

## PCI-EXPRESS 1 代、2 代和 3 代四输出时钟发生器

### 特点

- PCI-Express 1 代、2 代和 3 和 Gen 4 通用时钟兼容
- 第 3 代 SRNS 兼容
- 100 MHz 下支持串行 ATA (SATA)
- 低功耗，差分输出
- 无需终端电阻
- 各时钟专用输出使能硬件引脚
- 扩频控制专用硬件引脚
- 四个 PCI-Express 时钟
- 25 MHz 晶体输入或时钟输入
- 信号完整性调整
- 支持 I<sup>2</sup>C，带逆读功能
- 使用三角扩频改善图最大程度地减少电磁干扰 (EMI)
- 扩展的温度范围 -40 至 85 °C
- 3.3 V 电源
- 24 引脚 QFN 封装



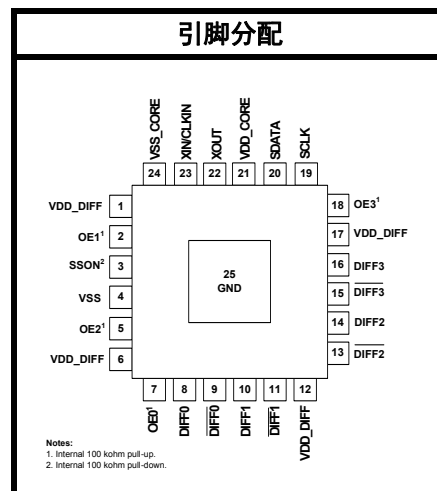
### 应用

- 网络附加存储
- 无线接入点
- 多功能打印机
- 路由器

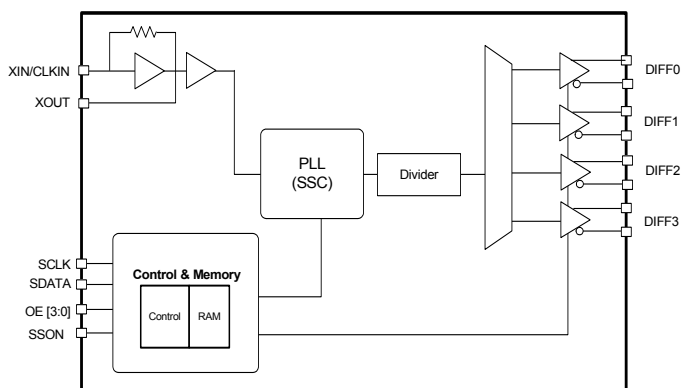
### 描述

Si52144 是扩频时钟使能 PCIe 时钟发生器，可作为四个 PCIe 时钟的源。该设备有四个用于启用输出的硬件输出使能引脚和一个控制 PCIe 时钟输出上的扩频的硬件引脚。除硬件控制引脚外，I<sup>2</sup>C 编程功能还可用于动态控制 PCIe 时钟输出上的真、补偿或两个差分信号上的偏移、边缘频率和振幅。这种控制功能可在 PCIe 时钟输出上实现最佳信号完整性和最佳 EMI 签名。

关于信号完整性调整和可配置性的信息请参考 AN636。使用 Silicon Labs PCIe 时钟抖动工具可快速轻松地测量 PCIe 时钟抖动。免费下载 [www.silabs.com/pcie-learningcenter](http://www.silabs.com/pcie-learningcenter)。



### 功能方框图



专利申请中



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## 1. Electrical Specifications

Table 1. DC Electrical Specifications

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
3.3 V Operating Voltage	VDD core	3.3 ±5%	3.135	3.3	3.465	V
3.3 V Input High Voltage	V <sub>IH</sub>	Control input pins	2.0	—	V <sub>DD</sub> + 0.3	V
3.3 V Input Low Voltage	V <sub>IL</sub>	Control input pins	V <sub>SS</sub> - 0.3	—	0.8	V
Input High Voltage	V <sub>IHI2C</sub>	SDATA, SCLK	2.2	—	—	V
Input Low Voltage	V <sub>ILI2C</sub>	SDATA, SCLK	—	—	1.0	V
Input High Leakage Current	I <sub>IH</sub>	Except internal pull-down resistors, 0 < V <sub>IN</sub> < V <sub>DD</sub>	—	—	5	μA
Input Low Leakage Current	I <sub>IL</sub>	Except internal pull-up resistors, 0 < V <sub>IN</sub> < V <sub>DD</sub>	-5	—	—	μA
High-impedance Output Current	I <sub>OZ</sub>		-10	—	10	μA
Input Pin Capacitance	C <sub>IN</sub>		1.5	—	5	pF
Output Pin Capacitance	C <sub>OUT</sub>		—	—	6	pF
Pin Inductance	L <sub>IN</sub>		—	—	7	nH
Dynamic Supply Current	I <sub>DD_3.3V</sub>	All outputs enabled. Differential clocks with 5" traces and 2 pF load.	—	—	50	mA

Table 2. AC Electrical Specifications

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Crystal</b>						
Long-term Accuracy	$L_{ACC}$	Measured at $V_{DD}/2$ differential	—	—	250	ppm
<b>Clock Input</b>						
Duty Cycle	$T_{DC}$	Measured at $V_{DD}/2$	45	—	55	%
CLKIN Rising and Falling Slew Rate	$T_R/T_F$	Measured between $0.2 V_{DD}$ and $0.8 V_{DD}$	0.5	—	4.0	V/ns
Cycle to Cycle Jitter	$T_{CCJ}$	Measured at $V_{DD}/2$	—	—	250	ps
Long Term Jitter	$T_{LTJ}$	Measured at $V_{DD}/2$	—	—	350	ps
Input High Voltage	$V_{IH}$	XIN/CLKIN pin	2	—	$V_{DD}+0.3$	V
Input Low Voltage	$V_{IL}$	XIN/CLKIN pin	—	—	0.8	V
Input High Current	$I_{IH}$	XIN/CLKIN pin, $V_{IN} = V_{DD}$	—	—	35	uA
Input Low Current	$I_{IL}$	XIN/CLKIN pin, $0 < V_{IN} < 0.8$	-35	—	—	uA
<b>DIFF at 0.7 V</b>						
Duty Cycle	$T_{DC}$	Measured at 0 V differential	45	—	55	%
Output-to-Output Skew	$T_{SKEW}$	Measured at 0 V differential	—	—	50	ps
Cycle to Cycle Jitter	$T_{CCJ}$	Measured at 0 V differential	—	35	50	ps
PCIe Gen 1 Pk-Pk Jitter, Common Clock	Pk-Pk	PCIe Gen 1	0	40	50	ps
PCIe Gen 2 Phase Jitter, Common Clock	$RMS_{GEN2}$	$10 \text{ kHz} < F < 1.5 \text{ MHz}$	0	1.8	2.0	ps
		$1.5 \text{ MHz} < F < \text{Nyquist Rate}$	0	1.8	2.1	ps
PCIe Gen 3 Phase Jitter, Common Clock	$RMS_{GEN3}$	PLL BW of 2–4 or 2–5 MHz, CDR = 10 MHz	0	0.45	0.6	ps
PCIe Gen 3 Phase Jitter, Separate Reference No Spread, SRNS	$RMS_{GEN3\_SRNS}$	PLL BW of 2–4 or 2–5 MHz, CDR = 10 MHz	—	0.35	0.42	ps
PCIe Gen 4 Phase Jitter, Common Clock	$RMS_{GEN4}$	PLL BW of 2–4 or 2–5 MHz, CDR = 10 MHz	—	0.45	0.6	ps
Long Term Accuracy	$L_{ACC}$	Measured at 0 V differential	—	—	100	ppm
Rising/Falling Slew Rate	$T_R/T_F$	Measured differentially from $\pm 150 \text{ mV}$	1	—	8	V/ns
Voltage High	$V_{HIGH}$		—	—	1.15	V
Voltage Low	$V_{LOW}$		-0.3	—	—	V
Crossing Point Voltage at 0.7 V Swing	$V_{OX}$		300	—	550	mV
Spread Range	SPR	Down spread	—	-0.5	—	%
Modulation Frequency	$F_{MOD}$		30	31.5	33	kHz

**Notes:**

1. Visit [www.pcisig.com](http://www.pcisig.com) for complete PCIe specifications.
2. Gen 4 specifications based on the PCI-Express Base Specification 4.0 rev. 0.5.
3. Download the Silicon Labs PCIe Clock Jitter Tool at [www.silabs.com/pcie-learningcenter](http://www.silabs.com/pcie-learningcenter).

**Table 2. AC Electrical Specifications (Continued)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Enable/Disable and Setup</b>						
Clock Stabilization from Power-up	$T_{\text{STABLE}}$	Measured from the point when both VDD and clock input are valid.	—	—	1.8	ms
Stopclock Set-up Time	$T_{\text{SS}}$		10.0	—	—	ns
<b>Notes:</b>						
<ol style="list-style-type: none"> <li>1. Visit <a href="http://www.pcisig.com">www.pcisig.com</a> for complete PCIe specifications.</li> <li>2. Gen 4 specifications based on the PCI-Express Base Specification 4.0 rev. 0.5.</li> <li>3. Download the Silicon Labs PCIe Clock Jitter Tool at <a href="http://www.silabs.com/pcie-learningcenter">www.silabs.com/pcie-learningcenter</a>.</li> </ol>						

**Table 3. Absolute Maximum Conditions**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Main Supply Voltage	$V_{\text{DD}_3.3\text{V}}$	Functional	—	—	4.6	V
Input Voltage	$V_{\text{IN}}$	Relative to $V_{\text{SS}}$	-0.5	—	4.6	$V_{\text{DC}}$
Temperature, Storage	$T_{\text{S}}$	Non-functional	-65	—	150	°C
Temperature, Operating Ambient	$T_{\text{A}}$	Functional	-40	—	85	°C
Temperature, Junction	$T_{\text{J}}$	Functional	—	—	150	°C
Dissipation, Junction to Case	$\theta_{\text{JC}}$	JEDEC (JESD 51)	—	—	25	°C/W
Dissipation, Junction to Ambient	$\theta_{\text{JA}}$	JEDEC (JESD 51)	—	—	37	°C/W
ESD Protection (Human Body Model)	$\text{ESD}_{\text{HBM}}$	JEDEC (JESD 22-A114)	2000	—	—	V
Flammability Rating	UL-94	UL (Class)	V-0			
<b>Note:</b> While using multiple power supplies, the voltage on any input or I/O pin cannot exceed the power pin during power-up. Power supply sequencing is not required.						

## 2. Functional Description

### 2.1. Crystal Recommendations

If using crystal input, the device requires a parallel resonance 25 MHz crystal.

**Table 4. Crystal Recommendations**

Frequency (Fund)	Cut	Loading	Load Cap	Shunt Cap (max)	Motional (max)	Tolerance (max)	Stability (max)	Aging (max)
25 MHz	AT	Parallel	12–15 pF	5 pF	0.016 pF	35 ppm	30 ppm	5 ppm

#### 2.1.1. Crystal Loading

Crystal loading is critical for ppm accuracy. In order to achieve low/zero ppm error, use the calculations in section “2.1.2. Calculating Load Capacitors” below to estimate the appropriate capacitive loading (CL).

Figure 1 shows a typical crystal configuration using two trim capacitors. It is important that the trim capacitors are in series with the crystal.



**Figure 1. Crystal Capacitive Clarification**

#### 2.1.2. Calculating Load Capacitors

In addition to the standard external trim capacitors, consider the trace capacitance and pin capacitance to calculate the crystal loading correctly. The capacitance on each side is in series with the crystal. The total capacitance on both sides is twice the specified crystal load capacitance (CL). Trim capacitors are calculated to provide equal capacitive loading on both sides.



**Figure 2. Crystal Loading Example**

Use the following formulas to calculate the trim capacitor values for Ce1 and Ce2.

## Load Capacitance (each side)

$$C_e = 2 \times CL - (C_s + C_i)$$

## Total Capacitance (as seen by the crystal)

$$CL_e = \frac{1}{\left( \frac{1}{C_{e1} + C_{s1} + C_{i1}} + \frac{1}{C_{e2} + C_{s2} + C_{i2}} \right)}$$

- CL: Crystal load capacitance
- CL<sub>e</sub>: Actual loading seen by crystal using standard value trim capacitors
- C<sub>e</sub>: External trim capacitors
- C<sub>s</sub>: Stray capacitance (terraced)
- C<sub>i</sub>: Internal capacitance (lead frame, bond wires, etc.)

## 2.2. OE Pin Definition

The OE pins are active high inputs used to enable and disable the output clocks. To enable the output clock, the OE pin needs to be logic high and the I<sup>2</sup>C output enable bit needs to be logic high. There are two methods to disable the output clocks: the OE is pulled to a logic low, or the I<sup>2</sup>C enable bit is set to a logic low. The OE pins is required to be driven at all time and even though it has an internally 100 kΩ resistor.

## 2.3. OE Assertion

The OE signals are active high input used for synchronous stopping and starting the DIFF output clocks respectively while the rest of the clock generator continues to function. The assertion of the OE signal by making it logic high causes stopped respective DIFF output to resume normal operation. No short or stretched clock pulses are produced when the clock resumes. The maximum latency from the assertion to active outputs is no more than two to six output clock cycles.

## 2.4. OE Deassertion

When the OE pin is deasserted by making its logic low, the corresponding DIFF output is stopped cleanly, and the final output state is driven low.

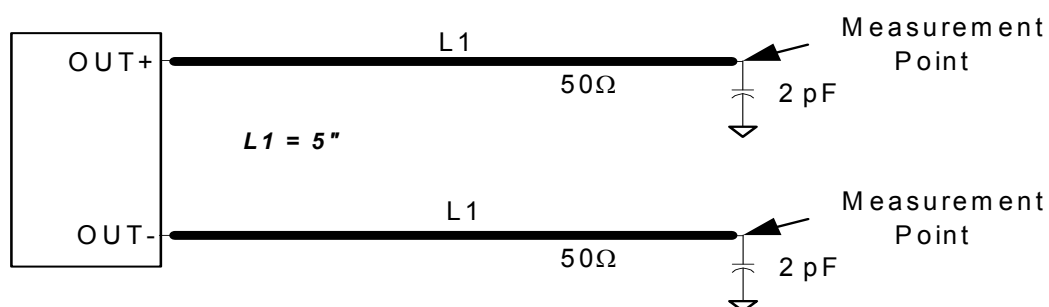
## 2.5. SSON Pin Definition

SSON is an active input used to enable –0.5% spread on all DIFF outputs. When sampled high, –0.5% spread is enabled on all DIFF outputs. When sampled low, the DIFF output frequencies are non-spread.



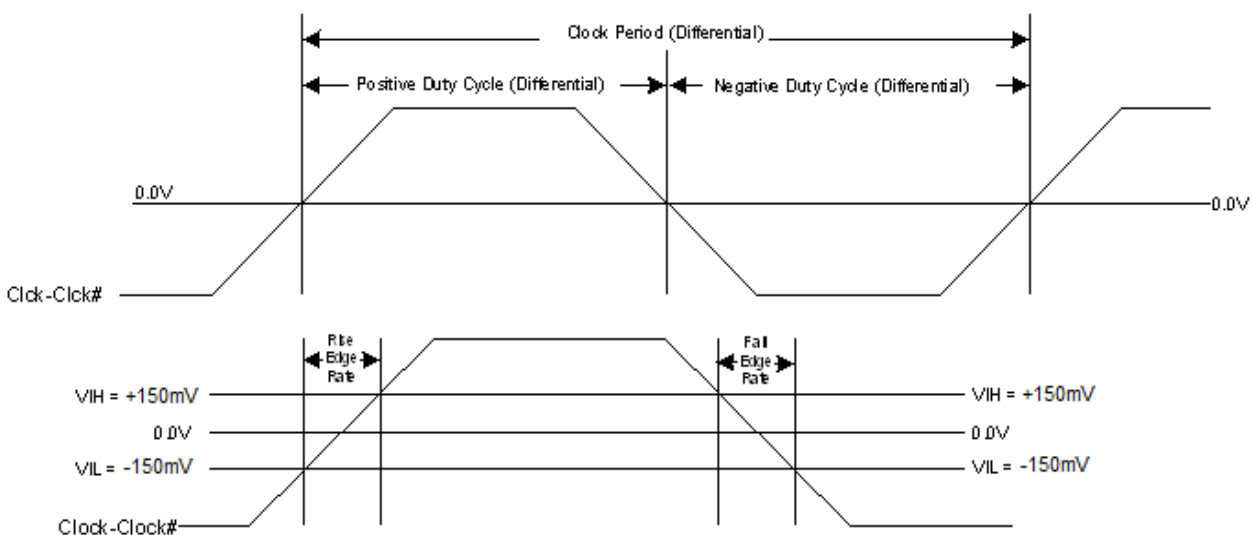
### 3. Test and Measurement Setup

Figure 3 shows the test load configuration for the differential HCSL clock outputs.

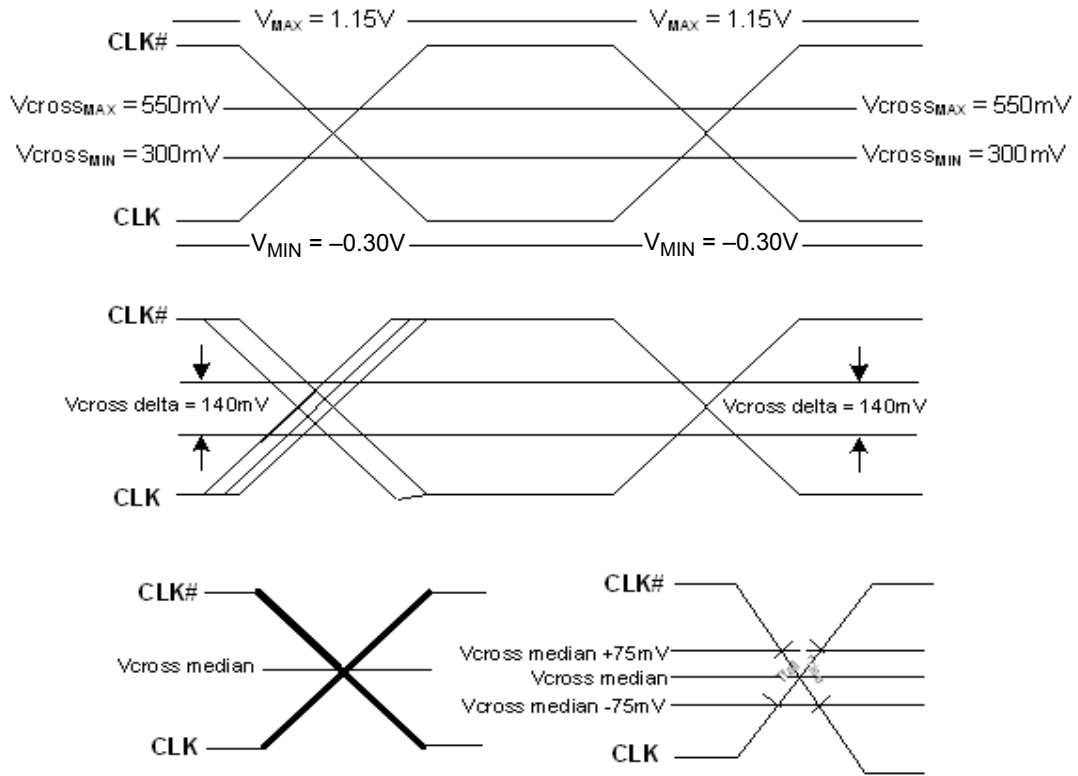


**Figure 3. 0.7 V Differential Load Configuration**

Please reference application note AN781 for recommendations on how to terminate the differential outputs for LVDS, LVPECL, or CML signalling levels.



**Figure 4. Differential Measurement for Differential Output Signals (for AC Parameters Measurement)**



**Figure 5. Single-Ended Measurement for Differential Output Signals (for AC Parameters Measurement)**

## 4. Control Registers

### 4.1. I<sup>2</sup>C Interface

To enhance the flexibility and function of the clock synthesizer, an I<sup>2</sup>C interface is provided. Through the Serial Data Interface, various device functions, such as individual clock enablement. The registers associated with the I<sup>2</sup>C Interface initialize to their default setting at power-up. The use of this interface is optional. Clock device register changes are normally made at system initialization, if any are required. Power management functions can only be programmed in program mode and not in normal operation modes.

### 4.2. Data Protocol

The clock driver I<sup>2</sup>C protocol accepts byte write, byte read, block write, and block read operations from the controller. For block write/read operation, access the bytes in sequential order from lowest to highest (most significant bit first) with the ability to stop after any complete byte is transferred. For byte write and byte read operations, the system controller can access individually indexed bytes.

The block write and block read protocol is outlined in Table 5 while Table 6 outlines byte write and byte read protocol. The slave receiver address is 11010110 (D6h).

**Table 5. Block Read and Block Write Protocol**

Block Write Protocol		Block Read Protocol	
Bit	Description	Bit	Description
1	Start	1	Start
8:2	Slave address—7 bits	8:2	Slave address—7 bits
9	Write	9	Write
10	Acknowledge from slave	10	Acknowledge from slave
18:11	Command Code—8 bits	18:11	Command Code—8 bits
19	Acknowledge from slave	19	Acknowledge from slave
27:20	Byte Count—8 bits	20	Repeat start
28	Acknowledge from slave	27:21	Slave address—7 bits
36:29	Data byte 1—8 bits	28	Read = 1
37	Acknowledge from slave	29	Acknowledge from slave
45:38	Data byte 2—8 bits	37:30	Byte Count from slave—8 bits
46	Acknowledge from slave	38	Acknowledge
....	Data Byte/Slave Acknowledges	46:39	Data byte 1 from slave—8 bits
....	Data Byte N—8 bits	47	Acknowledge
....	Acknowledge from slave	55:48	Data byte 2 from slave—8 bits
....	Stop	56	Acknowledge
		....	Data bytes from slave/Acknowledge
		....	Data Byte N from slave—8 bits
		....	NOT Acknowledge
		....	Stop

**Table 6. Byte Read and Byte Write Protocol**

Byte Write Protocol		Byte Read Protocol	
Bit	Description	Bit	Description
1	Start	1	Start
8:2	Slave address–7 bits	8:2	Slave address–7 bits
9	Write	9	Write
10	Acknowledge from slave	10	Acknowledge from slave
18:11	Command Code–8 bits	18:11	Command Code–8 bits
19	Acknowledge from slave	19	Acknowledge from slave
27:20	Data byte–8 bits	20	Repeated start
28	Acknowledge from slave	27:21	Slave address–7 bits
29	Stop	28	Read
		29	Acknowledge from slave
		37:30	Data from slave–8 bits
		38	NOT Acknowledge
		39	Stop

**Control Register 0. Byte 0**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Name								
Type	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Reset settings = 00000000

Bit	Name	Function
7:0	Reserved	

**Register 1. Byte 1**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Name						DIFF0_OE		DIFF1_OE
Type	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Reset settings = 00000101

Bit	Name	Function
7:3	Reserved	
2	DIFF0_OE	<b>Output Enable for DIFF0.</b> 0: Output disabled. 1: Output enabled.
1	Reserved	
0	DIFF1_OE	<b>Output Enable for DIFF1.</b> 0: Output disabled. 1: Output enabled.

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## Register 2. Byte 2

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Name	DIFF2_OE	DIFF3_OE						
Type	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Reset settings = 11000000

Bit	Name	Function
7	DIFF2_OE	<b>Output Enable for DIFF2.</b> 0: Output disabled. 1: Output enabled.
6	DIFF3_OE	<b>Output Enable for DIFF3.</b> 0: Output disabled. 1: Output enabled.
5:0	Reserved	

## Register 3. Byte 3

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Name	Rev Code[3:0]				Vendor ID[3:0]			
Type	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Reset settings = 00001000

Bit	Name	Function
7:4	Rev Code[3:0]	<b>Program Revision Code.</b>
3:0	Vendor ID[3:0]	<b>Vendor Identification Code.</b>

## Register 4. Byte 4

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Name	BC[7:0]							
Type	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Reset settings = 00000110

Bit	Name	Function
7:0	BC[7:0]	<b>Byte Count Register.</b>

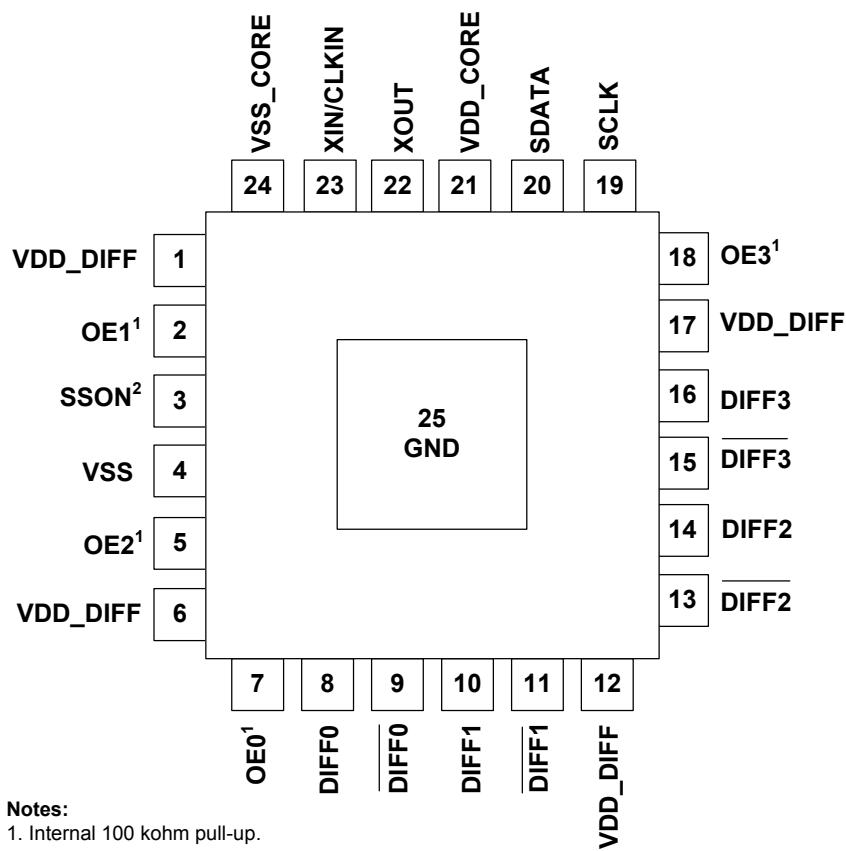
## Control Register 5. Byte 5

Bit	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	DIFF_Amp_Sel	DIFF_Amp_Cntl[2]	DIFF_Amp_Cntl[1]	DIFF_Amp_Cntl[0]				
<b>Type</b>	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Reset settings = 11011000

Bit	Name	Function
7	DIFF_Amp_Sel	<b>Amplitude Control for DIFF Differential Outputs.</b> 0: Differential outputs with Default amplitude. 1: Differential outputs amplitude is set by Byte 5[6:4].
6	DIFF_Amp_Cntl[2]	<b>DIFF Differential Outputs Amplitude Adjustment.</b> 000: 300 mV 001: 400 mV 010: 500 mV 011: 600 mV 100: 700 mV 101: 800 mV 110: 900 mV 111: 1000 mV
5	DIFF_Amp_Cntl[1]	
4	DIFF_Amp_Cntl[0]	
3:0	Reserved	

## 5. Pin Descriptions: 24-Pin QFN



**Table 7. Si52144 24-Pin QFN Descriptions**

Pin #	Name	Type	Description
1	VDD_DIFF	PWR	3.3 V power supply.
2	OE1	I,PU	Active high input pin to enable or disable DIFF1 clock (internal 100 kΩ pull-up).
3	SSON	I,PD	3.3 V input for Spread Control (internal 100 kΩ pull-down).
4	VSS	GND	Ground.
5	OE2	I,PU	Active high input pin to enable or disable DIFF2 clock (internal 100 kΩ pull-up).
6	VDD_DIFF	PWR	3.3 V power supply.
7	OE0	I,PU	Active high input pin to enable or disable DIFF0 clock (internal 100 kΩ pull-up).
8	DIFF0	O, DIF	0.7 V, 100 MHz differential clock output.
9	$\overline{\text{DIFF0}}$	O, DIF	0.7 V, 100 MHz differential clock output.
10	DIFF1	O, DIF	0.7 V, 100 MHz differential clock output.



Table 7. Si52144 24-Pin QFN Descriptions (Continued)

Pin #	Name	Type	Description
11	$\overline{\text{DIFF1}}$	O, DIF	0.7 V, 100 MHz differential clock output.
12	VDD_DIFF	PWR	3.3 V power supply.
13	$\overline{\text{DIFF2}}$	O, DIF	0.7 V, 100 MHz differential clock output.
14	DIFF2	O, DIF	0.7 V, 100 MHz differential clock output.
15	$\overline{\text{DIFF3}}$	O, DIF	0.7 V, 100 MHz differential clock output.
16	DIFF3	O, DIF	0.7 V, 100 MHz differential clock output.
17	VDD_DIFF	PWR	3.3 V power supply.
18	OE3	I,PU	Active high input pin to enable or disable DIFF3 clock (internal 100 k $\Omega$ pull-up).
19	SCLK	I	I <sup>2</sup> C SCLOCK.
20	SDATA	I/O	I <sup>2</sup> C SDATA.
21	VDD_CORE	PWR	3.3 V power supply.
22	XOUT	O	25.00 MHz crystal output, Float XOUT if using only CLKIN (clock input).
23	XIN/CLKIN	I	25.00 MHz crystal input or 3.3 V, 25 MHz clock Input.
24	VSS_CORE	GND	Ground.
25	GND	GND	Ground for bottom pad of the IC.

# Si52144

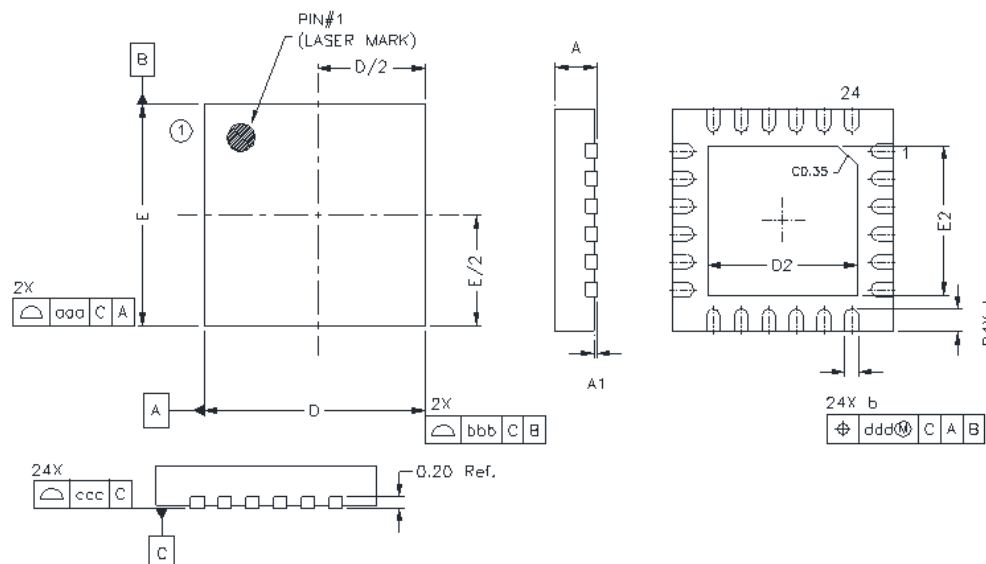
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## 6. Ordering Guide

Part Number	Package Type	Temperature
<b>Lead-free</b>		
Si52144-A01AGM	24-pin QFN	Industrial, -40 to 85 °C
Si52144-A01AGMR	24-pin QFN—Tape and Reel	Industrial, -40 to 85 °C

## 7. Package Outline

Figure 6 illustrates the package details for the Si52144. Table 8 lists the values for the dimensions shown in the illustration.



**Figure 6. 24-Pin Quad Flat No Lead (QFN) Package**

**Table 8. Package Diagram Dimensions**

Symbol	Millimeters		
	Min	Nom	Max
A	0.70	0.75	0.80
A1	0.00	0.025	0.05
b	0.20	0.25	0.30
D	4.00 BSC		
D2	2.60	2.70	2.80
e	0.50 BSC		
E	4.00 BSC		
E2	2.60	2.70	2.80
L	0.30	0.40	0.50
aaa	0.10		
bbb	0.10		
ccc	0.08		
ddd	0.07		
<b>Notes:</b>			
1. All dimensions shown are in millimeters (mm) unless otherwise noted.			
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.			
3. This drawing conforms to JEDEC outline MO-220, variation VGGD-8.			
4. Recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.			

## 8. Land Pattern

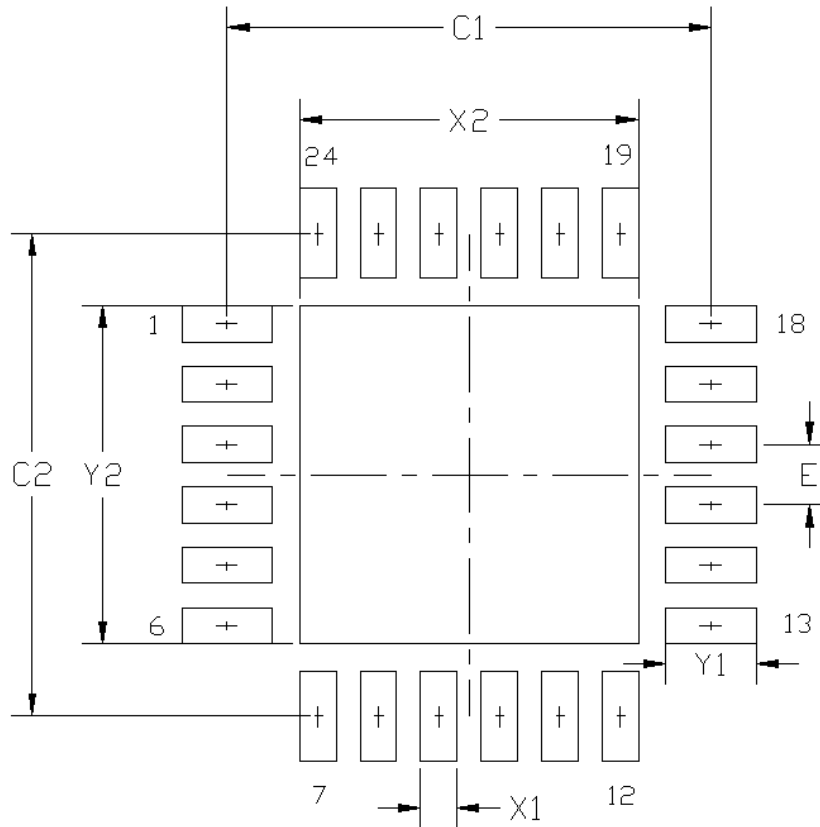


Figure 7. QFN Land Pattern

Table 9. Land Pattern Dimensions

Dimension	Unit mm
C1	4.0
C2	4.0
E	0.50 BSC
X1	0.30
X2	2.70
Y1	0.80

Table 9. Land Pattern Dimensions (Continued)

Y2	2.70
<p><b>Notes:</b></p> <p><b>General</b></p> <ol style="list-style-type: none"> <li>All dimensions shown are in millimeters (mm) unless otherwise noted.</li> <li>This land pattern design is based on the IPC-7351 guidelines.</li> </ol> <p><b>Solder Mask Design</b></p> <ol style="list-style-type: none"> <li>All metal pads are to be non-solder mask defined (NSMD). Clearance between the solder mask and the metal pad is to be 60 <math>\mu\text{m}</math> minimum, all the way around the pad.</li> </ol> <p><b>Stencil Design</b></p> <ol style="list-style-type: none"> <li>A stainless steel, laser-cut and electro-polished stencil with trapezoidal walls should be used to assure good solder paste release.</li> <li>The stencil thickness should be 0.125 mm (5 mils).</li> <li>The ratio of stencil aperture to land pad size should be 1:1 for all perimeter pads.</li> <li>A 2x2 array of 1.10 mm x 1.10 mm openings on 1.30mm pitch should be used for the center ground pad.</li> </ol> <p><b>Card Assembly</b></p> <ol style="list-style-type: none"> <li>A No-Clean, Type-3 solder paste is recommended.</li> <li>The recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.</li> </ol>	

## DOCUMENT CHANGE LIST

### Revision 0.1 to Revision 1.0

- Updated Features on page 1.
- Updated Description on page 1.
- Updated Table 1 on page 4.
- Updated Table 2 on page 5.
- Updated Section 2.1 on page 7.
- Updated Section 2.1.1 on page 7.
- Updated Section 4.1 on page 11.
- Updated Section 4.2 on page 11.
- Updated Pin Descriptions on page 16.

### Revision 1.0 to Revision 1.1

- Removed Moisture Sensitivity Level specification from Table 3.

### Revision 1.1 to Revision 1.2

- Updated Table 2.
- Updated Section 3.

### Revision 1.2 to Revision 1.3

- Updated Features on page 1.
- Updated Description on page 1.
- Updated specs in Table 2, “AC Electrical Specifications,” on page 5.

### Revision 1.3 to Revision 1.4

February 22, 2016

- Added test condition for  $T_{\text{STABLE}}$  in Table 2 on page 5.
- Updated pin descriptions for OEx in Table 7.



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