SamHop Microelectronics Corp.

# STU/D16L01

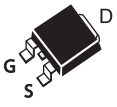
Ver 1.0

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

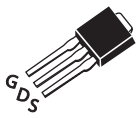
| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DSS}$ | $I_D$ | $R_{DS(ON)}$ (mΩ) Max |
| 100V | 13A | 98 @ VGS=10V |
| | | 118 @ VGS=4.5V |

### FEATURES

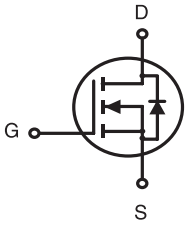
- Super high dense cell design for low $R_{DS(ON)}$.
- Rugged and reliable.
- TO-252 and TO-251 Package.




STU SERIES
TO-252AA(D-PAK)




STD SERIES
TO-251(I-PAK)




### ABSOLUTE MAXIMUM RATINGS ($T_C$=25°C unless otherwise noted)

| Symbol | Parameter | | Limit | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | | 100 | V |
| $V_{GS}$ | Gate-Source Voltage | | ±20 | V |
| $I_D$ | Drain Current-Continuous | $T_C$=25°C | 13 | A |
| | | $T_C$=70°C | 10.4 | A |
| $I_{DM}$ | -Pulsed [a] | | 38 | A |
| $E_{AS}$ | Single Pulse Avalanche Energy [c] | | 56 | mJ |
| $P_D$ | Maximum Power Dissipation | $T_C$=25°C | 42 | W |
| | | $T_C$=70°C | 27 | W |
| $T_J$, $T_{STG}$ | Operating Junction and Storage Temperature Range | | -55 to 150 | °C |

### THERMAL CHARACTERISTICS

| | | | |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 3 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 50 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_C$=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 100 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=80V , $V_{GS}$=0V | | | 1 | uA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$= ±20V , $V_{DS}$=0V | | | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ , $I_D$=250uA | 1 | 1.7 | 3 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}$=10V , $I_D$=6.5A | | 78 | 98 | m ohm |
| | | $V_{GS}$=4.5V , $I_D$=5.9A | | 87 | 118 | m ohm |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=10V , $I_D$=6.5A | | 18 | | S |
| **DYNAMIC CHARACTERISTICS** [b] | | | | | | |
| $C_{ISS}$ | Input Capacitance | $V_{DS}$=25V,$V_{GS}$=0V f=1.0MHz | | 1005 | | pF |
| $C_{OSS}$ | Output Capacitance | | | 62 | | pF |
| $C_{RSS}$ | Reverse Transfer Capacitance | | | 43 | | pF |
| **SWITCHING CHARACTERISTICS** [b] | | | | | | |
| $t_{D(ON)}$ | Turn-On Delay Time | $V_{DD}$=50V $I_D$=1A $V_{GS}$=10V $R_{GEN}$= 6 ohm | | 16 | | ns |
| $t_r$ | Rise Time | | | 15 | | ns |
| $t_{D(OFF)}$ | Turn-Off Delay Time | | | 40 | | ns |
| $t_f$ | Fall Time | | | 9 | | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$=50V,$I_D$=6.5A,$V_{GS}$=10V | | 15 | | nC |
| | | $V_{DS}$=50V,$I_D$=6.5A,$V_{GS}$=4.5V | | 7.5 | | nC |
| $Q_{gs}$ | Gate-Source Charge | $V_{DS}$=50V,$I_D$=6.5A, $V_{GS}$=10V | | 1.6 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 4.2 | | nC |
| **DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS** | | | | | | |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V,$I_S$=3A | | 0.81 | 1.3 | V |

### Notes

a.Pulse Test:Pulse Width ≤ 300us, Duty Cycle ≤ 2%.
b.Guaranteed by design, not subject to production testing.
c.Starting $T_J$=25°C,L=0.5mH,$V_{DD}$ = 50V.(See Figure13)

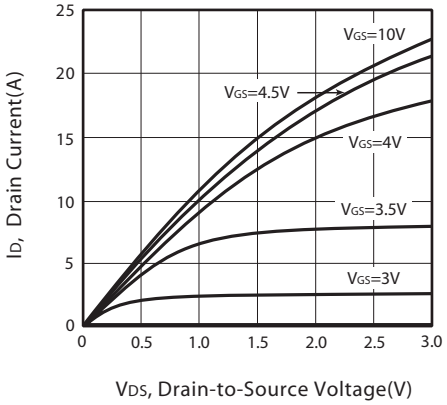



Figure 1. Output Characteristics

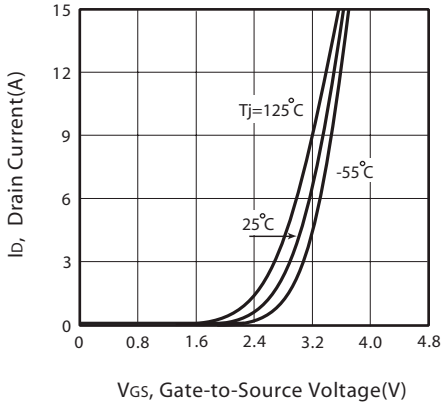



Figure 2. Transfer Characteristics

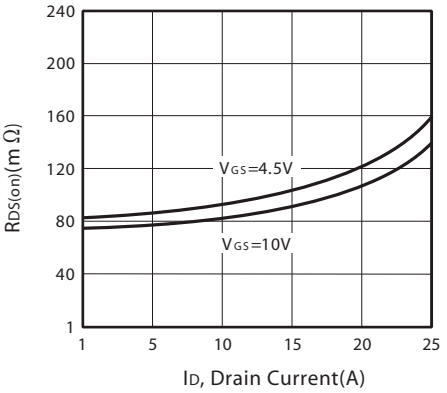



Figure 3. On-Resistance vs. Drain Current and Gate Voltage

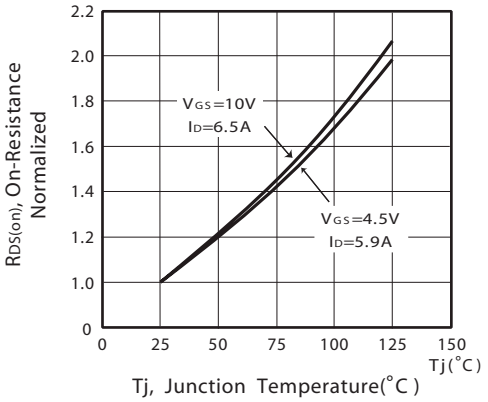



Figure 4. On-Resistance Variation with Drain Current and Temperature

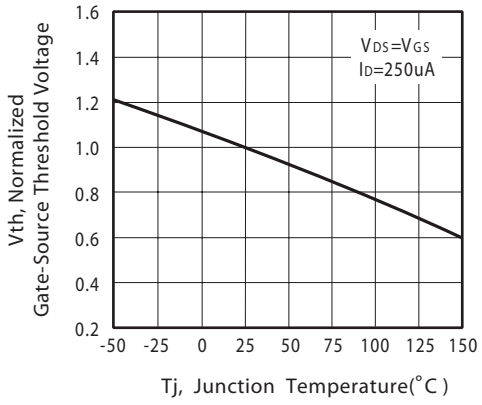



Figure 5. Gate Threshold Variation with Temperature

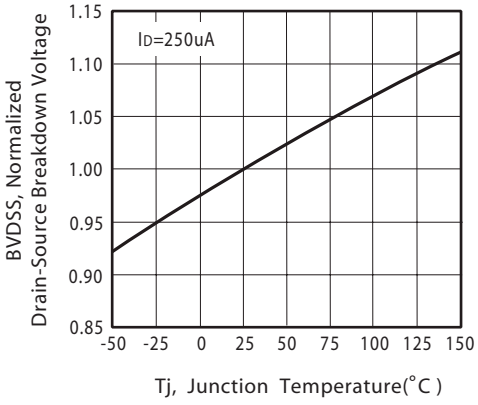



Figure 6. Breakdown Voltage Variation with Temperature

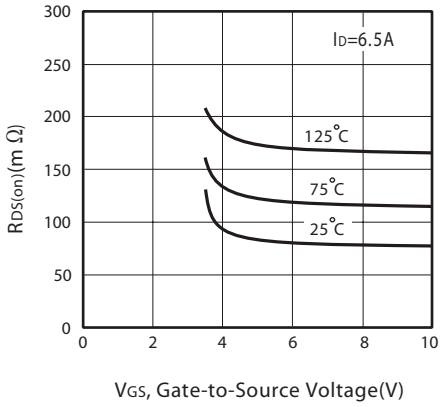



Figure 7. On-Resistance vs. Gate-Source Voltage

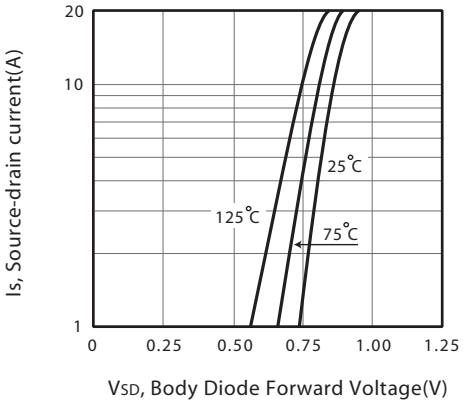



Figure 8. Body Diode Forward Voltage Variation with Source Current

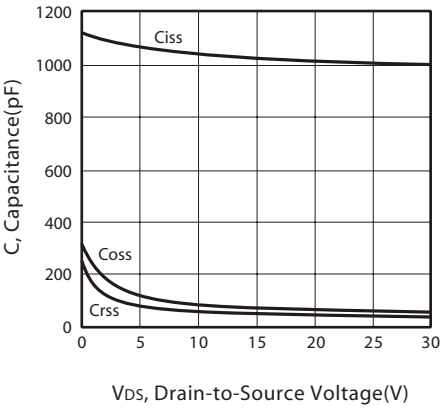



Figure 9. Capacitance

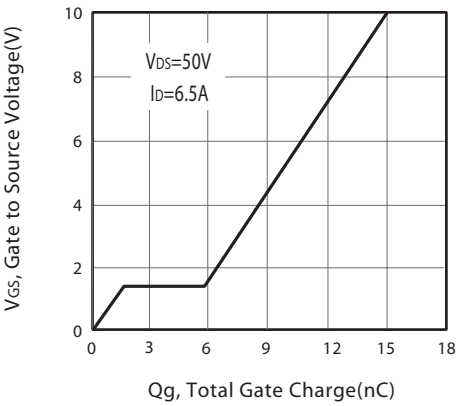



Figure 10. Gate Charge

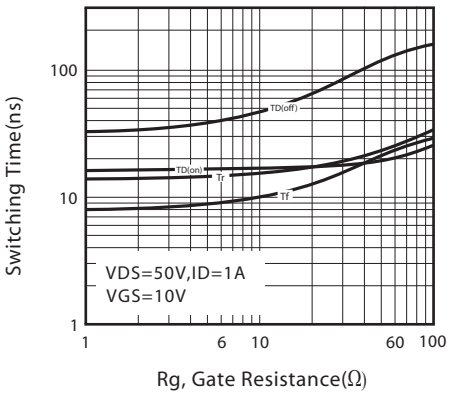



Figure 11. switching characteristics

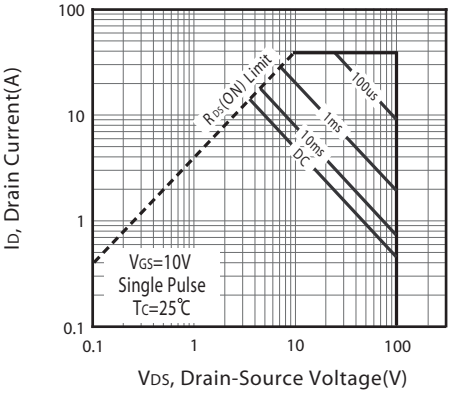
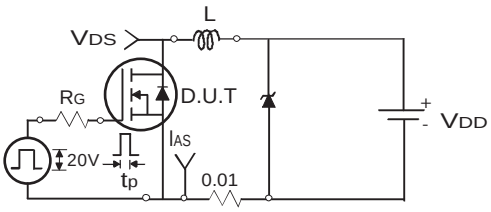
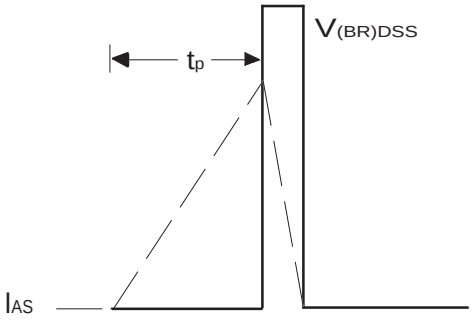



Figure 12. Maximum Safe Operating Area




Uncamped Inductive Test Circuit

Figure 13a.




Unclamped Inductive Waveforms

Figure 13b.

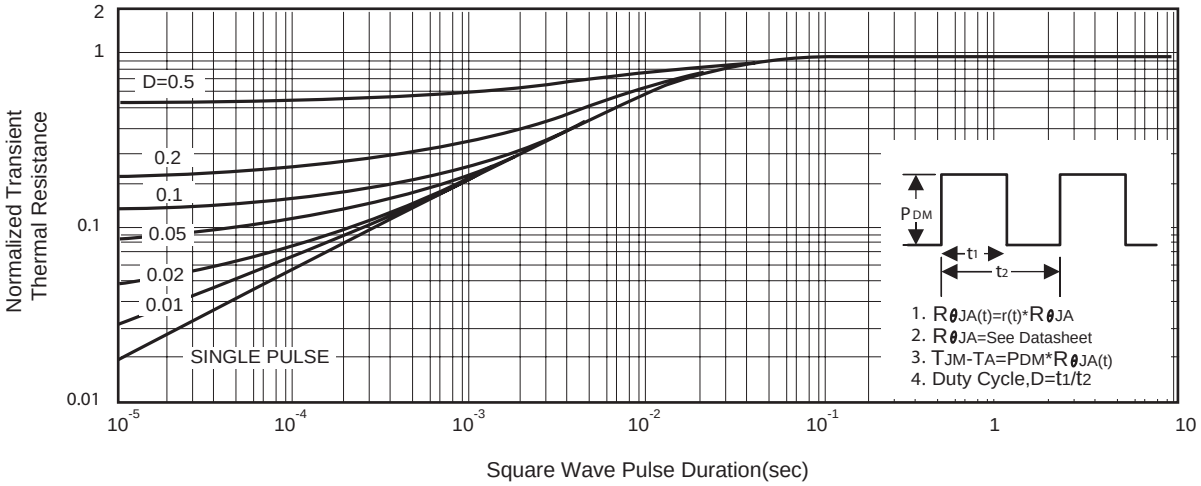
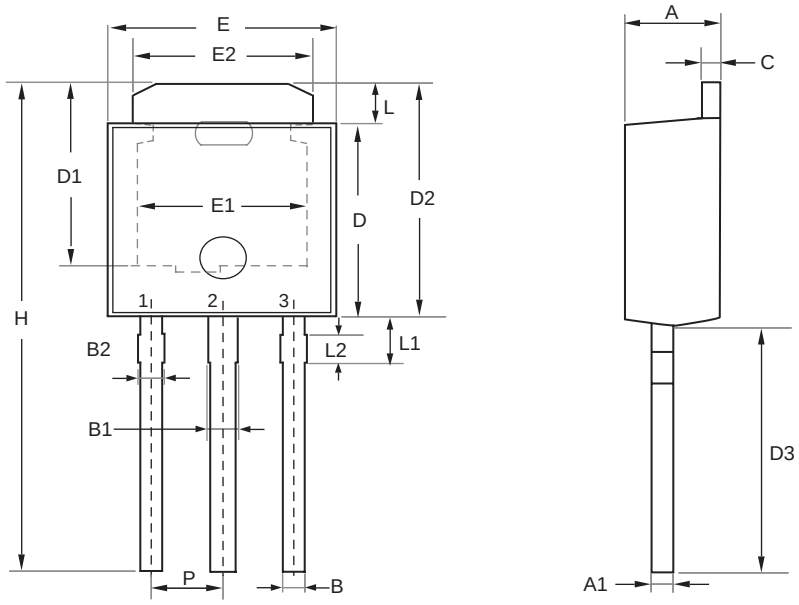



Figure 14. Normalized Thermal Transient Impedance Curve

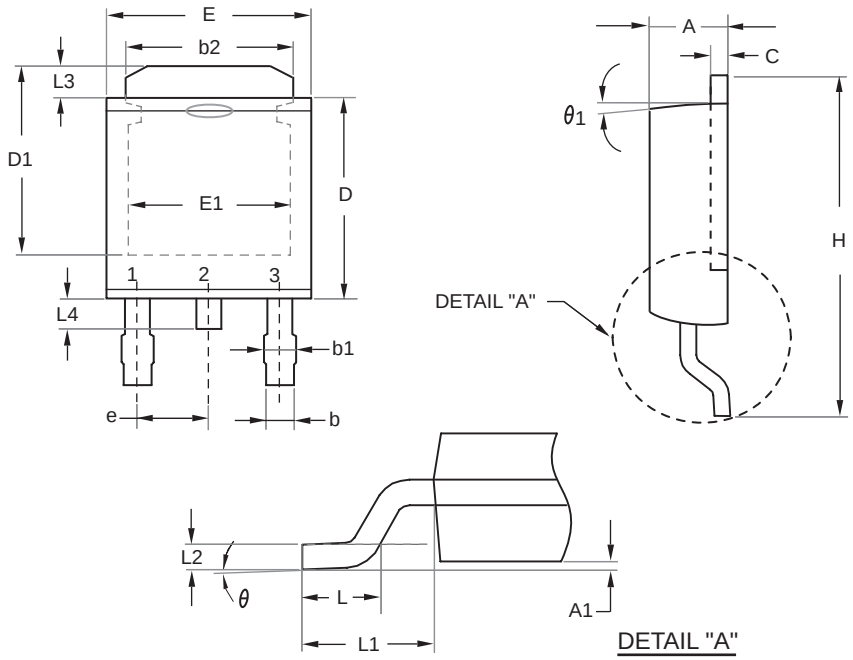
## PACKAGE OUTLINE DIMENSIONS

**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 | 13.700 | 15.300 | 0.539 | 0.602 |
| 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 | |

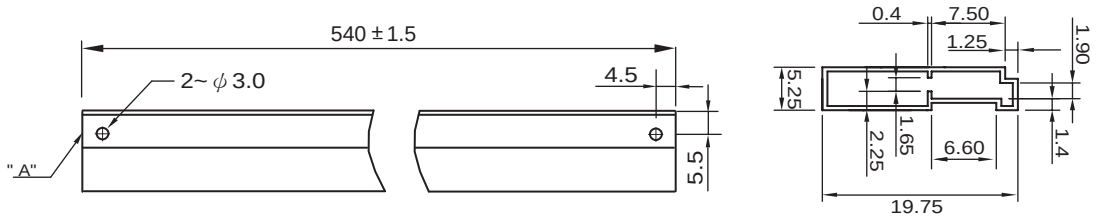
TO-252



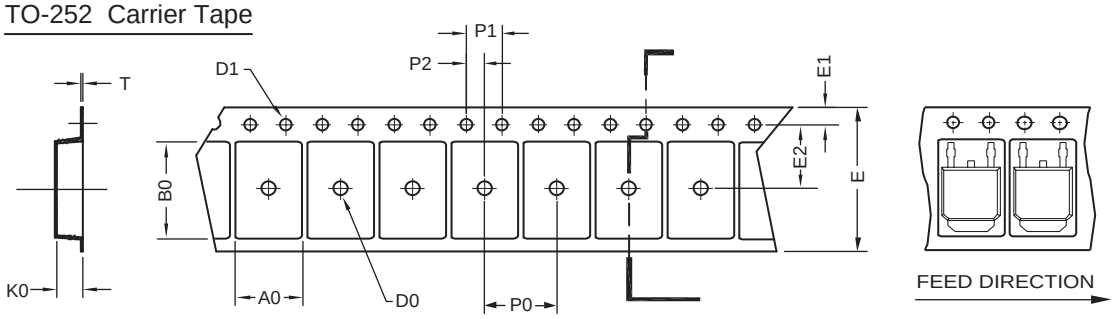

| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 2.100 | 2.500 | 0.083 | 0.098 |
| A1 | 0.000 | 0.200 | 0.000 | 0.008 |
| b | 0.400 | 0.889 | 0.016 | 0.035 |
| b1 | 0.770 | 1.140 | 0.030 | 0.045 |
| b2 | 4.800 | 5.460 | 0.189 | 0.215 |
| C | 0.400 | 0.600 | 0.016 | 0.024 |
| D | 5.300 | 6.223 | 0.209 | 0.245 |
| D1 | 4.900 | 5.515 | 0.193 | 0.217 |
| E | 6.300 | 6.731 | 0.248 | 0.265 |
| E1 | 4.320 | 5.004 | 0.170 | 0.197 |
| e | 2.290 REF | | 0.090 BSC | |
| H | 8.900 | 10.400 | 0.350 | 0.409 |
| L | 1.397 | 1.780 | 0.055 | 0.070 |
| L1 | 2.743 REF. | | 0.108 REF. | |
| L2 | 0.508 REF. | | 0.020 REF. | |
| L3 | 0.890 | 1.700 | 0.035 | 0.067 |
| L4 | 0.500 | 1.100 | 0.020 | 0.043 |
| θ | 0° | 10° | 0° | 10° |
| θ1 | 0° | 15° | 0° | 15° |

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

## TO-251 Tube



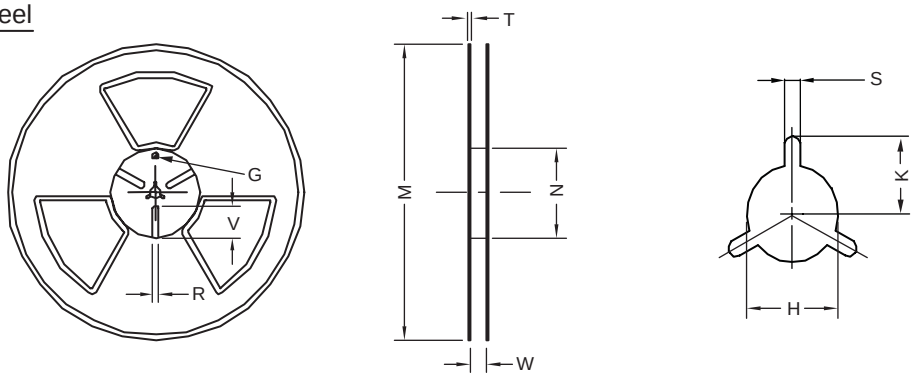

## TO-252 Carrier Tape




UNIT:㎜

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

## TO-252 Reel




UNIT:㎜

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