# CMP052N04/CMB052N04/CMI052N04/CMF052N04

**40V, 4.7mΩ typ., 90A N-Channel MOSFET**

## General Description

The 052N04 uses advanced SGT technology to provide excellent RDS(ON).It can be used in a wide variety of applications.

## Product Summary

| BVDSS | $R_{DS(on)}$ max. | ID |
|---|---|---|
| 40V | 5.2mΩ | 90A |

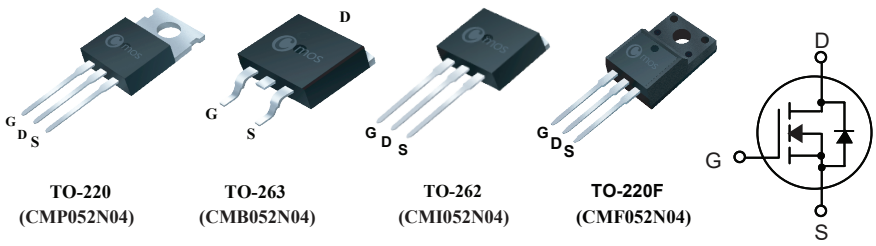
## Applications

- Motor control and drive
- Battery management
- Uninterruptible Power Supply

## Features

- Low On-Resistance
- 100% avalanche tested
- RoHS Compliant

## TO-220/263/262/220F Pin Configuration




TO-220 (CMP052N04) | TO-263 (CMB052N04) | TO-262 (CMI052N04) | TO-220F (CMF052N04)

## Absolute Maximum Ratings

| Symbol | Parameter | 220/263/262 | 220F | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 40 | | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current | 90 | 90* | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current | 63 | 63* | A |
| $I_{DM}$ | Pulsed Drain Current | 360 | 360* | A |
| EAS | Single Pulse Avalanche Energy (Note 1) | 225 | | mJ |
| $P_D$@$T_C$=25℃ | Total Power Dissipation | 100 | 35 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | | ℃ |

* Drain current limited by maximum junction temperature.

## Thermal Data

| Symbol | Parameter | 220/263/262 | 220F | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient Max. | 62 | 62 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-case Max. | 1.25 | 3.57 | ℃/W |

40V, 4.7mΩ typ., 90A N-Channel MOSFET

## Electrical Characteristics ($T_J$=25℃ , unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 40 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V , $I_D$=15A | --- | 4.7 | 5.2 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=10A | --- | 5.5 | 6.8 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250μA | 1 | --- | 3 | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=40V , $V_{GS}$=0V | --- | --- | 1 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$= ±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$ =10A | --- | 24 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 3 | --- | Ω |
| $Q_g$ | Total Gate Charge | $V_{DS}$=20V , $I_D$=20A<br>$V_{GS}$=10V | --- | 36.5 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 4 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 11 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DS}$=20V , $V_{GS}$=10V , $I_D$=1A<br>$R_G$ =3.3Ω , $R_D$=20Ω | --- | 9 | --- | ns |
| $T_r$ | Rise Time | | --- | 7 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 25 | --- | |
| $T_f$ | Fall Time | | --- | 29 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=25V , $V_{GS}$=0V , f=1MHz | --- | 1700 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 420 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 25 | --- | |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Diode continuous forward current | $V_G$=$V_D$=0V , Force Current | --- | --- | 90 | A |
| $I_{S,pulse}$ | Diode pulse current | | --- | --- | 360 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_F$=10A , Tj=25 ℃ | --- | 0.79 | 1.2 | V |

Note :

1.The EAS data shows Max. rating .The test condition is $V_{DS}$=30V , $V_{GS}$=10V , L=2mH , $I_{AS}$=15A.

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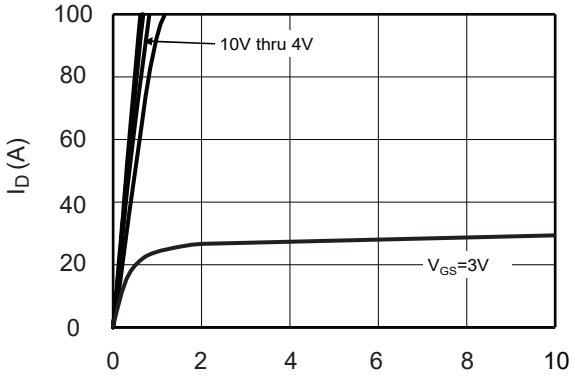
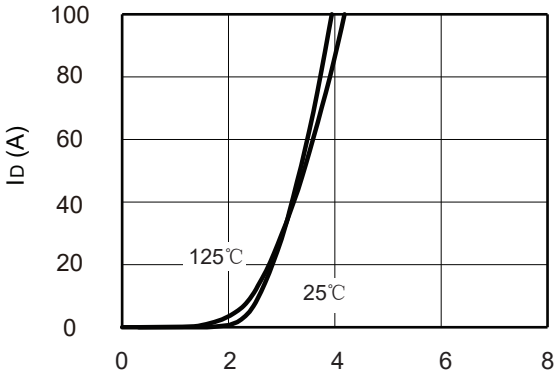
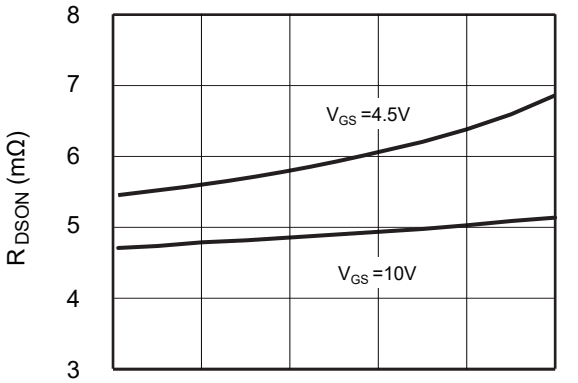
## Typical Characteristics



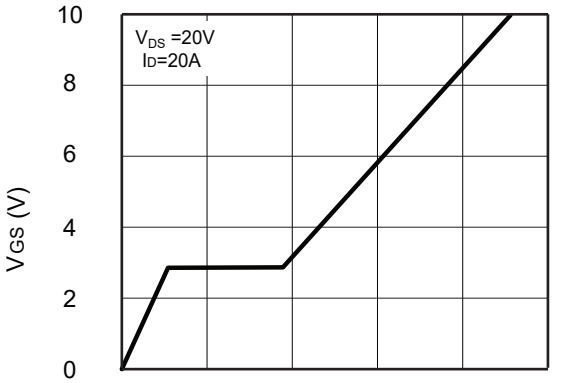

Output Characteristics



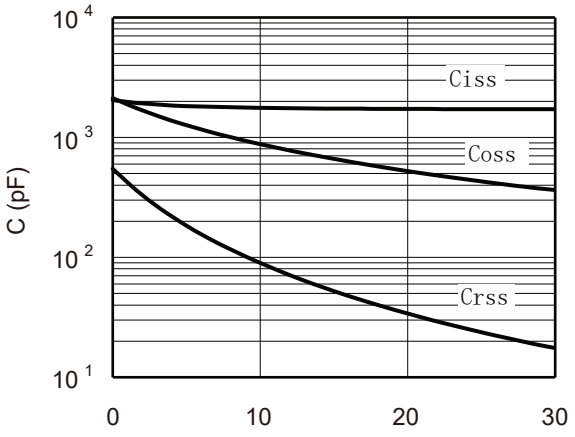

transfer characteristics



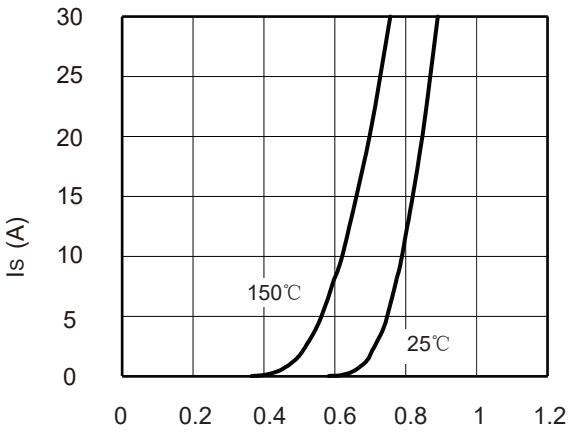

drain-source on-resistance




Gate charge vs gate-source voltage



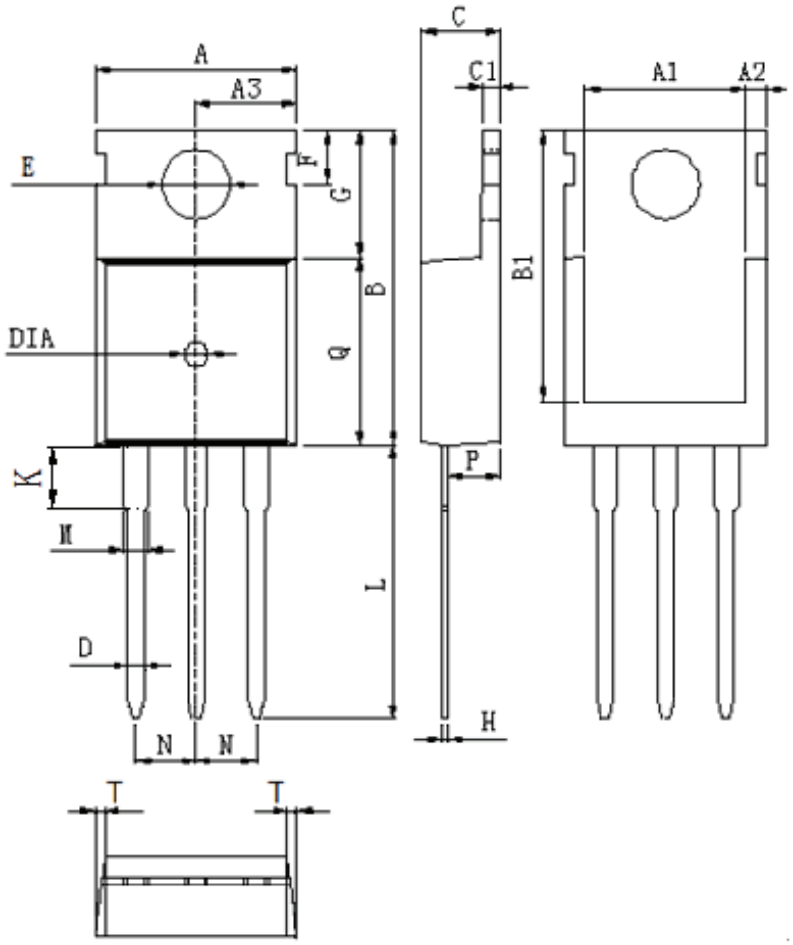

Capacitance Characteristics




Body-Diode Characteristics

## Package Dimension

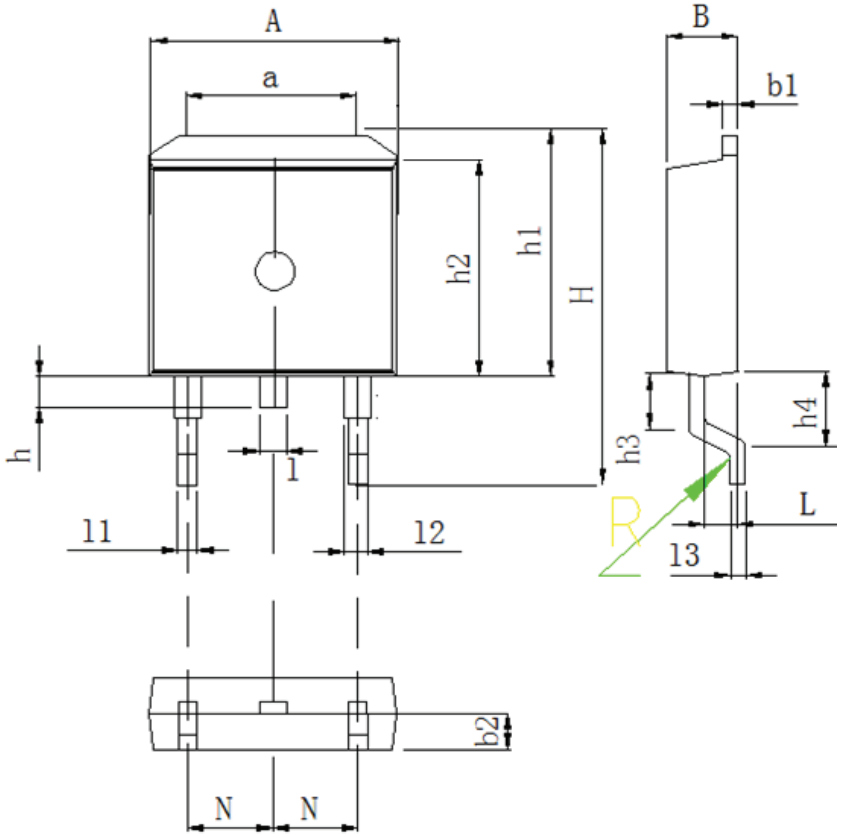
TO-220 Unit :mm




| DIM | MILLIMETERS |
|---|---|
| A | 10.0±0.3 |
| A1 | 8.64±0.2 |
| A2 | 1.15±0.1 |
| A3 | 5.0±0.2 |
| B | 15.8±0.4 |
| B1 | 13.2±0.3 |
| C | 4.56±0.1 |
| C1 | 1.3±0.2 |
| D | 0.8±0.2 |
| E | 3.6±0.2 |
| F | 2.95±0.3 |
| G | 6.5±0.3 |
| H | 0.5±0.1 |
| K | 3.1±0.2 |
| L | 13.2±0.4 |
| M | 1.25±0.1 |
| N | 2.54±0.1 |
| P | 2.4±0.3 |
| Q | 9.0±0.3 |
| T | W:0.35 |
| DIA | ⊙1.5(deep 0.2) |

## Package Dimension

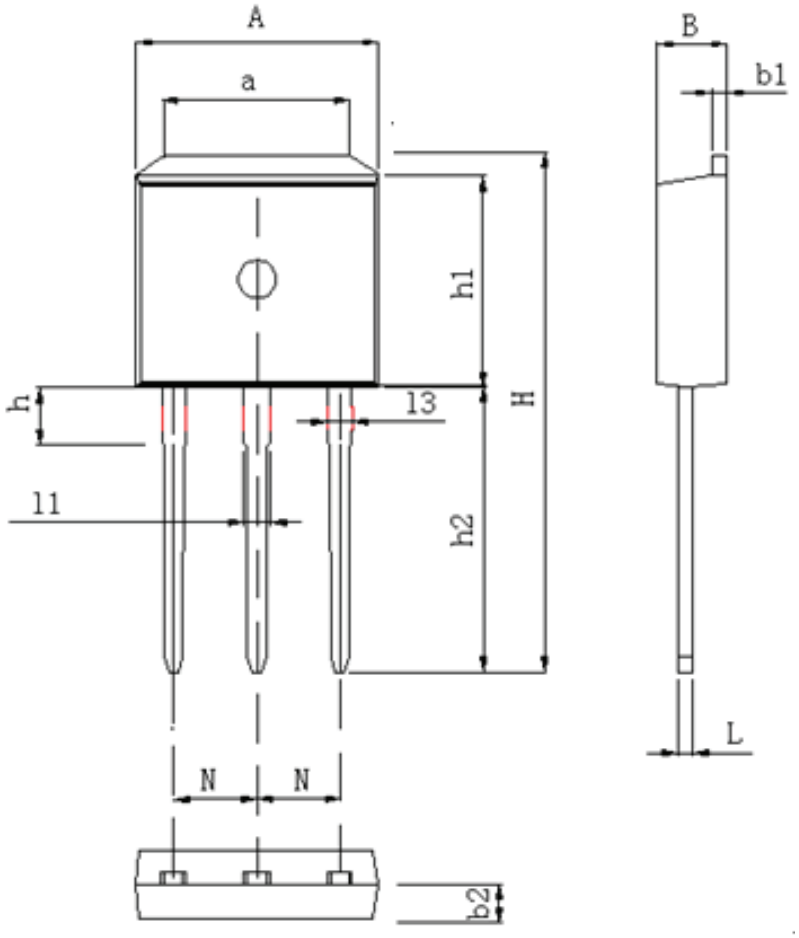
TO-263 Unit :mm




| DIM | MILLIMETERS |
|---|---|
| A | 9.8±0.2 |
| a | 7.4±0.4 |
| B | 4.5±0.2 |
| b1 | 1.3±0.05 |
| b2 | 2.4±0.2 |
| H | 15.5±0.3 |
| h | 1.54±0.2 |
| h1 | 10.5±0.2 |
| h2 | 9.2±0.1 |
| h3 | 1.54±0.2 |
| h4 | 2.7±0.2 |
| L | 2.4±0.2 |
| l | 1.3±0.1 |
| l1 | 0.8±0.1 |
| l2 | 1.3±0.1 |
| l3 | 0.5±0.1 |
| N | 2.54±0.1 |
| R | 0.5R±0.05 |

## Package Dimension

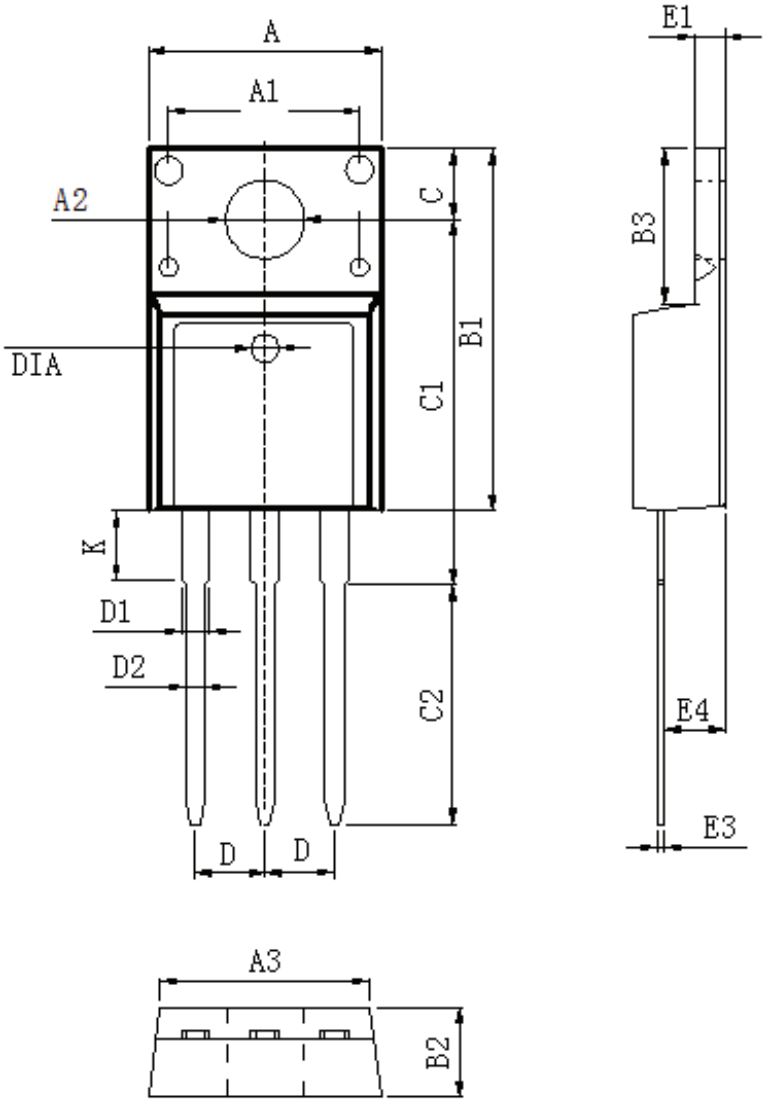
TO-262 Unit :mm




| DIM | MILLIMETERS |
|---|---|
| A | 9.98±0.2 |
| a | 7.4±0.4 |
| B | 4.5±0.2 |
| b1 | 1.3±0.05 |
| b2 | 2.4±0.2 |
| H | 23.9±0.3 |
| h | 3.1±0.2 |
| h1 | 9.16±0.2 |
| h2 | 13.2±0.2 |
| L | 0.5±0.1 |
| l1 | 1.3±0.1 |
| l2 | 0.8±0.1 |
| N | 2.45±0.1 |

## Package Dimension

TO-220F Unit :mm




| DIM | MILLIMETERS |
|---|---|
| A | 10.16±0.3 |
| A1 | 7.00±0.1 |
| A2 | 3.3±0.2 |
| A3 | 9.5±0.2 |
| B1 | 15.87±0.3 |
| B2 | 4.7±0.2 |
| B3 | 6.68±0.4 |
| C | 3.3±0.2 |
| C1 | 12.57±0.3 |
| C2 | 10.02±0.5 |
| D | 2.54±0.05 |
| D1 | 1.28±0.2 |
| D2 | 0.8±0.1 |
| K | 3.1±0.3 |
| E1 | 2.54±0.1 |
| E3 | 0.5±0.1 |
| E4 | 2.76±0.2 |
| DIA | ⊙1.5(deep 0.2) |