

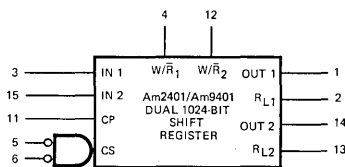
Am9401/Am2401

Dual 1024-Bit Dynamic Shift Register

Distinctive Characteristics

- Single +5V power supply
- High speed — 2MHz min.
- Single phase TTL clock
- Low clock capacitance — 7.0pF max.
- Low Power 315 mW max. @ 2MHz
40 μ W/bit typ. @ 2 MHz
- Chip select, write, and recirculate logic on chip
- 100% reliability assurance testing in accordance with MIL-STD-883

LOGIC SYMBOL



V_{CC} = Pin 16
GND = Pin 8

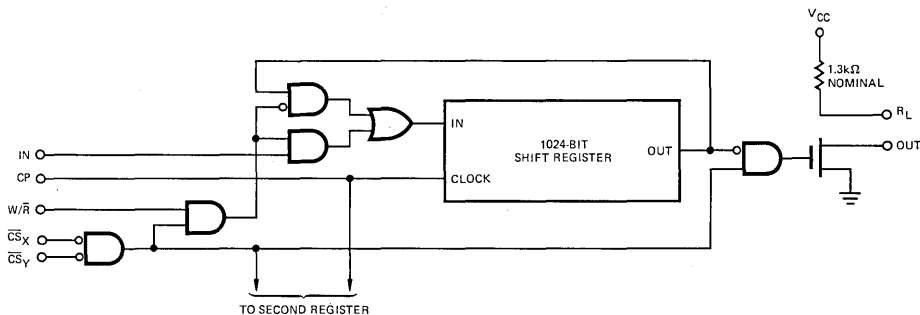
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FUNCTIONAL DESCRIPTION

The Am9401 is a dual 1024-bit dynamic shift register built using ion-implanted, N-channel, silicon gate MOS technology. The device operates from a single +5 volt power supply and all inputs and outputs, including the clock, are directly TTL compatible. Data is entered into the register on the LOW-to-HIGH transition of the clock input. New data appears on the output following the HIGH-to-LOW clock transition. There are two chip select inputs, $\overline{CS}_X$ and $\overline{CS}_Y$; if either is HIGH then the data in both registers recirculates and the outputs go to a HIGH impedance OFF state. If both chip selects are LOW, then the outputs will be LOW for LOW data and OFF for HIGH data (similar to TTL open collectors). When the chip is selected, the write-recirculate lines control the entry of new data. If $W/\overline{R}$ is HIGH new data is written into the corresponding register; if $W/\overline{R}$ is LOW, the data on the output is recirculated. An internal pull-up resistor to V_{CC} is provided at R_L . This point may be connected to the output to establish the HIGH logic level. Many register outputs may be connected together with the R_L connected only once. The Am9401 is a high performance plug-in replacement for the Am2401.

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LOGIC BLOCK DIAGRAM



Note: Only one register shown.

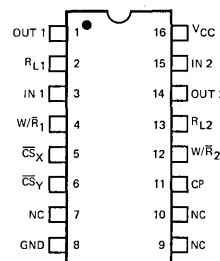
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ORDERING INFORMATION

Package Type	Temperature Range	Order Number	Order Number
16-Pin Molded DIP	0°C to +70°C	AM9401PC	P2401
16-Pin Hermetic DIP	0°C to +70°C	AM9401DC	C2401
16-Pin Hermetic DIP	-55°C to +125°C	AM9401DM	

CONNECTION DIAGRAM

Top View



Note: Pin 1 is marked for orientation.

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Am9401/Am2401**MAXIMUM RATINGS** (Above which the useful life may be impaired)

Storage Temperature	–65°C to +160°C
Temperature (Ambient) Under Bias	–55°C to +125°C
Power Dissipation	1W
Voltage on Any Pin	–0.5V to +7.0V

OPERATING RANGE

Part Number	Ambient Temperature	V _{CC}
Am9401, 2401PC, DC	0°C to +70°C	5.0V ± 5%
Am9401DM	–55°C to +125°C	5.0V ± 5%

ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Conditions	Typ.		Min.	(Note 1)	Max.	Min.	Typ.	Max.	Units
I _{LI}	Input Leakage Current	V _{IN} = 5.25V					10			10	μA
I _{LO}	Output Leakage Current	V _{OUT} = 5.25V					100			100	μA
I _{CC}	V _{CC} Current	V _{CC} = MAX. 80% Duty Cycle	T _A = 25°C				70			50	mA
			T _A = 0°C to +70°C				80			60	
			T _A = −55°C to +125°C						50	80	
V _{IH}	Input HIGH Level		2.2				2.2				Volts
V _{IL}	Input LOW Level		−0.3				0.65	−0.3		0.65	Volts
I _{OL}	Output LOW Current	V _{OL} = 0.45V	6.3	10			6.3				mA
V _{OL}	Output LOW Voltage	I _{OL} = 1.6mA, R _L connected					0.45			0.45	Volts
V _{OH}	Output HIGH Voltage	I _{OH} = −1mA, R _L connected	2.4				V _{CC}	2.4		V _{CC}	Volts
R _L	Internal Load Resistor		0.5	1.5			3.0	0.5		3.0	kΩ

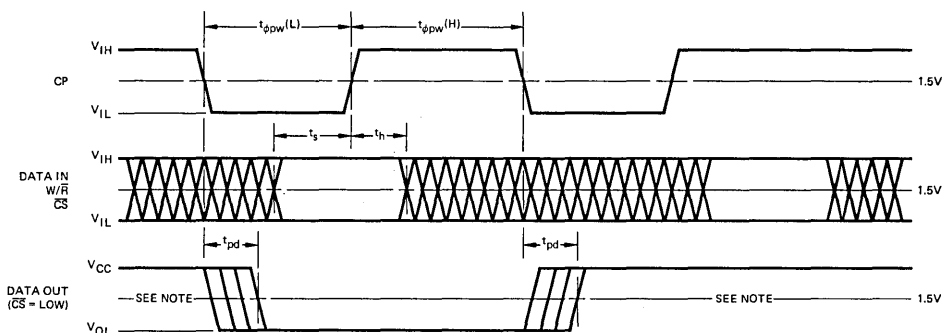
Note: 1. Typical values are at 25°C and V_{CC} = 5.0V.**SWITCHING CHARACTERISTICS OVER OPERATING RANGE**

Parameters	Description	Conditions	Typ.		Min.	Max.	Min.	Typ.	Max.	Units
			(Note 1)							
f _{max}	Maximum Data and Clock Rate					1.0			2.0	MHz
f _{min}	Minimum Data and Clock Rate	T _A = 25°C	1.0			1.0				kHz
		T _A = 0°C to +70°C	25			25				
		T _A = -55°C to +125°C				100				
t _{φpw(L)}	Clock LOW Time	T _A = 0°C to +70°C	0.8		10	0.4		10	μs	
		T _A = -55°C to +125°C						9		
t _{φpw(H)}	Clock HIGH Time	T _A = 25°C	0.2		1000	0.1		1000	μs	
		T _A = 0°C to +70°C	0.2		40	0.1		40		
		T _A = -55°C to +125°C				0.1		1.0		
t _r , t _f	Clock Rise and Fall Times				50			50	ns	
t _s	Data and Control Set-Up Time		200			80			ns	
t _h	Data and Control Hold Time		150			150			ns	
t _{pd}	Delay, Clock or Chip Select to Output	R _L connected (Note 2) C _L = 100pF, Load = 1 TTL gate		250	500		160	320 Note 2	ns	

Note: 2. C_L = 20pF for Am9401. The capacitive load is limited primarily by the internal load register.**CAPACITANCE** (T_A = 25°C)

Parameters	Description	Conditions	Am2401			Am9401			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
C _{IN}	Capacitance, All Data Inputs	f = 1 MHz, V _{IN} = 250mV All Pins at R _L Ground		4.0	7.0		4.0	7.0	pF
C _φ	Capacitance, Clock Input			4.0	7.0		4.0	7.0	pF
C _{OUT}	Capacitance, Data Output			10	14		5.0	10	pF

SWITCHING WAVEFORMS

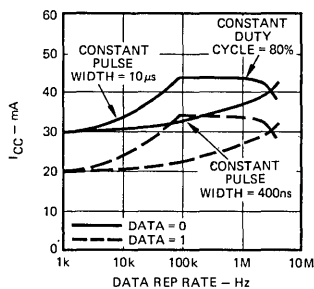


Note: HIGH level on output is established by externally connected load resistor.

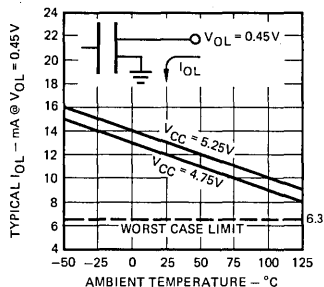
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TYPICAL PERFORMANCE CHARACTERISTICS

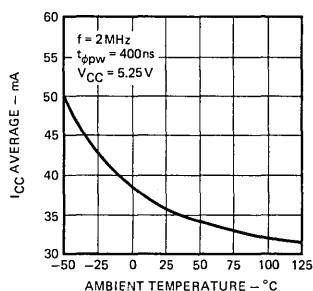
Power Supply Current (I_{CC}) Versus Data Rep. Rate



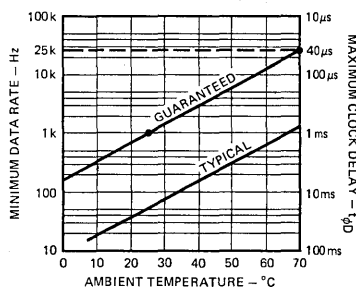
Temperature Dependence of Output LOW Level Sink Capability



**Power Supply Current (I_{CC})
Versus Ambient Temperature (0°C)**



Minimum Data Rate and Maximum Clock Delay Versus Ambient Temperature

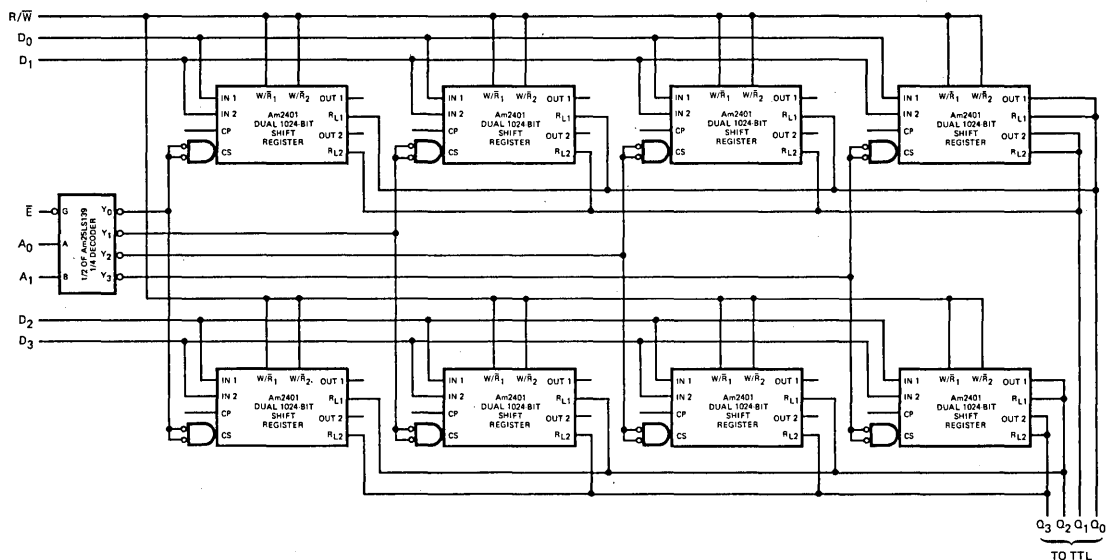


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TRUTH TABLE

W/R	$\overline{\text{CS}}_x$	$\overline{\text{CS}}_y$	D _{IN}	DATA ENTERED	OUTPUT	OPERATION
X	X	H	X	D _{IN} (t-1024)	OFF	Deselected, Recirculate
X	H	X	X	D _{IN} (t-1024)	OFF	Deselected, Recirculate
H	L	L	L	LOW	D _{IN} (t-1024)	Read, Write
H	L	L	H	HIGH	D _{IN} (t-1024)	Read, Write
L	L	L	X	D _{IN} (t-1024)	D _{IN} (t-1024)	Read, Recirculate

APPLICATIONS

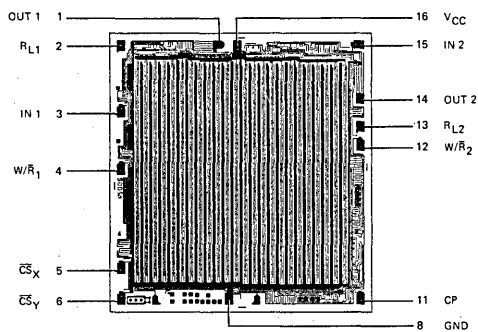


4k x 4 REGISTER ARRAY

Eight Am2401's form this 16k register array. Data inputs (D_0 - D_3) and data outputs (Q_0 - Q_3) may be connected directly to TTL. Note that the load resistors are only connected once to each line. A pair of devices (a 1k x 4 section) is selected by address bits A_0 and A_1 . The data in the selected devices are read out and, if $R/\bar{W}$ is LOW, updated with new data. All clock lines are driven from TTL levels.

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Metallization and Pad Layout



DIE SIZE 0.133" X 0.142"