## 2N3654, 2N3655, 2N3656, 2N3657, 2N3658, S7412M
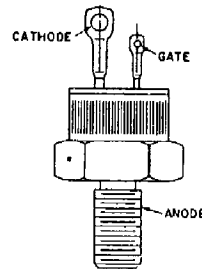
### 35-A Silicon Controlled Rectifiers

For Inverter Applications

**Features:**

- *Fast turn-off time — 10 μs max.*
- *High di/dt and dv/dt capability*
- *Low thermal resistance*

**TERMINAL DESIGNATIONS**



CATHODE
GATE
ANODE

**JEDEC TO-208AA**

The 2N3654 to 2N3658 have forward and reverse off-state voltage ratings of 50, 100, 200, 300, and 400 volts, respectively. Type S7412M has a forward and reverse off-state voltage rating of 600 volts.

These SCR's employ a hermetic JEDEC TO-208AA package.

**MAXIMUM RATINGS,** *Absolute-Maximum Values:*

| | 2N3654 | 2N3655 | 2N3656 | 2N3657 | 2N3658 | S7412M | |
|---|---|---|---|---|---|---|---|
| *$V_{RSOM}$† | 75 | 150 | 300 | 400 | 500 | 700 | V |
| $V_{DSOM}$† | 75 | 150 | 300 | 400 | 500 | 700 | V |
| *$V_{RROM}$† | 50 | 100 | 200 | 300 | 400 | 600 | V |
| *$V_{DROM}$† | 50 | 100 | 200 | 300 | 400 | 600 | V |
| $I_{T(RMS)}$ ($T_C = 40°C$, $θ = 180°$) | | | | 35 | | | A |
| *$I_{T(AV)}$ ($T_C = 40°C$, $θ = 180°$) | | | | 25 | | | A |
| *$I_{TSM}$: For one full cycle of applied principal voltage 60-Hz (Rectangular wave-pw = 5 ms, $t_r = 50 μs$), $T_C = 40°C$ | | | | 180 | | | A |
| *di/dt: $V_D = V_{DROM}$, $I_{GT} = 200$ mA, $t_r = 0.1 μs$ (See Fig. 15) | | | | 400 | | | A/μs |
| $I^2t$: $T_J = -65$ to $120°C$, $t = 1$ to 8.3 ms | | | | 165 | | | A2s |
| *$P_{GM}$■: Peak (forward or reverse) for 10μs maximum, See Fig. 7 | | | | 40 | | | W |
| *$P_{G(AV)}$■: Averaging time = 10 ms maximum | | | | 1 | | | W |
| *$T_{stg}$* | | | | -65 to 150 | | | °C |
| *$T_C$* | | | | -65 to 120 | | | °C |
| $T_T$: During soldering for 10 s maximum (terminal and case) | | | | 225 | | | °C |
| $T_S$: Recommended | | | | 35 | | | in-lbf |
| | | | | 0.4 | | | kgf-m |
| Maximum (DO NOT EXCEED) | | | | 50 | | | in-lbf |
| | | | | 0.57 | | | kgf-m |

* In accordance with JEDEC registration data format (JS-14, RDF-1) filed for the JEDEC (2N series) types.
† These values do not apply if there is a positive gate signal. Gate must be open or negatively biased.
■ Any product of gate current and gate voltage which results in a gate power less than the maximum is permitted.
• For temperature measurement reference point, see Dimensional Outline.
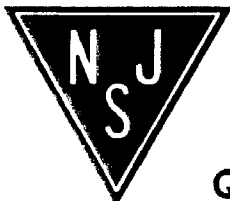
## Quality Semi-Conductors

## 2N3654, 2N3655, 2N3656, 2N3657, 2N3658, S7412M

**ELECTRICAL CHARACTERISTICS**

At Maximum Ratings Unless Otherwise Specified and at Indicated Case Temperature ($T_C$)

| CHARACTERISTIC | LIMITS FOR ALL TYPES Except as Specified | | | UNITS |
|---|---|---|---|---|
| | MIN. | TYP. | MAX. | |
| $I_{DOM}$ or $I_{ROM}$: <br> $V_D = V_{DROM}$ or $V_R = V_{RROM}$, $T_C = 120°C$ <br> 2N3654, 2N3655, 2N3656, S7412M .............. <br> 2N3657 ................................... <br> 2N3658 ................................... | <br><br>– <br>– <br>– | <br><br>2 <br>2 <br>2 | <br><br>6* <br>5.5* <br>4* | mA |
| $V_T$: <br> $i_T$ = 25 A (peak), $T_C = 25°C$ ..................... | – | 1.5 | 2.05* | V |
| $i_{HO}$: <br> $T_C = 25°C$ ................................. <br> $T_C = -65°C$ ................................. | – <br> – | 75 <br> 150 | 150 <br> 350* | mA |
| * dv/dt: <br> $V_D = V_{DROM}$, exponential voltage rise, $T_C = 120°C$ <br> (See Fig. 16) ................................. | <br>200 | <br>– | <br>– | V/μs |
| $I_{GT}$: <br> $V_D$ = 6 V (dc), $R_L$ = 4 Ω, $T_C = 25°C$ .............. <br> $V_D$ = 6 V (dc), $R_L$ = 2 Ω, $T_C = -65°C$ ............. | – <br> – | 80 <br> 150 | 180 <br> 500* | mA |
| $V_{GT}$: <br> $V_D$ = 6 V (dc), $R_L$ = 4 Ω, $T_C = 25°C$ .............. <br> * $V_D$ = 6 V (dc), $R_L$ = 200 Ω, $T_C = 120°C$ ........... <br> $V_D$ = 6 V (dc), $R_L$ = 2 Ω, $T_C = -65°C$ ............. | – <br> 0.25 <br> – | 1.5 <br> – <br> 2 | 3 <br> – <br> 4.5* | V |
| * tq: <br> Rectangular Pulse <br> $V_{DX} = V_{DROM}$, $i_T$ = 10 A, pulse duration = 50 μs, <br> dv/dt = 200 V/μs, –di/dt = 5 A/μs, $I_{GT}$ = 200 mA <br> at turn-on, $V_{RX}$ = 15 V minimum, $V_{GK}$ = 0 V at <br> turn-off, $T_C = 120°C$ (See Figs. 17 & 18) .......... <br> Sinusoidal Pulse <br> $V_{DX} = V_{DROM}$, $i_T$ = 100 A, pulse duration = 2 μs, <br> dv/dt = 200 V/μs, $V_{RX}$ = 30 V minimum, $V_{GK}$ = 0 <br> at turn-off, $T_C = 115°C$ (See Figs. 19 & 20) ......... | <br><br><br><br>– <br><br><br><br>– | <br><br><br><br>– <br><br><br><br>– | <br><br><br><br>10 <br><br><br><br>10 | μs |
| $R_{θJC}$ ...................................... | – | 0.85 | 1.7* | °C/W |

\* In accordance with JEDEC registration data format (JS-14, RDF-1) filed for the JEDEC (2N series) types.