SamHop Microelectronics Corp.

# STU/D320S

Ver 1.0

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

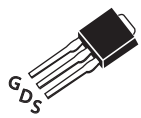
| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DSS}$ | $I_D$ | $R_{DS(ON)}$ (mΩ) Max |
| 30V | 30A | 20 @ VGS=10V |
| | | 29 @ VGS=4.5V |

### FEATURES

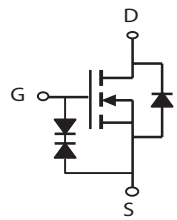
- Super high dense cell design for low $R_{DS(ON)}$.
- Rugged and reliable.
- TO-252 and TO-251 Package.
- ESD Protected.




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 | | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | | ±20 | V |
| $I_D$ | Drain Current-Continuous [a] | $T_C$=25°C | 30 [e] | A |
| | | $T_C$=70°C | 24 | A |
| $I_{DM}$ | -Pulsed [b] | | 120 | A |
| $E_{AS}$ | Avalanche Energy [d] | | 15 | mJ |
| $P_D$ | Maximum Power Dissipation [a] | $T_C$=25°C | 32 | W |
| | | $T_C$=70°C | 20 | 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 [a] | 4 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient [a] | 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 | 30 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=24V , $V_{GS}$=0V | | | 1 | A |
| $I_{GSS}$ | Gate-Body leakage current | $V_{GS}$= ±20V , $V_{DS}$=0V | | | ±10 | uA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ , $I_D$=250uA | 1 | 1.8 | 3 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}$=10V , $I_D$=15A | | 16 | 20 | m ohm |
| | | $V_{GS}$=4.5V , $I_D$=12.5A | | 22 | 29 | m ohm |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=10V , $I_D$=15A | | 12 | | S |
| **DYNAMIC CHARACTERISTICS** [c] | | | | | | |
| $C_{ISS}$ | Input Capacitance | $V_{DS}$=15V,$V_{GS}$=0V f=1.0MHz | | 430 | | pF |
| $C_{OSS}$ | Output Capacitance | | | 140 | | pF |
| $C_{RSS}$ | Reverse Transfer Capacitance | | | 88 | | pF |
| **SWITCHING CHARACTERISTICS** [c] | | | | | | |
| $t_{D(ON)}$ | Turn-On DelayTime | $V_{DD}$=15V $I_D$=1A $V_{GS}$=10V $R_{GEN}$=6 ohm | | 8 | | ns |
| $t_r$ | Rise Time | | | 13 | | ns |
| $t_{D(OFF)}$ | Turn-Off DelayTime | | | 16 | | ns |
| tf | Fall Time | | | 30 | | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$=15V,$I_D$=15A,$V_{GS}$=10V | | 8 | | nC |
| | | $V_{DS}$=15V,$I_D$=15A,$V_{GS}$=4.5V | | 4 | | nC |
| $Q_{gs}$ | Gate-Source Charge | $V_{DS}$=15V,$I_D$=15A, $V_{GS}$=10V | | 0.9 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 2.5 | | nC |
| **DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | | | 2.2 | A |
| $V_{SD}$ | Diode Forward Voltage [b] | $V_{GS}$=0V,$I_S$=2.2A | | 0.8 | 1.3 | V |

Notes

a.Surface Mounted on FR4 Board,t≤10 sec.

b.Pulse Test:Pulse Width ≤ 300us, Duty Ctcle ≤ 2%.

c.Guaranteed by design, not subject to production testing.

d.Starting $T_J$=25°C,L=0.5mH,$R_G$=25Ω,$V_{DD}$=30V,$V_{GS}$=10V .(See Figure13)

e.Package current limitation is 20A.

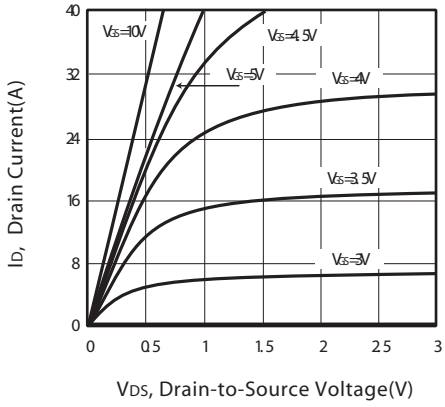



Figure 1. Output Characteristics

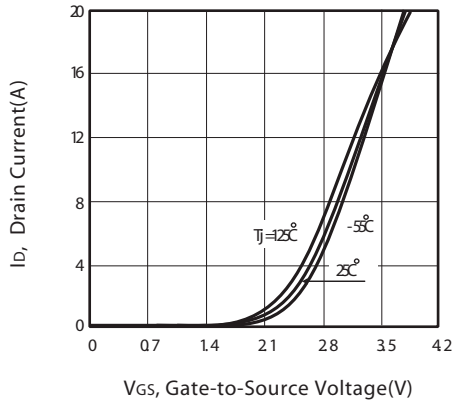



Figure 2. Transfer Characteristics

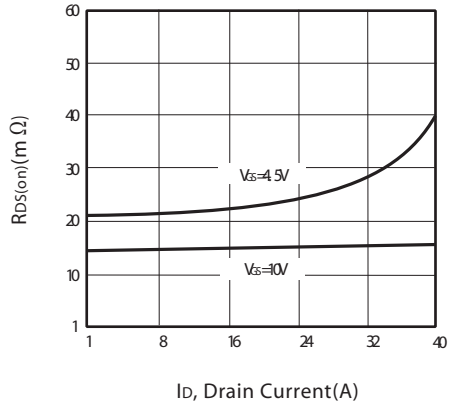



Figure 3. On-Resistance vs. Drain Current and Gate Voltage

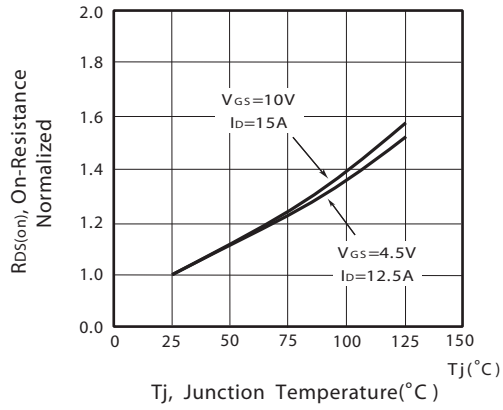



Figure 4. On-Resistance Variation with Drain Current and Temperature

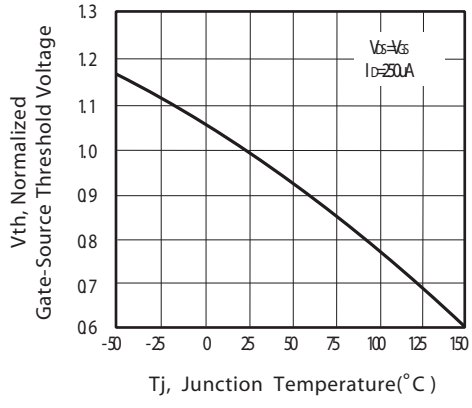



Figure 5. Gate Threshold Variation with Temperature

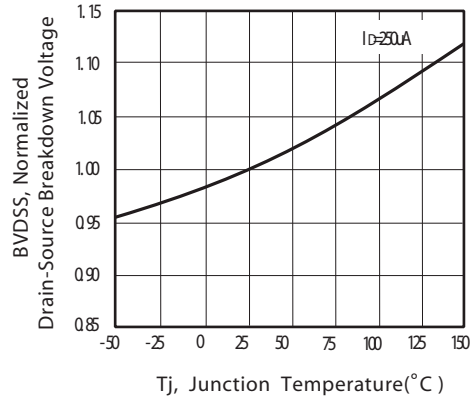



Figure 6. Breakdown Voltage Variation with Temperature

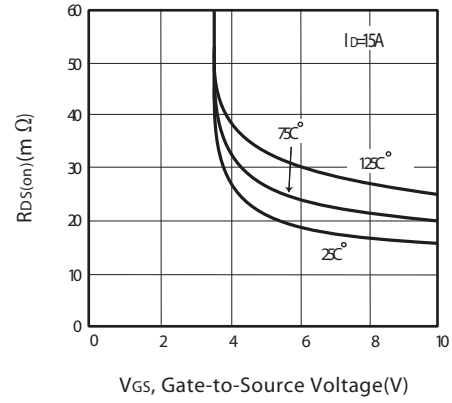



Figure 7. On-Resistance vs. Gate-Source Voltage

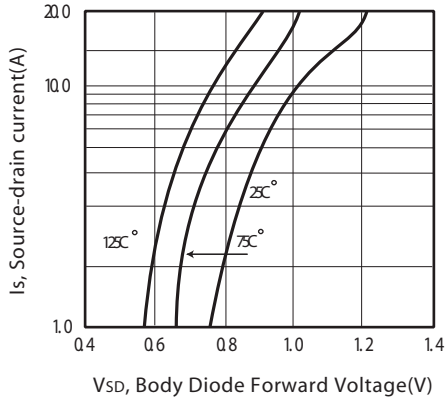



Figure 8. Body Diode Forward Voltage Variation with Source Current

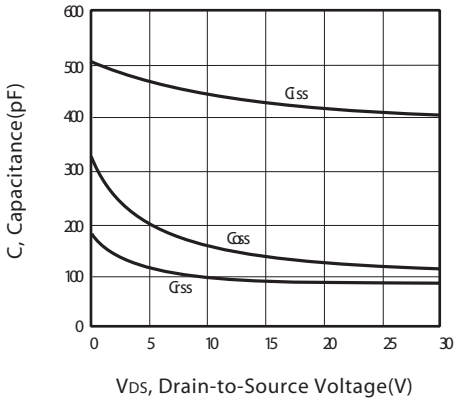



Figure 9. Capacitance

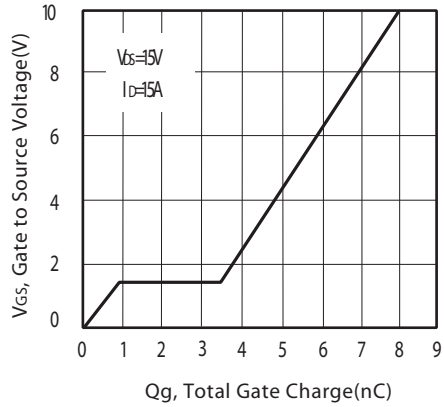



Figure 10. Gate Charge

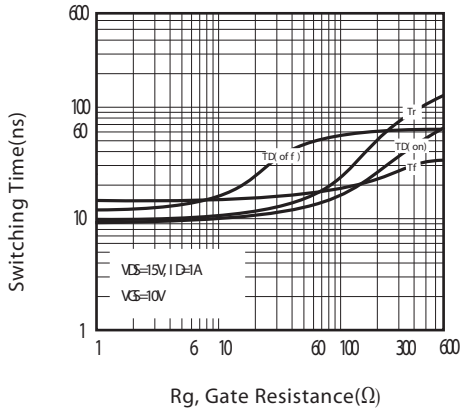



Figure 11. switching characteristics

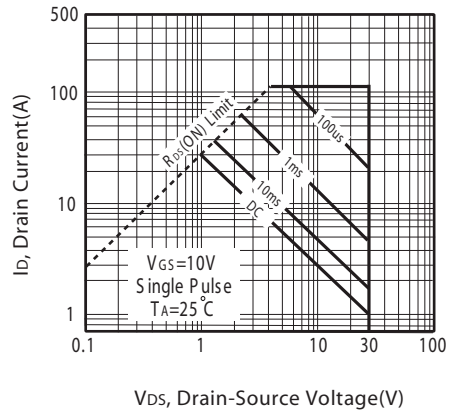
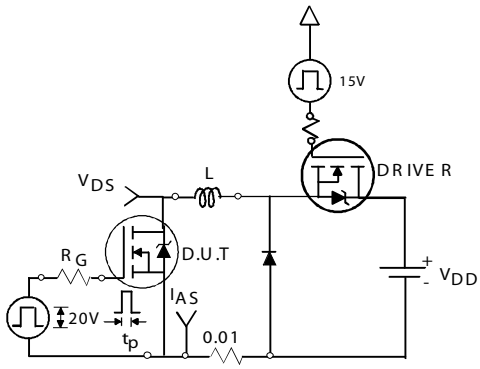
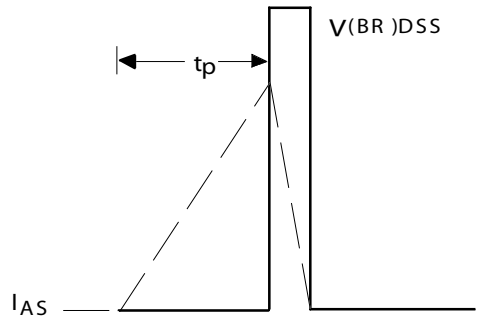



Figure 12. Maximum Safe Operating Area




Unclamped Inductive Test Circuit

Figure 13a.




Unclamped Inductive Waveforms

Figure 13b.

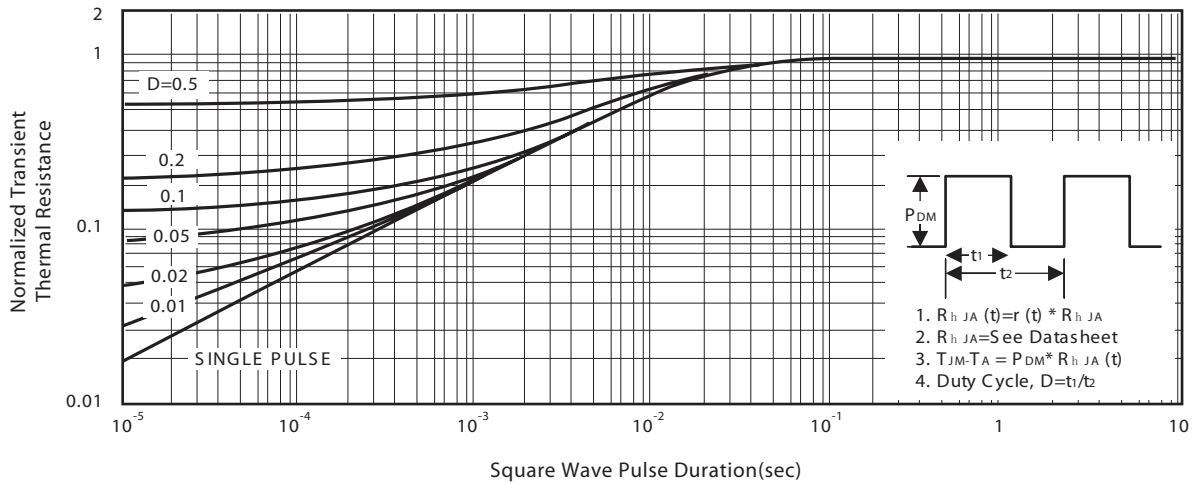
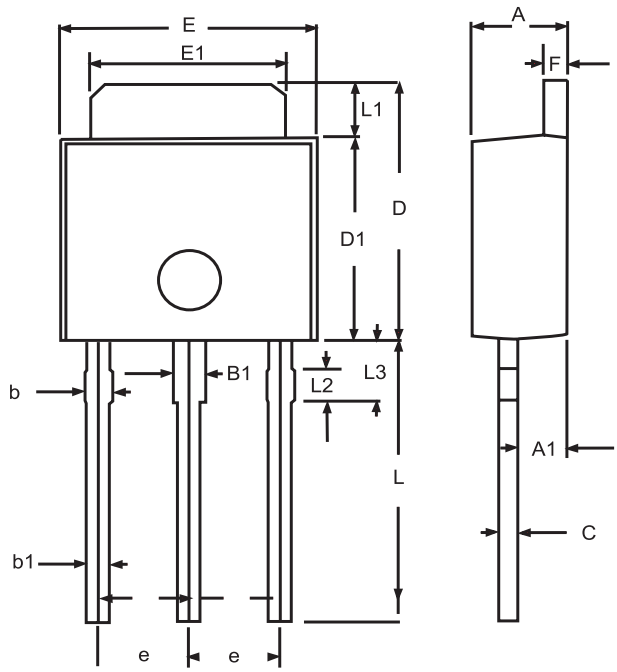



Figure 14. Normalized Thermal Transient Impedance Curve

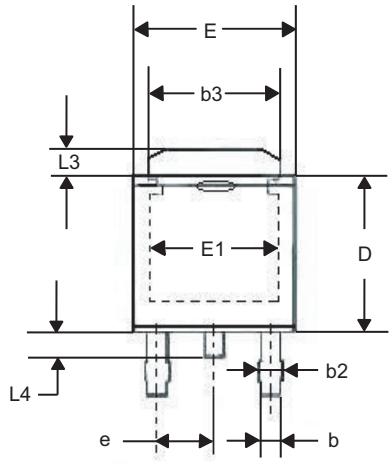
## PACKAGE OUTLINE DIMENSIONS

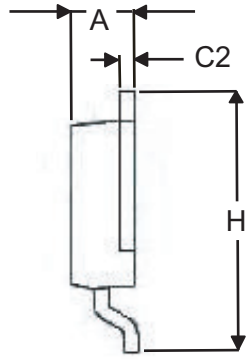
### TO-251

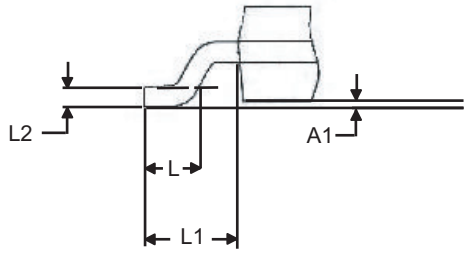



| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 2.20 | 2.40 | 0.087 | 0.095 |
| A1 | 1.100 | 1.300 | 0.043 | 0.051 |
| B1 | 0.650 | 1.050 | 0.026 | 0.041 |
| b | 0.500 | 0.900 | 0.020 | 0.035 |
| b1 | 0.400 | 0.800 | 0.016 | 0..32 |
| C | 0.400 | 0.600 | 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 |

## TO-252



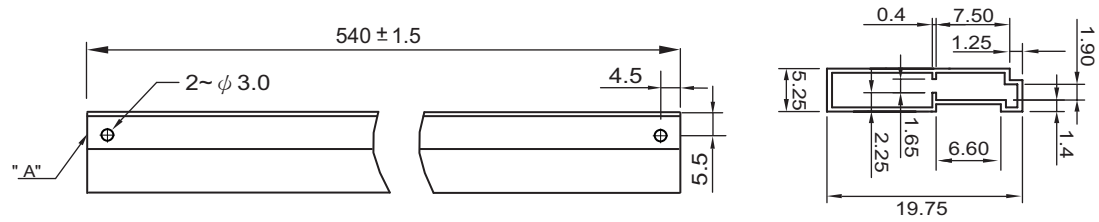



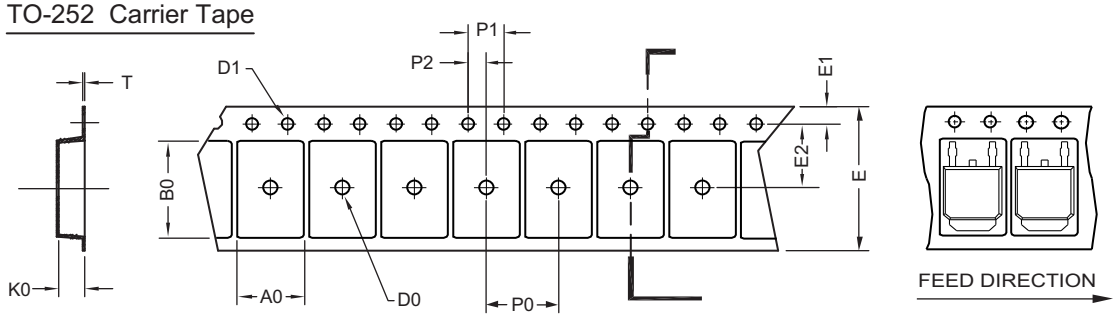

| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 2.210 | 2.387 | 0.087 | 0.094 |
| C2 | 0.483 | 0.584 | 0.019 | 0.023 |
| b | 0.814 | 0.889 | 0.032 | 0.035 |
| b2 | 0.864 | 1.092 | 0.034 | 0.043 |
| b3 | 5.232 | 5.436 | 0.206 | 0.214 |
| L2 | 0.508 | REF. | 0.020 | REF. |
| D | 6.000 | 6.200 | 0.236 | 0.244 |
| E | 6.400 | 6.604 | 0.252 | 0.260 |
| E1 | 4.902 | 5.004 | 0.193 | 0.197 |
| e | 2.290 | BSC | 0.090 | BSC |
| H | 9.601 | 10.210 | 0.378 | 0.402 |
| A1 | 0.010 | 0.127 | 0.0004 | 0.005 |
| L4 | 0.066 | 0.940 | 0.026 | 0.037 |
| L | 1.397 | 1.651 | 0.055 | 0.065 |
| L1 | 2.743 | REF. | 0.108 | REF. |
| L3 | 1.100 | REF. | 0.043 | REF. |

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

## TO-251 Tube



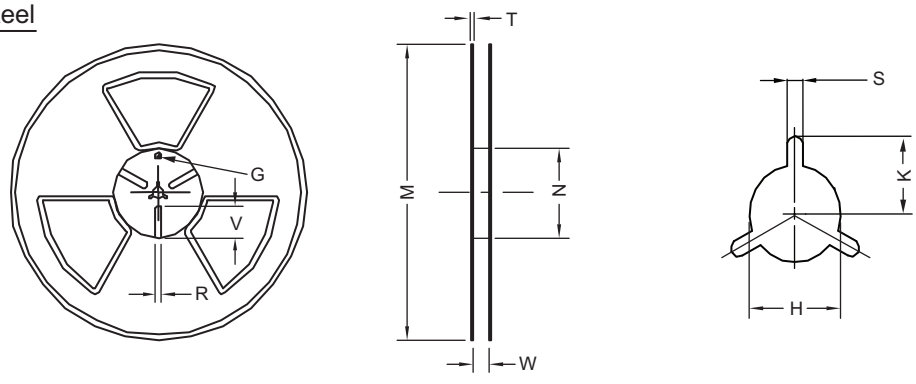

## TO-252 Carrier Tape




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 | φ2 | φ1.5 + 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 | φ330 ± 0.5 | φ97 ± 1.0 | 17.0 + 1.5 - 0 | 2.2 | φ13.0 + 0.5 - 0.2 | 10.6 | 2.0 ±0.5 | --- | --- | --- |