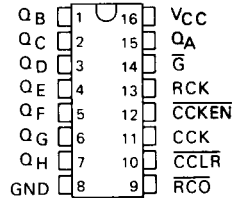


TYPES SN54LS590, SN54LS591, SN74LS590, SN74LS591 8-BIT BINARY COUNTERS WITH OUTPUT REGISTERS

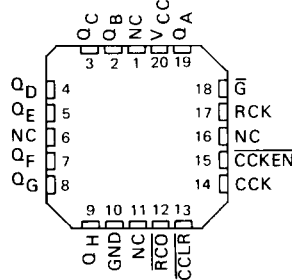
D2632, JANUARY 1981 — REVISED JUNE 1983

- **8-Bit Counter with Register**
- **Parallel Register Outputs**
- **Choice of 3-State ('LS590) or Open-Collector ('LS591) Register Outputs**
- **Guaranteed Counter Frequency: DC to 20 MHz**

SN54LS590, SN54LS591 ... J OR W PACKAGE
SN74LS590, SN74LS591 ... J OR N PACKAGE
(TOP VIEW)



SN54LS590, SN54LS591 ... FK PACKAGE
SN74LS590, SN74LS591 ... FN PACKAGE
(TOP VIEW)



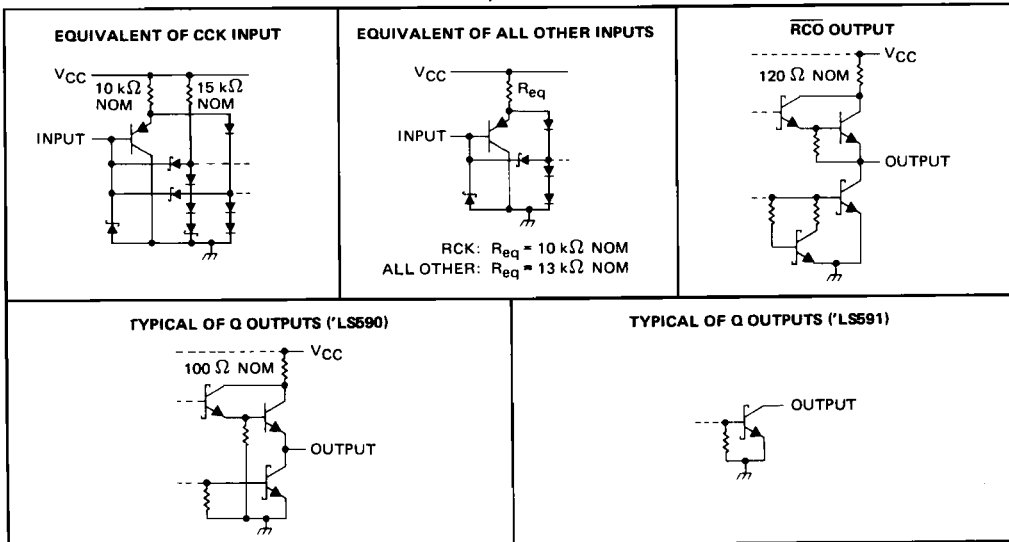
NC - No internal connection

description

These devices each contain an 8-bit binary counter that feeds an 8-bit storage register. The storage register has parallel outputs. Separate clocks are provided for both the binary counter and storage register. The binary counter features a direct clear input \overline{CCLR} and a count enable input \overline{CCKEN} . For cascading, a ripple carry output \overline{RCO} is provided. Expansion is easily accomplished for two stages by connecting \overline{RCO} of the first stage to \overline{CCKEN} of the second stage. Cascading for larger count chains can be accomplished by connecting \overline{RCO} of each stage to CCK of the following stage.

Both the counter and register clocks are positive-edge triggered. If the user wishes to connect both clocks together, the counter state will always be one count ahead of the register. Internal circuitry prevents clocking from the clock enable.

schematics of inputs and outputs



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TTL DEVICES

PRODUCTION DATA
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS INSTRUMENTS

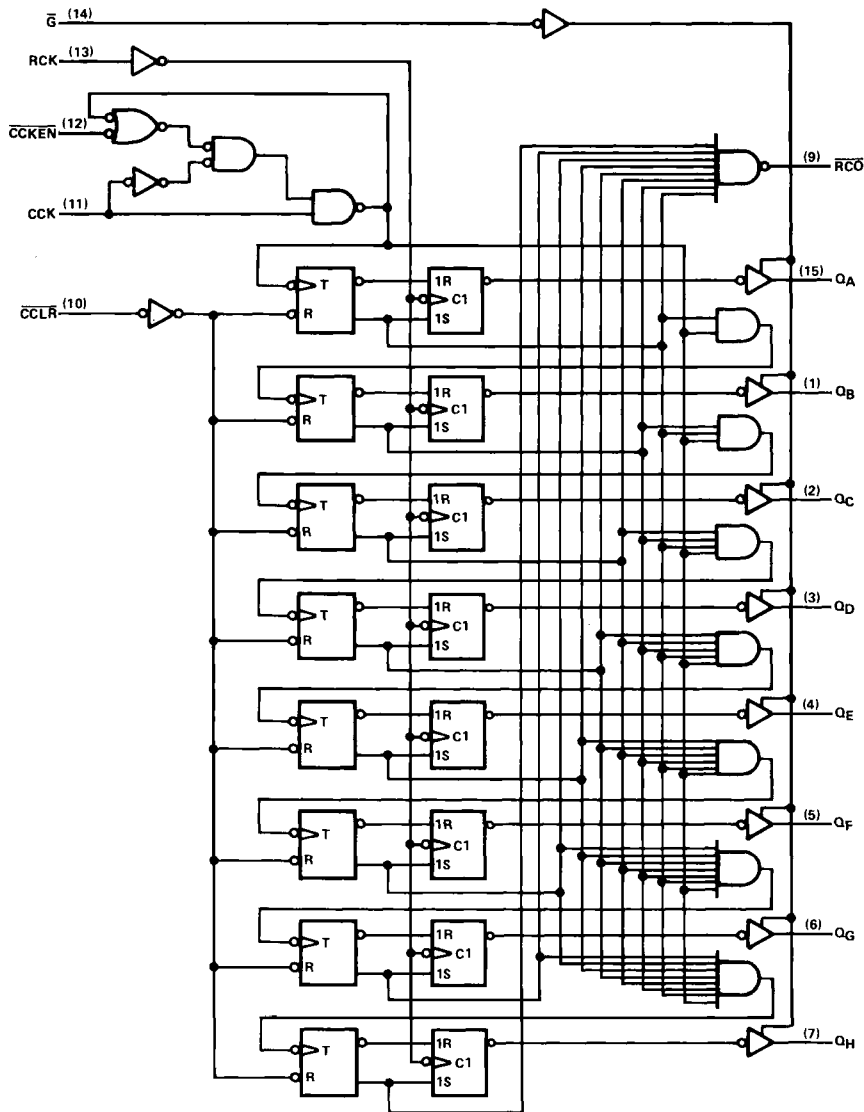
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3-1137

TYPES SN54LS590, SN54LS591, SN74LS590, SN74LS591

8-BIT BINARY COUNTERS WITH OUTPUT REGISTERS

logic diagram (positive logic)



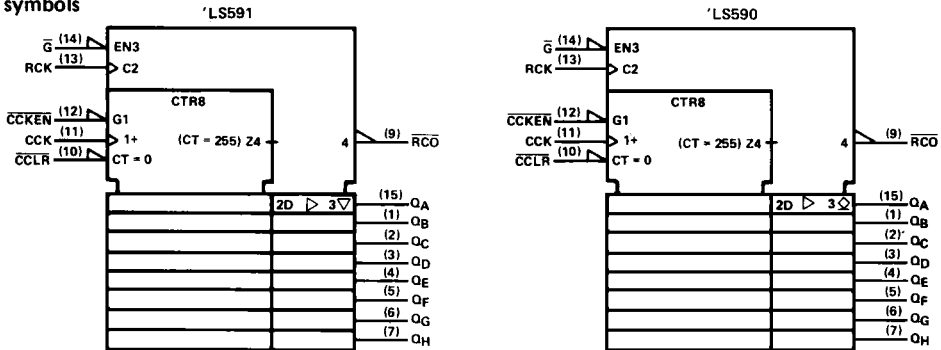
Pin numbers shown on logic notation are for J or N packages.

3

TTL DEVICES

TYPES SN54LS590, SN54LS591, SN74LS590, SN74LS591 8-BIT BINARY COUNTERS WITH OUTPUT REGISTERS

logic symbols



Pin numbers shown on logic notation are for J or N packages.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	7 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS590, SN54LS591	-55°C to 125°C
SN74LS590, SN74LS591	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to the network ground terminal.

recommended operating conditions

		SN54LS'			SN74LS'			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2						V
V_{IL}	Low-level input voltage	0.7						V
V_{OH}	High-level output voltage	Q, 'LS591 only			5.5			V
I_{OH}	High-level output current	RCO			-1			mA
		Q, 'LS590 only			-1			
I_{OL}	Low-level output current	RCO			8			mA
		Q			12			
		Q			24			
f_{CCK}	Counter clock frequency	0	20	0	20	20	MHz	
f_{RCK}	Register clock frequency	0	25	0	25	25	MHz	
$t_w(CCK)$	Duration of counter clock pulse	25			25			ns
$t_w(\overline{CCLR})$	Duration of counter clear pulse	20			20			ns
$t_w(RCK)$	Duration of register clock pulse	20			20			ns
t_{su}	Setup time	CCKEN low before CCK↑			20			ns
		CCLR inactive before CCK↑			20			
		CCK before RCK↑ (see Note 2)			40			
t_h	Hold time	CCKEN low after CCK↑			0			ns
T_A	Operating free-air temperature	-55	125	0	70	70	°C	

NOTE 2: This setup time ensures the register will see stable data from the counter outputs. The clocks may be tied together in which case the register state will be one clock pulse behind the counter.

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TTL DEVICES

TYPES SN54LS590, SN54LS591, SN74LS590, SN74LS591 8-BIT BINARY COUNTERS WITH OUTPUT REGISTERS

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		SN54LS*		SN74LS*		UNIT
			MIN	TYP‡	MAX	MIN	
V _{IK}		V _{CC} = MIN, I _I = -18 mA			-1.5	-1.5	V
V _{OH}	'LS590 Q	V _{CC} = MIN, V _{IH} = 2V, V _{IL} = MAX	I _{OH} = -1 mA		2.4	3.2	V
	RCO		I _{OH} = -2.6 mA			2.4 3.1	
I _{OH}	'LS591 Q	V _{CC} = MIN, V _{IH} = 2V, V _{OH} = 5.5V, V _{IL} = MAX	I _{OH} = -1 mA		2.4	3.2	mA
	Q		I _{OL} = 12 mA			0.25 0.4	
V _{OL}	RCO	V _{CC} = MIN, V _{IH} = 2V, V _{IL} = MAX	I _{OL} = 24 mA			0.25 0.5	V
			I _{OL} = 8 mA		0.25	0.4	
	I _{OL} = 16 mA			0.35 0.5			
I _{OZH}	'LS590 Q	V _{CC} = MAX, V _O = 2.7V, V _{IH} = 2V, V _{IL} = MAX,			20	20	μA
I _{OZL}	'LS590 Q	V _{CC} = MAX, V _O = 0.4V, V _{IH} = 2V, V _{IL} = MAX,			-20	-20	μA
I _I		V _{CC} = MAX, V _I = 7V			0.1	0.1	mA
I _{IH}		V _{CC} = MAX, V _I = 2.7V			20	20	μA
I _{IL}	CCK	V _{CC} = MAX, V _I = 0.4V			-0.8	-0.8	mA
	All others				-0.2	-0.2	
I _{OS} §	'LS590 Q	V _{CC} = MAX, V _O = 0V			-30	-130	mA
	RCO				-20	-100	
I _{CC}	'LS590	I _{CCH}	V _{CC} = MAX,		33	55	mA
		I _{CCL}	All possible inputs grounded,		44	65	
	I _{CCZ}	All outputs open		46	65		
	'LS591	I _{CCH}			35	55	
		I _{CCL}			42	65	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5V, T_A = 25°C

§ Not more than one output should be shorted at a time and the duration of the short-circuit should not exceed one second.

switching characteristics, V_{CC} = 5V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS590			'LS591			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
f _{max}	CCK	RCO	R _L = 1 kΩ, C _L = 30 pF	20	35		20	35		MHz
t _{PLH}	CCK↑	RCO		14	22		16	24		ns
t _{PHL}	CCK↓	RCO		20	30		25	38		ns
t _{PLH}	CCLR↓	RCO		30	45		32	48		ns
t _{PLH}	RCK↑	Q	R _L = 667 Ω, C _L = 45 pF	12	18		25	38		ns
t _{PHL}	RCK↓	Q		22	33		28	42		ns
t _{PZH}	G↓	Q		25	38					ns
t _{PZL}	G↓	Q		30	45					ns
t _{PHZ}	G↑	Q		20	30					ns
t _{PLZ}	G↑	Q		25	38					ns
t _{PLH}	G↑	Q	R _L = 667 Ω, C _L = 45 pF				34	50		ns
t _{PHL}	G↓	Q					32	48		ns

NOTE 3: See General Information Section for load circuits and voltage waveforms.

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