

Features

- x16 Organization Utilizing “No Connects” for Pins 6 and 7
- Low Voltage and Standard Voltage Operation
 - 5.0 ($V_{CC} = 4.5V$ to $5.5V$)
 - 2.7 ($V_{CC} = 2.7V$ to $5.5V$)
 - 2.5 ($V_{CC} = 2.5V$ to $5.5V$)
- 3-Wire Serial Interface
- 2 MHz Clock Rate (5V) Compatibility
- Self-Timed Write Cycle (10 ms max)
- High Reliability
 - Endurance: 1 Million Cycles
 - Data Retention: 100 Years
- Automotive Grade and Extended Temperature Devices Available
- 8-Pin PDIP and JEDEC SOIC Packages

Description

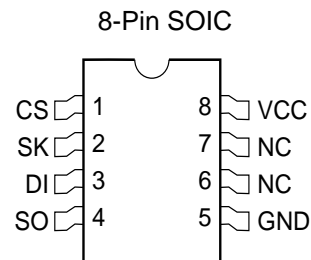
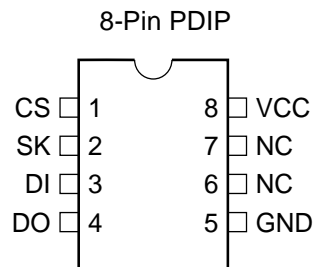
The AT93C46B provides 1024 bits of serial electrically erasable programmable read only memory (EEPROM) organized as 64 words of 16 bits each. The device is optimized for use in many industrial and commercial applications where low power and low voltage operation are essential. The AT93C46B is available in space saving 8-pin PDIP and 8-pin JEDEC SOIC packages.

The AT93C46B is enabled through the Chip Select pin (CS), and accessed via a 3-wire serial interface consisting of Data Input (DI), Data Output (DO), and Shift Clock (SK). Upon receiving a READ instruction at DI, the address is decoded and the data is clocked out serially on the data output pin DO. The WRITE cycle is completely self-timed and no separate ERASE cycle is required before WRITE. The WRITE cycle is only enabled when the part is in the ERASE/WRITE ENABLE state. When CS is brought “high” following the initiation of a WRITE cycle, the DO pin outputs the READY/BUSY status of the part.

The AT93C46B is available in 4.5V to 5.5V, 2.7V to 5.5V, and 2.5V to 5.5V versions.

Pin Configuration

Pin Name	Function
CS	Chip Select
SK	Serial Data Clock
DI	Serial Data Input
DO	Serial Data Output
GND	Ground
V_{CC}	Power Supply
NC	No Connect



3-Wire Serial E²PROMs

1K (64 x 16)

AT93C46B

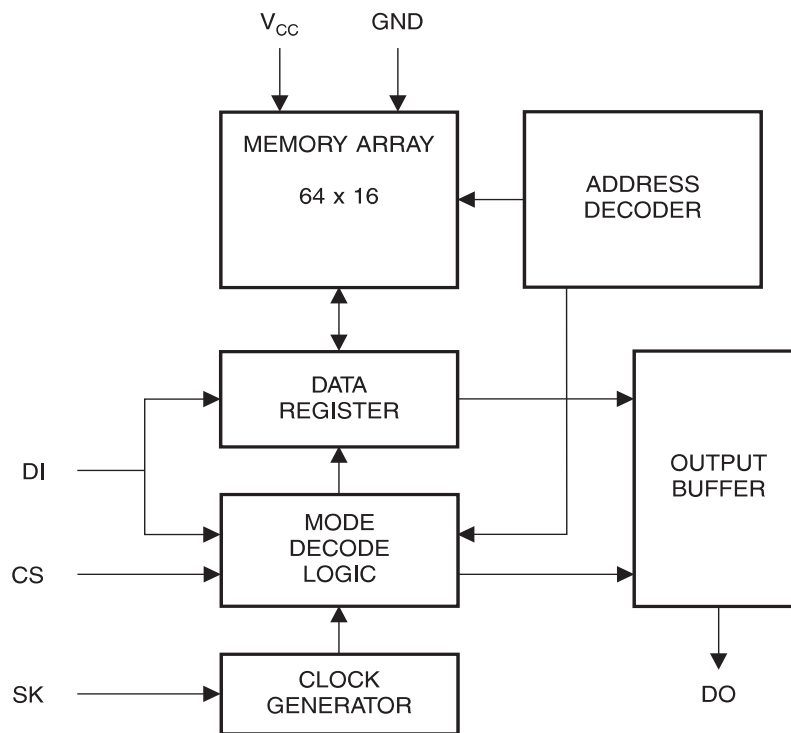


Absolute Maximum Ratings*

Operating Temperature.....	-55°C to +125°C
Storage Temperature.....	-65°C to +150°C
Voltage on Any Pin with Respect to Ground.....	-1.0V to +7.0V
Maximum Operating Voltage	6.25V
DC Output Current	5.0 mA

*NOTICE: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Block Diagram



Pin Capacitance⁽¹⁾

Applicable over recommended operating range from $T_A = 25^\circ\text{C}$, $f = 1.0\text{ MHz}$, $V_{CC} = +5.0\text{V}$ (unless otherwise noted).

	Test Conditions	Max	Units	Conditions
C_{OUT}	Output Capacitance (DO)	5	pF	$V_{OUT} = 0\text{V}$
C_{IN}	Input Capacitance (CS, SK, DI)	5	pF	$V_{IN} = 0\text{V}$

Note: 1. This parameter is characterized and is not 100% tested.

DC Characteristics

Applicable over recommended operating range from: $T_{AI} = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = +2.5\text{V}$ to $+5.5\text{V}$, $T_{AC} = 0^\circ\text{C}$ to $+70^\circ\text{C}$, $V_{CC} = +2.5\text{V}$ to $+5.5\text{V}$ (unless otherwise noted).

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
V_{CC2}	Supply Voltage		2.5		5.5	V
V_{CC3}	Supply Voltage		2.7		5.5	V
V_{CC4}	Supply Voltage		4.5		5.5	V
I_{CC}	Supply Current	$V_{CC} = 5.0\text{V}$	READ at 1.0 MHz	0.5	2.0	mA
			WRITE at 1.0 MHz	0.5	2.0	mA
I_{SB1}	Standby Current	$V_{CC} = 2.5\text{V}$	CS = 0V	14.0	20.0	μA
I_{SB2}	Standby Current	$V_{CC} = 2.7\text{V}$	CS = 0V	14.0	20.0	μA
I_{SB3}	Standby Current	$V_{CC} = 5.0\text{V}$	CS = 0V	35.0	50.0	μA
I_{IL}	Input Leakage	$V_{IN} = 0\text{V}$ to V_{CC}		0.1	1.0	μA
I_{OL}	Output Leakage	$V_{IN} = 0\text{V}$ to V_{CC}		0.1	1.0	μA
$V_{IL1}^{(1)}$ $V_{IH1}^{(1)}$	Input Low Voltage Input High Voltage	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$	-0.1 2.0		0.8 $V_{CC} + 1$	V
$V_{IL2}^{(1)}$ $V_{IH2}^{(1)}$	Input Low Voltage Input High Voltage	$1.8\text{V} \leq V_{CC} \leq 2.7\text{V}$	0.0 $V_{CC} \times 0.7$		$V_{CC} \times 0.3$ $V_{CC} + 1$	V
V_{OL1} V_{OH1}	Output Low Voltage Output High Voltage	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$	$I_{OL} = 2.1\text{ mA}$		0.4	V
			$I_{OH} = -0.4\text{ mA}$	2.4		V
V_{OL2} V_{OH2}	Output Low Voltage Output High Voltage	$1.8\text{V} \leq V_{CC} \leq 2.7\text{V}$	$I_{OL} = 0.15\text{ mA}$		0.2	V
			$I_{OH} = -100\ \mu\text{A}$	$V_{CC} - 0.2$		V

Note: 1. V_{IL} and V_{IH} max are reference only and are not tested.



AC Characteristics

Applicable over recommended operating range from $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = +2.5\text{V}$ to $+5.5\text{V}$, $C_L = 1$ TTL Gate and 100 pF (unless otherwise noted).

Symbol	Parameter	Test Condition		Min	Typ	Max	Units
f_{SK}	SK Clock Frequency	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$		0 0 0		2 1 0.5	MHz
t_{SKH}	SK High Time	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$		250 250 500			ns
t_{SKL}	SK Low Time	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$		250 250 500			ns
t_{CS}	Minimum CS Low Time	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$		250 250 500			ns
t_{CSS}	CS Setup Time	Relative to SK	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$	50 50 100			ns
t_{DIS}	DI Setup Time	Relative to SK	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$	100 100 200			ns
t_{CSH}	CS Hold Time	Relative to SK		0			ns
t_{DIH}	DI Hold Time	Relative to SK	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$	100 100 200			ns
t_{PD1}	Output Delay to '1'	AC Test	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$			250 250 500	ns
t_{PD0}	Output Delay to '0'	AC Test	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$			250 250 500	ns
t_{SV}	CS to Status Valid	AC Test	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$			250 250 500	ns
t_{DF}	CS to DO in High Impedance	AC Test CS = V_{IL}	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.5\text{V} \leq V_{CC} \leq 5.5\text{V}$			100 100 200	ns
t_{WP}	Write Cycle Time		$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$	0.1		10	ms
					1		ms
Endurance		25°C, $V_{CC} = 5.0\text{V}$, Page Mode		1M			Cycles

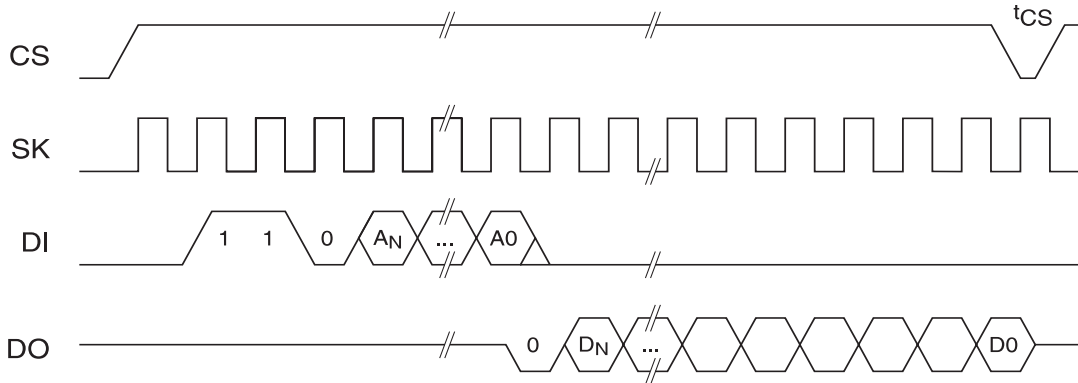
Instruction Set for the AT93C46B

Instruction	SB	Op Code	Address (x16)	Comments
READ	1	10	A ₅ - A ₀	Reads data stored in memory, at specified address.
EWEN	1	00	11XXXX	Write enable must precede all programming modes.
ERASE	1	11	A ₅ - A ₀	Erase memory location A _n - A ₀ .
WRITE	1	01	A ₅ - A ₀	Writes memory location A _n - A ₀ .
ERAL	1	00	10XXXX	Erases all memory locations. Valid only at V _{CC} = 4.5V to 5.5V.
WRAL	1	00	01XXXX	Writes all memory locations. Valid only at V _{CC} = 4.5V to 5.5V.
EWDS	1	00	00XXXX	Disables all programming instructions.

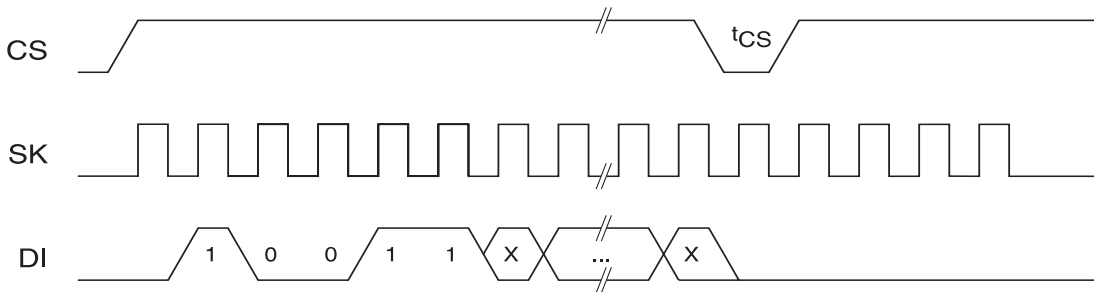
Organization Key for Timing Diagrams

I/O	AT93C46B (x16)
A _N	A ₅
D _N	D ₁₅

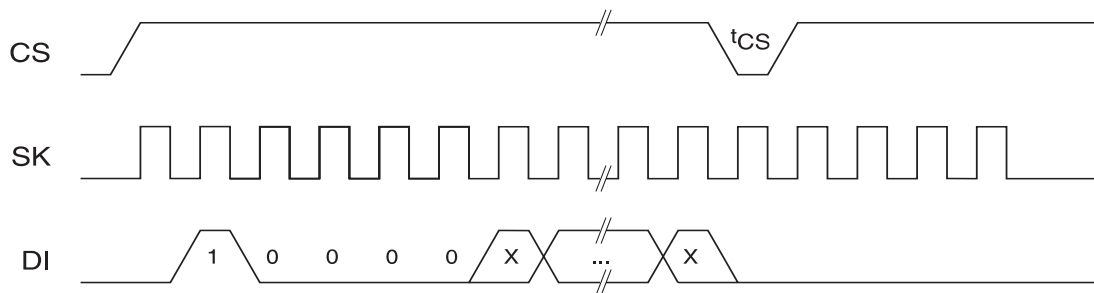
READ Timing



EWEN Timing

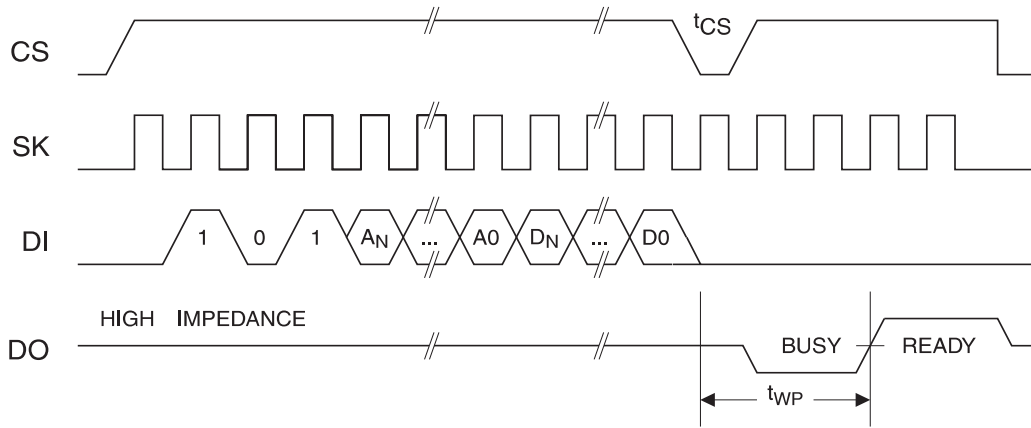


EWDS Timing⁽¹⁾

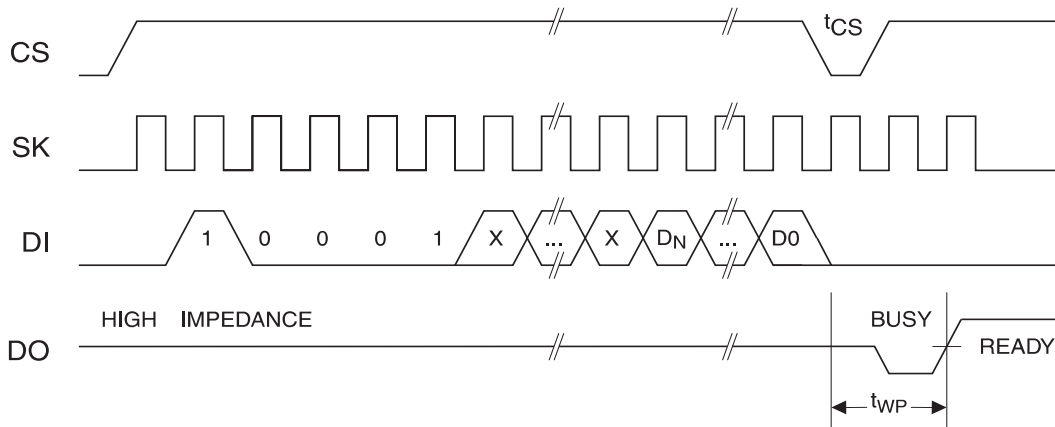


Note: 1. Requires a minimum of nine clock cycles.

WRITE Timing

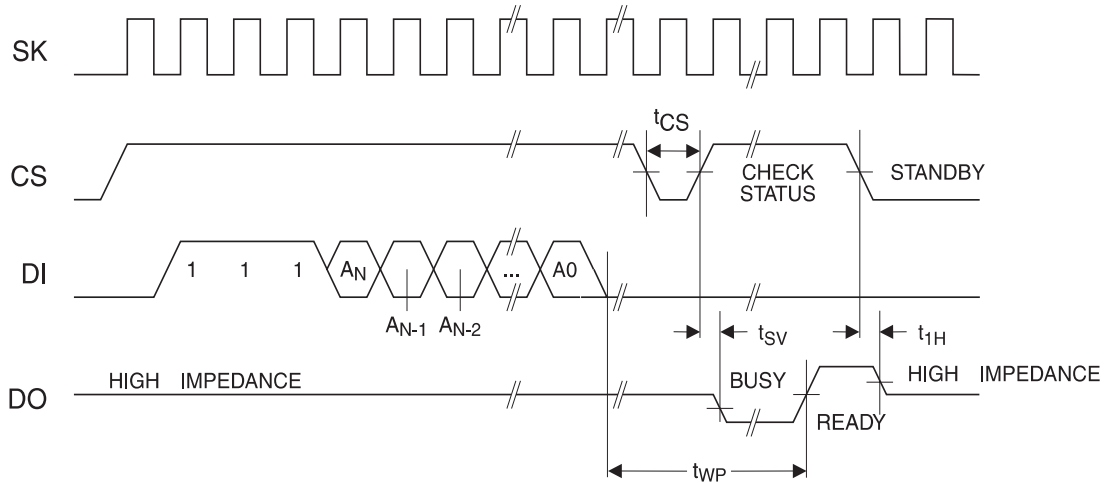


WRAL Timing⁽¹⁾⁽²⁾

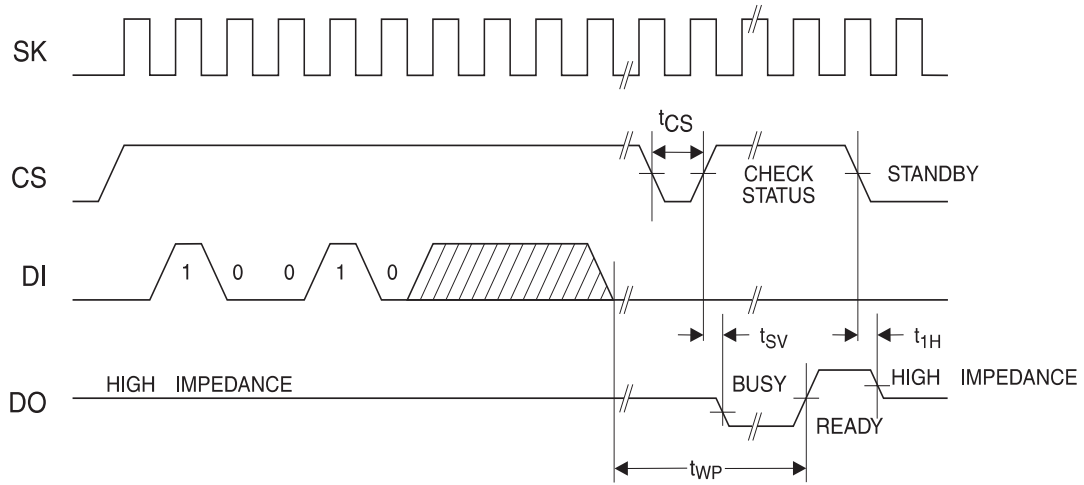


- Notes: 1. Valid only at $V_{CC} = 4.5V$ to $5.5V$.
2. Requires a minimum of nine clock cycles.

ERASE Timing



TERAL Timing⁽¹⁾



Note: 1. Valid only at $V_{CC} = 4.5V$ to $5.5V$.



Ordering Information

t_{WP} (max) (ms)	I_{CC} (max) (μ A)	I_{SB} (max) (μ A)	f_{MAX} (kHz)	Ordering Code	Package	Operation Range
10	2000	50.0	2000	AT93C46B-10PC AT93C46B-10SC	8P3 8S1	Commercial (0°C to 70°C)
10	800	20.0	1000	AT93C46B-10PC-2.7 AT93C46B-10SC-2.7	8P3 8S1	Commercial (0°C to 70°C)
10	600	20.0	500	AT93C46B-10PC-2.5 AT93C46B-10SC-2.5	8P3 8S1	Commercial (0°C to 70°C)
10	2000	50.0	2000	AT93C46B-10PI AT93C46B-10SI	8P3 8S1	Industrial (-40°C to 85°C)
10	800	20.0	1000	AT93C46B-10PI-2.7 AT93C46B-10SI-2.7	8P3 8S1	Industrial (-40°C to 85°C)
10	600	20.0	500	AT93C46B-10PI-2.5 AT93C46B-10SI-2.5	8P3 8S1	Industrial (-40°C to 85°C)

Package Type	
8P3	8 Lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)
8S1	8 Lead, 0.150" Wide, Plastic Gull Wing Small Outline (JEDEC SOIC)
Options	
Blank	Standard Device (4.5V to 5.5V)
-2.7	Low Voltage (2.7V to 5.5V)
-2.5	Low Voltage (2.5V to 5.5V)