# CMP/CMB/CMI/CMF65R090DT

**650V, 80mΩ typ., 40A N-Channel Super Junction Power MOSFET**

## General Description

The 65R090DT is power MOSFET using Cmos's advanced super junction technology. The resulting devices provide all benefits of a fast switching super junction MOSFET while offering an extremely fast and robust body diode.This combination of extremely low switching,commutation and conduction losses together with highest robustness make especially resonant switching applications more reliable,more efficient and lighter.

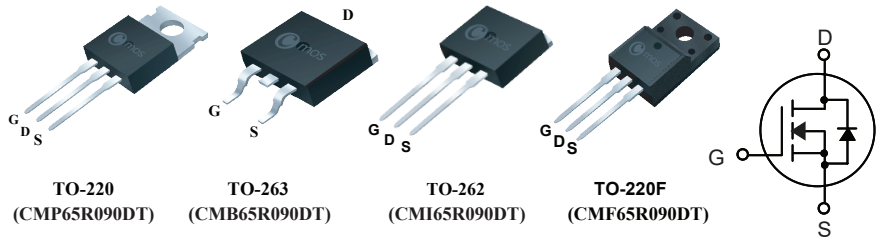
## Product Summary

| BVDSS | $R_{DS(on)}$ max. | ID |
|---|---|---|
| 650V | 90mΩ | 40A |

## Applications

- Charger
- Power Supply

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




TO-220 (CMP65R090DT) | TO-263 (CMB65R090DT) | TO-262 (CMI65R090DT) | TO-220F (CMF65R090DT)

## Features

- Ultra-fast body diode
- Low On-Resistance
- 100% avalanche tested
- RoHS Compliant
- Deep Trench

## Absolute Maximum Ratings

| Symbol | Parameter | 220/263/262 | 220F | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 650 | | V |
| $V_{GS}$ | Gate-Source Voltage | ±30 | | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current | 40 | 40* | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current | 29 | 29* | A |
| $I_{DM}$ | Pulsed Drain Current (Note 1) | 160 | 160* | A |
| EAS | Single Pulse Avalanche Energy (Note 2) | 845 | | mJ |
| $P_D$@$T_C$=25℃ | Total Power Dissipation | 300 | 45 | 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. | 62.5 | 62.5 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-case Max. | 0.42 | 2.78 | ℃/W |

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## 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 | 650 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V , $I_D$=15A | --- | 80 | 90 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250μA | 3.0 | --- | 5.0 | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=650V , $V_{GS}$=0V | --- | --- | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$= ±30V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=20V , $I_D$ =5A | --- | 10 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 3.2 | --- | Ω |
| $Q_g$ | Total Gate Charge | $V_{DS}$ =400V , $I_D$=12.5A<br>$V_{GS}$=0 to 10V | --- | 53 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 14 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 16 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=400V , $I_D$=12.5A<br>$R_G$ =5.3Ω , $V_{GS}$=13V | --- | 25 | --- | ns |
| $T_r$ | Rise Time | | --- | 11 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 92 | --- | |
| $T_f$ | Fall Time | | --- | 5 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=100V , $V_{GS}$=0V , f=1MHz | --- | 2300 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 100 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 4.5 | --- | |

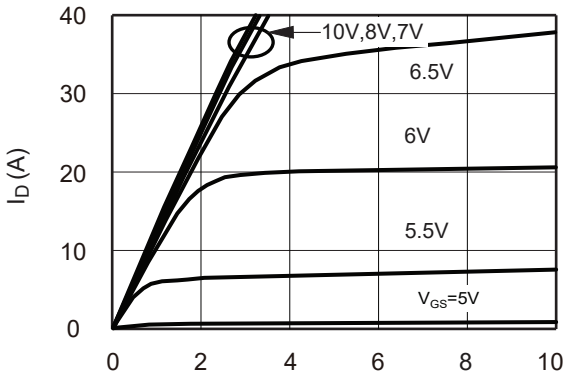
## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | $V_G$=$V_D$=0V , Force Current | --- | --- | 40 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | 160 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=15A ,$T_J$=25℃ | --- | 0.86 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | di/dt = 100A/μs<br>$I_F$ =20A , $V_{DD}$ =400V | --- | 121 | --- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 1.67 | --- | μC |

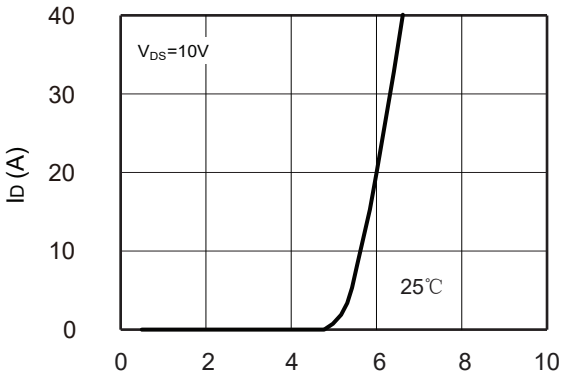
Note :

1. Repetitive rating: Pulse width limited by maximum junction temperature.
2. The EAS data shows Max. rating . The test condition is $V_{DD}$=100V , $V_{GS}$=10V , L=10mH , $I_{AS}$ =13A.

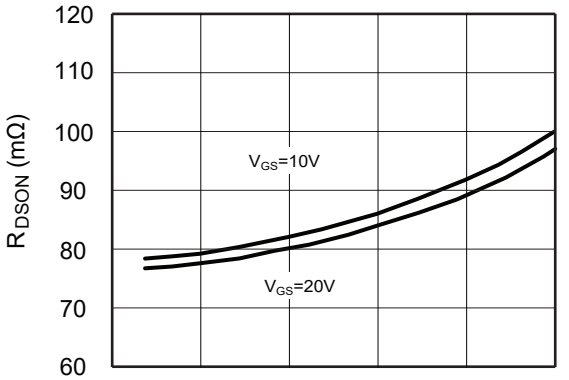
## Typical Characteristics



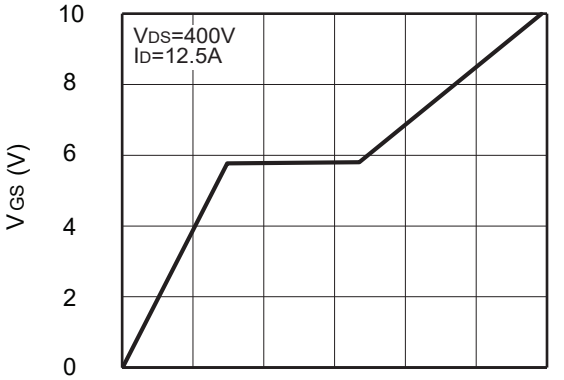

Output Characteristics



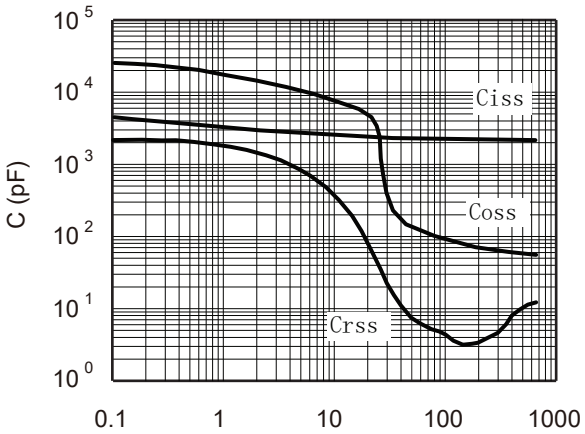

transfer characteristics



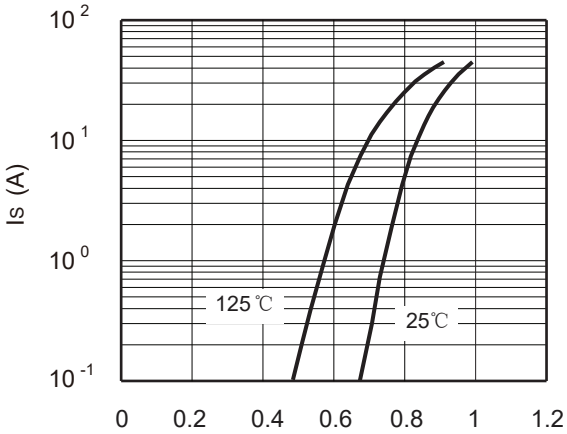

On-Resistance vs. Drain Current




Gate charge vs gate-source voltage




Capacitance Characteristics




Body-Diode Characteristics

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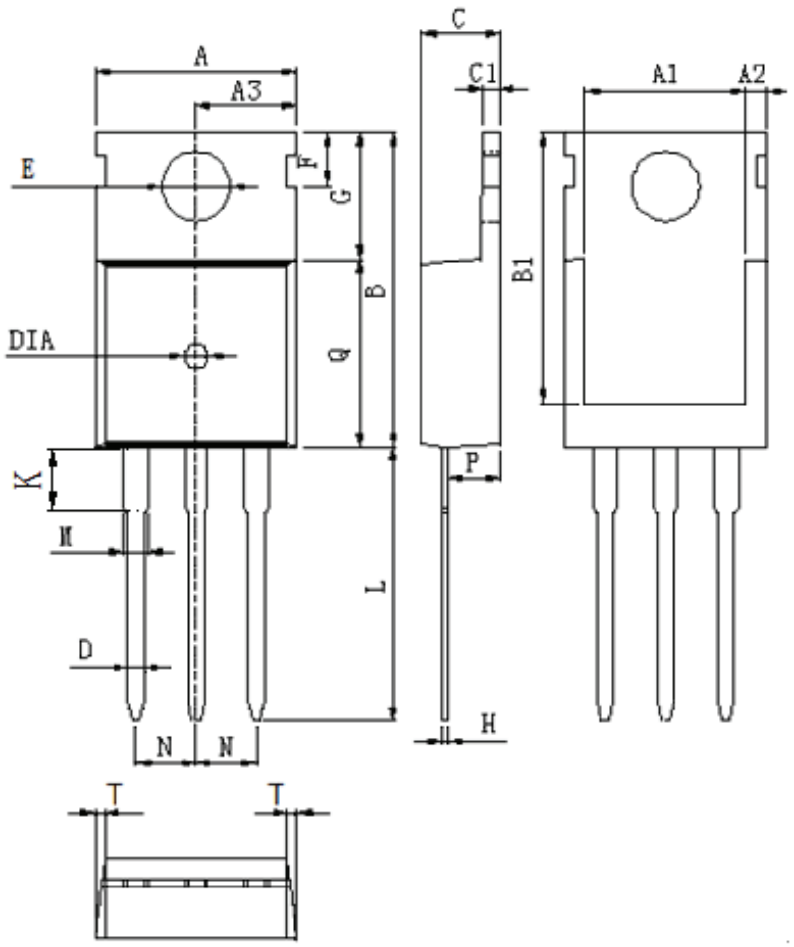
## Package Dimension

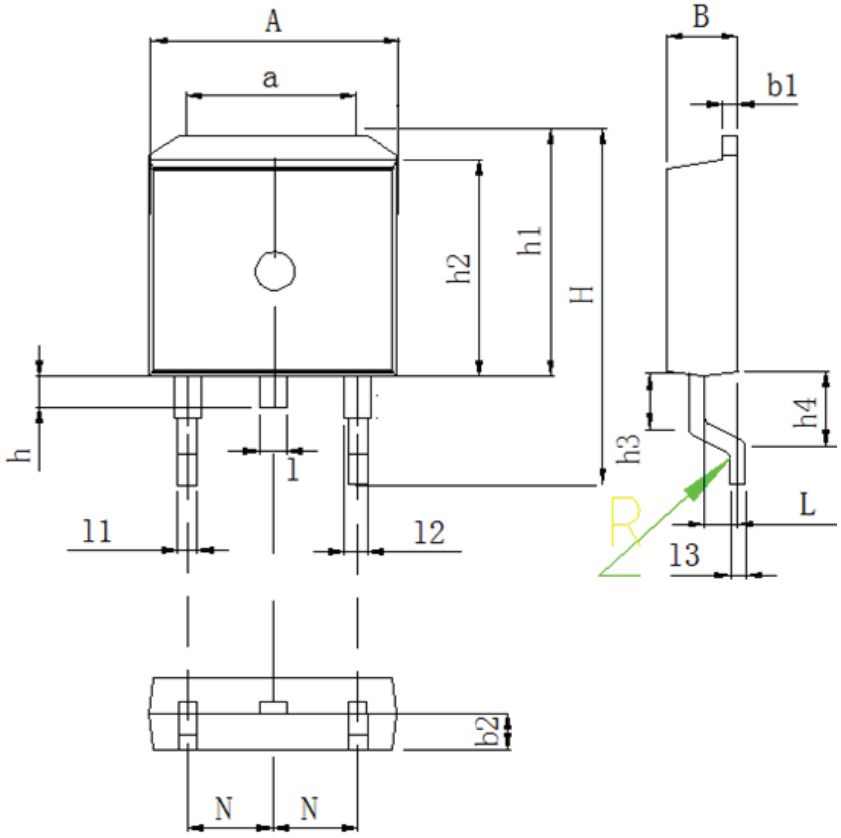
TO-220 Unit :mm




| 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

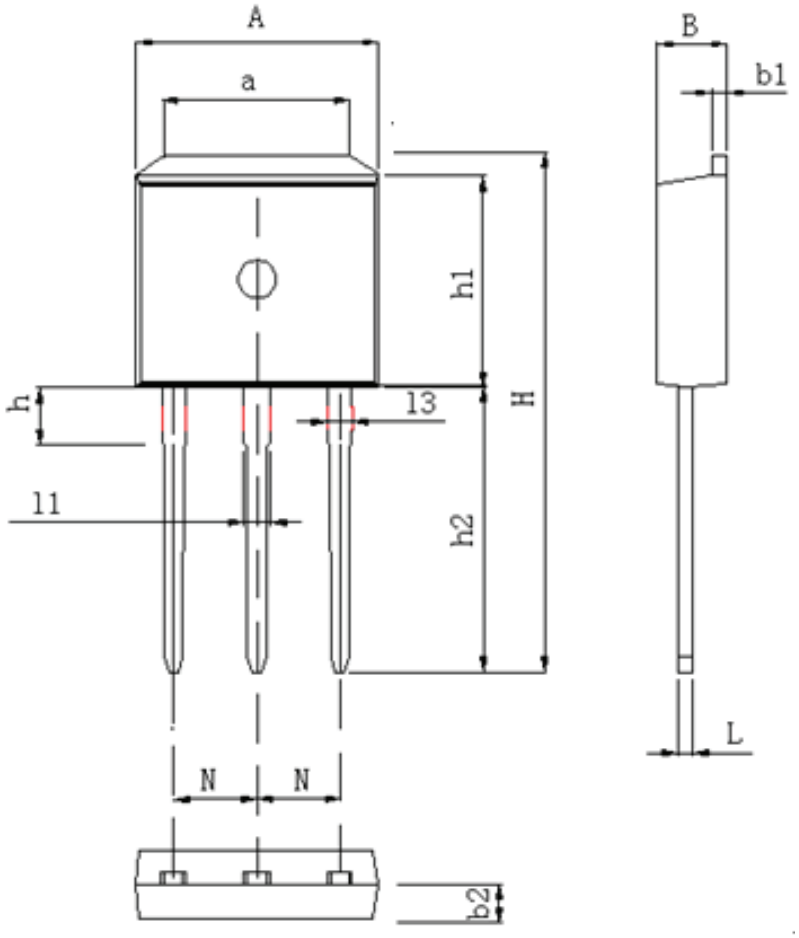
TO-263 Unit :mm




| 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

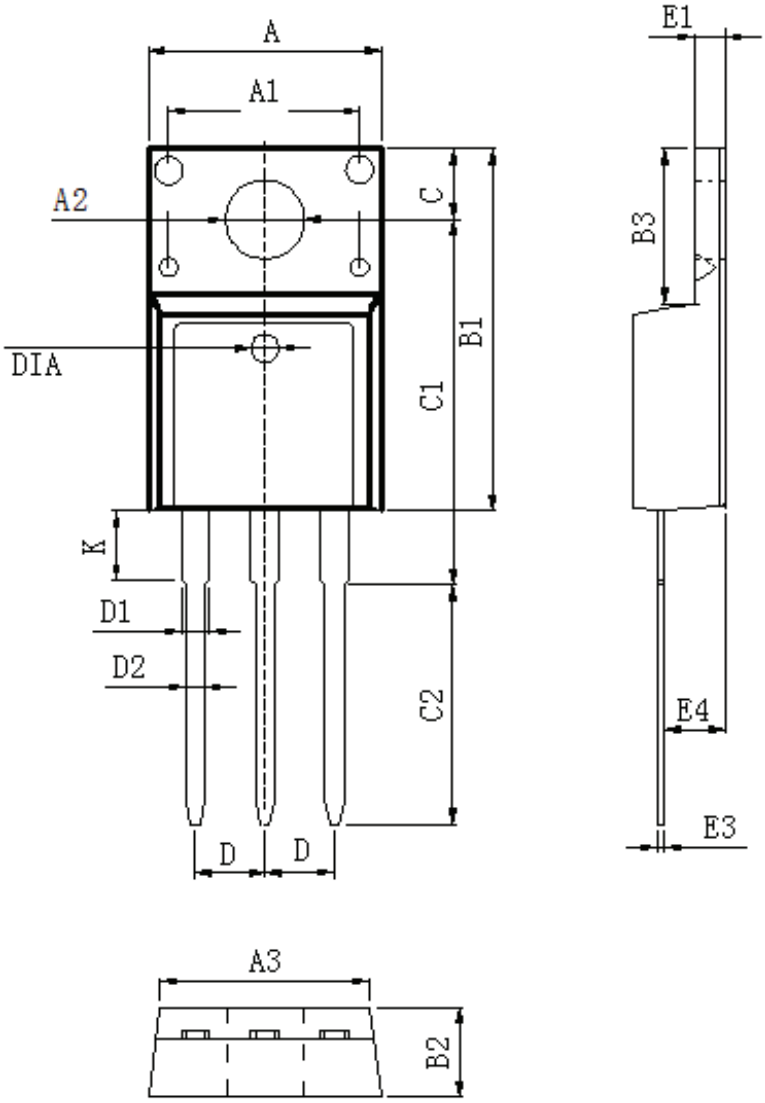
TO-262 Unit :mm




| 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) |