

## PC Card (PCMCIA) Interface Switch

### DESCRIPTION

The Si9711 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 Si9711.

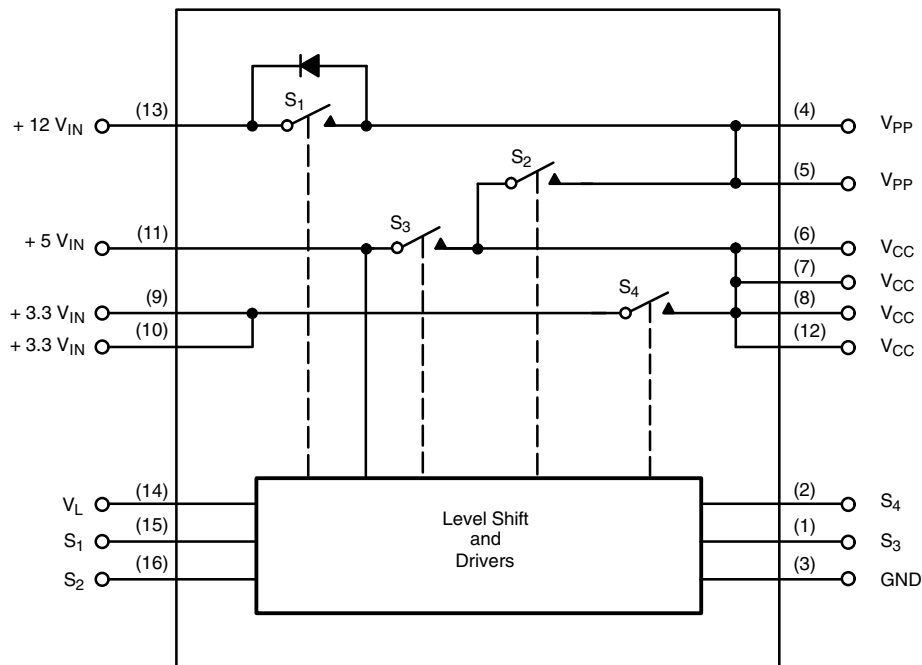
The Si9711 is packaged in an SO-16 package and is rated over the commercial temperature range 0 to 70 °C.

The Si9711 is available in both standard and lead (Pb)-free packages.

### 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

### FUNCTIONAL BLOCK DIAGRAM



**TRUTH TABLE -  $S_1$  THROUGH  $S_4$**

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

| ABSOLUTE MAXIMUM RATINGS          |                                      |             |                      |
|-----------------------------------|--------------------------------------|-------------|----------------------|
| Parameter                         |                                      | Limit       | Unit                 |
| Voltages Referenced to Ground     |                                      |             |                      |
| $V_L$                             |                                      | 7           | V                    |
| + 12 $V_{IN}$                     |                                      | 15          |                      |
| + 5 $V_{IN}$                      |                                      | 7           |                      |
| + 3.3 $V_{IN}$                    |                                      | 7           |                      |
| $S_1$ through $S_4$ (CMOS Inputs) |                                      | $V_L + 0.5$ |                      |
| $I_{OUT} V_{PP}$                  |                                      | 300         | mA                   |
| $V_{CC}$                          |                                      | 7           | V                    |
| $V_{PP}$                          |                                      | 15          |                      |
| All Pins                          |                                      | - 0.5       |                      |
| $I_{OUT} V_{CC}$                  |                                      | 1.5         | A                    |
| PD Max:                           | $(T_A = 25\text{ }^{\circ}\text{C})$ | 710         | mW                   |
|                                   | $(T_A = 70\text{ }^{\circ}\text{C})$ | 390         |                      |
| Junction Temperature              |                                      | 125         | $^{\circ}\text{C}$   |
| Thermal Ratings $R_{\theta JA}$   |                                      | 140         | $^{\circ}\text{C/W}$ |

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| RECOMMENDED OPERATING CONDITIONS |  |                  |      |
|----------------------------------|--|------------------|------|
| Parameter                        |  | Limit            | Unit |
| + 12 $V_{IN}$                    |  | 12 V $\pm$ 10 %  | V    |
| + 5 $V_{IN}$ (must be present)   |  | 5 V $\pm$ 10 %   |      |
| + 3.3 $V_{IN}$                   |  | 3.3 V $\pm$ 10 % |      |
| $I_{OUT} V_{CC}$                 |  | 1                | A    |
| $I_{OUT} V_{PP}$                 |  | 150              | mA   |
| $V_L$                            |  | 5.0 V $\pm$ 10 % | V    |

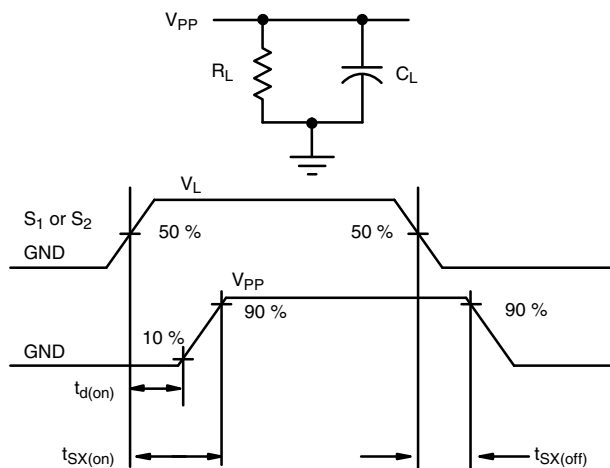
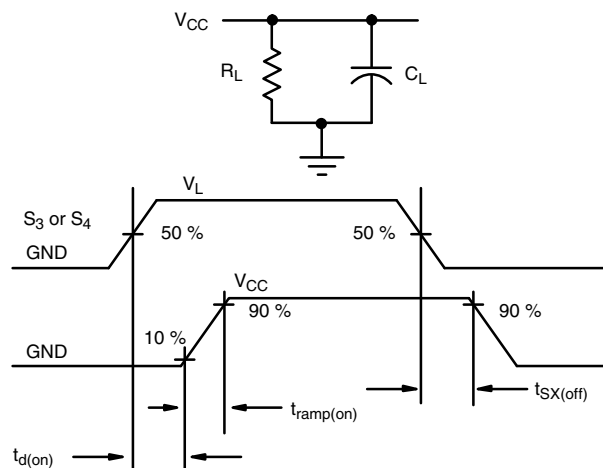
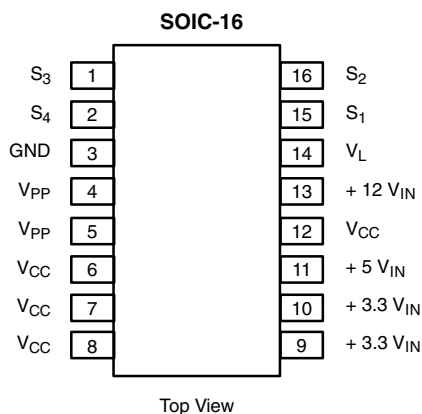
| SPECIFICATIONS                                         |                      |                                                                                                                                                                             |                        |                                |     |                  |      |
|--------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------|-----|------------------|------|
| Parameter                                              | Symbol               | Test Conditions<br>Unless Otherwise Specified<br>+ 5 V <sub>IN</sub> = 5 V, + 3.3 V <sub>IN</sub> = 3.3 V<br>+ 12 V <sub>IN</sub> = 12 V, V <sub>L</sub> = 5.0 V, GND = 0 V |                        | Limits<br>C Suffix, 0 to 70 °C |     |                  | Unit |
|                                                        |                      |                                                                                                                                                                             |                        | Min <sup>a</sup>               | Typ | Max <sup>a</sup> |      |
| Switch 1                                               |                      |                                                                                                                                                                             |                        |                                |     |                  |      |
| On Resistance                                          | R <sub>ON</sub>      | I = 120 mA, + 12 V <sub>IN</sub> = 10.8 V<br>S <sub>1</sub> = V <sub>L</sub> , S <sub>2</sub> = GND                                                                         | T <sub>A</sub> = 25 °C |                                |     | 200              | mΩ   |
|                                                        |                      |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 250              |      |
| Off Current (+ 12 V <sub>IN</sub> to V <sub>PP</sub> ) | I <sub>OFF</sub>     | + 12 V <sub>IN</sub> = 13.2 V, V <sub>PP</sub> = 0 V<br>S <sub>1</sub> = GND                                                                                                | T <sub>A</sub> = 25 °C |                                |     | 1                | μA   |
|                                                        |                      |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 10               |      |
| Switching Time                                         | t <sub>S1(on)</sub>  | C <sub>L</sub> = 0 1 μF, S <sub>2</sub> = Low, R <sub>L</sub> = 100 Ω, See Figure 1                                                                                         | 0.1                    |                                |     | 1                | μs   |
|                                                        | t <sub>S1(off)</sub> |                                                                                                                                                                             | 0.5                    |                                |     | 4                |      |
| Switch 2                                               |                      |                                                                                                                                                                             |                        |                                |     |                  |      |
| On Resistance                                          | R <sub>ON</sub>      | I = 120 mA, + 12 V <sub>IN</sub> = 10.8 V<br>S <sub>2</sub> = S <sub>3</sub> = V <sub>L</sub>                                                                               | T <sub>A</sub> = 25 °C |                                |     | 300              | mΩ   |
|                                                        |                      |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 350              |      |
| Off Current                                            | I <sub>OFF</sub>     | V <sub>PP</sub> = 13.2 V, V <sub>CC</sub> = 0 V<br>+ 12 V <sub>IN</sub> = 13.2 V                                                                                            | T <sub>A</sub> = 25 °C |                                |     | 1                | μA   |
|                                                        |                      |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 10               |      |
| Switching Time                                         | t <sub>S2(on)</sub>  | C <sub>L</sub> = 0.1 μF, R <sub>L</sub> = 100 Ω, S <sub>1</sub> = S <sub>4</sub> = GND,<br>S <sub>3</sub> = V <sub>L</sub> , See Figure 1                                   | 0.1                    |                                |     | 1                | μs   |
|                                                        | t <sub>S2(off)</sub> |                                                                                                                                                                             | 0.5                    |                                |     | 4                |      |



| SPECIFICATIONS                |                                       |                                                                                                                                                                             |                        |                                |     |                  |      |
|-------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------|-----|------------------|------|
| Parameter                     | Symbol                                | Test Conditions<br>Unless Otherwise Specified<br>+ 5 V <sub>IN</sub> = 5 V, + 3.3 V <sub>IN</sub> = 3.3 V<br>+ 12 V <sub>IN</sub> = 12 V, V <sub>L</sub> = 5.0 V, GND = 0 V |                        | Limits<br>C Suffix, 0 to 70 °C |     |                  | Unit |
|                               |                                       |                                                                                                                                                                             |                        | Min <sup>a</sup>               | Typ | Max <sup>a</sup> |      |
| Switch 3                      |                                       |                                                                                                                                                                             |                        |                                |     |                  |      |
| On Resistance                 | R <sub>ON</sub>                       | I = 500 mA, + 12 V <sub>IN</sub> = 10.8 V<br>S <sub>3</sub> = V <sub>L</sub>                                                                                                | T <sub>A</sub> = 25 °C |                                |     | 200              | mΩ   |
|                               |                                       |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 250              |      |
| Off Current                   | I <sub>OFF</sub>                      | + 5 V <sub>IN</sub> = 5 V, V <sub>CC</sub> = 0 V                                                                                                                            | T <sub>A</sub> = 25 °C |                                |     | 1                | μA   |
|                               |                                       |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 10               |      |
| Switching Time                | t <sub>d(on)</sub>                    | + 5 V <sub>IN</sub> = 5 V, C <sub>L</sub> = 0.1 μF, V <sub>CC</sub> to GND<br>R <sub>L</sub> = 100 Ω, V <sub>CC</sub> to GND, See Figure 2                                  |                        | 1                              |     |                  | μs   |
|                               | t <sub>ramp(on)</sub>                 |                                                                                                                                                                             |                        | 200                            |     |                  |      |
|                               | t <sub>S3(off)</sub>                  |                                                                                                                                                                             |                        | 0.5                            |     | 4                |      |
| Switch 4                      |                                       |                                                                                                                                                                             |                        |                                |     |                  |      |
| On Resistance                 | R <sub>ON</sub>                       | I = 500 mA, + 12 V <sub>IN</sub> = 10.8 V<br>S <sub>4</sub> = V <sub>L</sub>                                                                                                | T <sub>A</sub> = 25 °C |                                |     | 150              | mΩ   |
|                               |                                       |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 185              |      |
| Off Current                   | I <sub>OFF</sub>                      | + 3.3 V <sub>IN</sub> = 3.6 V, V <sub>CC</sub> = 0 V<br>S <sub>2</sub> = S <sub>3</sub> = S <sub>4</sub> = GND                                                              | T <sub>A</sub> = 25 °C |                                |     | 1                | μA   |
|                               |                                       |                                                                                                                                                                             | T <sub>A</sub> = 70 °C |                                |     | 10               |      |
| Switching Time                | t <sub>d(on)</sub>                    | + 3.3 V <sub>IN</sub> = 3.3 V, C <sub>L</sub> = 0.1 μF, S <sub>3</sub> = GND<br>R <sub>L</sub> = 100 Ω, See Figure 2                                                        |                        | 1                              |     |                  | μs   |
|                               | t <sub>ramp(on)</sub>                 |                                                                                                                                                                             |                        | 200                            |     |                  |      |
|                               | t <sub>S4(off)</sub>                  |                                                                                                                                                                             |                        | 0.5                            |     | 4                |      |
| Power Supply                  |                                       |                                                                                                                                                                             |                        |                                |     |                  |      |
| + 12 V <sub>IN</sub> Current  | I <sub>+12VIN(1)</sub>                | S <sub>1</sub> = S <sub>4</sub> = GND, S <sub>2</sub> = S <sub>3</sub> = V <sub>L</sub>                                                                                     |                        |                                |     | 10               | μA   |
|                               | I <sub>+12VIN(2)</sub>                | S <sub>1</sub> = S <sub>4</sub> = V <sub>L</sub> , S <sub>2</sub> = S <sub>3</sub> = GND                                                                                    |                        |                                |     | 10               |      |
| V <sub>L</sub> Current        | I <sub>VL(1)</sub>                    | S <sub>1</sub> = S <sub>4</sub> = GND, S <sub>2</sub> = S <sub>3</sub> = V <sub>L</sub>                                                                                     |                        |                                |     | 10               |      |
|                               | I <sub>VL(2)</sub>                    | S <sub>1</sub> = S <sub>4</sub> = V <sub>L</sub> , S <sub>2</sub> = S <sub>3</sub> = GND                                                                                    |                        |                                |     | 10               |      |
| Switch Control Inputs         |                                       |                                                                                                                                                                             |                        |                                |     |                  |      |
| Input Voltage High            | V <sub>I(H)</sub>                     |                                                                                                                                                                             | V <sub>L</sub> = 3.3 V | 2.8                            | 2.4 |                  | V    |
|                               |                                       |                                                                                                                                                                             | V <sub>L</sub> = 5 V   | 4.0                            | 3.3 |                  |      |
| Input Voltage Low             | V <sub>I(L)</sub>                     |                                                                                                                                                                             | V <sub>L</sub> = 3.3 V |                                | 1.1 | 0.4              |      |
|                               |                                       |                                                                                                                                                                             | V <sub>L</sub> = 5 V   |                                | 1.5 | 0.8              |      |
| Input Hysteresis <sup>b</sup> | V <sub>I(H)</sub> - V <sub>I(L)</sub> |                                                                                                                                                                             | V <sub>L</sub> = 3.3 V | 0.5                            | 1.3 |                  |      |
|                               |                                       |                                                                                                                                                                             | V <sub>L</sub> = 5 V   | 0.8                            | 1.8 |                  |      |
| Input Current High            | I <sub>I(H)</sub>                     | S <sub>1</sub> through S <sub>4</sub> = V <sub>L</sub> , V <sub>L</sub> = 5 V                                                                                               |                        |                                |     | 1.0              | μA   |
| Input Current Low             | I <sub>I(L)</sub>                     | S <sub>1</sub> through S <sub>4</sub> = GND, V <sub>L</sub> = 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.

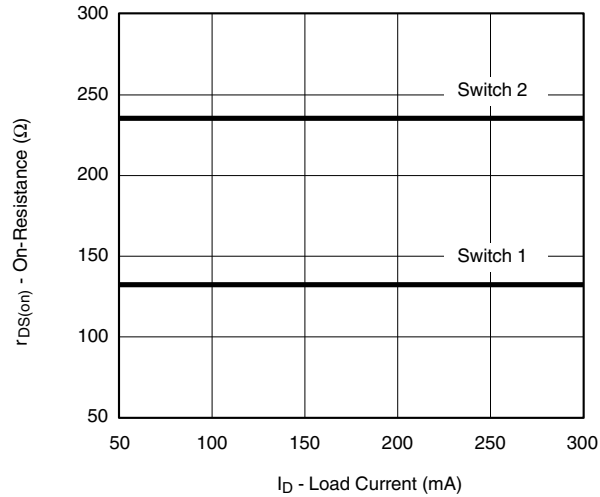
**TIMING WAVEFORMS**Figure 1.  $t_{d(on)}$  and  $t_{SX(on)}$ Figure 2.  $t_{ramp(on)}$ **PIN CONFIGURATION AND ORDERING INFORMATION****ORDERING INFORMATION**

| Part Number    | Temperature Range | Package |
|----------------|-------------------|---------|
| Si9711CY       | 0 to 70 °C        | SOIC-16 |
| Si9711CY-T1    |                   |         |
| Si9711CY-T1-E3 |                   |         |

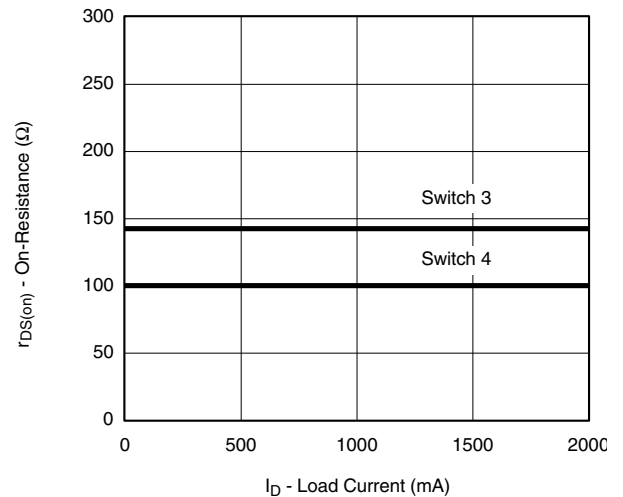
| Pin Number  | Symbol                | Description                                                                                                                          |
|-------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1           | S <sub>3</sub>        | Control input for selecting + 5 V <sub>IN</sub> to V <sub>CC</sub> . The PC Card terminology for this pin is V <sub>CC_EN1</sub> .   |
| 2           | S <sub>4</sub>        | Control input for selecting + 3.3 V <sub>IN</sub> to V <sub>CC</sub> . The PC Card terminology for this pin is V <sub>CC_EN0</sub> . |
| 3           | GND                   | Ground connection.                                                                                                                   |
| 4, 5        | V <sub>PP</sub>       | Program and peripheral voltage to PC Card slot.                                                                                      |
| 6, 7, 8, 12 | V <sub>CC</sub>       | Supply voltage to slot.                                                                                                              |
| 9, 10       | + 3.3 V <sub>IN</sub> | + 3.3 V supply.                                                                                                                      |
| 11          | + 5 V <sub>IN</sub>   | +5 V supply.                                                                                                                         |
| 13          | + 12 V <sub>IN</sub>  | + 12 V supply.                                                                                                                       |
| 14          | V <sub>L</sub>        | Rail voltage for switch control inputs, selectable to 5 V or 3.3 V.                                                                  |
| 15          | S <sub>1</sub>        | Control input for selecting + 12 V <sub>IN</sub> to V <sub>PP</sub> . The PC Card terminology for this pin is V <sub>PP_EN1</sub> .  |
| 16          | S <sub>2</sub>        | Control input for selecting V <sub>CC</sub> to V <sub>PP</sub> . The PC Card terminology for this pin is V <sub>PP_EN0</sub> .       |



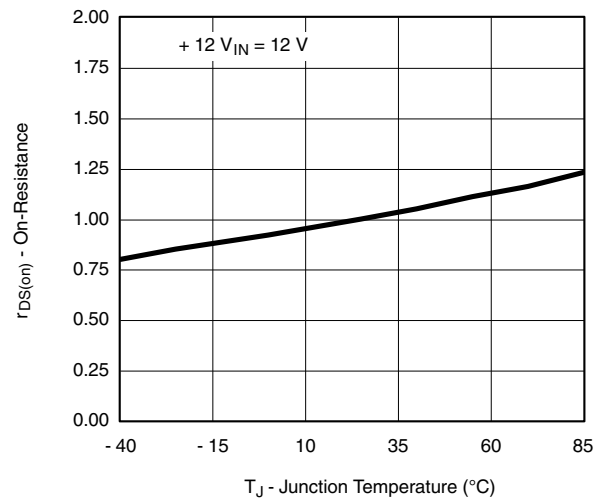
**TYPICAL CHARACTERISTICS** 25 °C unless otherwise noted



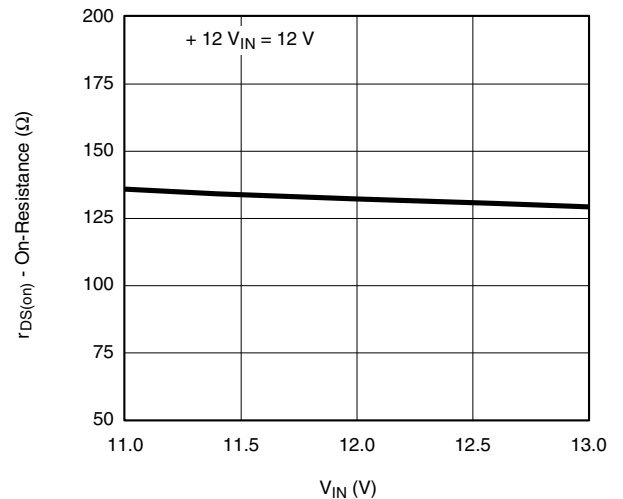
**On-Resistance vs. Load Current**



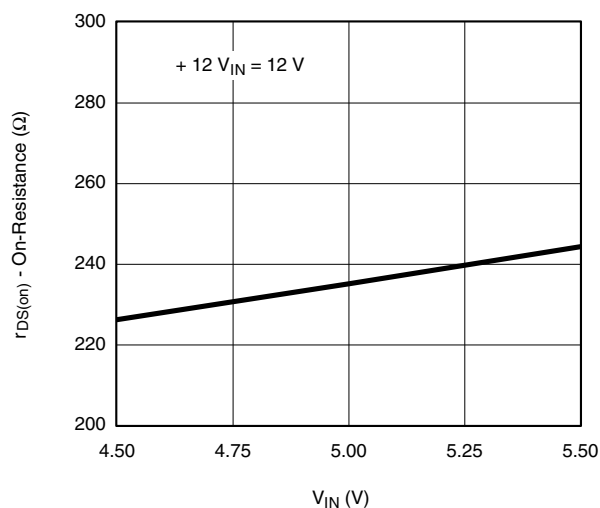
**On-Resistance vs. Load Current**



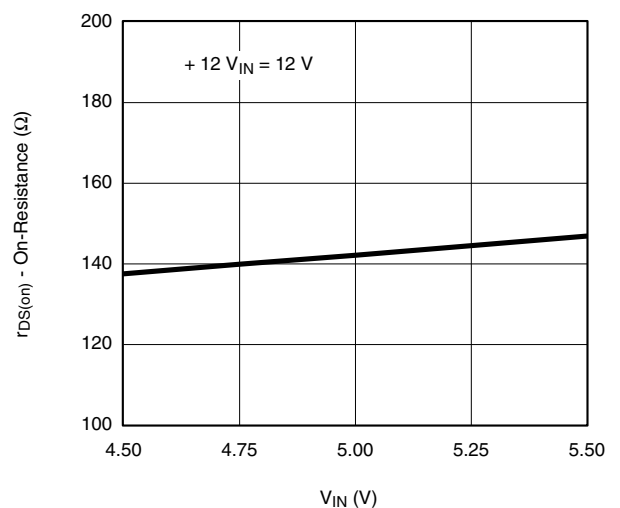
**Switch 1-4**  
**On-Resistance vs. Junction Temperature**



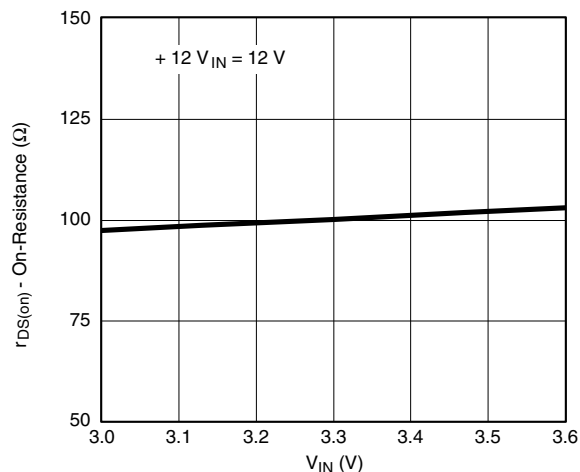
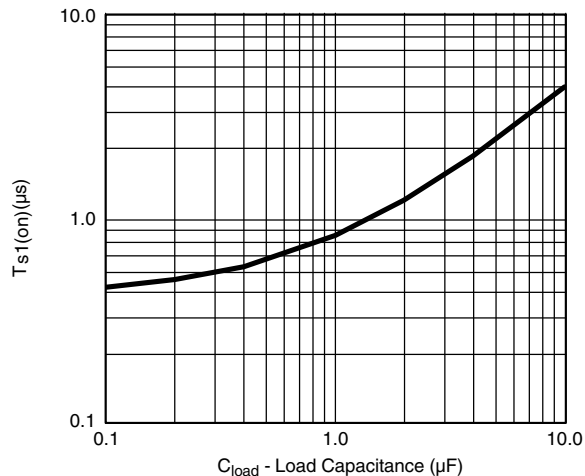
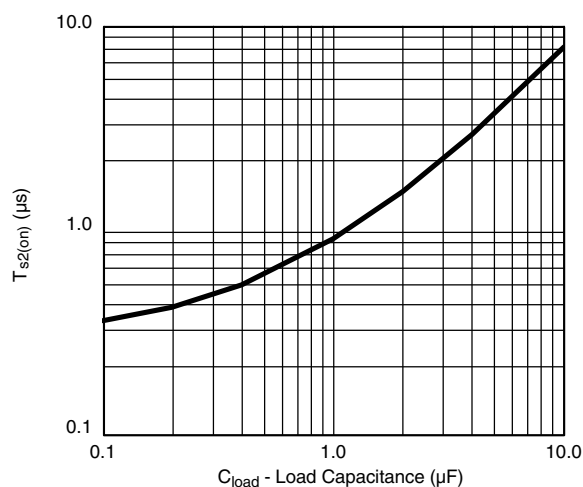
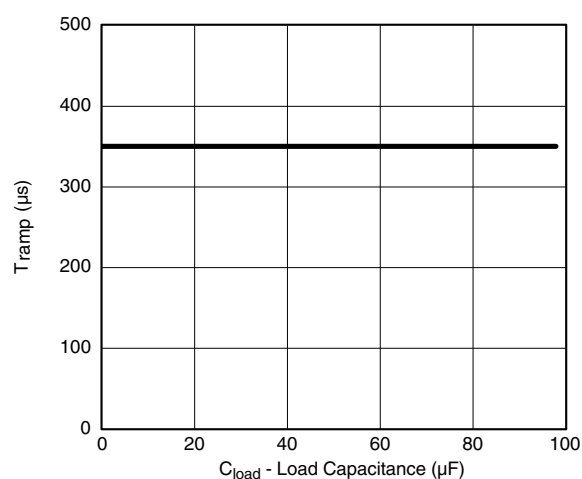
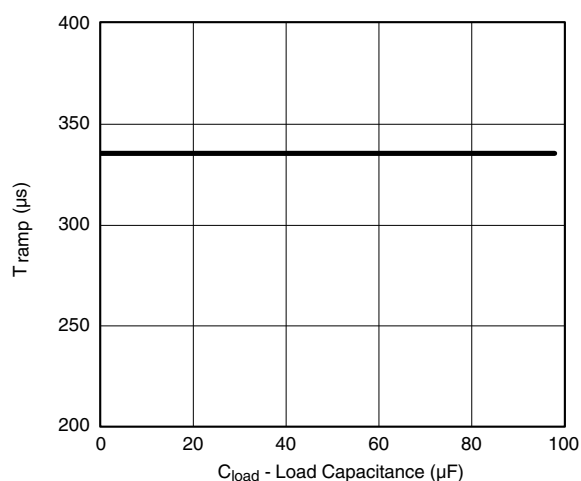
**Switch 1, On-Resistance vs.  $V_{IN}$**



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



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

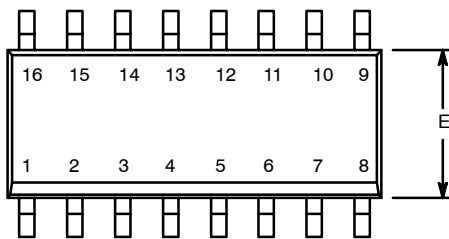
**TYPICAL CHARACTERISTICS** 25 °C unless otherwise noted**Switch 4, On-Resistance vs.  $V_{IN}$** **Switch 1, Switching Time vs. Load Capacitance****Switch 2, Switching Time vs. Load Capacitance****Switch 3, Ramp Time vs. Load Capacitance****Switch 4, Ramp Time vs. Load Capacitance**

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?70022>.



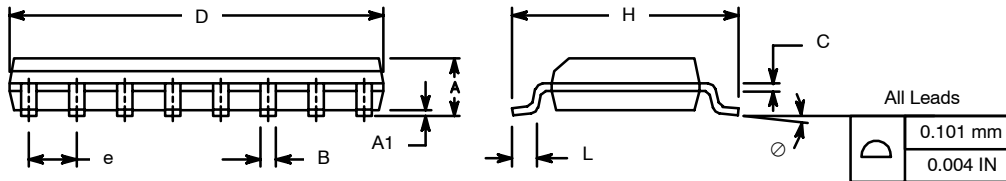
### SOIC (NARROW): 16-LEAD (POWER IC ONLY)

JEDEC Part Number: MS-012



| Dim            | MILLIMETERS |       | INCHES    |       |
|----------------|-------------|-------|-----------|-------|
|                | Min         | Max   | Min       | Max   |
| A              | 1.35        | 1.75  | 0.053     | 0.069 |
| A <sub>1</sub> | 0.10        | 0.20  | 0.004     | 0.008 |
| B              | 0.38        | 0.51  | 0.015     | 0.020 |
| C              | 0.18        | 0.23  | 0.007     | 0.009 |
| D              | 9.80        | 10.00 | 0.385     | 0.393 |
| E              | 3.80        | 4.00  | 0.149     | 0.157 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| H              | 5.80        | 6.20  | 0.228     | 0.244 |
| L              | 0.50        | 0.93  | 0.020     | 0.037 |
| ⌀              | 0°          | 8°    | 0°        | 8°    |

ECN: S-40080—Rev. A, 02-Feb-04  
DWG: 5912





## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Vishay:

[SI4788CY](#) [SI4720CY](#) [SI4779CY](#) [SI9750CY](#) [SI4726CY](#) [SI4728CY](#) [SI4728CY-E3](#) [SI4726CY-T1-E3](#) [SI4728CY-T1-E3](#) [SI4779CY-T1-E3](#) [SI9140CY](#) [SI9711CY](#) [SI9718CY](#) [SI9717CY](#) [SI4720CY-E3](#) [SI4726CY-E3](#) [SI4719CY-E3](#) [SI4779CY-E3](#) [SI4788CY-E3](#) [SI9711CY-E3](#) [SI9711CY-T1-E3](#) [SI9711CY-T1](#)