

## General Description

The 12N65A uses advanced planar stripe DMOS technology to provide excellent  $R_{DS(on)}$  and superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

## Features

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant

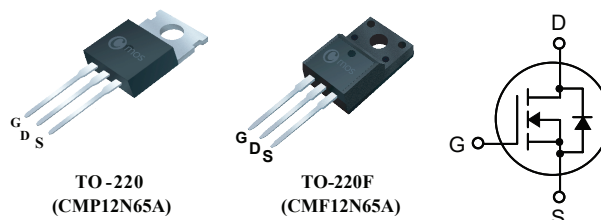
## Product Summary

| BVDSS | $R_{DS(on)}$ max. | ID  |
|-------|-------------------|-----|
| 650V  | 0.65Ω             | 12A |

## Applications

- Charger
- Adaptor
- Power Supply

## TO-220/220F Pin Configuration



## Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

| Symbol         | Parameter                                                                     | 220         | 220F | Units |
|----------------|-------------------------------------------------------------------------------|-------------|------|-------|
| $V_{DSS}$      | Drain-Source Voltage                                                          | 650         |      | V     |
| $I_D$          | Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )                       | 12          | 12*  | A     |
|                | - Continuous ( $T_C = 100^\circ\text{C}$ )                                    | 7.4         | 7.4* | A     |
| $I_{DM}$       | Drain Current - Pulsed <sup>1</sup>                                           | 48          | 48*  | A     |
| $V_{GSS}$      | Gate-Source Voltage                                                           | $\pm 30$    |      | V     |
| $E_{AS}$       | Single Pulsed Avalanche Energy <sup>2</sup>                                   | 1102        |      | mJ    |
| dv/dt          | Peak Diode Recovery dv/dt <sup>3</sup>                                        | 4.5         |      | V/ns  |
| $P_D$          | Power Dissipation ( $T_C = 25^\circ\text{C}$ )                                | 230         | 54   | W     |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                       | -55 to +150 |      | °C    |
| $T_L$          | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300         |      | °C    |

\* Drain current limited by maximum junction temperature

## Thermal Characteristics

| Symbol          | Parameter                               | 220  | 220F | Units |
|-----------------|-----------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 0.54 | 2.33 | °C/W  |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink Typ.   | 0.5  | ---  | °C/W  |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | 62.5 | °C/W  |

Electrical Characteristic (T<sub>C</sub>=25°C unless otherwise noted)

| Symbol                                                 | Parameter                                             | Test Conditions                                                       | Min | Typ  | Max  | Units |
|--------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------|-----|------|------|-------|
| Off Characteristics                                    |                                                       |                                                                       |     |      |      |       |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage                        | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                        | 650 | --   | --   | V     |
| BV <sub>DSS</sub> / T <sub>J</sub>                     | Breakdown Voltage Temperature Coefficient             | I <sub>D</sub> = 250 μA, Referenced to 25°C                           | --  | 0.7  | --   | V/°C  |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                       | V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V                        | --  | --   | 1    | μA    |
|                                                        |                                                       | V <sub>DS</sub> = 520 V, T <sub>C</sub> = 125°C                       | --  | --   | 10   |       |
| I <sub>GSSF</sub>                                      | Gate-Body Leakage Current, Forward                    | V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V                         | --  | --   | 100  | nA    |
| I <sub>GSSR</sub>                                      | Gate-Body Leakage Current, Reverse                    | V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V                        | --  | --   | -100 | nA    |
| On Characteristics                                     |                                                       |                                                                       |     |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA            | 2   | --   | 4    | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source On-Resistance                     | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6A                           | --  | 0.6  | 0.65 | Ω     |
| Dynamic Characteristics                                |                                                       |                                                                       |     |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                     | V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz            | --  | 2100 | --   | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                    |                                                                       | --  | 160  | --   | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                          |                                                                       | --  | 150  | --   | pF    |
| Switching Characteristics <sup>4 5</sup>               |                                                       |                                                                       |     |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-On Delay Time                                    | V <sub>DD</sub> = 325 V, I <sub>D</sub> = 12A<br>R <sub>G</sub> = 25Ω | --  | 27   | --   | ns    |
| t <sub>r</sub>                                         | Turn-On Rise Time                                     |                                                                       | --  | 52   | --   | ns    |
| t <sub>d(off)</sub>                                    | Turn-Off Delay Time                                   |                                                                       | --  | 135  | --   | ns    |
| t <sub>f</sub>                                         | Turn-Off Fall Time                                    |                                                                       | --  | 48   | --   | ns    |
| Q <sub>g</sub>                                         | Total Gate Charge                                     | V <sub>DS</sub> = 520 V, I <sub>D</sub> = 12A                         | --  | 31   | --   | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                    | V <sub>GS</sub> = 10 V                                                | --  | 9    | --   | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                                     |                                                                       | --  | 9.5  | --   | nC    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                       |                                                                       |     |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain-Source Diode Forward Current |                                                                       | --  | --   | 12   | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain-Source Diode Forward Current     |                                                                       | --  | --   | 48   | A     |
| V <sub>SD</sub>                                        | Drain-Source Diode Forward Voltage                    | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 12A                           | --  | --   | 1.5  | V     |
| t <sub>rr</sub>                                        | Reverse Recovery Time <sup>4</sup>                    | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 12A                           | --  | 360  | --   | ns    |
| Q <sub>rr</sub>                                        | Reverse Recovery Charge <sup>4</sup>                  | dl <sub>F</sub> / dt = 100 A/μs                                       | --  | 3.6  | --   | μC    |

note:

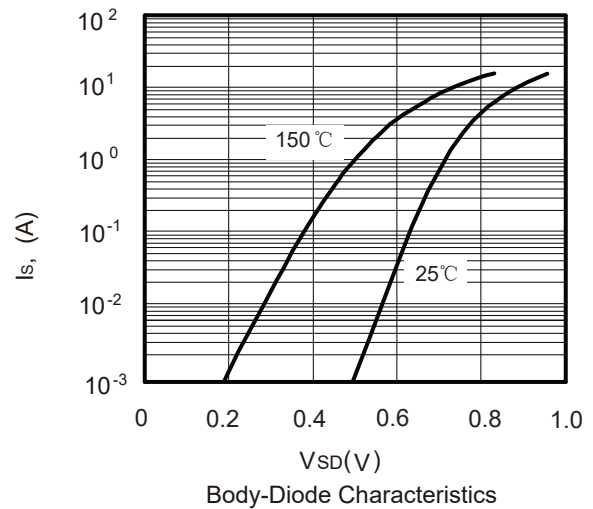
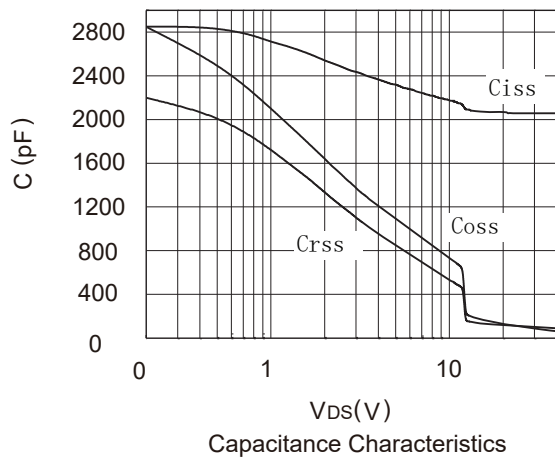
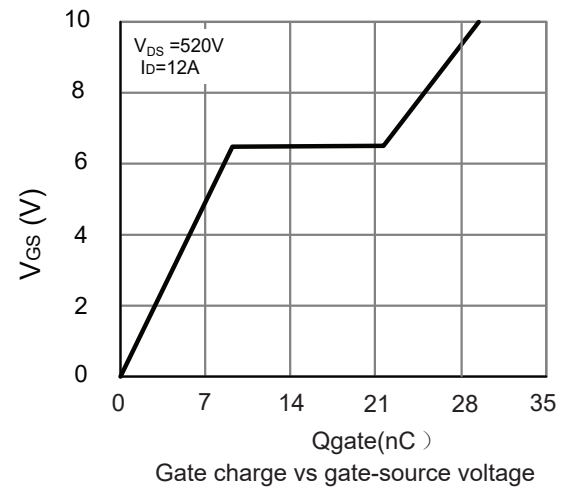
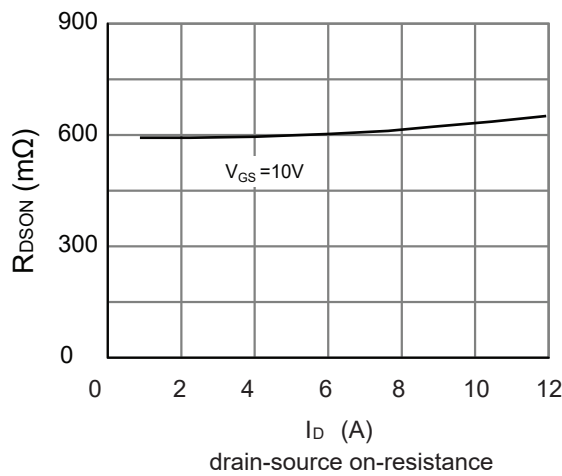
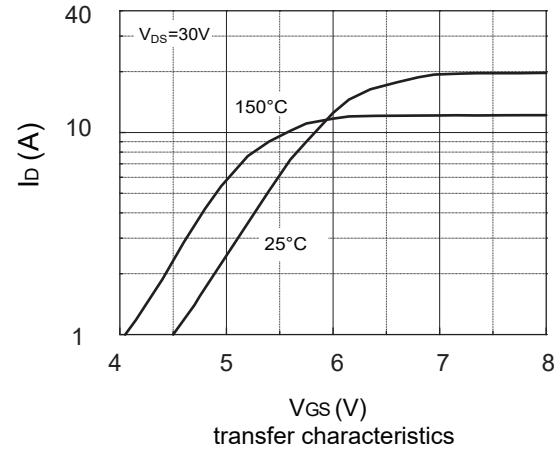
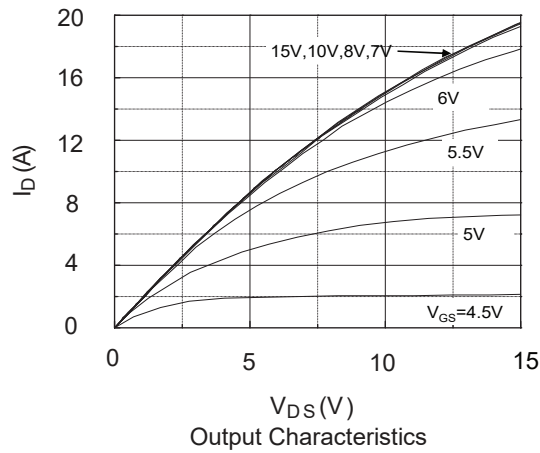
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The EAS data shows Max. rating .The test condition is V<sub>DS</sub>=80V , V<sub>GS</sub>=10V , L=20mH , I<sub>AS</sub>=10.5A.
3. I<sub>SD</sub>≤12A, di/dt ≤ 200A/us, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C.
4. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%.
5. Essentially Independent of Operating Temperature Typical Characteristics.

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

Cmos assumes no liability for customers' product design or applications.

Cmos reserves the right to improve product design ,functions and reliability without notice.

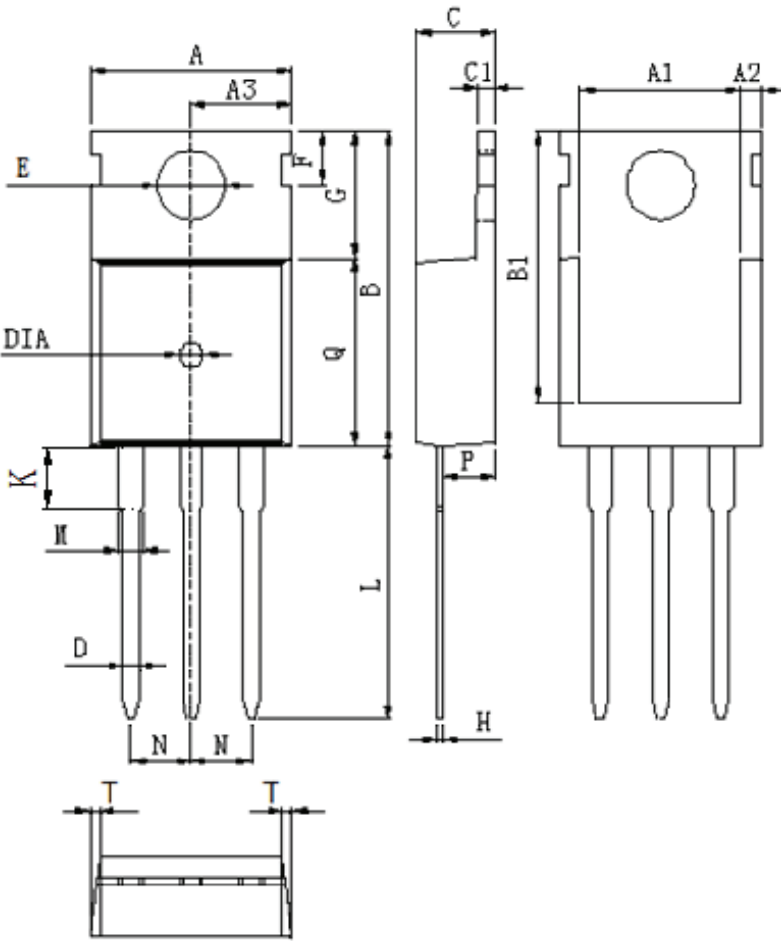
## Typical Characteristics



Package Dimension

TO-220

Unit :mm

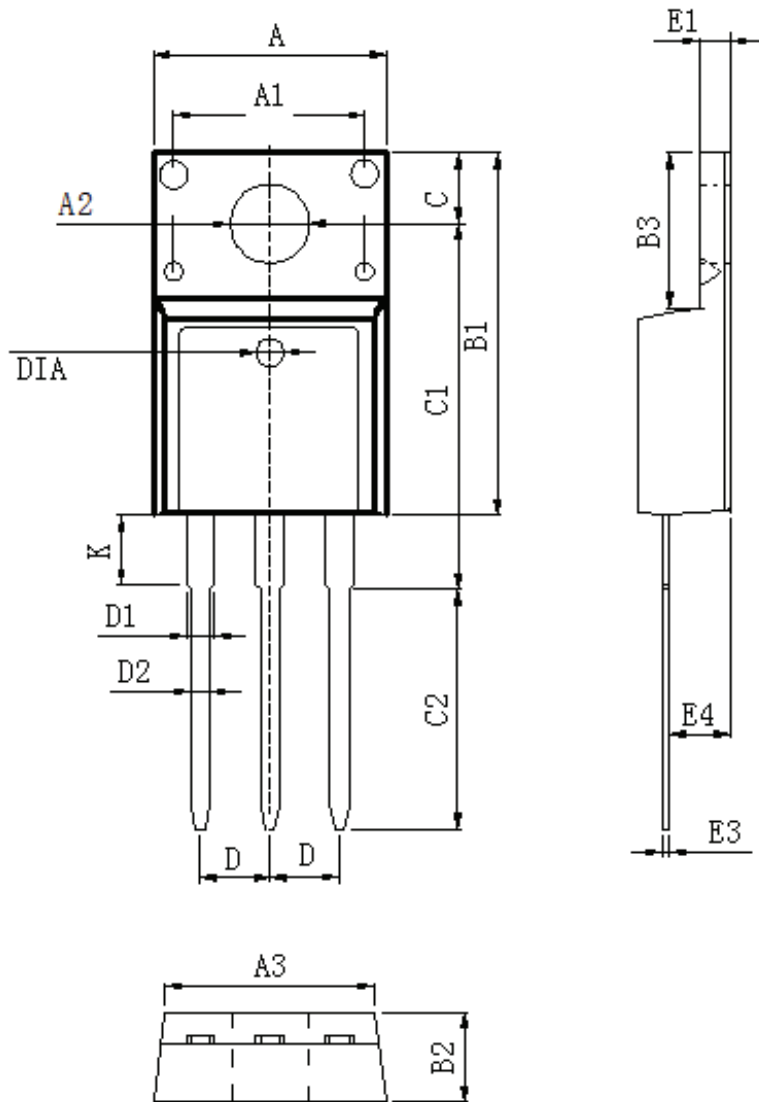


| DIM | MILLIMETERS    |
|-----|----------------|
| A   | 10.0±0.3       |
| A1  | 8.64±0.2       |
| A2  | 1.15±0.1       |
| A3  | 5.0±0.2        |
| B   | 15.8±0.4       |
| B1  | 13.2±0.3       |
| C   | 4.56±0.1       |
| C1  | 1.3±0.2        |
| D   | 0.8±0.2        |
| E   | 3.6±0.2        |
| 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-220F

Unit :mm



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