# S3M007075NK-A

**TriQSiC™750V Silicon Carbide Power MOSFET G3** N Channel Enhancement

## Features

- High speed switching
- Very l

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**Features** ..... **1**

**Benefits** ..... **1**

# 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 | 750 | 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 | 219 | A | $V_{GS}$ = 18V, $T_C$ = 25˚C | |
| | | 155 | | $V_{GS}$ = 18V, $T_C$ = 100˚C | |
| $I_{D(pulse)}$ | Pulsed drain current | 656 | A | Pulse width tp=100μs 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

# S3M009075LK

Datasheet

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $Q_{gs}$ | Gate source charge | - | 80 | - | nC | $V_{DS}$ = 500V, $V_{GS}$ = -4/+18V<br>$I_D$ = 96A | Fig.12 |
| $Q_{gd}$ | Gate drain charge | - | 52 | - | | | |
| $Q_g$ | Gate charge | - | 262 | - | | | |

## 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 | - | 1605 | - | μJ | $V_{DS}$ = 500V, $V_{GS}$ = -4/+18V<br>$I_D$ = 96A, Rg = 2.5Ω,<br>L = 16.7μH | |
| $E_{off}$ | Turn off switching energy | - | 1256 | - | | | |
| $t_{d\ on}$ | Turn on delay time | - | 30 | - | ns | | |
| $t_r$ | Rise time | - | 61 | - | | | |
| $t_{d\ off}$ | Turn off delay time | - | 140 | - | | | |
| $t_f$ | Fall time | - | 28 | - | | | |

**Table 7 Body diode characteristics**(The data comes from TO-247-4L)

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Test Conditions | Note |
|---|---|---|---|---|---|---|---|
| $V_{SD}$ | Diode forward voltage | - | 3.5 | - | V | $V_{GS}$ = -4V, $I_{SD}$ = 48A | Fig.8,9, 10 |
| | | - | 3.1 | - | V | $V_{GS}$ = -4V, $I_{SD}$ = 48A<br>$T_J$ = 175°C | |
| $I_S$ | Continuous diode forward current | - | 152 | - | A | $V_{GS}$ = -4V, Tc = 25°C | Note2 |
| $t_{rr}$ | Reverse recovery time | - | 60 | - | ns | $V_R$ = 500V, $V_{GS}$ = -4V<br>$I_D$ = 96A<br>di/dt = 2286A/μs<br>$T_J$ = 175°C | |
| $Q_{rr}$ | Reverse recovery charge | - | 873 | - | nC | | |
| $I_{rrm}$ | Peak reverse recovery current | - | 37 | - | A | | |

Note2 : When using SiC Body Diode the maximum recommended $V_{GS}$ = -4 V

# 3 Electrical characteristic diagrams

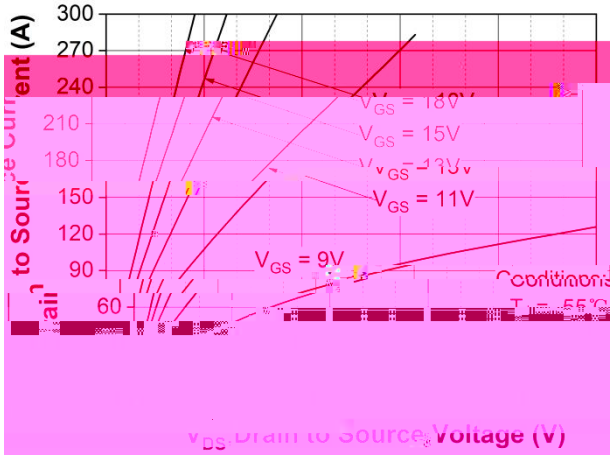



Figure 1. Output characteristics $T_J$ = -55 ºC

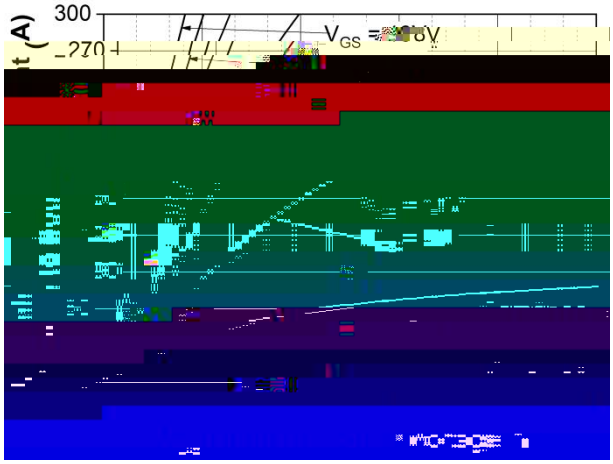



Figure 2. Output characteristics $T_J$ = 25 ºC

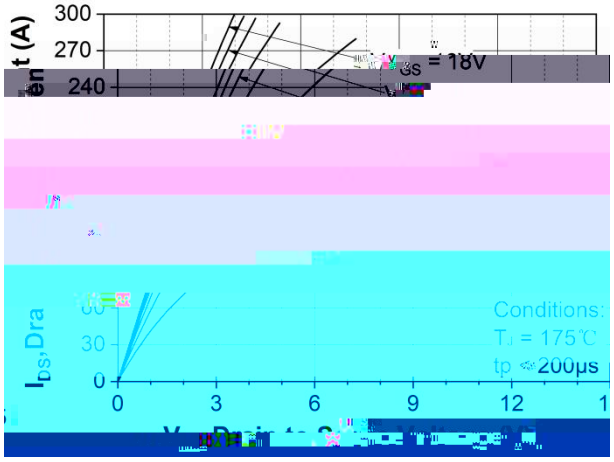



Figure 3. Output characteristics $T_J$ = 175 ºC

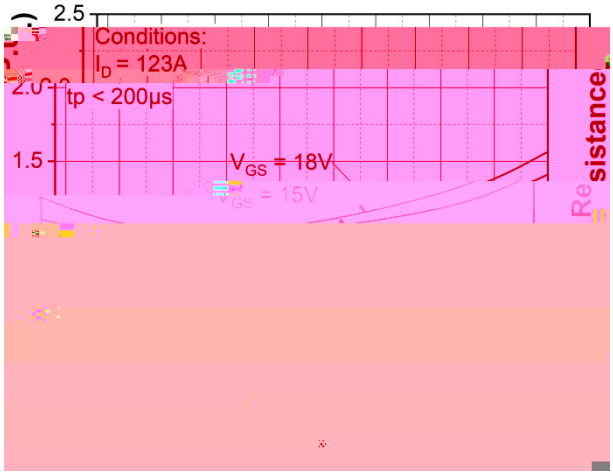



Figure 4. Normalized on-resistance vs. temperature

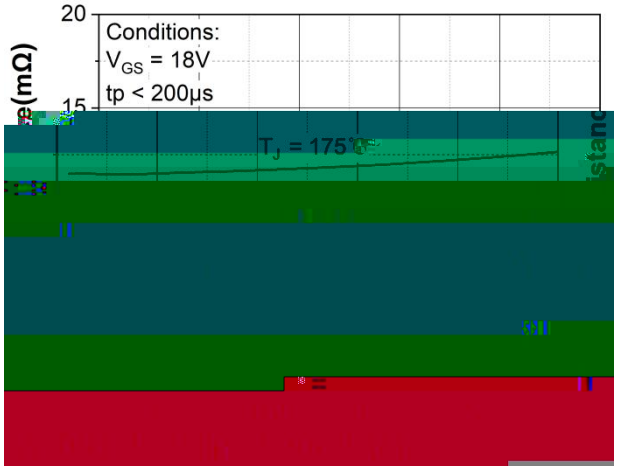



Figure 5. On-resistance vs. drain current for various temperatures

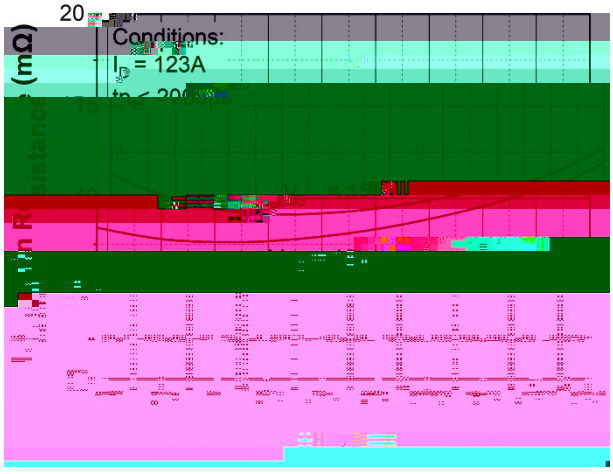



Figure 6. On-resistance vs. temperature for various gate voltages

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 c harge

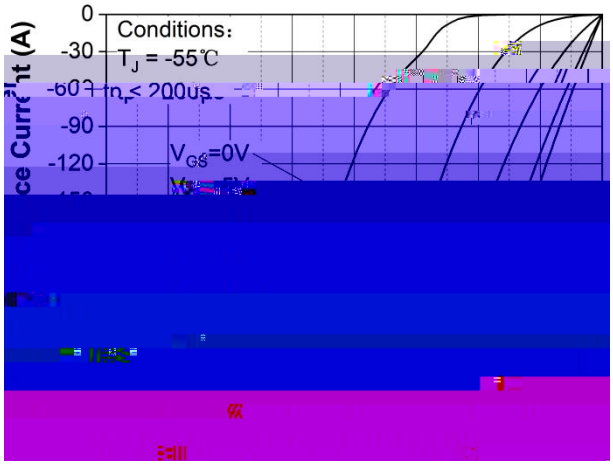



Figure 13. 3rd quadrant characteristic at $T_J$ = -55 ºC

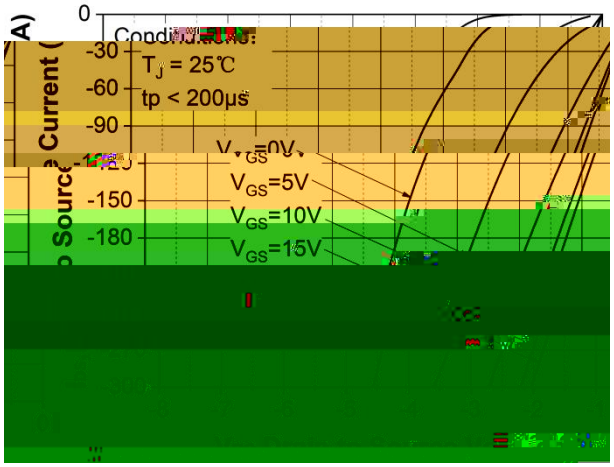



Figure 14. 3rd quadrant characteristic at $T_J$ = 25 ºC

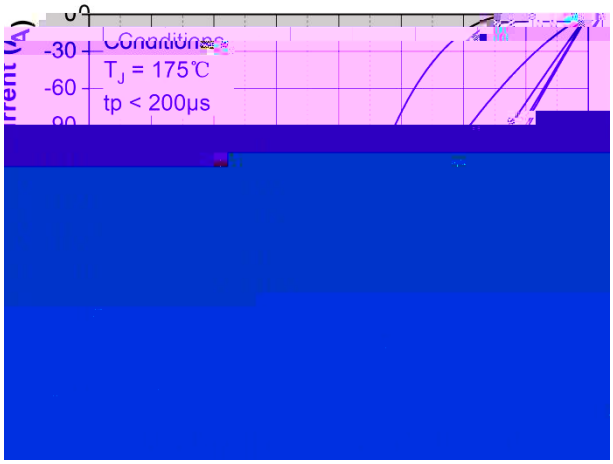



Figure 15. 3rd quadrant characteristic at $T_J$ = 175 ºC

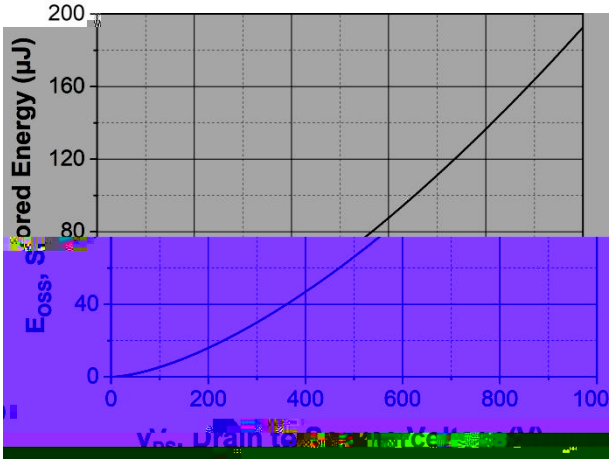



Figure 16. Output capacitor stored energy

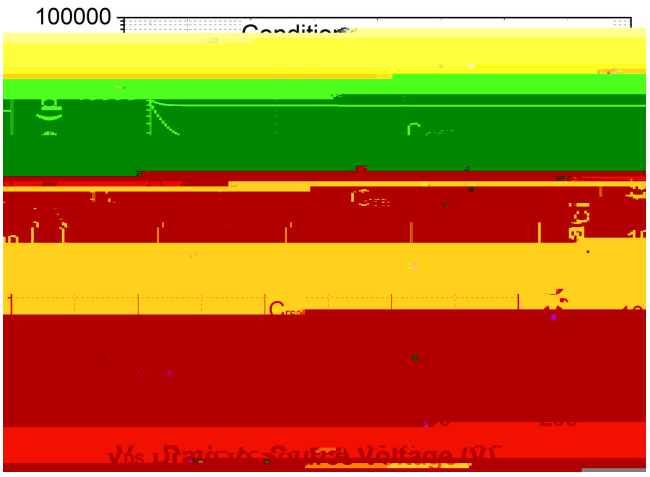



Figure 17. Capacitances vs. drain-source voltage (0 - 200V)

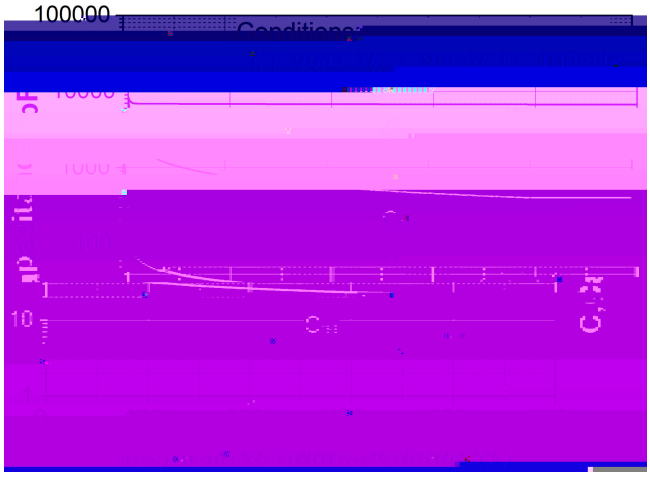



Figure 18. Capacitances vs. drain-source voltage (0 - 750V)

# 5 Test conditions

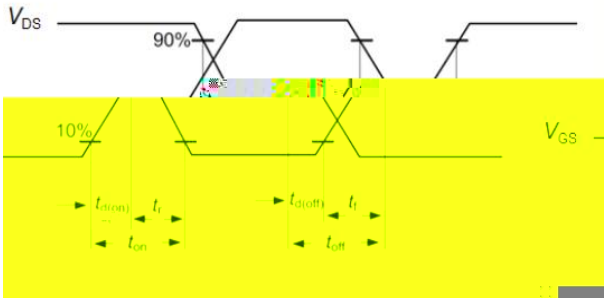



Figure A. Definition of switching times

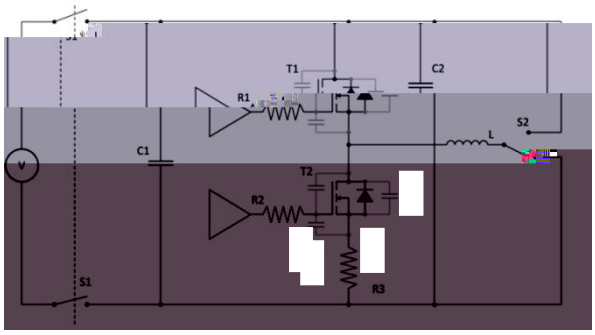



Figure B. Dynamic test circuit

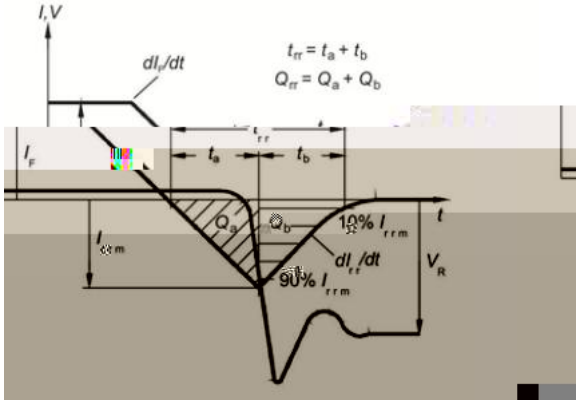



Figure C. Definition of body diode switching characteristics

# Revision history

| Document version | Date of release |
| --- | --- |

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