

# 承 认 书

客 户 名 称：兴储世纪科技有限公司

物 料 代 码：\_\_\_\_\_

客 户 规 格 型 号：\_\_\_\_\_

承 认 日 期：2021/12/30

供 应 商 名 称：广东恒芯半导体有限公司\_\_\_\_\_

供 应 商 规 格 型 号：HM20N06D T0-252 HKZ\_\_\_\_\_

## 承 认 签 章

| 供 应 商 承 认 |     |   | 客 户 承 认 |     |     |
|-----------|-----|---|---------|-----|-----|
| 工 程 师     | 审 核 | 批 准   | 工 程 师   | 审 核 | 批 准 |
| 郑玉宝       | 谢安娜 | 韩伟坚   |         |     |     |
| 盖章签署      |     |  | 盖章签署    |     |     |
| 日 期       |     |   | 日 期     |     |     |
| 备注：       |     |   |         |     |     |

供应商名称：广东恒芯半导体有限公司

供应商地址：深圳市南山区深南大道大冲商务中心 D 座 14A

电 话：0755-83463513

传 真：0755-83686859

网 址：[WWW.HKZSEMI.COM](http://WWW.HKZSEMI.COM)

### 60V N-Channel Enhancement Mode MOSFET

#### HM20N06D

##### General Features

$V_{DS} = 60V$   $I_D = 20A$

$R_{DS(ON)} < 40m\Omega$  @  $V_{GS}=10V$

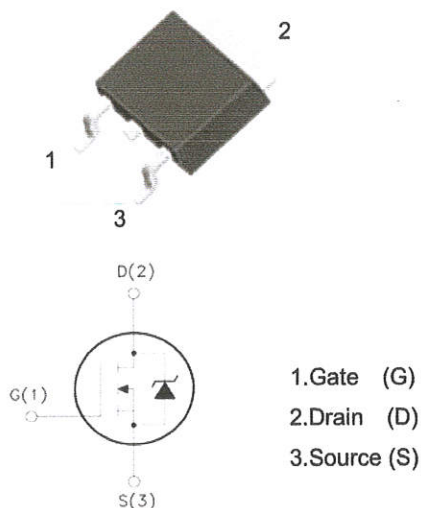
##### Application

Battery protection

Load switch

Uninterruptible power supply

#### TO-252



#### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise noted)

| Symbol                      | Parameter   | Rating     | Units              |
|-----------------------------|---|------------|--------------------|
| $V_{DS}$                    | Drain-Source Voltage                                  | 60         | V                  |
| $V_{GS}$                    | Gate-Source Voltage                                   | $\pm 20$   | V                  |
| $I_D@T_c=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 20         | A                  |
| $I_D@T_c=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 13         | A                  |
| $I_D@T_A=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 5          | A                  |
| $I_D@T_A=70^\circ\text{C}$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 4          | A                  |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>                     | 40         | A                  |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>            | 22         | mJ                 |
| $I_{AS}$                    | Avalanche Current                                     | 21         | A                  |
| $P_D@T_c=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>                  | 31.3       | W                  |
| $P_D@T_A=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>                  | 2          | W                  |
| $T_{STG}$                   | Storage Temperature Range                             | -55 to 150 | $^\circ\text{C}$   |
| $T_J$                       | Operating Junction Temperature Range                  | -55 to 150 | $^\circ\text{C}$   |
| $R_{\theta JA}$             | Thermal Resistance Junction-ambient <sup>1</sup>      | 62         | $^\circ\text{C/W}$ |
| $R_{\theta JC}$             | Thermal Resistance Junction-Case <sup>1</sup>         | 4          | $^\circ\text{C/W}$ |

### 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> =250uA   | 60   | ---   | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BVDSS Temperature Coefficient                  | Reference to 25°C, I <sub>D</sub> =1mA   | ---  | 0.044 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =15A  | ---  | 33    | 40   | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A  | ---  | 40    | 50   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         |  | 1.0  | ---   | 2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                             | ---  | -4.8  | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                      | ---  | ---   | 1    | uA    |
|                                     |  | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                      | ---  | ---   | 5    |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   | ---  | ---   | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =15A   | ---  | 25.3  | ---  | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                     | ---  | 2.5   | ---  | Ω     |
| Q <sub>g</sub>                      | Total Gate Charge (10V)                        | V <sub>DS</sub> =48V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A                      | ---  | 19    | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |  | ---  | 2.5   | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 5     | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3, I <sub>D</sub> =15A | ---  | 2.8   | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |  | ---  | 16.6  | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |  | ---  | 21.2  | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 5.6   | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz                                    | ---  | 1027  | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |  | ---  | 65    | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |  | ---  | 46    | ---  |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,6</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                                    | ---  | ---   | 20   | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,6</sup>           |  | ---  | ---   | 40   | A     |
| V <sub>SD</sub>                     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C                        | ---  | ---   | 1.2  | V     |
| t <sub>rr</sub>                     | Reverse Recovery Time                          | I <sub>F</sub> =15A, di/dt=100A/μs, T <sub>J</sub> =25°C                             | ---  | 12.2  | ---  | nS    |
| Q <sub>rr</sub>                     | Reverse Recovery Charge                        |  | ---  | 7.3   | ---  | nC    |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is VDD=25V,VGS=10V,L=0.1mH,IAS=21A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.



### Typical Characteristics

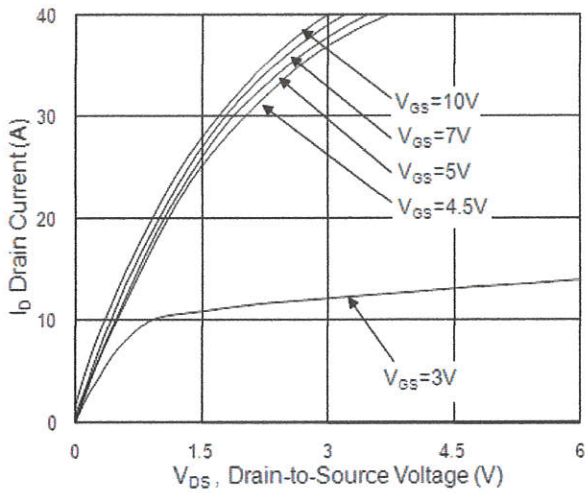


Fig.1 Typical Output Characteristics

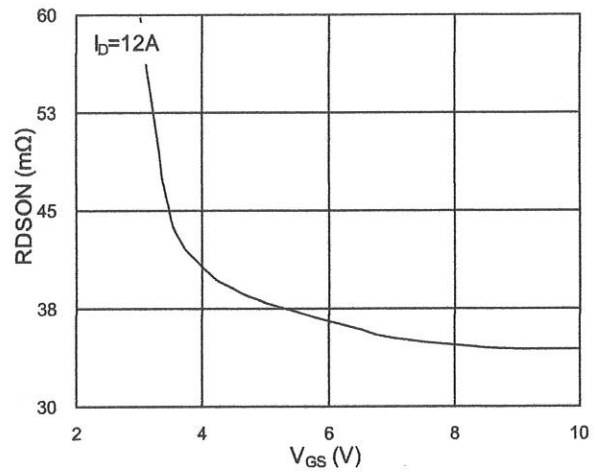


Fig.2 On-Resistance vs. Gate-Source

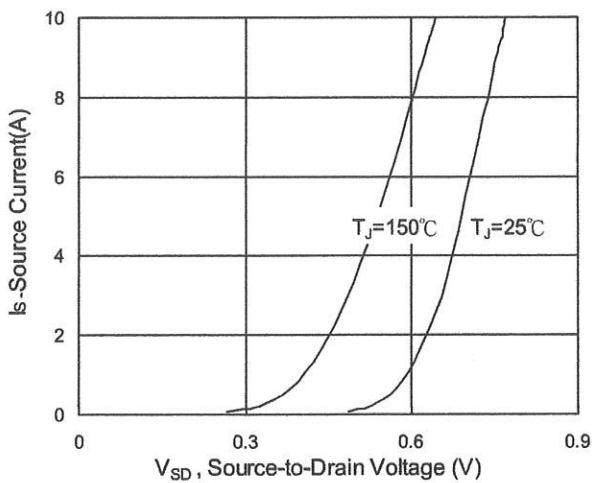


Fig.3 Forward Characteristics Of Reverse

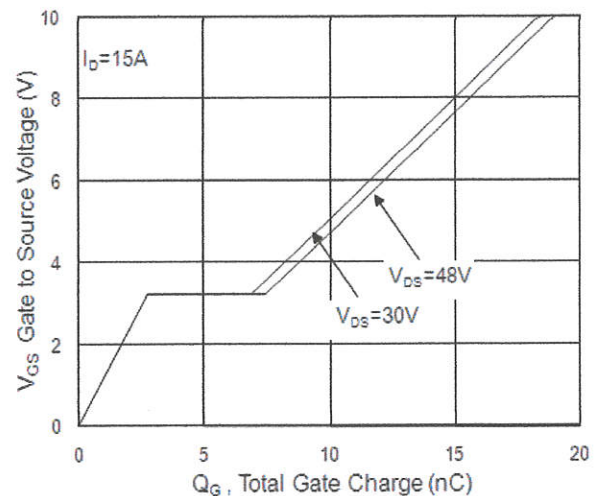


Fig.4 Gate-Charge Characteristics

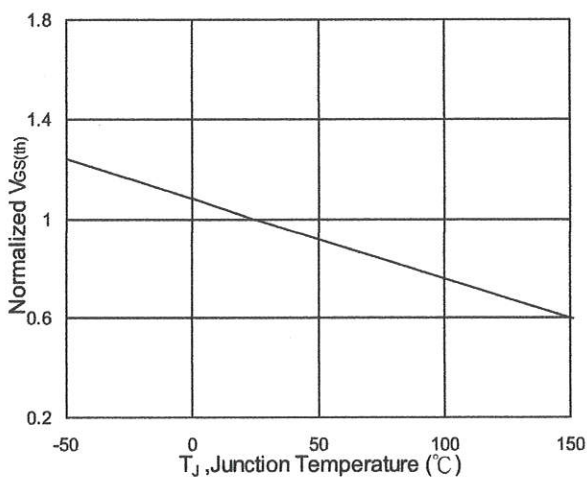


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

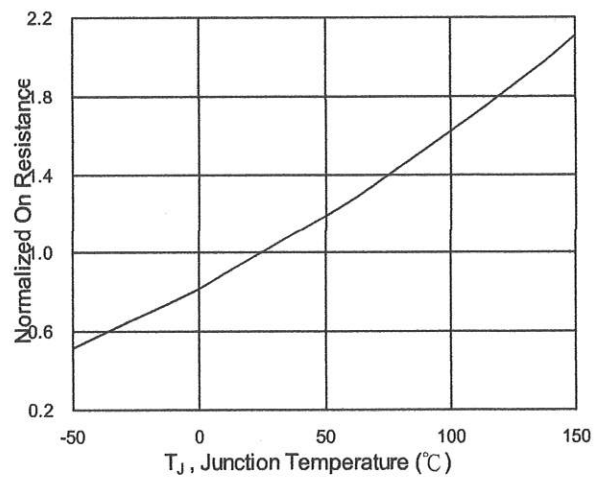


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

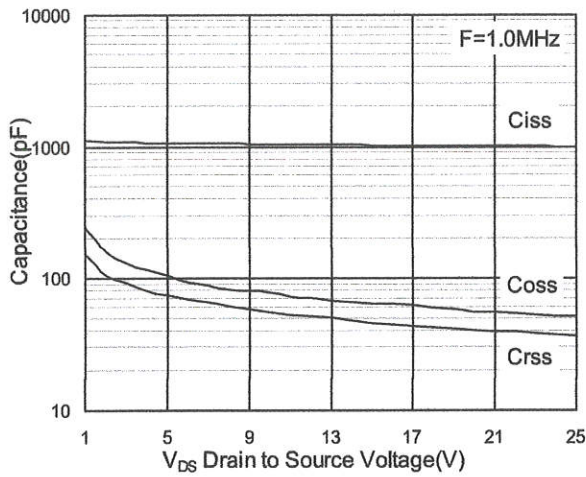


Fig.7 Capacitance

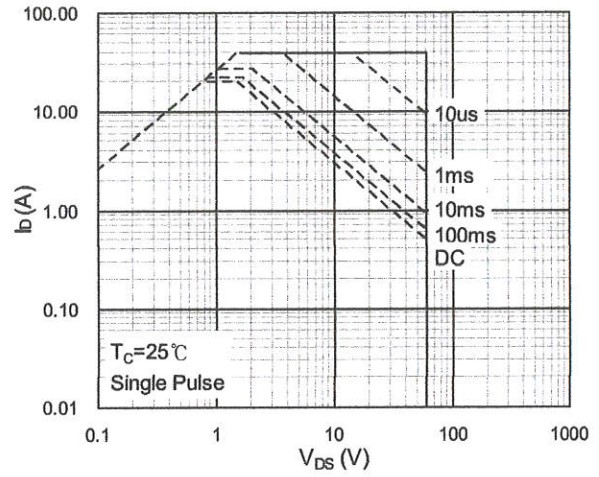


Fig.8 Safe Operating Area

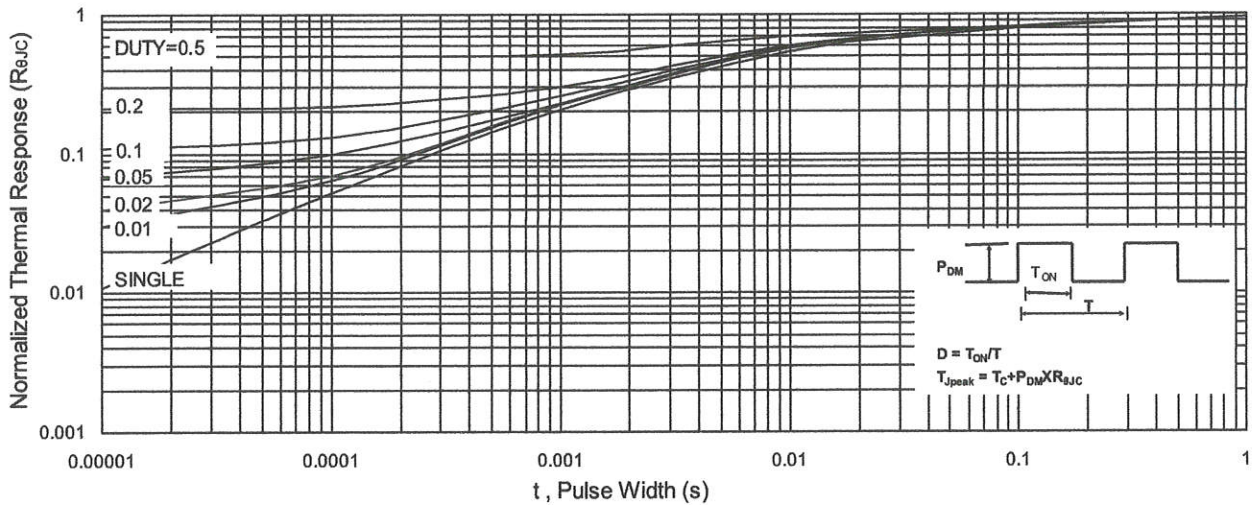


Fig.9 Normalized Maximum Transient Thermal Impedance

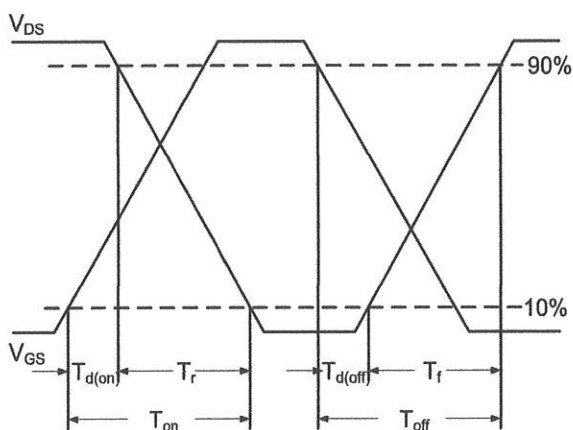


Fig.10 Switching Time Waveform

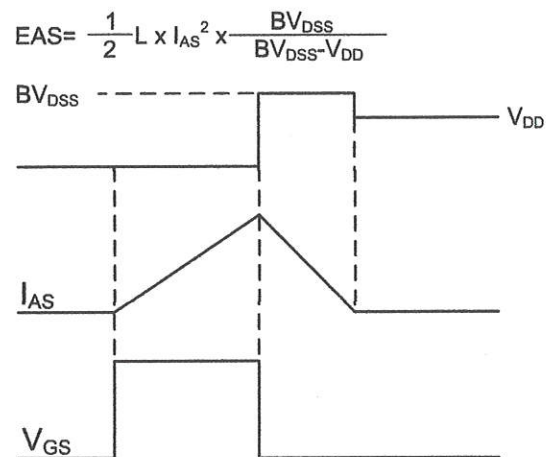
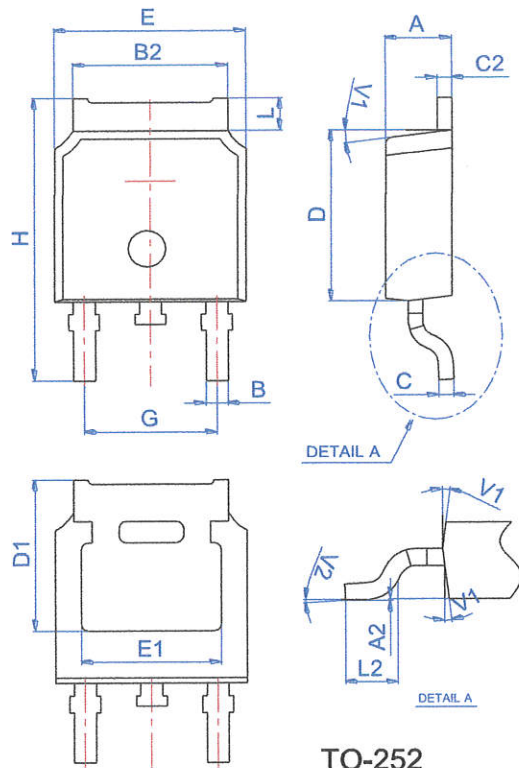


Fig.11 Unclamped Inductive Switching Waveform

### Package Mechanical Data: TO-252-3L



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |