

Burr-Brown Products



PLL1705 PLL1706 SLES046A – AUGUST 2002 – REVISED SEPTEMBER 2002

# **3.3-V DUAL PLL MULTICLOCK GENERATOR**

### FEATURES

- 27-MHz Master Clock Input
- Generated Audio System Clock:
  - SCKO0: 768 f<sub>S</sub> (f<sub>S</sub> = 44.1 kHz)
  - SCKO1: 384 f<sub>S</sub>, 768 f<sub>S</sub> (f<sub>S</sub> = 44.1 kHz)
  - SCKO2: 256 f<sub>S</sub> (f<sub>S</sub> = 32, 44.1, 48, 64, 88.2, 96 kHz)
  - SCKO3: 384 f<sub>S</sub> (f<sub>S</sub> = 32, 44.1, 48, 64, 88.2, 96 kHz)
- Zero PPM Error Output Clocks
- Low Clock Jitter: 50 ps (Typical)
- Multiple Sampling Frequencies:
   f<sub>S</sub> = 32, 44.1, 48, 64, 88.2, 96 kHz
- 3.3-V Single Power Supply
- PLL1705: Parallel Control
   PLL1706: Serial Control

FUNCTIONAL BLOCK DIAGRAM

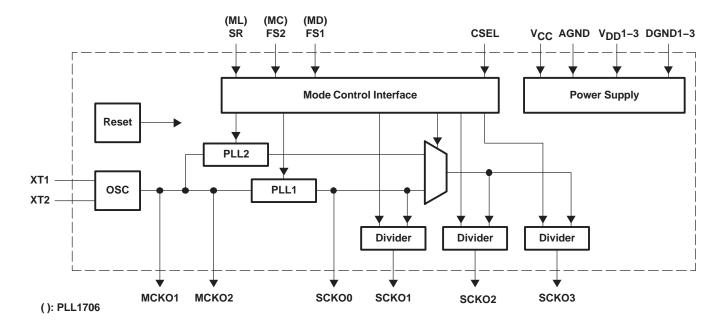
 Package: 20-Pin SSOP (150 mil), Lead-Free Product

# APPLICATIONS

- DVD Players
- DVD Add-On Cards for Multimedia PCs
- Digital HDTV Systems
- Set-Top Boxes

### DESCRIPTION

The PLL1705<sup>†</sup> and PLL1706<sup>†</sup> are low cost, phase-locked loop (PLL) multiclock generators. The PLL1705 and PLL1706 can generate four system clocks from a 27-MHz reference input frequency. The clock outputs of the PLL1705 can be controlled by sampling frequency-control pins and those of the PLL1706 can be controlled through serial-mode control pins. The device gives customers both cost and space savings by eliminating external components and enables customers to achieve the very low-jitter performance needed for high performance audio DACs and/or ADCs. The PLL1705 and PLL1706 are ideal for MPEG-2 applications which use a 27-MHz master clock such as DVD players, DVD add-on cards for multimedia PCs, digital HDTV systems, and set-top boxes.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

<sup>†</sup>The PLL1705 and PLL1706 use the same die and they are electrically identical except for mode control.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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## PLL1705 PLL1706



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This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### PACKAGE/ORDERING INFORMATION

PRODUCT	PACKAGE	PACKAGE CODE	OPERATION TEMPERATURE RANGE	PACKAGE MARKING	ORDERING NUMBER	TRANSPORT MEDIA
	0000.00	000000	0500 1- 0500	DI 1 4705	PLL1705DBQ	Tube
PLL1705DBQ	SSOP 20	20DBQ	–25°C to 85°C PLL1705		PLL1705DBQR	Tape and reel
	0000.00	000000		DI 1 4700	PLL1706DBQ	Tube
PLL1706DBQ	SSOP 20	20DBQ	–25°C to 85°C	PLL1706	PLL1706DBQR	Tape and reel

### **ABSOLUTE MAXIMUM RATINGS**

over operating free-air temperature range unless otherwise noted<sup>(1)</sup>

	PLL1705 AND PLL1706
Supply voltage: V <sub>CC</sub> , V <sub>DD</sub> 1–3	4 V
Supply voltage differences: V <sub>CC</sub> , V <sub>DD</sub> 1–3	±0.1 V
Ground voltage differences: AGND, DGND1–3	±0.1 V
Digital input voltage: FS1 (MD), FS2 (MC), SR (ML), CSEL	– 0.3 V to (V <sub>DD</sub> + 0.3) V
Analog input voltage, XT1, XT2	- 0.3 V to (V <sub>CC</sub> + 0.3) V
Input current (any pins except supplies)	±10 mA
Ambient temperature under bias	–40°C to 125°C
Storage temperature	–55°C to 150°C
Junction temperature	150°C
Lead temperature (soldering)	260°C, 5 s
Package temperature (IR reflow, peak)	260°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. TEXAS INSTRUMENTS www.ti.com

### **ELECTRICAL CHARACTERISTICS**

all specifications at  $T_A = 25^{\circ}C$ ,  $V_{DD}1 - V_{DD}3$  (=  $V_{DD}$ ) =  $V_{CC} = 3.3 \text{ V}$ ,  $f_M = 27 \text{ MHz}$ , crystal oscillation,  $f_S = 48 \text{ kHz}$  (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
DIGITAL I	NPUT/OUTPUT		•				
	Logic input		CMOS compati	ible			
VIH (1)			0.7V <sub>DD</sub>		3.6		
V <sub>IL</sub> <sup>(1)</sup>	Input logic level				0.3 V <sub>DD</sub>	Vdc	
I <sub>IH</sub> (1)		V <sub>IN</sub> = V <sub>DD</sub>		65	100		
I <sub>IL</sub> (1)	Input logic current	V <sub>IN</sub> = 0 V			±10	μA	
	Logic output		CMOS				
VOH <sup>(2)</sup>		$I_{OH} = -4 \text{ mA}$	V <sub>DD</sub> – 0.4 V			Vdc	
Vol (2)	Output logic level	I <sub>OL</sub> = 4 mA			0.4	Vdc	
		Standard fS	32	44.1	48		
	Sampling frequency	Double f <sub>S</sub>	64	88.2	96	kHz	
MASTER	CLOCK (MCKO1, 2) CHARACTERIS	<b>TICS</b> (f <sub>M</sub> = 27 MHz, C <sub>1</sub> = C <sub>2</sub> = 15 pF, C <sub>L</sub>	= 20 pF on measure	ement pin)			
	Master clock frequency		26.73	27	27.27	MHz	
VIH	(2)		0.7 V <sub>CC</sub>				
VIL	Input level <sup>(3)</sup>				0.3 V <sub>CC</sub>	V	
<u></u> Iн	(2)	V <sub>IN</sub> = V <sub>CC</sub>			±10		
<u>ц</u>	Input current <sup>(3)</sup>	$V_{IN} = 0 V$			±10	μA	
	Output voltage (4)			3.5		Vp-p	
	Output rise time	20% to 80% of V <sub>DD</sub>		2.0		ns	
	Output fall time	80% to 20% of V <sub>DD</sub>		2.0		ns	
		For crystal oscillation	45%	48%	55%		
	Duty cycle	For external clock		50%			
	Clock jitter (5)			50		ps	
	Power-up time (6)			0.5	1.5	ms	
PLL AC C	HARACTERISTICS (SCKO0-3) (fM	= 27 MHz, C <sub>L</sub> = 20 pF on measurement p	in)				
SCKO0		Fixed		33.8688			
SCKO1		Selectable for 44.1 kHz	16.9344		33.8688		
SCKO2	Output system clock frequency	256 fS	8.192	12.288	24.576	MHz	
SCKO3		384 f <sub>S</sub>	12.288	18.432	36.864		
	Output rise time	20% to 80% of V <sub>DD</sub>		2.0		ns	
	Output fall time	80% to 20% of V <sub>DD</sub>		2.0		ns	
	Output duty cycle		45	50	55	%	
	Output clock jitter (5)			50	100	ps	
		PLL1705, to stated output frequency		50	150	ns	
	Frequency Settling Time(7)	PLL1706, to stated output frequency		80	200	ns	
	Power-up time (8)	To stated output frequency		3	6	ms	

(1) Pins 5, 6, 7, 12: FS1/MD, FS2/MC, SR/ML, CSEL (Schmitt-trigger input with internal pulldown, 3.3-V tolerant)

(2) Pins 2, 3, 14, 15, 18, 19: SCKO2, SCKO3, MCKO1, MCKO2, SCKO1, SCKO0

(3) Pin 10: XT1

(4) Pin 11: XT2

(5) Jitter performance is specified as standard deviation of jitter for 27-MHz crystal oscillation and default SCKO frequency setting. Jitter performance varies with master clock mode, SCKO frequency setting and load capacitance on each clock output.

(6) The delay time from power on to oscillation

(7) The settling time when the sampling frequency is changed

(8) The delay time from power on to lockup

(9) f<sub>M</sub> = 27-MHz crystal oscillation, no load on MCKO1, MCKO2, SCKO0, SCKO1, SCKO2, SCKO3. Power supply current varies with sampling frequency selection and load condition.

(10) While all bits of CE[6:1] are 0, the PLL1706 goes into power-down mode.

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#### ELECTRICAL CHARACTERISTICS(continued)

all specifications at T<sub>A</sub> = 25°C, V<sub>DD</sub>1–V<sub>DD</sub>3 (= V<sub>DD</sub>) = V<sub>CC</sub> = 3.3 V, f<sub>M</sub> = 27 MHz, crystal oscillation, f<sub>S</sub> = 48 kHz (unless otherwise noted)

			-		1	
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SU	PPLY REQUIREMENTS					
V <sub>CC</sub> , V <sub>DD</sub>	Supply voltage range		2.7	3.3	3.6	Vdc
	Supply current (9)	$V_{DD} = V_{CC} = 3.3 \text{ V}, \text{ f}_{S} = 48 \text{ kHz}$		19	25	mA
IDD + ICC	Supply current (9)	Power down <sup>(10)</sup>		320	500	μΑ
	Power dissipation	$V_{DD} = V_{CC} = 3.3 \text{ V}, \text{ f}_{S} = 48 \text{ kHz}$		63	90	mW
TEMPERAT	URE RANGE					
	Operating temperature		-25		85	°C
θJA	Thermal resistance	PLL1705/6DBQ: 20-pin SSOP (150 mil)		150		°C/W

(1) Pins 5, 6, 7, 12: FS1/MD, FS2/MC, SR/ML, CSEL (Schmitt-trigger input with internal pulldown, 3.3-V tolerant)

(2) Pins 2, 3, 14, 15, 18, 19: SCKO2, SCKO3, MCKO1, MCKO2, SCKO1, SCKO0

(3) Pin 10: XT1

(4) Pin 11: XT2

(5) Jitter performance is specified as standard deviation of jitter for 27-MHz crystal oscillation and default SCKO frequency setting. Jitter performance varies with master clock mode, SCKO frequency setting and load capacitance on each clock output.

(6) The delay time from power on to oscillation

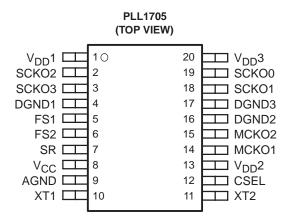
(7) The settling time when the sampling frequency is changed

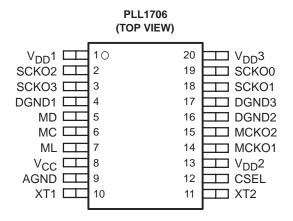
(8) The delay time from power on to lockup

(9) f<sub>M</sub> = 27-MHz crystal oscillation, no load on MCKO1, MCKO2, SCKO0, SCKO1, SCKO2, SCKO3. Power supply current varies with sampling frequency selection and load condition.

(10) While all bits of CE[6:1] are 0, the PLL1706 goes into power-down mode.

#### PIN ASSIGNMENTS





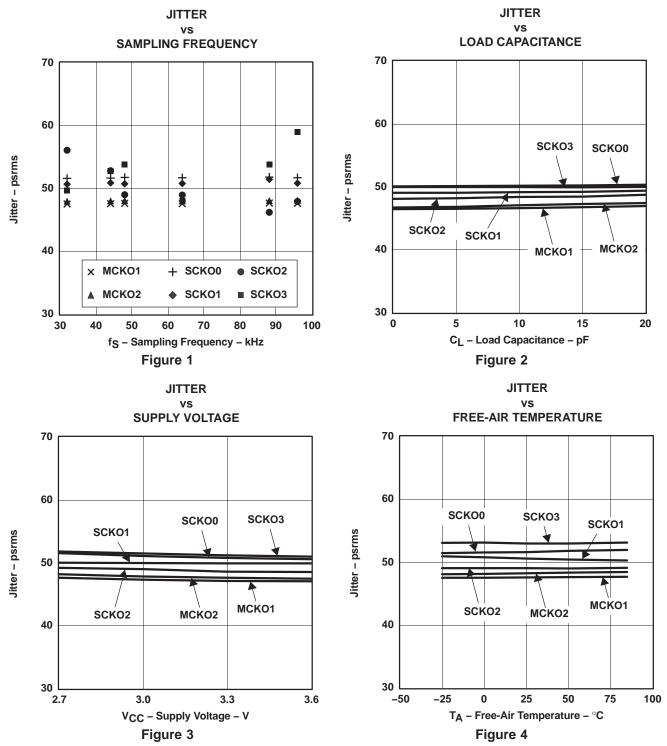
### **Terminal Functions**

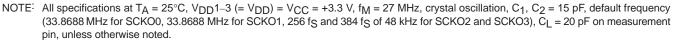
TERMINAL			DECODIDEION
NAME	NO.	I/O	DESCRIPTION
AGND	9	-	Analog ground
CSEL	12	IN	SCKO1 frequency selection control <sup>(1)</sup>
DGND1	4	_	Digital ground 1
DGND2	16	-	Digital ground 2
DGND3	17	_	Digital ground 3
FS1(MD)	5	IN	Sampling frequency group control in PLL1705, data input for serial control in PLL1706 <sup>(1)</sup>
FS2(MC)	6	IN	Sampling frequency group control in PLL1705, bit clock input for serial control in PLL1706 <sup>(1)</sup>
MCKO1	14	OUT	27-MHz master clock output 1
MCKO2	15	OUT	27-MHz master clock output 2
SCKO0	19	OUT	System clock output 0 (33.8688 MHz fixed)
SCKO1	18	OUT	System clock output 1 (selectable for 44.1 kHz)
SCKO2	2	OUT	System clock output 2 (256 fg)
SCKO3	3	OUT	System clock output 3 (384 fg)
SR(ML)	7	IN	Sampling rate control in PLL1705, load strobe input for serial control in PLL1706 <sup>(1)</sup>
VCC	8	-	Analog power supply, 3.3 V
V <sub>DD</sub> 1	1	-	Digital power supply 1, 3.3 V
V <sub>DD</sub> 2	13	-	Digital power supply 2, 3.3 V
V <sub>DD</sub> 3	20	-	Digital power supply 3, 3.3 V
XT1	10	IN	27-MHz crystal oscillator, or external clock input
XT2	11	OUT	27-MHz crystal oscillator, must be OPEN for external clock input mode

(1) Schmitt-trigger input with internal pulldown.



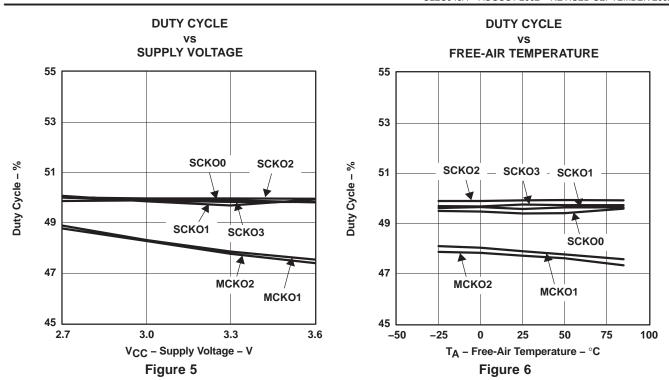
### **TYPICAL PERFORMANCE CURVES**

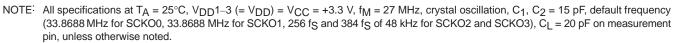






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### THEORY OF OPERATION

### MASTER CLOCK AND SYSTEM CLOCK OUTPUT

The PLL1705/6 consists of a dual PLL clock and master clock generator which generates four system clocks and two buffered 27-MHz clocks from a 27-MHz master clock. Figure 7 shows the block diagram of the PLL1705/6. The PLL is designed to accept a 27-MHz master clock.

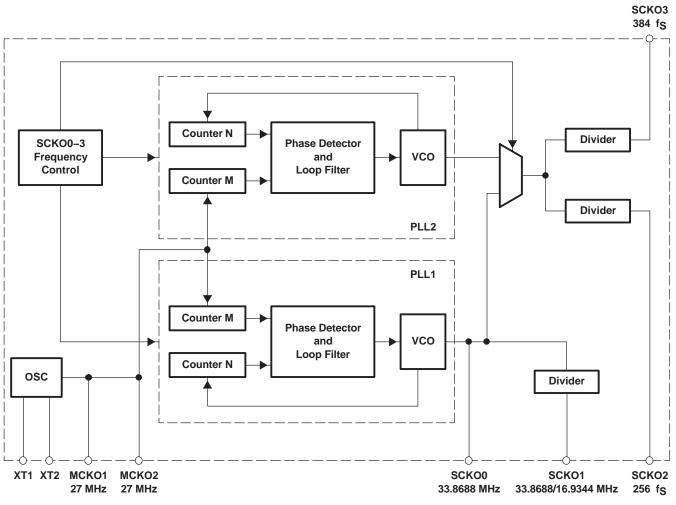
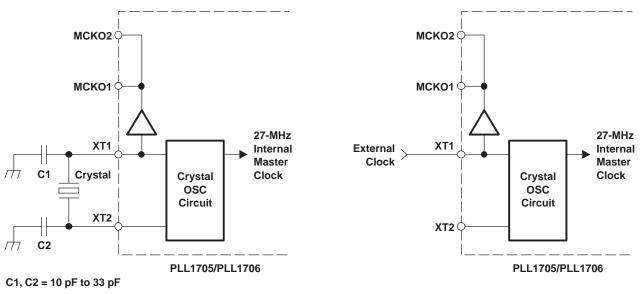


Figure 7. Block Diagram

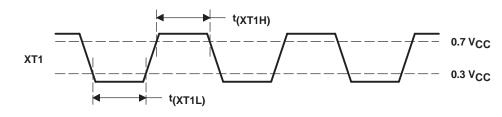
The master clock can be either a crystal oscillator placed between XT1 (pin 10) and XT2 (pin 11), or an external input to XT1. If an external master clock is used, XT2 must be open. Figure 8 illustrates possible system clock connection options, and Figure 9 illustrates the 27-MHz master clock timing requirement.



**Crystal Resonator Connection** 

External Clock Input Connection

#### Figure 8. Master Clock Generator Connection Diagram



DESCRIPTION	SYMBOL	MIN	MAX	UNIT
Master clock pulse duration HIGH	t <sub>XT1H</sub>	10		ns
Master clock pulse duration LOW	t <sub>XT1L</sub>	10		ns

Figure 9. External Master Clock Timing Requirement

The PLL1705/6 provides a very low-jitter, high-accuracy clock. SCKO0 outputs a fixed 33.8688-MHz clock, SCKO1 outputs 384  $f_S$  or 768  $f_S$  ( $f_S$  = 44.1 kHz) which is selected by CSEL (pin 12) for a CD-DA DSP. The output frequency of the remaining clocks is determined by the sampling frequency ( $f_S$ ) under hardware or software control. SCKO2 and SCKO3 output 256- $f_S$  and 384- $f_S$  system clocks, respectively. Table 2 shows each sampling frequency, which can be programmed. The system clock output frequencies for programmed sampling frequencies are shown in Table 3.

#### Table 1. Generated System Clock SCKO1 Frequency

CSEL	SCKO1 FREQUENCY
LOW	33.8688 MHz
HIGH	16.9344 MHz

#### **Table 2. Sampling Frequencies**

SAMPLING RATE	SAMPLING FREQUENCY (kHz)			
Standard sampling frequencies	32	44.1	48	
Double sampling frequencies	64	88.2	96	



SAMPLING FREQUENCY (kHz)	SAMPLING RATE	SCKO2 (MHZ)	SCKO3 (MHZ)
32	Standard	8.192	12.288
44.1	Standard	11.2896	16.9344
48	Standard	12.288	18.432
64	Double	16.384	24.576
88.2	Double	22.5792	33.8688
96	Double	24.576	36.864

#### Table 3. Sampling Frequencies and System Clock Output Frequencies

Response time from power on (or applying the clock to XT1) to SCKO settling time is typically 3 ms. Delay time from sampling frequency change to SCKO settling is 200 ns maximum. This clock transient timing is not synchronized with the SCKOx signals. Figure 10 illustrates SCKO transient timing in the PLL1706. External buffers are recommended on all output clocks in order to avoid degrading the jitter performance of the PLL1705/6.

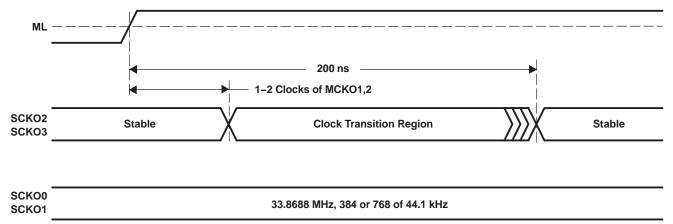
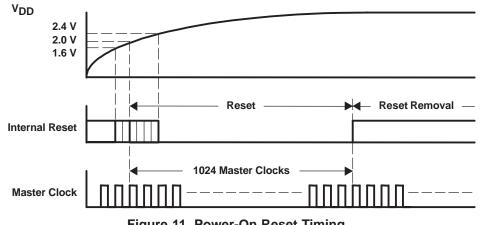


Figure 10. System Clock Transient Timing

### **POWER-ON RESET**

The PLL1705/6 has an internal power-on reset circuit. The mode register of PLL1706 is initialized with default settings by power-on reset. Throughout the reset period, all clock outputs are enabled with the default settings after power up time. Initialization by internal power-on reset is done automatically during 1024 master clocks at V<sub>DD</sub> > 2.0 V (TYP). Power-on reset timing is shown in Figure 11.





### **FUNCTION CONTROL**

The built-in functions of the PLL1705 can be controlled in the parallel mode (hardware mode), which uses SR (pin 7), FS1 (pin 5) and FS2 (pin 6). The PLL1706 can be controlled in the serial mode (software mode), which uses a three-wire interface by ML (pin 7), MC (pin 6), and MD (pin 5). The selectable functions are shown in Table 4.

SELECTABLE FUNCTION	PARALLEL MODE	SERIAL MODE
Sampling frequency select (32 kHz, 44.1 kHz, 48 kHz)	Yes	Yes
Sampling rate select (standard/double)	Yes	Yes
Each clock output enable/disable	No	Yes
Power down	No	Yes

#### **Table 4. Selectable Functions**

#### PLL1705 (Parallel Mode)

In the parallel mode, the following functions can be selected:

#### Sampling Frequency Group Select

The sampling frequency group can be selected by FS1 (pin 5) and FS2 (pin 6).

FS2 (PIN 6)	FS1 (PIN 5)	SAMPLING FREQUENCY
LOW	LOW	48 kHz
LOW	HIGH	44.1 kHz
HIGH	LOW	32 kHz
HIGH	HIGH	Reserved

#### Sampling Rate Select

The sampling rate can be selected by SR (pin 7)

SR (PIN 7)	SAMPLING RATE
LOW	Standard
HIGH	Double

#### PLL1706 (Serial Mode)

The built-in functions of the PLL1706 are shown in Table 5. These functions are controlled using the ML, MC, and MD serial control signals.

#### **Table 5. Selectable Functions**

SELECTABLE FUNCTION	DEFAULT
Sampling frequency select (32 kHz, 44.1 kHz, 48 kHz)	48-kHz group
Sampling rate select (standard/double)	Standard
Each clock output enable/disable	Enabled
Power down	Disabled

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#### **Program-Register Bit Mapping**

**PLL1705** 

**PLL1706** 

The built-in functions of the PLL1706 are controlled through a 16-bit program register. This register is loaded using MD, MC and ML. After the 16 data bits are clocked in using the rising edge of MC, ML is used to latch the data into the register. Table 6 shows the bit mapping of the register. The serial mode control format and control data input timing are shown in Figure 12 and Figure 13, respectively.

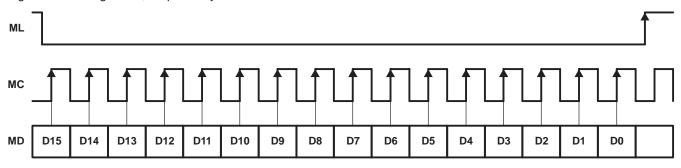
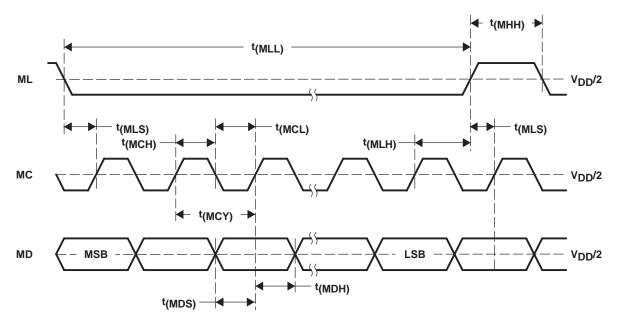


Figure 12. Serial Mode Control Format



DESCRIPTION	SYMBOL	MIN	TYP	MAX	UNIT
MC pulse cycle time	tMCY	100			ns
MC pulse duration LOW	tMCL	40			ns
MC pulse duration HIGH	<sup>t</sup> MCH	40			ns
MD hold time	<sup>t</sup> MDH	40			ns
MD setup time	<sup>t</sup> MDS	40			ns
ML low-level time	tMLL	16			MC clocks(1)
ML high-level time	<sup>t</sup> MHH	200			ns
ML hold time <sup>(2)</sup>	tMLH	40			ns
ML setup time <sup>(3)</sup>	<sup>t</sup> MLS	40			ns

(1) MC clocks: MC clock period

(2) MC rising edge for LSB to ML rising edge

<sup>(3)</sup> ML rising edge to the next MC rising edge. If the MC clock is stopped after the LSB, any ML rise time is accepted.

#### Figure 13. Control Data Input Timing



#### **Mode Register**

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	1	1	1	0	0	CE6	CE5	CE4	CE3	CE2	CE1	RSV	SR	FS2	FS1

#### Table 6. Register Mapping

REGISTER	BIT NAME	DESCRIPTION
	CE6	MCKO2 output enable/disable
	CE5	MCKO1 output enable/disable
	CE4	SCKO1 output enable/disable
	CE3	SCKO3 output enable/disable
Mode control	CE2	SCKO2 output enable/disable
	CE1	SCKO0 output enable/disable
	RSV	Reserved, must be 0
	SR	Sampling rate select
	FS[2:1]	Sampling frequency select

#### FS[2:1]: Sampling Frequency Group Select

FS2	FS1	SAMPLING FREQUENCY	DEFAULT
0	0	48 kHz	0
0	1	44.1 kHz	
1	0	32 kHz	
1	1	Reserved	

#### SR: Sampling Rate Select

SR	SAMPLING RATE	DEFAULT
0	Standard	0
1	Double	

#### CE [6:1]: Clock Output Control

CE1–CE6	CLOCK OUTPUT CONTROL	DEFAULT
0	Clock output disable	
1	Clock output enable	0

While all the bits of CE [6:1] are 0, the PLL1706 goes into the power-down mode, all dynamic operation including PLLs and the oscillator halt, but serial mode control is enabled for resumption.

#### CONNECTION DIAGRAM

Figure 14 shows the typical connection circuit for the PLL1705. There are four grounds for digital and analog power supplies. However, the use of one common ground connection is recommended to avoid latch-up or other power-supply-related troubles. Power supplies should be bypassed as close as possible to the device.

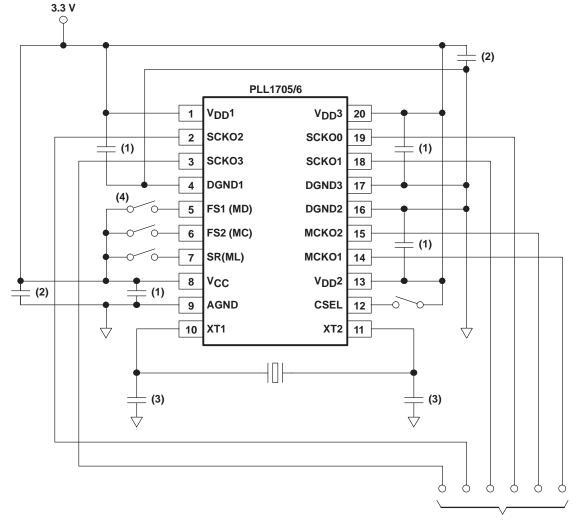
#### **MPEG-2 APPLICATIONS**

Typical applications for the PLL1705/6 are MPEG-2 based systems such as DVD players, DVD add-on cards for multimedia PCs, digital HDTV systems, and set-top boxes. The PLL1705/6 provides audio system clocks for a CD-DA DSP, DVD DSP, Karaoke DSP, and DAC(s) from a 27-MHz video clock.

PLL1705 PLL1706

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Clock Outputs (5)

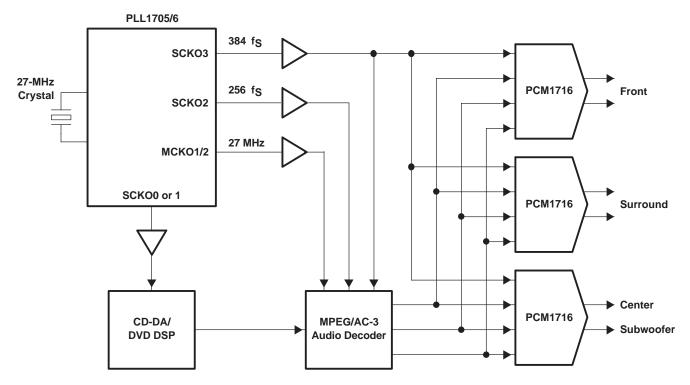
(1) 0.1-µF ceramic capacitor typical, depending on quality of power supply and pattern layout

- (2) 10-µF aluminum electrolytic capacitor typical, depending on quality of power supply and pattern layout
- (3) 27-MHz quartz crystal and 10–33 pF × 2 ceramic capacitors, which generate the appropriate amplitude of oscillation on XT1/XT2
- (4) This connection is for PLL1705 (parallel mode); when PLL1706 (serial mode) is to be used, control pins must be connected to serial interfaced controller.

(5) For good jitter performance, minimize the load capacitance on the clock output.

#### Figure 14. Typical Connection Diagram

#### **BLOCK DIAGRAM OF MPEG-2 BASED SYSTEM APPLICATION**



PLL1705 PLL1706

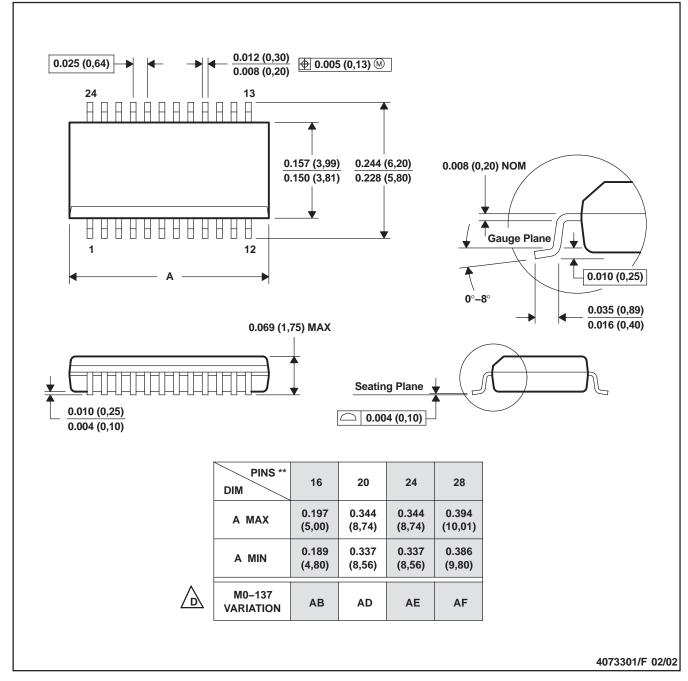
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**MECHANICAL DATA** 

#### DBQ (R-PDSO-G\*\*)

#### PLASTIC SMALL-OUTLINE PACKAGE



NOTES:A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- D. Falls within JEDEC MO-137.

#### **PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
PLL1705DBQ	ACTIVE	SSOP/ QSOP	DBQ	20	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1705DBQG4	ACTIVE	SSOP/ QSOP	DBQ	20	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1705DBQR	ACTIVE	SSOP/ QSOP	DBQ	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1705DBQRG4	ACTIVE	SSOP/ QSOP	DBQ	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1706DBQ	ACTIVE	SSOP/ QSOP	DBQ	20	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1706DBQG4	ACTIVE	SSOP/ QSOP	DBQ	20	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1706DBQR	ACTIVE	SSOP/ QSOP	DBQ	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PLL1706DBQRG4	ACTIVE	SSOP/ QSOP	DBQ	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details. TBD: The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

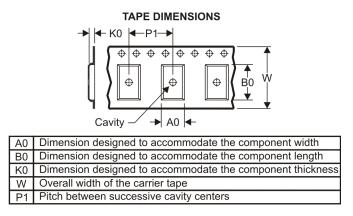
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### TAPE AND REEL INFORMATION





## QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal												
Device		Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
PLL1705DBQR	SSOP/ QSOP	DBQ	20	2000	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
PLL1706DBQR	SSOP/ QSOP	DBQ	20	2000	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1



# PACKAGE MATERIALS INFORMATION

11-Mar-2008



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
PLL1705DBQR	SSOP/QSOP	DBQ	20	2000	346.0	346.0	33.0
PLL1706DBQR	SSOP/QSOP	DBQ	20	2000	346.0	346.0	33.0

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