HARRIS SEMICONDUCTOR

ICM7226A, ICM7226B

8-Digit, Multi-Function, Frequency Counter/Timer

August 1997

Features

- CMOS Design for Very Low Power
- Output Drivers Directly Drive Both Digits and Segments of Large 8-Digit LED Displays
- Measures Frequencies from DC to 10MHz; Periods from 0.5µs to 10s
- Stable High Frequency Oscillator uses either 1MHz or 10MHz Crystal
- Both Common Anode and Common Cathode Available
- Control Signals Available for External Systems Interfacing
- Multiplexed BCD Outputs

Applications

- Frequency Counter
- Period Counter
- Unit Counter
- Frequency Ratio Counter
- Time Interval Counter

Ordering Information

PART NUMBER	TEMP. RANGE (^{o}C)	PACKAGE	PKG. NO.
ICM7226AIJL	-25 to 85	40 Ld CERDIP	F40.6
ICM7226BIPL	-25 to 85	40 Ld PDIP	E40.6

Description

The ICM7226 is a fully integrated Universal Counter and LED display driver. It combines a high frequency oscillator, a decade timebase counter, an 8-decade data counter and latches, a 7-segment decoder, digit multiplexer and segment and digit drivers which can directly drive large LED displays. The counter inputs accept a maximum frequency of 10MHz in frequency and unit counter modes and 2MHz in the other modes. Both inputs are digital inputs. In many applications, amplification and level shifting will be required to obtain proper digital signals for these inputs.

The ICM7226 can function as a frequency counter, period counter, frequency ratio (f_A/f_B) counter, time interval counter or as a totalizing counter. The devices require either a 10MHz or 1MHz quartz crystal timebase, or if desired an external timebase can also be used. For period and time interval, the 10MHz timebase gives a 0.1µs resolution. In period average and time interval average, the resolution can be in the nanosecond range. In the frequency mode, the user can select accumulation times of 0.01s, 0.1s, 1s and 10s. With a 10s accumulation time, the frequency can be displayed to a resolution of 0.1Hz. There is 0.2s between measurements in all ranges. Control signals are provided to enable gating and storing of prescaler data.

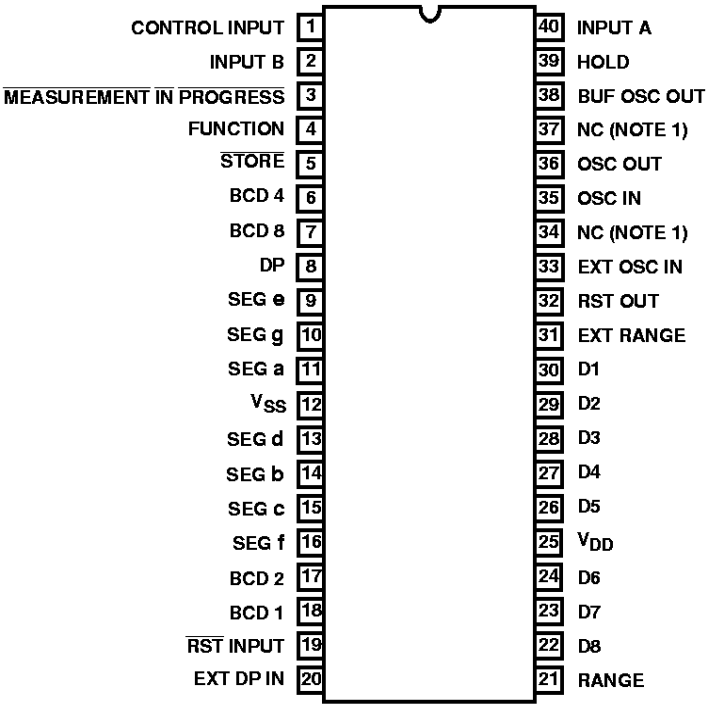
Leading zero blanking has been incorporated with frequency display in kHz and time in µs. The display is multiplexed at a 500Hz rate with a 12.2% duty cycle for each digit. The ICM7226A is designed for common anode displays with typical peak segment currents of 25mA, and the ICM7226B is designed for common cathode displays with typical segment currents of 12mA. In the display off mode, both digit drivers and segment drivers are turned off, allowing the display to be used for other functions.

CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper IC Handling Procedures.

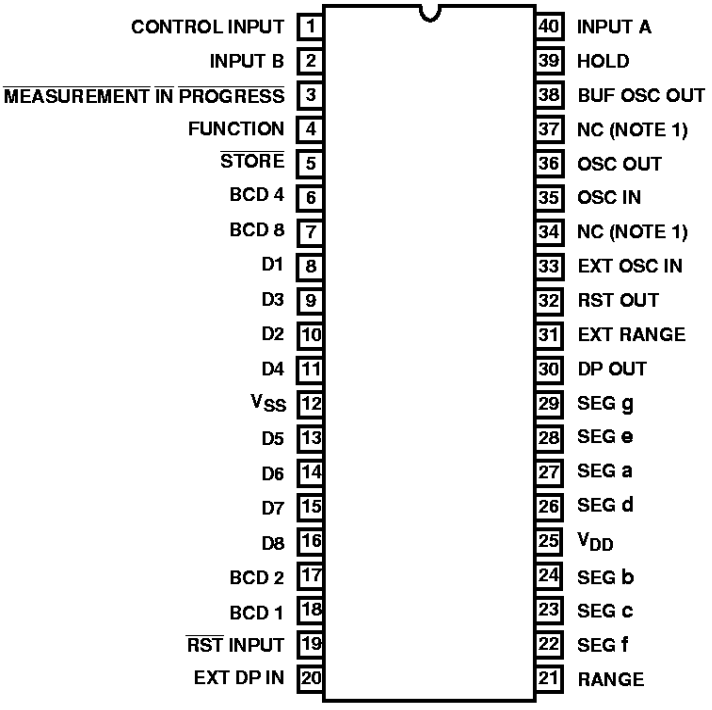
File Number **3169.1**

Pinouts

ICM7226A
COMMON ANODE (CERDIP)
TOP VIEW



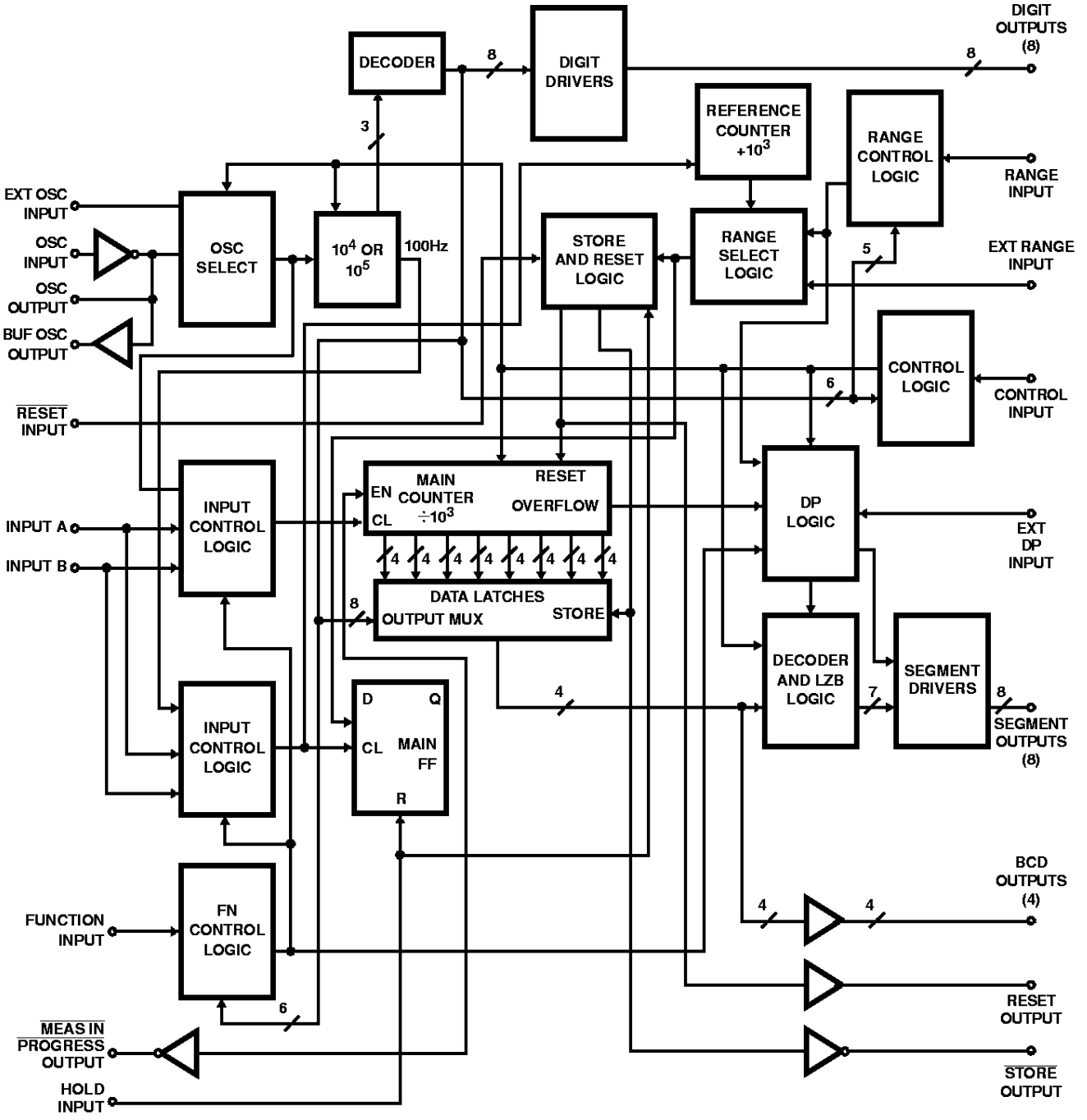
ICM7226B
COMMON CATHODE (PDIP)
TOP VIEW



NOTE:

1. For maximum frequency stability, connect to V_{DD} or V_{SS}.

Functional Block Diagram



Absolute Maximum Ratings

Maximum Supply Voltage (V_{DD} - V_{SS}) 6.5V
Maximum Digit Output Current 400mA
Maximum Segment Output Current 60mA
Voltage On Any Input or
Output Terminal (Note 1) . . . . . V_{DD} +0.3V to V_{SS} -0.3V

Operating Conditions

Temperature Range . . . . . -25°C to 85°C

Thermal Information

Thermal Resistance (Typical, Note 2)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
CERDIP Package	45	9
PDIP Package	50	N/A

Maximum Junction Temperature
CERDIP Package . . . . . 175°C
PDIP Package . . . . . 150°C
Maximum Storage Temperature Range . . . . . -55°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

1. Destructive latchup may occur if input signals are applied before the power supply is established or if inputs or outputs are forced to voltages exceeding V_{DD} or V_{SS} by 0.3V.
2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications

V_{DD} = 5.0V, T_A = 25°C, Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Operating Supply Current, I_{DD}	Display Off, Unused Inputs to V_{SS}	-	2	5	mA
Supply Voltage Range (V_{DD} -V_{SS}), V_{SUPPLY}	-25°C to 85°C, INPUT A, INPUT B Frequency at f_{MAX}	4.75	-	6.0	V
Maximum Frequency INPUT A, Pin 40, $f_{A(MAX)}$	-25°C to 85°C 4.75V < V_{DD} < 6.0V, Figure 9 Function = Frequency, Ratio, Unit Counter	10	14	-	MHz
	Function = Period, Time Interval	2.5	-	-	MHz
Maximum Frequency INPUT B, Pin 2, $f_{B(MAX)}$	-25°C to 85°C 4.75V < V_{DD} < 6.0V, Figure 10	2.5	-	-	MHz
Minimum Separation INPUT A to INPUT B, Time Interval Function	-25°C to 85°C 4.75V < V_{DD} < 6.0V, Figure 1	250	-	-	ns
Oscillator Frequency and External Oscillator Frequency, f_{OSC}	-25°C to 85°C 4.75V < V_{DD} < 6.0V	0.1	-	10	MHz
Oscillator Transconductance, g_M	V_{DD} -4.75V, T_A = 85°C	2000	-	-	µS
Multiplex Frequency, f_{MUX}	f_{OSC} = 10MHz	-	500	-	Hz
Time Between Measurements	f_{OSC} = 10MHz	-	200	-	ms
Input Rate of Charge, dV_{IN}/dt	Inputs A, B	-	15	-	mV/µs
Input Voltages: Pins 2, 19, 33, 39, 40, 35					
Input Low Voltage, V_{IL}	-25°C to 85°C	-	-	1.0	V
Input High Voltage, V_{IH}		3.5	-	-	V
Pins 2, 39, 40, Input Leakage, A, B, I_{ILK}		-	-	20	µA
Input Resistance to V_{DD} Pins 19, 33, R_{IN}	V_{IN} = V_{DD} -1.0V	100	400	-	kΩ
Input Resistance to V_{SS} Pin 31, R_{IN}	V_{IN} = +1.0V	50	100	-	kΩ
Output Current					
Low Output Current, Pins 3, 5-7, 17, 18, 32, 38, I_{OL}	V_{OL} = +0.4V	400	-	-	µA
High Output Current, Pins 5-7, 17, 18, 32, H_{OL}	V_{OH} = +2.4V	100	-	-	µA
High Output Current, Pins 3, 38, H_{OL}	V_{OH} = V_{DD} -0.8V	265	-	-	µA
ICM7226A					
Segment Driver: Pins 8-11, 13-16					
Low Output Current, I_{OL}	V_O = +1.5V	25	35	-	mA
High Output Current, I_{OH}	V_O = V_{DD} -1.0V	-	100	-	µA