



## Peak EMI Reducing Solution

### Features

- Generates a 1X low EMI spread spectrum clock of the input frequency.
- Integrated loop filter components.
- Operates with a 3.3V / 2.5V supply.
- Operating current less than 4mA.
- CMOS design.
- Input frequency range: 6MHz to 12MHz for 2.5V  
6MHz to 13MHz for 3.3V
- Frequency deviation:  $\pm 1\%$  @ 10MHz
- 6L-TSOP (6L-TSOT-23)

### Product Description

The ASM3P2669A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2669A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2669A allows significant

system cost savings by reducing the number of circuit board layers, ferrite beads and shielding that are traditionally required to pass EMI regulations.

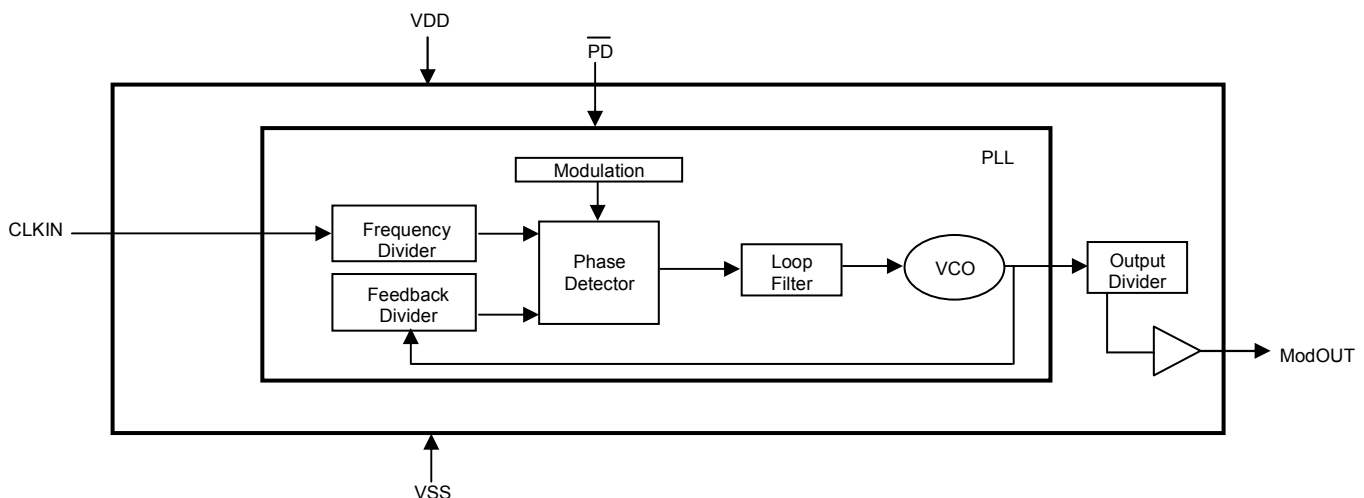
The ASM3P2669A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2669A modulates the output of a single PLL in order to “spread” the bandwidth of a synthesized clock, and more importantly, decreases the peak amplitudes of its harmonics. This results in significantly lower system EMI compared to the typical narrow band signal produced by oscillators and most frequency generators. Lowering EMI by increasing a signal’s bandwidth is called ‘spread spectrum clock generation.’

### Application

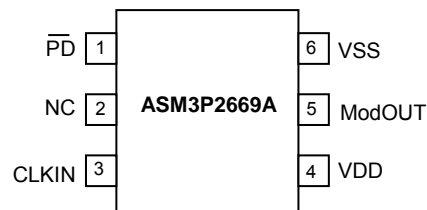
The ASM3P2669A is targeted towards all portable devices like MP3 players and digital still cameras.

### Block Diagram



# ASM3P2669A

## Pin Configuration (6L- TSOP Package)



## Pin Description

Pin#	Pin Name	Type	Description
1	$\overline{\text{PD}}$	I	Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used.
2	NC	-	No connect.
3	CLKIN	I	External reference clock input.
4	VDD	P	Power supply for the entire chip.
5	ModOUT	O	Spread spectrum clock output.
6	VSS	P	Ground connection.

## Specifications

VDD (V)	Frequency Range (MHz)	Modulation Rate
2.5	6-12	$F_{\text{IN}}/256$
3.3	6-13	

## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
VDD, V <sub>IN</sub>	Voltage on any pin with respect to Ground	-0.5 to +4.6	V
T <sub>STG</sub>	Storage temperature	-65 to +125	°C
T <sub>s</sub>	Max. Soldering Temperature (10 sec)	260	°C
T <sub>J</sub>	Junction Temperature	150	°C
T <sub>DV</sub>	Static Discharge Voltage (As per JEDEC STD22- A114-B)	2	KV

Note: These are stress ratings only and are not implied for functional use. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability.

## Operating Conditions

Parameter	Description	Min	Max	Unit
VDD	Supply Voltage	2.375	3.6	V
T <sub>A</sub>	Operating Temperature (Ambient Temperature)	-40	+85	°C
C <sub>L</sub>	Load Capacitance		15	pF
C <sub>IN</sub>	Input Capacitance		7	pF

## DC Electrical Characteristics for 2.5V Supply

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>IL</sub>	Input low voltage	VSS-0.3		0.8	V
V <sub>IH</sub>	Input high voltage	2.0		VDD+0.3	V
I <sub>IL</sub>	Input low current			-35	μA
I <sub>IH</sub>	Input high current			35	μA
V <sub>OL</sub>	Output low voltage (VDD = 2.5 V, I <sub>OL</sub> = 8mA)			0.6	V
V <sub>OH</sub>	Output high voltage (VDD = 2.5 V, I <sub>OH</sub> = 8mA)	1.8			V
I <sub>DD</sub>	Static supply current <sup>1</sup>			10	uA
I <sub>CC</sub>	Dynamic supply current (Unloaded Output)		2	2.5	mA
VDD	Operating voltage	2.375	2.5	2.625	V
t <sub>ON</sub>	Power-up time (first locked cycle after power-up) <sup>2</sup>			5	mS
Z <sub>OUT</sub>	Output impedance		40		Ω

Notes: 1. XIN / CLKIN pin and PD pin are pulled low.  
 2. V<sub>DD</sub> and XIN / CLKIN input are stable, PD pin is made high from low.

## AC Electrical Characteristics for 2.5V Supply

Symbol	Parameter	Min	Typ	Max	Unit
CLKIN	Input frequency	6		12	MHz
ModOUT	Output frequency	6		12	MHz
f <sub>d</sub>	Frequency Deviation	CLKIN = 6MHz	±1.25		%
		CLKIN = 10MHz	±1		
		CLKIN = 12MHz	±0.9		
t <sub>LH</sub> <sup>1</sup>	Output Rise time (measured from 0.7V to 1.7V)	0.9	1.7	2.5	nS
t <sub>HL</sub> <sup>1</sup>	Output Fall time (measured from 1.7V to 0.7V)	0.6	1	1.5	nS
t <sub>D</sub>	Output Duty Cycle	45	50	55	%
t <sub>JC</sub>	Cycle-to-Cycle Jitter		±250	±400	pS

Note: 1. t<sub>LH</sub> and t<sub>HL</sub> are measured into a capacitive load of 15pF.

## DC Electrical Characteristics for 3.3V Supply

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>IL</sub>	Input low voltage	VSS-0.3		0.8	V
V <sub>IH</sub>	Input high voltage	2.0		VDD+0.3	V
I <sub>IL</sub>	Input low current			-35	μA
I <sub>IH</sub>	Input high current			35	μA
V <sub>OL</sub>	Output low voltage (VDD = 3.3 V, I <sub>OL</sub> = 8mA)			0.4	V
V <sub>OH</sub>	Output high voltage (VDD = 3.3 V, I <sub>OH</sub> = 8mA)	2.5		-	V
I <sub>DD</sub>	Static supply current <sup>1</sup>			10	uA
I <sub>CC</sub>	Dynamic supply current (Unloaded Output)		2.5	3	mA
VDD	Operating voltage	2.7	3.3	3.6	V
t <sub>ON</sub>	Power-up time (first locked cycle after power-up) <sup>2</sup>			5	mS
Z <sub>OUT</sub>	Output impedance		35		Ω

Notes: 1. XIN / CLKIN pin and PD pin are pulled low.  
 2. V<sub>DD</sub> and XIN / CLKIN input are stable, PD pin is made high from low.

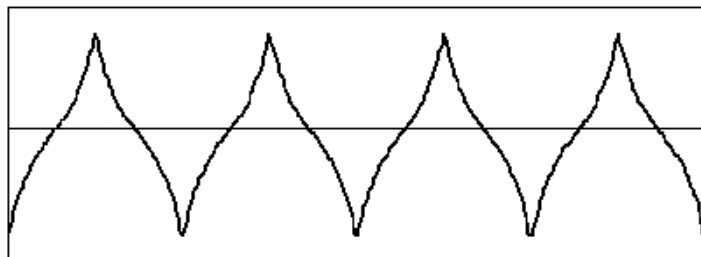
## AC Electrical Characteristics for 3.3V Supply

Symbol	Parameter	Min	Typ	Max	Unit
CLKIN	Input frequency	6		13	MHz
ModOUT	Output frequency	6		13	MHz
f <sub>d</sub>	Frequency Deviation	CLKIN = 6MHz	±1.25		%
		CLKIN = 10MHz	±1		
		CLKIN = 13MHz	±0.9		
t <sub>LH</sub> <sup>1</sup>	Output Rise time (measured from 0.8V to 2.0V)	0.7	1.3	1.7	nS
t <sub>HL</sub> <sup>1</sup>	Output Fall time (measured at 2.0V to 0.8V)	0.6	0.9	1.3	nS
t <sub>D</sub>	Output Duty Cycle	45	50	55	%
t <sub>JC</sub>	Cycle - Cycle Jitter		±300	±450	pS

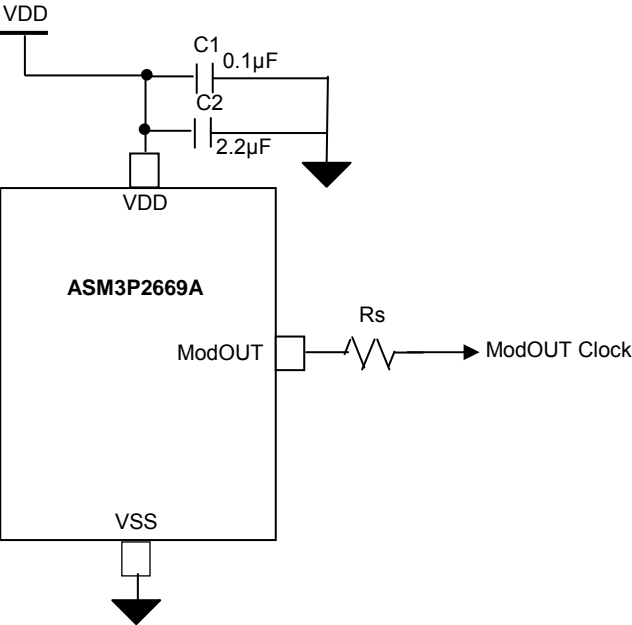
Note: 1. t<sub>LH</sub> and t<sub>HL</sub> are measured into a capacitive load of 15pF.

Note: All parameters are at an Extended Industrial temperature range unless otherwise stated.

## Modulation Profile

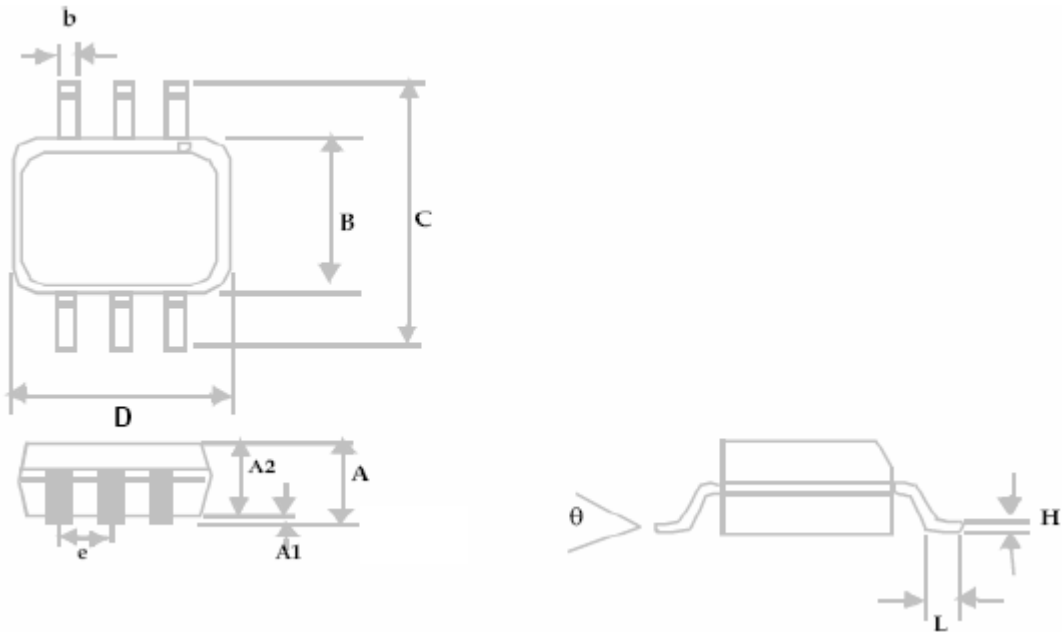


Typical Application Schematic



Package Information

6L-TSOP Package




Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.04		1.00
A1	0.00	0.004	0.00	0.10
A2	0.033	0.036	0.84	0.90
b	0.012	0.02	0.30	0.50
H	0.005 BSC		0.127 BSC	
D	0.114 BSC		2.90 BSC	
B	0.06 BSC		1.60 BSC	
e	0.0374 BSC		0.950 BSC	
C	0.11 BSC		2.80 BSC	
L	0.0118	0.02	0.30	0.50
θ	0°	4°	0°	4°

## Ordering Information

Part Number	Marking	Package Type	Temperature
ASM3P2669AF-06OR	H4L	6L-TSOP (6L-TSOT-23), TAPE & REEL, Pb Free	0°C to +70°C
ASM3I2669AF-06OR	H5L	6L-TSOP (6L-TSOT-23), TAPE & REEL, Pb Free	-40°C to +85°C

A "microdot" placed at the end of last row of marking or just below the last row toward the center of package indicates Pb-free.

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