

Features

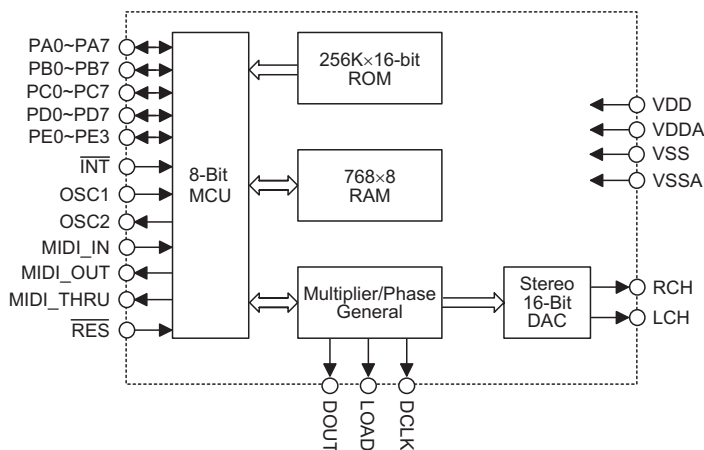
- Operating voltage: 3.6V~5.0V
- Operating frequency: 3.58MHz~12MHz, RC typ. 11.059MHz
- 36 bidirectional I/O lines
- Two 16-bit programmable timer/event counters with overflow interrupts
- Watchdog Timer
- Built-in 8-bit MCU with 768×8 bits RAM
- Built-in 256K×16-bit ROM for program/data shared
- Digital output pins for external DAC
- Single data format with 16 bits digital stereo audio output
- MIDI interface available
- Two High D/A converter resolution: 16 bits
- Polyphonic up to 16 notes
- Independent pan and volume mix can be assigned to each sound component
- Sampling rate of 44.1kHz as 11.059MHz for system frequency
- Eight-level subroutine nesting
- HALT function and wake-up feature to reduce power consumption
- Bit manipulation instructions
- 16-bit table read instructions
- 63 powerful instructions
- All instructions in 1 or 2 machine cycles
- UART input/output 31.25kbps
- 28-pin SOP, 64-pin QFP package

General Description

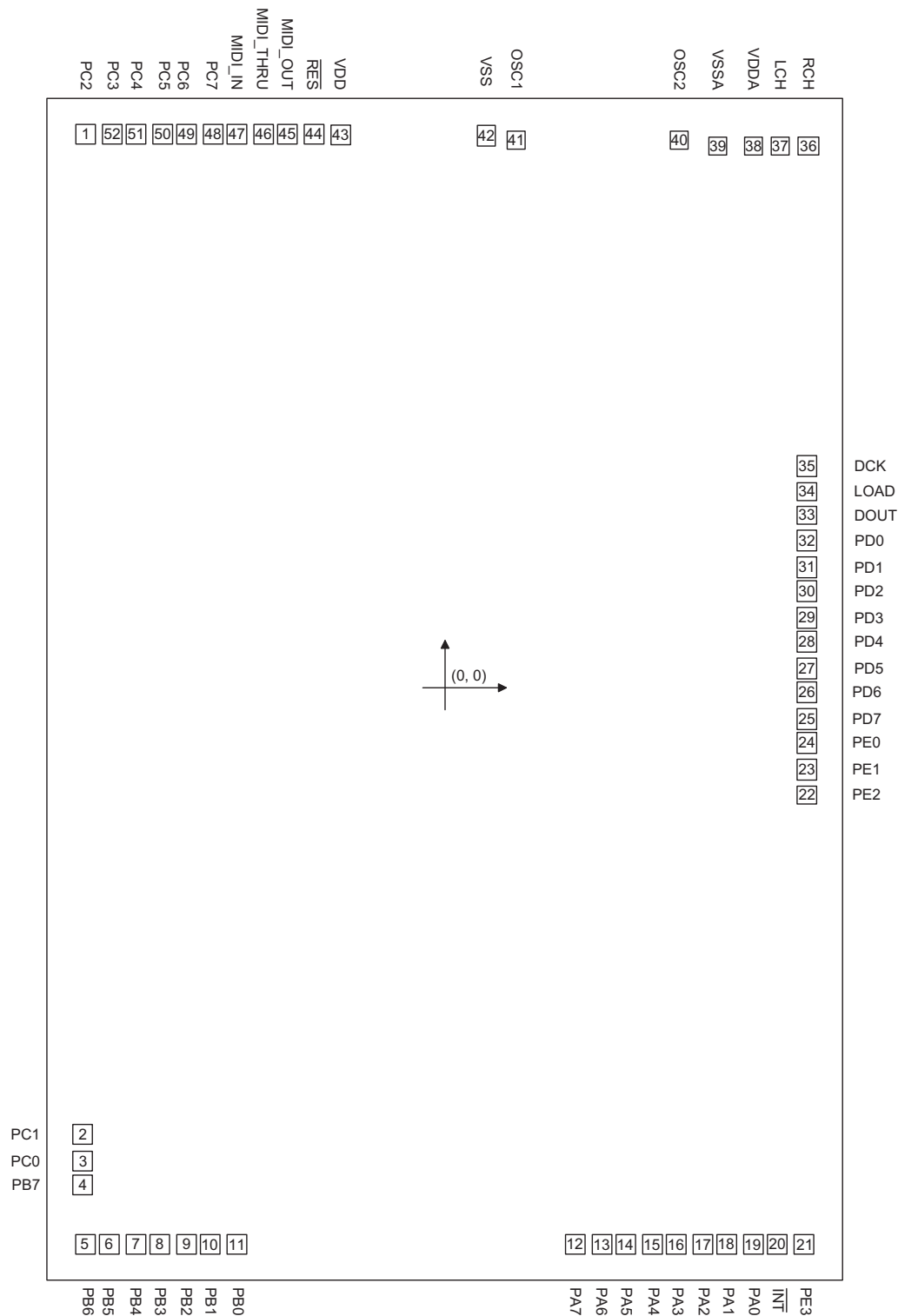
The HT36B0 is an 8-bit high performance RISC-like microcontroller specifically designed for music applications. It provides an 8-bit MCU and a 16 channel wavetable synthesizer. The program ROM is composed of both program control codes and wavetable voice codes, and can be easily programmed.

The HT36B0 has a built-in 8-bit microprocessor which programs the synthesizer to generate the melody by setting the special register from 20H~2AH. A HALT feature is provided to reduce power consumption.

Block Diagram



Pad Assignment



Chip size: 132.5 × 194.7 (mil)

* The IC substrate should be connected to VSS in the PCB layout artwork.

Pad Coordinates

 Unit: μm

| Pad No. | X | Y | Pad No. | X | Y |
|---------|----------|----------|---------|----------|---------|
| 1 | -1496.60 | 2302.60 | 27 | 1515.85 | 85.70 |
| 2 | -1517.35 | -1856.15 | 28 | 1515.85 | 196.30 |
| 3 | -1517.35 | -1966.75 | 29 | 1515.85 | 296.30 |
| 4 | -1517.35 | -2066.75 | 30 | 1515.85 | 406.90 |
| 5 | -1496.90 | -2307.35 | 31 | 1515.85 | 506.90 |
| 6 | -1396.90 | -2307.35 | 32 | 1515.85 | 617.50 |
| 7 | -1286.30 | -2307.35 | 33 | 1515.85 | 717.75 |
| 8 | -1186.30 | -2307.35 | 34 | 1515.85 | 825.85 |
| 9 | -1075.70 | -2307.35 | 35 | 1515.85 | 926.35 |
| 10 | -975.70 | -2307.35 | 36 | 1517.85 | 2262.00 |
| 11 | -865.10 | -2307.35 | 37 | 1404.55 | 2262.00 |
| 12 | 546.65 | -2307.35 | 38 | 1292.11 | 2262.00 |
| 13 | 657.25 | -2307.35 | 39 | 1143.45 | 2262.00 |
| 14 | 757.25 | -2307.35 | 40 | 975.076 | 2282.60 |
| 15 | 867.85 | -2307.35 | 41 | 294.224 | 2282.60 |
| 16 | 967.85 | -2307.35 | 42 | 176.10 | 2300.10 |
| 17 | 1078.45 | -2307.35 | 43 | -431.00 | 2300.10 |
| 18 | 1178.45 | -2307.35 | 44 | -547.124 | 2302.60 |
| 19 | 1289.05 | -2307.35 | 45 | -654.20 | 2302.60 |
| 20 | 1391.25 | -2307.35 | 46 | -754.20 | 2302.60 |
| 21 | 1499.65 | -2307.35 | 47 | -864.80 | 2302.60 |
| 22 | 1515.85 | -435.50 | 48 | -964.80 | 2302.60 |
| 23 | 1515.85 | -335.50 | 49 | -1075.40 | 2302.60 |
| 24 | 1515.85 | -224.90 | 50 | -1175.40 | 2302.60 |
| 25 | 1515.85 | -124.90 | 51 | -1286.00 | 2302.60 |
| 26 | 1515.85 | -14.30 | 52 | -1386.00 | 2302.60 |

Pad Description

| Pad Name | I/O | Internal Connection | Function |
|-------------------------|-----|---------------------|---|
| PA7~PA0 | I/O | Pull-High or None | Bidirectional 8-bit Input/Output port, wake-up by mask option |
| PB7~PB0 | I/O | Pull-High or None | Bidirectional 8-bit Input/Output port |
| PC7~PC0 | I/O | Pull-High or None | Bidirectional 8-bit Input/Output port |
| PD0~PD7 | I/O | Pull-High or None | Bidirectional 8-bit Input/Output port |
| PE0~PE3 | I/O | Pull-High or None | Bidirectional 4-bit Input/Output port |
| $\overline{\text{INT}}$ | I | Pull-High | External interrupt |
| DOUT | O | — | DAC data out |
| LOAD | O | — | $\overline{\text{DAC}}$ word clock |
| DCLK | O | — | $\overline{\text{DAC}}$ bit clock |
| RCH | O | — | R channel audio output |
| LCH | O | — | L channel audio output |

| Pad Name | I/O | Internal Connection | Function |
|-------------------------|--------|---------------------|---|
| VDDA | — | — | DAC power supply |
| VSSA | — | — | Negative power supply of DAC, ground |
| OSC1 OSC2 | I O | — | OSC1 and OSC2 are connected to an RC network or a crystal (by mask option) for the internal system clock. In the case of RC operation, OSC2 is the output terminal for 1/8 system clock. The system clock may come from the crystal, the two pins cannot be floating. |
| GND | — | — | Negative power supply, ground |
| VDD | — | — | Positive power supply |
| $\overline{\text{RES}}$ | I | — | Reset input, active low |
| MIDI_OUT | O | — | MIDI Output |
| MIDI_THRN | O | — | MIDI through |
| MIDI_IN | I | — | MIDI input |

Absolute Maximum Ratings

Supply Voltage $V_{SS}-0.3V$ to $V_{SS}+6V$ Storage Temperature -50°C to 125°C

Input Voltage $V_{SS}-0.3V$ to $V_{DD}+0.3V$ Operating Temperature -25°C to 70°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

$T_a=25^{\circ}\text{C}$

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|-----------|---|-----------------|---|-------------|------|-------------|------------------|
| | | V_{DD} | Conditions | | | | |
| V_{DD} | Operating Voltage | — | — | 3.6 | 4.5 | 5.5 | V |
| I_{DD} | Operating Current | 4.5V | No load, $f_{OSC}=11.0592\text{MHz}$ | — | 16 | 32 | mA |
| I_{STB} | Standby Current (WDT Disabled) | 4.5V | No load, System HALT | — | 1 | 3 | μA |
| I_{OH} | I/O Ports Source Current | 4.5V | $V_{OH}=4.5V$ | 5 | — | — | mA |
| I_{OL} | I/O Ports Sink Current | 4.5V | $V_{OL}=0.5V$ | 5 | — | — | mA |
| V_{IH} | Input High Voltage for I/O Ports | 4.5V | — | $0.8V_{DD}$ | — | V_{DD} | V |
| V_{IL} | Input Low Voltage for I/O Ports | 4.5V | — | 0 | — | $0.2V_{DD}$ | V |
| R_{PH} | Pull-High Resistance of I/O Ports ($\overline{\text{INT}}$) | 4.5V | $V_{IL}=0V$ | — | 30 | — | $\text{k}\Omega$ |

A.C. Characteristics

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|----------------------|--------------------------------|-----------------|-----------------------|------|--------|------|------|
| | | V _{DD} | Conditions | | | | |
| MCU interface | | | | | | | |
| f _{OSC} | System Frequency | 5V | 11.059MHz crystal | — | 11.059 | — | MHz |
| f _{SYS} | System Clock | 5V | — | 8 | — | 12 | MHz |
| t _{WDT} | Watchdog Time-Out Period (RC) | — | Without WDT prescaler | 9 | 17 | 35 | ms |
| t _{RES} | External Reset Low Pulse Width | — | — | 1 | — | — | μs |

| Symbol | Parameter | Figure | Min. | Typ. | Max. | Unit |
|----------------------|----------------------------|--------|------|----------------------|------|------|
| DAC interface | | | | | | |
| f _{BC} | DCK Bit Clock Frequency | Fig 1 | — | f _{SYS} /16 | — | MHz |
| t _{CH} | DCK Bit Clock H Level Time | Fig 1 | 600 | — | — | ns |
| t _{DOS} | Data Output Setup Time | Fig 1 | 200 | — | — | ns |
| t _{DOH} | Data Output Hold Time | Fig 1 | 200 | — | — | ns |
| t _{LCS} | Load Clock Setup Time | Fig 1 | 200 | — | — | ns |
| t _{LCH} | Load Clock Hold Time | Fig 1 | 200 | — | — | ns |

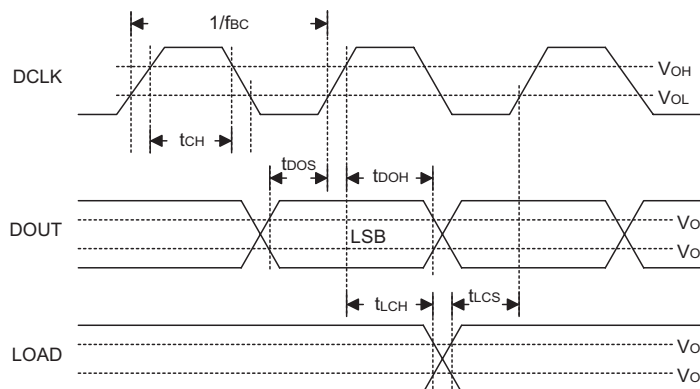
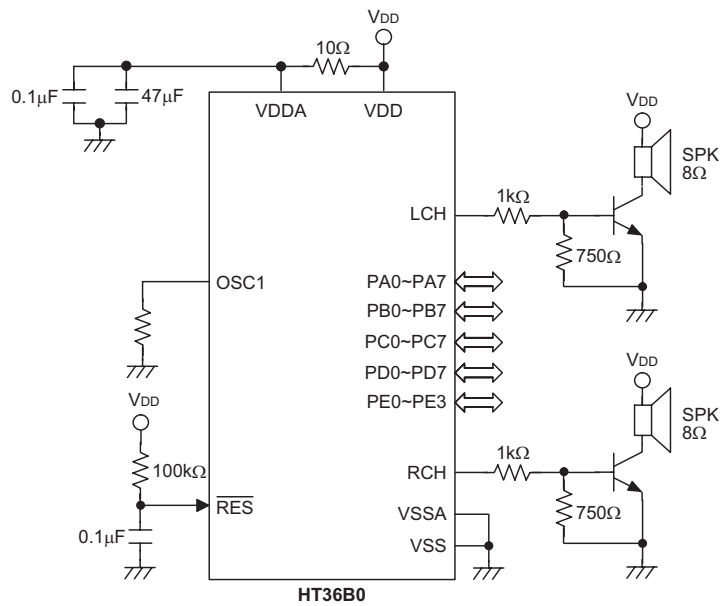
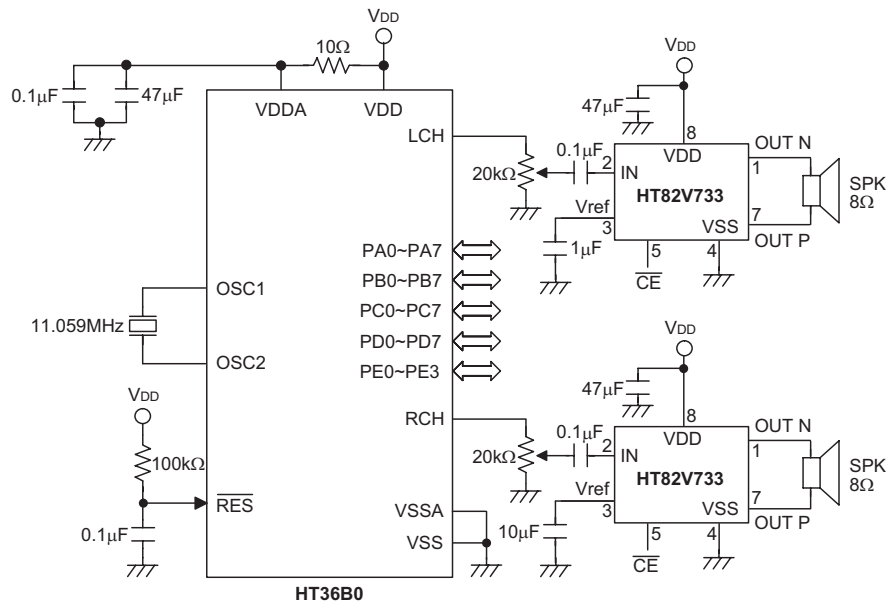
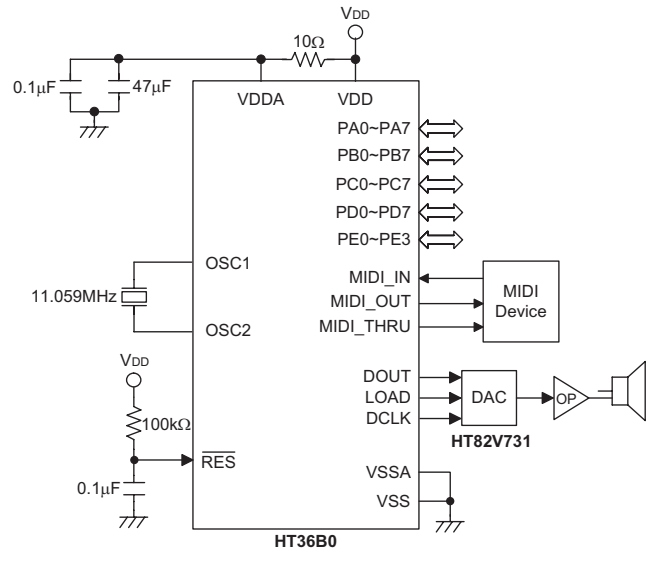


Fig 1. Audio output timing

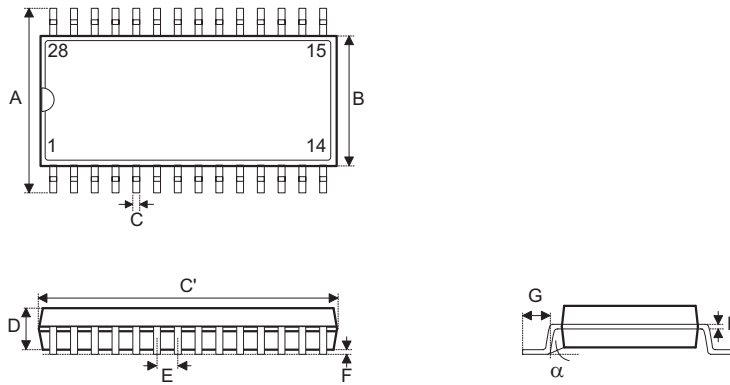
Application Circuit





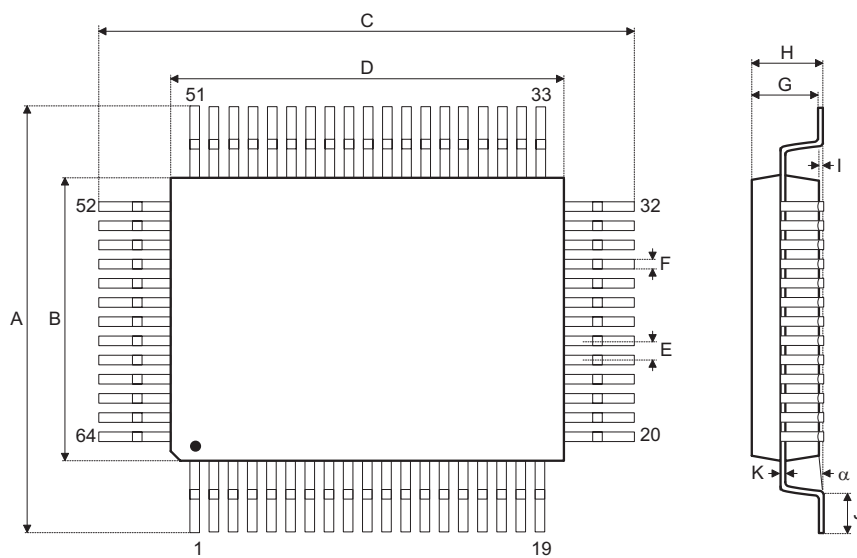
Package Information

28-pin SOP (300mil) Outline Dimensions



| Symbol | Dimensions in mil | | |
|----------|-------------------|------|------|
| | Min. | Nom. | Max. |
| A | 394 | — | 419 |
| B | 290 | — | 300 |
| C | 14 | — | 20 |
| C' | 697 | — | 713 |
| D | 92 | — | 104 |
| E | — | 50 | — |
| F | 4 | — | — |
| G | 32 | — | 38 |
| H | 4 | — | 12 |
| α | 0° | — | 10° |

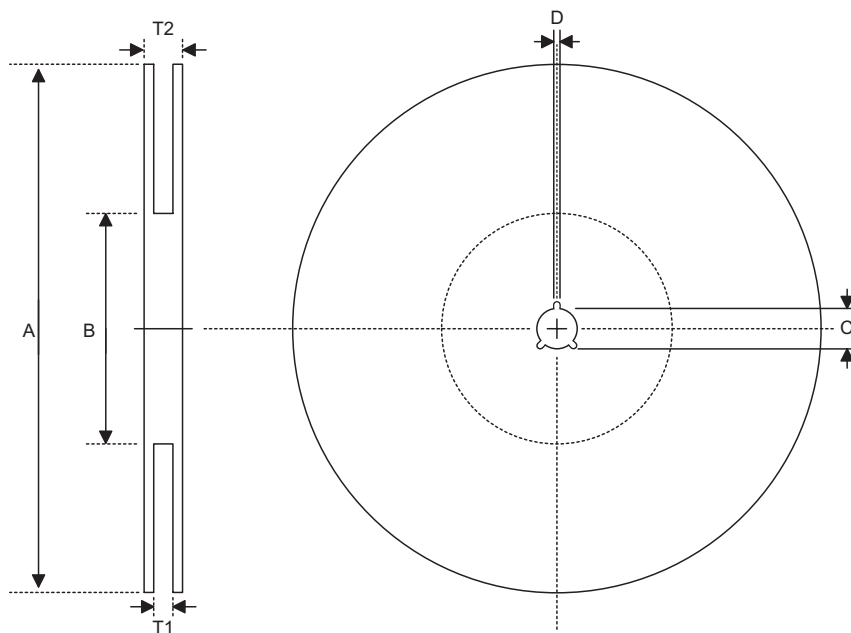
64-pin QFP (14×20) Outline Dimensions



| Symbol | Dimensions in mm | | |
|--------|------------------|------|-------|
| | Min. | Nom. | Max. |
| A | 18.80 | — | 19.20 |
| B | 13.90 | — | 14.10 |
| C | 24.80 | — | 25.20 |
| D | 19.90 | — | 20.10 |
| E | — | 1 | — |
| F | — | 0.40 | — |
| G | 2.50 | — | 3.10 |
| H | — | — | 3.40 |
| I | — | 0.10 | — |
| J | 1.15 | — | 1.45 |
| K | 0.10 | — | 0.20 |
| α | 0° | — | 7° |

Product Tape and Reel Specifications

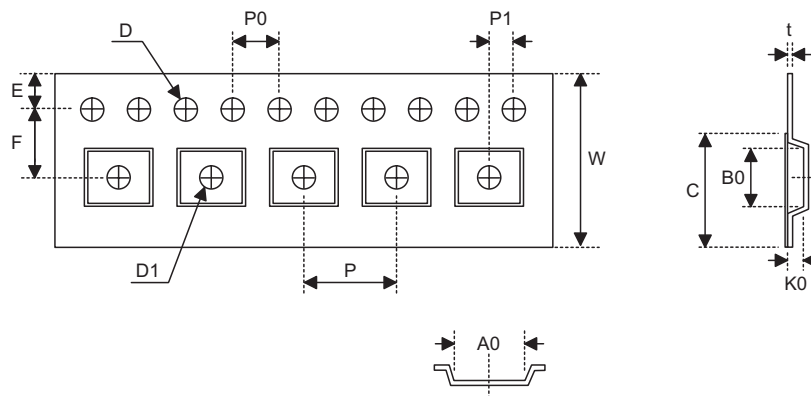
Reel Dimensions



SOP 28W (300mil)

| Symbol | Description | Dimensions in mm |
|--------|-----------------------|------------------|
| A | Reel Outer Diameter | 330±1.0 |
| B | Reel Inner Diameter | 62±1.5 |
| C | Spindle Hole Diameter | 13.0+0.5 -0.2 |
| D | Key Slit Width | 2.0±0.5 |
| T1 | Space Between Flange | 24.8+0.3 -0.2 |
| T2 | Reel Thickness | 30.2±0.2 |

Carrier Tape Dimensions



SOP 28W (300mil)

| Symbol | Description | Dimensions in mm |
|--------|--|------------------|
| W | Carrier Tape Width | 24.0±0.3 |
| P | Cavity Pitch | 12.0±0.1 |
| E | Perforation Position | 1.75±0.1 |
| F | Cavity to Perforation (Width Direction) | 11.5±0.1 |
| D | Perforation Diameter | 1.5+0.1 |
| D1 | Cavity Hole Diameter | 1.5+0.25 |
| P0 | Perforation Pitch | 4.0±0.1 |
| P1 | Cavity to Perforation (Length Direction) | 2.0±0.1 |
| A0 | Cavity Length | 10.85±0.1 |
| B0 | Cavity Width | 18.34±0.1 |
| K0 | Cavity Depth | 2.97±0.1 |
| t | Carrier Tape Thickness | 0.35±0.01 |
| C | Cover Tape Width | 21.3 |

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