

# CMHG120R022-4

## 1200V, 22mΩ typ., 100A N-Channel Silicon Carbide Power MOSFET

### General Description

This silicon carbide Power MOSFET device has been developed using Cmos's advanced SiC MOSFET technology. The device features a very low  $R_{DS(on)}$  over the entire temperature range combined with low capacitances and very high switching operations, which improve application performance in frequency, energy efficiency, system size and weight reduction.

### Features

- 100% Avalanche Tested
- High switching speed with a low gate charge
- Fast intrinsic diode with low reverse recovery
- RoHS Compliant

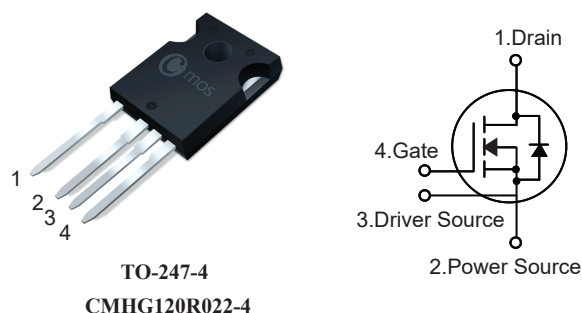
### Product Summary

| BVDSS | $R_{DS(on)}$ max. | ID   |
|-------|-------------------|------|
| 1200V | 30mΩ              | 100A |

### Applications

- inverter
- EV charging infrastructure
- uninterruptable power supplies

### TO-247-4 Pin Configuration



### Absolute Maximum Ratings

| Symbol                 | Parameter                            | Rating     | Units       |
|------------------------|--------------------------------------|------------|-------------|
| $V_{DS}$               | Drain-Source Voltage                 | 1200       | V           |
| $V_{GS}$               | Absolute maximum values              | -10/+22    | V           |
| $V_{GSop}$             | Recommended operational values       | -5/+18     | V           |
| $I_D@T_C=25^{\circ}C$  | Continuous Drain Current             | 100        | A           |
| $I_D@T_C=100^{\circ}C$ | Continuous Drain Current             | 71         | A           |
| $I_{DM}$               | Pulsed Drain Current                 | 250        | A           |
| $P_D@T_C=25^{\circ}C$  | Total Power Dissipation              | 470        | W           |
| $T_{STG}$              | Storage Temperature Range            | -55 to 175 | $^{\circ}C$ |
| $T_J$                  | Operating Junction Temperature Range | -55 to 175 | $^{\circ}C$ |

### Thermal Data

| Symbol          | Parameter                           | Typ. | Max. | Unit          |
|-----------------|-------------------------------------|------|------|---------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient | ---  | 40   | $^{\circ}C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-case    | ---  | 0.32 | $^{\circ}C/W$ |

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### Electrical Characteristics (T<sub>J</sub>=25°C , unless otherwise noted)

| Symbol              | Parameter                           | Conditions                                                                                                                                      | Min. | Typ. | Max. | Unit |
|---------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage      | V <sub>GS</sub> =0V, I <sub>D</sub> =1mA                                                                                                        | 1200 | ---  | ---  | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance   | V <sub>GS</sub> =18V, I <sub>D</sub> =30A                                                                                                       | ---  | 22   | 30   | mΩ   |
|                     |                                     | V <sub>GS</sub> =18V, I <sub>D</sub> =30A, T <sub>J</sub> =175°C                                                                                | ---  | 34   | ---  |      |
|                     |                                     | V <sub>GS</sub> =15V, I <sub>D</sub> =30A                                                                                                       | ---  | 30   | ---  |      |
|                     |                                     | V <sub>GS</sub> =15V, I <sub>D</sub> =30A, T <sub>J</sub> =175°C                                                                                | ---  | 50   | ---  |      |
| V <sub>GS(th)</sub> | Gate Threshold Voltage              | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =17mA<br>(tested after V <sub>GS</sub> =22V, 1ms pulse)                                       | 2.0  | 3.7  | 5.0  | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current        | V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V                                                                                                     | ---  | 1    | 100  | μA   |
|                     |                                     | V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V, T <sub>J</sub> =175°C                                                                              | ---  | 10   | ---  |      |
| I <sub>GSS</sub>    | Gate-Source Leakage Current         | V <sub>GS</sub> =+22V, V <sub>DS</sub> =0V                                                                                                      | ---  | ---  | +250 | nA   |
|                     |                                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =0V                                                                                                      | ---  | ---  | -250 |      |
| g <sub>fs</sub>     | Forward Transconductance            | V <sub>DS</sub> =20V, I <sub>D</sub> =30A                                                                                                       | ---  | 10   | ---  | S    |
| R <sub>g</sub>      | Gate Resistance                     | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                                                                                | ---  | 3.0  | ---  | Ω    |
| Q <sub>g(tot)</sub> | Total Gate Charge                   | V <sub>DS</sub> =800V, I <sub>D</sub> =50A<br>V <sub>GS</sub> =-5V to 18V                                                                       | ---  | 198  | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                  |                                                                                                                                                 | ---  | 48   | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                   |                                                                                                                                                 | ---  | 65   | ---  |      |
| E <sub>oss</sub>    | Stored Energy in Output Capacitance | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V to 800V                                                                                                | ---  | 93   | ---  | μJ   |
| C <sub>o(er)</sub>  | Energy Related Output Capacitance   |                                                                                                                                                 | ---  | 290  | ---  | pF   |
| C <sub>o(tr)</sub>  | Time Related Output Capacitance     |                                                                                                                                                 | ---  | 460  | ---  |      |
| E <sub>on</sub>     | Turn-on Switching Energy            | V <sub>DS</sub> =800V<br>I <sub>D</sub> =50A<br>V <sub>GS</sub> =-5V / 18V<br>R <sub>G</sub> =2Ω<br>FWD = 1200V 20A SiC Diode<br>Inductive load | ---  | 477  | ---  | μJ   |
| E <sub>off</sub>    | Turn-off Switching Energy           |                                                                                                                                                 | ---  | 342  | ---  |      |
| E <sub>tot</sub>    | Total Switching Energy              |                                                                                                                                                 | ---  | 819  | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                  |                                                                                                                                                 | ---  | 29   | ---  | ns   |
| T <sub>r</sub>      | Rise Time                           |                                                                                                                                                 | ---  | 29   | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                 |                                                                                                                                                 | ---  | 62   | ---  |      |
| T <sub>f</sub>      | Fall Time                           |                                                                                                                                                 | ---  | 12   | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                   | V <sub>DS</sub> =800V, V <sub>GS</sub> =0V, f=250kHz                                                                                            | ---  | 3750 | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                  |                                                                                                                                                 | ---  | 225  | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance        |                                                                                                                                                 | ---  | 17   | ---  |      |

### Diode Characteristics

| Symbol          | Parameter                 | Conditions                                                        | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|-------------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                 | ---  | ---  | 100  | A    |
| I <sub>SM</sub> | Pulsed Source Current     |                                                                   | ---  | ---  | 250  | A    |
| V <sub>SD</sub> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>SD</sub> =15A, T <sub>J</sub> =25°C   | ---  | 3.4  | ---  | V    |
| t <sub>rr</sub> | Reverse Recovery Time     | di/dt=3000A/μs, Includes Q <sub>oss</sub>                         | ---  | 22   | ---  | ns   |
| Q <sub>rr</sub> | Reverse Recovery Charge   | V <sub>DD</sub> =800V, I <sub>SD</sub> =50A, T <sub>J</sub> =25°C | ---  | 482  | ---  | nC   |

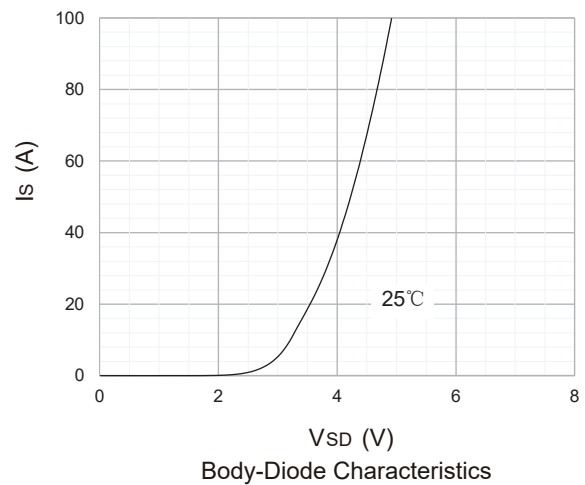
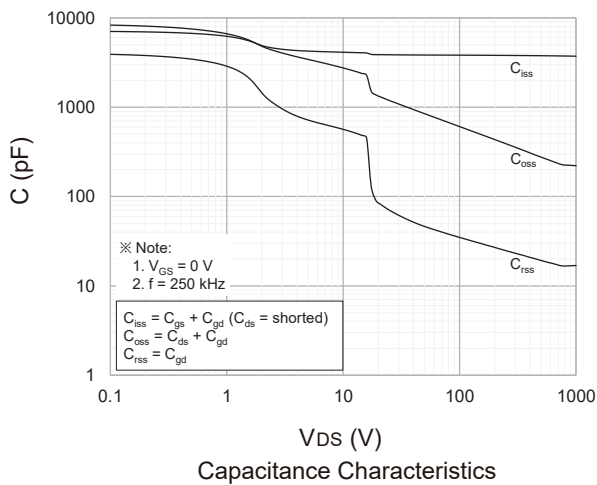
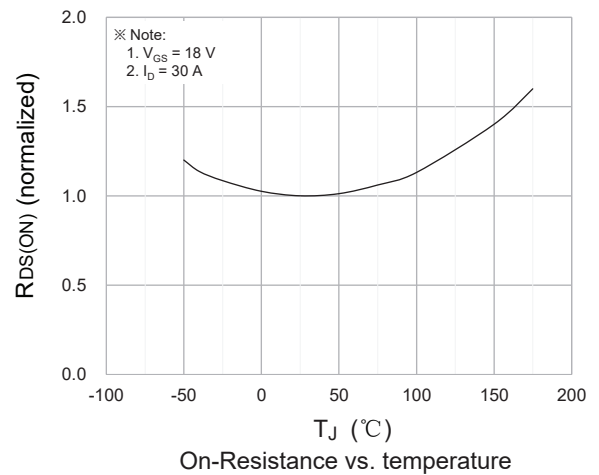
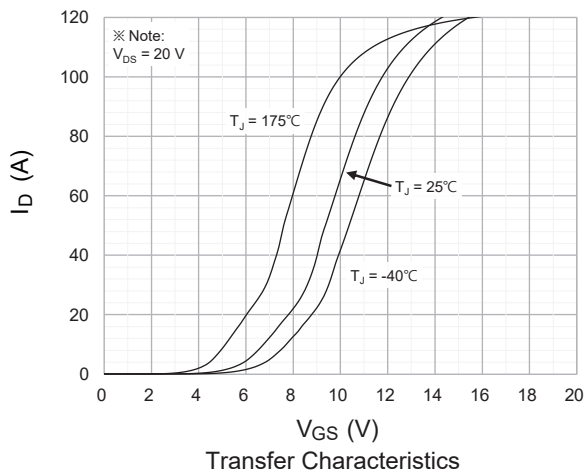
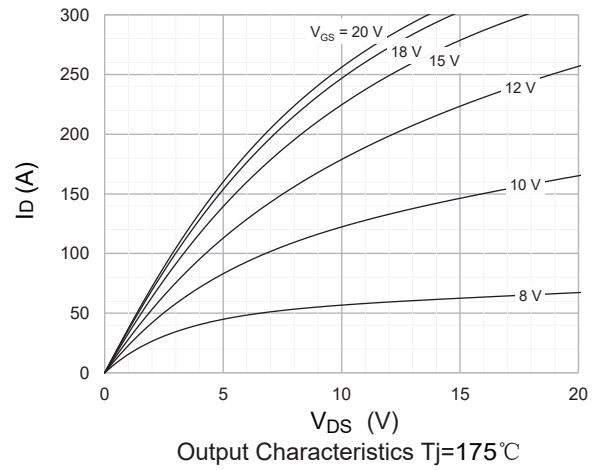
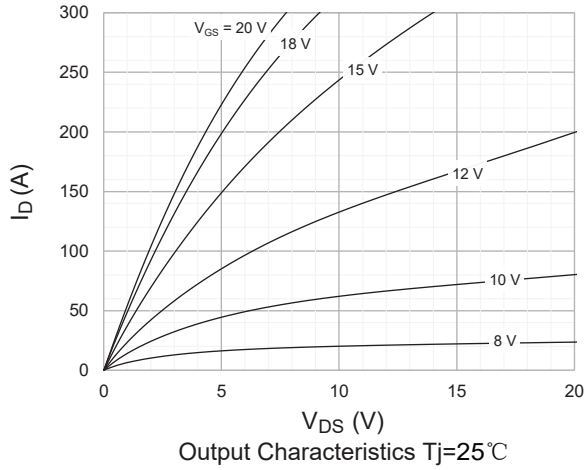
Note :

This product has been designed and qualified for the consumer market.

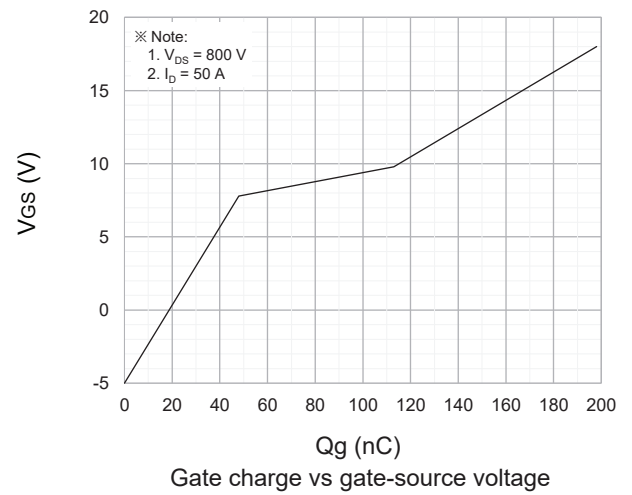
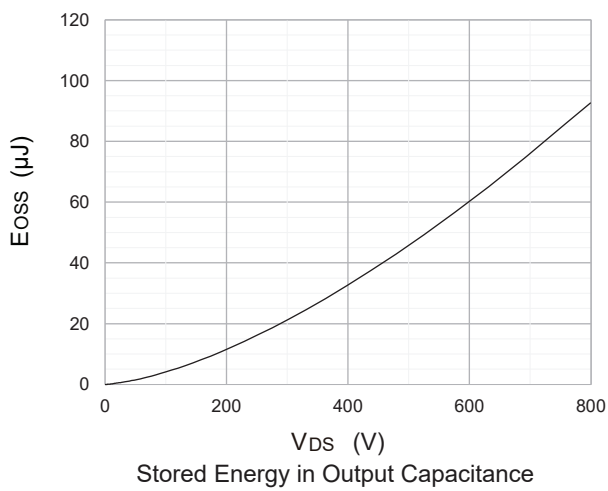
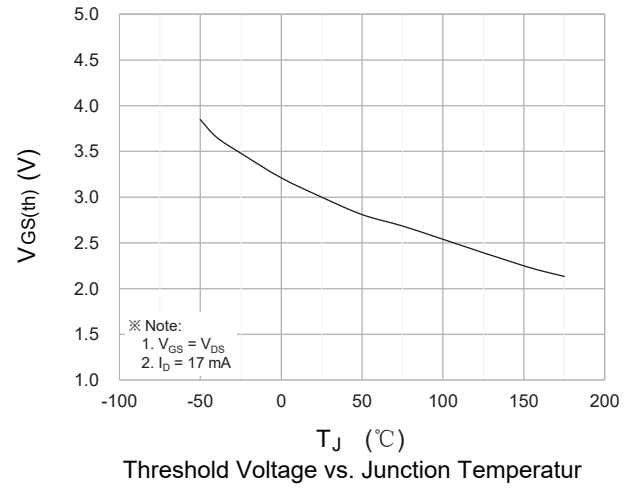
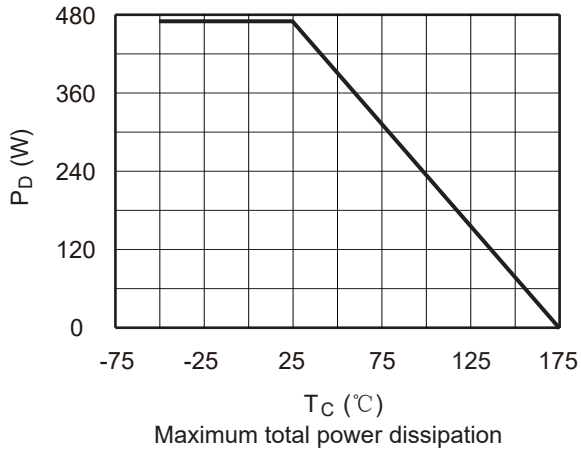
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### Typical Characteristics



### Typical Characteristics



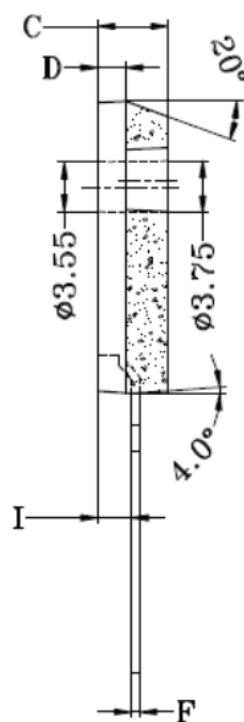
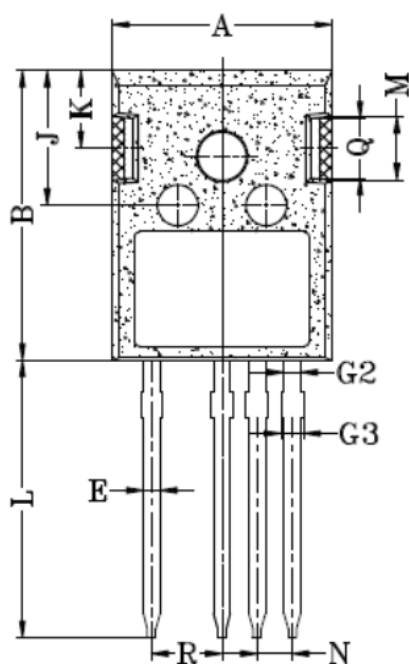
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## Package Dimension

TO-247-4

Unit :mm



| Symbol | Dimensions in Millimeter |       |
|--------|--------------------------|-------|
|        | MIN                      | MAX   |
| A      | 15.80                    | 16.00 |
| B      | 20.90                    | 21.10 |
| C      | 4.90                     | 5.10  |
| D      | 1.90                     | 2.10  |
| E      | 1.10                     | 1.30  |
| F      | 0.50                     | 0.70  |
| G2     | 1.10                     | 1.30  |
| G3     | 1.18                     | 1.38  |
| H      | 4.18                     | 4.38  |
| I      | 2.30                     | 2.50  |
| J      | 9.65                     | 9.85  |
| K      | 5.54                     | 5.74  |
| L      | 19.80                    | 20.20 |
| M      | 4.50                     | 4.70  |
| N      | 2.34                     | 2.74  |
| Φ P    | 3.40                     | 3.60  |
| Q      | 4.232                    | 4.432 |
| R      | 4.88                     | 5.28  |

