C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

TC4543BP/BF

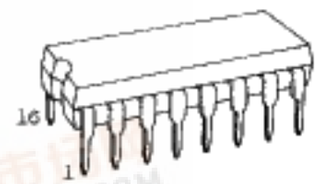
TC4543BP/TC4543BF BCD-TO-SEVEN SEGMENT LATCH/DECODER/DRIVER (For liquid Crystals)

TC4543BP/BF is 7 segment latch/decoder/driver which can directly drive field effect type liquid crystal display element (FEM type) and equipped with BLANKING input, PHASE input and LATCH DISABLE input.

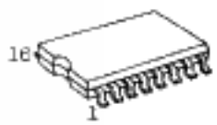
If erroneous BCD code is input, and when BI is "H", all the outputs are blanked.

When FEM type liquid crystal is driven, common pulse should be applied to the back plane of display element and the PHASE input of TC4543BP/BF.

When LED display element is to be driven, drivers should be added to the outputs.



DIP16(3D16A-P)

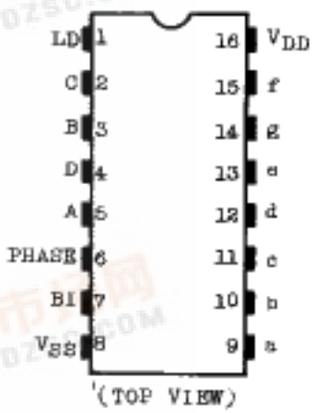


MFP16(F16GC-P)

ABSOLUTE MAXIMUM RATINGS

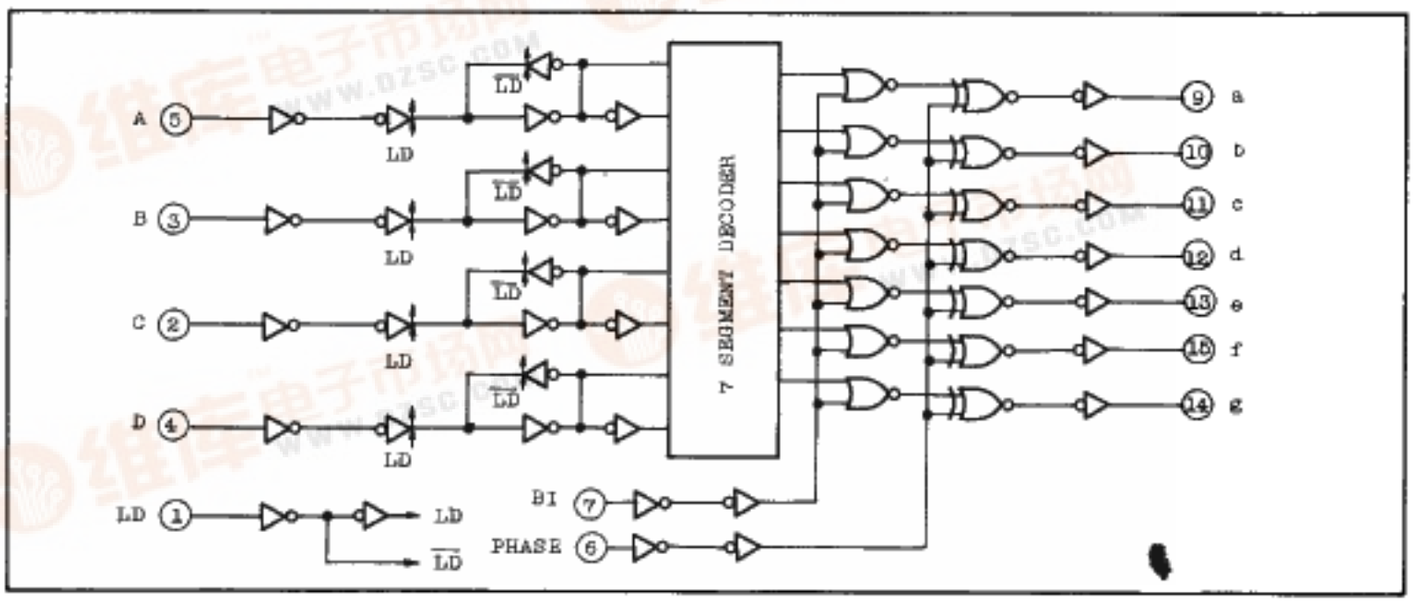
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	V_{SS} -0.5 ∿V_{SS} +20	V
Input Voltage	V_{IN}	V_{SS} -0.5 ∿V_{DD} +0.5	V
Output Voltage	V_{OUT}	V_{SS} -0.5 ∿V_{DD} +0.5	V
DC Input Current	I_{IN}	±10	mA
Power Dissipation	P_D	300(DIP)/180(MFP)	mW
Operating Temperature Range	T_A	-40 ∿85	°C
Storage Temperature Range	T_{stg}	-65 ∿150	°C
Lead Temp./Time	T_{sol}	260°C · 10 sec	

PIN ASSIGNMENT



(TOP VIEW)

LOGIC DIAGRAM



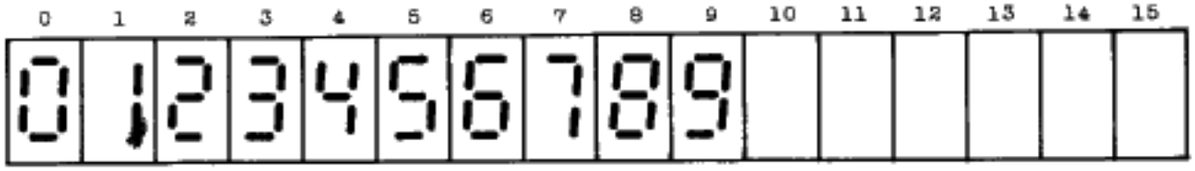
TRUTH TABLE

INPUTS							OUTPUTS							DISPLAY	NOTE
LD	BI	PHASE	A	B	C	D	a	b	c	d	e	f	g		
*	H	H	*	*	*	*	H	H	H	H	H	H	H	BLANK	
*	H	L	*	*	*	*	L	L	L	L	L	L	L	BLANK	
L	L	H	*	*	*	*	LATCH								
L	L	L	*	*	*	*	LATCH								
H	L	H	L	L	L	L	L	L	L	L	L	L	H	0	
H	L	H	H	L	L	L	H	L	L	H	H	H	H	1	
H	L	H	L	H	L	L	L	L	H	L	L	H	L	2	
H	L	H	H	H	L	L	L	L	L	L	H	H	L	3	
H	L	H	L	L	H	L	H	L	L	H	H	L	L	4	
H	L	H	H	L	H	L	L	H	L	L	H	L	L	5	
H	L	H	L	H	H	L	L	H	L	L	L	L	L	6	
H	L	H	H	H	H	L	L	L	L	H	H	H	H	7	
H	L	H	L	L	L	H	L	L	L	L	L	L	L	8	
H	L	H	H	L	L	H	L	L	L	L	H	L	L	9	
H	L	H	L	H	L	H	H	H	H	H	H	H	H	BLANK	
H	L	H	H	H	L	H	H	H	H	H	H	H	H	BLANK	
H	L	H	L	L	H	H	H	H	H	H	H	H	H	BLANK	
H	L	H	H	L	H	H	H	H	H	H	H	H	H	BLANK	
H	L	H	L	H	H	H	H	H	H	H	H	H	H	BLANK	
H	L	H	H	H	H	H	H	H	H	H	H	H	H	BLANK	
H	L	L	L	L	L	L	H	H	H	H	H	H	L	0	
H	L	L	H	L	L	L	L	H	H	L	L	L	L	1	
H	L	L	L	H	L	L	H	H	L	H	H	L	H	2	
H	L	L	H	H	L	L	H	H	H	H	L	L	H	3	
H	L	L	L	L	H	L	L	H	H	L	L	H	H	4	
H	L	L	H	L	H	L	H	L	H	H	L	H	H	5	
H	L	L	L	H	H	L	H	L	H	H	H	H	H	6	
H	L	L	H	H	H	L	H	H	H	L	L	L	L	7	
H	L	L	L	L	L	H	H	H	H	H	H	H	H	8	
H	L	L	H	L	L	H	H	H	H	H	L	H	H	9	
H	L	L	L	H	L	H	L	L	L	L	L	L	L	BLANK	
H	L	L	H	H	L	H	L	L	L	L	L	L	L	BLANK	
H	L	L	L	L	H	H	L	L	L	L	L	L	L	BLANK	
H	L	L	H	L	H	H	L	L	L	L	L	L	L	BLANK	
H	L	L	L	H	H	H	L	L	L	L	L	L	L	BLANK	
H	L	L	H	H	H	H	L	L	L	L	L	L	L	BLANK	

*: DON'T CARE

DISPLAY

7 SEGMENT DISPLAY



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

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

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	V_{DD} (V)	-40°C MIN.	-40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNITS
High-Level Output Voltage	V_{OH}	$\|I_{OUT}\|$<1μA	5	4.95	-	4.95	5.00	-	4.95	-	V
		$V_{IN}=V_{SS}$, V_{DD}	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	5	-	0.05	-	0.00	0.05	-	0.05	
		$V_{IN}=V_{SS}$, V_{DD}	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	5	-0.61	-	-0.51	-1.0	-	-0.42	-	mA
		V_{OH}=2.5V	5	-2.5	-	-2.1	-4.0	-	-1.7	-	
		V_{OH}=9.5V	10	-1.5	-	-1.3	-2.2	-	-1.1	-	
		V_{OH}=13.5V	15	-4.0	-	-3.4	-9.0	-	-2.8	-	
		$V_{IN}=V_{SS}$, V_{DD}									
Output Low Current	I_{OL}	V_{OL}=0.4V	5	0.61	-	0.51	1.2	-	0.42	-	
		V_{OL}=0.5V	10	1.5	-	1.3	3.2	-	1.1	-	
		V_{OL}=1.5V	15	4.0	-	3.4	12.0	-	2.8	-	
		$V_{IN}=V_{SS}$, V_{DD}									
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_{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
Input Current "H" Level	I_{IL}	V_{IL}=0V	18	-	-0.1	-	-10^{-5}	-0.1	-	-1.0	
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	

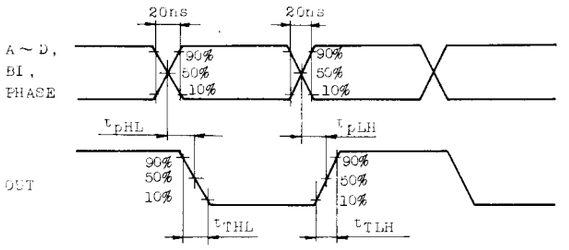
* All valid input combinations.

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

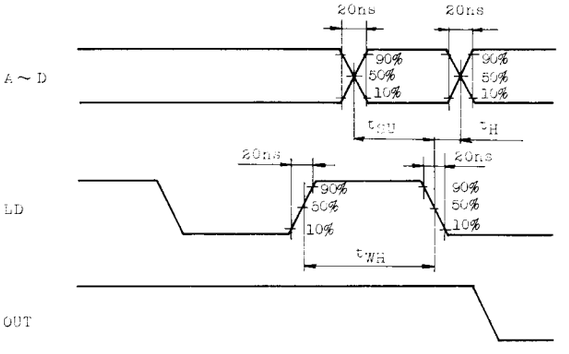
CHARACTERISTICS	SYMBOL	TEST CONDITION	V_{DD} (V)	MIN.	TYP.	MAX.	UNITS
Output Transition Time (Low to High)	t_{TLH}		5	-	70	200	ns
			10	-	35	100	
			15	-	30	80	
Output Transition Time (High to Low)	t_{THL}		5	-	70	200	
			10	-	35	100	
			15	-	30	80	
Propagation Delay Time (A∿D - OUT)	t_{pLH} t_{pHL}		5	-	280	1000	
			10	-	140	400	
			15	-	100	300	
Propagation Delay Time (BI - OUT)	t_{pLH} t_{pHL}		5	-	140	500	
			10	-	70	200	
			15	-	55	150	
Propagation Delay Time (LD - OUT)	t_{pLH} t_{pHL}		5	-	300	1000	
			10	-	140	400	
			15	-	100	300	
Propagation Delay Time (PHASE - OUT)	t_{pLH} t_{pHL}		5	-	170	550	
			10	-	85	220	
			15	-	65	180	
Min. Pulse Width (LD)	t_{WH}		5	-	30	250	
			10	-	25	100	
			15	-	20	80	
Min. Set-up Time (LD - A ∿ D)	t_{SU}		5	-	20	60	
			10	-	10	20	
			15	-	5	10	
Min. Hold Time (LD - A ∿ D)	t_H		5	-	0	25	
			10	-	0	20	
			15	-	0	20	
Input Capacitance	C_{IN}			-	5	7.5	pF

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

WAVEFORM 1



WAVEFORM 2



WAVEFORM 3