

KS5190

CMOS DIGITAL INTEGRATED CIRCUIT

**6 FUNCTION 6 DIGIT ALARM-CHRONOGRAPH
DUPLEXED LCD WATCH CIRCUIT**

The KS5190 is a CMOS 6 function watch circuit with alarm and autoranging chronograph function; designed to be used with a 6 digit duplexed liquid crystal display, 7 day mark, date mark, AM/PM mark, and colon.

FUNCTIONS

- 6 Function: Month, Date, Day-of-Week, Hour, Minute, Second
- Alarm function with 4 to 5 minute snooze
- 6 digit Chronograph: Autoranging after 30 minutes to hour, minute; second.
- Use selectable 12 hour/24 hour format
- Alarm output for melody IC (KS5310 Series)
- 4 year calendar
- One touch correction of time error within ± 30 seconds.
- Fast advance for time and alarm time set
- Chime on every hour
- 3 Switch sequential operation
- LCD test

FEATURES

- Single chip CMOS construction
- Drives 6 digit duplexed LCD with 7 day mark, AM/PM mark, date mark and alarm mark
- Colon display
- Direct drive of piezoelectric transducer at 3 volt peak to peak
- 32,768Hz crystal frequency
- On-chip oscillator and resistors
- On-chip voltage doubler
- Single 1.5V battery operation
- Low power dissipation
- Debounce circuitry on switch inputs
- Protection against static discharge

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Value	Unit
Supply Voltage ($V_{DD} - V_{SS}$)	V_{DS}	-0.3 ~ +2.0	V
Supply Voltage ($V_{DD} - V_{EE}$)	V_{DE}	-0.3 ~ +4.0	V
Operating Temperature	T_{opr}	-20 ~ +75	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 ~ +125	$^\circ\text{C}$

* Voltage greater than above may result in damage to the circuit.

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ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{DD} = 0\text{V}$, $V_{SS} = -1.5\text{V}$; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	$ V_{SS} $		1.2	1.5	1.8	V
	$ V_{EE} $		2.4	3.0	3.6	V
Supply Current	I_{DD}	Without Load		1.0	2.0	μA
Input High Voltage	V_{IH}		$V_{DD} - 0.3$		V_{DD}	V
Input Low Voltage	V_{IL}		V_{SS}		$V_{SS} + 0.3$	V
Switch Activation Current	I_{SW}	$V_{in} = V_{DD}$	0.1	0.5	3	μA
Oscillator Start Voltage	$ V_{OSCL} $	Within 5 Sec			1.45	V
Oscillator Stop Voltage	$ V_{OSPL} $				1.15	V
Alarm Drive Current	I_{ala}	$V_{sat} = 0.5\text{V}$ (Both Direction)	0.5	2.0		mA
	I_{alb}	$V_{sat} = 0.5\text{V}$	10	20		μA
Oscillator Frequency	F_{OSC}			32,768		Hz
DC-DC Conversion Frequency	F_{CON}	$C1 = C2 = 0.1\mu\text{F}$		1,024		Hz
LCD Frequency	F_d			32		Hz
Oscillator Input Capacitor	C_{in}			25		pF
Time Stability	T_{stb}	$\Delta V_{DD} = 0.5\text{V}$ ($C_{out} = 25\text{pF}$)			1	ppm
Switch Debouncing Time	T_{deb}				31.25	mSEC

LCD FORMAT

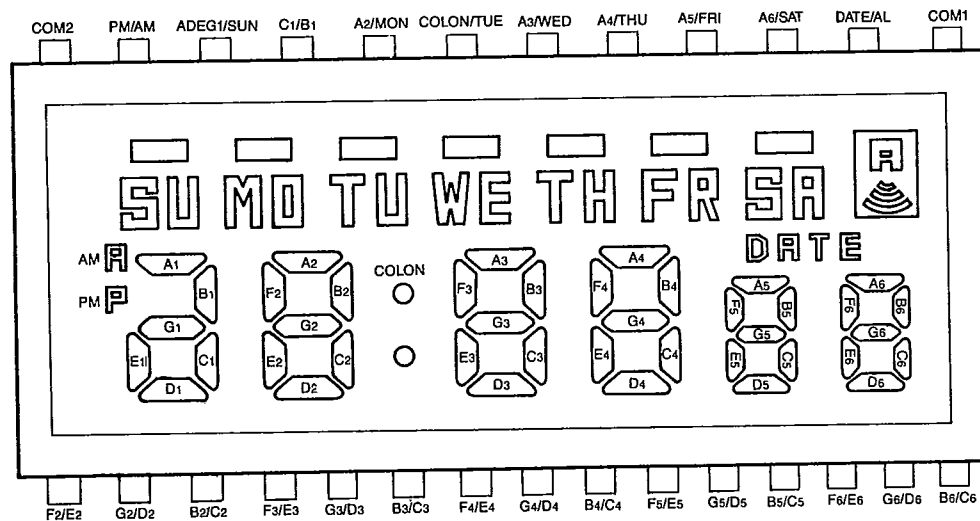


Fig. 1

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ALARM OUTPUT WAVEFORMS

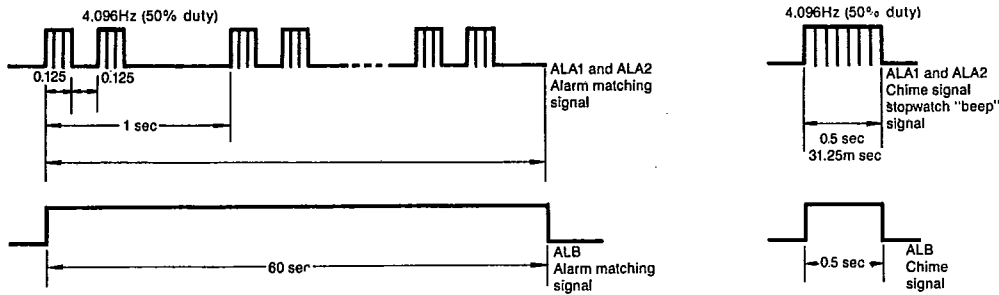


Fig. 2

APPLICATION CIRCUIT

1) Melody Drive Type

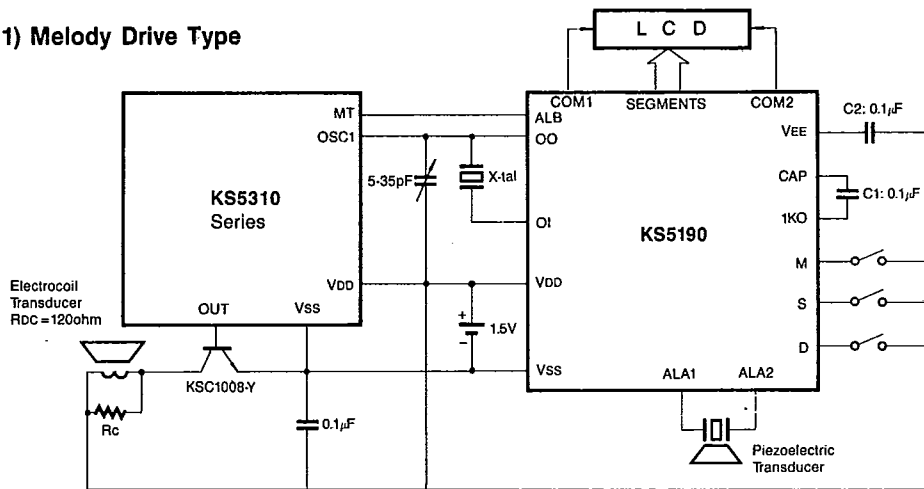
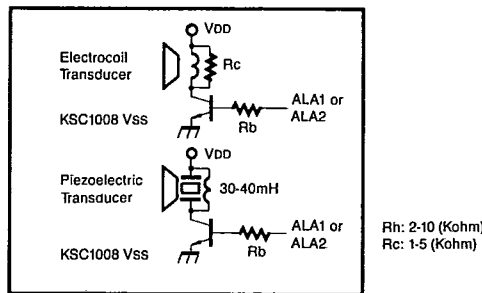


Fig. 3-1. Typical Application Circuit with Melody IC



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2) Piezo Drive Type

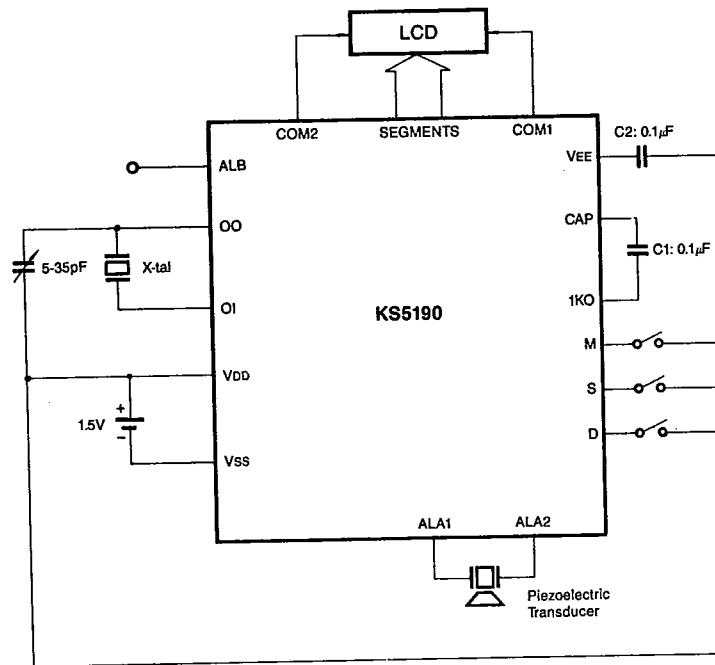


Fig. 3-2. Typical Application Circuit

- * Quartz Crystal Parameter
- F_p = 32,768Hz
- CL = 12.5pF
- C1 = 4 fF
- CO = 2.5pF
- Rs = 35KΩ
- Q = 35,000

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SETTING SEQUENCE AND SWITCH OPERATION

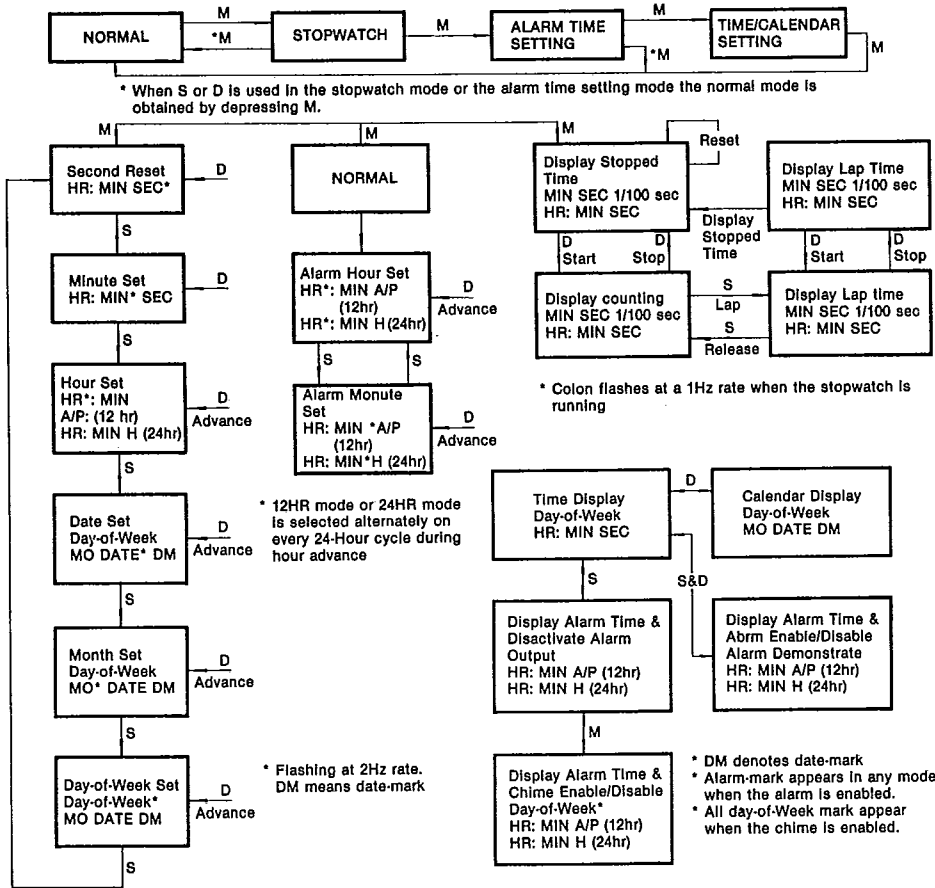


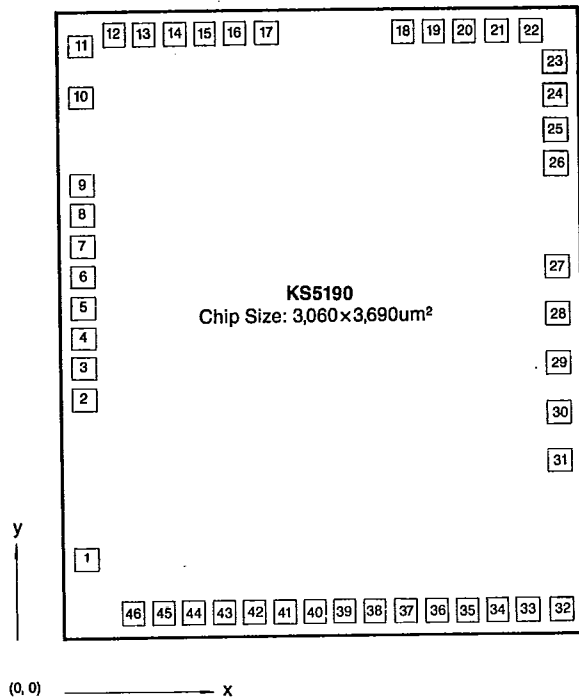
Fig. 4

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PAD DIAGRAM

(3,060, 3,690)

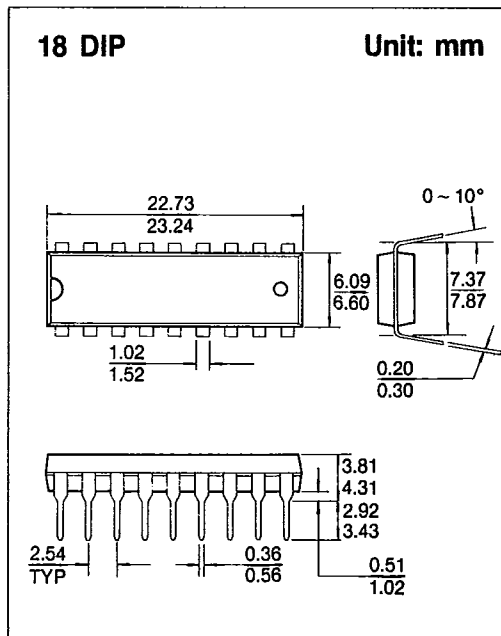
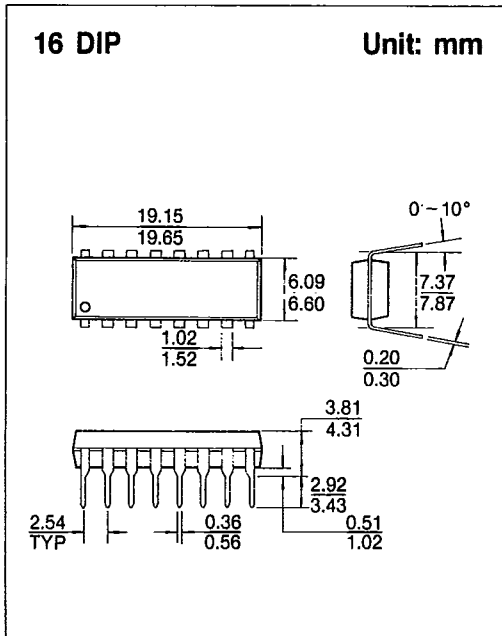
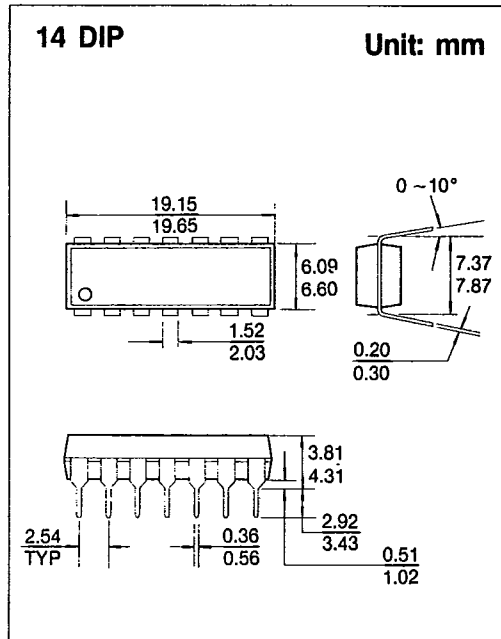
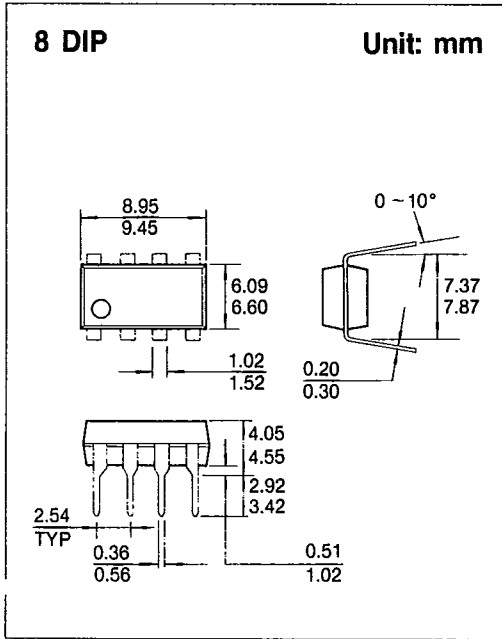


KS5190 PAD LOCATION

Pad No.	Pad Name	Coordinates		Pad No.	Pad Name	Coordinates		Pad No.	Pad Name	Coordinates		Pad No.	Pad Name	Coordinates	
		X	Y			X	Y			X	Y			X	Y
1	OI	135	450	13	A1/SUN	513	3554	25	S	2924	2959	37	F5/E5	1993	134
2	OO	135	1411	14	C1/B1	693	3554	25	CAP	2324	2777	38	B4/C4	1818	134
3	ALA1	135	1600	15	A2/MON	873	3554	27	1KO	2924	2154	39	G4/D4	1538	134
4	ALA2	135	1730	16	CL/TUE	1053	3554	28	V _{EE}	2924	1879	40	F4/E4	1458	134
5	ALB	125	1960	17	A3/WED	1233	3554	29	T2	2924	1591	41	B3/C3	1273	134
6	V _{EE}	135	2140	18	A4/THU	2052	3554	30	T1	2924	1294	42	G3/D3	1098	134
7	V _{SS}	135	2320	19	A5/FRI	2232	3554	31	V _{DD}	2924	1008	43	F3/E3	918	134
8	V _{DD}	135	2500	20	A6/SAT	2412	3554	32	B6/C6	2398	134	44	B2/C2	738	134
9	AC	135	2680	21	DTE/AL	2592	3554	33	C6/D6	2718	134	45	G2/G2	553	134
10	M	135	3202	22	COM1	2739	3554	34	F6/E6	2538	134	46	F2/E2	378	134
11	COM2	135	3507	23	T3	2024	3364	35	B5/C5	2353	134	—	—	—	—
12	PM/AM	333	3554	24	D	2024	3184	35	G5/D5	2173	134	—	—	—	—

PACKAGE DIMENSIONS

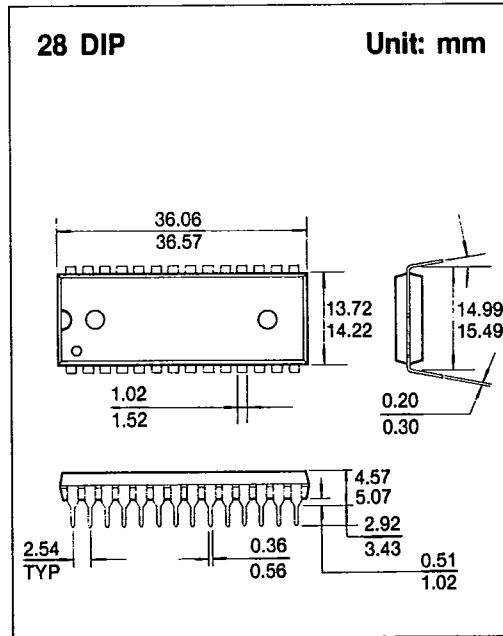
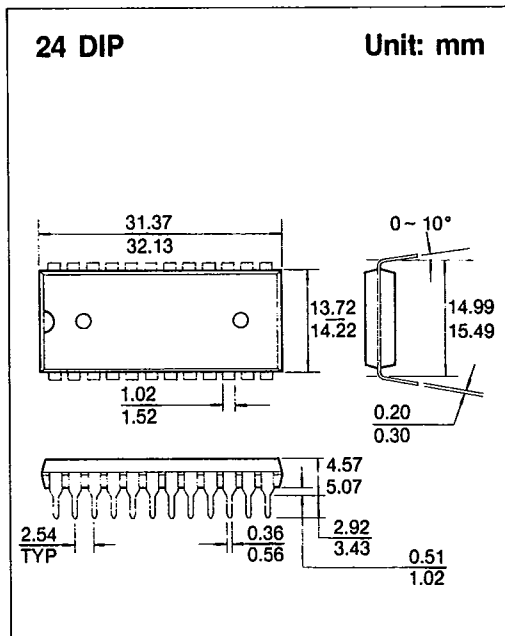
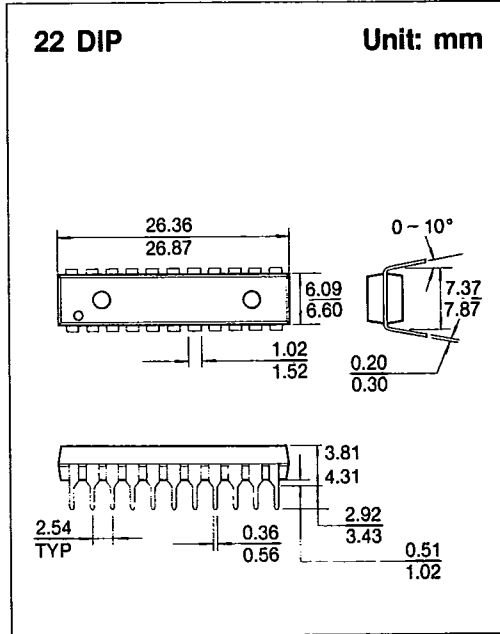
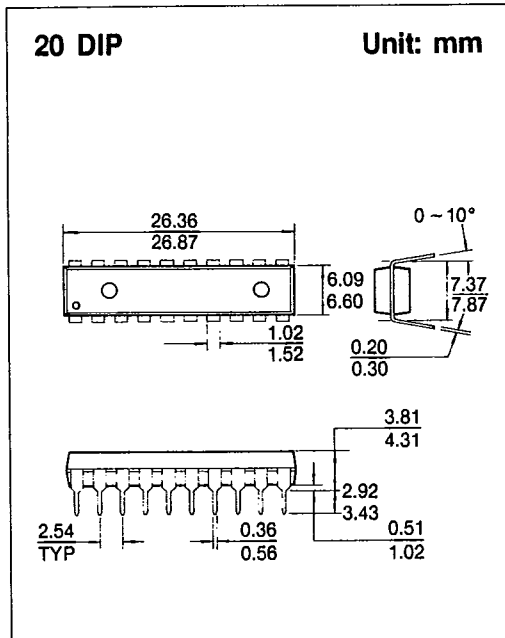
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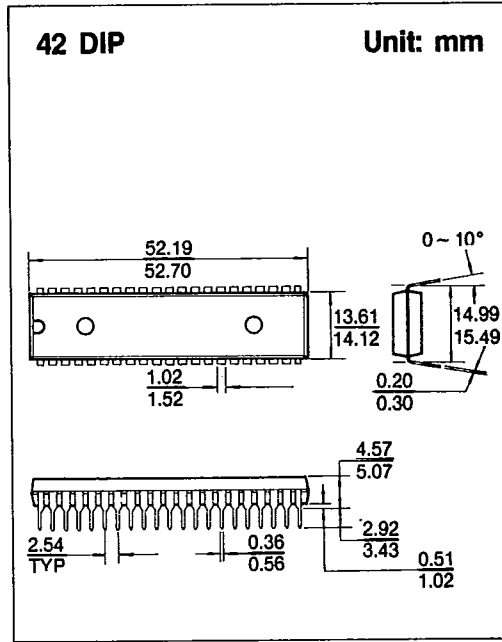
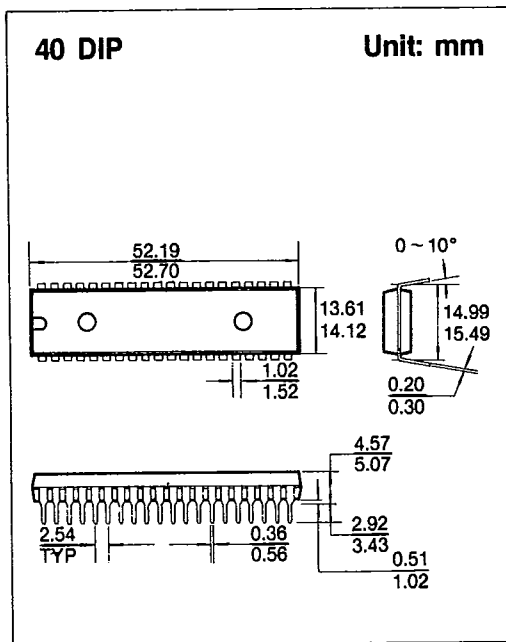
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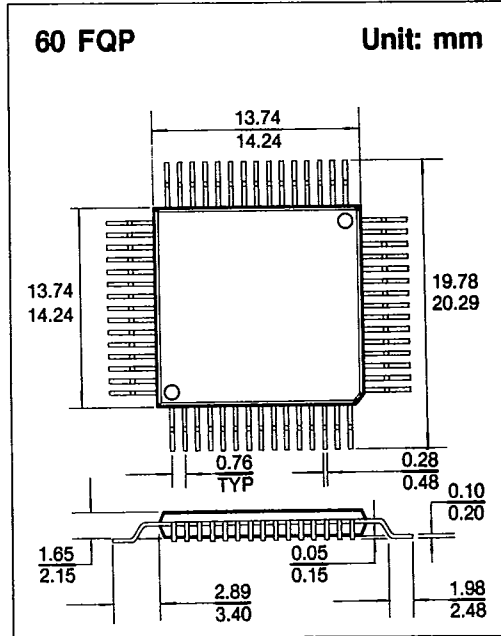
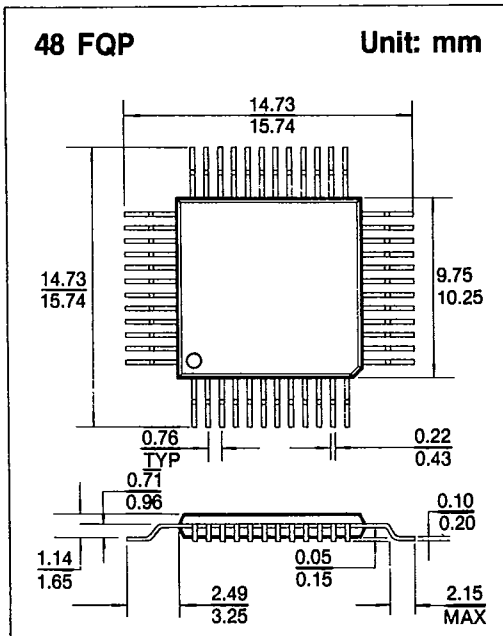


PACKAGE DIMENSIONS

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PACKAGE DIMENSIONS

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