Am2920

Octal D-Type Flip-Flop with Clear, Clock Enable and Three-State Control

DISTINCTIVE CHARACTERISTICS

- Buffered common clock enable input
- Buffered common asynchronous clear input
- Three-state outputs
- 8-bit, high-speed parallel register with positive edge-triggered, D-type flip-flops

GENERAL DESCRIPTION

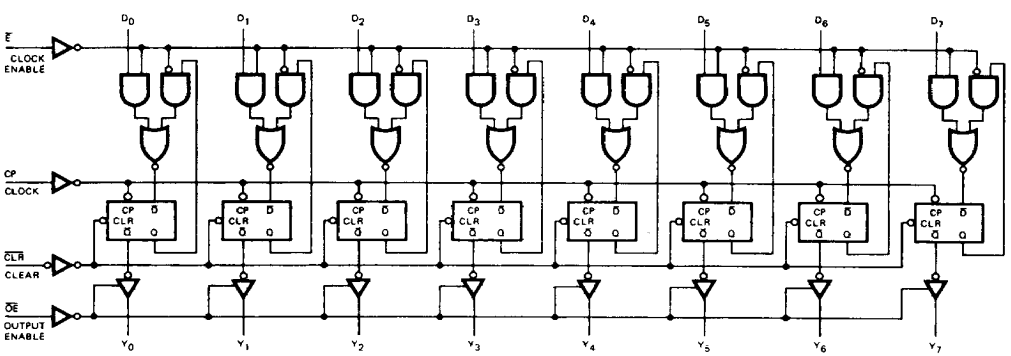
The Am2920 is an 8-bit register built using advanced Low-Power Schottky technology. The register consists of eight D-type flip-flops with a buffered common clock, a buffered common clock enable, a buffered asynchronous clear input, and three-state outputs.

When the clear input is LOW, the internal flip-flops of the register are reset to logic 0 (LOW), independent of all other inputs. When the clear input is HIGH, the register operates in the normal fashion.

When the three-state output enable ($\overline{OE}$) input is LOW, the Y outputs are enabled and appear as normal TTL outputs. When the output enable ($\overline{OE}$) input is HIGH, the Y outputs are in the high impedance (three-state) condition. This does not affect the internal state of the flip-flop Q output.

The clock enable input ($\overline{E}$) is used to selectively load data into the register. When the $\overline{E}$ input is HIGH, the register will retain its current data. When the $\overline{E}$ is LOW, new data is entered into the register on the LOW-to-HIGH transition of the clock input.

BLOCK DIAGRAM



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RELATED PRODUCTS

Part No.	Description
Am25LS2520	Octal D-type Flip-Flop
Am2918	Quad D-Registers
Am2954/55	Octal D-Registers
Am29821-26	8, 9, 10-Bit Registers

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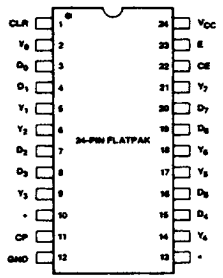
Refer to Page 13-1 for Essential Information on Military Devices

CONNECTION DIAGRAM
Top View

F-24



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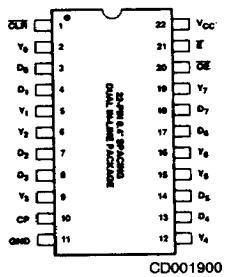
P-22
D-22



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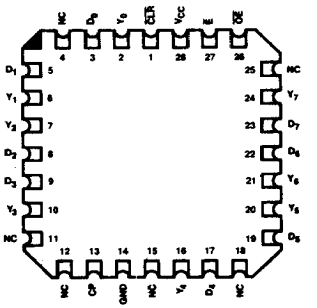

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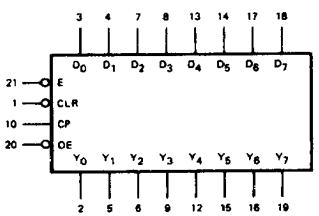
Note: Pin 1 is marked for orientation
*RESERVED — do not use.

LOGIC SYMBOL



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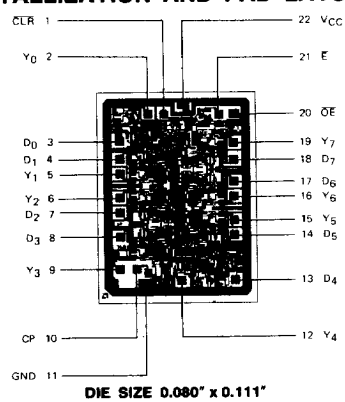
METALLIZATION AND PAD LAYOUT



DIE SIZE 0.080" x 0.111"

ORDERING INFORMATION

AMD products are available in several packages and operating ranges. The order number is formed by a combination of the following: Device number, speed option (if applicable), package type, operating range and screening option (if desired).

Am2920 **D** **C** **B**

- **B** — Screening Option
  - Blank – Standard processing
  - B – Burn-in
- **C** — Temperature (See Operating Range)
  - C – Commercial (0°C to +70°C)
  - M – Military (–55°C to +125°C)
- **D** — Package
  - D– 22-pin CERDIP
  - F– 24-pin flatpak
  - L– 28-pin leadless chip carrier
  - P– 22-pin plastic DIP
  - X– Dice
- **Am2920** — Device type
  - Octal D-Type Flip-Flop

Valid Combinations	
Am2920	PC DC, DCB, DM, DMB FM, FMB LC, LCB, LM, LMB XC, XM

Valid Combinations

Consult the AMD sales office in your area to determine if a device is currently available in the combination you wish.

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Refer to Page 13-1 for Essential Information on Military Devices

PIN DESCRIPTION

Pin No.	Name	I/O	Description
	D_i	I	The D flip-flop data inputs.
1	$\overline{CLR}$	I	When the clear input is LOW, the Q_i outputs are LOW, regardless of the other inputs. When the clear input is HIGH, data can be entered into the register.
10	CP	I	Clock Pulse for the Register; enters data into the register on the LOW-to-HIGH transition.
	Y_i	O	The register three-state outputs.
21	$\overline{E}$	I	Clock Enable. When the clock enable is LOW, data on the D_i input is transferred to the Q_i output on the LOW-to-HIGH clock transition. When the clock enable is HIGH, the Q_i outputs do not change state, regardless of the data or clock input transitions.
20	$\overline{OE}$	I	Output Control. When the $\overline{OE}$ input is HIGH, the Y_i outputs are in the high impedance state. When the $\overline{OE}$ input is LOW, the TRUE register data is present at the Y_i outputs.

GUARANTEED LOADING RULES OVER OPERATING RANGE (In Unit Loads)

A Low-Power Schottky TT2 Unit Load is defined as 20μA measured at 2.7V HIGH and −0.36mA measured at 0.4V LOW.

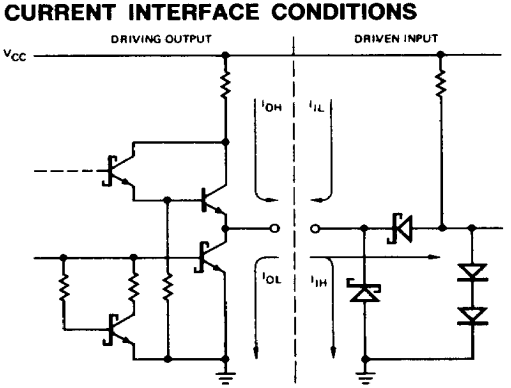
		Am2920				
			Output HIGH		Output LOW	
Pin No.'s	Input/ Output	Input Load	MIL	COM'L	MIL	COM'L
1	$\overline{CLR}$	1	–	–	–	–
2	Y_0	–	50	130	22	22
3	D_0	1	–	–	–	–
4	D_1	1	–	–	–	–
5	Y_1	–	50	130	22	22
6	Y_2	–	50	130	22	22
7	D_2	1	–	–	–	–
8	D_3	1	–	–	–	–
9	Y_3	–	50	130	22	22
10	CP	1	–	–	–	–
11	GND	–	–	–	–	–
12	Y_4	–	50	130	22	22
13	D_4	1	–	–	–	–
14	D_5	1	–	–	–	–
15	Y_5	–	50	130	22	22
16	Y_6	–	50	130	22	22
17	D_6	1	–	–	–	–
18	D_7	1	–	–	–	–
19	Y_7	–	50	130	22	22
20	$\overline{OE}$	1	–	–	–	–
21	$\overline{E}$	1	–	–	–	–
22	V_{CC}	–	–	–	–	–

FUNCTION TABLE

	Inputs					Internal	Outputs
Function	$\overline{OE}$	$\overline{CLR}$	$\overline{E}$	D_i	CP	Q_i	Y_i
Hi-Z	H	X	X	X	X	X	Z
Clear	H	L	X	X	X	L	Z
	L	L	X	X	X	L	L
Hold	H	H	H	X	X	NC	Z
	L	H	H	X	X	NC	NC
Load	H	H	L	L	↑	L	Z
	H	H	L	H	↑	H	Z
	L	H	L	L	↑	L	L
	L	H	L	H	↑	H	H

H = HIGH
L = LOW
X = Don't Care
NC = No Change
↑ = LOW-to-HIGH transition
Z = High-Impedance

LOW-POWER SCHOTTKY INPUT/OUTPUT CURRENT INTERFACE CONDITIONS



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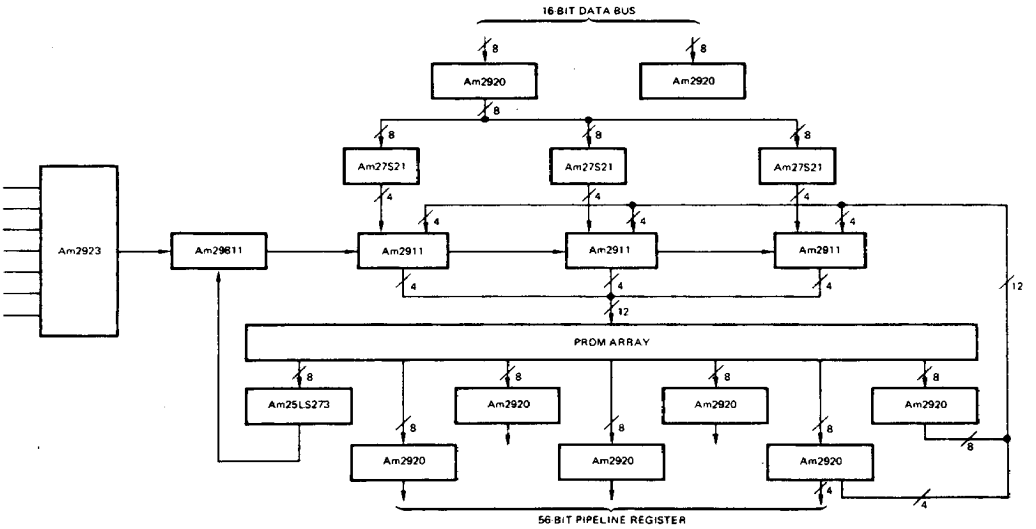
Note: Actual current flow direction shown.

APPLICATIONS



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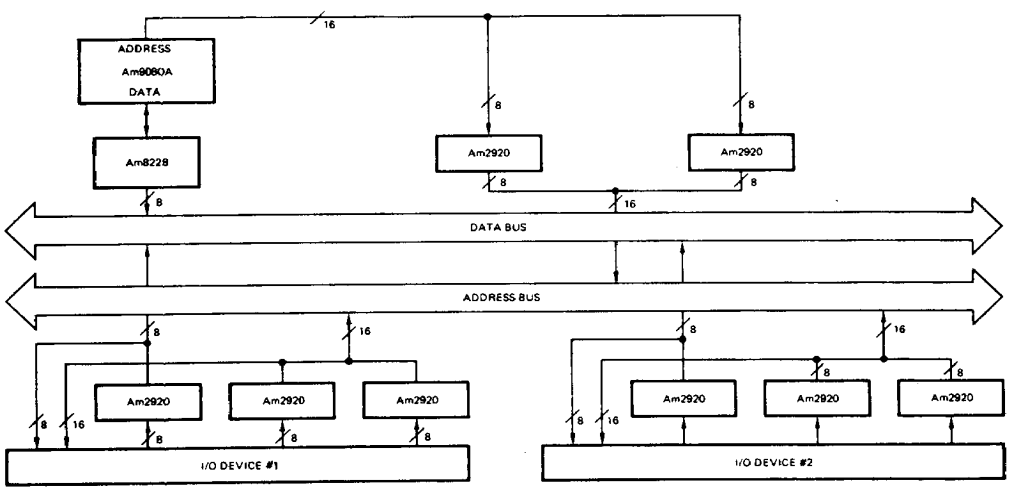
A typical Computer Control Unit for a microprogrammed machine.



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The Am2920 is a useful device in interfacing with the Am9080A system buses.

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Refer to Page 13-1 for Essential Information on Military Devices

ABSOLUTE MAXIMUM RATINGS

Storage Temperature ..... −65°C to +150°C
(Ambient) Temperature Under Bias ..... −55°C to +125°C
Supply Voltage to Ground Potential
Continuous ..... −0.5V to +7.0V
DC Voltage Applied to Outputs For
High Output State ..... −0.5V to +V_{CC} max
DC Input Voltage ..... −0.5V to +7.0V
DC Output Current, Into Outputs 30mA
DC Input Current ..... −30mA to +5.0mA

Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

OPERATING RANGES

Commercial (C) Devices
Temperature ..... 0°C to +70°C
Supply Voltage ..... +4.75V to +5.25V

Military (M) Devices
Temperature ..... −55°C to +125°C
Supply Voltage ..... +4.5V to +5.5V

Operating ranges define those limits over which the functionality of the device is guaranteed.

DC CHARACTERISTICS over operating range unless otherwise specified

Parameters	Description	Test Conditions (Note 2)		Min	Typ (Note 1)	Max	Units
V_{OH}	Output HIGH Voltage	V_{CC} = MIN, V_{IN} = V_{IH} or V_{IL}	MIL, I_{OH} = −1.0mA	2.4	3.4		Volts
			COM'L, I_{OH} = −2.6mA	2.4	3.4		
V_{OL}	Output LOW Voltage	V_{CC} = MIN, V_{IN} = V_{IH} or V_{IL}	I_{OL} = 4.0mA			0.4	Volts
			I_{OL} = 8.0mA			0.45	
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs		2.0			Volts
V_{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs	MIL			0.7	Volts
			COM'L			0.8	
V_I	Input Clamp Voltage	V_{CC} = MIN, I_{IN} = −18mA				−1.5	Volts
I_{IL}	Input LOW Current	V_{CC} = MAX, V_{IN} = 0.4V				−0.36	mA
I_{IH}	Input HIGH Current	V_{CC} = MAX, V_{IN} = 2.7V				20	μA
I_I	Input HIGH Current	V_{CC} = MAX, V_{IN} = 7.0V				0.1	mA
I_O	Off-State (High-Impedance) Output Current		V_O = 0.4V			−20	μA
			V_O = 2.4V			20	
I_{SC}	Output Short Circuit Current (Note 3)	V_{CC} = MAX		−15		−85	mA
I_{CC}	Power Supply Current (Note 4)	V_{CC} = MAX			24	37	mA

Notes: 1. Typical limits are at V_{CC} = 5.0V, 25°C ambient and maximum loading.
2. For conditions shown as MIN or MAX, use the appropriate value specified under Operating Ranges for the applicable device type.
3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.
4. All outputs open, $\overline{E}$ = GND, D_i inputs = CLR $\overline{OE}$ = 4.5V. Apply momentary ground, then 4.5V to clock input.

SWITCHING CHARACTERISTICS (T_A = +25°C, V_{CC} = 5.0V)

Parameters	Description		Test Conditions	Min	Typ	Max	Units
t_{PLH}	Clock to Y_i ($\overline{OE}$ LOW)		C_L = 15pF R_L = 2.0kΩ		18	27	ns
t_{PHL}					24	36	
t_{PHL}	Clear to Y				22	35	ns
t_s	Data (D_i)			10	3		ns
t_h	Data (D_i)			10	3		ns
t_s	Enable ($\overline{E}$)	Active		15	10		ns
		Inactive		20	12		
t_h	Enable ($\overline{E}$)			0	0		ns
t_s	Clear Recovery (In-Active) to Clock			11	7		ns
t_{pw}	Clock	HIGH		20	14		ns
		LOW		25	13		
t_{pw}	Clear			20	13		ns
t_{ZH}	$\overline{OE}$ to Y_i				9	13	ns
t_{ZL}					14	21	
t_{HZ}	$\overline{OE}$ to Y_i		C_L = 5.0pF R_L = 2.0kΩ		20	30	ns
t_{LZ}					24	36	
f_{max}	Maximum Clock Frequency (Note 1)				40		MHz

Note 1. Per industry convention, f_{max} is the worst case value of the maximum device operating frequency with no contraints on t_r, t_f, pulse width or duty cycle.

SWITCHING CHARACTERISTICS over operating range unless otherwise specified*

Parameters	Description		Test Conditions	COMMERCIAL Am2920		MILITARY Am2920		Units
				Min	Max	Min	Max	
t_{PLH}	Clock to Y_i ($\overline{OE}$ LOW)		C_L = 50pF R_L = 2.0kΩ		33		39	ns
t_{PHL}					45		54	
t_{PHL}	Clear to Y				43		51	ns
t_s	Data (D_i)			12		15		ns
t_h	Data (D_i)			12		15		ns
t_s	Enable ($\overline{E}$)	Active		17		20		ns
		Inactive		20		23		
t_h	Enable ($\overline{E}$)			0		0		ns
t_s	Clear Recovery (In-Active) to Clock			13		15		ns
t_{pw}	Clock	HIGH		25		30		ns
		LOW		30		35		
t_{pw}	Clear			22		25		ns
t_{ZH}	$\overline{OE}$ to Y_i				19		25	ns
t_{ZL}					30		39	
t_{HZ}	$\overline{OE}$ to Y_i		C_L = 5.0pF R_L = 2.0KΩ		35		40	ns
t_{LZ}					39		42	
f_{max}	Maximum Clock Frequency (Note 1)			25		20		MHz

*Switching Characteristics' performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

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Refer to Page 13-1 for Essential Information on Military Devices