

**Product Summary**

|               |                 |       |
|---------------|-----------------|-------|
| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
| 85V           | 3.5mΩ@10V       | 130A  |



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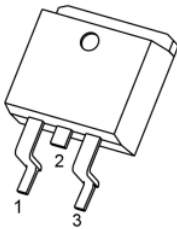
**Feature**

- Fast Switching
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- 100% Single Pulse avalanche energy Test

**Applications**

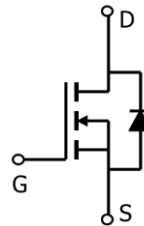
- Power switching application
- PWM Application
- DC-DC Converter

**Package**

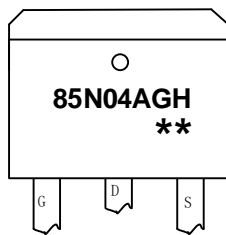


TO-263(1:G 2:D 3:S)

**Circuit diagram**



**Marking**



85N04AGH  
\*\*

=Device Code  
=Week Code

**Order Information**

| Device       | Package   | Unite/Tape |
|--------------|-----------|------------|
| SP85N04AGHTD | TO-263-3L | 800        |

### Absolute maximum ratings (Ta=25°C, unless otherwise noted)

| Parameter                                      | Symbol           | Rating     | Units |
|--|------------------|------------|-------|
| Drain-Source Voltage                           | V <sub>DS</sub>  | 85         | V     |
| Gate-Source Voltage                            | V <sub>GS</sub>  | ±20        | V     |
| Continuous Drain Current (Tc=25°C)             | I <sub>D</sub>   | 130        | A     |
| Pulsed Drain Current <sup>2</sup>              | I <sub>DM</sub>  | 520        | A     |
| Single Pulse Avalanche Energy <sup>3</sup>     | E <sub>AS</sub>  | 756        | mJ    |
| Total Power Dissipation <sup>4</sup> (Tc=25°C) | P <sub>D</sub>   | 140        | W     |
| Thermal Resistance Junction-Case <sup>1</sup>  | R <sub>θJC</sub> | 0.89       | °C/W  |
| Storage Temperature Range                      | T <sub>STG</sub> | -55 to 150 | °C    |
| Operating Junction Temperature Range           | T <sub>J</sub>   | -55 to 150 | °C    |

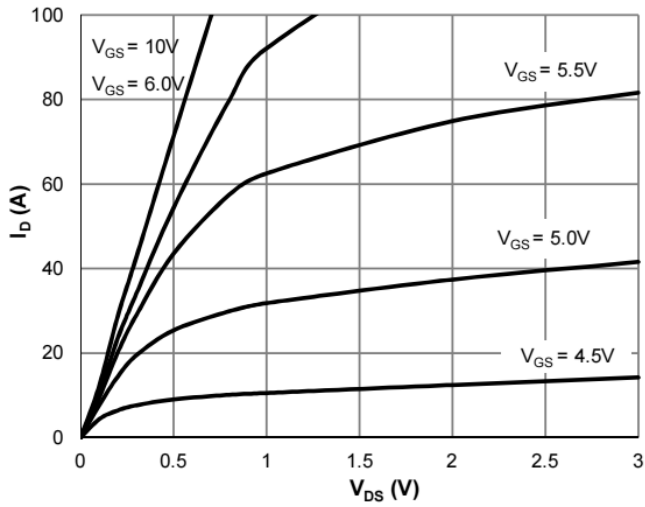
### Electrical characteristics (Ta=25°C, unless otherwise noted)

| Parameter                                      | Symbol            | Conditions                      | Min. | Typ. | Max. | Unit |
|--|-------------------|---------------------------------|------|------|------|------|
| <b>Static Characteristics</b>                  |                   |                                 |      |      |      |      |
| Drain-Source Breakdown Voltage                 | BV <sub>DSS</sub> | VGS=0V, ID=250uA                | 85   | ---  | ---  | V    |
| Drain-Source Leakage Current                   | IDSS              | VDS=85V, VGS=0V, TJ=25°C        | ---  | ---  | 1    | uA   |
| Gate-Source Leakage Current                    | IGSS              | VGS=±20V, VDS=0V                | ---  | ---  | ±100 | nA   |
| Gate Threshold Voltage                         | VGS(th)           | VGS=VDS, ID=250uA               | 2.0  | 2.9  | 4.0  | V    |
| Static Drain-Source On-Resistance <sup>2</sup> | RDS(ON)           | VGS=10V, ID=20A                 | ---  | 3.5  | 4.5  | mΩ   |
| <b>Dynamic Characteristics</b>                 |                   |                                 |      |      |      |      |
| Input Capacitance                              | Ciss              | VDS=40V, VGS=0V, f=1MHz         | ---  | 3451 | ---  | pF   |
| Output Capacitance                             | Coss              |                                 | ---  | 677  | ---  |      |
| Reverse Transfer Capacitance                   | Crss              |                                 | ---  | 18   | ---  |      |
| <b>Switching Characteristics</b>               |                   |                                 |      |      |      |      |
| Total Gate Charge                              | Qg                | VDS=40V, VGS=10V, ID=20A        | ---  | 26   | ---  | nC   |
| Gate-Source Charge                             | Qgs               |                                 | ---  | 10   | ---  |      |
| Gate-Drain Charge                              | Qgd               |                                 | ---  | 11   | ---  |      |
| Turn-On Delay Time                             | Td(on)            | VDD=40V, VGS=10V, RG=6Ω, ID=20A | ---  | 16   | ---  | ns   |
| Rise Time                                      | Tr                |                                 | ---  | 35   | ---  |      |
| Turn-Off Delay Time                            | Td(off)           |                                 | ---  | 33   | ---  |      |
| Fall Time                                      | Tf                |                                 | ---  | 22   | ---  |      |
| <b>Source-Drain Diode Characteristics</b>      |                   |                                 |      |      |      |      |
| Diode Forward Voltage <sup>2</sup>             | VSD               | VGS=0V, IS=1A, TJ=25°C          | ---  | ---  | 1.2  | V    |

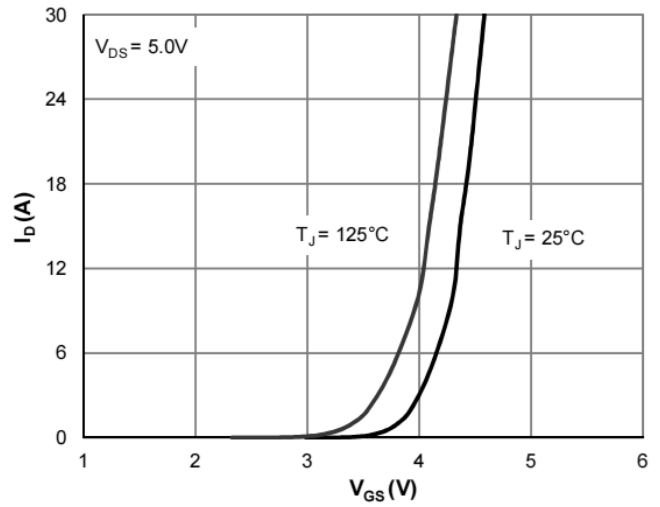
Note :

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width ≦ 300us, duty cycle ≦ 2%
- The EAS data shows Max. rating. The test condition is VDD=42.5V, VGS=10V, L=0.5mH, IAS=55A
- The power dissipation is limited by 150°C junction temperature

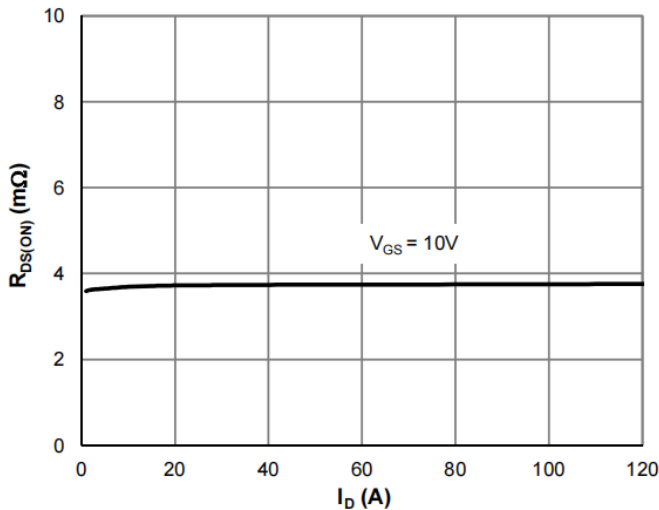
**Typical Characteristics**



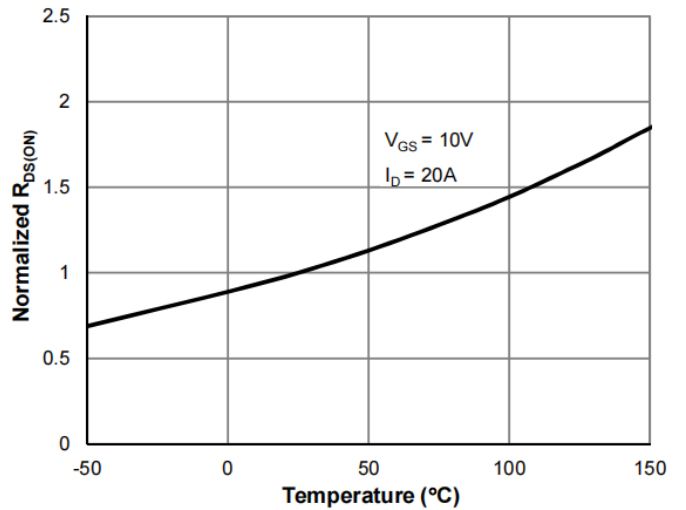
**Typical Output Characteristics**



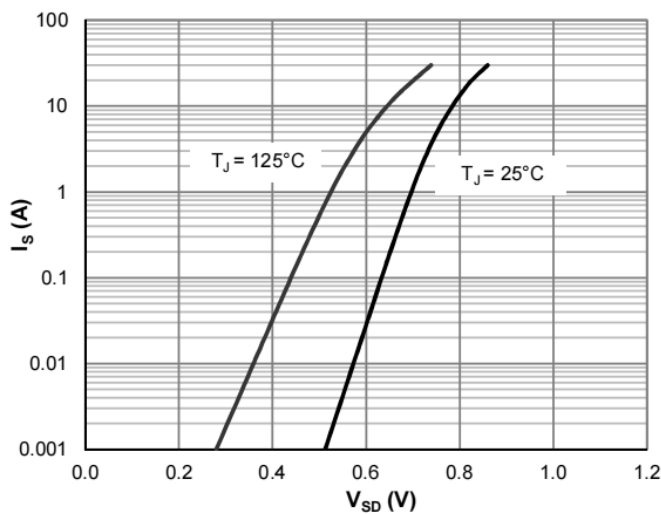
**Transfer Characteristics**



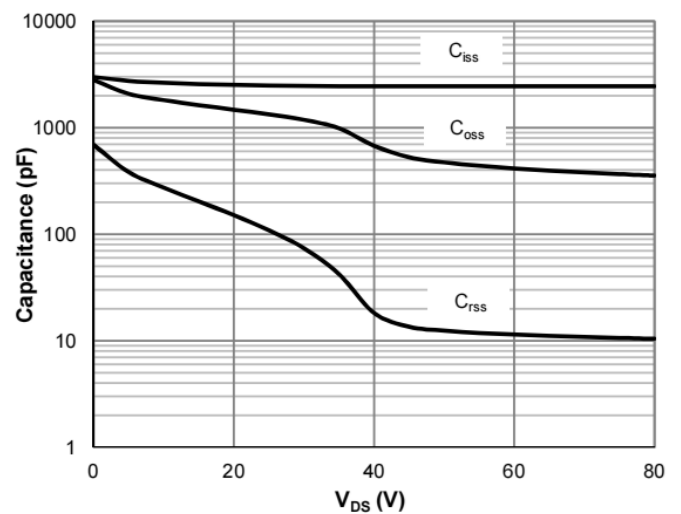
**On-Resistance vs. Drain Current**



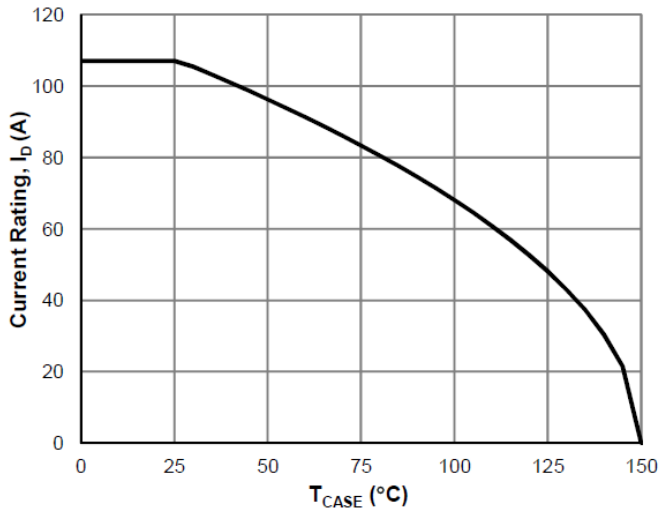
**On-Resistance vs. Junction Temperature**



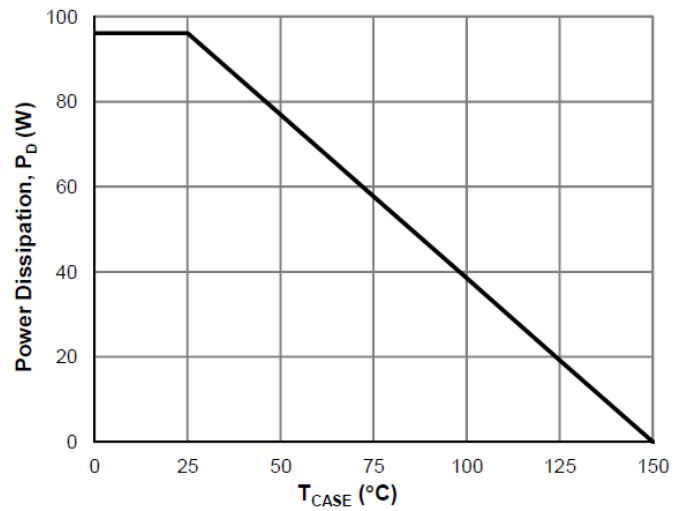
**Body-Diode Characteristics**



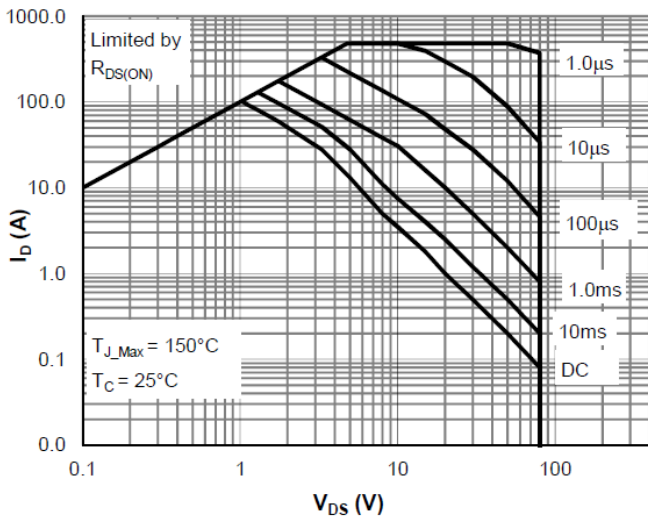
**Capacitance Characteristics**



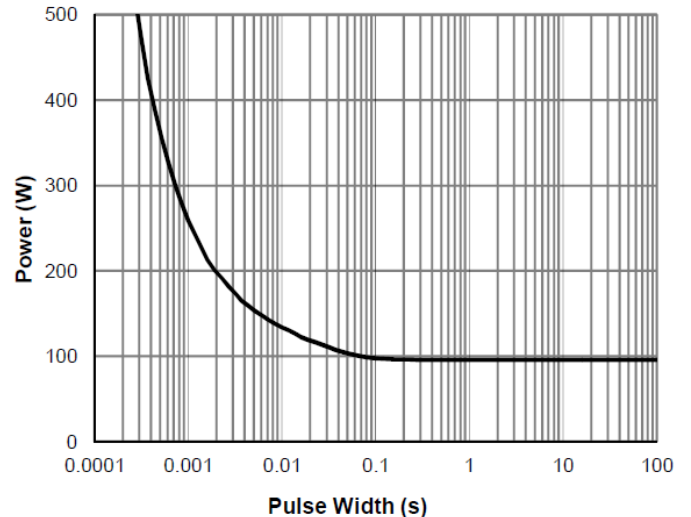
Current De-rating



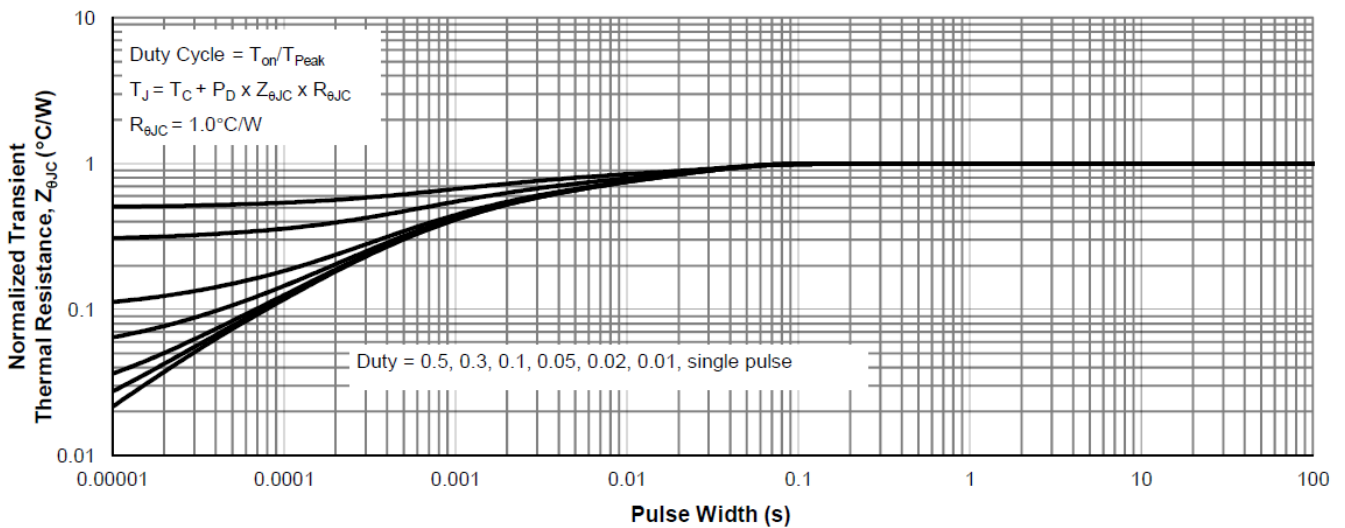
Power De-rating



Maximum Safe Operating Area

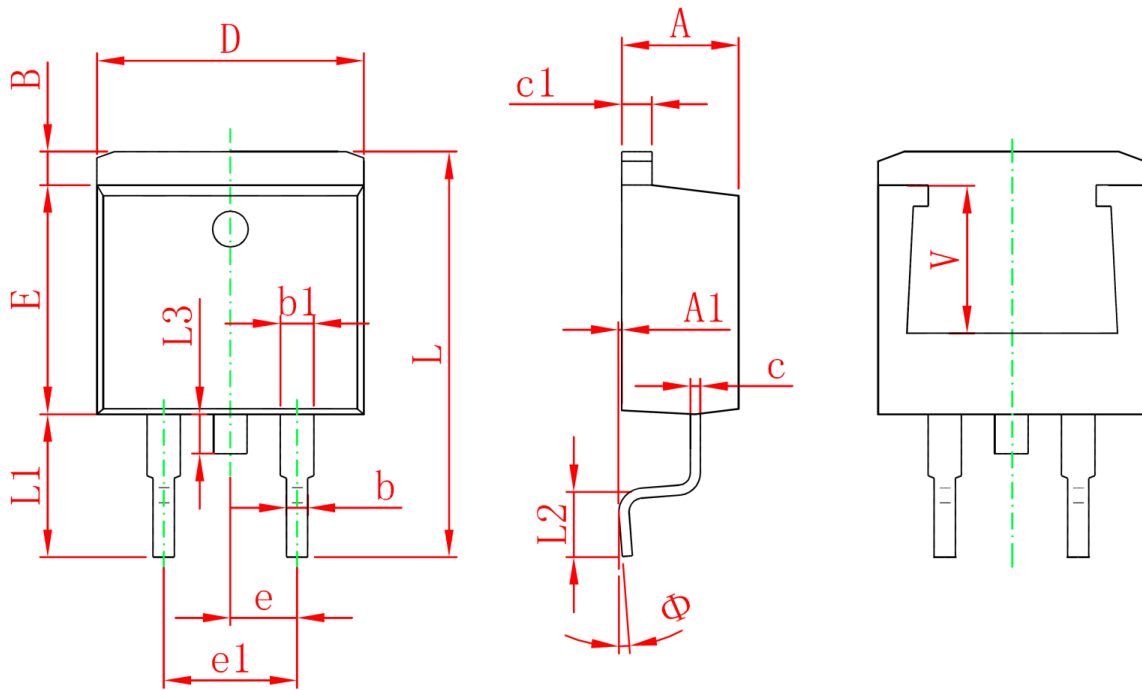


Single Pulse Power Rating, Junction-to-Case



Normalized Maximum Transient Thermal Impedance

**TO-263 Package Outline Dimensions**



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.470                     | 4.670  | 0.176                | 0.184 |
| A1     | 0.000                     | 0.150  | 0.000                | 0.006 |
| B      | 1.120                     | 1.420  | 0.044                | 0.056 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.310                     | 0.530  | 0.012                | 0.021 |
| c1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| D      | 10.010                    | 10.310 | 0.394                | 0.406 |
| E      | 8.500                     | 8.900  | 0.335                | 0.350 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| L      | 14.940                    | 15.500 | 0.588                | 0.610 |
| L1     | 4.950                     | 5.450  | 0.195                | 0.215 |
| L2     | 2.340                     | 2.740  | 0.092                | 0.108 |
| L3     | 1.300                     | 1.700  | 0.051                | 0.067 |
| $\Phi$ | 0°                        | 8°     | 0°                   | 8°    |
| V      | 5.600 REF.                |        | 0.220 REF.           |       |

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