



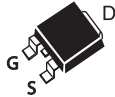
## N-Channel Logic Level Enhancement Mode Field Effect Transistor

### PRODUCT SUMMARY

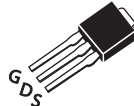
| V <sub>DSS</sub> | I <sub>D</sub> | R <sub>DS(ON)</sub> (mΩ) Typ |
|------------------|----------------|------------------------------|
| 200V             | 15A            | 190 @ V <sub>GS</sub> =10V   |

### FEATURES

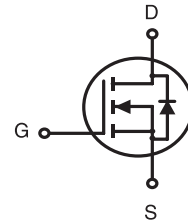
- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- TO-252 and TO-251 Package.



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                             |                      | 200        | V     |
| V <sub>GS</sub>                   | Gate-Source Voltage                              |                      | ±20        | V     |
| I <sub>D</sub>                    | Drain Current-Continuous <sup>a e</sup>          | T <sub>C</sub> =25°C | 15         | A     |
|                                   |                                                  | T <sub>C</sub> =70°C | 12         | A     |
| I <sub>DM</sub>                   | -Pulsed <sup>b</sup>                             |                      | 44         | A     |
| E <sub>AS</sub>                   | Single Pulse Avalanche Energy <sup>d</sup>       |                      | 64         | mJ    |
| P <sub>D</sub>                    | Maximum Power Dissipation                        | T <sub>C</sub> =25°C | 78         | W     |
|                                   |                                                  | T <sub>C</sub> =70°C | 50         | 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    | 1.6 | °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> =10mA                                                      | 200 |      |      | V     |
| I <sub>DSS</sub>                                                             | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =160V , 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                                        | 1   | 2    | 3    | V     |
| R <sub>DS(ON)</sub>                                                          | Drain-Source On-State Resistance | V <sub>GS</sub> =10V , I <sub>D</sub> =7.5A                                                     |     | 190  | 235  | m ohm |
| g <sub>FS</sub>                                                              | Forward Transconductance         | V <sub>DS</sub> =10V , I <sub>D</sub> =7.5A                                                     |     | 8    |      | S     |
| DYNAMIC CHARACTERISTICS <sup>c</sup>                                         |                                  |                                                                                                 |     |      |      |       |
| C <sub>iss</sub>                                                             | Input Capacitance                | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V<br>f=1.0MHz                                            |     | 1615 |      | pF    |
| C <sub>oss</sub>                                                             | Output Capacitance               |                                                                                                 |     | 85   |      | pF    |
| C <sub>RSS</sub>                                                             | Reverse Transfer Capacitance     |                                                                                                 |     | 64   |      | pF    |
| SWITCHING CHARACTERISTICS <sup>c</sup>                                       |                                  |                                                                                                 |     |      |      |       |
| t <sub>D(ON)</sub>                                                           | Turn-On Delay Time               | V <sub>DD</sub> =100V<br>I <sub>D</sub> =1A<br>V <sub>GS</sub> =10V<br>R <sub>GEN</sub> = 6 ohm |     | 35   |      | ns    |
| t <sub>r</sub>                                                               | Rise Time                        |                                                                                                 |     | 31   |      | ns    |
| t <sub>D(OFF)</sub>                                                          | Turn-Off Delay Time              |                                                                                                 |     | 54   |      | ns    |
| t <sub>f</sub>                                                               | Fall Time                        |                                                                                                 |     | 16   |      | ns    |
| Q <sub>g</sub>                                                               | Total Gate Charge                | V <sub>DS</sub> =100V,I <sub>D</sub> =1A,V <sub>GS</sub> =10V                                   |     | 21.4 |      | nC    |
| Q <sub>gs</sub>                                                              | Gate-Source Charge               | V <sub>DS</sub> =100V,I <sub>D</sub> =1A,<br>V <sub>GS</sub> =10V                               |     | 2.7  |      | nC    |
| Q <sub>gd</sub>                                                              | Gate-Drain Charge                |                                                                                                 |     | 7.2  |      | nC    |
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS                       |                                  |                                                                                                 |     |      |      |       |
| V <sub>SD</sub>                                                              | Diode Forward Voltage            | V <sub>GS</sub> =0V,I <sub>S</sub> =5A                                                          |     | 0.81 | 1.3  | V     |
| Notes                                                                        |                                  |                                                                                                 |     |      |      |       |
| a.Surface Mounted on FR4 Board,t ≤ 10sec.                                    |                                  |                                                                                                 |     |      |      |       |
| b.Pulse Test:Pulse Width ≤ 300us, Duty Cycle ≤ 2%.                           |                                  |                                                                                                 |     |      |      |       |
| c.Guaranteed by design, not subject to production testing.                   |                                  |                                                                                                 |     |      |      |       |
| d.Starting T <sub>J</sub> =25°C,L=0.5mH,V <sub>DD</sub> = 50V.(See Figure13) |                                  |                                                                                                 |     |      |      |       |
| e.Drain current limited by maximum junction temperature.                     |                                  |                                                                                                 |     |      |      |       |

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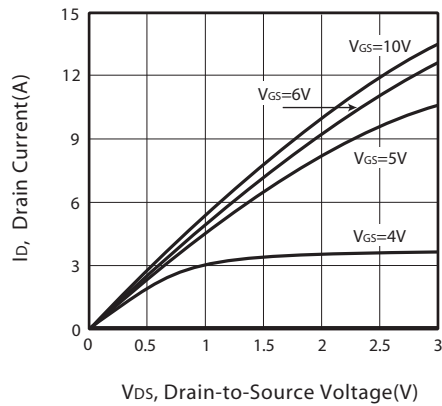


Figure 1. Output Characteristics

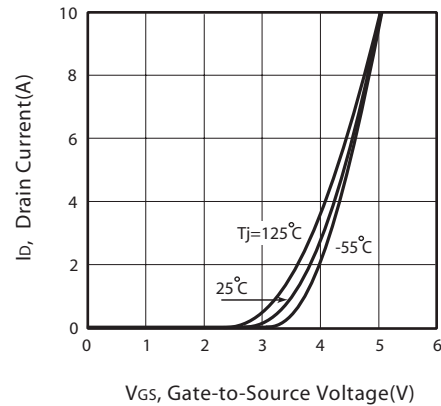


Figure 2. Transfer Characteristics

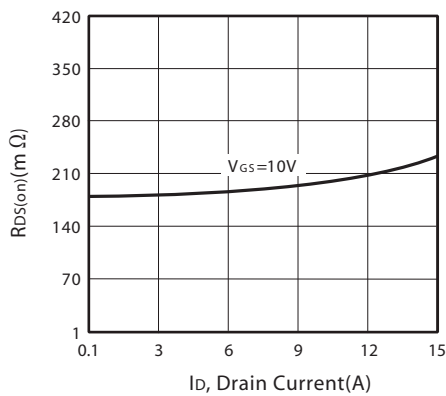


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

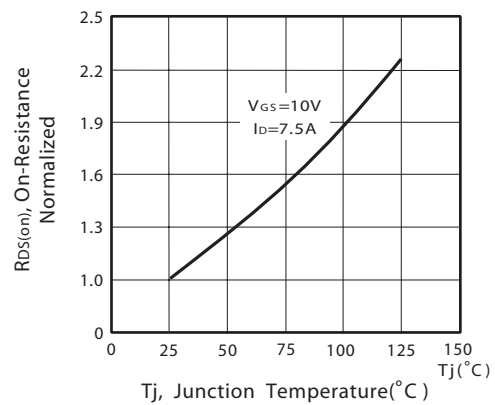


Figure 4. On-Resistance Variation with Drain Current and Temperature

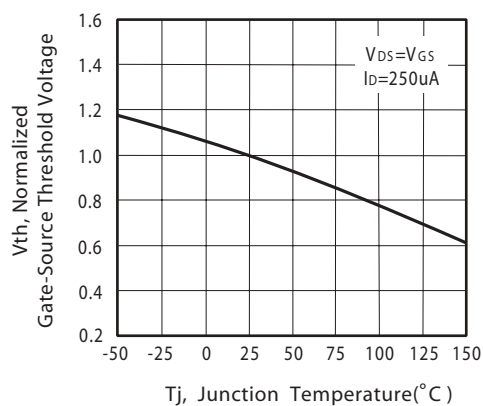


Figure 5. Gate Threshold Variation with Temperature

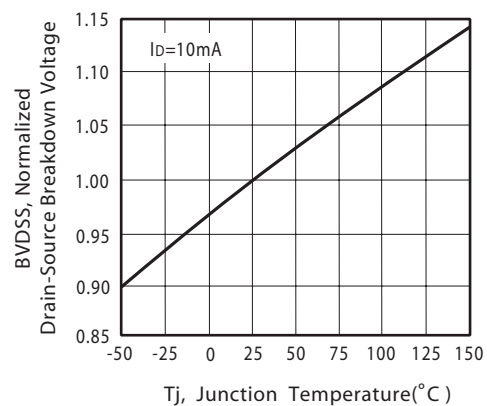


Figure 6. Breakdown Voltage Variation with Temperature

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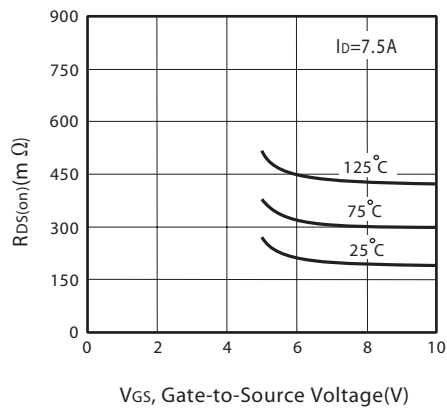


Figure 7. On-Resistance vs. Gate-Source Voltage

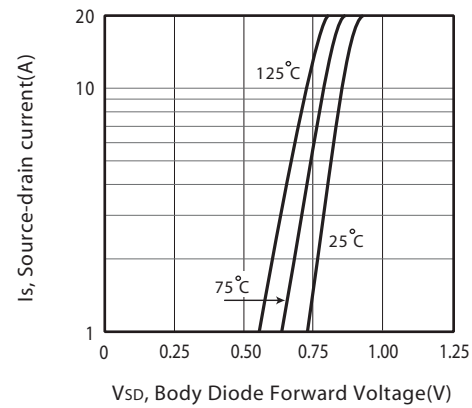


Figure 8. Body Diode Forward Voltage Variation with Source Current

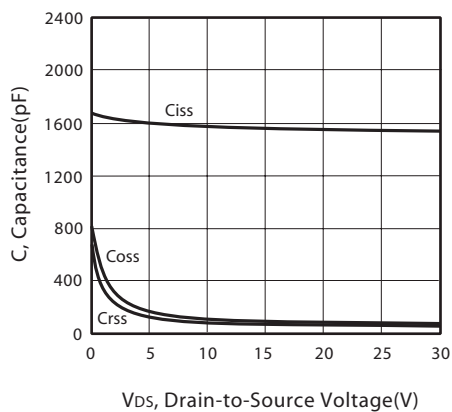


Figure 9. Capacitance

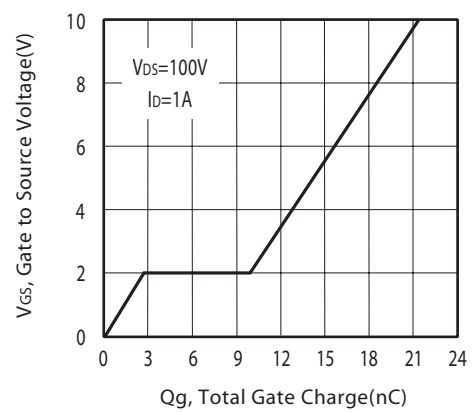


Figure 10. Gate Charge

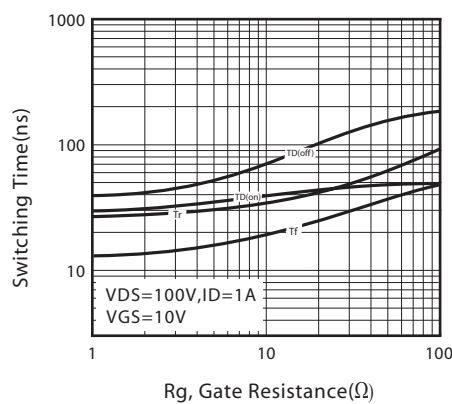


Figure 11. switching characteristics

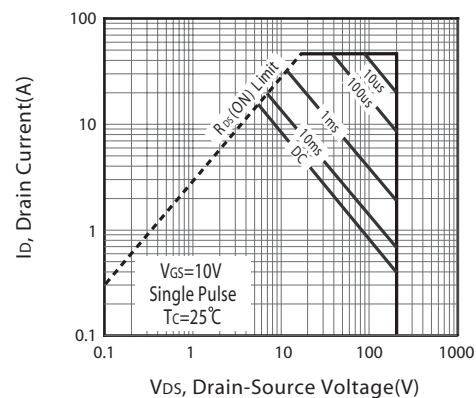
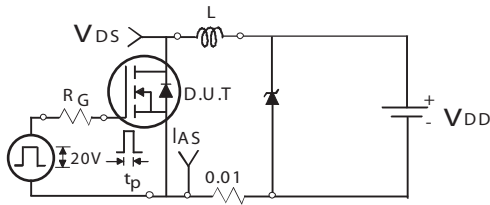


Figure 12. Maximum Safe Operating Area

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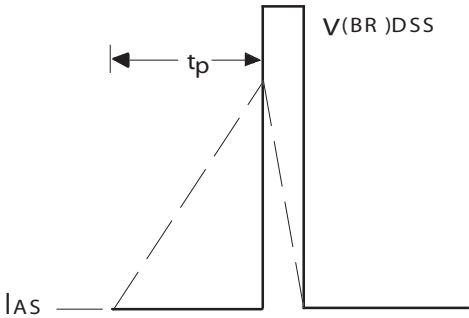
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Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

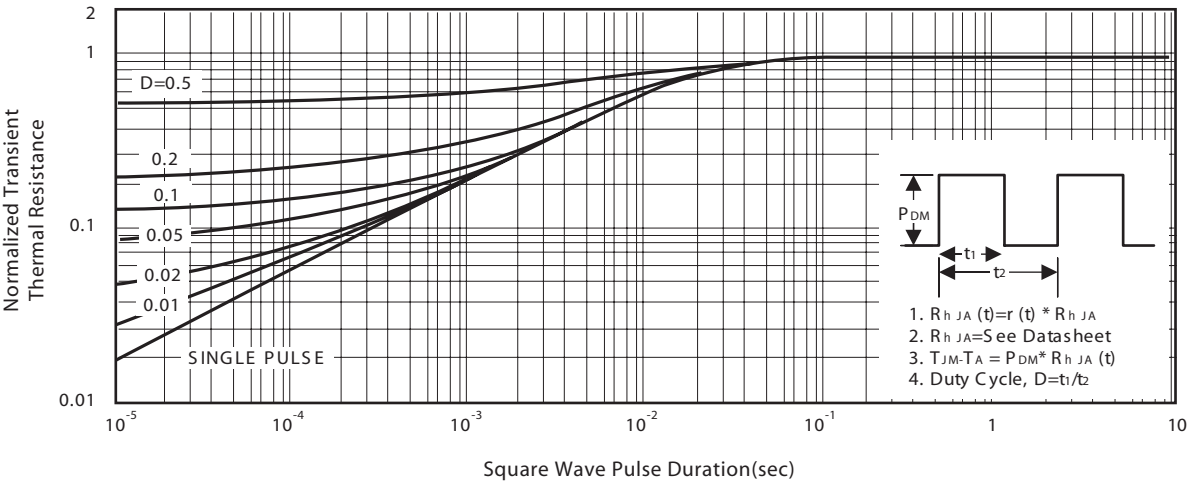


Figure 14. Normalized Thermal Transient Impedance Curve

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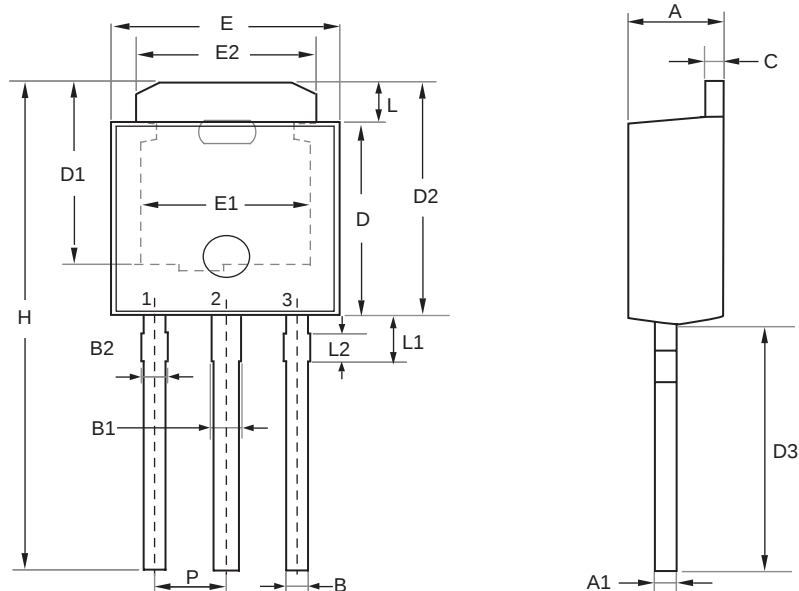
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### PACKAGE OUTLINE DIMENSIONS

TO-251



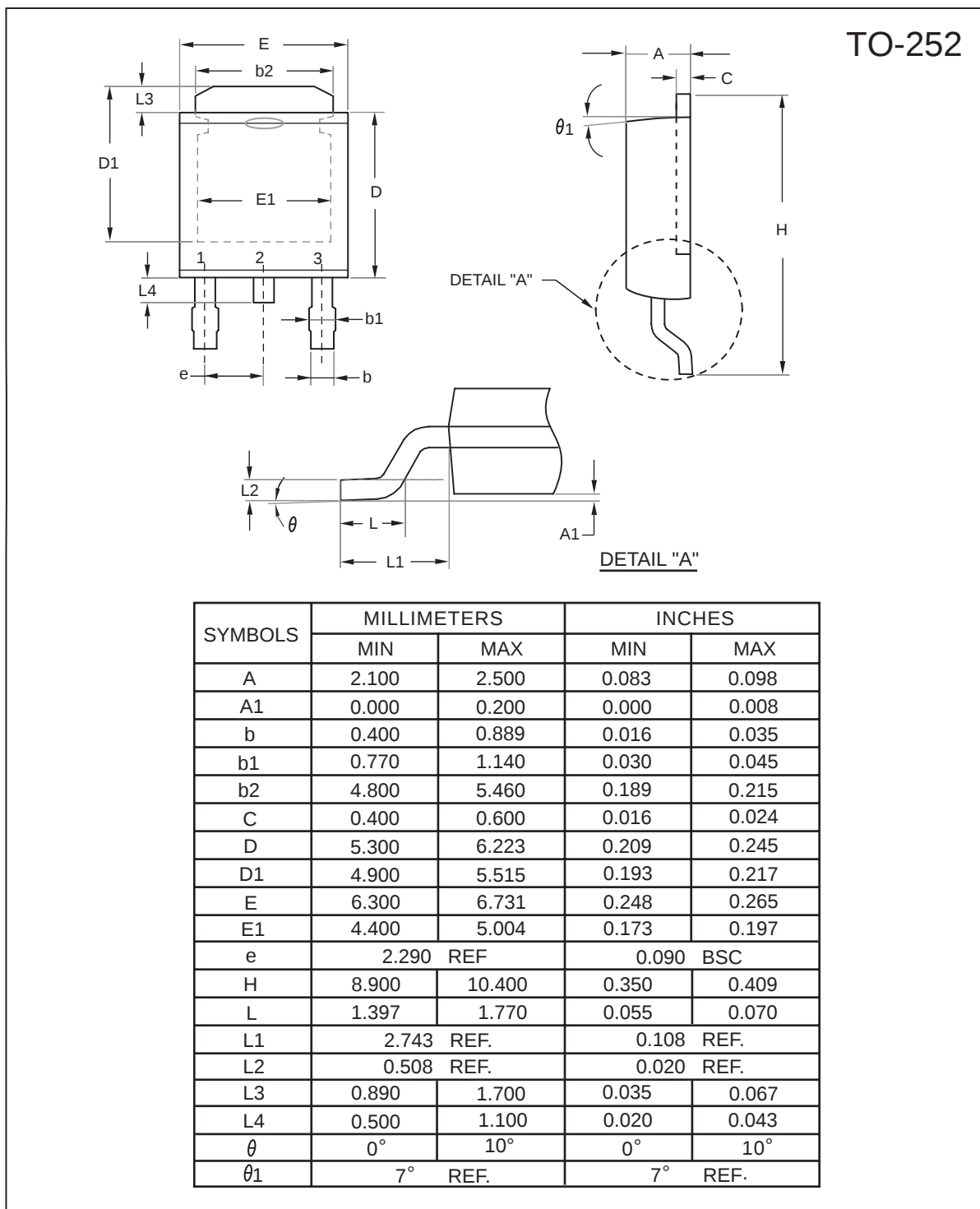
| SYMBOL | MILLIMETERS |        | INCHES    |       |
|--------|-------------|--------|-----------|-------|
|        | MIN         | MAX    | MIN       | MAX   |
| A      | 2.100       | 2.500  | 0.083     | 0.098 |
| A1     | 0.350       | 0.650  | 0.014     | 0.026 |
| B      | 0.400       | 0.800  | 0.016     | 0.031 |
| B1     | 0.650       | 1.050  | 0.026     | 0.041 |
| B2     | 0.500       | 0.900  | 0.020     | 0.035 |
| C      | 0.400       | 0.600  | 0.016     | 0.024 |
| D      | 5.300       | 5.700  | 0.209     | 0.224 |
| D1     | 4.900       | 5.300  | 0.193     | 0.209 |
| D2     | 6.700       | 7.300  | 0.264     | 0.287 |
| D3     | 7.000       | 8.000  | 0.276     | 0.315 |
| H      | 10.830      | 11.430 | 0.426     | 0.450 |
| E      | 6.300       | 6.700  | 0.248     | 0.264 |
| E1     | 4.600       | 4.900  | 0.181     | 0.193 |
| E2     | 4.800       | 5.200  | 0.189     | 0.205 |
| L      | 1.300       | 1.700  | 0.051     | 0.067 |
| L1     | 1.400       | 1.800  | 0.055     | 0.071 |
| L2     | 0.500       | 0.900  | 0.020     | 0.035 |
| P      | 2.300 BSC   |        | 0.091 BSC |       |

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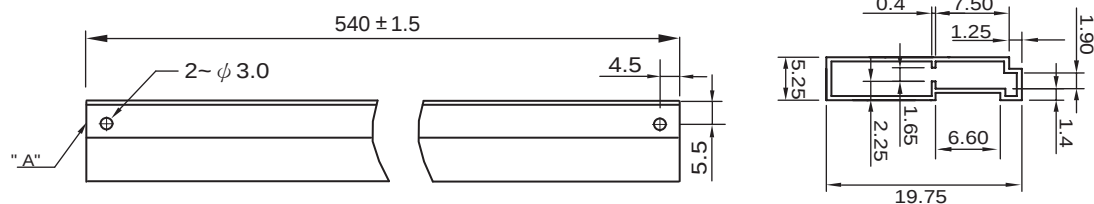
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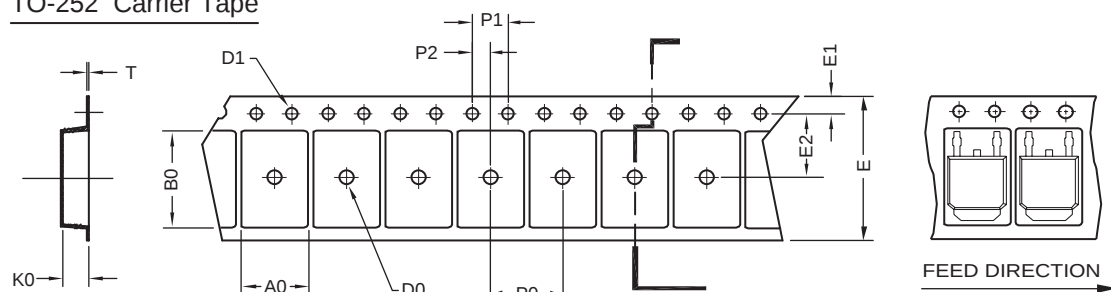
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### TO-251 Tube/TO-252 Tape and Reel Data

#### TO-251 Tube



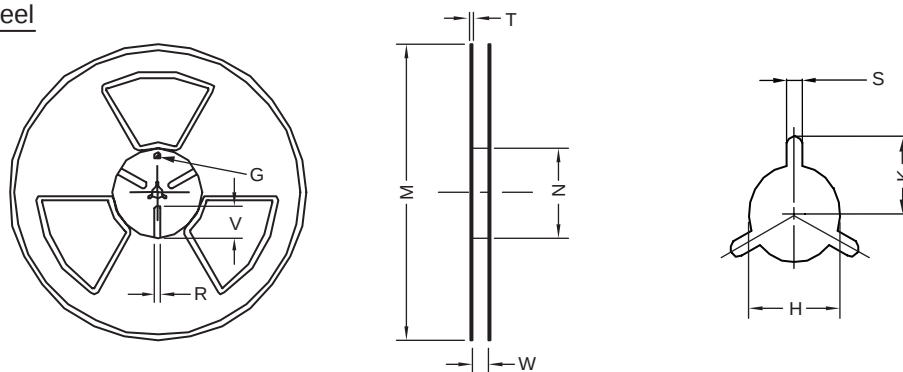
#### TO-252 Carrier Tape



UNIT:mm

| PACKAGE           | A0           | B0            | K0           | D0  | D1                   | E            | E1           | E2           | P0          | P1          | P2           | T            |
|-------------------|--------------|---------------|--------------|-----|----------------------|--------------|--------------|--------------|-------------|-------------|--------------|--------------|
| TO-252<br>(16 mm) | 6.96<br>±0.1 | 10.49<br>±0.1 | 2.79<br>±0.1 | φ 2 | φ 1.5<br>+0.1<br>- 0 | 16.0<br>±0.3 | 1.75<br>±0.1 | 7.5<br>±0.15 | 8.0<br>±0.1 | 4.0<br>±0.1 | 2.0<br>±0.15 | 0.3<br>±0.05 |

#### TO-252 Reel



UNIT:mm

| TAPE SIZE | REEL SIZE | M              | N             | W                    | T   | H                        | K    | S           | G   | R   | V   |
|-----------|-----------|----------------|---------------|----------------------|-----|--------------------------|------|-------------|-----|-----|-----|
| 16 mm     | φ 330     | φ 330<br>± 0.5 | φ 97<br>± 1.0 | 17.0<br>+ 1.5<br>- 0 | 2.2 | φ 13.0<br>+ 0.5<br>- 0.2 | 10.6 | 2.0<br>±0.5 | --- | --- | --- |

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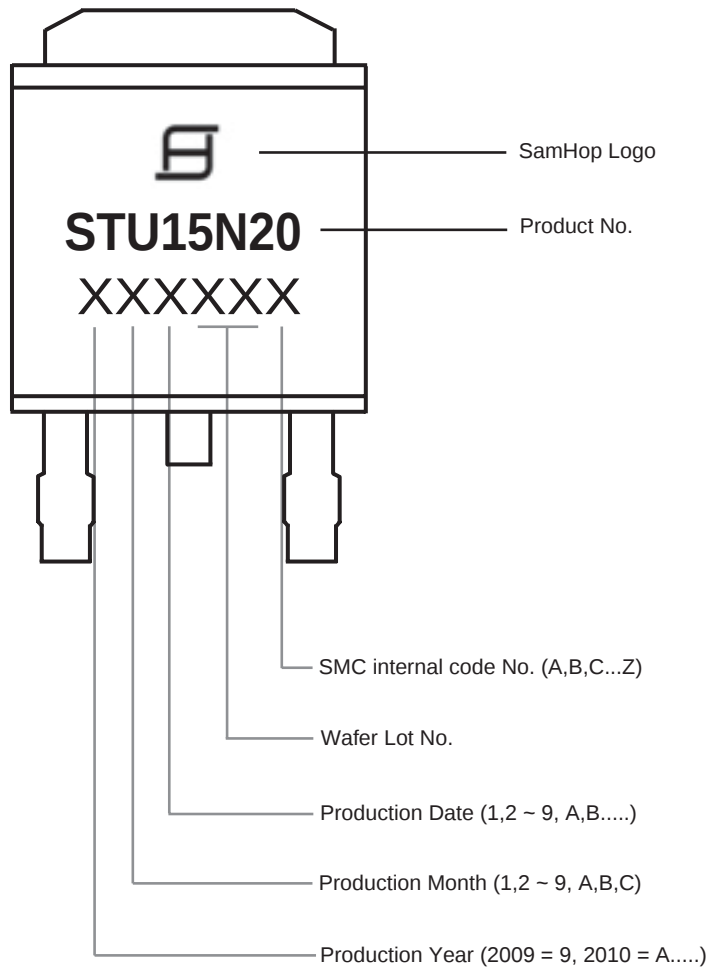
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### TOP MARKING DEFINITION

TO-252



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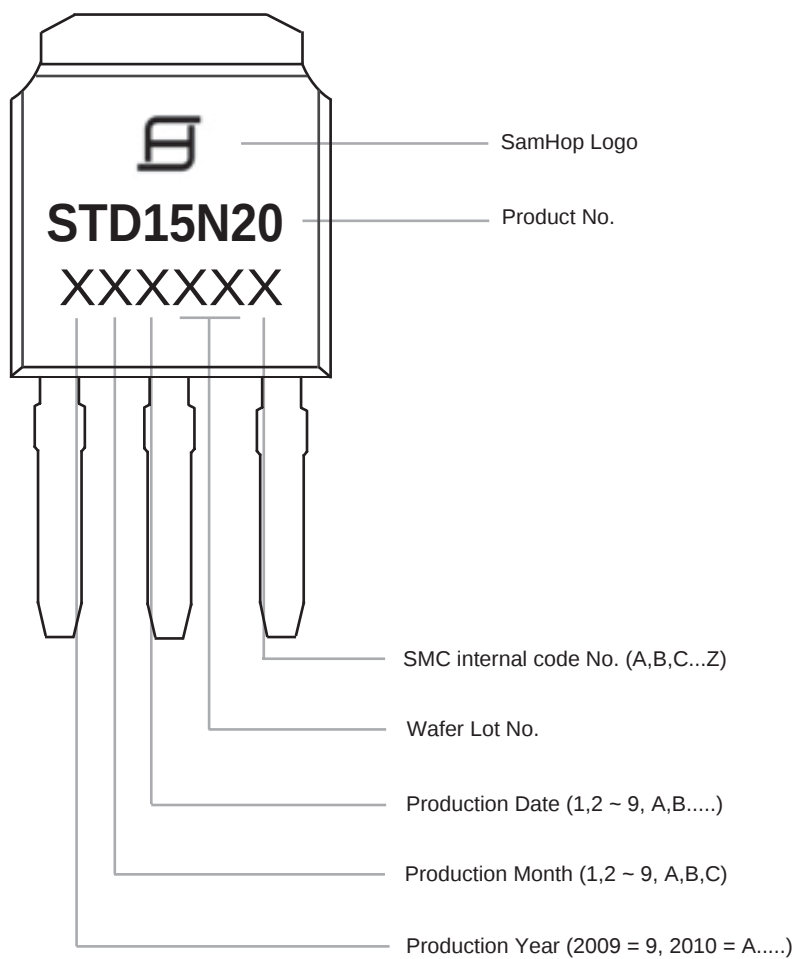
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### TOP MARKING DEFINITION

#### TO-251



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