ASMP5P2309A
ASMP5P2305A

3.3V Zero Delay Buffer

General Features

- 10 MHz to 133- MHz operating range, compatible with CPU and PCI bus frequencies.
- Zero input - output propagation delay.
- Multiple low-skew outputs.
  - Output-output skew less than 250 ps.
  - Device-device skew less than 700 ps.
  - One input drives 9 outputs, grouped as 4 + 4 + 1 (ASM5P2309A).
  - One input drives 5 outputs (ASM5P2305A).
- Less than 200 ps cycle-to-cycle jitter is compatible with Pentium® based systems.
- Test Mode to bypass PLL (ASM5P2309A only, refer Select Input Decoding Table).
- Available in 16-pin, 150-mil SOIC, 4.4 mm TSSOP, and 150-mil SSOP packages (ASM5P2309A) or in 8-pin, 150- mil SOIC package (ASM5P2305A).
- 3.3V operation, advanced 0.35µ CMOS technology.

Functional Description

ASM5P2309A is a versatile, 3.3V zero-delay buffer designed to distribute high-speed clocks. It accepts one reference input and drives out nine low-skew clocks. It is available in a 16-pin package. The ASM5P2305A is the eight-pin version of the ASM5P2309A. It accepts one reference input and drives out five low-skew clocks.

The -1H version of the ASM5P23XXA operates at up to 133- MHz frequencies, and has higher drive than the -1 devices. All parts have on-chip PLL's that lock to an input clock on the REF pin. The PLL feedback is on-chip and is obtained from the CLKOUT pad.

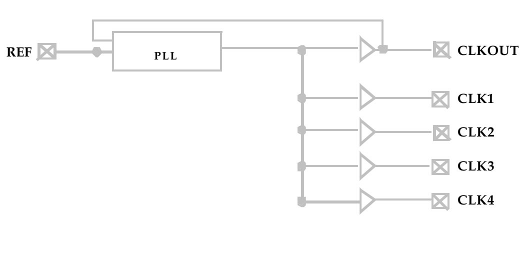
The ASM5P2309A has two banks of four outputs each, which can be controlled by the Select inputs as shown in the Select Input Decoding Table. If all the output clocks are not required, Bank B can be three-stated. The select input also allows the input clock to be directly applied to the outputs for chip and system testing purposes.

Multiple ASM5P2309A and ASM5P2305A devices can accept the same input clock and distribute it. In this case the skew between the outputs of the two devices is guaranteed to be less than 700ps.

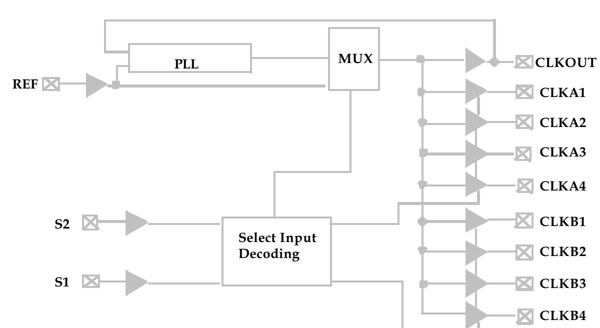
All outputs have less than 200 ps of cycle-to-cycle jitter. The input and output propagation delay is guaranteed to be less than 250 ps, and the output to output skew is guaranteed to be less than 250ps.

The ASM5P2309A and the ASM5P2305A are available in two different configurations, as shown in the ordering information table. The ASM5P23XXA-1 is the base part. The ASM5P23XXA-1H is the high drive version of the -1 and its rise and fall times are much faster than -1 part.

Block Diagram



ASM5P2305A



ASM5P2309A

Select Input Decoding for ASM5P2309A

S2	S1	Clock A1 - A4	Clock B1 - B4	CLKOUT [1]	Output Source	PLL Shut-Down
0	0	Three-state	Three-state	Driven	PLL	N
0	1	Driven	Three-state	Driven	PLL	N
1	0	Driven	Driven	Driven	Reference	Y
1	1	Driven	Driven	Driven	PLL	N

Notes:

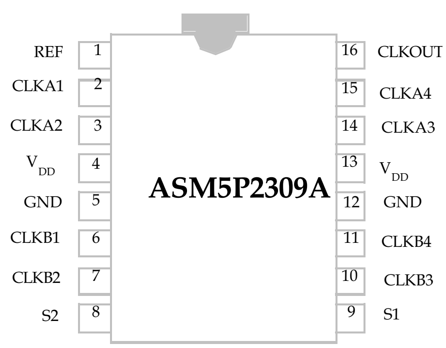
1. This output is driven and has an internal feedback for the PLL. The load on this output can be adjusted to change the skew between the reference and the output.

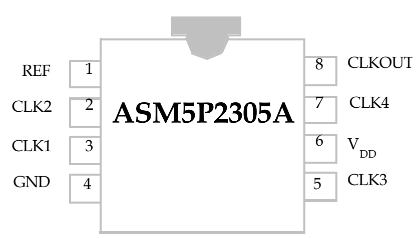
Zero Delay and Skew Control

All outputs should be uniformly loaded to achieve Zero Delay between input and output. Since the CLKOUT pin is the internal feedback to the PLL, its relative loading can adjust the input-output delay.

For applications requiring zero input-output delay, all outputs, including CLKOUT, must be equally loaded. Even if CLKOUT is not used, it must have a capacitive load equal to that on other outputs, for obtaining zero-input-output delay.

Pin Configuration





Pin Description for ASM5P2309A

Pin #	Pin Name	Description
1	REF[2]	Input reference frequency, 5V tolerant input
2	CLKA1[3]	Buffered clock output, bank A
3	CLKA2[3]	Buffered clock output, bank A
4	V_{DD}	3.3V supply
5	GND	Ground
6	CLKB1[3]	Buffered clock output, bank B
7	CLKB2[3]	Buffered clock output, bank B
8	S2[4]	Select input, bit 2
9	S1[4]	Select input, bit 1
10	CLKB3[3]	Buffered clock output, bank B
11	CLKB4[3]	Buffered clock output, bank B
12	GND	Ground
13	V_{DD}	3.3V supply
14	CLKA3[3]	Buffered clock output, bank A
15	CLKA4[3]	Buffered clock output, bank A
16	CLKOUT[3]	Buffered output, internal feedback on this pin

Pin Description for ASM5P2305A

Pin #	Pin Name	Description
1	REF[2]	Input reference frequency, 5V-tolerant input
2	CLK2[3]	Buffered clock output
3	CLK1[3]	Buffered clock output
4	GND	Ground
5	CLK3[3]	Buffered clock output
6	V_{DD}	3.3V supply
7	CLK4[3]	Buffered clock output
8	CLKOUT[3]	Buffered clock output, internal feedback on this pin

Notes:

2. Weak pull-down.
3. Weak pull-down on all outputs.
4. Weak pull-up on these inputs.

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply Voltage to Ground Potential	-0.5	+7.0	V
DC Input Voltage (Except REF)	-0.5	VDD + 0.5	V
DC Input Voltage (REF)	-0.5	7	V
Storage Temperature	-65	+150	°C
Max. Soldering Temperature (10 sec)		260	°C
Junction Temperature		150	°C
Static Discharge Voltage (per MIL-STD-883, Method 3015)		2000	V
Note: These are stress ratings only and functional usage is not implied. Exposure to absolute maximum ratings for prolonged periods can affect device reliability.			

Operating Conditions for ASM5P2305A and ASM5P2309A - Commercial Temperature Devices

Parameter	Description	Min	Max	Unit
V_{DD}	Supply Voltage	3.0	3.6	V
T_A	Operating Temperature (Ambient Temperature)	0	70	°C
C_L	Load Capacitance, below 100 MHz		30	pF
C_L	Load Capacitance, from 100 MHz to 133 MHz		10	pF
C_{IN}	Input Capacitance		7	pF

lectrical Characteristics for ASM5P2305A and ASM5P2309A - Commercial Temperature Devices

Parameter	Description	Test Conditions	Min	Max	Unit
V_{IL}	Input LOW Voltage [5]			0.8	V
V_{IH}	Input HIGH Voltage [5]		2.0		V
I_{IL}	Input LOW Current	V_{IN} = 0V		50.0	µA
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}		100.0	µA
V_{OL}	Output LOW Voltage [6]	I_{OL} = 8mA (-1) I_{OH} = 12mA (-1H)		0.4	V
V_{OH}	Output HIGH Voltage [6]	I_{OL} = -8mA (-1) I_{OH} = -12mA (-1H)	2.4		V
I_{DD}	Supply Current	Unloaded outputs at 66.67 MHz, SEL inputs at V_{DD}		TBD	mA

S1 / S2 inputs are CMOS, TTL compatible inputs –

The input must toggle somewhere between 0.8 and 2.0. We guarantee the limits of 0.8 and 2.0, but can't guarantee anything tighter than that. As Vdd moves higher the toggle point will move higher, but will always stay below 2.0V. As Vdd moves lower, the toggle point will move lower, but always stay higher than 0.8V. What the 2.0V MIN Vih specification means is that you put 2.0V or a higher voltage into the device, and you will have a logic HIGH. If you put 0.8V or a lower voltage into the device, you will have a logic LOW (Vil spec = 0.8V max). It will toggle someplace in between 0.8V and 2.0V, but we don't guarantee exactly where, and the exact point will change depending upon conditions. Characterization shows we toggle at 1.1V and 1.5V (showing a little hysteresis), everything is perfect. We meet spec, plus have ~ 300mV noise immunity on the low end and ~500mV noise immunity on the high side. Under nominal conditions, with no hysteresis, most devices will toggle at about 1.5V for both high and low.

Switching Characteristics for ASM5P2305A-1 and ASM5P2309A-1 - Commercial Temperature Devices[7]

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
$1/t_1$	Output Frequency	30-pF load 10-pF load	10 10		100 133.3 3	MHz
	Duty Cycle [6] = (t_2 / t_1) * 100	Measured at 1.4V, F_{OUT} = 66.67 MHz	40.0	50.0	60.0	%
t_3	Output Rise Time [6]	Measured between 0.8V and 2.0V			2.50	ns
t_4	Output Fall Time [6]	Measured between 2.0V and 0.8V			2.50	ns
t_5	Output-to-output skew [6]	All outputs equally loaded			250	ps
t_6	Delay, REF Rising Edge to CLKOUT Rising Edge [6]	Measured at V_{DD} /2		0	±350	ps
t_7	Device-to-Device Skew [6]	Measured at V_{DD}/2 on the CLKOUT pins of the device		0	700	ps
t_J	Cycle-to-cycle jitter [6]	Measured at 66.67 MHz, loaded outputs			200	ps
t_{LOCK}	PLL Lock Time [6]	Stable power supply, valid clock presented on REF pin			1.0	ms

Notes:

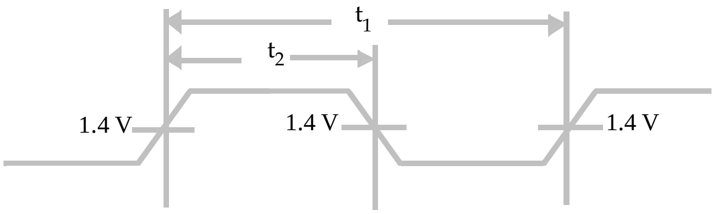
5. REF input has a threshold voltage of VDD/2
6. Parameter is guaranteed by design and characterization. Not 100% tested in production
7. All parameters specified with loaded outputs.

Switching Characteristics for ASM5I2305A-1H and ASM5I2309A-1H - Industrial Temperature Devices[7]

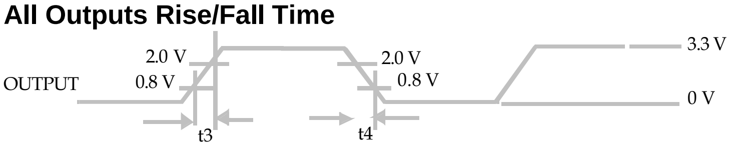
Parameter	Description	Test Conditions	Min	Typ	Max	Unit
$1/t_1$	Output Frequency	30-pF load 10-pF load	10 10		100 133.33	MHz
	Duty Cycle [6] = (t_2 / t_1) * 100	Measured at 1.4 V, F_{OUT} = 66.67 MHz	40.0	50.0	60.0	%
	Duty Cycle [6] = (t_2 / t_1) * 100	Measured at 1.4 V, F_{OUT} < 50.0 MHz	45.0	50.0	55.0	
t3	Output Rise Time 6	Measured between 0.8V and 2.0V			1.50	ns
t4	Output Fall Time 6	Measured between 2.0V and 0.8V			1.50	ns
t5	Output-to-output skew 6	All outputs equally loaded			250	ps
t6	Delay, REF Rising Edge to CLKOUT Rising Edge 6	Measured at VDD /2		0	± 350	ps
t7	Device-to-Device Skew 6	Measured at VDD/2 on the CLKOUT pins of the device		0	700	ps
t8	Output Slew Rate 6	Measured between 0.8V and 2.0V using Test Circuit #2	1			V/ns
tJ	Cycle-to-cycle jitter 6	Measured at 66.67 MHz, loaded outputs			200	ps
tLOCK	PLL Lock Time 6	Stable power supply, valid clock pre sented on REF pin			1.0	ms

Switching Waveforms

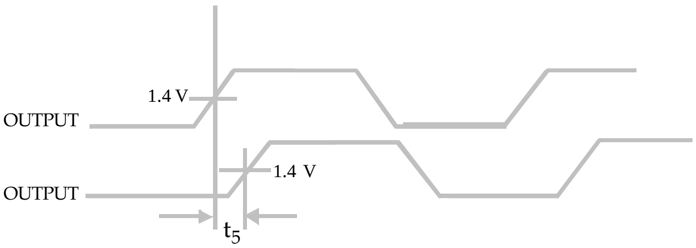
Duty Cycle Timing



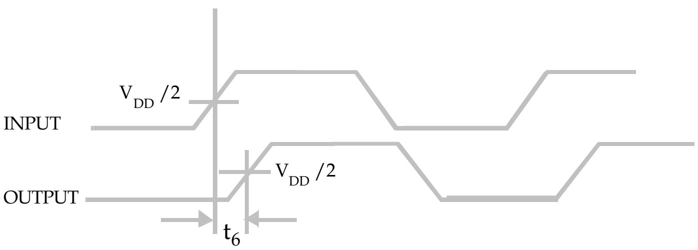
All Outputs Rise/Fall Time



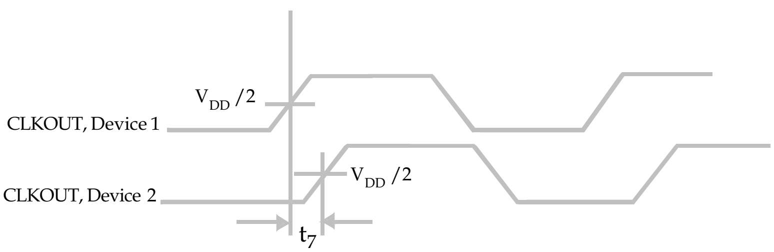
Output - Output Skew



Input - Output Propagation Delay

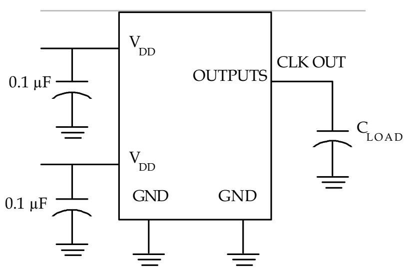


Device - Device Skew

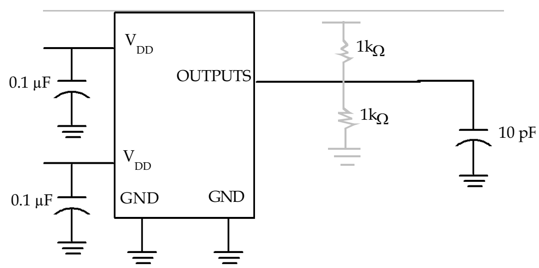


Test Circuits

Test Circuit #1

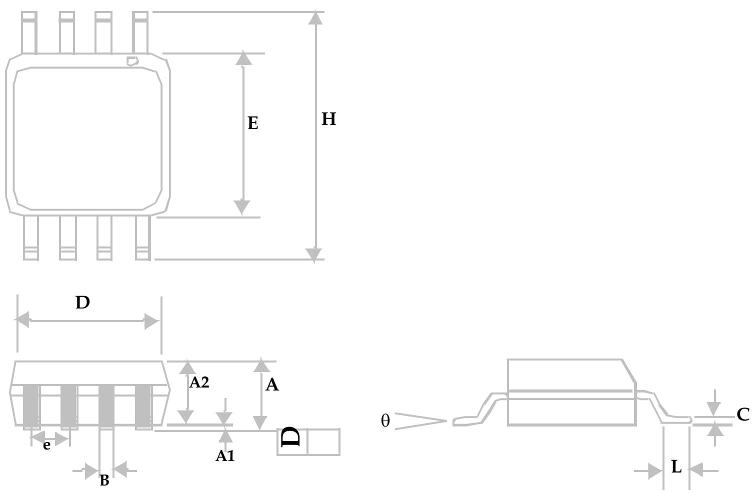


Test Circuit #2



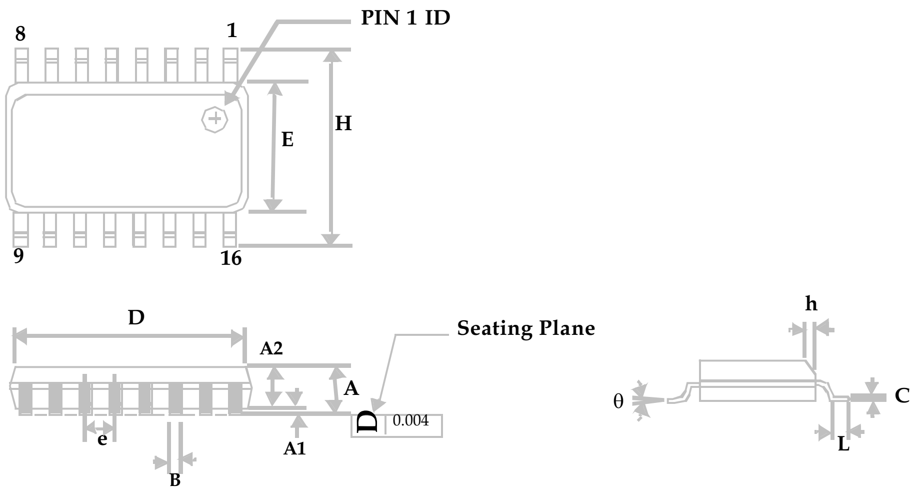
For parameter t_8 (output slew rate) on -1H devices

Package Information: 8-lead (150-mil) SOIC



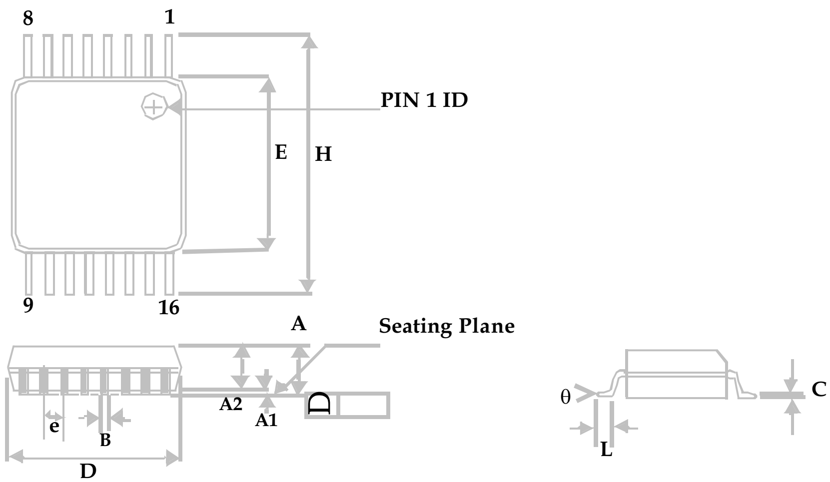
Symbol	Dimensions in inches		Dimensions in millimeters	
	Min	**Max**	**Min**	**Max**
A	0.057	0.071	1.45	1.80
A1	0.004	0.010	0.10	0.25
A2	0.053	0.069	1.35	1.75
B	0.012	0.020	0.31	0.51
C	0.004	0.01	0.10	0.25
D	0.186	0.202	4.72	5.12
E	0.148	0.164	3.75	4.15
e	0.050 BSC		1.27 BSC	
H	0.224	0.248	5.70	6.30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

Package Information: 16-lead (150 Mil) Molded SOIC



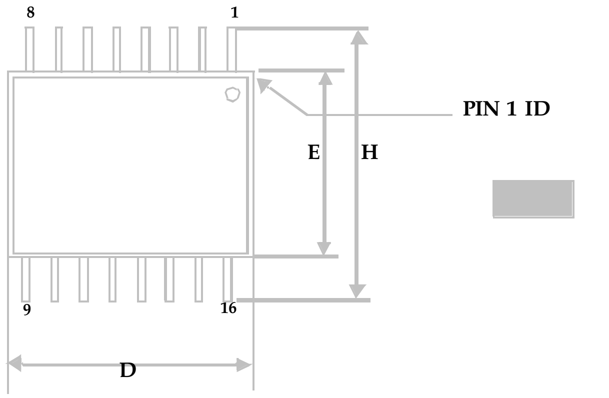
	DIMENSIONS			
	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.061	0.068	1.55	1.73
A1	0.004	0.0098	0.102	0.249
A2	0.055	0.061	1.40	1.55
B	0.013	0.019	0.33	0.49
C	0.0075	0.0098	0.191	0.249
D	0.386	0.393	9.80	9.98
E	0.150	0.157	3.81	3.99
e	0.050 BSC		1.27 BSC	
H	0.230	0.244	5.84	6.20
h	0.010	0.016	0.25	0.41
L	0.016	0.035	0.41	0.89
θ	0°	8°	0°	8°

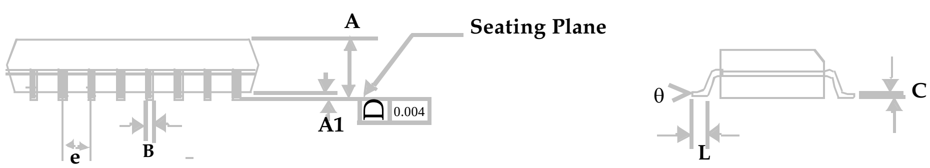
Package Information: 16-lead Thin Shrunk Small Outline Package (4.40-MM Body)



	DIMENSIONS (inches)		DIMENSIONS (mm)	
	MIN	MAX	MIN	MAX
A		0.043		1.10
A1	0.002	0.006	0.05	0.15
A2	0.003	0.37	0.85	0.95
B	0.007	0.012	0.19	0.30
C	0.004	0.008	0.09	0.20
D	0.193	2.008	4.90	5.10
E	0.169	0.177	4.30	4.50
e	0.026 BSC		0.65 BSC	
H	0.246	0.256	6.25	6.50
L	0.020	0.028	0.50	0.70
θ	0°	8°	0°	8°

Package Information: 16-lead (150-mil) SSOP





	DIMENSIONS (inches)		DIMENSIONS (millimeters)	
	MIN	MAX	MIN	MAX
A	0.049	0.065	1.245	1.651
A1	0.004	0.010	0.102	0.254
B	0.008	0.012	0.203	0.305
C	0.007	0.010	0.178	0.254
D	0.189	0.197	4.801	5.004
E	0.150	0.157	3.81	3.988
e	0.025 BSC		0.635 BSC	
H	0.228	0.244	5.791	6.198
L	0.016	0.050	0.406	1.27
θ	0°	8°	0°	8°

Ordering Codes

Ordering Code	Package Type	Operating Range
ASM5P2309A-1-16-ST	16-pin 150-mil SOIC-TUBE	Commercial
ASM5I2309A-1-16-ST	16-pin 150-mil SOIC- TUBE	Industrial
ASM5P2309A-1-16-SR	16-pin 150-mil SOIC-TAPE & REEL	Commercial
ASM5I2309A-1-16-SR	16-pin 150-mil SOIC-TAPE & REEL	Industrial
ASM5P2309A-1-16-TT	16-PIN 150-mil TSSOP - TUBE	Commercial
ASM5I2309A-1-16-TT	16-PIN 150-mil TSSOP - TUBE	Industrial
ASM5P2309A-1-16-TR	16-PIN 150-mil TSSOP - TAPE & REEL	Commercial
ASM5I2309A-1-16-TR	16-PIN 150-mil TSSOP - TAPE & REEL	Industrial
ASM5P2309A-1H-16-ST	16-pin 150-mil SOIC-TUBE	Commercial
ASM5I2309A-1H-16-ST	16-pin 150-mil SOIC- TUBE	Industrial
ASM5P2309A-1H-16-SR	16-pin 150-mil SOIC-TAPE & REEL	Commercial
ASM5I2309A-1H-16-SR	16-pin 150-mil SOIC-TAPE & REEL	Industrial
ASM5P2309A-1H-16-TT	16-PIN 150-mil TSSOP - TUBE	Commercial
ASM5I2309A-1H-16-TT	16-PIN 150-mil TSSOP - TUBE	Industrial
ASM5P2309A-1H-16-TR	16-PIN 150-mil TSSOP - TAPE & REEL	Commercial
ASM5I2309A-1H-16-TR	16-PIN 150-mil TSSOP - TAPE & REEL	Industrial
ASM5P2305A-1-08-ST	8-pin 150-mil SOIC-TUBE	Commercial
ASM5I2305A-1-08-ST	8-pin 150-mil SOIC- TUBE	Industrial
ASM5P2305A-1-08-SR	8-pin 150-mil SOIC-TAPE & REEL	Commercial
ASM5I2305A-1-08-SR	8-pin 150-mil SOIC-TAPE & REEL	Industrial
ASM5P2305A-1-08-TT	8-PIN 150-mil TSSOP - TUBE	Commercial
ASM5I2305A-1-08-TT	8-PIN 150-mil TSSOP - TUBE	Industrial
ASM5P2305A-1-08-TR	8-PIN 150-mil TSSOP - TAPE & REEL	Commercial
ASM5I2305A-1-08-TR	8-PIN 150-mil TSSOP - TAPE & REEL	Industrial
ASM5P2305A-1H-08-ST	8-pin 150-mil SOIC-TUBE	Commercial
ASM5I2305A-1H-08-ST	8-pin 150-mil SOIC- TUBE	Industrial
ASM5P2305A-1H-08-SR	8-pin 150-mil SOIC-TAPE & REEL	Commercial
ASM5I2305A-1H-08-SR	8-pin 150-mil SOIC-TAPE & REEL	Industrial
ASM5P2305A-1H-08-TT	8-PIN 150-mil TSSOP - TUBE	Commercial
ASM5I2305A-1H-08-TT	8-PIN 150-mil TSSOP - TUBE	Industrial
ASM5P2305A-1H-08-TR	8-PIN 150-mil TSSOP - TAPE & REEL	Commercial
ASM5I2305A-1H-08-TR	8-PIN 150-mil TSSOP - TAPE & REEL	Industrial

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