



# STU/D1855PLS

## P-Channel Enhancement Mode Field Effect Transistor

### PRODUCT SUMMARY

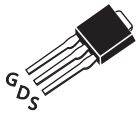
| V <sub>DSS</sub> | I <sub>D</sub> | R <sub>DS(ON)</sub> ( m $\Omega$ ) Max |
|------------------|----------------|----------------------------------------|
| -55V             | -15A           | 73 @ V <sub>GS</sub> = -10V            |
|                  |                | 90 @ V <sub>GS</sub> = -4.5V           |

### FEATURES

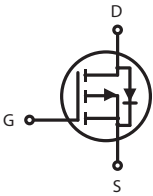
- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- TO-252 and TO-251 Package.



STU SERIES  
TO-252AA(D-PAK)



STD SERIES  
TO-251(I-PAK)



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

| Parameter                                              |                       | Symbol                            | Limit      | Unit |
|--------------------------------------------------------|-----------------------|-----------------------------------|------------|------|
| Drain-Source Voltage Rating                            |                       | V <sub>spike</sub> <sup>d</sup>   | 60         | V    |
| Drain-Source Voltage                                   |                       | V <sub>DS</sub>                   | -55        | V    |
| Gate-Source Voltage                                    |                       | V <sub>GS</sub>                   | ±20        | V    |
| Drain Current-Continuous <sup>a</sup> @ T <sub>a</sub> | 25°C                  | I <sub>D</sub>                    | -15        | A    |
|                                                        | 70°C                  |                                   | -12        | A    |
| -Pulsed <sup>b</sup>                                   |                       | I <sub>DM</sub>                   | -30        | A    |
| Drain-Source Diode Forward Current <sup>a</sup>        |                       | I <sub>S</sub>                    | -10        | A    |
| Maximum Power Dissipation <sup>a</sup>                 | T <sub>a</sub> = 25°C | P <sub>D</sub>                    | 42         | W    |
|                                                        | T <sub>a</sub> = 70°C |                                   | 28         |      |
| Operating Junction and Storage Temperature Range       |                       | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | °C   |

### THERMAL CHARACTERISTICS

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

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ELECTRICAL CHARACTERISTICS (TA 25 C unless otherwise noted)

| Parameter                              | Symbol              | Condition                                                                                               | Min  | Typ <sup>c</sup> | Max  | Unit  |
|----------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------|------|------------------|------|-------|
| OFF CHARACTERISTICS                    |                     |                                                                                                         |      |                  |      |       |
| Drain-Source Breakdown Voltage         | BV <sub>DSS</sub>   | V <sub>GS</sub> 0V, I <sub>D</sub> -250uA                                                               | -55  |                  |      | V     |
| Zero Gate Voltage Drain Current        | I <sub>DSS</sub>    | V <sub>DS</sub> -44V, V <sub>GS</sub> 0V                                                                |      |                  | -1   | uA    |
| Gate-Body Leakage                      | I <sub>GSS</sub>    | V <sub>GS</sub> ±20V, V <sub>DS</sub> 0V                                                                |      |                  | ±100 | nA    |
| ON CHARACTERISTICS <sup>b</sup>        |                     |                                                                                                         |      |                  |      |       |
| Gate Threshold Voltage                 | V <sub>GS(th)</sub> | V <sub>DS</sub> V <sub>GS</sub> , I <sub>D</sub> = -250uA                                               | -1.3 | -1.6             | -2.5 | V     |
| Drain-Source On-State Resistance       | R <sub>DS(ON)</sub> | V <sub>GS</sub> -10V, I <sub>D</sub> -10A                                                               |      | 62               | 73   | m-ohm |
|                                        |                     | V <sub>GS</sub> -4.5V, I <sub>D</sub> -6A                                                               |      | 80               | 90   | m-ohm |
| On-State Drain Current                 | I <sub>D(ON)</sub>  | V <sub>DS</sub> = -5V, V <sub>GS</sub> = -10V                                                           | 20   |                  |      | A     |
| Forward Transconductance               | g <sub>FS</sub>     | V <sub>DS</sub> -15V, I <sub>D</sub> -10A                                                               |      | 12               |      | S     |
| DYNAMIC CHARACTERISTICS <sup>c</sup>   |                     |                                                                                                         |      |                  |      |       |
| Input Capacitance                      | C <sub>ISS</sub>    | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                              |      | 925              |      | pF    |
| Output Capacitance                     | C <sub>OSS</sub>    |                                                                                                         |      | 86               |      | pF    |
| Reverse Transfer Capacitance           | C <sub>RSS</sub>    |                                                                                                         |      | 61               |      | pF    |
| Gate Resistance                        | R <sub>g</sub>      | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0A, f = 1MHz                                                    |      | 3.3              |      | ohm   |
| SWITCHING CHARACTERISTICS <sup>c</sup> |                     |                                                                                                         |      |                  |      |       |
| Turn-On Delay Time                     | t <sub>D(ON)</sub>  | V <sub>D</sub> = -30V,<br>I <sub>D</sub> = -1A,<br>V <sub>GEN</sub> = -10V,<br>R <sub>GEN</sub> = 6 ohm |      | 17.6             |      | ns    |
| Rise Time                              | t                   |                                                                                                         |      | 28               |      | ns    |
| Turn-Off Delay Time                    | t <sub>D(OFF)</sub> |                                                                                                         |      | 87.2             |      | ns    |
| Fall Time                              | t                   |                                                                                                         |      | 27.2             |      | ns    |
| Total Gate Charge                      | Q <sub>g</sub>      | V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V                                    |      | 18.8             |      | nC    |
|                                        |                     | V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -4.5V                                   |      | 9.2              |      | nC    |
| Gate-Source Charge                     | Q <sub>gs</sub>     | V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A,<br>V <sub>GS</sub> = -10V                                 |      | 1.6              |      | nC    |
| Gate-Drain Charge                      | Q <sub>gd</sub>     |                                                                                                         |      | 4.7              |      | nC    |

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

| Parameter                                       | Symbol          | Condition                                   | Min | Typ <sup>c</sup> | Max  | Unit |
|-------------------------------------------------|-----------------|---------------------------------------------|-----|------------------|------|------|
| DRAIN-SOURCE DIODE CHARACTERISTICS <sup>b</sup> |                 |                                             |     |                  |      |      |
| Diode Forward Voltage                           | V <sub>SD</sub> | V <sub>GS</sub> = 0V, I <sub>S</sub> = -10A |     | -0.9             | -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.Guaranteed when external R<sub>g</sub>=6 ohm and t<sub>f</sub> < t<sub>f</sub> max

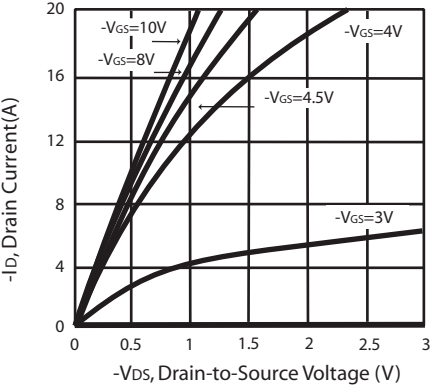


Figure 1. Output Characteristics

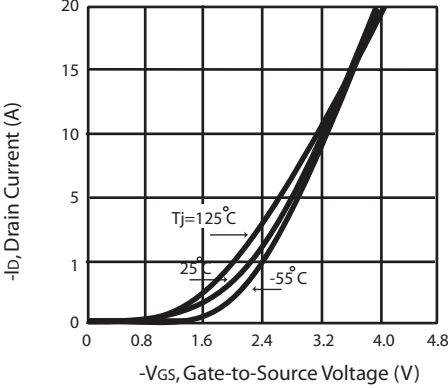


Figure 2. Transfer Characteristics

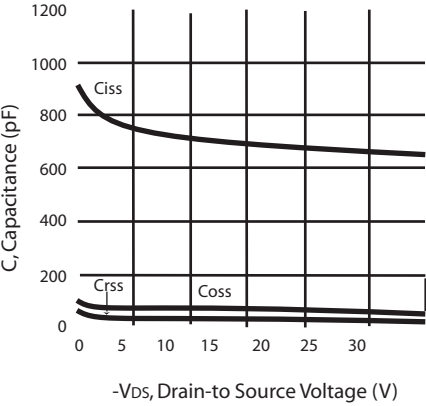


Figure 3. Capacitance

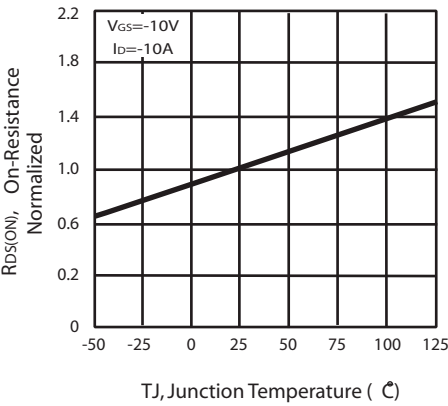


Figure 4. On-Resistance Variation with Temperature

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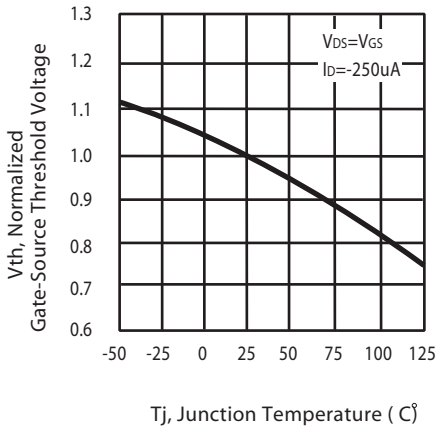


Figure 5. Gate Threshold Variation with Temperature

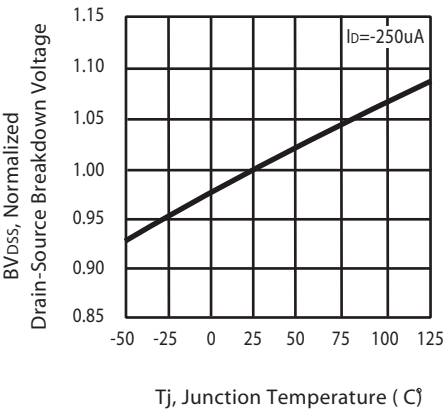


Figure 6. Breakdown Voltage Variation with Temperature

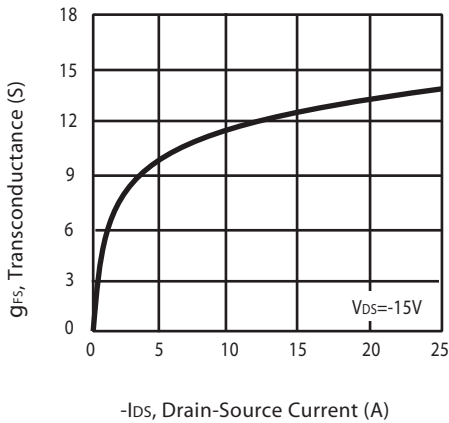


Figure 7. Transconductance Variation with Drain Current

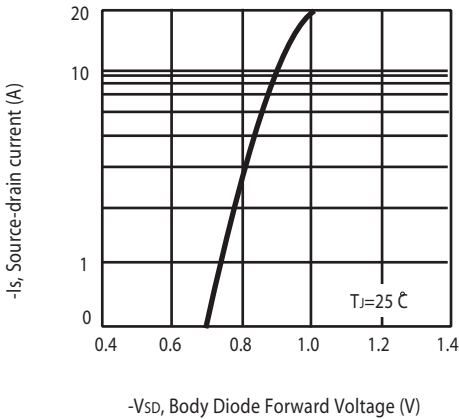


Figure 8. Body Diode Forward Voltage Variation with Source Current

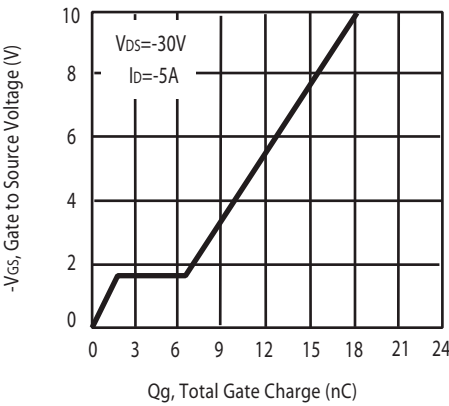


Figure 9. Gate Charge

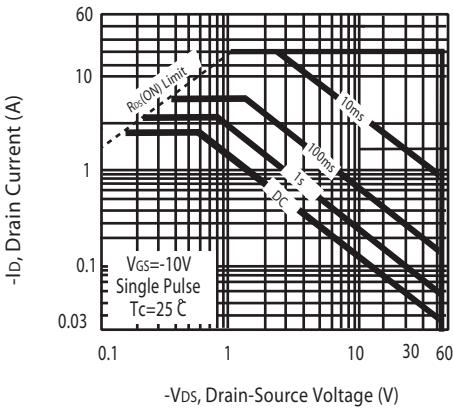


Figure 10. Maximum Safe Operating Area

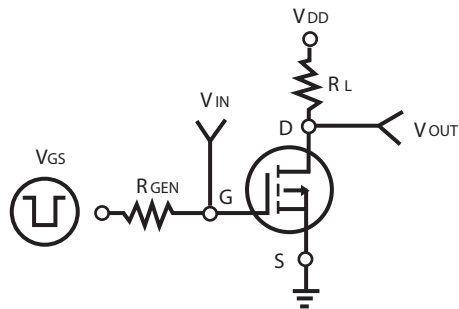


Figure 11. Switching Test Circuit

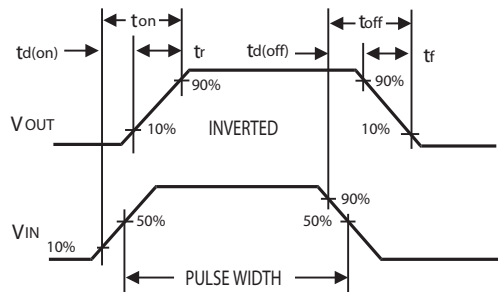


Figure 12. Switching Waveforms

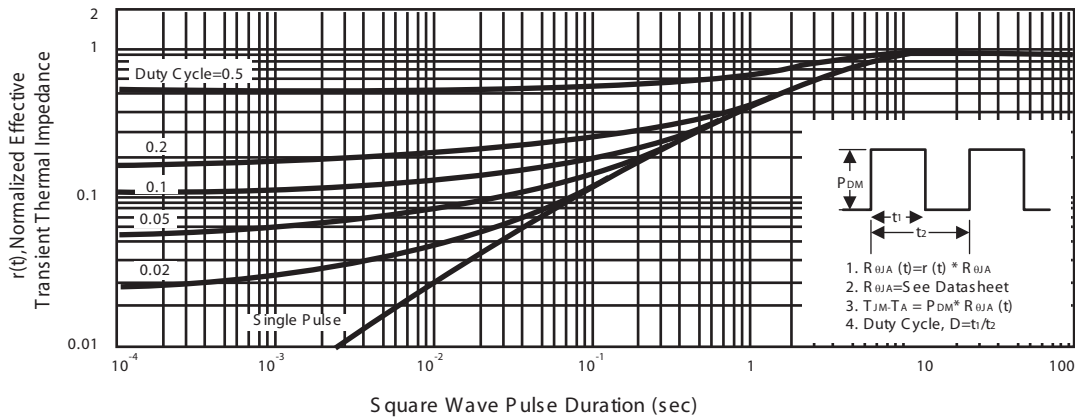
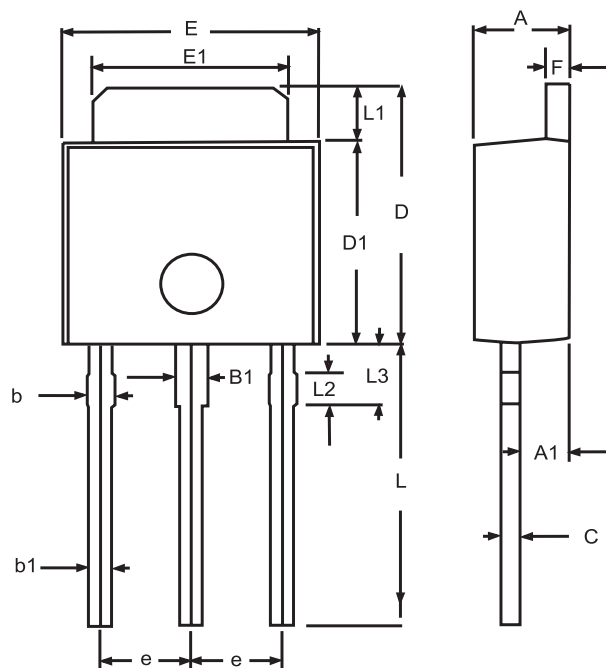


Figure 13. Normalized Thermal Transient Impedance Curve

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## PACKAGE OUTLINE DIMENSIONS

### TO-251

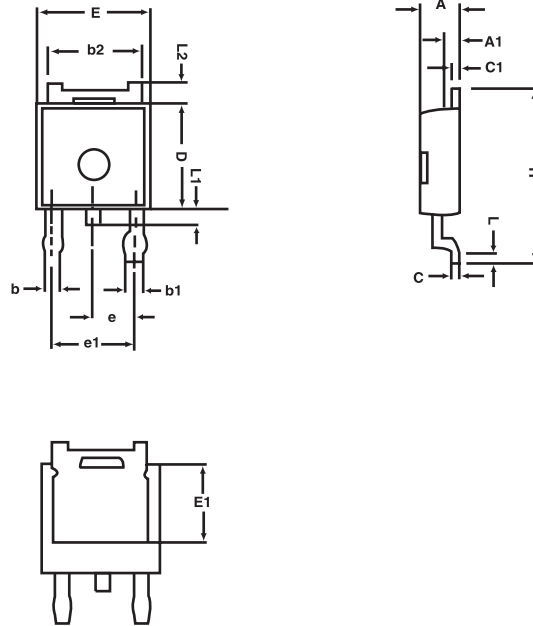


| SYMBOLS | MILLIMETERS |       | INCHES |       |
|---------|-------------|-------|--------|-------|
|         | MIN         | MAX   | MIN    | MAX   |
| A       | 2.20        | 2.40  | 0.087  | 0.095 |
| A1      | 1.100       | 1.300 | 0.043  | 0.051 |
| B1      | 0.650       | 1.050 | 0.026  | 0.041 |
| b       | 0.500       | 0.900 | 0.020  | 0.035 |
| b1      | 0.400       | 0.800 | 0.016  | 0.32  |
| C       | 0.400       | 0.600 | 0.016  | 0.024 |
| D       | 6.700       | 7.300 | 0.264  | 0.287 |
| D1      | 5.400       | 5.650 | 0.213  | 0.222 |
| E       | 6.40        | 6.650 | 0.252  | 0.262 |
| e       | 2.100       | 2.500 | 0.083  | 0.098 |
| F       | 0.400       | 0.600 | 0.016  | 0.024 |
| L       | 7.000       | 8.000 | 0.276  | 0.315 |
| L1      | 1.300       | 1.700 | 0.051  | 0.067 |
| L2      | 0.700       | 0.900 | 0.028  | 0.035 |
| L3      | 1.400       | 1.800 | 0.055  | 0.071 |

# S TU/D1855P LS

## PACKAGE OUTLINE DIMENSIONS

### TO-252

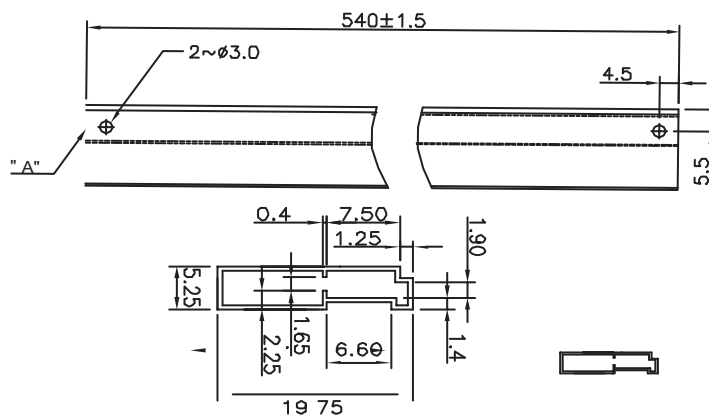


| SYMBOLS | MILLIMETERS |       | INCHES |       |
|---------|-------------|-------|--------|-------|
|         | MIN         | MAX   | MIN    | MAX   |
| A       | 2.25        | 2.35  | 0.089  | 0.093 |
| A1      | 0.95        | 1.05  | 0.037  | 0.041 |
| b       | 0.77        | 0.85  | 0.030  | 0.033 |
| b1      | 0.84        | 0.94  | 0.033  | 0.037 |
| b2      | 5.30        | 5.45  | 0.209  | 0.215 |
| C       | 0.49        | 0.53  | 0.019  | 0.021 |
| D       | 6.00        | 6.20  | 0.236  | 0.244 |
| E       | 6.40        | 6.60  | 0.252  | 0.260 |
| E1      | 3.18        | 3.67  | 0.125  | 0.145 |
| e       | 2.29        | BSC   | 0.090  | BSC   |
| H       | 9.70        | 10.10 | 0.382  | 0.398 |
| L       | 1.425       | 1.625 | 0.056  | 0.064 |
| L1      | 0.650       | 0.850 | 0.026  | 0.033 |
| L2      | 0.600       | REF.  | 0.024  | REF.  |

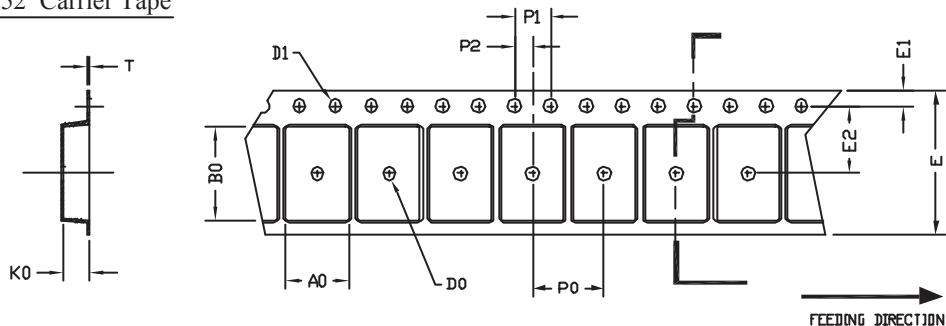
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## TO251 Tube/TO-252 Tape and Reel Data

### TO-251 Tube



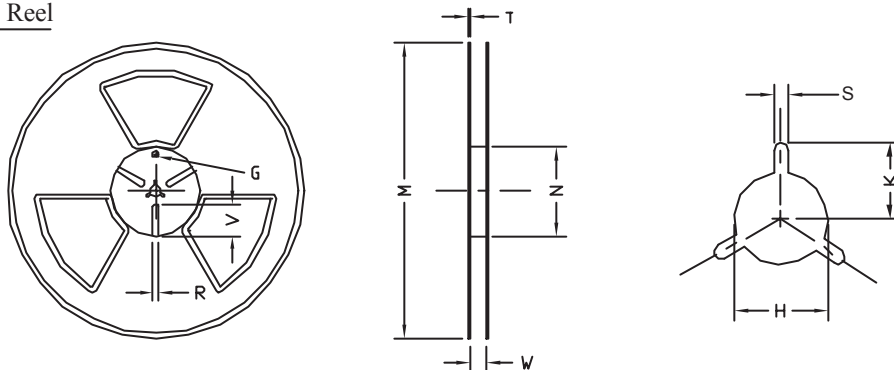
### TO-252 Carrier Tape



UNIT:mm

| PACKAGE      | A0             | B0             | K0             | D0       | D1                 | E              | E1             | E2             | P0            | P1            | P2             | T              |
|--------------|----------------|----------------|----------------|----------|--------------------|----------------|----------------|----------------|---------------|---------------|----------------|----------------|
| TO-252(16mm) | $6.80 \pm 0.1$ | $10.3 \pm 0.1$ | $2.50 \pm 0.1$ | $\phi 2$ | $\phi 1.5 \pm 0.1$ | $16.0 \pm 0.3$ | $1.75 \pm 0.1$ | $7.5 \pm 0.15$ | $8.0 \pm 0.1$ | $4.0 \pm 0.1$ | $2.0 \pm 0.15$ | $0.3 \pm 0.05$ |

### TO-252 Reel



UNIT:mm

| TAPE SIZE | REEL SIZE  | M                  | N            | W              | T     | H                   | K              | S             | G   | R   | V   |
|-----------|------------|--------------------|--------------|----------------|-------|---------------------|----------------|---------------|-----|-----|-----|
| 16 mm     | $\phi 330$ | $\phi 330 \pm 0.5$ | $97 \pm 1.0$ | $17.0 \pm 1.5$ | $2.2$ | $\phi 13.0 \pm 0.5$ | $10.6 \pm 0.2$ | $2.0 \pm 0.5$ | --- | --- | --- |