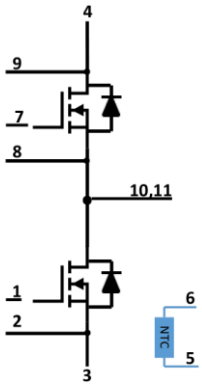
# ATSCM2R5N170HBMW

Half Bridge SiC MOSFET Module

Preliminary version

## Product Summary

| Product Type | $V_{DSS}$ | $I_D$ | $R_{DS(on)}$ | Package |
|---|---|---|---|---|
| ATSCM2R5N170HBMW | 1700V | 800A | 2.5mΩ | EcoDual 3 |




## Features

- 1700V SiC MOSFET Power Module
- Very Low $R_{DS(on)}$
- Very low switching loss
- EcoDual 3 half bridge module
- Halogen Free, RoHS compliant

## Typica Applications

- Motor drive
- Servo drive
- UPS / Solar
- Energy storage system

### Maximum Ratings (SiC MOSFET, $T_j$=25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | | 1700 | V |
| Gate-Source Voltage | $V_{GSS}$ | | -8/+22 | V |
| Drain Current | $I_D$ | $T_C$ =25°C<br>$T_C$=100°C | 890<br>625 | A |
| Pulse Drain Current | $I_{DM}$ | | 1800 | A |
| Maximum Power Dissipation | $P_D$ | $T_C$ =25°C, $T_j$ =150°C | 3900 | W |
| Operation junction temperature | $T_{vj-op}$ | | -55 to175 | °C |
| Storage temperature | $T_{stg}$ | | -55 to 150 | °C |

## Maximum Ratings (diode, Tj =25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Body diode current | $I_S$ | $T_C$ =25°C, $V_{GS}$=-4V | 800 | A |
| Pulse source current | $I_{SM}$ | verified by design, tp limited by $T_{vjmax}$ | 1800 | A |

## Module information

| Parameter | Conditions | Value | Unit |
|---|---|---|---|
| Isolation Voltage | RMS, f = 50Hz, t =1min | 4 | KV |
| Mounting torque for module mounting | M5, M6 | 3 to 5 | Nm |
| Weight of Module | G | 340 | g |
| Junction to case (MOSFET) | $R_{th(j-c)}$ | 0.04 max | K/W |
| Case to heatsink (MOSFET)<br>Case to heatsink ( per module) | $R_{thCH}$ | 0.02 typ.<br>0.01 typ. | K/W |

## MOSFET Electrical characteristics ($T_j$ =25°C unless otherwise specified, chip)

| Parameter | Symbol | conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V, ID=100uA | | 1700 | | | V |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | $I_D$=600A, $V_{GS}$=18V | $T_j$=25 °C | | 2.5 | 3.3 | mΩ |
| | | | $T_j$=175 °C | | 4.4 | | mΩ |
| Gate-Source threshold Voltage | $V_{GS(th)}$ | $I_D$ =240mA, $V_{DS}$ =$V_{GS}$ | $T_j$=25 °C | 2.3 | 3.3 | 4.0 | V |
| | | | $T_j$=175 °C | | 2.5 | | |
| Gate charge | $Q_G$ | $V_{DS}$=1200V, $V_{GS}$=-4/+18V<br>$I_D$=600A | | | 1680 | | nC |
| Internal gate resistor | $R_{Gint}$ | $V_{AC}$=25mV, f=1MHz | $T_j$=25 °C | | 1.6 | | Ω |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ =0V, $V_{DS}$ =1400V f =100KHz | $T_j$=25 °C | | 42 | | nF |
| Output Capacitance | $C_{oss}$ | | | | 1500 | | pF |
| Reverse transfer Capacitance | $C_{rss}$ | | | | 61 | | pF |
| Drain-Source leakage Current | $I_{DSS}$ | $V_{DS}$ =1700V, $V_{GS}$ =0V | $T_j$=25 °C | | | 30 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$ =18V<br>$V_{DS}$ =0V | $T_j$=25 °C | | | 100 | nA |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$ =1200V<br>$I_D$ = 600A<br>$V_{GS}$ =-4V/18V<br>$R_G$ =2.5Ω<br>L=16.7uH | $T_j$=25 °C | | | | ns |
| Rise time | $t_r$ | | $T_j$=25 °C | | | | ns |
| Turn-off delay time | $t_{d(off)}$ | | $T_j$=25 °C | | | | ns |
| Fall time | $t_f$ | | $T_j$=25 °C | | | | ns |
| Turn-on switch loss | $E_{on}$ | | $T_j$=25 °C | | | | mJ |
| Turn-off switch loss | $E_{off}$ | | $T_j$=25 °C | | | | mJ |

## Diode Electrical characteristics (Tj =25°C unless otherwise specified, chip)

| Item | Symbol | Condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_{SD}$ | $I_S$ =400A, $V_{GS}$ =-4V | $T_j$=25 °C | | 4.0 | | V |
| | | | $_j$=175 °C | | 3.5 | | V |
| Peak reverse recovery Current | $I_{rr}$ | $V_{rr}$ =1200V, $I_F$ =600A $V_{GS}$=-4V | $T_j$=175 °C | | | | A |
| Diodes reverse recovery time | trr | | $T_j$=175 °C | | | | ns |
| Recovered charge | $Q_{rr}$ | | $T_j$=175 °C | | | | uC |

## NTC characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Rated Resistance | $R_{25}$ | $T_c$=25 °C | | 5.0 | | KΩ |
| Deviation for R100 | △R/R | $T_c$=25 °C, $R_{100}$=493Ω | -5 | | 5 | % |
| Power dissipation | $P_{25}$ | $T_c$=25 °C | | 20 | | mW |
| B value | $B_{25/50}$ | $R_2$ =$R_{25}$ exp[B 25/50 (1/T2-1/(298,15K))] | | 3375 | | K |

## Characteristics graphs:

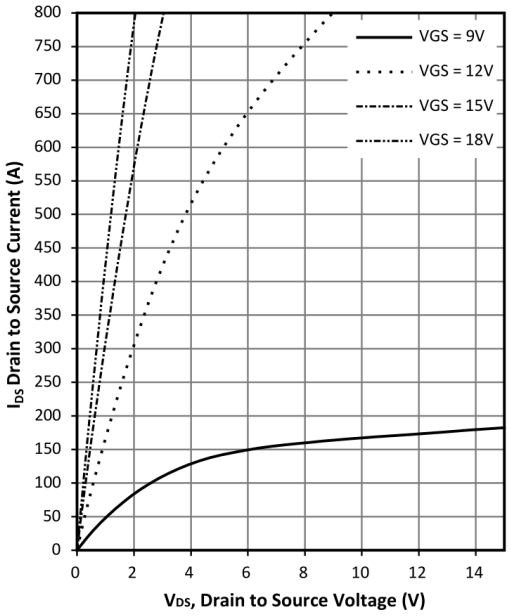



Fig 1: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=-55°C

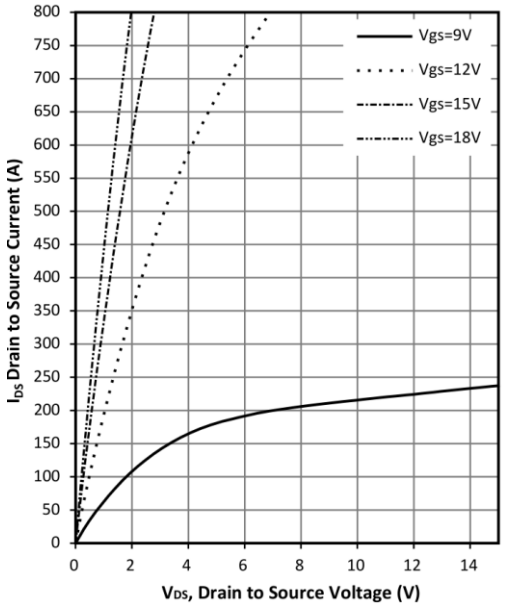



Fig 2: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=25°C

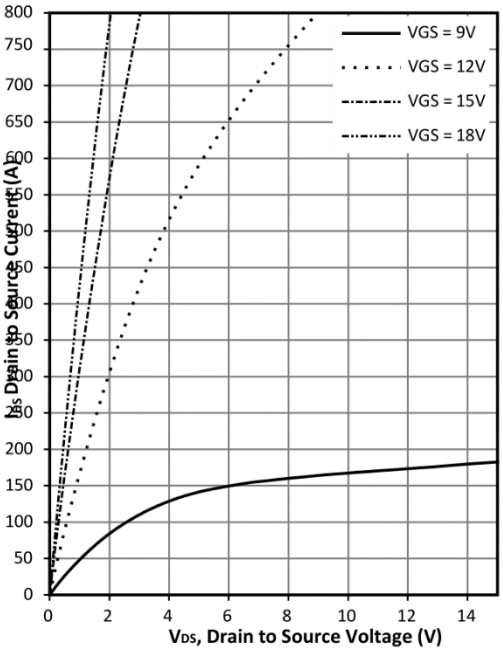



Fig 3: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=175°C

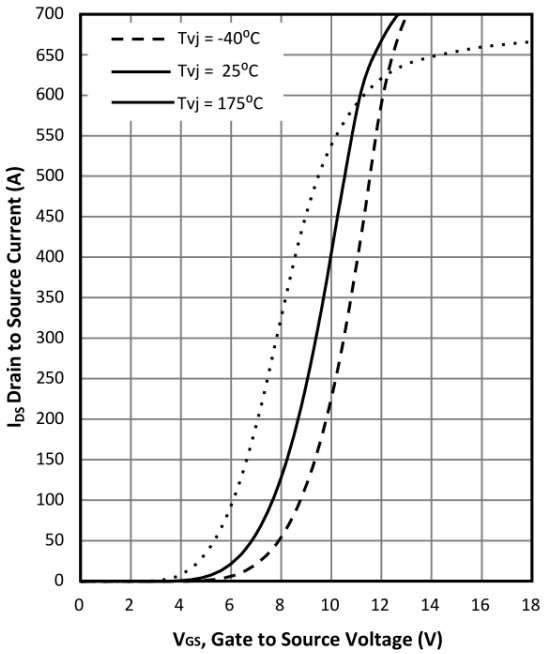



Fig 4: Transfer characteristics versus temperature

$I_D=f(V_{DS})$, tp<200us, $V_{DS}$=20V

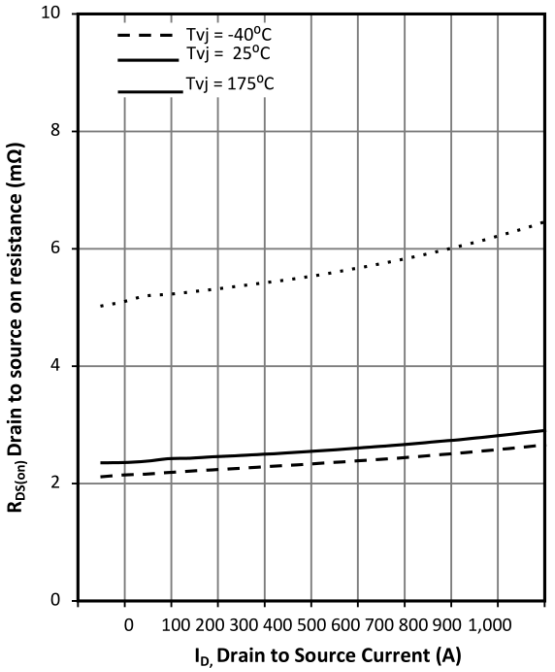



Fig 5: $R_{DS(on)}$ vs Drain current vs Temperature

$R_{DS(on)}=f(I_D)$, tp<200us, $V_{GS}$=18V

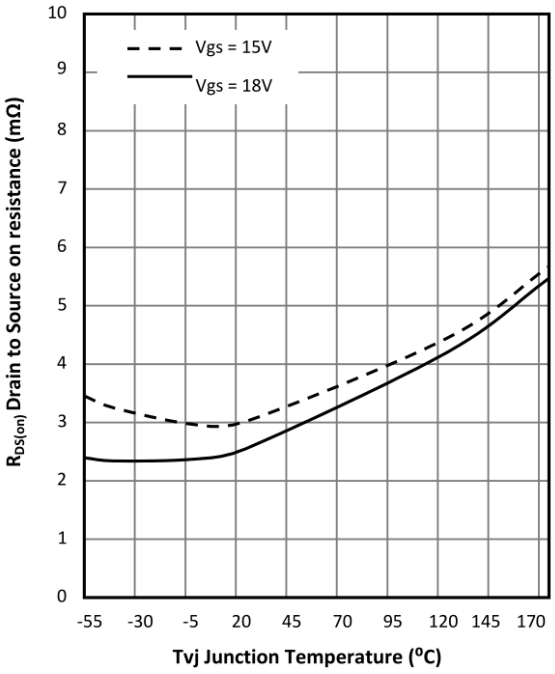



Fig 6: $R_{DS(on)}$ vs gate voltage vs Temperature

$R_{DS(on)}=f(Tj)$, ID=600A, $V_{GS}$=18V

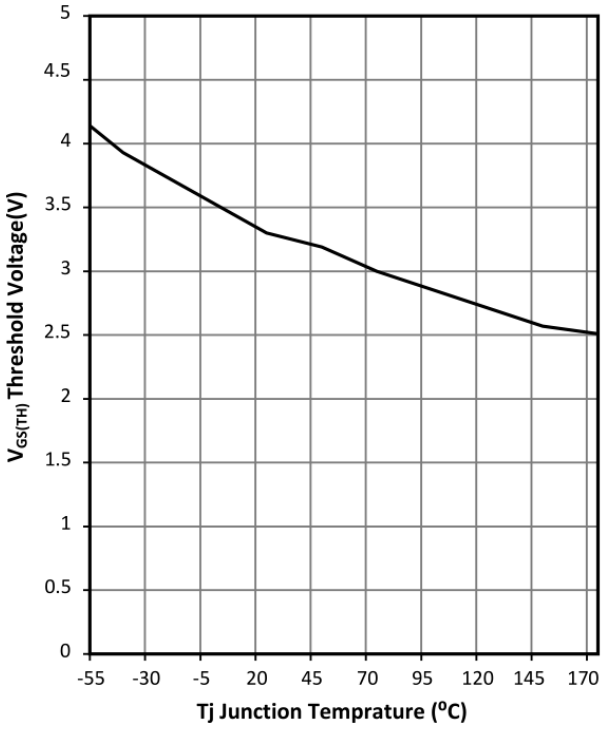



Fig 7: Threshold voltage vs Temperature

$V_{GS}=V_{DS}$, tp<200us, $I_D$=240mA

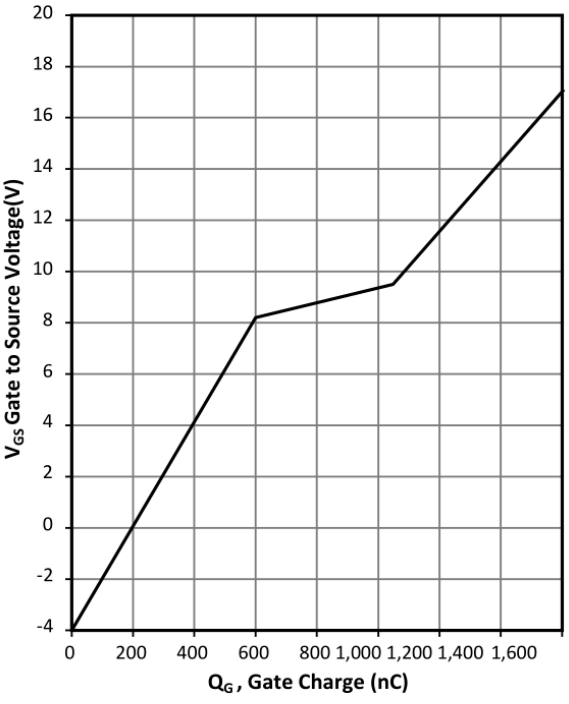



Fig 8: Gate characteristic

$V_{DS}$=1200V, tp<200us, $I_D$=600A, Tj=25°C

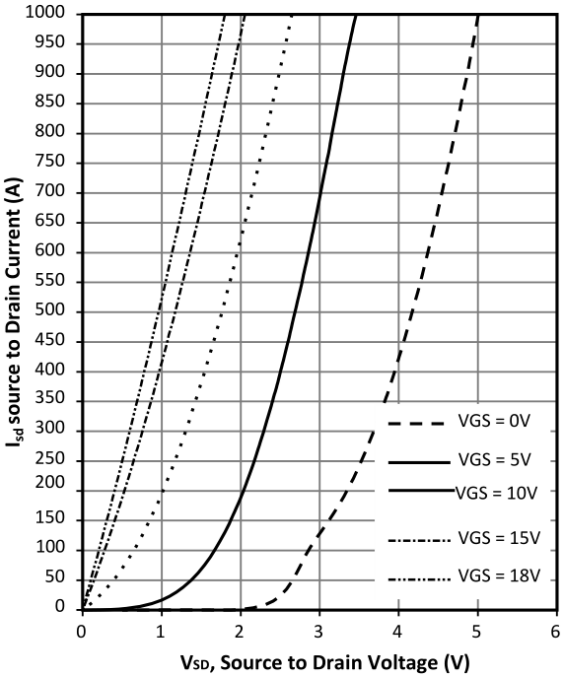



Fig 9: Reverse conduct characteristic @ different $V_{GS}$

$I_S=f(V_{SD})$, tp<200us, Tj=-55ºC

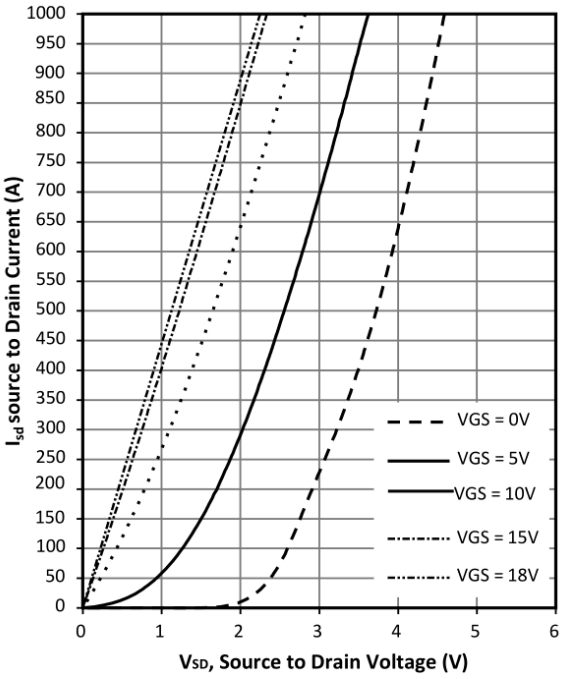



Fig 10: Reverse conduct characteristic @ different $V_{GS}$

$I_S=f(V_{SD})$, tp<200us, Tj=25ºC

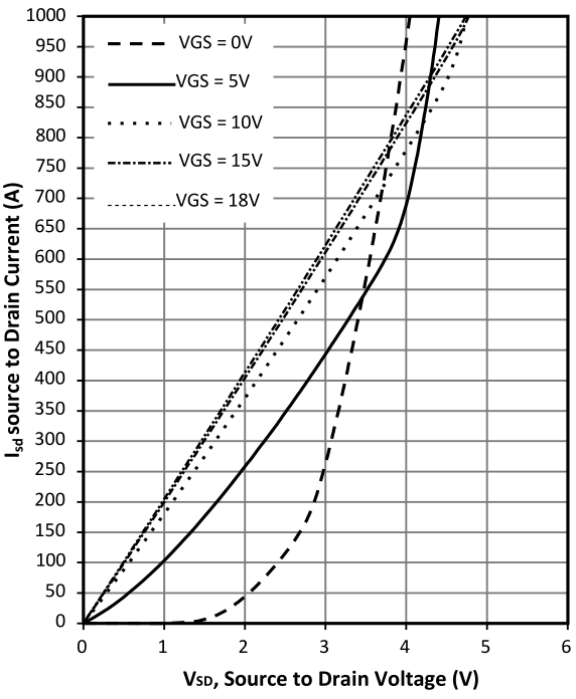



Fig 11: Reverse conduct characteristic @ different $V_{GS}$

$I_S=f(V_{SD})$, tp<200us, Tj=175ºC

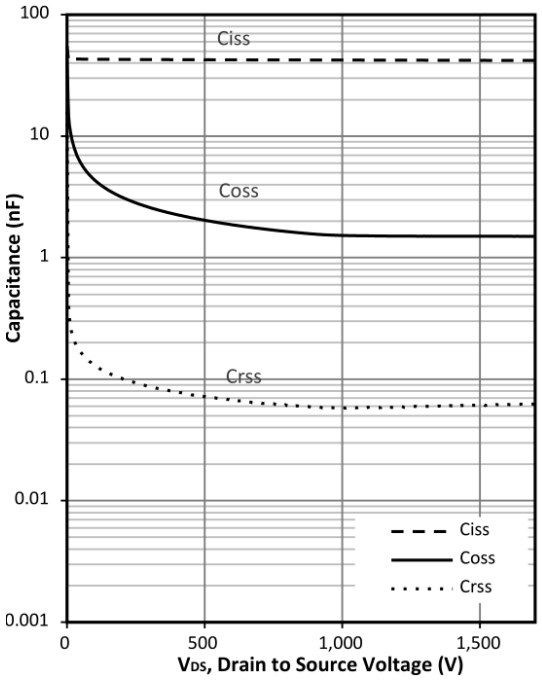


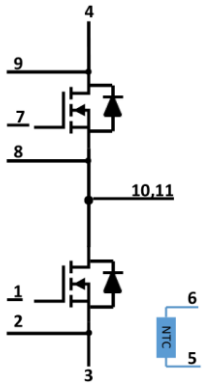

Fig 12: Capacitance vs drain source voltage

$V_{AC}$=25mV, f=100kHz, $T_j$=25ºC

## Package Information: EcoDual 3

### Circuit diagram




Dimensions in Millimeters