

TOSHIBA ZENER DIODE SILICON EPITAXIAL PLANAR TYPE

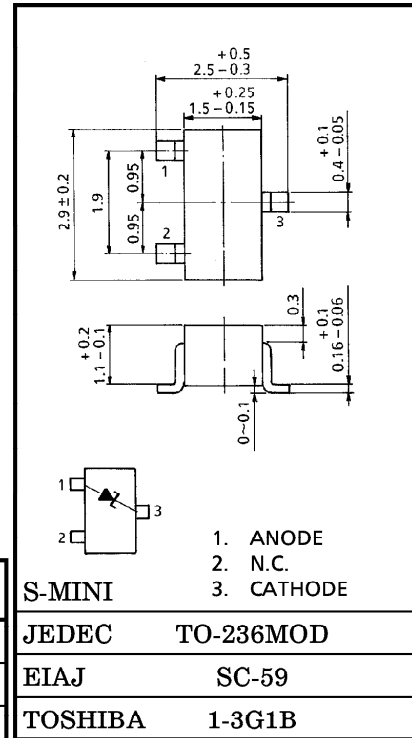
# 02CZ2.0~02CZ47

CONSTANT VOLTAGE REGULATION APPLICATIONS.

REFERENCE VOLTAGE APPLICATIONS.

- Small Package : SC-59
- Nominal Voltage Tolerance About  $\pm 2.5\%$  (4.3V~24V)

Unit in mm

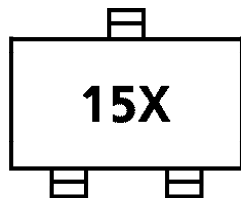


MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

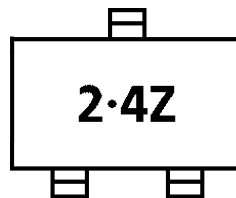
| CHARACTERISTIC            | SYMBOL    | RATING  | UNIT             |
|---------------------------|-----------|---------|------------------|
| Power Dissipation         | P         | 200     | mW               |
| Junction Temperature      | $T_j$     | 150     | $^\circ\text{C}$ |
| Storage Temperature Range | $T_{stg}$ | -55~150 | $^\circ\text{C}$ |

Weight : 0.012g

MARKING



(02CZ15-X)



(02CZ2.4-Z)

961001EAA2

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## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| TYPE No.     | ZENER VOLTAGE          |       |                     | DYNAMIC IMPEDANCE  |                     | KNEE DYNAMIC IMPEDANCE |                     | REVERSE CURRENT     |                    |
|--------------|------------------------|-------|---------------------|--------------------|---------------------|------------------------|---------------------|---------------------|--------------------|
|              | (*) V <sub>Z</sub> (V) |       | I <sub>Z</sub> (mA) | Z <sub>Z</sub> (Ω) | I <sub>Z</sub> (mA) | Z <sub>ZK</sub> (Ω)    | I <sub>Z</sub> (mA) | I <sub>R</sub> (μA) | V <sub>R</sub> (V) |
|              | MIN.                   | MAX.  |                     | MAX.               |                     | MAX.                   |                     | MAX.                |                    |
| 02CZ2.0 (**) | 1.85                   | 2.15  | 5                   | 100                | 5                   | 1000                   | 0.5                 | 120                 | 1.0                |
| 02CZ2.2 (**) | 2.05                   | 2.38  | 5                   | 100                | 5                   | 1000                   | 0.5                 | 120                 | 1.0                |
| 02CZ2.4      | 2.28                   | 2.60  | 5                   | 100                | 5                   | 1000                   | 0.5                 | 120                 | 1.0                |
| 02CZ2.7      | 2.50                   | 2.90  | 5                   | 110                | 5                   | 1000                   | 0.5                 | 120                 | 1.0                |
| 02CZ3.0      | 2.80                   | 3.20  | 5                   | 120                | 5                   | 1000                   | 0.5                 | 50                  | 1.0                |
| 02CZ3.3      | 3.10                   | 3.50  | 5                   | 130                | 5                   | 1000                   | 0.5                 | 20                  | 1.0                |
| 02CZ3.6      | 3.40                   | 3.80  | 5                   | 130                | 5                   | 1000                   | 0.5                 | 10                  | 1.0                |
| 02CZ3.9      | 3.70                   | 4.10  | 5                   | 130                | 5                   | 1000                   | 0.5                 | 10                  | 1.0                |
| 02CZ4.3      | 4.00                   | 4.50  | 5                   | 130                | 5                   | 1000                   | 0.5                 | 5                   | 1.0                |
| 02CZ4.7      | 4.40                   | 4.90  | 5                   | 120                | 5                   | 1000                   | 0.5                 | 5                   | 1.0                |
| 02CZ5.1      | 4.80                   | 5.40  | 5                   | 70                 | 5                   | 1000                   | 0.5                 | 1                   | 1.5                |
| 02CZ5.6      | 5.30                   | 6.00  | 5                   | 40                 | 5                   | 900                    | 0.5                 | 1                   | 2.5                |
| 02CZ6.2      | 5.80                   | 6.60  | 5                   | 30                 | 5                   | 500                    | 0.5                 | 1                   | 3.0                |
| 02CZ6.8      | 6.40                   | 7.20  | 5                   | 25                 | 5                   | 150                    | 0.5                 | 0.5                 | 5.0                |
| 02CZ7.5      | 7.00                   | 7.90  | 5                   | 23                 | 5                   | 120                    | 0.5                 | 0.5                 | 6.0                |
| 02CZ8.2      | 7.70                   | 8.70  | 5                   | 20                 | 5                   | 120                    | 0.5                 | 0.5                 | 6.5                |
| 02CZ9.1      | 8.50                   | 9.60  | 5                   | 18                 | 5                   | 120                    | 0.5                 | 0.5                 | 7.0                |
| 02CZ10       | 9.40                   | 10.60 | 5                   | 15                 | 5                   | 120                    | 0.5                 | 0.5                 | 8.0                |
| 02CZ11       | 10.40                  | 11.60 | 5                   | 15                 | 5                   | 120                    | 0.5                 | 0.5                 | 8.5                |
| 02CZ12       | 11.40                  | 12.60 | 5                   | 15                 | 5                   | 110                    | 0.5                 | 0.5                 | 9.0                |
| 02CZ13       | 12.40                  | 14.10 | 5                   | 15                 | 5                   | 110                    | 0.5                 | 0.5                 | 10                 |
| 02CZ15       | 13.80                  | 15.60 | 5                   | 15                 | 5                   | 110                    | 0.5                 | 0.5                 | 11                 |
| 02CZ16       | 15.30                  | 17.10 | 5                   | 18                 | 5                   | 150                    | 0.5                 | 0.5                 | 12                 |
| 02CZ18       | 16.80                  | 19.10 | 5                   | 20                 | 5                   | 150                    | 0.5                 | 0.5                 | 14                 |
| 02CZ20       | 18.80                  | 21.20 | 5                   | 25                 | 5                   | 200                    | 0.5                 | 0.5                 | 15                 |
| 02CZ22       | 20.80                  | 23.30 | 5                   | 30                 | 5                   | 200                    | 0.5                 | 0.5                 | 17                 |
| 02CZ24       | 22.80                  | 25.60 | 5                   | 40                 | 5                   | 200                    | 0.5                 | 0.5                 | 19                 |
| 02CZ27       | 25.10                  | 28.90 | 2                   | 70                 | 2                   | 250                    | 0.5                 | 0.5                 | 21                 |
| 02CZ30       | 28.00                  | 32.00 | 2                   | 80                 | 2                   | 250                    | 0.5                 | 0.5                 | 23                 |
| 02CZ33       | 31.00                  | 35.00 | 2                   | 80                 | 2                   | 250                    | 0.5                 | 0.5                 | 25                 |
| 02CZ36       | 34.00                  | 38.00 | 2                   | 90                 | 2                   | 250                    | 0.5                 | 0.5                 | 27                 |
| 02CZ39       | 37.00                  | 41.00 | 2                   | 100                | 2                   | 250                    | 0.5                 | 0.5                 | 30                 |
| 02CZ43       | 40.00                  | 45.00 | 2                   | 130                | 2                   | —                      | —                   | 0.5                 | 33                 |
| 02CZ47       | 44.00                  | 49.00 | 2                   | 150                | 2                   | —                      | —                   | 0.5                 | 36                 |

(\*) Test time : t=30ms    (\*\*) Product by order

## ZENER VOLTAGE CLASSIFICATION

| TYPE No.  |   | ZENER VOLTAGE $V_Z$ (V) $t=30\text{ms}$ |      |                  |      |                  |      |
|-----------|---|---|------|------------------|------|------------------|------|
|           |   | REFERENCE                               |      |                  |      |                  |      |
|           |   | $I_Z=0.5\text{mA}$                      |      | $I_Z=1\text{mA}$ |      | $I_Z=5\text{mA}$ |      |
|           |   | MIN.                                    | MAX. | MIN.             | MAX. | MIN.             | MAX. |
| 02CZ2.0-X | X | 1.28                                    | 1.46 | 1.40             | 1.62 | 1.85             | 2.05 |
| 02CZ2.0-Z | Z | 1.38                                    | 1.52 | 1.52             | 1.69 | 1.95             | 2.15 |
| 02CZ2.2-X | X | 1.45                                    | 1.60 | 1.59             | 1.78 | 2.05             | 2.26 |
| 02CZ2.2-Z | Z | 1.52                                    | 1.67 | 1.68             | 1.92 | 2.16             | 2.38 |
| 02CZ2.4-X | X | 1.64                                    | 1.81 | 1.82             | 2.03 | 2.28             | 2.50 |
| 02CZ2.4-Z | Z | 1.72                                    | 1.89 | 1.87             | 2.10 | 2.40             | 2.60 |
| 02CZ2.7-X | X | 1.81                                    | 2.00 | 2.00             | 2.21 | 2.50             | 2.75 |
| 02CZ2.7-Z | Z | 1.92                                    | 2.12 | 2.11             | 2.33 | 2.65             | 2.90 |
| 02CZ3.0-X | X | 2.04                                    | 2.23 | 2.23             | 2.46 | 2.80             | 3.05 |
| 02CZ3.0-Z | Z | 2.16                                    | 2.35 | 2.36             | 2.58 | 2.95             | 3.20 |
| 02CZ3.3-X | X | 2.27                                    | 2.47 | 2.48             | 2.73 | 3.10             | 3.35 |
| 02CZ3.3-Z | Z | 2.39                                    | 2.60 | 2.63             | 2.86 | 3.25             | 3.50 |
| 02CZ3.6-X | X | 2.51                                    | 2.74 | 2.76             | 3.00 | 3.40             | 3.65 |
| 02CZ3.6-Z | Z | 2.65                                    | 2.89 | 2.90             | 3.16 | 3.55             | 3.80 |
| 02CZ3.9-X | X | 2.79                                    | 3.06 | 3.06             | 3.33 | 3.70             | 3.97 |
| 02CZ3.9-Z | Z | 2.95                                    | 3.20 | 3.23             | 3.46 | 3.87             | 4.10 |
| 02CZ4.3-X | X | 3.06                                    | 3.35 | 3.36             | 3.63 | 4.00             | 4.23 |
| 02CZ4.3-Y | Y | 3.23                                    | 3.46 | 3.53             | 3.75 | 4.13             | 4.35 |
| 02CZ4.3-Z | Z | 3.35                                    | 3.72 | 3.65             | 3.93 | 4.25             | 4.50 |
| 02CZ4.7-X | X | 3.56                                    | 3.92 | 3.83             | 4.10 | 4.40             | 4.63 |
| 02CZ4.7-Y | Y | 3.74                                    | 4.05 | 4.00             | 4.25 | 4.53             | 4.76 |
| 02CZ4.7-Z | Z | 3.90                                    | 4.22 | 4.15             | 4.44 | 4.66             | 4.90 |
| 02CZ5.1-X | X | 4.08                                    | 4.48 | 4.34             | 4.66 | 4.80             | 5.07 |
| 02CZ5.1-Y | Y | 4.32                                    | 4.73 | 4.56             | 4.90 | 4.97             | 5.24 |
| 02CZ5.1-Z | Z | 4.56                                    | 4.96 | 4.80             | 5.12 | 5.14             | 5.40 |
| 02CZ5.6-X | X | 4.80                                    | 5.36 | 5.02             | 5.43 | 5.30             | 5.63 |
| 02CZ5.6-Y | Y | 5.00                                    | 5.63 | 5.23             | 5.65 | 5.43             | 5.81 |
| 02CZ5.6-Z | Z | 5.30                                    | 5.90 | 5.45             | 5.90 | 5.61             | 6.00 |

## ZENER VOLTAGE CLASSIFICATION

| TYPE No.  |   | ZENER VOLTAGE $V_Z$ (V) $t=30\text{ms}$ |       |                  |       |                  |       |
|-----------|---|---|-------|------------------|-------|------------------|-------|
|           |   | REFERENCE                               |       |                  |       |                  |       |
|           |   | $I_Z=0.5\text{mA}$                      |       | $I_Z=1\text{mA}$ |       | $I_Z=5\text{mA}$ |       |
|           |   | MIN.                                    | MAX.  | MIN.             | MAX.  | MIN.             | MAX.  |
| 02CZ6.2-X | X | 5.60                                    | 6.12  | 5.70             | 6.13  | 5.80             | 6.20  |
| 02CZ6.2-Y | Y | 5.89                                    | 6.34  | 5.93             | 6.35  | 6.00             | 6.39  |
| 02CZ6.2-Z | Z | 6.12                                    | 6.57  | 6.15             | 6.58  | 6.19             | 6.60  |
| 02CZ6.8-X | X | 6.35                                    | 6.80  | 6.38             | 6.80  | 6.40             | 6.80  |
| 02CZ6.8-Y | Y | 6.59                                    | 7.02  | 6.60             | 7.02  | 6.60             | 7.02  |
| 02CZ6.8-Z | Z | 6.81                                    | 7.20  | 6.82             | 7.20  | 6.82             | 7.20  |
| 02CZ7.5-X | X | 6.96                                    | 7.43  | 6.97             | 7.43  | 7.00             | 7.43  |
| 02CZ7.5-Y | Y | 7.19                                    | 7.66  | 7.20             | 7.66  | 7.23             | 7.66  |
| 02CZ7.5-Z | Z | 7.42                                    | 7.90  | 7.43             | 7.90  | 7.46             | 7.90  |
| 02CZ8.2-X | X | 7.66                                    | 8.16  | 7.67             | 8.16  | 7.70             | 8.16  |
| 02CZ8.2-Y | Y | 7.92                                    | 8.43  | 7.93             | 8.43  | 7.96             | 8.43  |
| 02CZ8.2-Z | Z | 8.19                                    | 8.70  | 8.20             | 8.70  | 8.23             | 8.70  |
| 02CZ9.1-X | X | 8.46                                    | 9.00  | 8.47             | 9.00  | 8.50             | 9.00  |
| 02CZ9.1-Y | Y | 8.76                                    | 9.30  | 8.77             | 9.30  | 8.80             | 9.30  |
| 02CZ9.1-Z | Z | 9.06                                    | 9.60  | 9.07             | 9.60  | 9.10             | 9.60  |
| 02CZ10-X  | X | 9.36                                    | 9.93  | 9.37             | 9.93  | 9.40             | 9.93  |
| 02CZ10-Y  | Y | 9.69                                    | 10.26 | 9.70             | 10.26 | 9.73             | 10.26 |
| 02CZ10-Z  | Z | 10.02                                   | 10.60 | 10.03            | 10.60 | 10.06            | 10.60 |
| 02CZ11-X  | X | 10.34                                   | 10.95 | 10.36            | 10.96 | 10.40            | 10.98 |
| 02CZ11-Y  | Y | 10.67                                   | 11.23 | 10.69            | 11.24 | 10.73            | 11.26 |
| 02CZ11-Z  | Z | 11.00                                   | 11.57 | 11.02            | 11.58 | 11.06            | 11.60 |
| 02CZ12-X  | X | 11.34                                   | 11.90 | 11.36            | 11.91 | 11.40            | 11.93 |
| 02CZ12-Y  | Y | 11.67                                   | 12.23 | 11.69            | 12.24 | 11.73            | 12.26 |
| 02CZ12-Z  | Z | 12.00                                   | 12.57 | 12.02            | 12.58 | 12.06            | 12.60 |
| 02CZ13-X  | X | 12.34                                   | 13.05 | 12.36            | 13.06 | 12.40            | 13.08 |
| 02CZ13-Y  | Y | 12.82                                   | 13.54 | 12.84            | 13.55 | 12.88            | 13.57 |
| 02CZ13-Z  | Z | 13.31                                   | 14.07 | 13.33            | 14.08 | 13.37            | 14.10 |

## ZENER VOLTAGE CLASSIFICATION

| TYPE No. |   | ZENER VOLTAGE $V_Z$ (V) $t=30\text{ms}$ |       |                  |       |                  |       |
|----------|---|---|-------|------------------|-------|------------------|-------|
|          |   | REFERENCE                               |       |                  |       |                  |       |
|          |   | $I_Z=0.5\text{mA}$                      |       | $I_Z=1\text{mA}$ |       | $I_Z=5\text{mA}$ |       |
|          |   | MIN.                                    | MAX.  | MIN.             | MAX.  | MIN.             | MAX.  |
| 02CZ15-X | X | 13.74                                   | 14.60 | 13.76            | 14.61 | 13.80            | 14.63 |
| 02CZ15-Y | Y | 14.27                                   | 15.08 | 14.29            | 15.09 | 14.33            | 15.11 |
| 02CZ15-Z | Z | 14.75                                   | 15.54 | 14.77            | 15.56 | 14.81            | 15.60 |
| 02CZ16-X | X | 15.15                                   | 16.04 | 15.18            | 16.06 | 15.30            | 16.10 |
| 02CZ16-Y | Y | 15.65                                   | 16.54 | 15.68            | 16.56 | 15.80            | 16.60 |
| 02CZ16-Z | Z | 16.15                                   | 17.04 | 16.18            | 17.06 | 16.30            | 17.10 |
| 02CZ18-X | X | 16.65                                   | 17.70 | 16.68            | 17.72 | 16.80            | 17.76 |
| 02CZ18-Y | Y | 17.31                                   | 18.37 | 17.34            | 18.39 | 17.46            | 18.43 |
| 02CZ18-Z | Z | 17.98                                   | 19.04 | 18.01            | 19.06 | 18.13            | 19.10 |
| 02CZ20-X | X | 18.65                                   | 19.72 | 18.68            | 19.74 | 18.80            | 19.78 |
| 02CZ20-Y | Y | 19.33                                   | 20.40 | 19.36            | 20.42 | 19.48            | 20.46 |
| 02CZ20-Z | Z | 19.97                                   | 21.14 | 20.01            | 21.16 | 20.16            | 21.20 |
| 02CZ22-X | X | 20.61                                   | 21.82 | 20.65            | 21.84 | 20.80            | 21.88 |
| 02CZ22-Y | Y | 21.29                                   | 22.50 | 21.33            | 22.52 | 21.48            | 22.56 |
| 02CZ22-Z | Z | 21.97                                   | 23.24 | 22.01            | 23.26 | 22.16            | 23.30 |
| 02CZ24-X | X | 22.61                                   | 24.05 | 22.65            | 24.07 | 22.80            | 24.11 |
| 02CZ24-Y | Y | 23.42                                   | 24.86 | 23.46            | 24.88 | 23.61            | 24.92 |
| 02CZ24-Z | Z | 24.23                                   | 25.54 | 24.27            | 25.56 | 24.42            | 25.60 |

