# D I G I T R O N  S E M I C O N D U C T O R S

## 2N6504 SERIES

## SILICON CONTROLLED RECTIFIERS
## REVERSE BLOCKING THYRISTORS

Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).
Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.

### MAXIMUM RATINGS $T_J$ = 25°C unless otherwise noted

| Rating | | Symbol | Value | Unit |
|---|---|---|---|---|
| **Peak repetitive off state voltage** (1) **(Gate open, sine wave 50 to 60 Hz, $T_J$ = 25° to 125°C)** | 2N6504<br>2N6505<br>2N6507<br>2N6508<br>2N6509 | $V_{DRM}$, $V_{RRM}$ | 50<br>100<br>400<br>600<br>800 | V |
| **On-state current RMS (180° conduction angles; $T_C$ = 85°C)** | | $I_{T(RMS)}$ | 25 | A |
| **Average on-state current (180° conduction angles; $T_C$ = 85°C)** | | $I_{T(AV)}$ | 16 | A |
| **Peak non-repetitive surge current (1/2 cycle, sine wave 60 Hz, $T_J$ = 100°C** | | $I_{TSM}$ | 250 | A |
| **Forward peak gate power (pulse width ≤ 1.0 µs, $T_C$ = 85°C)** | | $P_{GM}$ | 20 | W |
| **Forward average gate power (t = 8.3ms, $T_C$ = 85°C)** | | $P_{G(AV)}$ | `0.5 | W |
| **Forward peak gate current (pulse width ≤ 1.0 µs, $T_C$ = 85°C)** | | $I_{GM}$ | 2.0 | A |
| **Operating junction temperature range** | | $T_J$ | -40 to +125 | °C |
| **Storage temperature range** | | $T_{stg}$ | -40 to +150 | °C |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. $V_{DRM}$ and $V_{RRM}$ for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| **Thermal resistance, junction-to-case** | $R_{\Theta JC}$ | 1.5 | °C/W |
| **Maximum lead temperature for soldering purposes 1/8" in from case for 10 seconds** | $T_L$ | 260 | °C |

### ELECTRICAL CHARACTERISTICS

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| **Peak repetitive forward or reverse blocking current** | $T_J$ = 25°C | $I_{DRM}$, | - | - | 10 | µA |
| ($V_{AK}$ = rated $V_{DRM}$ or $V_{RRM}$, gate open) | $T_J$ = 125°C | $I_{RRM}$ | - | - | 2.0 | mA |
| **ON CHARACTERISTICS** | | | | | | |
| **Forward on-state voltage** (2) **($I_{TM}$ = 50A)** | | $V_{TM}$ | - | - | 1.8 | V |
| **Gate trigger current (continuous dc)** | $T_C$ = 25°C | $I_{GT}$ | - | 9.0 | 30 | mA |
| ($V_{AK}$ = 12Vdc, $R_L$ = 100Ω) | $T_C$ = -40°C | | - | - | 75 | |
| **Gate trigger voltage (continuous dc)** ($V_{AK}$ = 12 Vdc, $R_L$ = 100Ω, $T_C$ = -40°C) | | $V_{GT}$ | - | 1.0 | 1.5 | V |
| **Gate non-trigger voltage** ($V_{AK}$ = 12Vdc, $R_L$ = 100Ω, $T_J$ = 125°C) | | $V_{GD}$ | 0.2 | - | - | V |
| **Holding current** | $T_C$ = 25°C | $I_H$ | - | 18 | 40 | mA |
| ($V_{AK}$ = 12Vdc, initiating current = 200mA, gate open) | $T_C$ = -40°C | | - | - | 80 | |
| **Turn-on time ($I_{TM}$ = 25A, $I_{GT}$ = 50mAdc)** | | $t_{gt}$ | - | 1.5 | 2.0 | µs |
| **Turn-off time ($V_{DRM}$ = rated voltage)** | | | | | | |
| ($I_{TM}$ = 25A, $I_R$ = 25A) | | $t_q$ | - | 15 | - | µs |
| ($I_{TM}$ = 25A, $I_R$ = 25A, $T_J$ = 125°C) | | | - | 35 | - | |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| **Critical rate of rise of off state voltage** | | dv/dt | - | 50 | - | V/µs |
| (Gate open, rated $V_{DRM}$, exponential waveform) | | | | | | |

2. Pulse test: Pulse width ≤ 300µs, duty cycle ≤ 2%.

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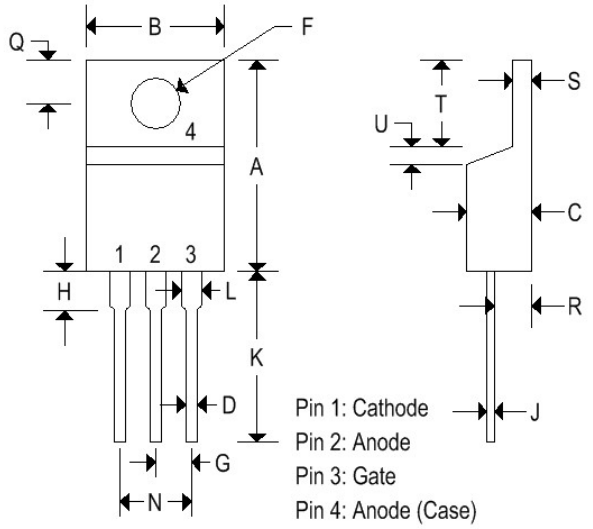
## REVERSE BLOCKING THYRISTORS

### MECHANICAL CHARACTERISTICS

| | |
|---|---|
| **Case** | TO-220AB |
| **Marking** | Alpha-numeric |
| **Pin out** | See below |




| | TO-220AB | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 0.575 | 0.620 | 14.600 | 15.750 |
| B | 0.380 | 0.405 | 9.650 | 10.290 |
| C | 0.160 | 0.190 | 4.060 | 4.820 |
| D | 0.025 | 0.035 | 0.640 | 0.890 |
| F | 0.142 | 0.147 | 3.610 | 3.730 |
| G | 0.095 | 0.105 | 2.410 | 2.670 |
| H | 0.110 | 0.155 | 2.790 | 3.930 |
| J | 0.014 | 0.022 | 0.360 | 0.560 |
| K | 0.500 | 0.562 | 12.700 | 14.270 |
| L | 0.045 | 0.055 | 1.140 | 1.390 |
| N | 0.190 | 0.210 | 4.830 | 5.330 |
| Q | 0.100 | 0.120 | 2.540 | 3.040 |
| R | 0.080 | 0.110 | 2.040 | 2.790 |
| S | 0.045 | 0.055 | 1.140 | 1.390 |
| T | 0.235 | 0.255 | 5.970 | 6.480 |
| U | - | 0.050 | - | 1.270 |
| V | 0.045 | - | 1.140 | - |
| Z | - | 0.080 | - | 2.030 |

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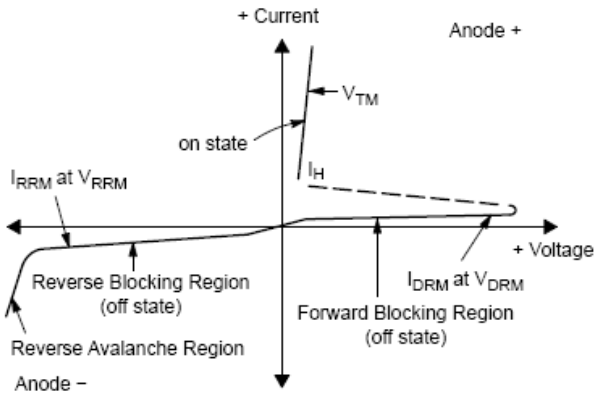
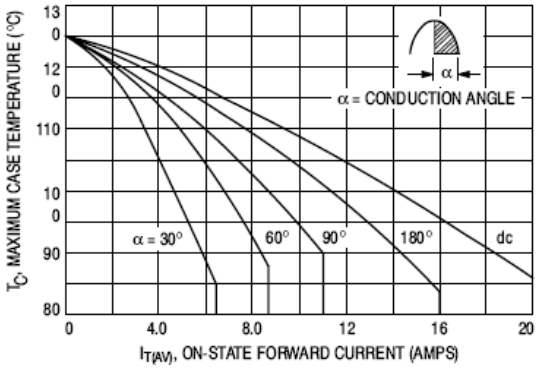
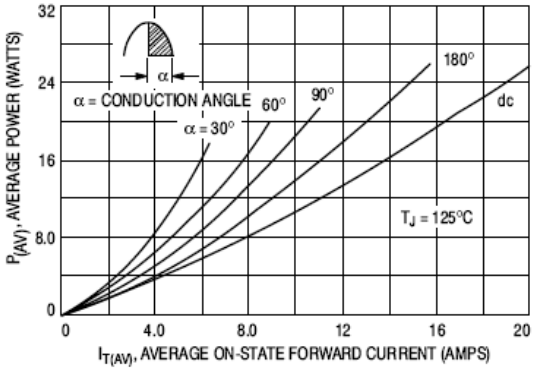


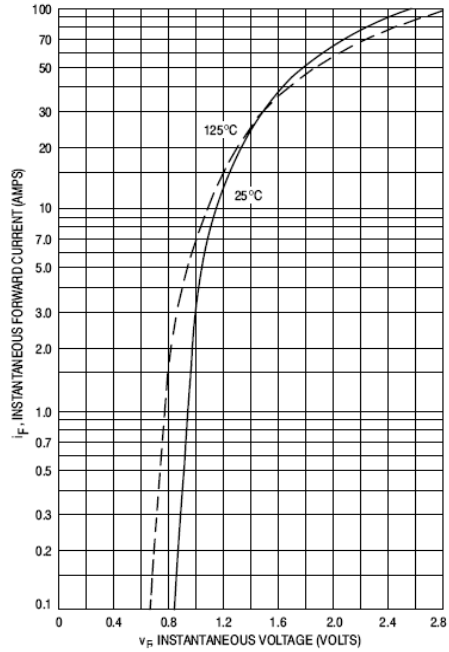

| Symbol | Parameter |
|---|---|
| $V_{DRM}$ | Peak repetitive off state forward voltage |
| $I_{DRM}$ | Peak forward blocking current |
| $V_{RRM}$ | Peak repetitive off state reverse voltage |
| $I_{RRM}$ | Peak reverse blocking current |
| $V_{TM}$ | Peak on state voltage |
| $I_H$ | Holding current |



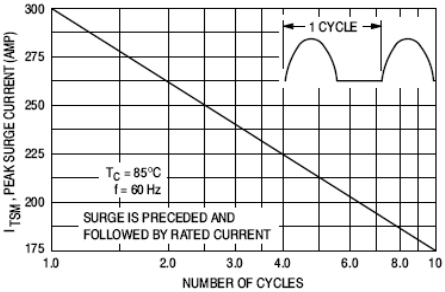

**Average Current Derating**




**Maximum On-State Power Dissipation**




**Typical On-State Characteristics**




**Maximum Non-Repetitive Surge Current**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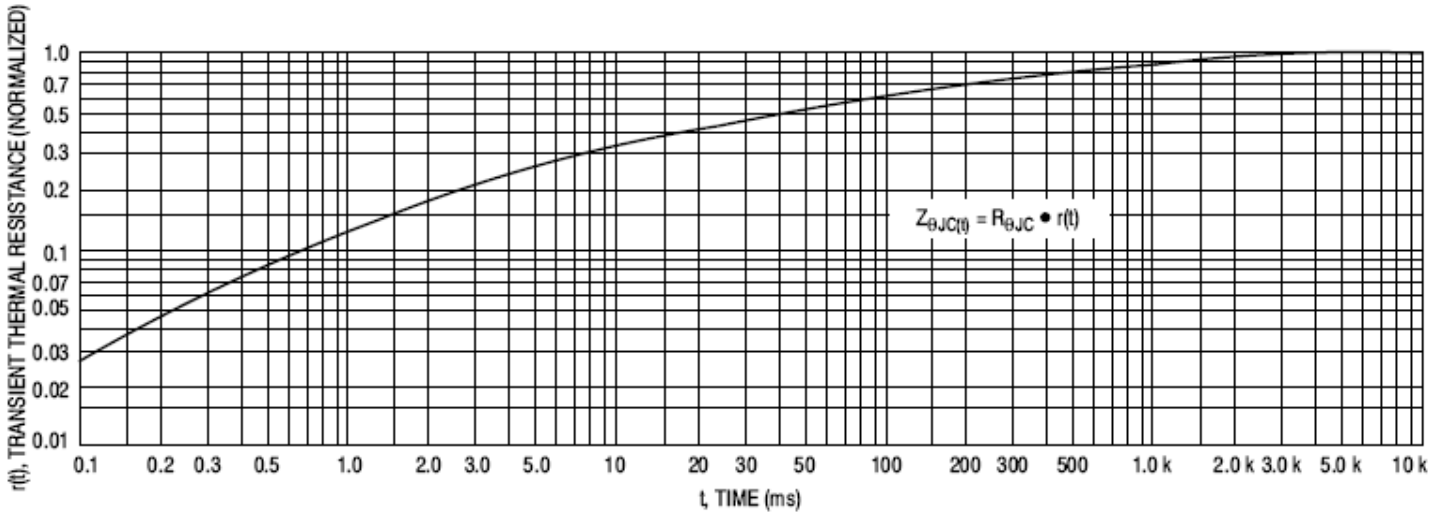
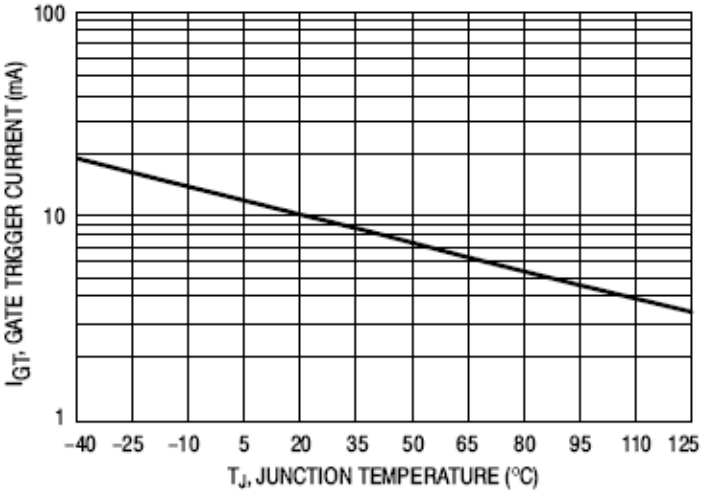
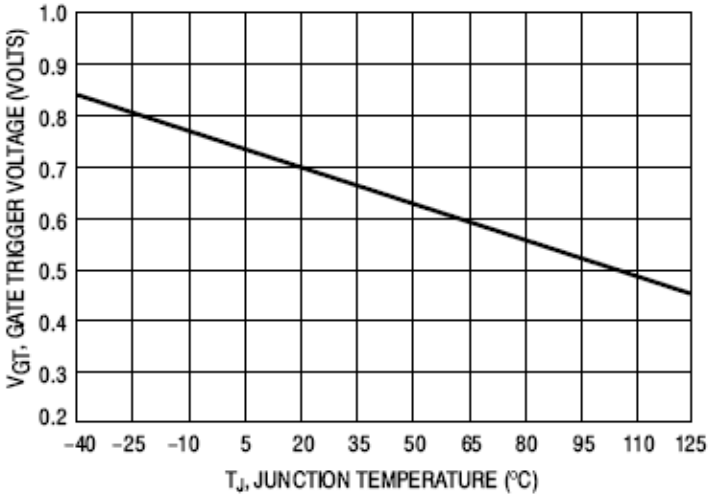


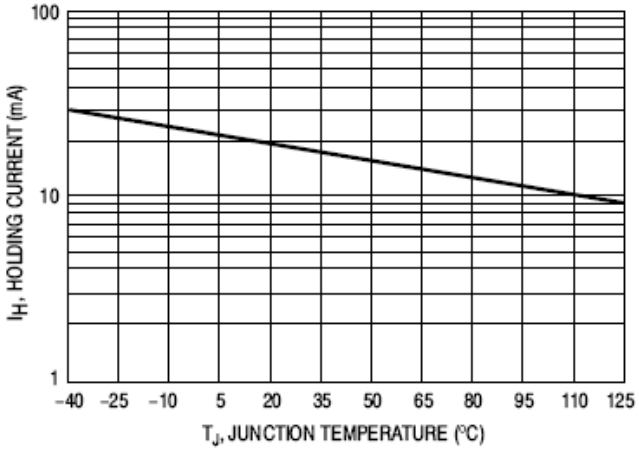

**Thermal Response**




**Typical Gate Trigger Current vs. Junction Temperature**




**Typical Gate Trigger Voltage vs. Junction Temperature**




**Typical Holding Current vs. Junction Temperature**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