

# HD14527B

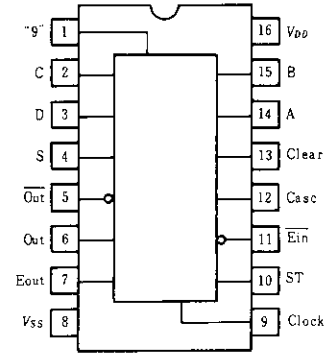
## BCD Rate Multiplier

The HD14527B BCD rate multiplier(DRM) provides an output pulse rate based upon the BCD input number. For example, if 6 is the BCD input number, there will be six output pulses for every ten input pulses. This part may be used for arithmetic operations including multiplication and division. Typical applications include digital filters, motor speed control and frequency synthesizers.

### FEATURES

- Quiescent Current=5nA/pkg typ. @5V
- Supply Voltage Range=3 to 18V
- Low Input Capacitance= 5pF typ.
- Internally Synchronous for High Speed
- Output Clocked on the Negative Going Edge of Clock
- Strobe for Inhibiting or Enabling Outputs
- Enable and Cascade Inputs for Cascade Operation of Two or More DRMs
- " 9 " Output for the Parallel Enable Configuration and DRMs in Cascade
- Complementary Outputs
- Clear and Set to Nine Inputs

### PIN ARRANGEMENT



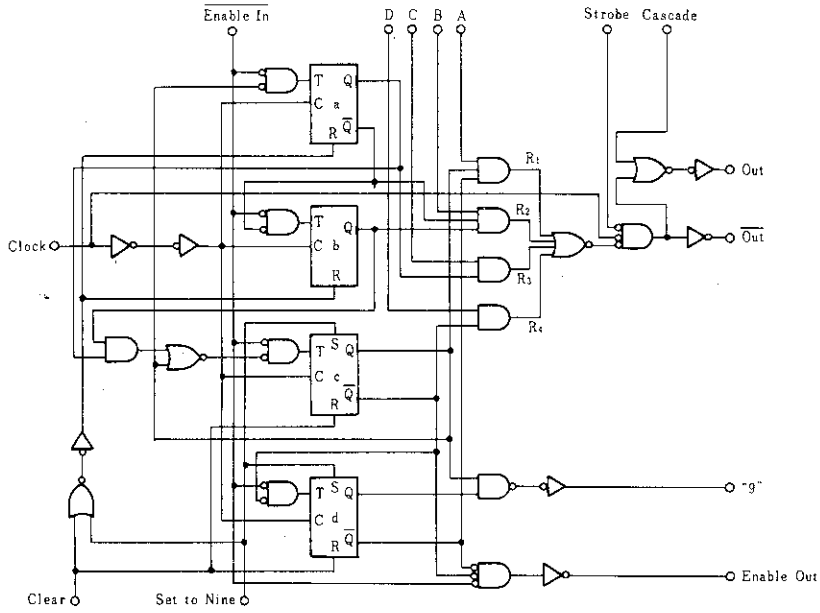
(Top View)

### TRUTH TABLE

Inputs										Output			
										Logic Level			
										Number of Pulses			
D	C	B	A	Number of Clock Pulses	Ein	Strobe	Cascade	Clear	Set	Out	Out	Eout	" 9 "
0	0	0	0	10	0	0	0	0	0	0	1	1	1
0	0	0	1	10	0	0	0	0	0	1	1	1	1
0	0	1	0	10	0	0	0	0	0	2	2	1	1
0	0	1	1	10	0	0	0	0	0	3	3	1	1
0	1	0	0	10	0	0	0	0	0	4	4	1	1
0	1	0	1	10	0	0	0	0	0	5	5	1	1
0	1	1	0	10	0	0	0	0	0	6	6	1	1
0	1	1	1	10	0	0	0	0	0	7	7	1	1
1	0	0	0	10	0	0	0	0	0	8	8	1	1
1	0	0	1	10	0	0	0	0	0	9	9	1	1
1	0	1	0	10	0	0	0	0	0	8	8	1	1
1	0	1	1	10	0	0	0	0	0	9	9	1	1
1	1	0	0	10	0	0	0	0	0	8	8	1	1
1	1	0	1	10	0	0	0	0	0	9	9	1	1
1	1	1	0	10	0	0	0	0	0	8	8	1	1
1	1	1	1	10	0	0	0	0	0	9	9	1	1
x	x	x	x	10	1	0	0	0	0	--	--	--	--
x	x	x	x	10	0	1	0	0	0	0	1	1	1
x	x	x	x	10	0	0	1	0	0	1	0	1	1
1	x	x	x	10	0	0	0	1	0	10	10	1	0
0	x	x	x	10	0	0	0	1	0	0	1	1	0
x	x	x	x	10	0	0	0	0	1	0	1	0	1

x=Don't Care

LOGIC DIAGRAM



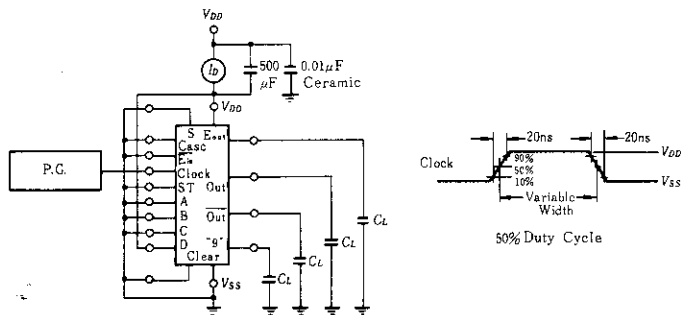
ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V <sub>DD</sub> (V)	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	V <sub>OL</sub>	5.0	V <sub>in</sub> =V <sub>DD</sub> or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	V <sub>OH</sub>	5.0	V <sub>in</sub> =0 or V <sub>DD</sub>	4.95	—	4.95	5.0	—	4.95	—	V
		10		9.95	—	9.95	10	—	9.95	—	
		15		14.95	—	14.95	15	—	14.95	—	
Input Voltage	V <sub>IL</sub>	5.0	V <sub>out</sub> =4.5 or 0.5V	—	1.5	—	2.25	1.5	—	1.5	V
		10	V <sub>out</sub> =9.0 or 1.0V	—	3.0	—	4.50	3.0	—	3.0	
		15	V <sub>out</sub> =13.5 or 1.5V	—	4.0	—	6.75	4.0	—	4.0	
	V <sub>IH</sub>	5.0	V <sub>out</sub> =0.5 or 4.5V	3.5	—	3.5	2.75	—	3.5	—	V
		10	V <sub>out</sub> =1.0 or 9.0V	7.0	—	7.0	5.50	—	7.0	—	
		15	V <sub>out</sub> =1.5 or 13.5V	11.0	—	11.0	8.25	—	11.0	—	
Output Drive Current	I <sub>OH</sub>	5.0	V <sub>OH</sub> =2.5V	-1.0	—	-0.8	-1.7	—	-0.6	—	mA
		5.0	V <sub>OH</sub> =4.6V	-0.2	—	-0.16	-0.36	—	-0.12	—	
		10	V <sub>OH</sub> =9.5V	-0.5	—	-0.4	-0.9	—	-0.3	—	
		15	V <sub>OH</sub> =13.5V	-1.4	—	-1.2	-3.5	—	-1.0	—	
	I <sub>OL</sub>	5.0	V <sub>OL</sub> =0.4V	0.52	—	0.44	0.88	—	0.36	—	mA
		10	V <sub>OL</sub> =0.5V	1.3	—	1.1	2.25	—	0.9	—	
15		V <sub>OL</sub> =1.5V	3.6	—	3.0	8.8	—	2.4	—		
Input Current	I <sub>in</sub>	15		—	±0.3	—	±0.0001	±0.3	—	±1.0	μA
Input Capacitance	C <sub>in</sub>	—	V <sub>in</sub> =0	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	I <sub>DD</sub>	5.0	Zero Signal, per Package	—	20	—	0.005	20	—	150	μA
		10		—	40	—	0.010	40	—	300	
		15		—	80	—	0.015	80	—	600	
Total Supply Current*	I <sub>T</sub>	5.0	Dynamic+I <sub>DD</sub> ,	—	—	—	0.85	—	—	—	μA
		10	per Gate	—	—	—	1.75	—	—	—	
		15	C <sub>L</sub> =50 pF, f=1 kHz	—	—	—	2.6	—	—	—	

\* To calculate total supply current at frequency other than 1kHz.

@V<sub>DD</sub>=5.0V I<sub>T</sub>=(0.85μA/kHz)f+I<sub>DD</sub>. @V<sub>DD</sub>=10V I<sub>T</sub>=(1.75μA/kHz)f+I<sub>DD</sub>. @V<sub>DD</sub>=15V I<sub>T</sub>=(2.6μA/kHz)f+I<sub>DD</sub>

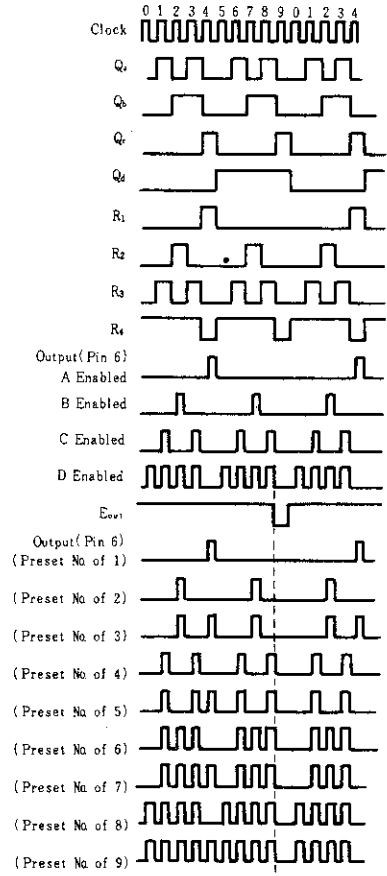
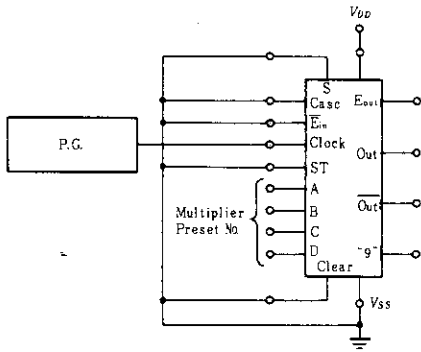
● POWER DISSIPATION TEST CIRCUIT AND WAVEFORM



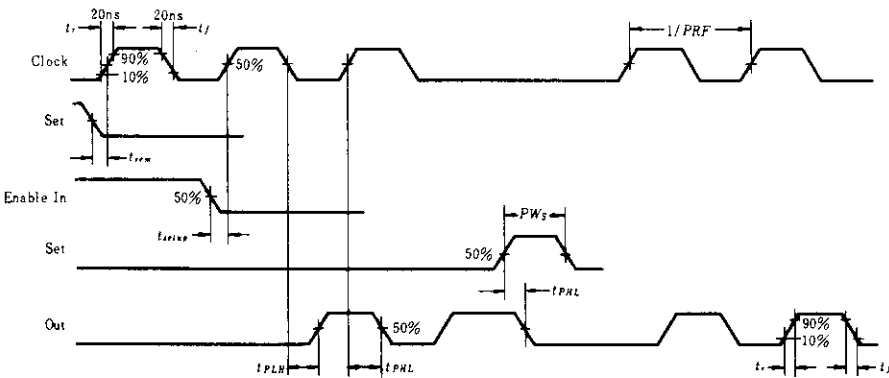
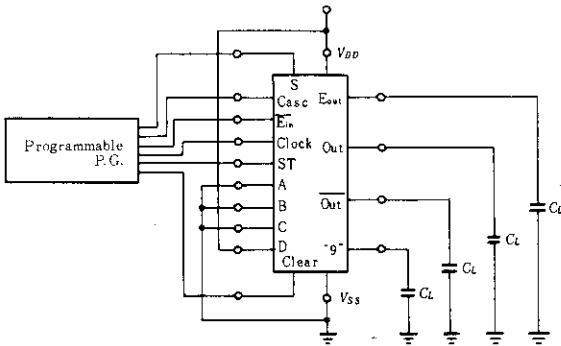
■ SWITCHING CHARACTERISTICS ( $C_L=50\text{pF}$ ,  $T_a=25^\circ\text{C}$ )

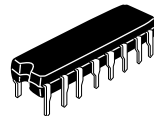
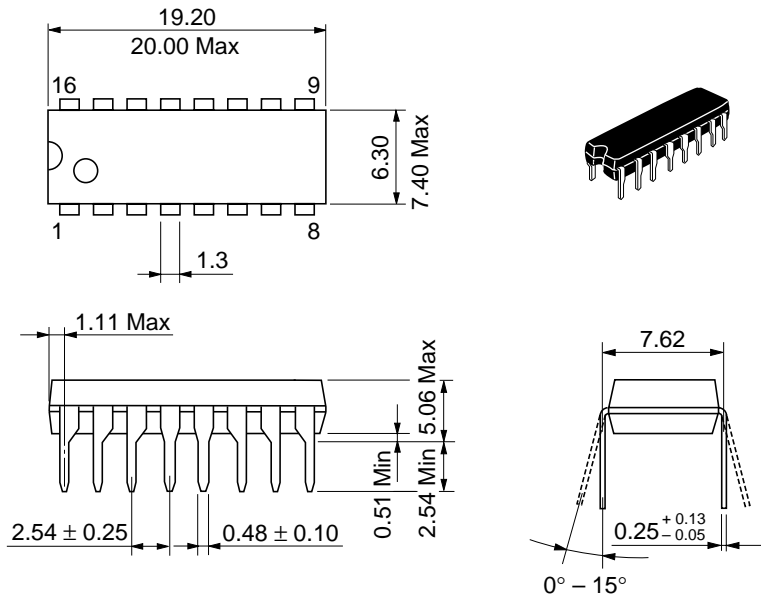
Characteristic		Symbol	$V_{DD}$ (V)	min	typ	max	Unit
Output Rise Time		$t_r$	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		$t_f$	5.0	—	100	200	ns
			10	—	50	100	
			15	—	37	80	
Propagation Delay Time	Clock to Out	$t_{PHL}$	5.0	—	200	500	ns
			10	—	100	250	
			15	—	70	175	
	Clock to $\overline{\text{Out}}$	$t_{PLH}$	5.0	—	125	315	
			10	—	65	150	
			15	—	45	115	
	Clock to Eout	$t_{PHL}$	5.0	—	295	900	
			10	—	130	325	
			15	—	85	230	
	Clock to "g"	$t_{PHL}$	5.0	—	400	1000	
			10	—	155	400	
			15	—	110	300	
Set, Clear to Out	$t_{PHL}$	5.0	—	380	1000	ns	
		10	—	165	400		
		15	—	110	300		
Cascade to Out	$t_{PLH}$	5.0	—	125	315	ns	
		10	—	65	150		
		15	—	45	115		
Strobe to Out	$t_{PLH}$	5.0	—	230	700	ns	
		10	—	105	265		
		15	—	70	190		
Clock Pulse Width	$PW_C$	5.0	500	250	—	ns	
		10	200	110	—		
		15	150	80	—		
Clock Frequency	$PRF$	5.0	—	2.0	1.0	MHz	
		10	—	4.5	2.5		
		15	—	6.0	3.3		
Clock Pulse Rise and Fall Time	$t_r, t_f$	5.0	—	—	15	$\mu\text{s}$	
		10	—	—	15		
		15	—	—	15		
Set or Clear Pulse Width	$PW_S$ $PW_{clear}$	5.0	240	80	—	ns	
		10	100	35	—		
		15	75	30	—		
Set Removal Time	$t_{rem}$	5.0	0	-20	—	ns	
		10	0	-10	—		
		15	0	-7.5	—		
Enable In Setup Time	$t_{setup}$	5.0	400	175	—	ns	
		10	150	60	—		
		15	120	45	—		

■ TIMING DIAGRAM



■ SWITCHING TIME TEST CIRCUIT





Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

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