Advance Product Information

VSC6108/10/12

Low Jitter
Clock Multiplier and Distributor

Features

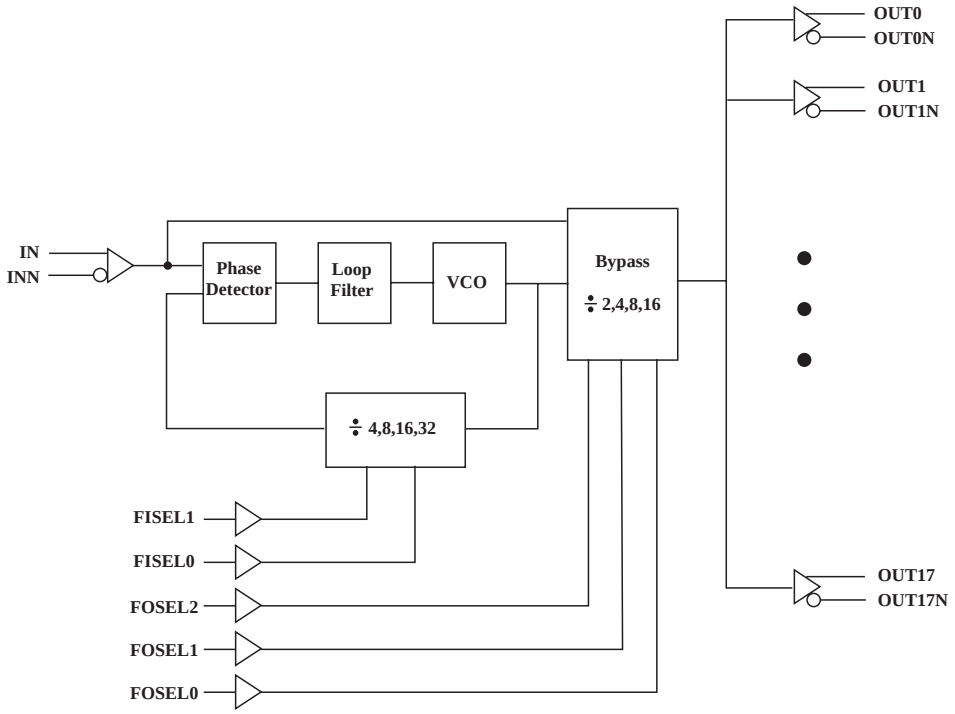
- Recommended Companion for VSC6250 500MHz Deskew IC and Vitesse Timing Generator ICs
- Input Clock Frequency: 50MHz to 622MHz
- Output Clock Frequency: 100MHz to 1.25GHz
- 1 Differential ECL or PECL Clock Input
- 18 Differential ECL or PECL Clock Outputs
- Very Low Jitter: 4ps rms, 25ps Peak-to-Peak
- 10µs Lock Time
- < 50ps Skew Between Outputs
- Single Supply: 3.3V ± 5% @ 2 Watts
- Commercial (0^{o} to $+70^{o}$C) Temperature Range
- Package: 10mm x 10mm 64 PQFP

General Description

The VSC6108/10/12 are a family of low-jitter clock multiplication and distribution ICs. Each IC uses a phase locked-loop to lock an on-chip low-noise VCO to an off-chip reference frequency. The VCO output can be divided down and is output to 18 differential ECL outputs. The VSC6108/10/12 are packaged in a 10 mm x 10 mm 64-pin plastic quad flat pack and consume less than 2 Watts from a single 3.3V power supply.

The VSC6108/10/12 provide high-precision clocks for ATE, instrumentation, telecommunications, data-communications, and computer system applications where jitter and skew are critical timing parameters. Skew between outputs is less than 50 ps. Jitter is less than 4 ps rms or 25 ps peak-to-peak. Lock time is 10 µs.

VSC6108/10/12 Functional Block Diagram



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Three versions of the clock multiplier and distributor IC are available.

1. The VSC6108 has a VCO frequency of 1.6 GHz and can output clocks at 800 MHz, 400 MHz, 200 MHz, and 100 MHz.
2. The VSC6110 has a VCO frequency of 2.0 GHz and can output clocks at 1 GHz, 500 MHz, 250 MHz, and 125 MHz.
3. The VSC6112 has a VCO frequency of 2.488 GHz and can output clocks at 1.244GHz, 622 MHz, 311MHz, and 155MHz.

VCO multiplication and output division ratios are user-selectable. Each of the ICs can be configured for an input frequency of 1/4, 1/8, 1/16, or 1/32 of the VCO frequency as shown in Table 1 below. The output frequencies are selected as shown in Table 2 below.

Table 1: Input Frequency vs. Mode

			f_{IN}		
Mode Name	***FISEL1***	***FISEL0***	***VSC6108***	***VSC6110***	***VSC6112***
$f_{VCO} = f_{IN} * 4$	0	0	400 MHz	500 MHz	622 MHz
$f_{VCO} = f_{IN} * 8$	0	1	200 MHz	250 MHz	311 MHz
$f_{VCO} = f_{IN} * 16$	1	0	100 MHz	125 MHz	155 MHz
$f_{VCO} = f_{IN} * 32$	1	1	50 MHz	62.5 MHz	77.5 MHz

Table 2: Output Frequency vs. Mode

				f_{OUT}		
Mode Name	***FOSEL2***	***FOSEL1***	***FOSEL0***	***VSC6108***	***VSC6110***	***VSC6112***
$f_{OUT} = f_{IN}$	0	0	0	f_{IN}	f_{IN}	f_{IN}
$f_{OUT} = f_{VCO} / 2$	0	0	1	800 MHz	1 GHz	1.244GHz
$f_{OUT} = f_{VCO} / 4$	0	1	0	400 MHz	500 MHz	622 MHz
$f_{OUT} = f_{VCO} / 8$	0	1	1	200 MHz	250 MHz	311 MHz
$f_{OUT} = f_{VCO} / 16$	1	0	0	100 MHz	125 MHz	155 MHz

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AC Timing Characteristics

The VSC6108/6110/6112 has an output time jitter of less than 25 ps peak-to-peak. To achieve this jitter specification the input reference clock must have less than 10 ps peak-to-peak. Output skew is less than 50 ps between any two outputs.

Table 3: AC Timing Specifications

Parameter	*Description*	*Min*	*Typ*	*Max*	*Units*
RCd	Reference clock duty cycle	40		60	%
RCj	Reference clock jitter			10	pSPP
OCd	Output clock duty cycle	40		60	%
OCj	Output clock OCLK0-17 jitter			25	pSPP
Tsk	Skew between any output clock to any other clock	-50		+50	ps
Lr	Reference Clock RCK/RCKN frequency range	-1.0		+1.0	%
Lt	Lock time			10	µS
t_{rf}	Output rise/fall time 20-80%		100	150	ps

DC Characteristics

The VSC6108/6110/6112 can be operated from a single 3.3-Volt power supply. Using a -3.3-Volt supply, the inputs and outputs are ECL-compatible. Using a +3.3-Volt power supply, the inputs and outputs are PECL-compatible. Total power dissipation is less than 2 Watts.

Table 4: Single Ended ECL Inputs

Parameter	*Description*	*Min*	*Typ*	*Max*	*Units*	*Conditions*
V_{IH}	Input HIGH voltage	-1020	-	-700	mV	
V_{IL}	Input LOW voltage	-2000	-	-1620	mV	

Note: V_{EE} = -3.3V ±5%, V_{CC} = GND, Load = 50 to -2.0V, V_{REF} = -1.32V ±25 mV.

Table 5: Differential ECL Inputs and Outputs

Parameter	*Description*	*Min*	*Typ*	*Max*	*Units*	*Conditions*
$V_{IN,DIFF}$	Input Voltage Differential	200	-	-	mV	Required input voltage swing
$V_{IN,CM}$	Input Common Mode Voltage	-1.5	-	-0.5	V	Required input common mode voltage
$V_{OUT,DIFF}$	Output Voltage Differential	400	-	800	mV	Output voltage swing
$V_{OUT,CM}$	Output Common Mode Voltage	-1.6	-	-1.2	V	Common mode output voltage

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Table 6: Power Dissipation

	Description	Min	Typ	Max	Units
I_{CC}	Power supply current		0.45	0.6	A
P_D	Power dissipation		1.5	2	Watts

Note: Output power dissipation does not include load power.

Absolute Maximum Ratings(1)

Power Supply Voltage, (V_{CC}) ..... -0.5V to +4.3V
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

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

Recommended Operating Conditions

Power Supply Voltage, (V_{CC}) ..... +3.3V±5%
Commercial Operating Temperature Range(2) (T) ..... 0°C to 70°C

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 VSC6108, VSC6110 and VSC6112 are rated to the following ESD voltages based on the human body model:

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

Package Pin Description

Table 7: Package Pin Identification

Pin #	Signal	Signal Type	I/O Type	Comments	Pin Description
1	VREF	Power	---	-1.32V	Power
2	FOSEL0	I	ECL		Output Frequency Select 0
3	VEE	Power		-3.3V	Negative Supply Voltage
4	VEE	Power		-3.3V	Negative Supply Voltage
5	FOSEL1	I	ECL		Output Frequency Select 1
6	FOSEL2	I	ECL		Output Frequency Select 2

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Pin #	*Signal*	*Signal Type*	*I/O Type*	*Comments*	*Pin Description*
7	VCC	Power		0V	Positive Supply Voltage
8	FISEL1	I	ECL		Input Frequency Select 1
9	FISEL0	I	ECL		Input Frequency Select 0
10	VEE	Power		-3.3V	Negative Supply Voltage
11	not used	---	---		n/c
12	not used	---	---		n/c
13	VCC	Power		0V	Positive Supply Voltage
14	VEE	Power		-3.3V	Negative Supply Voltage
15	IN	I	ECL		Input Clock
16	INN	I	ECL		Input Clock Inverted
17	OUT0	O	ECL		Output 0
18	OUT0N	O	ECL		Output 0 Inverted
19	VEE	Power		-3.3V	Negative Supply Voltage
20	OUT1	O	ECL		Output 1
21	OUT1N	O	ECL		Output 1 Inverted
22	OUT2	O	ECL		Output 2
23	OUT2N	O	ECL		Output 2 Inverted
24	OUT3	O	ECL		Output 3
25	OUT3N	O	ECL		Output 3 Inverted
26	VCC	Power		0V	Positive Supply Voltage
27	OUT4	O	ECL		Output 4
28	OUT4N	O	ECL		Output 4 Inverted
29	OUT5	O	ECL		Output 5
30	OUT5N	O	ECL		Output 5 Inverted
31	VEE	Power		-3.3V	Negative Supply Voltage
32	VCC	Power		0V	Positive Supply Voltage
33	OUT6	O	ECL		Output 6
34	OUT6N	O	ECL		Output 6 Inverted
35	OUT7	O	ECL		Output 7
36	OUT7N	O	ECL		Output 7 Inverted
37	VCC	Power		0V	Positive Supply Voltage
38	OUT8	O	ECL		Output 8
39	OUT8N	O	ECL		Output 8 Inverted

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Pin #	*Signal*	*Signal Type*	*I/O Type*	*Comments*	*Pin Description*
40	OUT9	O	ECL		Output 9
41	OUT9N	O	ECL		Output 9 Inverted
42	VCC	Power		0V	Positive Supply Voltage
43	OUT10	O	ECL		Output 10
44	OUT10N	O	ECL		Output 10 Inverted
45	VEE	Power		-3.3V	Negative Supply Voltage
46	OUT11	O	ECL		Output 11
47	OUT11N	O	ECL		Output 11 Inverted
48	VCC	Power		0V	Positive Supply Voltage
49	VEE	Power		-3.3V	Negative Supply Voltage
50	OUT12N	O	ECL		Output 12 Inverted
51	OUT12	O	ECL		Output 12
52	OUT13N	O	ECL		Output 13 Inverted
53	OUT13	O	ECL		Output 13
54	VCC	Power		0V	Positive Supply Voltage
55	OUT14N	O	ECL		Output 14 Inverted
56	OUT14	O	ECL		Output 14
57	OUT15N	O	ECL		Output 15 Inverted
58	OUT15	O	ECL		Output 15
59	VCC	Power		0V	Positive Supply Voltage
60	OUT16N	O	ECL		Output 16 Inverted
61	OUT16	O	ECL		Output 16
62	VEE	Power		-3.3V	Negative Supply Voltage
63	OUT17N	O	ECL		Output 17 Inverted
64	OUT17	O	ECL		Output 17

Note:(1) The pin description above assumes that VEE is connected to -3.3 Volts, VCC is connected to 0 Volts, VREF is connected to -1.32 Volts, and all I/Os are ECL. If the device is operated using a +3.3 Volt power supply, VCC should be connected to +3.3 Volts and VEE should be connected to 0 Volts. In this case, I/Os are PECL and VREF should be connected to +1.98 Volts.

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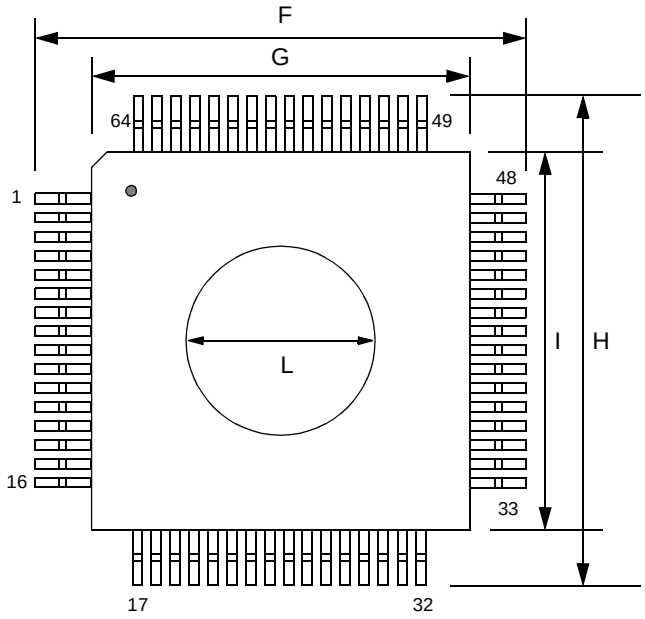
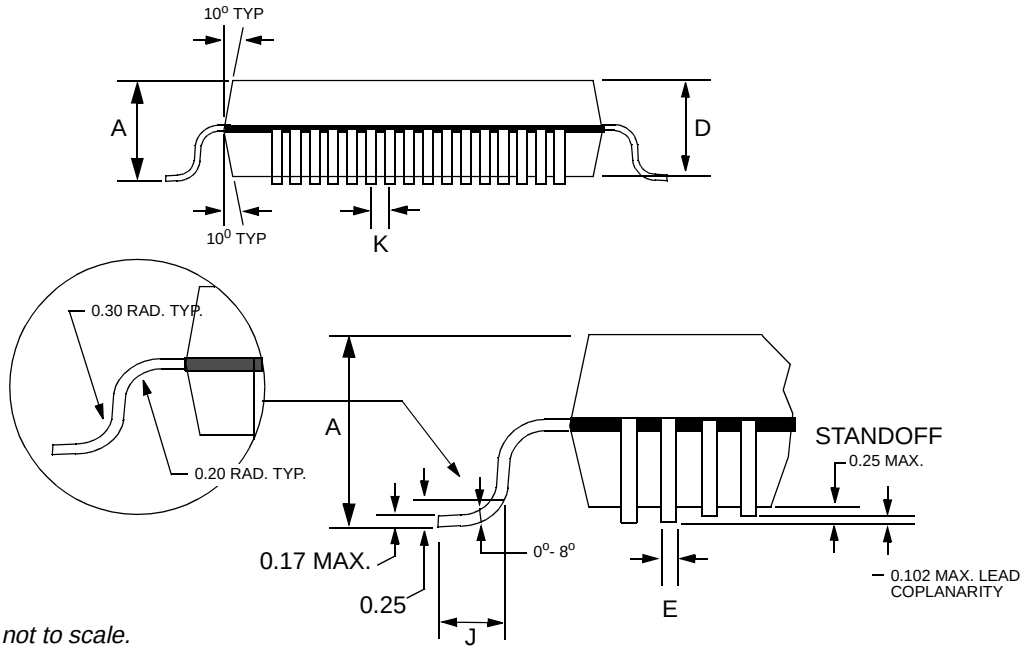
Package Information

64-Pin Thermally Enhanced PQFP



Item	*mm*	*Tol.*
A	2.45	MAX
D	2.00	+0.10
E	0.30	±.05
F	13.20	±.25
G	10.00	±.10
H	13.20	±.25
I	10.00	±.10
J	0.88	±.15
K	0.50	BASIC
L	3.56	±.50 DIA.



NOTES:
Drawing not to scale.
Heat spreader up.
All units in mm unless otherwise noted.
Heat spreader is not electrically connected.

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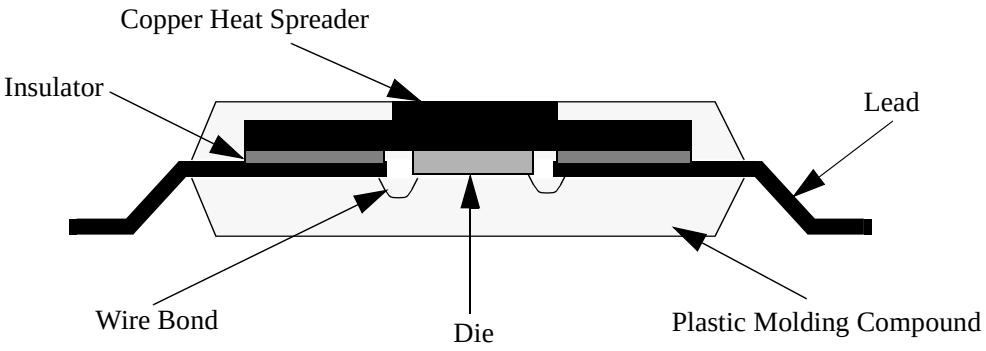
Package Thermal Characteristics

The VSC6108/10/12 is packaged into a thermally-enhanced plastic quad flatpack (PQFP). This package adheres to the industry-standard EIAJ footprint for a 10x10mm body but has been enhanced to improve thermal dissipation with the inclusion of an exposed Copper Heat Spreader. The package construction is as shown in Figure 1.

Figure 1: Package Cross Section



The thermal resistance is improved through low thermal resistance paths from the die to the exposed surface of the heat spreader and from the die to the lead frame through the heat spreader overlap of the lead frame.

Table 8: 64-Pin PQFP Thermal Resistance

Symbol	*Description*	*Value*	*Units*
θ_{jc}	Thermal resistance from junction to case	2.5	^{o}C/W
θ_{ca}	Thermal resistance from case to ambient in still air including conduction through the leads for a non-thermally saturated board.	37	^{o}C/W
$\theta_{ca\text{-}100}$	Thermal resistance from case to ambient in 100 LPFM air	31	^{o}C/W
$\theta_{ca\text{-}200}$	Thermal resistance from case to ambient in 200 LPFM air	28	^{o}C/W
$\theta_{ca\text{-}400}$	Thermal resistance from case to ambient in 400 LPFM air	24	^{o}C/W
$\theta_{ca\text{-}600}$	Thermal resistance from case to ambient in 600 LPFM air	22	^{o}C/W

The VSC6108/10/12 is designed to operate at a maximum case temperature of up to 70 ^{o}C. The user must guarantee that the maximum case temperature specification is not violated, most applications will require a heatsink.

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

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