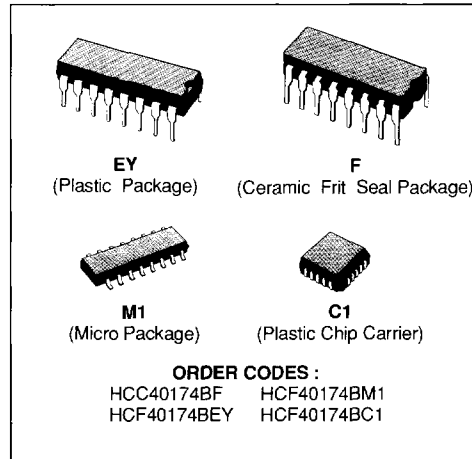


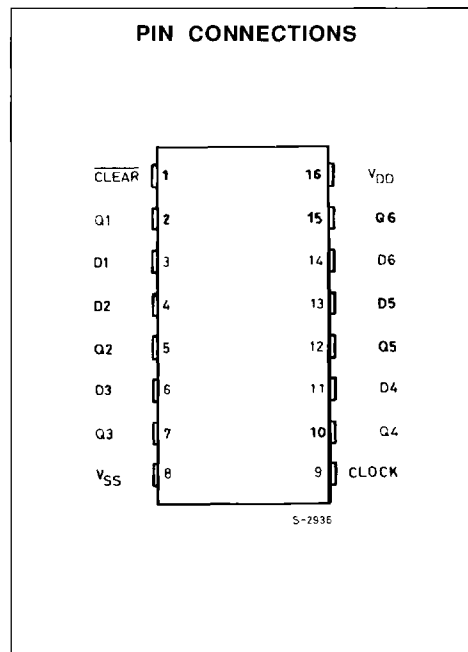
HEX "D" – TYPE FLIP-FLOP

- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED AT 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18 V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N°. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

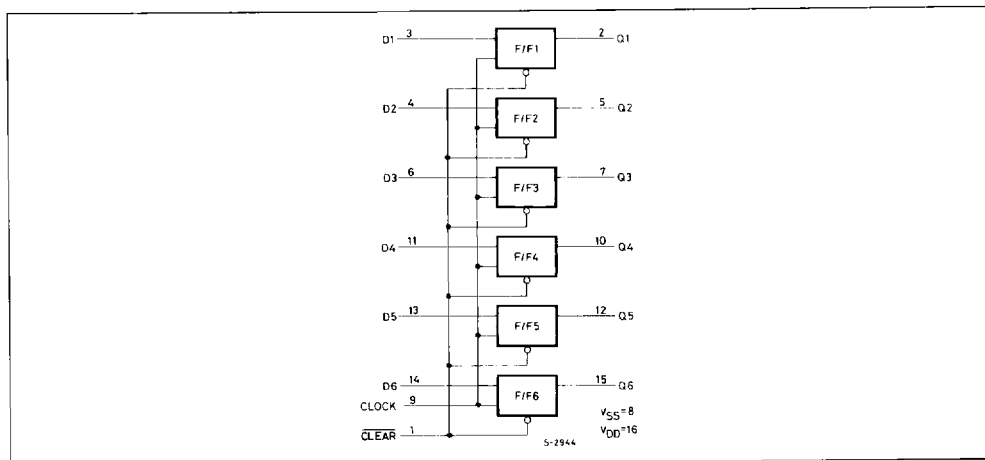

DESCRIPTION

The **HCC40174B** (extended temperature range) and **HCF40174B** (intermediate temperature range) are monolithic integrated circuits available in 16-lead dual in-line plastic or ceramic package and plastic micro package.

The **HCC/HCF40174B** consists of six identical 'D' - type flip-flops having independent DATA inputs. The CLOCK and CLEAR inputs are common to all six units. Data is transferred to the Q outputs on the positive-going transition of the clock pulse. All six flip-flops are simultaneously reset by a low level on the CLEAR input.



FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

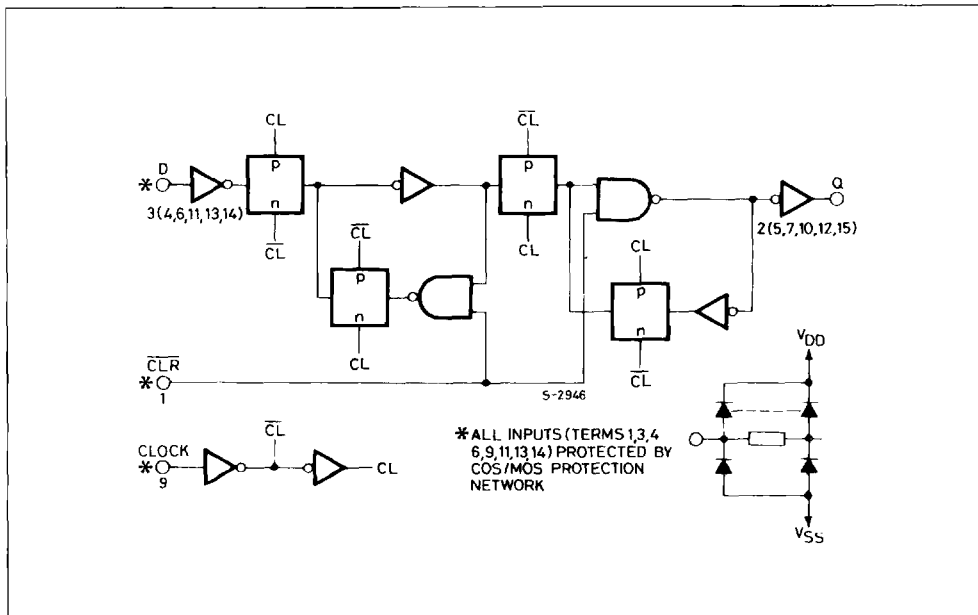
Symbol	Parameter	Value	Unit
V_{DD}^*	Supply Voltage : HCC Types HCF Types	- 0.5 to + 20	V
		- 0.5 to + 18	V
V_i	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
I_i	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = Full Package-temperature Range	200	mW
		100	mW
T_{op}	Operating Temperature : HCC Types HCF Types	- 55 to + 125	$^{\circ}$ C
		- 40 to + 85	$^{\circ}$ C
T_{stg}	Storage Temperature	- 65 to + 150	$^{\circ}$ C

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : HCC Types HCF Types	3 to 18	V
		3 to 15	V
V_i	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : HCC Types HCF Types	- 55 to + 125	$^{\circ}$ C
		- 40 to + 85	$^{\circ}$ C

LOGIC DIAGRAM (1 of 6 Flip-Flops)



TRUTH TABLE

Inputs			Output
Clock	Data	Clear	Q
	0	1	0
	1	1	1
	X	1	NC
X	X	0	0

1 = High Level X = Don't Care
 0 = Low Level NC = No Change

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

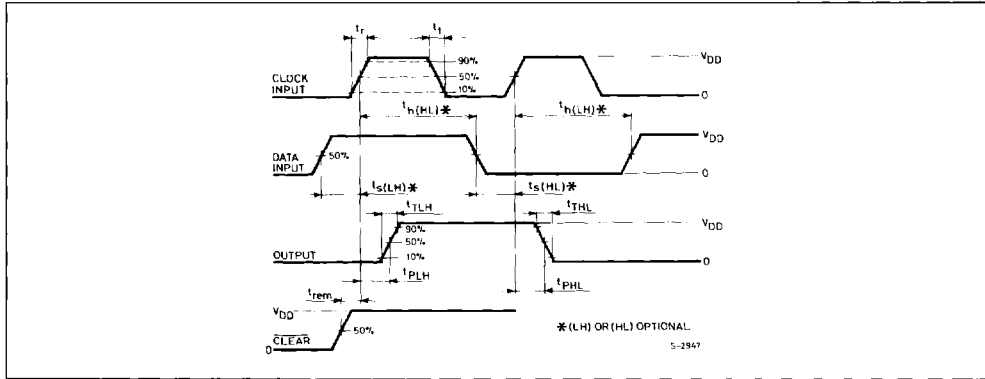
Symbol	Parameter		Test Conditions				Value						Unit	
			V _I (V)	V _O (V)	I _O (μ A)	V _{DD} (V)	T _{Low} *		25°C			T _{High} *		
							Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I _L	Quiescent Current	HCC Types	0/5			5		1		0.02	1		30	μ A
			0/10			10		2		0.02	2		60	
			0/15			15		4		0.02	4		120	
			0/20			20		20		0.04	20		600	
		HCF Types	0/5			5		4		0.02	4		30	
			0/10			10		8		0.02	8		60	
V _{OH}	Output High Voltage		0/5		< 1	5	4.95		4.95			4.95	V	
			0/10		< 1	10	9.95		9.95			9.95		
			0/15		< 1	15	14.95		14.95			14.95		
V _{OL}	Output Low Voltage		5/0		< 1	5		0.05			0.05		V	
			10/0		< 1	10		0.05			0.05			
			15/0		< 1	15		0.05			0.05			
V _{IH}	Input High Voltage			0.5/4.5	< 1	5	3.5		3.5			3.5	V	
				1/9	< 1	10	7		7			7		
				1.5/13.5	< 1	15	11		11			11		
V _{IL}	Input Low Voltage			4.5/0.5	< 1	5		1.5			1.5		V	
				9/1	< 1	10		3			3			
				13.5/1.5	< 1	15		4			4			
I _{OH}	Output Drive Current	HCC Types	0/5	2.5		5	-2		-1.6	-3.2		-1.15	mA	
			0/5	4.6		5	-0.64		-0.51	-1		-0.36		
			0/10	9.5		10	-1.6		-1.3	-2.6		-0.9		
			0/15	13.5		15	-4.2		-3.4	-6.8		-2.4		
		HCF Types	0/5	2.5		5	-1.53		-1.36	-3.2		-1.1		
			0/5	4.6		5	-0.52		-0.44	-1		-0.36		
I _{OL}	Output Sink Current	HCC Types	0/5	0.4		5	0.64		0.51	1		0.36	mA	
			0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
			HCF Types	0/5	0.4		5	0.52		0.44	1			0.36
		0/10		0.5		10	1.3		1.1	2.6		0.9		
		0/15	1.5		15	3.6		3.0	6.8		2.4			
I _{IH} , I _{IL}	Input Leakage Current		HCC Types	0/18	Any Input	18		± 0.1		$\pm 10^{-5}$	± 0.1		± 1	μ A
		HCF Types	0/15	15										
C _I	Input Capacitance		Any Input						5	7.5			pF	

* T_{Low} = -55°C for HCC device ; -40°C for HCF device.* T_{High} = +125°C for HCC device ; +85°C for HCF device.The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5 V min. with V_{DD} = 15V.

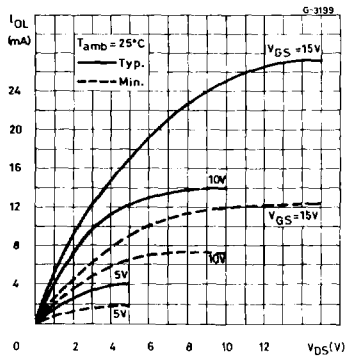
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}\text{C}$, all input rise and fall time = 20ns)

Symbol	Parameter	Test Conditions	Value			Unit	
			V_{DD} (V)	Min.	Typ.		Max.
t_{PLH} , t_{PHL}	Propagation Delay Time Clock to Output		5		150	300	ns
			10		70	140	
			15		50	100	
t_{PHL}	Propagation Delay Time Clear to Output		5		100	200	ns
			10		50	100	
			15		40	80	
t_{THL} , t_{TLH}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	
t_{setup}	Data Setup Time		5	40	20		ns
			10	20	10		
			15	10	0		
t_{hold}	Data Hold Time		5	80	40		ns
			10	40	20		
			15	30	15		
t_w	Clock Input Pulse Width Low Level		5	130	65		ns
			10	60	30		
			15	40	20		
t_w	Clock Input Pulse Width High Level		5	130	65		ns
			10	60	30		
			15	40	20		
t_w	Clear Input Pulse Width Low Level		5	100	50		ns
			10	50	25		
			15	40	20		
t_r , t_f	Clock Input Rise or Fall Time		5			15	μs
			10			15	
			15			15	
t_{rem}	Clear Removal Time		5	0	-40		ns
			10	0	-15		
			15	0	-10		
f_{CL}	Maximum Clock Input Frequency		5	3.5	7		MHz
			10	6	12		
			15	8	16		

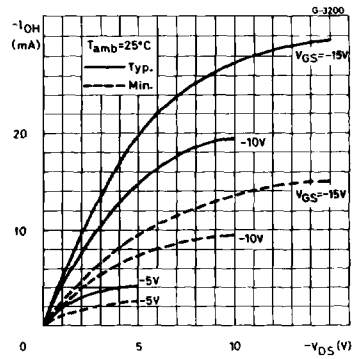
WAVEFORMS



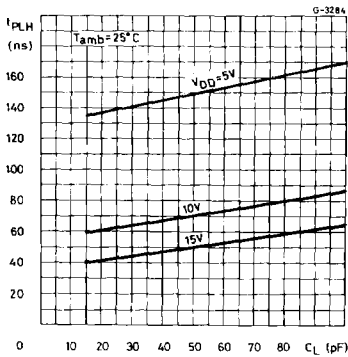
Output Low (sink) Current Characteristics.



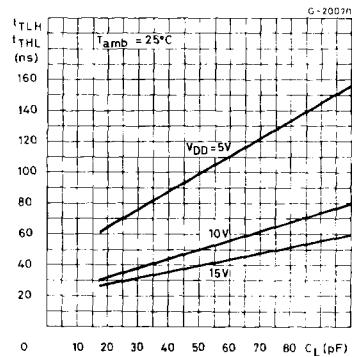
Output High (source) Current Characteristics.



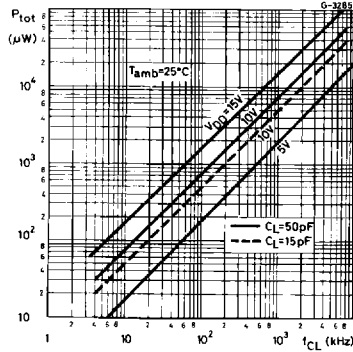
Typical Propagation Delay Time (clock to output) vs. Load Capacitance.



Typical Transition Time vs. Load Capacitance.

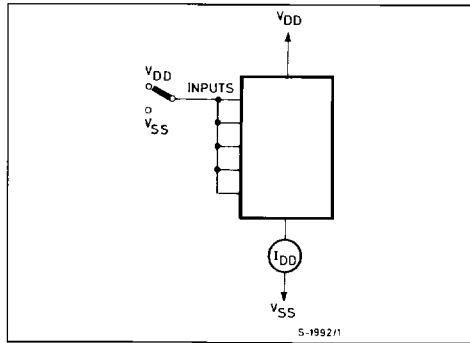


Typical Dynamical Power Dissipation vs. Clock Frequency.

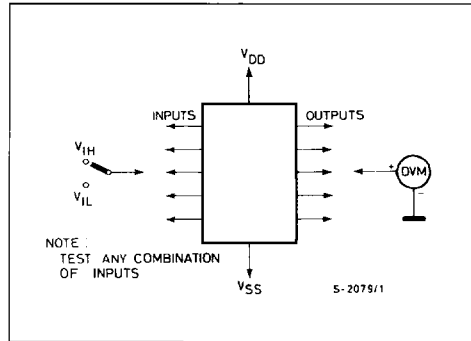


TEST CIRCUITS

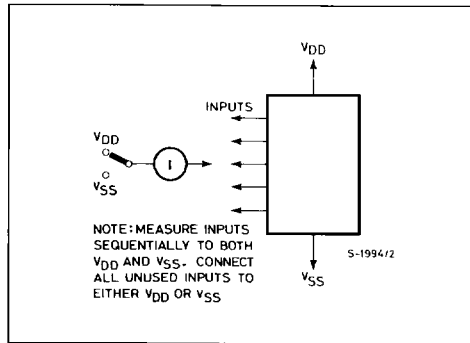
Quiescent Device Current.



Input Voltage.



Input Leakage Current.



Dynamic Power Dissipation.

