SiT92182

High Performance 1:2 LVCMOS Clock Buffer

Description

The SiT92182 is a high-performance LVCMOS clock buffer family of devices. It has an additive phase jitter of 50 fs RMS.

The SiT92182 supports a synchronous glitch-free output enable (OE) function to eliminate any potential intermediate incorrect output clock cycles when enabling or disabling outputs. It can operate from a 1.8 V to 3.3 V supply.

The SiT92182 is available in an Automotive Grade 1, AEC-Q100 qualified version.

Applications

- Automotive Applications

Features

- High-performance 1:2 Buffer
- LVCMOS clock buffer
- Very low pin-to-pin skew: <50 ps
- Very low additive jitter: <50 fs
- Supply voltage: 1.8 V to 3.3 V
- 3.3 V tolerant input clock
- F_{MAX} = 200 MHz
- Integrated serial termination for 50 Ω channel
- Packaged in 8 pin, 2 x 2 mm DFN packages
- AEC-Q100 qualified
- Automotive Grade 1 (-40°C to 125°C)

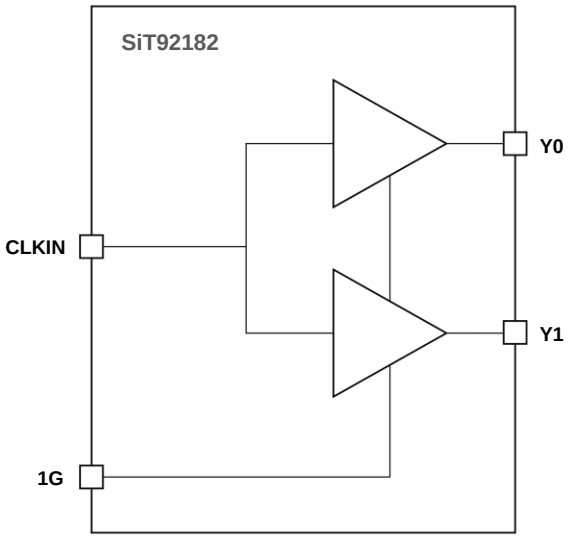

Figure 1. SiT92182 Functional Overview

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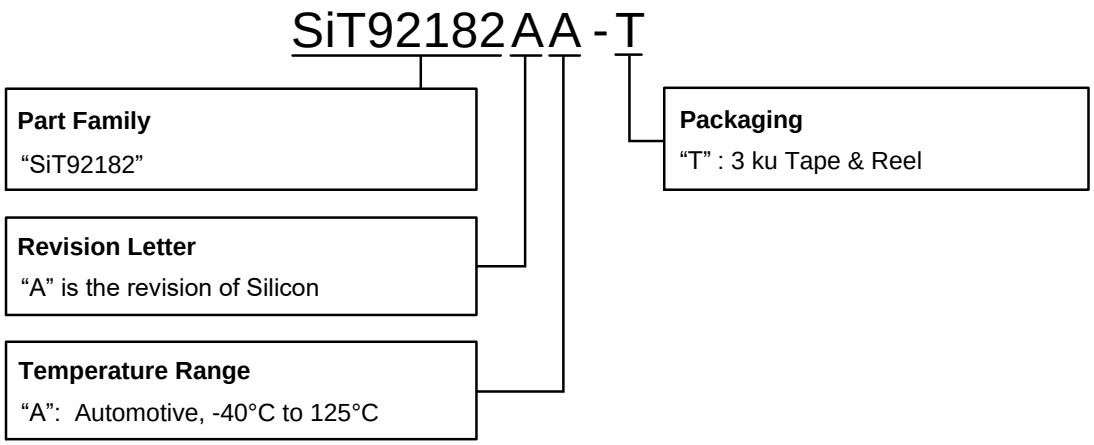
Ordering Information



Electrical Characteristics

Table 1. Absolute Maximum Ratings

Parameters	Conditions	Symbol	Min	Typ	Max	Units
Supply Voltage, VDD					3.6	V
Output Enable and All Outputs			-0.4		VDD+0.3	V
Input voltage, CLKIN			-0.4		3.465	V
Ambient Operating Temperature, Automotive grade 1			-40		+125	°C
Storage Temperature			-65		+150	°C
Junction Temperature					+150	°C
Soldering Temperature					+260	°C
Moisture Sensitivity Level	8-DFN	MSL	3			

Notes:

1. Exceeding maximum ratings may shorten the useful life of the device.
2. 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 at any other conditions beyond those indicated under the DC Electrical Characteristics is not implied. Exposure to Absolute-Maximum-Rated conditions for extended periods may affect device reliability or cause permanent device damage.

Table 2. Recommended Operating Supply and Temperature

Parameter	Symbol	Min	Typ	Max	Units
Ambient Operating Temperature (Automotive Grade 1)		-40		+125	°C
Power Supply Voltage (Measured in respect to GND)		+1.71		+3.465	V

Table 3. DC Electrical Characteristics V_{DD} = 1.8 V ±5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Voltage		V_{DD}	1.71	1.8	1.89	V
Input High Voltage, CLKIN[1]		V_{IH}	0.7×V_{DD}			V
Input Low Voltage, CLKIN[1]		V_{IL}			0.3×V_{DD}	V
Input High Voltage, 1G		V_{IH}	1.6		V_{DD}	V
Input Low Voltage, 1G		V_{IL}			0.6	V
Output High Voltage	I_{OH} = -5 mA	V_{OH}	1.2			V
Output Low Voltage	I_{OL} = 5 mA	V_{OL}			0.45	V
Nominal Output Impedance		Z_O		50		Ω
Input Capacitance	CLKIN, 1G pin	C_{IN}		5		pF
Operating Supply Current[2]	0.001 MHz, C_L = 5 pF	I_{DD}		0.7	1.7	mA
	0.008 MHz, C_L = 5 pF			0.7	1.7	
	40 MHz, C_L = 5 pF			11	13	
	100 MHz, C_L = 5 pF			25	30	
	156.25 MHz, C_L = 5 pF			37	47	
	200 MHz, C_L = 5 pF			39	57	

Notes:

1. Nominal switching threshold is VDD/2.
2. TA = -40°C to 125°C unless stated otherwise.

Table 4. DC Electrical Characteristics V_{DD} = 2.5 V ±5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Voltage		V_{DD}	2.375	2.5	2.625	V
Input High Voltage, CLKIN[1]		V_{IH}	0.7×V_{DD}			V
Input Low Voltage, CLKIN[1]		V_{IL}			0.3×V_{DD}	V
Input High Voltage, 1G		V_{IH}	1.8		V_{DD}	V
Input Low Voltage, 1G		V_{IL}			0.7	V
Output High Voltage	I_{OH} = -8 mA	V_{OH}	1.6			V
Output Low Voltage	I_{OL} = 8 mA	V_{OL}			0.625	V
Nominal Output Impedance		Z_O		50		Ω
Input Capacitance	CLKIN, 1G pin	C_{IN}		5		pF
Operating Supply Current[2]	0.001 MHz, C_L = 5 pF	I_{DD}		0.9	2.0	mA
	0.008 MHz, C_L = 5 pF			0.9	2.0	
	40 MHz, C_L = 5 pF			15	17.2	
	100 MHz, C_L = 5 pF			35	42	
	156.25 MHz, C_L = 5 pF			52	67	
	200 MHz, C_L = 5 pF			56	80	

Notes:

1. Nominal switching threshold is VDD/2.
2. TA = -40°C to 125°C unless stated otherwise.

Table 5. DC Electrical Characteristics - V_{DD} = 3.3 V ±5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Voltage		V_{DD}	3.135	3.3	3.465	V
Input High Voltage, CLKIN[1]		V_{IH}	0.7×V_{DD}			V
Input Low Voltage, CLKIN[1]		V_{IL}			0.3×V_{DD}	V
Input High Voltage, 1G		V_{IH}	2.1		V_{DD}	V
Input Low Voltage, 1G		V_{IL}			0.8	V
Output High Voltage	I_{OH} = -12 mA	V_{OH}	2.1			V
Output Low Voltage	I_{OL} = 12 mA	V_{OL}			0.825	V
Nominal Output Impedance		Z_O		50		Ω
Input Capacitance	CLKIN, 1G pin	C_{IN}		5		pF
Operating Supply Current[2]	0.001 MHz, C_L = 5 pF	I_{DD}		1.2	2.2	mA
	0.008 MHz, C_L = 5 pF			1.2	2.2	
	40 MHz, C_L = 5 pF			19	23.3	
Operating Supply Current[2]	100 MHz, C_L = 5 pF	I_{DD}		45	54	
	156.25 MHz, C_L = 5 pF			67	87	
	200 MHz, C_L = 5 pF			75	107	

Notes:

1. Nominal switching threshold is VDD/2.
2. TA = -40°C to 125°C unless stated otherwise.

Table 6. AC Electrical Characteristics - V_{DD} = 1.8 V ±5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Input Frequency			0		200	MHz
Input Slew rate			2			V/ns
Output Rise Time (5 pF load)[2]	0.36 V to 1.44 V, C_L = 5 pF	t_{OR}		0.65	1.2	ns
Output Fall Time (5 pF load)[2]	1.44 V to 0.36 V, C_L = 5 pF	t_{OF}		0.65	1.2	ns
Start-up Time	Part start-up time for valid outputs after VDD ramp-up.	$t_{START-UP}$			3	ms
Propagation Delay[3]		t_{PD}	0.24		3.4	ns
Buffer Additive Phase Jitter, RMS	156.25 MHz, Integration Range: 12 kHz – 20 MHz	t_{JIT}			0.06	ps
Output to Output Skew	Rising edges at VDD/2 [1]	t_{SK}		35	77	ps
Device to Device Skew	Rising edges at VDD/2				200	ps
Output Enable Time	C_L ≤ 5 pF Frequency = 25 Mhz	t_{EN}			3	cycles
	C_L ≤ 5 pF Frequency = 200 Mhz	t_{EN}			5	cycles
Output Disable Time	C_L ≤ 5 pF Frequency = 25 Mhz	t_{DIS}			3	cycles
	C_L ≤ 5 pF Frequency = 200 Mhz	t_{DIS}			5	cycles
Duty Cycle		t_{DC}		50		%

Notes:

1. Between any 2 outputs with equal loading.
2. TA = -40°C to 125°C unless stated otherwise.
3. With rail to rail input clock

Table 7. AC Electrical Characteristics - V_{DD} = 2.5 V ±5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Input Frequency			0		200	MHz
Input Slew rate			2			V/ns
Output Rise Time (5 pF load)[2]	0.5 V to 2.0 V, C_L = 5 pF	t_{OR}		0.63	1.2	ns
Output Fall Time (5 pF load)[2]	2.0 V to 0.5 V, C_L = 5 pF	t_{OF}		0.63	1.2	ns
Start-up Time	Part start-up time for valid outputs after V_{DD} ramp-up.	$t_{START-UP}$			3	ms
Propagation Delay[3]		t_{PD}	0.24		3.4	ns
Buffer Additive Phase Jitter, RMS	156.25 MHz, Integration Range: 12 kHz – 20 MHz	t_{JIT}			0.06	ps
Output to Output Skew	Rising edges at V_{DD}/2 [1]	t_{SK}		35	77	ps
Device to Device Skew	Rising edges at V_{DD}/2	t_{SKD}			200	ps
Output Enable Time	C_L ≤ 5 pF Frequency = 25 Mhz	t_{EN}			3	cycles
	C_L ≤ 5 pF Frequency = 200 Mhz	t_{EN}			5	cycles
Output Disable Time	C_L ≤ 5 pF Frequency = 25 Mhz	t_{DIS}			3	cycles
	C_L ≤ 5 pF Frequency = 200 Mhz	t_{DIS}			5	cycles
Duty Cycle		t_{DS}		50		%

Notes:

1. Between any 2 outputs with equal loading.
2. TA = -40°C to 125°C unless stated otherwise.
3. With rail to rail input clock.

Table 8. AC Electrical Characteristics - V_{DD} = 3.3 V ±5%

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Input Frequency			0		200	MHz
Input Slew rate			2			V/ns
Output Rise Time (5 pF load)[2]	0.66 V to 2.64 V, CL = 5 pF	t_{OR}		0.61	1.2	ns
Output Fall Time (5 pF load)[2]	2.64 V to 0.66 V, CL = 5 pF	t_{OF}		0.61	1.2	ns
Start-up Time	Part start-up time for valid outputs after VDD ramp-up.	$t_{START-UP}$			3	ms
Propagation Delay[3]		t_{PD}	0.24		3.4	ns
Buffer Additive Phase Jitter, RMS	156.25 MHz, Integration Range: 12 kHz – 20 MHz	t_{JIT}			0.05	ps
Output to Output Skew	Rising edges at VDD/2 [1]	t_{SK}		35	77	ps
Device to Device Skew	Rising edges at VDD/2	t_{SKD}			200	ps
Output Enable Time	C_L ≤ 5 pF Frequency = 25 Mhz	t_{EN}			3	cycles
	C_L ≤ 5 pF Frequency = 200 Mhz	t_{EN}			5	cycles
Output Disable Time	C_L ≤ 5 pF. Frequency = 25 Mhz	t_{DIS}			3	cycles
	C_L ≤ 5 pF Frequency = 200 Mhz	t_{DIS}			5	cycles
Duty Cycle		t_{DC}		50		%

Notes:

1. Between any 2 outputs with equal loading.
2. TA = -40°C to 125°C unless stated otherwise.
3. With rail to rail input clock.

Table 9. ESD Ratings

Parameter	Conditions	Symbol	Min	Typ	Max	Units
ESD (Human Body Model)	AEC-Q100-002	ESD_{HBM}	-	2000	-	V
ESD(Charged Device Model)	AEC-Q100-011	ESD_{CDM}	-	500	-	V

Table 10. Thermal Characteristics

Package	ΘJA	Units
8-DFN	75	°C/W; still air

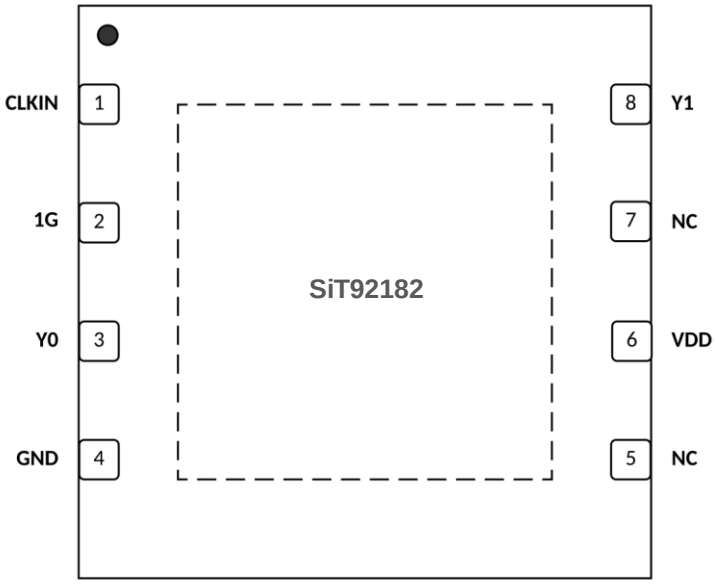


Figure 2. SiT92182 Pin Configuration

Table 11. Detailed Pin Description

Pin Name	Pin Number	Functionality SiT92182
Y0	3	LVCMOS output 0
Y1	8	LVCMOS output 1
NC	5, 7	Not Connected
CLKIN	1	Single Ended Input Clock
1G	2	All outputs enable/disable
VDD	6	Core Supply Voltage, VDD
GND	4	Ground

Functional Description

Output Logic Tables

Table 12. Output Logic Tables

Inputs		Output
CLKIN	1G	Yn
X	L	L
L	H	L
H	H	H

Typical Application Diagram

The following are the typical application diagram for Automotive applications.

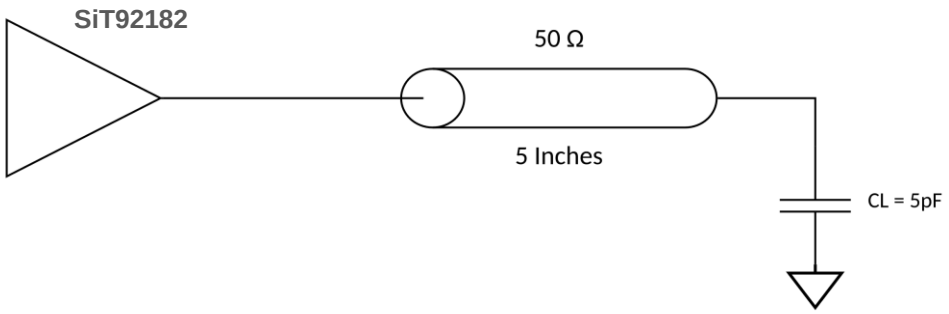


Figure 3. SiT92182 Typical Application Load

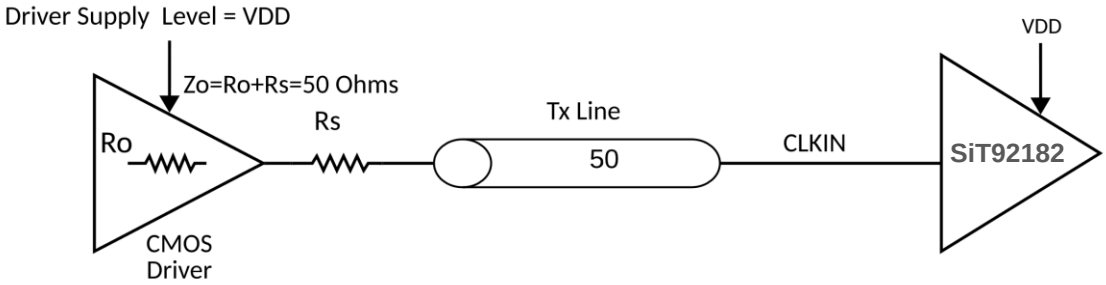


Figure 4. Recommended input clock configuration

Input Clock and Power Supply Sequencing

The input clock to the SiT92182 buffer should come after the power supply ramp. Figure 5 shows the timing requirement of Input Clock start versus VDD ramp. However, for the supply rail of VDD = 1.8 V (±5%), the above timing requirement is not mandatory.

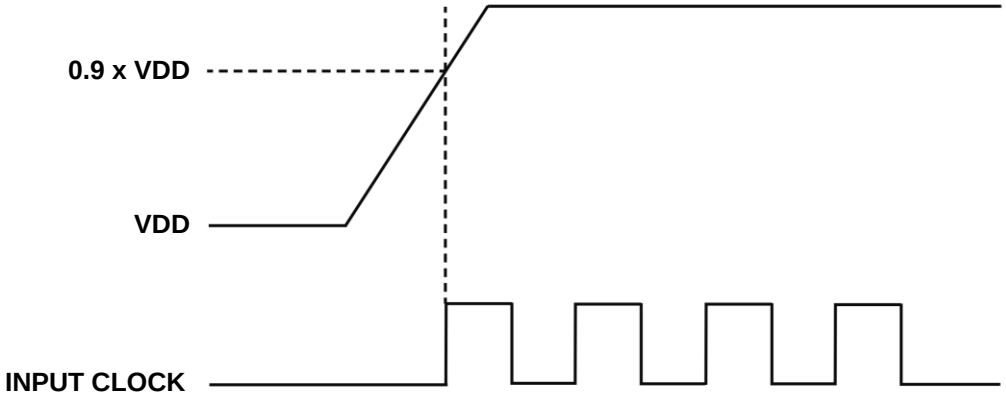


Figure 5. Input clock to VDD ramp timing requirement for SiT92182 LVCMOS

Package Dimensions and Patterns

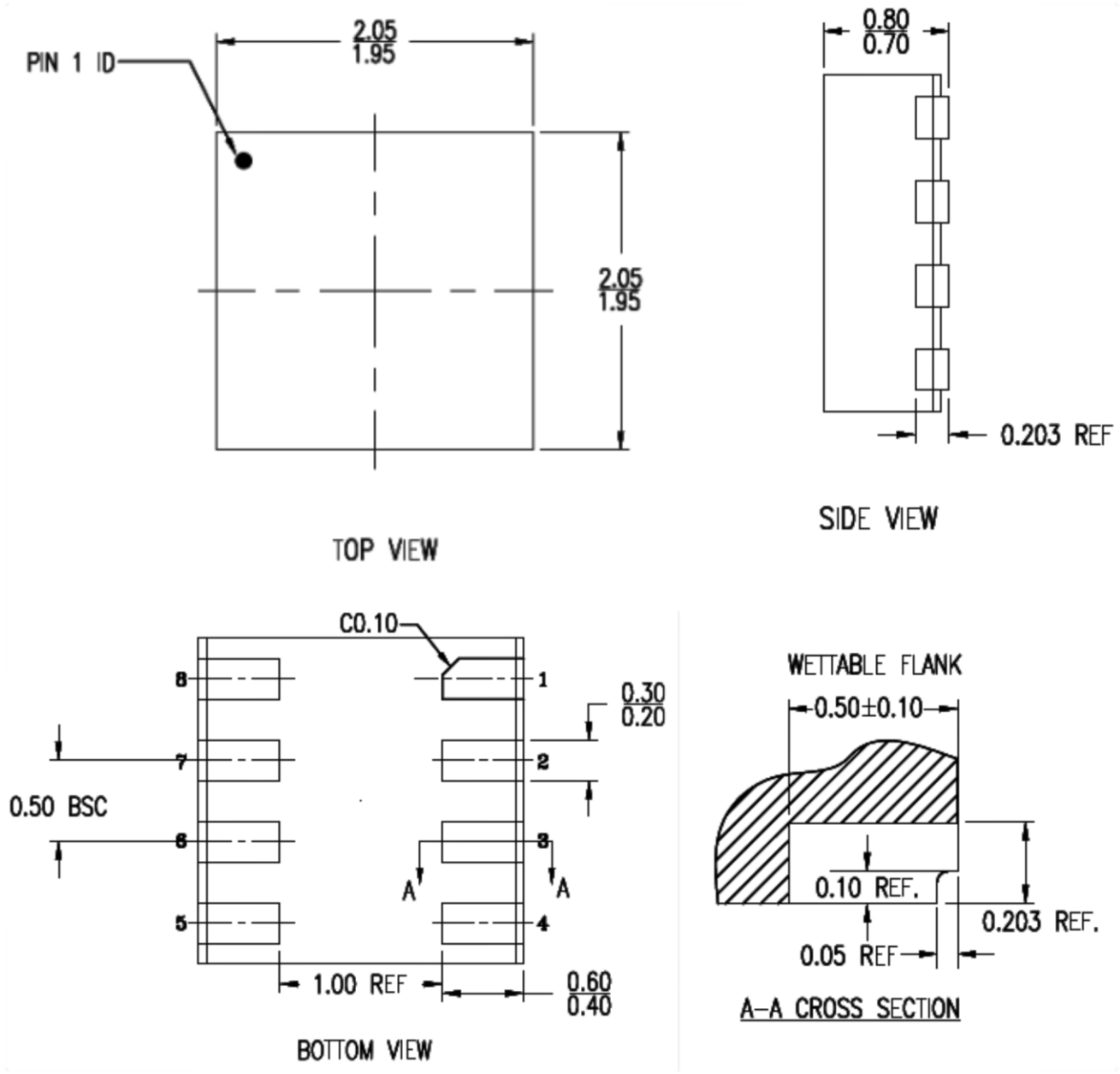


Figure 6. SiT92182 Cross Sections

Notes:

1. All Dimensions and Tolerancing Conform to ANSI Y14.5M -1982.
2. All Dimensions are in Millimeters (mm).

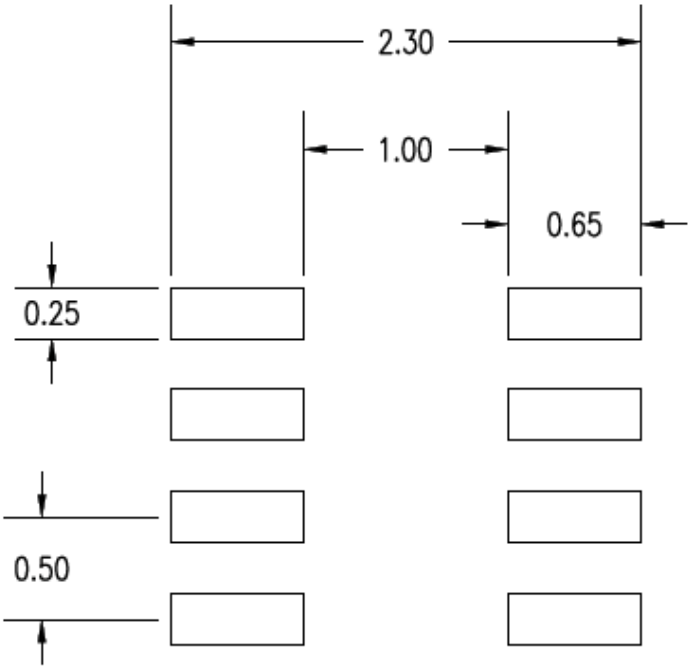


Figure 7. Recommended Land Pattern Dimension

Notes:

1. All Dimensions are in Millimeters (mm).
2. All Angles are in Degrees.
3. Land Pattern Recommendation per IPC-7351B Generic Requirement for Mount Design and Land Pattern.

Table 13. Revision History

Revisions	Release Date	Change Summary
0.5	28-Dec-2023	Initial Release

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