

Features

- Operating voltage: 4.4V~5.25V
- Compatible with Microsoft Windows 2000 and 5-button Wheel Mouse
- Supports 5/7 buttons and Z-axis input
- Z-axis can support only encoder Z/2 scroller input
- Complete Universal Serial Bus specs V2.0 compatibility
- Vista tilt mouse protocol supported
- 3 key or 5 key mode can be selected by circuit
- DPI can be selected high or low by circuit
- Tilt or Non-tilt protocol can be selected by circuit
- Serial Bus Interface Engine (SIE)
- USB transceiver
- Single chip solution especially for USB mouse function
- HALT function and wake-up feature reduce power consumption
- Plug and Play functions
- Minimal external components
- 6MHz crystal oscillator for system clock
- Interface compliant with A2610, A2620, A5020, and P3101
- Pass USB-IF and EMC testing
- 20-pin DIP/SOP package

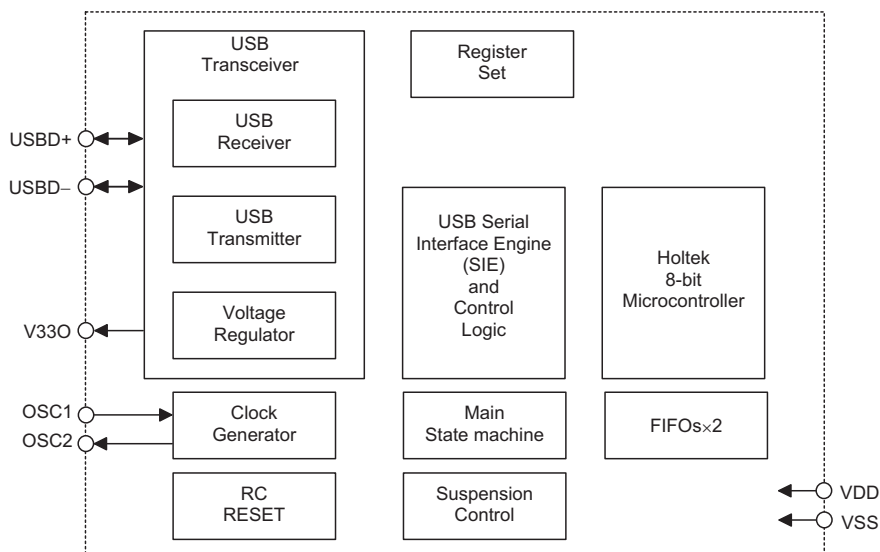
General Description

HT82M28A is a Plug and Play 3D USB Mouse controller. The HT82M28A can support the USB Standard Request as well as HID Class Request version 1.1. The Z-axis can support only Z/2 encoder scroller input. It requires minimal external components to implement 3D and Windows Vista 7 key USB mouse. All its features combined

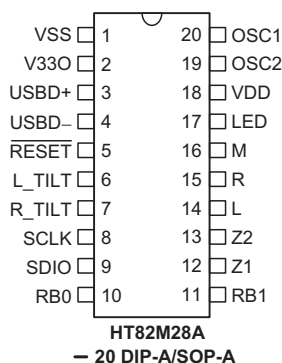
and make up this versatile Holtek 8-bit MCU with an on-chip USB interface logic. The USB is specified by the Universal Serial Bus Specification V2.0.

The USB product ID of 5 key mode is 2083H, and the USB product ID of 3 key mode is 2082H.

Block Diagram



Pin Assignment



Pin Description

Pin Name	I/O	Description
VSS	—	Negative power supply, ground
V33O	O	3.3V voltage output
USB D+	I/O	USB data plus, F/W auto-detect USB D+ for USB.
USB D-	I/O	USB data minus, F/W auto-detect USB- for USB.
RESET	I	Chip reset input, low active
SDIO	I/O	Serial data for optical sensor IC SDIO
SCLK	O	Serial data for optical sensor IC SCLK
	I	DPI selection, N/C or GND(connect to a 5.1kΩ pull-down resistor) For A2610, A2620: N/C-800dpi; GND-400dpi For A5020: N/C-1000dpi; GND-500dpi For P3101: N/C-800dpi; GND-1600dpi
RB0, RB1, L, R, M, L_TILT, R_TILT	I	Click button detection. Input ports with 30kΩ pull-high resistor. Input ports with pull-high resistor. These pads can function as Left, Right, Middle, RB0, RB1, L_TILT and R_TILT button input lines.
Z1, Z2	I	Z-axis input supports only Z/2 encoder scroller input.
LED	I/O	Drives LED output
VDD	—	5V positive power supply
OSC2	O	6MHz OSC output
OSC1	I	6MHz OSC input

Absolute Maximum Ratings

Supply Voltage	$V_{SS}-0.3V$ to $V_{SS}+6V$	Storage Temperature	-50°C to 125°C
MCU Input Voltage.....	$V_{SS}-0.3V$ to $V_{DD}+0.3V$	Operating Temperature.....	-25°C to 70°C
USB Input Voltage	$V_{SS}-0.3V$ to $V_{33O}+0.3V$		

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

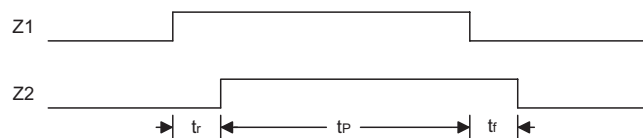
Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{DD}	Operating Voltage	—	—	4.4	—	5.25	V
I _{DD}	Operating Current (Crystal OSC)	5V	No load, f _{sys} =6MHz USB mode	—	10	—	mA
I _{SUS}	USB Suspend Mode	5V	No load, system HALT	—	—	250	μA
V _{IL1}	Input Low Voltage (Z1, Z2, L, M, R, L_TILT, R_TILT)	5V	—	0	—	1.0	V
V _{IH1}	Input High Voltage (Z1, Z2, L, M, R, L_TILT, R_TILT)	5V	—	3.5	—	5	V
V _{IL2}	Input Low Voltage (RESET)	5V	—	0	—	1.5	V
V _{IH2}	Input High Voltage (RESET)	5V	—	3.5	—	5	V
V _{POR}	Built-in Power on Reset V _{DD} Detection Voltage	5V	—	—	3.7	—	V
I _{OL}	Sink Current (LED)	5V	V _{OL} =0.8V	—	50	—	mA

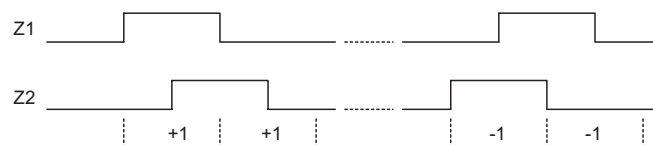
A.C. Characteristics

Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
f _{sys}	System Clock (Crystal OSC)	5V	—	0	6000	—	kHz

Note: t_{sys}=1/f_{sys}
Timing Diagram
Z-axis Photo-Coupler Crossed Width


Note: For Z-axis tr, tp, tf > 1ms

Z-axis Counting


Functional Description

- USB mouse data format for 3D mod

Bit No.	7	6	5	4	3	2	1	0
1st word	0	0	0	0	0	M	R	L
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0

- USB mouse data format for 3D with Vista tilt mode

Bit No.	7	6	5	4	3	2	1	0
1st word	0	0	0	0	0	M	R	L
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0
5th word	H7	H6	H5	H4	H3	H2	H1	H0

- USB mouse data format for Windows 2000 mode

Bit No.	7	6	5	4	3	2	1	0
1st word	0	0	0	RB1	RB0	M	R	L
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0

- USB mouse data format for Windows 2000 with Vista tilt mode

Bit No.	7	6	5	4	3	2	1	0
1st word	0	0	0	RB1	RB0	M	R	L
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0
5th word	H7	H6	H5	H4	H3	H2	H1	H0

Note: X- movement towards the right is positive, moving towards the left is negative

Y- upward movement is negative, moving down is positive

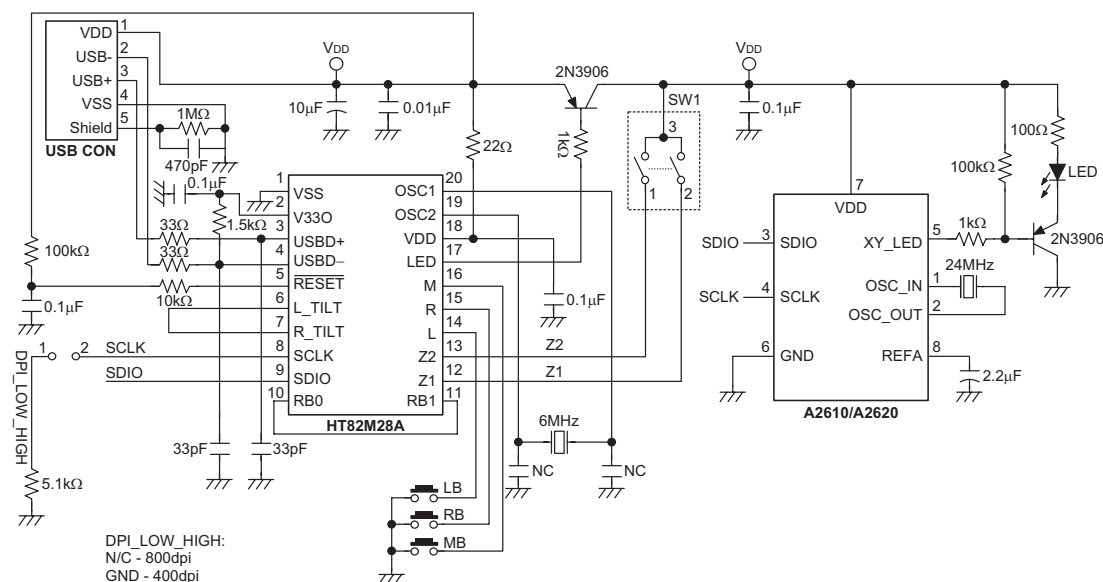
Z-rolling towards the user is negative, otherwise positive

H-scrolling towards left is negative, otherwise positive

Button status: 1=pressed, 0=released

Application Circuits

3Key non-tilt with A2610/A2620



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The schematic diagram illustrates the electrical connections between the HT82M28A module and two external components: a USB connector and an A2610/A2620 module.

HT82M28A Module: This module features pins for power (VDD, VSS), USB (USB+, USB-, Shield), control (RESET, L_TILT, R_TILT), and data (SCLK, SDIO, RB0, RB1). It also includes internal components like a 2N3906 transistor, a 6MHz oscillator, and various passive components (resistors, capacitors).

USB Connector: The USB connector provides VDD, USB-, USB+, and Shield connections. It is interfaced to the HT82M28A module via a 100kΩ resistor and a 0.1μF capacitor.

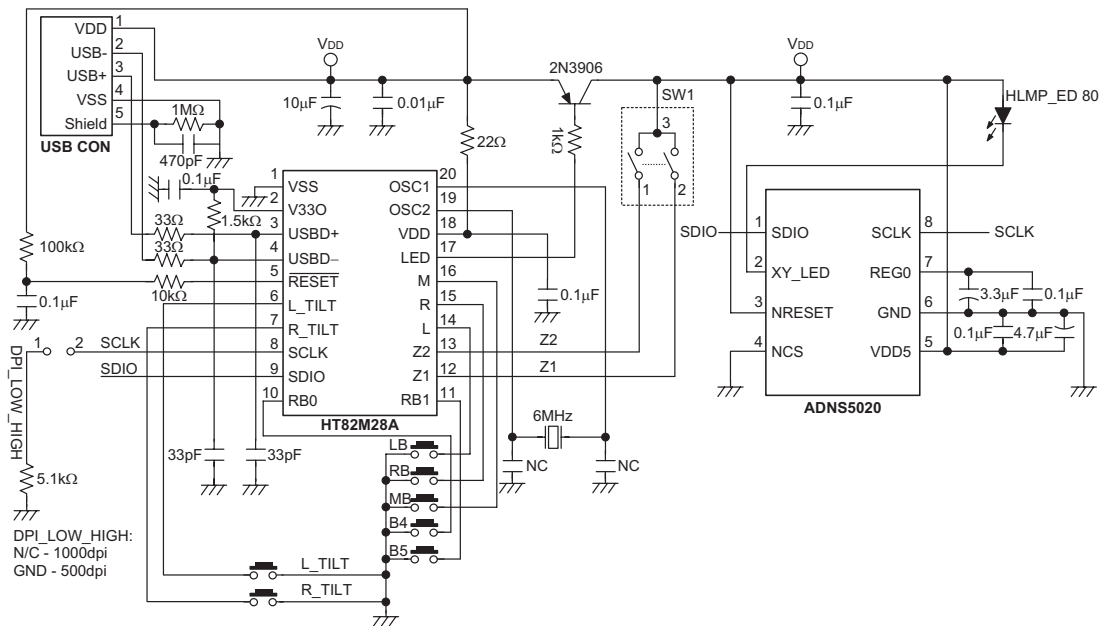
A2610/A2620 Module: This module includes pins for VDD, VSS, XY_LED, OSC_IN, OSC_OUT, REFA, SCLK, and SDIO. It is interfaced to the HT82M28A module via a 1kΩ resistor and a 0.1μF capacitor.

Key Components and Connections:

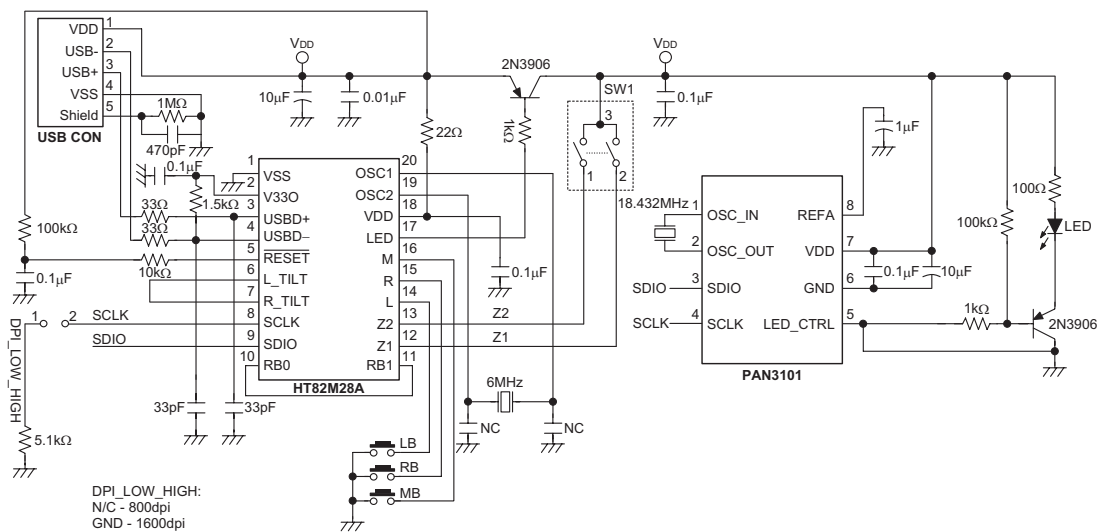
- Power Supply:** VDD and VSS are connected to the power supply rails. A 100kΩ resistor and a 0.1μF capacitor are used for decoupling.
- Control Signals:** The RESET pin is connected to the USB connector. The L_TILT and R_TILT pins are connected to the HT82M28A module.
- Data Signals:** The SCLK and SDIO pins are connected to the HT82M28A module.
- LED and Transistor:** The XY_LED pin is connected to an LED via a 1kΩ resistor. The OSC_IN and OSC_OUT pins are connected to a 2N3906 transistor.
- Resistors and Capacitors:** Various passive components are used for signal conditioning and decoupling, including 100kΩ, 1kΩ, 10kΩ, 33pF, 470pF, 0.1μF, 0.01μF, 10μF, 22Ω, 1kΩ, 100kΩ, 100Ω, 24MHz, and 2.2μF.

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5Key tilt with A5020

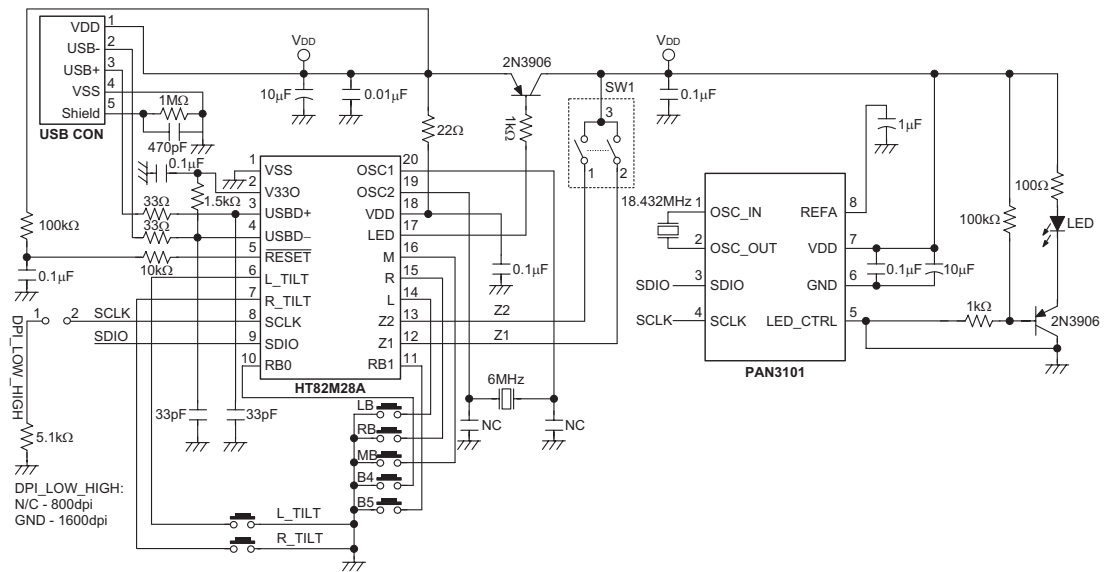


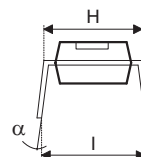
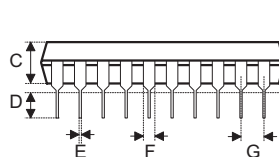
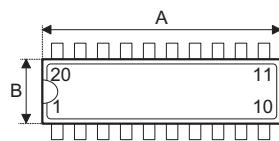
3Key non-tilt with P3101



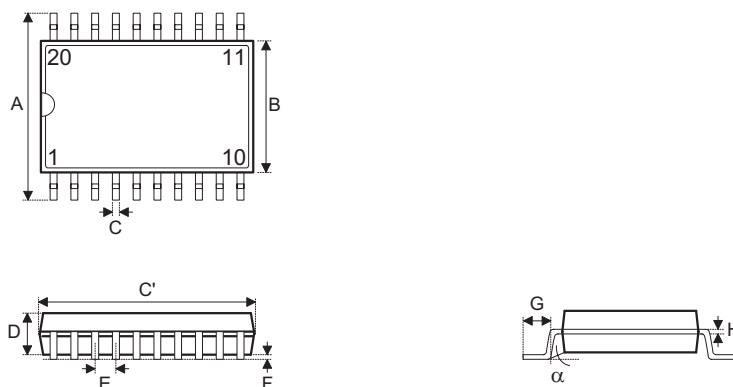
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5Key tilt with P3101

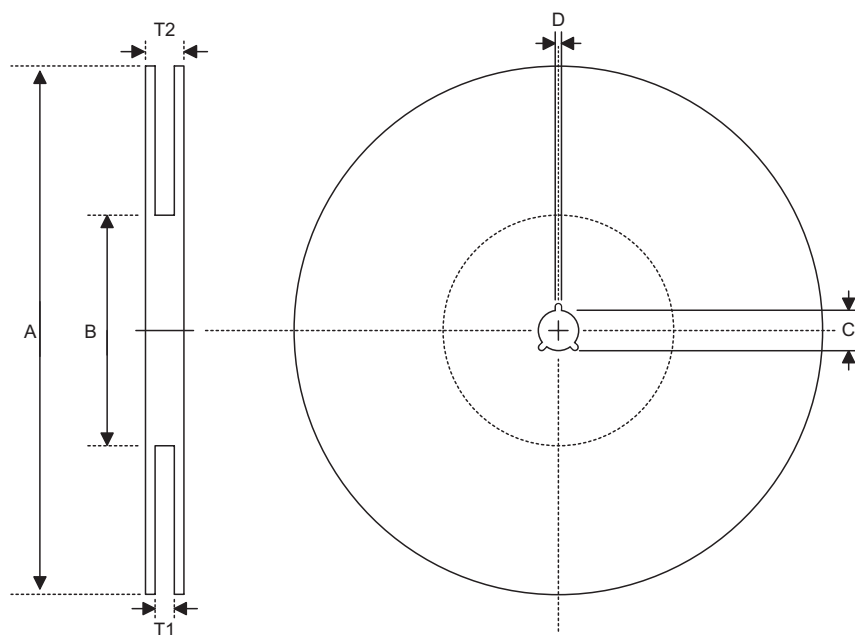


Package Information
20-pin DIP (300mil) Outline Dimensions


Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	1020	—	1045
B	240	—	260
C	125	—	135
D	125	—	145
E	16	—	20
F	50	—	70
G	—	100	—
H	295	—	315
I	335	—	375
α	0°	—	15°

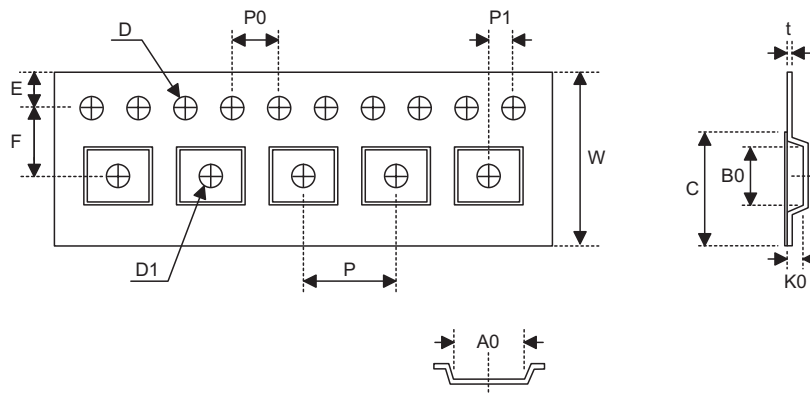
20-pin SOP (300mil) Outline Dimensions


Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	394	—	419
B	290	—	300
C	14	—	20
C'	490	—	510
D	92	—	104
E	—	50	—
F	4	—	—
G	32	—	38
H	4	—	12
α	0°	—	10°

Product Tape and Reel Specifications
Reel Dimensions


SOP 20W

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 20W

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	24.0+0.3 -0.1
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	10.8±0.1
B0	Cavity Width	13.3±0.1
K0	Cavity Depth	3.2±0.1
t	Carrier Tape Thickness	0.3±0.05
C	Cover Tape Width	21.3

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