

Low Power 4X Multiplier EMI Reduction IC

Features

- Generates a 4X EMI optimized clock signal at the output.
- Integrated loop filter components.
- Operates with a 3.3 / 2.5V Supply.
- Low power CMOS design.
- Input frequency range: 12MHz to 30MHz for 2.5V.
: 12MHz to 30MHz for 3.3V.
- Frequency deviation: -1.5% (Typ) @66MHz Output Frequency.
- Available in 6-pin TSOT-23 Package.

The ASM3P2274A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2274A 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’.

Product Description

The ASM3P2274 is a versatile Spread Spectrum Frequency Modulator designed specifically for a wide range of clock frequencies. It provides a 4x Spread Spectrum Modulated output from an input clock source.

The ASM3P2274A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2274A allows significant system cost savings by reducing the number of circuit board layers ferrite beads, shielding that are traditionally required to pass EMI regulations.

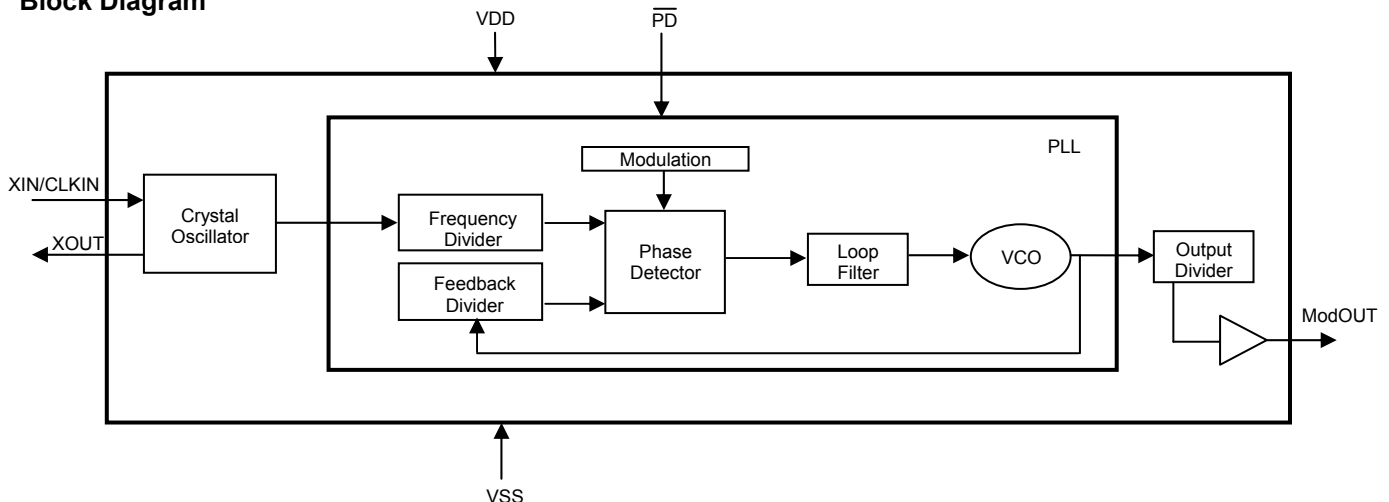
Applications

The ASM3P2274A is targeted towards all portable devices with very low power requirements like MP3 players, MFP, LCD Panel Module and digital still cameras.

Key Specifications

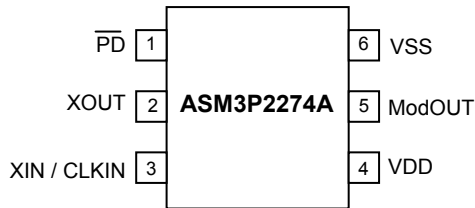
| Description | Specification |
|--------------------------|----------------------------|
| Supply voltages | VDD = 3.3V / 2.5V |
| Cycle-to-Cycle Jitter | 360pS (Typ) |
| Output Duty Cycle | 45/55% |
| Modulation Rate Equation | $F_{IN}/640$ |
| Frequency Deviation | -1.5% (Typ) @ 66MHz Output |

Block Diagram



rev 1.1

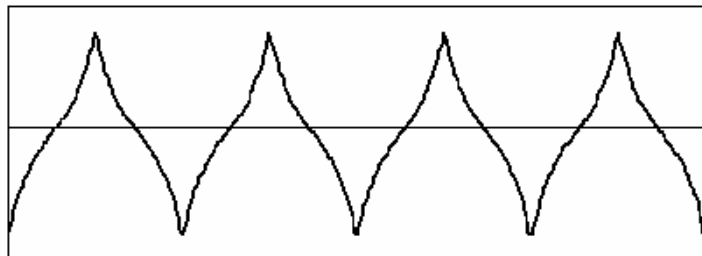
Pin Configuration (6-pin TSOT- 23 Package)



Pin Description

| Pin# | Pin Name | Type | Description |
|------|-----------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | \overline{PD} | I | Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used. |
| 2 | XOUT | O | Crystal connection. If using an external reference, this pin must be left unconnected. |
| 3 | XIN / CLKIN | I | Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock. |
| 4 | VDD | P | Power supply for the entire chip. |
| 5 | ModOUT | O | Spread spectrum clock output (4X output) |
| 6 | VSS | P | Ground connection. |

Modulation Profile



Specifications

| Description | | Specification |
|-----------------------|-----------------|----------------------------|
| Input Frequency Range | For 2.5V Supply | 12MHz < CLKIN < 30MHz |
| | For 3.3V Supply | 12MHz < CLKIN < 30MHz |
| Modulation Equation | | $F_{IN}/640$ |
| Frequency Deviation | | -1.5% (Typ) @ 66MHz Output |

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Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit |
|----------------------|----------------------------------------------------------|--------------|------|
| VDD, V _{IN} | Voltage on any pin with respect to Ground | -0.5 to +4.6 | V |
| T _{STG} | Storage temperature | -65 to +125 | °C |
| T _A | Operating temperature | -40 to +85 | °C |
| T _s | Max. Soldering Temperature (10 sec) | 260 | °C |
| T _J | Junction Temperature | 150 | °C |
| T _{DV} | 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.

DC Electrical Characteristics for 2.5V Supply

(Test condition: All parameters are measured at room temperature (+25°C) unless otherwise stated)

| Symbol | Parameter | Min | Typ | Max | Unit |
|------------------|----------------------------------------------------------|-----------|-----|-----------|------|
| V _{IL} | Input low voltage | VSS - 0.3 | - | 0.8 | V |
| V _{IH} | Input high voltage | 2.0 | - | VDD + 0.3 | V |
| I _{IL} | Input low current | - | - | -35 | µA |
| I _{IH} | Input high current | - | - | 35 | µA |
| I _{XOL} | XOUT output low current (@0.5V, VDD=2.5V) | - | 3 | - | mA |
| I _{XOH} | XOUT output high current (@1.8V, VDD=2.5V) | - | 3 | - | mA |
| V _{OL} | Output low voltage (VDD = 2.5V, I _{OL} = 8 mA) | - | - | 0.6 | V |
| V _{OH} | Output high voltage (VDD = 2.5V, I _{OH} = 8 mA) | 1.8 | - | - | V |
| I _{DD} | Static supply current* | - | - | 2 | µA |
| I _{CC} | Dynamic supply current (2.5V, 66MHz and no load) | - | 3.0 | - | mA |
| VDD | Operating voltage | 2.375 | 2.5 | 2.625 | V |
| t _{ON} | Power-up time (first locked cycle after power-up)** | - | - | 5 | mS |
| Z _{OUT} | Output impedance | - | 50 | - | Ω |

* XIN /CLKIN pin and \overline{PD} pin are pulled low

** VDD and XIN/CLKIN input are stable, \overline{PD} pin is made high from low.

AC Electrical Characteristics for 2.5V Supply

| Symbol | Parameter | Min | Typ | Max | Unit | |
|-------------------|-----------------------------------------------|---------------------------|-----|------|------|---|
| CLKIN | Input frequency | 12 | - | 30 | MHz | |
| ModOUT | Output frequency | 48 | - | 120 | MHz | |
| f _d | Frequency Deviation | Output Frequency = 48MHz | - | -1.6 | - | % |
| | | Output Frequency = 120MHz | - | -1.4 | - | |
| t _{LH} * | Output rise time (measured from 0.7V to 1.7V) | 0.5 | 2.0 | 2.3 | nS | |
| t _{HL} * | Output fall time (measured from 1.7V to 0.7V) | 0.4 | 1.0 | 1.2 | nS | |
| t _{JC} | Jitter (Cycle to cycle) | - | 360 | - | pS | |
| t _D | Output duty cycle | 40 | 50 | 60 | % | |

* t_{LH} and t_{HL} are measured into a capacitive load of 15pF

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DC Electrical Characteristics for 3.3V Supply

(Test condition: All parameters are measured at room temperature (+ 25°C) unless otherwise stated)

| Symbol | Parameter | Min | Typ | Max | Unit |
|------------------|----------------------------------------------------------|-----------|-----|-----------|------|
| V _{IL} | Input low voltage | VSS - 0.3 | - | 0.8 | V |
| V _{IH} | Input high voltage | 2.0 | - | VDD + 0.3 | V |
| I _{IL} | Input low current | - | - | -35 | μA |
| I _{IH} | Input high current | - | - | 35 | μA |
| I _{XOL} | XOUT output low current (@0.4V, VDD=3.3V) | - | 3 | - | mA |
| I _{XOH} | XOUT output high current (@2.5V, VDD=3.3V) | - | 3 | - | mA |
| V _{OL} | Output low voltage (VDD = 3.3V, I _{OL} = 8 mA) | - | - | 0.4 | V |
| V _{OH} | Output high voltage (VDD = 3.3V, I _{OH} = 8 mA) | 2.5 | - | - | V |
| I _{DD} | Static supply current* | - | - | 2 | uA |
| I _{CC} | Dynamic supply current (3.3V, 66MHz and no load) | - | 4.0 | - | mA |
| VDD | Operating voltage | 3.0 | 3.3 | 3.6 | V |
| t _{ON} | Power-up time (first locked cycle after power-up)** | - | - | 5 | mS |
| Z _{OUT} | Output impedance | - | 45 | - | Ω |

* XIN /CLKIN pin and \overline{PD} pin are pulled low
 ** VDD and XIN/CLKIN input are stable, PD pin is made high from low.

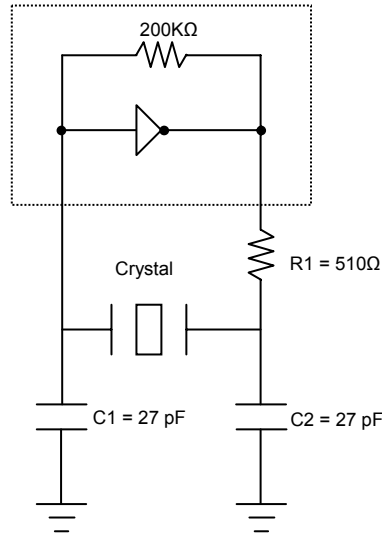
AC Electrical Characteristics for 3.3V Supply

| Symbol | Parameter | Min | Typ | Max | Unit | |
|-------------------|----------------------------------------------|---------------------------|-----|------|------|---|
| CLKIN | Input frequency | 12 | - | 30 | MHz | |
| ModOUT | Output frequency | 48 | - | 120 | MHz | |
| f _d | Frequency Deviation | Output Frequency = 48MHz | - | -1.6 | - | % |
| | | Output Frequency = 120MHz | - | -1.4 | - | |
| t _{LH} * | Output rise time (measured from 0.8 to 2.0V) | 0.4 | 1.3 | 1.6 | nS | |
| t _{HL} * | Output fall time (measured at 2.0V to 0.8V) | 0.4 | 0.8 | 1.1 | nS | |
| t _{JC} | Jitter (Cycle to cycle) | - | 360 | - | pS | |
| t _D | Output duty cycle | 40 | 50 | 60 | % | |

*t_{LH} and t_{HL} are measured into a capacitive load of 15pF

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Typical Crystal Oscillator Circuit

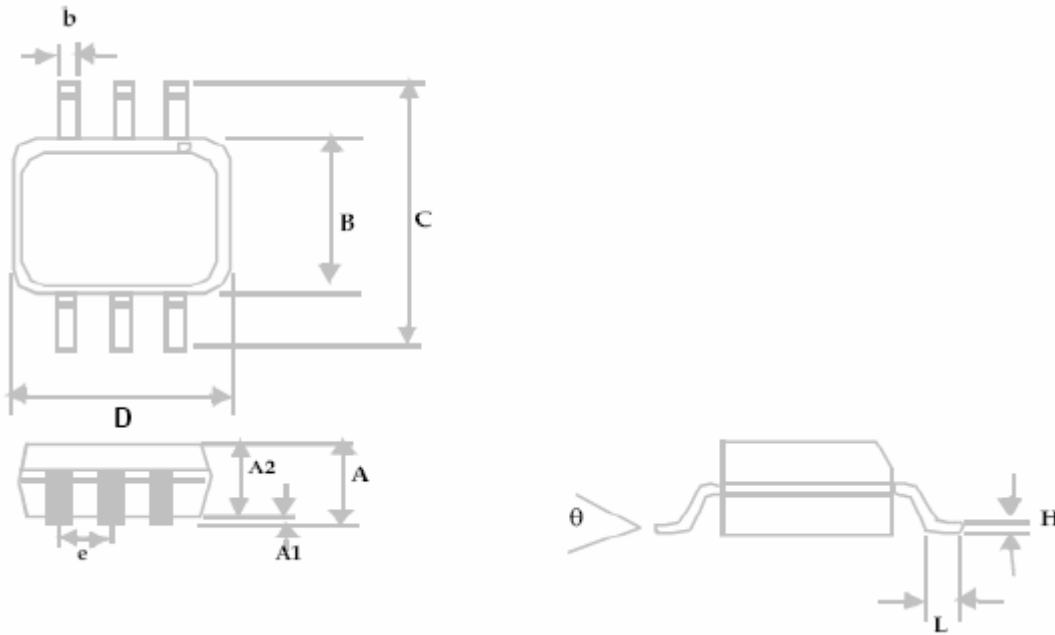


Typical Crystal Specifications

| Fundamental AT cut parallel resonant crystal | |
|----------------------------------------------|----------------------------|
| Nominal frequency | 14.31818MHz |
| Frequency tolerance | ± 50 ppm or better at 25°C |
| Operating temperature range | -25°C to +85°C |
| Storage temperature | -40°C to +85°C |
| Load capacitance | 18pF |
| Shunt capacitance | 7pF maximum |
| ESR | 25 Ω |

Package Information

6-pin TSOT-23 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° |

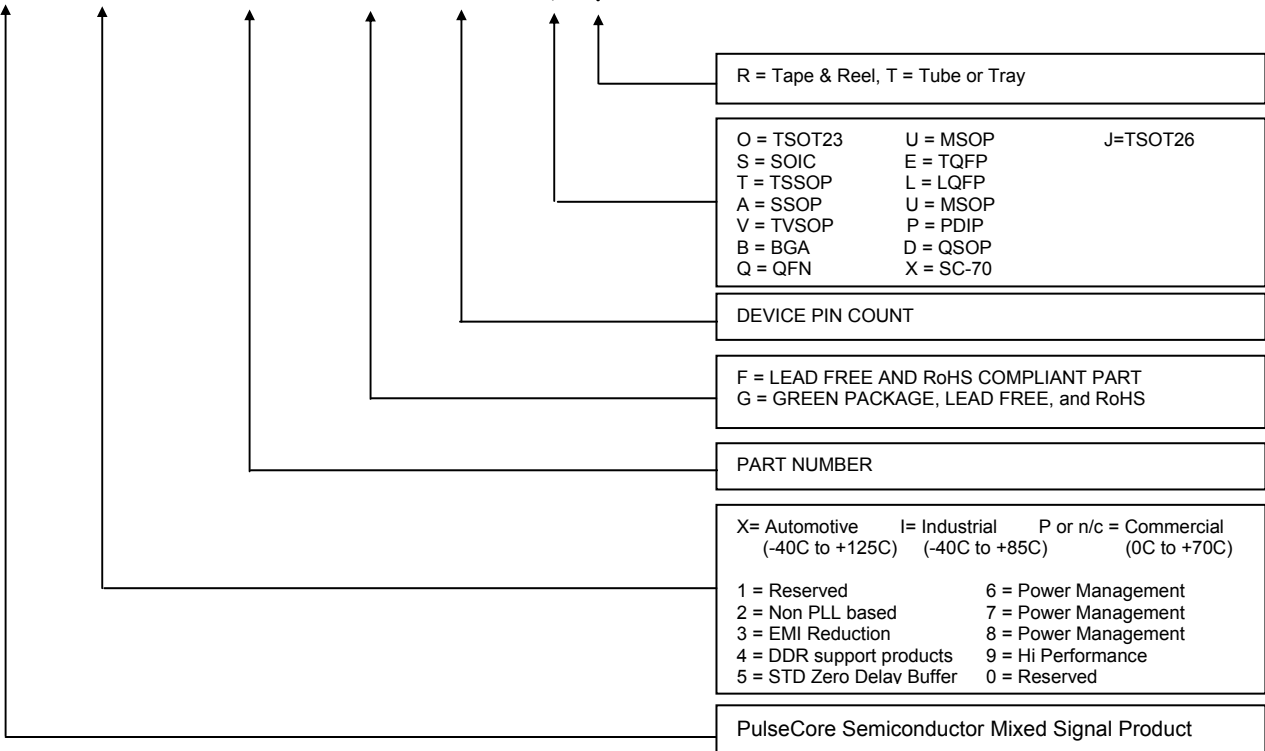
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Ordering Information

| Part Number | Marking | Package Type | Temperature |
|-------------------|---------|-----------------------------------|-------------|
| ASM3P2274AG-06-OR | Z3 | 6-Pin TSOT-23, TAPE & REEL, Green | Commercial |
| ASM3I2274AG-06-OR | Z6 | 6-Pin TSOT-23, TAPE & REEL, Green | Industrial |

Device Ordering Information

ASM3P2274AF-06-OR



Licensed under U.S Patent Nos 5,488,627 and 5,631,921



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Part Number: ASM3P2274A
Document Version: v1.1

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

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