AMERICAN MICROSYSTEMS, INC.

FS6322-05

Three-PLL Clock Generator IC

July 2000

1.0 Features

- Three PLLs with deep reference, feedback, and post dividers to provide precision clock frequencies
- Multiple outputs provide several clocking options
- Outputs may be tristated for board testing
- S0, S1, and S2 inputs modify output frequencies for design flexibility
- 3.3V operation
- Accepts 5 to 30MHz crystals (see Frequency Table for specific reference frequencies required)
- Custom frequency patterns, pinouts, and packages are available. Contact your local AMI Sales Representative for more information.

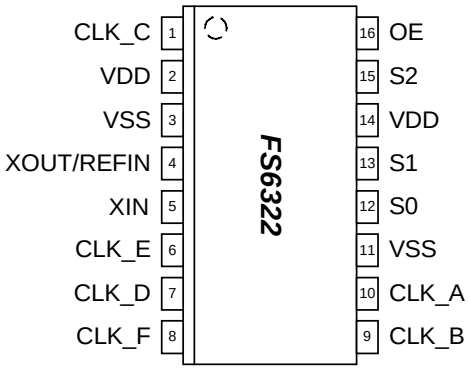
2.0 Description

The FS6322 is a ROM-based CMOS clock generator IC designed to minimize cost and component count in a variety of electronic systems.

Three low-jitter phase-locked loops (PLLs) drive up to five low-skew clock outputs to provide a high degree of flexibility. The device is packaged in a 16-pin SOIC to minimize board space.

High-resolution divider capability permits generation of desired frequencies.

Figure 1: Pin Configuration



16-pin (0.150”) SOIC

Figure 2: Block Diagram

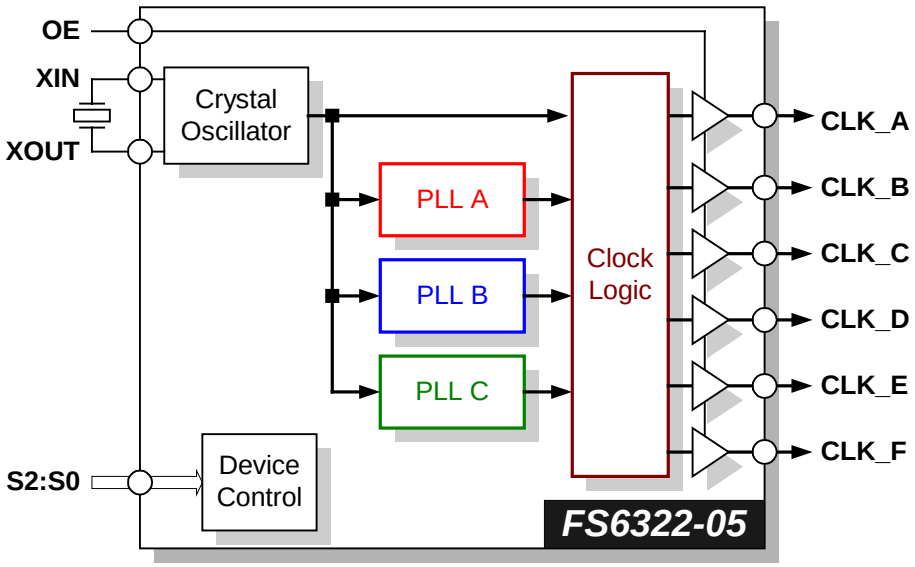


Table 1: Pin Descriptions

Key: AI = Analog Input; AO = Analog Output; DI = Digital Input; DI^U = Input with Internal Pull-Up; DI_D = Input with Internal Pull-Down; DIO = Digital Input/Output; DI-3 = Three-Level Digital Input, DO = Digital Output; P = Power/Ground; # = Active Low pin

PIN	TYPE	NAME	DESCRIPTION
1	DO	CLK_C	C clock output
2	P	VDD	Power supply (3.3V nominal – see version specific information)
3	P	VSS	Ground
4	AI	XOUT / REFIN	Crystal oscillator drive / external reference input
5	AO	XIN	Crystal oscillator feedback
6	DO	CLK_E	E clock output
7	DO	CLK_D	D clock output
8	DO	CLK_F	F clock output
9	DO	CLK_B	A clock output
10	DO	CLK_A	B clock output
11	P	VSS	Ground
12	DI^U	S0	Frequency select control input
13	DI^U	S1	Frequency select control input
14	P	VDD	Power supply (5V to 3.3V)
15	DI^U	S2	Frequency select control input
16	DI^U	OE	Output enable input: logic-high enables outputs; logic-low tristates outputs (high impedance)

Table 2: Frequency Table – FS6322-05 (3.3volt) (all frequencies in MHz)

S2	S1	S0	FREF	CLK_A (pin 10)	CLK_B (pin 9)	CLK_C (pin 1)	CLK_D (pin 7)	CLK_E (pin 6)	CLK_F (pin 8)
0	0	0	16.0000	25.00000	10.00000	1.84320	0.00000	0.00000	0.00000
0	0	1	11.0592	24.57600	11.28960	1.84320	33.33336	25.00002	20.00002
0	1	0	13.5000	36.86400	18.43200	16.93440	27.00000	33.86880	54.00000
0	1	1	13.5000	33.86880	16.93440	16.93440	27.00000	33.86880	54.00000
1	0	0	13.5000	33.86880	73.72800	49.15200	27.00000	27.00000	54.00000
1	0	1	13.5000	33.86880	67.73760	45.15840	27.00000	27.00000	54.00000
1	1	0	13.5000	33.86880	49.15200	32.76800	27.00000	27.00000	54.00000
1	1	1	13.5000	33.86880	36.86400	24.57600	27.00000	27.00000	54.00000

July 2000

3.0 Electrical Specifications

Table 3: Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. These conditions represent a stress rating only, and functional operation of the device at these or any other conditions above the operational limits noted in this specification is not implied. Exposure to maximum rating conditions for extended conditions may affect device performance, functionality, and reliability.

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage, dc (V_{SS} = ground)	V_{DD}	V_{SS}-0.5	7	V
Input Voltage, dc	V_I	V_{SS}-0.5	V_{DD}+0.5	V
Output Voltage, dc	V_O	V_{SS}-0.5	V_{DD}+0.5	V
Input Clamp Current, dc (V_I < 0 or V_I > V_{DD})	I_{IK}	-50	50	mA
Output Clamp Current, dc (V_I < 0 or V_I > V_{DD})	I_{OK}	-50	50	mA
Storage Temperature Range (non-condensing)	T_S	-65	150	°C
Ambient Temperature Range, Under Bias	T_A	-55	125	°C
Junction Temperature	T_J		150	°C
Lead Temperature (soldering, 10s)			260	°C
Input Static Discharge Voltage Protection (MIL-STD 883E, Method 3015.7)			2	kV

CAUTION: ELECTROSTATIC SENSITIVE DEVICE

Permanent damage resulting in a loss of functionality or performance may occur if this device is subjected to a high-energy electrostatic discharge.

Table 4: Operating Conditions

PARAMETER	SYMBOL	CONDITIONS/DESCRIPTION	MIN.	TYP.	MAX.	UNITS
Supply Voltage	V_{DD}	3.3V ± 10%	3	3.3	3.6	V
Ambient Operating Temperature Range	T_A		0		70	°C
Crystal Resonator Frequency	f_{XIN}		5		30	MHz
Output Load Capacitance	C_L				20	pF

Table 5: DC Electrical Specifications

Unless otherwise stated, V_{DD} = 3.3V ± 10%, no load on any output, and ambient temperature range T_A = 0°C to 70°C. Parameters denoted with an asterisk (*) represent nominal characterization data and are not production tested to any specific limits. Where given, MIN and MAX characterization data are ± 3σ from typical. Negative currents indicate current flows out of the device.

PARAMETER	SYMBOL	CONDITIONS/DESCRIPTION	MIN.	TYP.	MAX.	UNITS
Overall						
Supply Current, Dynamic, with Loaded Outputs	I_{DD}	f_{XTAL} = 27MHz; C_L = 0pF, V_{DD} = 3.3V FS6322-05: S[2:0]=[100]		20		mA
Digital Inputs (OE, S2, S0)						
High-Level Input Voltage	V_{IH}		2.4		V_{DD}+0.3	V
Low-Level Input Voltage	V_{IL}		V_{SS}-0.3		0.8	V
High-Level Input Current	I_{IH}	$V_{IN} = V_{DD}$	-1		1	µA
Low-Level Input Current (pull-up)	I_{IL}	V_{IN} = 0V		-8		µA
Digital Inputs (S1)						
High-Level Input Voltage	V_{IH}		2.4		V_{DD}+0.3	V
Low-Level Input Voltage	V_{IL}		V_{SS}-0.3		0.8	V
High-Level Input Current	I_{IH}	$V_{IN} = V_{DD}$	-1		1	µA
Low-Level Input Current (pull-up)	I_{IL}	V_{IN} = 0V		-16		µA
Crystal Oscillator						
Crystal Loading Capacitance	$C_{L(xtal)}$	As seen by a crystal connected to XIN and XOUT		16		pF
Crystal Drive Level		R_{XTAL}=20Ω		200		uW
Clock Outputs (CLKA, CLKB)						
Output Current High	I_{OH}	V_O = 2.4V	-4			mA
Output Current Low	I_{OL}	V_O = 0.4V	4			mA
Short Circuit Source Current *	I_{OSH}	V_O = 0V; shorted for 30s, max.		-35		mA
Short Circuit Sink Current *	I_{OSL}	V_O = 3.3V; shorted for 30s, max.		40		mA
Output Impedance *	z_{OH}	$V_O = 0.5V_{DD}$; output driving high		45		Ω
	z_{OL}	$V_O = 0.5V_{DD}$; output driving low		45		

July 2000

Table 6: AC Timing Specifications

Unless otherwise stated, V_{DD} = 3.3V ± 10%, no load on any output, and ambient temperature range T_A = 0°C to 70°C. Parameters denoted with an asterisk (*) represent nominal characterization data and are not production tested to any specific limits. Where given, MIN and MAX characterization data are ± 3σ from typical.

PARAMETER	SYMBOL	CONDITIONS/DESCRIPTION	CLOCK (MHz)	MIN.	TYP.	MAX.	UNITS
Clock Output (CLK_X)							
Duty Cycle *		Crystal oscillator derived outputs Measured @1.4V; C_L = 20pF		43	51	57	%
Duty Cycle *		PLL derived outputs Measured @1.4V; C_L = 20pF		45	51	55	%
Rise Time *	t_r	V_O = 0.4V to 2.4V; C_L = 20pF			2.2		ns
Fall Time *	t_f	V_O = 2.4V to 0.4V; C_L = 20pF			1.8		ns
Jitter, Period (RMS) *	$t_{j(1\sigma)}$	From rising edge to next rising edge at $V_{DD}/2$, C_L = 20pF			50		ps
Jitter, Period (peak-peak) *	$t_{j(\Delta P)}$	From rising edge to next rising edge at $V_{DD}/2$, C_L = 20pF			400		ps
Jitter, Cumulative (RMS)*	$t_{j(LT)}$	PLL-derived outputs From 0-500µs at $V_{DD}/2$, C_L = 20pF compared to ideal clock source			100		ps
Phase Noise *		PLL derived outputs @ 100KHz offset from fundamental			-80		dbC/Hz

4.0 Package Information

Table 7: 16-pin SOIC (0.150") Package Dimensions

	DIMENSIONS			
	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.061	0.068	1.55	1.73
A1	0.004	0.0098	0.102	0.249
A2	0.055	0.061	1.40	1.55
B	0.013	0.019	0.33	0.49
C	0.0075	0.0098	0.191	0.249
D	0.386	0.393	9.80	9.98
E	0.150	0.157	3.81	3.99
e	0.050 BSC		1.27 BSC	
H	0.230	0.244	5.84	6.20
h	0.010	0.016	0.25	0.41
L	0.016	0.035	0.41	0.89
Θ	0°	8°	0°	8°

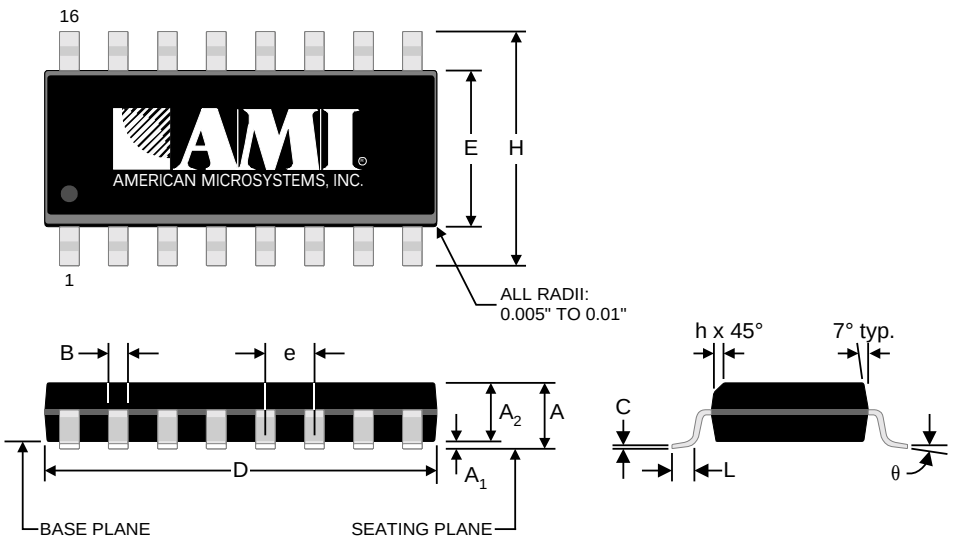


Table 8: 16-pin SOIC (0.150") Package Characteristics

PARAMETER	SYMBOL	CONDITIONS/DESCRIPTION	TYP.	UNITS
Thermal Impedance, Junction to Free-Air 16-pin 0.150" SOIC	Θ_{JA}	Air flow = 0 m/s	95	°C/W
Lead Inductance, Self	L_{11}	Corner lead	4.0	nH
		Center lead	3.0	
Lead Inductance, Mutual	L_{12}	Any lead to any adjacent lead	0.4	nH
Lead Capacitance, Bulk	C_{11}	Any lead to V_{SS}	0.5	pF

July 2000

5.0 Ordering Information

ORDERING CODE	DEVICE NUMBER	PACKAGE TYPE	OPERATING TEMPERATURE RANGE	SHIPPING CONFIGURATION
11825-808	FS6322-05	16-pin (0.150") SOIC (Small Outline Package)	0°C to 70°C (Commercial)	Tape and Reel
11825-818	FS6322-05	16-pin (0.150") SOIC (Small Outline Package)	0°C to 70°C (Commercial)	Tubes

American Microsystems, Inc., 2300 Buckskin Rd., Pocatello, ID 83201, (208) 233-4690, FAX (208) 234-6796, WWW Address: http://www.amis.com E-mail: tgp@amis.com