# 750V 20A N-Channel SIC Power MOSFET

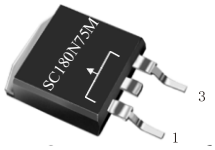
## Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- Wide Bandgap SiC MOSFET Technology
- Halogen free, RoHs compliant
- Easy to Parallel and Simple to Drive
- Robust against Parasitic Turn on Even 0V Turn off Gate Voltage

| Product Summary | | | |
|---|---|---|---|
| $V_{DS}$ | $R_{DS(on)}$(mΩ)Typ | $I_D$(A) | Qg(Typ) |
| 750V | 180@ 15V 8.5A | 20 | 28nc |

TO-252

KWSC180N75M




## Mechanical Data

- Case:TO- 252 Package

## Application

- EV Charging
- Server Power Supplies
- Automotive DC/DC converters
- Solar PV Inverters
- UPS

Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

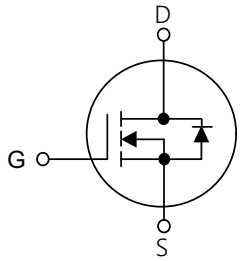



Table1 Absolute Maximum Ratings ($T_C$=25°C, unless otherwise specified)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 750 | V |
| Gate-Source Voltage(Max) | | $V_{GS(max)}$ | -10/+22 | V |
| Recommend Gate-Source Voltage | | $V_{GSop}$ | 0/+18 | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 20 ※ | A |
| | $T_C$=100°C | | 18 ※ | |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 40 | A |
| Power Dissipation | $T_C$=25°C | $P_D$ | 42 | W |
| Operating Junction and Storage Temperature | | $T_J/T_{STG}$ | -55 ~ +175 | °C |

※limited by maximum junction temperature

Table 2.Thermal Characteristics

| Parameter | Symbol | KWSC180N75M | Unit |
|---|---|---|---|
| Thermal resistance Junction to Case | $R_{\theta JC}$ | 3.6 | °C/W |
| Thermal resistance Junction to Ambient | $R_{\theta JA}$ | 62 | °C/W |

Table 3. Electrical Characteristics ($T_J$=25°C, unless otherwise specified)

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Off Characteristics | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=100μA | 750 | - | - | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=750V,$V_{GS}$=0V | - | - | 10 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=18V,$V_{DS}$=0V | - | 10 | 250 | nA |
| | Reverse | | $V_{GS}$=-4V,$V_{DS}$=0V | - | -10 | -250 | nA |
| On Characteristics | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$,$I_D$=3.5mA | 2.7 | - | 4.5 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=15V,$I_D$=8.5A,$T_J$=25°C | - | 180 | 240 | mΩ |
| | | | $V_{GS}$=15V,$I_D$=8.5A,$T_J$=175°C | - | 160 | - | |
| | | | $V_{GS}$=18V,$I_D$=8.5A,$T_J$=25°C | - | 120 | - | |
| | | | $V_{GS}$=18V,$I_D$=8.5A,$T_J$=175°C | - | 130 | - | |
| Gate Resisitance | | $R_G$ | f=1MHz | - | 6.5 | - | Ω |
| Dynamic Characteristics | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{DS}$=500V,$V_{GS}$=0V, f=1MHz | - | 491 | - | pF |
| Output Capacitance | | $C_{OSS}$ | | - | 39 | - | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | - | 4.2 | - | pF |
| Turn-On Delay Time | | td(on) | $V_{DS}$=500V,$I_D$=8.5A $V_{GS}$=0/15V,$R_G$=10Ω, $T_J$=25°C | - | 16 | - | ns |
| Turn-On Rise Time | | $t_R$ | | - | 55 | - | ns |
| Turn-Off Delay Time | | td(off) | | - | 34 | - | ns |
| Turn-Off Fall Time | | tf | | - | 71 | - | ns |
| Total Gate Charge | | $Q_G$ | $V_{DD}$=500V,$I_D$=8.5A, $V_{GS}$=0/15V | - | 28 | - | nC |
| Gate-Source Charge | | $Q_{GS}$ | | - | 8.3 | - | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | - | 13.8 | - | nC |
| Drain-Source Diode Characteristics and Maximum Ratings(Note 2) | | | | | | | |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $V_{GS}$=0V,$I_S$=5A | - | 3.4 | - | V |
| Continuous Diode Forward Current | | $I_S$ | | - | 20 | - | A |
| Reverse Recovery Time | | trr | $V_R$=500V,$V_{GS}$=0V $I_{SD}$=8.5A, di/dt=530A/us | - | 17.6 | - | ns |
| Recovered charge | | Qrr | | - | 43 | - | nC |
| Peak reverse recovery current | | Irrm | | - | 4.2 | - | A |

Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

2 Pulse Test: Pulse width ≤300μS,Duty cycle≤2%

## Typical Characteristics Diagrams

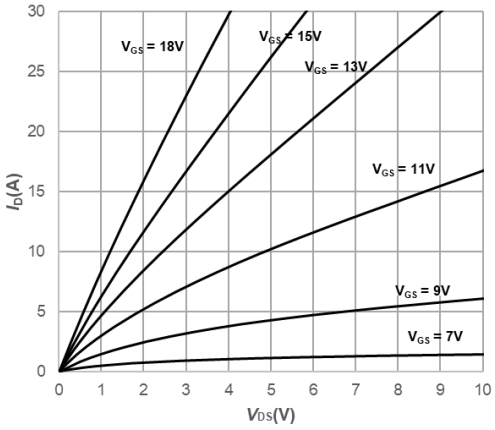



Fig1. Output Characteristics $T_j$=25℃

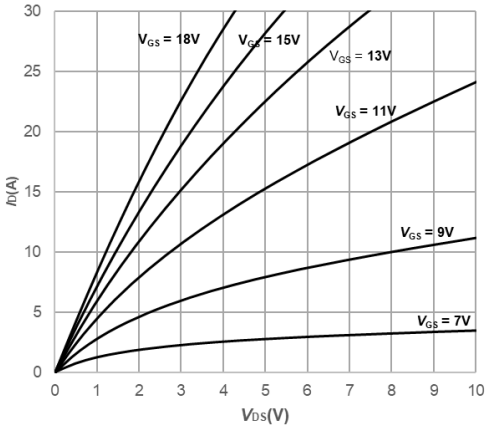



Fig2. Output Characteristics $T_j$=175℃

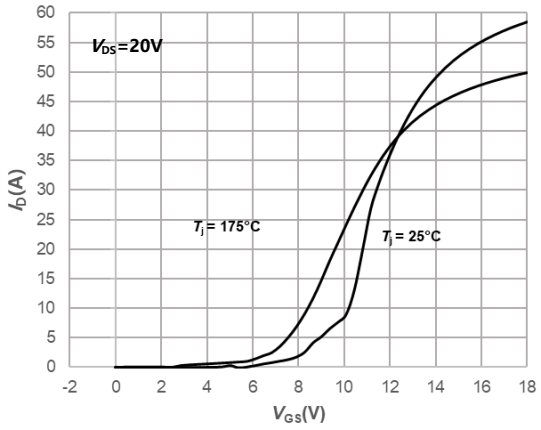



Fig3. Typical Transfer Characteristics

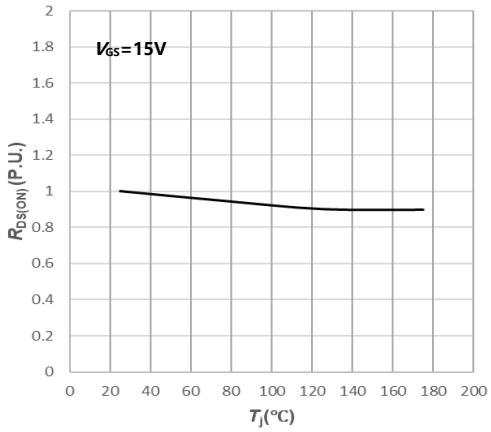



Fig4. Normalized On-Resistance vs. Temperature

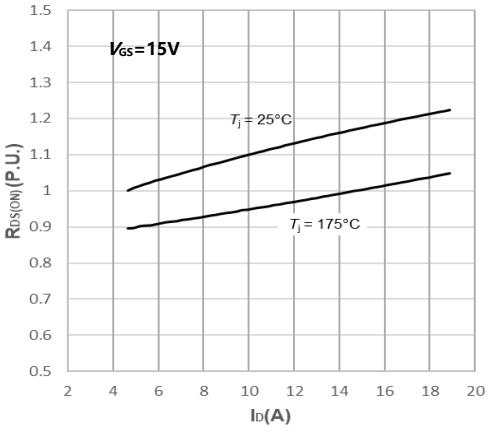



Fig5. Normalized On-Resistance vs. Drain Current For Various Temperatures

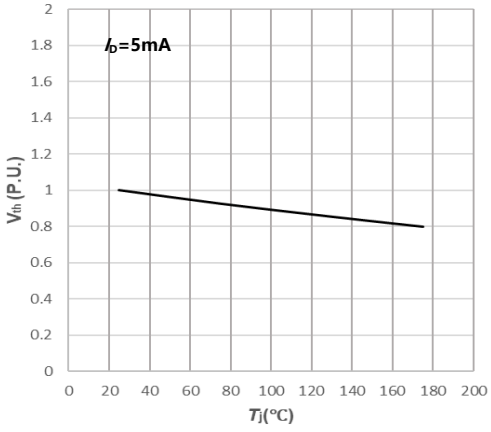



Fig6. Normalized Threshold Voltage vs. Temperature

## Typical Characteristics Diagrams

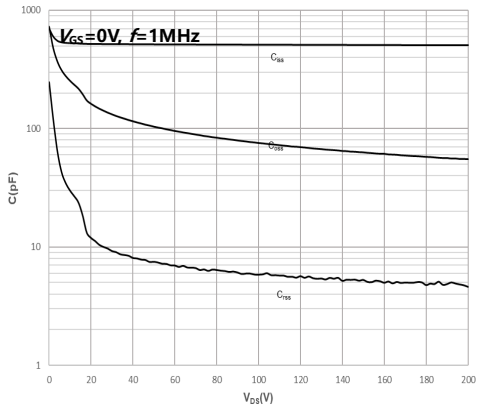



Fig7. Capacitances vs. Drain-Source Voltage (0-200V)

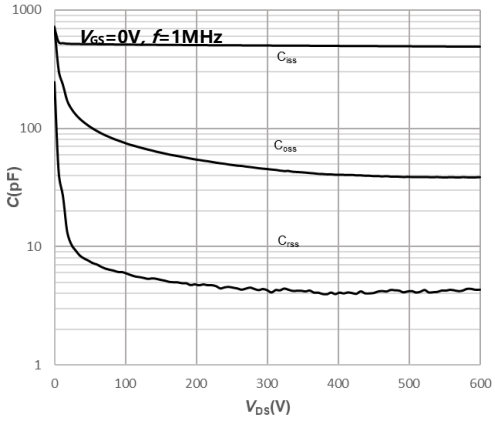



Fig8. Capacitances vs. Drain-Source Voltage (0-600V)

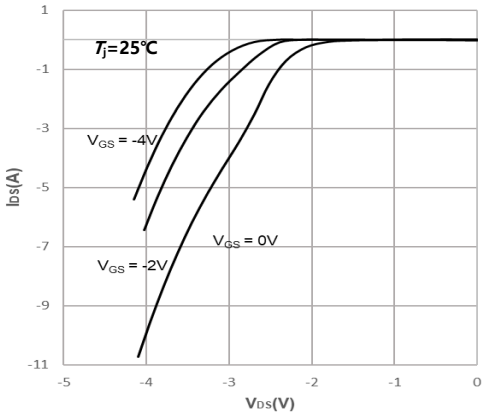
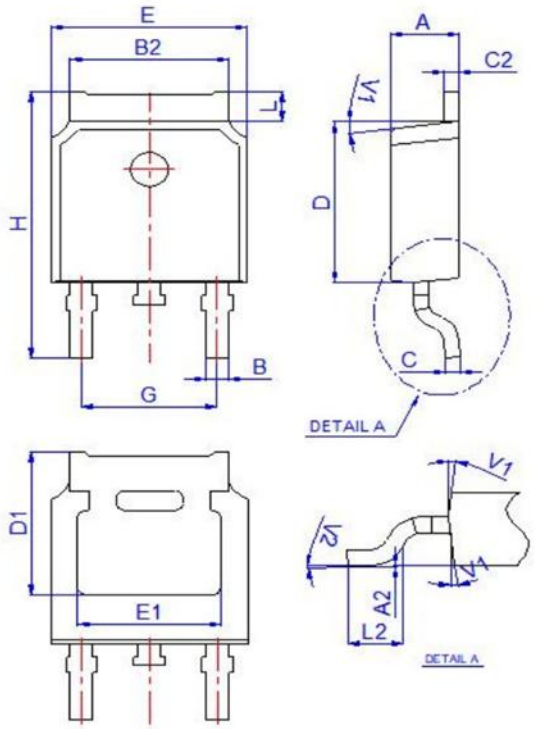



Fig9. Body Diode Characteristics

Dimensions

TO-252 package




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0 | | 0.10 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.90 | | 6.30 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.50 | | 10.70 | 0.374 | | 0.421 |
| L | 1.09 | | 1.21 | 0.043 | | 0.048 |
| L2 | 1.35 | | 1.65 | 0.053 | | 0.065 |
| V1 | | 7° | | | 7° | |
| V2 | 0° | | 6° | 0° | | 6° |