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## Features

- High Performance CMOS Technology
- Low Power Dissipation - Active and Standby
- Hardware and Software Data Protection Features
- $\overline{\text{DATA}}$  Polling for End of Write Detection
- High Reliability
  - Endurance:  $10^4$  Cycles
  - Data Retention: 10 years
- Single  $5\text{V} \pm 10\%$  Supply
- Single  $3\text{V} \pm 10\%$  Supply
- CMOS Compatible Inputs and Outputs
- $0^\circ\text{C}$  to  $+70^\circ\text{C}$  Operating Range
- Typical Die Thickness of 22 Mils
- Extended Endurance:  $10^5$  Cycles
- Military Product Performance ( $-55^\circ\text{C}$  to  $+125^\circ\text{C}$ )
- Element Evaluation Program

## Description

Atmel Parallel EEPROMs are available in die form. All die products are 100% electrically tested in wafer form and visually inspected after saw and clean. Atmel's EEPROM die products are processed with an advanced CMOS floating gate technology. As with all Atmel products, they are designed and tested to ensure high quality and manufacturability. The devices include such features as internal error correction for extended endurance and improved data retention characteristics.

Atmel offers a full line of 5V and 3V die products (see ordering information table). An optional Element Evaluation test flow which entails sample packaging and electrical screening in accordance with MIL-STD 883 M5008 is available for military and automotive grade applications. Standard shipping methods for Atmel die products include protective wafer and wafer carriers. Optional packaging methods are available, including wafer ring mounting and wafer orientation to accommodate the customer's manufacturing equipment.

## Testing

Reference Parallel EEPROM Die Product Test Flow. Die product Sort Test includes checks for DC parameters such as  $I_{\text{CC}}$  and input leakage as well as for AC switching parameters. Data pattern testing, several oxide stress tests, and data retention high temperature bake tests are performed on a 100% basis to guard against pattern sensitivity and infant mortality, and ensure integrity of the core cell oxides. Contact Atmel for a detailed Die Product Test Flow Diagram, including all test conditions.

Atmel also supplies die product processed to the Element Evaluation Test Flow which includes wafer lot assembly and test in accordance with MIL-STD 883 M5004 (reference Atmel Military MIL-STD 883 Test Flow, Section 7).



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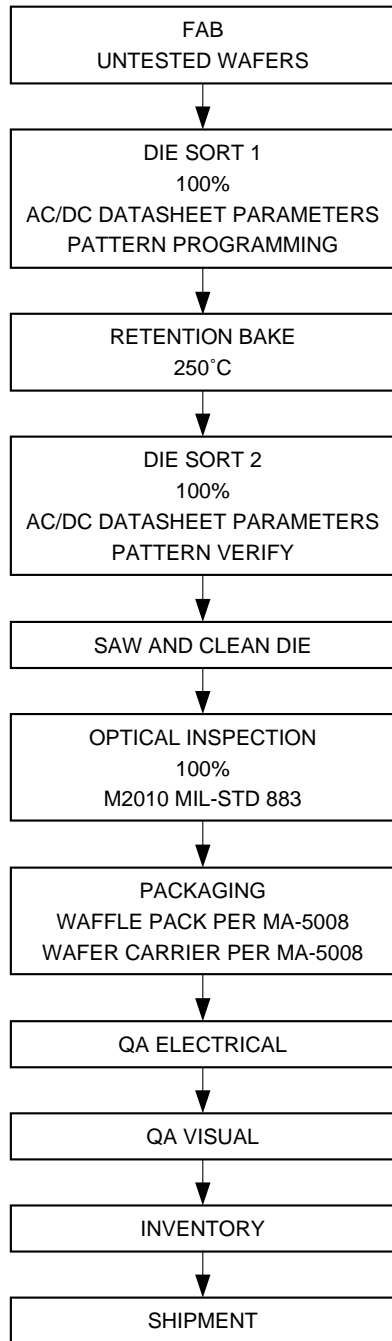
## Parallel EEPROM Die Products

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## Die Products



## Parallel EEPROM Die Product Test Flow



- Backside Condition: Silicon (grind).
- Connection: Connect substrate to GND.
- Die Map Logo: Not to scale and is shown only as a reference for proper orientation of the wafer.

## Die Product Offering – Battery Volt, 5 Volt, Low Volt

Ordering Code <sup>(1)</sup>	V <sub>CC</sub>	Device T <sub>AA</sub>	Package Configuration
AT28BV16-W	2.7V - 3.6V	250 ns	Die
AT28BV16-DWF	2.7V - 3.6V	250 ns	Wafer
AT28BV64-W	2.7V - 3.6V	250 ns	Die
AT28BV64-DWF	2.7V - 3.6V	250 ns	Wafer
AT28BV64B-W	2.7V - 3.6V	250 ns	Die
AT28BV64B-DWF	2.7V - 3.6V	250 ns	Wafer
AT28BV256-W	2.7V - 3.6V	250 ns	Die
AT28BV256-DWF	2.7V - 3.6V	250 ns	Wafer
AT28LV010-W	3.0V - 3.6V	250 ns	Die
AT28LV010-DWF	3.0V - 3.6V	250 ns	Wafer
AT28C16-W	4.5V - 5.5V	200 ns	Die
AT28C16-DWF	4.5V - 5.5V	200 ns	Wafer
AT28C64-W	4.5V - 5.5V	200 ns	Die
AT28C64-DWF	4.5V - 5.5V	200 ns	Wafer
AT28C64B-W	4.5V - 5.5V	200 ns	Die
AT28C64B-DWF	4.5V - 5.5V	200 ns	Wafer
AT28HC64B-W	4.5V - 5.5V	120 ns	Die
AT28HC64B-DWF	4.5V - 5.5V	120 ns	Wafer
AT28C256-W	4.5V - 5.5V	200 ns	Die
AT28C256-DWF	4.5V - 5.5V	200 ns	Wafer
AT28HC256-W	4.5V - 5.5V	120 ns	Die
AT28HC256-DWF	4.5V - 5.5V	120 ns	Wafer
AT28C010-W	4.5V - 5.5V	200 ns	Die
AT28C010-DWF	4.5V - 5.5V	200 ns	Wafer

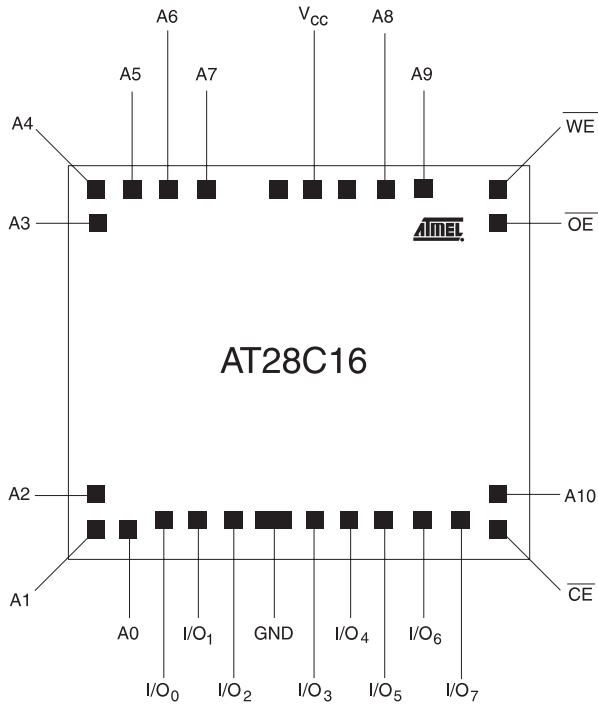
Note: 1. Represents standard die product commercial temperature range guarantee.

## Die Information

- Handling: Instructions for Parallel EEPROM Die Product is available from Atmel.

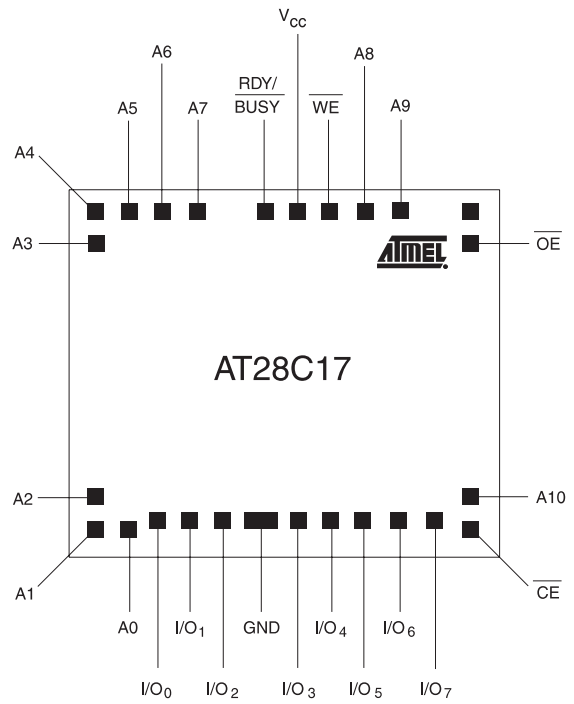
## AT28C16 Die Map

Die Size: 137 X 117 mils  
Connect Substrate to Ground



## AT28C17 Die Map

Die Size: 137 X 117 mils  
Connect Substrate to Ground



### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1130	-1270
A <sub>1</sub>	-1420	-1270
A <sub>2</sub>	-1420	-920
A <sub>3</sub>	-1370	950
A <sub>4</sub>	-1370	1230
A <sub>5</sub>	-1140	1230
A <sub>6</sub>	-900	1230
A <sub>7</sub>	-660	1230
A <sub>8</sub>	680	1230
A <sub>9</sub>	920	1230
A <sub>10</sub>	1630	-1000
I/O <sub>0</sub>	-870	-1190

Signal Name	X (μ)	Y (μ)
I/O <sub>1</sub>	-610	-1190
I/O <sub>2</sub>	-360	-1190
I/O <sub>3</sub>	230	-1190
I/O <sub>4</sub>	480	-1190
I/O <sub>5</sub>	740	-1190
I/O <sub>6</sub>	990	-1190
I/O <sub>7</sub>	1250	-1190
GND	-60	-1190
V <sub>CC</sub>	210	1230
$\overline{WE}$	1630	1230
$\overline{OE}$	1630	1000
$\overline{CE}$	1630	-1220

\*Coordinates are calculated from die center point

### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1130	-1270
A <sub>1</sub>	-1420	-1270
A <sub>2</sub>	-1420	-920
A <sub>3</sub>	-1370	950
A <sub>4</sub>	-1370	1230
A <sub>5</sub>	-1140	1230
A <sub>6</sub>	-900	1230
A <sub>7</sub>	-660	1230
A <sub>8</sub>	680	1230
A <sub>9</sub>	920	1230
A <sub>10</sub>	1630	-1000
I/O <sub>0</sub>	-870	-1190
I/O <sub>1</sub>	-610	-1190

Signal Name	X (μ)	Y (μ)
I/O <sub>2</sub>	-360	-1190
I/O <sub>3</sub>	230	-1190
I/O <sub>4</sub>	480	-1190
I/O <sub>5</sub>	740	-1190
I/O <sub>6</sub>	990	-1190
I/O <sub>7</sub>	1250	-1190
RDY/ $\overline{BSY}$	-100	1230
GND	-60	-1190
V <sub>CC</sub>	210	1230
$\overline{WE}$	450	1230
$\overline{OE}$	1630	1000
$\overline{CE}$	1630	-1220

\*Coordinates are calculated from die center point

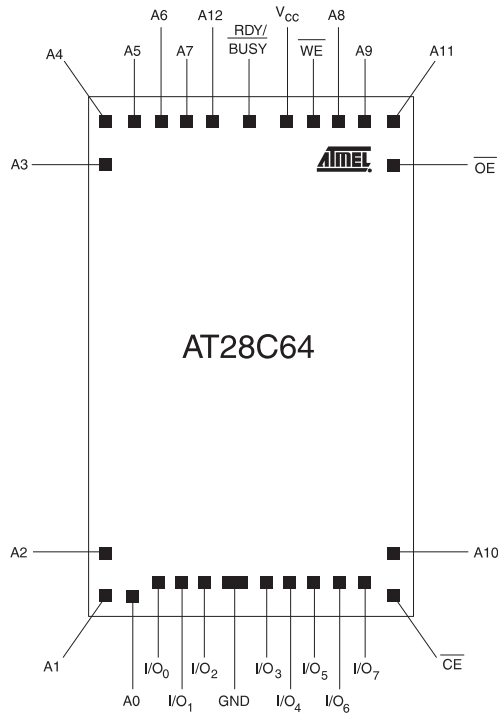
Note: Die size is subject to change. Contact the Atmel Sales Representative to confirm die size.





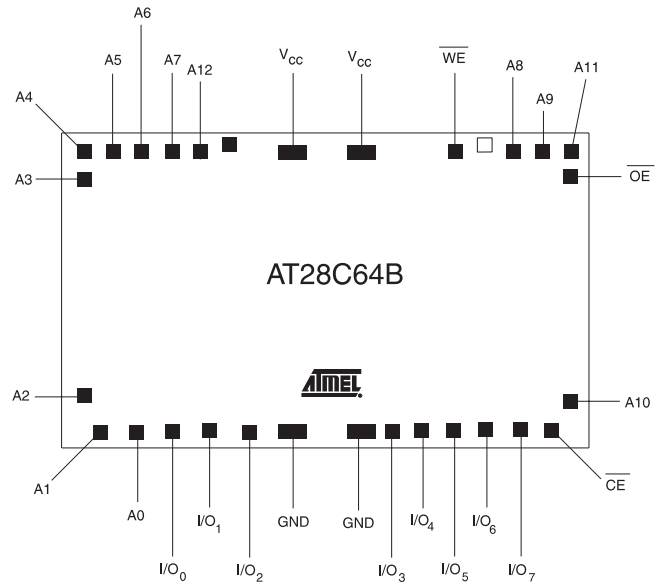
## AT28C64 Die Map

Die Size: 88 X 139 mils  
Connect Substrate to Ground



## AT28C64B Die Map

Die Size: 178 X 120 mils  
Connect Substrate to Ground



### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-861	-1604
A <sub>1</sub>	-1015	-1613
A <sub>2</sub>	-1016	-1459
A <sub>3</sub>	-987	1308
A <sub>4</sub>	-992	1461
A <sub>5</sub>	-838	1461
A <sub>6</sub>	-685	1461
A <sub>7</sub>	-532	1461
A <sub>8</sub>	343	1461
A <sub>9</sub>	496	1461
A <sub>10</sub>	908	-1406
A <sub>11</sub>	872	1506
A <sub>12</sub>	-378	1461
I/O <sub>0</sub>	-655	-1557

Signal Name	X (μ)	Y (μ)
I/O <sub>1</sub>	-494	-1557
I/O <sub>2</sub>	-337	-1557
I/O <sub>3</sub>	58	-1557
I/O <sub>4</sub>	223	-1557
I/O <sub>5</sub>	389	-1557
I/O <sub>6</sub>	546	-1557
I/O <sub>7</sub>	703	-1557
RDY/BSY	-122	1496
GND	-141	-1634
V <sub>CC</sub>	32	1471
WE	189	1461
OE	870	1294
CE	903	-1557

\*Coordinates are calculated from die center point

### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1721	-1401
A <sub>1</sub>	-1966	-1401
A <sub>2</sub>	-2142	-1131
A <sub>3</sub>	-2142	939
A <sub>4</sub>	-2125	1171
A <sub>5</sub>	-1884	1171
A <sub>6</sub>	-1440	1171
A <sub>7</sub>	-1237	1171
A <sub>8</sub>	1657	1171
A <sub>9</sub>	1832	1171
A <sub>10</sub>	2035	-1128
A <sub>11</sub>	2035	1171
A <sub>12</sub>	-1063	1171
I/O <sub>0</sub>	-1425	-1362

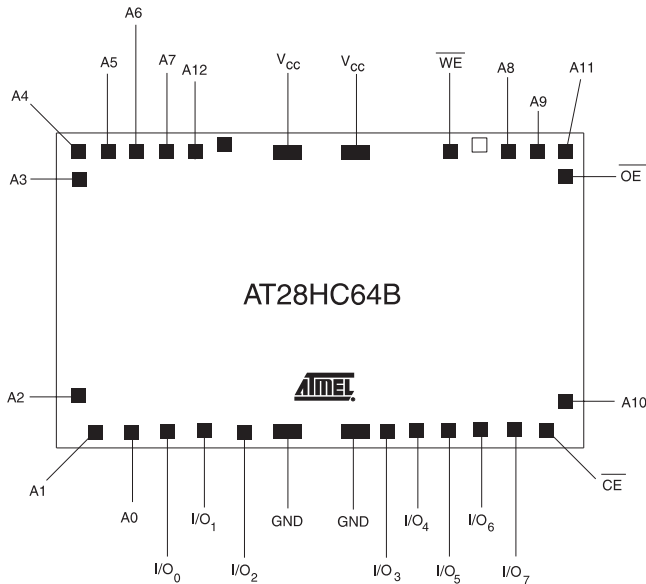
Signal Name	X (μ)	Y (μ)
I/O <sub>1</sub>	-1126	-1362
I/O <sub>2</sub>	-796	-1362
I/O <sub>3</sub>	406	-1362
I/O <sub>4</sub>	735	-1362
I/O <sub>5</sub>	1035	-1362
I/O <sub>6</sub>	1365	-1362
I/O <sub>7</sub>	1664	-1362
GND	57	-1353
GND	-446	-1353
V <sub>CC</sub>	-443	1240
V <sub>CC</sub>	-98	1240
WE	1272	1171
OE	2039	939
CE	1954	-1401

\*Coordinates are calculated from die center point

Note: Die size is subject to change. Contact the Atmel Sales Representative to confirm die size.

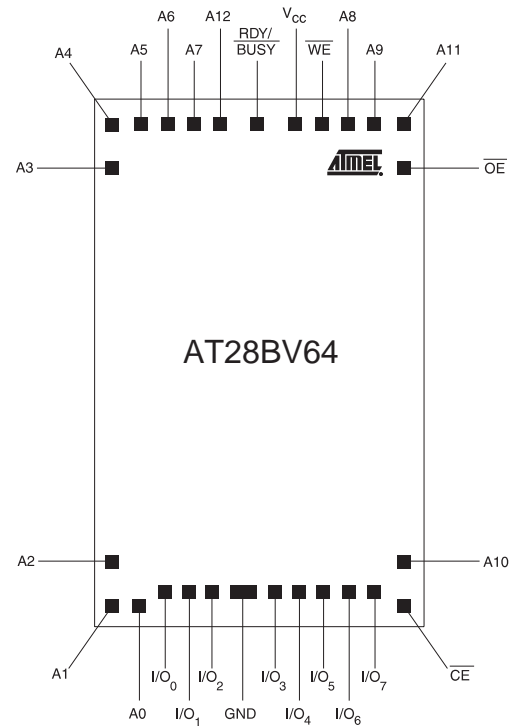
## AT28HC64B Die Map

Die Size: 178 X 120 mils  
Connect Substrate to Ground



## AT28BV64 Die Map

Die Size: 100 X 168 mils  
Connect Substrate to Ground



### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1721	-1401
A <sub>1</sub>	-1966	-1401
A <sub>2</sub>	-2142	-1131
A <sub>3</sub>	-2142	939
A <sub>4</sub>	-2125	1171
A <sub>5</sub>	-1884	1171
A <sub>6</sub>	-1440	1171
A <sub>7</sub>	-1237	1171
A <sub>8</sub>	1657	1171
A <sub>9</sub>	1832	1171
A <sub>10</sub>	2035	-1128
A <sub>11</sub>	2035	1171
A <sub>12</sub>	-1063	1171
I/O <sub>0</sub>	-1425	-1362

Signal Name	X (μ)	Y (μ)
I/O <sub>1</sub>	-1126	-1362
I/O <sub>2</sub>	-796	-1362
I/O <sub>3</sub>	406	-1362
I/O <sub>4</sub>	735	-1362
I/O <sub>5</sub>	1035	-1362
I/O <sub>6</sub>	1365	-1362
I/O <sub>7</sub>	1664	-1362
GND	57	-1353
GND	-446	-1353
V <sub>CC</sub>	-443	1240
V <sub>CC</sub>	-98	1240
WE	1272	1171
OE	2039	939
CE	1954	-1401

### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-921	-1867
A <sub>1</sub>	-1078	-1867
A <sub>2</sub>	-1113	-1710
A <sub>3</sub>	-1080	1702
A <sub>4</sub>	-1075	1870
A <sub>5</sub>	-882	1870
A <sub>6</sub>	-721	1870
A <sub>7</sub>	-528	1870
A <sub>8</sub>	446	1870
A <sub>9</sub>	607	1870
A <sub>10</sub>	1097	-1720
A <sub>11</sub>	1070	1924
A <sub>12</sub>	-367	1870
I/O <sub>0</sub>	-693	-1826

Signal Name	X (μ)	Y (μ)
I/O <sub>1</sub>	-507	-1826
I/O <sub>2</sub>	-326	-1826
I/O <sub>3</sub>	124	-1826
I/O <sub>4</sub>	315	-1826
I/O <sub>5</sub>	506	-1826
I/O <sub>6</sub>	688	-1826
I/O <sub>7</sub>	869	-1826
RDY/BSY	-77	1924
GND	-100	-1910
V <sub>CC</sub>	89	1895
WE	253	1870
OE	1060	1679
CE	1090	-1872

\*Coordinates are calculated from die center point

\*Coordinates are calculated from die center point

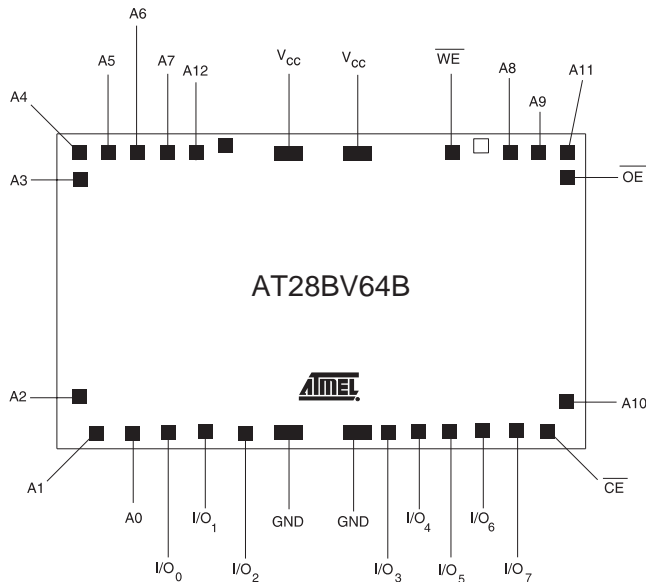
Note: Die size is subject to change. Contact the Atmel Sales Representative to confirm die size.





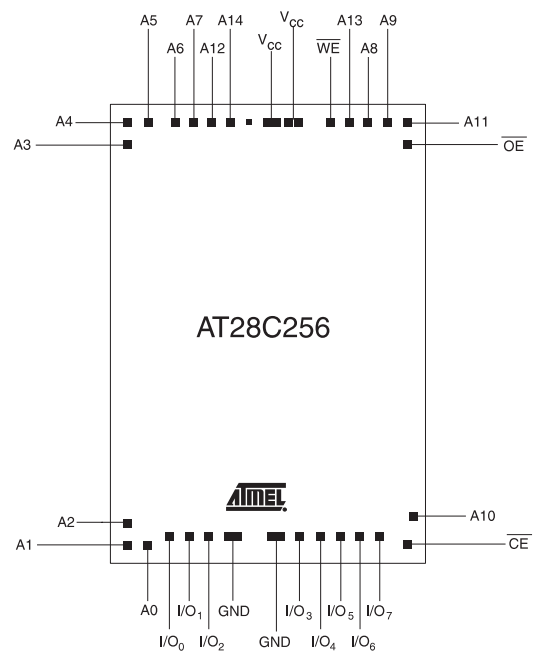
### AT28BV64B Die Map

Die Size: 178 X 120 mils  
Connect Substrate to Ground



### AT28C256 Die Map

Die Size: 178 X 242 mils  
Connect Substrate to Ground



#### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1721	-1401
A <sub>1</sub>	-1966	-1401
A <sub>2</sub>	-2142	-1131
A <sub>3</sub>	-2142	939
A <sub>4</sub>	-2125	1171
A <sub>5</sub>	-1884	1171
A <sub>6</sub>	-1440	1171
A <sub>7</sub>	-1237	1171
A <sub>8</sub>	1657	1171
A <sub>9</sub>	1832	1171
A <sub>10</sub>	2035	-1128
A <sub>11</sub>	2035	1171
A <sub>12</sub>	-1063	1171
I/O <sub>0</sub>	-1425	-1362

Signal Name	X (μ)	Y (μ)
I/O <sub>1</sub>	-1126	-1362
I/O <sub>2</sub>	-796	-1362
I/O <sub>3</sub>	406	-1362
I/O <sub>4</sub>	735	-1362
I/O <sub>5</sub>	1035	-1362
I/O <sub>6</sub>	1365	-1362
I/O <sub>7</sub>	1664	-1362
GND	57	-1353
GND	-446	-1353
V <sub>CC</sub>	-443	1240
V <sub>CC</sub>	-98	1240
$\overline{WE}$	1272	1171
$\overline{OE}$	2039	939
$\overline{CE}$	1954	-1401

#### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1792	-2951
A <sub>1</sub>	-2037	-2951
A <sub>2</sub>	-2126	-2711
A <sub>3</sub>	-2126	2490
A <sub>4</sub>	-2108	2722
A <sub>5</sub>	-1868	2722
A <sub>6</sub>	-1432	2722
A <sub>7</sub>	-1228	2722
A <sub>8</sub>	1658	2722
A <sub>9</sub>	1832	2722
A <sub>10</sub>	2035	-2677
A <sub>11</sub>	2035	2722
A <sub>12</sub>	-1054	2722
A <sub>13</sub>	1454	2722
A <sub>14</sub>	-851	2722

Signal Name	X (μ)	Y (μ)
I/O <sub>0</sub>	-1416	-2911
I/O <sub>1</sub>	-1117	-2911
I/O <sub>2</sub>	-787	-2911
I/O <sub>3</sub>	415	-2911
I/O <sub>4</sub>	745	-2911
I/O <sub>5</sub>	1044	-2911
I/O <sub>6</sub>	1374	-2911
I/O <sub>7</sub>	1673	-2911
GND	-438	-2902
GND	66	-2902
V <sub>CC</sub>	-435	2790
V <sub>CC</sub>	-89	2790
$\overline{WE}$	1280	2722
$\overline{OE}$	2039	2490
$\overline{CE}$	2035	-2951

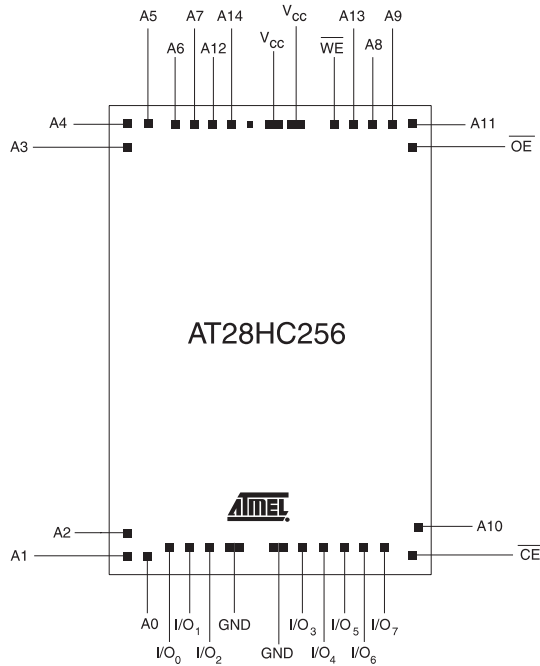
\*Coordinates are calculated from die center point

\*Coordinates are calculated from die center point

Note: Die size is subject to change. Contact the Atmel Sales Representative to confirm die size.

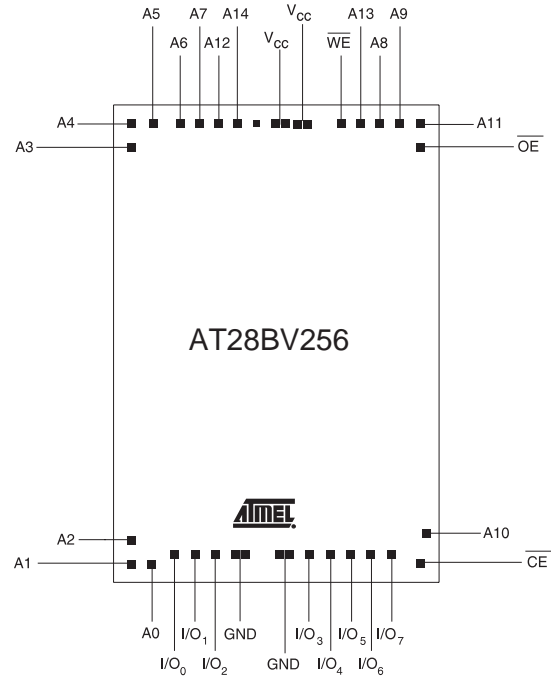
## AT28HC256 Die Map

Die Size: 178 X 242 mils  
Connect Substrate to Ground



## AT28BV256 Die Map

Die Size: 178 X 242 mils  
Connect Substrate to Ground



### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)	Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1792	-2951	I/O <sub>0</sub>	-1416	-2911
A <sub>1</sub>	-2037	-2951	I/O <sub>1</sub>	-1117	-2911
A <sub>2</sub>	-2126	-2711	I/O <sub>2</sub>	-787	-2911
A <sub>3</sub>	-2126	2490	I/O <sub>3</sub>	415	-2911
A <sub>4</sub>	-2108	2722	I/O <sub>4</sub>	745	-2911
A <sub>5</sub>	-1868	2722	I/O <sub>5</sub>	1044	-2911
A <sub>6</sub>	-1432	2722	I/O <sub>6</sub>	1374	-2911
A <sub>7</sub>	-1228	2722	I/O <sub>7</sub>	1673	-2911
A <sub>8</sub>	1658	2722	GND	-438	-2902
A <sub>9</sub>	1832	2722	GND	66	-2902
A <sub>10</sub>	2035	-2677	V <sub>CC</sub>	-435	2790
A <sub>11</sub>	2035	2722	V <sub>CC</sub>	-89	2790
A <sub>12</sub>	-1054	2722	$\overline{WE}$	1280	2722
A <sub>13</sub>	1454	2722	$\overline{OE}$	2039	2490
A <sub>14</sub>	-851	2722	$\overline{CE}$	2035	-2951

\*Coordinates are calculated from die center point

### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)	Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-1792	-2951	I/O <sub>0</sub>	-1416	-2911
A <sub>1</sub>	-2037	-2951	I/O <sub>1</sub>	-1117	-2911
A <sub>2</sub>	-2126	-2711	I/O <sub>2</sub>	-787	-2911
A <sub>3</sub>	-2126	2490	I/O <sub>3</sub>	415	-2911
A <sub>4</sub>	-2108	2722	I/O <sub>4</sub>	745	-2911
A <sub>5</sub>	-1868	2722	I/O <sub>5</sub>	1044	-2911
A <sub>6</sub>	-1432	2722	I/O <sub>6</sub>	1374	-2911
A <sub>7</sub>	-1228	2722	I/O <sub>7</sub>	1673	-2911
A <sub>8</sub>	1658	2722	GND	-438	-2902
A <sub>9</sub>	1832	2722	GND	66	-2902
A <sub>10</sub>	2035	-2677	V <sub>CC</sub>	-435	2790
A <sub>11</sub>	2035	2722	V <sub>CC</sub>	-89	2790
A <sub>12</sub>	-1054	2722	$\overline{WE}$	1280	2722
A <sub>13</sub>	1454	2722	$\overline{OE}$	2039	2490
A <sub>14</sub>	-851	2722	$\overline{CE}$	2035	-2951

\*Coordinates are calculated from die center point

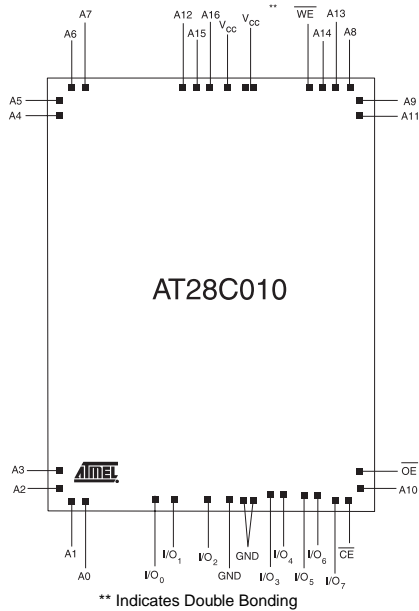
Note: Die size is subject to change. Contact the Atmel Sales Representative to confirm die size.



## AT28C010 Die Map

Die Size: 245 X 361 mils

Connect Substrate to Ground



### Die Pad Coordinates\*

Signal Name	X (μ)	Y (μ)	Signal Name	X (μ)	Y (μ)
A <sub>0</sub>	-2647	-4318	I/O <sub>0</sub>	-609	-4399
A <sub>1</sub>	-2875	-4318	I/O <sub>1</sub>	-274	-4399
A <sub>2</sub>	-2960	-4053	I/O <sub>2</sub>	62	-4399
A <sub>3</sub>	-2960	-3825	I/O <sub>3</sub>	950	-4399
A <sub>4</sub>	-2973	3847	I/O <sub>4</sub>	1288	-4399
A <sub>5</sub>	-2973	4112	I/O <sub>5</sub>	1623	-4399
A <sub>6</sub>	-2673	4280	I/O <sub>6</sub>	1961	-4399
A <sub>7</sub>	-2433	4280	I/O <sub>7</sub>	2296	-4399
A <sub>8</sub>	2611	4274	GND	311	-4399
A <sub>9</sub>	2857	4067	GND	530	-4405
A <sub>10</sub>	2783	-4200	GND	688	-4405
A <sub>11</sub>	2857	3839	V <sub>CC</sub>	286	4310
A <sub>12</sub>	-454	4274	V <sub>CC</sub>	575	4286
A <sub>13</sub>	2384	4274	$\overline{WE}$	1928	4274
A <sub>14</sub>	2156	4274	$\overline{OE}$	2783	-3973
A <sub>15</sub>	-226	4274	$\overline{CE}$	2716	-4444
A <sub>16</sub>	2	4274			

\*Coordinates are calculated from die center point

Note: Die size is subject to change. Contact the Atmel Sales Representative to confirm die size.











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