SamHop Microelectronics Corp.

# STU/D302S

Apr 03,2006

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

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DSS}$ | $I_D$ | $R_{DS(ON)}$ (mΩ) Max |
| 30V | 50 A | 9 @ $V_{GS}$ = 10V |
| | | 12 @ $V_{GS}$ = 4.5V |

### FEATURES

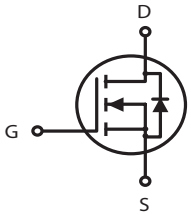
- Super high dense cell design for low $R_{DS(ON)}$.
- Rugged and reliable.
- TO-252 and TO-251 Package.




STU SERIES
TO-252AA(D-PAK)




STD SERIES
TO-251(I-PAK)




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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous @ Tc=25°C | $I_D$ | 50 | A |
| -Pulsed [a] | $I_{DM}$ | 180 | A |
| Drain-Source Diode Forward Current | $I_S$ | 20 | A |
| Maximum Power Dissipation @ Tc=25°C | $P_D$ | 50 | W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| **THERMAL CHARACTERISTICS** | | | |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 3 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 50 | °C/W |

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

| Parameter | Symbol | Condition | Min | Typ [c] | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=24V, $V_{GS}$=0V | | | 1 | uA |
| Gate-Body Leakage | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | | | ±100 | nA |
| **ON CHARACTERISTICS [a]** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 1 | 1.7 | 3 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=20A | | 7 | 9 | m ohm |
| | | $V_{GS}$=4.5V, $I_D$=10A | | 10 | 12 | m ohm |
| On-State Drain Current | $I_{D(ON)}$ | $V_{DS}$=10V, $V_{GS}$=10V | 50 | | | A |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=10V, $I_D$=10A | | 22 | | S |
| **DYNAMIC CHARACTERISTICS [b]** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{DS}$=15V, $V_{GS}$=0V<br>f=1.0MHz | | 1020 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 325 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 225 | | pF |
| Gate resistance | Rg | $V_{GS}$=0V, $V_{DS}$=0V, f=1.0MHz | | 0.25 | | ohm |
| **SWITCHING CHARACTERISTICS [b]** | | | | | | |
| Turn-On Delay Time | $t_{D(ON)}$ | $V_{DD}$=15V<br>$I_D$=1 A<br>$V_{GS}$=10V<br>$R_{GEN}$=6 ohm | | 18 | | ns |
| Rise Time | $t_r$ | | | 33 | | ns |
| Turn-Off Delay Time | $t_{D(OFF)}$ | | | 37 | | ns |
| Fall Time | $t_f$ | | | 28 | | ns |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V, $I_D$=20A, $V_{GS}$=10V | | 26 | | nC |
| | | $V_{DS}$=15V, $I_D$=20A, $V_{GS}$=4.5V | | 13 | | nC |
| Gate-Source Charge | $Q_{gs}$ | $V_{DS}$=15V, $I_D$=20A<br>$V_{GS}$=10V | | 2.3 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 8.2 | | nC |

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| DRAIN-SOURCE DIODE CHARACTERISTICS [a] | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0V, Is = 10A | | 0.83 | 1.3 | V |

Notes

a.Pulse Test:Pulse Width ≤ 300us, Duty Cycle ≤ 2%.

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

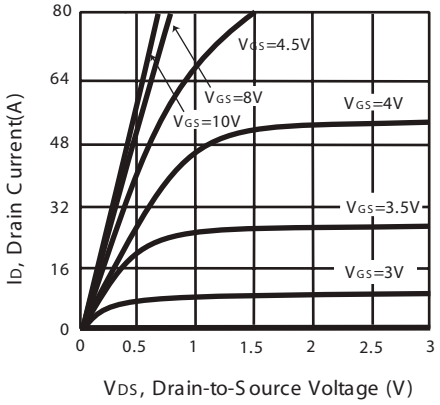



Figure 1. Output Characteristics

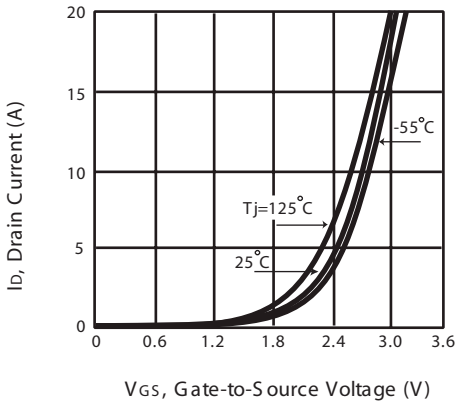



Figure 2. Transfer Characteristics

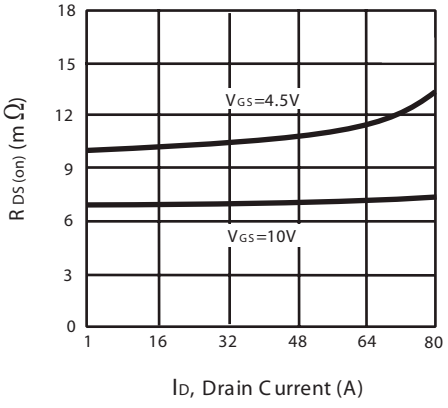



Figure 3. On-Resistance vs. Drain Current and Gate Voltage

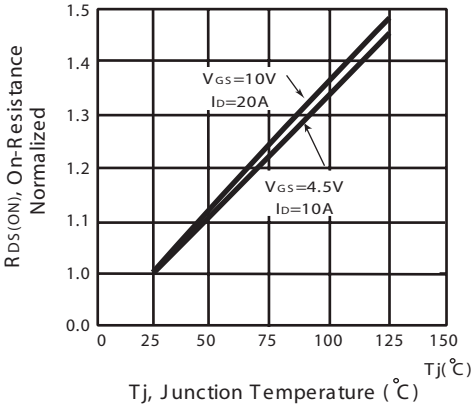



Figure 4. On-Resistance Variation with Drain Current and Temperature

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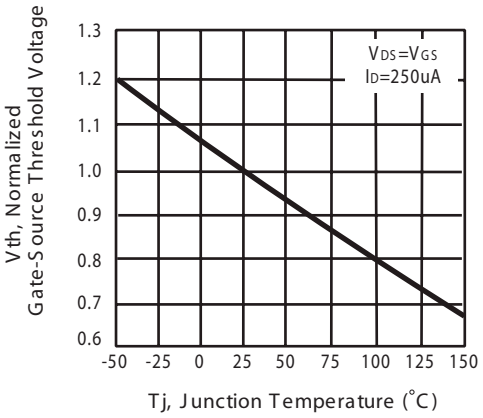



Figure 5. Gate Threshold Variation with Temperature

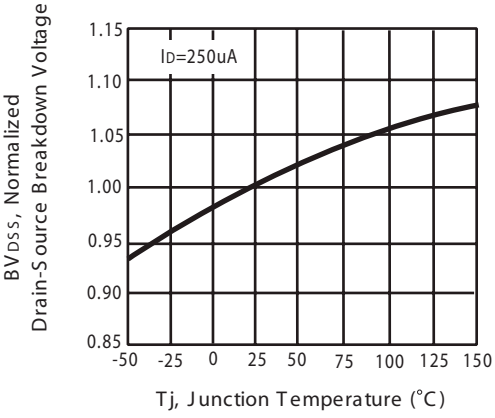



Figure 6. Breakdown Voltage Variation with Temperature

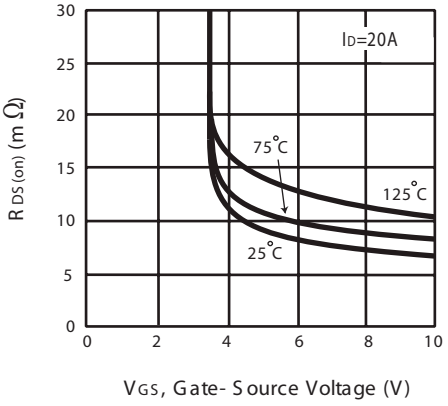



Figure 7. On-Resistance vs. Gate-Source Voltage

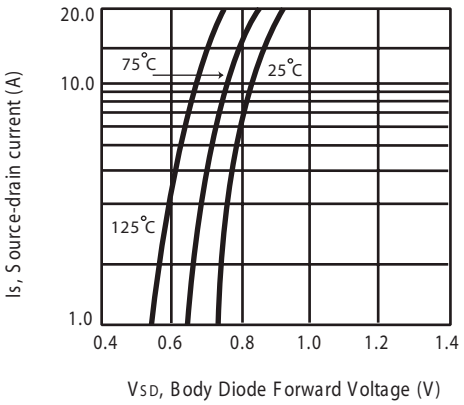



Figure 8. Body Diode Forward Voltage Variation with Source Current

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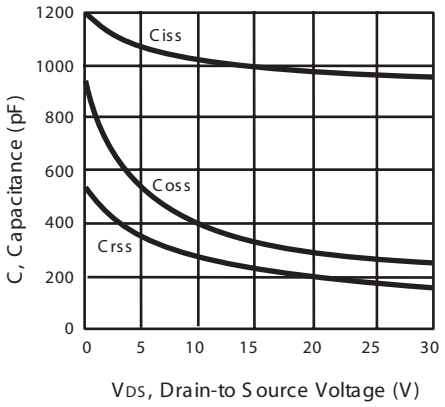



Figure 9. Capacitance

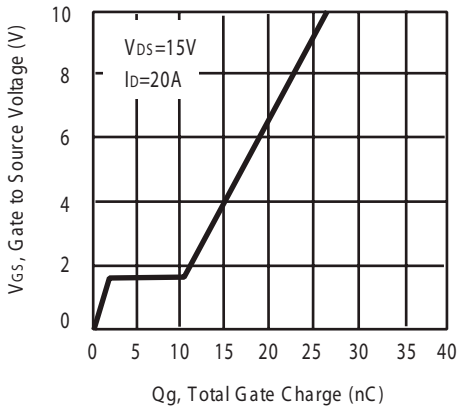



Figure 10. Gate Charge

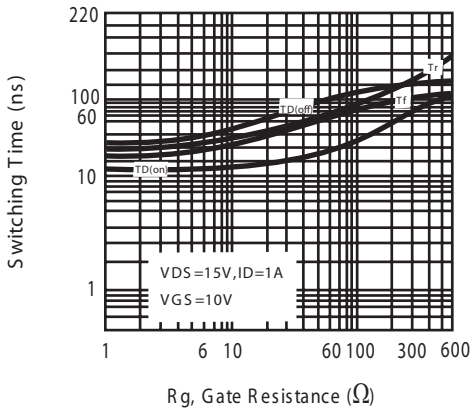



Figure 11.switching characteristics

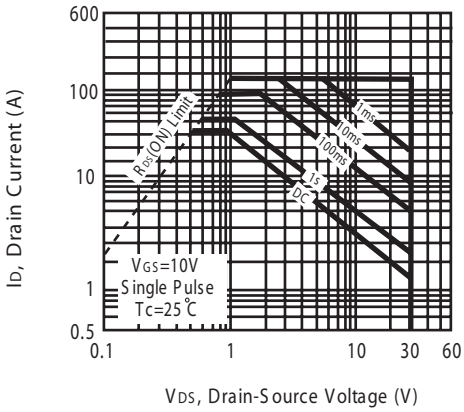



Figure 12. Maximum Safe Operating Area

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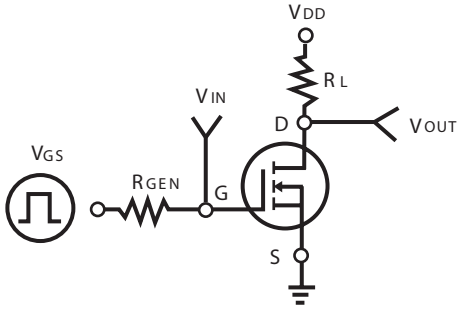



Figure 13. Switching Test Circuit

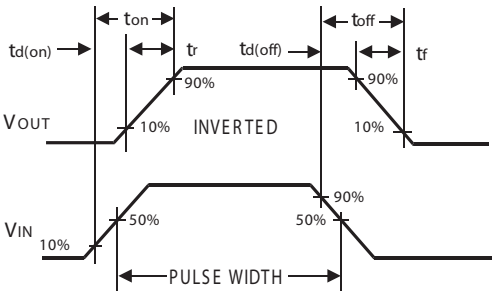



Figure 14. Switching Waveforms

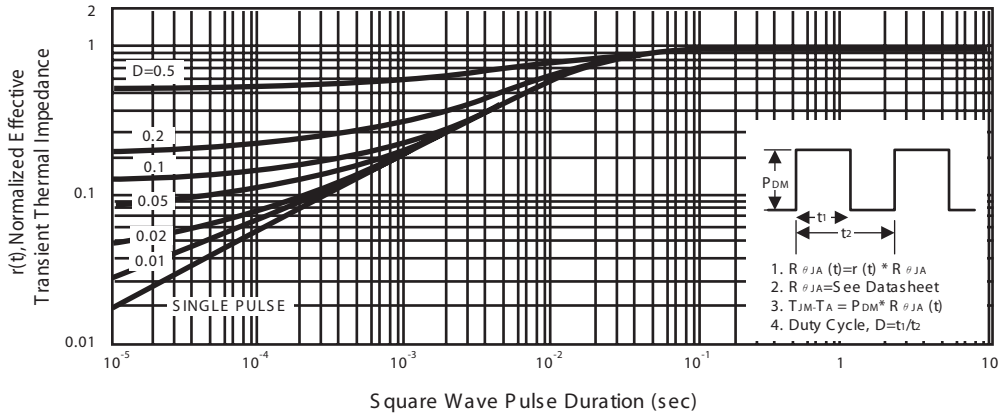
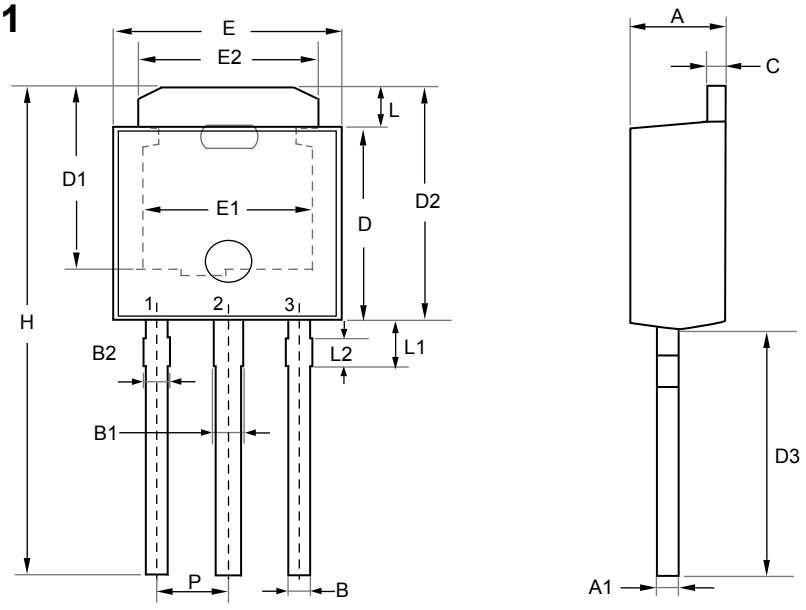



Figure 15. Normalized Thermal Transient Impedance Curve

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## PACKAGE OUTLINE DIMENSIONS

### TO-251

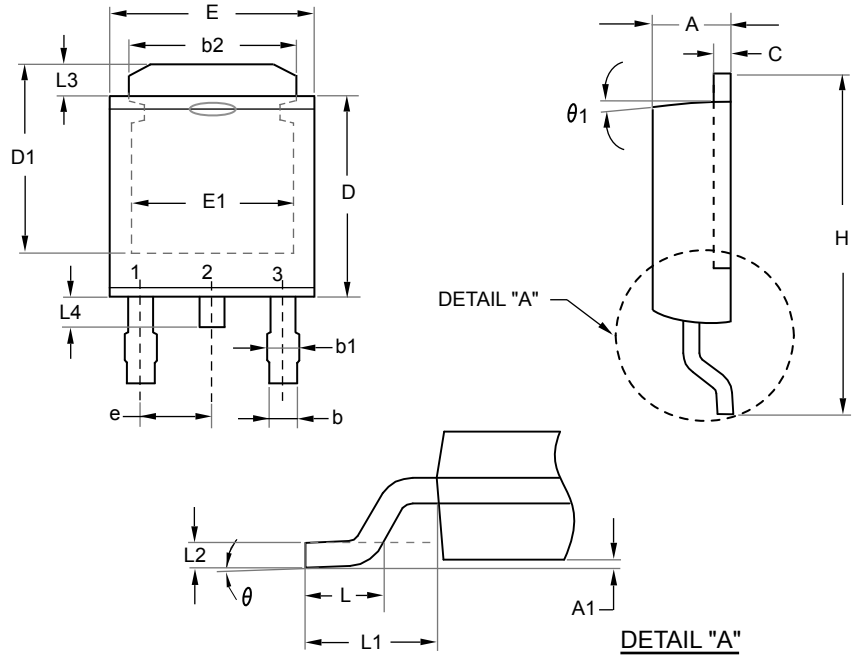



| SYMBOL | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 2.100 | 2.500 | 0.083 | 0.098 |
| A1 | 0.350 | 0.650 | 0.014 | 0.026 |
| B | 0.400 | 0.800 | 0.016 | 0.031 |
| B1 | 0.650 | 1.050 | 0.026 | 0.041 |
| B2 | 0.500 | 0.900 | 0.020 | 0.035 |
| C | 0.400 | 0.600 | 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 | 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 | |

# STU/D302S

## PACKAGE OUTLINE DIMENSIONS

TO-252

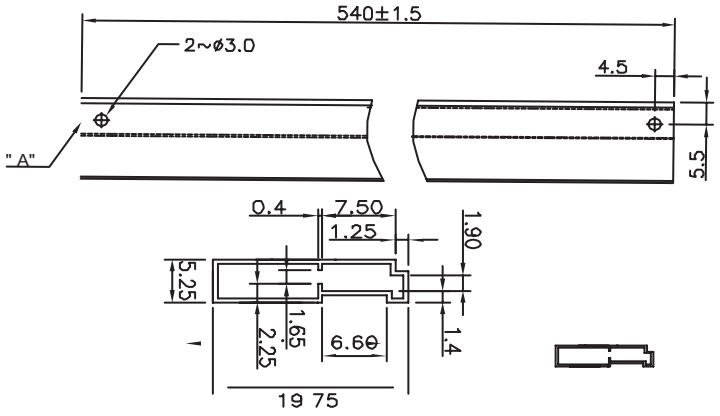



| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 2.100 | 2.500 | 0.083 | 0.098 |
| A1 | 0.000 | 0.200 | 0.000 | 0.008 |
| b | 0.400 | 0.889 | 0.016 | 0.035 |
| b1 | 0.770 | 1.140 | 0.030 | 0.045 |
| b2 | 4.800 | 5.460 | 0.189 | 0.215 |
| C | 0.400 | 0.600 | 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 | 4.400 | 5.004 | 0.173 | 0.197 |
| e | 2.290 REF | | 0.090 BSC | |
| H | 8.900 | 10.400 | 0.350 | 0.409 |
| L | 1.397 | 1.770 | 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 | 7° REF. | | 7° REF. | |

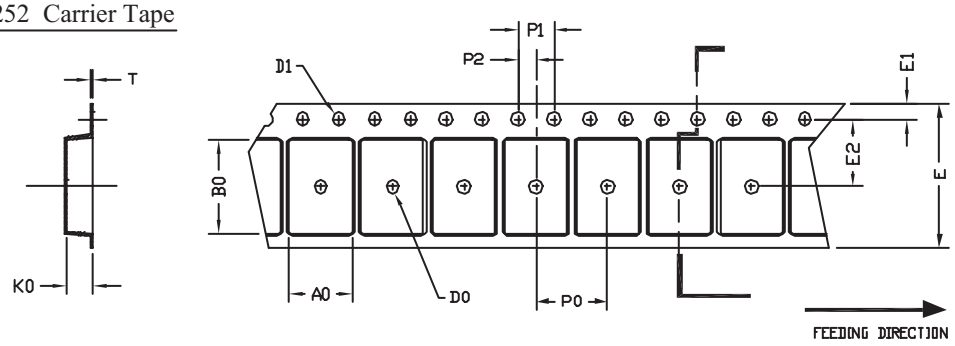
# STU/D302S

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

### TO-251 Tube



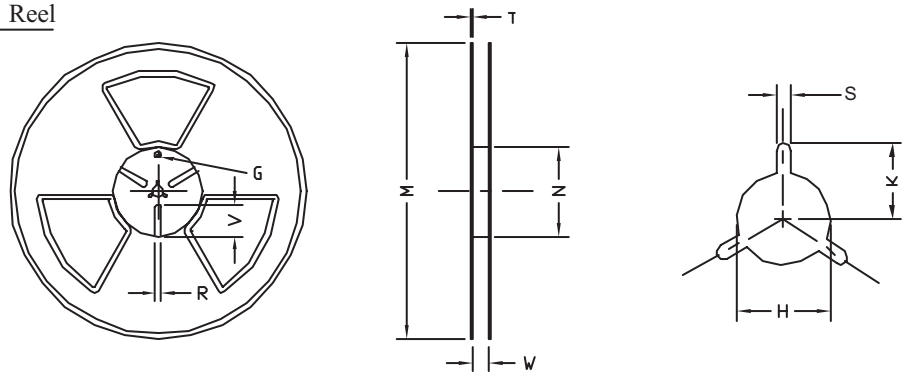

### TO-252 Carrier Tape




UNIT:㎜

| PACKAGE | A0 | B0 | K0 | D0 | D1 | E | E1 | E2 | P0 | P1 | P2 | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TO-252 (16 ㎜) | 6.80 ±0.1 | 10.3 ±0.1 | 2.50 ±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 | --- | --- | --- |