

N-Channel Enhancement Mode Power MOSFET

LUD2N60

BV_{DSS} : 600V
 $R_{DS(ON)}$: 4.0 Ω (typ.)
 I_D : 2A

Description

The LUD2N60 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-252 package is universally preferred for all commercial-industrial applications

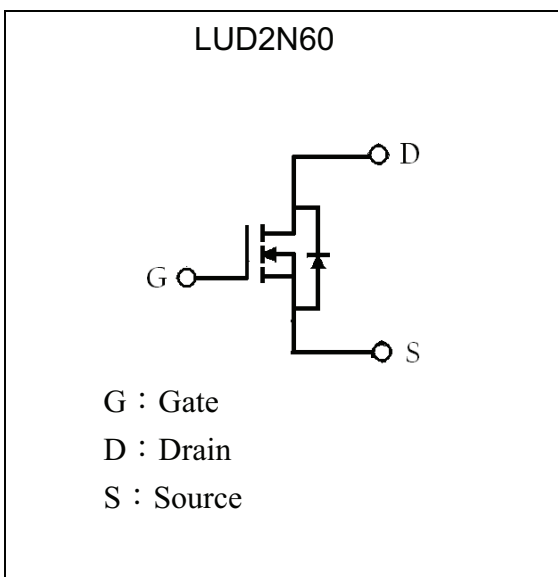
Features

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

Applications

- Open Framed Power Supply
- Adapter
- STB
- BLDC Motor Control Application

Symbol



Outline



Absolute Maximum Ratings (T_C=25°C)

| Parameter | Symbol | Limits | Unit |
|--|-----------------------------------|----------|------|
| Drain-Source Voltage | V _{DS} | 600 | V |
| Gate-Source Voltage | V _{GS} | ±30 | V |
| Continuous Drain Current | I _D | 2 | A |
| Continuous Drain Current @T _C =100°C | I _D | 1.2 | A |
| Pulsed Drain Current @ V _{GS} =10V (Note 1) | I _{DM} | 8 | A |
| Single Pulse Avalanche Energy (Note 2) | E _{AS} | 63 | mJ |
| Avalanche Current (Note 1) | I _{AR} | 1.9 | A |
| Repetitive Avalanche Energy (Note 1) | E _{AR} | 4.4 | mJ |
| Peak Diode Recovery dv/dt (Note 3) | dv/dt | 4.5 | V/ns |
| Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds | T _L | 300 | °C |
| Total Power Dissipation (T _A =25°C) | P _D | 1.5 | W |
| Total Power Dissipation (T _C =25°C) | | 44 | W |
| Linear Derating Factor | | 0.35 | W/°C |
| Operating Junction and Storage Temperature | T _j , T _{stg} | -55~+150 | °C |

Note : 1.Repetitive rating; pulse width limited by maximum junction temperature.

2. I_{AS}=2A, V_{DD}=50V, L=30mH, R_G=25Ω, starting T_J=+25°C.

3. I_{SD}≤2A, di/dt≤100A/μs, V_{DD}≤BV_{DSS}, starting T_J=+25°C.

Thermal Data

| Parameter | Symbol | Value | Unit |
|--|---------------------|-----------|------|
| Thermal Resistance, Junction-to-case, max | R _{th,j-c} | 2.87 | °C/W |
| Thermal Resistance, Junction-to-ambient, max | R _{th,j-a} | 50 (Note) | °C/W |
| Thermal Resistance, Junction-to-ambient, max | R _{th,j-a} | 110 | °C/W |

Note : When mounted on the minimum pad size recommended (PCB mount).

Characteristics (Tc=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|-------------------------------------|------|------|------|------|---|
| Static | | | | | |
| BV _{DSS} | 600 | - | - | V | V _{GS} =0, I _D =250μA, T _j =25°C |
| ΔBV _{DSS} /ΔT _j | - | 0.6 | - | V/°C | Reference to 25°C, I _D =250μA |
| V _{GS(th)} | 2.0 | - | 4.0 | V | V _{DS} = V _{GS} , I _D =250μA |
| *G _{FS} | - | 1.7 | - | S | V _{DS} =15V, I _D =1A |
| I _{GSS} | - | - | ±100 | nA | V _{GS} =±30 |
| I _{DSS} | - | - | 1 | μA | V _{DS} =600V, V _{GS} =0 |
| | - | - | 10 | μA | V _{DS} =480V, V _{GS} =0, T _C =125°C |
| *R _{DS(ON)} | - | 4 | 4.7 | Ω | V _{GS} =10V, I _D =1A |
| Dynamic | | | | | |
| *Q _g | - | 8.5 | - | nC | I _D =2A, V _{DD} =480V, V _{GS} =10V |
| *Q _{gs} | - | 1.3 | - | | |
| *Q _{gd} | - | 4.1 | - | | |
| *t _{d(ON)} | - | 9 | - | ns | V _{DD} =300V, I _D =2A, V _{GS} =10V, R _G =25 Ω, R _D =150 Ω |
| *t _r | - | 25 | - | | |
| *t _{d(OFF)} | - | 24 | - | | |
| *t _f | - | 28 | - | | |
| C _{iss} | - | 340 | - | pF | V _{GS} =0V, V _{DS} =25V, f=1MHz |
| C _{oss} | - | 35 | - | | |
| C _{rss} | - | 5.2 | - | | |
| Source-Drain Diode | | | | | |
| *V _{SD} | - | - | 1.4 | V | I _S =2A, V _{GS} =0V |
| *I _S | - | - | 2 | A | |
| *I _{SM} | - | - | 8 | | |
| *t _{rr} | - | 230 | - | ns | V _{GS} =0, I _F =2A, dI/dt=100A/μs |
| *Q _{rr} | - | 1 | - | μC | |

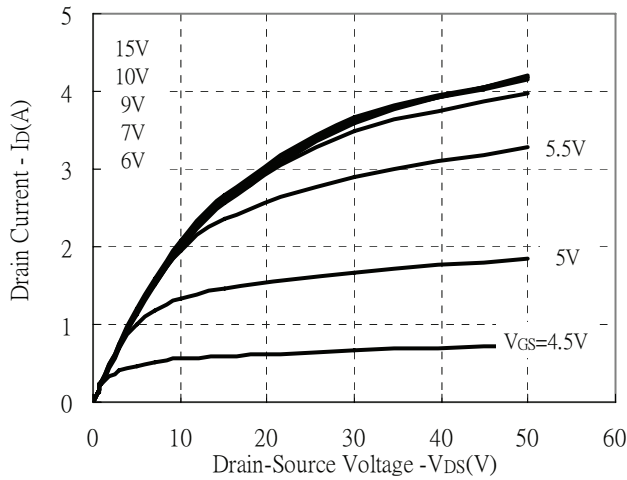
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Ordering Information

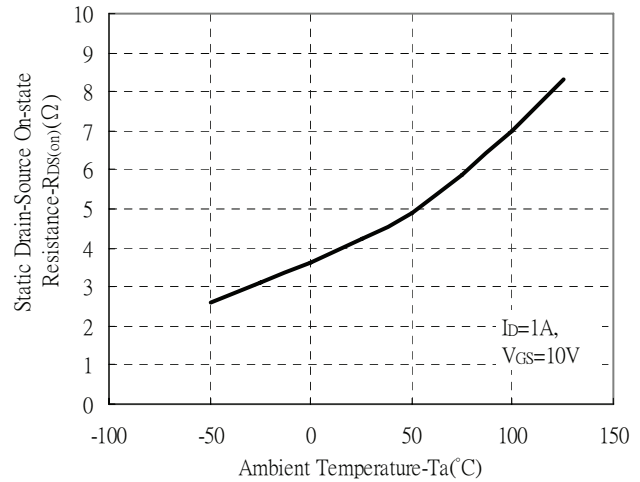
| Device | Package | Shipping |
|---------|--|------------------------|
| LUD2N60 | TO-252 (Pb-free lead plating package) | 2500 pcs / tape & reel |

Typical Characteristics

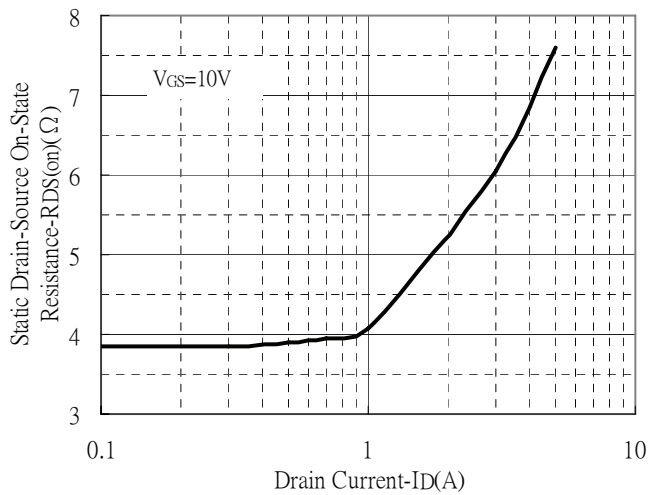
Typical Output Characteristics



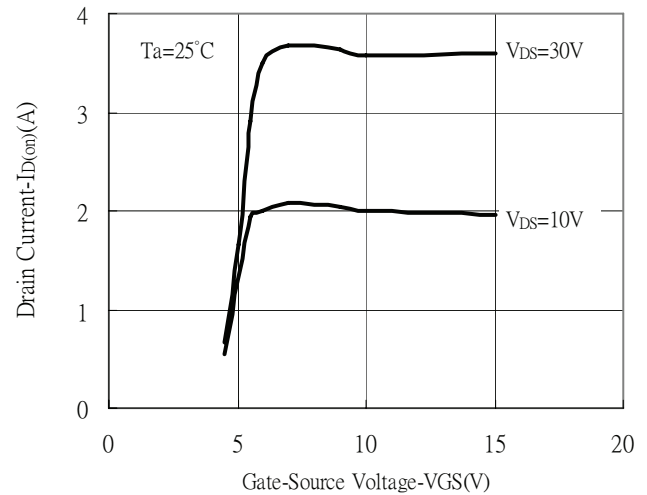
Static Drain-Source On-resistance vs Ambient Temperature



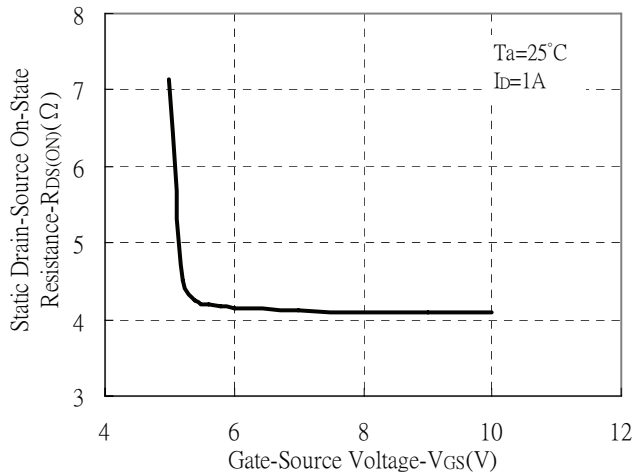
Static Drain-Source On-State resistance vs Drain Current



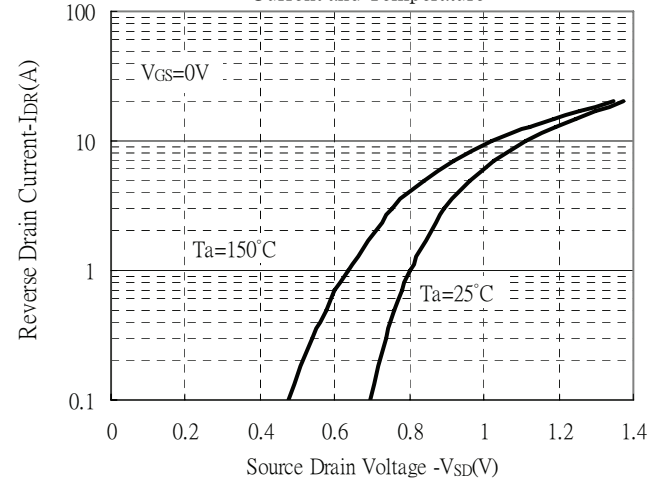
Drain Current vs Gate-Source Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

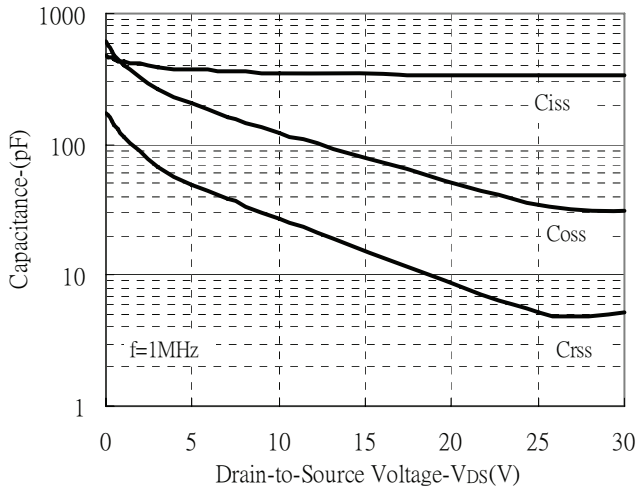


Body Diode Forward Voltage Variation vs Source Current and Temperature

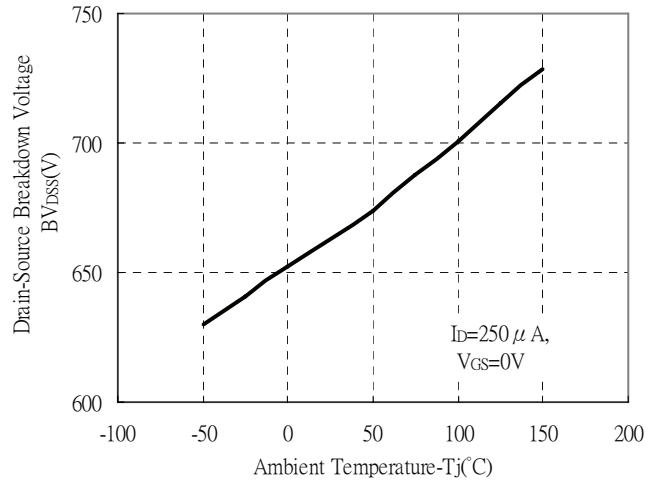


Typical Characteristics(Cont.)

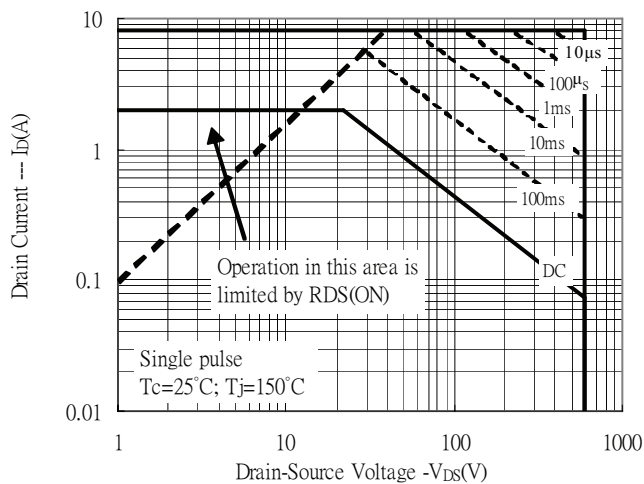
Capacitance vs Reverse Voltage



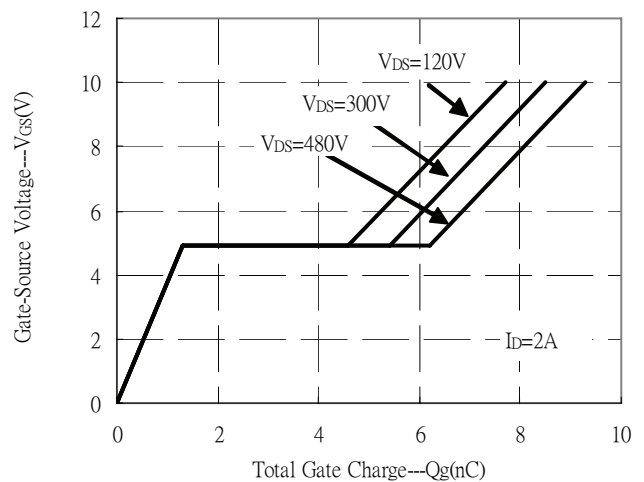
Brekdown Voltage vs Ambient Temperature



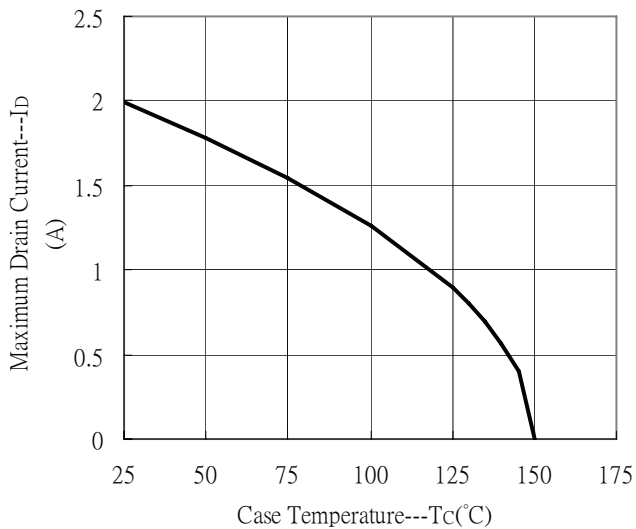
Maximum Safe Operating Area



Gate Charge Characteristics

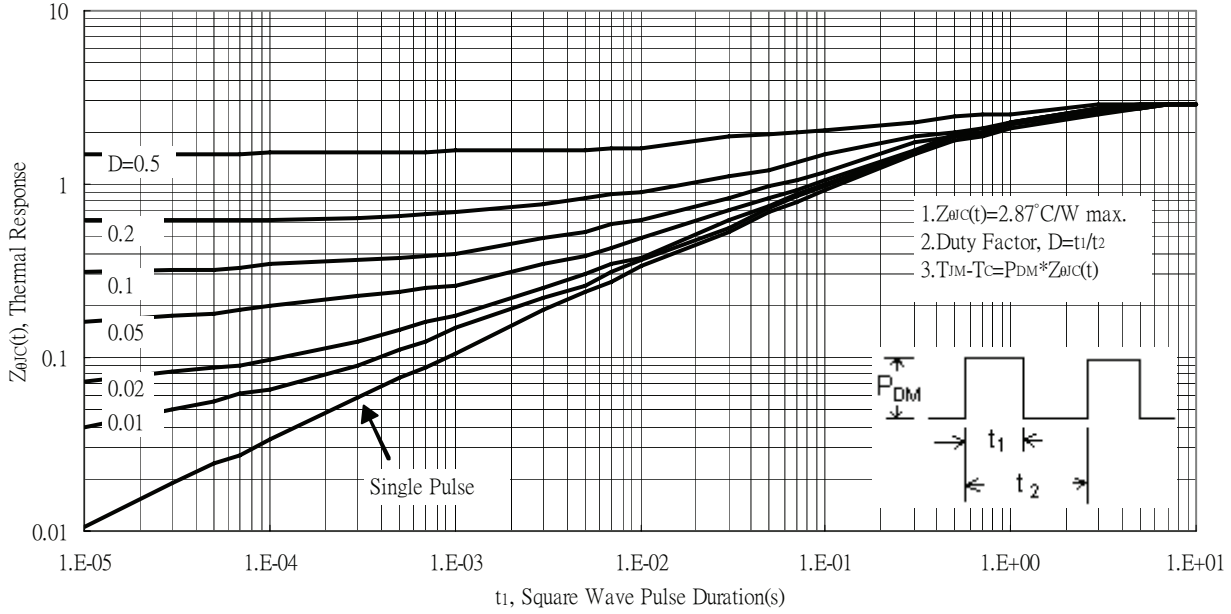


Maximum Drain Current vs Case Temperature

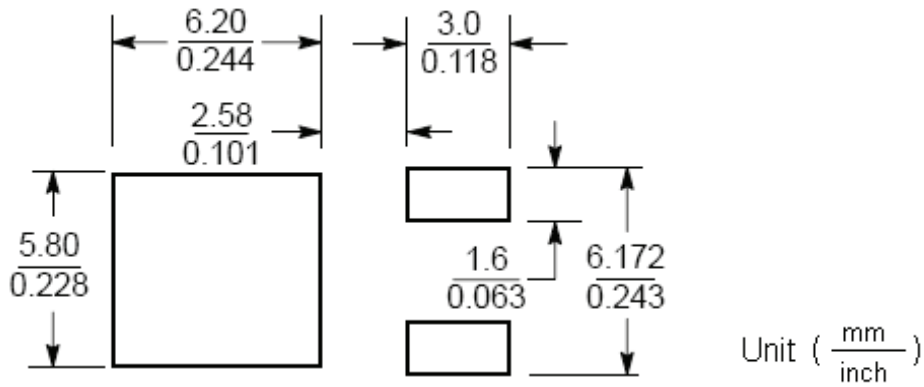


Typical Characteristics(Cont.)

Transient Thermal Response Curves

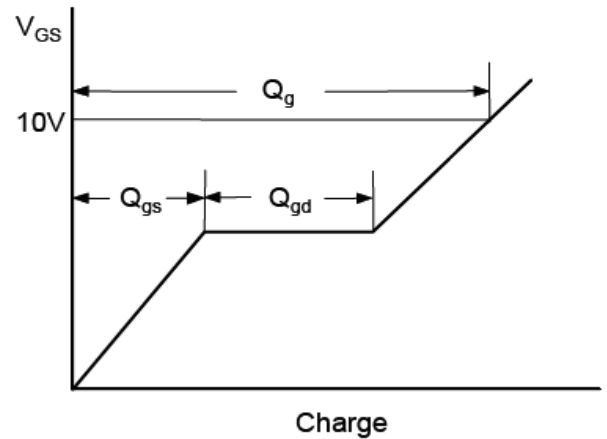
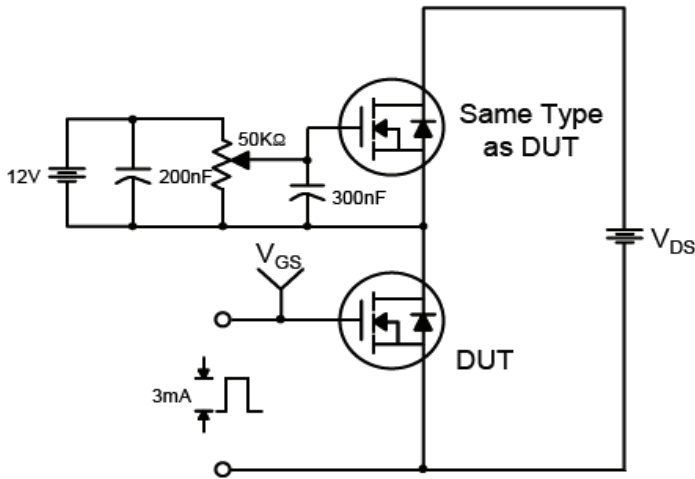


Recommended soldering footprint

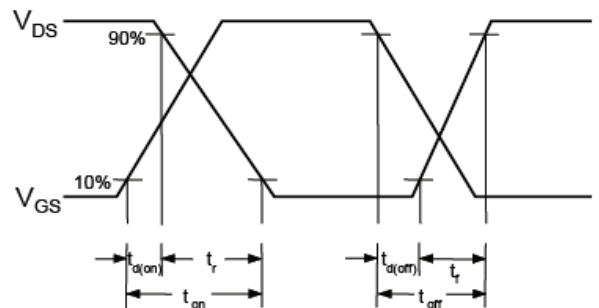
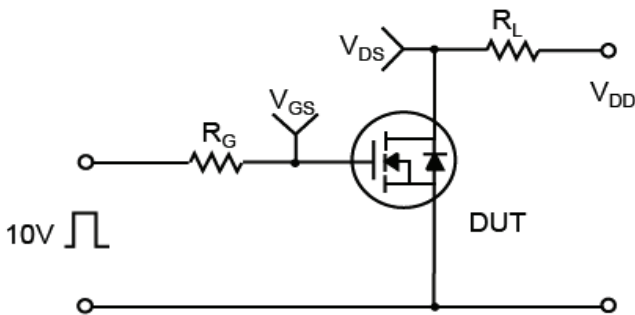


Test Circuits and Waveforms

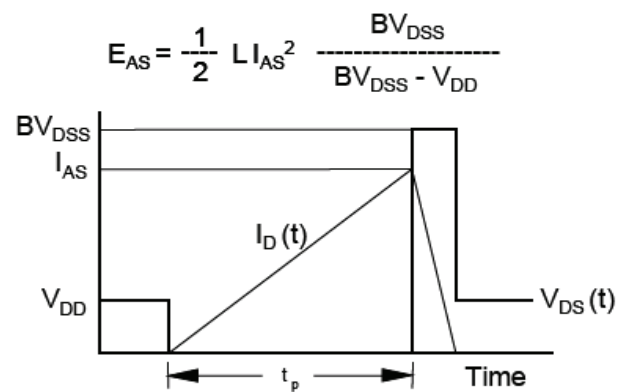
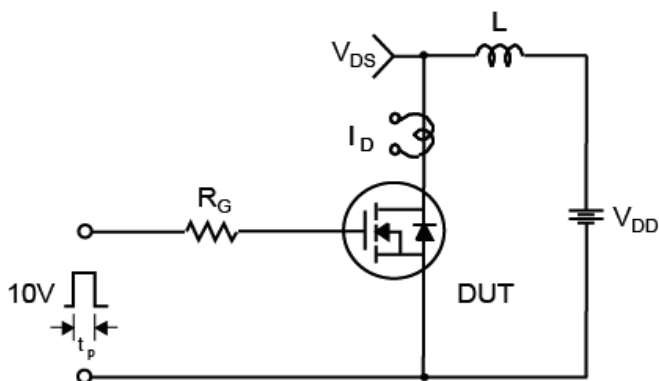
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

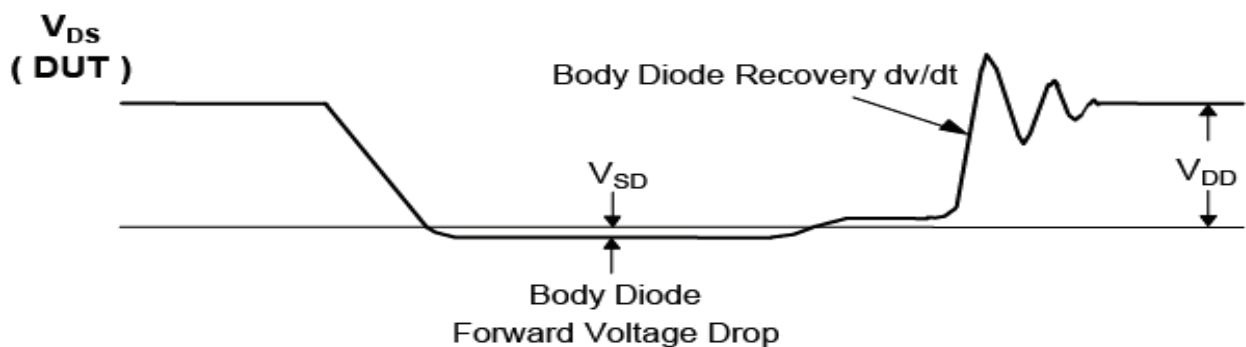
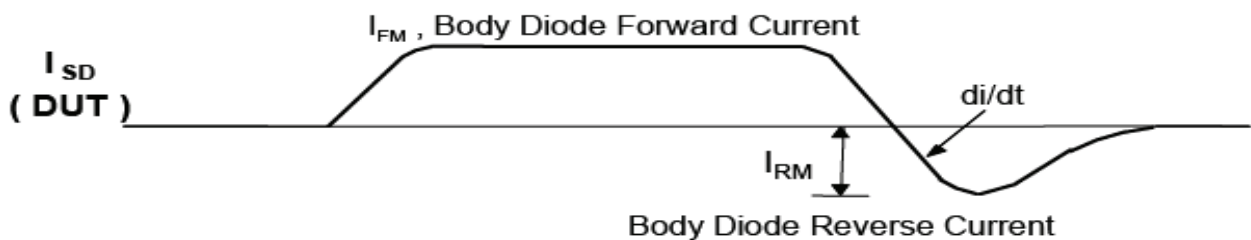
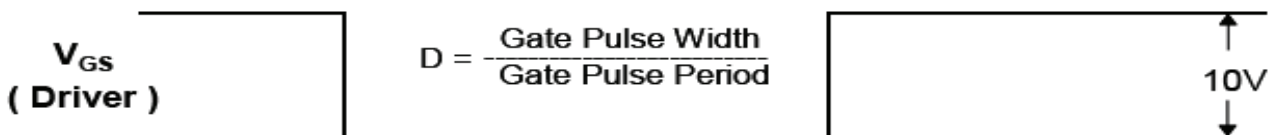
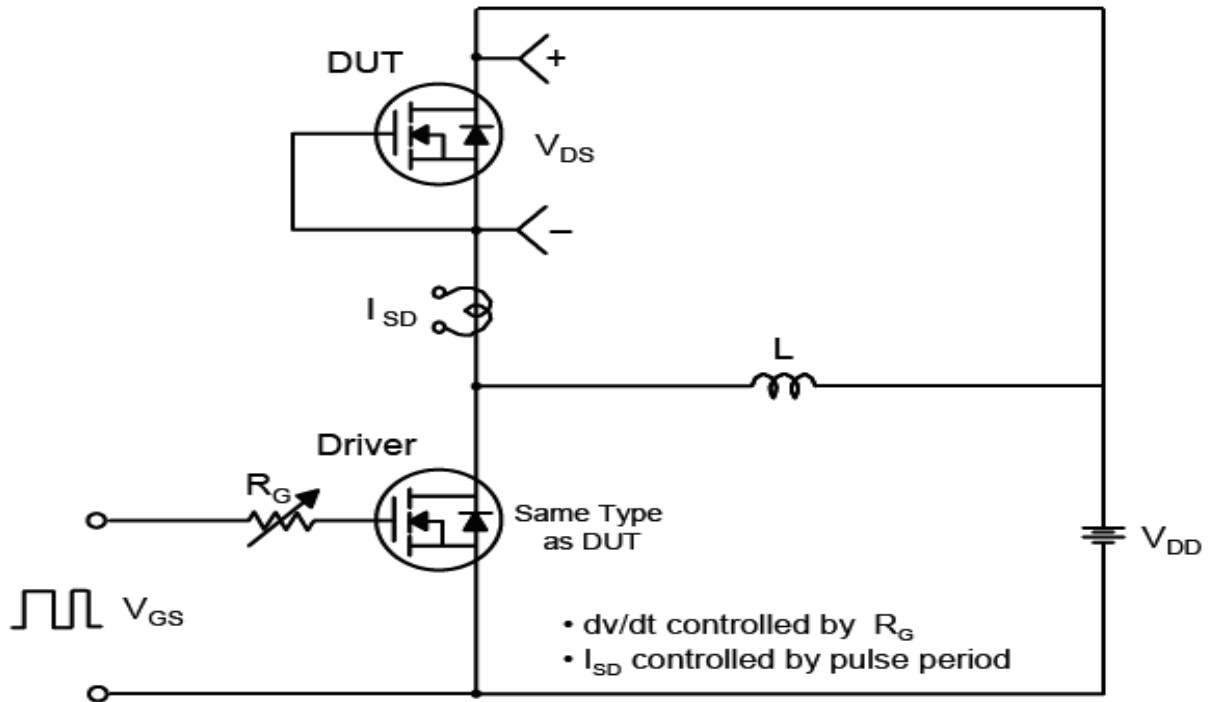


Unclamped Inductive Switching Test Circuit & Waveforms

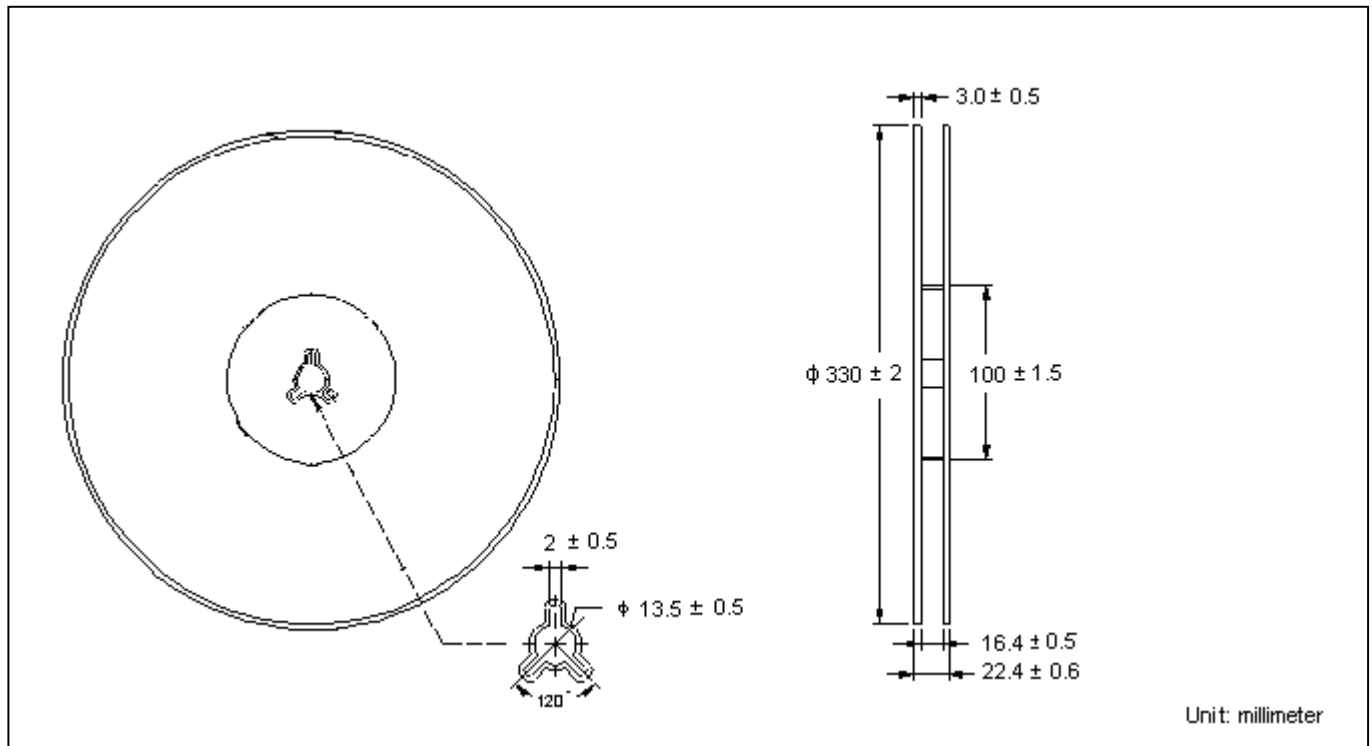


Test Circuits and Waveforms(Cont.)

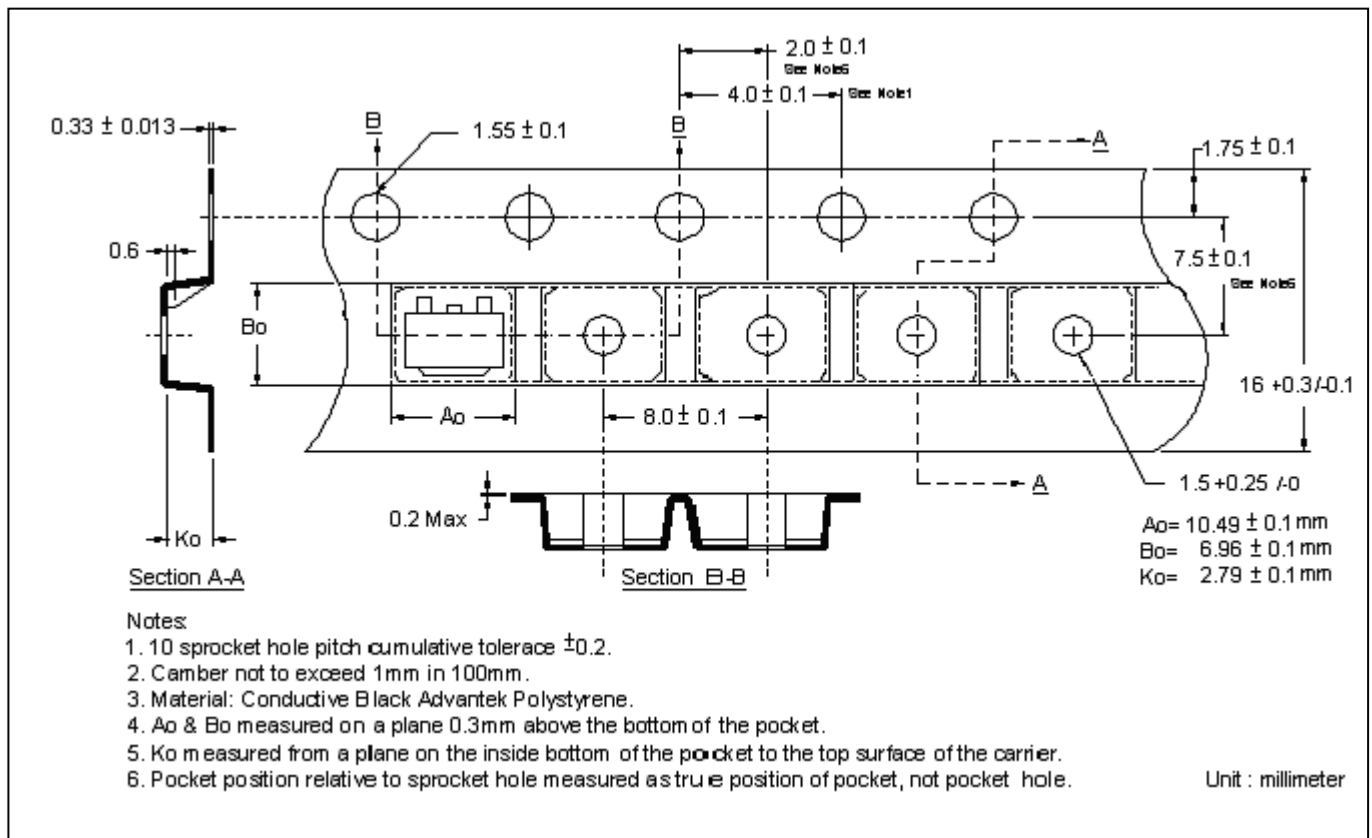
Peak Diode Recovery dv/dt Test Circuit & Waveforms



Reel Dimension



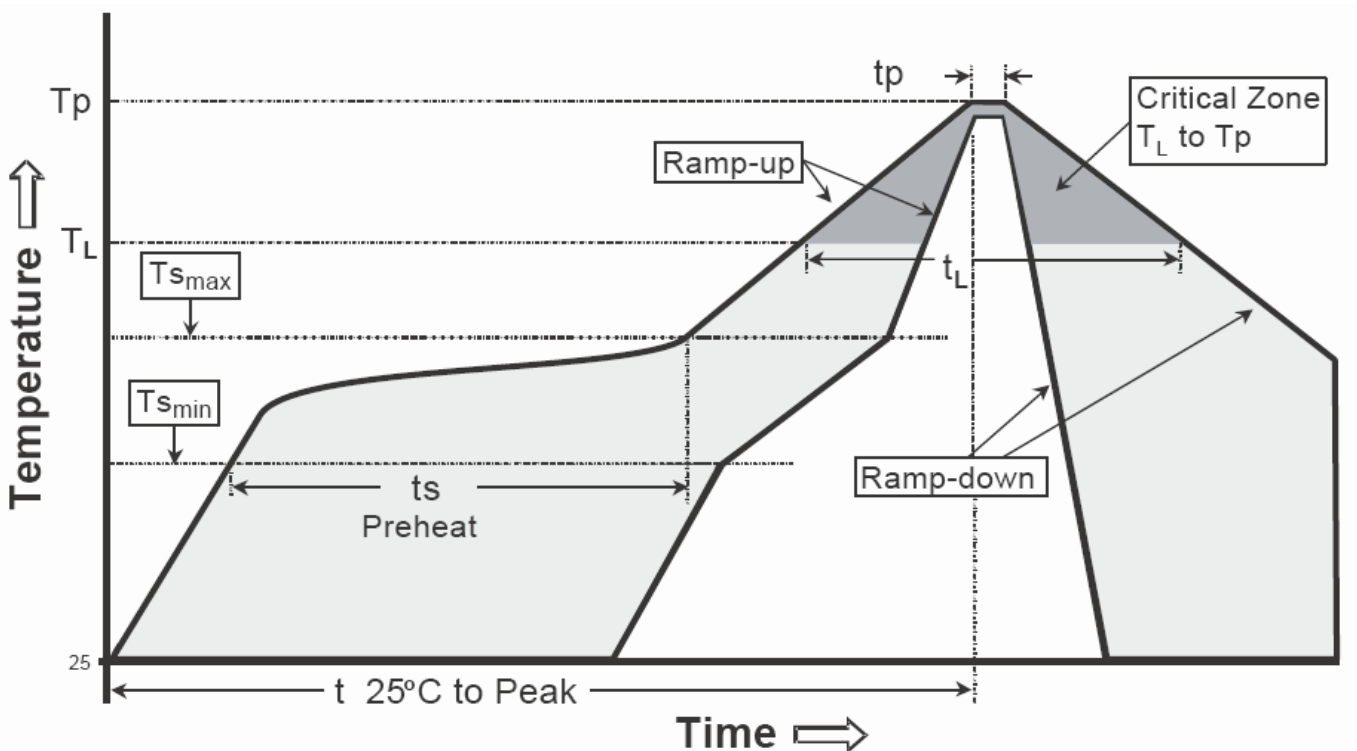
Carrier Tape Dimension



Recommended wave soldering condition

| Product | Peak Temperature | Soldering Time |
|-----------------|------------------|-----------------|
| Pb-free devices | 260 +0/-5 °C | 5 +1/-1 seconds |

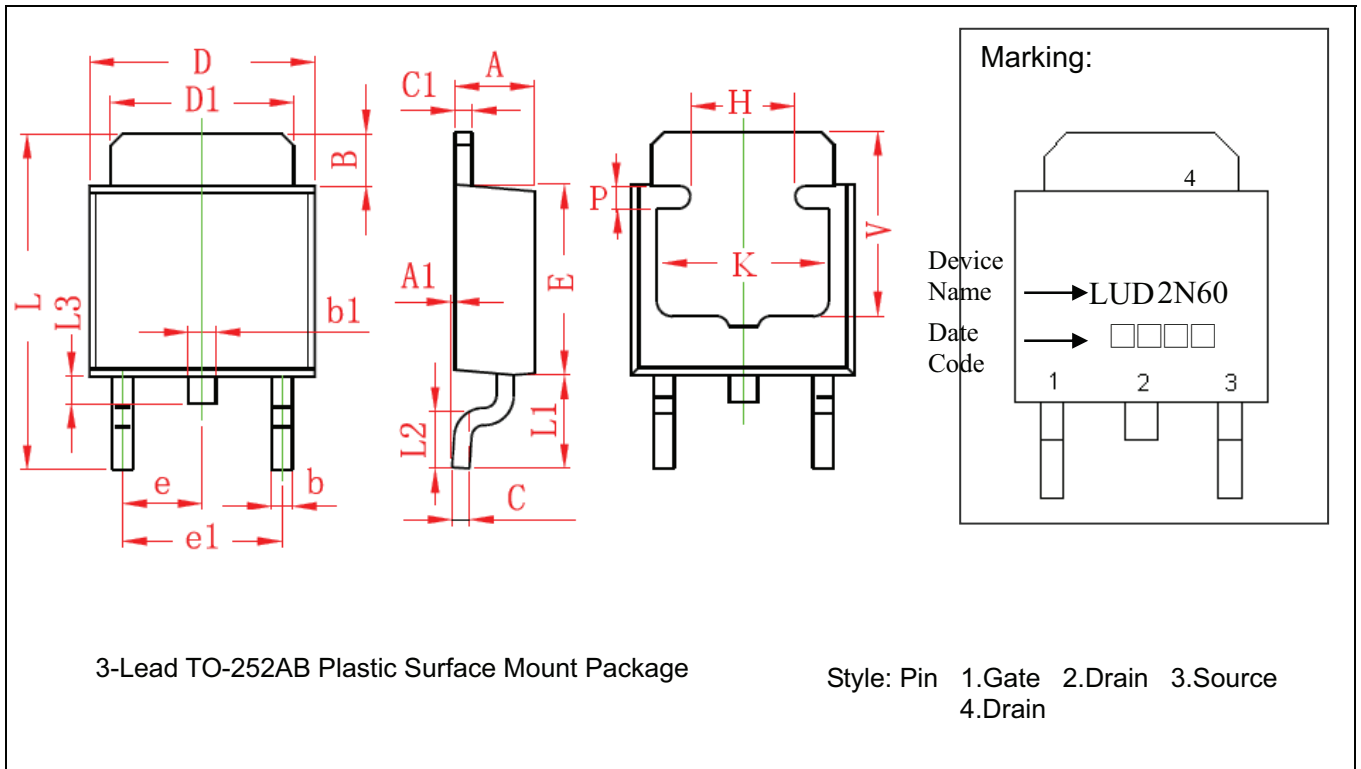
Recommended temperature profile for IR reflow



| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|-------------------------|------------------|
| Average ramp-up rate (T _{smax} to T _p) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| -Temperature Min(T _{s min}) | 100°C | 150°C |
| -Temperature Max(T _{s max}) | 150°C | 200°C |
| -Time(t _{s min} to t _{s max}) | 60-120 seconds | 60-180 seconds |
| Time maintained above: | | |
| -Temperature (T _L) | 183°C | 217°C |
| - Time (t _L) | 60-150 seconds | 60-150 seconds |
| Peak Temperature(T _P) | 240 +0/-5 °C | 260 +0/-5 °C |
| Time within 5°C of actual peak temperature(tp) | 10-30 seconds | 20-40 seconds |
| Ramp down rate | 6°C/second max. | 6°C/second max. |
| Time 25 °C to peak temperature | 6 minutes max. | 8 minutes max. |

Note : All temperatures refer to topside of the package, measured on the package body surface.

TO-252AB Dimension



*: Typical

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|-------|-----|--------|-------|-------------|-------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.087 | 0.094 | 2.200 | 2.400 | e | *0.091 | | *2.300 | |
| A1 | 0.000 | 0.005 | 0.000 | 0.127 | e1 | 0.177 | 0.185 | 4.500 | 4.700 |
| B | 0.053 | 0.065 | 1.350 | 1.650 | H | 0.118 | REF | 3.000 | REF |
| b | 0.020 | 0.028 | 0.500 | 0.700 | K | 0.197 | REF | 5.000 | REF |
| b1 | 0.028 | 0.035 | 0.700 | 0.900 | L | 0.374 | 0.390 | 9.500 | 9.900 |
| C | 0.017 | 0.023 | 0.430 | 0.580 | L1 | 0.100 | 0.114 | 2.550 | 2.900 |
| C1 | 0.017 | 0.023 | 0.430 | 0.580 | L2 | 0.055 | 0.070 | 1.400 | 1.780 |
| D | 0.250 | 0.262 | 6.350 | 6.650 | L3 | 0.024 | 0.035 | 0.600 | 0.900 |
| D1 | 0.205 | 0.213 | 5.200 | 5.400 | P | 0.028 | REF | 0.700 | REF |
| E | 0.213 | 0.224 | 5.400 | 5.700 | V | 0.209 | REF | 5.300 | REF |

Notes: 1.Controlling dimension: millimeters.

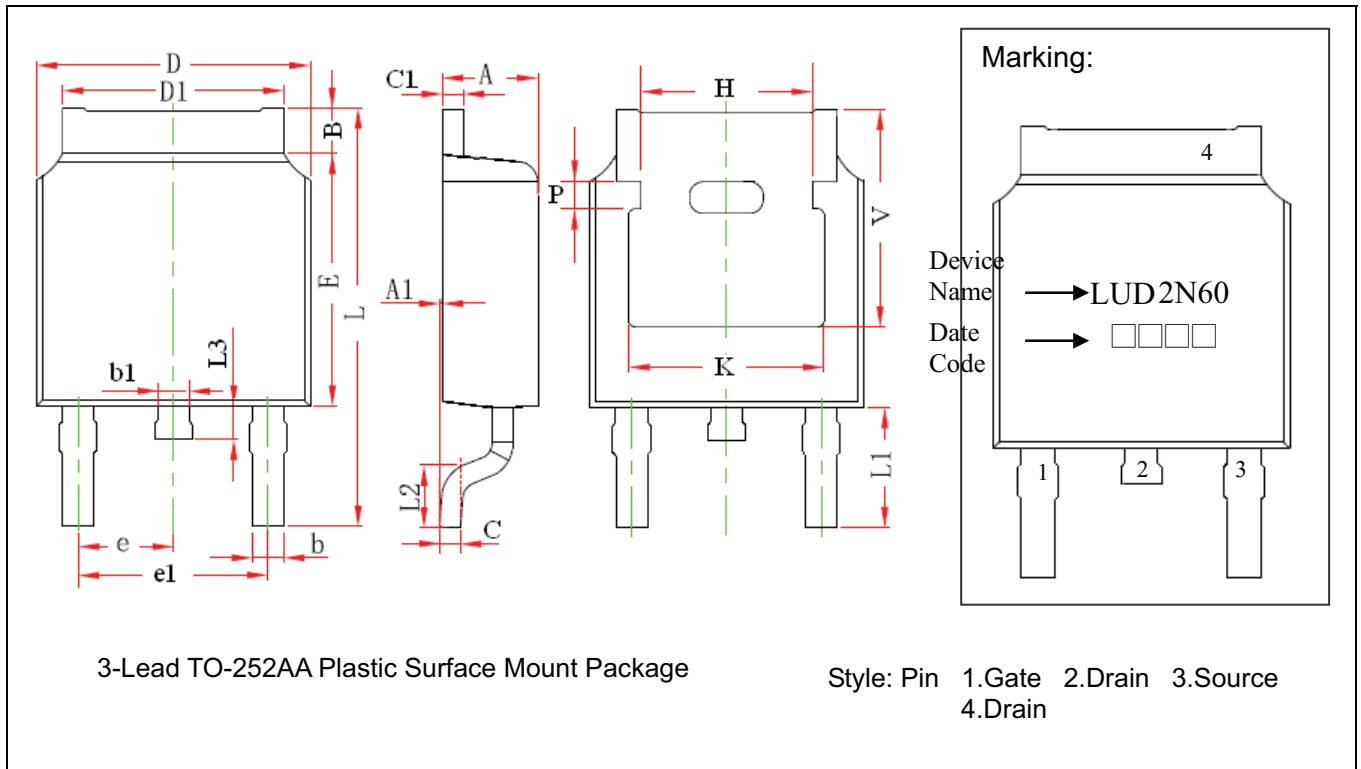
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.

3.If there is any question with packing specification or packing method, please contact your local LUL sales office.

Material:

- Lead : Pure tin plated
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

TO-252AA Dimension



| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|-------|-----|--------|-------|-------------|--------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.087 | 0.094 | 2.200 | 2.400 | e | 0.086 | 0.094 | 2.186 | 2.386 |
| A1 | 0.000 | 0.005 | 0.000 | 0.127 | e1 | 0.172 | 0.188 | 4.372 | 4.772 |
| B | 0.039 | 0.048 | 0.990 | 1.210 | H | 0.163 | REF | 4.140 | REF |
| b | 0.026 | 0.034 | 0.660 | 0.860 | K | 0.190 | REF | 4.830 | REF |
| b1 | 0.026 | 0.034 | 0.660 | 0.860 | L | 0.386 | 0.409 | 9.800 | 10.400 |
| C | 0.018 | 0.023 | 0.460 | 0.580 | L1 | 0.114 | REF | 2.900 | REF |
| C1 | 0.018 | 0.023 | 0.460 | 0.580 | L2 | 0.055 | 0.067 | 1.400 | 1.700 |
| D | 0.256 | 0.264 | 6.500 | 6.700 | L3 | 0.024 | 0.039 | 0.600 | 1.000 |
| D1 | 0.201 | 0.215 | 5.100 | 5.460 | P | 0.026 | REF | 0.650 | REF |
| E | 0.236 | 0.244 | 6.000 | 6.200 | V | 0.211 | REF | 5.350 | REF |

Notes: 1.Controlling dimension: millimeters.
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
 3.If there is any question with packing specification or packing method, please contact your local LUL sales office.

Material:

- Lead : Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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