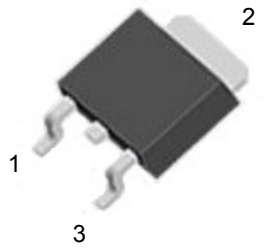
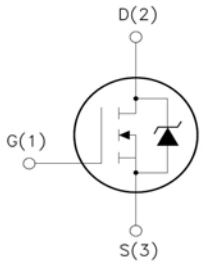
# CTKD2N60

## Features:

- ☐ Low Intrinsic Capacitances.
- ☐ Excellent Switching Characteristics.
- ☐ Extended Safe Operating Area.
- ☐ Unrivalled Gate Charge :Qg= 90nC (Typ.).
- ☐ BVDSS=650V,$I_D$=2A
- ☐ $R_{DS}$(on) : 4.5Ω (Max) @$V_G$=10V
- ☐ 100% Avalanche Tested

TO-252




1.Gate (G)
2.Drain (D)
3.Source (S)

## Absolute Maximum Ratings (Ta=25℃ unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 600 | V |
| $I_D$ | Drain Current | $T_C$=25℃ | 2 | A |
| | | $T_C$=100℃ | 1.5 | |
| $V_{GSS}$ | Gate-Source Voltage | | ±30 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy (note1) | | 120 | mJ |
| $I_{AR}$ | Avalanche Current (note2) | | 2 | A |
| $P_D$ | Power Dissipation (Ta=25℃) | | 40 | W |
| $T_j$ | Junction Temperature(Max) | | 150 | ℃ |
| $T_{stg}$ | Storage Temperature | | -55~+150 | |
| TL | Maximum lead temperature for soldering purpose,1/8” from case for 5 seconds | | 300 | |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance,Junction to Case | - | 2.87 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance,Junction to Ambient | - | 50 | |

## Electrical Characteristics (Ta=25℃ unless otherwise noted)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $I_D$=250μA，$V_{GS}$=0 | 600 | - | - | V |
| △BVDSS/△TJ | Breakdown Voltage Temperature Coefficient | $I_D$=250μA ,Reference to 25℃ | - | 0.4 | - | V/℃ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=600V, $V_{GS}$=0V | - | - | 1 | μA |
| | | $V_{DS}$=520V, $T_C$=125℃ | | | 10 | |
| $I_{GSSF}$ | Gate-body leakage Current, Forward | $V_{GS}$=+30V, $V_{DS}$=0V | - | - | 100 | nA |
| $I_{GSSR}$ | Gate-body leakage Current, Reverse | $V_{GS}$=-30V, $V_{DS}$=0V | - | - | -100 | |
| **On Characteristics** | | | | | | |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $I_D$=250μA,$V_{DS}$=$V_{GS}$ | 2 | - | 4 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $I_D$=1A,$V_{GS}$=10V | - | 3.6 | 4.5 | Ω |
| **Dynamic Characteristics** | | | | | | |
| Ciss | Input Capacitance | $V_{DS}$=25V，$V_{GS}$=0，f=1.0MHz | - | 270 | 350 | pF |
| Coss | Output Capacitance | | - | 40 | 50 | |
| Crss | Reverse Transfer Capacitance | | - | 5 | 7 | |
| **Switching Characteristics** | | | | | | |
| Td(on) | Turn-On Delay Time | $V_{DD}$=300V，$I_D$=2A $R_G$=25Ω (Note 3,4) | - | 10 | 30 | ns |
| Tr | Turn-On Rise Time | | - | 25 | 60 | |
| Td(off) | Turn-Off Delay Time | | - | 20 | 50 | |
| Tf | Turn-Off Rise Time | | - | 25 | 60 | |
| Qg | Total Gate Charge | $V_{DS}$=520V,$V_{GS}$=10V，$I_D$=2A (Note 3,4) | - | 90 | 110 | nC |
| Qgs | Gate-Source Charge | | - | 1.6 | - | |
| Qgd | Gate-Drain Charge | | - | 4.3 | - | |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| Is | Max. Diode Forward Current | - | - | - | 2 | A |
| $I_{SM}$ | Max. Pulsed Forward Current | - | - | - | 8 | |
| $V_{SD}$ | Diode Forward Voltage | $I_D$=2A | - | - | 1.5 | V |
| Trr | Reverse Recovery Time | $I_S$=2A,$V_{GS}$ =0V diF/dt=100A/μs (Note3) | - | 180 | - | ns |
| Qrr | Reverse Recovery Charge | | - | 0.72 | - | μC |

Notes : 1, L=60mH, IAS=2A, VDD=50V, RG=25Ω, Starting TJ =25°C
2, Repetitive Rating : Pulse width limited by maximum junction temperature
3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%
4, Essentially Independent of Operating Temperature

## Typical Characteristics

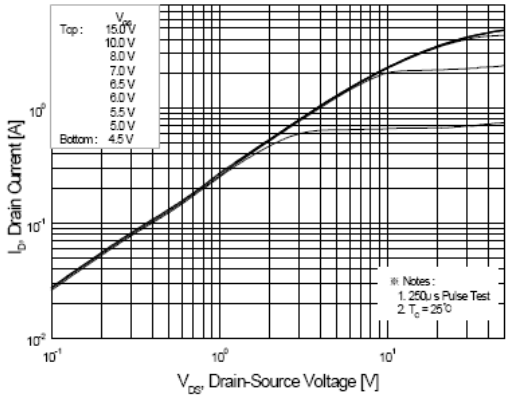



**Figure 1. On-Region Characteristics**

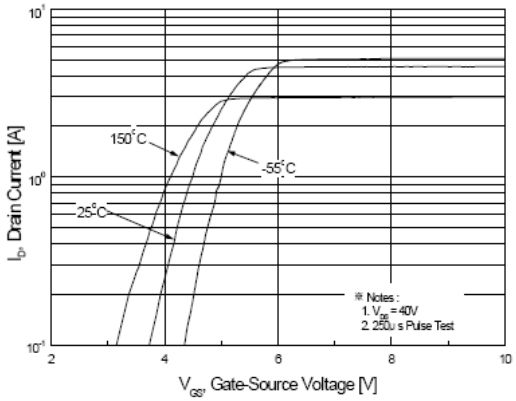



**Figure 2. Transfer Characteristics**

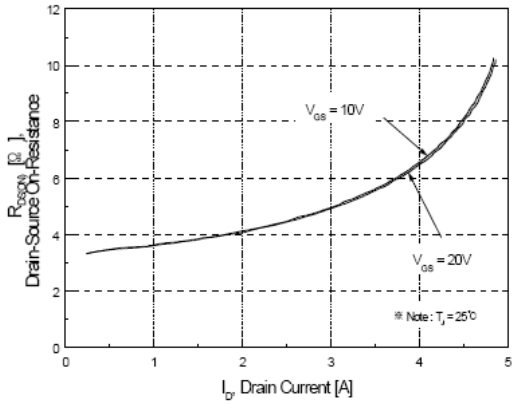



**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**

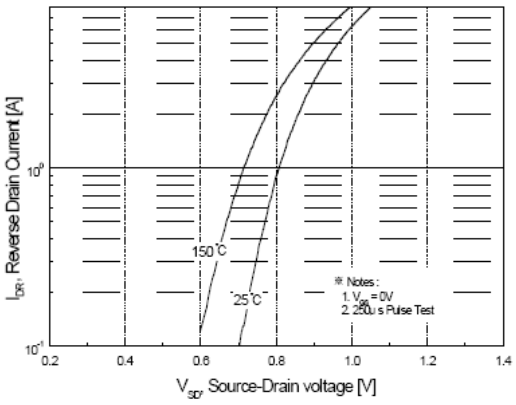



**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

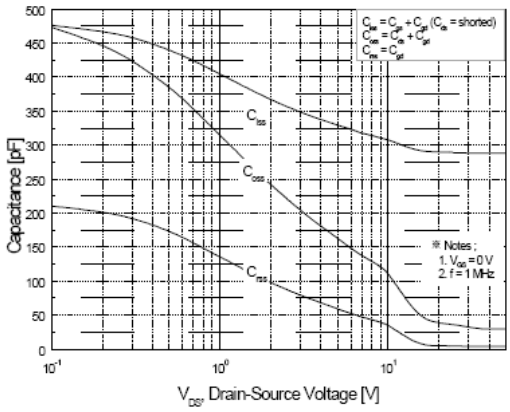



**Figure 5. Capacitance Characteristics**

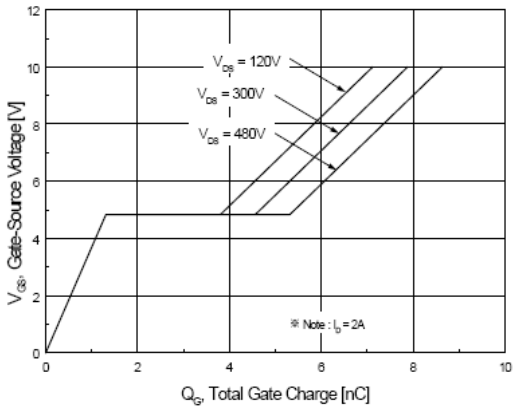



**Figure 6. Gate Charge Characteristics**

## Typical Characteristics (Continued)

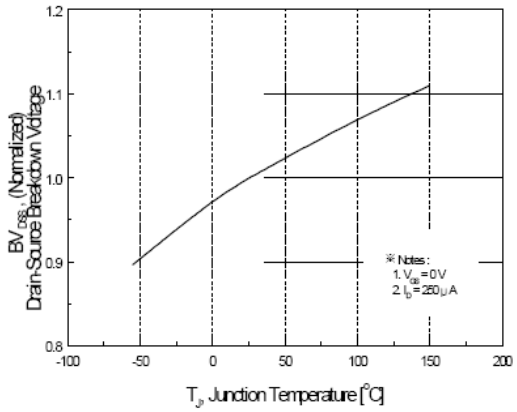



**Figure 7. Breakdown Voltage Variation vs Temperature**

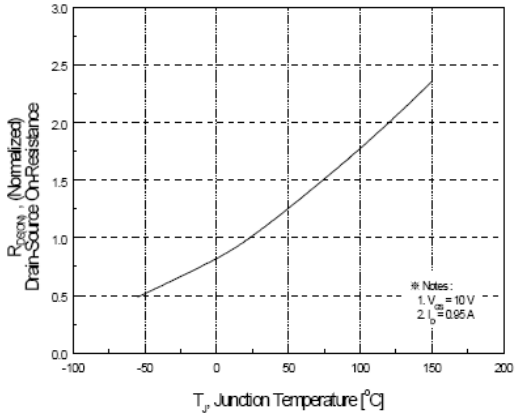



**Figure 8. On-Resistance Variation vs Temperature**

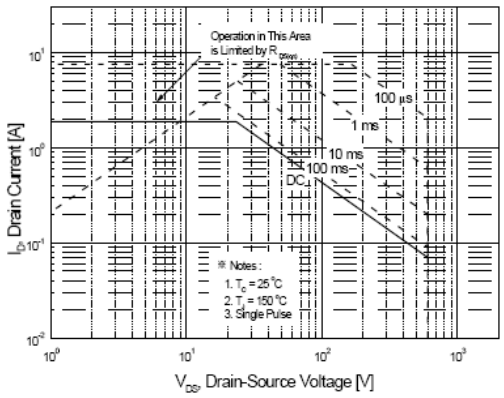



**Figure 9. Maximum Safe Operating Area**

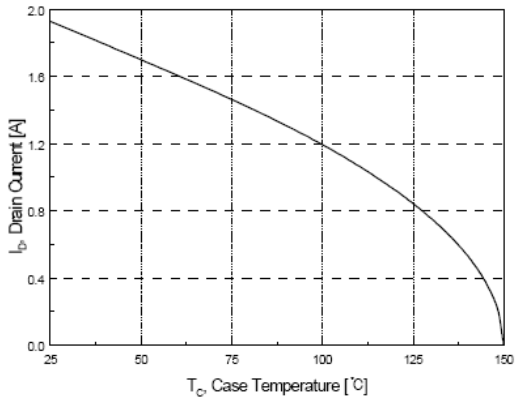



**Figure 10. Maximum Drain Current vs Case Temperature**

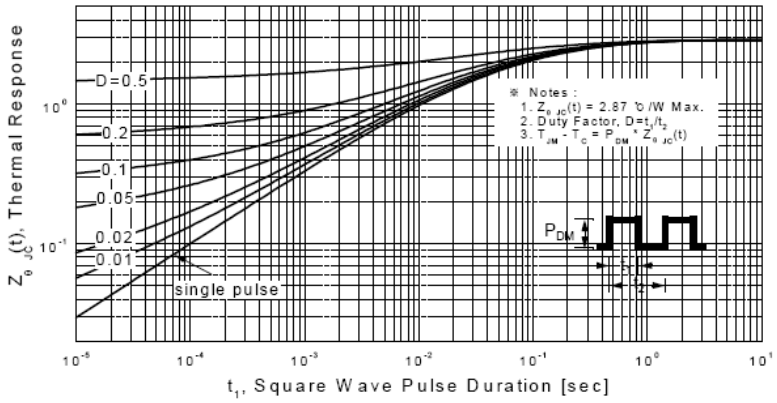
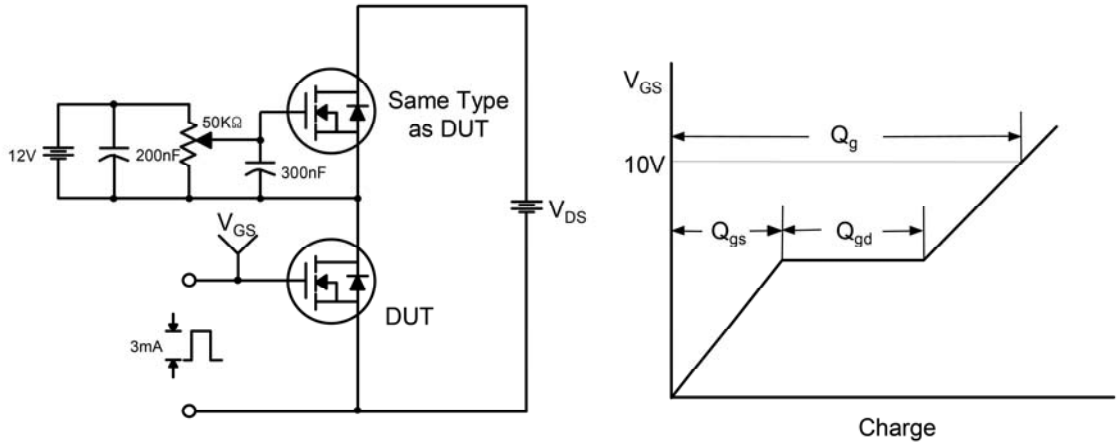
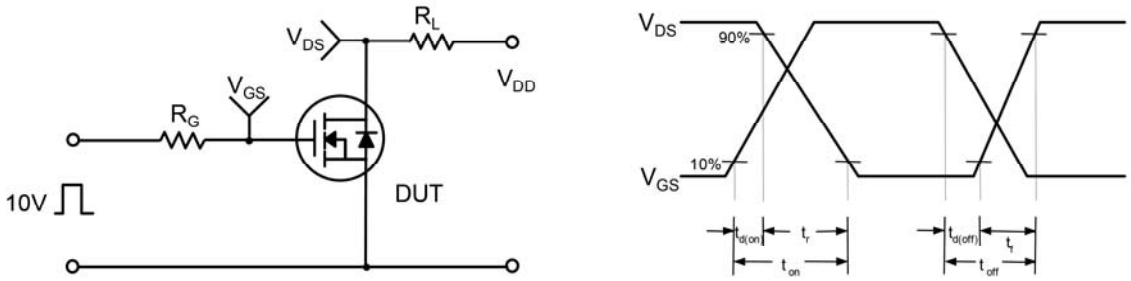



**Figure 11. Transient Thermal Response Curve**

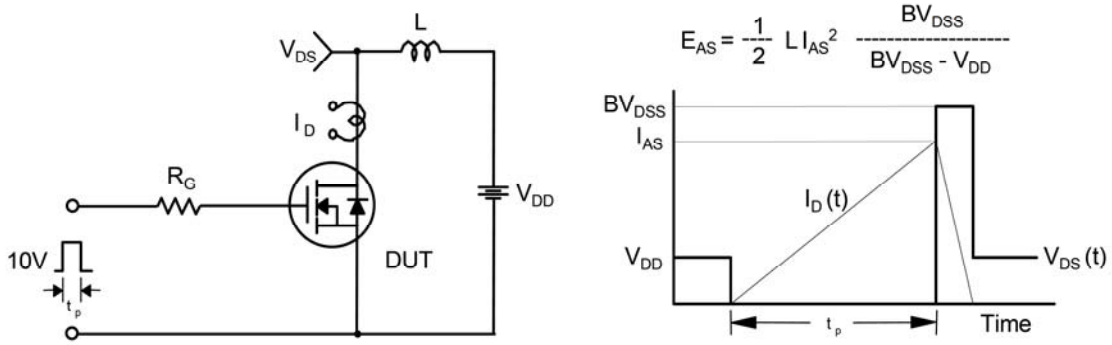
## Gate Charge Test Circuit & Waveform



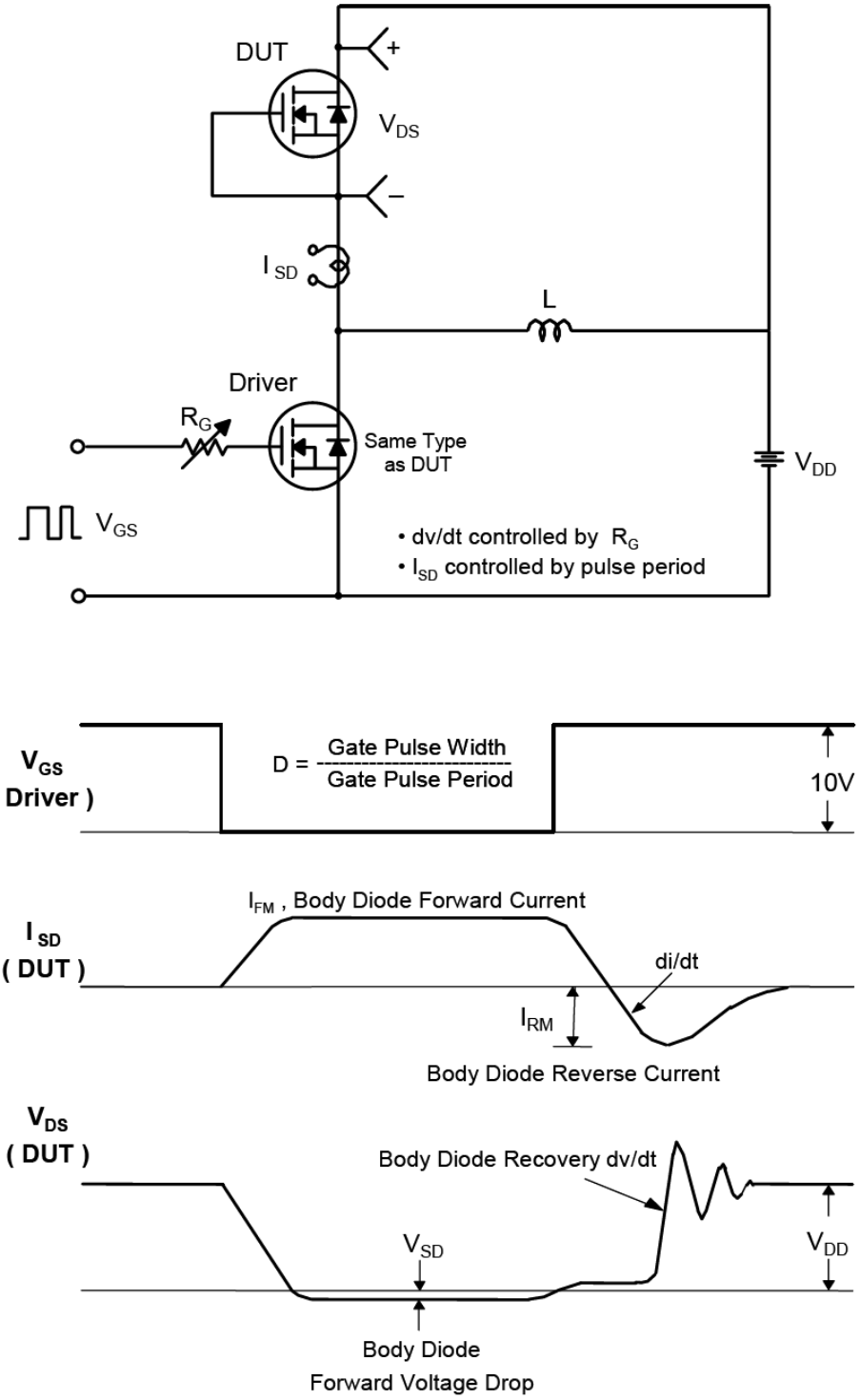

**Resistive Switching Test Circuit & Waveforms**



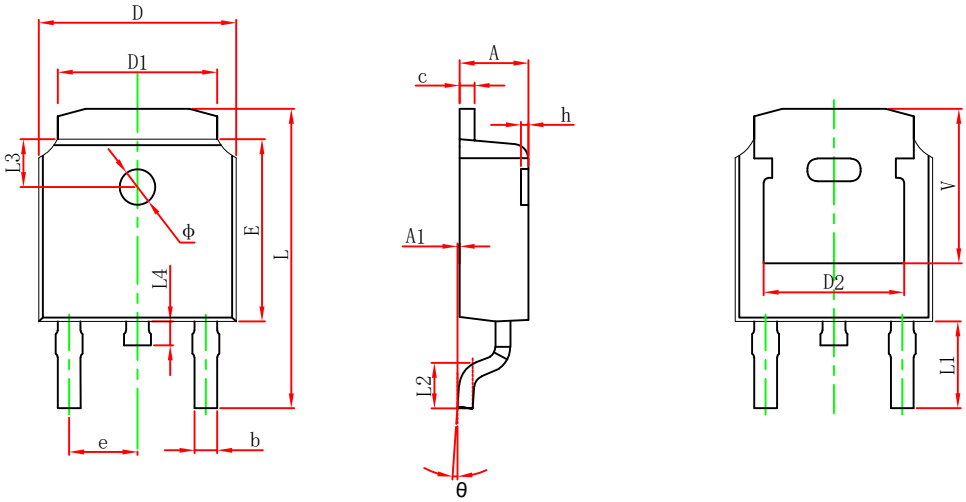

**Unclamped Inductive Switching Test Circuit & Waveforms**



## Peak Diode Recovery dv/dt Test Circuit & Waveform

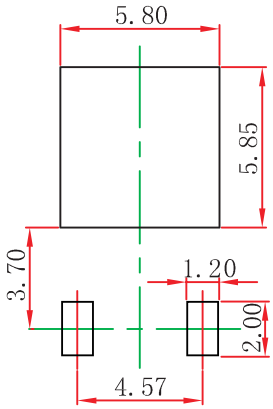


## Package Dimension




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| b | 0.700 | 0.860 | 0.025 | 0.030 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 REF. | | 0.190 REF. | |
| E | 6.000 | 6.300 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 9.712 | 10.312 | 0.382 | 0.406 |
| L1 | 2.900 REF. | | 0.114 REF. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 REF. | | 0.063 REF. | |
| L4 | 0.600 | 1.000 | 0.024 | 0.039 |
| Φ | 1.100 | 1.300 | 0.043 | 0.051 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.250 REF. | | 0.207 REF. | |

## TO-252-2L Suggest Pad Layout




**NOTE:**

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purposes only.