HT36B0
8-Bit Music Synthesizer MCU

Features

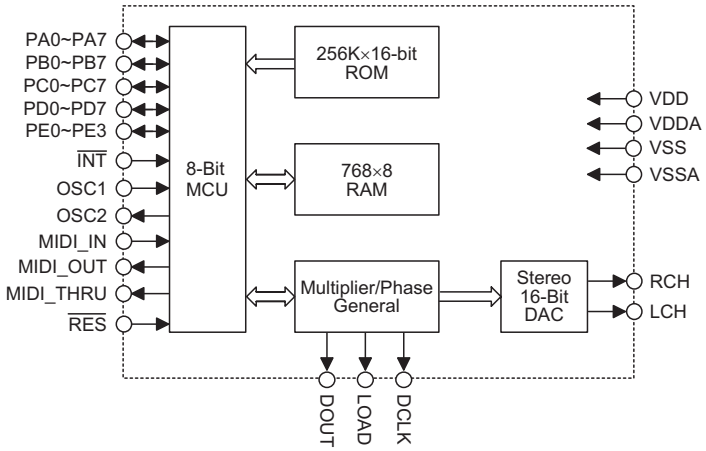
- Operating voltage: 3.6V~5.0V
- Operating frequency: 3.58MHz~12MHz, RC typ. 11.059MHz
- 36 bidirectional I/O lines
- Two 16-bit programmable timer/event counters with overflow interrupts
- Watchdog Timer
- Built-in 8-bit MCU with 768×8 bits RAM
- Built-in 256K×16-bit ROM for program/data shared
- Digital 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

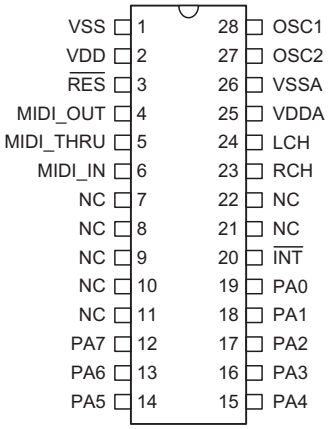
The HT36B0 is an 8-bit high performance RISC-like microcontroller specifically designed for music applications. It provides an 8-bit MCU and a 16 channel wavetable synthesizer. The program ROM is composed of both program control codes and wavetable voice codes, and can be easily programmed.

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.

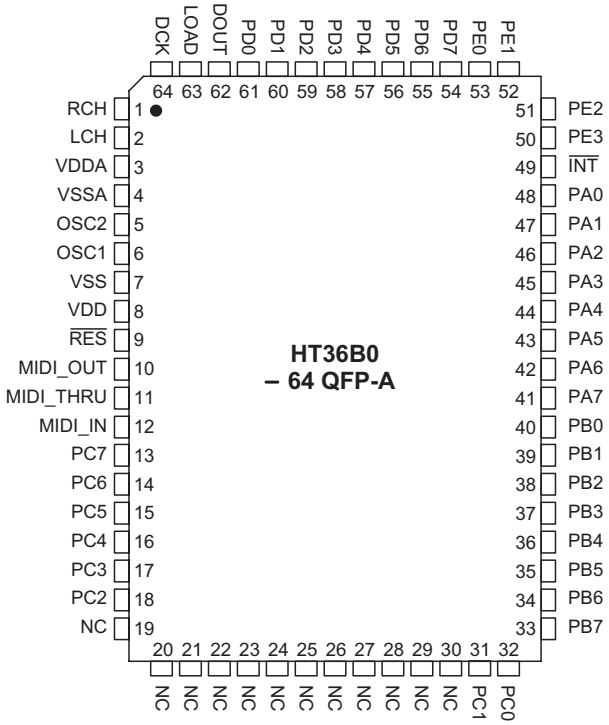
Block Diagram



Pin Assignment

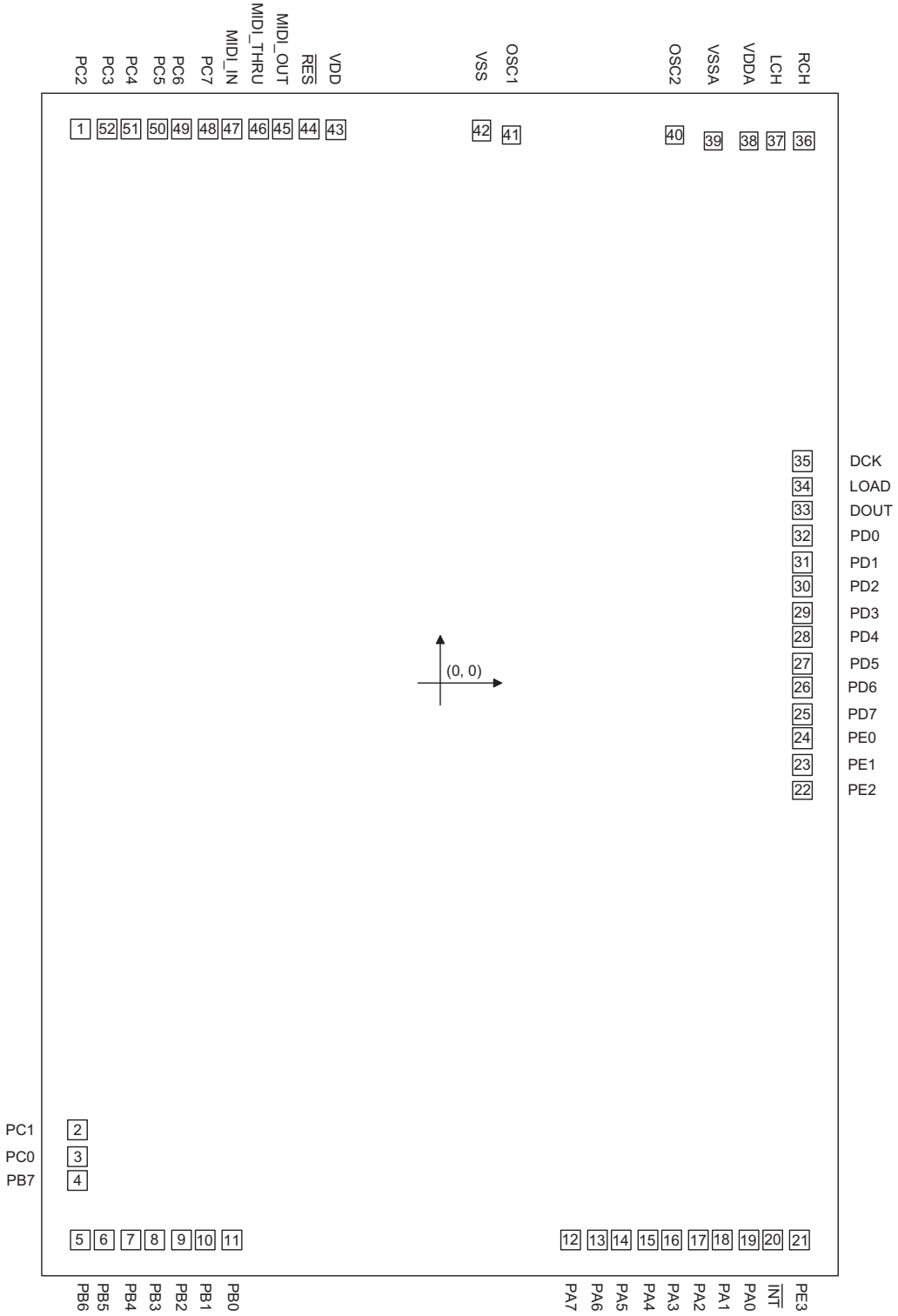


HT36B0
– 28 SOP-A



HT36B0
– 64 QFP-A

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
$\overline{INT}$	I	Pull-High	External interrupt
DOUT	O	—	$\overline{DAC}$ data out
LOAD	O	—	$\overline{DAC}$ word clock
DCLK	O	—	$\overline{DAC}$ 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
$\overline{RES}$	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

Input Voltage .....V_{SS}–0.3V to V_{DD}+0.3V

Storage Temperature .....–50°C to 125°C

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

Ta=25°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}=11.0592MHz	—	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 ($\overline{INT}$)	4.5V	V_{IL}=0V	—	30	—	kΩ

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

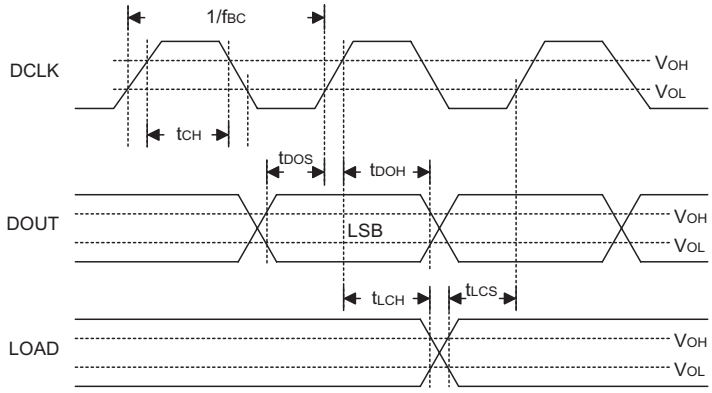
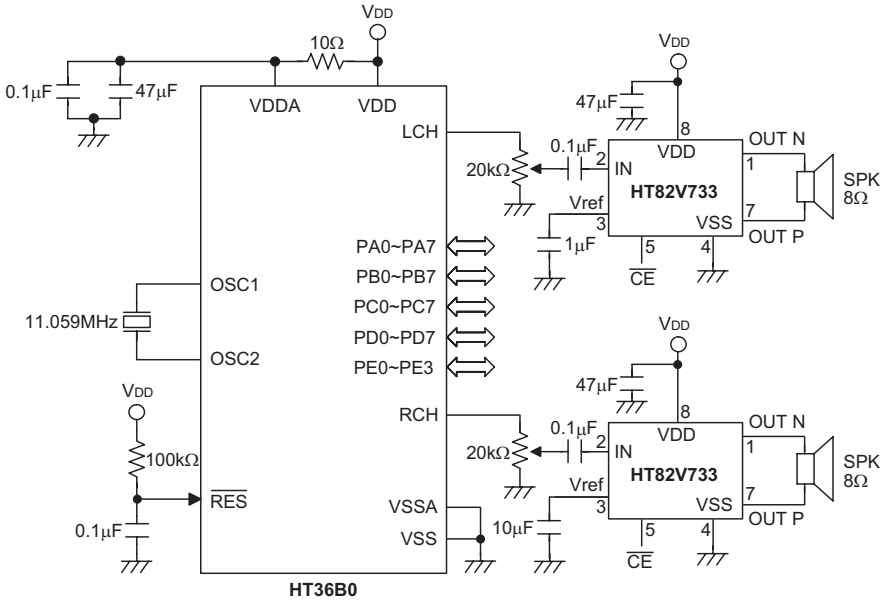
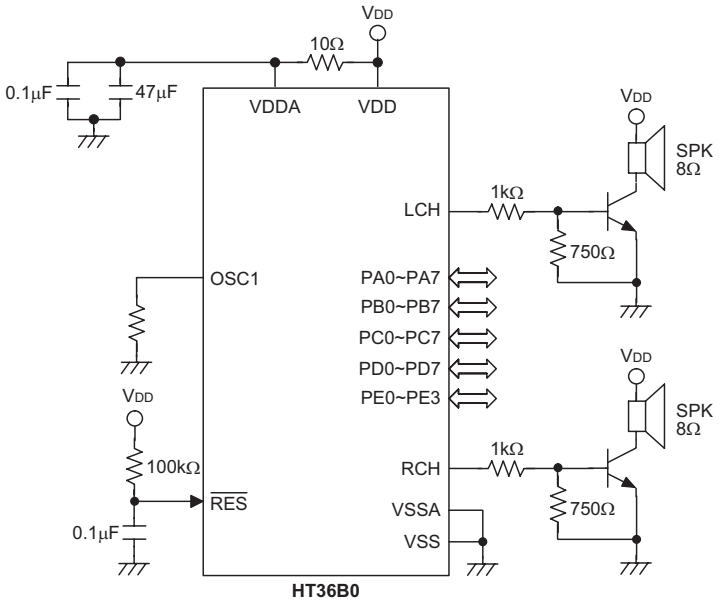
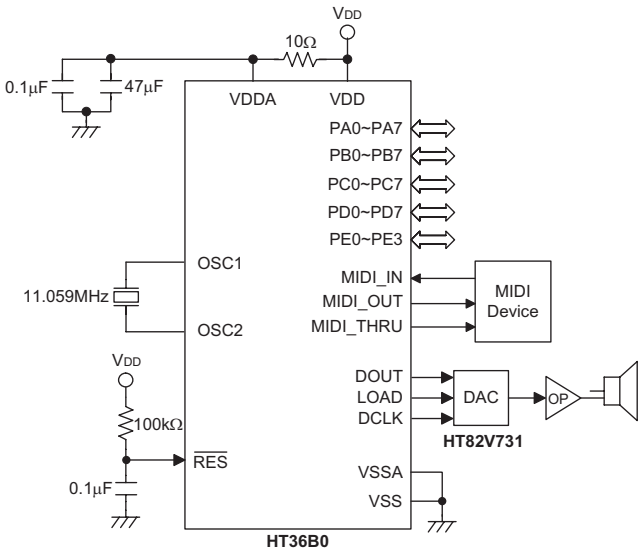


Fig 1. Audio output timing

Application Circuit

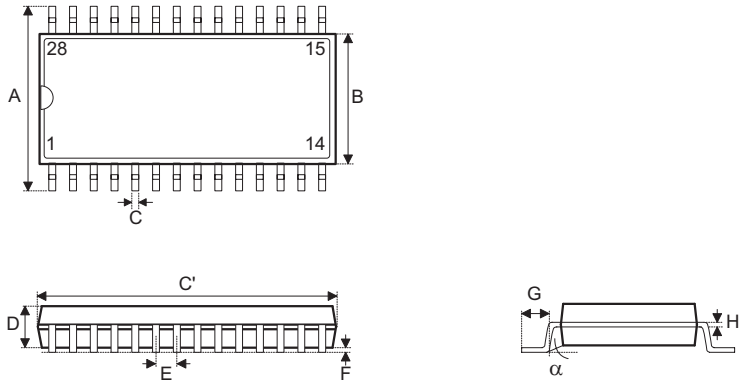





VDD
10Ω
0.1μF
47μF
VDDA
VDD
PA0~PA7
PB0~PB7
PC0~PC7
PD0~PD7
PE0~PE3
OSC1
11.059MHz
OSC2
MIDI_IN
MIDI_OUT
MIDI_THRU
MIDI Device
VDD
100kΩ
DOUT
LOAD
DCLK
DAC
OP
HT82V731
RES
0.1μF
VSSA
VSS
HT36B0

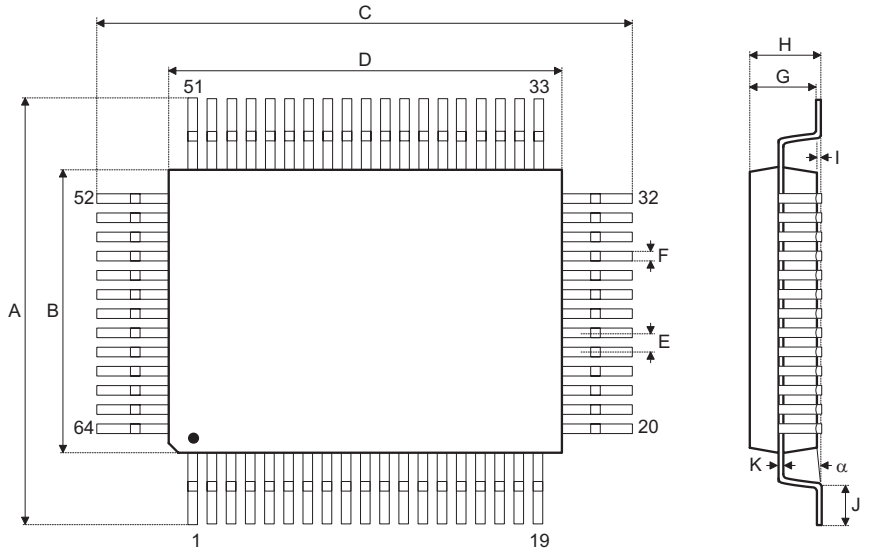
Package Information

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°

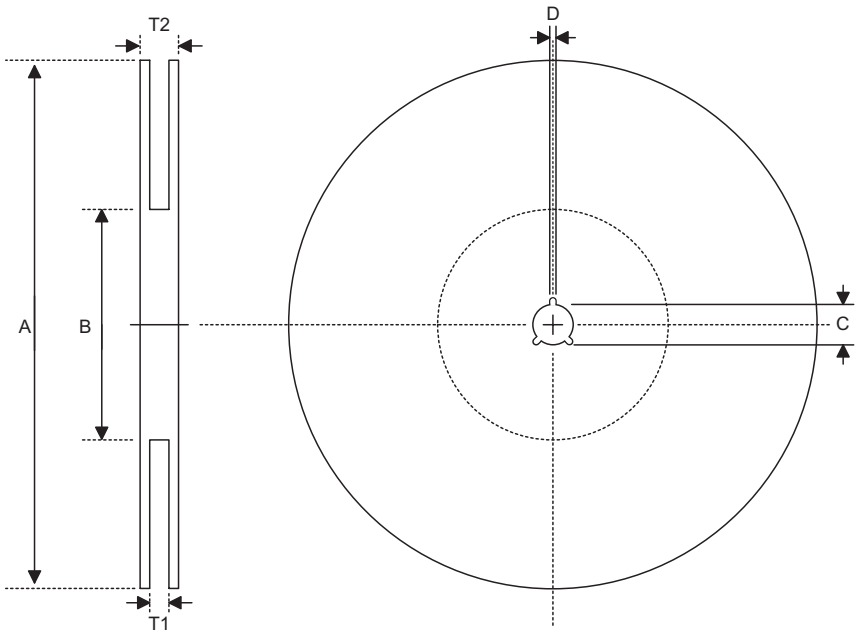
64-pin QFP (14×20) Outline Dimensions



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

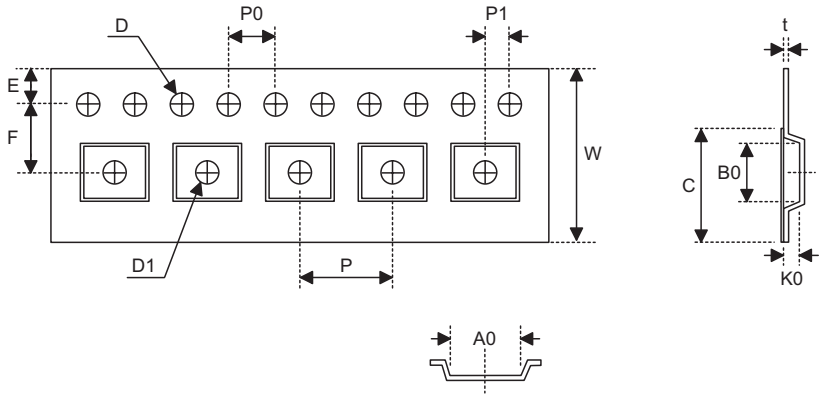
Reel Dimensions



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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