



# Peak EMI Reducing Solution

## Features

- Generates a 1X low EMI optimized clock signal at the output.
- Integrated loop filter components.
- Operates with a 3.3 / 2.5V Supply.
- Operating current less than 5mA.
- CMOS design.
- Input frequency range:
  - 60MHz to 120MHz for 2.5V
  - 60MHz to 120MHz for 3.3V
- Frequency deviation:  $\pm 1.5$  (Typ) @ 85MHz Output frequency.
- Available in 6L-TSOP (6L-TSOT-23) Package.

## Product Description

The ASM3P2598A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2598A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2598A 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 ASM3P2598A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2598A 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 result 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.’

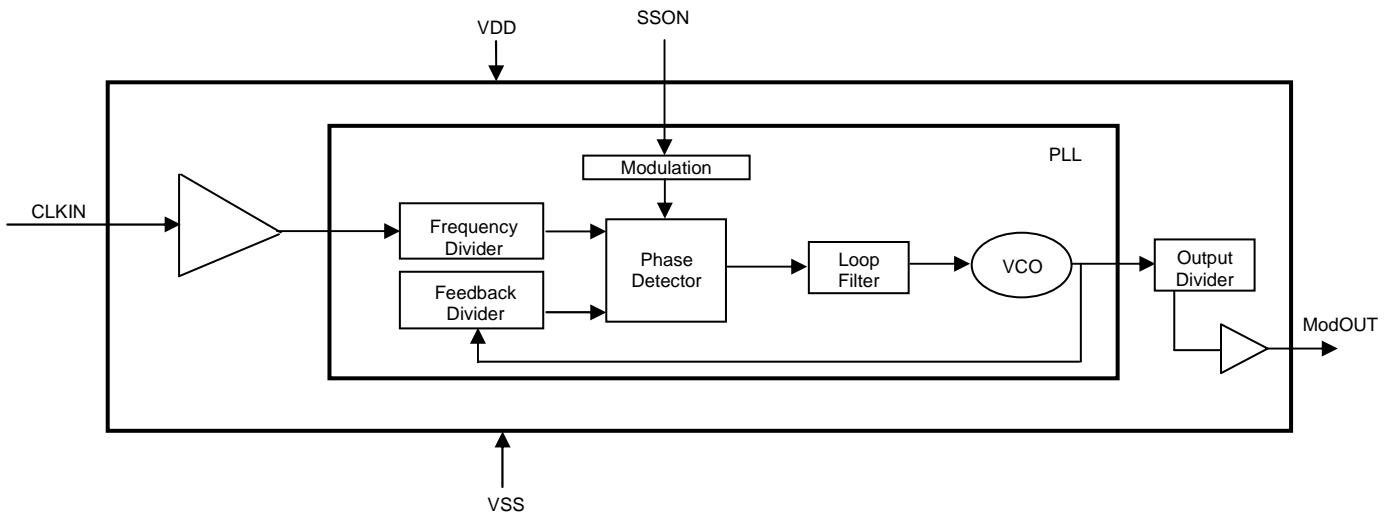
## Applications

The ASM3P2598A is targeted towards all portable devices with very low power requirements like MP3 players, MFP, LCD Panel Module and digital still cameras.

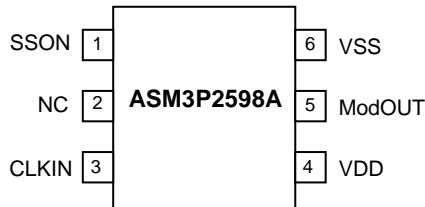
## Key Specifications

Description	Specification
Supply voltages	VDD = 3.3V / 2.5V
Cycle-to-Cycle Jitter	$\pm 360$ pS (Typ)
Output Duty Cycle	45/55%
Modulation Rate Equation	$F_{IN}/2560$
Frequency Deviation	$\pm 1.5\%$ (Typ) @ 85MHz Output

## Block Diagram



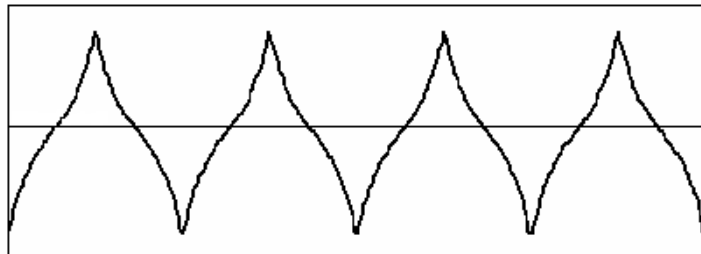
### Pin Configuration (6L-TSOP Package)



### Pin Description

Pin#	Pin Name	Type	Description
1	SSON	I	When SSON is HIGH, the spread spectrum is enabled and when LOW, it turns off the spread spectrum. Connect the pin to ground When Spread Spectrum feature is not required.
2	NC	-	No Connect.
3	CLKIN	I	Clock Input.
4	VDD	P	Power supply for the entire chip.
5	ModOUT	O	Spread spectrum clock output.
6	VSS	P	Ground connection.

### Modulation Profile



### Specifications

Description		Specification
Frequency Range	For 2.5V Supply	60MHz < CLKIN < 120MHz
	For 3.3V Supply	60MHz < CLKIN < 120MHz
Modulation Equation		$F_{IN}/2560$
Frequency Deviation		$\pm 1.5\%$ (Typ) @ 85MHz Output

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
VDD, VIN	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)	0	70	°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 = 2.5V, I <sub>OL</sub> = 8mA)			0.6	V
V <sub>OH</sub>	Output high voltage (VDD = 2.5V, I <sub>OH</sub> = 8mA)	1.8			V
I <sub>DD</sub>	Static supply current <sup>1</sup>		1.8		mA
I <sub>CC</sub>	Dynamic supply current (2.5V, 85MHz and no load)		4.0		mA
VDD	Operating voltage	2.375	2.5	2.625	V
t <sub>ON</sub>	Power-up time (first locked cycle after power-up)			5	mS
Z <sub>OUT</sub>	Output impedance		50		Ω

Note: 1. CLKIN pin is pulled low.

### AC Electrical Characteristics for 2.5V Supply

Symbol	Parameter	Min	Typ	Max	Unit
CLKIN	Input frequency	60		120	MHz
ModOUT	Output frequency	60		120	MHz
f <sub>d</sub>	Frequency Deviation	Input Frequency = 60MHz		±1.6	%
		Input Frequency = 120MHz		±1.1	
t <sub>LH</sub> <sup>1</sup>	Output rise time (measured from 0.7V to 1.7V)	0.7	1.8	2.6	nS
t <sub>HL</sub> <sup>1</sup>	Output fall time (measured from 1.7V to 0.7V)	0.4	0.9	1.1	nS
t <sub>JC</sub>	Jitter (Cycle-to-cycle)		±360		pS
t <sub>D</sub>	Output duty cycle	45	50	55	%

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 = 3.3V, I <sub>OL</sub> = 8mA)			0.4	V
V <sub>OH</sub>	Output high voltage (VDD = 3.3V, I <sub>OH</sub> = 8mA)	2.5			V
I <sub>DD</sub>	Static supply current <sup>1</sup>		2.2		mA
I <sub>CC</sub>	Dynamic supply current (3.3V, 85MHz and no load)		4.5		mA
VDD	Operating voltage	3.0	3.3	3.6	V
t <sub>ON</sub>	Power-up time (first locked cycle after power-up)			5	mS
Z <sub>OUT</sub>	Output impedance		45		Ω

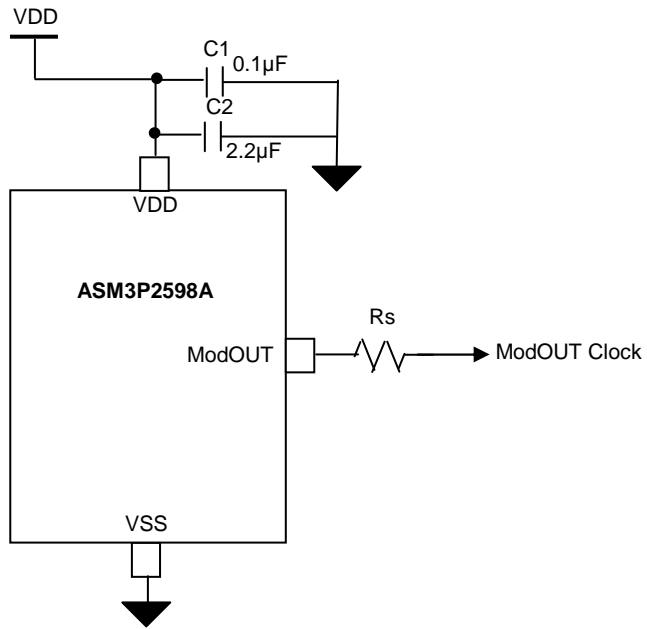
Note: 1. CLKIN pin is pulled low.

### AC Electrical Characteristics for 3.3V Supply

Symbol	Parameter	Min	Typ	Max	Unit
CLKIN	Input frequency	60		120	MHz
ModOUT	Output frequency	60		120	MHz
f <sub>d</sub>	Frequency Deviation	Input Frequency = 60MHz		±1.6	%
		Input Frequency = 120MHz		±1.1	
t <sub>LH</sub> <sup>1</sup>	Output rise time (measured from 0.8 to 2.0V)	0.5	1.2	1.8	nS
t <sub>HL</sub> <sup>1</sup>	Output fall time (measured at 2.0V to 0.8V)	0.3	0.8	1.1	nS
t <sub>JC</sub>	Jitter (cycle-to-cycle)		±360		pS
t <sub>D</sub>	Output duty cycle	45	50	55	%

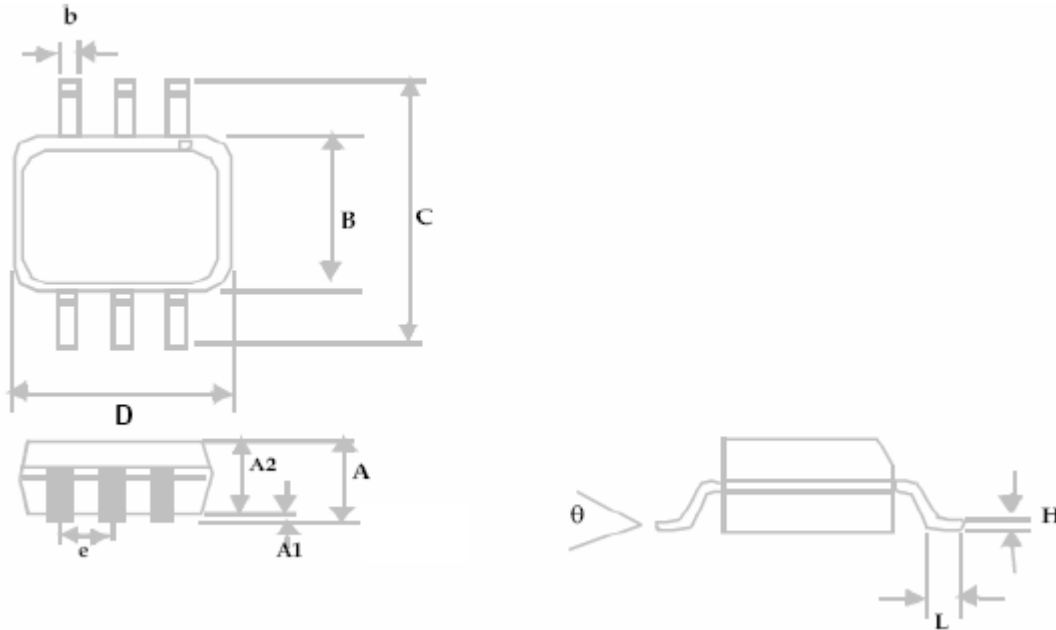
Note: 1. t<sub>LH</sub> and t<sub>HL</sub> are measured into a capacitive load of 15pF.

**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
theta	0°	4°	0°	4°


**Ordering Information**

Part Number	Marking	Package Type	Temperature
ASM3P2598AF-06OR	A11	6L-TSOP (6L-TSOT-23), TAPE & REEL, Pb Free	0°C to +70°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.

Licensed under US Patent #5,488,627 and #5,631,921.

Note: This product utilizes US Patent #6,646,463 Impedance Emulator Patent issued to PulseCore Semiconductor, dated 11-11-2003.

**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. U.S Patent Pending; Timing-Safe and Active Bead are trademarks of PulseCore Semiconductor, a wholly owned subsidiary of ON Semiconductor. This literature is subject to all applicable copyright laws and is not for resale in any manner.

#### PUBLICATION ORDERING INFORMATION

##### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855  
Toll Free USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5773-3850

**ON Semiconductor Website:**  
[www.onsemi.com](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative