TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

T6F18,JT6F18-AS

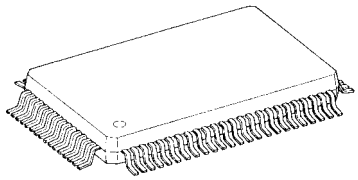
T6F18, JT6F18-AS CMOS Single-Chip LSI for LCD Calculator

The T6F18, JT6F18-AS is a CMOS single chip microcomputer for 12-digit capacity 1-memory calculation.

T6F18, JT6F18-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 T6F18, JT6F18-AS can selectable with a pin-programmable to function of Power timer and Memory hold. With the following features.



QFP80-P-1420-0.80A

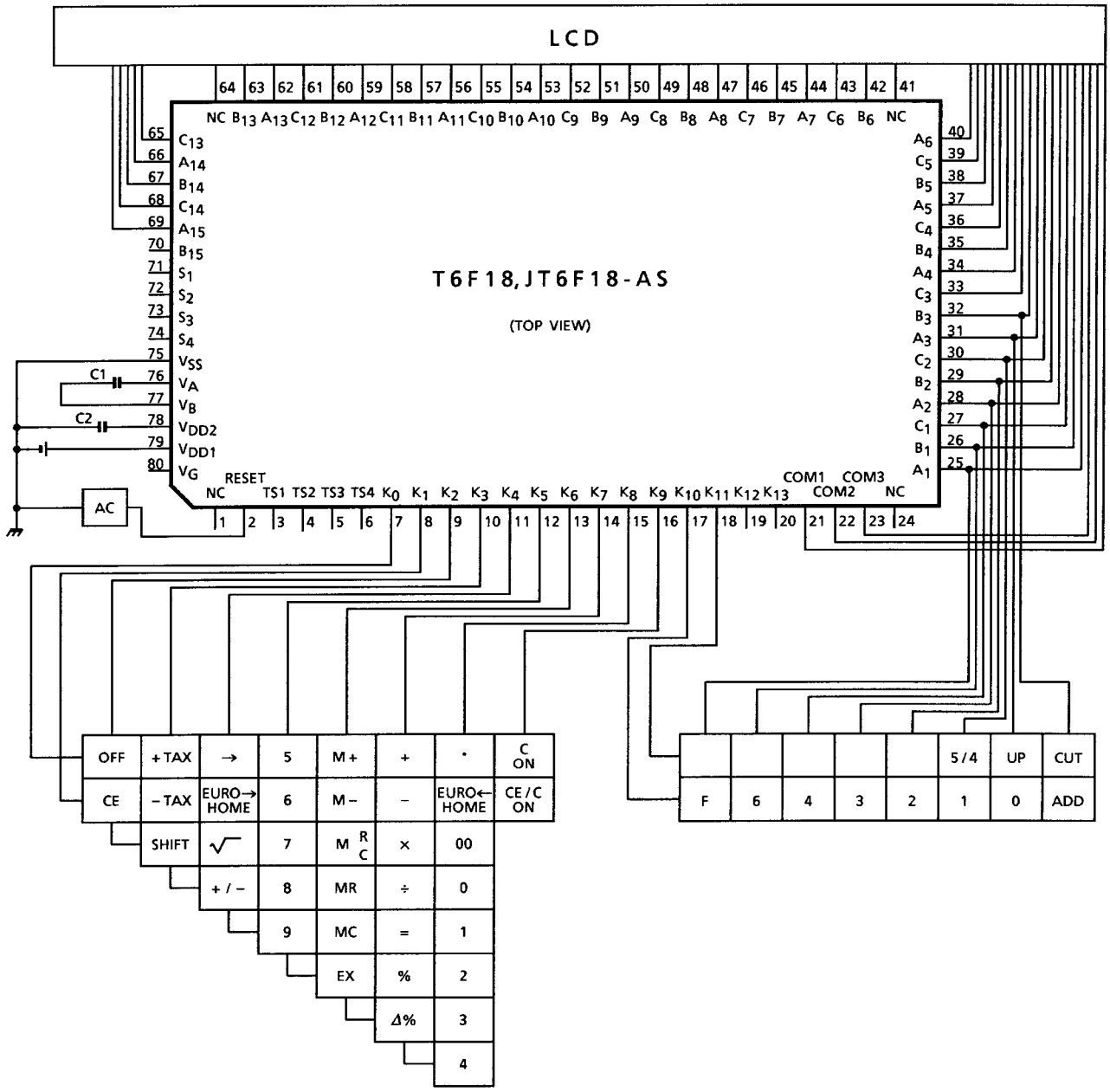
Weight: 1.52 g (typ.)

Features

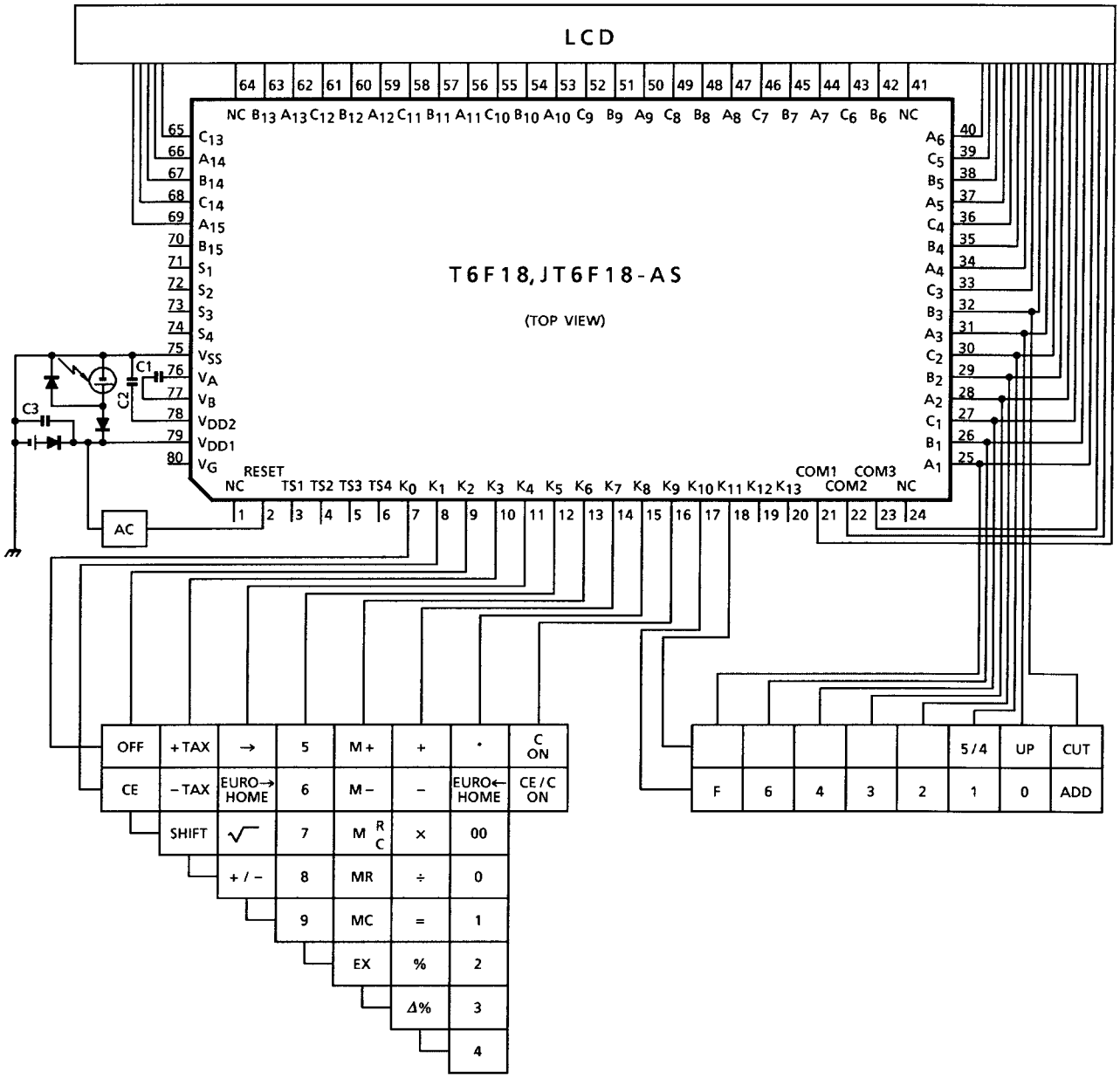
- Display: 12-digits (selectable with a pin-programmable) of data, 2-digits of sign, error symbol, memory load symbol.
- Algebraic mode.
- Standard 4 functions (+, −, ×, ÷)
- Rate conversion calculation
- Automatic percentage operation with add-on, discount.
- Automatic delta percentage, mark-up and mark-down 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.

System Block Diagram

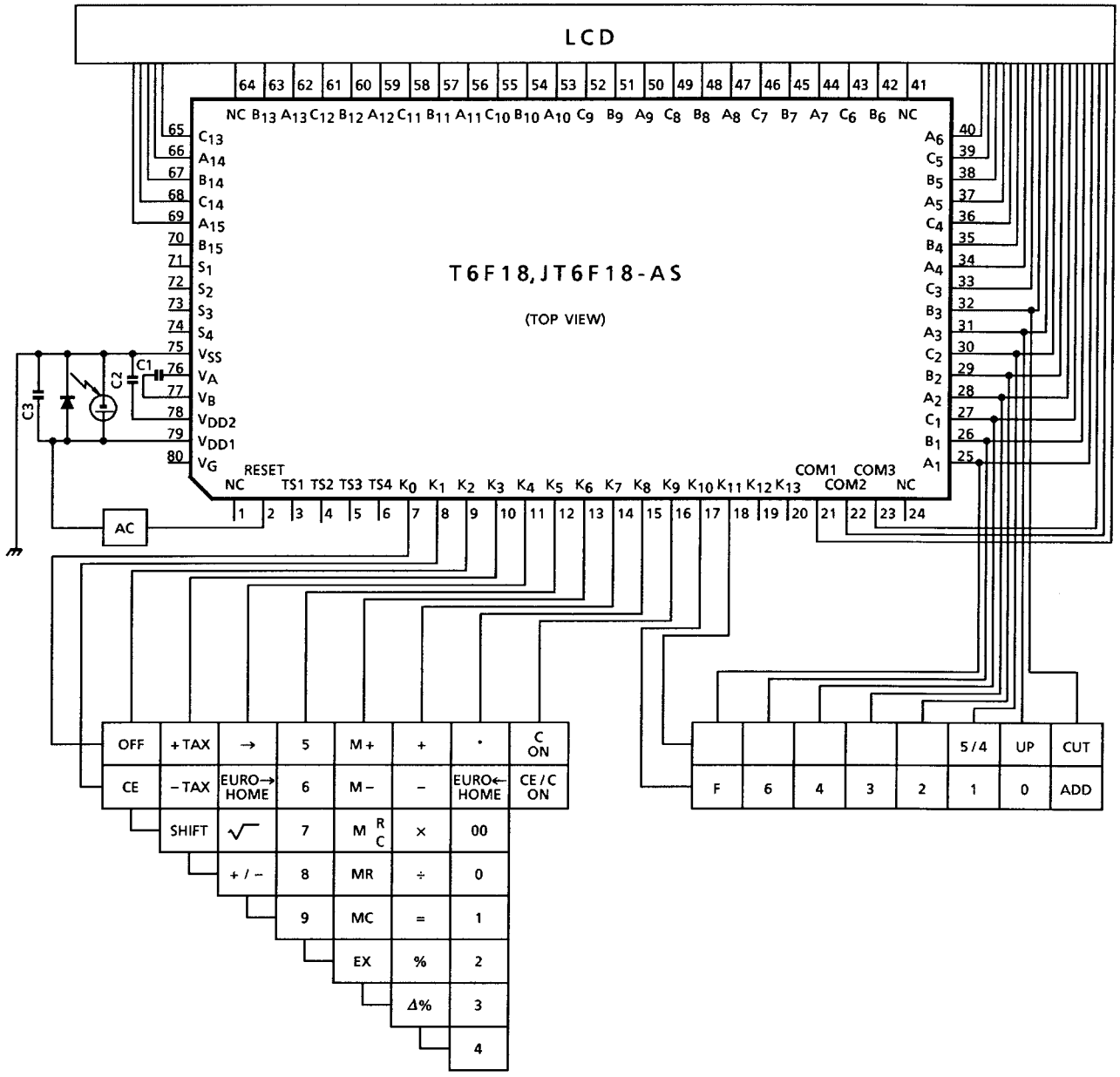
Battery Type



Dual Type

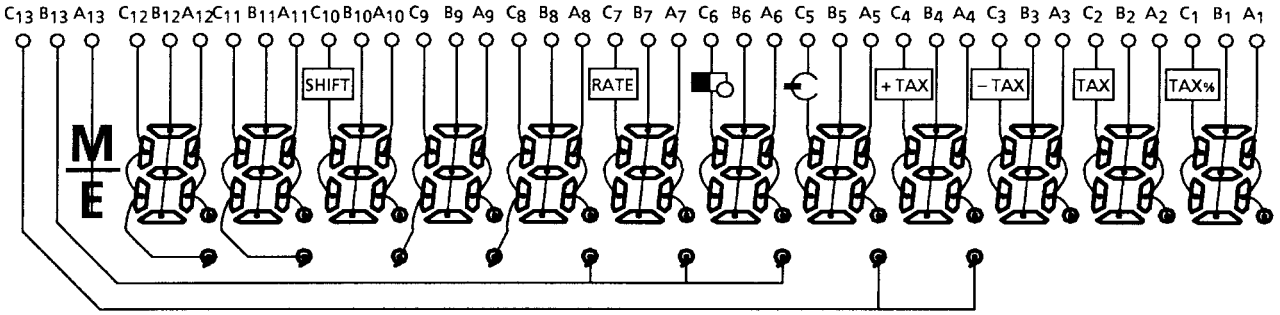

LCD
T6F18,JT6F18-AS
(TOP VIEW)
NC B13 A13 C12 B12 A12 C11 B11 A11 C10 B10 A10 C9 B9 A9 C8 B8 A8 C7 B7 A7 C6 B6 NC
C13 A14 B14 C14 A15 B15 S1 S2 S3 S4 VSS VA VB VDD2 VDD1 VG
A6 C5 B5 A5 C4 B4 A4 C3 B3 A3 C2 B2 A2 C1 B1 A1
NC RESET TS1 TS2 TS3 TS4 K0 K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 COM1 COM2 COM3 NC
C1
C2
C3
AC
OFF +TAX → 5 M+ + · C ON
CE −TAX EURO→ HOME 6 M− − EURO← HOME CE/C ON
SHIFT √ 7 M R C × 00
+/− 8 MR ÷ 0
9 MC = 1
EX % 2
Δ% 3
4
5/4 UP CUT
F 6 4 3 2 1 0 ADD

Solar Type

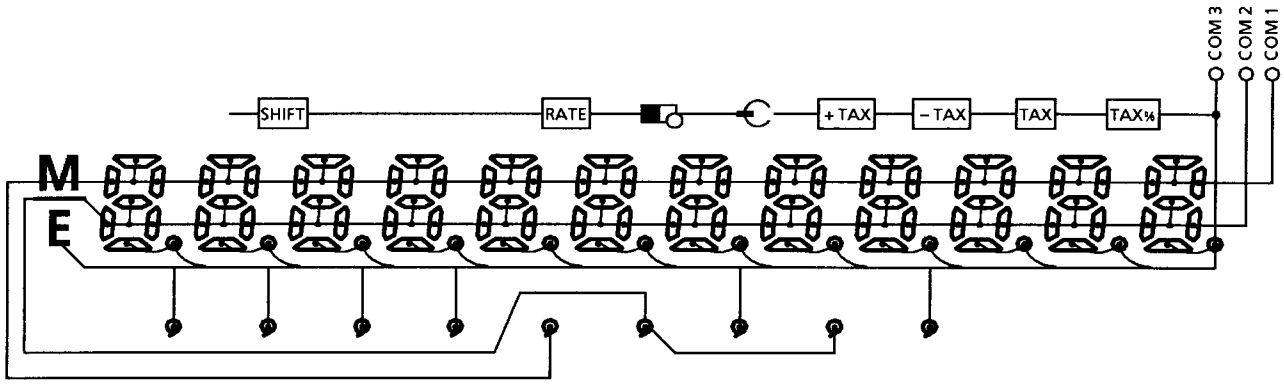

LCD
T6F18,JT6F18-AS
(TOP VIEW)
C1
C2
C3
AC
OFF
+TAX
→
5
M+
+
·
C ON
CE
−TAX
EURO→ HOME
6
M−
−
EURO← HOME
CE/C ON
SHIFT
√
7
M R C
×
00
+/−
8
MR
÷
0
9
MC
=
1
EX
%
2
Δ%
3
4
F
6
4
3
2
1
0
ADD
5/4
UP
CUT

Connection of LCD

Segment

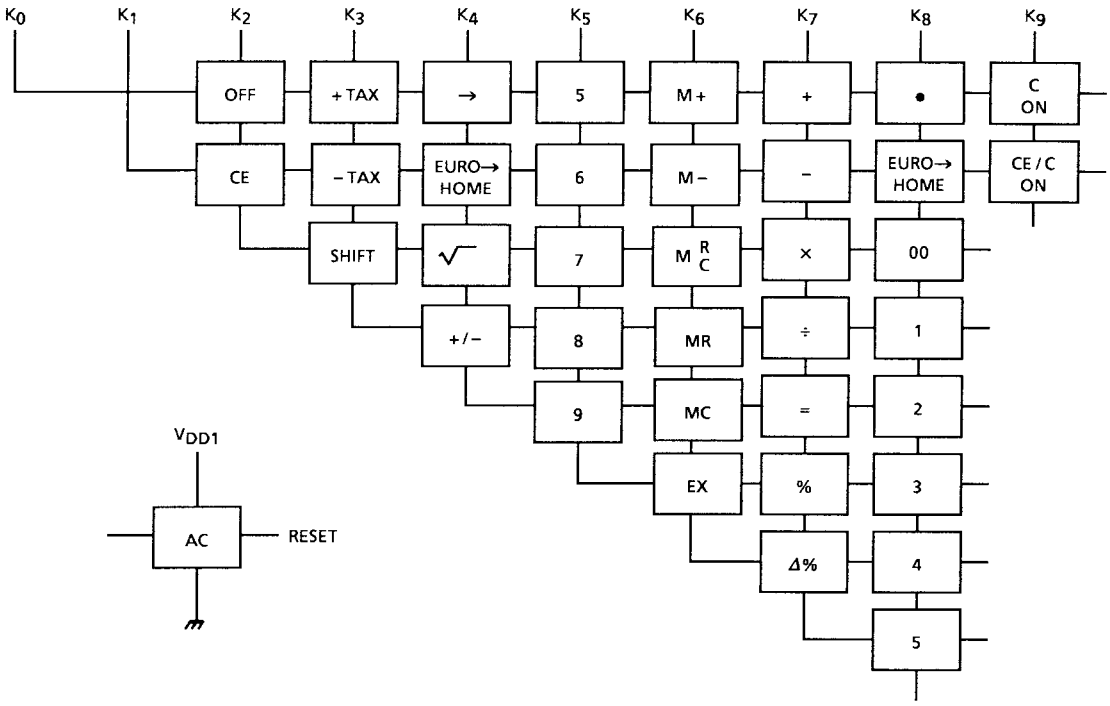


Common

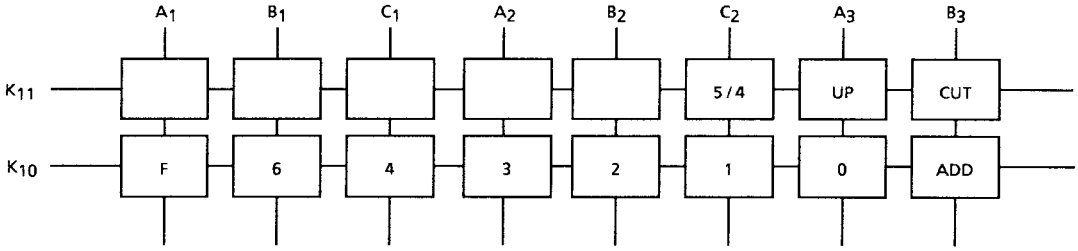


Key Connection

Touch Key



Lock Key



K_{11}: Rounding switches.

K_{10}: Selectable with fixed point or floating mode.

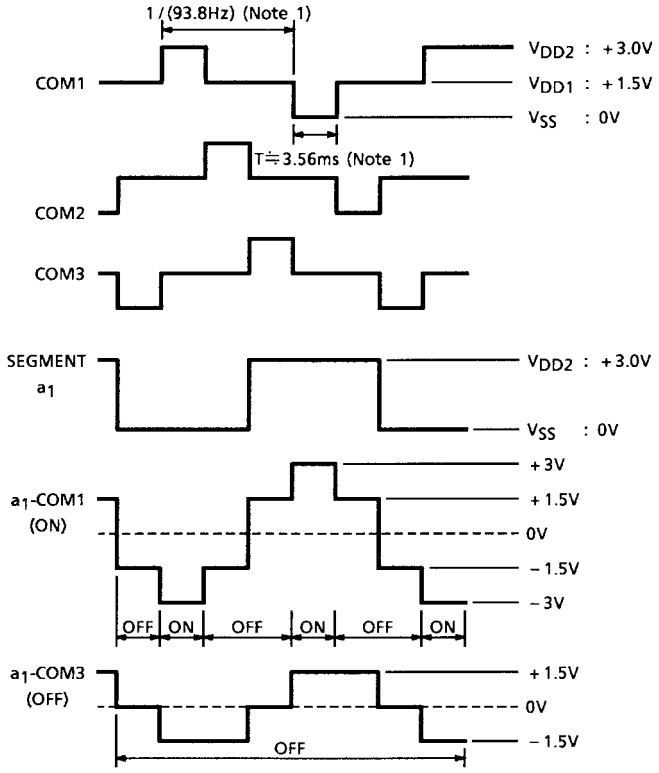
Maximum Ratings

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 ± 0.2 V, V_{DD2} = 3.0 ± 0.4 V, V_{SS} = 0 V, Ta = 25°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	kΩ
“0” output resistance		R_{OL}	—	SEGMENT COM1~3	V_{OUT} = 0.5 V	—	—	70	kΩ
Key pull up resistance		$R_{KEYH\ (1)}$	—	RESET	V_{OUT} = V_{DD1} − 0.5 V	—	—	25	kΩ
		$R_{KEYH\ (2)}$	—	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	kΩ
		$R_{KEYL\ (2)}$	—	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)		fϕWAIT	—	—	V_{DD1} = 1.5 V	5.4	9.0	15.5	kHz
Frequency (OPERATE)		fϕOP	—	—	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_{DDWAIT}	—	—	V_{DD1} = 1.5 V	—	—	3.3	μA
	2 (OPERATE)	I_{DDOP}	—	—	V_{DD1} = 1.2 V	—	—	8.9	
	3 (OFF)	I_{DDOFF}	—	—	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 fϕ = 9 kHz

Pad Location Table

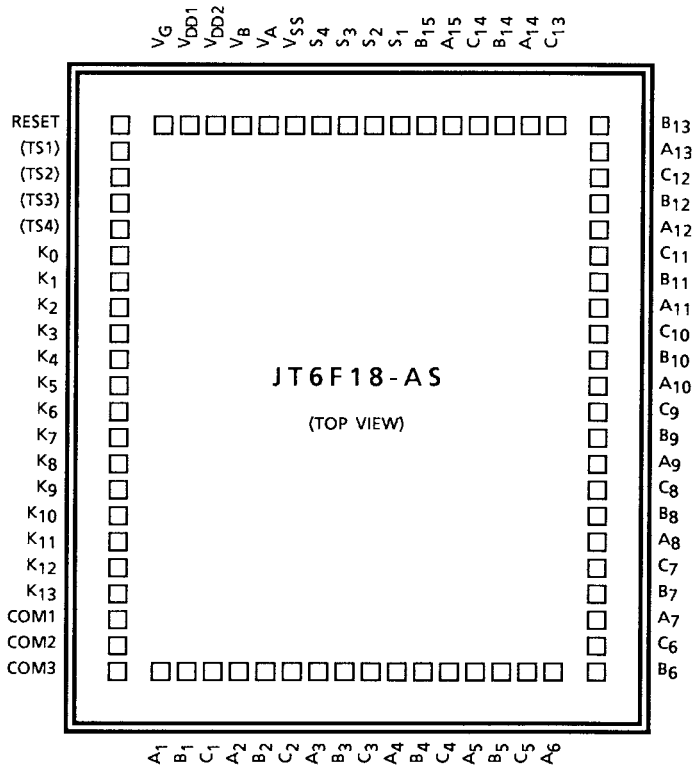
(μm)

Name	X Point	Y Point
COM3	−1757	−1680
COM2	−1757	−1520
COM1	−1757	−1360
K_{13}	−1757	−1200
K_{12}	−1757	−1040
K_{11}	−1757	−880
K_{10}	−1757	−720
K_9	−1757	−560
K_8	−1757	−400
K_7	−1757	−240
K_6	−1757	−80
K_5	−1757	80
K_4	−1757	240
K_3	−1757	400
K_2	−1757	560
K_1	−1757	720
K_0	−1757	880
(TS4)	−1757	1040
(TS3)	−1757	1200
(TS2)	−1757	1360
(TS1)	−1757	1520
RESET	−1757	1680
V_G	−1388	1753
V_{DD1}	−1151	1753
V_{DD2}	−991	1753
V_B	−831	1753
V_A	−671	1753
V_{SS}	−511	1753
S_4	−351	1753
S_3	−191	1753
S_2	−31	1753
S_1	129	1753
B_{15}	289	1753
A_{15}	449	1753
C_{14}	609	1753
B_{14}	769	1753
A_{14}	929	1753
C_{13}	1089	1753

Name	X Point	Y Point
B_{13}	1757	1680
A_{13}	1757	1520
C_{12}	1757	1360
B_{12}	1757	1200
A_{12}	1757	1040
C_{11}	1757	880
B_{11}	1757	720
A_{11}	1757	560
C_{10}	1757	400
B_{10}	1757	240
A_{10}	1757	80
C_9	1757	−80
B_9	1757	−240
A_9	1757	−400
C_8	1757	−560
B_8	1757	−720
A_8	1757	−880
C_7	1757	−1040
B_7	1757	−1200
A_7	1757	−1360
C_6	1757	−1520
B_6	1757	−1680
A_6	1278	−1752
C_5	1118	−1752
B_5	958	−1752
A_5	798	−1752
C_4	638	−1752
B_4	478	−1752
A_4	318	−1752
C_3	158	−1752
B_3	−2	−1752
A_3	−162	−1752
C_2	−322	−1752
B_2	−482	−1752
A_2	−642	−1752
C_1	−802	−1752
B_1	−962	−1752
A_1	−1122	−1752

Note 2: ( ) Do not connect.

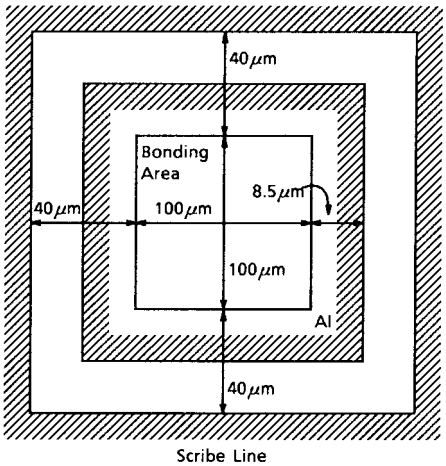
Chip Layout



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

Pad Layout

Active Element

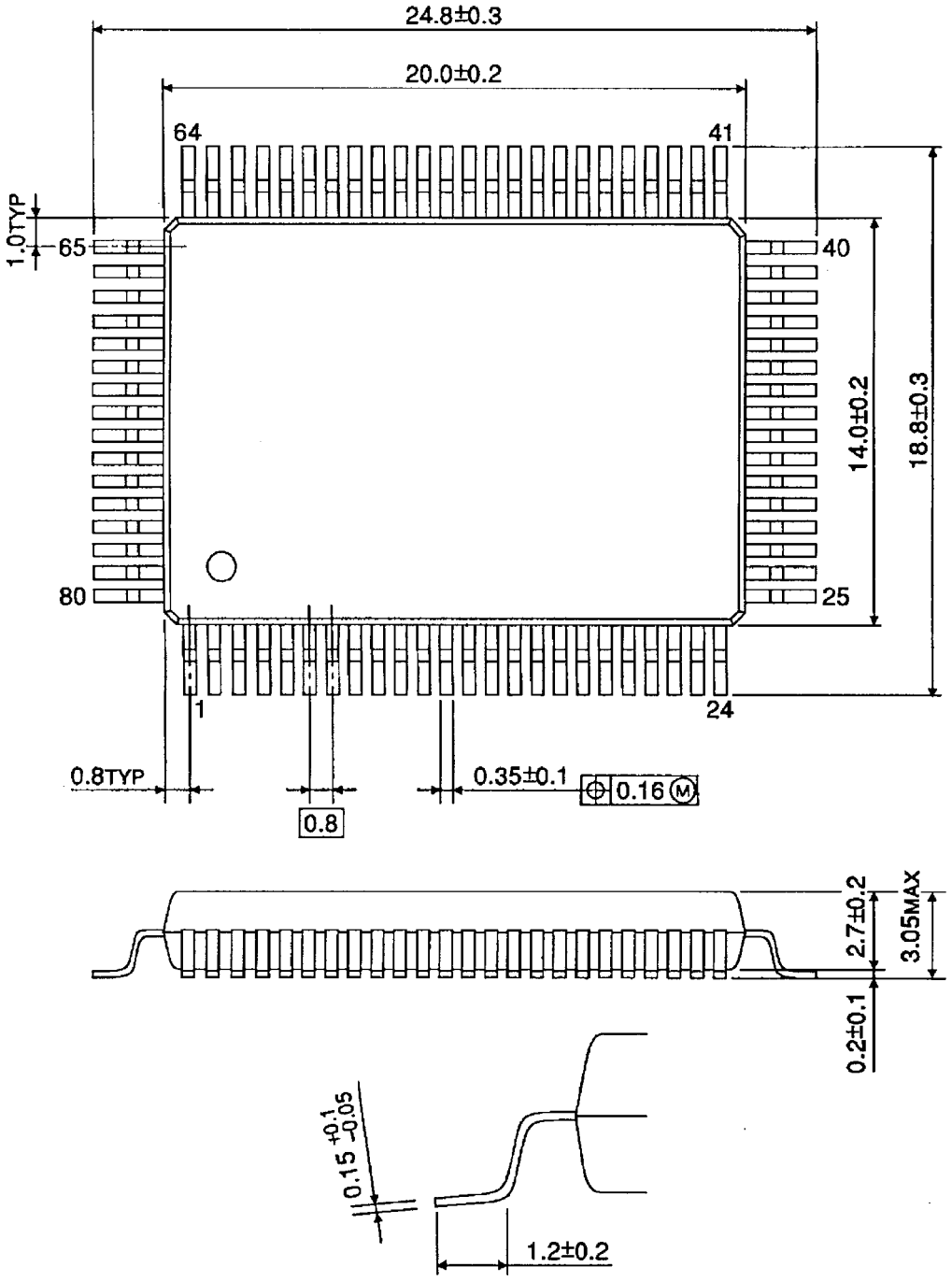


Scribe Line

PAD Pitch 160μm

Package Dimensions

QFP80-P-1420-0.80A Unit : mm



Weight: 1.52 g (typ.)

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