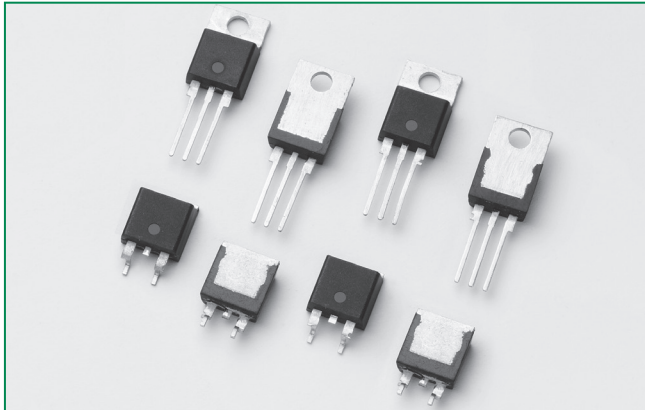


S4040xQx Series

RoHS



Main Features

| Symbol | Value | Unit |
|-------------------|----------|------|
| $I_{T(RMS)}$ | 40 | A |
| V_{DRM}/V_{RRM} | 400 | V |
| I_{GT} | 15 to 65 | mA |

Description

The S4040xQx series of SCRs offer fast turn-off time (t_q) characteristics required for applications such as power inverters, switching regulator, and high frequency pulse circuits.

These fast turn-off time SCRs offer high dv/dt and high di/dt characteristics required in higher frequency (>1000 PPS) switching circuits.

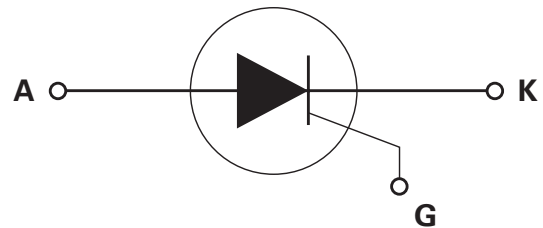
Features & Benefits

- RoHS compliant
- Glass – passivated junctions
- Voltage capability up to 400 V
- Surge capability up to 520 A
- TO-220 and TO-263 packages

Applications

Fast turn-off time SCRs are ideal for multi phase voltage regulator circuits, DC/AC inverters, and higher frequency pulsing power supplies.

Schematic Symbol



Absolute Maximum Ratings

| Symbol | Parameter | Test Conditions | Value | Unit |
|--------------|---|--|------------|------------------------|
| $I_{T(RMS)}$ | RMS on-state current | $T_c = 100^\circ\text{C}$ | 40 | A |
| $I_{T(AV)}$ | Average on-state current | $T_c = 100^\circ\text{C}$ | 25.0 | A |
| I_{TSM} | Peak non-repetitive surge current | single half cycle; $f = 50\text{Hz}$; T_j (initial) = 25°C | 430 | A |
| | | single half cycle; $f = 60\text{Hz}$; T_j (initial) = 25°C | 520 | |
| I^2t | I^2t Value for fusing | $t_p = 8.3\text{ ms}$ | 1122 | A^2s |
| di/dt | Critical rate of rise of on-state current | $f = 60\text{Hz}$; $T_j = 125^\circ\text{C}$ | 175 | $\text{A}/\mu\text{s}$ |
| I_{GM} | Peak gate current | $T_j = 125^\circ\text{C}$ | 3.5 | A |
| $P_{G(AV)}$ | Average gate power dissipation | $T_j = 125^\circ\text{C}$ | 0.8 | W |
| T_{stg} | Storage temperature range | | -40 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature range | | -40 to 125 | $^\circ\text{C}$ |

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise specified)

| Symbol | Test Conditions | | Sxx40xQ | Sxx40xQ2 | Sxx40xQ3 | Unit |
|----------|---|------|---------|----------|----------|------------------|
| I_{GT} | $V_D = 12\text{V}; R_L = 30\ \Omega$ | MAX. | 35 | 45 | 65 | mA |
| | | MIN. | 15 | 30 | 38 | |
| V_{GT} | | MAX. | 1.5 | | | V |
| I_{GT} | $V_D = 12\text{V}; R_L = 30\ \Omega; T_J = -40^\circ\text{C}$ | MAX. | 75 | 95 | 160 | mA |
| dv/dt | $V_D = V_{DRM};$ gate open; $T_J = 100^\circ\text{C}$ | MIN. | 650 | | | V/ μs |
| | $V_D = V_{DRM};$ gate open; $T_J = 125^\circ\text{C}$ | | 550 | | | |
| V_{GD} | $V_D = V_{DRM}; R_L = 3.3\ \text{k}\Omega; T_J = 125^\circ\text{C}$ | MIN. | 0.2 | | | V |
| I_H | $I_T = 400\text{mA}$ (initial) | MAX. | 70 | 120 | 200 | mA |
| t_q | (1) | MAX. | 15 | 12 | 5 | μs |
| t_{gt} | $I_G = 2 \times I_{GT}; PW = 15\ \mu\text{s}; I_T = 80\text{A}$ | TYP. | 3.0 | | 3.5 | μs |

Note :

 (1) $I_T=0.5\text{A}; t_p=50\ \mu\text{s}; dv/dt=5\text{V}/\mu\text{s}; di/dt=30\text{A}/\mu\text{s}$
Static Characteristics

| Symbol | Test Conditions | | S4040xQ | S4040xQ2 | S4040xQ3 | Unit |
|---------------------|--|---------------------------|---------|----------|----------|---------------|
| V_{TM} | $I_T = 80\text{A}; t_p = 380\ \mu\text{s}$ | MAX. | 1.8 | | 2.2 | V |
| I_{DRM} / I_{RRM} | V_{DRM} / V_{RRM} | $T_J = 25^\circ\text{C}$ | 10 | | | μA |
| | | $T_J = 100^\circ\text{C}$ | 1000 | | | |
| | | $T_J = 125^\circ\text{C}$ | 2000 | | | |

Thermal Resistances

| Symbol | Parameter | Value | Unit |
|-------------------|-----------------------|-------|---------------------------|
| $R_{\theta(J-C)}$ | Junction to case (AC) | 0.6 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta(J-A)}$ | Junction to ambient | 40 | $^\circ\text{C}/\text{W}$ |

Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature

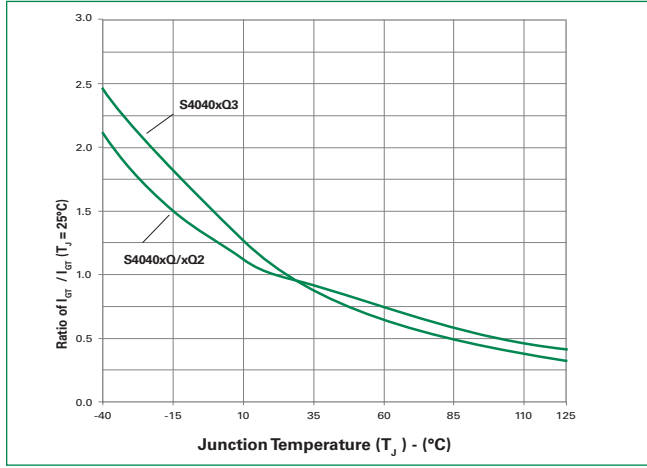


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

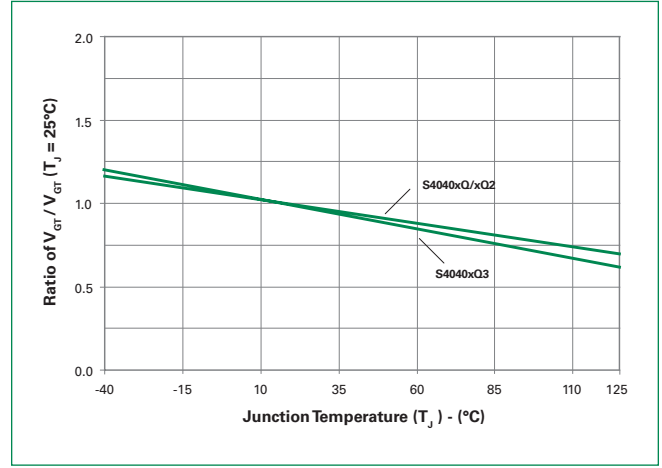


Figure 3: Normalized DC Holding Current vs. Junction Temperature

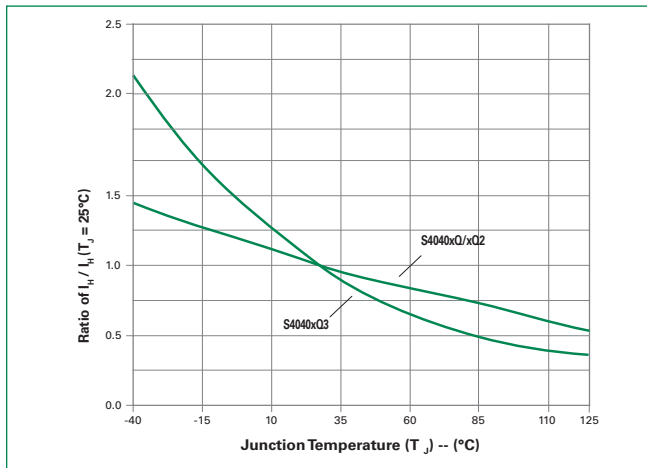


Figure 4: On-State Current vs. On-State Voltage (Typical)

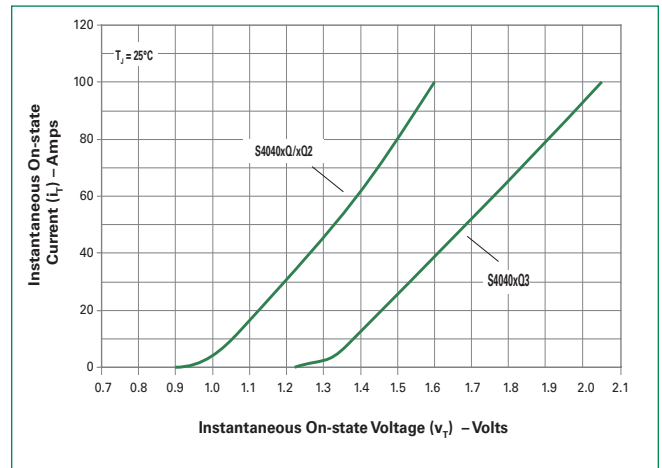


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

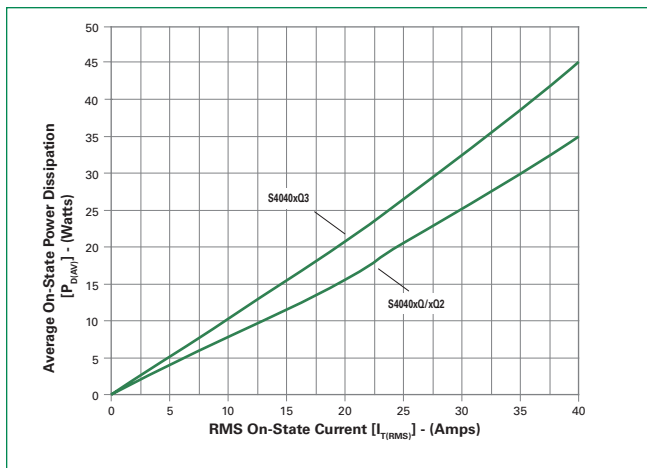


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

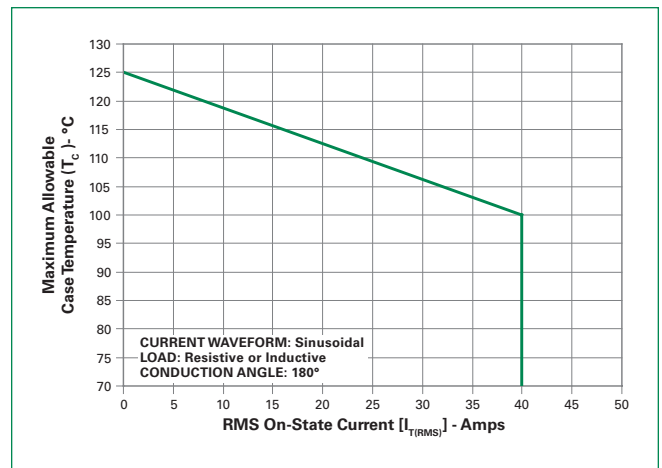


Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

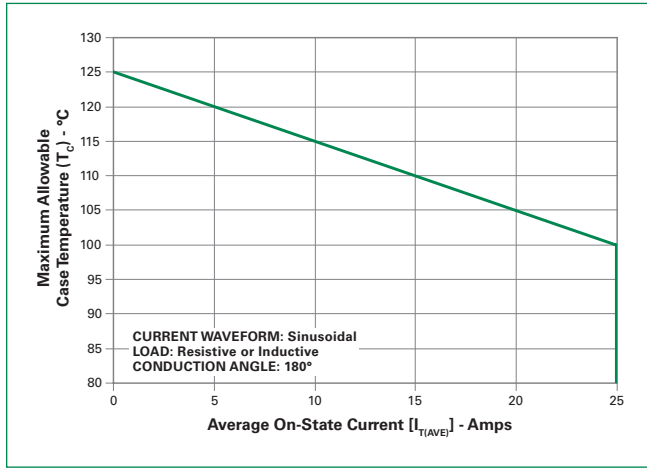


Figure 8: Maximum Allowable Ambient Temperature vs. RMS On-State Current

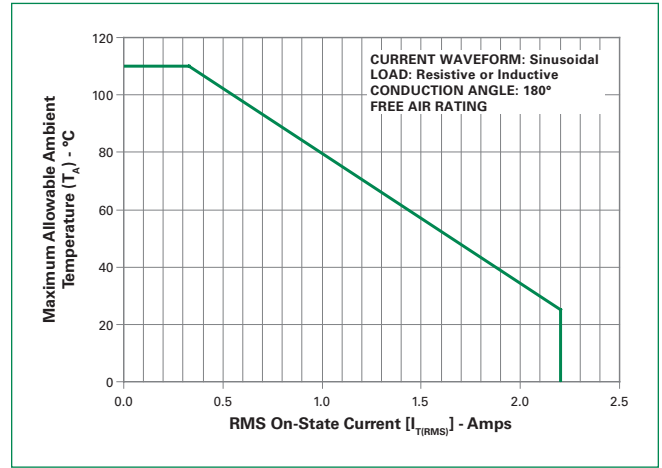


Figure 9: Maximum Allowable Ambient Temperature vs. Average On-State Current

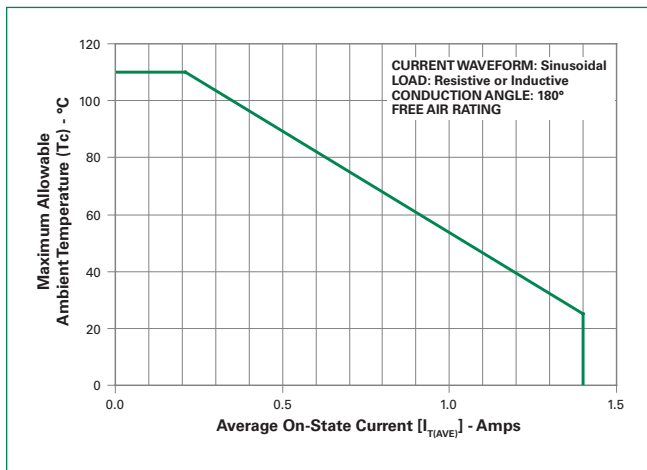


Figure 10: Peak Capacitor Discharge Current

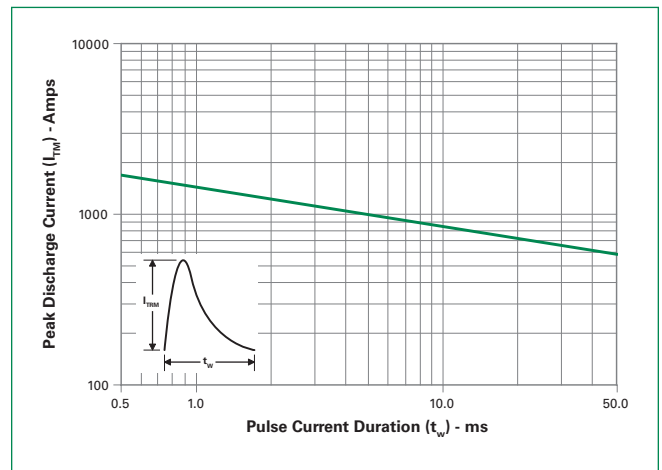


Figure 11: Peak Capacitor Discharge Current Derating

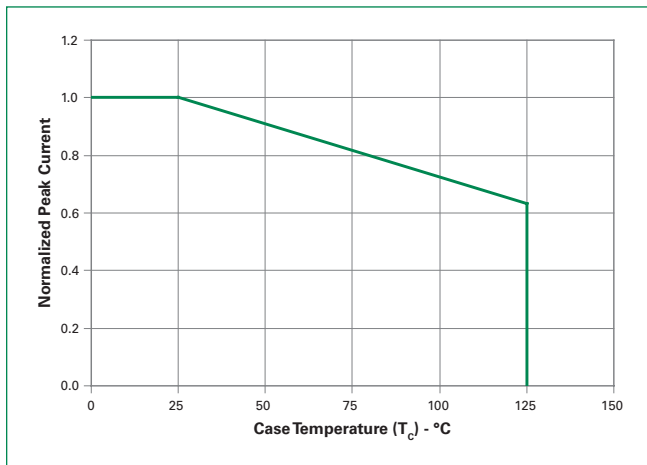
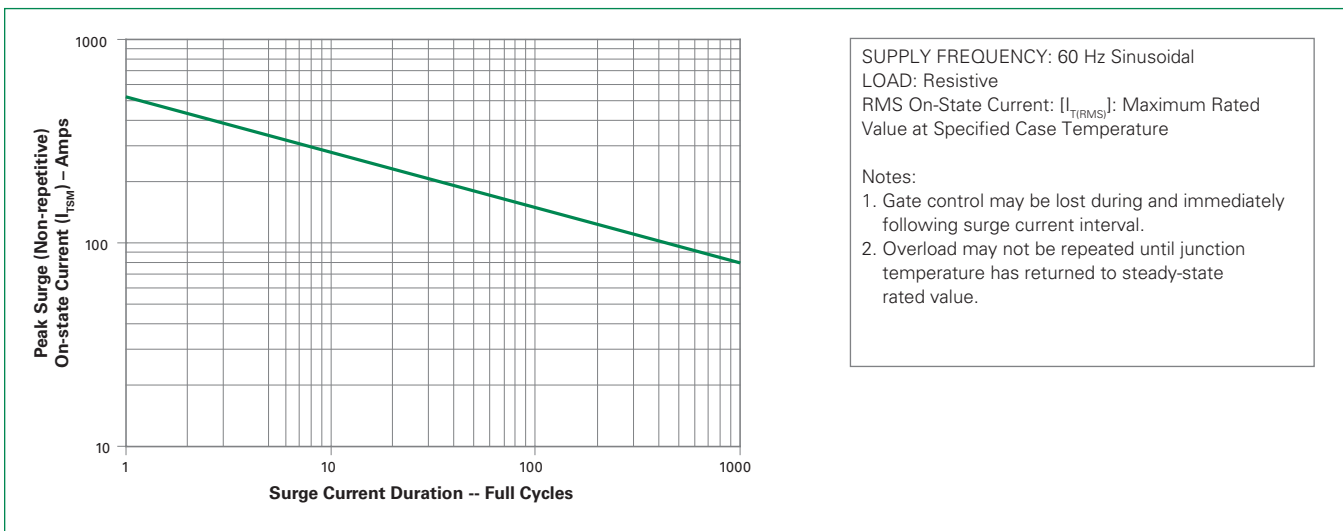
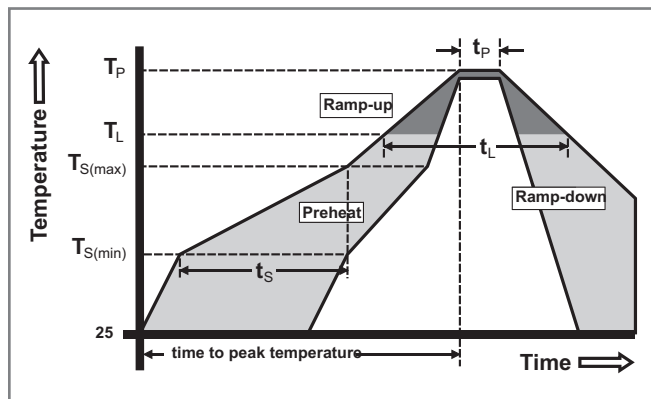


Figure 12: Surge Peak On-State Current vs. Number of Cycles



Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| Reflow Condition | | Pb – Free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 180 secs |
| Average ramp up rate (Liquidus Temp) (T_L) to peak | | 5°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 5°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Temperature (t_L) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 20 – 40 seconds |
| Ramp-down Rate | | 5°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes Max. |
| Do not exceed | | 280°C |



Physical Specifications

| | |
|------------------------|---|
| Terminal Finish | 100% Matte Tin-plated |
| Body Material | UL recognized epoxy meeting flammability classification 94V-0 |
| Lead Material | Copper Alloy |

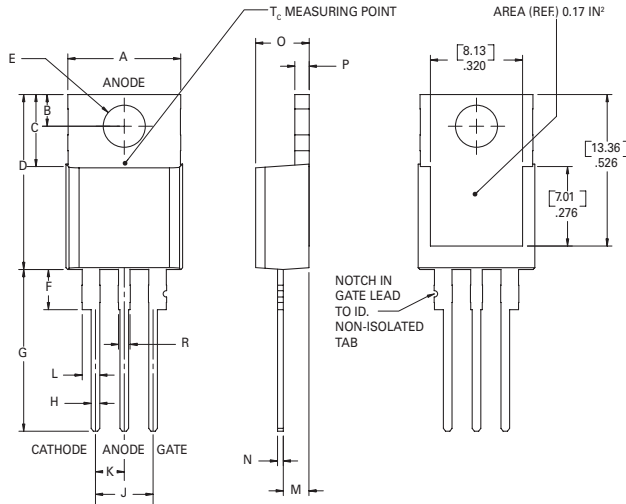
Design Considerations

Careful selection of the correct device for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the device rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

Environmental Specifications

| Test | Specifications and Conditions |
|----------------------------------|--|
| AC Blocking | MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours |
| Temperature Cycling | MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time |
| Temperature/Humidity | EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity |
| High Temp Storage | MIL-STD-750, M-1031, 1008 hours; 150°C |
| Low-Temp Storage | 1008 hours; -40°C |
| Resistance to Solder Heat | MIL-STD-750 Method 2031 |
| Solderability | ANSI/J-STD-002, category 3, Test A |
| Lead Bend | MIL-STD-750, M-2036 Cond E |

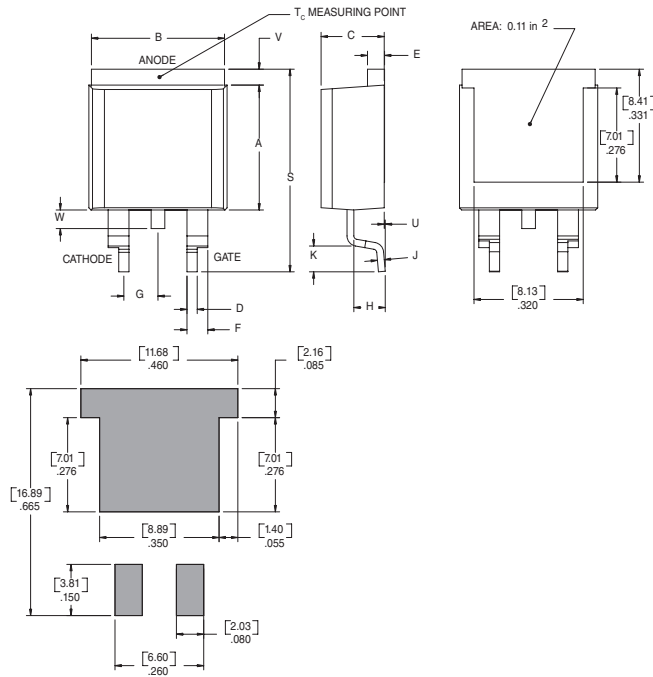
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

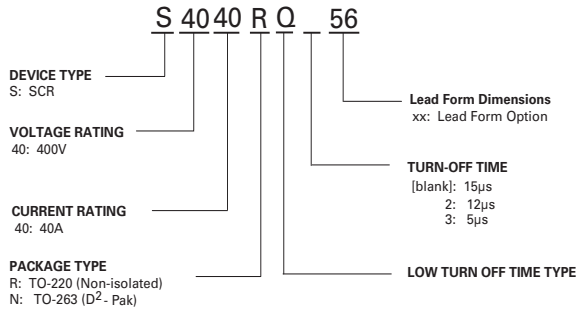
| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.380 | 0.420 | 9.65 | 10.67 |
| B | 0.105 | 0.115 | 2.67 | 2.92 |
| C | 0.230 | 0.250 | 5.84 | 6.35 |
| D | 0.590 | 0.620 | 14.99 | 15.75 |
| E | 0.142 | 0.147 | 3.61 | 3.73 |
| F | 0.110 | 0.130 | 2.79 | 3.30 |
| G | 0.540 | 0.575 | 13.72 | 14.61 |
| H | 0.025 | 0.035 | 0.64 | 0.89 |
| J | 0.195 | 0.205 | 4.95 | 5.21 |
| K | 0.095 | 0.105 | 2.41 | 2.67 |
| L | 0.060 | 0.075 | 1.52 | 1.91 |
| M | 0.085 | 0.095 | 2.16 | 2.41 |
| N | 0.018 | 0.024 | 0.46 | 0.61 |
| O | 0.178 | 0.188 | 4.52 | 4.78 |
| P | 0.045 | 0.060 | 1.14 | 1.52 |
| R | 0.038 | 0.048 | 0.97 | 1.22 |

Dimensions – TO- 263 (N-package) – D²-Pak Surface Mount



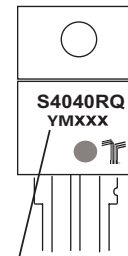
| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.360 | 0.370 | 9.14 | 9.40 |
| B | 0.380 | 0.420 | 9.65 | 10.67 |
| C | 0.178 | 0.188 | 4.52 | 4.78 |
| D | 0.025 | 0.035 | 0.63 | 0.89 |
| E | 0.048 | 0.055 | 1.22 | 1.40 |
| F | 0.060 | 0.075 | 1.52 | 1.91 |
| G | 0.095 | 0.105 | 2.41 | 2.67 |
| H | 0.083 | 0.093 | 2.11 | 2.36 |
| J | 0.018 | 0.024 | 0.46 | 0.61 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| S | 0.590 | 0.625 | 14.99 | 15.87 |
| V | 0.035 | 0.045 | 0.89 | 1.14 |
| U | 0.002 | 0.010 | 0.05 | 0.25 |
| W | 0.040 | 0.070 | 1.02 | 1.78 |

Part Numbering System



Part Marking System

TO-220 AB - (R Package)
TO-263 (N Package)



Date Code Marking
Y: Year Code
M: Month Code
XXX: Lot Trace Code

Product Selector

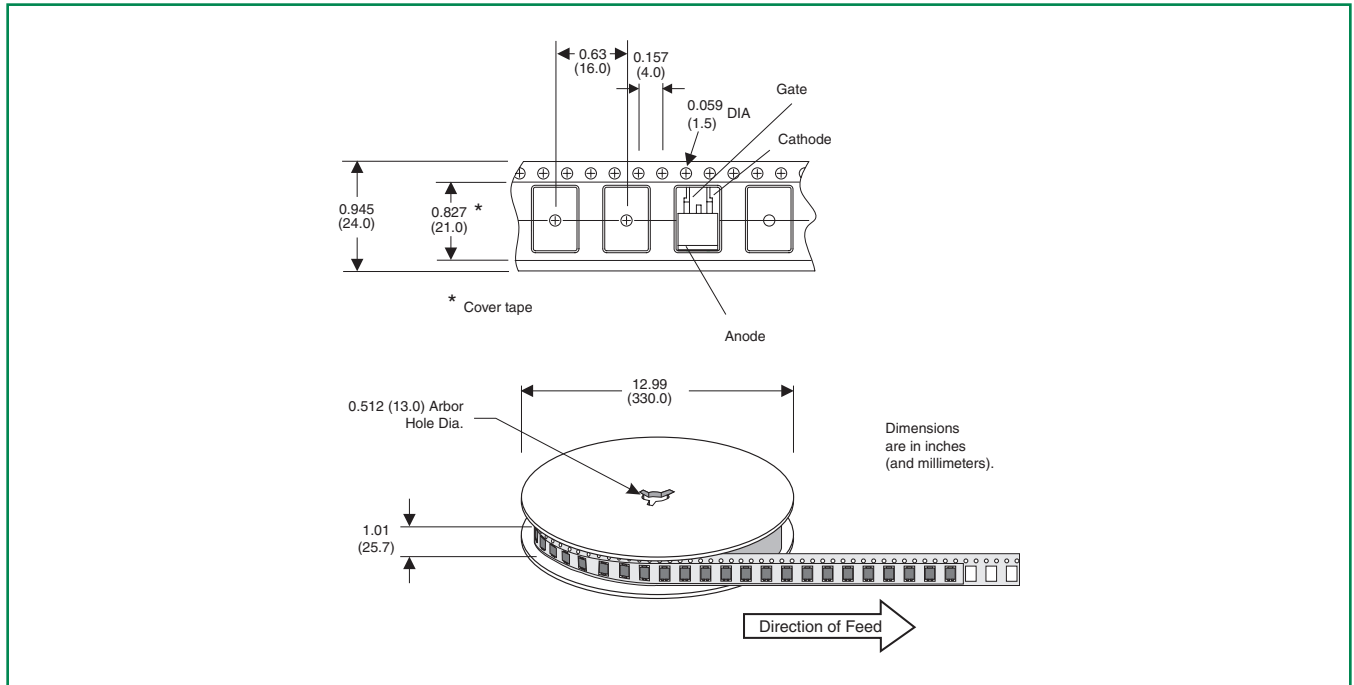
| Part Number | Voltage | Gate Sensitivity | Type | Package |
|-------------|---------|------------------|--------------|----------|
| | 400V | | | |
| S4040RQ | X | 15-35 | Standard SCR | TO-220AB |
| S4040NQ | X | 15-35 | Standard SCR | TO-263 |
| S4040RQ2 | X | 30-45 | Standard SCR | TO-220AB |
| S4040NQ2 | X | 30-45 | Standard SCR | TO-263 |
| S4040RQ3 | X | 38-65 | Standard SCR | TO-220AB |
| S4040NQ3 | X | 38-65 | Standard SCR | TO-263 |

Packing Options

| Part Number | Marking | Weight | Packing Mode | Base Quantity |
|-------------|----------|--------|------------------|-------------------|
| S4040RQTP | S4040RQ | 2.2g | Tube | 500 (50 per tube) |
| S4040RQ2TP | S4040RQ2 | 2.2g | Tube | 500 (50 per tube) |
| S4040RQ3TP | S4040RQ3 | 2.2g | Tube | 500 (50 per tube) |
| S4040NQRP | S4040NQ | 1.6g | Embossed Carrier | 500 |
| S4040NQ2RP | S4040NQ2 | 1.6g | Embossed Carrier | 500 |
| S4040NQ3RP | S4040NQ3 | 1.6g | Embossed Carrier | 500 |

Reel Pack (RP) for TO-263 Embossed Carrier Specifications

Meets all EIA-481-2 Standards





Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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