

## 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.

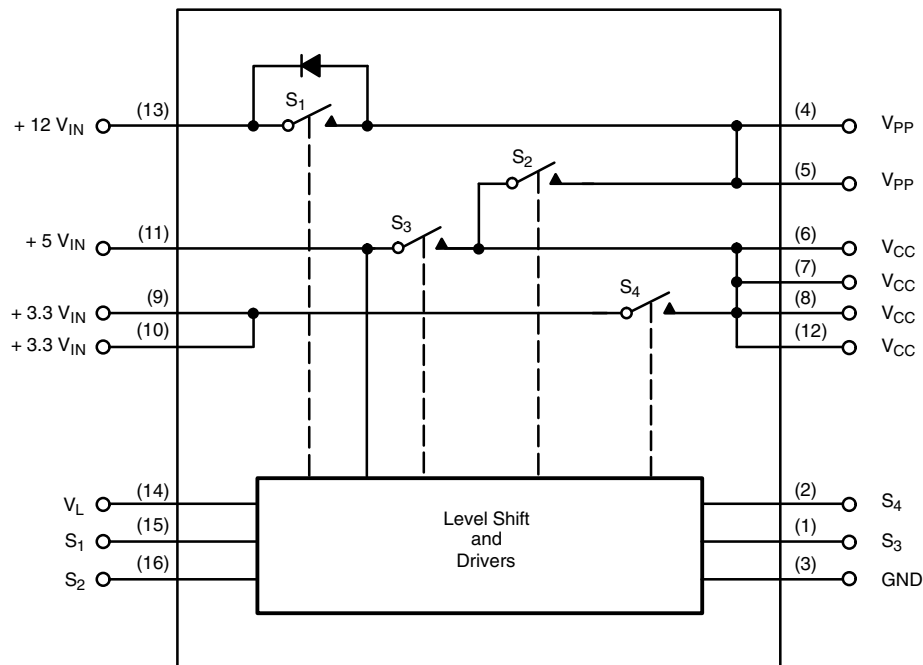
The Si9711 is packaged in an SO-16 package and is rated over the commercial temperature range 0 to 70 °C.

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
<b>Voltages Referenced to Ground</b>		
$V_L$	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:	( $T_A = 25\text{ }^{\circ}\text{C}$ )	mW
	( $T_A = 70\text{ }^{\circ}\text{C}$ )	
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**

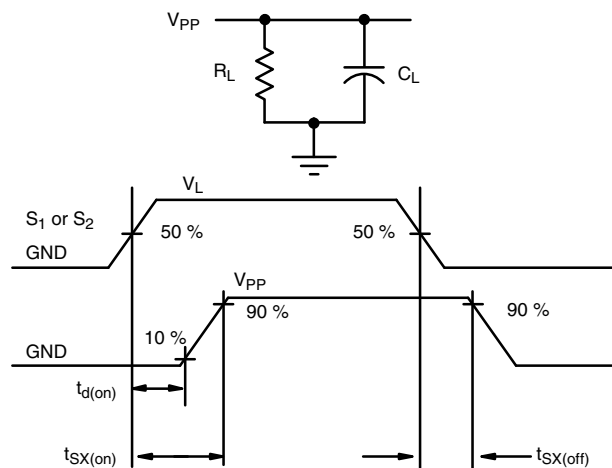
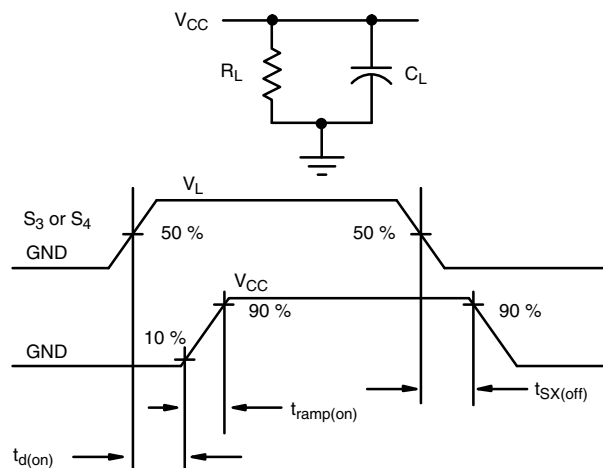
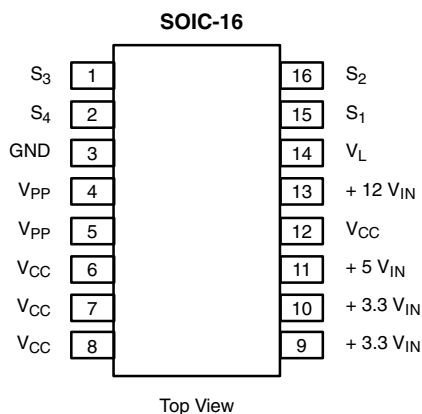
Parameter	Symbol	Test Conditions Unless Otherwise Specified + 5 V <sub>IN</sub> = 5 V, + 3.3 V <sub>IN</sub> = 3.3 V + 12 V <sub>IN</sub> = 12 V, V <sub>L</sub> = 5.0 V, GND = 0 V	Limits C Suffix, 0 to 70 °C			Unit
			Min <sup>a</sup>	Typ	Max <sup>a</sup>	
Switch 1						
On Resistance	R <sub>ON</sub>	I = 120 mA, + 12 V <sub>IN</sub> = 10.8 V 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 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 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 + 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, 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 Unless Otherwise Specified + 5 V <sub>IN</sub> = 5 V, + 3.3 V <sub>IN</sub> = 3.3 V + 12 V <sub>IN</sub> = 12 V, V <sub>L</sub> = 5.0 V, GND = 0 V		Limits 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 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 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 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 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 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.

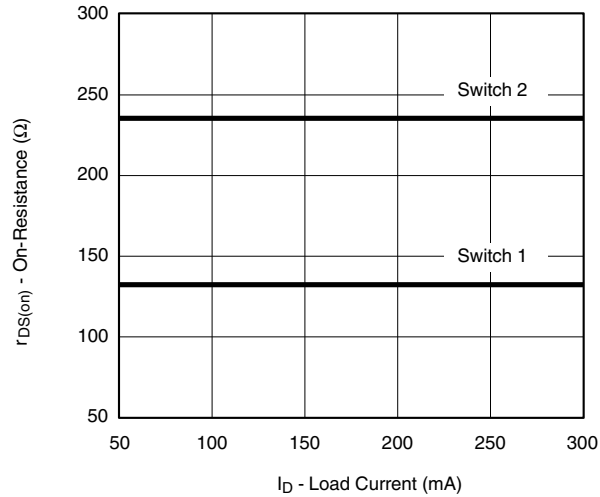
**TIMING WAVEFORMS**Figure 1.  $t_{d(on)}$  and  $t_{SX(on)}$ Figure 2.  $t_{ramp(on)}$ **PIN CONFIGURATION AND ORDERING INFORMATION****ORDERING INFORMATION**

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

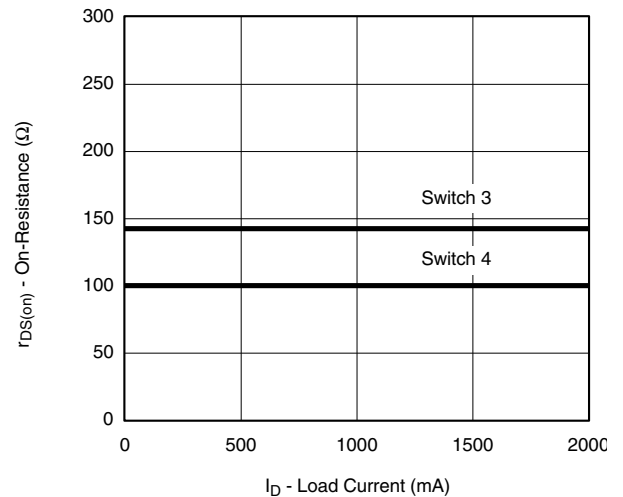
Pin Number	Symbol	Description
1	$S_3$	Control input for selecting + 5 $V_{IN}$ to $V_{CC}$ . The PC Card terminology for this pin is $V_{CC\_EN1}$ .
2	$S_4$	Control input for selecting + 3.3 $V_{IN}$ to $V_{CC}$ . The PC Card terminology for this pin is $V_{CC\_EN0}$ .
3	GND	Ground connection.
4, 5	$V_{PP}$	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 $V_{PP\_EN1}$ .
16	$S_2$	Control input for selecting $V_{CC}$ to $V_{PP}$ . The PC Card terminology for this pin is $V_{PP\_EN0}$ .



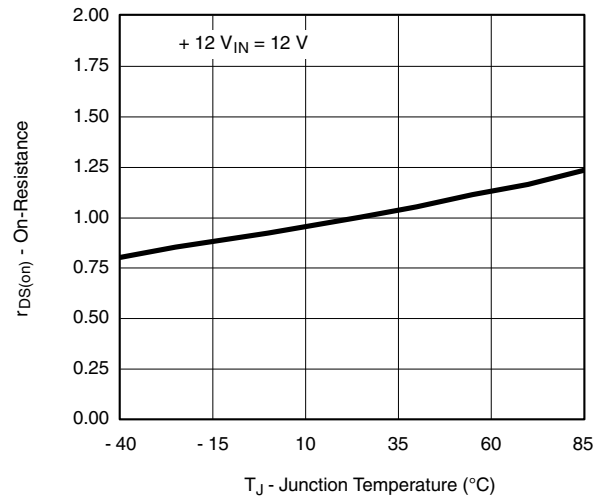
**TYPICAL CHARACTERISTICS** 25 °C unless otherwise noted



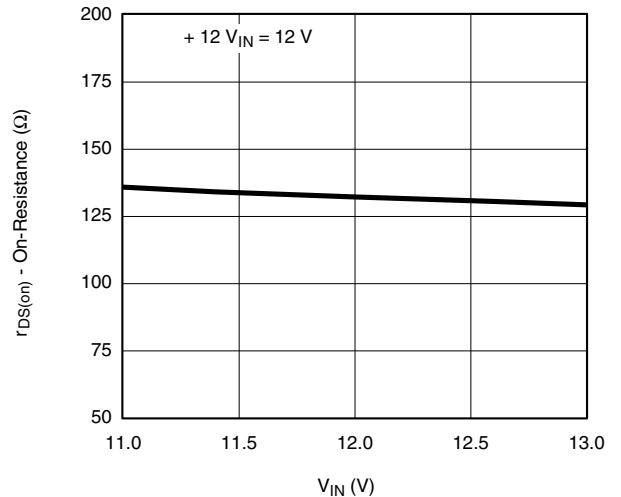
**On-Resistance vs. Load Current**



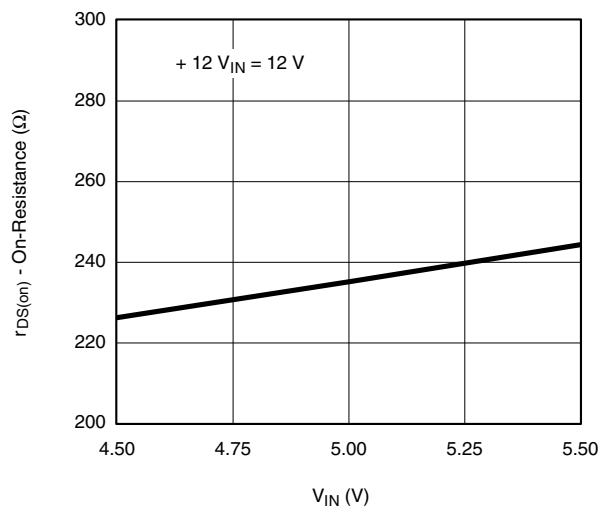
**On-Resistance vs. Load Current**



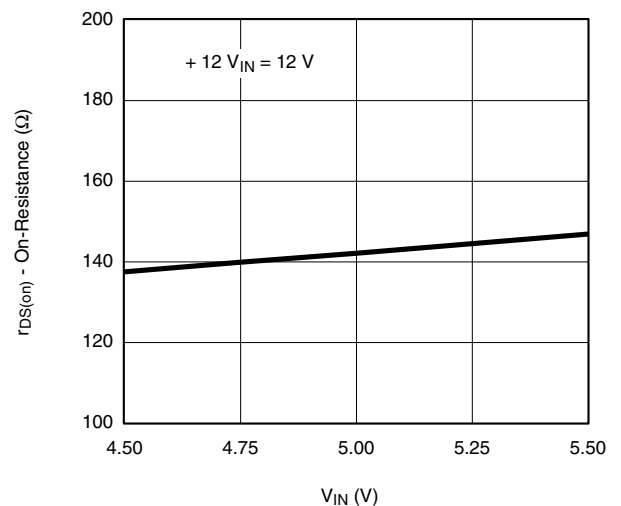
**Switch 1-4**  
**On-Resistance vs. Junction Temperature**



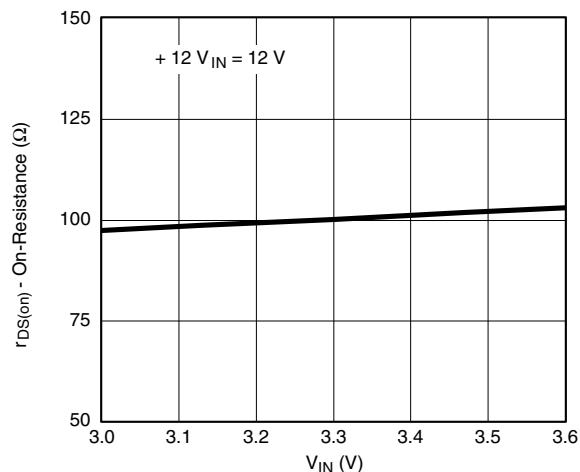
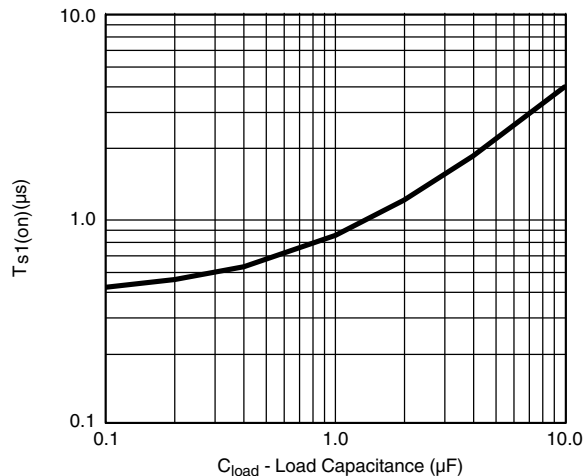
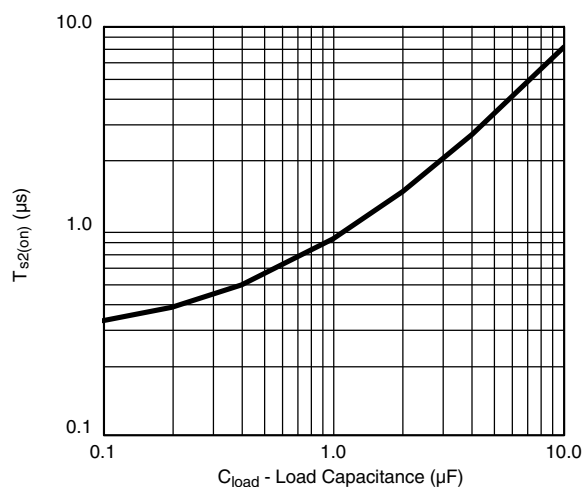
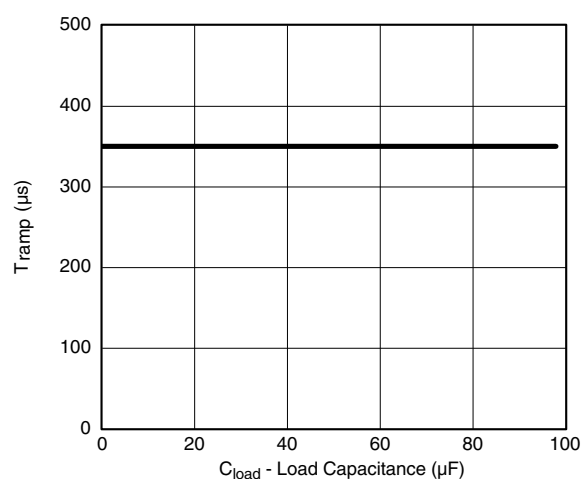
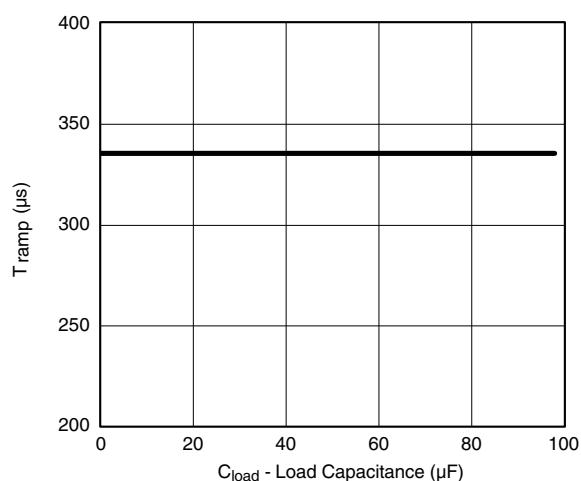
**Switch 1, On-Resistance vs.  $V_{IN}$**



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



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

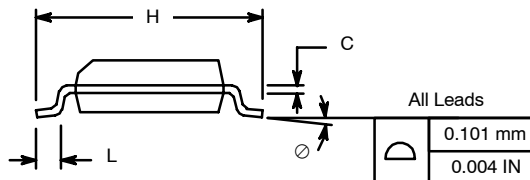
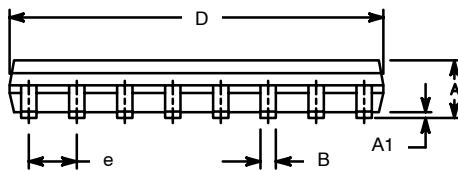
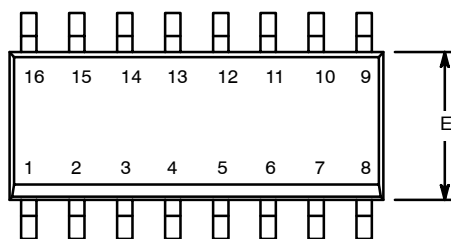
**TYPICAL CHARACTERISTICS** 25 °C unless otherwise noted**Switch 4, On-Resistance vs.  $V_{IN}$** **Switch 1, Switching Time vs. Load Capacitance****Switch 2, Switching Time vs. Load Capacitance****Switch 3, Ramp Time vs. Load Capacitance****Switch 4, Ramp Time vs. Load Capacitance**

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### 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



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