# PC Card (PCMCIA) Interface Switch

## FEATURES

- Single SO-16 Package
- CMOS Inputs with Hysteresis
- Extremely Low $R_{ON}$
- Reverse Blocking Switches
- HiZ Outputs in the Off-State
- Low Power Consumption
- Safe Power-Up

## DESCRIPTION

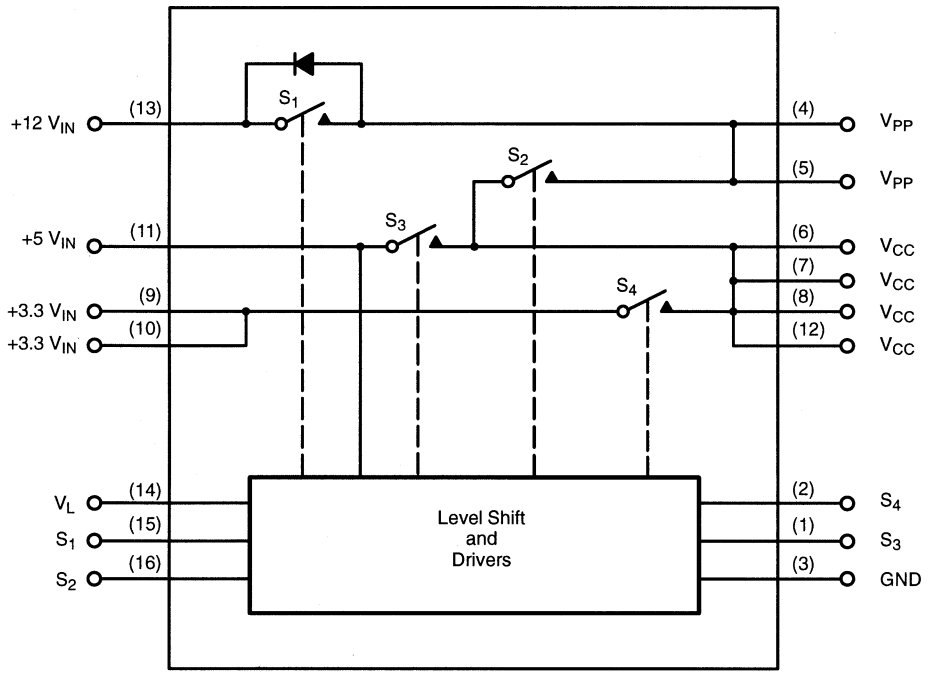
The Si9711CY is a monolithic switch designed to meet the needs of the PC Card interface. The inputs are fully CMOS compatible and incorporate all the level shift and interface required to be driven by any CMOS driver. The external inputs can be driven to 3.3-V or 5-V by setting $V_L$ at the appropriate level. The switches are low $R_{ON}$ and can carry the maximum currents found on the PC Card interface.

The 5-V and 3.3-V switches do not have the parasitic diode found in vertical DMOS power switches.

Low $R_{ON}$ is achieved by using MOSFETs driven off the +12-$V_{IN}$ input. All level shifting is built into the Si9711CY.

The Si9711CY is packaged in an SO-16 package and is rated over the commercial temperature range 0 to 70°C.

## FUNCTIONAL BLOCK DIAGRAM




**TRUTH TABLE: $S_1$ - $S_4$**

| Logic | Switch |
|---|---|
| 0 | OFF |
| 1 | ON |

## ABSOLUTE MAXIMUM RATINGS

Voltages Referenced to Ground

$V_L$ . . . . . 7 V
+12 $V_{IN}$ . . . . . 15 V
+5 $V_{IN}$ . . . . . 7 V
+3.3 $V_{IN}$ . . . . . 7 V
$S_1$ through $S_4$ (CMOS Inputs) . . . . . $V_L$ + 0.5 V
$I_{OUT}$ $V_{PP}$ . . . . . 300 mA
$V_{CC}$ . . . . . 7 V
$V_{PP}$ . . . . . 15 V
All Pins . . . . . -0.5 V
$I_{OUT}$ $V_{CC}$ . . . . . 1.5 A
PD Max: ($T_A$ = 25°C) . . . . . 710 mW
($T_A$ = 70°C) . . . . . 390 mW
Junction Temperature . . . . . 125°C
Thermal Ratings
$R_{\Theta JA}$ . . . . . 140°C/W

## RECOMMENDED OPERATING CONDITIONS

+12 $V_{IN}$ . . . . . 12 V ± 10%
+5 $V_{IN}$ (must be present) . . . . . 5 V ± 10%
+3.3 $V_{IN}$ . . . . . 3.3 V ± 10%
$I_{OUT}$ $V_{CC}$ . . . . . 1 A
$I_{OUT}$ $V_{PP}$ . . . . . 150 mA
$V_L$ . . . . . 5.0 V ± 10%

## SPECIFICATIONS

| Parameter | Symbol | Test Conditions Unless Otherwise Specified<br>+5 $V_{IN}$ = 5 V, +3.3 $V_{IN}$ = 3.3 V<br>+12 $V_{IN}$ = 12 V, $V_L$ = 5.0 V, GND = 0 V | | Limits C Suffix, 0 to 70°C<br>Min[a] | Typ | Max[a] | Unit |
|---|---|---|---|---|---|---|---|
| **Switch 1** | | | | | | | |
| On-Resistance | $R_{ON}$ | I = 120 mA, +12 $V_{IN}$ = 10.8 V<br>$S_1$ = VL, $S_2$ = GND | $T_A$ = 25°C | | | 200 | mΩ |
| | | | $T_A$ = 70°C | | | 250 | |
| Off Current (+12 $V_{IN}$ to $V_{PP}$) | $I_{OFF}$ | +12 $V_{IN}$ = 13.2 V, $V_{PP}$ = 0 V<br>$S_1$ = GND | $T_A$ = 25°C | | | 1 | µA |
| | | | $T_A$ = 70°C | | | 10 | |
| Switching Time | $t_{S1(on)}$ | $C_L$ = 0.1 µF, $S_2$ = Low, $R_L$ = 100 Ω, See Figure 1. | | 0.1 | | 1 | µs |
| | $t_{S1(off)}$ | | | 0.5 | | 4 | |
| **Switch 2** | | | | | | | |
| On-Resistance | $R_{ON}$ | I = 120 mA, +12 $V_{IN}$ = 10.8 V<br>$S_2$ = $S_3$ = $V_L$ | $T_A$ = 25°C | | | 300 | mΩ |
| | | | $T_A$ = 70°C | | | 350 | |
| Off Current (+12 $V_{IN}$ to $V_{PP}$) | $I_{OFF}$ | $V_{PP}$ = 13.2 V, $V_{CC}$ = 0 V<br>+12 $V_{IN}$ = 13.2 V | $T_A$ = 25°C | | | 1 | µA |
| | | | $T_A$ = 70°C | | | 10 | |
| Switching Time | $t_{S2(on)}$ | $C_L$ = 0.1 µF, $R_L$ = 100 Ω, $S_1$ = $S_4$ = GND,<br>$S_3$ = $V_L$, See Figure 1. | | 0.1 | | 1 | µs |
| | $t_{S2(off)}$ | | | 0.5 | | 4 | |
| **Switch 3** | | | | | | | |
| On-Resistance | $R_{ON}$ | I = 500 mA, +12 $V_{IN}$ = 10.8 V<br>$S_3$ = $V_L$ | $T_A$ = 25°C | | | 200 | mΩ |
| | | | $T_A$ = 70°C | | | 250 | |
| Off Current (+12 $V_{IN}$ to $V_{PP}$) | $I_{OFF}$ | +5 $V_{IN}$ = 5.5 V, $V_{CC}$ = 0 V | $T_A$ = 25°C | | | 1 | µA |
| | | | $T_A$ = 70°C | | | 10 | |
| Switching Time | $t_{d(on)}$ | +5 $V_{IN}$ = 5 V, $C_L$ = 0.1 µF, $V_{CC}$ to GND<br>$R_L$ = 100 Ω, $V_{CC}$ to GND, See Figure 2. | | 1 | | | µs |
| | $t_{ramp(on)}$ | | | 200 | | | |
| | $t_{S3(off)}$ | | | 0.5 | | 4 | |

## SPECIFICATIONS

| Parameter | Symbol | Test Conditions Unless Otherwise Specified<br>+5 $V_{IN}$ = 5 V, +3.3 $V_{IN}$ = 3.3 V<br>+12 $V_{IN}$ = 12 V, $V_L$ = 5.0 V, GND = 0 V | | Limits C Suffix, 0 to 70°C<br>Min[a] | Typ | Max[a] | Unit |
|---|---|---|---|---|---|---|---|
| **Switch 4** | | | | | | | |
| On-Resistance | $R_{ON}$ | I = 500 mA, +12 $V_{IN}$ = 10.8 V<br>$S_4 = V_L$ | $T_A$ = 25°C | | | 150 | mΩ |
| | | | $T_A$ = 70°C | | | 185 | |
| Off Current | $I_{OFF}$ | +3.3 $V_{IN}$ = 3.6 V, $V_{CC}$ = 0 V<br>$S_2 = S_3 = S_4$ = GND | $T_A$ = 25°C | | | 1 | µA |
| | | | $T_A$ = 70°C | | | 10 | |
| Switching Time | $t_{d(on)}$ | +3.3 $V_{IN}$ = 3.3 V, $C_L$ = 0.1 µF, $S_3$ = GND<br>$R_L$ = 100 Ω, See Figure 2. | | 1 | | | µs |
| | $t_{ramp(on)}$ | | | 200 | | | |
| | $t_{S4(off)}$ | | | 0.5 | | 4 | |
| **Power Supply** | | | | | | | |
| +12 $V_{IN}$ Current | $I_{+12VIN(1)}$ | $S_1 = S_4$ = GND, $S_2 = S_3 = V_L$ | | | | 10 | µA |
| | $I_{+12VIN(2)}$ | $S_1 = S_4 = V_L$, $S_2 = S_3$ = GND | | | | 10 | |
| $V_L$ Current | $I_{VL(1)}$ | $S_1 = S_4$ = GND, $S_2 = S_3 = V_L$ | | | | 10 | |
| | $I_{VL(2)}$ | $S_1 = S_4 = V_L$, $S_2 = S_3$ = GND | | | | 10 | |
| **Switch Control Inputs** | | | | | | | |
| Input Voltage High | $V_{I(H)}$ | | $V_L$ = 3.3 V | 2.8 | 2.4 | | V |
| | | | $V_L$ = 5 V | 4.0 | 3.3 | | |
| Input Voltage Low | $V_{I(L)}$ | | $V_L$ = 3.3 V | | 1.1 | 0.4 | |
| | | | $V_L$ = 5 V | | 1.5 | 0.8 | |
| Input Hysteresis[b] | $V_{I(H)} - V_{I(L)}$ | | $V_L$ = 3.3 V | 0.5 | 1.3 | | |
| | | | $V_L$ = 5 V | 0.8 | 1.8 | | |
| Input Current High | $I_{I(H)}$ | $S_1$ through $S_4 = V_L$, $V_L$ = 5 V | | | | 1.0 | µA |
| Input Current Low | $I_{I(L)}$ | $S_1$ through $S_4$ = GND, $V_L$ = 5 V | | -1.0 | | | |

Notes

a. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.

b. Guaranteed by design, not subject to production testing.

## TIMING WAVEFORMS

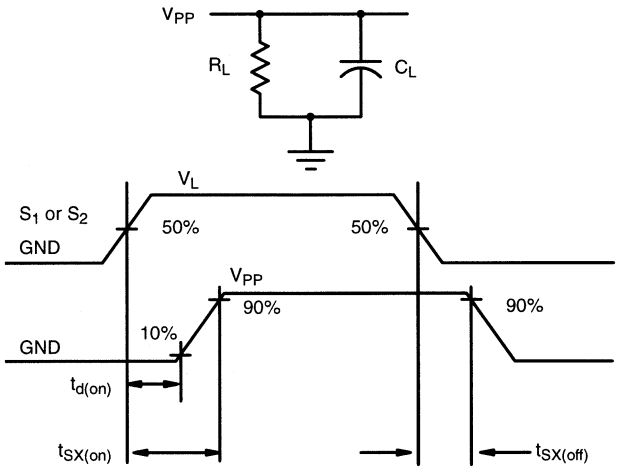



**FIGURE 1.** $t_{d(on)}$ and $t_{SX(on)}$

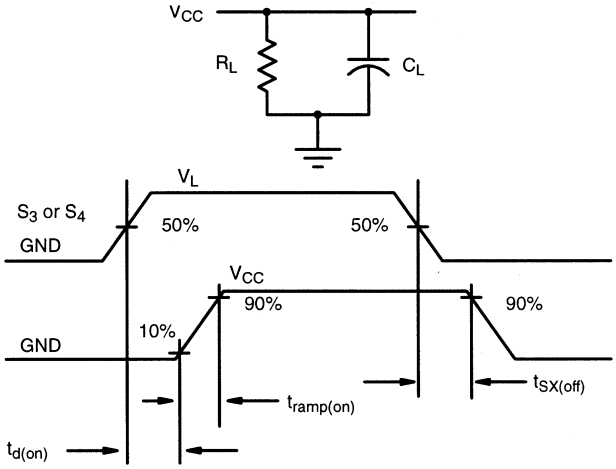
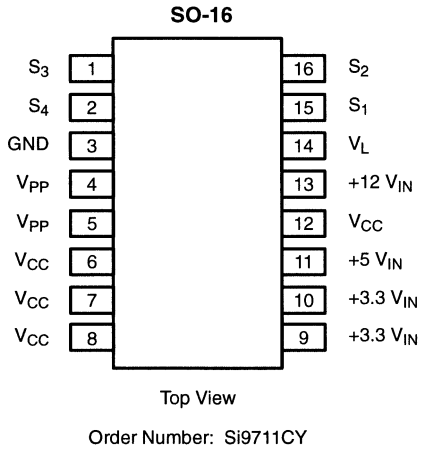



**FIGURE 2.** $t_{ramp(on)}$

## PIN CONFIGURATION

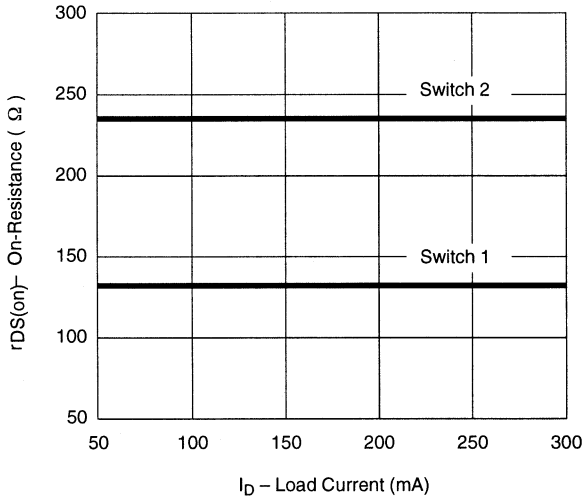



Order Number: Si9711CY

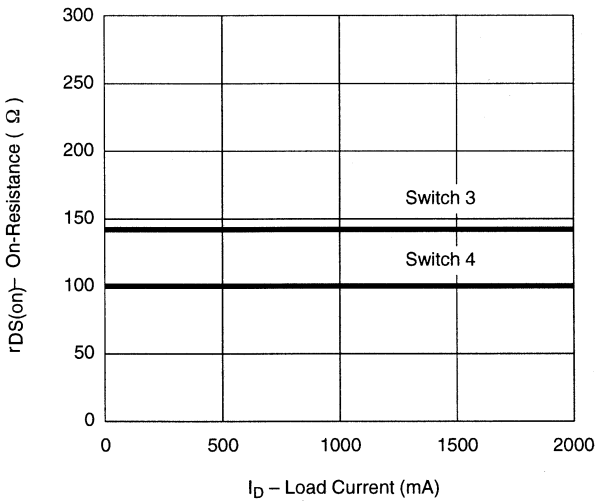
| PIN DESCRIPTION | | |
|---|---|---|
| **Pin Number** | **Symbol** | **Description** |
| 1 | $S_3$ | Control input for selecting +5 $V_{IN}$ to $V_{CC}$. The PC Card terminology for this pin is $V_{CC}\_EN_1$. |
| 2 | $S_4$ | Control input for selecting +3.3 $V_{IN}$ to $V_{CC}$. The PC Card terminology for this pin is $V_{CC}\_EN_0$. |
| 3 | GND | Ground connection. |
| 4, 5 | $V_{PP}$ | Program and peripheral voltage to PC Card slot. |
| 6, 7, 8, 12 | $V_{CC}$ | Supply voltage to slot. |
| 9, 10 | +3.3 $V_{IN}$ | +3.3-V supply. |
| 11 | +5 $V_{IN}$ | +5-V supply. |
| 13 | +12 $V_{IN}$ | +12-V supply. |
| 14 | $V_L$ | Rail voltage for switch control inputs, selectable to 5-V or 3.3-V. |
| 15 | $S_1$ | Control input for selecting +12 $V_{IN}$ to $V_{PP}$ . The PC Card terminology for this pin is $V_{PP}\_EN_1$. |
| 16 | $S_2$ | Control input for selecting $V_{CC}$ to $V_{PP}$ . The PC Card terminology for this pin is $V_{PP}\_EN_0$. |

## TYPICAL CHARACTERISTICS (25°C UNLESS OTHERWISE NOTED)

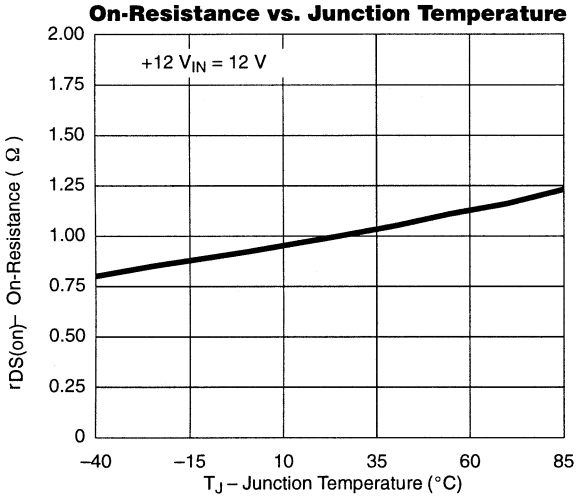
**On-Resistance vs. Load Current**



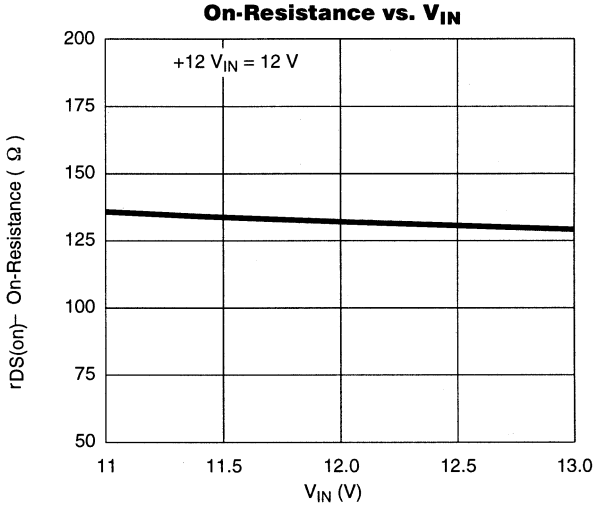

**On-Resistance vs. Load Current**



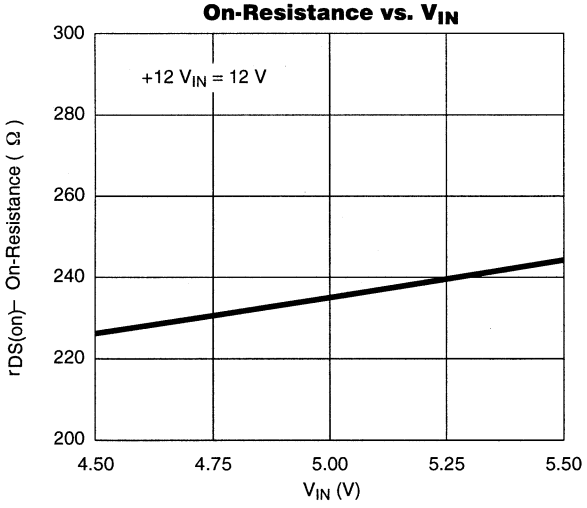

**Switch 1 - 4**
**On-Resistance vs. Junction Temperature**



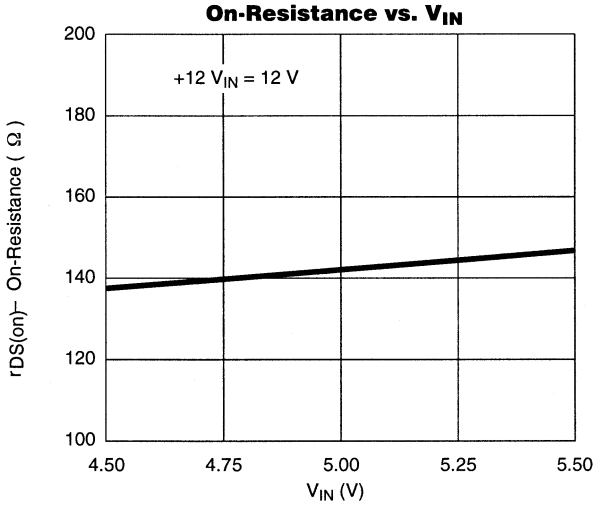

**Switch 1**
**On-Resistance vs. $V_{IN}$**




**Switch 2**
**On-Resistance vs. $V_{IN}$**

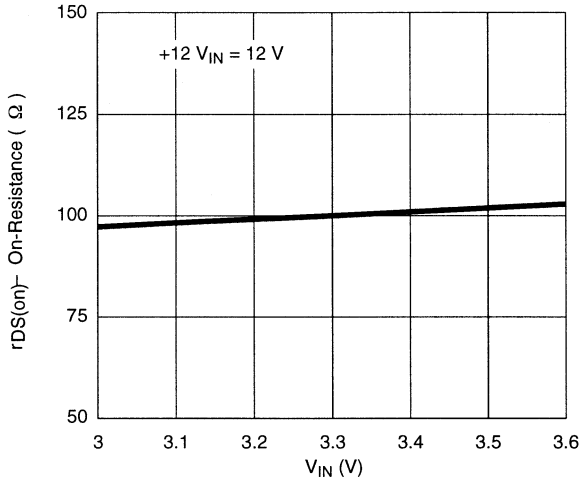



**Switch 3**
**On-Resistance vs. $V_{IN}$**

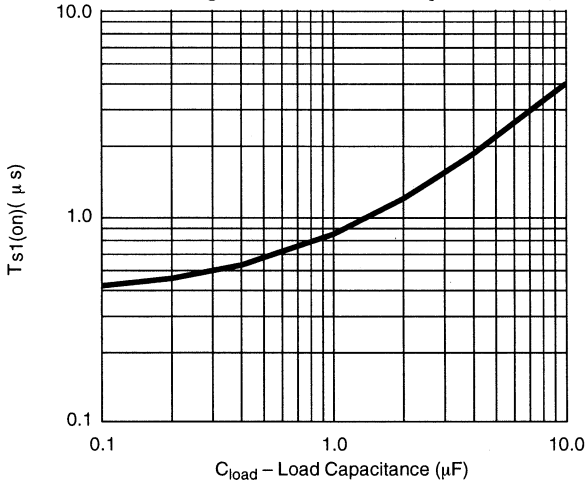


## TYPICAL CHARACTERISTICS (25°C UNLESS OTHERWISE NOTED)

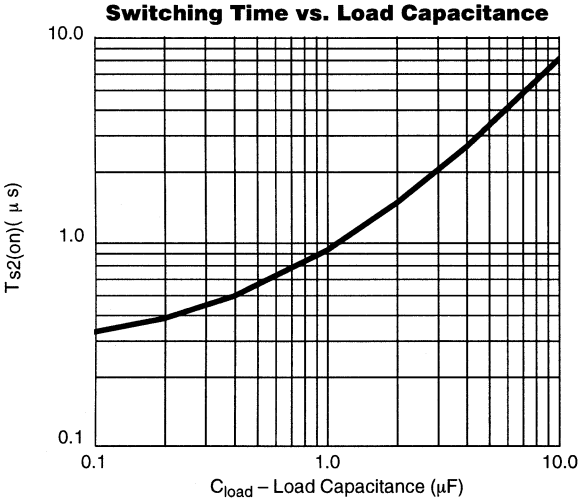
**Switch 4**
**On-Resistance vs. $V_{IN}$**



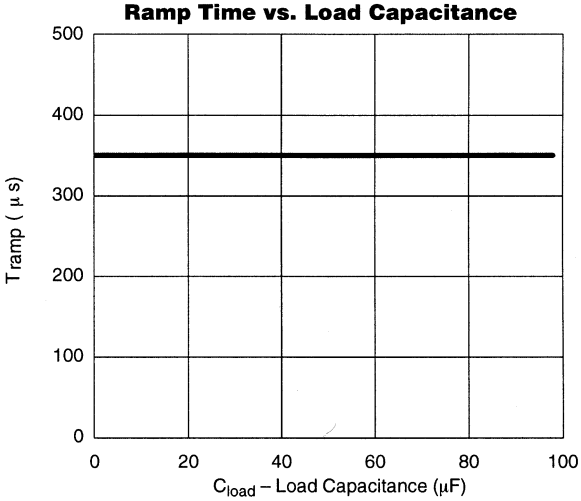

**Switch 1**
**Switching Time vs. Load Capacitance**




**Switch 2**
**Switching Time vs. Load Capacitance**




**Switch 3**
**Ramp Time vs. Load Capacitance**




**Switch 4**
**Ramp Time vs. Load Capacitance**