

ICM7224/D, ICM7225/D, ICM7224/W, ICM7225/W

4 $\frac{1}{2}$ -Digit LCD/LED Display Counter



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GENERAL DESCRIPTION

The ICM7224 and ICM7225 devices constitute a family of high-performance CMOS 4 $\frac{1}{2}$ -digit counters, including decoders, output latches, display drivers, count inhibit, leading zero blanking, and reset circuitry.

The counter section provides direct static counting, guaranteed from DC to 15 MHz, using a 5V \pm 10% supply over the operating temperature range. At normal ambient temperatures, the devices will typically count up to 25 MHz. The COUNT input is provided with a Schmitt trigger to allow operation in noisy environments and correct counting with slowly changing inputs. The COUNT INHIBIT, STORE and RESET inputs allow a direct interface with the ICM7207/A to implement a low cost, low power frequency counter with a minimum component count.

These devices also incorporate several features intended to simplify cascading four-digit blocks. The CARRY output allows the counter to be cascaded, while the Leading Zero Blanking INput and OUTput allows correct Leading Zero Blanking between four-decade blocks. The BackPlane driver of the LCD devices may be disabled, allowing the segments to be slaved to another backplane signal, necessary when using an eight or twelve digit, single backplane display. In LED systems, the BRighTness input to several ICM7225 devices may be ganged to one potentiometer.

FEATURES

- **High Frequency Counting**—Guaranteed 15 MHz, Typically 25 MHz at 5V
- **Low Power Operation**—Typically Less Than 100 μ W Quiescent
- **STORE and RESET Inputs Permit Operation as Frequency or Period Counter**
- **True COUNT INHIBIT Disables First Counter Stage**
- **CARRY Output for Cascading Four-Digit Blocks**
- **Schmitt-Trigger On the COUNT Input Allows Operation In Noisy Environments or With Slowly Changing Inputs**
- **Leading Zero Blanking INput and OUTput for Correct Leading Zero Blanking With Cascaded Devices**
- **LCD Devices Provide Complete Onboard Oscillator and Divider Chain to Generate Backplane Frequency, or Backplane Driver May Be Disabled Allowing Segments to be Slaved to a Master Backplane Signal**
- **LED Devices Provide BRighTness Input Which Can Function Digitally as a Display Enable or as a Continuous Display Brightness Control With a Single Potentiometer and Directly Drive Common Anode LED Displays**

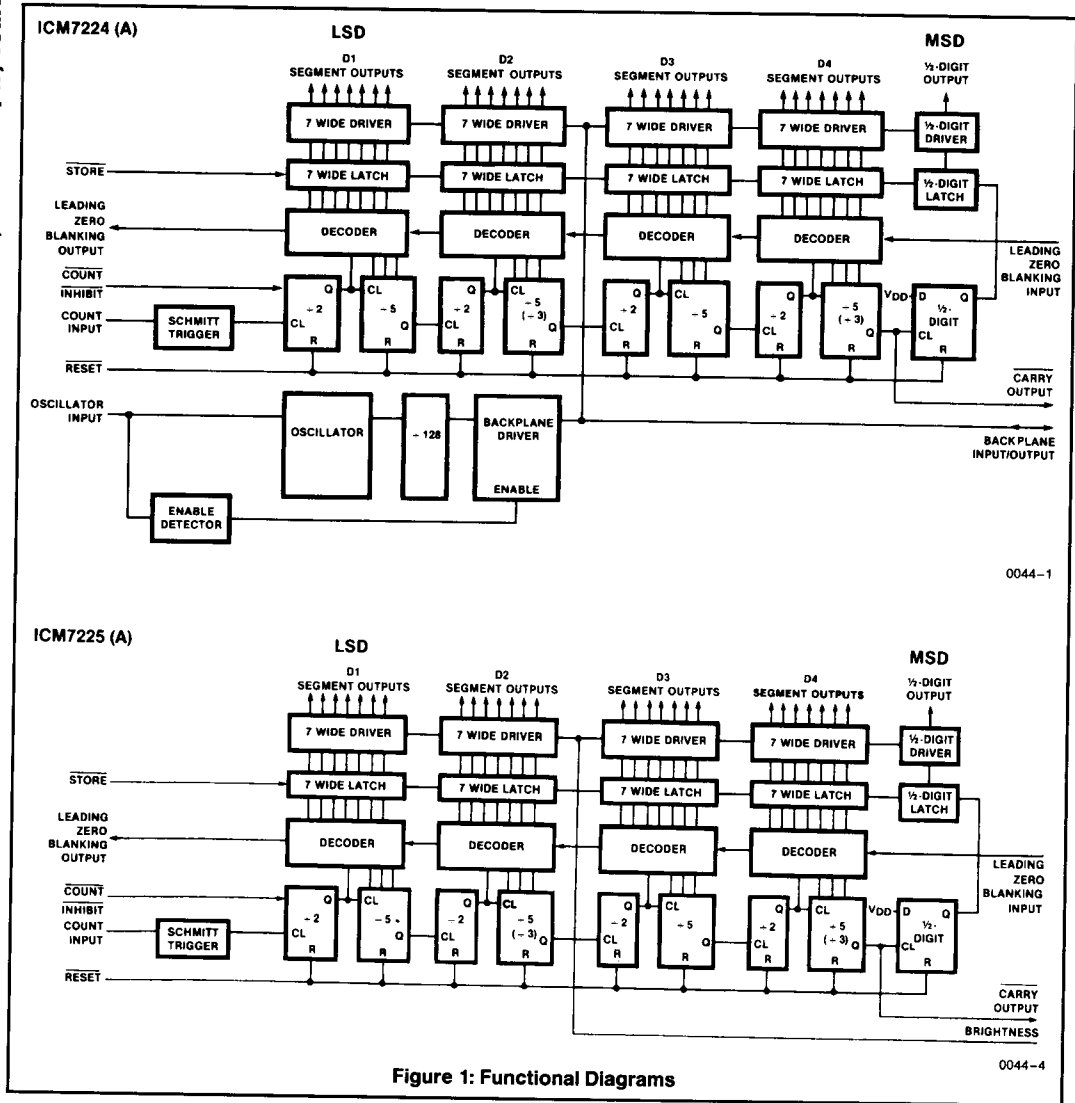
ORDERING INFORMATION

Part Number	Temperature	Form	Display Type	Count Option
ICM7224/D	+ 25°C	Dice	LCD	19999
ICM7224A/D	+ 25°C	Dice	LCD	15959
ICM7225/D	+ 25°C	Dice	LED	19999
ICM7225A/D	+ 25°C	Dice	LED	15959
ICM7224/W	+ 25°C	Wafer	LCD	19999
ICM7224A/W	+ 25°C	Wafer	LCD	15959
ICM7225/W	+ 25°C	Wafer	LED	19999
ICM7225A/W	+ 25°C	Wafer	LED	15959

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NOTE: All typical values have been characterized but are not tested.

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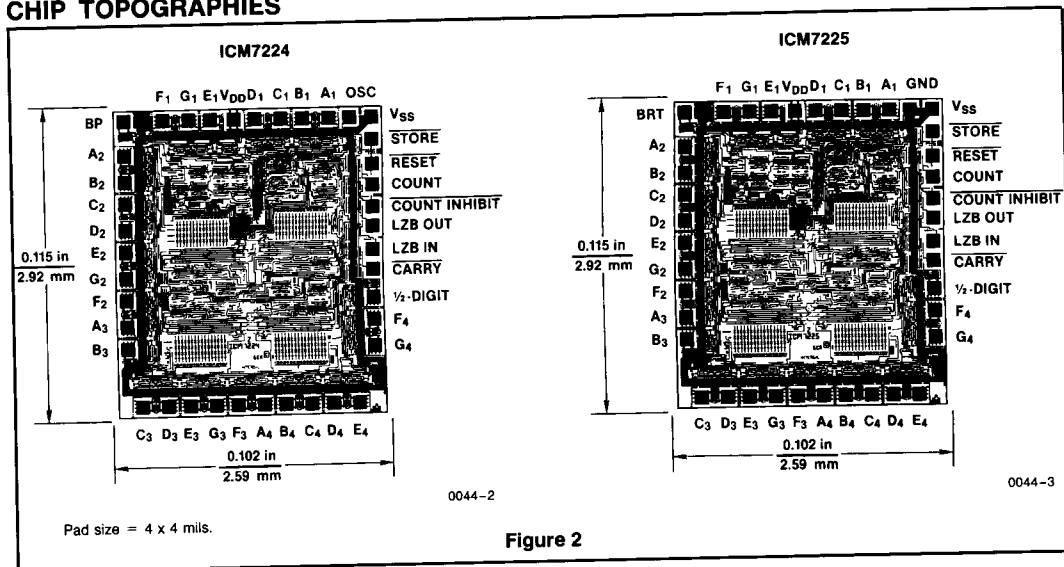
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CHIP TOPOGRAPHIES



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ABSOLUTE MAXIMUM RATINGS

Supply Voltage $V_{DD}-V_{SS}$	6.5V
Input Voltage (Any Terminal) (Note 1)	$V_{DD} + 0.3V$ to $V_{SS} - 0.3V$
Operating Temperature Range	25°C
Storage Temperature Range	-55°C to +125°C

NOTE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

NOTE 1: Due to the SCR structure inherent in the CMOS process, connecting any terminal to voltages greater than V_{DD} or less than V_{SS} may cause destructive device latchup. For this reason, it is recommended that no inputs from sources operating on a different power supply be applied to the device before its supply is established, and that in multiple supply systems, the supply to the ICM7224/ICM7225 be turned on first.

ELECTRICAL CHARACTERISTICS $V_{DD} = 5V \pm 10\%$, $T_A = 25^\circ C$, $V_{SS} = 0V$ unless otherwise indicated

ICM7224 CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{DD}	Operating Current	Test Circuit, Display Blank		10	50	μA
V_{SUPPLY}	Operating Supply Voltage Range ($V_{DD}-V_{SS}$)		3		6	V
I_{OSCI}	Oscillator Input Current	Pin 36		± 2	± 10	μA
t_R, t_F	Segment Rise/Fall Time	$C_{load} = 200 pF$		0.5		μs
t_R, t_F	BackPlane Rise/Fall Time	$C_{load} = 5000 pF$		1.5		
f_{OSC}	Oscillator Frequency	Pin 36 Floating		19		kHz
f_{BP}	Backplane Frequency	Pin 36 Floating		150		Hz

ICM7225 CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{STBY}	Operating Current Display Off	Pin 5 (BRIghtness) at V_{SS} Pins 29, 31-34 at V_{DD}		10	50	μA
V_{SUPP}	Operating Supply Voltage Range ($V_{DD}-V_{SS}$)		4		6	V
I_{DD}	Operating Current	Pin 5 at V_{DD} , Display 18888		200		mA
I_{SLK}	Segment Leakage Current	Segment OFF		± 0.01	± 1	μA
I_{SEG}	Segment ON Current	Segment ON, $V_{OUT} = +3V$	5	8		mA
I_H	Half-Digit ON Current	Half-Digit ON, $V_{OUT} = +3V$	10	16		

FAMILY CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_P	Input Pullup Currents	Pins 29, 31, 33, 34 $V_{OUT} = V_{DD} - 3V$		10		μA
V_{IH}	Input High Voltage	Pins 29, 31, 33, 34	3			V
V_{IL}	Input Low Voltage	Pins 29, 31, 33, 34			1	
V_{CT}	COUNT Input Threshold			2		
V_{CH}	COUNT Input Hysteresis			0.5		
I_{OH}	Output High Current	CARRY Pin 28 Leading Zero Blanking OUT Pin 30 $V_{OUT} = V_{DD} - 3V$	350	500		μA
I_{OL}	Output Low Current	CARRY Pin 28 Leading Zero Blanking OUT Pin 30 $V_{OUT} = +3V$	350	500		
f_{COUNT}	Count Frequency	$4.5V < V_{DD} < 6V$	0		15	MHz
t_S, t_R	STORE, RESET Minimum Pulse Width		3			μs

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