



2.5V CMOS 1-TO-10 CLOCK DRIVER

Features

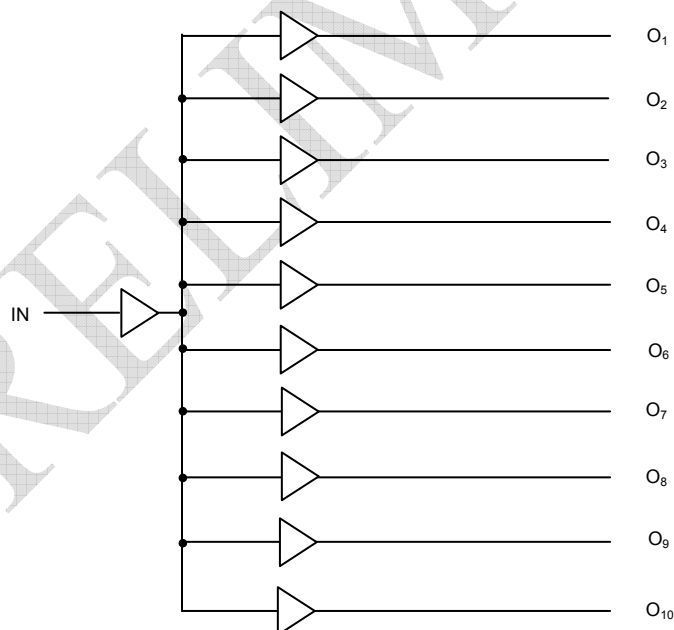
- High frequency > 150MHz
- Guaranteed low skew < 150pS (max.) between any two outputs
- Very low duty cycle distortion < 300pS
- High speed: propagation delay < 3nS
- Very low CMOS power levels
- TTL compatible inputs and outputs
- 1:10 fanout
- Maximum output rise and fall time < 1.25nS (max.)
- Low input capacitance: 3pF (typ)
- 2.5V Supply Voltage
- Available in SSOP and QSOP Packages

Product Description

The ASM2P20807A is a 2.5V compatible, high speed, low noise, 1:10 fanout, non-inverting clock buffer. The large fanout from a single input reduces loading on the preceding driver and provides an efficient clock distribution network.

Providing output to output skew as low as 150pS, the ASM20807A is an ideal clock distribution device for synchronous systems. Multiple power and grounds reduce noise. Typical applications are clock and signal distribution.

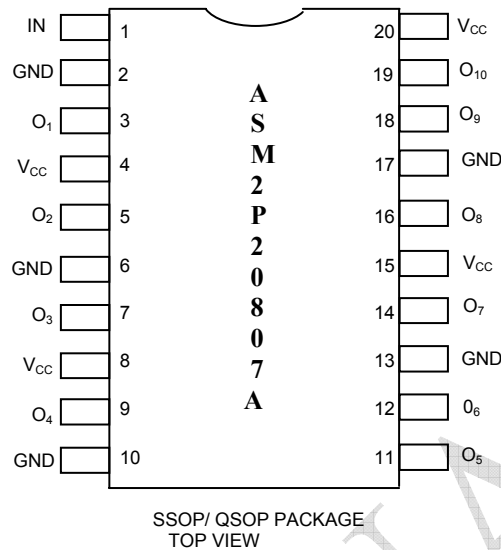
Block Diagram





rev 0.2

Pin Configuration



Pin Description

| Pin # | Pin Names | Description |
|---------------------------|---------------------------------|---------------|
| 1 | IN | Clock Input |
| 3,5,7,9,11,12,14,16,18,19 | O ₁ -O ₁₀ | Clock Outputs |
| 2,6,10,13,17 | GND | Ground |
| 4,8,15,20 | V _{CC} | Power supply |

Capacitance (TA = +25°C, f = 1.0MHz)

| Symbol | Parameter ¹ | Conditions | Typ | Max | Unit |
|-----------------|------------------------|----------------------|-----|-----|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 3 | 4 | pF |

NOTE:1. This parameter is measured at characterization but not tested.

Absolute Maximum Ratings¹

| Symbol | Description | Max | Unit |
|--------------------------------|--------------------------------------|------------------------------|------|
| V _{TERM} ² | Terminal Voltage with Respect to GND | -0.5 to +4.6 | V |
| V _{TERM} ³ | Terminal Voltage with Respect to GND | -0.5 to +5.5 | V |
| V _{TERM} ⁴ | Terminal Voltage with Respect to GND | -0.5 to V _{CC} +0.5 | V |
| TSTG | Storage Temperature | -65 to +150 | °C |
| IOUT | DC Output Current | -60 to +60 | mA |

NOTES:

- 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.
- V_{CC} terminals.
- Input terminals.
- Outputs and I/O terminals.



rev 0.2

Power Supply Characteristics

| Symbol | Parameter | Test Conditions ¹ | Min | Typ ² | Max | Unit |
|------------------------|--|--|-----|------------------|-----|----------------------------|
| I_{CCL} I_{CCH} | Quiescent Power Supply Current TTL Inputs HIGH | $V_{CC} = \text{Max}$ $V_{IN} = \text{GND or } V_{CC}$ | - | 0.1 | 20 | μA |
| ΔI_{CC} | Power Supply Current per Input HIGH | $V_{CC} = \text{Max}$ $V_{IN} = V_{CC} - 0.6\text{V}$ | - | 45 | 300 | μA |
| I_{CCD} | Dynamic Power Supply Current per Output ³ | $V_{CC} = 2.7\text{V}$ and 15 pF load 150 MHz | - | 40 | - | $\mu\text{A} / \text{MHz}$ |
| I_C | Total Power Supply Current ⁴ | $V_{CC} = \text{Max.}$ $C_L = 12\text{pF}$ All outputs toggling $f_i = 150\text{MHz}$ | - | 65 | 90 | mA |
| | | $V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$ | - | 75 | 100 | |

NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 2.5\text{V}$, $+25^\circ\text{C}$ ambient.
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
 $I_C = I_{CC} + \Delta I_{CC} \text{ DHNT} + I_{CCD} (f_i)$
 $I_{CC} = \text{Quiescent Current } (I_{CCL}, I_{CCH} \text{ and } I_{CCZ})$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = V_{CC} - 0.6\text{V})$
 $D_H = \text{Duty Cycle for TTL Inputs High}$
 $N_T = \text{Number of TTL Inputs at DH}$
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$
 $f_i = \text{Input Frequency}$



DC Electrical Characteristics Over Operating Range

Following Conditions Apply Unless Otherwise Specified
 Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 2.5\text{V} \pm 0.2\text{V}$

| Symbol | Parameter | Test Conditions ¹ | Min | Typ ² | Max | Unit | |
|-----------|------------------------------------|--|------------------------|------------------|---------|------|---|
| V_{IH} | Input HIGH Level | | 1.7 | - | - | V | |
| V_{IL} | Input LOW Level | | - | - | 0.7 | V | |
| I_{IH} | Input HIGH Current (Input pins) | $V_{CC} = \text{Max}$, $V_I = V_{CC}$ | - | - | ± 1 | mA | |
| I_{IL} | Input LOW Current (Input pins) | $V_{CC} = \text{Max}$, $V_I = \text{GND}$ | - | - | ± 1 | mA | |
| V_{IK} | Clamp Diode Voltage | $V_{CC} = \text{Min}$, $I_{IN} = -18\text{mA}$ | - | -0.7 | -1 | V | |
| I_{ODH} | Output HIGH Current | $V_{CC} = 2.5\text{V}$, $V_{IN} = V_{IH}$ or V_{IL} $V_O = 1.25\text{V}^3$ | -25 | -45 | -100 | mA | |
| I_{ODL} | Output LOW Current | $V_{CC} = 2.5\text{V}$, $V_{IN} = V_{IH}$ or V_{IL} $V_O = 1.25\text{V}^3$ | 20 | 55 | 120 | mA | |
| V_{OH} | Output HIGH Voltage | $V_{CC} = \text{Min}$, $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -1\text{mA}$ | $V_{CC} - 0.2$ | - | - | V |
| | | | $I_{OH} = -8\text{mA}$ | 1.8^5 | - | - | |
| V_{OL} | Output LOW Voltage | $V_{CC} = \text{Min}$ | $I_{OL} = 1\text{mA}$ | - | - | 0.4 | V |
| | | | $I_{OL} = 8\text{mA}$ | - | - | 0.6 | |
| I_{OS} | Short Circuit Current ⁴ | $V_{CC} = \text{Max.}$, $V_O = \text{GND}^3$ | -25 | -60 | -135 | mA | |

NOTES:

1. For conditions shown as Max or Min, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 2.5\text{V}$, $+25^{\circ}\text{C}$ ambient.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5. $V_{OH} = V_{CC} - 0.6\text{V}$ at rated current.



Switching Characteristics Over Operating Range^{1,2}

Following Conditions Apply Unless Otherwise Specified
 Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 2.5\text{V} \pm 0.2\text{V}$

| Symbol | Parameter | Conditions ³ | Min | Typ | Max | Unit |
|------------------------|---|--------------------------------|-----|-----|------|------|
| t_{PLH} t_{PHL} | Propagation Delay | $C_L = 22\text{pF}$ 100 MHz | - | 3 | 3.5 | nS |
| t_R | Output Rise Time | | - | 1 | 1.25 | nS |
| t_F | Output Fall Time | | - | 1 | 1.25 | nS |
| $t_{SK(O)}$ | Same Device Output Pin-to-Pin Skew ⁴ | | - | 100 | 150 | pS |
| $t_{SK(P)}$ | Pulse Skew ⁵ | | - | 250 | 300 | pS |
| $t_{SK(PP)}$ | Part-to-Part Skew ⁶ | | - | 400 | 600 | pS |

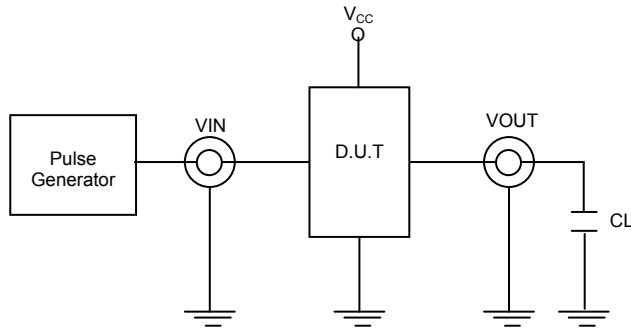
| Symbol | Parameter | Conditions ^{3,7} | Min | Typ | Max | Unit |
|------------------------|---|--------------------------------|-----|-----|-----|------|
| t_{PLH} t_{PHL} | Propagation Delay | $C_L = 12\text{pF}$ 150 MHz | - | 2.4 | 2.7 | nS |
| t_R | Output Rise Time | | - | 1 | 1.2 | nS |
| t_F | Output Fall Time | | - | 1 | 1.2 | nS |
| $t_{SK(O)}$ | Same Device Output Pin-to-Pin Skew ⁴ | | - | 100 | 150 | pS |
| $t_{SK(P)}$ | Pulse Skew ⁵ | | - | 250 | 300 | pS |
| $t_{SK(PP)}$ | Part-to-Part Skew ⁶ | | - | 400 | 600 | pS |

NOTES:

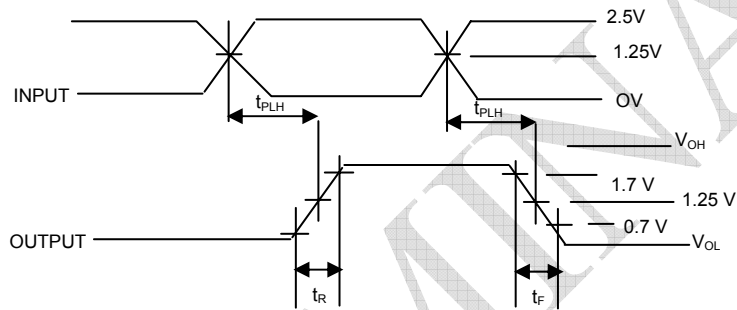
- t_{PLH} and t_{PHL} are production tested. All other parameters guaranteed but not production tested.
- Propagation delay range indicated by Min. and Max. limit is due to VCC, operating temperature and process parameters. These propagation delay limits do not imply skew.
- See test circuits and waveforms.
- Skew measured between all outputs under identical transitions and load conditions.
- Skew measured is difference between propagation delay times t_{PHL} and t_{PLH} of same output under identical load conditions.
- Part to part skew for all outputs given identical transitions and load conditions at identical VCC levels and temperature.
- Airflow of 1m/s is recommended for frequencies above 133MHz.



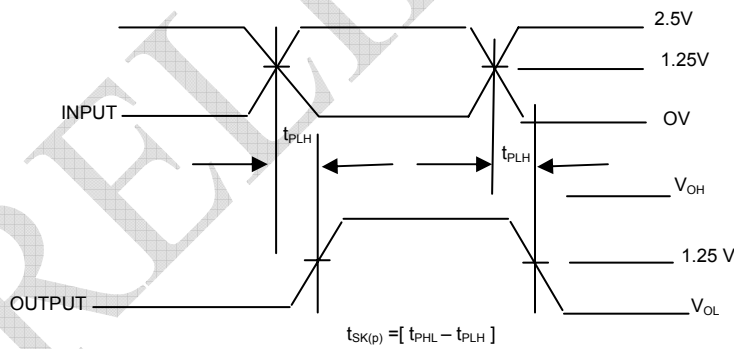
Test Circuits and Waveforms



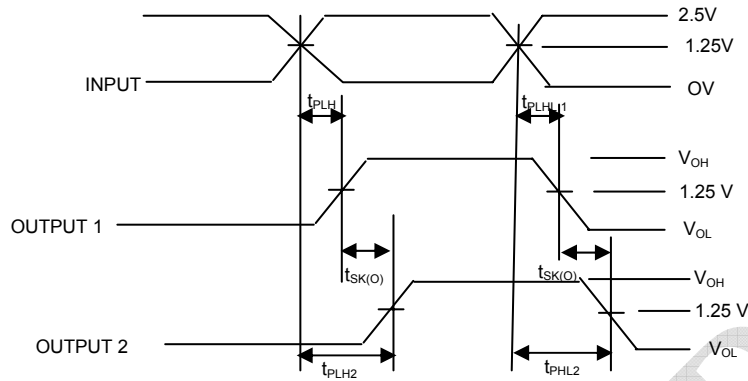
CL = Load Capacitance: Includes Jig and Capacitance probe



Propagation Delay

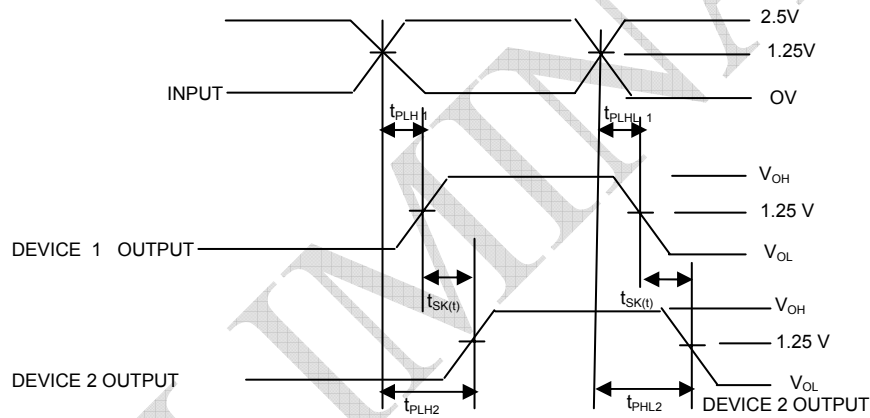


Pulse Skew - $t_{SK(P)}$



$$t_{SK(O)} = [t_{PLH2} - t_{PLH1}] \text{ or } [t_{PHL2} - t_{PHL1}]$$

Output Skew - $t_{SK(O)}$



$$t_{SK(I)} = [t_{PLH2} - t_{PLH1}] \text{ or } [t_{PHL2} - t_{PHL1}]$$

Part-to-Part Skew - $t_{SK(PP)}$

NOTE: Device 1 and device 2 are same package type and speed grade.

Test Conditions

| Symbol | VCC = 2.5V ±0.2V | Unit |
|---------------------------------|-------------------------------------|------|
| CL | 22 ¹ | pF |
| | 12 ² | |
| RT | Z _{OUT} of pulse generator | Ω |
| t _R / t _F | 1.25 ¹ | nS |
| | 1.2 ² | |

DEFINITIONS:

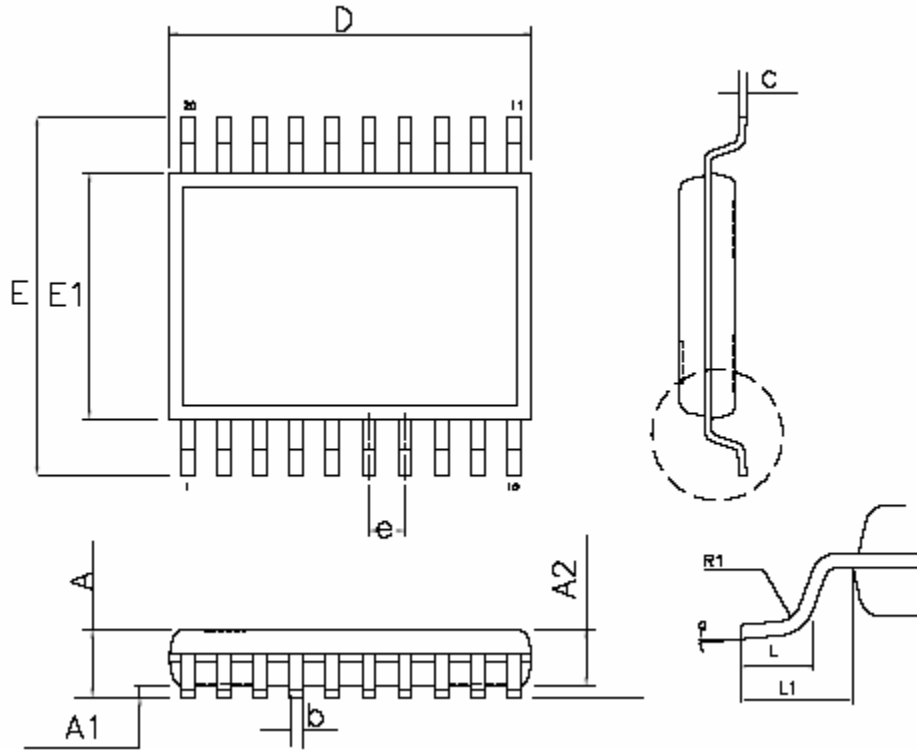
CL = Load capacitance: includes jig and probe capacitance.
 RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.
 t_R / t_F = Rise/Fall time of the input stimulus from the Pulse Generator.

NOTES:

1. Test conditions at 100MHz.
2. Test conditions at 150MHz.



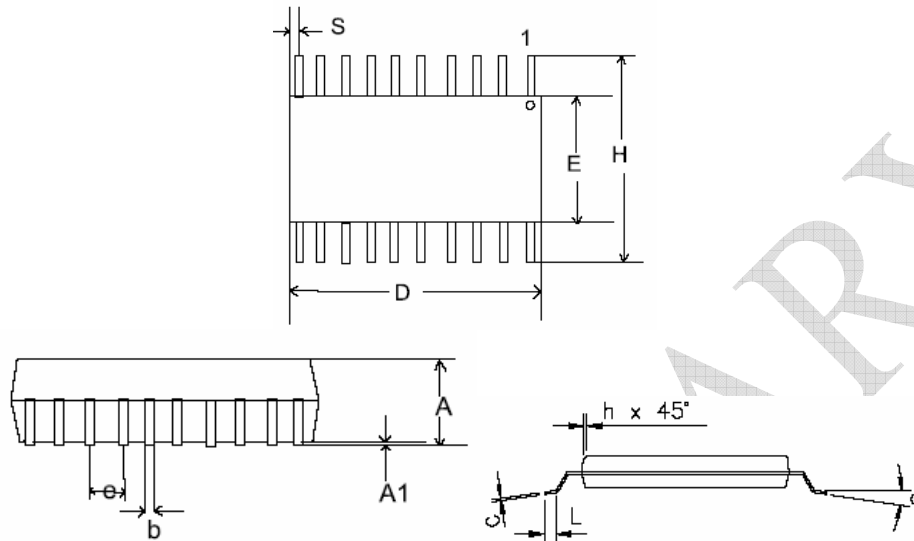
20-lead SSOP (150 mil) Package



| Symbol | Dimensions | | | |
|--------|-------------|-------|-------------|-------|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 0.053 | 0.069 | 1.346 | 1.753 |
| A1 | 0.004 | 0.010 | 0.102 | 0.254 |
| A2 | | 0.059 | | 1.499 |
| D | 0.337 | 0.344 | 8.560 | 8.738 |
| c | 0.007 | 0.012 | 0.178 | 0.274 |
| E | 0.228 | 0.244 | 5.791 | 6.198 |
| E1 | 0.150 | 0.157 | 3.810 | 3.988 |
| L | 0.016 | 0.035 | 0.406 | 0.890 |
| L1 | 0.010 BASIC | | 0.254 BASIC | |
| b | 0.203 | 0.325 | 0.008 | 0.014 |
| R1 | 0.003 | | 0.08 | |
| a | 0° | 8° | 0° | 8° |
| e | 0.025 BASIC | | 0.635 BASIC | |



20-lead QSOP Package



| Symbol | Dimensions | | | |
|--------|------------|-------|-------------|------|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 0.060 | 0.068 | 1.52 | 1.73 |
| A1 | 0.004 | 0.008 | 0.10 | 0.20 |
| b | 0.009 | 0.012 | 0.23 | 0.30 |
| c | 0.007 | 0.010 | 0.18 | 0.25 |
| D | 0.337 | 0.344 | 8.56 | 8.74 |
| E | 0.150 | 0.157 | 3.81 | 3.99 |
| e | 0.025 BSC | | 0.64 BSC | |
| H | 0.230 | 0.244 | 5.84 | 6.20 |
| h | 0.010 | 0.016 | 0.25 | 0.41 |
| L | 0.016 | 0.035 | 0.41 | 0.89 |
| S | 0.056 | 0.060 | 1.42 | 1.52 |
| a | 0° | 8° | 0° | 8° |



Ordering Information

| Part Number | Marking | Package Type | Temperature |
|--------------------|-----------|---------------------------------|-------------|
| ASM2P20807A-20-AR | 2P20807A | 20-Pin SSOP, TAPE & REEL | Commercial |
| ASM2P20807A-20-AT | 2P20807A | 20-Pin SSOP, TUBE | Commercial |
| ASM2P20807A-20-DR | 2P20807A | 20-Pin QSOP, TAPE & REEL | Commercial |
| ASM2P20807A-20-DT | 2P20807A | 20-Pin QSOP, TUBE | Commercial |
| ASM2I20807AG-20-AR | 2I20807AG | 20-Pin SSOP, TAPE & REEL, Green | Industrial |
| ASM2I20807AG-20-AT | 2I20807AG | 20-Pin SSOP, TUBE, Green | Industrial |
| ASM2I20807AG-20-DR | 2I20807AG | 20-Pin QSOP, TAPE & REEL, Green | Industrial |
| ASM2I20807AG-20-DT | 2I20807AG | 20-Pin QSOP, TUBE, Green | Industrial |

Device Ordering Information

ASM2P20807AG-20-AR

R = Tape & reel, T = Tube or Tray

| | |
|-----------|-----------|
| O = SOT | U = MSOP |
| S = SOIC | E = TQFP |
| T = TSSOP | L = LQFP |
| A = SSOP | U = MSOP |
| V = TVSOP | P = PDIP |
| B = BGA | D = QSOP |
| Q = QFN | X = SC-70 |

DEVICE PIN COUNT

F = LEAD FREE AND RoHS COMPLIANT PART
G = GREEN PACKAGE

PART NUMBER

| | | |
|--------------------------------|-------------------------------|------------------------------------|
| X = Automotive (-40C to +125C) | I = Industrial (-40C to +85C) | P or n/c = Commercial (0C to +70C) |
|--------------------------------|-------------------------------|------------------------------------|

| | |
|---------------------------|----------------------|
| 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 Delav Buffer | 0 = Reserved |

ALLIANCE SEMICONDUCTOR MIXED SIGNAL PRODUCT

Licensed under US patent Nos 5,488,627 and 5,631,920.



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Advance Information
Part Number: ASM2P20807A
Document Version: v0.2

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

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