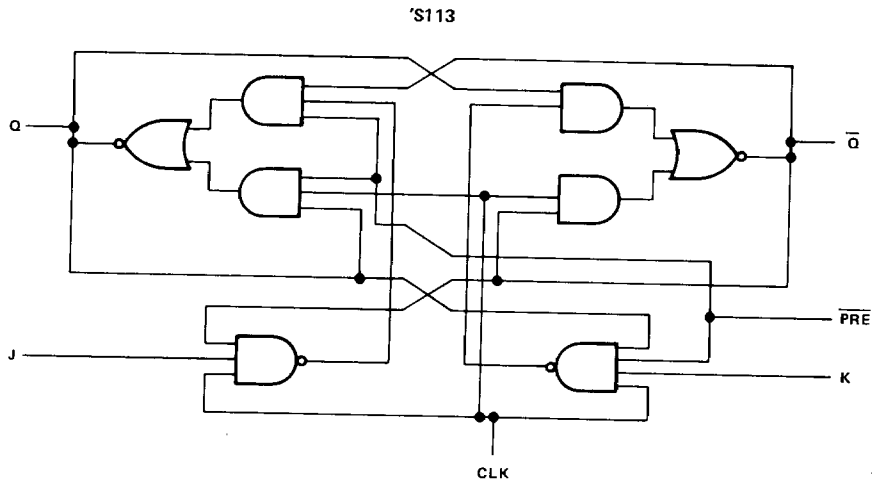
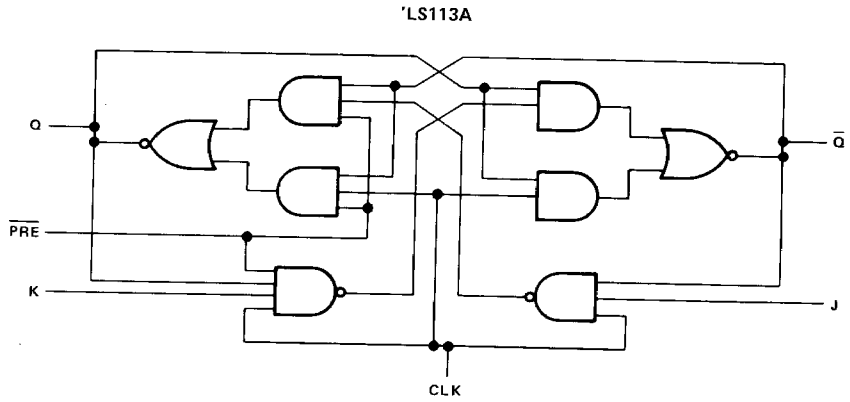


TYPES SN54LS113A, SN54S113, SN74LS113A, SN74S113
 DUAL J-K NEGATIVE-EDGE-TRIGGERED
 FLIP-FLOPS WITH PRESET

logic diagrams

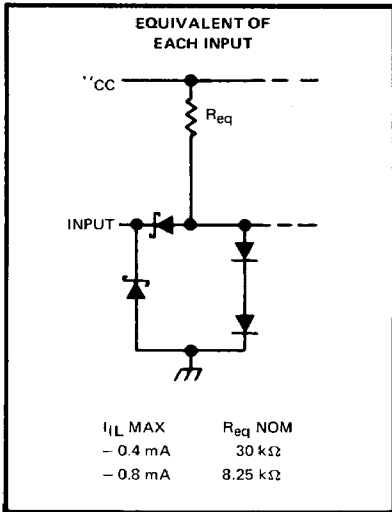


3

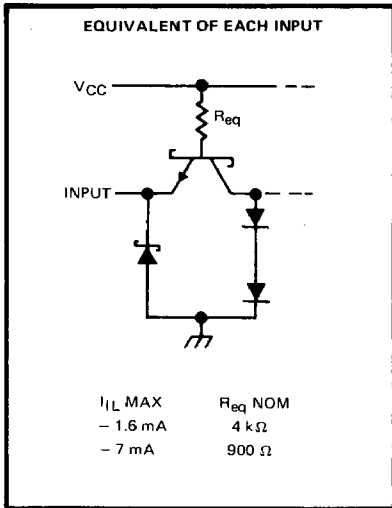
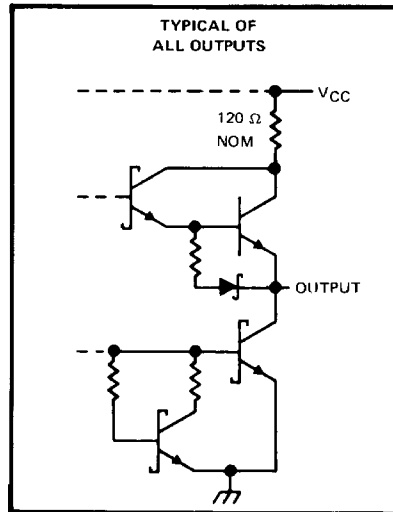
TTL DEVICES

TYPES SN54LS113A, SN54S113, SN74LS113A, SN74S113
 DUAL J-K NEGATIVE-EDGE-TRIGGERED
 FLIP-FLOPS WITH PRESET

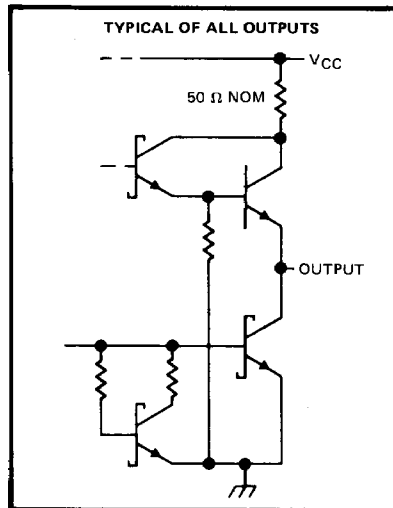
schematics of inputs and outputs



'LS113A



'S113



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 TTL DEVICES

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

| | |
|---|----------------|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage: 'LS113A | 7 V |
| 'S113 | 5.5 V |
| Operating free-air temperature range: SN54' | -55°C to 125°C |
| SN74' | 0°C to 70°C |
| Storage temperature range | -65°C to 150°C |

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

TYPES SN54LS113A, SN74LS113A DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET

recommended operating conditions

| | | SN54LS113A | | | SN74LS113A | | | 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 | | | 2 | | | V |
| V _{IL} | Low-level input voltage | | | | 0.8 | | | V |
| I _{OH} | High-level output current | | | | -0.4 | | | mA |
| I _{OL} | Low-level output current | | | | 8 | | | mA |
| f _{clock} | Clock frequency | 0 | 30 | | 0 | 30 | | MHz |
| t _w | Pulse duration | CLK high | | 20 | | 20 | | ns |
| | | PRE or CLR low | | 25 | | 25 | | |
| | | data high or low | | 20 | | 20 | | |
| t _{su} | Setup time before CLK ↓ | 20 | | 20 | | | | ns |
| t _h | Hold time-data after CLK ↓ | 20 | | 20 | | | | |
| T _A | Operating free-air temperature | -55 | 125 | | 0 | 70 | | °C |

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

| PARAMETER | TEST CONDITIONS† | SN54LS113A | | SN74LS113A | | UNIT |
|-------------------|--|---|------|------------|------|------|
| | | MIN | TYP‡ | MAX | MIN | |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | -1.5 | | -1.5 | | V |
| V _{OH} | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX, I _{OH} = -0.4 mA | 2.5 | 3.4 | 2.7 | 3.4 | V |
| V _{OL} | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = 2 V, I _{OL} = 4 mA | 0.25 | 0.4 | 0.25 | 0.4 | V |
| | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = 2 V, I _{OL} = 8 mA | | | 0.35 | 0.5 | |
| I _I | J or K | V _{CC} = MAX, V _I = 7 V | | 0.1 | | mA |
| | PRE | | | 0.3 | | |
| | CLK | | | 0.4 | | |
| I _{IH} | J or K | V _{CC} = MAX, V _I = 2.7 V | | 20 | | μA |
| | PRE | | | 60 | | |
| | CLK | | | 80 | | |
| I _{IL} | J or K | V _{CC} = MAX, V _I = 0.4 V | | -0.4 | | mA |
| | PRE or CLK | | | -0.8 | | |
| I _{OS} § | V _{CC} = MAX, see Note 4 | -20 | -100 | -20 | -100 | mA |
| I _{CC} | V _{CC} = MAX, see Note 2 | 4 | 6 | 4 | 6 | mA |

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

‡ All typical values are at V_{CC} = 5 V, 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.

NOTE 2: With all outputs open, I_{CC} is measured with the Q and \bar{Q} outputs high in turn. At the time of measurement, the clock input is grounded.

NOTE 4: For certain devices where state commutation can be caused by shorting an output to ground, an equivalent test may be performed with V_O = 2.25 V and 2.125 V for the 54 family and the 74 family, respectively, with the minimum and maximum limits reduced to one half of their stated values.

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|------------------|--------------|----------------|---|--|-----|-----|-----|------|
| f _{max} | | | R _L = 2 kΩ, C _L = 15 pF | | 30 | 45 | | MHz |
| t _{PLH} | PRE or CLK | Q or \bar{Q} | | | 15 | | 20 | ns |
| t _{PHL} | | | | | 15 | | 20 | ns |

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

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TTL DEVICES

TYPES SN54S113, SN74S113

DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET

recommended operating conditions

| | | SN54S113 | | | SN74S113 | | | 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 | | | 2 | | | V |
| V _{IL} | Low-level input voltage | | | | 0.8 | | | V |
| I _{OH} | High-level output current | | | | -1 | | | mA |
| I _{OL} | Low-level output current | | | | 20 | | | mA |
| t _w | Pulse duration | CLK high | 6 | | 6 | | ns | |
| | | CLK low | 6.5 | | 6.5 | | | |
| | | PRE low | 8 | | 8 | | | |
| t _{su} | Setup time before CLK ↓ | data high or low | | 3 | | ns | | |
| t _h | Hold time-data after CLK ↓ | | | 0 | | ns | | |
| T _A | Operating free-air temperature | -55 | | 125 | | 0 70 °C | | |

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

| PARAMETER | TEST CONDITIONS† | SN54S113 | | SN74S113 | | UNIT | |
|-------------------|--|---|-------|----------|------|------|-------|
| | | MIN | TYP ‡ | MAX | MIN | | TYP ‡ |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | | | -1.2 | | V | |
| V _{OH} | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = -1 mA | 2.5 | 3.4 | 2.7 | 3.4 | V | |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 20 mA | | | 0.5 | | V | |
| I _I | V _{CC} = MAX, V _I = 5.5 V | | | 1 | | mA | |
| I _{IH} | J or K PRE or CLK | V _{CC} = MAX, V _I = 2.7 V | 50 | | 50 | | μA |
| | | | 100 | | 100 | | |
| I _{IL} | J or K PRE CLK | V _{CC} = MAX, V _I = 0.5 V | -1.6 | | -1.6 | | mA |
| | | | -7 | | -7 | | |
| | | | -4 | | -4 | | |
| I _{OS} § | V _{CC} = MAX | -40 | -100 | -40 | -100 | mA | |
| I _{CC} | V _{CC} = MAX, see Note 2 | 15 | 25 | 15 | 25 | mA | |

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

‡ All typical values are at V_{CC} = 5 V, 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.

NOTE 2: With all outputs open, I_{CC} is measured with the Q and \bar{Q} outputs high in turn. At the time of measurement, the clock input is grounded.

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|------------------|----------------|----------------|--|--|-----|-----|-----|------|
| f _{max} | | | | | 80 | 125 | | MHz |
| t _{PLH} | PRE | Q or \bar{Q} | R _L = 280 Ω, C _L = 15 pF | | 4 | | 7 | ns |
| t _{PHL} | PRE (CLK high) | \bar{Q} or Q | | | 5 | | 7 | ns |
| | PRE (CLK low) | | | | 5 | | 7 | ns |
| t _{PLH} | CLK | Q or \bar{Q} | | | 4 | | 7 | ns |
| t _{PHL} | | | | | 5 | | 7 | ns |

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

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TTL DEVICES