



### 3.3V CMOS Dual 1-To-5 Clock Driver

#### Features

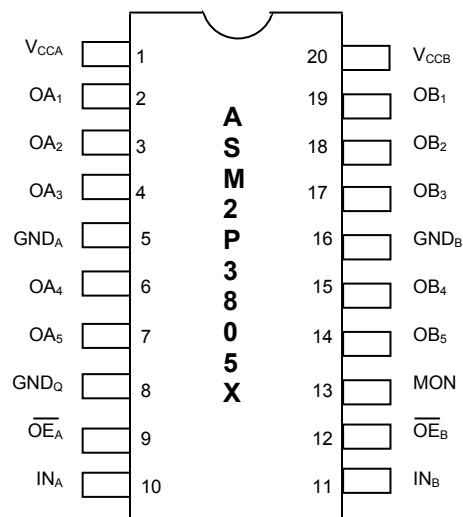
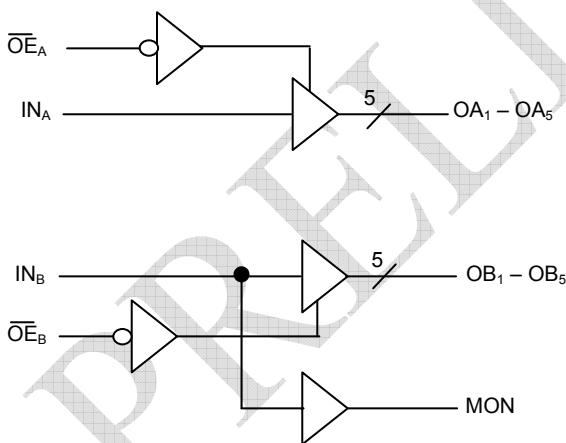
- Advanced CMOS Technology
- Guaranteed low skew < 200pS (max)
- Very low propagation delay < 2.5nS (max)
- Very low duty cycle distortion < 270pS (max)
- Very low CMOS power levels
- Operating frequency up to 166MHz
- TTL compatible inputs and outputs
- Inputs can be driven from 3.3V or 5V components
- Two independent output banks with 3-state control
- 1:5 fanout per bank
- ASM2P3805X  
Where X =D for 133MHz Operation  
X =E for 166MHz Operation
- "Heartbeat" monitor output
- $V_{CC} = 3.3V \pm 0.3V$
- Available in SSOP and QSOP Packages

#### Functional Description

The ASM2P3805X is a 3.3V clock driver built using advanced CMOS technology. The device consists of two banks of drivers, each with a 1:5 fanout and its own output enable control. The device has a "heartbeat" monitor for diagnostics and PLL driving. The MON output is identical to all other outputs and complies with the output specifications in this document. The ASM2P3805X offers low capacitance inputs. The ASM2P3805X is designed for high speed clock distribution where signal quality and skew are critical. The ASM2P3805X also allows single point-to-point transmission line driving in applications such as address distribution, where one signal must be distributed to multiple receivers with low skew and high signal quality.

#### Pin Diagram

#### Block Diagram





rev 0.2

## Pin Description

Pin #	Pin Names	Description
9,12	$\overline{OE}_A, \overline{OE}_B$	3-State Output Enable Inputs (Active LOW)
10,11	$IN_A, IN_B$	Clock Inputs
2,3,4,6,7	$OA_1-OA_5$	Clock Outputs from Bank A
19,18,17,15,14	$OB_1-OB_5$	Clock Outputs from Bank B
1	$V_{CCA}$	Power supply for Bank A
20	$V_{CCB}$	Power supply for Bank B
5	$GND_A$	Ground for Bank A
16	$GND_B$	Ground for Bank B
8	$GND_Q$	Ground
13	MON	Monitor Output

Function Table<sup>1</sup>

Inputs		Outputs	
$\overline{OE}_A, \overline{OE}_B$	$IN_A, IN_B$	$OA_n, OB_n$	MON
L	L	L	L
L	H	H	H
H	L	Z	L
H	H	Z	H

Note: 1 H = HIGH; L = LOW; Z = High-Impedance

Capacitance ( $T_A = +25^\circ\text{C}$ ,  $f = 1.0\text{MHz}$ )

Symbol	Parameter <sup>1</sup>	Conditions	Typ	Max	Unit
$C_{IN}$	Input Capacitance	$V_{IN} = 0V$	3	4	pF
$C_{OUT}$	Output Capacitance	$V_{OUT} = 0V$	—	6	pF

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



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Absolute Maximum Ratings<sup>1</sup>

Symbol	Description	Max	Unit
V <sub>CC</sub>	Input Power Supply Voltage	-0.5 to +4.6	V
V <sub>I</sub>	Input Voltage	-0.5 to +5.5	V
V <sub>O</sub>	Output Voltage	-0.5 to V <sub>CC</sub> +0.5	V
T <sub>J</sub>	Junction Temperature	150	°C
T <sub>STG</sub>	Storage Temperature	-65 to +165	°C
T <sub>DV</sub>	Static Discharge Voltage (As per JEDEC STD 22- A114-B)	2	KV

Note: 1 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 over Operating Range

Following Conditions Apply Unless Otherwise Specified

Industrial: T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 3.3V ± 0.3V

Symbol	Parameter	Test Conditions <sup>1</sup>	Min	Typ <sup>2</sup>	Max	Unit	
V <sub>IH</sub>	Input HIGH Level		2	-	5.5	V	
V <sub>IL</sub>	Input LOW Level		-0.5	-	0.8	V	
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> = Max., V <sub>I</sub> = 5.5V	-	-	±1	μA	
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> = Max., V <sub>I</sub> = GND	-	-	±1		
I <sub>OZH</sub>	High Impedance Output Current (3-State Outputs Pins)	V <sub>CC</sub> = Max., V <sub>O</sub> = V <sub>CC</sub>	-	-	±1		
I <sub>OZL</sub>		V <sub>CC</sub> = Max., V <sub>O</sub> = GND	-	-	±1		
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>CC</sub> = Min., I <sub>IN</sub> = -18mA	-	-0.7	-1.2	V	
I <sub>ODH</sub>	Output HIGH Current	V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>O</sub> = 1.5V <sup>3,4</sup>	-45	-74	-180	mA	
I <sub>ODL</sub>	Output LOW Current	V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>O</sub> = 1.5V <sup>3,4</sup>	50	90	200	mA	
I <sub>OS</sub>	Short Circuit Current	V <sub>CC</sub> = Max., V <sub>O</sub> = GND <sup>3,4</sup>	-60	-135	-240	mA	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 12mA	2.4 <sup>5</sup>	3	-	V
			I <sub>OH</sub> = -8mA	2.4 <sup>5</sup>	3	-	
			I <sub>OH</sub> = -100μA	V <sub>CC</sub> - 0.2	-	-	
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 12mA	-	0.3	0.4	V
			I <sub>OL</sub> = 8mA	-	0.2	0.4	
			I <sub>OL</sub> = 100μA	-	-	0.2	

## 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<sub>CC</sub> = 3.3V, 25°C ambient.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
- This parameter is guaranteed but not tested.
- V<sub>OH</sub> = V<sub>CC</sub> - 0.6V at rated current.



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## Power Supply Characteristics

Symbol	Parameter	Test Conditions <sup>1</sup>		Min	Typ <sup>2</sup>	Max	Unit
$I_{CCL}$ $I_{CCH}$ $I_{CCZ}$	Quiescent Power Supply Current	$V_{CC} = \text{Max. } V_{IN} = \text{GND or } V_{CC}$		-	0.1	30	$\mu\text{A}$
$\Delta I_{CC}$	Power Supply Current per Input HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = V_{CC} - 0.6\text{V}$		-	45	300	$\mu\text{A}$
$I_{CCD}$	Dynamic Power Supply Current per Output <sup>3</sup>	$V_{CC} = \text{Max.}$ $C_L = 15\text{pF}$ All Outputs Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	-	80	120	$\mu\text{A}/\text{MHz}$
$I_C$	Total Power Supply Current <sup>4</sup>	$V_{CC} = \text{Max.}$ $C_L = 15\text{pF}$ All Outputs Toggling $f_i = 133\text{MHz}$	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	-	125	150	mA
			$V_{IN} = V_{CC} - 0.6\text{V}$ $V_{IN} = \text{GND}$	-	125	150	
		$V_{CC} = \text{Max.}$ $C_L = 15\text{pF}$ All Outputs Toggling $f_i = 166\text{MHz}$	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	-	155	195	
			$V_{IN} = V_{CC} - 0.6\text{V}$ $V_{IN} = \text{GND}$	-	160	195	

## 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  $V_{CC} = 3.3\text{V}$ ,  $+25^\circ\text{C}$  ambient.

3. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.

4.  $I_C = I_{CCL} + \Delta I_{CC} D_H N_T + I_{CCD} (f_o N_O)$

$I_{CCL} = \text{Quiescent Current } (I_{CCL}, I_{CCH} \text{ and } I_{CCZ})$

$\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = V_{CC} - 0.6\text{V})$

$D_H = \text{Duty Cycle for TTL Inputs High}$

$N_T = \text{Number of TTL Inputs at } D_H$

$I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$

$f_o = \text{Output Frequency}$

$N_O = \text{Number of Outputs at } f_o$



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Switching Characteristics Over Operating Range – ASM2P3805D<sup>3,4</sup>

Symbol	Parameter	Conditions <sup>1</sup>	Min <sup>2</sup>	Max	Unit
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay IN <sub>A</sub> to OA <sub>n</sub> , IN <sub>B</sub> to OB <sub>n</sub>	C <sub>L</sub> = 15pF f ≤ 133MHz	1	3	nS
t <sub>R</sub>	Output Rise Time (Measured from 0.8V to 2V)		-	1.5	nS
t <sub>F</sub>	Output Fall Time (Measured from 2V to 0.8V)		-	1.5	nS
t <sub>SK(O)</sub>	Same device output pin to pin skew <sup>5</sup>		-	270	pS
t <sub>SK(P)</sub>	Pulse skew <sup>6,9</sup>		-	270	pS
t <sub>SK(PP)</sub>	Part to part skew <sup>7</sup>		-	550	pS
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time $\overline{OE}_A$ to OA <sub>n</sub> , $\overline{OE}_B$ to OB <sub>n</sub>		-	5.2	nS
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time $\overline{OE}_A$ to OA <sub>n</sub> , $\overline{OE}_B$ to OB <sub>n</sub>		-	5.2	nS
f <sub>MAX</sub>	Input Frequency		-	133	MHz

Switching Characteristics Over Operating Range – ASM2P3805E<sup>3,4</sup>

Symbol	Parameter	Conditions <sup>1,8</sup>	Min <sup>2</sup>	Max	Unit
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay IN <sub>A</sub> to OA <sub>n</sub> , IN <sub>B</sub> to OB <sub>n</sub>	C <sub>L</sub> = 15pF f ≤ 166MHz	0.5	2.5	nS
t <sub>R</sub>	Output Rise Time (Measured from 0.7V to 1.7V)		-	1	nS
t <sub>F</sub>	Output Fall Time (Measured from 1.7V to 0.7V)		-	1	nS
t <sub>SK(O)</sub>	Same device output pin to pin skew <sup>5</sup>		-	200	pS
t <sub>SK(P)</sub>	Pulse skew <sup>6,9</sup>		-	270	pS
t <sub>SK(PP)</sub>	Part to part skew <sup>7</sup>		-	550	pS
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time $\overline{OE}_A$ to OA <sub>n</sub> , $\overline{OE}_B$ to OB <sub>n</sub>		-	5.2	nS
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time $\overline{OE}_A$ to OA <sub>n</sub> , $\overline{OE}_B$ to OB <sub>n</sub>		-	5.2	nS
f <sub>MAX</sub>	Input Frequency		-	166	MHz

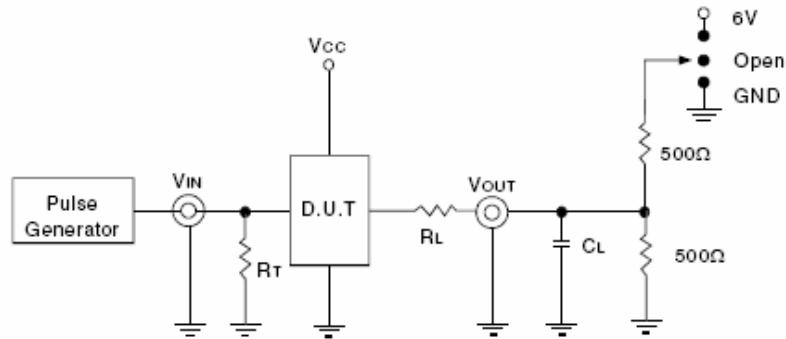
## Notes:

- See test circuits and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delays.
- t<sub>PLH</sub>, t<sub>PHL</sub> and t<sub>SK(O)</sub> are production tested. All other parameters guaranteed but not production tested.
- Propagation delay range indicated by Min and Max limit is due to V<sub>CC</sub>, operating temperature and process parameters. These propagation delay limits do not imply skew.
- Skew measured between all outputs under identical transitions and load conditions.
- Skew measured is difference between propagation delay times t<sub>PHL</sub> and t<sub>PLH</sub> of same outputs under identical load conditions.
- Part to part skew for all outputs given identical transitions and load conditions at identical V<sub>CC</sub> levels and temperature.
- Airflow of 1m/s is recommended for frequencies above 133MHz.
- This parameter is measured using f = 1MHz.

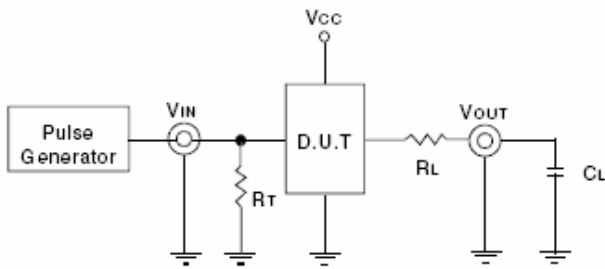


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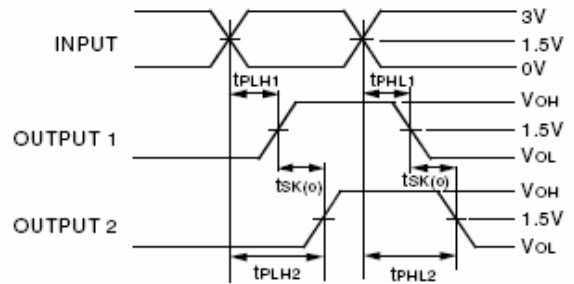
Test Circuits and Waveforms



Enable and Disable Time Circuit



CL = 15pF Test Circuit



$$t_{SK(0)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

Output Skew - tSK(0)

Switch Position

Test	Switch
Disable Low Enable Low	6V
Disable High Enable High	GND

Test Conditions

Symbol	V <sub>CC</sub> = 3.3V ±0.3V	Unit
C <sub>L</sub>	15	pF
R <sub>T</sub>	Z <sub>OUT</sub> of pulse generator	Ω
R <sub>L</sub>	33	Ω
t <sub>R</sub> / t <sub>F</sub>	1 (0V to 3V or 3V to 0V)	nS

Definitions:

C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.

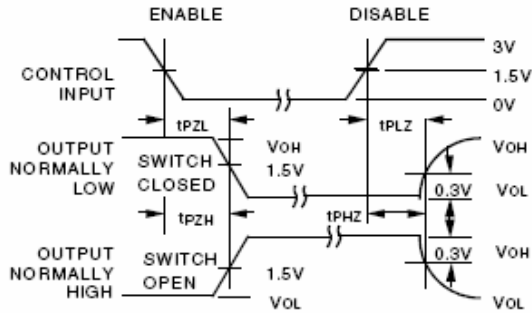
R<sub>T</sub> = Termination resistance: should be equal to Z<sub>OUT</sub> of the Pulse Generator.

t<sub>R</sub> / t<sub>F</sub> = Rise/Fall time of the input stimulus from the Pulse Generator.

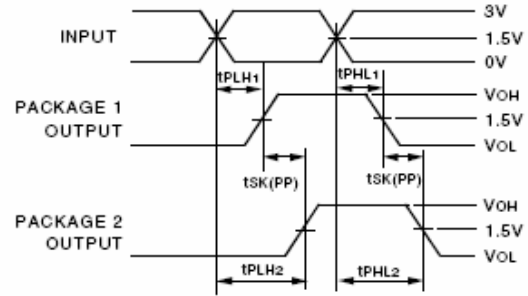


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Test Circuits and Waveforms



Enable and Disable Times



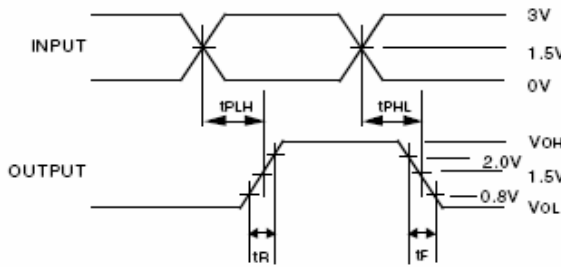
$$tSK(PP) = |tPLH2 - tPLH1| \text{ or } |tPHL2 - tPHL1|$$

Part-to-Part Skew -  $tSK(PP)$

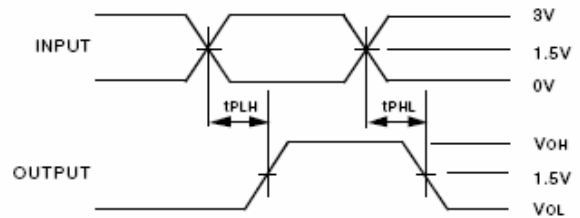
NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH

Part-to-Part Skew is for the same package and speed grade.



Propagation Delay



$$tSK(P) = |tPLH - tPHL|$$

Pulse Skew

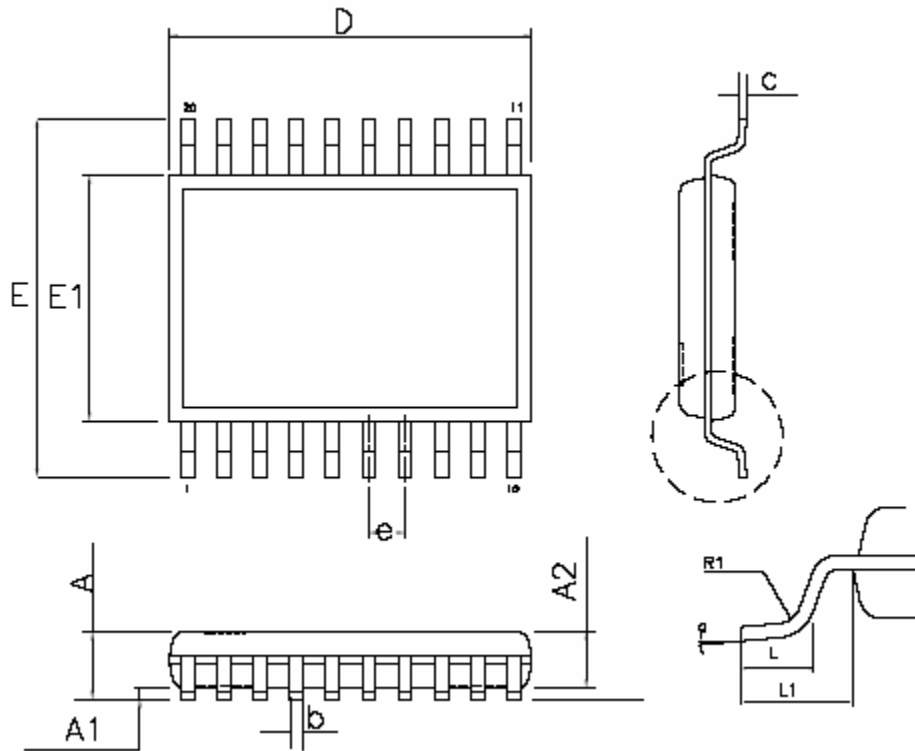
PRELIMINARY



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Package Information

20-lead SSOP ( 150 mil ) Package

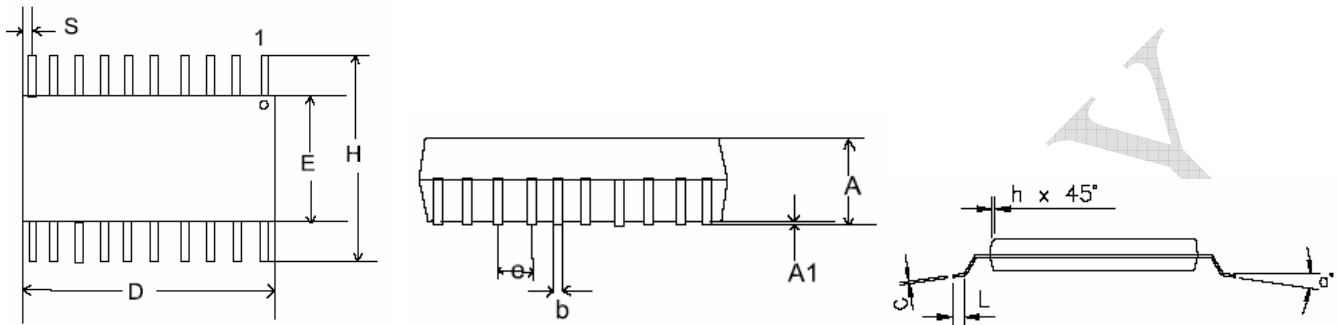


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.053	0.069	1.346	1.753
A1	0.004	0.010	0.102	0.254
A2	....	0.059	....	1.499
D	0.337	0.344	8.560	8.738
c	0.007	0.012	0.178	0.274
E	0.228	0.244	5.791	6.198
E1	0.150	0.157	3.810	3.988
L	0.016	0.035	0.406	0.890
L1	0.010 BASIC		0.254 BASIC	
b	0.203	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°



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## Ordering Information

Part Number	Marking	Package Type	Temperature
ASM2P3805DG-20-AR	2P3805DG	20-Pin SSOP, TAPE & REEL, Green	Commercial
ASM2P3805DG-20-AT	2P3805DG	20-Pin SSOP, TUBE, Green	Commercial
ASM2P3805DG-20-DR	2P3805DG	20-Pin QSOP, TAPE & REEL, Green	Commercial
ASM2P3805DG-20-DT	2P3805DG	20-Pin QSOP, TUBE, Green	Commercial
ASM2I3805DG-20-AR	2I3805DG	20-Pin SSOP, TAPE & REEL, Green	Industrial
ASM2I3805DG-20-AT	2I3805DG	20-Pin SSOP, TUBE, Green	Industrial
ASM2I3805DG-20-DR	2I3805DG	20-Pin QSOP, TAPE & REEL, Green	Industrial
ASM2I3805DG-20-DT	2I3805DG	20-Pin QSOP, TUBE, Green	Industrial
ASM2P3805EG-20-AR	2P3805EG	20-Pin SSOP, TAPE & REEL, Green	Commercial
ASM2P3805EG-20-AT	2P3805EG	20-Pin SSOP, TUBE, Green	Commercial
ASM2P3805EG-20-DR	2P3805EG	20-Pin QSOP, TAPE & REEL, Green	Commercial
ASM2P3805EG-20-DT	2P3805EG	20-Pin QSOP, TUBE, Green	Commercial
ASM2I3805EG-20-AR	2I3805EG	20-Pin SSOP, TAPE & REEL, Green	Industrial
ASM2I3805EG-20-AT	2I3805EG	20-Pin SSOP, TUBE, Green	Industrial
ASM2I3805EG-20-DR	2I3805EG	20-Pin QSOP, TAPE & REEL, Green	Industrial
ASM2I3805EG-20-DT	2I3805EG	20-Pin QSOP, TUBE, Green	Industrial



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Device Ordering Information

ASM2P3805D G-20-AT

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

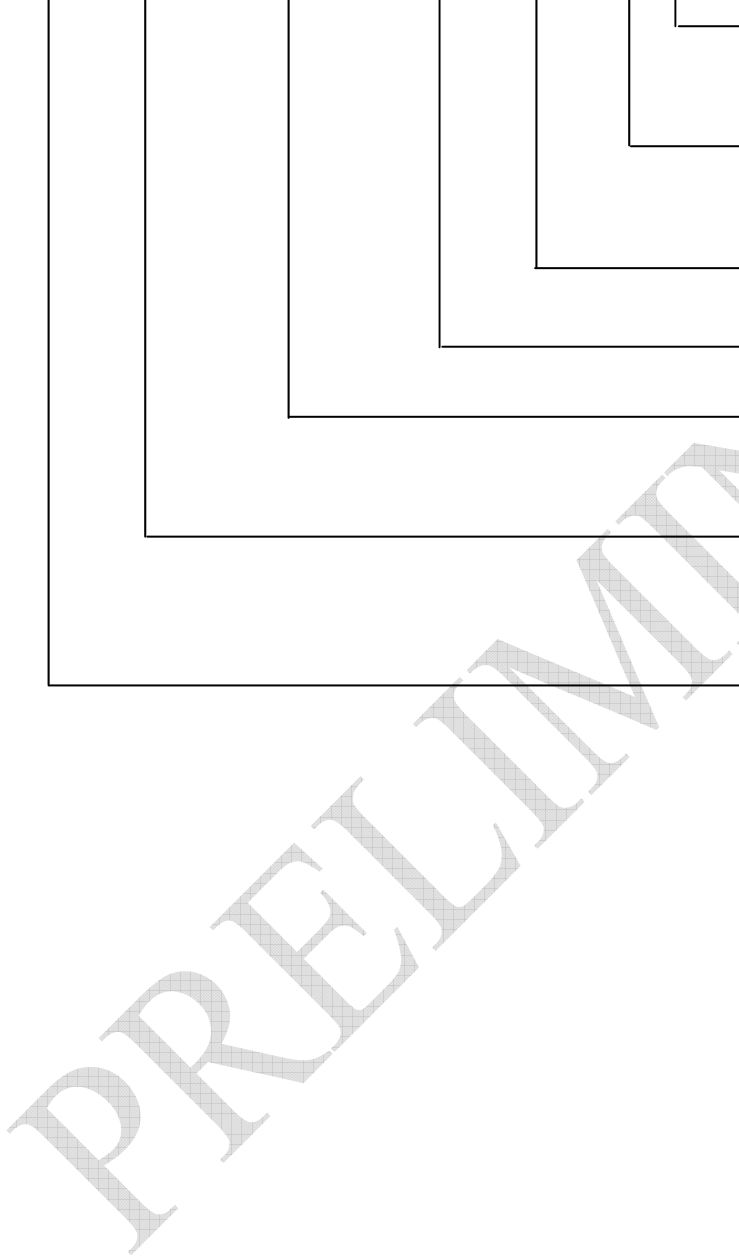
F = LEAD FREE AND RoHS COMPLIANT PART  
G = GREEN PACKAGE

PART NUMBER

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

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Document Version: 0.2

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

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