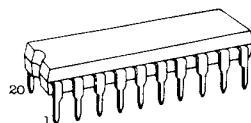


CMOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC**TC40H240P/F • TC40H244P/F
TC40H241P/F****OCTAL BUS BUFFER**

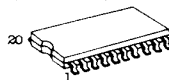
TC40H240 INVERTED 3-STATE OUTPUTS
 TC40H241 NONINVERTED 3-STATE OUTPUTS
 TC40H244 NONINVERTED 3-STATE OUTPUTS

MAXIMUM RATINGS

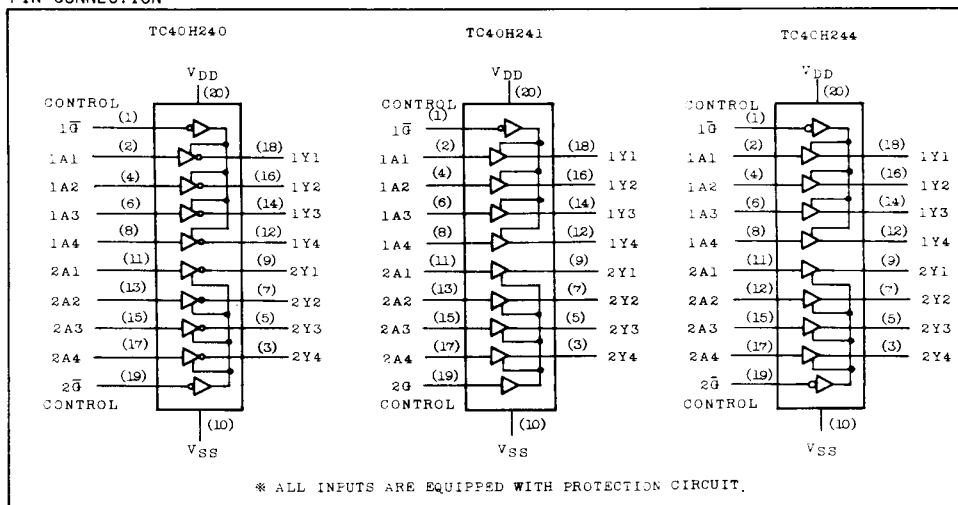
CHARACTERISTIC	SYMBOL	RATING	SYMBOL
Supply Voltage	V _{DD}	V _{SS} -0.5 ~ V _{SS} +10	V
Input Voltage	V _{IN}	V _{SS} -0.5 ~ V _{DD} +0.5	V
Output Voltage	V _{OUT}	V _{SS} -0.5 ~ V _{DD} +0.5	V
Input Current	I _{IN}	±10	V
Power Dissipation	P _D	300 (DIP) / 180 (MFP)	mW
Storage Temperature	T _{stg}	-65 ~ 150	°C
Lead Temp./Time	T _{sol}	260°C • 10 sec	



DIP20 (3D20A-P)



MFP20 (P20GA-P)

PIN CONNECTION**RECOMMENDED OPERATING CONDITIONS (V_{SS}=0.0V)**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V _{DD}	—	2.0	—	8.0	V
Input Voltage	V _{IN}	—	0	—	V _{DD}	V
Operating Temperature	T _{opr}	—	-40	—	85	°C

TC40H240P/F • TC40H244P/F

TC40H241P/F

TRUTH TABLE

TC40H240

INPUTS			OUTPUTS	
CONTROL	DATA		Yn	
1G	2G	An		
L	L	L	H	
L	L	H	L	
H	L	X	1Y1~1Y4 Hz	
L	H	X	2Y1~2Y4 Hz	
H	H	X	1Y1~1Y4, 2Y1~2Y4 Hz	

TC40H241

INPUTS			OUTPUTS	
CONTROL	DATA		Yn	
1G	2G	An		
L	H	L	L	
L	H	H	H	
H	H	X	1Y1~1Y4 Hz	
L	L	X	2Y1~2Y4 Hz	
H	L	X	1Y1~1Y4, 2Y1~2Y4 Hz	

TC40H244

INPUTS			OUTPUTS	
CONTROL	DATA		Yn	
1G	2G	An		
L	L	L	L	
L	L	H	H	
H	L	X	1Y1~1Y4 Hz	
L	H	X	2Y1~2Y4 Hz	
H	H	X	1Y1~1Y4, 2Y1~2Y4 Hz	

X = DON'T CARE. Hz = HIGH IMPEDANCE.

ELECTRICAL CHARACTERISTICS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL	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	5.0	-	4.95	-	V
Low Level Output Voltage	V _{OL}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	-	0.05	-	0.0	0.05	-	0.05	
High Level Output Current	I _{OH}	V _{OUT} =4.6V V _{IN} =V _{SS} , V _{DD}	5	-0.95	-	-0.88	-	-	-0.8	-	mA
Low Level Output Current	I _{OL}	V _{OUT} =0.4V V _{IN} =V _{SS} , V _{DD}	5	4.7	-	4.4	-	-	4.0	-	
Input Voltage	"H" Level V _{IH}	I _{OUT} < 1μA V _{OUT} =0.5V	5	4.0	-	4.0	-	-	4.0	-	V
	"L" Level V _{IL}	V _{OUT} =4.5V	5	-	1.0	-	-	1.0	-	1.0	
Input Current	"H" Level I _{IH}	V _{IN} =8.0V	8	-	0.3	-	10 ⁻⁵	0.3	-	1.0	μA
	"L" Level I _{IL}	V _{IN} =0.0V	8	-	-0.3	-	-10 ⁻⁵	-0.3	-	-1.0	
Output Disable Current	"H" Level I _{DH}	V _{DH} =8.0V	8	-	0.5	-	10 ⁻⁴	0.5	-	5	μA
	"L" Level I _{DL}	V _{DL} =0.0V	8	-	-0.5	-	-10 ⁻⁴	-0.5	-	-5	
Quiescent Supply Current	I _{DD}	*V _{IN} =V _{SS} , V _{DD}	8	-	5.0	-	0.005	5.0	-	25	μA

*All valid input combinations.

SWITCHING CHARACTERISTICS (T_a=25°C, V_{SS}=0V, V_{DD}=5V, C_L=50pF, R_L=1kΩ)

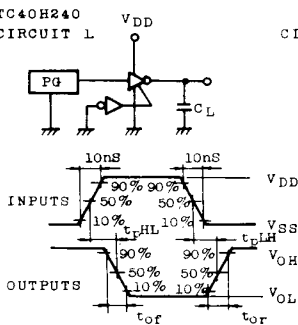
CHARACTERISTIC	SYMBOL	TEST CONDITION	TC40H240			TC40H241			TC40H244			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Output Rise Time	t _{OR}	Fig. 1	-	15	30	-	15	30	-	15	30	ns
Output Fall Time	t _{OF}		-	15	30	-	15	30	-	15	30	
Propagation Delay Time	(Low-High) t _{PLH}	Fig. 1	-	24	36	-	24	36	-	24	36	ns
	(High-Low) t _{PHL}		-	28	42	-	28	42	-	28	42	
Output Disable Time	"H" Level t _{pHZ}	Fig. 3	-	27	45	-	30	45	-	24	45	ns
	"L" Level t _{pLZ}	Fig. 2	-	27	45	-	27	45	-	27	45	
Output Enable Time	"H" Level t _{pZH}	Fig. 3	-	27	45	-	27	45	-	24	45	ns
	"L" Level t _{pZL}	Fig. 2	-	30	45	-	27	45	-	30	45	
Input Capacitance	C _{IN}		-	5	-	-	5	-	-	5	-	pF
Output Capacitance	C _{OUT}		-	16	-	-	16	-	-	16	-	

TOSHIBA

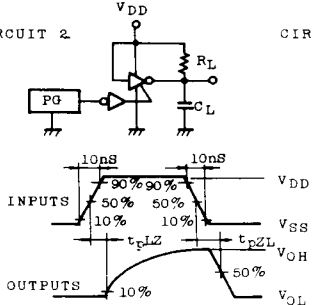
TC40H240P/F • TC40H244P/F TC40H241P/F

SWITCHING TIME TEST CIRCUIT AND WAVEFORM

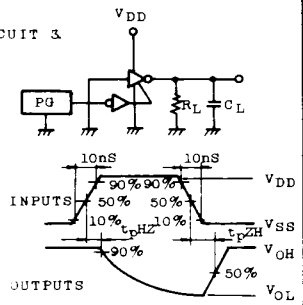
TC40H240
CIRCUIT 1



CIRCUIT 2

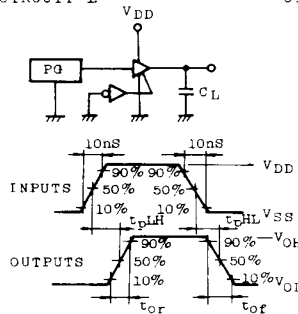


CIRCUIT 3

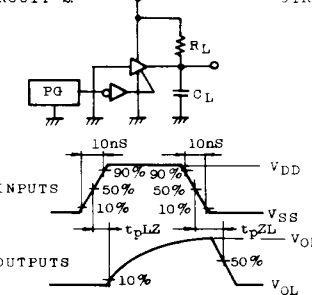


TC40H241

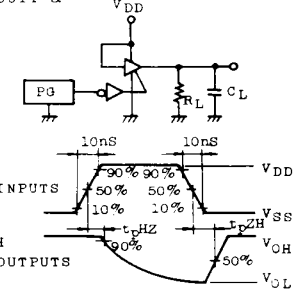
CIRCUIT 1



CIRCUIT 2

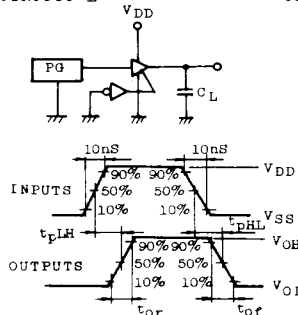


CIRCUIT 3

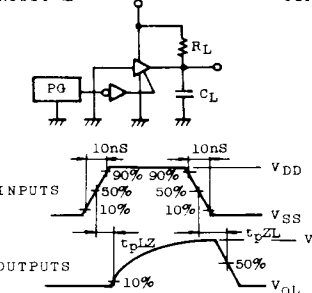


TC40H244

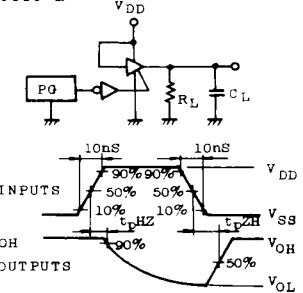
CIRCUIT 1



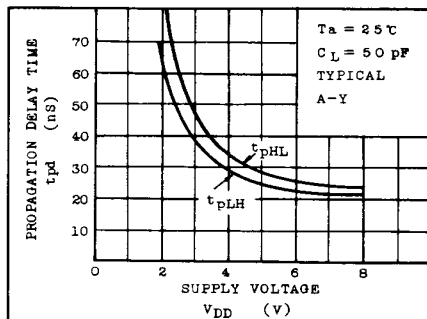
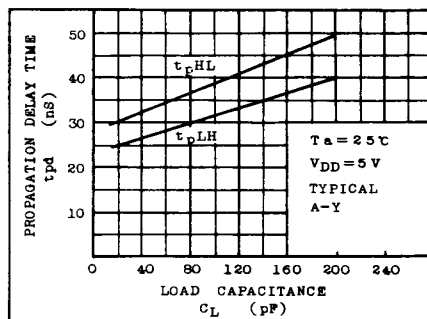
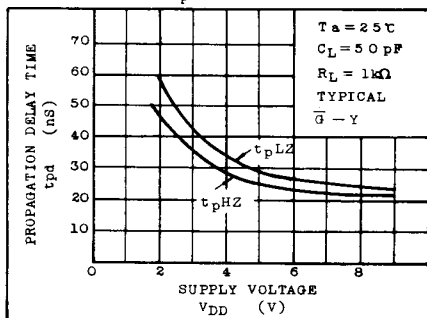
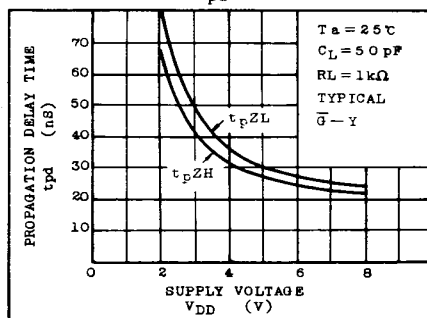
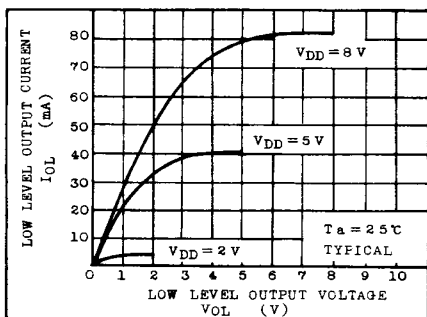
CIRCUIT 2



CIRCUIT 3



TC40H240P/F • TC40H244P/F TC40H241P/F

 $t_{pd} - V_{DD}$  $t_{pd} - C_L$  $t_{pd} - V_{DD}$  $t_{pd} - V_{DD}$  $I_{OL} - V_{OL}$  $I_{OH} - (V_{DD} - V_{OH})$ 