

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC74VHC245F, TC74VHC245FW, TC74VHC245FT

## OCTAL BUS TRANSCEIVER

The TC74VHC245 is an advanced high speed CMOS OCTAL BUS TRANSCEIVER fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

It is intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the DIR input.

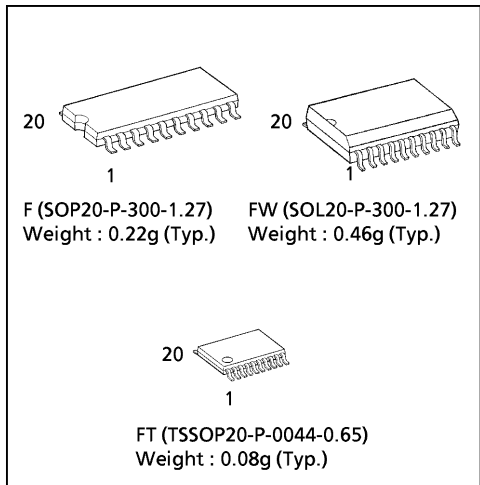
The enable input ( $\bar{G}$ ) can be used to disable the device so that the busses are effectively isolated.

All inputs are equipped with protection circuits against static discharge.

### FEATURES:

- High Speed..... $t_{pd} = 4.0ns(typ.)$  at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(Max.)$  at  $T_a = 25^\circ C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (Min.)$
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range..... $V_{CC} (opr) = 2V \sim 5.5V$
- Low Noise..... $V_{OLP} = 1.2V (Max.)$
- Pin and Function Compatible with 74ALS245

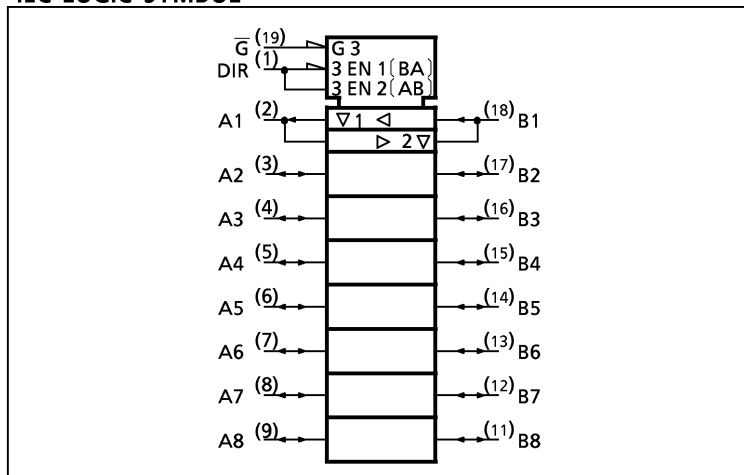
(Note) The JEDEC SOP (FW) is not available in Japan.



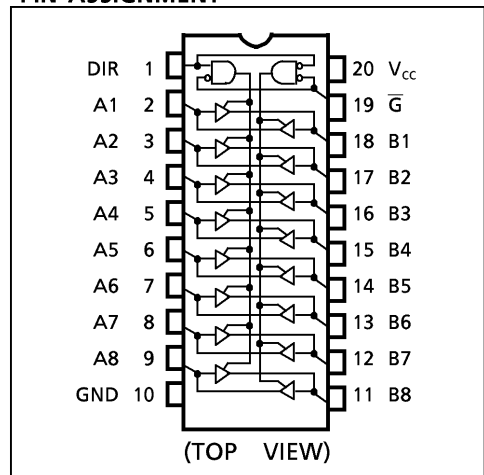
### APPLICATION NOTES

- 1) Do not apply a signal to any bus terminal when it is in the output mode. Damage may result.
- 2) All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors.
- 3) A parasitic diode is formed between the bus and Vcc terminals. Therefore bus terminal can not be used to interface 5V to 3V systems directly.

### IEC LOGIC SYMBOL



### PIN ASSIGNMENT



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## TRUTH TABLE

INPUTS		FUNCTION		OUTPUT
$\overline{G}$	DIR	A BUS	B BUS	
L	L	OUTPUT	INPUT	A = B
L	H	INPUT	OUTPUT	B = A
H	X	High Impedance		Z

X : Don't Care

Z : High Impedance

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	V
DC Input Voltage (DIR, $\overline{G}$ )	$V_{IN}$	-0.5~7.0	V
DC Bus I/O Voltage	$V_{I/O}$	-0.5~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	-20	mA
Output Diode Current	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 75$	mA
Power Dissipation	$P_D$	180	mW
Storage Temperature	$T_{stg}$	-65~150	°C

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2.0~5.5	V
Input Voltage (DIR, $\overline{G}$ )	$V_{IN}$	0~5.5	V
Bus I/O Voltage	$V_{I/O}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise and Fall Time	dt/dv	0~100 ( $V_{CC} = 3.3 \pm 0.3V$ ) 0~20 ( $V_{CC} = 5 \pm 0.5V$ )	ns/V

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**DC ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	V <sub>IH</sub>		2.0 3.0~ 5.5	1.50 V <sub>CC</sub> × 0.7	— —	— —	1.50 V <sub>CC</sub> × 0.7	—	V	
Low - Level Input Voltage	V <sub>IL</sub>		2.0 3.0~ 5.5	— —	— —	0.50 V <sub>CC</sub> × 0.3	— —	0.50 V <sub>CC</sub> × 0.3	V	
High - Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>		I <sub>OH</sub> = -50μA	2.0	1.9	2.0	—	1.9	—
					3.0	2.9	3.0	—	2.9	—
				I <sub>OH</sub> = -4mA I <sub>OH</sub> = -8mA	3.0	2.58	—	—	2.48	—
					4.5	3.94	—	—	3.80	—
Low - Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>		I <sub>OL</sub> = 50μA	2.0	—	0.0	0.1	—	0.1
					3.0	—	0.0	0.1	—	0.1
				I <sub>OL</sub> = 4mA I <sub>OL</sub> = 8mA	3.0	—	—	0.36	—	0.44
					4.5	—	—	0.36	—	0.44
3 - State Output Off - State Current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND	5.5	—	—	± 0.25	—	± 2.50	μA	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5V or GND	0~5.5	—	—	± 0.1	—	± 1.0		
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5	—	—	4.0	—	40.0		

**AC ELECTRICAL CHARACTERISTICS ( Input t<sub>r</sub> = t<sub>f</sub> = 3ns )**

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	CL (pF)	Ta = 25°C			Ta = -40~85°C		UNIT		
					MIN.	TYP.	MAX.	MIN.	MAX.			
Propagation Delay Time	t <sub>pLH</sub> t <sub>pHL</sub>		3.3 ± 0.3	15	—	5.8	8.4	1.0	10.0			
					—	8.3	11.9	1.0	13.5			
					5.0 ± 0.5	15	—	4.0	5.5		1.0	6.5
						50	—	5.5	7.5		1.0	8.5
3-State Output Enable Time	t <sub>pZL</sub> t <sub>pZH</sub>	RL = 1kΩ	3.3 ± 0.3	15	—	8.5	13.2	1.0	15.5	ns		
					—	11.0	16.7	1.0	19.0			
					5.0 ± 0.5	15	—	5.8	8.5		1.0	10.0
						50	—	7.3	10.6		1.0	12.0
3-State Output Disable Time	t <sub>pLZ</sub> t <sub>pHZ</sub>	RL = 1kΩ	3.3 ± 0.3	50	—	11.5	15.8	1.0	18.0			
					—	7.0	9.7	1.0	11.0			
Output to Output Skew	t <sub>osLH</sub> t <sub>osHL</sub>	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5			
					—	—	1.0	—	1.0			
Input Capacitance	C <sub>IN</sub>	DIR, $\bar{G}$			—	4	10	—	10	pF		
Bus Input Capacitance	C <sub>I/O</sub>	An, Bn			—	8	—	—	—			
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 2)			—	21	—	—	—			

Note (1) Parameter guaranteed by design. t<sub>osLH</sub> = |t<sub>pLHm</sub> - t<sub>pLHn</sub>|, t<sub>osHL</sub> = |t<sub>pHLm</sub> - t<sub>pHLn</sub>|

Note (2) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

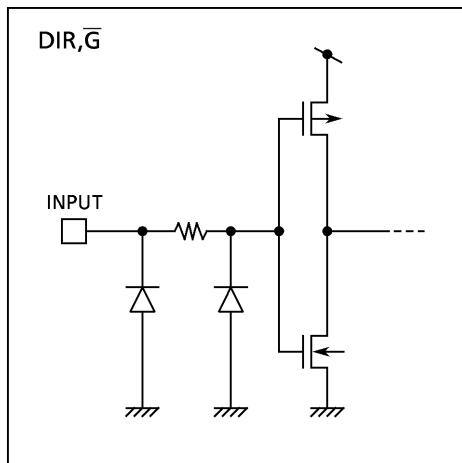
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8 \text{ (per bit)}$$

**NOISE CHARACTERISTICS ( Input  $t_r = t_f = 3ns$  )**

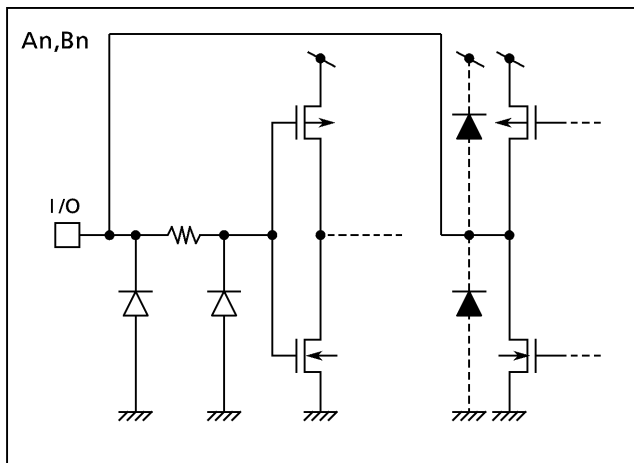
PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		UNIT	
			V <sub>CC</sub> (V)	TYP.		MAX.
Quiet Output Maximum Dynamic V <sub>OL</sub>	V <sub>OLP</sub>	C <sub>L</sub> = 50pF	5.0	0.7 (0.9)	1.0 (1.2)	V
Quiet Output Minimum Dynamic V <sub>OL</sub>	V <sub>OLV</sub>	C <sub>L</sub> = 50pF	5.0	-0.7 (-0.9)	-1.0 (-1.2)	V
Minimum High Level Dynamic Input Voltage	V <sub>IHD</sub>	C <sub>L</sub> = 50pF	5.0	-	3.5	V
Maximum Low Level Dynamic Input Voltage	V <sub>ILD</sub>	C <sub>L</sub> = 50pF	5.0	-	1.5	V

(Note) The value in ( ) only applies to JEDEC SOP (FW) devices.

**INPUT EQUIVALENT CIRCUIT**

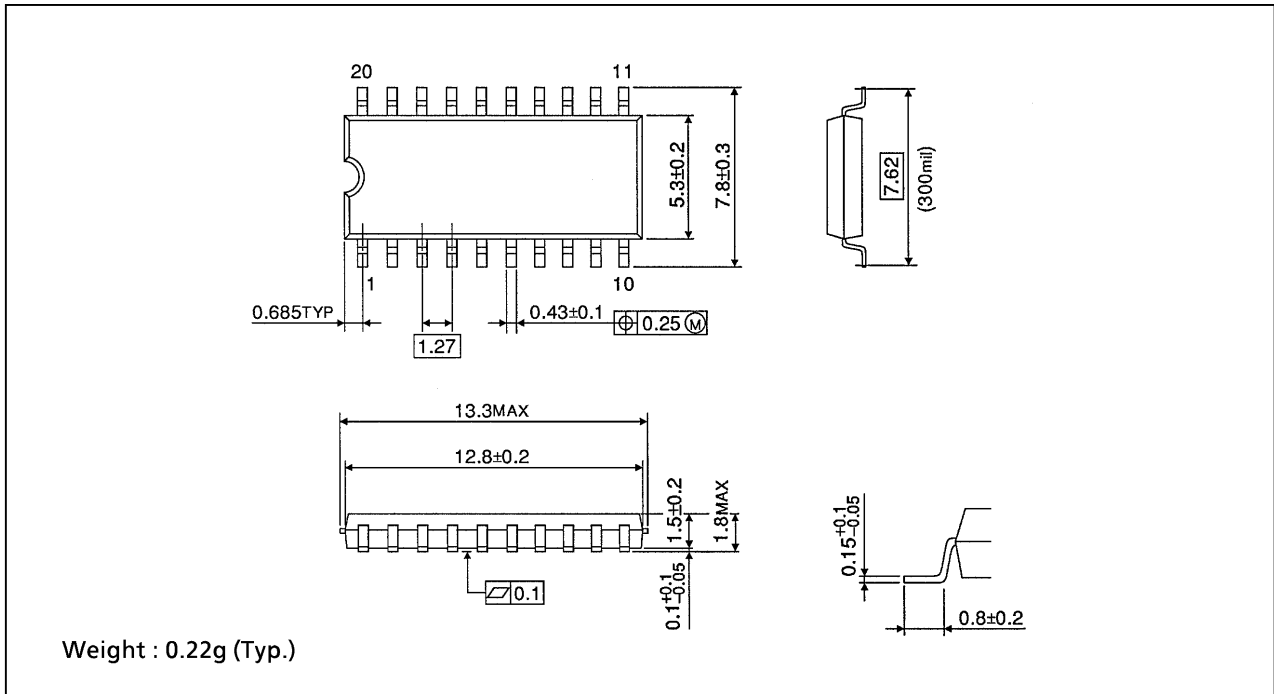


**BUS TERMINAL EQUIVALENT CIRCUIT**



**SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)**

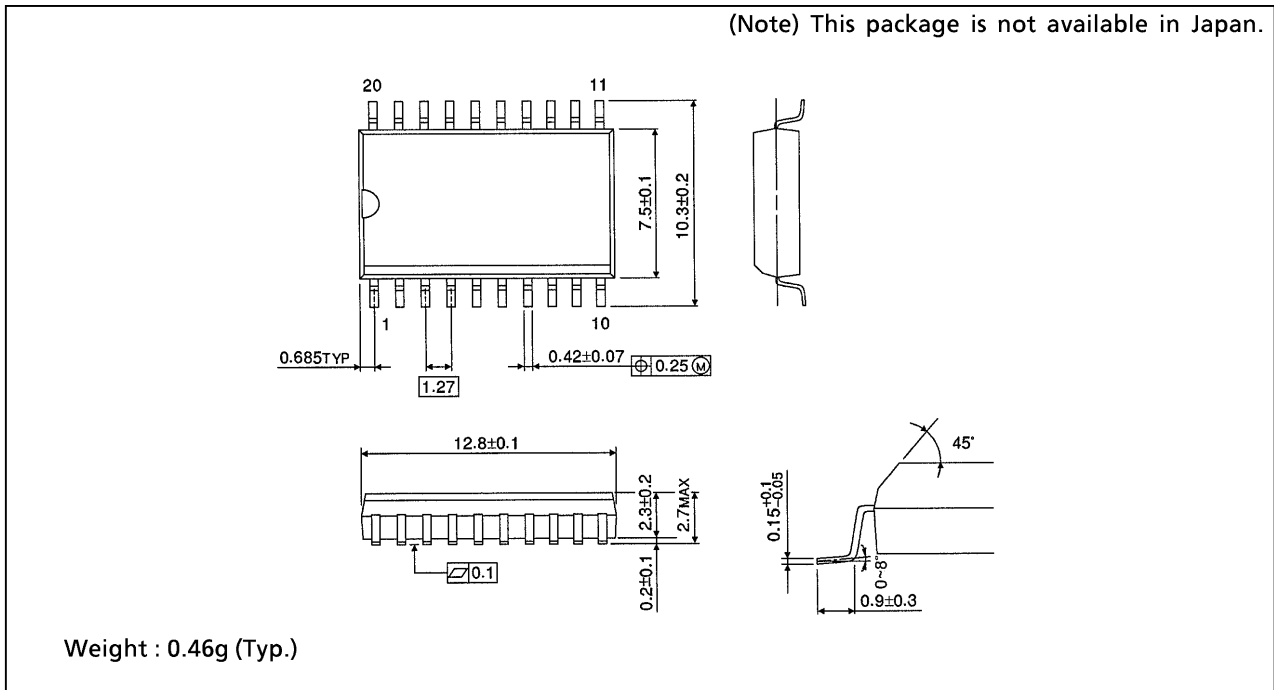
Unit in mm



**SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27)**

Unit in mm

(Note) This package is not available in Japan.



TSSOP 20PIN OUTLINE DRAWING (TSSOP20-P-0044-0.65)

Unit in mm

