



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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## Product Summary

| $BV_{DSS}$ | $R_{DS(on)}$ Max              | $I_D$ Max<br>$T_C = +25^\circ C$ |
|------------|-------------------------------|----------------------------------|
| 60V        | 10m $\Omega$ @ $V_{GS} = 10V$ | 128A                             |

## Features and Benefits

- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- Low  $R_{DS(on)}$  – Minimizes Power Losses
- Low  $Q_g$  – Minimizes Switching Losses

## Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Motor Controls
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

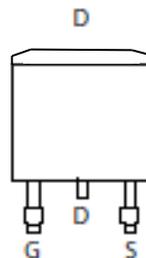
## Mechanical Data

- Package: TO263AB
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 
- Terminal Connections: See Diagram Below
- Weight: 1.7 grams (Approximate)

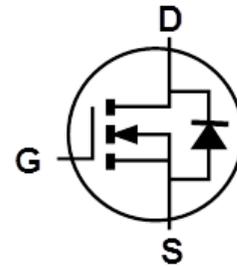
TO263AB (D2PAK)



Top View



Pin Out  
Top View



Internal Schematic

**Maximum Ratings** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   | Symbol    | Value                     | Unit |
|--|-----------|---------------------------|------|
| Drain-Source Voltage   | $V_{DSS}$ | 60                        | V    |
| Gate-Source Voltage  | $V_{GSS}$ | $\pm 20$                  | V    |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$        | $I_D$     | $T_C = +25^\circ\text{C}$ | 128  |
|  |           | $T_C = +70^\circ\text{C}$ | 102  |
| Maximum Continuous Body Diode Forward Current (Note 6)         | $I_S$     | 128                       | A    |
| Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%) | $I_{DM}$  | 512                       | A    |
| Avalanche Current, $L = 0.1\text{mH}$                          | $I_{AS}$  | 71                        | A    |
| Avalanche Energy, $L = 0.1\text{mH}$                           | $E_{AS}$  | 252                       | mJ   |

**Thermal Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                                   | Symbol          | Value       | Unit               |
|--|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5)                 | $P_D$           | 5           | W                  |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 30          | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6)                 | $P_D$           | 312         | W                  |
| Thermal Resistance, Junction to Case (Note 6)    | $R_{\theta JC}$ | 0.4         | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                          | Symbol       | Min | Typ  | Max | Unit          | Test Condition  |
|---|--------------|-----|------|-----|---------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>     |              |     |      |     |               |   |
| Drain-Source Breakdown Voltage          | $BV_{DSS}$   | 60  | —    | —   | V             | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$                        |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | —   | —    | 10  | $\mu\text{A}$ | $V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$                         |
| Gate-Source Leakage                     | $I_{GSS}$    | —   | —    | 100 | nA            | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$                     |
| <b>ON CHARACTERISTICS (Note 7)</b>      |              |     |      |     |               |   |
| Gate Threshold Voltage                  | $V_{GS(th)}$ | 2   | —    | 4   | V             | $V_{DS} = V_{GS}, I_D = 1\text{mA}$                               |
| Static Drain-Source On-Resistance       | $R_{DS(on)}$ | —   | 7.7  | 10  | m $\Omega$    | $V_{GS} = 10\text{V}, I_D = 25\text{A}$                           |
| Diode Forward Voltage                   | $V_{SD}$     | —   | 0.8  | 1.2 | V             | $V_{GS} = 0\text{V}, I_S = 25\text{A}$                            |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b> |              |     |      |     |               |   |
| Input Capacitance                       | $C_{iss}$    | —   | 2692 | —   | pF            | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$<br>$f = 1\text{MHz}$    |
| Output Capacitance                      | $C_{oss}$    | —   | 909  | —   |               |   |
| Reverse Transfer Capacitance            | $C_{rss}$    | —   | 65   | —   |               |   |
| Gate Resistance                         | $R_g$        | —   | 3.6  | —   | $\Omega$      | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$         |
| Total Gate Charge                       | $Q_g$        | —   | 46   | —   | nC            | $V_{DS} = 44\text{V}, I_D = 25\text{A},$<br>$V_{GS} = 10\text{V}$ |
| Gate-Source Charge                      | $Q_{gs}$     | —   | 12   | —   |               |   |
| Gate-Drain Charge                       | $Q_{gd}$     | —   | 13   | —   |               |   |
| Turn-On Delay Time                      | $t_{D(on)}$  | —   | 13.5 | —   | ns            | $V_{DS} = 30\text{V}, V_{GEN} = 10\text{V},$<br>$R_L = 1.2\Omega$ |
| Turn-On Rise Time                       | $t_r$        | —   | 44   | —   |               |   |
| Turn-Off Delay Time                     | $t_{D(off)}$ | —   | 45   | —   |               |   |
| Turn-Off Fall Time                      | $t_f$        | —   | 29   | —   |               |   |
| Reverse Recovery Time                   | $t_{RR}$     | —   | 51.5 | —   | ns            | $I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s},$              |
| Reverse Recovery Charge                 | $Q_{RR}$     | —   | 92   | —   | nC            | $V_R = 30\text{V}$  |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

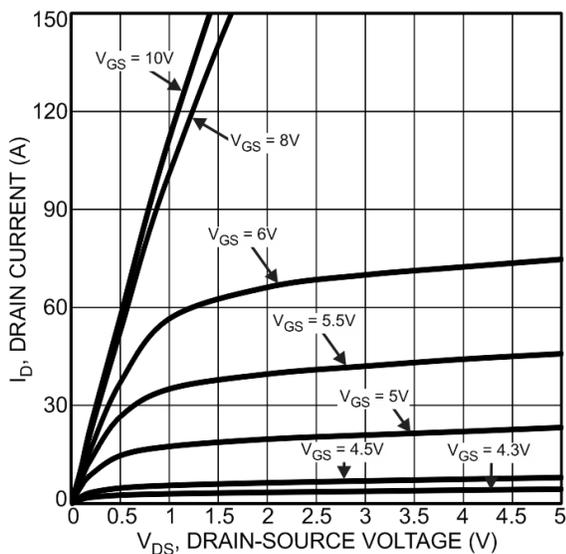


Fig. 1 Typical Output Characteristic

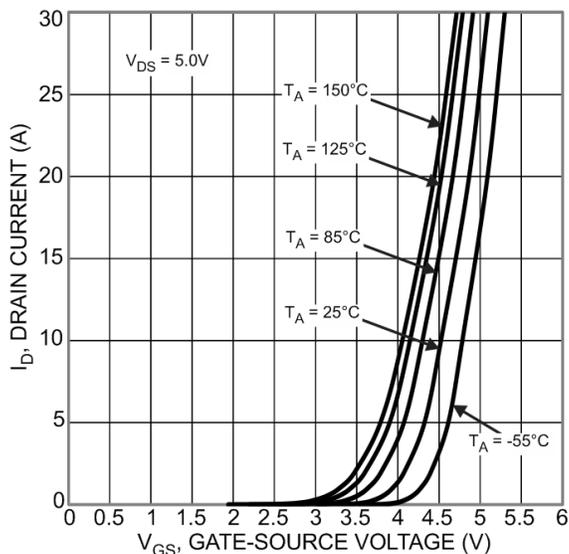


Fig. 2 Typical Transfer Characteristics

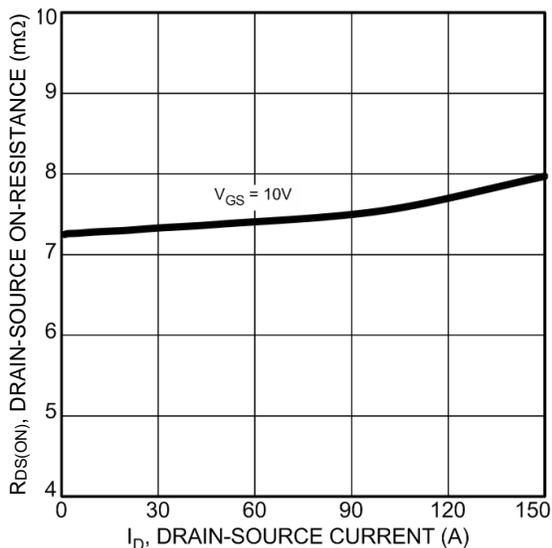


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

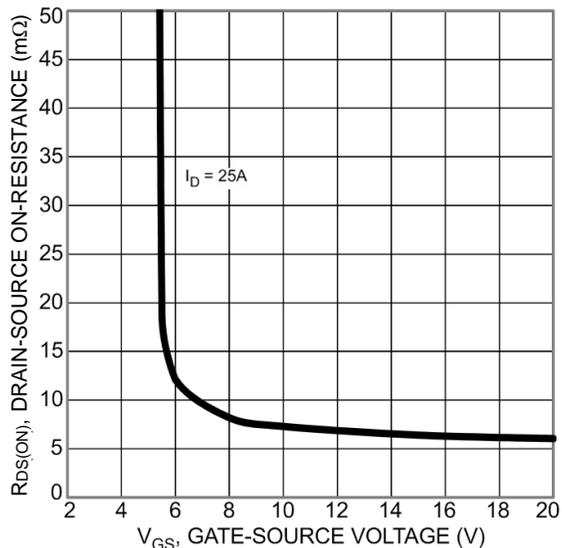


Fig. 4 Typical Transfer Characteristic

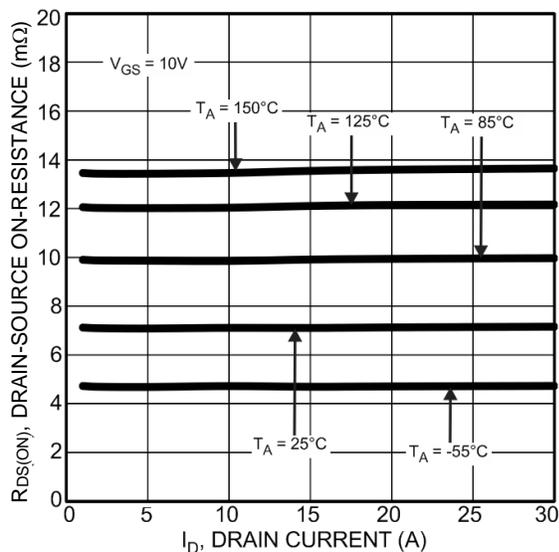


Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

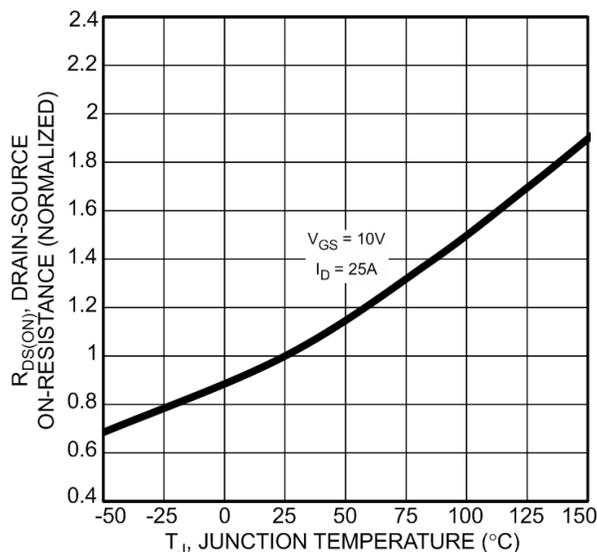


Fig. 6 On-Resistance Variation with Temperature

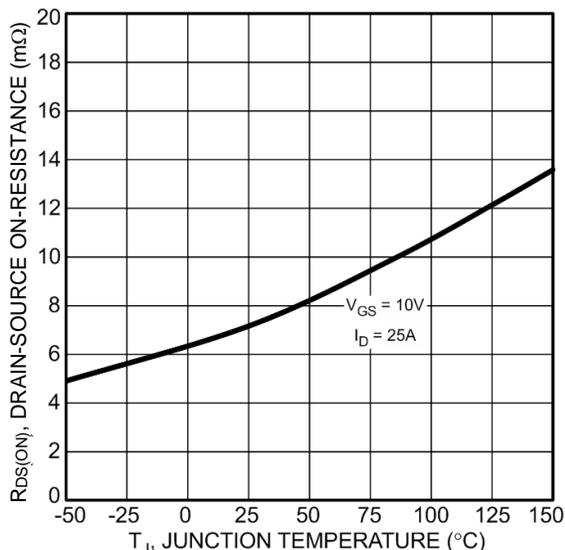


Fig. 7 On-Resistance Variation with Temperature

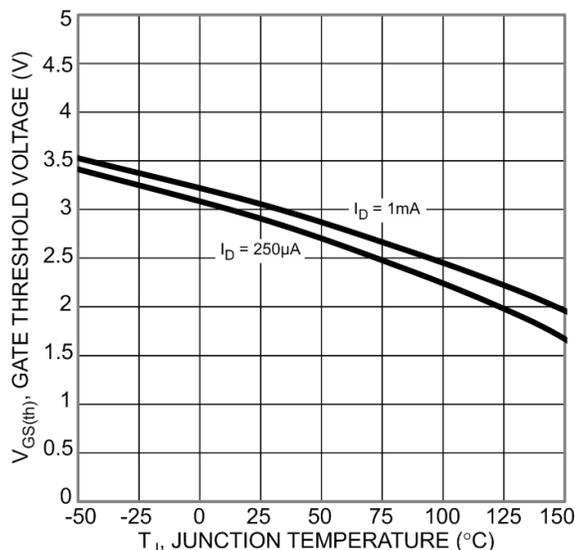


Fig. 8 Gate Threshold Variation vs. Junction Temperature

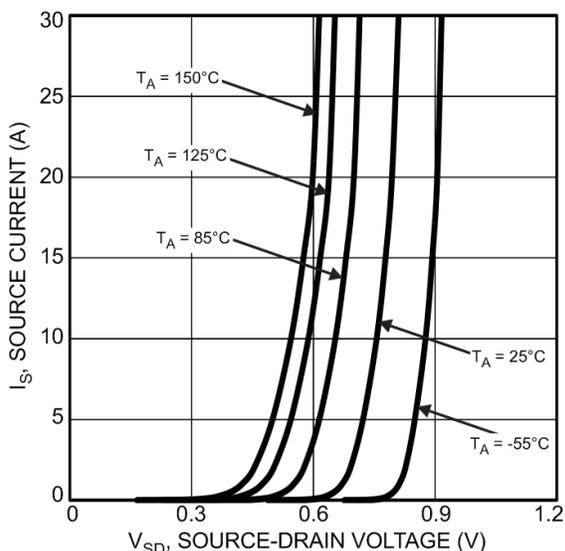


Fig. 9 Diode Forward Voltage vs. Current

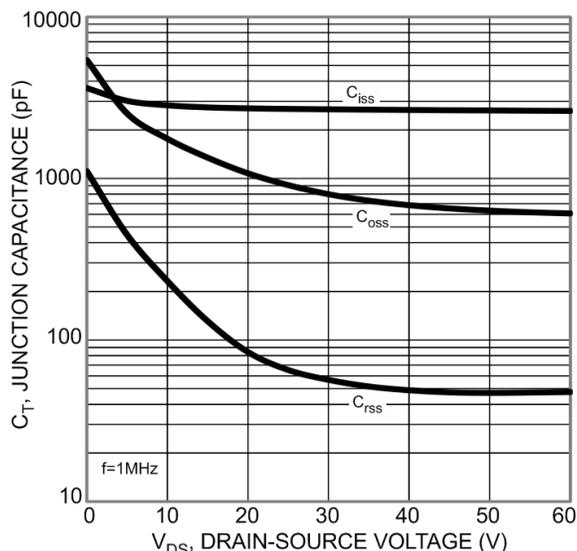


Fig. 10 Typical Junction Capacitance

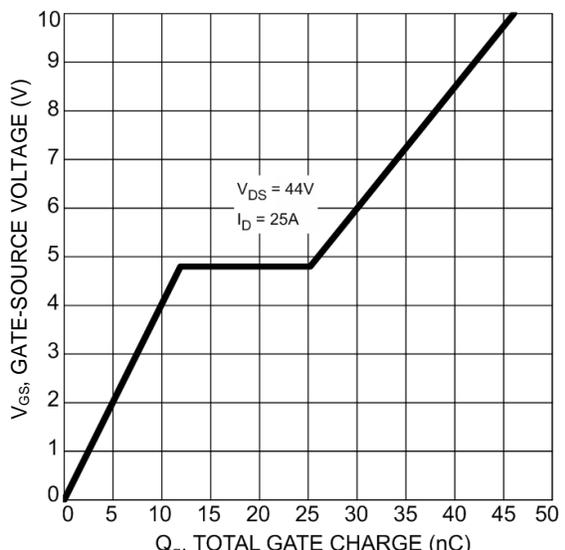


Fig. 11 Gate Charge

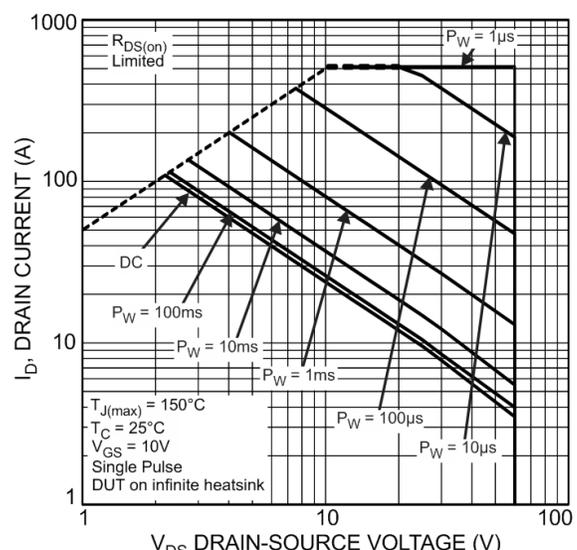
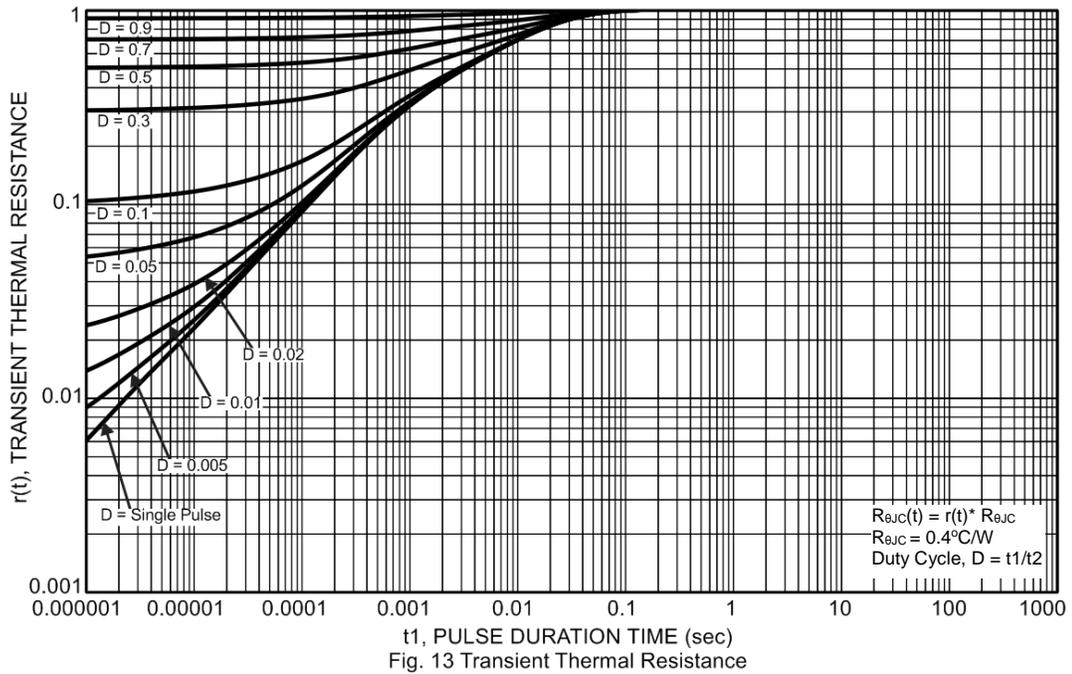
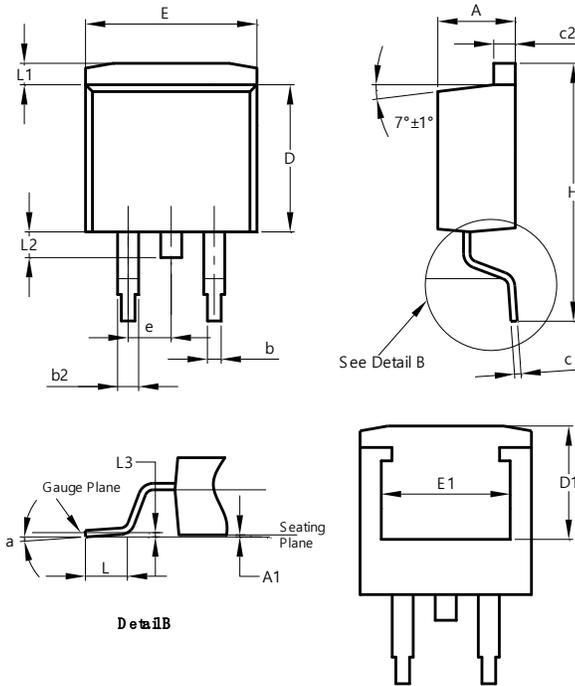


Fig. 12 SOA, Safe Operation Area



## Package Outline Dimensions

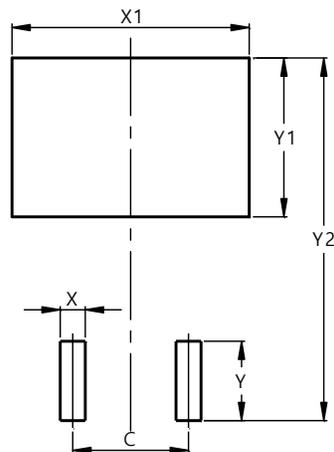
TO263AB (D2PAK)



| TO263AB (D2PAK)      |          |       |       |
|----------------------|----------|-------|-------|
| Dim                  | Min      | Max   | Typ   |
| A                    | 4.07     | 4.82  | -     |
| A1                   | 0.00     | 0.25  | -     |
| b                    | 0.51     | 0.99  | -     |
| b2                   | 1.15     | 1.77  | -     |
| c                    | 0.356    | 0.73  | -     |
| c2                   | 1.143    | 1.65  | -     |
| D                    | 8.39     | 9.65  | -     |
| D1                   | 6.55     | 6.95  | -     |
| e                    | 2.54 TYP |       |       |
| E                    | 9.66     | 10.66 | -     |
| E1                   | 6.23     | 8.23  | -     |
| H                    | 14.61    | 15.87 | -     |
| L                    | 1.78     | 2.79  | -     |
| L1                   | -        | 1.67  | -     |
| L2                   | -        | 1.77  | -     |
| L3                   | -        | -     | 0.254 |
| a                    | 0°       | 8°    | -     |
| All Dimensions in mm |          |       |       |

## Suggested Pad Layout

TO263AB (D2PAK)



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 5.08          |
| X          | 1.10          |
| X1         | 10.41         |
| Y          | 3.50          |
| Y1         | 7.01          |
| Y2         | 15.99         |