



SIGNAL PROCESSING EXCELLENCE

T-51-10-16

# SP1676 Series

## Monolithic 16-bit, 17 $\mu$ s Sampling ADC

### FEATURES

- Complete 16-bit ADC with Integral Sample/Hold, Reference and Clock
- $\pm 0.003\%$  FSR Integral Linearity
- Monotonicity to 14 Bits Over Full Operating Temperature
- 50kHz Throughput
- 16-Bit Parallel or Double-Byte Read Outputs
- 400mW Power Dissipation

### APPLICATIONS

- Vibration Analysis
- Medical Instrumentation
- PC-Based Lab Instrumentation
- Spectrophotometry
- Test Equipment

### DESCRIPTION

The **SP1676 Series** of 16-bit, 50kHz sampling ADCs feature fully integrated successive-approximation ADC, sample-and-hold, reference and clock in a single monolithic IC. On-board thin-film input range scaling resistors provide full scale ranges of  $\pm 5V$ ,  $\pm 10V$ ,  $0V$  to  $+10V$  and  $0V$  to  $+20V$ . Optional output configurations provide full 16-bit parallel outputs as well as double-byte read and serial data outputs.

The **SP1676 Series** features 17 $\mu$ s maximum conversion and 3 $\mu$ s signal acquisition times, thereby providing a 50kHz overall throughput. Input full scale signal bandwidth is 25kHz. Integral linearity is specified at  $\pm 0.003\%$  FSR maximum, with 14-bit monotonicity guaranteed over the full operating temperature range.

Versions of the **SP1676 Series** are available for specified performance over the commercial ( $0^{\circ}C$  to  $+70^{\circ}C$ ), industrial ( $-40^{\circ}C$  to  $+85^{\circ}C$ ) and military ( $-55^{\circ}C$  to  $+125^{\circ}C$ ) temperature ranges. Package options include plastic and ceramic DIP, J-lead LCC and PLCC. For product screened to full MIL-STD-883, please consult the factory.

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**SPECIFICATIONS**

(Typical for all models @ 25°C and nominal supply voltages unless otherwise specified)

PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITIONS
<b>ANALOG INPUT</b>					
Input Ranges					
Bipolar		±5 ±10		V V	
Unipolar		0 to +10 0 to +20		V V	
Impedance					
10V FSR		2.5		kΩ	
20V FSR		10		kΩ	
<b>TRANSFER CHARACTERISTICS</b>					
Resolution			16	Bits	over temperature
Integral Non-Linearity					
"-4" suffix			±0.006	% FSR	
"-5" suffix			±0.003	% FSR	
Differential Non-Linearity					
"-4" suffix		±1	±1.5	LSB	
"-5" suffix		±0.5	±1.0	LSB	
No Missing Codes					
"-4" suffix			13	Bits	
"-5" suffix			14	Bits	
Gain Error		±0.1	±0.2	% FSR	
Zero Error		±0.1	±0.2	% FSR	
Bipolar Zero Error		±0.1	±0.2	% FSR	
Noise at Transitions			±0.003	% FSR	
Power Supply Sensitivity					
+V <sub>Loic</sub>		±0.006		% FSR/%	
+V <sub>cc</sub>		±0.006		% FSR/%	
Conversion Time		15	17	μsec	
<b>STABILITY</b>					
Integral Linearity Tempco		±1	±2	ppm/°C	
Gain Tempco		±20	±30	ppm/°C	
Zero Tempco		±20	±30	ppm/°C	
Unipolar Zero Tempco		±20	±30	ppm/°C	
Bipolar Zero Tempco		±20	±30	ppm/°C	
<b>DIGITAL INPUTS/OUTPUTS</b>					
Input Logic Levels					
V <sub>IH</sub>		+2.0	+5.5	V	V <sub>H</sub> = +2.7V V <sub>L</sub> = +0.4V
V <sub>IL</sub>		0	+0.8	V	
I <sub>IH</sub>			±10	μA	
I <sub>IL</sub>			±20	μA	
Output Logic Levels					
V <sub>OH</sub>			+0.4	V	I <sub>OL</sub> = -1.6mA I <sub>OH</sub> = 200μA High impedance
V <sub>OL</sub>				V	
Data Output Leakage Current		+2.4		nA	
<b>POWER SUPPLY REQUIREMENTS</b>					
Voltage Range					
V <sub>Loic</sub>	4.75	5	5.25	V	
V <sub>cc</sub>	13.5	15	16.0	V	
Current Drain					
I <sub>Loic</sub>		7	10	mA	
I <sub>cc</sub>		17	23	mA	
Power Dissipation		300	400	mW	
<b>ENVIRONMENTAL</b>					
Operating Temperature Range					
"C-" suffix	0		+70	°C	
"I-" suffix	-40		+85	°C	

**SPECIFICATIONS**

(Typical for all models @ 25°C and nominal supply voltages unless otherwise specified)

PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITIONS
<b>ENVIRONMENTAL</b>					
"B-" suffix	-55		+125	°C	
Storage Temperature Range	-65		+150	°C	

**SPECIFICATIONS**(Typical for all models @ 25°C and rated supplies,  $V_{CC} = +15V$ ,  $V_{LOGIC} = +5V$ , unless otherwise noted)

PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITIONS
<b>CONVERT MODE TIMING</b>					
$t_{DSC}$ — STS Delay from CE			200	ns	
$t_{HEC}$ — CE Pulse Width	50			ns	
$t_{SSC}$ — $\overline{CS}$ to CE Setup	50			ns	
$t_{SRC}$ — $R/\overline{C}$ to CE Setup	50			ns	
$t_{HRC}$ — $R/\overline{C}$ Low During CE High	50			ns	
$t_C$ — Conversion Time		15	17	$\mu s$	
$t_{HRL}$ — Low $R/\overline{C}$ Pulse Width	50			ns	
$t_{DS}$ — STS Delay from $R/\overline{C}$		200		ns	
$t_{HDR}$ — Data Valid After $R/\overline{C}$	25			ns	
$t_{HS}$ — STS Delay After Data Valid	300			ns	
$t_{HRH}$ — High $R/\overline{C}$ Pulse Width	150			ns	
$t_{DDR}$ — Data Access Time		150		ns	

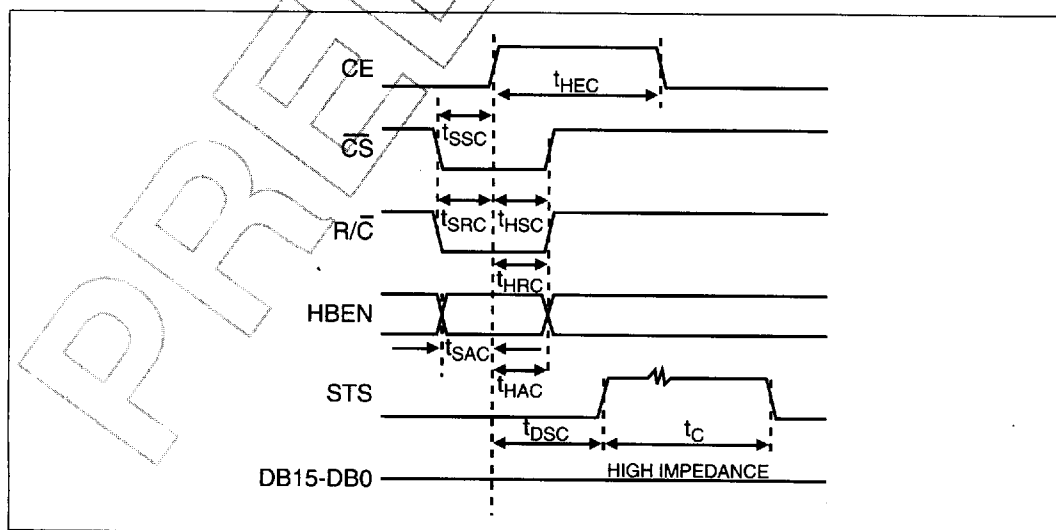


Figure 1. Convert Mode Timing

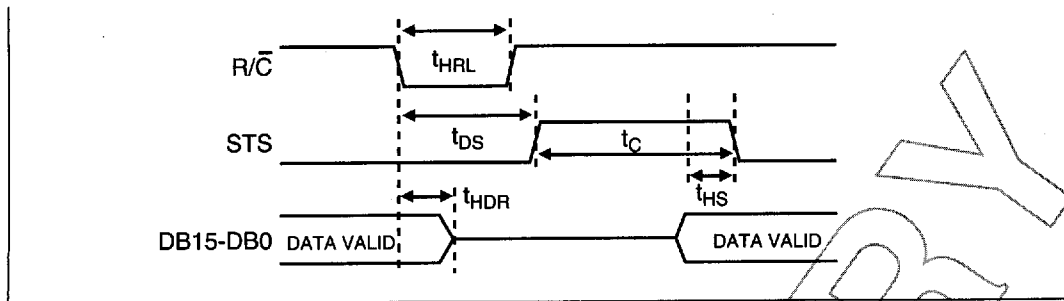


Figure 2. Low Pulse for R/C — Outputs Enabled After Conversion

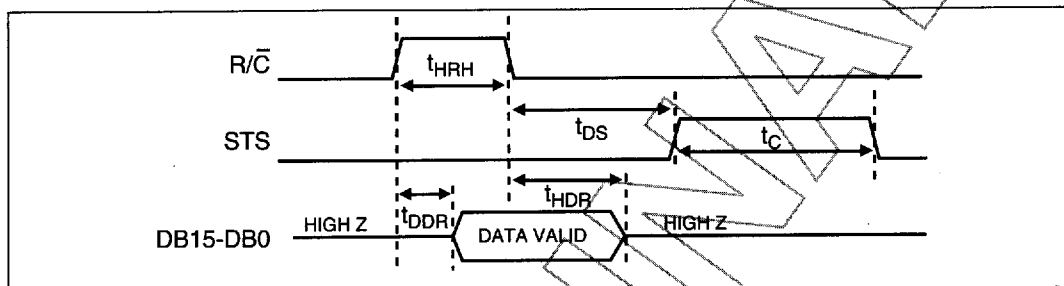


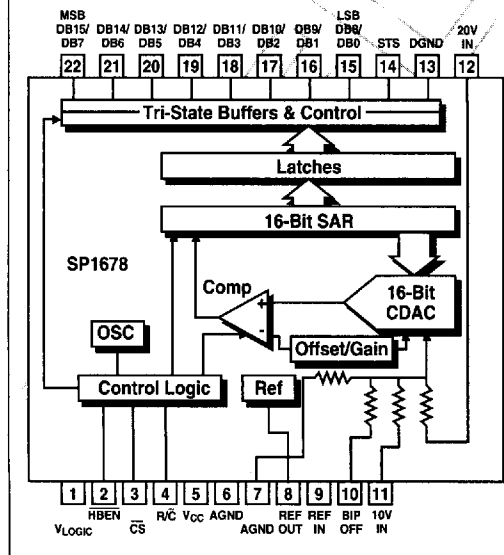
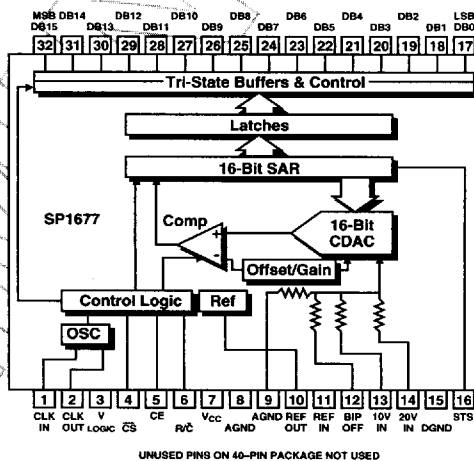
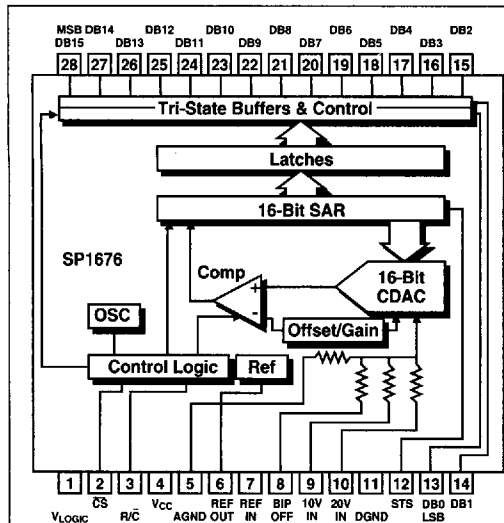
Figure 3. High Pulse for R/C — Outputs Enabled While R/C is High, Otherwise High Impedance

### Ordering Information

16-bit, 50kHz Monolithic, Sampling ADC

Model	Linearity	Temperature	Package
SP1676C-4	±0.006%	0°C to +70°C	28-pin plastic DIP
SP1676C-5	±0.003%	0°C to +70°C	28-pin plastic DIP
SP1677C-4	±0.006%	0°C to +70°C	40-pin plastic DIP
SP1677C-5	±0.003%	0°C to +70°C	40-pin plastic DIP
SP1678C-4	±0.006%	0°C to +70°C	22-pin plastic DIP
SP1678C-5	±0.003%	0°C to +70°C	22-pin plastic DIP
SP1676I-4	±0.006%	-40°C to +85°C	28-pin plastic DIP
SP1676I-5	±0.003%	-40°C to +85°C	28-pin plastic DIP
SP1677I-4	±0.006%	-40°C to +85°C	40-pin plastic DIP
SP1677I-5	±0.003%	-40°C to +85°C	40-pin plastic DIP
SP1678I-4	±0.006%	-40°C to +85°C	22-pin plastic DIP
SP1678I-5	±0.003%	-40°C to +85°C	22-pin plastic DIP
SP1676B-4	±0.006%	-55°C to +125°C	28-pin CerDIP
SP1676B-5	±0.003%	-55°C to +125°C	28-pin CerDIP
SP1677B-4	±0.006%	-55°C to +125°C	32-pin CerDIP
SP1677B-5	±0.003%	-55°C to +125°C	32-pin CerDIP
SP1678B-4	±0.006%	-55°C to +125°C	22-pin CerDIP
SP1678B-5	±0.003%	-55°C to +125°C	22-pin CerDIP

PIN ASSIGNMENTS & BLOCK DIAGRAM



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