

3875081 G E SOLID STATE

01E 17669 D T-25-13
Silicon Controlled Rectifiers

File Number 114

2N3228, 2N3525, 2N4101

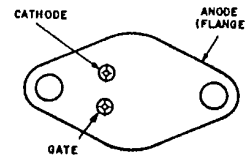
5-A Silicon Controlled Rectifiers

For Low-Cost Power-Control and Power-Switching Applications

Features

- High di/dt and dv/dt capabilities
- Low leakage currents, both forward and reverse
- Low forward voltage drop at high current levels
- Low thermal resistance

TERMINAL DESIGNATIONS



JEDEC TO-213AA

RCA 2N3228*, 2N3525*, and 2N4101* are all-diffused, three-junction, silicon controlled rectifiers (SCR's) intended for use in power-control and power-switching applications.

Types 2N3228, 2N3525, and 2N4101 use the JEDEC TO-66 package and have a blocking voltage capability of up to 600 volts and a forward current rating of 5 amperes (rms value) at a case temperature of 75°C.

*Formerly Dev. Types TA1222, TA1225, and TA2773, respectively.

ABSOLUTE-MAXIMUM RATINGS, for Operation with Sinusoidal AC Supply Voltage at a Frequency between 50 and 400 Hz, and with Resistive or Inductive Load.

| | 2N3228 | 2N3525 | 2N4101 | |
|---|--------|-------------|--------|------------------|
| Transient Peak Reverse Voltage (Non-Replicative), V_{RM} (non-rep) | 330 | 660 | 700 | V |
| Peak Reverse Voltage (Replicative), V_{RM} (rep) | 200 | 400 | 600 | V |
| Peak Forward Blocking Voltage (Replicative), V_{FBOM} (rep) | 200 | 400 | 600 | V |
| Forward Current: For case temperature (T_C) of +75°C, and unit mounted on heat sink | | | | |
| Average DC value at a conduction angle of 180°, I_{FAV} | 3.2 | 3.2 | 3.2 | A |
| RMS value, I_{FRMS} | 5.0 | 5.0 | 5.0 | A |
| For free-air temperature (T_{FA}) of 25°C, and with no heat sink employed— | | | | |
| Average DC value at a conduction angle of 180°, I_{FAV} | 1.7 | 1.7 | 1.7 | A |
| For other conditions, See Fig. 2 | | | | |
| Peak Surge Current, I_{FM} (surge): For one cycle of applied principal voltage. | | | | |
| 60 Hz (sinusoidal), $T_C = 75^\circ\text{C}$ | | 60 | | A |
| 50 Hz (sinusoidal), $T_C = 75^\circ\text{C}$ | | 50 | | A |
| For more than one cycle of applied voltage, See Fig. 5 | | | | |
| Fusing Current (for SCR protection): | | | | |
| $T_J = -40$ to 100°C , $t = 1$ to 8.3 ns, i^2t | | 15 | | A ² s |
| Rate of Change of Forward Current, di/dt | | 200* | | A/ μ s |
| $I_{GT} = 200$ mA, 0.5 μ s rise time | | | | |
| Gate Power*: Peak, Forward or Reverse, for 10 μ s duration, P_{GM} | | 13 | | W |
| Average, P_{GAV} | | 0.5 | | W |
| Temperature: | | | | |
| Storage, T_{stg} | | -40 to +125 | | °C |
| Operating (Case), T_C | | -40 to +100 | | °C |

*Any values of peak gate current or peak gate voltage to give the maximum gate power is permissible.

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Characteristics at Maximum Ratings (unless otherwise specified), and at Indicated Case Temperature (T_C)

| CHARACTERISTICS | CONTROLLED-RECTIFIER TYPES | | | | | | | | | UNITS |
|---|----------------------------|------|------|--------|------|------|--------|------|------|---------------------------|
| | 2N3228 | | | 2N3525 | | | 2N4101 | | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Forward Breakover Voltage, V_{BO0} : At $T_C = +100^\circ\text{C}$ | 200 | — | — | 400 | — | — | 600 | — | — | vols |
| Peak Blocking Current, at $T_C = +100^\circ\text{C}$: | | | | | | | | | | |
| Forward, I_{FBOM} | — | 0.10 | 1.5 | — | 0.20 | 3.0 | — | 0.40 | 4.0 | mA |
| $V_{FBO} = V_{BO0}$ (min. value) | — | 0.05 | 0.75 | — | 0.10 | 1.5 | — | 0.20 | 2.0 | mA |
| Reverse, I_{RBO} | — | 0.05 | 0.75 | — | 0.10 | 1.5 | — | 0.20 | 2.0 | mA |
| $V_{RBO} = V_{RM}$ (rep) value | — | 0.05 | 0.75 | — | 0.10 | 1.5 | — | 0.20 | 2.0 | mA |
| Forward Voltage Drop, V_F At a Forward Current of 30 amperes and a $T_C = +25^\circ\text{C}$ | — | 2.15 | 2.8 | — | 2.15 | 2.8 | — | 2.15 | 2.8 | vols |
| DC Gate-Trigger Current, I_{GT} At $T_C = +25^\circ\text{C}$ | — | 8 | 15 | — | 8 | 15 | — | 8 | 15 | mA(dc) |
| Gate-Trigger Voltage, V_{GT} At $T_C = +25^\circ\text{C}$ | — | 1.2 | 2.0 | — | 1.2 | 2.0 | — | 1.2 | 2.0 | vols(dc) |
| Holding Current, I_{H00} At $T_C = +25^\circ\text{C}$ | — | 10 | 20 | — | 10 | 20 | — | 10 | 20 | mA |
| Critical Rate of Applied Forward Voltage, Critical dv/dt | 10 | 200 | — | 10 | 200 | — | 10 | 200 | — | vols/ microsecond |
| $V_{FB} = V_{BO0}$ (min. value), exponential rise, $T_C = +100^\circ\text{C}$ | — | 0.75 | 1.5 | — | 0.75 | 1.5 | — | 0.75 | 1.5 | microseconds |
| Turn-On Time, t_{on} , (Delay Time + Rise Time) $V_{FB} = V_{BO0}$ (min. value), $i_F = 4.5$ amperes, $I_{GT} = 200$ mA, $0.1 \mu\text{s}$ rise time, $T_C = +25^\circ\text{C}$ | — | 0.75 | 1.5 | — | 0.75 | 1.5 | — | 0.75 | 1.5 | microseconds |
| Turn-Off Time, t_{off} , $i_F = 2$ amperes, $50 \mu\text{s}$ pulse width, $dv_{FB}/dt = 20 \text{ v}/\mu\text{s}$, $di_T/dt = 30 \text{ A}/\mu\text{s}$, $I_{GT} = 200$ mA, $T_C = +75^\circ\text{C}$ | — | 15 | 50 | — | 15 | 50 | — | 15 | 50 | microseconds |
| Thermal Resistance: Junction-to-case | — | — | 4 | — | — | 4 | — | — | 4 | $^\circ\text{C}/\text{W}$ |
| Junction-to-ambient | — | — | 40 | — | — | 40 | — | — | 40 | $^\circ\text{C}/\text{W}$ |

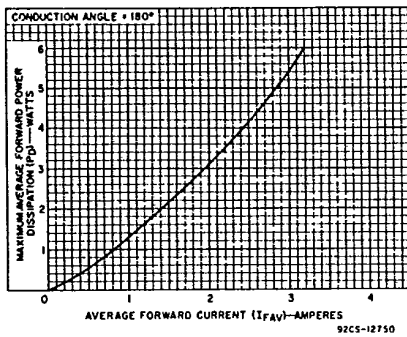


Fig. 1 — Power dissipation chart for all types.

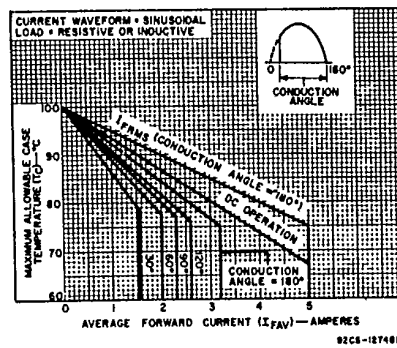


Fig. 2 — Rating chart (case temperature).

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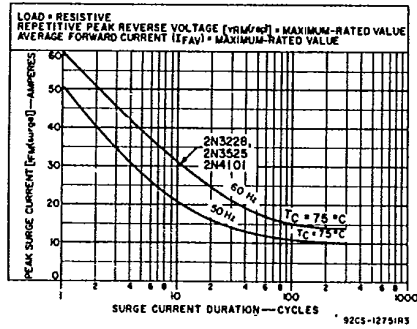


Fig. 3 - Surge-current rating chart.

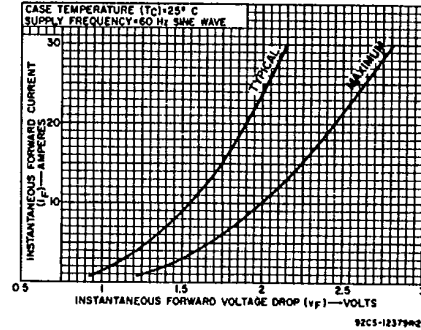


Fig. 4 - Forward characteristics for all types.

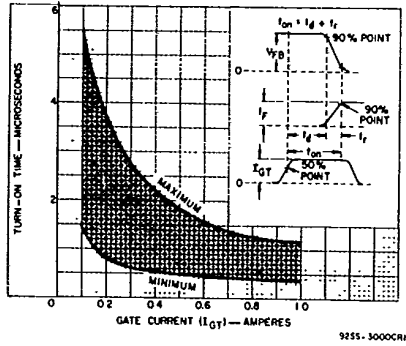


Fig. 5 - Turn-on time characteristics.

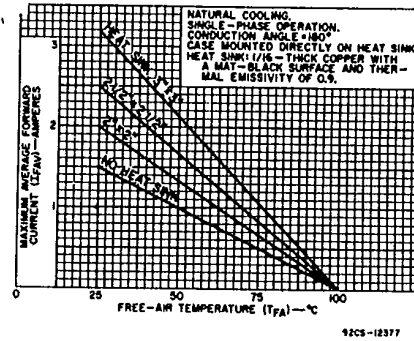


Fig. 6 - Operation guidance chart for types 2N3228, 2N3525, and 2N4101.

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