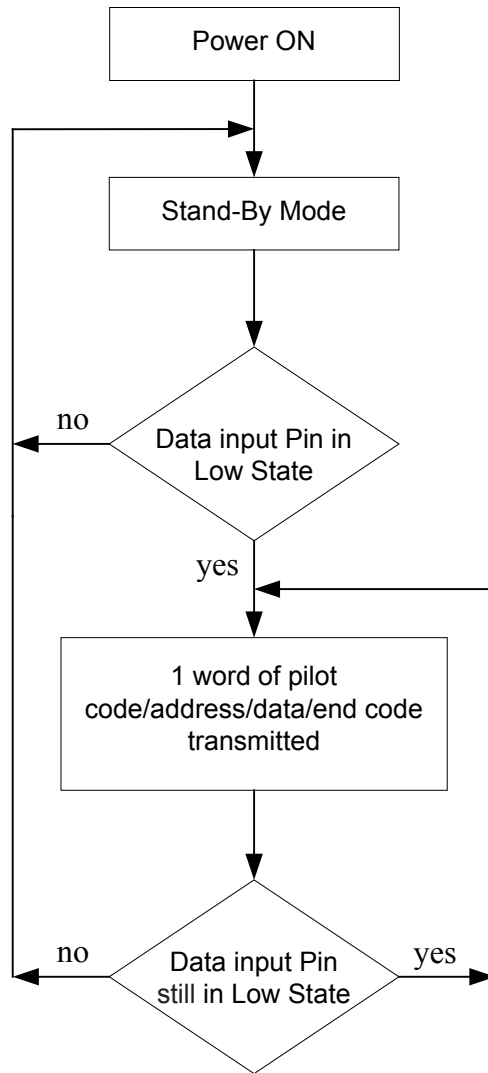
- Note:
- $1\lambda = 32$ internal oscillator time periods.
 - Bit "0" consists of a "low" pulse for 1λ then a "high" pulse for 2λ .
 - Bit "1" consists of a "low" pulse for 2λ then a "high" pulse for 1λ .

End code Waveform

The end code is located after the address/data and consists of 4 bits of data with the bit pattern 0101 as shown below

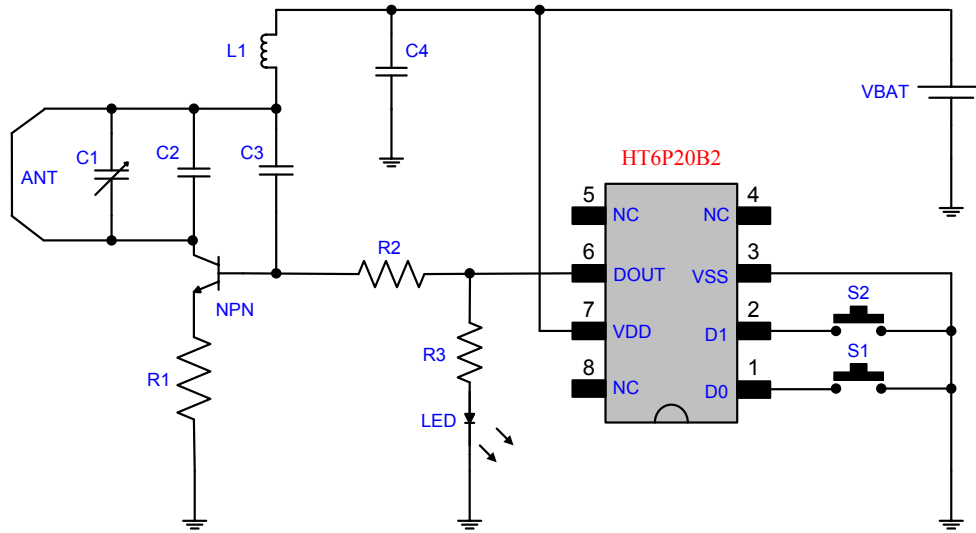


Operation Flowchart

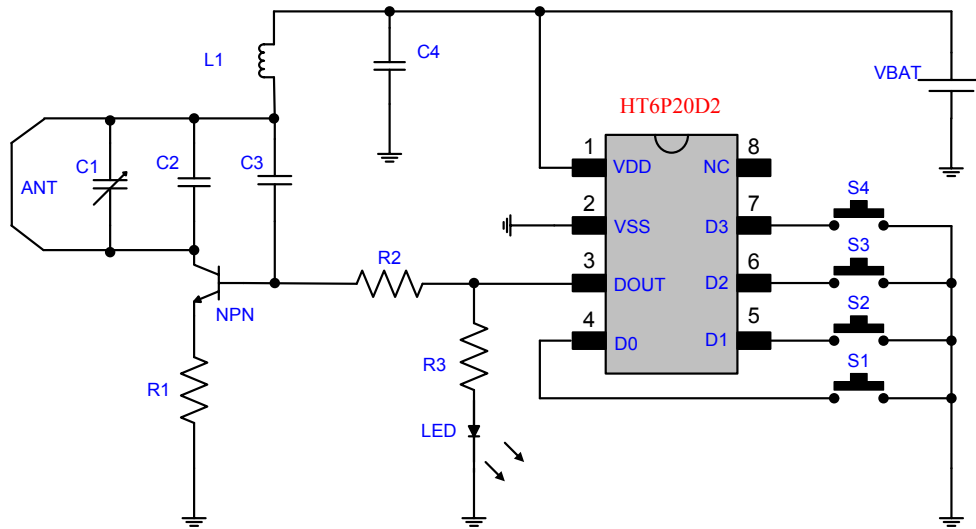


Application Circuit

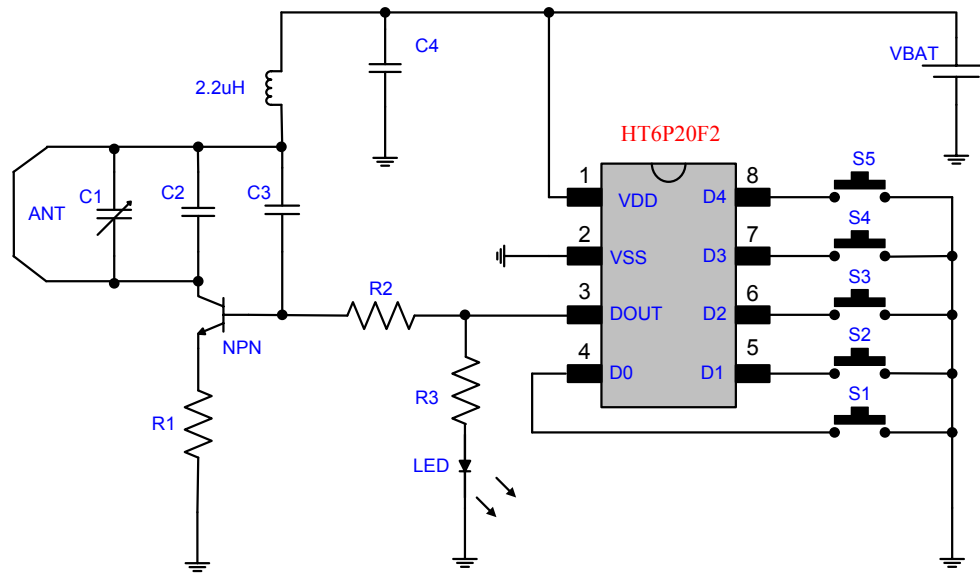
HT6P20B2



HT6P20D2

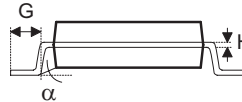
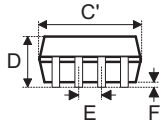
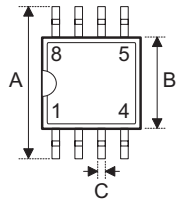


HT6P20F2



Package Information

8-pin SOP (150mil) Outline Dimensions

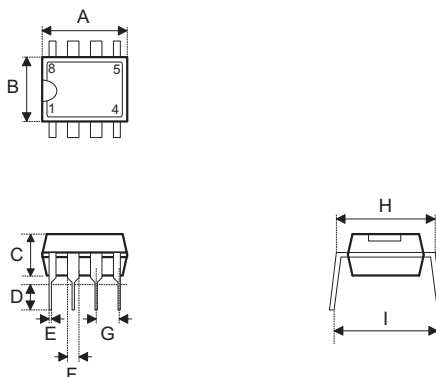


• MS-012

| Symbol | Dimensions in inch | | |
|----------|--------------------|-------|-------|
| | Min. | Nom. | Max. |
| A | 0.228 | — | 0.244 |
| B | 0.150 | — | 0.157 |
| C | 0.012 | — | 0.020 |
| C' | 0.188 | — | 0.197 |
| D | — | — | 0.069 |
| E | — | 0.050 | — |
| F | 0.004 | — | 0.010 |
| G | 0.016 | — | 0.050 |
| H | 0.007 | — | 0.010 |
| α | 0° | — | 8° |

| Symbol | Dimensions in mm | | |
|----------|------------------|------|------|
| | Min. | Nom. | Max. |
| A | 5.79 | — | 6.20 |
| B | 3.81 | — | 3.99 |
| C | 0.30 | — | 0.51 |
| C' | 4.78 | — | 5.00 |
| D | — | — | 1.75 |
| E | — | 1.27 | — |
| F | 0.10 | — | 0.25 |
| G | 0.41 | — | 1.27 |
| H | 0.18 | — | 0.25 |
| α | 0° | — | 8° |

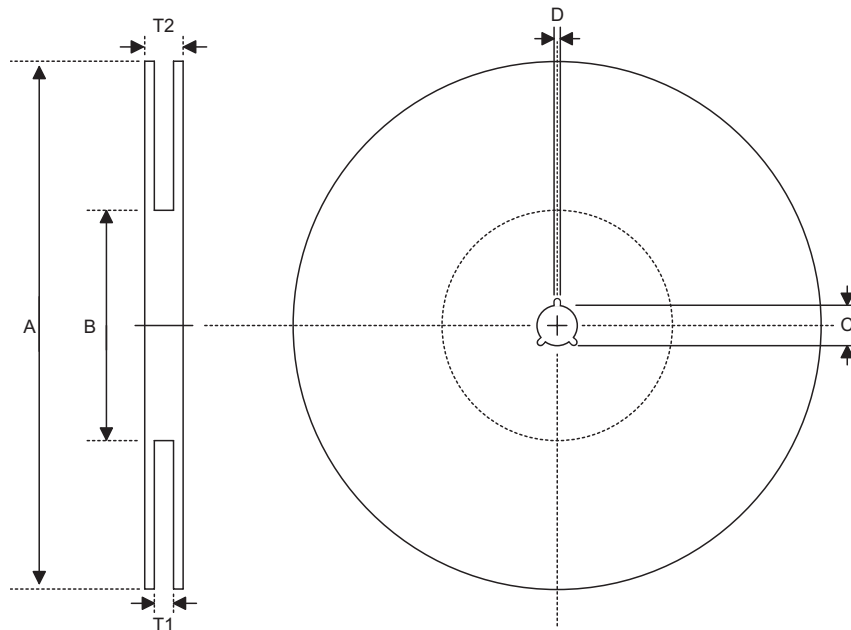
8-pin DIP (300mil) Outline Dimensions



| Symbol | Dimensions in inch | | |
|--------|--------------------|-------|-------|
| | Min. | Nom. | Max. |
| A | 0.355 | — | 0.375 |
| B | 0.240 | — | 0.260 |
| C | 0.125 | — | 0.135 |
| D | 0.125 | — | 0.145 |
| E | 0.016 | — | 0.020 |
| F | 0.050 | — | 0.070 |
| G | — | 0.100 | — |
| H | 0.295 | — | 0.315 |
| I | — | 0.375 | — |

| Symbol | Dimensions in mm | | |
|--------|------------------|------|------|
| | Min. | Nom. | Max. |
| A | 9.02 | — | 9.53 |
| B | 6.10 | — | 6.60 |
| C | 3.18 | — | 3.43 |
| D | 3.18 | — | 3.68 |
| E | 0.41 | — | 0.51 |
| F | 1.27 | — | 1.78 |
| G | — | 2.54 | — |
| H | 7.49 | — | 8.00 |
| I | — | 9.53 | — |

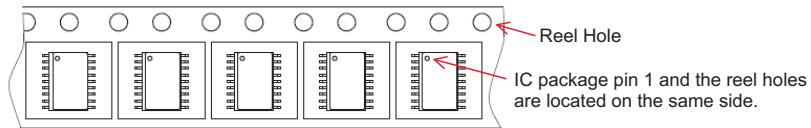
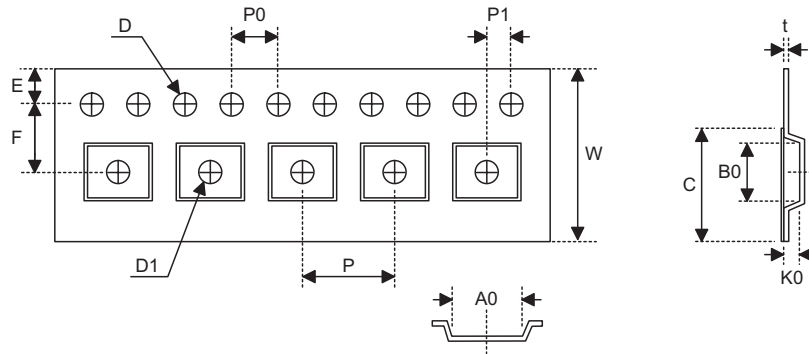
Reel Dimensions



• SOP 8N

| Symbol | Description | Dimensions in mm |
|--------|-----------------------|---------------------------|
| A | Reel Outer Diameter | 330.0±1.0 |
| B | Reel Inner Diameter | 100.0±1.5 |
| C | Spindle Hole Diameter | 13.0 ^{+0.5/-0.2} |
| D | Key Slit Width | 2.0±0.5 |
| T1 | Space Between Flange | 12.8 ^{+0.3/-0.2} |
| T2 | Reel Thickness | 18.2±0.2 |

Carrier Tape Dimensions



- SOP 8N

| Symbol | Description | Dimensions in mm |
|--------|--|-----------------------------|
| W | Carrier Tape Width | 12.0 ^{+0.3/-0.1} |
| P | Cavity Pitch | 8.0±0.1 |
| E | Perforation Position | 1.75±0.1 |
| F | Cavity to Perforation (Width Direction) | 5.5±0.1 |
| D | Perforation Diameter | 1.55±0.1 |
| D1 | Cavity Hole Diameter | 1.50 ^{+0.25/-0.00} |
| P0 | Perforation Pitch | 4.0±0.1 |
| P1 | Cavity to Perforation (Length Direction) | 2.0±0.1 |
| A0 | Cavity Length | 6.4±0.1 |
| B0 | Cavity Width | 5.2±0.1 |
| K0 | Cavity Depth | 2.1±0.1 |
| t | Carrier Tape Thickness | 0.30±0.05 |
| C | Cover Tape Width | 9.3±0.1 |

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