TOSHIBA ZENZER DIODE SILICON EPITAXIAL PLANAR TYPE

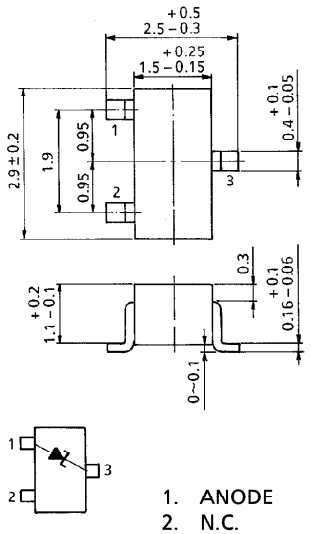
# 02CZ2.0~02CZ47

CONSTANT VOLTAGE REGULATION APPLICATIONS.

REFERENCE VOLTAGE APPLICATIONS.

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

Unit in mm




1. ANODE
2. N.C.
3. CATHODE

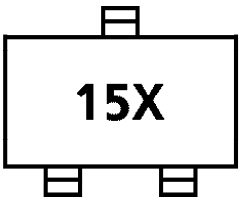
| | |
|---|---|
| S-MINI | |
| JEDEC | TO-236MOD |
| EIAJ | SC-59 |
| TOSHIBA | 1-3G1B |

Weight : 0.012g

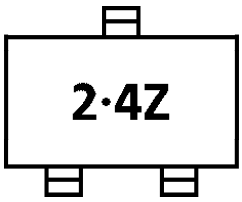
MAXIMUM RATINGS (Ta = 25°C)

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

MARKING




(02CZ15-X)




(02CZ2.4-Z)

961001EAA2


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ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| TYPE No. | ZENER VOLTAGE (*) $V_Z$ (V) MIN. | ZENER VOLTAGE (*) $V_Z$ (V) MAX. | $I_Z$ (mA) | DYNAMIC IMPEDANCE $Z_Z$ (Ω) MAX. | $I_Z$ (mA) | KNEE DYNAMIC IMPEDANCE $Z_{ZK}$ (Ω) MAX. | $I_Z$ (mA) | REVERSE CURRENT $I_R$ (μA) MAX. | $V_R$ (V) |
|---|---|---|---|---|---|---|---|---|---|
| 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=30ms REFERENCE | | | | | |
|---|---|---|---|---|---|---|---|
| | | $I_Z$=0.5mA | | $I_Z$=1mA | | $I_Z$=5mA | |
| | | 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 |

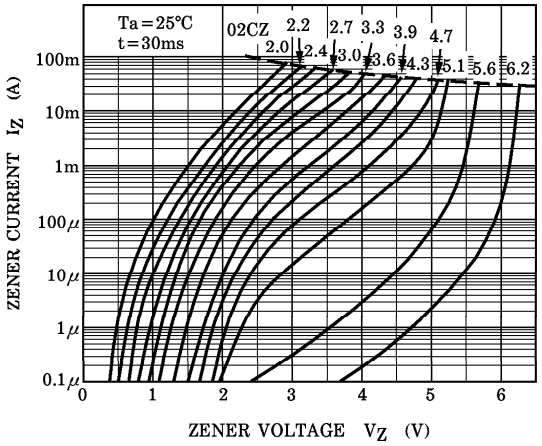
ZENER VOLTAGE CLASSIFICATION

| TYPE No. | | ZENER VOLTAGE $V_Z$ (V) t=30ms REFERENCE | | | | | |
|---|---|---|---|---|---|---|---|
| | | $I_Z$=0.5mA | | $I_Z$=1mA | | $I_Z$=5mA | |
| | | 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 |

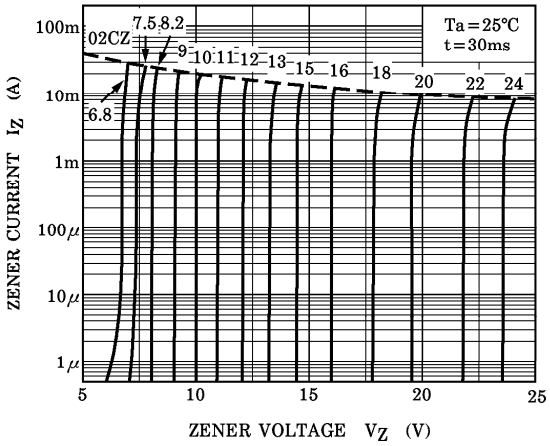
ZENER VOLTAGE CLASSIFICATION

| TYPE No. | | ZENER VOLTAGE $V_Z$ (V) t=30ms REFERENCE | | | | | |
|---|---|---|---|---|---|---|---|
| | | $I_Z$=0.5mA | | $I_Z$=1mA | | $I_Z$=5mA | |
| | | 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 |

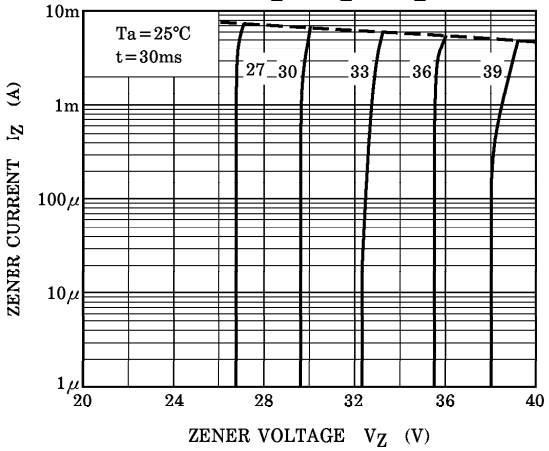
$I_Z - V_Z$ ($V_Z$ : 2.0~6.2)



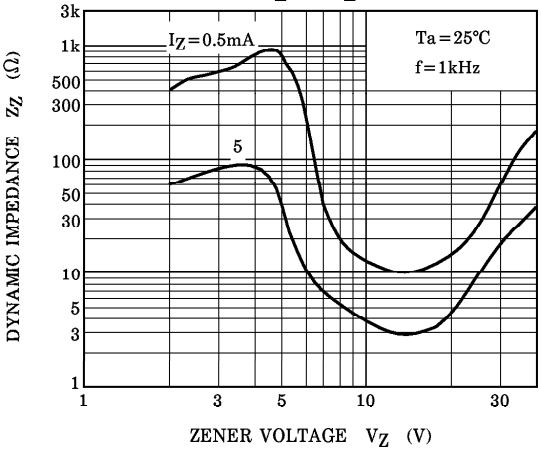

$I_Z - V_Z$ ($V_Z$ : 6.8~24)



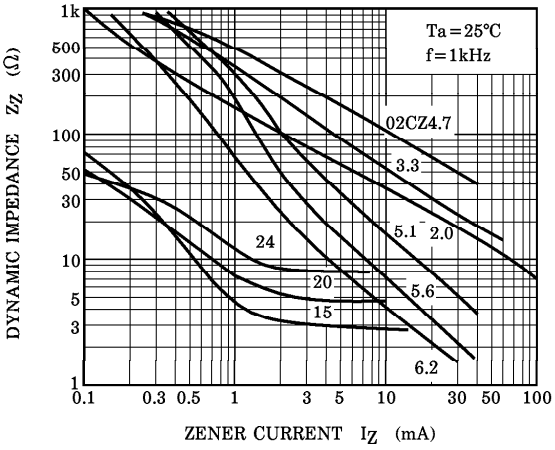

$I_Z - V_Z$ ($V_Z$ : 27~39)



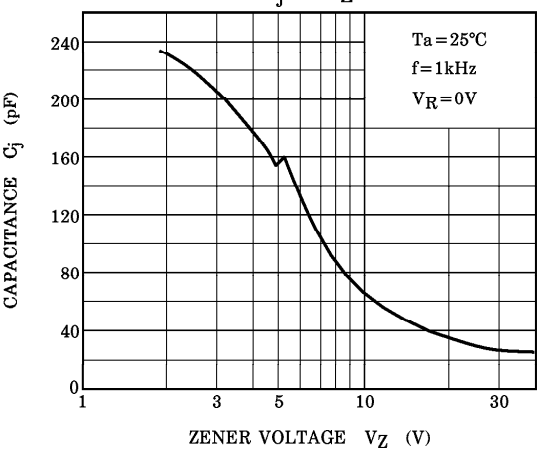

$Z_Z - V_Z$



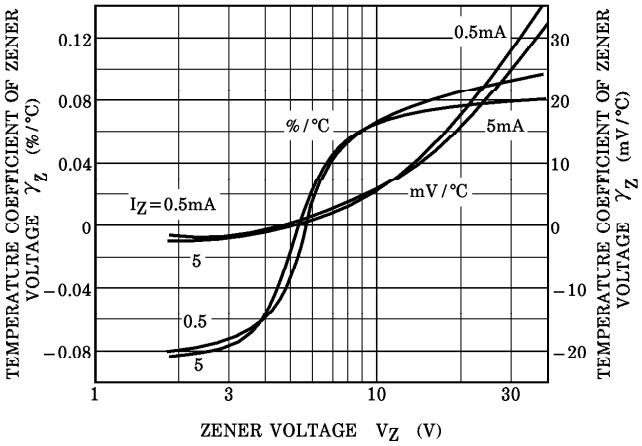

$Z_Z - I_Z$



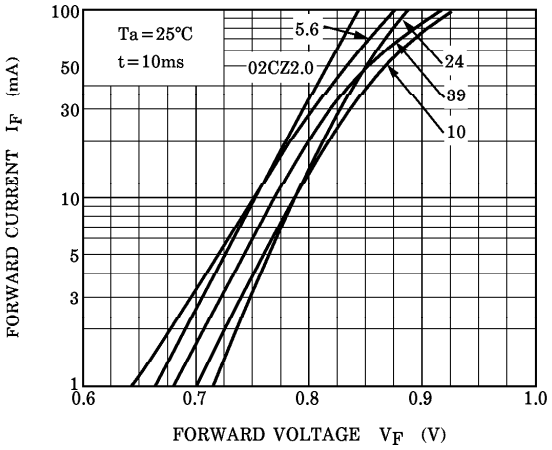

$C_j - V_Z$



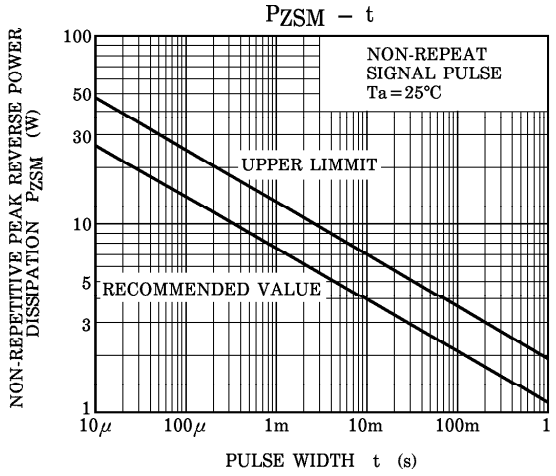
$\gamma_Z - V_Z$



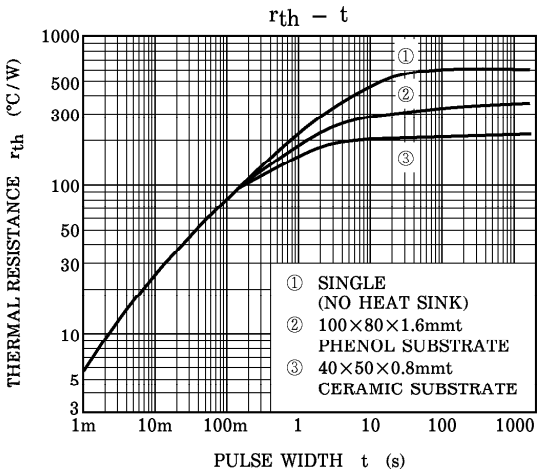

$I_F - V_F$



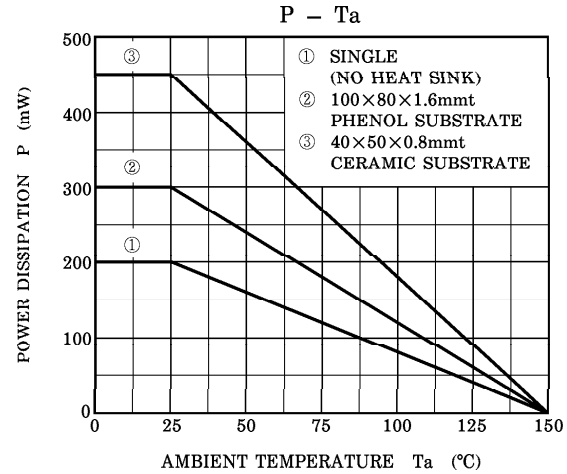

$P_{ZSM} - t$




$r_{th} - t$




P – Ta



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