

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

T6F19, JT6F19-AS

T6F19, JT6F19-AS CMOS Single-Chip LSI for LCD Calculator

The T6F19, JT6F19-AS is a CMOS single-chip microcomputer for 12-digit capacity 1-memory calculation.

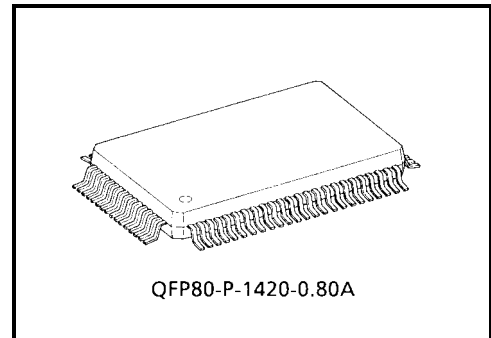
T6F19, JT6F19-AS is the complete single chip CMOS LSI for calculator with single power supply operation.

Wide operating voltage range and low power consumption make it suitable for 1.5 V solar battery operated.

Besides T6F19, JT6F19-AS can be selectable with a pin-programmable to function of Power timer and Memory hold. With the following features.

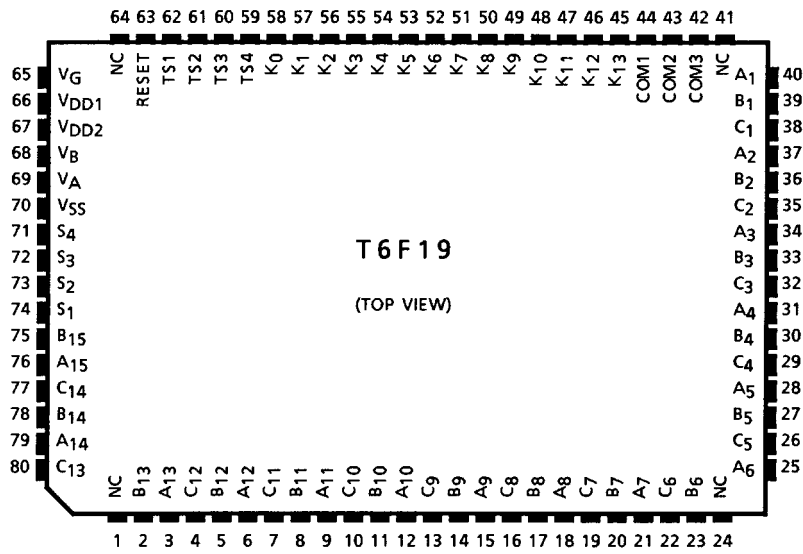
Features

- Display: 12 digits (selectable with a pin-programmable) of data, 2 digits of sign, error symbol, memory load symbol.
- Algebraic mode.
- Standard 4 functions (+, -, ×, ÷)
- Rate conversion calculation
- Automatic percentage operation with add-on, discount.
- Automatic delta percentage, mark-up and markdown operations.
- Square root.
- Constant calculation.
- Chain calculation.
- Change sign.
- Floating point or momentary mode (selectable with a switch).
- Fixed point ("0", "1", "2", "3", "4" or "6" places) or floating point (selectable with a switch).
- Adding point mode (selectable with a switch).
- Rounding switches (rounding up, down and off).
- Leading zero suppression.
- Trailing zero suppression.
- Punctuation on display, commas for thousands.
- Memory contents indicator, turned on with non-zero in the memory.
- Registration overflow, indicating that too many digits are entered (the most significant digit are protected).
- Result overflow, indicating during calculation (most function key are locked as it happened).
- Memory overflow indicating to flashing of memory load mark.
- Key roll over function.
- Floating minus.



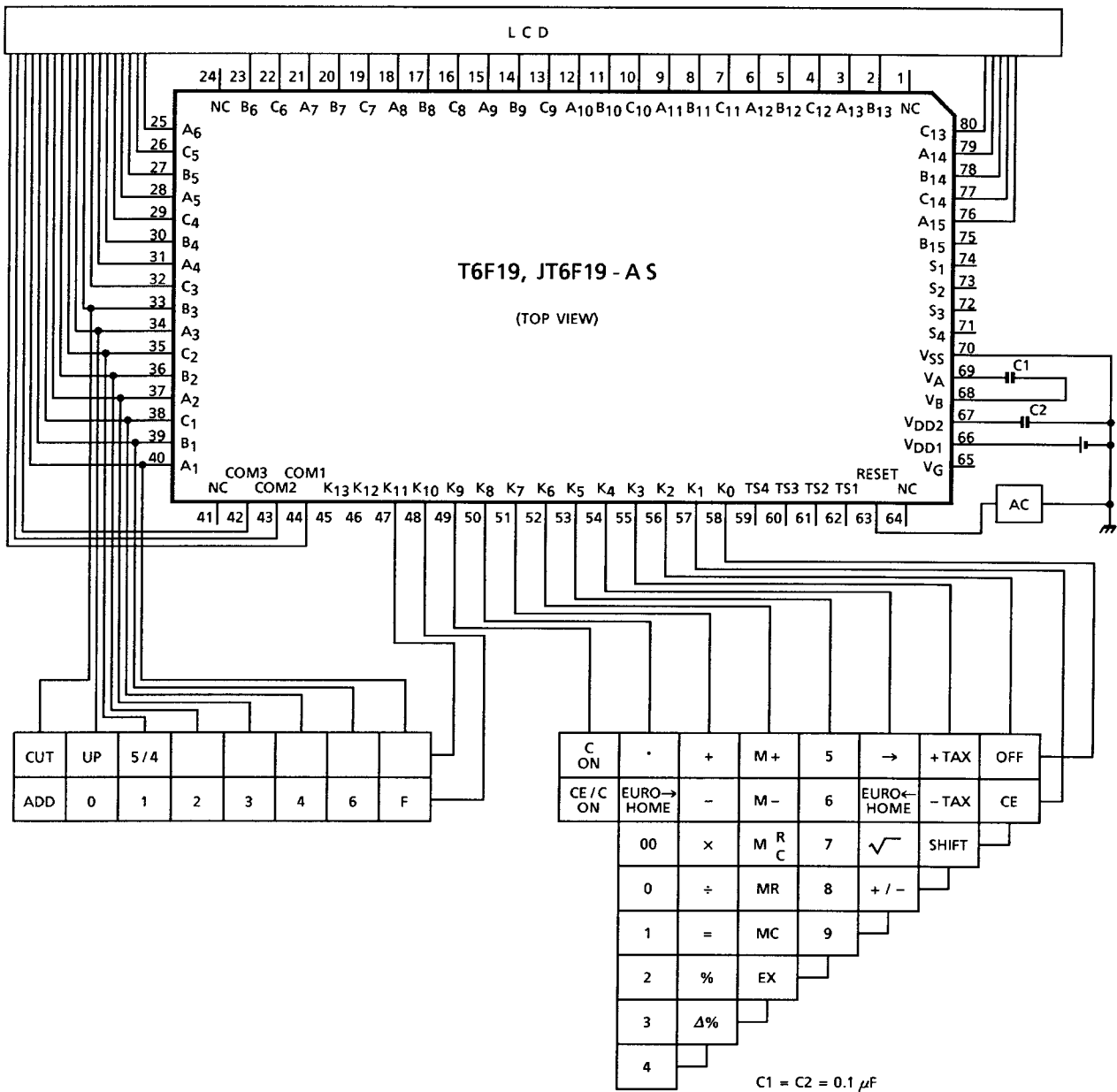
Weight: 1.52 g (typ.)

Pin Assignment (top view)

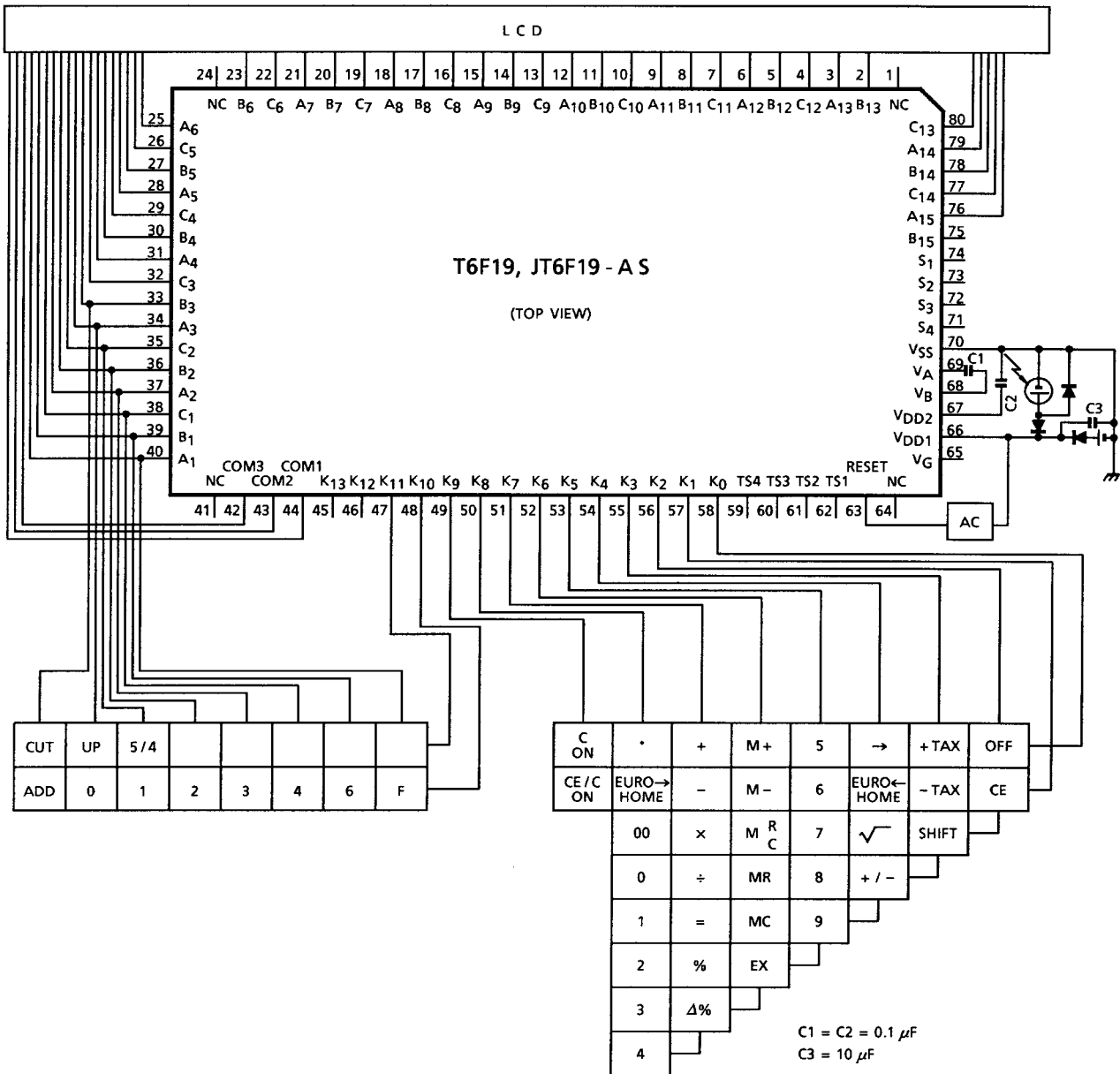


System Block Diagram

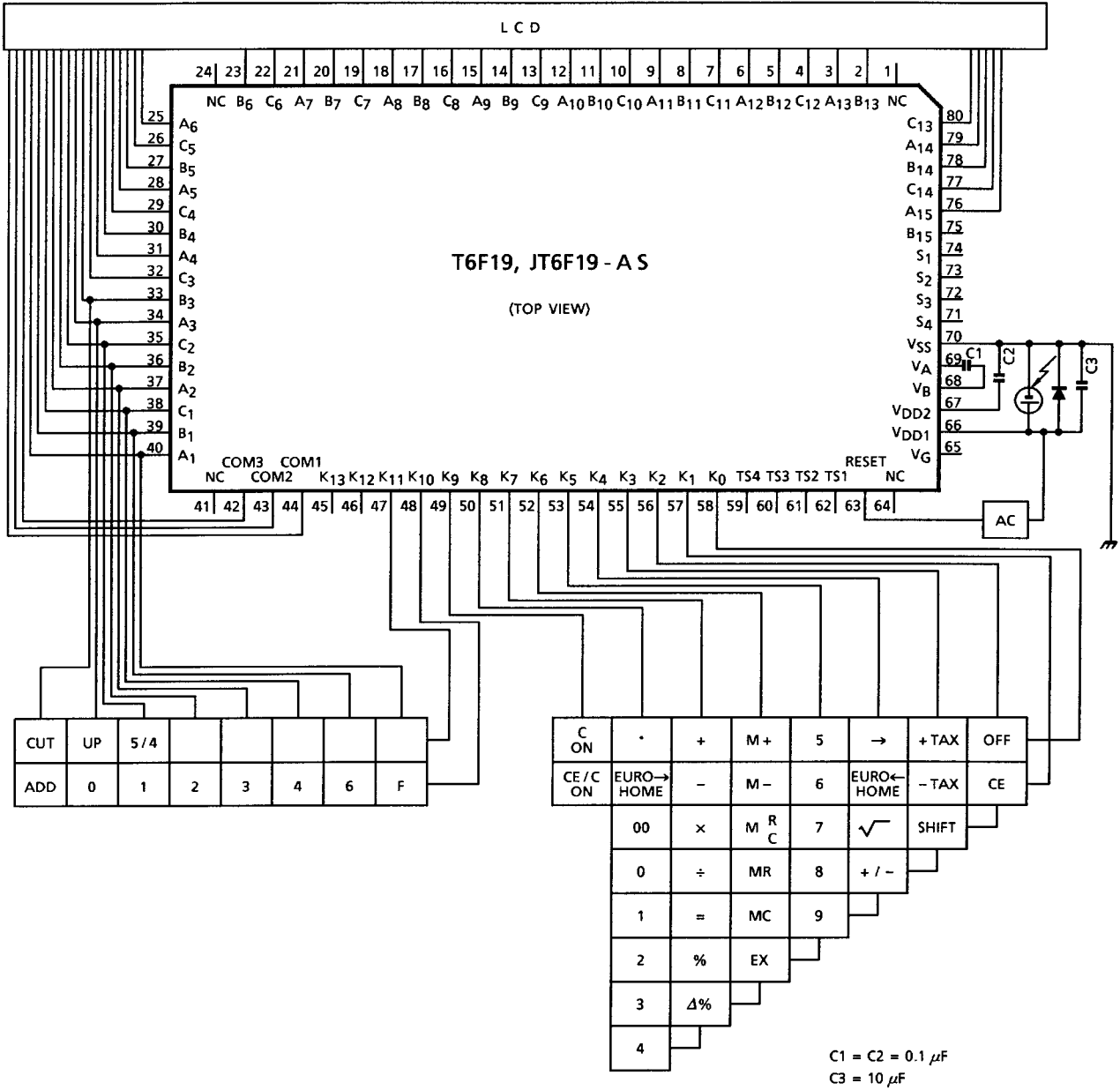
Battery Type



Dual Type

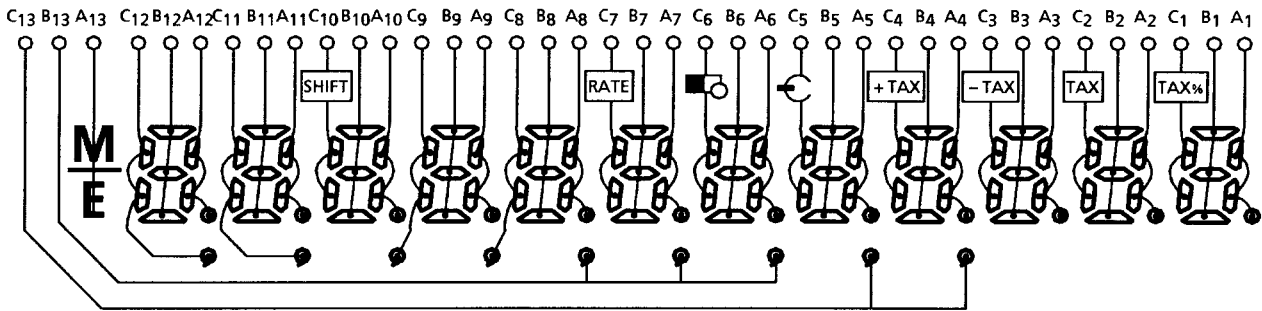


Solar Type

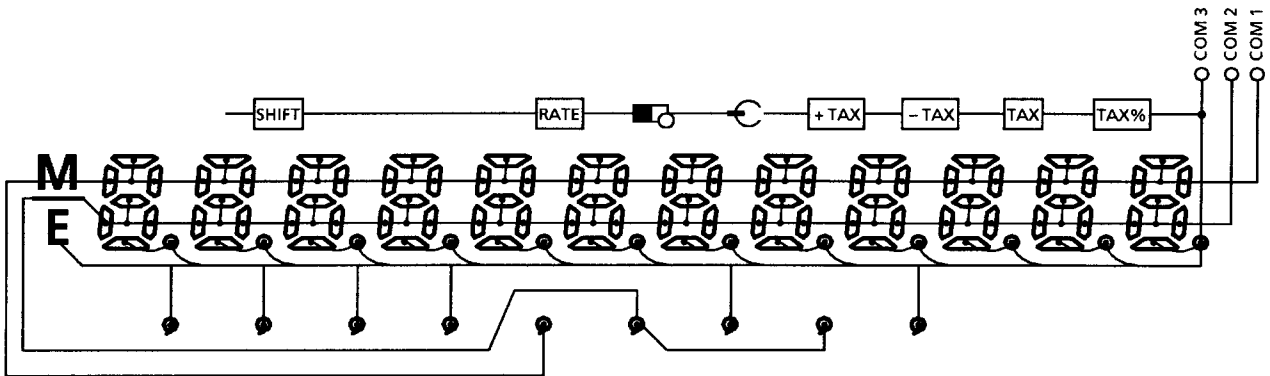


Connection of LCD

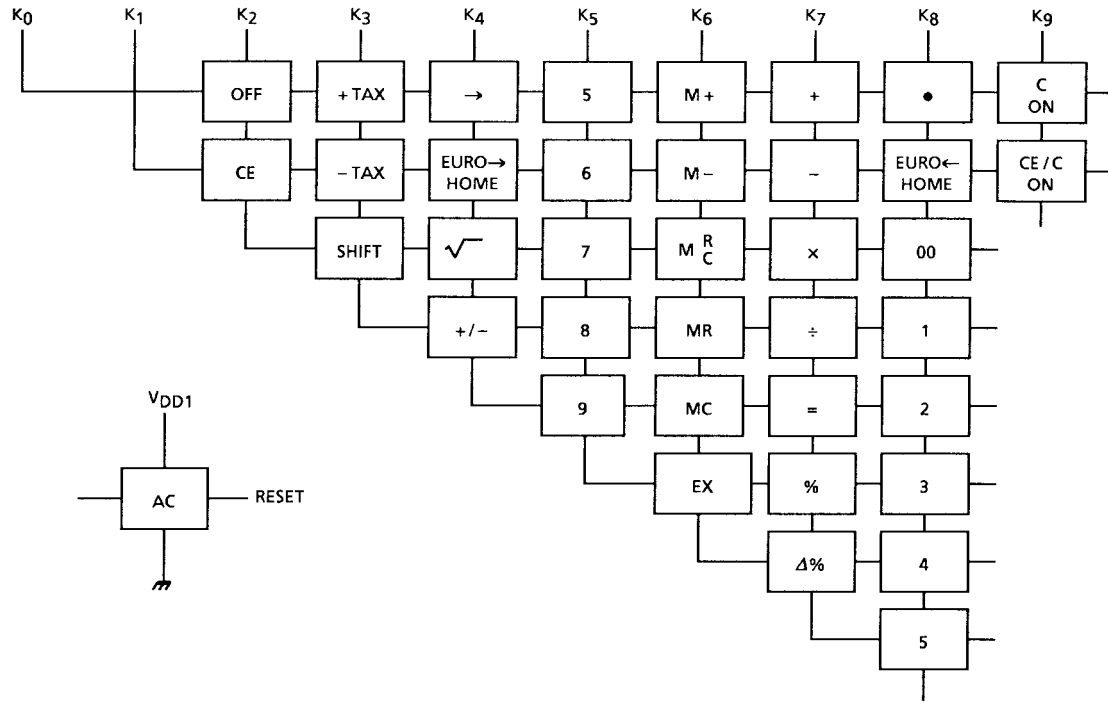
Segment



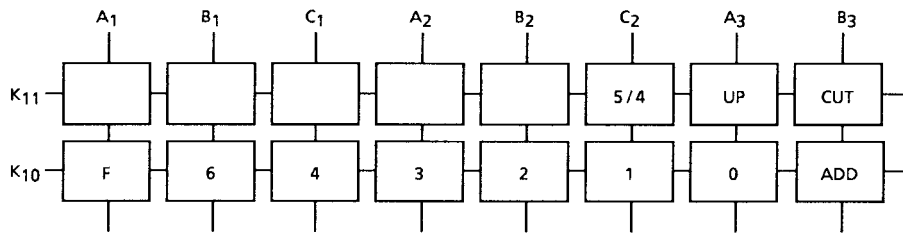
Common



Key Connection



Touch Key



Lock Key

K11: Rounding switches.

K10: Selectable with fixed point or floating mode.

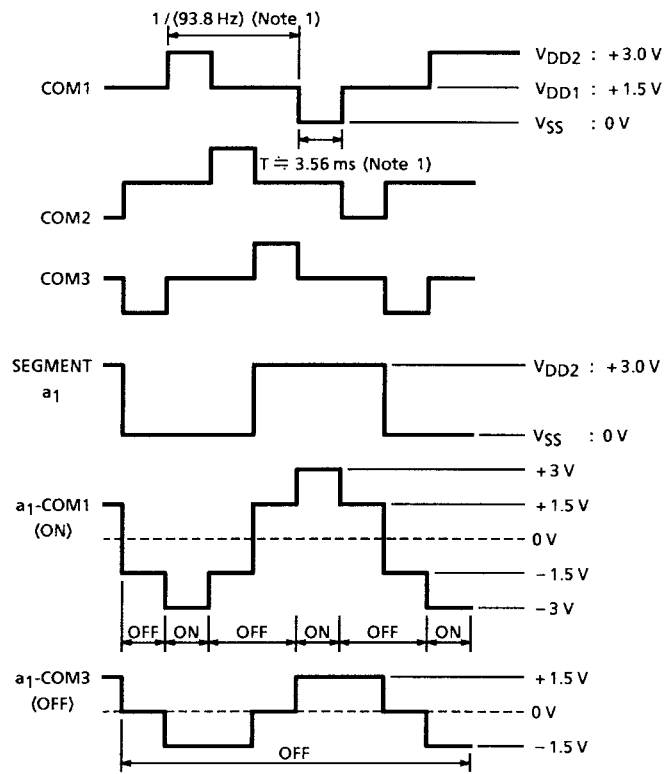
Maximum Ratings

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{DD1}	-0.3~2.0	V
Input voltage	V_{IN}	-0.3~ $V_{DD1} + 0.3$	V
Operating temperature	T_{opr}	0~40	°C
Storage temperature	T_{stg}	-55~125	°C

Electrical Characteristics ($V_{DD1} = 1.5 \pm 0.2$ V, $V_{DD2} = 3.0 \pm 0.4$ V, $V_{SS} = 0$ V, $T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Pin Name	Test Condition	Min	Typ.	Max	Unit	
Operating voltage	V_{DD1}	—	—	—	1.2	1.5	2.0	V	
"1" input voltage	V_{IH} (1)	—	K ₂ ~K ₉ RESET	—	$V_{DD1} - 0.4$	—	V_{DD1}	V	
"1" input voltage	V_{IH} (2)	—	K ₁₀ ~K ₁₃	—	$V_{DD2} - 0.4$	—	V_{DD2}	V	
"0" input voltage	V_{IL}	—	K ₂ ~K ₁₃ RESET	—	0	—	0.4	V	
"1" output voltage	V_{OH} (1)	—	SEGMENT COM1~3	—	$V_{DD2} - 0.2$	—	V_{DD2}	V	
"0" output voltage	V_{OL} (1)	—	SEGMENT COM1~3	—	0	—	0.2	V	
"M" output voltage	V_{OM}	—	COM1~3	—	$V_{DD1} - 0.2$	—	$V_{DD1} + 0.2$	V	
"1" output voltage	V_{OH} (2)	—	K ₁ ~K ₉	—	$V_{DD1} - 0.2$	—	V_{DD1}	V	
"0" output voltage	V_{OL} (2)	—	K ₁ ~K ₁₃	—	0	—	0.2	V	
"1" output resistance	R_{OH}	—	SEGMENT COM1~3	$V_{OUT} = V_{DD2} - 0.5$ V	—	—	70	k Ω	
"0" output resistance	R_{OL}	—	SEGMENT COM1~3	$V_{OUT} = 0.5$ V	—	—	70	k Ω	
Key pull up resistance	R_{KEYH} (1)	—	RESET	$V_{OUT} = V_{DD1} - 0.5$ V	—	—	25	k Ω	
	R_{KEYH} (2)	—	K ₀ ~K ₉	$V_{OUT} = V_{DD1} - 0.5$ V	—	—	14		
	R_{KEYH} (3)	—	K ₁₀ ~K ₁₃	$V_{OUT} = 0$ V	120	—	800		
Key pull down resistance	R_{KEYL} (1)	—	RESET (1)	$V_{OUT} = V_{DD1}$	100	—	300	k Ω	
	R_{KEYL} (2)	—	RESET (2)	$V_{OUT} = V_{DD1}$	18	—	300		
	R_{KEYL} (3)	—	K ₀ ~K ₉ (1)	$V_{OUT} = 0.5$ V	—	—	50		
	R_{KEYL} (4)	—	K ₀ ~K ₉ (2)	$V_{OUT} = V_{DD1}$	72	—	170		
Oscillating (WAIT)	f_{ϕ} WAIT	—	—	$V_{DD1} = 1.5$ V	5.4	9.0	15.5	kHz	
Frequency (OPERATE)	f_{ϕ} OP	—	—	$V_{DD1} = 1.5$ V	20.0	34	61.3	kHz	
Frame frequency	f_F	—	SEGMENT COM1~3	$V_{DD1} = 1.5$ V	56.3	93.8	161.5	Hz	
Supply current	1 (WAIT)	I_{DD} WAIT	—	—	$V_{DD1} = 1.5$ V	—	—	3.3	μ A
	2 (OPERATE)	I_{DD} OP	—	—	$V_{DD1} = 1.2$ V	—	—	8.9	
	3 (OFF)	I_{DD} OFF	—	—	$V_{DD1} = 1.5$ V	—	—	2.0	
Power off timer times	T	—	—	$V_{DD1} = 1.5$ V	429	600	1001	s	

Waveforms for Display



Note 1: at $f_{\phi} = 9 \text{ kHz}$

Pad Location Table

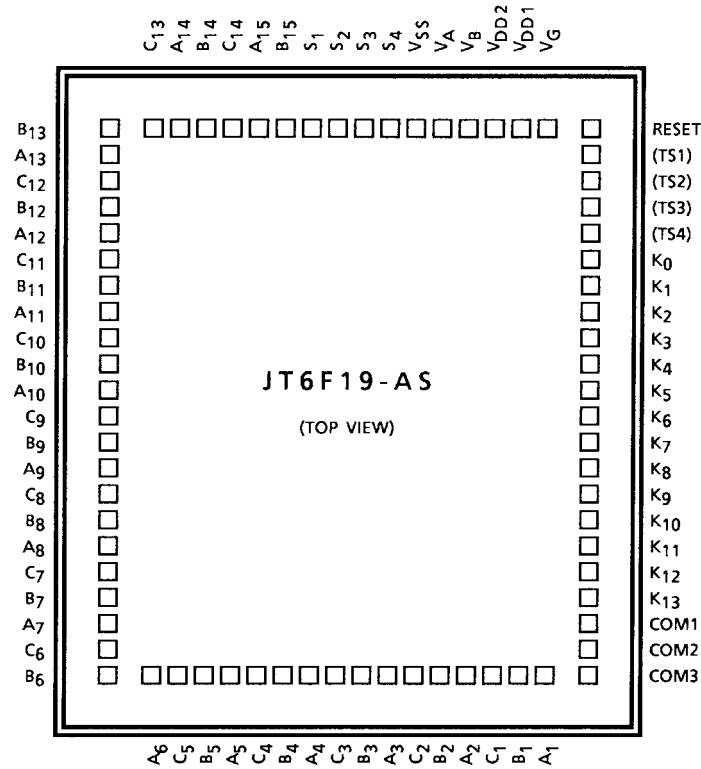
(μm)

Name	X Point	Y Point
B ₆	-1757	-1680
C ₆	-1757	-1520
A ₇	-1757	-1360
B ₇	-1757	-1200
C ₇	-1757	-1040
A ₈	-1757	-880
B ₈	-1757	-720
C ₈	-1757	-560
A ₉	-1757	-400
B ₉	-1757	-240
C ₉	-1757	-80
A ₁₀	-1757	80
B ₁₀	-1757	240
C ₁₀	-1757	400
A ₁₁	-1757	560
B ₁₁	-1757	720
C ₁₁	-1757	880
A ₁₂	-1757	1040
B ₁₂	-1757	1200
C ₁₂	-1757	1360
A ₁₃	-1757	1520
B ₁₃	-1757	1680
C ₁₃	-1089	1753
A ₁₄	-929	1753
B ₁₄	-769	1753
C ₁₄	-609	1753
A ₁₅	-449	1753
B ₁₅	-289	1753
S ₁	-129	1753
S ₂	31	1753
S ₃	191	1753
S ₄	351	1753
V _{SS}	511	1753
V _A	671	1753
V _B	831	1753
V _{DD2}	991	1753
V _{DD1}	1151	1753
V _G	1388	1753

Name	X Point	Y Point
RESET	1757	1680
(TS1)	1757	1520
(TS2)	1757	1360
(TS3)	1757	1200
(TS4)	1757	1040
K ₀	1757	880
K ₁	1757	720
K ₂	1757	560
K ₃	1757	400
K ₄	1757	240
K ₅	1757	80
K ₆	1757	-80
K ₇	1757	-240
K ₈	1757	-400
K ₉	1757	-560
K ₁₀	1757	-720
K ₁₁	1757	-880
K ₁₂	1757	-1040
K ₁₃	1757	-1200
COM1	1757	-1360
COM2	1757	-1520
COM3	1757	-1680
A ₁	1122	-1752
B ₁	962	-1752
C ₁	802	-1752
A ₂	642	-1752
B ₂	482	-1752
C ₂	322	-1752
A ₃	162	-1752
B ₃	2	-1752
C ₃	-158	-1752
A ₄	-318	-1752
B ₄	-478	-1752
C ₄	-638	-1752
A ₅	-798	-1752
B ₅	-958	-1752
C ₅	-1118	-1752
A ₆	-1278	-1752

Note 2: () Do not connect.

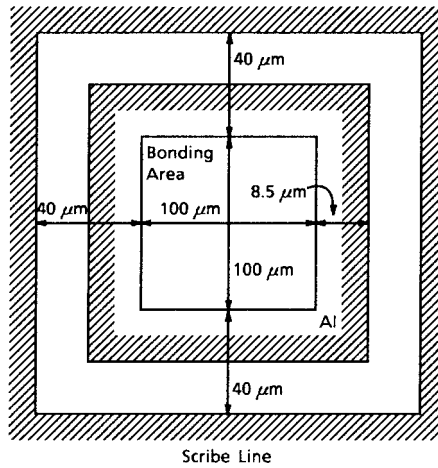
Chip Layout



Chip size : 3.79 × 3.84 (mm)
 Chip thickness : 440 ± 30 (μm)
 Substrate : V_{SS}

Pad Layout

Active Element

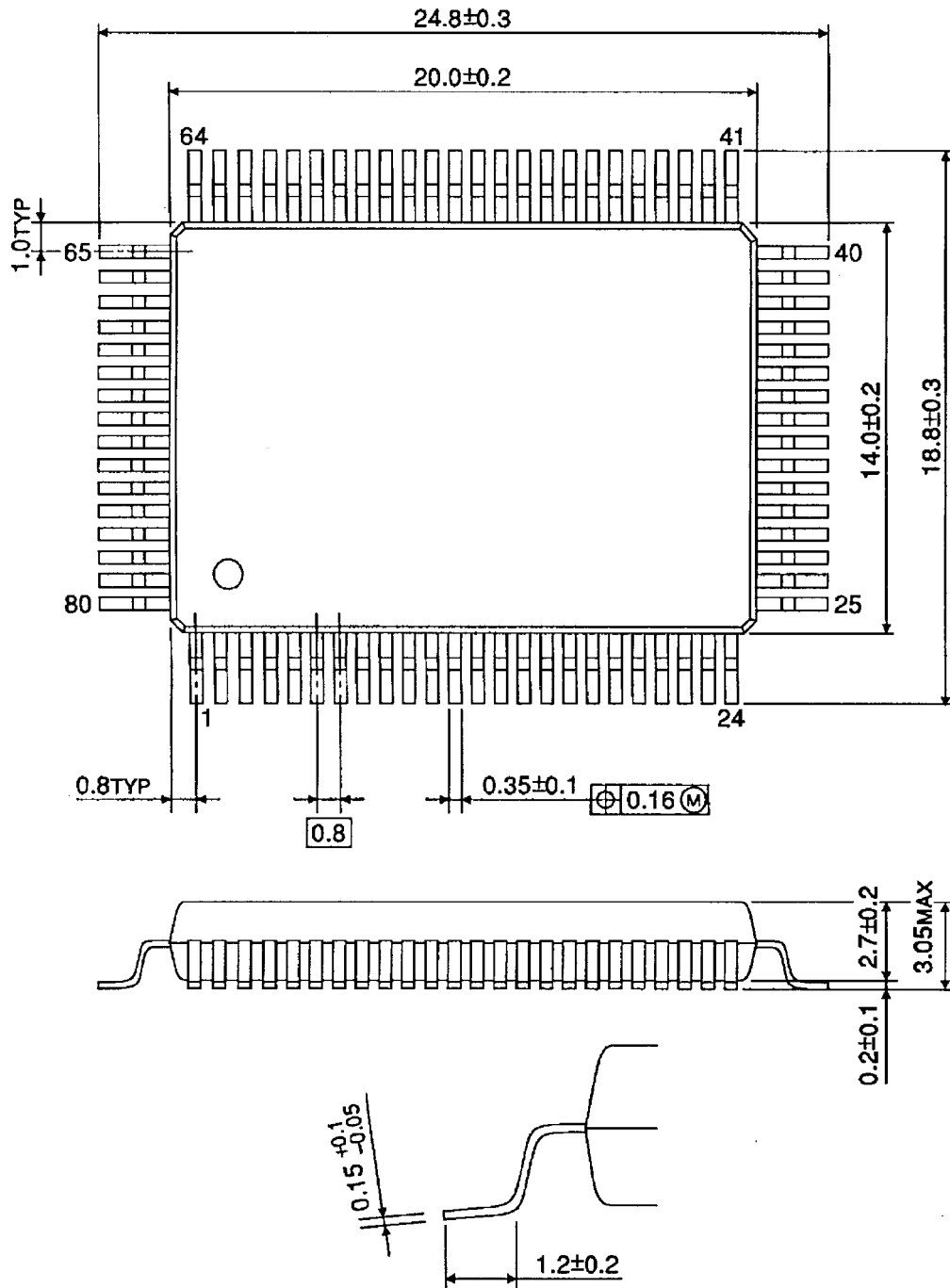


PAD Pitch 160 μm

Package Dimensions

QFP80-P-1420-0.80A

Unit : mm



Weight: 1.52 g (typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.