



## Peak EMI Reducing Solution

### Features

- Generates an EMI optimized clock signal at the output.
- Integrated loop filter components.
- Operates with a 3.3V Supply.
- Operating current less than 4mA.
- CMOS design.
- Input frequency range: 13MHz to 30MHz
- Generates a 1X low EMI spread spectrum clock of the input frequency.
- Frequency deviation:  $\pm 1.8\%$  (Typ) @ 14.7MHz Input Frequency.
- Available in 6L-TSOP (6L-TSOT-23) package.

### Product Description

The ASM3P2775A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2775A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2775A 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 ASM3P2775A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2775A 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.’

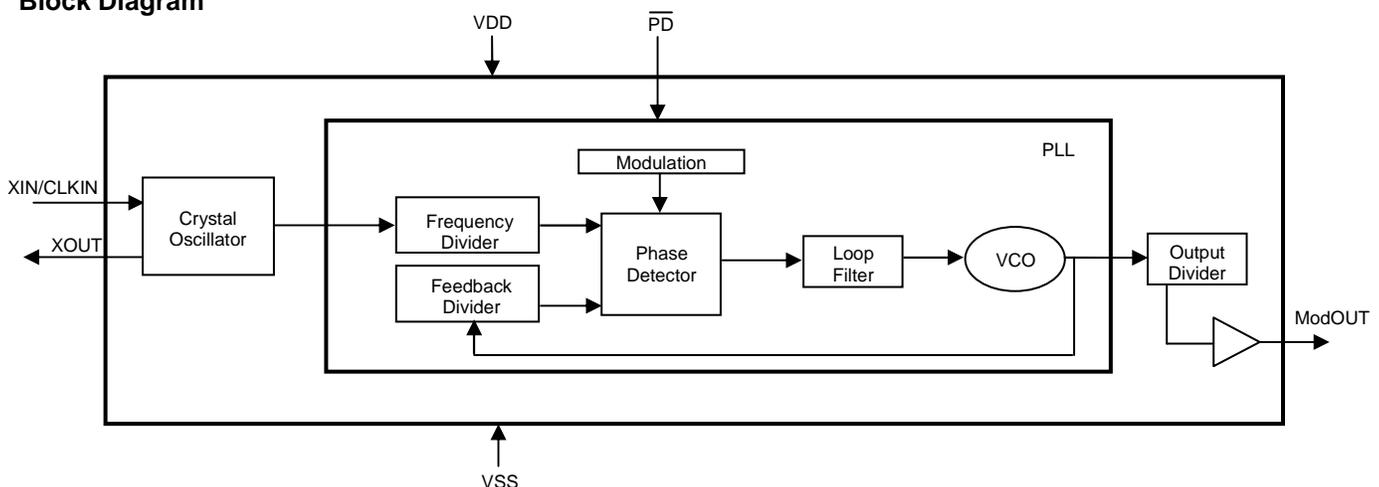
### Applications

The ASM3P2775A is targeted towards all portable devices with very low power requirements like MP3 players and digital still cameras.

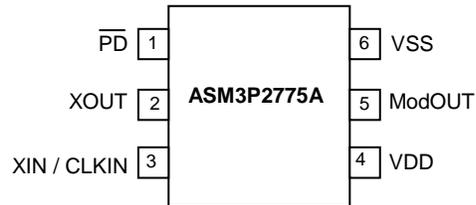
### Key Specifications

| Description              | Specification               |
|--------------------------|-----------------------------|
| Supply voltage           | VDD = 3.3V $\pm$ 0.3V       |
| Cycle-to-Cycle Jitter    | $\pm 200\text{pS}$ (typ)    |
| Output Duty Cycle        | 45/55% (worst case)         |
| Modulation Rate Equation | $F_{IN}/640$                |
| Frequency Deviation      | $\pm 1.8\%$ (Typ) @ 14.7MHz |

### Block Diagram



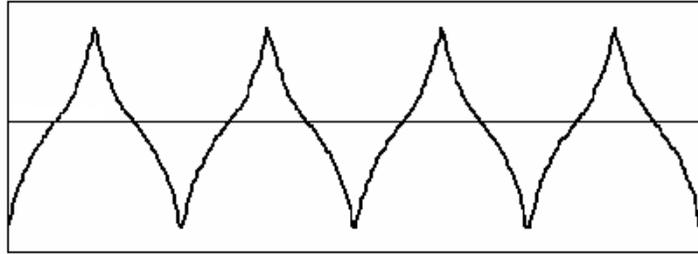
## Pin Configuration (6L-TSOP Package)



## 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    | 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.  |
| 6    | VSS                    | P    | Ground connection.   |

## Modulation Profile



## Specifications

| Description         | Specification               |
|---------------------|-----------------------------|
| Frequency Range     | 13MHz < CLKIN < 30MHz       |
| Modulation Equation | $F_{IN}/640$                |
| Frequency Deviation | $\pm 1.8\%$ (Typ) @ 14.7MHz |

## 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>A</sub>       | Operating temperature                                    | -40 to +85   | °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<br>(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                              | 3.0 | 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

| 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   |
| I <sub>XOL</sub> | XOUT output low current (@ 0.4V, VDD = 3.3V)                   |         | 3   |         | mA   |
| I <sub>XOH</sub> | XOUT output high current (@ 2.5V, VDD = 3.3V)                  |         | 3   |         | mA   |
| 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 (3.3V, 16MHz and no load)               |         | 3.5 |         | mA   |
| VDD              | Operating voltage  | 3.0     | 3.3 | 3.6     | V    |
| t <sub>ON</sub>  | Power-up time (first locked cycle after power-up) <sup>1</sup> |         |     | 5       | mS   |
| Z <sub>OUT</sub> | Output impedance   |         | 45  |         | Ω    |

Notes: 1. XIN / CLKIN pin and PD pin are pulled low.  
2. VDD and XIN / CLKIN input are stable, PD pin is made high from low.

## AC Electrical Characteristics

| Symbol                       | Parameter                                    | Min                     | Typ  | Max  | Unit |
|------------------------------|--|-------------------------|------|------|------|
| CLKIN                        | Input frequency                              | 13                      |      | 30   | MHz  |
| ModOUT                       | Output frequency                             | 13                      |      | 30   | MHz  |
| f <sub>d</sub>               | Frequency Deviation                          | Input Frequency = 13MHz |      |      | %    |
|                              |  | Input Frequency = 30MHz |      |      |      |
| t <sub>LH</sub> <sup>1</sup> | Output rise time (measured from 0.8 to 2.0V) | 0.5                     | 1.1  | 1.3  | nS   |
| t <sub>HL</sub> <sup>1</sup> | Output fall time (measured at 2.0V to 0.8V)  | 0.3                     | 0.8  | 1.0  | nS   |
| t <sub>JC</sub>              | Jitter (cycle-to-cycle)                      |                         | ±200 | ±300 | pS   |
| t <sub>D</sub>               | Output duty cycle                            | 45                      | 50   | 55   | %    |

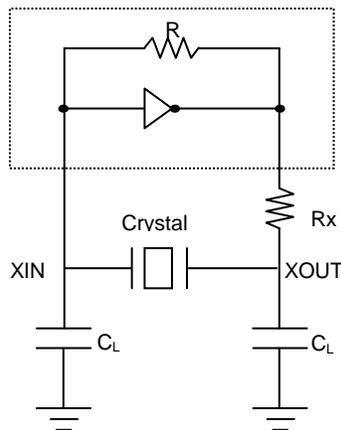
Note: 1. t<sub>LH</sub> and t<sub>HL</sub> are measured into a capacitive load of 15pF.

## Typical Crystal Specifications

| Fundamental AT cut parallel resonant crystal |                          |
|--|--------------------------|
| Nominal frequency                            | 14.31818MHz              |
| Frequency tolerance                          | ±50ppm 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                     |

Note:  $C_L$  is Load Capacitance and  $R_x$  is used to prevent oscillations at overtone frequency of the Fundamental frequency.

## Typical Crystal Interface Circuit

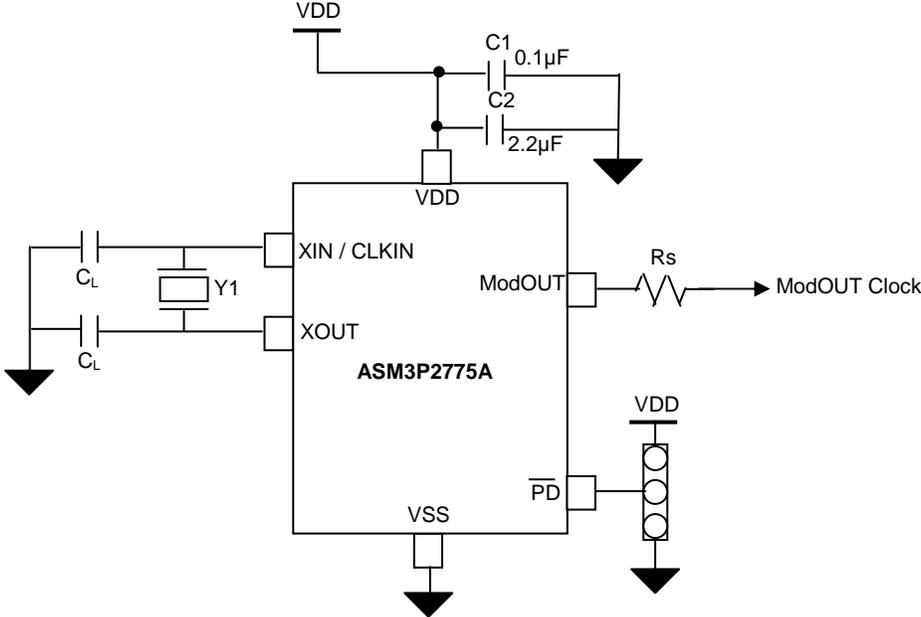


$$C_L = 2 * (C_P - C_S),$$

Where  $C_P$  = Load capacitance of crystal from crystal vendor datasheet.

$C_S$  = Stray capacitance due to  $C_{IN}$ , PCB, Trace, etc.

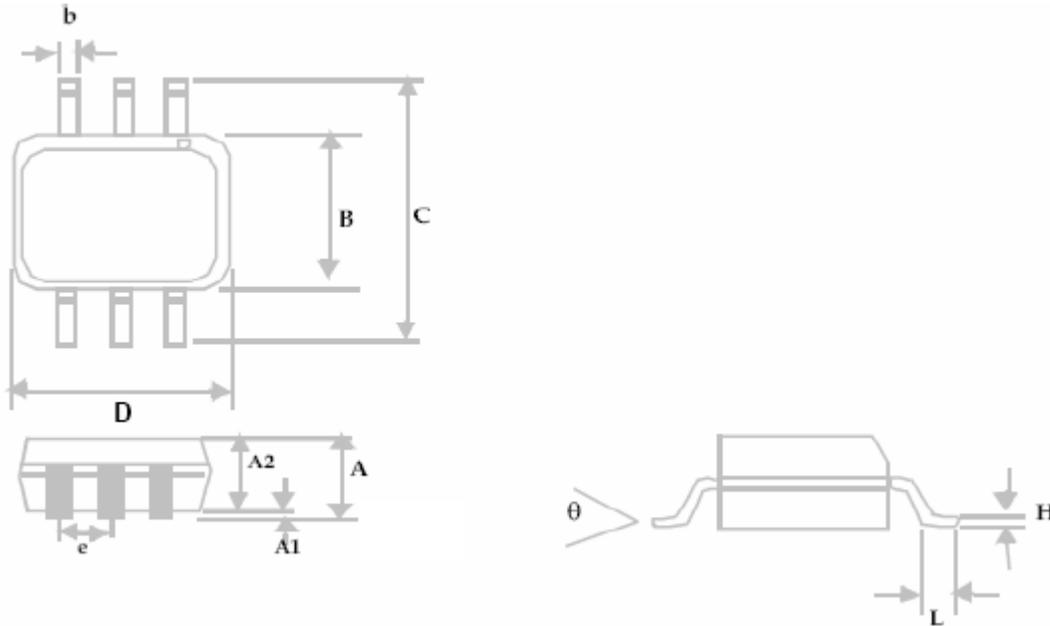
Typical Application Schematic



Note: Refer to Pin Description table for Functionality details.

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°   |

# ASM3P2775A

## Ordering Information

| Part Number      | Marking | Package Type                                  | Temperature  |
|------------------|---------|---|--------------|
| ASM3P2775AF-06OR | X4L     | 6L-TSOP (6L-TSOT-23), TAPE & REEL,<br>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.

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