



## Peak Reducing EMI Solution

### Features

- Generates an EMI optimized clocking signal at the output.
- Selectable output frequency range.
- Single 1.25% or 2.4% down spread output.
- Integrated loop filter components.
- Operates with a 3.3V supply.
- Low-power CMOS design.
- Available in 8-pin SOIC and 8-pin TSSOP packages.

### Product Description

The ASM3P2190A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2190A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of down stream clock and data dependent signals. The ASM3P2190A allows significant system cost savings by reducing the number of circuit board layers and shielding that are traditionally required to pass EMI regulations.

The ASM3P2190A modulates the output of a single PLL in order to “spread” the bandwidth of a synthesized clock, thereby decreasing 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 clock generators. Lowering EMI by increasing a signal’s bandwidth is called spread spectrum clock generation.

The ASM3P2190A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all-digital method.

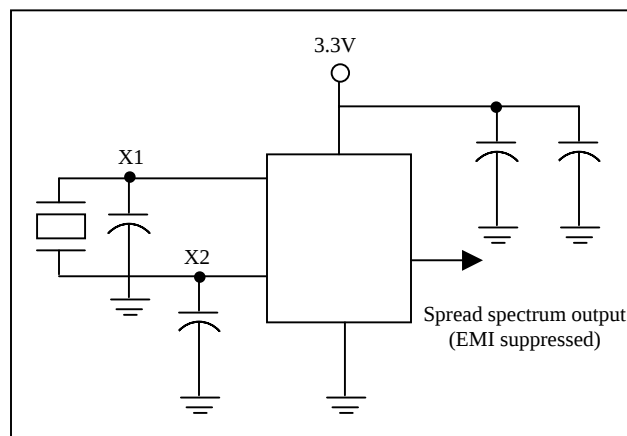
### Applications

The ASM3P2190A is targeted towards notebook LCD displays, other displays using an LVDS interface, PC peripheral devices and embedded systems.

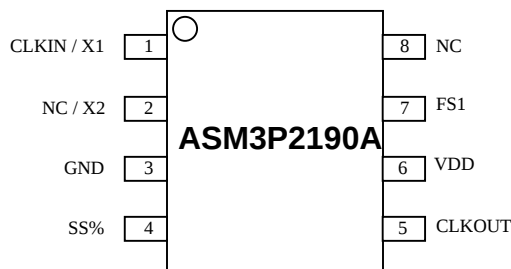
### Key Specifications

| Description                  | Specification                     |
|------------------------------|-----------------------------------|
| Supply voltages              | $V_{DD} = 3.3V \pm 5\%$           |
| Frequency range              | $6\text{ MHz} \leq 30\text{ MHz}$ |
| Cycle-to-cycle jitter        | 325 ps (typical)                  |
| Selectable spread percentage | -1.25% or -2.4%                   |
| Output duty cycle            | 40/60% (worst case)               |
| Output rise and fall time    | 5ns (maximum)                     |

### Simplified Block Diagram



### Pin Diagram





## Modulation Width Selection

| SS% | Output                            |
|-----|-----------------------------------|
| 0   | $FIN \geq FOUT \geq FIN - 1.25\%$ |
| 1   | $FIN \geq FOUT \geq FIN - 2.4\%$  |

## Frequency Range Selection

| FS1 | Modulation Rate       |
|-----|-----------------------|
| 0   | $6 \leq FIN \leq 10$  |
| 1   | $18 \leq FIN \leq 30$ |

## Pin Description

| Pin# | Pin Name    | Type | Description                                                                                                                                                                                                       |
|------|-------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | CLKIN or X1 | I    | Crystal connection or external reference frequency input. This pin has dual functions. It can be connected to either an external crystal or an external reference clock.                                          |
| 2    | NC OR X2    | O    | Crystal connection. Connection for an external crystal. If using an external reference, this pin must be left unconnected.                                                                                        |
| 3    | GND         | G    | Ground to entire chip.                                                                                                                                                                                            |
| 4    | SS%         | I    | Modulation width selection. When spread spectrum feature is turned on, this pin is used to select the amount of variation and peak EMI reduction that is desired on the output signal. Internal pull-up resistor. |
| 5    | CLKOUT      | O    | Output modulated frequency. Copy of the un-modulated input clock.                                                                                                                                                 |
| 6    | VDD         | P    | Power supply for the entire chip (3.3V).                                                                                                                                                                          |
| 7    | FS1         | I    | Frequency selection bit 1. This pin selects the frequency range of operation. ( <i>Refer to the Frequency Range Selection Table</i> ). This pin has an internal pull-up resistor.                                 |
| 8    | NC          | -    | No connect.                                                                                                                                                                                                       |



## Absolute Maximum Ratings

| Symbol                                                                                                                                                                | Parameter                              | Rating        | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------|------|
| $V_{DD}, V_{IN}$                                                                                                                                                      | Voltage on any pin with respect to GND | -0.5 to + 7.0 | V    |
| $T_{STG}$                                                                                                                                                             | Storage temperature                    | -65 to +125   | °C   |
| $T_A$                                                                                                                                                                 | Operating temperature                  | 0 to 70       | °C   |
| Note: These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability. |                                        |               |      |

## DC Electrical Characteristics

| Symbol    | Parameter                                                  | Min       | Typ  | Max            | Unit |
|-----------|------------------------------------------------------------|-----------|------|----------------|------|
| $V_{IL}$  | Input low voltage                                          | GND – 0.3 | -    | 0.8            | V    |
| $V_{IH}$  | Input high voltage                                         | 2.0       | -    | $V_{DD} + 0.3$ | V    |
| $I_{IL}$  | Input low current (pull-up resistors on inputs SS%, FS1)   | -         | -    | -27            | μA   |
| $I_{IH}$  | Input high current                                         | -         | -    | 18             | μA   |
| $I_{XOL}$ | $X_{OUT}$ output low current (@ 0.4V, $V_{DD} = 3.3V$ )    | -         | 3    | -              | mA   |
| $I_{XOH}$ | $X_{OUT}$ output high current (@2.5V, $V_{DD} = 3.3V$ )    | -         | 4    | -              | mA   |
| $V_{OL}$  | Output low voltage ( $V_{DD} = 3.3V$ , $I_{OL} = 4mA$ )    | -         | -    | 0.4            | V    |
| $V_{OH}$  | Output high voltage ( $V_{DD} = 3.3V$ , $I_{OH} = 4mA$ )   | 2.5       | -    | -              | V    |
| $I_{CC}$  | Dynamic supply current normal mode (3.3V and 10pF loading) | 8         | 21   | 35             | mA   |
| $I_{DD}$  | Static supply current standby mode                         | -         | 0.8  | -              | μA   |
| $V_{DD}$  | Operating voltage                                          | 2.8       | 3.3  | 3.7            | V    |
| $t_{ON}$  | Power up time (first locked clock cycle after power up)    | -         | 0.18 | -              | mS   |
| $Z_{OUT}$ | Clock output impedance                                     | -         | 50   | -              | Ω    |

## AC Electrical Characteristics

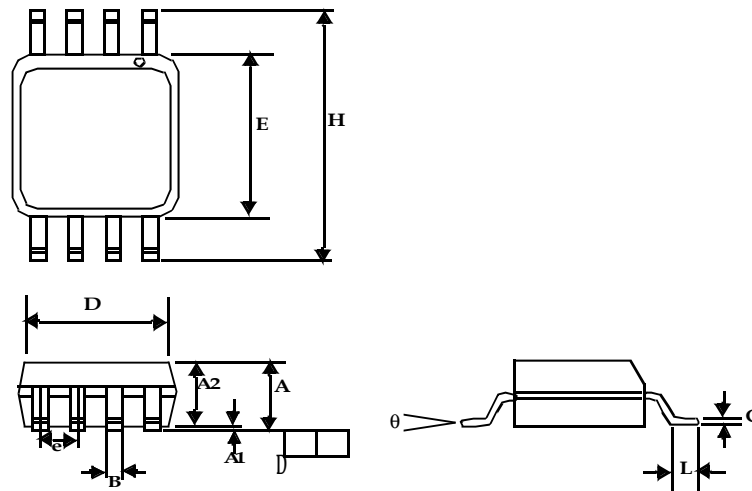
| Symbol                                                              | Parameter                                   | Min | Typ | Max | Unit |
|---------------------------------------------------------------------|---------------------------------------------|-----|-----|-----|------|
| CLKIN                                                               | Input frequency                             | 6   | -   | 30  | MHz  |
| CLKOUT                                                              | Output frequency                            | 6   | -   | 30  | MHz  |
| $t_{LH}^*$                                                          | Output rise time (measured at 0.8V to 2.0V) | 1.2 | 1.3 | 1.4 | ns   |
| $t_{HL}^*$                                                          | Output fall time (measured at 2.0V to 0.8V) | 0.8 | 0.9 | 1.0 | ns   |
| $t_{JC}$                                                            | Jitter (cycle to cycle)                     | -   | -   | 325 | ps   |
| $t_D$                                                               | Output duty cycle                           | 45  | 50  | 55  | %    |
| * $t_{LH}$ and $t_{HL}$ are measured into a capacitive load of 15pF |                                             |     |     |     |      |



rev 1.0

## Package Information:

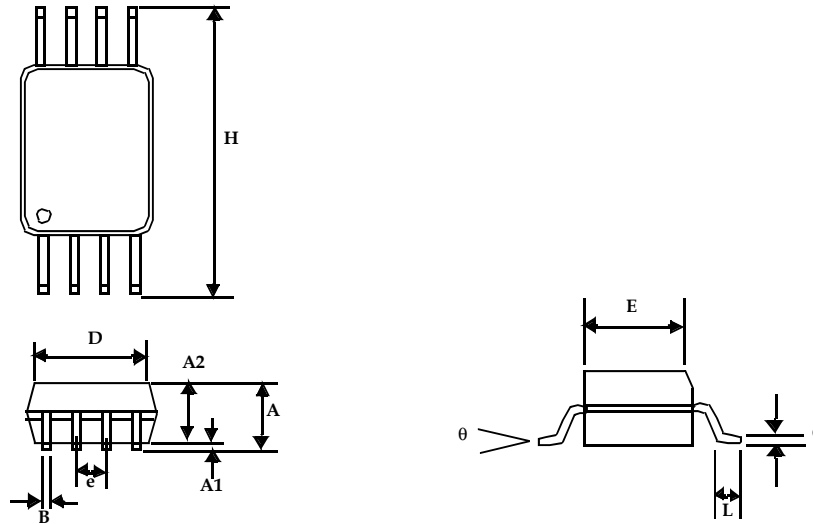
## 8-Pin SOIC



| Symbol | Dimensions in inches |       | Dimensions in millimeters |      |
|--------|----------------------|-------|---------------------------|------|
|        | Min                  | Max   | Min                       | Max  |
| A      | 0.057                | 0.071 | 1.45                      | 1.80 |
| A1     | 0.004                | 0.010 | 0.10                      | 0.25 |
| A2     | 0.053                | 0.069 | 1.35                      | 1.75 |
| B      | 0.012                | 0.020 | 0.31                      | 0.51 |
| C      | 0.004                | 0.01  | 0.10                      | 0.25 |
| D      | 0.186                | 0.202 | 4.72                      | 5.12 |
| E      | 0.148                | 0.164 | 3.75                      | 4.15 |
| e      | 0.050 BSC            |       | 1.27 BSC                  |      |
| H      | 0.224                | 0.248 | 5.70                      | 6.30 |
| L      | 0.012                | 0.028 | 0.30                      | 0.70 |
| □      | 0°                   | 8°    | 0°                        | 8°   |



## 8-Pin TSSOP



| Symbol   | Dimensions<br>in inches |       | Dimensions<br>in millimeters |      |
|----------|-------------------------|-------|------------------------------|------|
|          | Min                     | Max   | Min                          | Max  |
| A        | 0.047                   |       |                              | 1.10 |
| A1       | 0.002                   | 0.006 | 0.05                         | 0.15 |
| A2       | 0.031                   | 0.041 | 0.80                         | 1.05 |
| B        | 0.007                   | 0.012 | 0.19                         | 0.30 |
| C        | 0.004                   | 0.008 | 0.09                         | 0.20 |
| D        | 0.114                   | 0.122 | 2.90                         | 3.10 |
| E        | 0.169                   | 0.177 | 4.30                         | 4.50 |
| e        | 0.026 BSC               |       | 0.65 BSC                     |      |
| H        | 0.244                   | 0.260 | 6.20                         | 6.60 |
| L        | 0.018                   | 0.030 | 0.45                         | 0.75 |
| $\theta$ | 0°                      | 8°    | 0°                           | 8°   |



rev 1.0

## Ordering Codes

| Ordering Number | Marking    | Package Type               | Quantity per reel | Temperature  |
|-----------------|------------|----------------------------|-------------------|--------------|
| ASM3P2190A-08ST | ASM3P2190A | 8-pin SOIC, tube           |                   | 0° C to 70°C |
| ASM3P2190A-08SR | ASM3P2190A | 8-pin SOIC, tape and reel  | 2500              | 0° C to 70°C |
| ASM3P2190A-08TT | ASM3P2190A | 8-pin TSSOP, tube          |                   | 0° C to 70°C |
| ASM3P2190A-08TR | ASM3P2190A | 8-pin TSSOP, tape and reel | 2500              | 0° C to 70°C |

## Ordering Information

A S M 3 P 2 1 9 0 A - 0 8 S T

OR - SOT23/T/R  
 TT - TSSOP, TUBE  
 TR - TSSOP, T/R  
 VT - TVSOP, TUBE  
 VR - TVSOP, T/R  
 ST - SOIC, TUBE

SR - SOIC, T/R  
 QR - QFN, T/R  
 QT - QFN, TUBE  
 BT - BGA, TUBE  
 BR - BGA, T/R

PIN COUNT

PART NUMBER

|                           |                |                       |
|---------------------------|----------------|-----------------------|
| X = Automotive            | I = Industrial | P or n/c = Commercial |
| 1 - reserved              |                | 6 - power management  |
| 2 - Non PLL based         |                | 7 - power management  |
| 3 - EMI Reduction         |                | 8 - power management  |
| 4 - DDR support products  |                | 9 - Hi performance    |
| 5 - STD Zero Delay Buffer |                | 0 - reserved          |

Alliance Semiconductor Mixed Signal Product



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- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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