# N-Channel Depletion-Mode DMOS FET

## Features

- Free from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Excellent thermal stability
- Integral source-drain diode
- High input impedance and low $C_{ISS}$
- ESD gate protection

## General Description

The LND150 is a high voltage N-channel depletion mode (normally-on) transistor utilizing Supertex's lateral DMOS technology. The gate is ESD protected.

The LND150 is ideal for high voltage applications in the areas of normally-on switches, precision constant current sources, voltage ramp generation and amplification.

## Applications

- Solid state relays
- Normally-on switches
- Converters
- Power supply circuits
- Constant current sources
- Input protection circuits

## Ordering Information

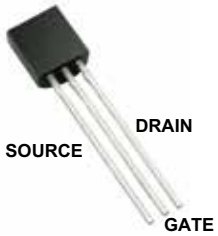
| Part Number | Package Options | Packing |
|---|---|---|
| LND150K1-G | TO-236AB (SOT-23) | 3000/Reel |
| LND150N3-G | TO-92 | 1000/Bag |
| LND150N3-G P002 | TO-92 | 2000/Reel |
| LND150N3-G P003 | TO-92 | 2000/Reel |
| LND150N3-G P005 | TO-92 | 2000/Reel |
| LND150N3-G P013 | TO-92 | 2000/Reel |
| LND150N3-G P014 | TO-92 | 2000/Reel |
| LND150N8-G | TO-243AA (SOT-89) | 2000/Reel |

*-G denotes a lead (Pb)-free / RoHS compliant package*

## Product Summary

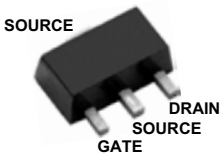
| $BV_{DSX}/BV_{DGX}$ (V) | $R_{DS(ON)}$ (max) | $I_{DSS}$ (min) |
|---|---|---|
| 500 | 1.0kΩ | 1.0mA |

## Pin Configuration




**TO-92**


**TO-236AB (SOT-23)**




**TO-243AA (SOT-89)**

## Absolute Maximum Ratings

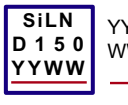
| Parameter | Value |
|---|---|
| Drain-to-source | $BV_{DSX}$ |
| Drain-to-gate | $BV_{DGX}$ |
| Gate-to-source | ±20V |
| Operating and storage temperature | -55°C to +150°C |

*Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.*

## Product Marking


W = Code for Week Sealed
_____ = "Green" Packaging

**TO-236AB (SOT-23)**




YY = Year Sealed
WW = Week Sealed
_____ = "Green" Packaging

**TO-92**


W = Code for Week Sealed
_____ = "Green" Packaging

**TO-243AA (SOT-89)**

*Packages may or may not include the following marks: Si or*

## Thermal Characteristics

| Package | $I_D$ (continuous)† (mA) | $I_D$ (pulsed) (mA) | Power Dissipation @$T_A$ = 25°C (W) | $\theta_{ja}$ (°C/W) | $I_{DR}$ (mA) | $I_{DRM}$† (mA) |
|---|---|---|---|---|---|---|
| TO-236AB (SOT-23) | 13 | 30 | 0.36 | 203 | 13 | 30 |
| TO-92 | 30 | 30 | 0.74 | 132 | 30 | 30 |
| TO-243AA (SOT-89) | 30 | 30 | 1.6‡ | 133 | 30 | 30 |

***Notes:***

† $I_D$ *(continuous) is limited by max rated* $T_j$.

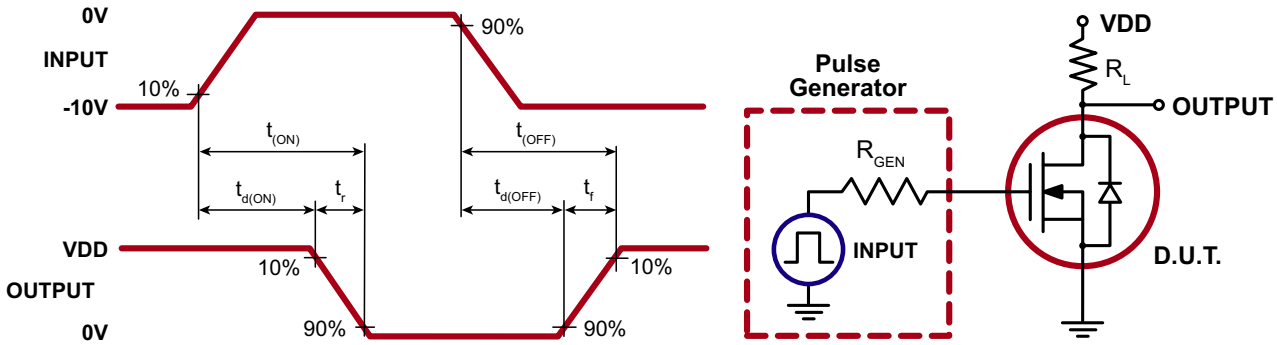
## Electrical Characteristics *($T_A$ = 25°C unless otherwise specified)*

| Sym | Parameter | Min | Typ | Max | Units | Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSX}$ | Drain-to-source breakdown voltage | 500 | - | - | V | $V_{GS}$ = -10V, $I_D$ = 1.0mA |
| $V_{GS(OFF)}$ | Gate-to-source off voltage | -1.0 | - | -3.0 | V | $V_{GS}$ = 25V, $I_D$ = 100nA |
| $\Delta V_{GS(OFF)}$ | Change in $V_{GS(OFF)}$ with temperature | - | - | 5.0 | mV/°C | $V_{GS}$ = 25V, $I_D$ = 100nA |
| $I_{GSS}$ | Gate body leakage current | - | - | 100 | nA | $V_{GS}$ = ± 20V, $V_{DS}$ = 0V |
| $I_{D(OFF)}$ | Drain-to-source leakage current | - | - | 100 | nA | $V_{GS}$ = -10V, $V_{DS}$ = 450V |
| | | - | - | 100 | µA | $V_{DS}$ = 0.8V Max Rating, $V_{GS}$ = -10V, $T_A$ = 125°C |
| $I_{DSS}$ | Saturated drain-to-source current | 1.0 | - | 3.0 | mA | $V_{GS}$ = 0V, $V_{DS}$ = 25V |
| $R_{DS(ON)}$ | Static drain-to-source on-state resistance | - | 850 | 1000 | Ω | $V_{GS}$ = 0V, $I_D$ = 0.5mA |
| $\Delta R_{DS(ON)}$ | Change in $R_{DS(ON)}$ with temperature | - | - | 1.2 | %/°C | $V_{GS}$ = 0V, $I_D$ = 0.5mA |
| $G_{FS}$ | Forward transductance | 1.0 | 2.0 | - | m℧ | $V_{DS}$ = 0V, $I_D$ = 1.0mA |
| $C_{ISS}$ | Input capacitance | - | 7.5 | 10 | pF | $V_{GS}$ = -10V, $V_{DS}$ = 25V, f = 1.0MHz |
| $C_{OSS}$ | Common source output capacitance | - | 2.0 | 3.5 | | |
| $C_{RSS}$ | Reverse transfer capacitance | - | 0.5 | 1.0 | | |
| $t_{d(ON)}$ | Turn-on delay time | - | 0.09 | - | µs | $V_{DD}$ = 25V, $I_D$ = 1.0mA, $R_{GEN}$ = 25Ω |
| $t_r$ | Rise time | - | 0.45 | - | | |
| $t_{d(OFF)}$ | Turn-off delay time | - | 0.1 | - | | |
| $t_f$ | Fall time | - | 1.3 | - | | |
| $V_{SD}$ | Diode forward voltage drop | - | - | 0.9 | V | $V_{GS}$ = -10V, $I_{SD}$ = 1.0mA |
| $t_{rr}$ | Reverse recovery time | - | 200 | - | ns | $V_{GS}$ = -10V, $I_{SD}$ = 1.0mA |

***Notes:***

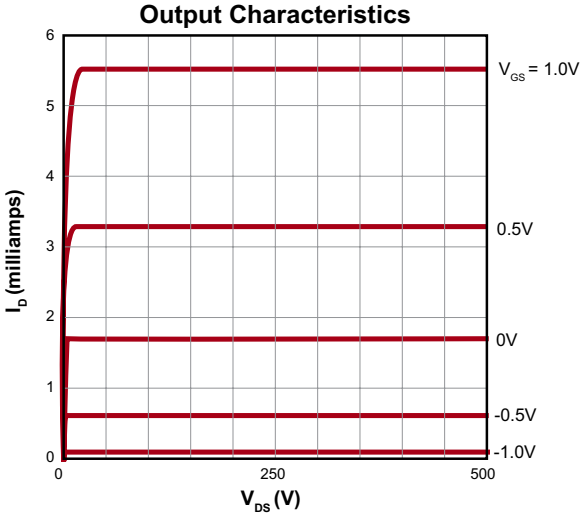
1. *All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)*
2. *All A.C. parameters sample tested.*

## Switching Waveforms and Test Circuit

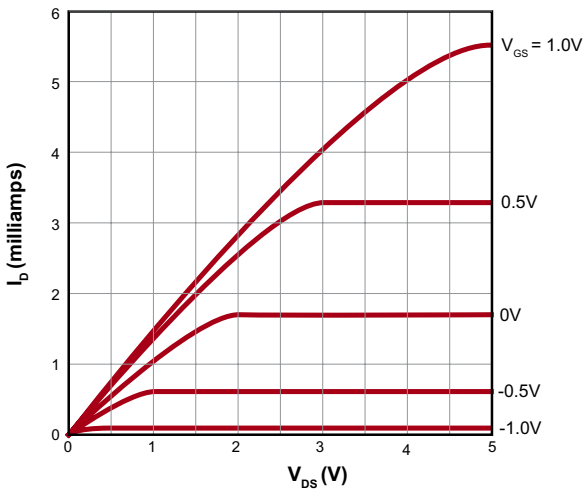


# Typical Performance Curves

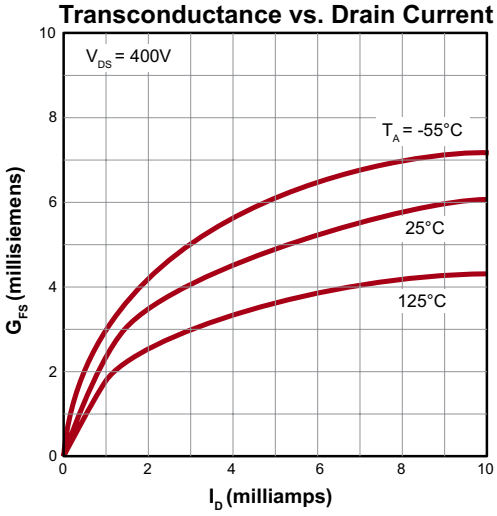
### Output Characteristics



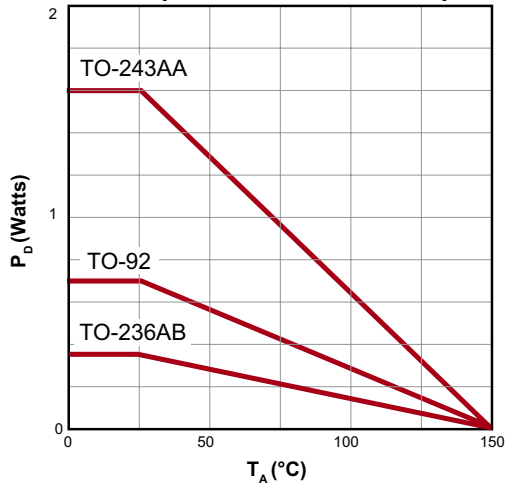

### Saturation Characteristics



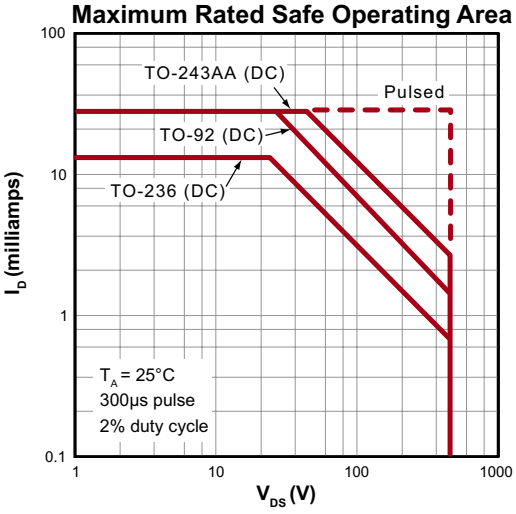

### Transconductance vs. Drain Current



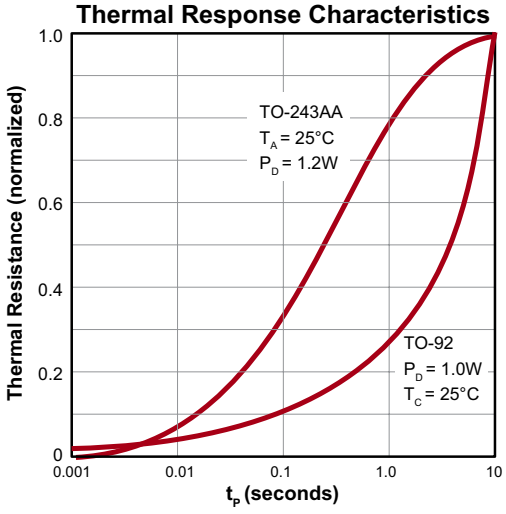

### Power Dissipation vs. Ambient Temperature




### Maximum Rated Safe Operating Area

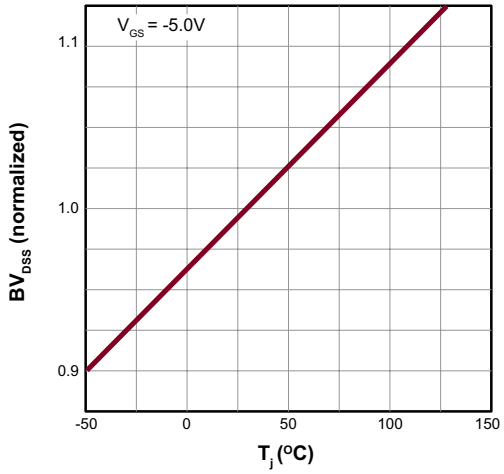



### Thermal Response Characteristics

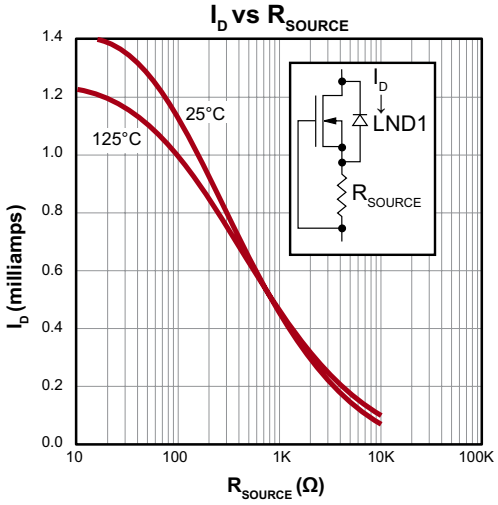


## Typical Performance Curves *(cont.)*

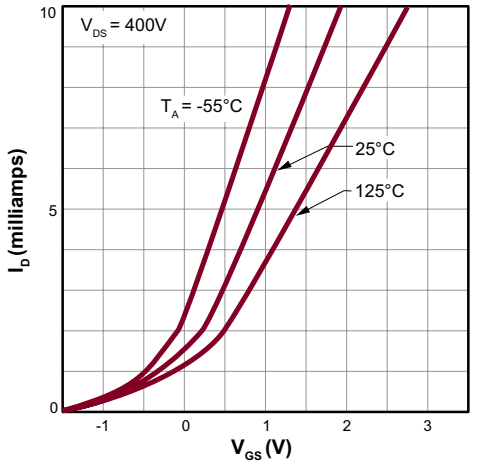
**$BV_{DSS}$ Variation with Temperature**



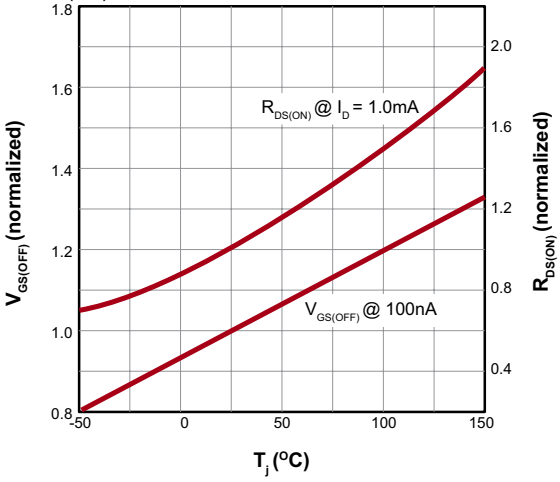

**$I_D$ vs $R_{SOURCE}$**



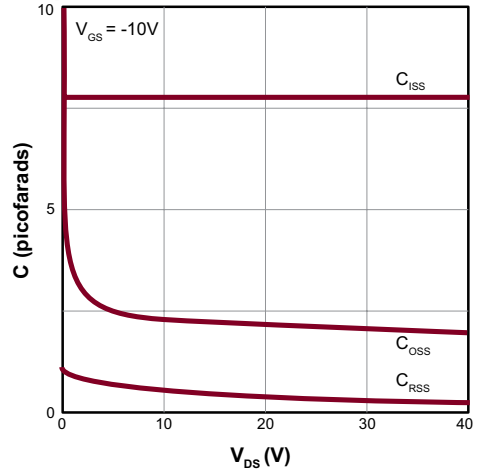

**Transfer Characteristics**



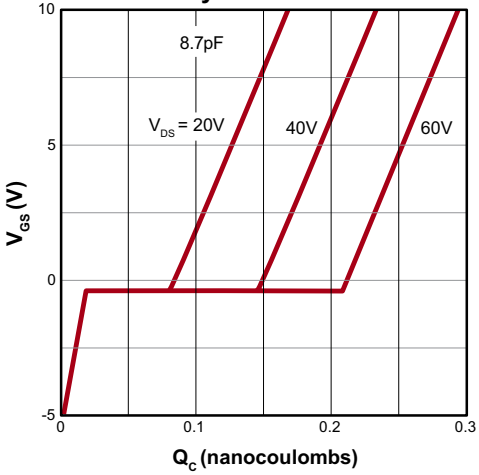

**$V_{GS(OFF)}$ and $R_{DS}$ Variation with Temperature**




**Capacitance vs. Drain-to-Source Voltage**

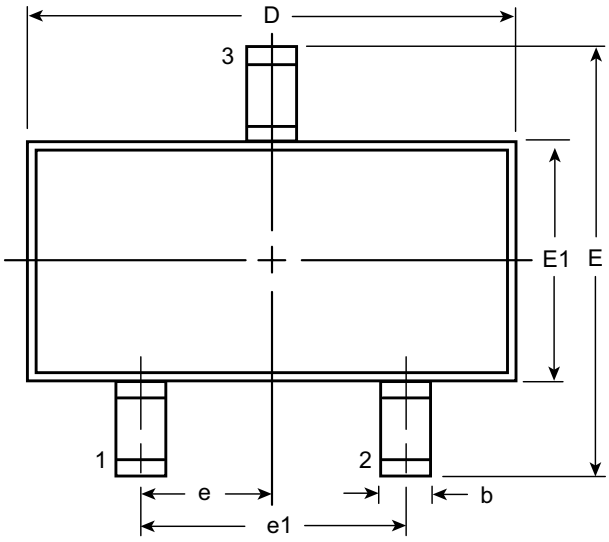



**Gate Drive Dynamic Characteristics**

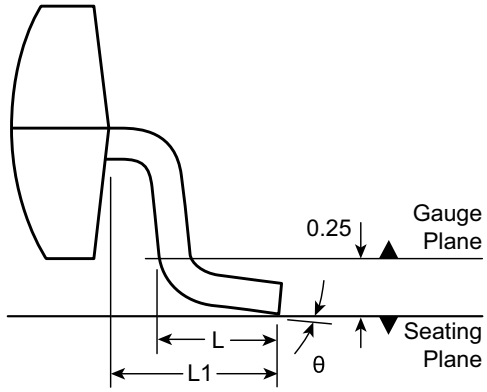


# 3-Lead TO-236AB (SOT-23) Package Outline (K1)

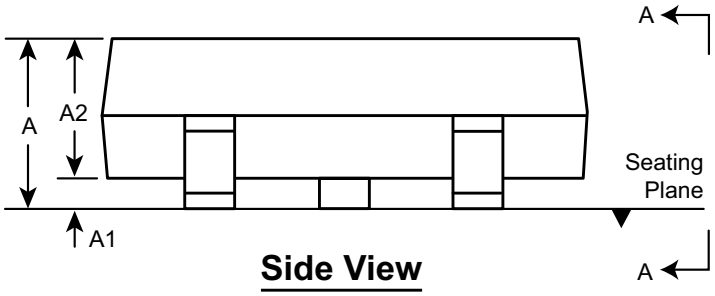
***2.90x1.30mm body, 1.12mm height (max), 1.90mm pitch***



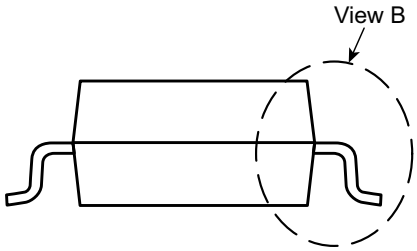

**Top View**




**View B**




**Side View**

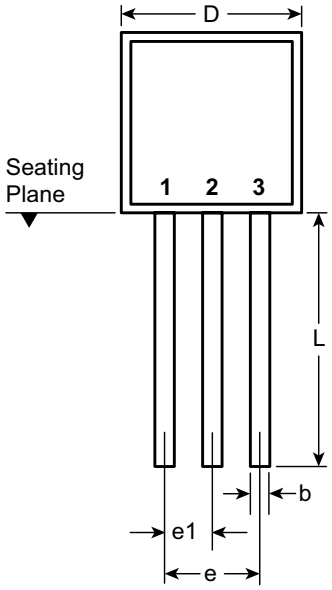



**View A - A**

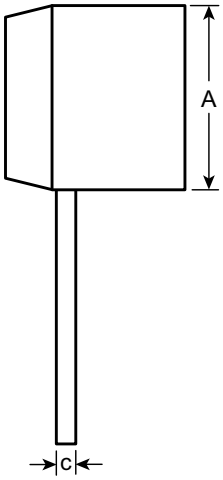
| Symbol | | A | A1 | A2 | b | D | E | E1 | e | e1 | L | L1 | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimension (mm) | MIN | 0.89 | 0.01 | 0.88 | 0.30 | 2.80 | 2.10 | 1.20 | 0.95 BSC | 1.90 BSC | 0.20† | 0.54 REF | 0° |
| | NOM | - | - | 0.95 | - | 2.90 | - | 1.30 | | | 0.50 | | - |
| | MAX | 1.12 | 0.10 | 1.02 | 0.50 | 3.04 | 2.64 | 1.40 | | | 0.60 | | 8° |

*JEDEC Registration TO-236, Variation AB, Issue H, Jan. 1999.*
*† This dimension differs from the JEDEC drawing.*
***Drawings not to scale.***
***Supertex Doc.#:*** *DSPD-3TO236ABK1, Version C041309.*

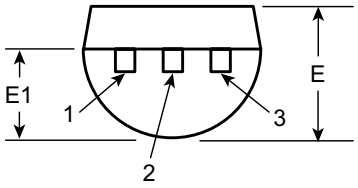
# 3-Lead TO-92 Package Outline (N3)




**Front View**




**Side View**

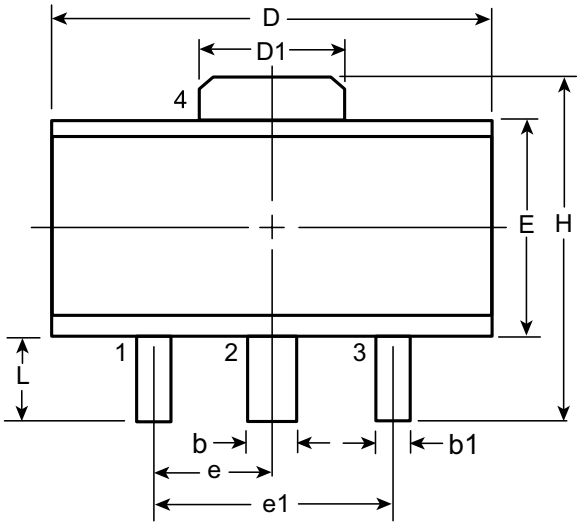



**Bottom View**

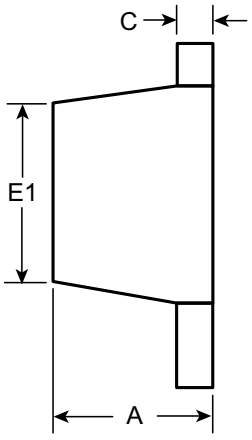
| Symbol | | A | b | c | D | E | E1 | e | e1 | L |
|---|---|---|---|---|---|---|---|---|---|---|
| Dimensions (inches) | MIN | .170 | .014† | .014† | .175 | .125 | .080 | .095 | .045 | .500 |
| | NOM | - | - | - | - | - | - | - | - | - |
| | MAX | .210 | .022† | .022† | .205 | .165 | .105 | .105 | .055 | .610* |

*JEDEC Registration TO-92.*
** This dimension is not specified in the JEDEC drawing.*
*† This dimension differs from the JEDEC drawing.*
***Drawings not to scale.***
***Supertex Doc.#:** DSPD-3TO92N3, Version E041009.*

# 3-Lead TO-243AA (SOT-89) Package Outline (N8)




**Top View**




**Side View**

| Symbol | | A | b | b1 | C | D | D1 | E | E1 | e | e1 | H | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimensions (mm) | MIN | 1.40 | 0.44 | 0.36 | 0.35 | 4.40 | 1.62 | 2.29 | 2.00† | 1.50 BSC | 3.00 BSC | 3.94 | 0.73† |
| | NOM | - | - | - | - | - | - | - | - | | | - | - |
| | MAX | 1.60 | 0.56 | 0.48 | 0.44 | 4.60 | 1.83 | 2.60 | 2.29 | | | 4.25 | 1.20 |

*JEDEC Registration TO-243, Variation AA, Issue C, July 1986.*
***†*** *This dimension differs from the JEDEC drawing*
***Drawings not to scale.***
***Supertex Doc. #:*** *DSPD-3TO243AAN8, Version F111010.*

*(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to http://www.supertex.com/packaging.html.)*

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**Supertex inc.**
1235 Bordeaux Drive, Sunnyvale, CA 94089
Tel: 408-222-8888
***www.supertex.com***