

## CRYSTAL-LESS PCI-EXPRESS GEN 1 & GEN 2 DUAL OUTPUT CLOCK GENERATOR

### Features

- Crystal-less clock generator with integrated CMEMS
- PCI-Express Gen 1/2 compliant
- Two PCIe 100 MHz differential HCSL outputs
- One 25 MHz single-ended LVCMOS output
- Supports Serial (ATA) at 100 MHz
- Low power differential output buffers
- No termination resistors required for differential output clocks
- Triangular spread spectrum profile for maximum EMI reduction (Si50122-A4)
- Industrial Temperature -40 to 85 °C
- 2.5 V, 3.3 V Power supply
- Small package 10-pin TDFN (2.0x2.5 mm)
- Si50122-A3 does not support spread spectrum outputs
- Si50122-A4 supports 0.5% down spread outputs

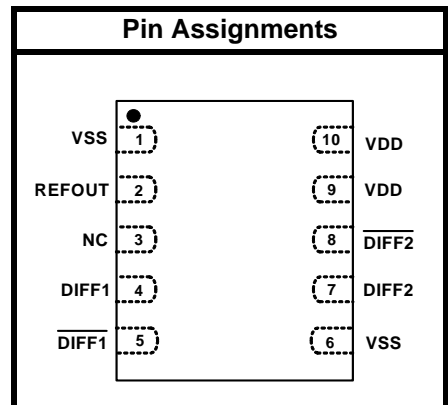


### Applications

- Digital TV
- Set top box
- Solid State Drives (SSD)
- Wireless Access Point
- Home Gateway
- Network Attached Storage
- Multi-function Printer
- Wireless Access Point
- Digital Video Cameras

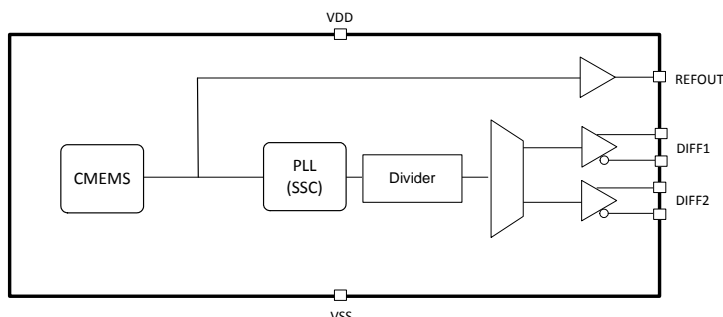
### Description

Si50122-A3/A4 is a high performance, crystal-less PCIe clock generator that can generate two 100 MHz PCIe clock and one 25 MHz LVCMOS clock outputs. The differential clock outputs are compliant to PCIe Gen1 and Gen 2 specifications. The ultra-small footprint (2.0x2.5 mm) and industry leading low power consumption make Si50122-A3/A4 the ideal clock solution for consumer and embedded applications where board space is limited and low power is needed.



Patents pending

### Functional Block Diagram





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# TABLE OF CONTENTS

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<u>Section</u>	<u>Page</u>
1. Electrical Specifications .....	4
2. Test and Measurement Setup .....	7
3. Pin Descriptions .....	9
4. Ordering Guide .....	10
5. Package Outlines .....	11
6. Recommended Design Guideline .....	13
Contact Information .....	14

# Si50122-A3/A4

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## 1. Electrical Specifications

**Table 1. Recommended Operating Conditions**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Supply Voltage (3.3 V Supply)	$V_{DD}$	$3.3\text{ V} \pm 10\%$	2.97	3.3	3.63	V
Supply Voltage (2.5 V Supply)	$V_{DD}$	$2.5\text{ V} \pm 10\%$	2.25	2.5	2.75	V

**Table 2. DC Electrical Specifications**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage $_{V_{DD}=3.3\text{ V}}$	$V_{DD}$	$3.3\text{ V} \pm 10\%$	2.97	3.30	3.63	V
Operating Voltage $_{V_{DD}=2.5\text{ V}}$	$V_{DD}$	$2.5\text{ V} \pm 10\%$	2.25	2.5	2.75	V
Operating Supply Current	$I_{DD}$	Full active; $3.3\text{ V} \pm 10\%$	—	20	23	mA
		Full active; $2.5\text{ V} \pm 10\%$	—	18	21	mA
Input Pin Capacitance	$C_{IN}$	Input Pin Capacitance	—	3	5	pF
Output Pin Capacitance	$C_{OUT}$	Output Pin Capacitance	—	—	5	pF

Table 3. AC Electrical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>DIFF Clocks</b>						
Duty Cycle	$T_{DC}$	Measured at 0 V differential	45	—	55	%
Skew	$T_{SKEW}$	Measured at 0 V differential	—	—	100	ps
Output Frequency	$F_{OUT}$	VDD = 3.3 V	—	100	—	MHz
Frequency Accuracy	$F_{ACC}$	All output clocks	—	—	100	ppm
Slew Rate	$t_{r/f2}$	Measured differentially from $\pm 150$ mV	0.6	—	5.0	V/ns
Crossing Point Voltage at 0.7 V Swing	$V_{OX}$		300	—	550	mV
Voltage High	$V_{HIGH}$		—	—	1.15	V
Voltage Low	$V_{LOW}$		-0.3	—	—	V
Spread Range	$S_{RNG}$	Down Spread, -A4 only	—	—	-0.5	%
Modulation Frequency	$F_{MOD}$	-A4 only	30	31.5	33	kHz
<b>DIFF Clocks Jitter Parameters, VDD = 3.3 V <math>\pm</math> 10%</b>						
PCIe Gen1 Pk-Pk	$Pk-Pk_{GEN1}$	PCIe Gen 1	—	20.7	35	ps
PCIe Gen2 Phase Jitter	$RMS_{GEN2}$	10 kHz < F < 1.5 MHz	—	0.8	2.1	ps
		1.5 MHz < F < Nyquist	—	1.4	2.2	ps
<b>DIFF Clocks Jitter Parameters, VDD = 2.5V <math>\pm</math> 10%</b>						
PCIe Gen1 Pk-Pk	$Pk-Pk_{GEN1}$	PCIe Gen 1	—	25	40	ps
PCIe Gen2 Phase Jitter	$RMS_{GEN2}$	10 kHz < F < 1.5 MHz	—	0.9	2.9	ps
		1.5 MHz < F < Nyquist	—	1.7	3.0	ps
<b>25 MHz at 3.3 V</b>						
Duty Cycle	$T_{DC}$	Measurement at 1.5 V	45	—	55	%
Output Rise Time	$t_r$	$C_L = 10$ pF, 20% to 80%		1.2	3.0	ns
Output Fall Time	$t_f$	$C_L = 10$ pF, 20% to 80%		1.2	3.0	ns
Cycle to Cycle Jitter	$T_{CCJ}$	Measurement at 1.5 V	—	—	250	ps
Long Term Accuracy	$L_{ACC}$	Measured at 1.5 V	—	—	100	ppm
<b>Powerup Time</b>						
Clock Stabilization from Powerup	$T_{STABLE}$	First powerup to first output	—	—	10	ms
<b>Note:</b> Visit <a href="http://www.pcisig.com">www.pcisig.com</a> for complete PCIe specifications.						

# Si50122-A3/A4

**Table 4. Thermal Conditions**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Temperature, Storage	$T_S$	Non-functional	-65		150	°C
Temperature, Operating Ambient	$T_A$	Functional	-40		85	°C
Temperature, Junction	$T_J$	Functional	—		150	°C
Dissipation, Junction to Case	$\emptyset_{JC}$	JEDEC (JESD 51)	—		38.3	°C/W
Dissipation, Junction to Ambient	$\emptyset_{JA}$	JEDEC (JESD 51)	—		90.4	°C/W

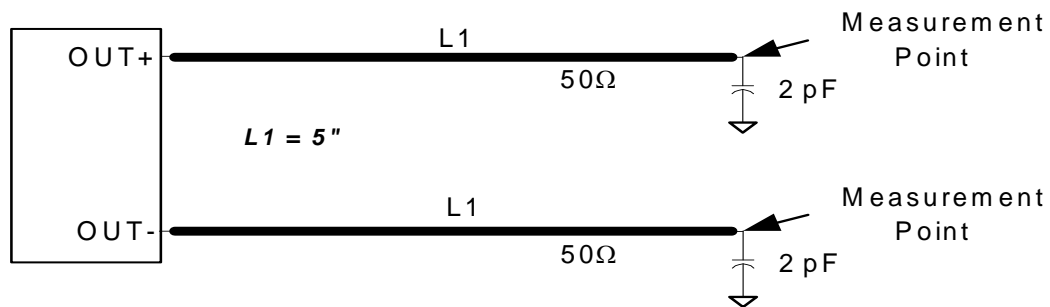
**Table 5. Absolute Maximum Conditions**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Main Supply Voltage	$V_{DD\_3.3V}$		—		4.6	V
Input Voltage	$V_{IN}$	Relative to $V_{SS}$	-0.5		4.6	$V_{DC}$
ESD Protection (Human Body Model)	$ESD_{HBM}$	JEDEC (JESD 22 - A114)	2000		—	V
Flammability Rating	UL-94	UL (Class)	V-0			

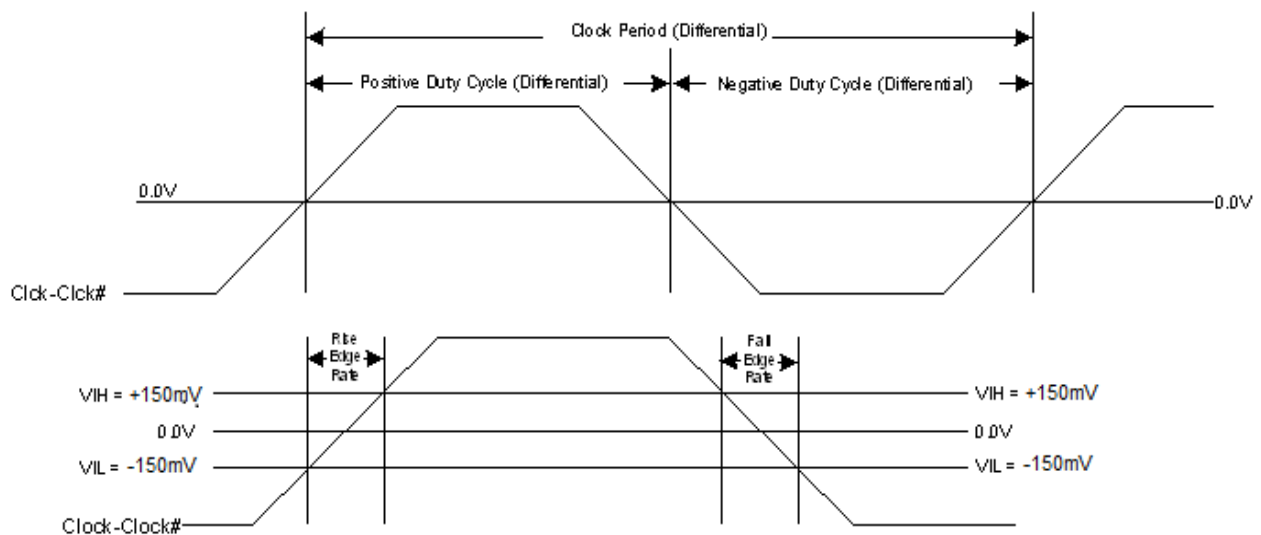
**Note:** While using multiple power supplies, the voltage on any input or I/O pin cannot exceed the power pin during powerup. Power supply sequencing is NOT required.

## 2. Test and Measurement Setup

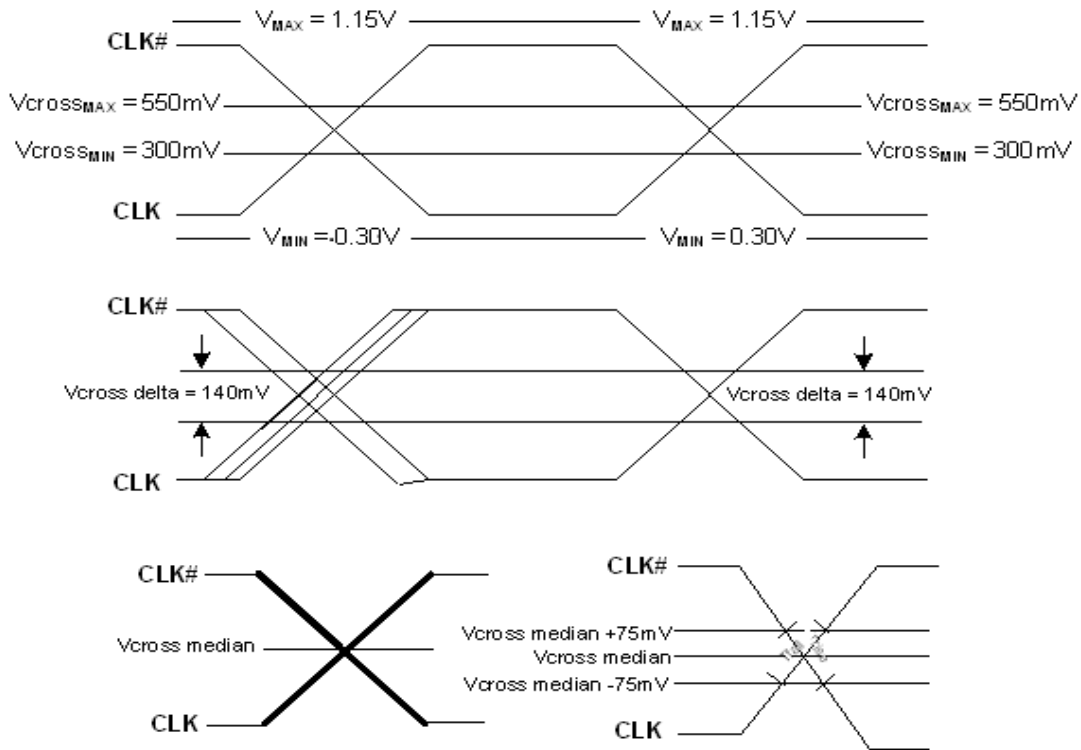
Figures 1–3 show the test load configuration for the differential clock signals.



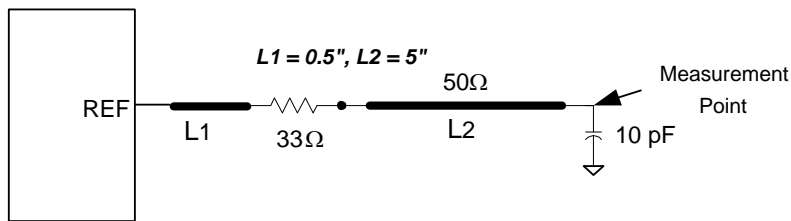
**Figure 1. 0.7 V Differential Load Configuration**



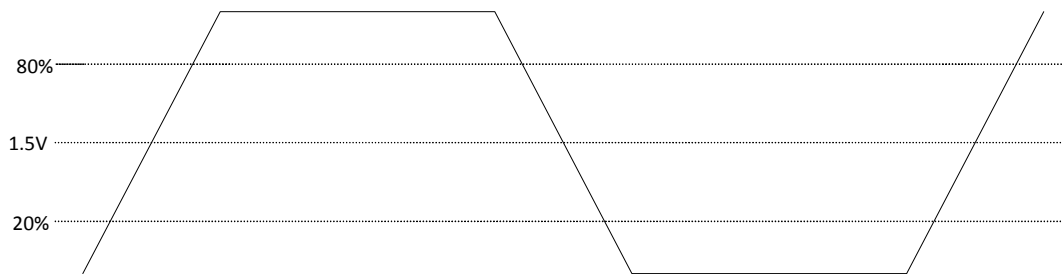
**Figure 2. Differential Measurement for Differential Output Signals  
(for AC Parameters Measurement)**



**Figure 3. Single-ended Measurement for Differential Output Signals (for AC Parameters Measurement)**



**Figure 4. Single-ended Clocks with Single Load Configuration**



**Figure 5. Single-ended Output Signal (for AC Parameter Measurement)**



### 3. Pin Descriptions

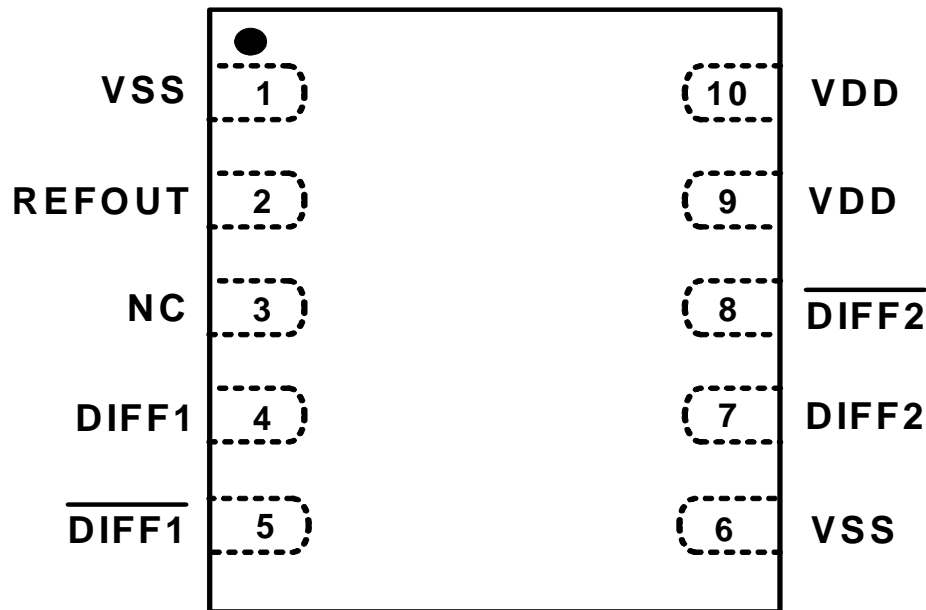


Figure 6. 10-Pin TDFN

Table 6. Si50122-Ax-GM 10-Pin TDFN Descriptions

Pin #	Name	Type	Description
1	VSS	GND	Connect to Ground
2	REFOUT	O, SE	25 MHz LVCMOS clock output
3	NC	NC	No Connect. Do not connect this pin to anything.
4	DIFF1	O, DIF	0.7 V, 100 MHz differential clock output
5	$\overline{\text{DIFF1}}$	O, DIF	0.7 V, 100 MHz differential clock output
6	VSS	GND	Connect to Ground
7	DIFF2	O, DIF	0.7 V, 100 MHz differential clock output
8	$\overline{\text{DIFF2}}$	O, DIF	0.7 V, 100 MHz differential clock output
9	VDD	PWR	Power supply
10	VDD	PWR	Power supply

# Si50122-A3/A4

## 4. Ordering Guide

Part Number	Spread Option	Package Type	Temperature
Si50122-A3-GM	No Spread	10-pin TDFN	Industrial, -40 to 85 °C
Si50122-A3-GMR	No Spread	10-pin TDFN—Tape and Reel	Industrial, -40 to 85 °C
Si50122-A4-GM	-0.5% Spread	10-pin TDFN	Industrial, -40 to 85 °C
Si50122-A4-GMR	-0.5% Spread	10-pin TDFN—Tape and Reel	Industrial, -40 to 85 °C

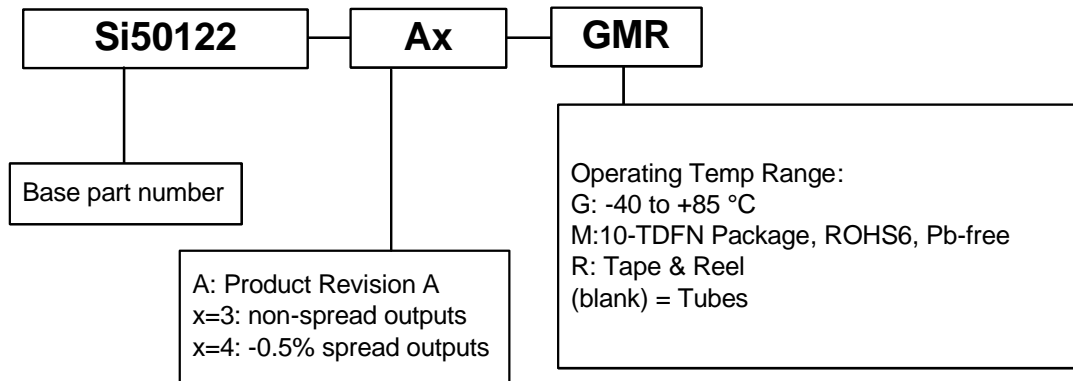


Figure 7. Ordering Information

5. Package Outlines

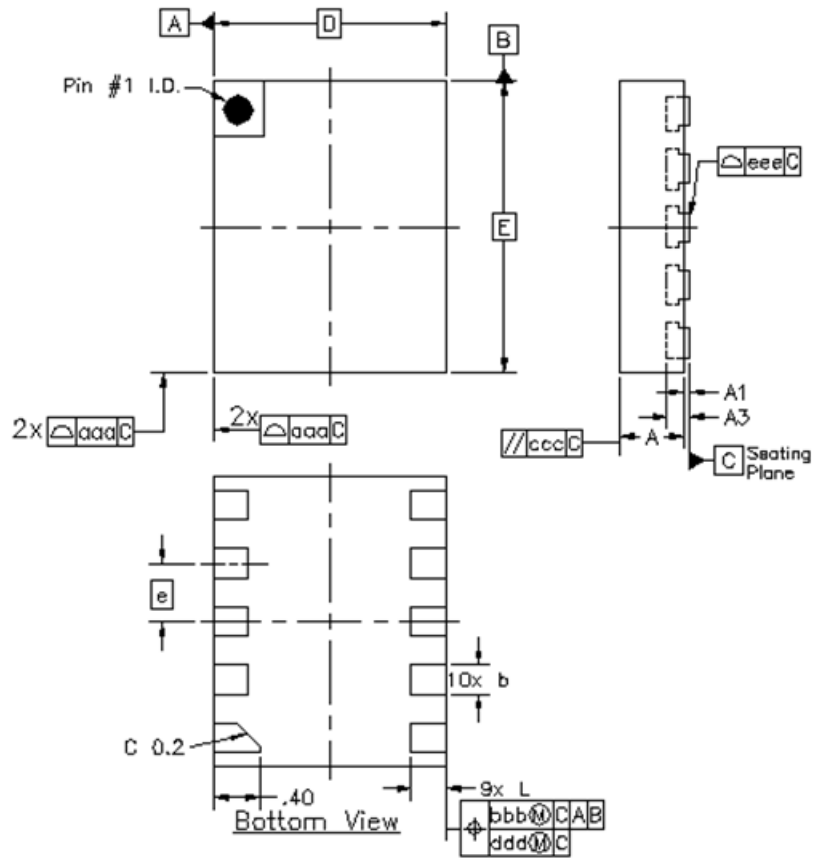
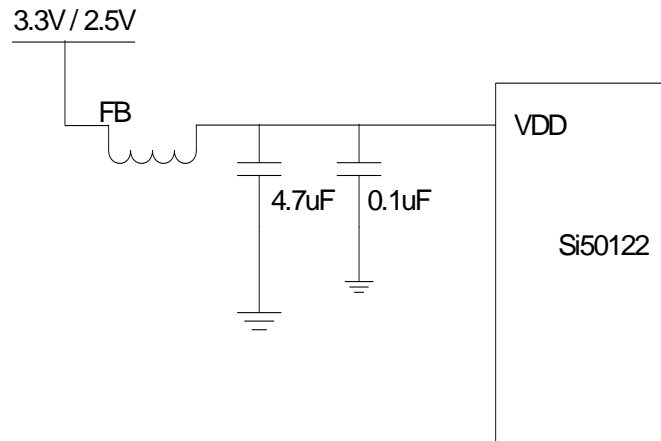


Figure 8. 10-Pin TDFN Package Drawing

**Table 7. Package Diagram Dimensions**

Symbol	Min	Nom	Max
A	0.80	0.85	0.90
A1	0.00	—	0.05
A3	0.203 REF		
b	0.20	0.25	0.30
D	2.00 BSC		
e	0.50 BSC		
E	2.50 BSC		
L	0.35	0.4	0.45
aaa	0.10		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.08		
<b>Notes:</b> <ol style="list-style-type: none"><li>1. All dimensions shown are in millimeters (mm) unless otherwise noted.</li><li>2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.</li></ol>			

## 6. Recommended Design Guideline



**Note:** FB Specifications:  
DC resistance 0.1–0.3  $\Omega$   
Impedance at 100 MHz  $\geq 1000 \Omega$

**Figure 9. Recommended Application Schematic**



## ClockBuilder Pro

One-click access to Timing tools, documentation, software, source code libraries & more. Available for Windows and iOS (CBGo only).

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