NEC

MOS DIGITAL INTEGRATED CIRCUIT
μPD2813C

CLOCK AND RADIO FREQUENCY COUNTER/DISPLAY CIRCUIT
CMOS LSI

The μPD2813C is a CMOS LSI very suitable for U.S. band automotive radios and stereos.
The μPD2813C is packaged in a 42 pin plastic dual in-line package (DIP).

CLOCK FEATURES

1. Standard Clock
   - 12 hour clock (With AM/PM display)
   - Hour and minute display
   - Easy time set controls
2. Elapsed Time Counter
   - Measures elapsed time (Max. 19 hours 59 minutes)
   - Easy reset/start control
3. Calendar Function
   - Month and day display
   - Automatic calendar correction (for 4 years)
   - Easy calendar set controls

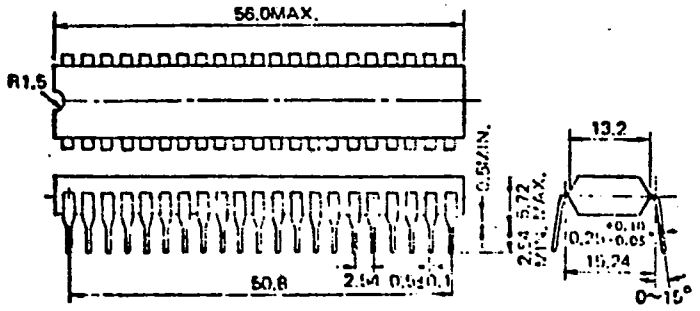
RADIO FEATURES

- Measures standard AM and FM frequencies
- Display frequencies on 3½ digit display
- External programmable IF offset (AM only)

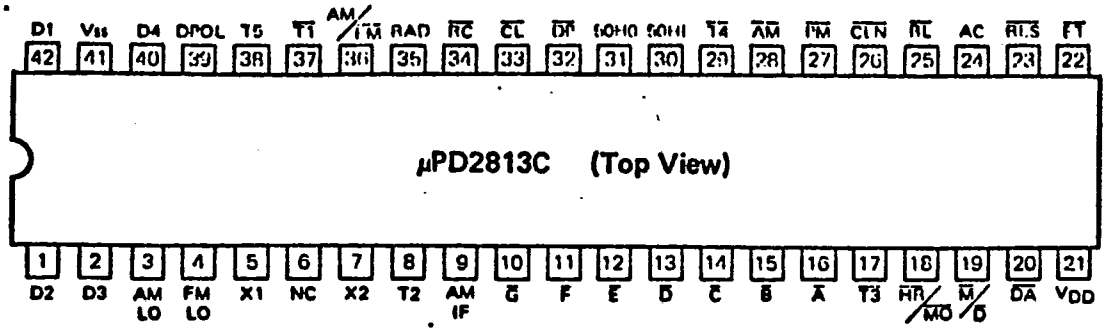
GENERAL FEATURES

- Low power due to CMOS ..... I_{DD} = 8.0mA (MAX.)
- Single power supply ..... V_{DD} = 5.0 ± 0.5 volts
- Display blanking

PACKAGE DIMENSIONS (Unit: mm)



PIN CONNECTION



PIN NO.	SYMBOL	DESCRIPTION	PIN NO.	SYMBOL	DESCRIPTION
1	D2	Digit pulse "D2" output	22	$\overline{ET}$	Elapsed time call input
2	D3	Digit pulse "D3" output	23	$\overline{RES}$	Elapsed time reset/start input
3	AM LO	AM local frequency input	24	AC	Clock counter all clear input
4	FM LO	FM frequency input (1/40)	25	$\overline{BL}$	Display blanking input
5	X1	10.24 MHz oscillator input	26	$\overline{CLN}$	Segment signal "COLON" outpu
6	NC	No connection	27	$\overline{PM}$	Segment signal "PM" output
7	X2	10.24 MHz oscillator output	28	$\overline{AM}$	Segment signal "AM" output
8	T2	Test terminal 2 (Normal open)	29	$\overline{T4}$	Test terminal 4 (Normal V_{DD})
9	AM IF	AM IF offset	30	50HI	50Hz clock pulse input
10	$\overline{G}$	Segment signal "G" output	31	50HO	50Hz clock pulse output
11	$\overline{F}$	Segment signal "F" output	32	$\overline{DP}$	Segment signal "DP" output
12	$\overline{E}$	Segment signal "E" output	33	$\overline{CL}$	Timing circuit clearing input
13	$\overline{D}$	Segment signal "D" output	34	$\overline{RC}$	Radio frequency call input
14	$\overline{C}$	Segment signal "C" output	35	RAD	Radio power indicating input
15	$\overline{B}$	Segment signal "B" output	36	AM/$\overline{FM}$	AM/FM switching input
16	$\overline{A}$	Segment signal "A" output	37	$\overline{T1}$	Test terminal 1 (Normal V_{DD})
17	$\overline{T3}$	Test terminal 3 (Normal V_{DD})	38	T5	Test terminal 5 (Normal open)
18	$\overline{HR}/\overline{MO}$	Hour or month set control	39	DPOL	Digit polarity selection input
19	$\overline{M}/\overline{D}$	Minute or day set control	40	D4	Digit pulse "D4" output
20	$\overline{DA}$	Calendar call input	41	Vss	System ground (0V)
21	V_{DD}	Power supply (+5 ± 0.5V)	42	D1	Digit pulse "D1" output

PIN EXPLANATIONS

PIN NO.	NAME	DESCRIPTION
1, 2, 40, 42, 39	Digit Digit Polarity	These outputs are used as digit drivers for the display. These pins go to high/low level to select the appropriate digit with DPOL Terminal put to low/high level. DPOL is provided with internal pull up resistor.
3 4	AM Local FM Local	This input is the AM band local oscillator input. This input is the FM band local oscillator input. The frequency is divided by 40 using a prescaler (μPB551C).
5, 7	Crystal Osc.	These pins are for connection to a 10.24MHz crystal.
8, 17, 29, 37, 38	Test	These pins are for testing. 8, 38 pin .... Normally use at open. 17, 29, 37 pin ...... Normally connect to V_{DD}.
10–16, 26–28, 32	Segments & CO-LON,PM,AM,DP	These outputs are used as segment drivers for the display. Active Low (An output is low for a segment to be on.)
18 19	Set Hours/Months Set Minutes /Days	A ground on these pins causes the hours or months and minutes or days to update at 1 per second rate. There is a one second delay before updating. These inputs are provided with internal pull up resistors.
20 22 23 34	Call Date Call Elapsed Time Reset/Start Elapsed Time Call Radio Freq.	A ground on this pin switches the display from standard time to date and remains there for 4 seconds. A ground on this pin switches the display from standard time to elapsed time and remains there for 4 seconds. A ground on this pin resets the elapsed time counter. The elapsed time counter starts automatically. A ground on this pin switches the display from standard time to radio frequency and remains there for 4 seconds. These inputs are provided with internal pull up resistors.
35 36 9	Radio Vcc AM/$\overline{FM}$ AM IF Offset	The display automatically switches time to frequency when radio is turned on and remains there for 4 seconds, and frequency to time as soon as radio is turned off. A high on this pin sets the logic to expect a AM frequency in. A low sets the internal logic to FM. This input is provided with internal pull up resistor. A high on this pin sets AM IF to 455kHz. A low sets to 262kHz. (Pull up resistor is installed.)
24 33	All Clear Clear	A high level resets the time counter. Normally pull down to ground with a resistor. A high level resets the timing circuit. Normally connect to V_{DD}.
25	Display blanking	A low level inhibits the display and key inputs ($\overline{HR}/\overline{MO}$, $\overline{M}/\overline{D}$, $\overline{DA}$, $\overline{ET}$, $\overline{RES}$). This input is provided with internal pull up resistor.

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Supply Voltage	V_{DD}	−0.3 to +6.0	V
Input Voltage	V_I	−0.3 to V_{DD}	V
Output Voltage	V_O	−0.3 to V_{DD}	V
Operating Temperature	Topt	−30 to +75	°C
Storage Temperature	Tstg	−55 to +125	°C

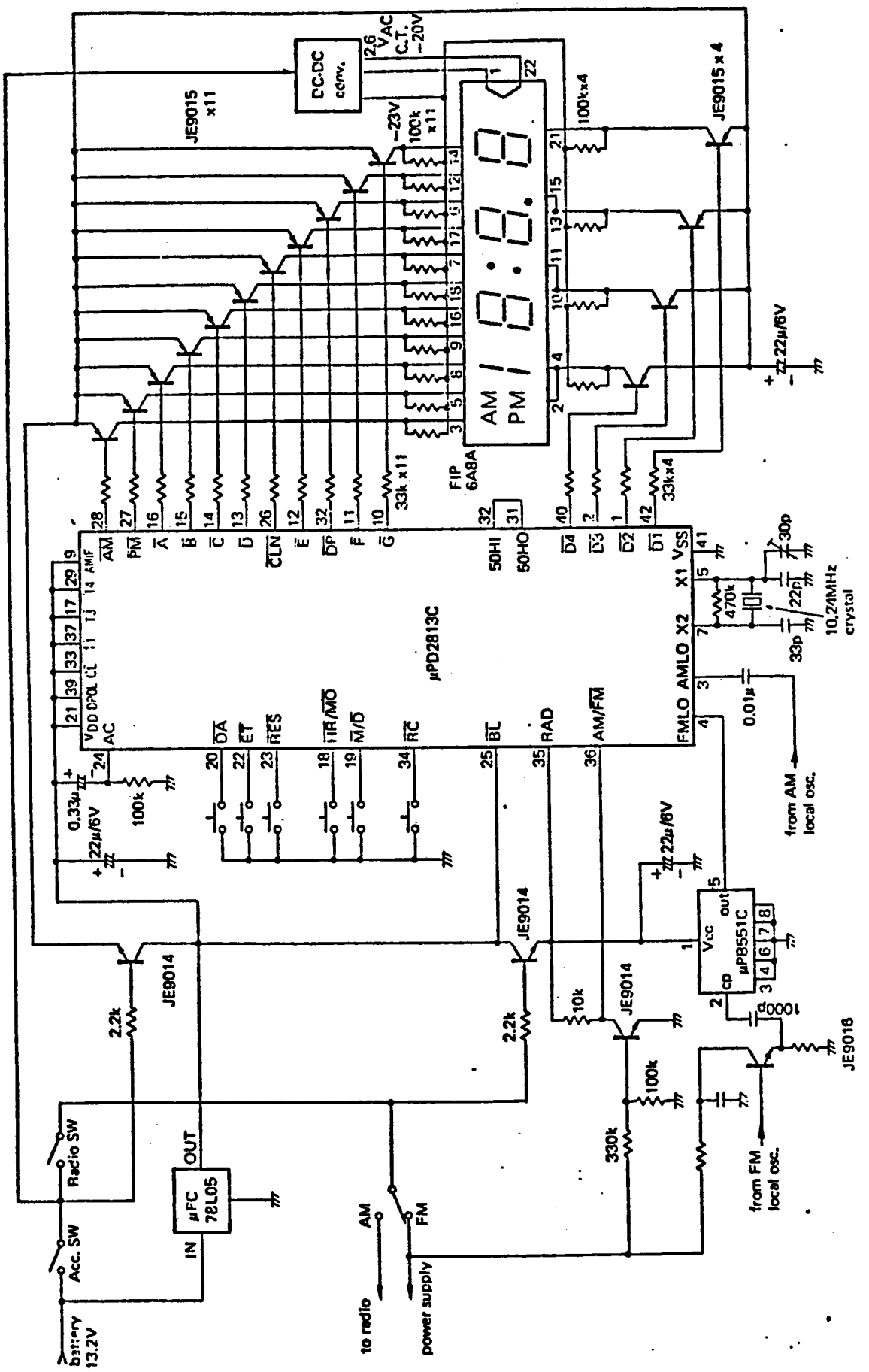
ELECTRICAL CHARACTERISTICS (Ta=−30 to +75°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Power Supply Voltage	V_{DD}	4.5	5.0	5.5	V	
High Level Input Voltage	V_{IH}	0.75V_{DD}		V_{DD}	V	All inputs except
Low Level Input Voltage	V_{IL}	0		0.25V_{DD}	V	3pin, $\overline{T1}$, $\overline{T3}$ and $\overline{T4}$
High Level Output Voltage	V_{OH1}	0.75V_{DD}			V	I_{OH}=−1.3mA, *1
Low Level Output Voltage	V_{OL1}			0.25V_{DD}	V	I_{OL}= 1.3mA, *1
High Level Output Voltage	V_{OH2}	0.75V_{DD}			V	I_{OH}=−0.5mA, *2
Low Level Output Voltage	V_{OL2}			0.25V_{DD}	V	I_{OL}= 0.5mA, *2
Maximum Frequency Response	f_{dmax}	11.0			MHz	X1−X2, divider
	f_{pmax1}	3.1			MHz	FM input divider
	f_{pmax2}	2.1			MHz	AM input divider
AM Local Input Voltage	V_{am}	1.0			V_{p-p}	C coupled input
Power Supply Current	I_{DD}			8.0	mA	X1−X2, divider

*1 : 1, 2, 40, 42 pin (digit output)

*2 : 10 to 16, 26 to 28, 32 pin (segment, AM, PM, colon and decimal point output).

TYPICAL APPLICATION CIRCUIT



BLOCK DIAGRAM OF A FM/AM AUTOMOTIVE STEREO USING μPD2813C