3-Channel High-Performance TCXO/LVCMOS Clock Buffer Family

5PB12xx

DATASHEET

Description

The 5PB12xx is a high-performance TCXO/LVCMOS clock fanout buffer family with individual OE pin for each output. The CLKIN pin can accept either a square wave (LVCMOS) or clipped sine wave (such as TCXO clipped sine wave output) as input.

There are 3 different fan-out versions available: 1:3, 1:4 and 1:6.

The 5PB12xx has industry-leading low jitter and extremely low current consumption, making it ideal for smart mobile devices.

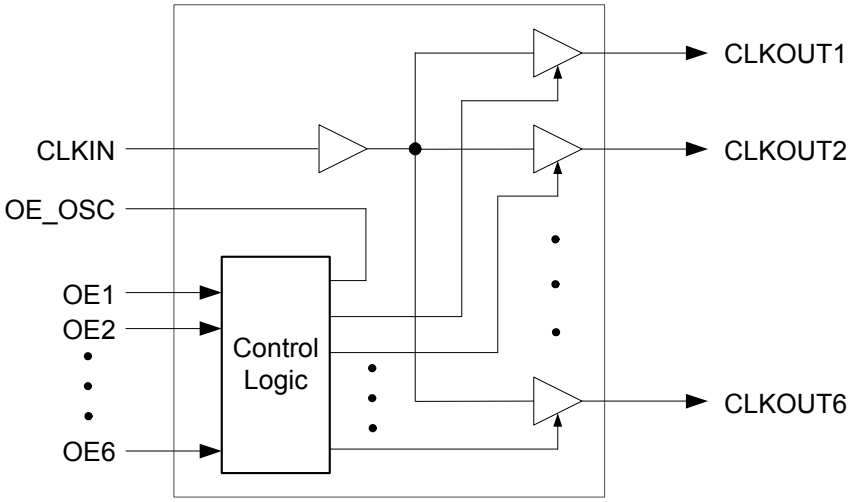
Typical Applications

- Smart Mobile Handsets
- RF and baseband peripheral clock distribution
- Automotive

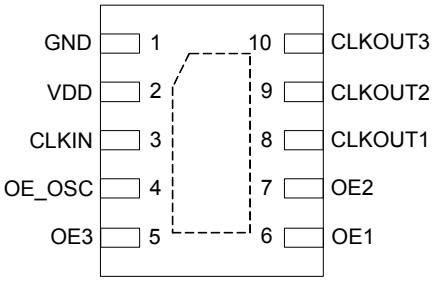
Features

- Extremely low operating and standby current consumption
- Low RMS additive phase jitter
- Family supports 1.8V to 3.3V power supply voltage:
  - For 1.8V supply: 5PB1203, 5PB1204, 5PB1206
  - For 2.5V / 3.3V supply: 5PB1213, 5PB1214, 5PB1216
- Three, four, and six outputs with individual Output Enable pin
- One input
- OE_OSC control pin to enable/disable reference TCXO/XO
- Small 10-pin, 16-pin and 20-pin packages available
- Industrial -40º to +105ºC temperature range

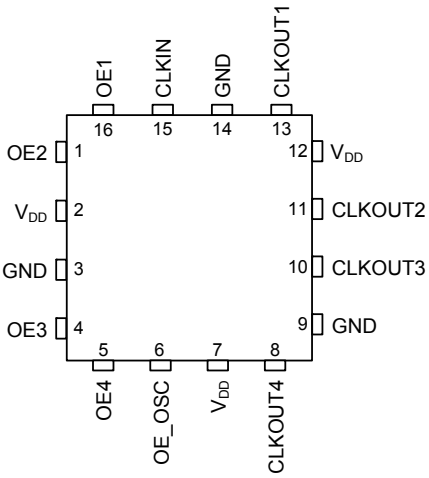
Block Diagram



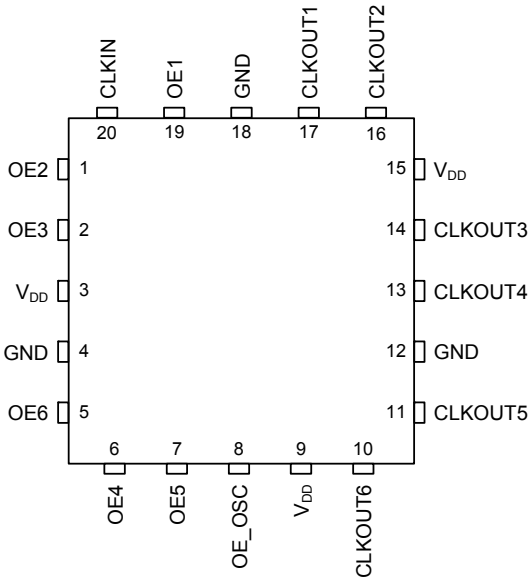
Pin Assignments



5PB1203 / 5PB1213
10-pin 2mm x 2mm DFN



5PB1204 / 5PB1214
16-pin, 2.5mm x 2.5mm VFQFPN



5PB1206 / 5PB1216
20-pin, 3mm x 3mm VFQFPN

Pin Descriptions

Pin Name	Pin Number			Pin Type	Pin Description
	5PB1203 5PB1213	5PB1204 5PB1214	5PB1206 5PB1216		
VDD	2	2, 7, 12	3, 9, 15	Power	Connect 1.8V to 5PB1203/5PB1204/5PB1206. Connect 2.5V or 3.3V to 5PB1213/5PB1214/5PB1216.
GND	1	3, 9, 14	4, 12, 18	Power	Power supply ground.
CLKIN	3	15	20	Input	Reference input pin. Connect to LVCMOS input or TCXO.
OE_OSC	4	6	8	Output	Input Crystal Oscillator enable pin. Follow Enable Function Truth Table. If all OE pins are low then OE_OSC is low. Otherwise OE_OSC is high, enabling reference crystal oscillator.
OE1	6	16	19	Input	Output Enable pin for CLKOUT1. Active High. Internal 120kΩ pull-down.
OE2	7	1	1	Input	Output Enable pin for CLKOUT2. Active High. Internal 120kΩ pull-down.
OE3	5	4	2	Input	Output Enable pin for CLKOUT3. Active High. Internal 120kΩ pull-down.
OE4	—	5	6	Input	Output Enable pin for CLKOUT4. Active High. Internal 120kΩ pull-down.
OE5	—	—	7	Input	Output Enable pin for CLKOUT5. Active High. Internal 120kΩ pull-down.
OE6	—	—	5	Input	Output Enable pin for CLKOUT6. Active High. Internal 120kΩ pull-down.
CLKOUT1	8	13	17	Output	Clock Output 1. Same frequency as CLKIN.
CLKOUT2	9	11	16	Output	Clock Output 2. Same frequency as CLKIN.
CLKOUT3	10	10	14	Output	Clock Output 3. Same frequency as CLKIN.
CLKOUT4	—	8	13	Output	Clock Output 4. Same frequency as CLKIN.
CLKOUT5	—	—	11	Output	Clock Output 5. Same frequency as CLKIN.
CLKOUT6	—	—	10	Output	Clock Output 6. Same frequency as CLKIN.

Enable Function Truth Table

Input						Output						
OE1	OE2	OE3	OE4	OE5	OE6	OE_OSC	CLKOUT1	CLKOUT2	CLKOUT3	CLKOUT4	CLKOUT5	CLKOUT6
0	0	0	0	0	0	0	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z
1	0	0	0	0	0	1	CLOCK	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z
1	1	0	0	0	0	1	CLOCK	CLOCK	Hi-Z	Hi-Z	Hi-Z	Hi-Z
…	…	…	…	…	…	…	…	…	…	…	…	…
1	1	1	1	1	1	1	CLOCK	CLOCK	CLOCK	CLOCK	CLOCK	CLOCK

External Components

A minimum number of external components are required for proper operation. A decoupling capacitor of 0.01µF should be connected between VDD on pin 1 and GND on pin 4, as close to the device as possible. A 33Ω series terminating resistor may be used on each clock output if the trace is longer than 1 inch.

To achieve the low output skew that the 5PB12xx is capable of, careful attention must be paid to board layout. Essentially, all four outputs must have identical terminations, identical loads and identical trace geometries. If they do not, the output skew will be degraded. For example, using a 30Ω series termination on one output (with 33Ω on the others) will cause at least 15ps of skew.

Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the 5PB12xx. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

Item	Rating
Supply Voltage, VDD	3.8V
Output Enable and All Inputs/Outputs	-0.5 V to VDD + 0.5 V
Ambient Operating Temperature (extended)	-40 to +105°C
Storage Temperature	-65 to +150°C
Junction Temperature	125°C
Soldering Temperature	260°C

DC Electrical Characteristics

(VDD = 1.8V, 2.5V, 3.3V)

VDD = 1.8V ±5%, for **5PB1203 / 1204 / 1206**, ambient temperature -40° to +105°C, unless stated otherwise.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		1.71		1.89	V
Input High Voltage, CLKIN	V_{IH}	LVCMOS input. Note 1	VDD/2 + 200		VDD	mV
Input Low Voltage, CLKIN	V_{IL}	LVCMOS input. Note 1			VDD/2 - 200	mV
Input High Voltage, OE	V_{IH}		0.7xVDD		VDD	V
Input Low Voltage, OE	V_{IL}				0.3xVDD	V
Output High Voltage	V_{OH}	I_{OH} = -4mA	0.8xVDD			V
Output Low Voltage	V_{OL}	I_{OL} = 4mA			0.2xVDD	V
Nominal Output Impedance	Z_O			17		Ω
Input Capacitance	C_{IN}			5		pF
Operating Supply Current						
5PB1203	IDD	CLKIN = 26MHz, all outputs enabled		5.10		mA
		CLKIN = Low or High, all outputs disabled		0.02	0.03	
5PB1204		CLKIN = 26MHz, all outputs enabled		9.30		
		CLKIN = Low or High, all outputs disabled		2.51	4	
5PB1206		CLKIN = 26MHz, all outputs enabled		11.90		
		CLKIN = Low or High, all outputs disabled		2.5	4	

VDD = 2.5V ±5%, for **5PB1213 / 1214 / 1216**, ambient temperature -40° to +105°C, unless stated otherwise.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		2.375		2.625	V
Input High Voltage, CLKIN	V_{IH}	LVCMOS input. Note 1	VDD/2 + 200		VDD	mV
Input Low Voltage, CLKIN	V_{IL}	LVCMOS input. Note 1			VDD/2 - 200	mV
Input High Voltage, OE	V_{IH}		0.7xVDD		VDD	V
Input Low Voltage, OE	V_{IL}				0.3xVDD	V
Output High Voltage	V_{OH}	I_{OH} = -4mA	0.8xVDD			V
Output Low Voltage	V_{OL}	I_{OL} = 4mA			0.2xVDD	V
Nominal Output Impedance	Z_O			17		Ω
Input Capacitance	C_{IN}	ICLK, OE pin		5		pF
Operating Supply Current						
5PB1213	IDD	CLKIN = 26MHz, all outputs enabled		6.68		mA
		CLKIN = Low or High, all outputs disabled		0.05	0.5	
5PB1214		CLKIN = 26MHz, all outputs enabled		10.2		
		CLKIN = Low or High, all outputs disabled		3.47	5	
5PB1216		CLKIN = 26MHz, all outputs enabled		16.5		
		CLKIN = Low or High, all outputs disabled		3.50	5	

VDD = 3.3V ±5%, for **5PB1213 / 1214 / 1216**, ambient temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		3.135		3.465	V
Input High Voltage, CLKIN	V_{IH}	LVCMOS input. Note 1	VDD/2 + 200		VDD	mV
Input Low Voltage, CLKIN	V_{IL}	LVCMOS input. Note 1			VDD/2 - 200	mV
Input High Voltage, OE	V_{IH}		0.7xVDD		VDD	V
Input Low Voltage, OE	V_{IL}				0.3xVDD	V
Output High Voltage	V_{OH}	I_{OH} = -4mA	0.8xVDD			V
Output Low Voltage	V_{OL}	I_{OL} = 4mA			0.2xVDD	V
Nominal Output Impedance	Z_O			17		Ω
Input Capacitance	C_{IN}	ICLK, OE pin		5		pF
Operating Supply Current						
5PB1213	IDD	CLKIN = 26MHz, all outputs enabled		9.10		mA
		CLKIN = Low or High, all outputs disabled		0.22	0.5	
5PB1214		CLKIN = 26MHz, all outputs enabled		13.4		
		CLKIN = Low or High, all outputs disabled		4.28	7	
5PB1216		CLKIN = 26MHz, all outputs enabled		21.4		
		CLKIN = Low or High, all outputs disabled		4.60	7	

Notes: 1. Nominal switching threshold is VDD/2.

AC Electrical Characteristics

(VDD = 1.8V, 2.5V, 3.3V)

VDD = 1.8V ±5%; for **5PB1203 / 1204 / 1206**, ambient Temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t_{OR}	0.36 to 1.44V, C_L = 5pF		0.6	1.0	ns
Output Fall Time	t_{OF}	1.44 to 0.36V, C_L = 5pF		0.6	1.0	ns
Propagation Delay	Note 1	Note 1	1.5	2.0	2.5	ns
Buffer Additive Phase Jitter, RMS		26MHz TCXO clipped sine wave input, Integration Range: 12kHz to 20MHz		420		fs
		125MHz LVCMOS input, Integration Range: 12kHz to 20MHz		42		fs
Output to Output Skew	$t_{SKEWO-O}$	Note 2, Rising edges at VDD/2		20	50	ps
Device to Device Skew	$t_{SKEWD-D}$	Rising edges at VDD/2			200	ps
Delay for Output Enable / Disable Time ENABLEx to BCLKn	t_{EN}/t_{DIS}	CL < 5pF			3	cycles
Start-up Time	$t_{START-UP}$				2	ms
TCXO Clock Clipped Sine Wave Input Voltage Swing Level	VIN_{pp}	VDD = 1.8V, should connect to CLKIN through AC coupling and bias circuit		0.8		V

VDD = 2.5V ±5%; for **5PB1213 / 1214 / 1216**, ambient Temperature -40° to +105°C, unless stated otherwise

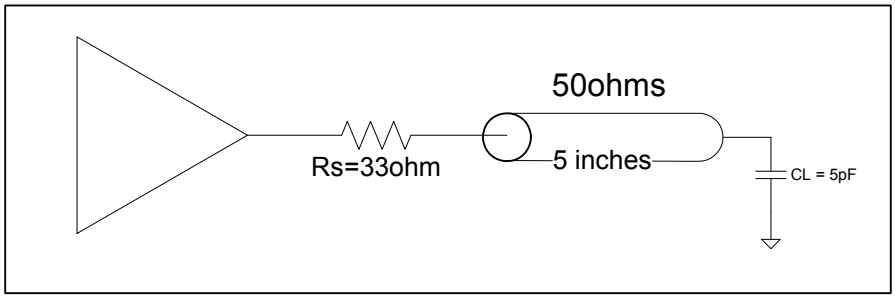
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t_{OR}	0.5 to 2.0V, C_L = 5pF		0.6	1.0	ns
Output Fall Time	t_{OF}	2.0 to 0.5V, C_L = 5pF		0.6	1.0	ns
Propagation Delay	Note 1	Note 1	1.7	2.2	2.7	ns
Buffer Additive Phase Jitter, RMS		26MHz TCXO clipped sine wave input, Integration Range: 12kHz to 20MHz		280		fs
		125MHz LVCMOS input, Integration Range: 12kHz to 20MHz		30		fs
Output to Output Skew	$t_{SKEWO-O}$	Note 2, Rising edges at VDD/2		20	50	ps
Device to Device Skew	$t_{SKEWD-D}$	Rising edges at VDD/2			200	ps
Delay for Output Enable / Disable Time ENABLEx to BCLKn	t_{EN}/t_{DIS}	CL < 5pF			3	cycles
Start-up Time	$t_{START-UP}$	Part start-up time for valid outputs after VDD ramp-up			2	ms
TCXO Clock Clipped Sine Wave Input Voltage Swing Level	VIN_{pp}	VDD = 2.5V, should connect to CLKIN through AC coupling and bias circuit		0.8		V

VDD = 3.3V ±5%; for **5PB1213 / 1214 / 1216**, ambient Temperature -40° to +105°C, unless stated otherwise

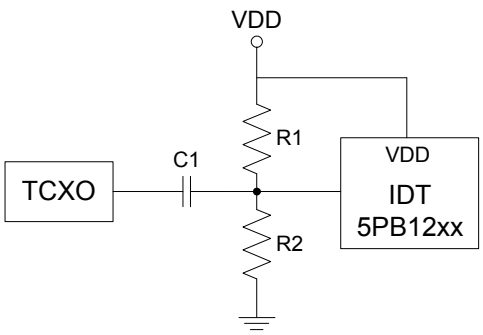
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t_{OR}	0.66 to 2.64V, C_L = 5pF		0.6	1.0	ns
Output Fall Time	t_{OF}	2.64 to 0.66V, C_L = 5pF		0.6	1.0	ns
Propagation Delay	Note 1	Note 1	1.4	1.9	2.4	ns
Buffer Additive Phase Jitter, RMS		26MHz TCXO clipped sine wave input, Integration Range: 12kHz to 20MHz		377		fs
		125MHz LVCMOS input, Integration Range: 12kHz to 20MHz		18		fs
Output to Output Skew	$t_{SKEWO-O}$	Note 2, Rising edges at VDD/2		20	50	ps
Device to Device Skew	$t_{SKEWD-D}$	Rising edges at VDD/2			200	ps
Delay for Output Enable / Disable Time ENABLEx to BCLKn	t_{EN}/t_{DIS}	CL < 5pF			3	cycles
Start-up Time	$t_{START-UP}$	Part start-up time for valid outputs after VDD ramp-up			2	ms
TCXO Clock Clipped Sine Wave Input Voltage Swing Level	VIN_{pp}	VDD = 3.3V, should connect to CLKIN through AC coupling and bias circuit		0.5		V

Notes:
1. With rail to rail input clock.
2. Between any 2 outputs with equal loading.
3. Duty cycle on outputs will match incoming clock duty cycle. Consult IDT for tight duty cycle clock generators.

Test Load and Circuit

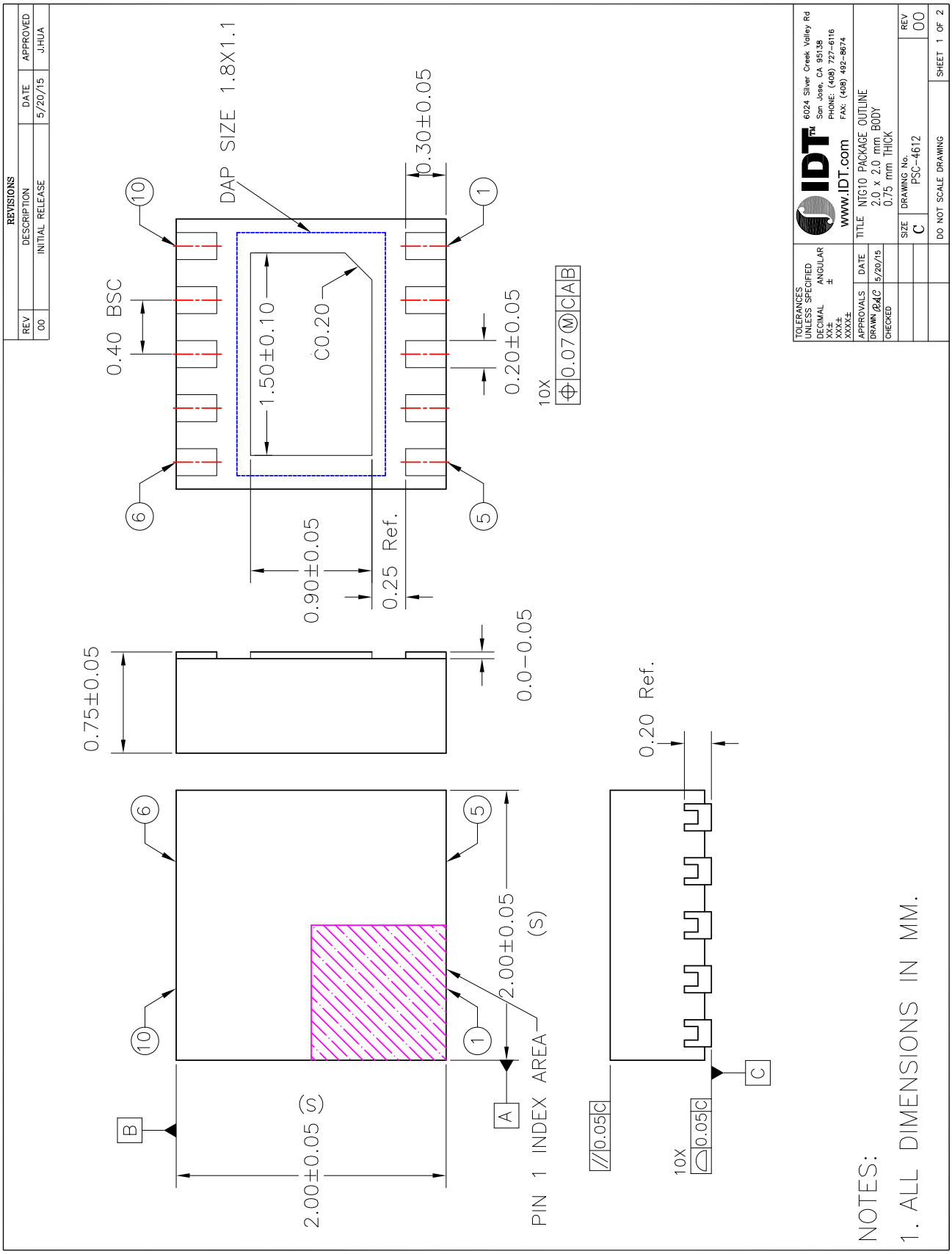


AC Coupling and Bias Circuit

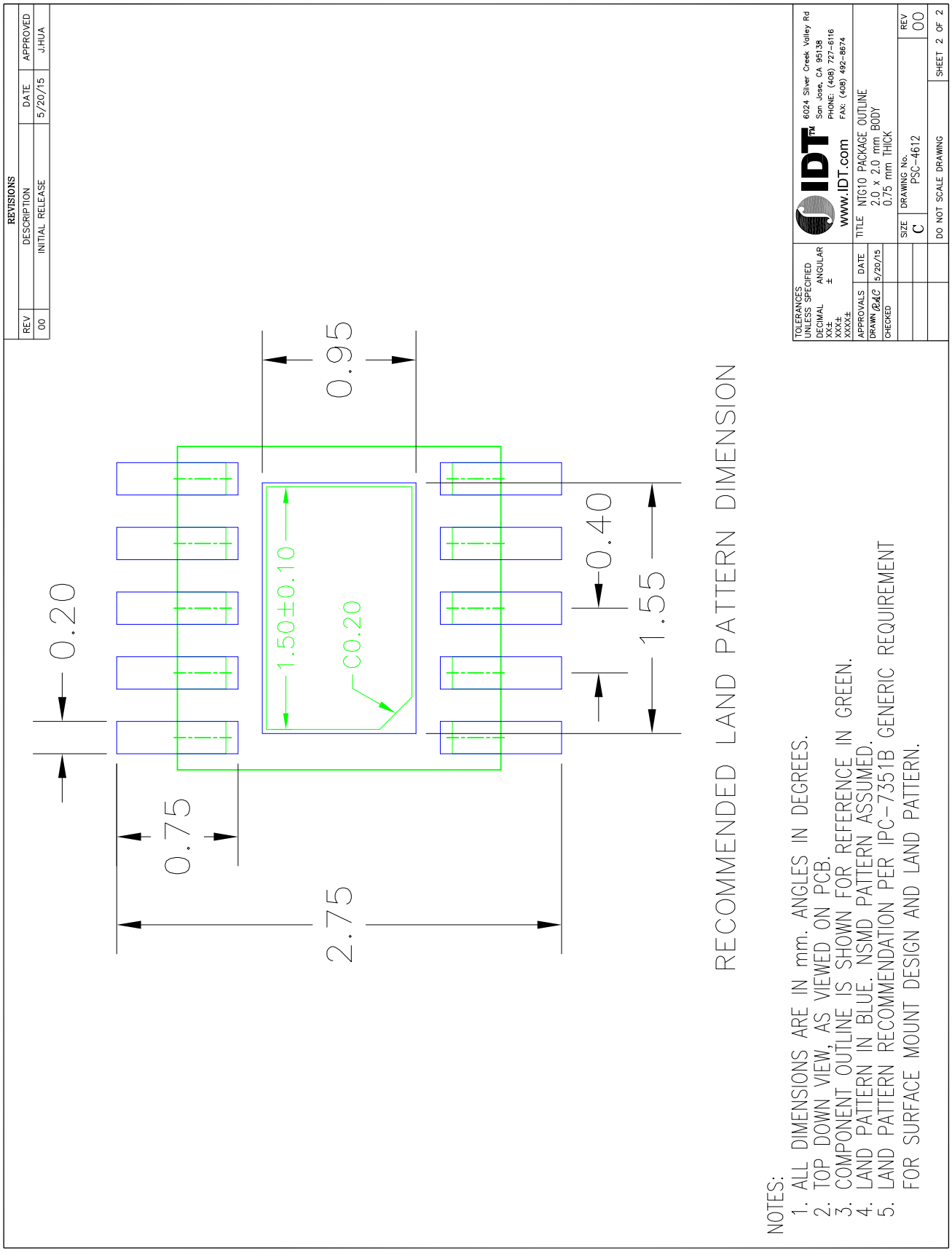


Component	Value
C1	1µF
R1	10k
R2	10k

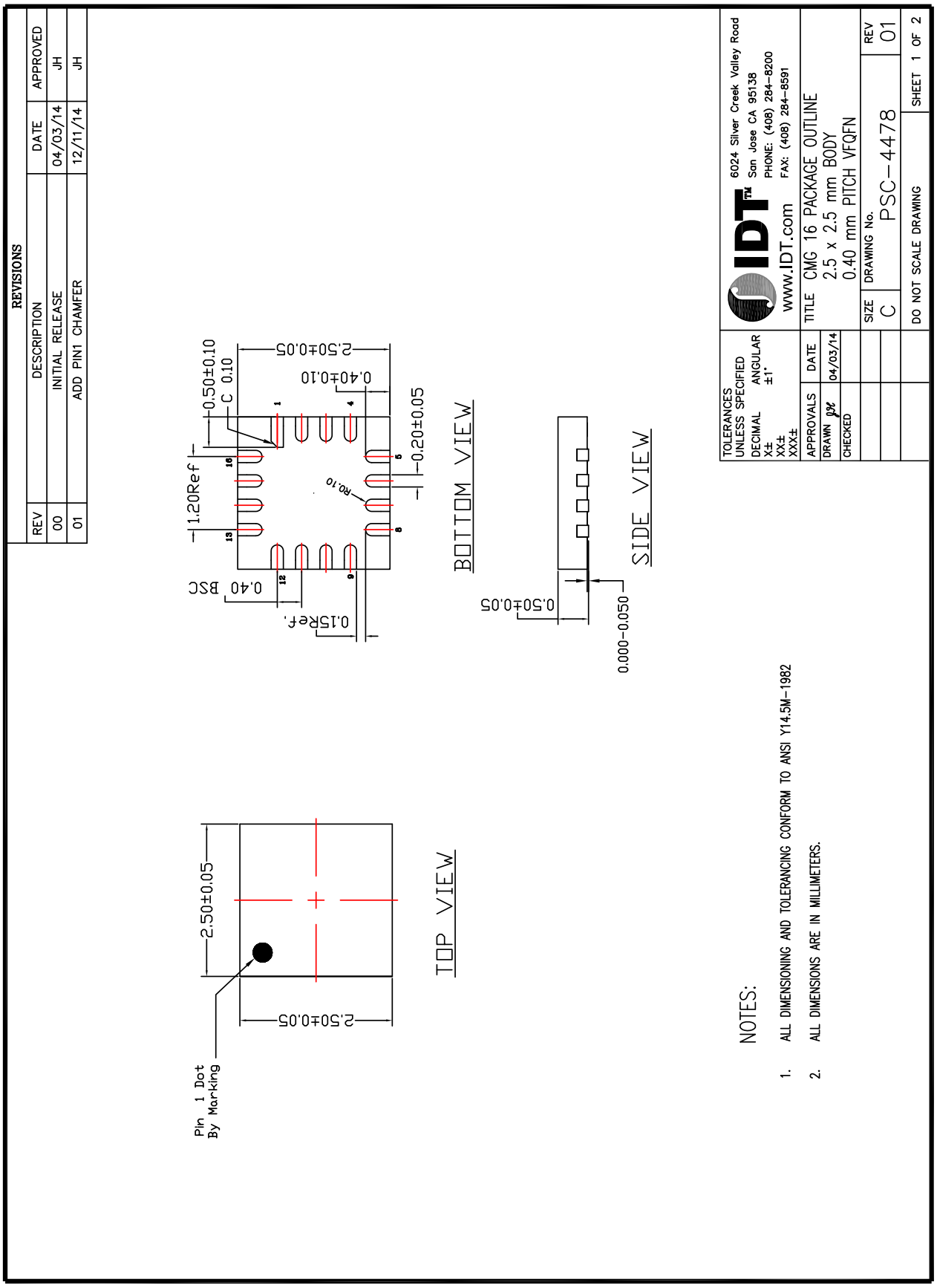
Package Outline Drawings (5PB1203 / 5PB1213 10-pin DFN)



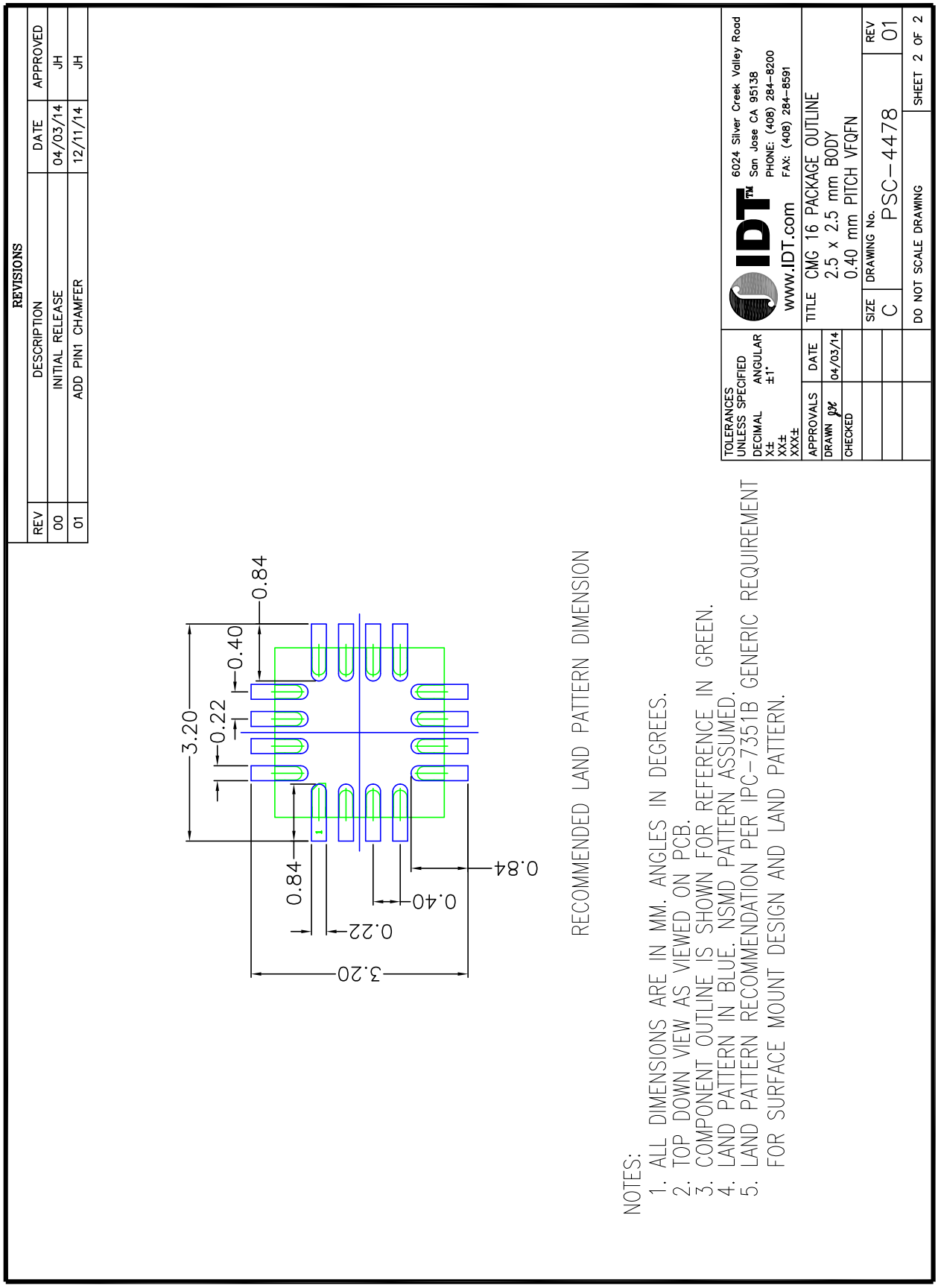
Package Outline Drawings (5PB1203 / 5PB1213 10-pin DFN), cont.



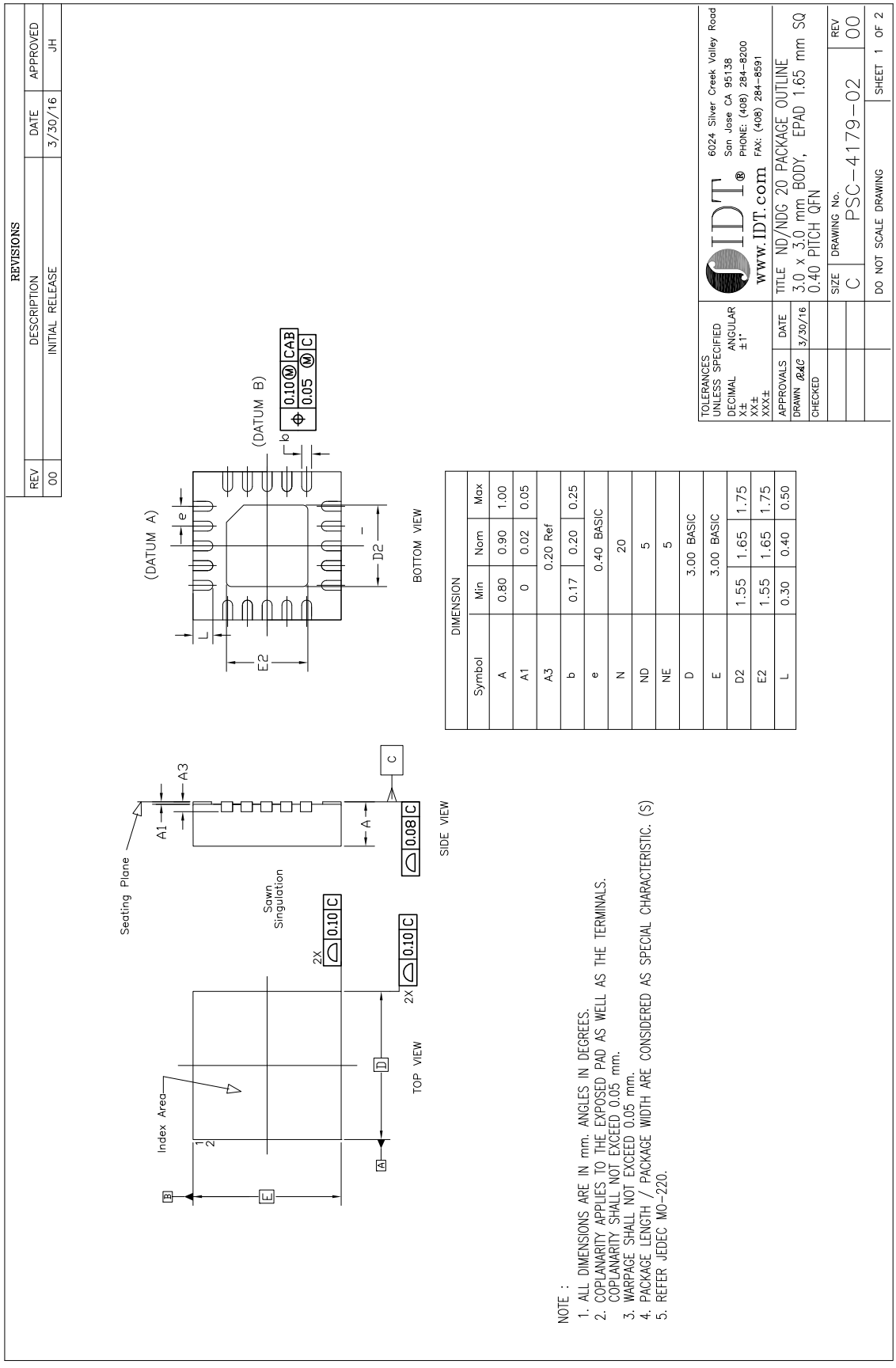
Package Outline Drawings (5PB1204 / 5PB1214 16-pin VFQFPN)



Package Outline Drawings (5PB1204 / 5PB1214 16-pin VFQFPN), cont.



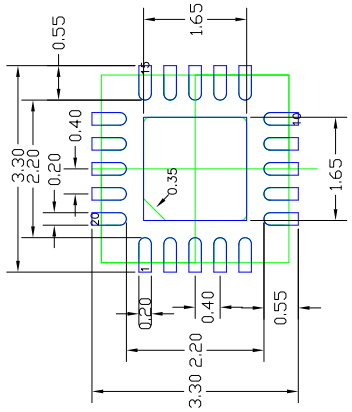
Package Outline Drawings (5PB1206 / 5PB1216 20-pin VFQFPN)



Package Outline Drawings (5PB1206 / 5PB1216 20-pin VFQFPN), cont.

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	3/30/16	JH



RECOMMENDED LAND PATTERN DIMENSION

NOTES:
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. TOP DOWN VIEW. AS VIEWED ON PCB.
3. COMPONENT OUTLINE SHOWS FOR REFERENCE IN GREEN.
4. LAND PATTERN IN BLUE, NSMD PATTERN ASSUMED.
5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

TOLERANCES
UNLESS SPECIFIED
DECIMAL ANGULAR
X± ±1°
XX±
XXX±

APPROVALS DATE
DRAWN RAC 3/30/16
CHECKED

IDT® 6024 Silver Creek Valley Road
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TITLE ND/NDG 20 PACKAGE OUTLINE
3.0 x 3.0 mm BODY, EPAD 1.65 mm SQ
0.40 PITCH QFN

SIZE C | DRAWING No. PSC-4179-02 | REV 00

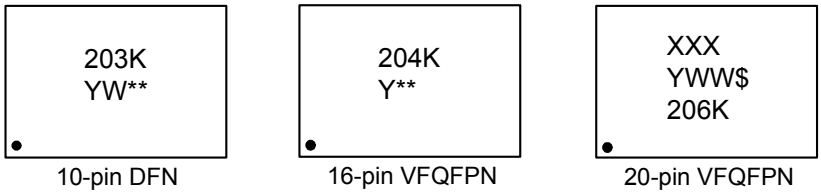
DO NOT SCALE DRAWING | SHEET 2 OF 2

Ordering Information

Part / Order Number	Shipping Packaging	Package	Temperature
5PB1203NTGK	Cut Tape	10-pin DFN	-40 to +105°C
5PB1203NTGK8	Tape and Reel	10-pin DFN	-40 to +105°C
5PB1213NTGK	Cut Tape	10-pin DFN	-40 to +105°C
5PB1213NTGK8	Tape and Reel	10-pin DFN	-40 to +105°C
5PB1204CMGK	Cut Tape	16-pin VFQFPN	-40 to +105°C
5PB1204CMGK8	Tape and Reel	16-pin VFQFPN	-40 to +105°C
5PB1214CMGK	Cut Tape	16-pin VFQFPN	-40 to +105°C
5PB1214CMGK8	Tape and Reel	16-pin VFQFPN	-40 to +105°C
5PB1206NDGK	Tube	20-pin VFQFPN	-40 to +105°C
5PB1206NDGK8	Tape and Reel	20-pin VFQFPN	-40 to +105°C
5PB1216NDGK	Tube	20-pin VFQFPN	-40 to +105°C
5PB1216NDGK8	Tape and Reel	20-pin VFQFPN	-40 to +105°C

“G” after the two-letter package code denotes Pb-Free configuration, RoHS compliant.

Marking Diagrams



10-pin DFN | 16-pin VFQFPN | 20-pin VFQFPN

10-pin DFN | 16-pin VFQFPN | 20-pin VFQFPN

Notes:
1. “**” is the lot number.
2. “YWW”, “YW”, or “Y” are the last digit(s) of the year and week that the part was assembled.
3. “$” denotes mark code.
4. “K” denotes extended temperature range device.
5. “XXX” denotes last three characters of Asm lot.

Revision History

Date	Description of Change
February 28, 2018	1. Updated CLKIN input high and low voltage ratings in DC characterization tables. 2. Updated Absolute Maximum supply voltage (VDD) from 3.465V to 3.8V.
April 10, 2017	1. Updated Operating Supply Current and Operating Voltage values in DC electrical characteristics tables. 2. Updated Propagation Delay and Output skew values in AC electrical characteristics tables. 3. Updated package outline drawings. 4. Updated legal disclaimer.
July 11, 2016	Initial release.

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Данный компонент на территории Российской Федерации

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http://moschip.ru/get-element

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