

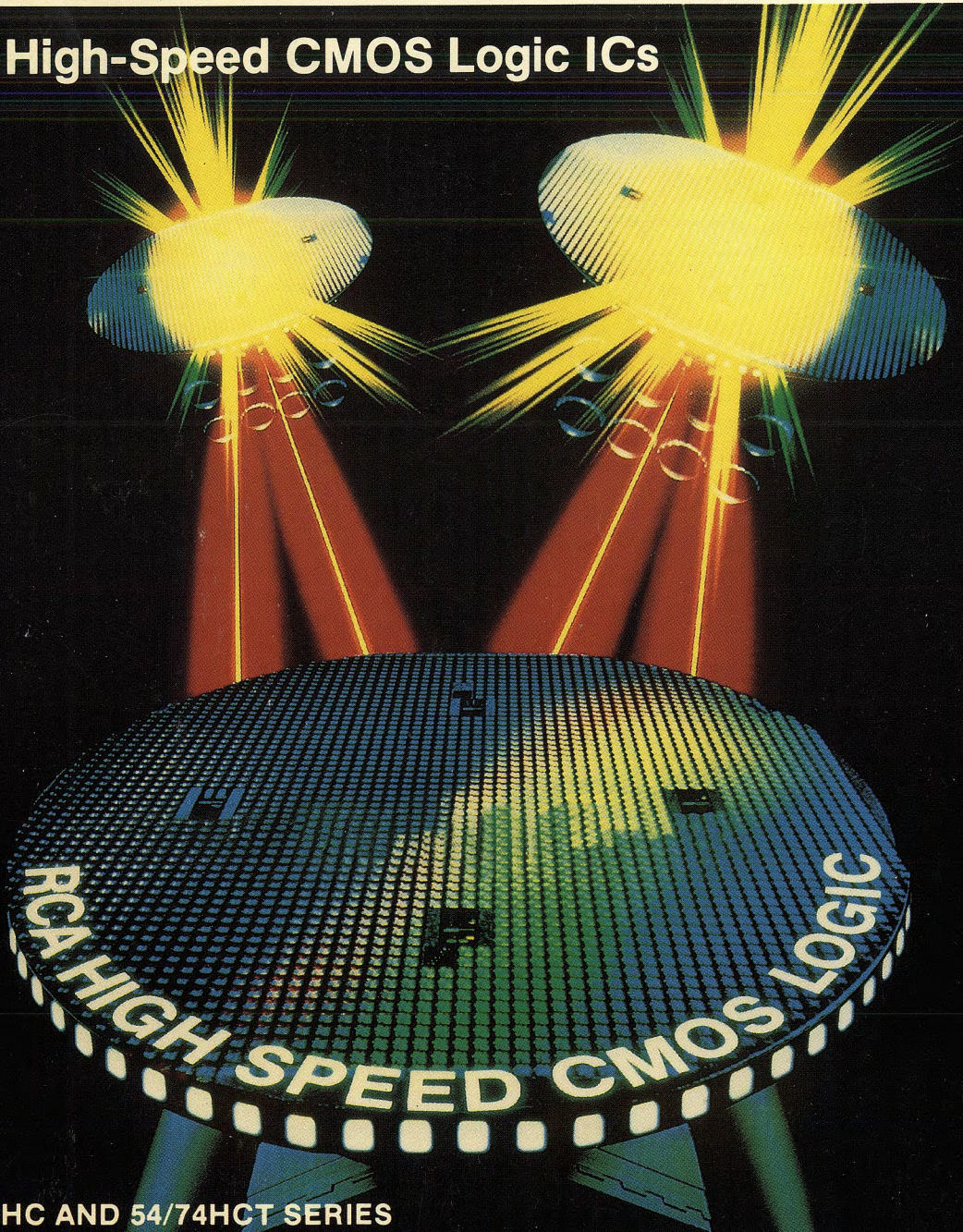


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DATA BOOK

RCA High-Speed CMOS Logic ICs



54/74HC AND 54/74HCT SERIES

CD54/74HC4067 CD54/74HCT4067

MAXIMUM RATINGS, Absolute-Maximum Values:

| | |
|--|--|
| DC SUPPLY-VOLTAGE, (V _{CC}): | |
| (Voltages referenced to ground) | -0.5 to + 7 V |
| DC INPUT DIODE CURRENT, I _{IK} (FOR V _i < -0.5 V OR V _i > V _{CC} +0.5V) | ±20mA |
| DC OUTPUT DIODE CURRENT, I _{OK} (FOR V _o < -0.5 V OR V _o > V _{CC} +0.5V) | ±20mA |
| DC DRAIN CURRENT, PER OUTPUT (I _o) (FOR -0.5 V < V _o < V _{CC} + 0.5V) | ±25mA |
| DC V _{CC} OR GROUND CURRENT (I _{CC}) | ±50mA |
| POWER DISSIPATION PER PACKAGE (P _D): | |
| For T _A = -40 to +60°C (PACKAGE TYPE E) | 500 mW |
| For T _A = +60 to +85°C (PACKAGE TYPE E) | Derate Linearly at 8 mW/°C to 300 mW |
| For T _A = -55 to +100°C (PACKAGE TYPE F, H) | 500 mW |
| For T _A = +100 to +125°C (PACKAGE TYPE F, H) | Derate Linearly at 8 mW/°C to 300 mW |
| For T _A = -40 to +70°C (PACKAGE TYPE M) | 400 mW |
| For T _A = +70 to +125°C (PACKAGE TYPE M) | Derate Linearly at 6 mW/°C to 70 mW |
| OPERATING-TEMPERATURE RANGE (T _A): | |
| PACKAGE TYPE F, H | -55 to +125°C |
| PACKAGE TYPE E, M | -40 to +85°C |
| STORAGE TEMPERATURE (T _{stg}) | -65 to +150°C |
| LEAD TEMPERATURE (DURING SOLDERING): | |
| At distance 1/16 ± 1/32 in. (1.59 ± 0.79 mm) from case for 10 s max. | +265°C |
| Unit inserted into a PC Board (min. thickness 1/16 in., 1.59 mm) | |
| with solder contacting lead tips only | +300°C |

RECOMMENDED OPERATING CONDITIONS:

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC | LIMITS | | UNITS |
|---|--------|-----------------|-------|
| | MIN. | MAX. | |
| Supply-Voltage Range (For T _A = Full Package-Temperature Range) V _{CC} * CD54/74HC Types | 2 | 6 | V |
| CD54/74HCT Types | 4.5 | 5.5 | V |
| DC Input or Output Voltage V _{IN} , V _{OUT} | 0 | V _{CC} | V |
| Operating Temperature T _A : CD74 Types | -40 | +85 | °C |
| CD54 Types | -55 | +125 | °C |
| Input Rise and Fall Times t _r , t _f (Control Inputs) at 2 V | 0 | 1000 | ns |
| at 4.5 V | 0 | 500 | |
| at 6 V | 0 | 400 | |

*Unless otherwise specified, all voltages are referenced to Ground.

CD54/74HC4067 CD54/74HCT4067

STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC | CD74HC/CD54HC4067 | | | | | | | | | | CD74HCT/CD54HCT4067 | | | | | | | | UNITS | | | |
|--|-----------------------|---------------------------|-----------------|-----------------|-----|------|----------------|------|-----------------|------|-----------------------|-----------------------|---------------------------|-------------------|------|-----|----------------|-----|-------|-----------------|-----|-----|
| | TEST CONDITIONS | | | 74HC/54HC TYPES | | | 74HC TYPE | | 54HC TYPE | | | TEST CONDITIONS | | 74HCT/54HCT TYPES | | | 74HCT TYPE | | | 54HCT TYPE | | |
| | LOGIC V_i V | SWITCH V_{is} V | V_{cc} V | +25° C | | | -40/ +85° C | | -55/ +125° C | | | V_i V | SWITCH V_{is} V | +25° C | | | -40/ +85° C | | | -55/ +125° C | | |
| | | | | Min | Typ | Max | Min | Max | Min | Max | Min | | | Max | Min | Typ | Max | Min | | Max | Min | Max |
| High-Level Input Voltage V_{IH} | | | 2 | 1.5 | — | — | 1.5 | — | 1.5 | — | — | — | — | 2 | — | — | 2 | — | 2 | — | V | |
| | | | 4.5 | 3.15 | — | — | 3.15 | — | 3.15 | — | — | — | — | — | — | — | — | — | — | — | | |
| | | | 6 | 4.2 | — | — | 4.2 | — | 4.2 | — | — | — | — | — | — | — | — | — | — | — | | |
| Low-Level Input Voltage V_{IL} | | | 2 | — | — | 0.5 | — | 0.5 | — | 0.5 | — | — | — | — | — | 0.8 | — | 0.8 | — | 0.8 | V | |
| | | | 4.5 | — | — | 1.35 | — | 1.35 | — | 1.35 | — | — | — | — | — | — | — | — | — | — | | |
| | | | 6 | — | — | 1.8 | — | 1.8 | — | 1.8 | — | — | — | — | — | — | — | — | — | — | | |
| Maximum "On" Resistance R_{ON} $I_o = 1mA$ | V_{cc} or Gnd | V_{cc} or Gnd | 4.5 | — | 70 | 160 | — | 200 | — | 240 | V_{cc} or Gnd | V_{cc} or Gnd | — | 70 | 160 | — | 200 | — | 240 | — | Ω | |
| | | | 6 | — | 60 | 140 | — | 175 | — | 210 | | | — | — | — | — | — | — | — | — | | |
| | V_{cc} to Gnd | V_{cc} to Gnd | 4.5 | — | 90 | 180 | — | 225 | — | 270 | V_{cc} to Gnd | V_{cc} to Gnd | — | 90 | 180 | — | 225 | — | 270 | — | | |
| | | | 6 | — | 80 | 160 | — | 200 | — | 240 | | | — | — | — | — | — | — | — | — | | |
| Maximum "On" resistance between any two switches ΔR_{ON} | — | — | 4.5 | — | 10 | — | — | — | — | — | — | — | — | 10 | — | — | — | — | — | — | | |
| | | | 6 | — | 8.5 | — | — | — | — | — | | | — | — | — | — | — | — | — | — | | |
| Switch "Off" Leakage Current I_{LZ} 16 Channels | $\bar{E} = V_{cc}$ | V_{cc} or Gnd | 6 | — | — | ±0.8 | — | ±8 | — | ±8 | $\bar{E} = V_{cc}$ | V_{cc} or Gnd | — | — | ±0.8 | — | ±8 | — | ±8 | — | μA | |
| Logic Input Leakage Current I_i | V_{cc} or Gnd | — | 6 | — | — | ±0.1 | — | ±1 | — | ±1 | ** | — | — | — | ±0.1 | — | ±1 | — | ±1 | — | | |
| Quiescent Device Current $I_o = 0mA$ I_{cc} | V_{cc} or Gnd | — | 6 | — | — | 8 | — | 80 | — | 160 | V_{cc} or Gnd | — | — | — | 8 | — | 80 | — | 160 | — | | |
| Additional Quiescent Device Current per input pin: 1 unit load ΔI_{cc}^* | — | — | — | — | — | — | — | — | — | — | $V_{cc} - 2.1$ | — | — | 100 | 360 | — | 450 | — | 490 | — | | |

*For dual-supply systems theoretical worst case ($V_i = 2.4 V$, $V_{cc} = 5.5 V$) specification is 1.8 mA.

**Any Voltage Between V_{cc} & Gnd.

HCT INPUT LOADING TABLE

| INPUT | UNIT LOADS* |
|-------------|-------------|
| $S_0 - S_3$ | 0.5 |
| \bar{E} | 0.3 |

*Unit Load is ΔI_{cc} limit specified in Static Characteristic Chart, e.g., 360 μA max. @ 25° C.

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SWITCHING CHARACTERISTICS (V_{CC} = 5 V, T_A = 25° C, Input t_r, t_f = 6 ns)

| CHARACTERISTIC | CL (pF) | TYPICAL | | UNITS |
|--|-----------------|---------|-----|-------|
| | | HC | HCT | |
| Propagation Delay Time: Switch In to Switch Out | 15 | 6 | 6 | ns |
| Switch Turn Off Ē to Out | 15 | 23 | 23 | |
| Sn to Out | | 21 | 21 | |
| Switch Turn On Ē to Out | 15 | 23 | 25 | |
| Sn to Out | | 25 | 25 | |
| Power Dissipation Capacitance* | C _{PD} | 93 | 96 | |

*C_{PD} is used to determine the dynamic power consumption, per package.

P_D = C_{PD} V_{CC}² f_i + Σ (C_L + C_S) V_{CC}² f_o where: f_i = input frequency f_o = output frequency
 C_L = load capacitance C_S = switch capacitance
 V_{CC} = supply voltage

SWITCHING CHARACTERISTICS (C_L = 50 pF, Input t_r, t_f = 6 ns)

| CHARACTERISTIC | V _{CC} V | 25° C | | | | -40° C to +85° C | | | | -55° C to +125° C | | | | UNITS | |
|--|--------------------------------------|-------|------|------|------|------------------|------|-------|------|-------------------|------|-------|------|-------|----|
| | | HC | | HCT | | 74HC | | 74HCT | | 54HC | | 54HCT | | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | | |
| Propagation Delay Time Switch In to Out | t _{PLH} t _{PHL} | 4.5 | — | 75 | — | — | — | 95 | — | — | — | 110 | — | — | ns |
| Switch Turn-On Ē to Out | t _{PZL} t _{PZH} | 6 | — | 13 | — | — | — | 16 | — | — | — | 19 | — | — | |
| | | 2 | — | 275 | — | — | — | 345 | — | — | — | 415 | — | — | |
| Sn to Out | t _{PLZ} t _{PHZ} | 4.5 | — | 55 | — | 60 | — | 69 | — | 75 | — | 83 | — | 90 | |
| | | 6 | — | 47 | — | — | — | 59 | — | — | — | 71 | — | — | |
| Switch Turn-Off Ē to Out | t _{PLZ} t _{PHZ} | 2 | — | 300 | — | — | — | 375 | — | — | — | 450 | — | — | |
| | | 4.5 | — | 60 | — | 60 | — | 75 | — | 75 | — | 90 | — | 90 | |
| Switch Turn-On Ē to Out | t _{PLZ} t _{PHZ} | 6 | — | 51 | — | — | — | 64 | — | — | — | 76 | — | — | |
| | | 2 | — | 275 | — | — | — | 345 | — | — | — | 415 | — | — | |
| Sn to Out | t _{PLZ} t _{PHZ} | 4.5 | — | 55 | — | 55 | — | 69 | — | 69 | — | 83 | — | 83 | |
| | | 6 | — | 47 | — | — | — | 59 | — | — | — | 71 | — | — | |
| Input (Control) Capacitance | C _i | 2 | — | 290 | — | — | — | 365 | — | — | — | 435 | — | — | |
| | | 4.5 | — | 58 | — | 58 | — | 73 | — | 73 | — | 87 | — | 87 | |
| | | 6 | — | 49 | — | — | — | 62 | — | — | — | 74 | — | — | |

ANALOG CHANNEL CHARACTERISTICS — Typical Values at T_A = 25° C

| CHARACTERISTICS | TEST CONDITION | V _{CC} V | HC/HCT | UNITS |
|---|-----------------------|----------------------|--------|-------|
| Switch Frequency Response at -3 dB (Fig. 12) | Fig. 3 Notes 1 & 2 | 4.5 | 89 | MHz |
| Sine Wave Distortion | Fig. 4 | 4.5 | 0.051 | % |
| Feedthrough Noise: Ē to Switch | Fig. 5 Notes 2 & 3 | 4.5 | TBE | mV |
| S to Switch | | | TBE | |
| Switch "OFF" Signal Feedthrough (Fig. 13) | Fig. 6 | 4.5 | -75 | dB |
| Switch Input Capacitance | C _S | — | 5 | pF |
| Common Capacitance | C _{COM} | — | 50 | |

NOTES: 1. Adjust input level for 0 dBm at output, f = 1 kHz.

2. V_{IS} is centered at V_{CC}/2.

3. Adjust input for 0 dBm. at V_{IS}

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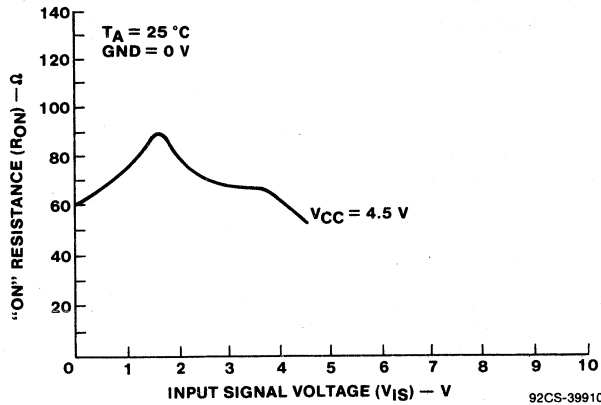


Fig. 2 - Typical "ON" resistance versus input signal voltage.

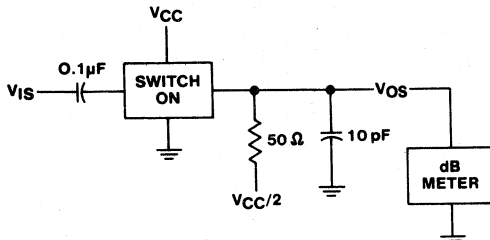


Fig. 3 - Frequency response test circuit.

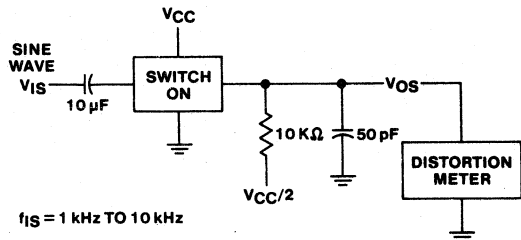


Fig. 4 - Sine wave distortion test circuit.

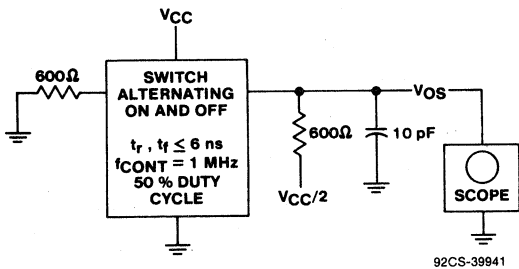


Fig. 5 - Control-to-switch feedthrough noise test circuit.

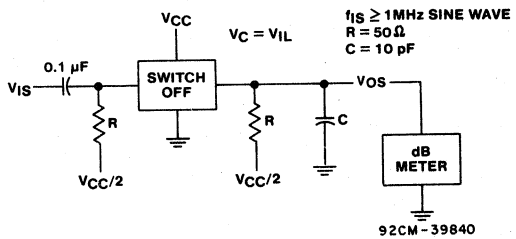
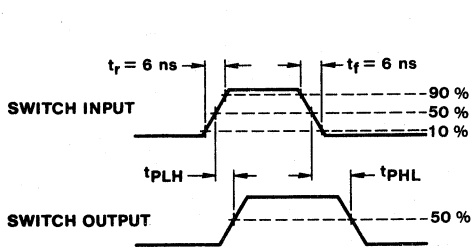
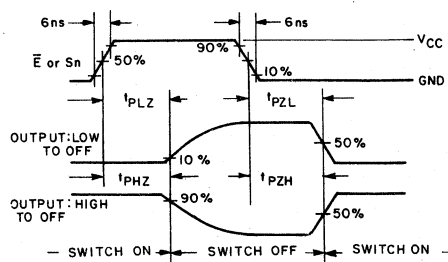


Fig. 6 - Switch off signal feedthrough test circuit.



92CS-39914

Fig. 7 - Switch propagation-delay times wave forms.



92CS-39359

Fig. 8 - Switch turn-on and turn-off propagation delay times waveforms, for HC types.

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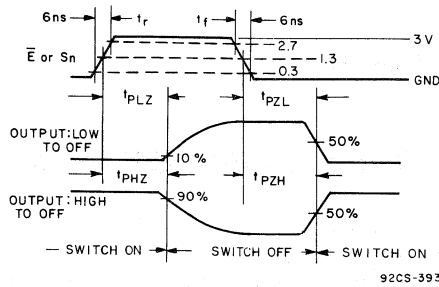


Fig. 9 - Switch turn-on and turn-off propagation delay times waveforms for HCT Types.

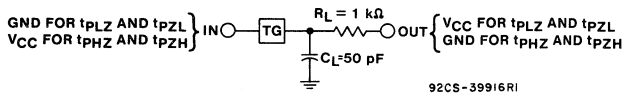


Fig. 10 - Switch on/off propagation delay time test circuit.

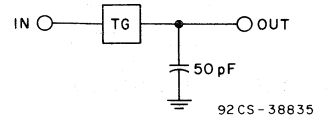


Fig. 11 - Switch In to Switch Out Propagation delay time test circuit.

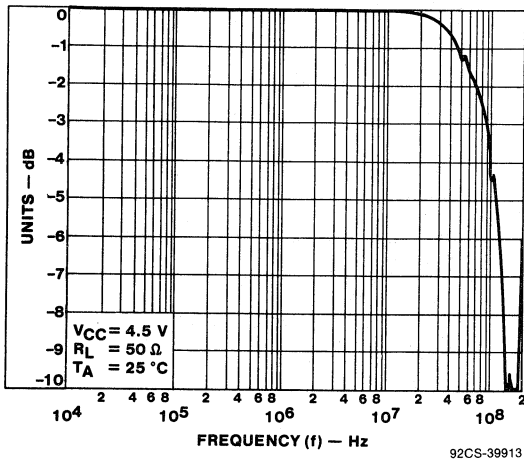


Fig. 12 - Typical switch frequency response.

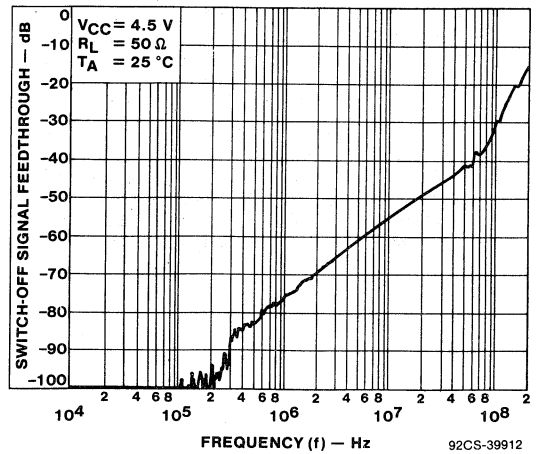


Fig. 13 - Typical switch-off signal feed through vs. frequency.