

# N-Channel 100-V (D-S) 175 °C MOSFET

## PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 100          | 0.025 at $V_{GS} = 10$ V  | 40        |
|              | 0.028 at $V_{GS} = 4.5$ V | 38        |

## FEATURES

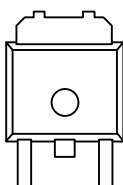
- TrenchFET® Power MOSFET
- 175 °C Maximum Junction Temperature
- 100 %  $R_g$  Tested



Available

**RoHS\***  
COMPLIANT

TO-252

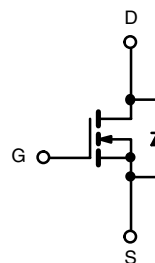


G D S

Top View

Drain Connected to Tab

Ordering Information: SUD40N10-25  
SUD40N10-25-E3 (Lead (Pb)-free)



N-Channel MOSFET

## ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

| Parameter                                               |                | Symbol         | Limit            | Unit |
|---------------------------------------------------------|----------------|----------------|------------------|------|
| Drain-Source Voltage                                    |                | $V_{DS}$       | 100              | V    |
| Gate-Source Voltage                                     |                | $V_{GS}$       | $\pm 20$         |      |
| Continuous Drain Current ( $T_J = 175$ °C) <sup>b</sup> | $T_C = 25$ °C  | $I_D$          | 40               | A    |
|                                                         | $T_C = 125$ °C |                | 23               |      |
| Pulsed Drain Current                                    |                | $I_{DM}$       | 70               |      |
| Continuous Source Current (Diode Conduction)            |                | $I_S$          | 40               |      |
| Avalanche Current                                       |                | $I_{AS}$       | 40               | mJ   |
| Single Pulse Avalanche Energy (Duty Cycle $\leq 1$ %)   | $L = 0.1$ mH   | $E_{AS}$       | 80               |      |
| Maximum Power Dissipation                               | $T_C = 25$ °C  | $P_D$          | 136 <sup>b</sup> | W    |
|                                                         | $T_A = 25$ °C  |                | 3 <sup>a</sup>   |      |
| Operating Junction and Storage Temperature Range        |                | $T_J, T_{stg}$ | - 55 to 175      | °C   |

## THERMAL RESISTANCE RATINGS

| Parameter                        |               | Symbol     | Typical | Maximum | Unit |
|----------------------------------|---------------|------------|---------|---------|------|
| Junction-to-Ambient <sup>a</sup> | $t \leq 10$ s | $R_{thJA}$ | 15      | 18      | °C/W |
|                                  | Steady State  |            | 40      | 50      |      |
| Junction-to-Case                 |               | $R_{thJC}$ | 0.85    | 1.1     |      |

Notes:

a. Surface Mounted on 1" x 1" FR4 board.

b. See SOA curve for voltage derating.

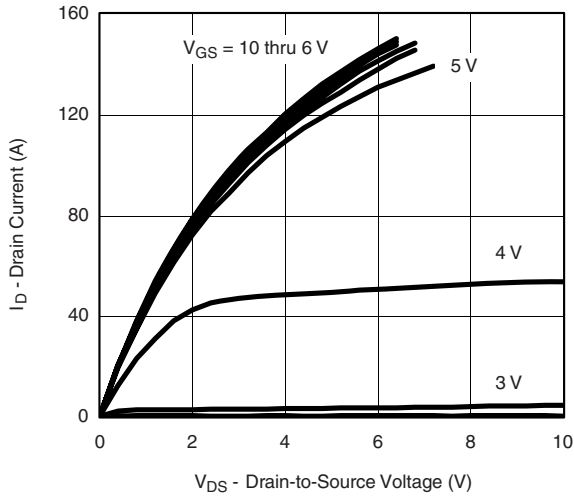
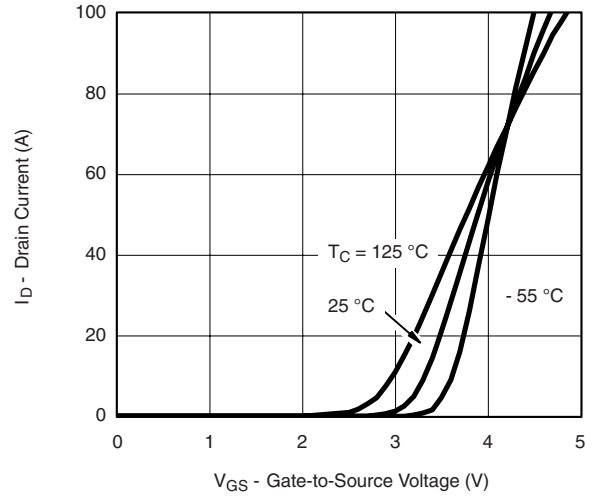
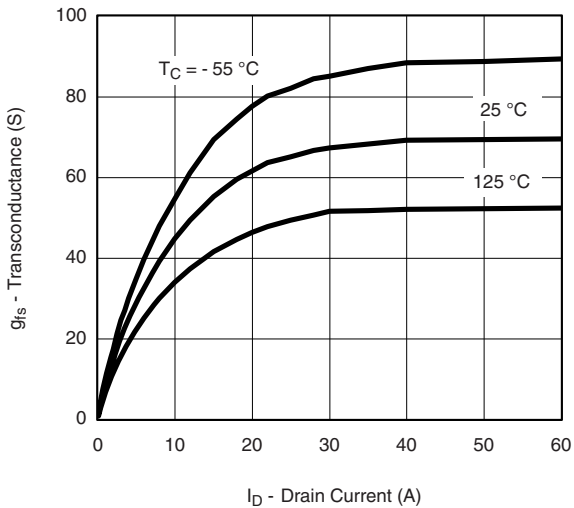
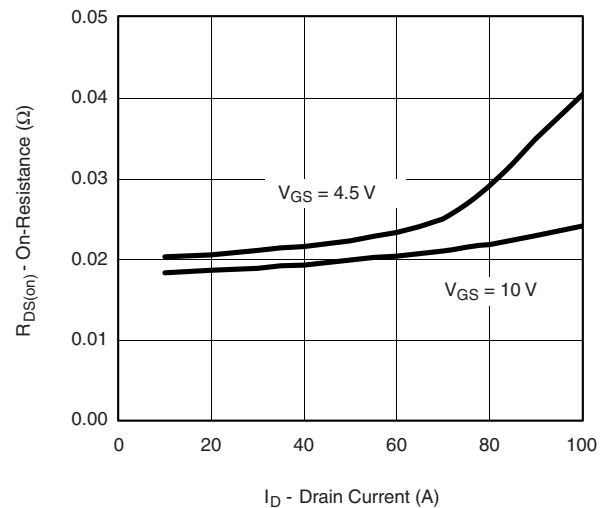
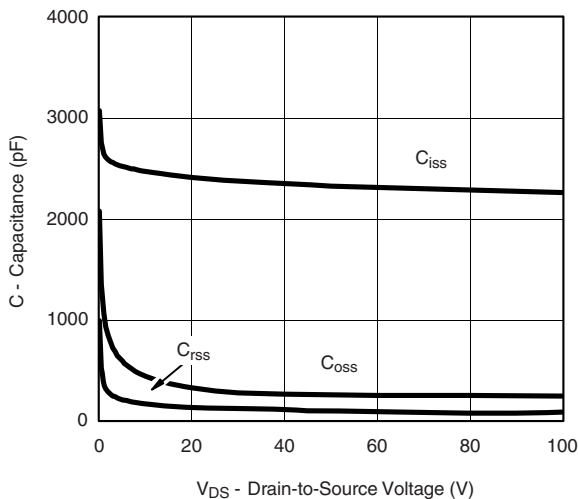
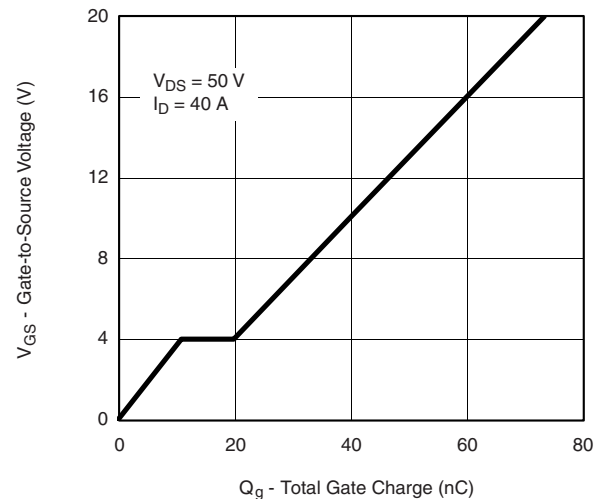
\* Pb containing terminations are not RoHS compliant, exemptions may apply.

| SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted        |              |                                                                                                                                      |      |                   |           |               |
|-----------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------|------|-------------------|-----------|---------------|
| Parameter                                                                         | Symbol       | Test Conditions                                                                                                                      | Min. | Typ. <sup>a</sup> | Max.      | Unit          |
| Static                                                                            |              |                                                                                                                                      |      |                   |           |               |
| Drain-Source Breakdown Voltage                                                    | $V_{DS}$     | $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$                                                                               | 100  |                   |           | V             |
| Gate Threshold Voltage                                                            | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                   | 1.0  |                   | 3.0       |               |
| Gate-Body Leakage                                                                 | $I_{GSS}$    | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$                                                                                   |      |                   | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current                                                   | $I_{DSS}$    | $V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                      |      |                   | 1         | $\mu\text{A}$ |
|                                                                                   |              | $V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$                                                |      |                   | 50        |               |
|                                                                                   |              | $V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$                                                |      |                   | 250       |               |
| On-State Drain Current <sup>b</sup>                                               | $I_{D(on)}$  | $V_{DS} = 5\text{ V}$ , $V_{GS} = 10\text{ V}$                                                                                       | 70   |                   |           | A             |
| Drain-Source On-State Resistance <sup>b</sup>                                     | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 40\text{ A}$                                                                                         |      | 0.02              | 0.025     | $\Omega$      |
|                                                                                   |              | $V_{GS} = 10\text{ V}$ , $I_D = 40\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$                                                   |      |                   | 0.05      |               |
|                                                                                   |              | $V_{GS} = 10\text{ V}$ , $I_D = 40\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$                                                   |      |                   | 0.063     |               |
|                                                                                   |              | $V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$                                                                                        |      | 0.022             | 0.028     |               |
| Forward Transconductance <sup>b</sup>                                             | $g_{fs}$     | $V_{DS} = 15\text{ V}$ , $I_D = 40\text{ A}$                                                                                         |      | 70                |           | S             |
| Dynamic <sup>a</sup>                                                              |              |                                                                                                                                      |      |                   |           |               |
| Input Capacitance                                                                 | $C_{iss}$    | $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $F = 1\text{ MHz}$                                                                  |      | 2400              |           | pF            |
| Output Capacitance                                                                | $C_{oss}$    |                                                                                                                                      |      | 290               |           |               |
| Reverse Transfer Capacitance                                                      | $C_{rss}$    |                                                                                                                                      |      | 120               |           |               |
| Total Gate Charge <sup>c</sup>                                                    | $Q_g$        | $V_{DS} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 40\text{ A}$                                                                |      | 40                | 60        | nC            |
| Gate-Source Charge <sup>c</sup>                                                   | $Q_{gs}$     |                                                                                                                                      |      | 11                |           |               |
| Gate-Drain Charge <sup>c</sup>                                                    | $Q_{gd}$     |                                                                                                                                      |      | 9                 |           |               |
| Gate Resistance                                                                   | $R_g$        |                                                                                                                                      | 1    |                   | 3.5       | $\Omega$      |
| Turn-On Delay Time <sup>c</sup>                                                   | $t_{d(on)}$  | $V_{DD} = 50\text{ V}$ , $R_L = 1.25\text{ }\Omega$<br>$I_D \cong 40\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$ |      | 8                 | 13        | ns            |
| Rise Time <sup>c</sup>                                                            | $t_r$        |                                                                                                                                      |      | 40                | 60        |               |
| Turn-Off Delay Time <sup>c</sup>                                                  | $t_{d(off)}$ |                                                                                                                                      |      | 15                | 25        |               |
| Fall Time <sup>c</sup>                                                            | $t_f$        |                                                                                                                                      |      | 80                | 120       |               |
| Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ |              |                                                                                                                                      |      |                   |           |               |
| Pulsed Current                                                                    | $I_{SM}$     |                                                                                                                                      |      |                   | 70        | A             |
| Diode Forward Voltage <sup>b</sup>                                                | $V_{SD}$     | $I_F = 40\text{ A}$ , $V_{GS} = 0\text{ V}$                                                                                          |      | 1.0               | 1.5       | V             |
| Source-Drain Reverse Recovery Time                                                | $t_{rr}$     | $I_F = 40\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$                                                                             |      | 75                | 120       | ns            |

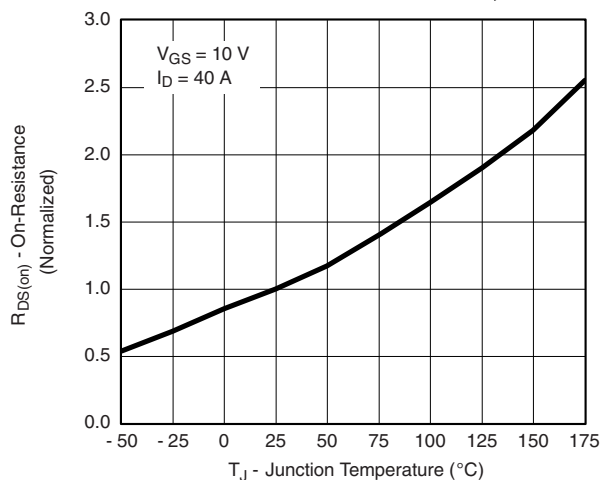
## Notes:

- a. Guaranteed by design, not subject to production testing.  
b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
c. Independent of operating temperature.

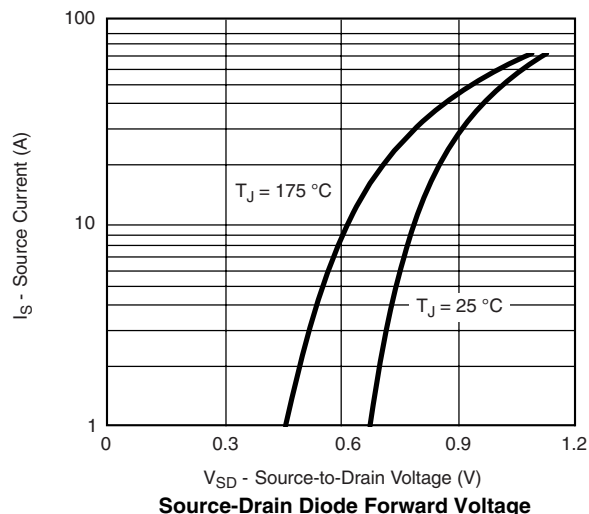
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

**Output Characteristics**

**Transfer Characteristics**

**Transconductance**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

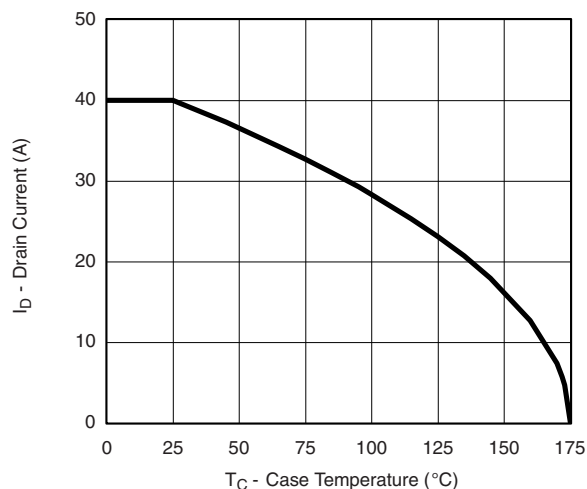


On-Resistance vs. Junction Temperature

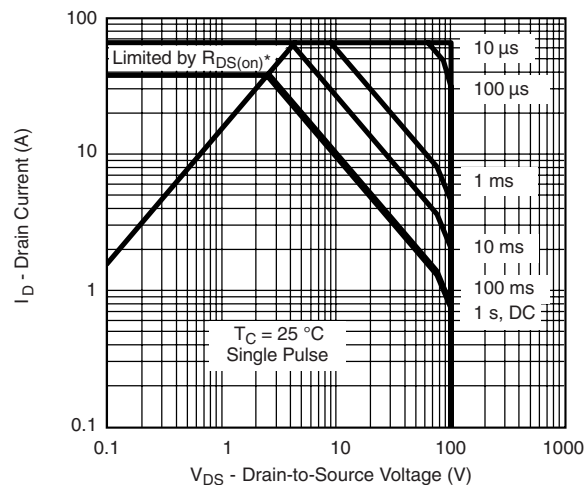


Source-Drain Diode Forward Voltage

### THERMAL RATINGS

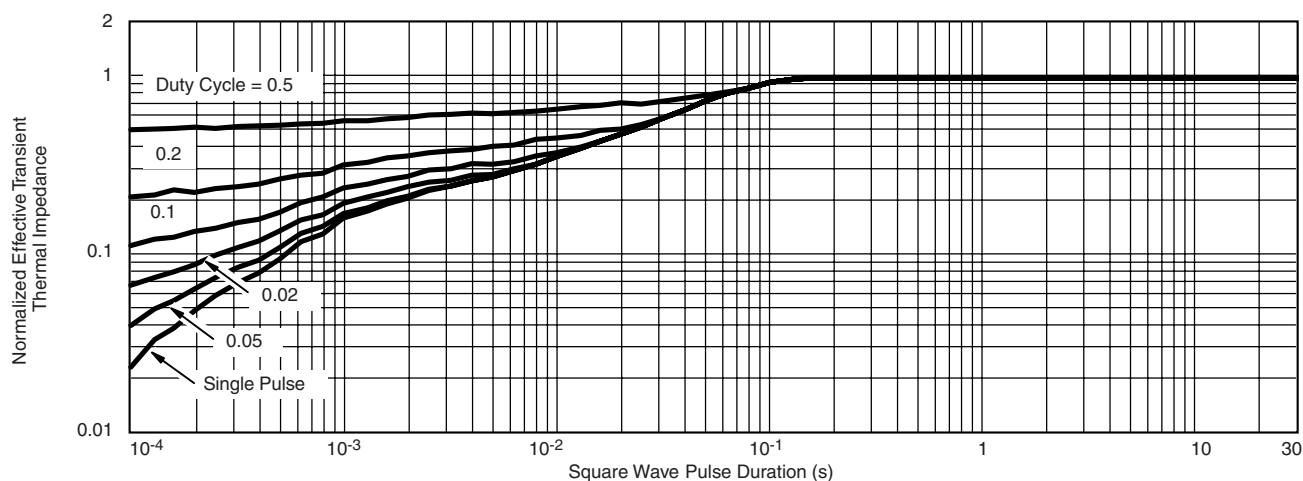


Maximum Avalanche Drain Current vs. Case Temperature



\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area

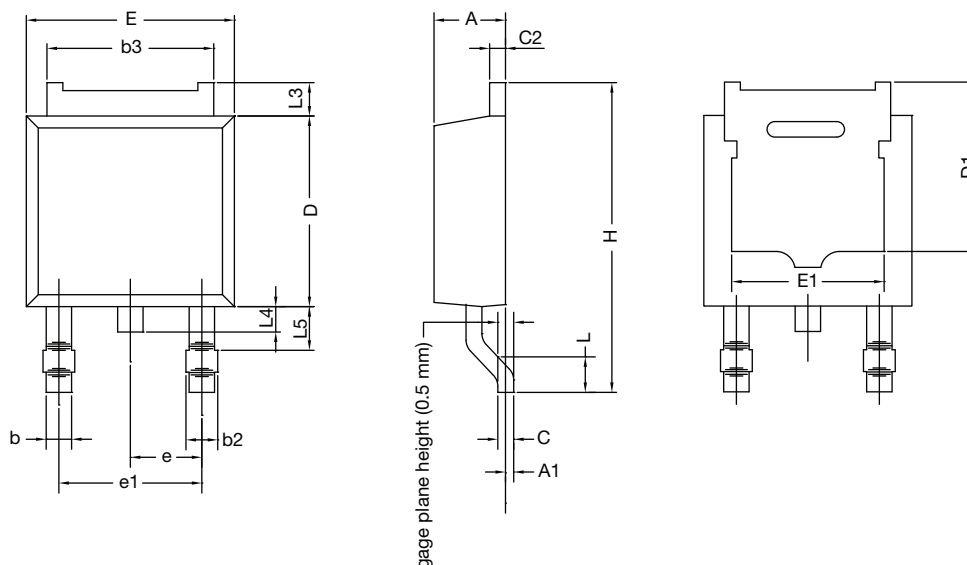


Normalized Thermal Transient Impedance, Junction-to-Case

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## TO-252AA Case Outline

### VERSION 1: FACILITY CODE = Y



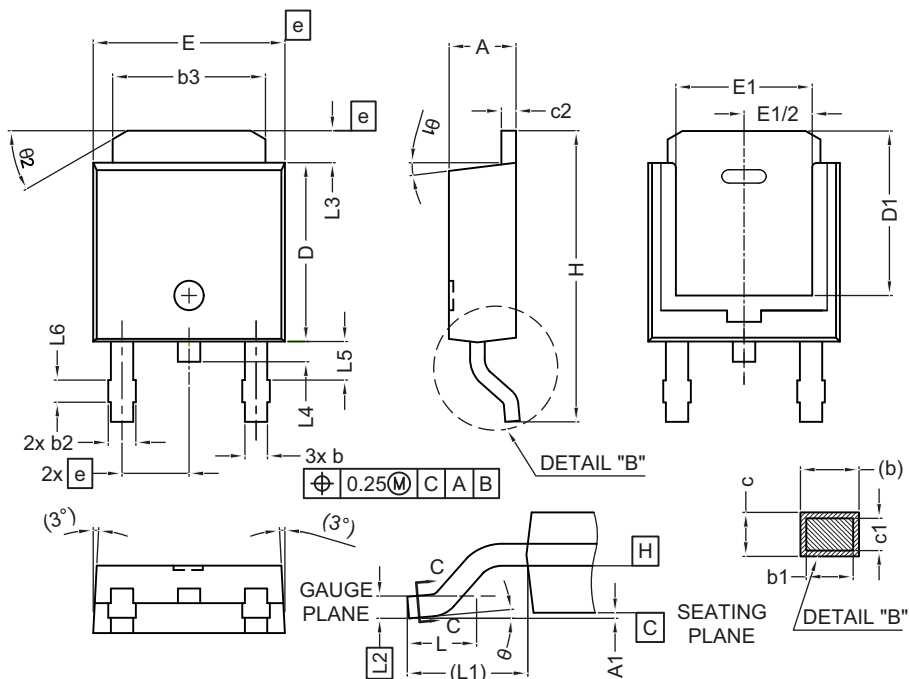
| MILLIMETERS |          |       |
|-------------|----------|-------|
| DIM.        | MIN.     | MAX.  |
| A           | 2.18     | 2.38  |
| A1          | -        | 0.127 |
| b           | 0.64     | 0.88  |
| b2          | 0.76     | 1.14  |
| b3          | 4.95     | 5.46  |
| C           | 0.46     | 0.61  |
| C2          | 0.46     | 0.89  |
| D           | 5.97     | 6.22  |
| D1          | 4.10     | -     |
| E           | 6.35     | 6.73  |
| E1          | 4.32     | -     |
| H           | 9.40     | 10.41 |
| e           | 2.28 BSC |       |
| e1          | 4.56 BSC |       |
| L           | 1.40     | 1.78  |
| L3          | 0.89     | 1.27  |
| L4          | -        | 1.02  |
| L5          | 1.01     | 1.52  |

#### Note

- Dimension L3 is for reference only



## VERSION 2: FACILITY CODE = N



| DIM. | MILLIMETERS |       |
|------|-------------|-------|
|      | MIN.        | MAX.  |
| A    | 2.18        | 2.39  |
| A1   | -           | 0.13  |
| b    | 0.65        | 0.89  |
| b1   | 0.64        | 0.79  |
| b2   | 0.76        | 1.13  |
| b3   | 4.95        | 5.46  |
| c    | 0.46        | 0.61  |
| c1   | 0.41        | 0.56  |
| c2   | 0.46        | 0.60  |
| D    | 5.97        | 6.22  |
| D1   | 5.21        | -     |
| E    | 6.35        | 6.73  |
| E1   | 4.32        | -     |
| e    | 2.29 BSC    |       |
| H    | 9.94        | 10.34 |

| DIM. | MILLIMETERS |      |
|------|-------------|------|
|      | MIN.        | MAX. |
| L    | 1.50        | 1.78 |
| L1   | 2.74 ref.   |      |
| L2   | 0.51 BSC    |      |
| L3   | 0.89        | 1.27 |
| L4   | -           | 1.02 |
| L5   | 1.14        | 1.49 |
| L6   | 0.65        | 0.85 |
| θ    | 0°          | 10°  |
| θ1   | 0°          | 15°  |
| θ2   | 25°         | 35°  |

### Notes

- Dimensioning and tolerance confirm to ASME Y14.5M-1994
- All dimensions are in millimeters. Angles are in degrees
- Heat sink side flash is max. 0.8 mm
- Radius on terminal is optional

ECN: E19-0649-Rev. Q, 16-Dec-2019  
DWG: 5347

## RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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