

## Data Sheet

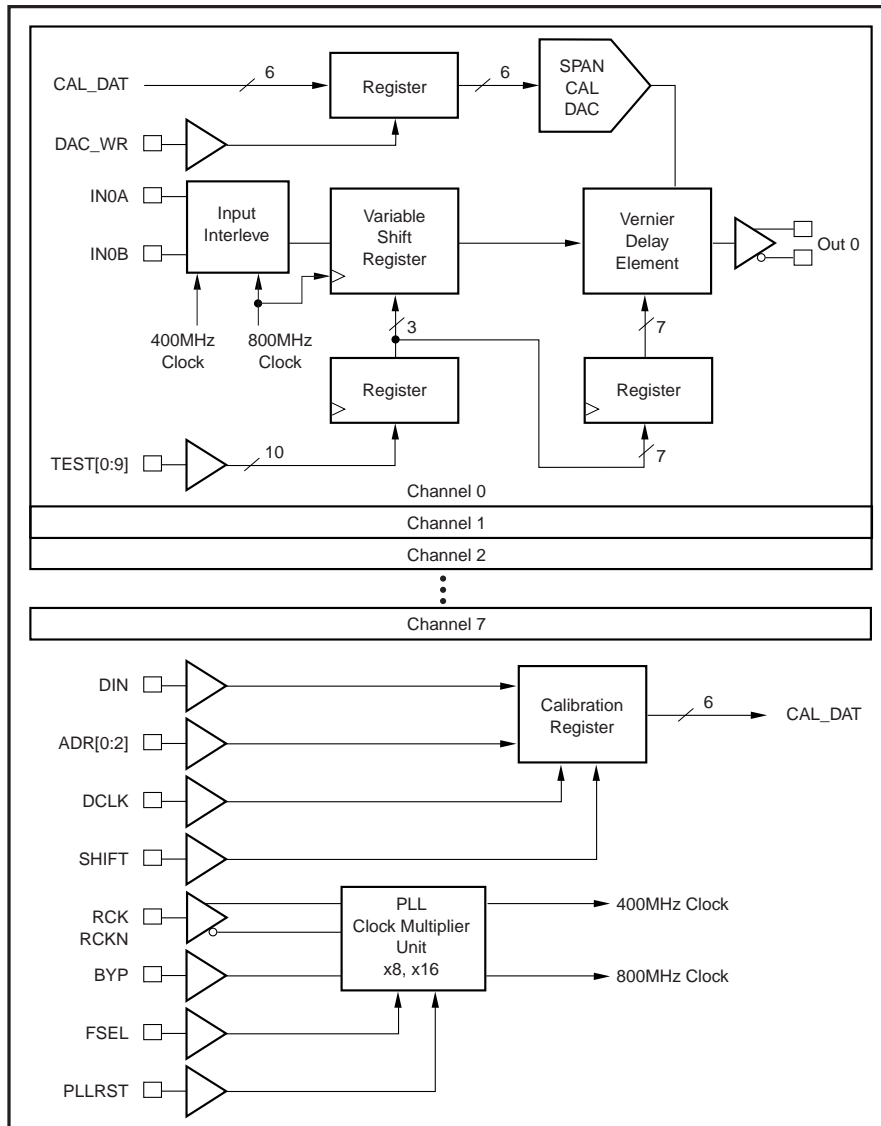
# VSC6048

## High-Speed Octal Programmable Timing Generator

### Features

- 8 Fully Integrated Timing Generators for ATE Applications
- 10/5ns Delay Range, 10ps Resolution
- Fully Digital Interface. No Off-Chip DACs or Trim Components Required
- $\pm 4$  LSB Differential Non-Linearity
- 100MHz/200MHz Dynamic Reprogram Frequency for Incrementing and Decrementing
- Internal or External High-Speed Clock Option
- Low Power: 8 Watts, max
- Low Cost 160-Pin PQFP Packaging

### VSC6048 Block Diagram



## Functional Description

### Reference Clock Selection

Clock multiplication of x8 or x16 may be selected via the FSEL pin, requiring a reference clock of 100  $\pm$ 2.5MHz or 50  $\pm$ 1.25MHz, respectively. For system applications with 800MHz on board clock, the CMU can be bypassed by asserting **BYP** signal and **RCK** will accept an external 800MHz clock.

In Bypass mode (**BYP** = 1, **RCK** = 800MHz) the skew from **INX** to **RCK** at the pin is 550ps  $\pm$ 250ps.

**Table 1: Reference Clock Selection**

<i>BYP</i>	<i>FSEL</i>	<i>RCK</i>
0	0	100MHz
0	1	50MHz
1	X	800MHz

*X = don't care.*

### Mode of Operations

There are 6 basic modes of operation. These modes are based on two inputs per channel (**INA** and **INB**) that can be interleaved and refire rate. The maximum refire rate for full 10ns span is 100MHz, where the maximum refire rate for 5ns span is 200MHz. The maximum refire rate at the input to the fine vernier must not be sooner than 4 cycles of the high-speed clock (800MHz).

**Table 2: Suggested Operating Modes**

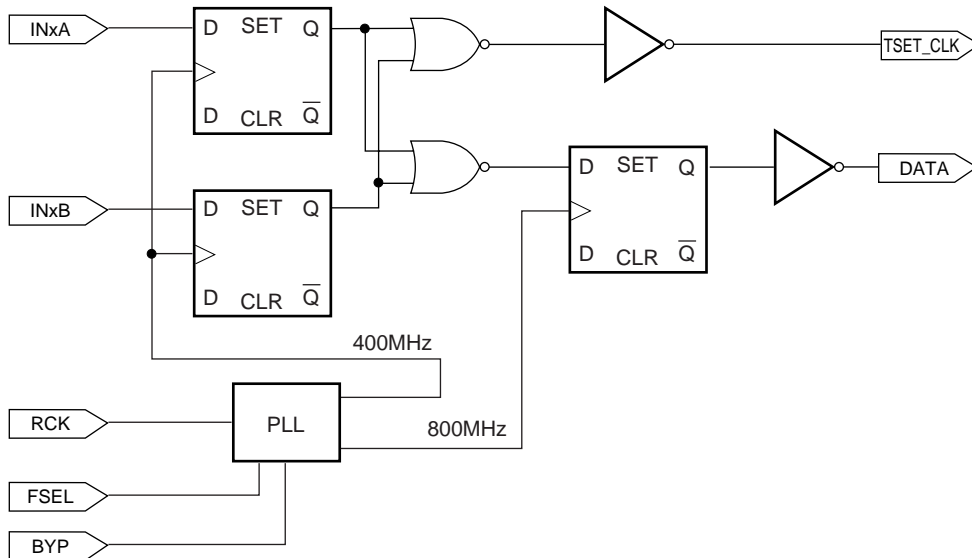
<i>Program Rate</i>	<i>Interleaved</i>	<i>INA</i>	<i>INB</i>	<i>TSET[0:9] Range</i>
200Mbps	Yes	100MHz	100MHz	000 to 1FF
100Mbps	Yes	50MHz	50MHz	000 to 3FF
200Mbps	No	200MHz	Low	000 to 1FF
100Mbps	No	100MHz	Low	000 to 3FF
200Mbps	No	Low	200MHz	000 to 1FF
100Mbps	No	Low	100MHz	000 to 3FF

### Data Input (**INA**, **INB**)

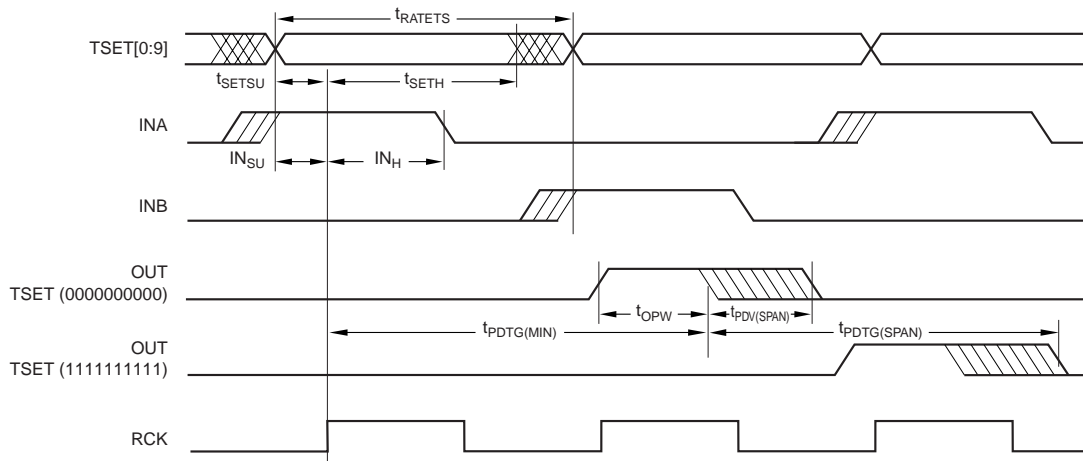
There are two interleaved inputs per channel. Each input is capable of running at full rate (200MHz). The input is first retimed off of the internal 400MHz clock generated from the PLL. This means there is a 2.5ns edge placement window that defines the setup time. This also means that the input pulse must span at least one 400MHz clock edge.

The inputs are low to high edge sensitive. Figure 1 illustrates an equivalent circuit of the input structure for each channel. Note that the **TSET** input clock is generated based on the input data.

**Figure 1: Input Interleave**



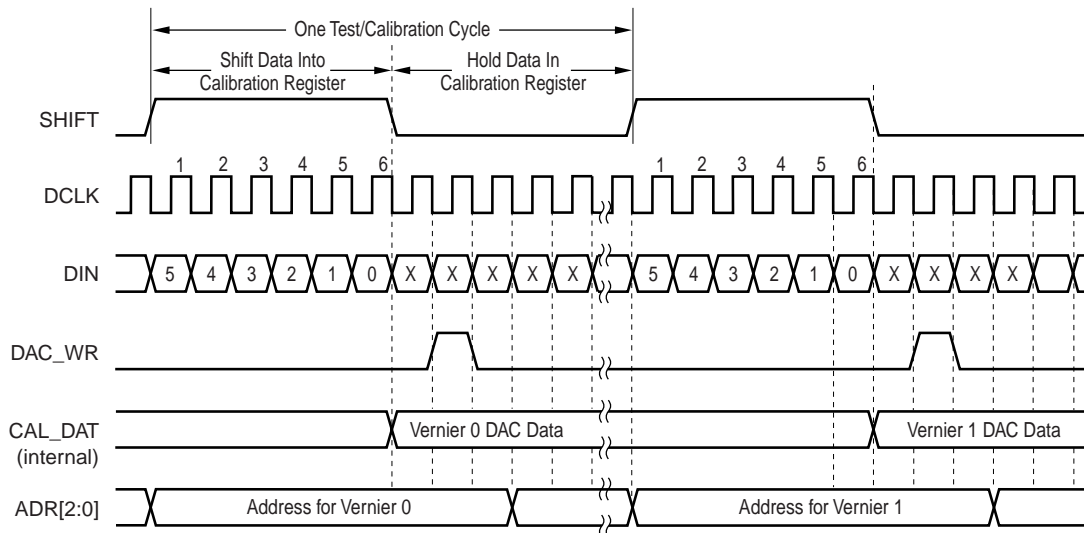
**Figure 2: Functional Timing Diagram**



**Time Set Input (TSET<0:9>)**

This is a 10-bit TTL bus that controls the delay value of the vernier. The 3 MSBs control the 800MHz shift register and the 7 LSBs control the fine delay element. The TSET data is clocked in by a pulse generated from the input data. The setup time of the TSET data is the same as the input signals (INA, INB). The TSET data must be stable by the time the input edge arrives at the input pin and data must then be held stable for at least 3.5ns after the input edge arrives at the pin.

**Figure 3: Fine Vernier Calibration DAC Programming**



### DAC Calibration

Each fine vernier must be calibrated to a 1240ps span, one step (10ps) shorter than the 800MHz period (1.25ns). This is accomplished by setting the fine vernier to maximum delay and adjusting the 6-bit calibration DAC until the desired range has been achieved.

The calibration data is transferred into the device through a 3-bit serial interface. Refer to Figure 3 for the programming sequence. Typical DCLK frequencies are 1MHz to 10MHz. Once the calibration value has been transferred into the device, the data is written into the specified DAC by the rising edge of DCLK when DAC\_WR is HIGH. The address lines must remain stable from the enable of SHIFT to one cycle after the disable of DAC\_WR.

### DAC Application

There are three DAC\_REF pins on this device. Each pin supplies the reference for two or three calibration DACs. In order to reduce crosstalk between verniers through the DAC\_REF supply, it is recommended that each DAC\_REF pin be isolated from each other. This will reduce crosstalk between the the three channel groups, however, it will not effect crosstalk between verniers within each group.

**Table 3: DAC Reference Pin Identification**

DAC_REF Pin #	Vernier Channels
1	0, 1, 2
18	3, 4
40	5, 6, 7

### Outputs

Each channel has a differential ECL output. The output of the verniers is falling edge active. The shift register propagates a 2ns pulse. The fine vernier then stretches the pulse width based on the programmed delay.

## DC Characteristics

**Table 4: Single Ended ECL Inputs and Outputs**

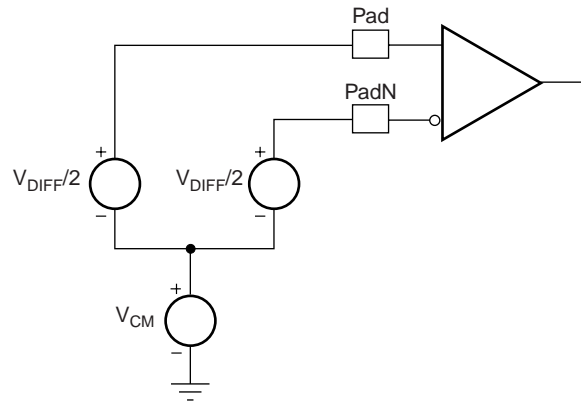
Parameter	Description	Min	Typ	Max	Units	Conditions
$V_{OH}$	Output HIGH Voltage	-1020	-	-700	mV	
$V_{OL}$	Output LOW Voltage	-2000	-	-1620	mV	
$V_{IH}$	Input HIGH Voltage	-1165	-	-700	mV	
$V_{IL}$	Input LOW Voltage	-2000	-	-1475	mV	
$I_{IH}$	Input HIGH Current	-	-	200	uA	$V_{IN} = V_{IH} (max)$
$I_{IL}$	Input LOW Current	-50	-	-	uA	$V_{IN} = V_{IL} (min)$

NOTE:  $V_{TT} = -2.0V \pm 5%$ ,  $V_{CC} = V_{CCA} = GND$ ,  $R_{LOAD} = 50\Omega$  to  $-2.0V$ .

**Table 5: Differential ECL Inputs and Outputs**

Parameter	Description	Min	Typ	Max	Units	Conditions
$V_{DIFF}$	Input Voltage Differential	200	-	-	mV	Required for full output swing
$V_{CM}$	Common-Mode Voltage	-1.5	-	-0.5	V	Common-mode range required for full output swing with $V_{DIFF}$ applied

**Figure 4: Differential ECL Input Voltages**



**Table 6: TTL Inputs and Outputs**

Parameter	Description	Min	Typ	Max	Units	Conditions
V <sub>OH</sub>	Output HIGH Voltage	2.4	-	-	V	I <sub>OH</sub> = -2.4mA
V <sub>OL</sub>	Output LOW Voltage	0	-	0.4	V	I <sub>OL</sub> = 16 mA
V <sub>IH</sub>	Input HIGH Voltage	2.0	-	V <sub>TTL</sub> +1.0V	V	-
V <sub>IL</sub>	Input LOW Voltage	0	-	0.8	V	-
I <sub>IH</sub>	Input HIGH Current	-	-	50	μA	V <sub>IN</sub> = 2.4V
I <sub>IL</sub>	Input LOW Current	-500	-	-	μA	V <sub>IN</sub> = 0.4V
I <sub>OZH</sub>	Tri-State Output OFF Current HIGH	-	-	200	μA	V <sub>OUT</sub> = 2.4V
I <sub>OZL</sub>	Tri-State Output OFF Current LOW	-100	-	-	μA	V <sub>OUT</sub> = 0.4V
I <sub>OZLB</sub>	Tri-State Output OFF Current Low for Bi-directs	-600	-	-	μA	V <sub>OUT</sub> = 0.4V
I <sub>OCZ</sub>	Open Collector Output Leakage Current	-	-	200	μA	V <sub>OUT</sub> = 2.4V

NOTE: All specifications are over recommended commercial operating conditions, TTL/GND = GND.

**Table 7: Power Supply Requirements**

Parameter	Description	Min	Typ	Max	Units	Conditions
I <sub>TT</sub>	Power Supply Current from V <sub>TT</sub>			3.4	mA	
I <sub>DACREF</sub>	Power Supply Current from V <sub>DACREF</sub>			80	mA	
I <sub>TTL</sub>	Power Supply Current from V <sub>TTL</sub>			250	mA	
P <sub>D</sub>	Power Dissipation <sup>(1)</sup>			8	W	

NOTE: (1) Output power dissipation does not include load power.

**Table 8: AC Characteristics**

<i>Parameter</i>	<i>Description</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Units</i>
$t_{\text{RATE IN}}$	INA and INB Reprogram Rate	5			ns
$t_{\text{RATE TS}}$	TSET Reprogram Rate, 200MHz Application	5			ns
$t_{\text{RATE TS}}$	TSET Reprogram Rate, 100MHz Application	10			ns
$t_{\text{RES}}$	Nominal Resolution ( $t_{\text{PDV}}(\text{SPAN})/127$ )		10		ps
$t_{\text{SPAN}}$	Propagation Delay, 200MHz Application Full TG Span (TSET = 0011111111) After Vernier Span DAC Calibration	4980	4990		ps
$t_{\text{PDTG}}(\text{SPAN})$	Propagation Delay, 100MHz Application Full TG Span (TSET = 1111111111) After Vernier Span DAC Calibration	9980	9990		ps
$t_{\text{PDV}}(\text{SPAN})$	Propagation Delay Vernier Delay Element Span (TSET=0001111111) After Vernier Span DAC Calibration	1230	1240		ps
$t_{\text{PDTG}}(\text{MIN})$	Propagation Delay TG Minimum Delay (TSET=000000000)	11.0		14.0	ns
$t_{\text{PDV}}(\text{MIN})$	Propagation Delay Vernier Delay Element Zero Delay	1300		1700	ps
INL	Integral Non-Linearity Dynamic on-the-fly TSET Switching	-4		+4	LSBs
DNL	Differential Non-Linearity Dynamic on-the-fly TSET Switching	-4		+4	LSBs
DCV	Variation in Delay vs. Duty Cycle and Frequency Full TG Span (TSET=1111111111)	-40		+40	ps
$D_{\text{TCO}}$	Variation in Delay vs. Temperature Full TG Span (TSET=1111111111)	-6		+6	ps/°C
PSRR	Variation in Delay vs. Supply Voltage Full TG Span (TSET=1111111111)	-8		+8	ps/100mV
OSJ	Random Output Signal Jitter		10		ps rms
$\text{DAC}_{\text{RES}}$	Calibration DAC Resolution		25		ps
$t_{\text{OPW}}$	Width of the Output Pulse	800		2500	ps
$t_{\text{R}}/t_{\text{F}}$	Output Rise/Fall Times (20% to 80%)		300		ps
$\text{IN}_{\text{SU}}$	IN0 - IN7 to REF_CLK Setup <sup>(1)</sup>	250		1250	ps
$\text{IN}_{\text{H}}$	IN0 - IN7 to REF_CLK Hold <sup>(1)</sup>	1750			ps
$t_{\text{SETSU}}$	TSET [0:9] Setup with Respect to IN	250			ps
$t_{\text{SETH}}$	TSET [0:9] Hold with Respect to IN	3500			ps
$\text{IN}_{\text{PW}}$	IN0 - IN7 Pulse Width	2			ns

NOTE: (1) The rising edge of the input (INA, INB) must fall in the setup region defined from 250ps to 1250ps before the rising edge of the reference clock (RCK, RCKN).

## Absolute Maximum Ratings<sup>(1)</sup>

Power Supply Voltage ( $V_{TT}$ ) .....	-2.5V to +0.5V
Power Supply Voltage ( $V_{DACREF}$ ) .....	-0.5V to +4.3V
Power Supply Voltage ( $V_{TTL}$ ) .....	-0.5V to +4.3V
ECL Input Voltage Applied, ( $V_{IN\ ECL}$ ) .....	+0.5V to $V_{TT} + -0.5V$
TTL Input Voltage Applied, ( $V_{IN\ TTL}$ ).....	-0.5V to $V_{TTL} + 1.0V$
Output Current ( $I_{OUT}$ ) .....	50mA
Case Temperature Under Bias ( $T_C$ ).....	-55°C to + 125°C
Storage Temperature ( $T_{STG}$ ).....	-65°C to + 150°C

## Recommended Operating Conditions

Power Supply Voltage ( $V_{TT}$ ).....	-2.0V ±5 %
Power Supply Voltage ( $V_{DACREF}$ ) .....	+3.0V ±5 %
Power Supply Voltage ( $V_{TTL}$ ).....	+3.3V ±5 %
Commercial Operating Temperature Range <sup>(2)</sup> (T).....	0°C to 70°C

*NOTES: (1) Caution: Stresses listed under "Absolute Maximum Ratings" may be applied to devices one at a time without causing permanent damage. Functionality at or above the values listed is not implied. Exposure to these values for extended periods may affect device reliability.*

*(2) Lower limit of specification is ambient temperature and upper limit is case temperature.*

## ESD Ratings

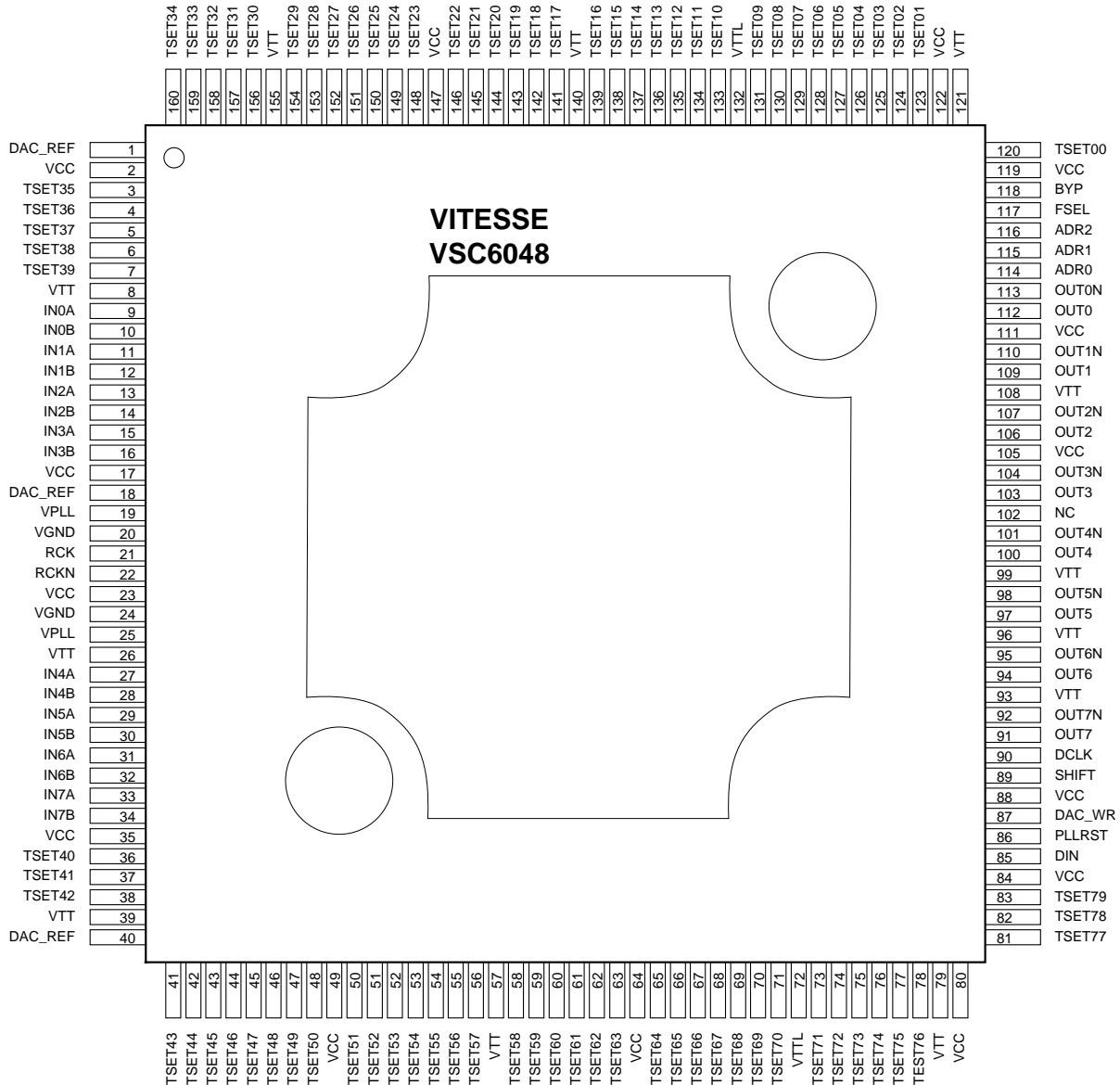
Proper ESD procedures should be used when handling this product. The VSC6048 is rated to the following ESD voltages based on the human body model:

1. All pins are rated at or above 1500V.



## Package Pin Description

Figure 5: Pin Diagram



**Table 9: Pin Identifications**

<i>Pin #</i>	<i>Signal Name</i>	<i>Signal Type</i>	<i>Levels</i>	<i>Description</i>
1	DAC_REF	—	+3.0V	DAC Reference Supply
2	VCC	—	0V	Ground
3	TSET35	TTL	I	Timeset Data for Channel 3, Bit 5
4	TSET36	TTL	I	Timeset Data for Channel 3, Bit 6
5	TSET37	TTL	I	Timeset Data for Channel 3, Bit 7
6	TSET38	TTL	I	Timeset Data for Channel 3, Bit 8
7	TSET39	TTL	I	Timeset Data for Channel 3, Bit 9
8	VTT	—	-2.0V	Power Supply
9	IN0A	ECL	I	Channel 0, Input A
10	IN0B	ECL	I	Channel 0, Input B
11	IN1A	ECL	I	Channel 1, Input A
12	IN1B	ECL	I	Channel 1, Input B
13	IN2A	ECL	I	Channel 2, Input A
14	IN2B	ECL	I	Channel 2, Input B
15	IN3A	ECL	I	Channel 3, Input A
16	IN3B	ECL	I	Channel 3, Input B
17	VCC	—	0V	Ground
18	DAC_REF	—	+3.0V	DAC Reference Supply
19	VPLL	—	-2.0V	PLL Power Supply
20	VGND	—	0V	PLL Ground
21	RCK	ECL	I	PLL Reference Clock
22	RCKN	ECL	I	PLL Reference Clock, Complementary
23	VCC	—	0V	Ground
24	VGND	—	0V	PLL Ground
25	VPLL	—	-2.0V	PLL Power Supply
26	VTT	—	-2.0V	Power Supply
27	IN4A	ECL	I	Channel 4, Input A
28	IN4B	ECL	I	Channel 4, Input B
29	IN5A	ECL	I	Channel 5, Input A
30	IN5B	ECL	I	Channel 5, Input B
31	IN6A	ECL	I	Channel 6, Input A
32	IN6B	ECL	I	Channel 6, Input B
33	IN7A	ECL	I	Channel 7, Input A
34	IN7B	ECL	I	Channel 7, Input B
35	VCC	—	0V	Ground
36	TSET40	TTL	I	Timeset Data for Channel 4, Bit 0
37	TSET41	TTL	I	Timeset Data for Channel 4, Bit 1

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<i>Pin #</i>	<i>Signal Name</i>	<i>Signal Type</i>	<i>Levels</i>	<i>Description</i>
38	TSET42	TTL	I	Timeset Data for Channel 4, Bit 2
39	VTT	—	-2.0V	Power Supply
40	DAC_REF	—	+3.0V	DAC Reference Supply, +3.0V
41	TSET43	TTL	I	Timeset Data for Channel 4, Bit 3
42	TSET44	TTL	I	Timeset Data for Channel 4, Bit 4
43	TSET45	TTL	I	Timeset Data for Channel 4, Bit 5
44	TSET46	TTL	I	Timeset Data for Channel 4, Bit 6
45	TSET47	TTL	I	Timeset Data for Channel 4, Bit 7
46	TSET48	TTL	I	Timeset Data for Channel 4, Bit 8
47	TSET49	TTL	I	Timeset Data for Channel 4, Bit 9
48	TSET50	TTL	I	Timeset Data for Channel 5, Bit 0
49	VCC	—	0V	Ground
50	TSET51	TTL	I	Timeset Data for Channel 5, Bit 1
51	TSET52	TTL	I	Timeset Data for Channel 5, Bit 2
52	TSET53	TTL	I	Timeset Data for Channel 5, Bit 3
53	TSET54	TTL	I	Timeset Data for Channel 5, Bit 4
54	TSET55	TTL	I	Timeset Data for Channel 5, Bit 5
55	TSET56	TTL	I	Timeset Data for Channel 5, Bit 6
56	TSET57	TTL	I	Timeset Data for Channel 5, Bit 7
57	VTT	—	-2.0V	Power Supply
58	TSET58	TTL	I	Timeset Data for Channel 5, Bit 8
59	TSET59	TTL	I	Timeset Data for Channel 5, Bit 9
60	TSET60	TTL	I	Timeset Data for Channel 6, Bit 0
61	TSET61	TTL	I	Timeset Data for Channel 6, Bit 1
62	TSET62	TTL	I	Timeset Data for Channel 6, Bit 2
63	TSET63	TTL	I	Timeset Data for Channel 6, Bit 3
64	VCC	—	0V	Ground
65	TSET64	TTL	I	Timeset Data for Channel 6, Bit 4
66	TSET65	TTL	I	Timeset Data for Channel 6, Bit 5
67	TSET66	TTL	I	Timeset Data for Channel 6, Bit 6
68	TSET67	TTL	I	Timeset Data for Channel 6, Bit 7
69	TSET68	TTL	I	Timeset Data for Channel 6, Bit 8
70	TSET69	TTL	I	Timeset Data for Channel 6, Bit 9
71	TSET70	TTL	I	Timeset Data for Channel 7, Bit 0
72	VTTL	—	+3.3V	TTL Power Supply
73	TSET71	TTL	I	Timeset Data for Channel 7, Bit 1
74	TSET72	TTL	I	Timeset Data for Channel 7, Bit 2
75	TSET73	TTL	I	Timeset Data for Channel 7, Bit 3

<i>Pin #</i>	<i>Signal Name</i>	<i>Signal Type</i>	<i>Levels</i>	<i>Description</i>
76	TSET74	TTL	I	Timeset Data for Channel 7, Bit 4
77	TSET75	TTL	I	Timeset Data for Channel 7, Bit 5
78	TSET76	TTL	I	Timeset Data for Channel 7, Bit 6
79	VTT	—	-2.0V	Power Supply
80	VCC	—	0V	Ground
81	TSET77	TTL	I	Timeset data for Channel 7, Bit 7
82	TSET78	TTL	I	Timeset data for Channel 7, Bit 8
83	TSET79	TTL	I	Timeset data for Channel 7, Bit 9
84	VCC	—	0V	Ground
85	DIN	TTL	I	Serial Calibration Data for Vernier Delay Setting
86	PLL_RST	TTL	I	Resets PLL Feedback Counter
87	DAC_WR	TTL	I	Write Pulse for DAC Register
88	VCC	—	0V	Ground
89	SHIFT	TTL	I	Enables Shift of Data in the Calibration Register
90	DCLK	TTL	I	Clock for Serial Data Shift for Calibration Register
91	OUT7	ECL	O	Delayed Signal Output Channel 7
92	OUT7N	ECL	O	Delayed Signal Output Channel 7, Complementary
93	VTT	—	-2.0V	Power Supply
94	OUT6	ECL	O	Delayed Signal Output Channel 6
95	OUT6N	ECL	O	Delayed Signal Output Channel 6, Complementary
96	VCC	—	0V	Ground
97	OUT5	ECL	O	Delayed Signal Output Channel 5
98	OUT5N	ECL	O	Delayed Signal Output Channel 5 Complementary
99	VTT	—	-2.0V	Power Supply
100	OUT4	ECL	O	Delayed Signal Output Channel 4
101	OUT4N	ECL	O	Delayed Signal Output Channel 4, Complementary
102	NC	—	—	Not Connected
103	OUT3	ECL	O	Delayed Signal Output Channel 3
104	OUT3N	ECL	O	Delayed Signal Output Channel 3, Complementary
105	VCC	—	0V	Ground, 0V
106	OUT2	ECL	O	Delayed Signal Output Channel 2
107	OUT2N	ECL	O	Delayed Signal Output Channel 2, Complementary
108	VTT	—	-2.0V	Power Supply

<i>Pin #</i>	<i>Signal Name</i>	<i>Signal Type</i>	<i>Levels</i>	<i>Description</i>
109	OUT1	ECL	O	Delayed Signal Output Channel 1
110	OUT1N	ECL	O	Delayed Signal Output Channel 1 Complementary
111	VCC	—	0V	Ground
112	OUT0	ECL	O	Delayed Signal Output Channel 0
113	OUT0N	ECL	O	Delayed Signal Output Channel 0, Complementary
114	ADR0	TTL	I	Address Bit 0 for Vernier Calibration
115	ADR1	TTL	I	Address Bit 1 for Vernier Calibration
116	ADR2	TTL	I	Address Bit 2 for Vernier Calibration
117	FSEL	TTL	I	Selects Reference Clock Frequency
118	BYP	TTL	I	PLL Bypass Mode
119	VCC	—	0V	Ground
120	TSET00	TTL	I	Timeset Data for Channel 0, Bit 0
121	VTT	—	-2.0V	Power Supply
122	VCC	—	0V	Ground
123	TSET01	TTL	I	Timeset Data for Channel 0, Bit 1
124	TSET02	TTL	I	Timeset Data for Channel 0, Bit 2
125	TSET03	TTL	I	Timeset Data for Channel 0, Bit 3
126	TSET04	TTL	I	Timeset Data for Channel 0, Bit 4
127	TSET05	TTL	I	Timeset Data for Channel 0, Bit 5
128	TSET06	TTL	I	Timeset Data for Channel 0, Bit 6
129	TSET07	TTL	I	Timeset Data for Channel 0, Bit 7
130	TSET08	TTL	I	Timeset Data for Channel 0, Bit 8
131	TSET09	TTL	I	Timeset Data for Channel 0, Bit 9
132	VTTL	—	+3.3V	TTL Power Supply
133	TSET10	TTL	I	Timeset Data for Channel 1, Bit 0
134	TSET11	TTL	I	Timeset Data for Channel 1, Bit 1
135	TSET12	TTL	I	Timeset Data for Channel 1, Bit 2
136	TSET13	TTL	I	Timeset Data for Channel 1, Bit 3
137	TSET14	TTL	I	Timeset Data for Channel 1, Bit 4
138	TSET15	TTL	I	Timeset Data for Channel 1, Bit 5
139	TSET16	TTL	I	Timeset Data for Channel 1, Bit 6
140	VTT	—	-2.0V	Power Supply
141	TSET17	TTL	I	Timeset Data for Channel 1, Bit 7
142	TSET18	TTL	I	Timeset Data for Channel 1, Bit 8
143	TSET19	TTL	I	Timeset Data for Channel 1, Bit 9
144	TSET20	TTL	I	Timeset Data for Channel 2, Bit 0
145	TSET21	TTL	I	Timeset Data for Channel 2, Bit 1
146	TSET22	TTL	I	Timeset Data for Channel 2, Bit 2
147	VCC	—	0V	Ground,

<i>Pin #</i>	<i>Signal Name</i>	<i>Signal Type</i>	<i>Levels</i>	<i>Description</i>
148	TSET23	TTL	I	Timeset Data for Channel 2, Bit 3
149	TSET24	TTL	I	Timeset Data for Channel 2, Bit 4
150	TSET25	TTL	I	Timeset Data for Channel 2, Bit 5
151	TSET26	TTL	I	Timeset Data for Channel 2, Bit 6
152	TSET27	TTL	I	Timeset Data for Channel 2, Bit 7
153	TSET28	TTL	I	Timeset Data for Channel 2, Bit 8
154	TSET29	TTL	I	Timeset Data for Channel 2, Bit 9
155	VTT	—	-2.0V	Power Supply
156	TSET30	TTL	I	Timeset Data for Channel 3, Bit 0
157	TSET31	TTL	I	Timeset Data for Channel 3, Bit 1
158	TSET32	TTL	I	Timeset Data for Channel 3, Bit 2
159	TSET33	TTL	I	Timeset Data for Channel 3, Bit 3
160	TSET34	TTL	I	Timeset Data for Channel 3, Bit 4
<b>Ground and Power Supply Pins</b>				
2, 17, 23, 35, 49, 64, 80, 84, 88, 96, 105, 111, 119, 122, 147	VCC			
8, 26, 39, 57, 79, 93, 99, 108, 121, 140, 155	VTT			
72, 132	VTTL			
19, 25	VPLL			
20, 24	VGND			
1, 18, 40	DAC_REF			

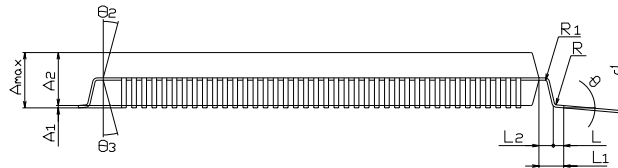
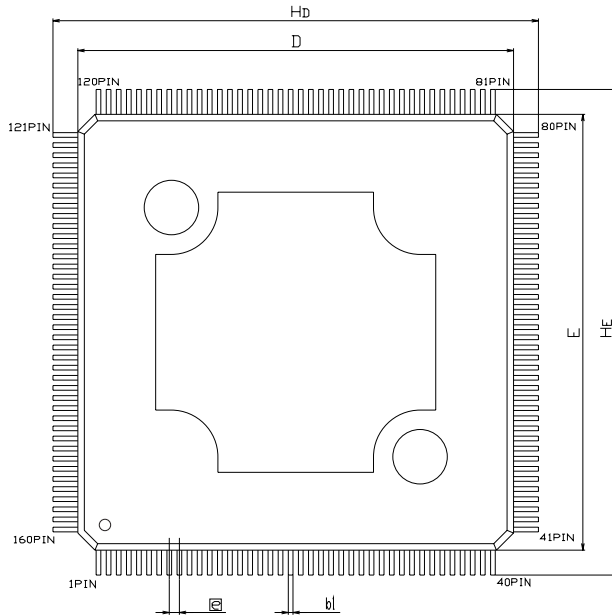
## Data Sheet

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High-Speed Octal  
Programmable Timing Generator

### Package Information

The VSC6048 is packaged in a thermally-enhanced 160-pin PQFP with an embedded heat sink.



SYMBOL	Dimensions in Millimeters			NOTES:
	Min	Nom	Max	
* E	27.9	28	28.1	* E, D Excluding the tie bar cutting stub
* D	27.9	28	28.1	b1 Lead width of basemetal.
A <sub>MAX</sub>			4	c1 Lead thickness of basemetal.
A <sub>1</sub>		0.35		
A <sub>2</sub>	3.25	3.35	3.45	
ⓐ		0.65		
b1	0.2	0.3	0.4	
* c1		0.15		
* θ	0°		10°	
L	0.6	0.8	1	
L <sub>1</sub>		1.6		
L <sub>2</sub>		0.8		
H <sub>E</sub>	30.8	31.2	31.6	
H <sub>D</sub>	30.8	31.2	31.6	
θ <sub>2</sub>		15°		
θ <sub>3</sub>		15°		
R		0.2		
R <sub>1</sub>		0.2		

## Package Thermal Characteristics

The VSC6048 is packaged in an 160-pin, 28x28mm thermally-enhanced PQFP with an internal heat spreader. These packages use industry-standard EIAJ footprints, which have been enhanced to improve thermal dissipation. The construction of the packages are as shown in Figure 6. The VSC6048 is designed to operate with a case temperature up to 70°C. The user must guarantee that the temperature specification is not violated.

Figure 6: Package Cross Section

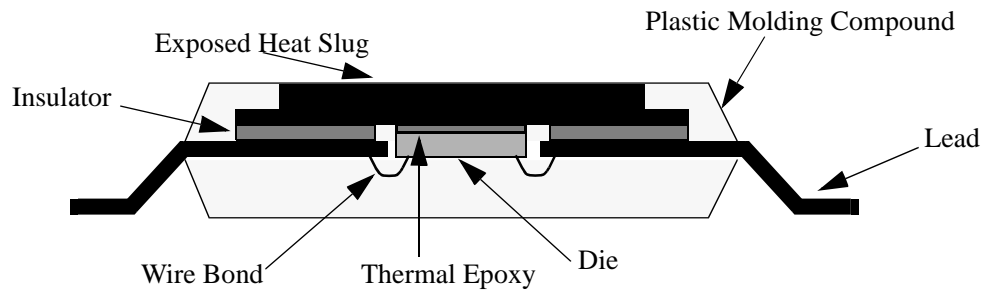


Table 10: Thermal Resistance

Symbol	Description	Value	Units
$\theta_{JC}$	Thermal resistance from junction-to-case	1.3	°C/W
$\theta_{CA-0}$	Thermal resistance from case-to-ambient, still air	16.5	°C/W
$\theta_{CA-100}$	Thermal resistance from case-to-ambient, 100 LFPM air	14.1	°C/W
$\theta_{CA-200}$	Thermal resistance from case-to-ambient, 200 LFPM air	12.3	°C/W
$\theta_{CA-400}$	Thermal resistance from case-to-ambient, 400 LFPM air	10.7	°C/W
$\theta_{CA-600}$	Thermal resistance from case-to-ambient, 600 LFPM air	9.3	°C/W
$\theta_{CA-800}$	Thermal resistance from case-to-ambient, 800 LFPM air	7.9	°C/W



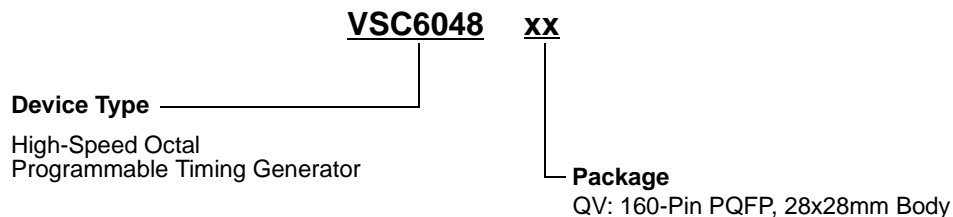
## Data Sheet

# VSC6048

High-Speed Octal  
Programmable Timing Generator

### Ordering Information

The order number for this product is formed by a combination of the device number, and package type.



### Notice

This document contains information about a product during its fabrication or early sampling phase of development. The information contained in this document is based on design targets, simulation results or early prototype test results. Characteristic data and other specifications are subject to change without notice. Therefore the reader is cautioned to confirm that this datasheet is current prior to design or order placement.

### Warning

Vitesse Semiconductor Corporation's product are not intended for use in life support appliances, devices or systems. Use of a Vitesse product in such applications without written consent is prohibited.

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