# AG10KSDE176

# DATASHEET

AGM AG10KSDE176 是由 AGM FPGA AG10K 与 SDRAM 叠封集成的芯片，具有 AG10K FPGA 的可编程功能，提供更多可编程 IO，同时内部连接大容量 SDRAM。

- **FPGA 外部管脚输出**

  EQFP176 封装底部 Pad 为 GND，管脚说明请见下表：

| Bank | Pin Name | Function |
|---|---|---|
| B1 | Pin_1 | IO |
| B1 | Pin_2 | IO |
| B1 | Pin_3 | IO |
| B1 | Pin_4 | IO |
| B1 | Pin_5 | Ground |
| B1 | Pin_6 | IO |
| B1 | Pin_7 | VDDC Power 1.2V |
| B1 | Pin_8 | IO(DATA1,ASDO) |
| B1 | Pin_9 | IO(nCSO) |
| B1 | Pin_10 | IO |
| B1 | Pin_11 | nSTATUS |
| B1 | Pin_12 | Ground |
| B1 | Pin_13 | IO |
| B1 | Pin_14 | IO |
| B1 | Pin_15 | DCLK |
| B1 | Pin_16 | IO(DATA0) |
| B1 | Pin_17 | nCONFIG |
| B1 | Pin_18 | TDI |
| B1 | Pin_19 | TCK |
| B1 | Pin_20 | VDDIO1 Power 3.3V |

| | | |
|---|---|---|
| B1 | Pin_21 | TMS |
| B1 | Pin_22 | TDO |
| B1 | Pin_23 | CLK1 |
| B2 | Pin_24 | CLK2 |
| B2 | Pin_25 | CLK3 |
| B2 | Pin_26 | IO |
| B2 | Pin_27 | IO |
| B2 | Pin_28 | VDDIO2 Power 3.3V |
| B2 | Pin_29 | Ground |
| B2 | Pin_30 | VDDC Power 1.2V |
| B2 | Pin_31 | IO |
| B2 | Pin_32 | IO |
| B2 | Pin_33 | IO |
| B2 | Pin_34 | IO |
| B2 | Pin_35 | IO |
| B2 | Pin_36 | IO |
| B2 | Pin_37 | IO |
| B2 | Pin_38 | IO |
| B2 | Pin_39 | IO |
| B2 | Pin_40 | IO |
| B2 | Pin_41 | Ground |
| B2 | Pin_42 | IO |
| B2 | Pin_43 | PLL0 analog power 2.5V |
| B2 | Pin_44 | PLL0 digital ground |
| B2 | Pin_45 | PLL0 digital power 1.2V |
| B3 | Pin_46 | IO |

| | | |
|---|---|---|
| B3 | Pin_47 | IO |
| B3 | Pin_48 | IO |
| B3 | Pin_49 | IO |
| B3 | Pin_50 | IO |
| B3 | Pin_51 | Ground |
| B3 | Pin_52 | IO |
| B3 | Pin_53 | IO |
| B3 | Pin_54 | VDDC Power 1.2V |
| B3 | Pin_55 | Ground |
| B3 | Pin_56 | IO |
| B3 | Pin_57 | IO |
| B3 | Pin_58 | IO |
| B3 | Pin_59 | IO |
| B3 | Pin_60 | IO |
| B3 | Pin_61 | IO |
| B3 | Pin_62 | IO |
| B3 | Pin_63 | IO |
| B3 | Pin_64 | IO |
| B3 | Pin_65 | IO |
| B3 | Pin_66 | VDDIO3 Power 3.3V |
| B3 | Pin_67 | IO |
| B3 | Pin_68 | Ground |
| B4 | Pin_69 | Ground |
| B4 | Pin_70 | IO |
| B4 | Pin_71 | VDDC Power 1.2V |
| B4 | Pin_72 | IO |

| | | |
|---|---|---|
| B4 | Pin_73 | Ground |
| B4 | Pin_74 | IO |
| B4 | Pin_75 | IO |
| B4 | Pin_76 | IO |
| B4 | Pin_77 | IO |
| B4 | Pin_78 | IO |
| B4 | Pin_79 | IO |
| B4 | Pin_80 | IO |
| B4 | Pin_81 | IO |
| B4 | Pin_82 | VDDIO4 Power 3.3V |
| B4 | Pin_83 | IO |
| B4 | Pin_84 | Ground |
| B4 | Pin_85 | IO |
| B4 | Pin_86 | IO |
| B4 | Pin_87 | IO |
| B4 | Pin_88 | IO |
| B5 | Pin_89 | IO |
| B5 | Pin_90 | IO |
| B5 | Pin_91 | IO |
| B5 | Pin_92 | IO |
| B5 | Pin_93 | IO |
| B5 | Pin_94 | IO |
| B5 | Pin_95 | IO |
| B5 | Pin_96 | IO |
| B5 | Pin_97 | VDDC Power 1.2V |
| B5 | Pin_98 | IO |

| | | |
|---|---|---|
| B5 | Pin_99 | Ground |
| B5 | Pin_100 | IO |
| B5 | Pin_101 | IO |
| B5 | Pin_102 | IO |
| B5 | Pin_103 | IO |
| B5 | Pin_104 | IO |
| B5 | Pin_105 | VDDIO5 Power 3.3V |
| B5 | Pin_106 | IO |
| B5 | Pin_107 | IO |
| B5 | Pin_108 | IO |
| B5 | Pin_109 | IO |
| B5 | Pin_110 | IO |
| B5 | Pin_111 | CLK7 |
| B5 | Pin_112 | CLK6 |
| B5 | Pin_113 | Ground |
| B6 | Pin_114 | CLK5 |
| B6 | Pin_115 | CLK4 |
| B6 | Pin_116 | CONF_DONE |
| B6 | Pin_117 | Ground |
| B6 | Pin_118 | MSEL1 |
| B6 | Pin_119 | IO |
| B6 | Pin_120 | IO |
| B6 | Pin_121 | VDDC Power 1.2V |
| B6 | Pin_122 | IO |
| B6 | Pin_123 | Ground |
| B6 | Pin_124 | IO |

| | | |
|---|---|---|
| B6 | Pin_125 | IO |
| B6 | Pin_126 | IO |
| B6 | Pin_127 | VDDIO6 Power 3.3V |
| B6 | Pin_128 | IO |
| B6 | Pin_129 | IO |
| B6 | Pin_130 | IO |
| B6 | Pin_131 | PLL1 analog power 2.5V |
| B6 | Pin_132 | PLL1 digital ground |
| B6 | Pin_133 | PLL1 digital power 1.2V |
| B7 | Pin_134 | IO |
| B7 | Pin_135 | IO |
| B7 | Pin_136 | IO |
| B7 | Pin_137 | IO |
| B7 | Pin_138 | Ground |
| B7 | Pin_139 | IO |
| B7 | Pin_140 | IO |
| B7 | Pin_141 | VDDC Power 1.2V |
| B7 | Pin_142 | IO |
| B7 | Pin_143 | IO |
| B7 | Pin_144 | IO |
| B7 | Pin_145 | Ground |
| B7 | Pin_146 | IO |
| B7 | Pin_147 | VDDIO7 Power 3.3V |
| B7 | Pin_148 | IO |
| B7 | Pin_149 | Ground |
| B7 | Pin_150 | Ground |

| | | |
|---|---|---|
| B7 | Pin_151 | IO |
| B7 | Pin_152 | IO |
| B8 | Pin_153 | IO |
| B8 | Pin_154 | IO |
| B8 | Pin_155 | Ground |
| B8 | Pin_156 | IO |
| B8 | Pin_157 | IO |
| B8 | Pin_158 | IO |
| B8 | Pin_159 | IO |
| B8 | Pin_160 | IO |
| B8 | Pin_161 | VDDC Power 1.2V |
| B8 | Pin_162 | IO |
| B8 | Pin_163 | IO |
| B8 | Pin_164 | Ground |
| B8 | Pin_165 | IO |
| B8 | Pin_166 | IO |
| B8 | Pin_167 | VDDIO8 Power 3.3V |
| B8 | Pin_168 | IO |
| B8 | Pin_169 | Ground |
| B8 | Pin_170 | IO |
| B8 | Pin_171 | IO |
| B8 | Pin_172 | IO |
| B8 | Pin_173 | IO |
| B8 | Pin_174 | Ground |
| B8 | Pin_175 | IO |
| B8 | Pin_176 | IO |

- **SDRAM 说明**

  内部 SDRAM 为 64Mbit（512K words × 4 banks × 32 bits）容量。由于 SDRAM 为 3.3V 器件，FPGA 的 VCCIO 也需接 3.3V。

  FPGA 的 IO 与 SDRAM 的内部连接，请见下表：

| Bank | SDRAM Finger | FPGA Pin Name | Function |
|---|---|---|---|
| B3 | /CAS | SDRAM_CAS | IO |
| B4 | /CS | SDRAM_CS | IO |
| B3 | /RAS | SDRAM_RAS | IO |
| B3 | /WE | SDRAM_WE | IO |
| B7 | A0 | SDRAM_A0 | IO |
| B7 | A1 | SDRAM_A1 | IO |
| B7 | A2 | SDRAM_A2 | IO |
| B7 | A3 | SDRAM_A3 | IO |
| B4 | A4 | SDRAM_A4 | IO |
| B4 | A5 | SDRAM_A5 | IO |
| B4 | A6 | SDRAM_A6 | IO |
| B4 | A7 | SDRAM_A7 | IO |
| B4 | A8 | SDRAM_A8 | IO |
| B4 | A9 | SDRAM_A9 | IO |
| B7 | A10 | SDRAM_A10 | IO |
| B7 | BA0 | SDRAM_BA0 | IO |
| B8 | BA1 | SDRAM_BA1 | IO |
| B3 | CKE | SDRAM_CKE | IO |
| B8 | CLK | SDRAM_CLK | IO |
| B2 | DQ0 | SDRAM_DQ0 | IO |

| | | | |
|---|---|---|---|
| B2 | DQ1 | SDRAM_DQ1 | IO |
| B2 | DQ2 | SDRAM_DQ2 | IO |
| B2 | DQ3 | SDRAM_DQ3 | IO |
| B2 | DQ4 | SDRAM_DQ4 | IO |
| B3 | DQ5 | SDRAM_DQ5 | IO |
| B3 | DQ6 | SDRAM_DQ6 | IO |
| B3 | DQ7 | SDRAM_DQ7 | IO |
| B8 | DQ8 | SDRAM_DQ8 | IO |
| B8 | DQ9 | SDRAM_DQ9 | IO |
| B8 | DQ10 | SDRAM_DQ10 | IO |
| B8 | DQ11 | SDRAM_DQ11 | IO |
| B8 | DQ12 | SDRAM_DQ12 | IO |
| B8 | DQ13 | SDRAM_DQ13 | IO |
| B1 | DQ14 | SDRAM_DQ14 | IO |
| B1 | DQ15 | SDRAM_DQ15 | IO |
| B5 | DQ16 | SDRAM_DQ16 | IO |
| B5 | DQ17 | SDRAM_DQ17 | IO |
| B5 | DQ18 | SDRAM_DQ18 | IO |
| B5 | DQ19 | SDRAM_DQ19 | IO |
| B4 | DQ20 | SDRAM_DQ20 | IO |
| B4 | DQ21 | SDRAM_DQ21 | IO |
| B4 | DQ22 | SDRAM_DQ22 | IO |
| B4 | DQ23 | SDRAM_DQ23 | IO |
| B7 | DQ24 | SDRAM_DQ24 | IO |

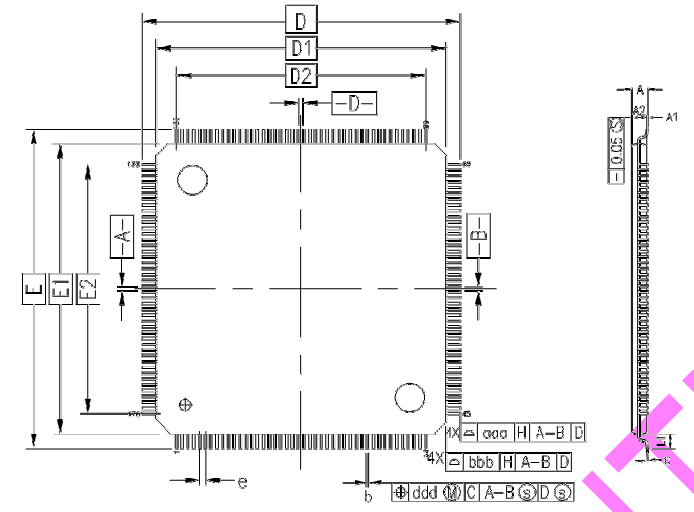
| | | | |
|---|---|---|---|
| B7 | DQ25 | SDRAM_DQ25 | IO |
| B7 | DQ26 | SDRAM_DQ26 | IO |
| B7 | DQ27 | SDRAM_DQ27 | IO |
| B7 | DQ28 | SDRAM_DQ28 | IO |
| B7 | DQ29 | SDRAM_DQ29 | IO |
| B6 | DQ30 | SDRAM_DQ30 | IO |
| B6 | DQ31 | SDRAM_DQ31 | IO |
| B3 | DQM0 | SDRAM_DQM0 | IO |
| B8 | DQM1 | SDRAM_DQM1 | IO |
| B4 | DQM2 | SDRAM_DQM2 | IO |
| B7 | DQM3 | SDRAM_DQM3 | IO |

- **配置说明**

AG10K 配置方式支持 JTAG，AS（Master）和 PS（Slave）方式，可通过 MSEL[2..0]选择。其中 MSEL2 和 MSEL0 已在封装内接到 GND，仅需把外部管脚 MSEL1 按照下表设置，选择不同配置模式。

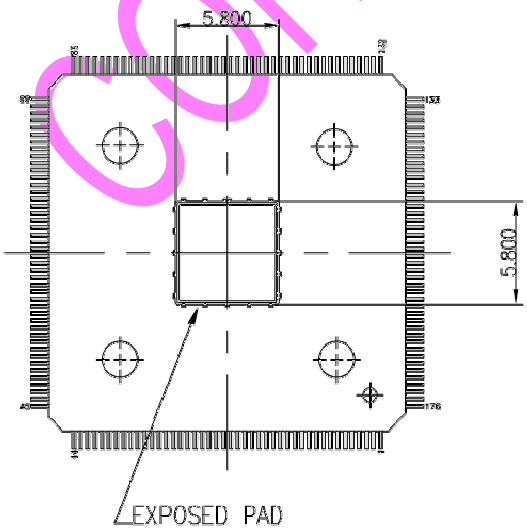
| 配置方式 | MSEL1 |
|---|---|
| **AS** | **1** |
| **PS** | **0** |
| **JTAG** | **0/1** |

- 封装图




COTROL DIMENSIONS ARE IN MILLIMETERS.

| SYMBOL | MILLIMETER | | | INCH | | |
|---|---|---|---|---|---|---|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 1.00 | 1.10 | 1.20 | 0.039 | 0.043 | 0.047 |
| $A_1$ | 0.05 | 0.10 | 0.15 | 0.002 | 0.004 | 0.006 |
| $A_2$ | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |
| D | 22.00 BSC. | | | 0.866 BSC. | | |
| $D_1$ | 20.00 BSC. | | | 0.787 BSC. | | |
| E | 22.00 BSC. | | | 0.866 BSC. | | |
| $E_1$ | 20.00 BSC. | | | 0.787 BSC. | | |
| $R_2$ | 0.08 | — | 0.20 | 0.003 | — | 0.008 |
| $R_1$ | 0.08 | — | — | 0.003 | — | — |
| θ | 0° | 3.5° | 7° | 0° | 3.5° | 7° |
| $\theta_1$ | 0° | — | — | 0° | — | — |
| $\theta_2$ | 11° | 12° | 13° | 11° | 12° | 13° |
| $\theta_3$ | 11° | 12° | 13° | 11° | 12° | 13° |
| c | 0.09 | — | 0.20 | 0.004 | — | 0.008 |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |
| $L_1$ | 1.00 REF | | | 0.039 REF | | |
| S | 0.20 | — | — | 0.008 | — | — |




| SYMBOL | 176L | | | | | |
|---|---|---|---|---|---|---|
| | MILLIMETER | | | INCH | | |
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| b | 0.13 | 0.16 | 0.23 | 0.005 | 0.006 | 0.009 |
| e | 0.40 BSC. | | | 0.016 BSC. | | |
| D2 | 17.20 | | | 0.677 | | |
| E2 | 17.20 | | | 0.677 | | |
| TOLERANCES OF FORM AND POSITION | | | | | | |
| aaa | 0.20 | | | 0.008 | | |
| bbb | 0.20 | | | 0.008 | | |
| ccc | 0.08 | | | 0.003 | | |
| ddd | 0.07 | | | 0.003 | | |