## Descriptions

This is N-CHANNEL MOSFET in a TO-252 Plastic Package.

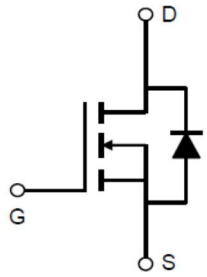
## Features

- Low $R_{DS(on)}$
- low gate charge
- low $C_{rss}$ ,
- fast switching.

## Applications

- Suited for low voltage applications such as automotive
- DC/DC Converters
- and high efficiency switching for power management in portable and battery operated products.

## Equivalent Circuit




## Pinning


PIN1： G　　PIN 2： D　　PIN 3： S　　PIN 4： D

## Marking

See Marking Instructions.

## Absolute Maximum Ratings(Ta=25℃)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 100 | V |
| Drain Current | $I_D$(Tc=25℃) | 30 | A |
| Drain Current | $I_D$(Tc=100℃) | 20 | A |
| Drain Current - Pulsed [C] | $I_{DM}$ | 70 | A |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Avalanche Current [C] | $I_{AS}$ | 18.3 | A |
| Avalanche energy L=0.5mH [C] | $E_{AS}$ | 133 | mJ |
| Power Dissipation [B] | $P_D$(Tc=25℃) | 100 | W |
| | $P_D$(Tc=100℃) | 50 | W |
| Power Dissipation [A] | $P_{DSM}$($T_A$=25℃) | 2.5 | W |
| | $P_{DSM}$($T_A$=70℃) | 1.6 | W |
| Junction and Storage Temperature Range | $T_j$, $T_{stg}$ | -55～150 | ℃ |

## Electrical Characteristics(Ta=25℃)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=-250μA | 100 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=100V $V_{GS}$=0V | | | 1.0 | μA |
| | | $V_{DS}$=100V $V_{GS}$=0V $T_J$=55°C | | | 5.0 | μA |
| Gate-Body Leakage Current Forward | $I_{GSS}$ | $V_{GS}$=±20V $V_{DS}$=0V | | | 100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$ $I_D$=250μA | 1 | 1.4 | 2.5 | V |
| Static Drain-Source On-Resistance | $R_{DS(on)1}$ | $V_{GS}$=10V $I_D$=30A | | 48 | 55 | mΩ |
| | $R_{DS(on)2}$ | $V_{GS}$=4.5V $I_D$=15A | | 62 | 70 | mΩ |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=10A $V_{GS}$=0V | | 0.8 | 1.0 | V |

## Electrical Characteristics(Ta=25℃)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Capacitance | $C_{iss}$ | $V_{DS}$=25V $V_{GS}$=0V f=1.0MHz | | 888 | | pF |
| Output Capacitance | $C_{oss}$ | | | 9.4 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 72 | | |
| Gate resistance | $R_g$ | $V_{GS}$=0V $V_{DS}$=0V f=1MHz | | 1.61 | | Ω |
| Total Gate Charge | $Q_g$(10V) | $V_{GS}$=10V $V_{DS}$=50V $I_D$=10A | 26 | 34 | 44 | nC |
| Total Gate Charge | $Q_g$(4.5V) | | 14 | 18 | 22 | |
| Gate Source Charge | $Q_{gs}$ | | 4 | 6 | 8 | |
| Gate Drain Charge | $Q_{gd}$ | | 5 | 9 | 13 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$=10V $V_{DS}$=50V $R_L$=5Ω $R_{GEN}$=3Ω | | 7 | | ns |
| Turn-On Rise Time | $t_r$ | | | 7 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 29 | | |
| Turn-Off Fall Time | $t_f$ | | | 7 | | |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$=10A dI/dt=500A/ms | 22 | 32 | 42 | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | $I_F$=10A dI/dt=500A/ms | 140 | 200 | 260 | nC |
| Maximum Junction to Ambient [A] | $R_{\theta JA}$ | t≤10s | | 14.2 | 20 | ℃/W |
| Maximum Junction to Ambient [AD] | | teady-State | | 39 | 50 | ℃/W |
| Maximum Junction-to-Case | $R_{\theta JC}$ | teady-State | | 0.8 | 1.5 | ℃/W |

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°C. The Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.

B. The power dissipation PD is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance,and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used. C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial $T_J$ =25°C.

D. The RqJA is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

E. The static characteristics in Figures 1to6 are obtained using <300ms pulses, duty cycle 0.5% max. F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150 °C.The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C.

## Electrical Characteristic Curve

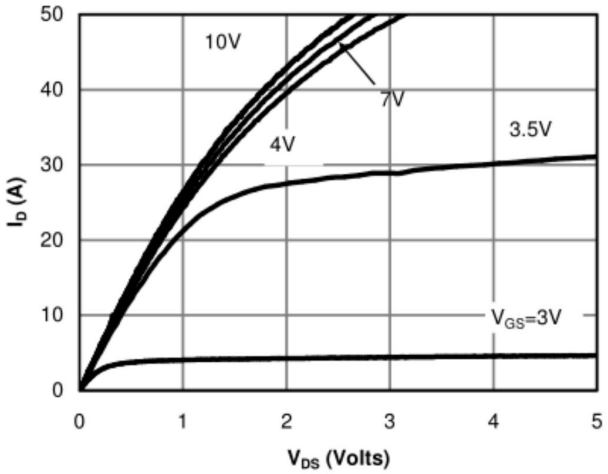



Fig 1: On-Region Characteristics

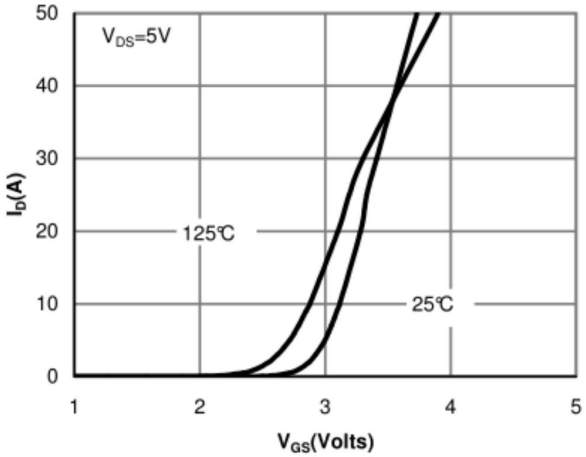



Figure 2: Transfer Characteristics

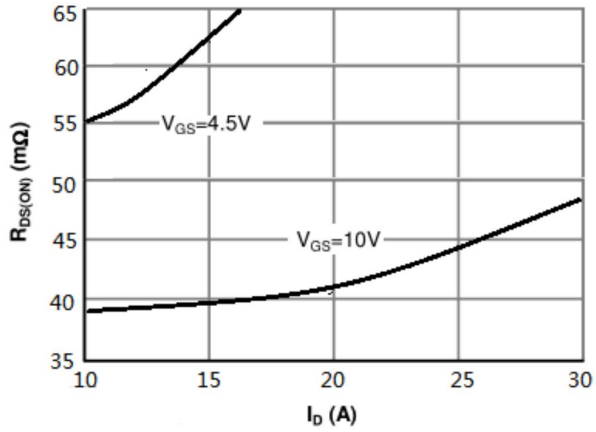



Figure 3: On-Resistance vs. Drain Current and Gate Voltage

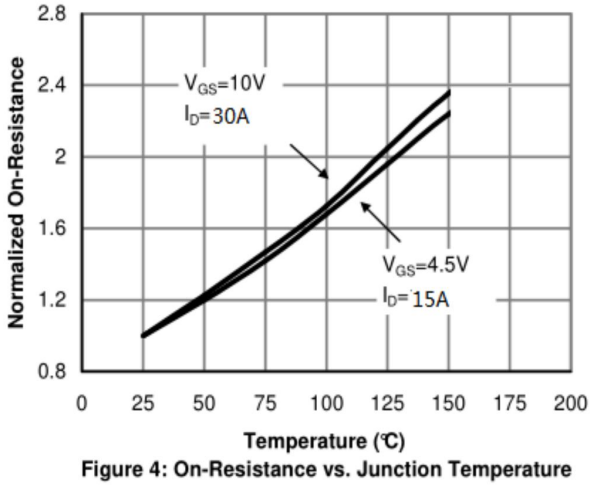



Figure 4: On-Resistance vs. Junction Temperature

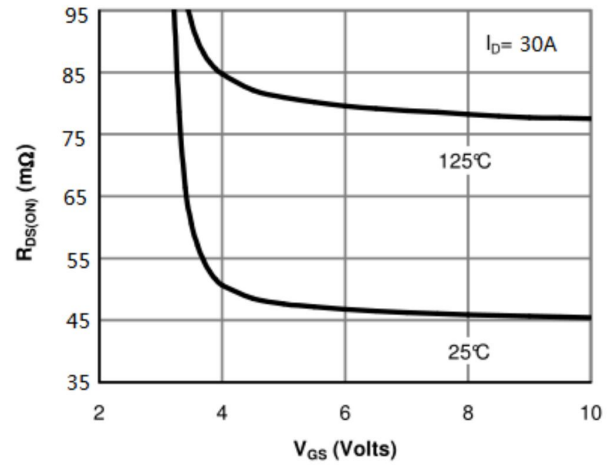



Figure 5: On-Resistance vs. Gate-Source Voltage

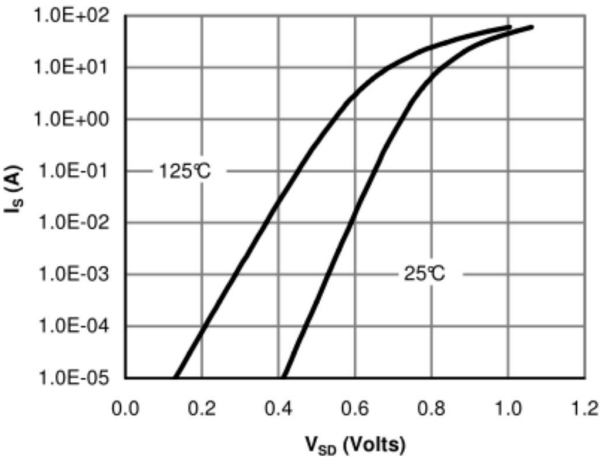



Figure 6: Body-Diode Characteristics

## Electrical Characteristic Curve

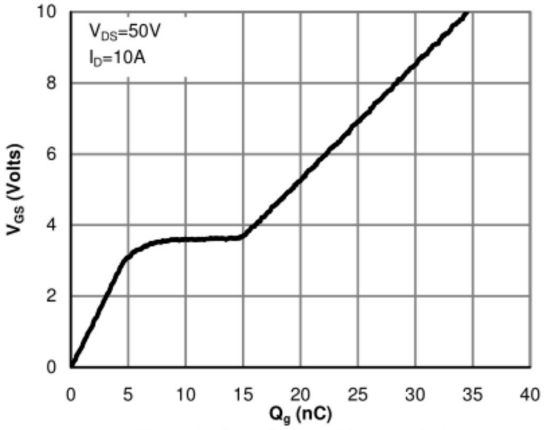



Figure 7: Gate-Charge Characteristics

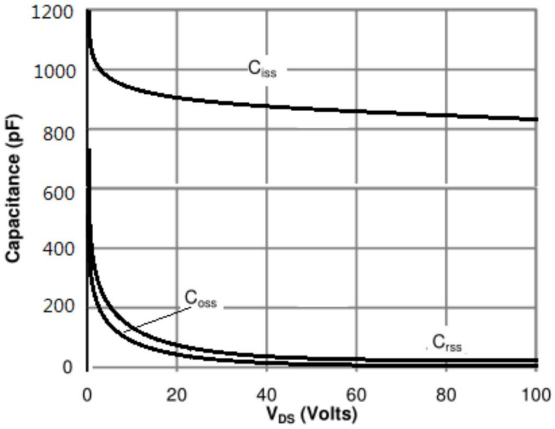



Figure 8: Capacitance Characteristics

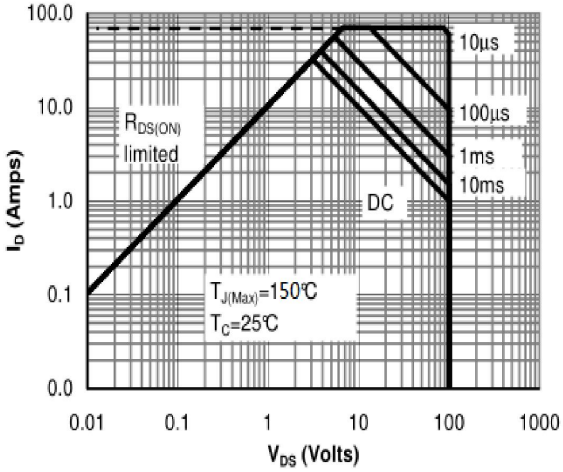



Figure 9: Maximum Forward Biased Safe Operating Area

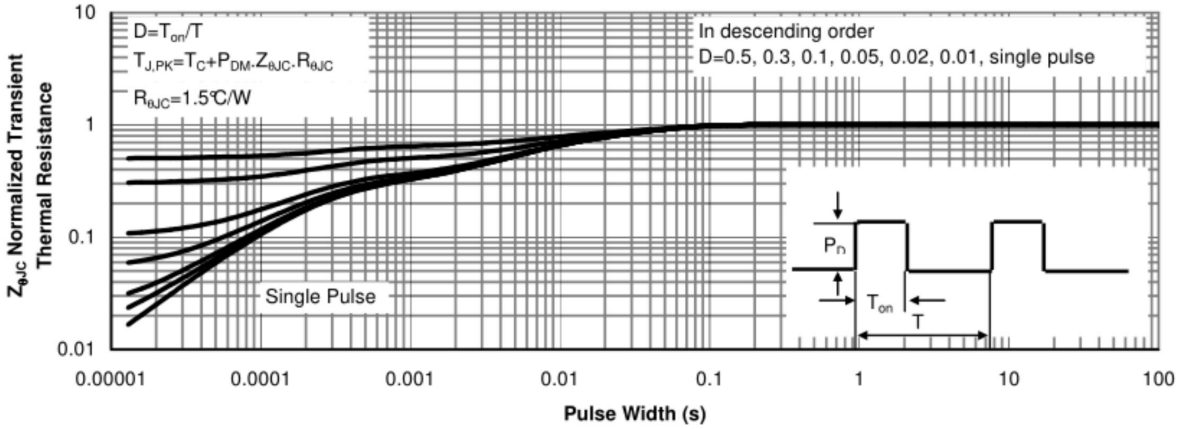
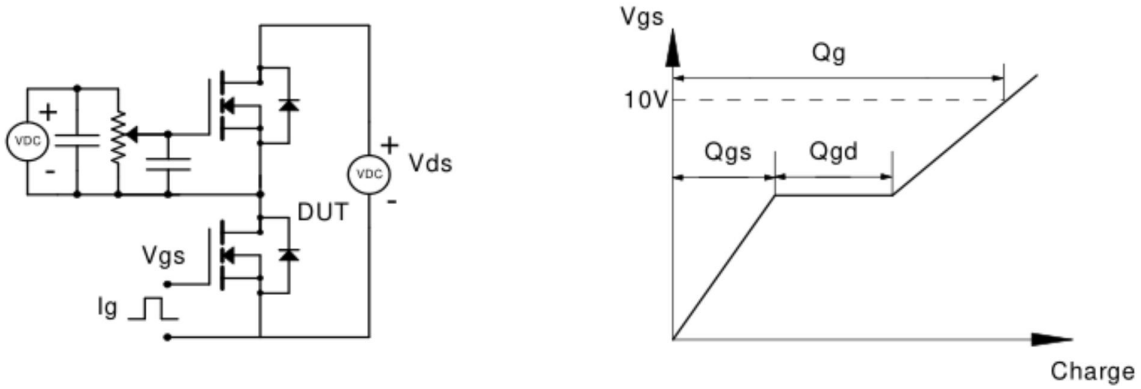


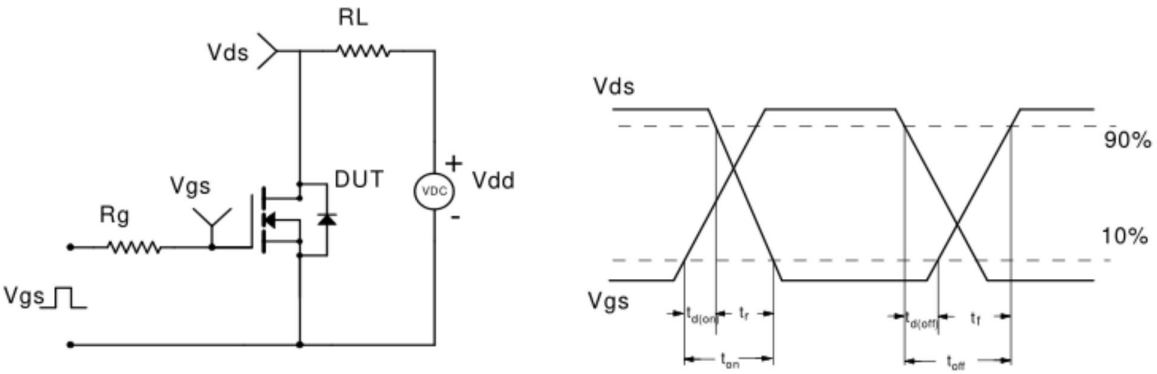

Figure 10: Normalized Maximum Transient Thermal Impedance

## Test circuits & Typical Application

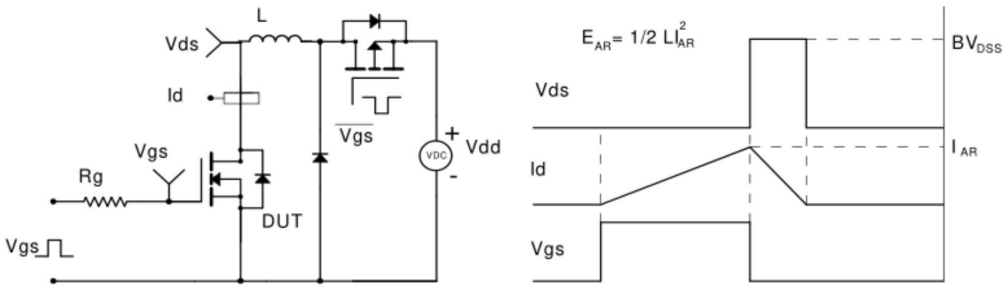
Gate Charge Test Circuit & Waveform



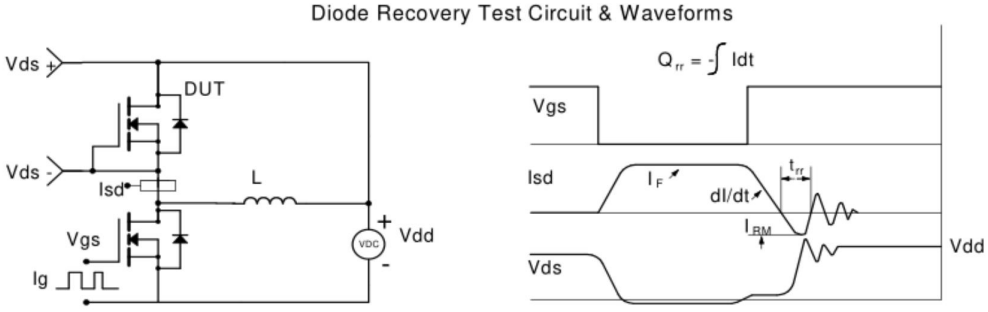

Resistive Switching Test Circuit & Waveforms



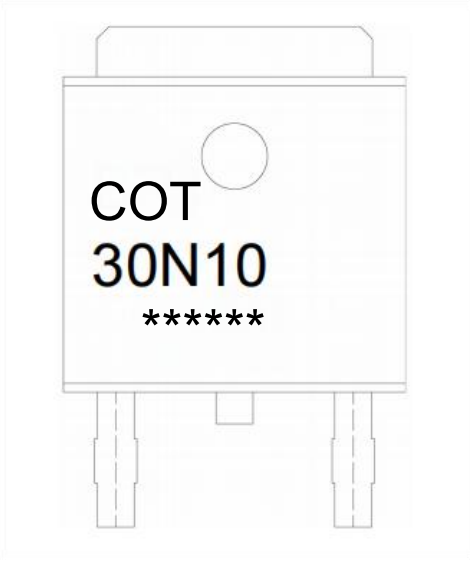

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



## Marking Instructions




Note:

COT: Company Code

30N10: Product Type Code.

******: Lot No. Code, code change with Lot No.

## Packaging SPEC

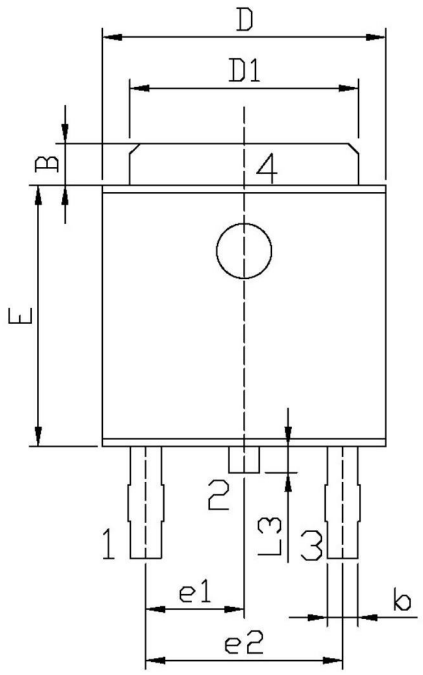
REEL

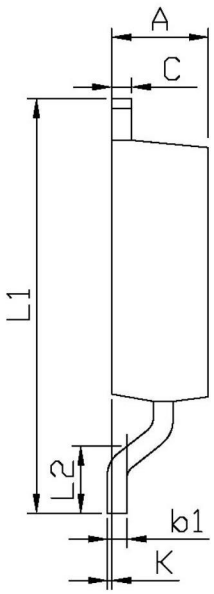
| Package Type | Units | | | | | Dimension (unit: $mm^3$) | | |
|---|---|---|---|---|---|---|---|---|
| | Units/Reel | Reels/Inner Box | Units/Inner Box | Inner Boxes/Outer Box | Units/Outer Box | Reel | Inner Box | Outer Box |
| TO-252 | 2,500 | 2 | 5,000 | 6 | 30,000 | 13″ ×16 | 360×360×50 | 380×335×366 |

TUBE

| Package Type | Units | | | | | Dimension (unit: $mm^3$) | | |
|---|---|---|---|---|---|---|---|---|
| | Units/Tube | Tubes/Inner Box | Units/Inner Box | Inner Boxes/Outer Box | Units/Outer Box | Tube | Inner Box | Outer Box |
| TO-251/252 | 75 | 48 | 3,600 | 5 | 18,000 | 526×20.5×5.25 | 555×164×50 | 575×290×180 |

## Package Outline Dimensions




单位：mm

| Symbol | Dimensions In Millimeters | | Symbol | Dimensions In Millimeters | |
|---|---|---|---|---|---|
| | Min | Max | | Min | Max |
| A | 2.20 | 2.40 | E | 5.95 | 6.25 |
| B | 0.95 | 1.25 | e1 | 2.24 | 2.34 |
| b | 0.50 | 0.70 | e2 | 4.43 | 4.73 |
| b1 | 0.45 | 0.55 | L1 | 9.45 | 9.95 |
| C | 0.45 | 0.55 | L2 | 1.25 | 1.75 |
| D | 6.45 | 6.75 | L3 | 0.60 | 0.90 |
| D1 | 5.10 | 5.50 | K | 0.00 | 0.10 |

TO-252