# SG2M040170BJ

**TriQSiC™1700V Silicon Carbide Power MOSFET G2** N Channel Enhancement

## Features

- High speed switching
- Very low switching losses
- Fully controllable dv/dt
- High blocking voltage with low on-resistance
- Fast intrinsic diode with low reverse recovery (Qrr)
- Temperature independent turn-off switching

# 1 Maximum ratings

**Table 2 Maximum rating** (Tc = 25°C unless otherwise specified)

| Symbol | Parameter | Value | Unit | Test Conditions | Note |
|---|---|---|---|---|---|
| $V_{DS,max}$ | Drain source voltage | 1700 | V | $V_{GS}$ = 0V, $I_D$ = 100μA | |
| $V_{GS,max}$ | Gate source voltage | -8 /+22 | V | Absolute maximum values | Note1 |
| $V_{GSpulse}$ | Gate-source voltage,max. transient voltage | -10 /+25 | V | $t_p \leq 0.5\mu s$, D 0.01 | |
| $V_{GSop}$ | Gate source voltage | -4 /+18 | V | Recommended operational values | |
| $I_D$ | Continuous drain current | 66 | A | $V_{GS}$ = 18V, $T_C$ = 25˚C | |
| | | 47 | | $V_{GS}$ = 18V, $T_C$ = 100˚C | |
| $I_D$(pulse) | Pulsed drain current | 188 | A | Pulse width $t_P$=100μs limited by $T_{J,max}$ | |
| $T_J$ ,$T_{stg}$ | Operating Junction and storage v temperature | -55 to +175 | ˚C | | |

Note 1 wh

# 2 Electrical characteristics

## 2.1 Static characteristics

**Table 4 Static characteristics** (Tc = 25°C unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Test Conditions | Note |
|---|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | 1700 | - | - | V | $V_{GS}$ = 0V, $I_D$ = 100μA | |
| $V_{GS(th)}$ | Gate threshold voltage | 2.5 | 3.1 | 4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 12mA | Fig.11 |
| | | - | 2.4 | - | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 12mA<br>$T_J$ = 175°C | |
| $I_{DSS}$ | Zero gate voltage drain current | - | - | 10 | μA | $V_{DS}$ = 1700V, $V_{GS}$ = 0V | |
| $I_{GSS}$ | Gate source leakage current | - | - | 100 | nA | $V_{GS}$ = 18V, $V_{DS}$ = 0V | |
| $R_{DS(on)}$ | Current drain-source on-state resistance | - | 47 | 65 | mΩ | $V_{GS}$ = 15V, $I_D$ = 38A | Fig.4,5,6 |
| | | - | 91 | - | | $V_{GS}$ = 15V, $I_D$ = 38A,<br>$T_J$ = 175°C | |
| | | - | 40 | 52 | | $V_{GS}$ = 18V, $I_D$ = 38A | |
| | | - | 88 | - | | $V_{GS}$ = 18V, $I_D$ = 38A,<br>$T_J$ = 175°C | |
| $g_{fs}$ | Transconductance | - | 23 | - | S | $V_{DS}$ = 20V, $I_D$ = 38A | Fig.7 |
| | | - | 22 | - | | $V_{DS}$ = 20V, $I_D$ = 38A,<br>$T_J$ = 175°C | |
| $R_{g,int}$ | Intenal gate resistance | - | 1.4 | - | Ω | $V_{AC}$ = 25mV, f | |

## 3 Electrical characteristic diagrams

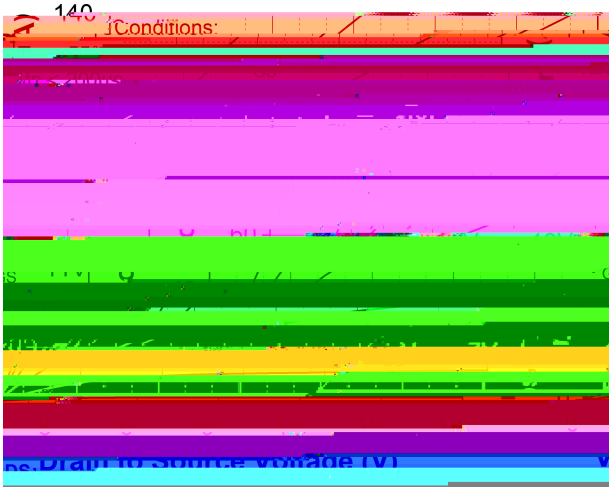


Figure 1. Output characteristics $T_J$ = -55 ºC

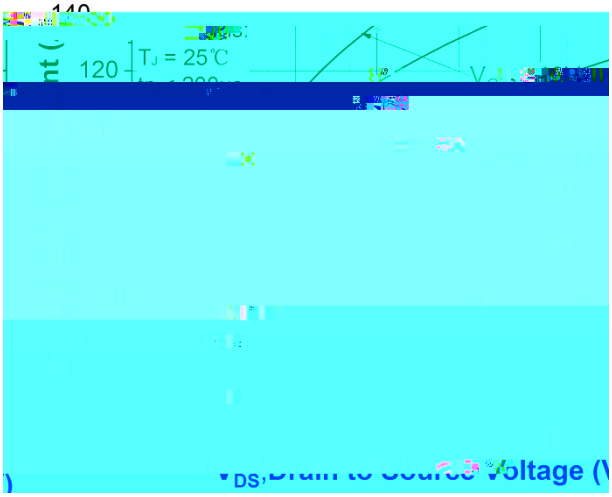


Figure 2. Output characteristics $T_J$ = 25 ºC

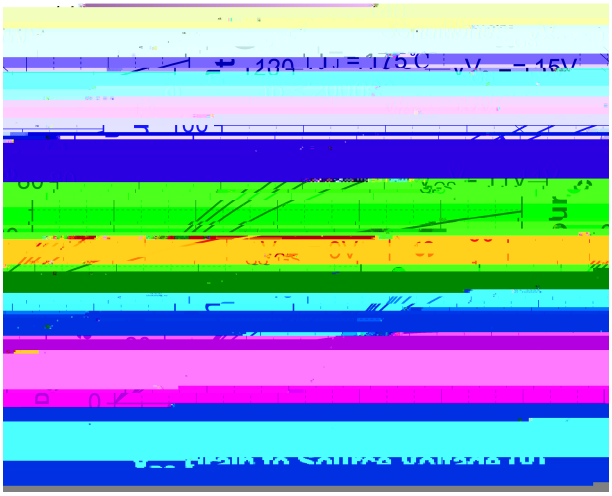


Figure 3. Output characteristics $T_J$ = 175 ºC

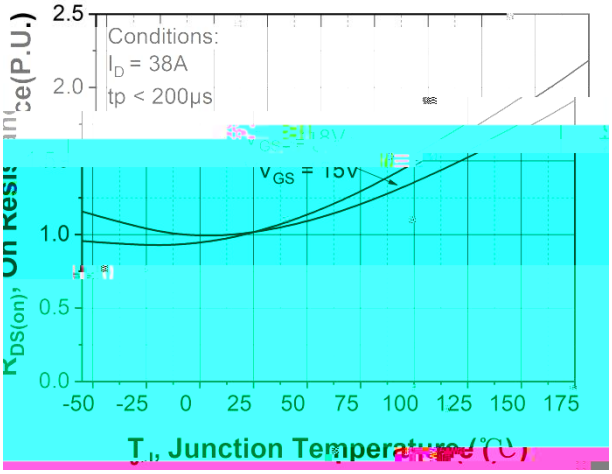



Figure 4. Normalized on-resistance vs. temperature

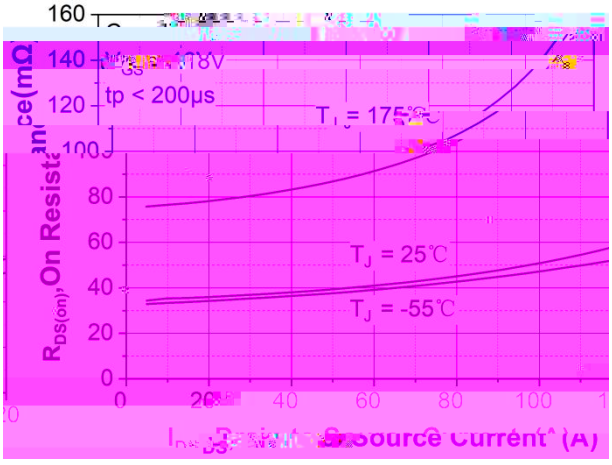



Figure 5. On-resistance vs. drain current for various temperatures

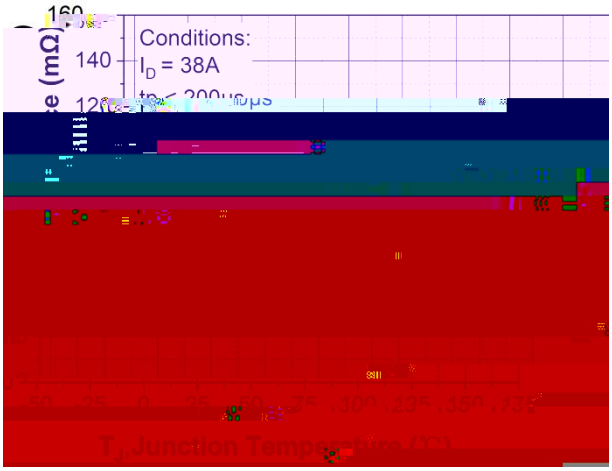



Figure 6. On-resistance vs. Temperature for various gate voltages

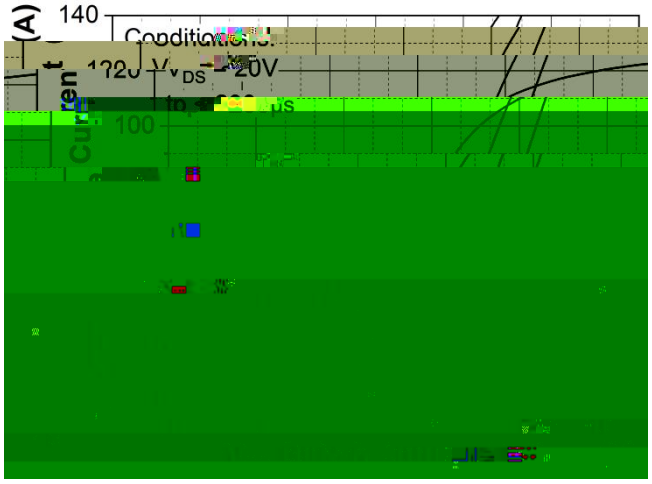



Figure 7. Transfer characteristic for various junction temperatures

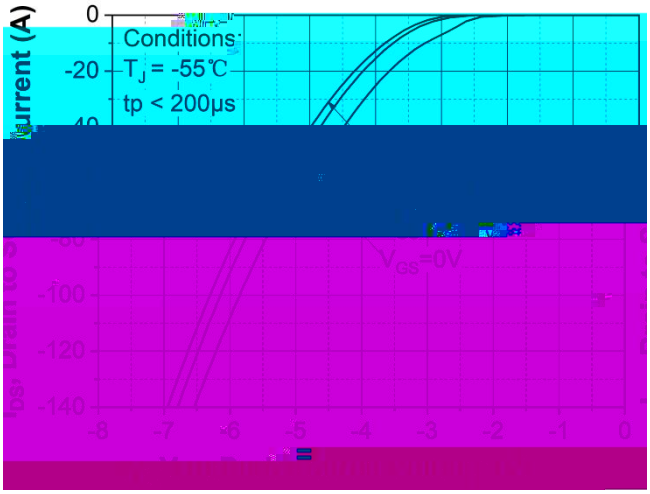



Figure 8. Body diode characteristic at $T_J$ = -55 ºC

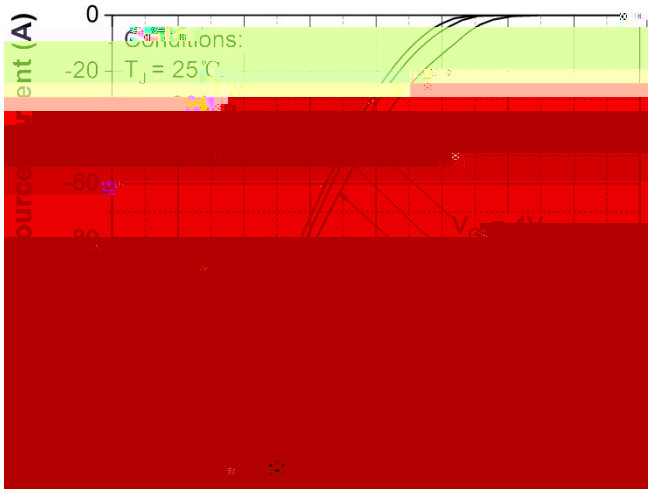



Figure 9. Body diode characteristic at $T_J$ = 25 ºC

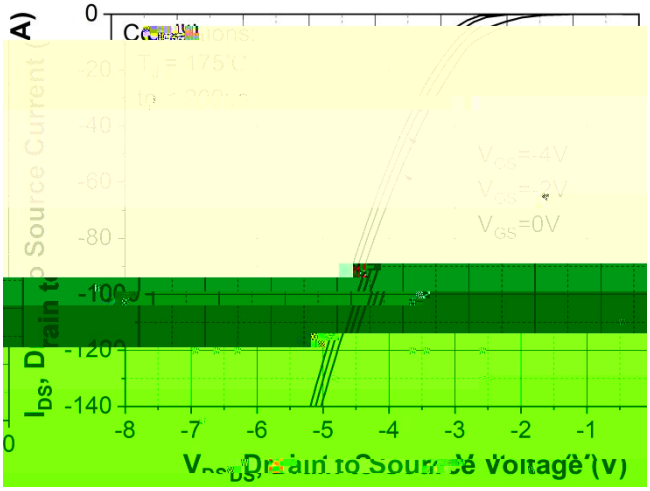



Figure 10. Body diode characteristic at $T_J$ = 175ºC

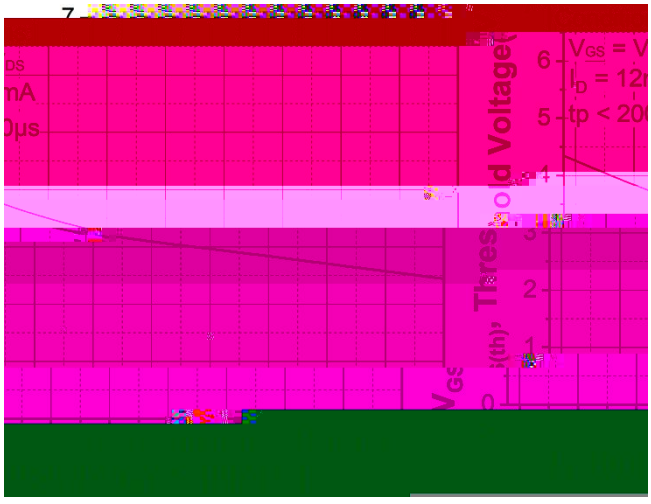



Figure 11. Threshold voltage vs. temperature

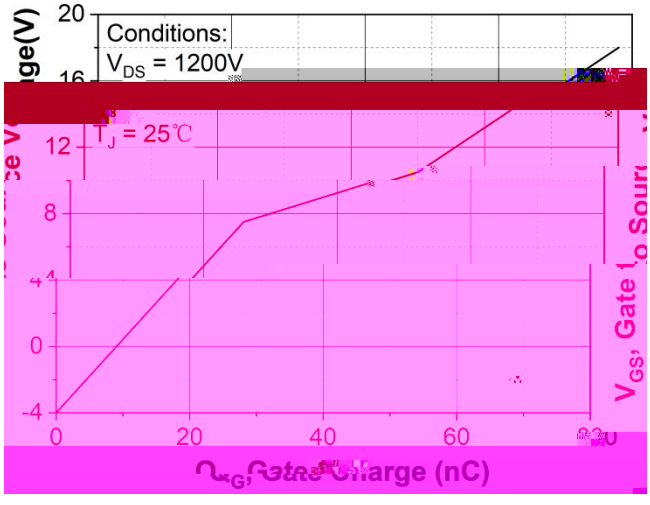



Figure 12. Gate charge characteristic

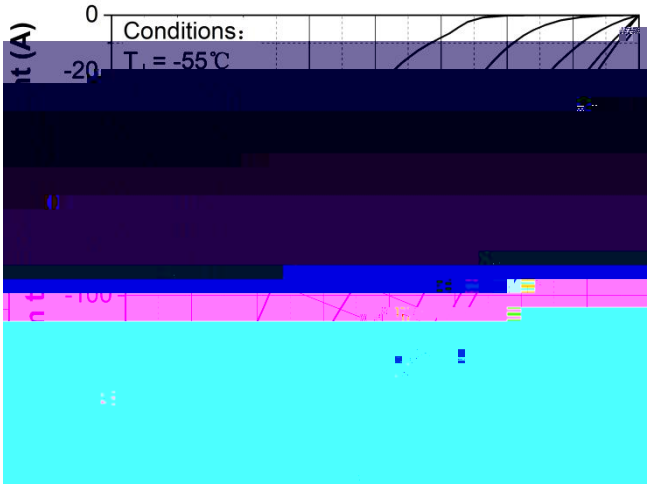



Figure 13. 3rd quadrant characteristic at $T_J$ = -55 ºC

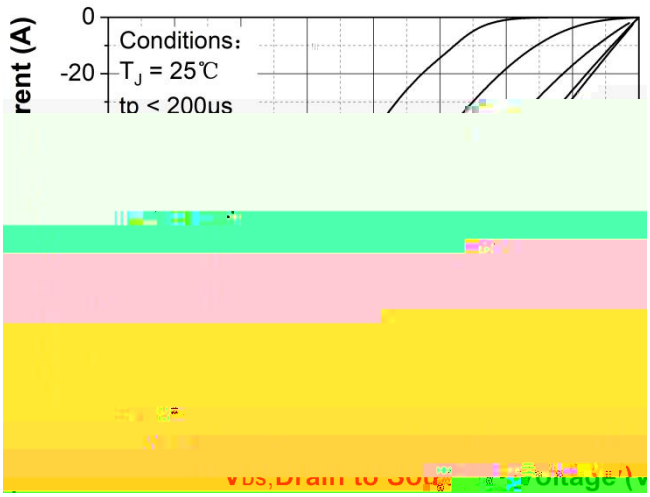



Figure 14. 3rd quadrant characteristic at $T_J$ = 25 ºC

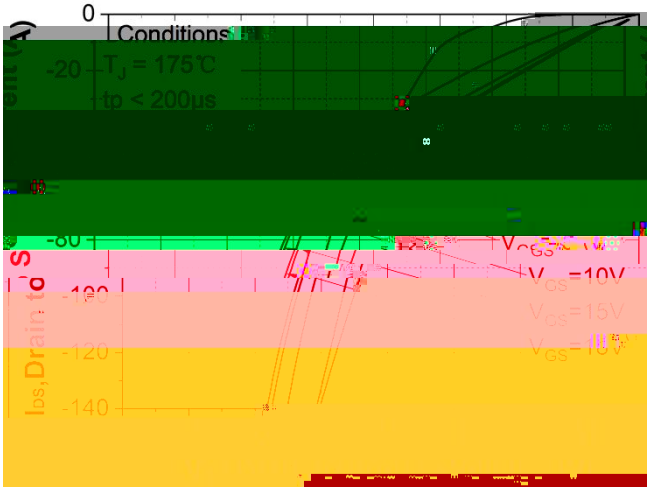



Figure 15. 3rd quadrant characteristic at $T_J$ = 175 ºC

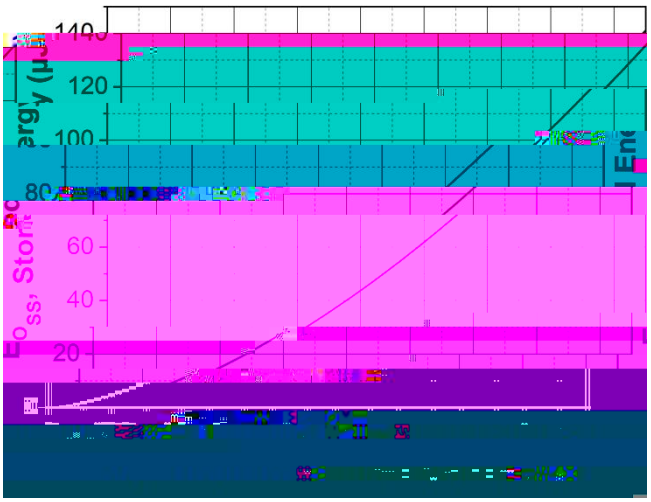



Figure 16. Output capacitor stored energy

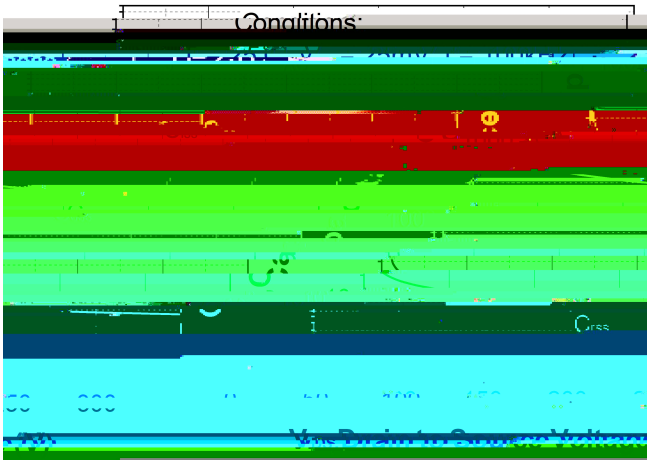



Figure 17. Capacitances vs. drain-source voltage (0 - 300V)

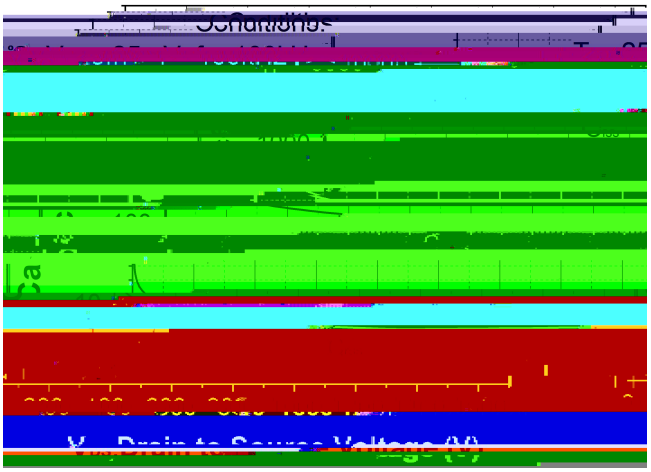


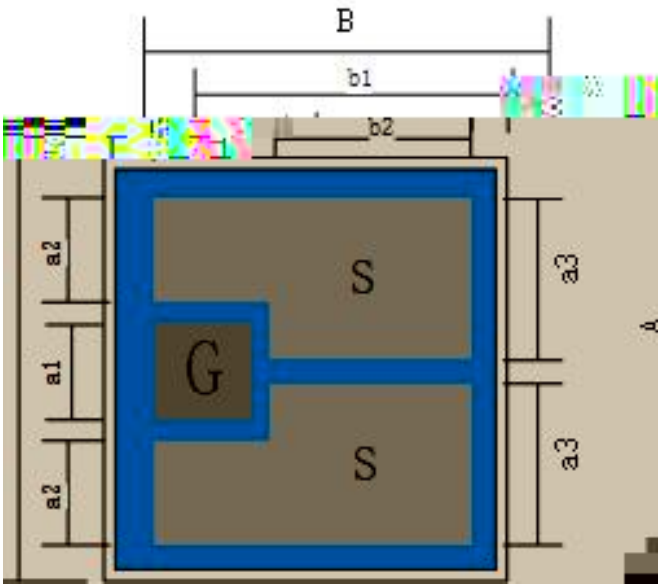

Figure 18. Capacitances vs. drain-source voltage (0 - 1700V)

# 4 Mechanical parameters

## 4.1 Dimensions and metallization

| Parameter | Typical value | Unit | Metallization |
|---|---|---|---|
| Die size W x L | 3.39 * 5.12 | mm | |
| Gate pad size W x L | 0.80 * 0.80 | mm | |
| Die thickness | 175 | μm | |
| Top side source gate metallization | 4 | μm | Al |
| Back side drain metallization | 1 | μm | Ag |

## 4.2 Layout




| Symbol | Dimension / mm |
|---|---|
| B | 5.12 |
| b1 | 4.38 |
| b2 | 3.43 |
| b3 | 0.80 |
| A | 3.39 |
| a1 | 0.80 |
| a2 | 0.80 |
| a3 | 1.27 |

# Revision history

| Document version | Date of release | Document stage | Description of changes |
|---|---|---|---|
| V01_00 | 2025-06-06 | —— | —— |
| V01_01 | 2025-09-08 | —— | —— |
| V01_02 | 2025-12-30 | Final | —— |
| | | | |

# Attention

1. **Rohs complian ]tꜷ ᵀ ℵt c**

7. Except as otherwise explicitly approved by Sichain in a written document signed by authorized representatives of Sichain, Sichain' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

8. For use of our products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a Sichain representatives, for example but not limited to: transportation equipment,primary communication equipment,traffic lights,fire/crime prevention, safety equipment, medical systems, and power transmission systems.