

# 78MXX

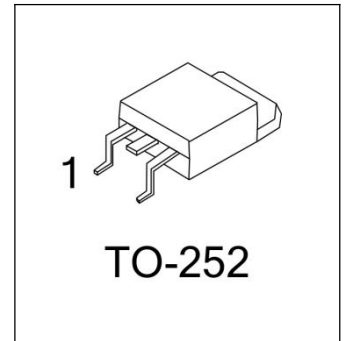
## Three-terminal positive Voltage Regulator

### General Description

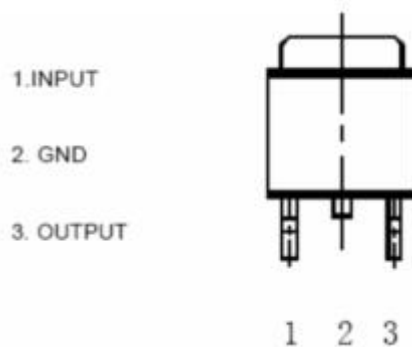
The 78MXX(78M05/78M06/78M08/78M09/78M12/78M15) family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 0.5 A.

### Features

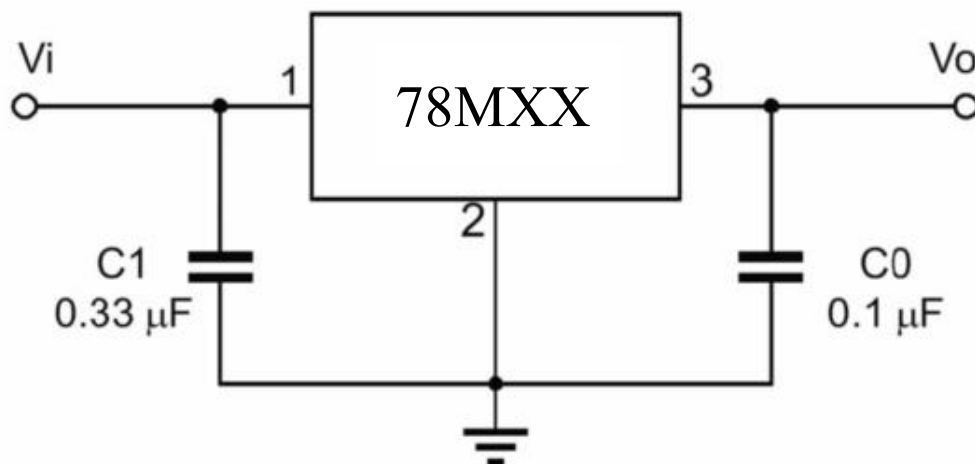
- Output Current Up To 0.5 A
- Fixed Output Voltage Of 5V, 6V, 8V, 9V, 12V and 15V Available
- Thermal Overload Shutdown Protection
- Short Circuit Current Limiting
- Output Transistor SOA Protection



### Pin Connection



### Typical Application Circuits



## Absolute Maximum Ratings ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

| Characteristic                   | Value           | Value    | Unit                 |
|----------------------------------|-----------------|----------|----------------------|
| Input Voltage                    | $V_i$           | 35       | V                    |
| Thermal Resistance Junction-Case | $R_{\theta JC}$ | 10       | $^{\circ}\text{C/W}$ |
| Thermal Resistance Junction-Air  | $R_{\theta JA}$ | 93       | $^{\circ}\text{C/W}$ |
| Operating Temperature Range      | $T_{OPR}$       | -40~+85  | $^{\circ}\text{C}$   |
| Storage Temperature Range        | $T_{STG}$       | -55~+150 | $^{\circ}\text{C}$   |

## Electrical Characteristics

(Unless otherwise specified,  $-40^{\circ}\text{C} < T_J < 85^{\circ}\text{C}$ ,  $I_o=500\text{mA}$ ,  $V_i=10\text{V}$ ,  $C_i=0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

**For 78M05 (unless otherwise noted,  $V_i=10\text{V}$ ,  $I_o=350\text{mA}$ ,  $-30^{\circ}\text{C} < T_J < 85^{\circ}\text{C}$ ,  $C_i=0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )**

| Characteristics             | Symbol       | Test Conditions                                                                                         | Min  | Typ | Max  | Unit          |
|-----------------------------|--------------|---------------------------------------------------------------------------------------------------------|------|-----|------|---------------|
| Output Voltage              | $V_o$        | $T_J=+25^{\circ}\text{C}$ , $I_o=5\text{mA} \sim 0.5\text{A}$                                           | 4.8  | 5.0 | 5.2  | V             |
|                             |              | $7.5\text{V} \leq V_i \leq 20\text{V}$ , $I_o=5\text{mA} \sim 0.5\text{A}$                              | 4.75 | 5.0 | 5.25 |               |
| Line Regulation*            | $\Delta V_o$ | $7.5\text{V} \leq V_i \leq 25\text{V}$ , $T_J=25^{\circ}\text{C}$ , $I_o=200\text{mA}$                  |      | 4.0 | 100  | mV            |
|                             |              | $8\text{V} \leq V_i \leq 20\text{V}$ , $T_J=25^{\circ}\text{C}$ , $I_o=200\text{mA}$                    |      | 2   | 50   |               |
| Load Regulation*            | $\Delta V_o$ | $T_J=25^{\circ}\text{C}$ , $I_o=5\text{mA} \sim 0.5\text{A}$                                            |      | 25  | 100  | mV            |
|                             |              | $T_J=25^{\circ}\text{C}$ , $I_o=5\text{mA} \sim 200\text{mA}$                                           |      | 10  | 50   |               |
| Quiescent Current           | $I_Q$        | $T_J=+25^{\circ}\text{C}$ , $I_o=0.5\text{A}$                                                           |      | 4   | 6    | mA            |
| Quiescent Current Change    | $\Delta I_Q$ | $8\text{V} \leq V_i \leq 25\text{V}$ , $I_o=200\text{mA}$                                               |      |     | 0.8  | mA            |
|                             |              | $5\text{mA} \leq I_o \leq 0.35\text{A}$                                                                 |      |     | 0.5  |               |
| Output Noise Voltage        | $V_N$        | $10\text{Hz} \leq f \leq 100\text{kHz}$ , $T_J=25^{\circ}\text{C}$                                      |      | 40  | 200  | $\mu\text{V}$ |
| Ripple Rejection            | RR           | $8\text{V} \leq V_i \leq 18\text{V}$ , $f=120\text{Hz}$ , $I_o=300\text{mA}$ , $T_J=25^{\circ}\text{C}$ | 56   | 80  |      | dB            |
| Dropout Voltage             | $V_d$        | $T_J=+25^{\circ}\text{C}$                                                                               |      | 2   |      | V             |
| Short Circuit Current Limit | $I_{SC}$     | $V_i=30\text{V}$ , $V_o=0\text{V}$ , $T_J=+25^{\circ}\text{C}$                                          |      | 0.8 |      | A             |

**For 78M06 (unless otherwise noted,  $V_i=11V, I_o=350mA, -30^{\circ}C < T_j < 85^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ )**

| Characteristics             | Symbol       | Test Conditions                                             | Min  | Typ | Max  | Unit    |
|-----------------------------|--------------|-------------------------------------------------------------|------|-----|------|---------|
| Output Voltage              | $V_o$        | $T_j=+25^{\circ}C$                                          | 5.75 | 6.0 | 6.25 | V       |
|                             |              | $8.5V \leq V_i \leq 21V, I_o=5mA \sim 0.35A$                | 5.7  | 6.0 | 6.3  |         |
| Line Regulation*            | $\Delta V_o$ | $8V \leq V_i \leq 25V, T_j=25^{\circ}C, I_o=200mA$          |      | 4   | 100  | mV      |
|                             |              | $8.5V \leq V_i \leq 21V, I_o=0.2A, T_j=25^{\circ}C$         |      | 2   | 50   |         |
| Load Regulation*            | $\Delta V_o$ | $T_j=25^{\circ}C, I_o=5mA \sim 0.5A$                        |      | 25  | 120  | mV      |
|                             |              | $T_j=25^{\circ}C, I_o=5mA \sim 200mA$                       |      | 10  | 60   |         |
| Quiescent Current           | $I_Q$        | $T_j=+25^{\circ}C$                                          |      | 4   | 6    | mA      |
| Quiescent Current Change    | $\Delta I_Q$ | $9V \leq V_i \leq 25V, I_o=200mA$                           |      |     | 0.8  | mA      |
|                             |              | $5mA \leq I_o \leq 0.35A$                                   |      |     | 0.5  |         |
| Output Noise Voltage        | $V_N$        | $10Hz \leq f \leq 100kHz, T_j=25^{\circ}C$                  |      | 40  | 200  | $\mu V$ |
| Ripple Rejection            | RR           | $9V \leq V_i \leq 19V, f=120Hz, I_o=300mA, T_j=25^{\circ}C$ | 56   | 80  |      | dB      |
| Dropout Voltage             | $V_d$        | $T_j=+25^{\circ}C$                                          |      | 2   |      | V       |
| Short Circuit Current Limit | $I_{SC}$     | $V_i=30V, V_o=0V, T_j=+25^{\circ}C$                         |      | 0.8 |      | A       |

**For 78M08 (unless otherwise noted,  $V_i=14V, I_o=350mA, 0^{\circ}C < T_j < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ )**

| Characteristics             | Symbol       | Test Conditions                                                  | Min  | Typ | Max  | Unit    |
|-----------------------------|--------------|------------------------------------------------------------------|------|-----|------|---------|
| Output Voltage              | $V_o$        | $T_j=+25^{\circ}C$                                               | 7.68 | 8.0 | 8.32 | V       |
|                             |              | $10.5V \leq V_i \leq 23V, I_o=5mA \sim 0.35A$                    | 7.6  | 8.0 | 8.4  |         |
| Line Regulation*            | $\Delta V_o$ | $10.5V \leq V_i \leq 25V, T_j=25^{\circ}C, I_o=200mA$            |      | 6   | 100  | mV      |
|                             |              | $11V \leq V_i \leq 25V, I_o=0.5A, T_j=25^{\circ}C, I_o=200mA$    |      | 2   | 50   |         |
| Load Regulation*            | $\Delta V_o$ | $T_j=25^{\circ}C, I_o=5mA \sim 0.5A$                             |      | 26  | 160  | mV      |
|                             |              | $T_j=25^{\circ}C, I_o=5mA \sim 200mA$                            |      | 10  | 80   |         |
| Quiescent Current           | $I_Q$        | $T_j=+25^{\circ}C$                                               |      | 4.0 | 6.0  | mA      |
| Quiescent Current Change    | $\Delta I_Q$ | $10.5V \leq V_i \leq 25V, I_o=200mA$                             |      |     | 0.8  | mA      |
|                             |              | $5mA \leq I_o \leq 0.5A$                                         |      |     | 0.5  |         |
| Output Noise Voltage        | $V_N$        | $10Hz \leq f \leq 100kHz$                                        |      | 60  | 250  | $\mu V$ |
| Ripple Rejection            | RR           | $11.5V \leq V_i \leq 21.5V, f=120Hz, I_o=300mA, T_j=25^{\circ}C$ | 56   | 80  |      | dB      |
| Dropout Voltage             | $V_d$        | $T_j=+25^{\circ}C$                                               |      | 2   |      | V       |
| Short Circuit Current Limit | $I_{SC}$     | $V_i=30V, V_o=0V, T_j=+25^{\circ}C$                              |      | 0.8 |      | A       |

For 78M09 (unless otherwise noted,  $V_i=15V, I_o=350mA, 0^\circ C < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ )

| Characteristics             | Symbol       | Test Conditions                                             | Min  | Typ | Max  | Unit    |
|-----------------------------|--------------|-------------------------------------------------------------|------|-----|------|---------|
| Output Voltage              | $V_o$        | $T_j=+25^\circ C$                                           | 8.64 | 9   | 9.36 | V       |
|                             |              | $11.5V \leq V_i \leq 26V, I_o=5mA \sim 0.35A$               | 8.55 | 9   | 9.45 |         |
| Line Regulation*            | $\Delta V_o$ | $11.5V \leq V_i \leq 26V, I_o=0.2A, T_j=25^\circ C$         |      | 5   | 100  | mV      |
|                             |              | $13V \leq V_i \leq 26V, I_o=0.2A, T_j=25^\circ C$           |      | 3   | 50   |         |
| Load Regulation*            | $\Delta V_o$ | $T_j=25^\circ C, I_o=5mA \sim 0.5A$                         |      | 25  | 180  | mV      |
|                             |              | $T_j=25^\circ C, I_o=5mA \sim 200mA$                        |      | 10  | 90   |         |
| Quiescent Current           | $I_Q$        | $T_j=+25^\circ C$                                           |      | 4.0 | 6.0  | mA      |
| Quiescent Current Change    | $\Delta I_Q$ | $12V \leq V_i \leq 26V, I_o=0.2A$                           |      |     | 0.8  | mA      |
|                             |              | $5mA \leq I_o \leq 0.35A$                                   |      |     | 0.5  |         |
| Output Noise Voltage        | $V_N$        | $10Hz \leq f \leq 100kHz, T_j=25^\circ C$                   |      | 60  | 250  | $\mu V$ |
| Ripple Rejection            | RR           | $12V \leq V_i \leq 22V, f=120Hz, I_o=300mA, T_j=25^\circ C$ | 56   | 80  |      | dB      |
| Dropout Voltage             | $V_d$        | $T_j=+25^\circ C$                                           |      | 2   |      | V       |
| Short Circuit Current Limit | $I_{SC}$     | $T_j=+25^\circ C$                                           |      | 0.8 |      | A       |

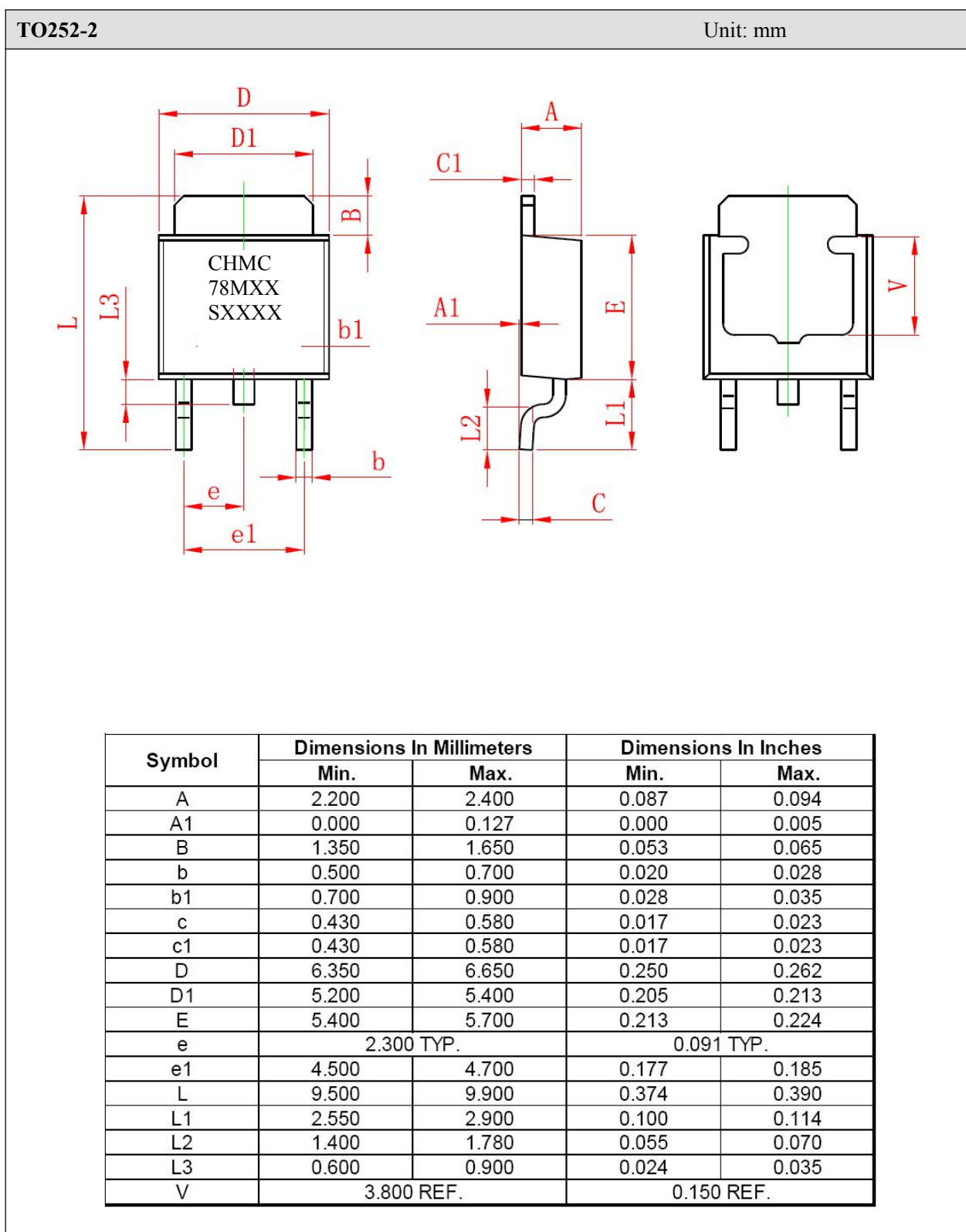
For 78M12 (unless otherwise noted,  $V_i=19V, I_o=350mA, 0^\circ C < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F$ )

| Characteristics             | Symbol       | Test Conditions                                             | Min  | Typ | Max  | Unit    |
|-----------------------------|--------------|-------------------------------------------------------------|------|-----|------|---------|
| Output Voltage              | $V_o$        | $T_j=+25^\circ C$                                           | 11.5 | 12  | 12.5 | V       |
|                             |              | $14.5V \leq V_i \leq 27V, I_o=5mA \sim 0.35A$               | 11.4 | 12  | 12.6 |         |
| Line Regulation*            | $\Delta V_o$ | $14.5V \leq V_i \leq 30V, I_o=0.2A, T_j=25^\circ C$         |      | 7   | 100  | mV      |
|                             |              | $16V \leq V_i \leq 30V, I_o=0.2A, T_j=25^\circ C$           |      | 3   | 50   |         |
| Load Regulation*            | $\Delta V_o$ | $T_j=25^\circ C, I_o=5mA \sim 0.5A$                         |      | 27  | 240  | mV      |
|                             |              | $T_j=25^\circ C, I_o=5mA \sim 200mA$                        |      | 10  | 120  |         |
| Quiescent Current           | $I_Q$        | $T_j=+25^\circ C$                                           |      | 4.0 | 6.0  | mA      |
| Quiescent Current Change    | $\Delta I_Q$ | $15V \leq V_i \leq 30V, I_o=0.2A$                           |      |     | 0.8  | mA      |
|                             |              | $5mA \leq I_o \leq 0.5A$                                    |      |     | 0.5  |         |
| Output Noise Voltage        | $V_N$        | $10Hz \leq f \leq 100kHz, T_j=25^\circ C$                   |      | 70  | 300  | $\mu V$ |
| Ripple Rejection            | RR           | $15V \leq V_i \leq 25V, f=120Hz, I_o=300mA, T_j=25^\circ C$ | 50   | 57  |      | dB      |
| Dropout Voltage             | $V_d$        | $T_j=+25^\circ C$                                           |      | 2   |      | V       |
| Short Circuit Current Limit | $I_{SC}$     | $T_j=+25^\circ C$                                           |      | 0.8 |      | A       |

For 78M15 (unless otherwise noted,  $V_i=23V, I_o=350mA, 0^{\circ}C < T_j < 125^{\circ}C$ ,  $C_1=0.33\mu F, C_o=0.1\mu F$ )

| Characteristics             | Symbol       | Test Conditions                                                  | Min   | Typ | Max   | Unit    |
|-----------------------------|--------------|------------------------------------------------------------------|-------|-----|-------|---------|
| Output Voltage              | $V_o$        | $T_j=+25^{\circ}C$                                               | 14.4  | 15  | 15.6  | V       |
|                             |              | $17.5V \leq V_i \leq 30V, I_o=5mA \sim 0.35A$                    | 14.25 | 15  | 15.75 |         |
| Line Regulation*            | $\Delta V_o$ | $18.5V \leq V_i \leq 30V, I_o=0.2A, T_j=25^{\circ}C$             |       | 8   | 100   | mV      |
|                             |              | $17.5V \leq V_i \leq 30V, I_o=0.2A, T_j=25^{\circ}C$             |       | 4   | 50    |         |
| Load Regulation*            | $\Delta V_o$ | $T_j=25^{\circ}C, I_o=5mA \sim 0.5A$                             |       | 27  | 300   | mV      |
|                             |              | $T_j=25^{\circ}C, I_o=5mA \sim 200mA$                            |       | 10  | 150   |         |
| Quiescent Current           | $I_Q$        | $T_j=+25^{\circ}C$                                               |       | 4.0 | 6.0   | mA      |
| Quiescent Current Change    | $\Delta I_Q$ | $18V \leq V_i \leq 30V, I_o=200mA$                               |       |     | 0.8   | mA      |
|                             |              | $5mA \leq I_o \leq 0.35A$                                        |       |     | 0.5   |         |
| Output Noise Voltage        | $V_N$        | $10Hz \leq f \leq 100kHz, T_j=25^{\circ}C$                       |       | 70  | 300   | $\mu V$ |
| Ripple Rejection            | RR           | $18.5V \leq V_i \leq 28.5V, f=120Hz, I_o=300mA, T_j=25^{\circ}C$ | 48    | 55  |       | dB      |
| Dropout Voltage             | $V_d$        | $T_j=+25^{\circ}C$                                               |       | 2   |       | V       |
| Short Circuit Current Limit | $I_{SC}$     | $V_i=30V, V_o=0V, T_j=+25^{\circ}C$                              |       | 0.8 |       | A       |

## OUTLINE DRAWING



## Statements

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