# S3M013120V1K-A

**TriQSiC™1200V Silicon Carbide Power MOSFET G3** N Channel Enhancement

## Features

- High speed switching
- Very low switching losses
- High blocking voltage with low on-resistance
- Temperature independent turn-off switching losses
- Halogen free, RoHS compliant

## Benefits

- Cooling effort reduction
- Efficiency improvement
- Reduced cooling requirements
- Increased power density
- Increased system switching frequency

| Part number | Die size W x L mm |
|---|---|
| S3M013120V1K-A | 5 * 5 |

## Applications

- EV motor drive
- PV string inverters
- Solar power optimizer
- Switch mode power supplies

**Table 1 Key performance and package parameters**

| Type | $V_{DS}$ | $I_{DS}$ ($T_C$=25 , $R_{th\ (j\text{-}c),max}$ ≤ 0.29 °C/W) | $R_{DS(on),\ typ}$ ($T_J$=25 ,$V_{GS}$ = 18V, $I_D$ = 70A) | $T_{J,max}$ |
|---|---|---|---|---|
| S3M013120V1K-A | 1200V | 15Ď5s | | |

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## 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 | 1200 | V | $V_{GS}$ = 0V, $I_D$ = 100 μA | |
| $V_{GS,max}$ | 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 | 150 | A | $V_{GS}$ = 18V, $T_C$ = 25˚C | |
| | | 106 | | $V_{GS}$ = 18V, $T_C$ = 100˚C | |
| $I_{D(pulse)}$ | Pulsed drain current | 444 | A | Pulse width tp=100 μs limited by $T_{J,max}$ | |
| $T_J$ , $T_{stg}$ | Operating Junction and storage temperature | -55 to +175 | ˚C | | |

Note 1 when using MOSFET Body Diode $V_{GS,max}$ = -4 / +22V

# 2 Electrical characteristics

## 2.1 Static characteristics

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

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $Q_{gs}$ | Gate source charge | - | 58 | - | nC | $V_{DS}$ = 800V, $V_{GS}$ = -4/+18V<br>$I_D$ = 70A | Fig.12 |
| $Q_{gd}$ | Gate drain charge | - | 40 | - | | | |
| $Q_g$ | Gate charge | - | 197 | - | | | |

## 2.3 Switching characteristics

**Table 6 Dynamic characteristics(**Tc = 25°C unless otherwise specified,the data comes from TO-247-4L)

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Test Conditions | Note |
|---|---|---|---|---|---|---|---|
| $E_{on}$ | Turn on switching energy | - | 1901 | - | μJ | $V_{DS}$ = 800V, $V_{GS}$ = -4/+18V<br>$I_D$ = 70A, Rg L v | |

# 3 Electrical characteristic diagrams

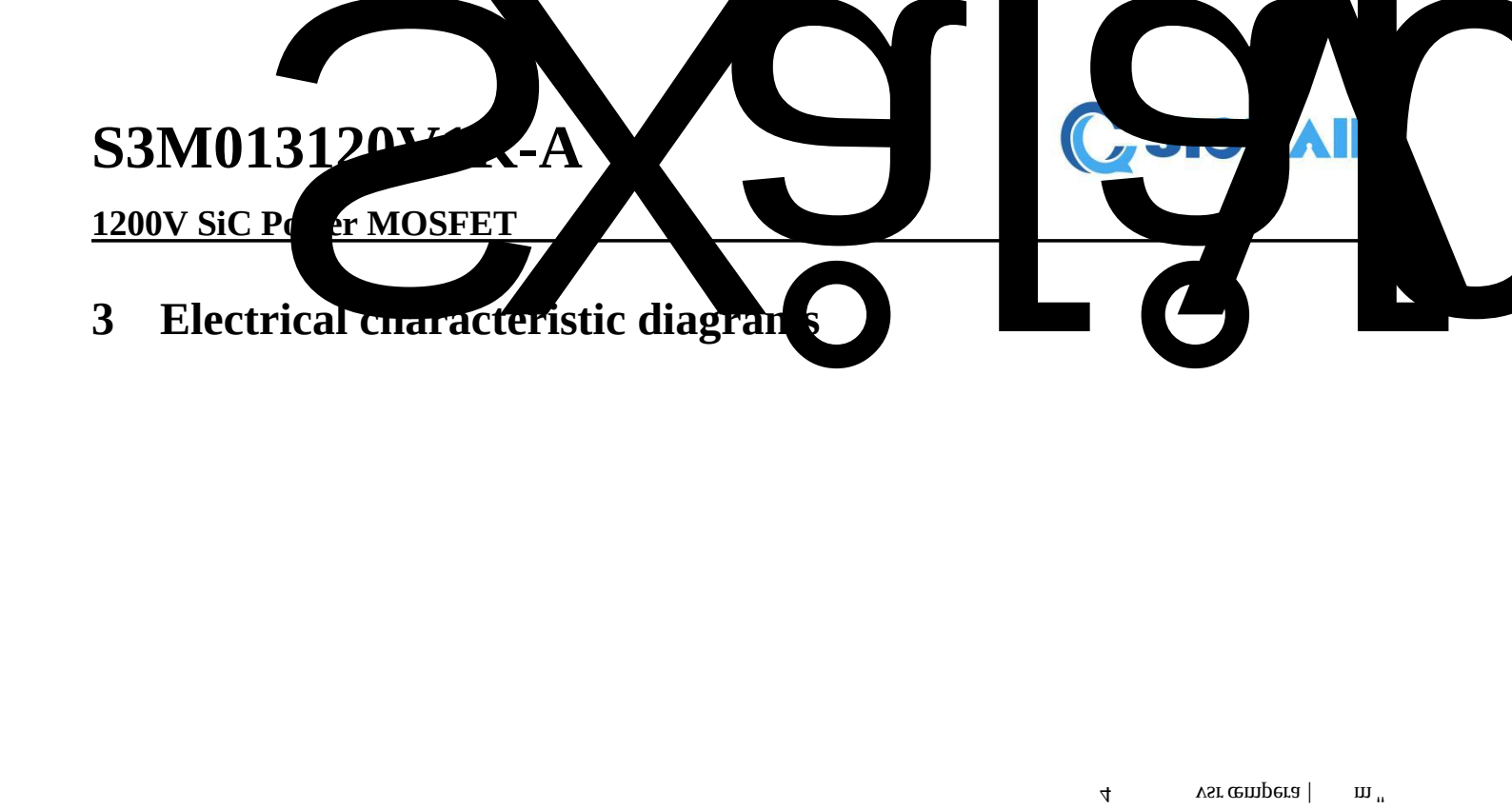


Figure 1. Output characteristics $T_J$ = -55 ºC



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

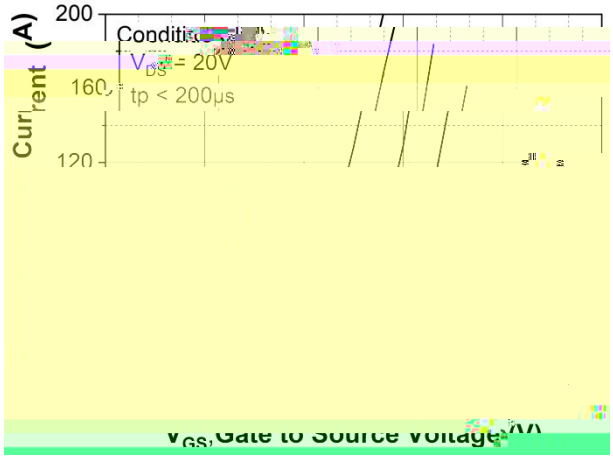



Figure 7. Transfer characteristic for various junction temperatures

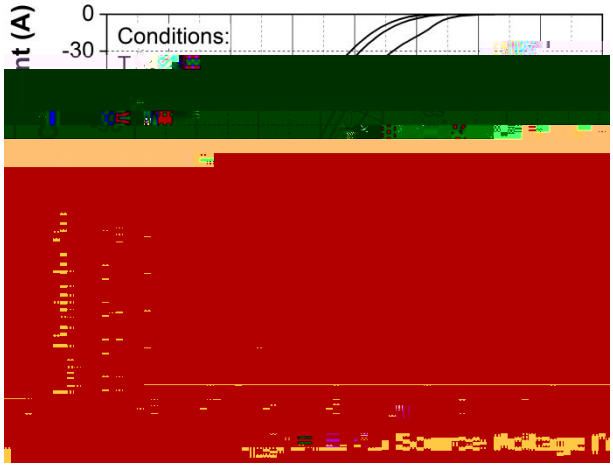



Figure 8. Body diode characteristic at $T_J$ = -55 ºC




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




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

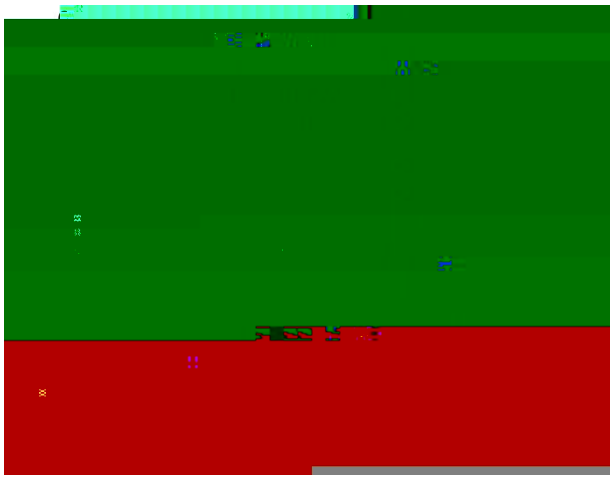


Figure 11. Threshold voltage vs. temperature

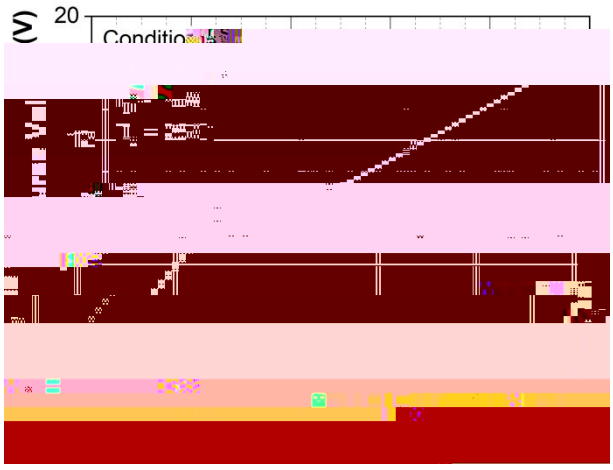



Figure 12. Gate charge characteristic

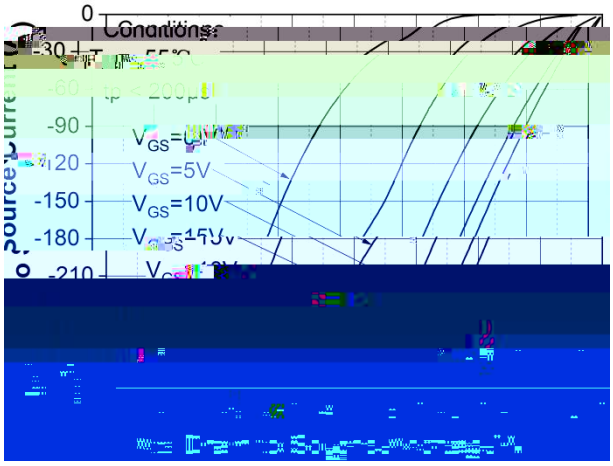



Figure 13. 3rd quadrant characteristic at $T_J$ = -55 ºC

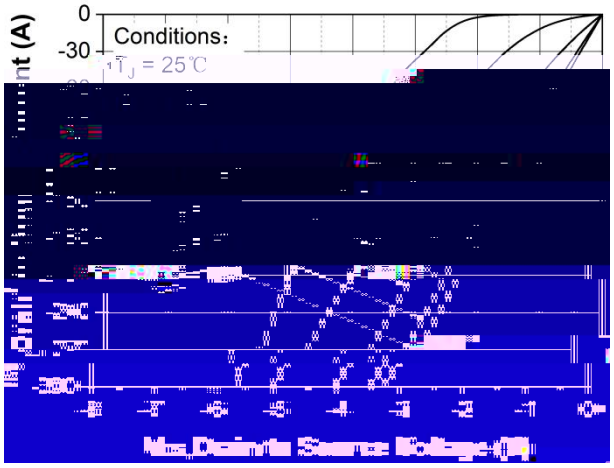



Figure 14. 3rd quadrant characteristic at $T_J$ = 25 ºC

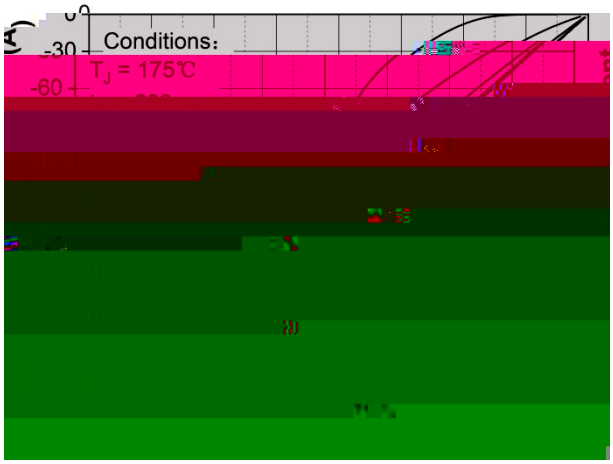



Figure 15. 3rd quadrant characteristic at $T_J$ = 175 ºC

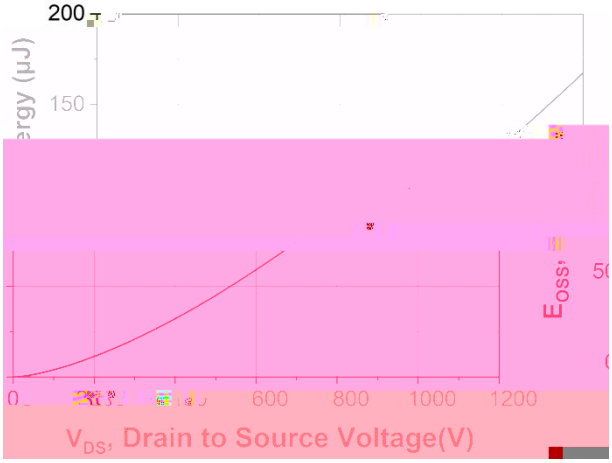



Figure 16. Output capacitor stored energy

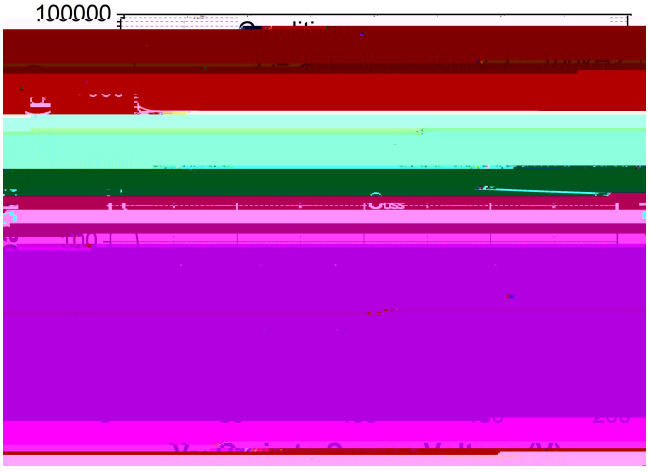


Figure 17. Capacitances vs. drain-source voltage (0 - 200V)

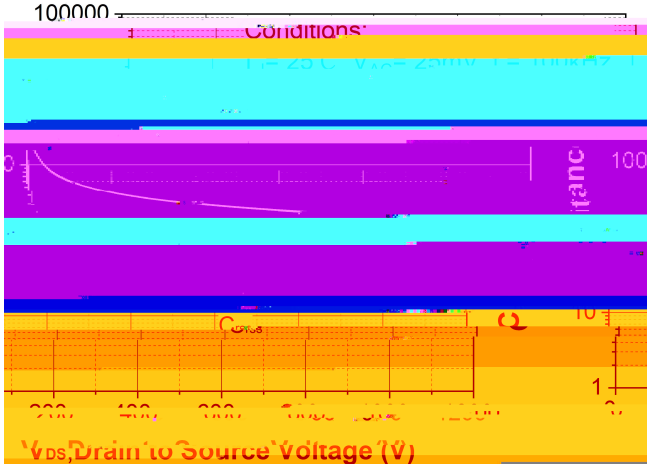
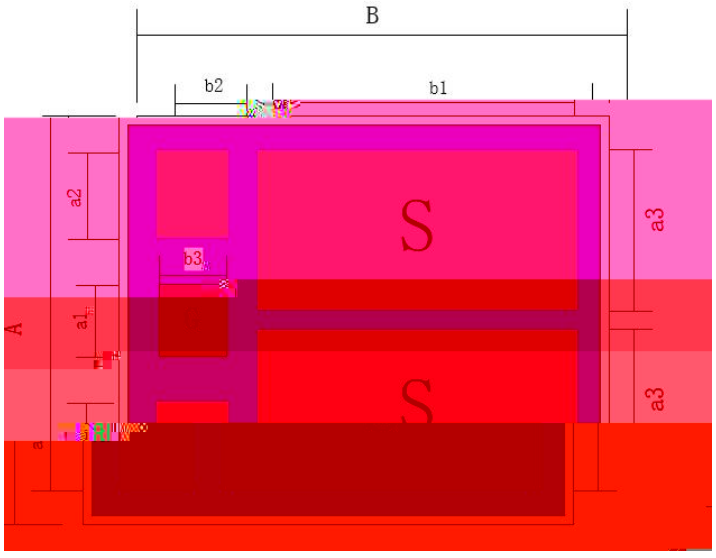



Figure 18. Capacitances vs. drain-source voltage (0 - 1200V)

# 4 Mechanical parameters

## 4.1 Dimensions and metallization

| Parameter | Typical value | Unit | Metallization |
|---|---|---|---|
| Die size W x L | 5 * 5 | mm | |
| Gate pad size W x L | 0.78 * 04 | | |



# 5 Test conditions

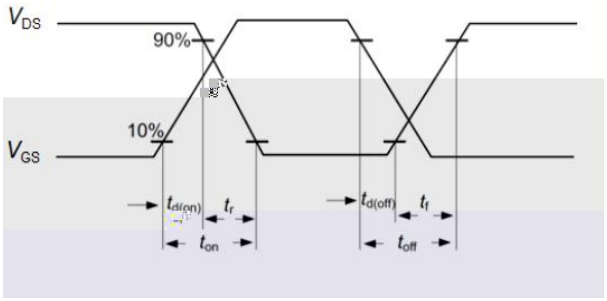



Figure A. Definition of switching times

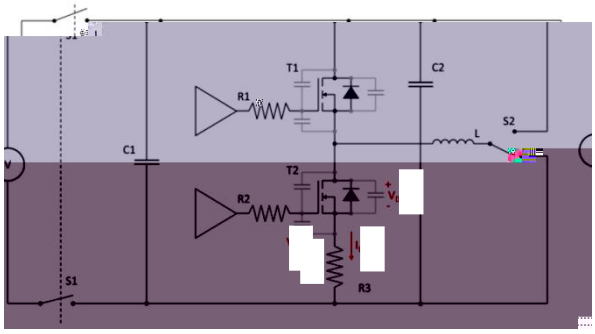



Figure B. Dynamic test circuit

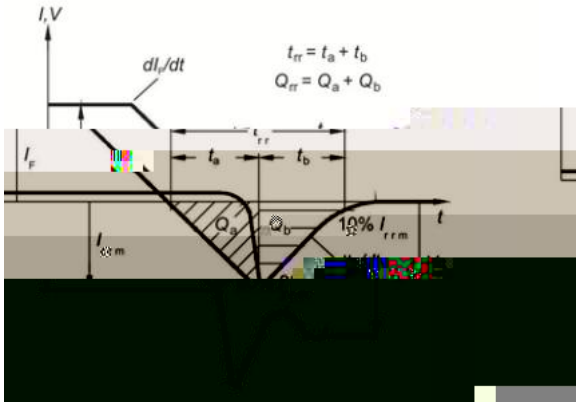



Figure C. Definition of body diode switching characteristics

## Revision history

| Document version | Date of release | Document stage | Description of changes |
|---|---|---|---|
| V01_00 | 2026-06-29 | Final | —— |
| | | | |
| | | | |
| | | | |
| | | | |

## Attention

1. **RoHS compliance**

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/ EC (RoHS2), as implemented January 2, 2013.

2. **REACH compliance**

REACh substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a Sichain representative to insure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information (REACh Article 67) is also available upon request.

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