



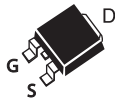
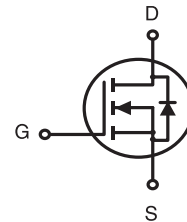
## N-Channel Logic Level Enhancement Mode Field Effect Transistor

### PRODUCT SUMMARY

| V <sub>DSS</sub> | I <sub>D</sub> | R <sub>DS(ON)</sub> (mΩ) Max |
|------------------|----------------|------------------------------|
| 60V              | 48A            | 9.0 @ V <sub>GS</sub> =10V   |

### FEATURES

- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- TO-252 and TO-251 Package.

STU SERIES  
TO-252AA(D-PAK)STD SERIES  
TO-251(I-PAK)

### ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C unless otherwise noted)

| Symbol                            | Parameter                                        |                      | Limit      | Units |
|-----------------------------------|--------------------------------------------------|----------------------|------------|-------|
| V <sub>DS</sub>                   | Drain-Source Voltage                             |                      | 60         | V     |
| V <sub>GS</sub>                   | Gate-Source Voltage                              |                      | ±20        | V     |
| I <sub>D</sub>                    | Drain Current-Continuous <sup>c</sup>            | T <sub>C</sub> =25°C | 48         | A     |
|                                   |                                                  | T <sub>C</sub> =70°C | 38.4       | A     |
| I <sub>DM</sub>                   | -Pulsed <sup>a c</sup>                           |                      | 140        | A     |
| E <sub>AS</sub>                   | Single Pulse Avalanche Energy <sup>d</sup>       |                      | 361        | mJ    |
| P <sub>D</sub>                    | Maximum Power Dissipation                        | T <sub>C</sub> =25°C | 42         | W     |
|                                   |                                                  | T <sub>C</sub> =70°C | 27         | W     |
| T <sub>J</sub> , T <sub>STG</sub> | Operating Junction and Storage Temperature Range |                      | -55 to 150 | °C    |

### THERMAL CHARACTERISTICS

|                  |                                         |    |      |
|------------------|-----------------------------------------|----|------|
| R <sub>θJC</sub> | Thermal Resistance, Junction-to-Case    | 3  | °C/W |
| R <sub>θJA</sub> | Thermal Resistance, Junction-to-Ambient | 50 | °C/W |

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### ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C unless otherwise noted)

| Symbol                                                 | Parameter                        | Conditions                                                                                     | Min | Typ  | Max  | Units |
|--------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------|-----|------|------|-------|
| OFF CHARACTERISTICS                                    |                                  |                                                                                                |     |      |      |       |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V , I <sub>D</sub> =250uA                                                    | 60  |      |      | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =48V , V <sub>GS</sub> =0V                                                     |     |      | 1    | uA    |
| I <sub>GSS</sub>                                       | Gate-Body Leakage Current        | V <sub>GS</sub> = ±20V , V <sub>DS</sub> =0V                                                   |     |      | ±100 | nA    |
| ON CHARACTERISTICS                                     |                                  |                                                                                                |     |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                                       | 2   | 3    | 4    | V     |
| R <sub>DS(ON)</sub>                                    | Drain-Source On-State Resistance | V <sub>GS</sub> =10V , I <sub>D</sub> =24A                                                     |     | 7.5  | 9.0  | m ohm |
| g <sub>FS</sub>                                        | Forward Transconductance         | V <sub>DS</sub> =10V , I <sub>D</sub> =24A                                                     |     | 49   |      | S     |
| DYNAMIC CHARACTERISTICS <sup>b</sup>                   |                                  |                                                                                                |     |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V<br>f=1.0MHz                                           |     | 1670 |      | pF    |
| C <sub>oss</sub>                                       | Output Capacitance               |                                                                                                |     | 341  |      | pF    |
| C <sub>rSS</sub>                                       | Reverse Transfer Capacitance     |                                                                                                |     | 228  |      | pF    |
| SWITCHING CHARACTERISTICS <sup>b</sup>                 |                                  |                                                                                                |     |      |      |       |
| t <sub>D(ON)</sub>                                     | Turn-On Delay Time               | V <sub>DD</sub> =30V<br>I <sub>D</sub> =1A<br>V <sub>GS</sub> =10V<br>R <sub>GEN</sub> = 6 ohm |     | 53   |      | ns    |
| t <sub>r</sub>                                         | Rise Time                        |                                                                                                |     | 75   |      | ns    |
| t <sub>D(OFF)</sub>                                    | Turn-Off Delay Time              |                                                                                                |     | 46   |      | ns    |
| t <sub>f</sub>                                         | Fall Time                        |                                                                                                |     | 23   |      | ns    |
| Q <sub>g</sub>                                         | Total Gate Charge                | V <sub>DS</sub> =30V,I <sub>D</sub> =24A,V <sub>GS</sub> =10V                                  |     | 26   |      | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge               | V <sub>DS</sub> =30V,I <sub>D</sub> =24A,<br>V <sub>GS</sub> =10V                              |     | 4    |      | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                |                                                                                                |     | 12   |      | nC    |
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS |                                  |                                                                                                |     |      |      |       |
| V <sub>SD</sub>                                        | Diode Forward Voltage            | V <sub>GS</sub> =0V,I <sub>S</sub> =8A                                                         |     | 0.77 | 1.3  | V     |

### Notes

- Pulse Test: Pulse Width ≤ 10us, Duty Cycle ≤ 1%.
- Guaranteed by design, not subject to production testing.
- Drain current limited by maximum junction temperature.
- Starting T<sub>J</sub>=25°C, L=0.5mH, V<sub>DD</sub> = 30V. (See Figure13)
- Mounted on FR4 Board of 1 inch<sup>2</sup> , 2oz.

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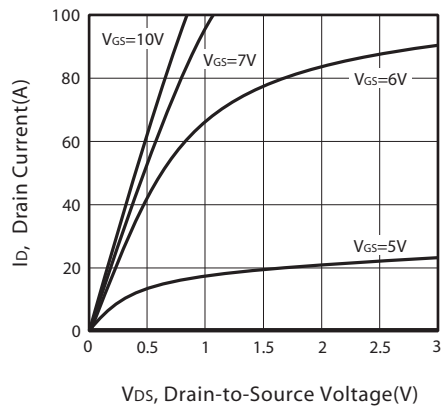


Figure 1. Output Characteristics

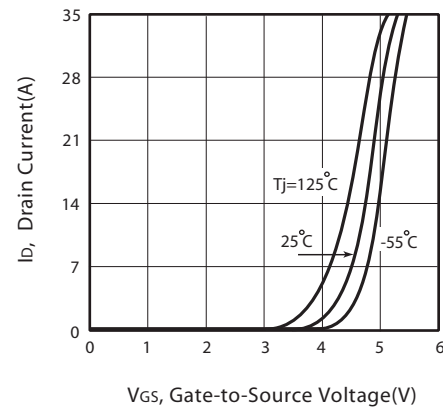


Figure 2. Transfer Characteristics

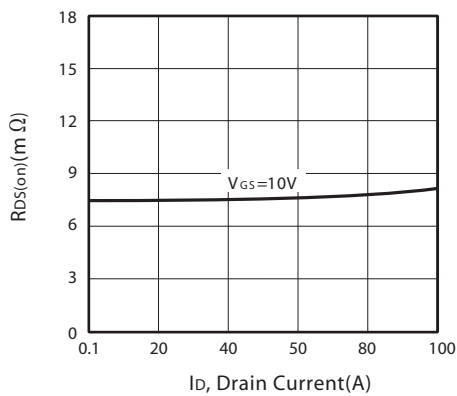


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

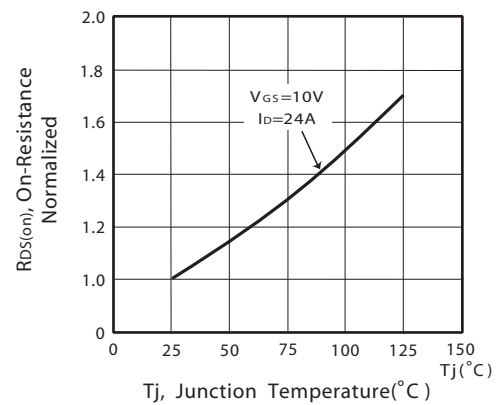


Figure 4. On-Resistance Variation with Drain Current and Temperature

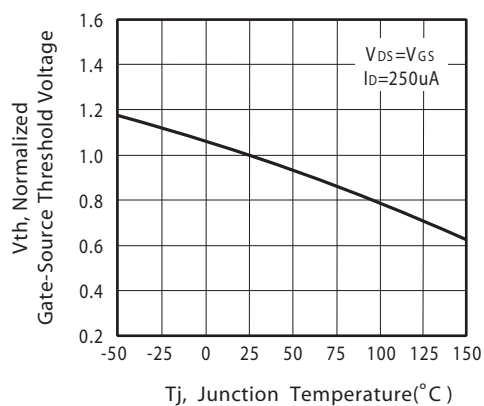


Figure 5. Gate Threshold Variation with Temperature

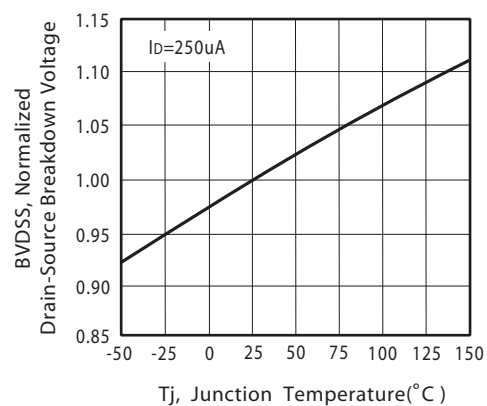


Figure 6. Breakdown Voltage Variation with Temperature

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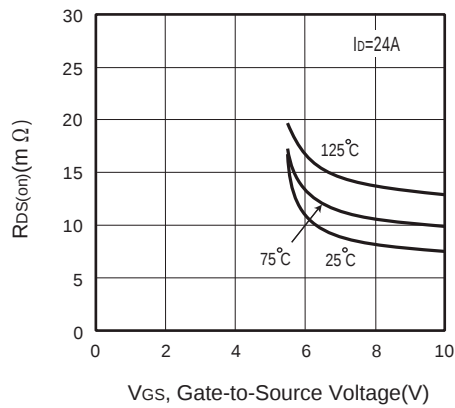


Figure 7. On-Resistance vs. Gate-Source Voltage

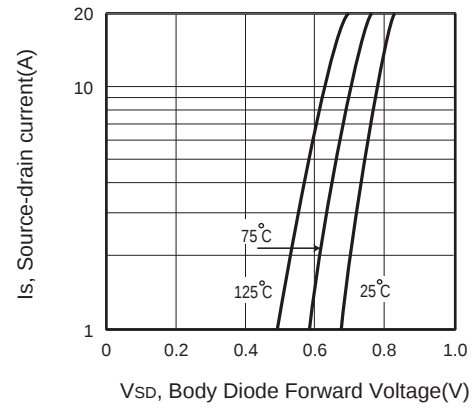


Figure 8. Body Diode Forward Voltage Variation with Source Current

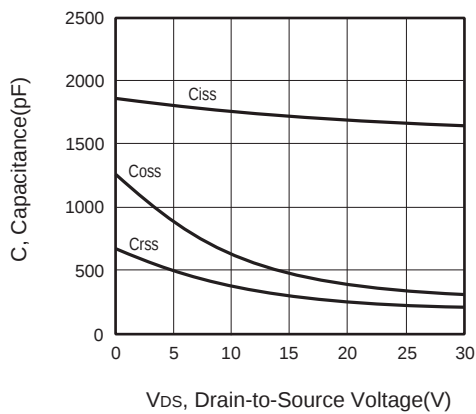


Figure 9. Capacitance

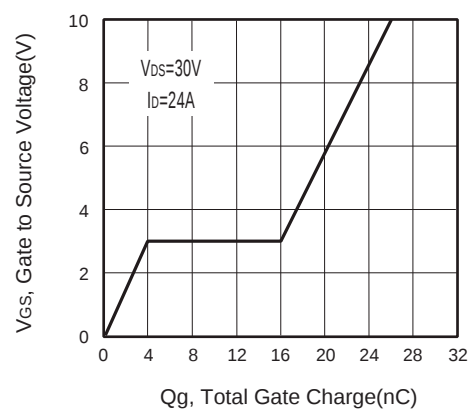


Figure 10. Gate Charge

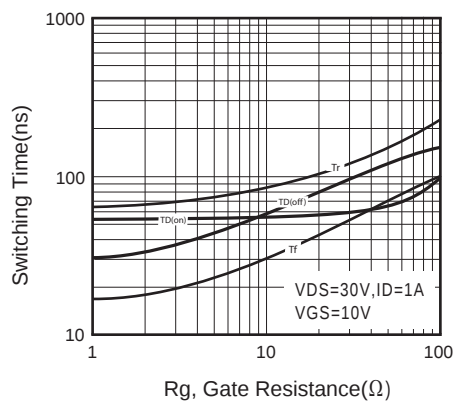


Figure 11. switching characteristics

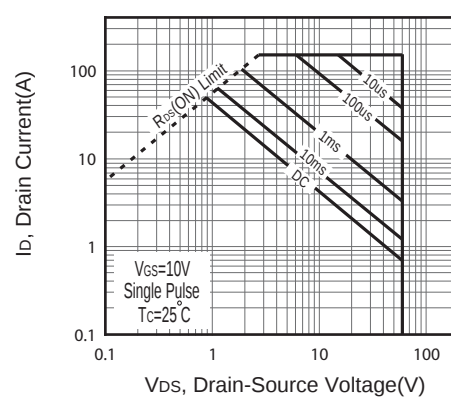
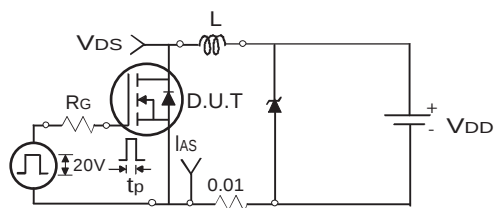


Figure 12. Maximum Safe Operating Area

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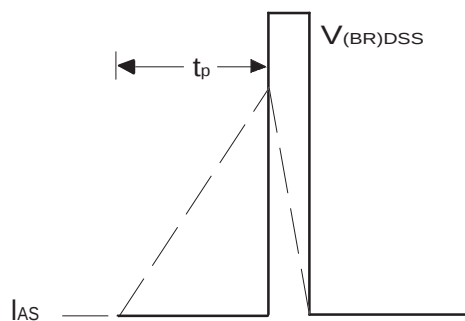
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Uncamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

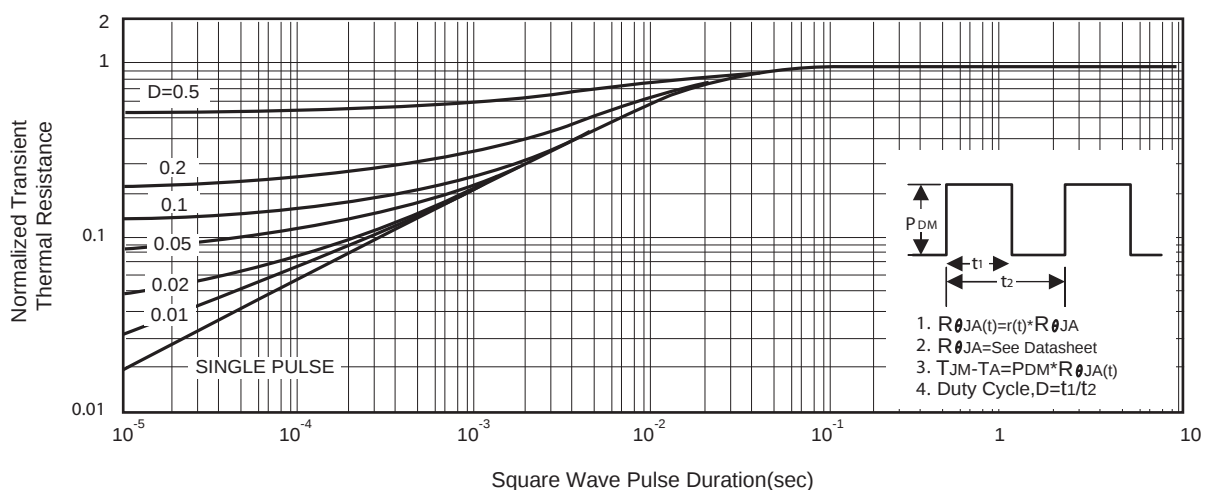


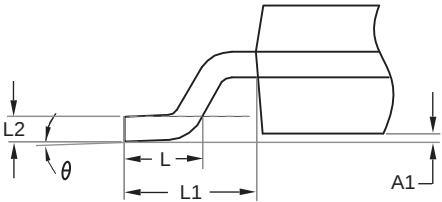
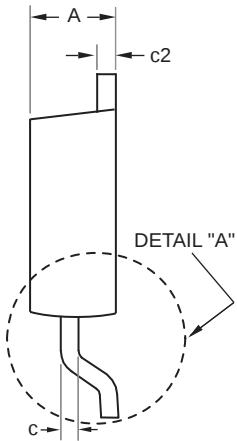
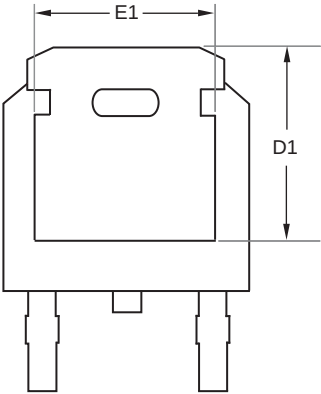
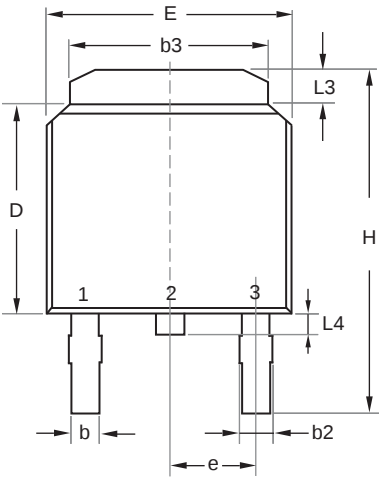
Figure 14. Normalized Thermal Transient Impedance Curve

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TO-252



DETAIL "A"

| SYMBOLS  | MILLIMETERS |        |
|----------|-------------|--------|
|          | MIN         | MAX    |
| A        | 2.200       | 2.380  |
| A1       | 0.000       | 0.127  |
| b        | 0.635       | 0.889  |
| b2       | 0.762       | 1.143  |
| b3       | 5.200       | 5.460  |
| c        | 0.450       | 0.600  |
| c2       | 0.450       | 0.580  |
| D        | 6.000       | 6.223  |
| D1       | 5.210       | 5.380  |
| e        | 2.286 BSC   |        |
| E        | 6.400       | 6.731  |
| E1       | 4.318       | 4.900  |
| H        | 9.400       | 10.400 |
| L        | 1.400       | 1.770  |
| L1       | 2.743 REF   |        |
| L2       | 0.508 BSC   |        |
| L3       | 0.890       | 1.270  |
| L4       | 0.640       | 1.010  |
| $\theta$ | 0°          | 10°    |

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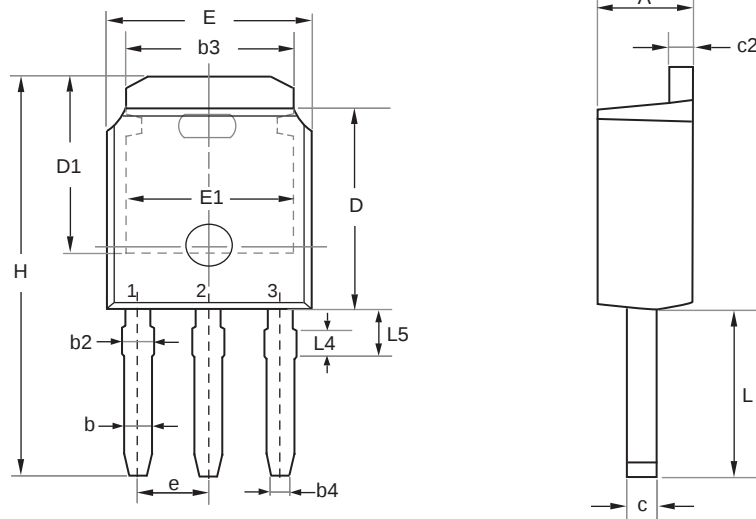
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### PACKAGE OUTLINE DIMENSIONS

#### TO-251



| SYMBOL | MILLIMETERS |        |
|--------|-------------|--------|
|        | MIN         | MAX    |
| E      | 6.350       | 6.731  |
| L      | 3.700       | 4.400  |
| L4     | 0.698 REF   |        |
| L5     | 0.972       | 1.226  |
| D      | 5.970       | 6.223  |
| H      | 9.670       | 11.450 |
| b      | 0.630       | 0.850  |
| b2     | 0.760       | 1.140  |
| b3     | 4.950       | 5.460  |
| b4     | 0.450       | 0.550  |
| e      | 2.286 BSC   |        |
| A      | 2.180       | 2.390  |
| c      | 0.400       | 0.610  |
| c2     | 0.400       | 0.610  |
| D1     | 5.100       | ---    |
| E1     | 4.318       | ---    |

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TO-251 Tube

TO-252 Reel

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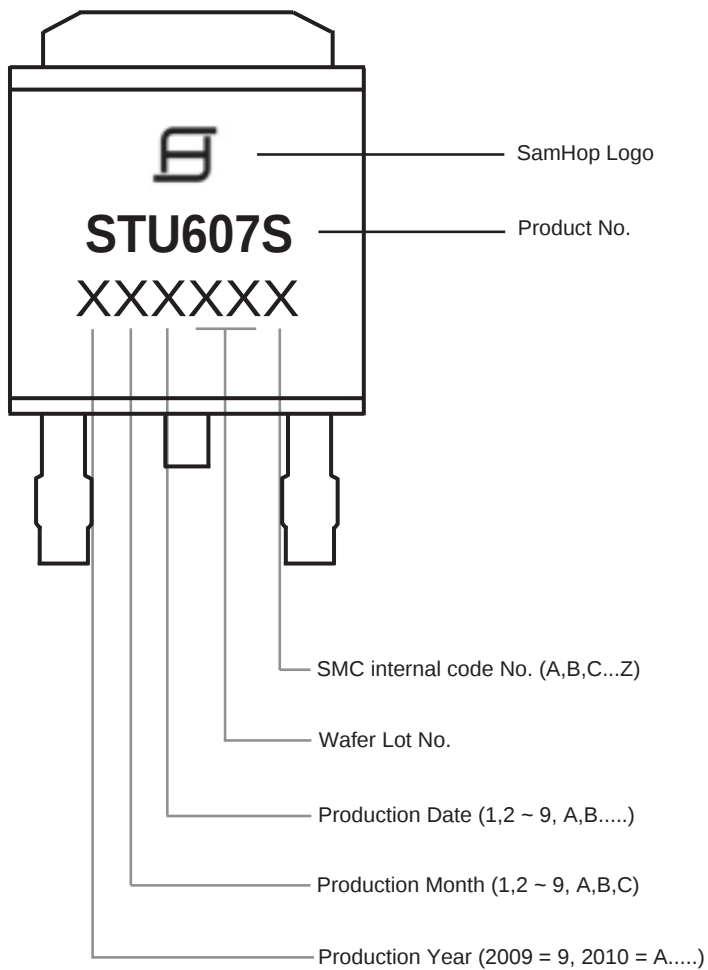
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### TOP MARKING DEFINITION

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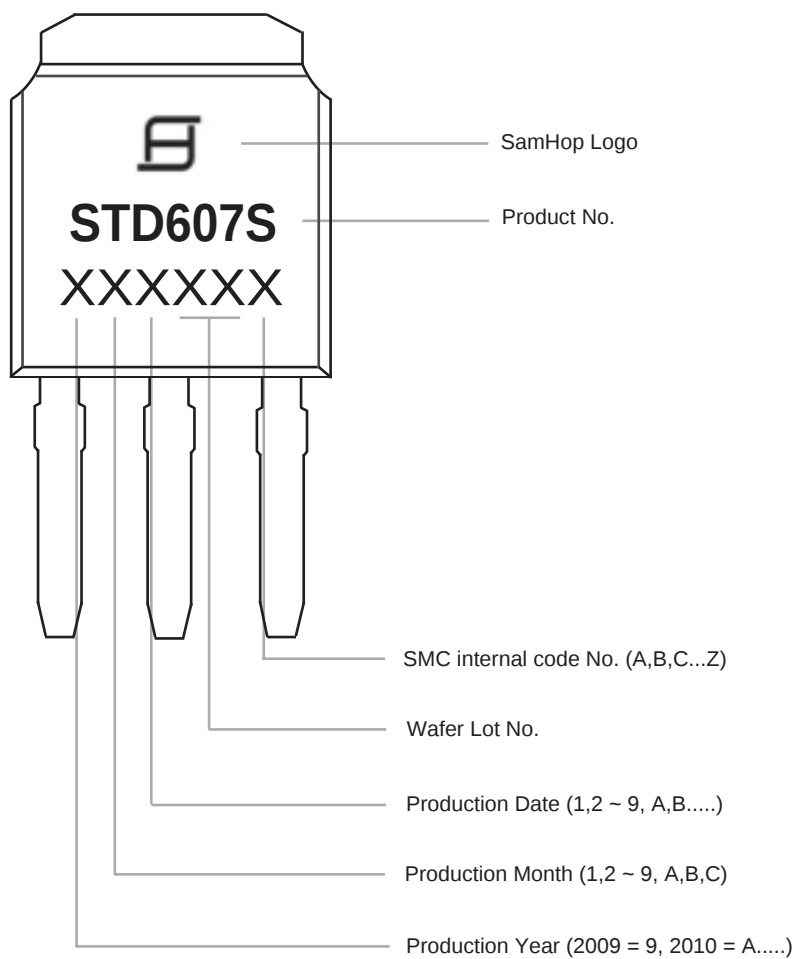
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