

# GD54/74HC113, GD54/74HCT113

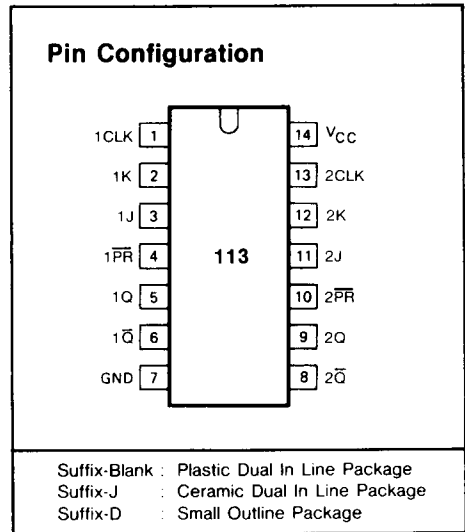
## DUAL J-K FLIP-FLOPS WITH PRESET

### General Description

These devices are identical in pinout to the 54/74LS113. They consist of two J-K flip-flops with individual J, K, Clock, and Preset inputs. These flip-flops are edge sensitive to the clock input and change state on the negative going transition of the clock pulse. Both Q and  $\bar{Q}$  outputs are available from each flip-flop. Preset is independent of the Clock and accomplished by a Low level on the input. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

### Features

- Low Power consumption characteristic of CMOS devices
- Output drive capability: 10 LS TTL Loads Min.
- Operating speed superior to LS TTL
- Wide operating voltage range: for HC 2 to 6 volts  
for HCT 4.5 to 5.5 volts
- Low input current:  $1\mu\text{A}$  Max.
- Low quiescent current:  $40\mu\text{A}$  Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs.



### Logic Symbol

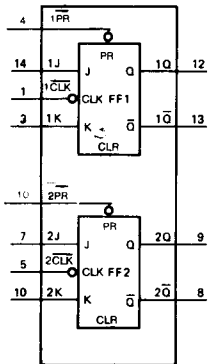


Fig. 1 Logic symbol

### Function Table

INPUTS				OUTPUTS	
$\overline{nPR}$	nCLK	nJ	nK	nQ	$\overline{nQ}$
L	X	X	X	H	L
H	↓	L	L	$Q_0$	$\overline{Q_0}$
H	↓	H	L	H	L
H	↓	L	H	L	H
H	↓	H	H	TOGGLE	
H	H	X	X	$Q_0$	$\overline{Q_0}$

**Absolute Maximum Ratings**

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CC}$	DC Supply voltage		-0.5	+7	V
$I_{IK}, I_{OK}$	DC input or output diode current	for $V_I < -0.5$ or $V_I > V_{CC} + 0.5V$		20	mA
$I_O$	DC output source or sink current	for $-0.5V < V_O < V_{CC} + 0.5V$		25	mA
$I_{CC}$	DC $V_{CC}$ or GND current			50	mA
$T_{stg}$	Storage temperature range		-65	150	°C
$P_D$	Power dissipation per package	above +70°C: derate linearly with 8mW/K		500	mW
$T_L$	Lead temperature	At distance 1/16±1/32 in. from case for 60 sec(CERAMIC) 10 sec(PLASTIC)		300 260	°C

**Recommended Operating Conditions**

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range $V_{CC}$ : GD54/74HC Types GD54/74HCT Types	2 4.5	6 5.5	V
DC Input or Output Voltage $V_I, V_O$	0	$V_{CC}$	V
Operating Temperature $T_A$ : GD74 Types GD54 Types	-40 -55	+85 +125	°C
Input Rise and Fall times $t_r, t_f$ : GD54/74HC Types at 2V at 4.5V at 6V GD54/74HCT Types at 4.5V		1000 500 400 500	ns

**Logic Diagram**

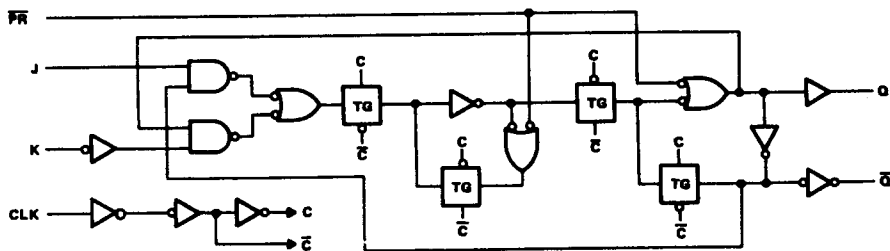


Fig. 2 Logic diagram (one flip flop)

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HC113		GD54HC113		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.		
V <sub>IH</sub>	HIGH level input Voltage		2.0	1.5			1.5		1.5		V	
			4.5	3.15			3.15		3.15			
			6.0	4.2			4.2		4.2			
V <sub>IL</sub>	LOW level input voltage		2.0			0.3		0.3		0.3	V	
			4.5			0.9		0.9		0.9		
			6.0			1.2		1.2		1.2		
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> =-20μA	2.0	1.9	2.0		1.9		1.9	V	
				4.5	4.4	4.5		4.4		4.4		
				6.0	5.9	6.0		5.9		5.9		
	or V <sub>IL</sub>	I <sub>OH</sub> =-4mA I <sub>OH</sub> =-5.2mA	4.5	3.98	4.3		3.84		3.7			
			6.0	5.48	5.2		5.34		5.2			
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> =20μA	2.0			0.1		0.1		V	
				4.5			0.1		0.1			0.1
				6.0			0.1		0.1			0.1
	or V <sub>IL</sub>	I <sub>OL</sub> =4mA I <sub>OL</sub> =5.2mA	4.5		0.17	0.26		0.33		0.4		
			6.0		0.15	0.26		0.33		0.4		
I <sub>IN</sub>	Input leakage Current	V <sub>IN</sub> =V <sub>CC</sub> or GND	6.0			0.1		1.0		1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =V <sub>CC</sub> or GND I <sub>out</sub> =0μA	6.0			4		40		80	μA	

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HCT113		GD54HCT113		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.		
V <sub>IH</sub>	HIGH level input Voltage		4.5 to 5.5	2.0			2.0		2.0		V	
V <sub>IL</sub>	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V	
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> =-20μA	4.5	4.4	4.5		4.4		4.4	V	
				4.5	3.98	4.3		3.84		3.7		
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> =20μA	4.5			0.1		0.1		0.1	V
				4.5		0.17	0.26		0.33		0.4	
I <sub>IN</sub>	Input leakage Current	V <sub>IN</sub> =V <sub>CC</sub> or GND	5.5			0.1		1.0		1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =V <sub>CC</sub> or GND I <sub>out</sub> =0μA	5.5			4		40		80	μA	

Timing Requirements for HC:  $t_r=t_f=6ns$   $C_L=50 pF$

SYMBOL	PARAMETER		V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD54HC113		GD54HC113		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.		
t <sub>w</sub>	Pulse width	P̄R	2.0	80	30		100		120		ns	
			4.5	16	10		20		25			
			6.0	14	8		18		22			
		CLK	2.0	80	30		100		120			ns
			4.5	16	10		20		25			
			6.0	14	8		18		22			
t <sub>su</sub>	Setup time	Data to CLK	2.0	60	30		80		100		ns	
			4.5	15	10		18		20			
			6.0	14	8		16		18			
t <sub>rec</sub>	Recovery time	P̄R to CLK	2.0	5	0		5		5		ns	
			4.5	5	0		5		5			
			6.0	5	0		5		5			
t <sub>h</sub>	Hold time	CLK to Data	2.0	3	0		3		3		ns	
			4.5	3	0		3		3			
			6.0	3	0		3		3			

AC Characteristics for HC:  $t_r=t_f=6ns$   $C_L=50 pF$

SYMBOL	PARAMETER		V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HC113		GD54HC113		UNIT
				MIN.	TPY.	MAX.	MIN.	MAX.	MIN.	MAX.	
f <sub>max</sub>	Muximum Clock Pulse Frequency		2.0	6	20		5		4		MHz
			4.5	30	65		25		20		
			6.0	35	75		30		25		
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time nCLK to nQ		2.0		46	160		200		240	ns
			4.5		15	30		40		45	
			6.0		14	28		35		50	
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time nCLK to nQ̄		2.0		50	160		200		240	ns
			4.5		17	30		40		50	
			6.0		16	28		35		45	
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time nP̄R to nQ, nQ̄		2.0		45	155		190		230	ns
			4.5		15	28		38		45	
			6.0		14	26		34		40	
t <sub>TLH</sub> / t <sub>THL</sub>	Output Transition Time		2.0		25	70		85		100	ns
			4.5		8	15		18		22	
			6.0		7	13		16		19	

# GD54/74HC113, GD54/74HCT113

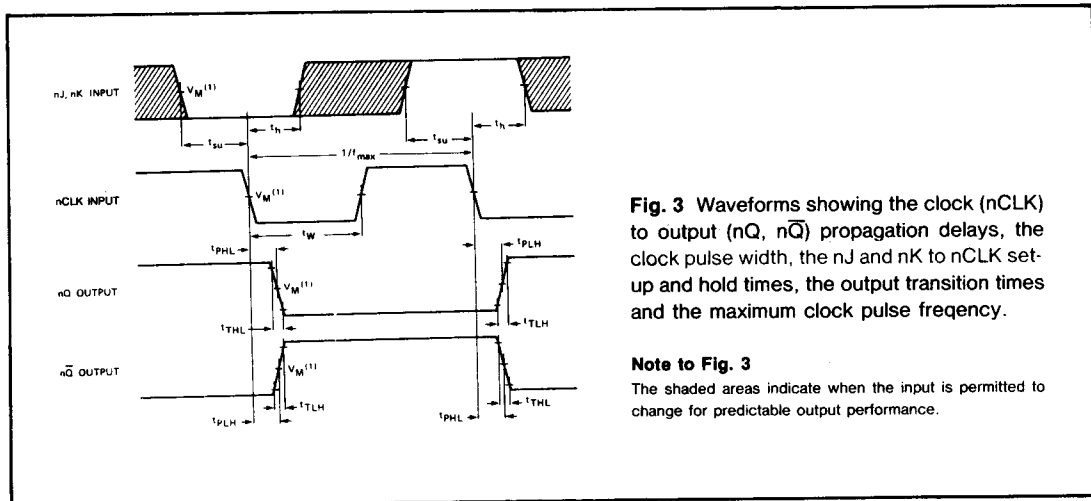
## Timing Requirements for HCT: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER		V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HCT113		GD54HCT113		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t <sub>w</sub>	Pulse width	$\overline{\text{PR}}$	4.5	18	10		20		25		ns
		CLK	4.5	16	10		20		25		ns
t <sub>su</sub>	Setup time	Data to CLK	4.5	15	10		18		20		ns
t <sub>rec</sub>	Recovery time	$\overline{\text{PR}}$ to CLK	4.5	5	0		5		5		ns
t <sub>h</sub>	Hold time	CLK to Data	4.5	3	0		3		3		ns

## AC Characteristics for HC: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER		V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HCT113		GD54HCT113		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
f <sub>max</sub>	Maximum Clock Pulse Frequency		4.5	27	54		22		18		MHz
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time nCLK to nQ		4.5		17	30		40		50	ns
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time nCLK to n $\overline{\text{Q}}$		4.5		17	30		40		50	ns
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time n $\overline{\text{PR}}$ to nQ, n $\overline{\text{Q}}$		4.5		15	28		38		45	ns
t <sub>TLH</sub> / t <sub>THL</sub>	Output Transition Time		4.5		8	15		18		22	ns

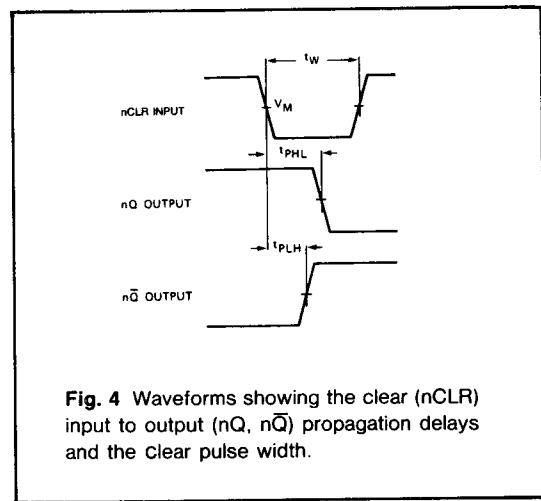
AC Waveforms



**Fig. 3** Waveforms showing the clock (nCLK) to output (nQ, nQ̄) propagation delays, the clock pulse width, the nJ and nK to nCLK set-up and hold times, the output transition times and the maximum clock pulse frequency.

**Note to Fig. 3**

The shaded areas indicate when the input is permitted to change for predictable output performance.



**Fig. 4** Waveforms showing the clear (nCLR) input to output (nQ, nQ̄) propagation delays and the clear pulse width.

**Note to AC waveforms**

(1) HC :  $V_M = 50\%$ ;  $V_I = \text{GND to } V_{CC}$ .  
 HCT :  $V_M = 1.3V$ ;  $V_I = \text{GND to } 3V$ .

This datasheet has been downloaded from:

[www.DatasheetCatalog.com](http://www.DatasheetCatalog.com)

Datasheets for electronic components.



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

[LittleDiode.com](http://LittleDiode.com)

Looking forward to providing you with the best possible service.