

TOSHIBA MOS DIGITAL INTEGRATED CIRCUIT SILICON GATE CMOS

131,072-WORD BY 8-BIT CMOS STATIC RAM

## DESCRIPTION

The TC558128BJ/BFT is a 1,048,576-bit high-speed static random access memory (SRAM) organized as 131,072 words by 8 bits. Fabricated using CMOS technology and advanced circuit techniques to provide high speed, it operates from a single 5 V power supply. There are two control inputs. Chip enable ( $\overline{CE}$ ) can be used to place the device in a low-power mode, and output enable ( $\overline{OE}$ ) provides fast memory access. This device is well suited to cache memory applications where high-speed access and high-speed storage are required. All inputs and outputs are directly TTL compatible. The TC558128BJ/BFT is available in a plastic 32-pin SOJ (400 mil width) and TSOP packages for high density surface assembly.

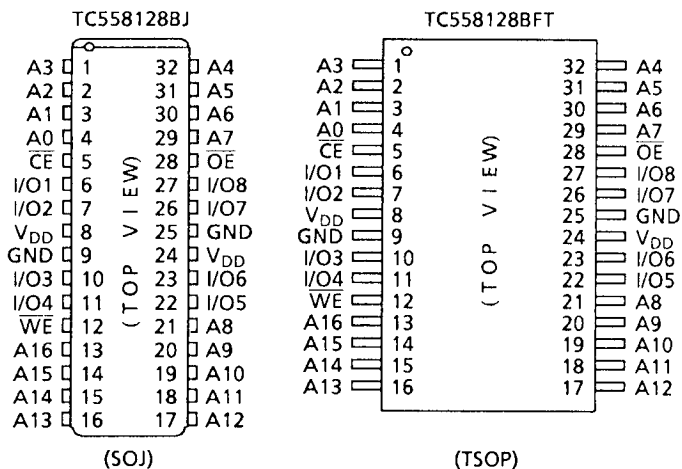
## FEATURES

- Fast access time (the following are maximum values)
  - TC558128BJ/BFT-12: 12 ns
  - TC558128BJ/BFT-15: 15 ns
- Low-power dissipation (the following are maximum values)
 

Cycle Time	12	15	20	25	30	ns
Operation (max)	190	170	140	130	120	mA
- Single power supply voltage of 5 V  $\pm$  10%
- Fully static operation
- All inputs and outputs are TTL compatible
- Output buffer control using  $\overline{OE}$
- Package:
  - SOJ32-P-400-1.27A (BJ) (Weight: 1.22 g typ)
  - TSOP II 32-P-400-0.80C (BFT) (Weight: 0.34 g typ)

Standby: 1 mA (both devices)

## PIN ASSIGNMENT



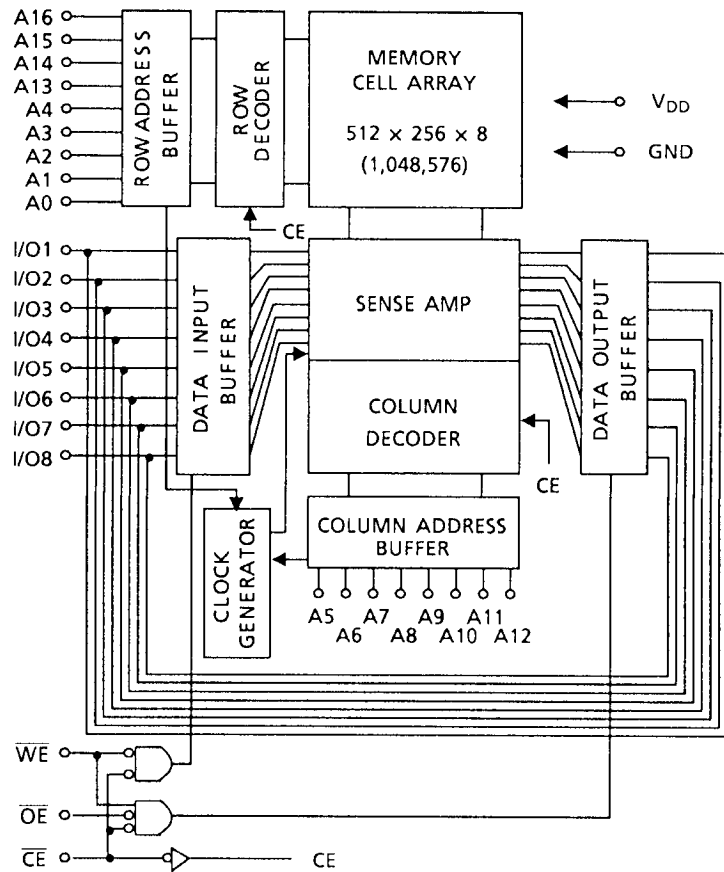
## PIN NAMES

A0 to A16	Address Inputs
I/O1 to I/O8	Data Inputs/Outputs
$\overline{CE}$	Chip Enable
$\overline{WE}$	Write Enable Input
$\overline{OE}$	Output Enable
$V_{DD}$	Power (+ 5V)
GND	Ground

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BLOCK DIAGRAM



MAXIMUM RATINGS

SYMBOL	RATING	VALUE	UNIT
V <sub>DD</sub>	Power Supply Voltage	- 0.5 to 7.0	V
V <sub>IN</sub>	Input Terminal Voltage	- 2.0* to 7.0	V
V <sub>I/O</sub>	Input/Output Terminal Voltage	- 0.5* to V <sub>DD</sub> + 0.5	V
P <sub>D</sub>	Power Dissipation	1.1	W
T <sub>solder</sub>	Soldering Temperature (10 s)	260	°C
T <sub>strg</sub>	Storage Temperature	- 65 to 150	°C
T <sub>opr</sub>	Operating Temperature	- 10 to 85	°C

\*: I/O pins : -2.0 V with a pulse width of 20% · Cycle Time min(4 ns max)  
 Other pins : -2.5 V with a pulse width of 20% · Cycle Time min(4 ns max)

**DC RECOMMENDED OPERATING CONDITIONS (Ta = 0° to 70°C)**

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
V <sub>DD</sub>	Power Supply Voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	Input High Voltage	2.2	-	V <sub>DD</sub> + 0.5	V
V <sub>IL</sub>	Input Low Voltage	- 0.5 *	-	0.8	V

\*: I/O pins : -1.5 V with a pulse width of 20% · Cycle Time min(4 ns max)  
 Other pins : -2.0 V with a pulse width of 20% · Cycle Time min(4 ns max)

**DC CHARACTERISTICS (Ta = 0° to 70°C, V<sub>DD</sub> = 5 V ± 10%)**

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT	
I <sub>IL</sub>	Input Leakage Current	V <sub>IN</sub> = 0 V to V <sub>DD</sub>	-	-	± 10	μA	
I <sub>LO</sub>	Output Leakage Current	$\overline{CE} = V_{IH}$ or $\overline{WE} = V_{IL}$ or $\overline{OE} = V_{IH}$ V <sub>OUT</sub> = 0 V to V <sub>DD</sub>	-	-	± 10	μA	
I <sub>OH</sub>	Output High Current	V <sub>OH</sub> = 2.4 V	- 4	-	-	mA	
I <sub>OL</sub>	Output Low Current	V <sub>OL</sub> = 0.4 V	8	-	-	mA	
I <sub>DDO</sub>	Operating Current	$\overline{CE} = V_{IL}$ , I <sub>out</sub> = 0 mA Other Inputs = V <sub>IH</sub> or V <sub>IL</sub>	tcycle = 12 ns	-	-	190	mA
			tcycle = 15 ns	-	-	170	
			tcycle = 20 ns	-	-	140	
			tcycle = 25 ns	-	-	130	
			tcycle = 30 ns	-	-	120	
I <sub>DD51</sub>	Standby Current	$\overline{CE} = V_{IH}$ , Other Inputs = V <sub>IH</sub> or V <sub>IL</sub>	-	-	30	mA	
I <sub>DD52</sub>		$\overline{CE} = V_{DD} - 0.2 V$ Other Inputs = V <sub>DD</sub> - 0.2 V or 0.2 V	-	-	1		

**CAPACITANCE (Ta = 25°C, f = 1.0 MHz)**

SYMBOL	PARAMETER	TEST CONDITION	MAX	UNIT
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = GND	6	pF
C <sub>I/O</sub>	Input/Output Capacitance	V <sub>I/O</sub> = GND	8	pF

Note: This parameter is periodically sampled and is not 100% tested.

## OPERATING MODE

MODE	$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	I/O1 to I/O8	POWER
Read	L	L	H	Output	$I_{DD0}$
Write	L	x	L	Input	$I_{DD0}$
Outputs Disable	L	H	H	High Impedance	$I_{DD0}$
Standby	H	x	x	High Impedance	$I_{DDs}$

X: Don't care

AC CHARACTERISTICS (Ta = 0° to 70°C (Note 1), VDD = 5 V ± 10%)

READ CYCLE

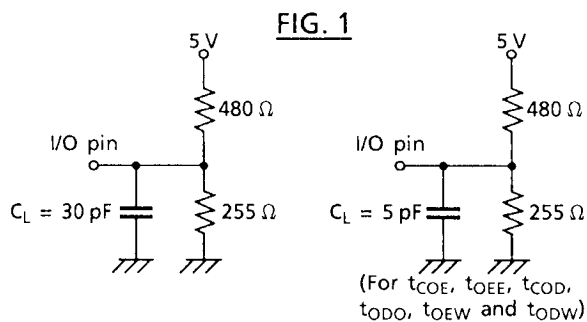
SYMBOL	PARAMETER	TC558128BJ/BFT-12		TC558128BJ/BFT-15		UNIT
		MIN	MAX	MIN	MAX	
t <sub>RC</sub>	Read Cycle Time	12	-	15	-	ns
t <sub>ACC</sub>	Address Access Time	-	12	-	15	
t <sub>CO</sub>	Chip Enable Access Time	-	12	-	15	
t <sub>OE</sub>	Output Enable Access Time	-	6	-	8	
t <sub>OH</sub>	Output Data Hold Time from Address Change	5	-	5	-	
t <sub>COE</sub>	Output Enable Time from Chip Enable	5	-	5	-	
t <sub>OEE</sub>	Output Enable Time from Output Enable	1	-	1	-	
t <sub>COD</sub>	Output Disable Time from Chip Enable	-	6	-	8	
t <sub>ODO</sub>	Output Disable Time from Output Enable	-	6	-	8	

WRITE CYCLE

SYMBOL	PARAMETER	TC558128BJ/BFT-12		TC558128BJ/BFT-15		UNIT
		MIN	MAX	MIN	MAX	
t <sub>WC</sub>	Write Cycle Time	12	-	15	-	ns
t <sub>WP</sub>	Write Pulse Width	8	-	9	-	
t <sub>CW</sub>	Chip Enable to End of Write	10	-	12	-	
t <sub>AW</sub>	Address Valid to End of Write	10	-	12	-	
t <sub>AS</sub>	Address Setup Time	0	-	0	-	
t <sub>WR</sub>	Write Recovery Time	0	-	0	-	
t <sub>DS</sub>	Data Setup Time	6	-	8	-	
t <sub>DH</sub>	Data Hold Time	0	-	0	-	
t <sub>OE<sub>W</sub></sub>	Output Enable Time from Write Enable	1	-	1	-	
t <sub>OD<sub>W</sub></sub>	Output Disable Time from Write Enable	-	6	-	8	

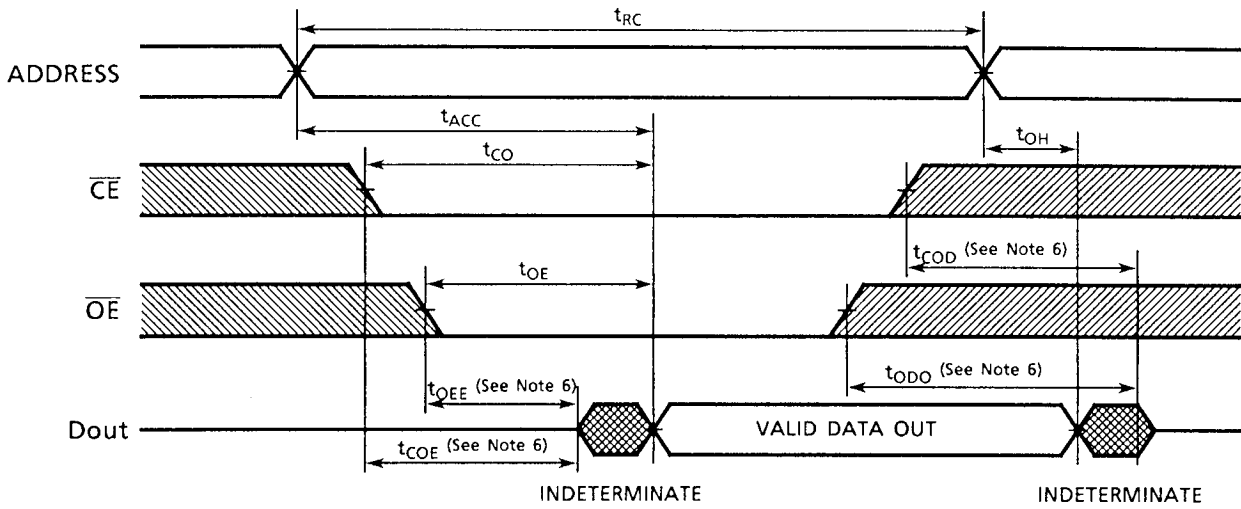
AC TEST CONDITIONS

Input Pulse Level	3.0 V, 0.0 V
Input Pulse Rise and Fall Time	3 ns
Input timing Measurement Reference Level	1.5 V
Output Timing Measurement Reference Level	1.5 V
Output Load	Fig. 1

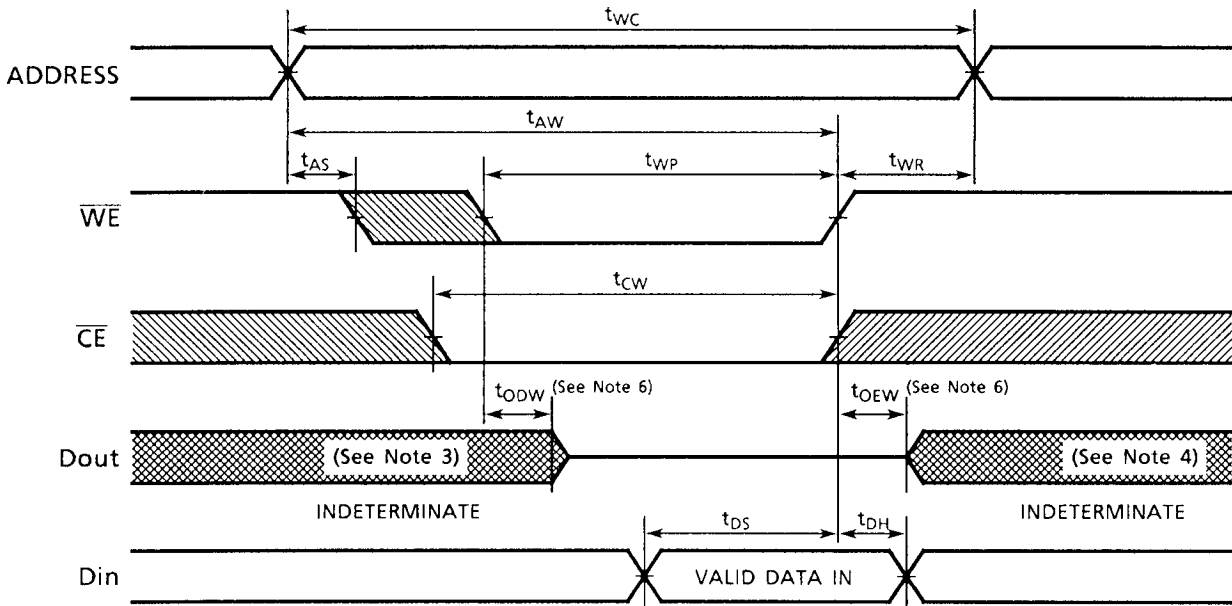


TIMING DIAGRAMS

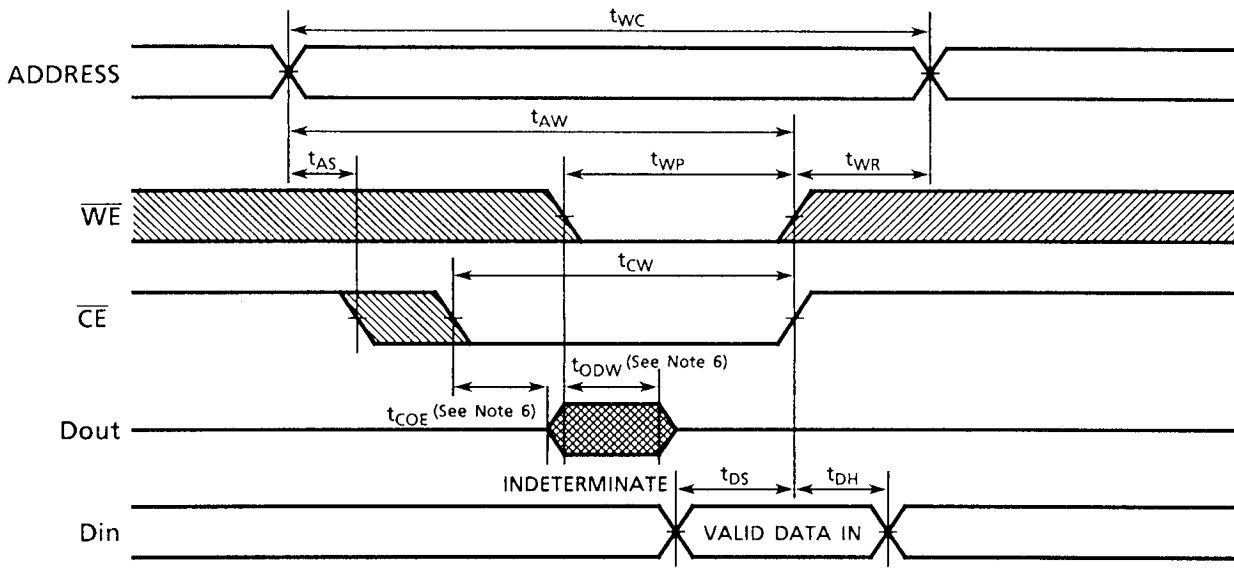
READ CYCLE (See Note 2)



WRITE CYCLE 1 ( $\overline{WE}$  CONTROLLED) (See Note 5)



WRITE CYCLE 2 ( $\overline{CE}$  CONTROLLED) (See Note 5)



Note: (1) Operating temperature ( $T_a$ ) is guaranteed for transverse air flow exceeding 400 linear feet per minute.

(2)  $\overline{WE}$  remains HIGH for the Read Cycle.

(3) If  $\overline{CE}$  goes LOW coincident with or after  $\overline{WE}$  goes LOW, the outputs will remain at high impedance.

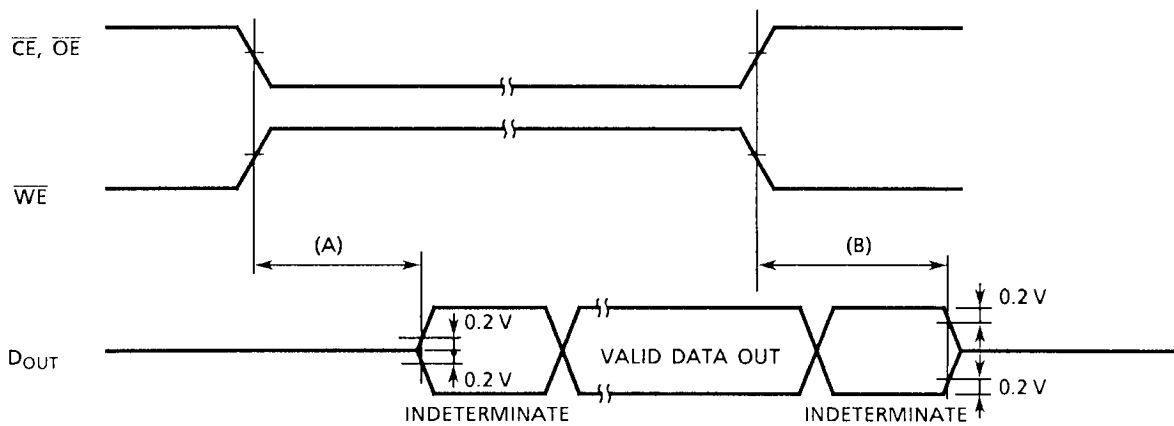
(4) If  $\overline{CE}$  goes HIGH coincident with or before  $\overline{WE}$  goes HIGH, the outputs will remain at high impedance.

(5) If  $\overline{OE}$  is HIGH during the write cycle, the outputs will remain at high impedance.

(6) The parameters specified below are measured using the load shown in Fig. 1.

(A)  $t_{COE}, t_{OEE}, t_{OEw}$  Output ..... Enable Time

(B)  $t_{COD}, t_{ODO}, t_{ODW}$  Output ..... Disable Time

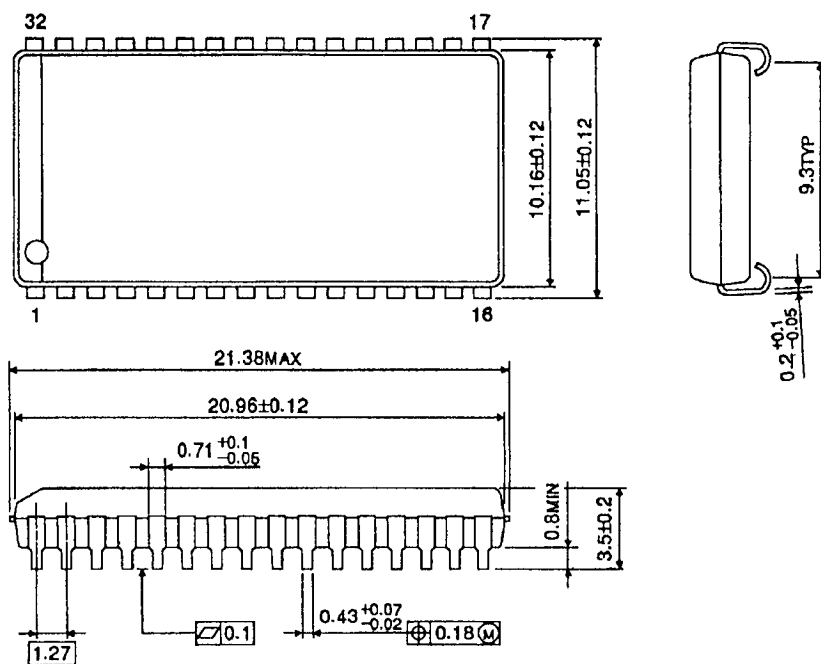




PACKAGE DIMENSIONS

Plastic SOJ (SOJ32-P-400-1.27A)

Units in mm

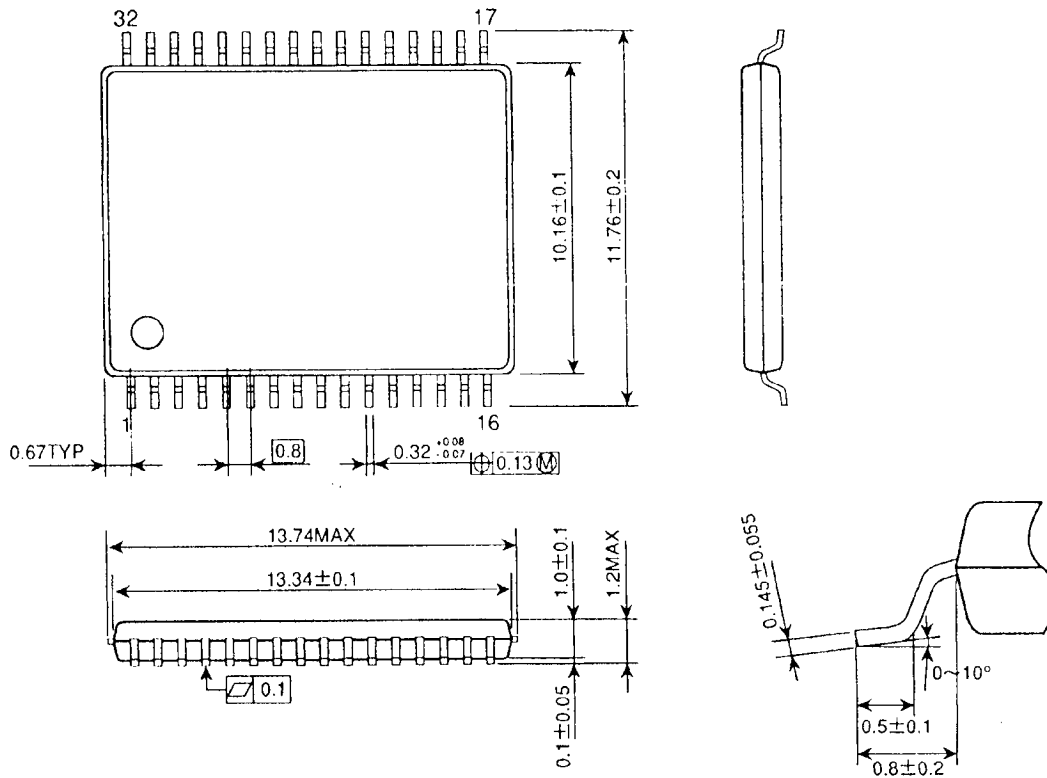


Weight: 1.22 g (typ)

PACKAGE DIMENSIONS

Plastic TSOP (TSOPII 32-P-400-0.80C)

Units in mm



Weight: 0.34 g (typ)