

TC4036BP, TC4039BP

C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

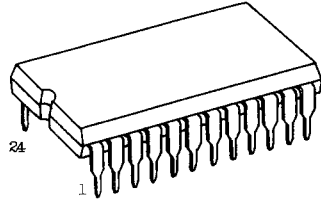
TC4036BP 4 WORD × 8 BIT STATIC RAM (BINARY ADDRESSING)

TC4039BP 4 WORD × 8 BIT STATIC RAM (DIRECT WORD-LINE ADDRESSING)

TC4036BP/TC4039BP are static RAM of 4 × 8 bits and since eight data input/output lines are mutually independently provided for one word, wide variety of applications are expected for scratch pad memories, channel preset memories of digital frequency synthesizer systems, etc.

TC4036BP Each word is binarily selected by two lines of address inputs A₀ and A₁.

TC4039BP Each word is directly selected by mutually independent four lines of address inputs WORD 1 through WORD 4.



P(DIP24-P-600)

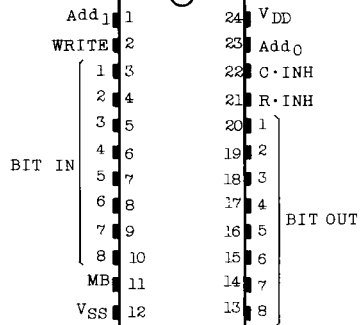
Weight : 3.4g(Typ.)

ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V _{DD}	V _{SS} -0.5 ~ V _{SS} +20	V
Input Voltage	V _{IN}	V _{SS} -0.5 ~ V _{DD} +0.5	V
Output Voltage	V _{OUT}	V _{SS} -0.5 ~ V _{DD} +0.5	V
DC Input Current	I _{IN}	±10	mA
Power Dissipation	P _D	300	mW
Operating Temperature Range	T _A	-40 ~ 85	°C
Storage Temperature Range	T _{stg}	-65 ~ 150	°C
Lead Temp./Time	T _{sol}	260°C · 10 sec	

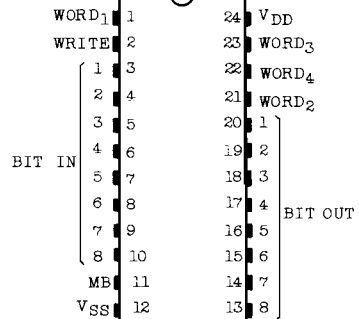
PIN ASSIGNMENT

TC4036BP



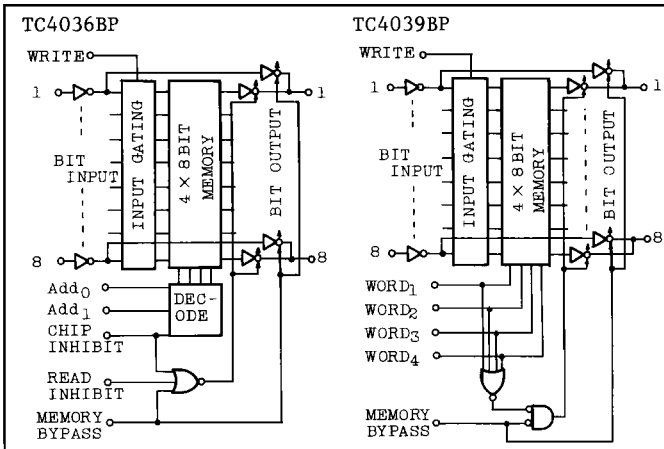
(TOP VIEW)

TC4039BP



(TOP VIEW)

BLOCK DIAGRAM



FUNCTION TABLE

TC4036BP				
WRITE	READ INHIBIT	MEMORY BYPASS	CHIP INHIBIT	OPERATIONAL MODEL
*	*	L	H	Each bit output has high impedance generating floating condition. Writing into the memory is not performed.
*	*	H	H	Bit input data is directly output to the corresponding bit output. The memory retains the content of bit input data written in previous write mode.
L	*	H	L	
H	*	H	L	Bit input data is directly output to the corresponding bit output. But input data is written into the word memory designated by address inputs A0 and A1.
L	L	L	L	Memory data is read from the word designated by address inputs A0 and A1. Writing into the memory is not performed.
L	H	L	L	Each bit output has high impedance generating floating condition. Writing into the memory is not performed.
H	L	L	L	As well as each bit input data is written into the word memory designated by address inputs A0 and A1, the input data is read out.
H	H	L	L	Each bit output has high impedance generating floating condition. Each bit input data is written into the word memory designated by address inputs A0 and A1.
TC4039BP				
WRITE	MEMORY BYPASS	WORD1 ~ WORD4	OPERATIONAL MODE	
*	L	all L	Each bit output has high impedance generating floating condition. The memory retains the content of bit input data written in previous write mode.	
*	H	all L	Bit input data is directly output to the corresponding bit output. The memory retains the content of bit input data written in previous write mode.	
L	H	△△		
H	H	△△	Bit input data is directly output to the corresponding bit output. Each bit input data is written into the memory designated by the word input.	
L	L	△△	Memory data designated by the word input is read out. Writing into the memory is not performed.	
H	L	△△	As well as each bit input data is written into the memory designated by the word input, the input data is read out.	
* Don't care △△ Only one WORD input has "H" level.				

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ADDRESS TRUTH TABLE

TC4036BP			TC4039BP				
Add ₁	Add ₀	ADDRESSED WORD	WORD 1	WORD 2	WORD 3	WORD 4	ADDRESSED WORD
L	L	WORD 1	H	L	L	L	WORD 1
L	H	WORD 2	L	H	L	L	WORD 2
H	L	WORD 3	L	L	H	L	WORD 3
H	H	WORD 4	L	L	L	H	WORD 4
			L	L	L	L	NONE
			OTHER STATES				*

※ Inhibit mode

RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V _{DD}	3	-	18	V
Input Voltage	V _{IN}	0	-	V _{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V)

CHARACTERISTIC	SYM-BOL	TEST CONDITION	V _{DD} (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Output Voltage	V _{OH}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	4.95	-	4.95	5.00	-	4.95	-	V
			10	9.95	-	9.95	10.00	-	9.95	-	
			15	14.95	-	14.95	15.00	-	14.95	-	
Low-Level Output Voltage	V _{OL}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	-	0.05	-	0.00	0.05	-	0.05	V
			10	-	0.05	-	0.00	0.05	-	0.05	
			15	-	0.05	-	0.00	0.05	-	0.05	
Output High Current	I _{OH}	V _{OH} =4.6V V _{OH} =2.5V V _{OH} =9.5V V _{OH} =13.5V V _{IN} =V _{SS} , V _{DD}	5	-0.61	-	-0.51	-1.0	-	-0.42	-	mA
			5	-2.5	-	-2.1	-4.0	-	-1.7	-	
			10	-1.5	-	-1.3	-2.2	-	-1.1	-	
			15	-4.0	-	-3.4	-9.0	-	-2.8	-	
Output Low Current	I _{OL}	V _{OL} =0.4V V _{OL} =0.5V V _{OL} =1.5V V _{IN} =V _{SS} , V _{DD}	5	0.61	-	0.51	1.5	-	0.42	-	mA
			10	1.5	-	1.3	3.8	-	1.1	-	
			15	4.0	-	3.4	15.0	-	2.8	-	

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V)

CHARACTERISTIC	SYM-BOL	TEST CONDITION	V _{DD} (V)	-40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
Input High Voltage	V _{IH}	V _{OUT} =0.5V, 4.5V	5	3.5	-	3.5	2.75	-	3.5	-	V	
		V _{OUT} =1.0V, 9.0V	10	7.0	-	7.0	5.5	-	7.0	-		
		V _{OUT} =1.5V, 13.5V	15	11.0	-	11.0	8.25	-	11.0	-		
		I _{OUT} < 1μA										
Input Low Voltage	V _{IL}	V _{OUT} =0.5V, 4.5V	5	-	1.5	-	2.25	1.5	-	1.5	V	
		V _{OUT} =1.0V, 9.0V	10	-	3.0	-	4.5	3.0	-	3.0		
		V _{OUT} =1.5V, 13.5V	15	-	4.0	-	6.75	4.0	-	4.0		
		I _{OUT} < 1μA										
Input Current	"H" Level	I _{IH}	V _{IH} =18V	18	-	0.1	-	10 ⁻⁵	0.1	-	1.0	μA
	"L" Level	I _{IL}	V _{IL} =0V	18	-	-0.1	-	-10 ⁻⁵	-0.1	-	-1.0	
3-State Output Leakage Current	"H" Level	I _{DH}	V _{OUT} =18V	18	-	0.4	-	10 ⁻⁴	0.4	-	12	μA
	"L" Level	I _{DL}	V _{OUT} =0V	18	-	-0.4	-	-10 ⁻⁴	-0.4	-	-12	
Quiescent Device Current	I _{DD}	V _{IN} =V _{SS} , V _{DD} *	5	-	5	-	0.005	5	-	150	μA	
			10	-	10	-	0.010	10	-	300		
			15	-	20	-	0.015	20	-	600		

* All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS (T_a=25°C, V_{SS}=0V, C_L=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t _{TLH}		5	-	80	200	ns
			10	-	50	100	
			15	-	40	80	
Output Transition Time (High to Low)	t _{THL}		5	-	80	200	
			10	-	50	100	
			15	-	40	80	

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DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, VSS=0V, CL=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (R·INH - BIT OUT) (TC4036BP)	t _{pZL} t _{pZH}	R _L =1kΩ	5	-	200	750	ns
			10	-	90	350	
			15	-	70	300	
Propagation Delay Time (C·INH - BIT OUT) (TC4036BP)	t _{pZL} t _{pZH}	R _L =1kΩ	5	-	250	750	ns
			10	-	120	350	
			15	-	90	300	
Propagation Delay Time (M·B - BIT OUT)	t _{pLH} t _{pHL}		5	-	210	750	ns
			10	-	100	350	
			15	-	80	300	
Propagation Delay Time (Add.WORD - BIT OUT)	t _{pLH} t _{pHL}		5	-	260	750	ns
			10	-	110	350	
			15	-	80	300	
Min. Set-up Time (Add. WORD - WRITE)	t _{SU}		5	-	45	200	ns
			10	-	25	110	
			15	-	20	60	
Min. Hold Time (Add. WORD - WRITE)	t _H		5	-	-60	100	ns
			10	-	-35	70	
			15	-	-25	40	
Min. Pulse Width (WRITE)	t _{WH}		5	-	60	150	ns
			10	-	20	60	
			15	-	15	50	
Min. Set-up Time (BIT IN - WRITE)	t _{SU}		5	-	-20	100	ns
			10	-	-15	50	
			15	-	-10	40	
Min. Hold Time (BIT IN - WRITE)	t _H		5	-	40	200	ns
			10	-	25	90	
			15	-	20	60	
Input Capacitance	C _{IN}			-	5	7.5	pF

WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

