

N-Channel 150-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) |
|--------------|---------------------------|-----------|
| 150 | 0.052 at $V_{GS} = 10$ V | 25 |
| | 0.060 at $V_{GS} = 6$ V | 23 |

FEATURES

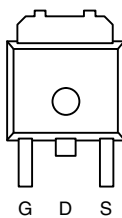
- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- PWM Optimized
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC


RoHS
COMPLIANT

APPLICATIONS

- Primary Side Switch

TO-252

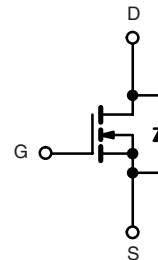


Top View

Drain Connected to Tab

Ordering Information:

SUD25N15-52-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} | 150 | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | | |
| Continuous Drain Current ($T_J = 175$ °C) ^b | I_D | $T_C = 25$ °C | 25 | |
| | | $T_C = 125$ °C | 14.5 | |
| Pulsed Drain Current | I_{DM} | 50 | A | |
| Continuous Source Current (Diode Conduction) | I_S | 25 | | |
| Avalanche Current | I_{AR} | 25 | | |
| Repetitive Avalanche Energy (Duty Cycle ≤ 1 %) | $L = 0.1$ mH | E_{AR} | 31 | mJ |
| Maximum Power Dissipation | | $T_C = 25$ °C | P_D | 136 ^b |
| | | $T_A = 25$ °C | | 3 ^a |
| 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 ^a | R_{thJA} | $t \leq 10$ s | 15 | 18 |
| | | Steady State | 40 | 50 |
| Junction-to-Case (Drain) | R_{thJC} | 0.85 | 1.1 | °C/W |

Notes:

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

b. See SOA curve for voltage derating.

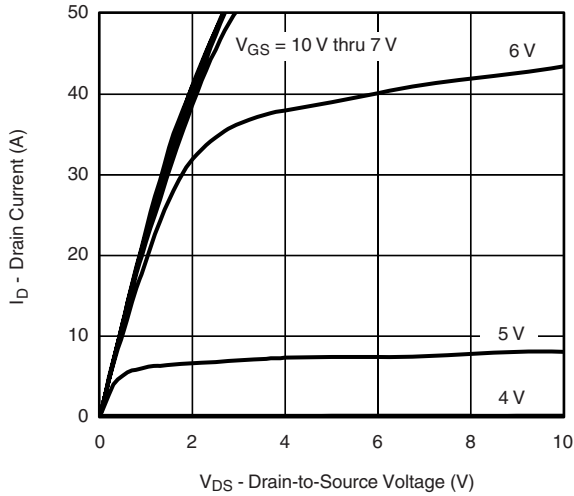
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|--|--------------|--|------|-------------------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 150 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | | 4 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 50 | |
| | | $V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | | | 250 | |
| On-State Drain Current ^b | $I_{D(on)}$ | $V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$ | 50 | | | A |
| Drain-Source On-State Resistance ^b | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 5\text{ A}$ | | 0.042 | 0.052 | Ω |
| | | $V_{GS} = 10\text{ V}, I_D = 5\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | | 0.109 | |
| | | $V_{GS} = 10\text{ V}, I_D = 5\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | | | 0.145 | |
| | | $V_{GS} = 6\text{ V}, I_D = 5\text{ A}$ | | 0.047 | 0.060 | |
| Forward Transconductance ^b | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 25\text{ A}$ | | 40 | | S |
| Dynamic^a | | | | | | |
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | | 1725 | | pF |
| Output Capacitance | C_{OSS} | | | 216 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 100 | | |
| Total Gate Charge ^c | Q_g | $V_{DS} = 75\text{ V}, V_{GS} = 10\text{ V}, I_D = 25\text{ A}$ | | 33 | 40 | nC |
| Gate-Source Charge ^c | Q_{gs} | | | 9 | | |
| Gate-Drain Charge ^c | Q_{gd} | | | 12 | | |
| Gate Resistance | R_g | | 1 | | 3 | Ω |
| Turn-On Delay Time ^c | $t_{d(on)}$ | $V_{DD} = 50\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 25\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$ | | 15 | 25 | ns |
| Rise Time ^c | t_r | | | 70 | 100 | |
| Turn-Off Delay Time ^c | $t_{d(off)}$ | | | 25 | 40 | |
| Fall Time ^c | t_f | | | 60 | 90 | |
| Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^\circ\text{C}$ | | | | | | |
| Pulsed Current | I_{SM} | | | | 50 | A |
| Diode Forward Voltage ^b | V_{SD} | $I_F = 25\text{ A}, V_{GS} = 0\text{ V}$ | | 0.9 | 1.5 | V |
| Source-Drain Reverse Recovery Time | t_{rr} | $I_F = 25\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 95 | 140 | ns |

Notes:

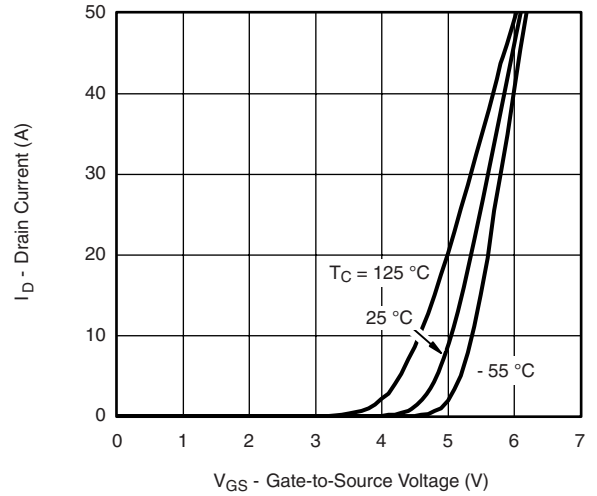
- Guaranteed by design, not subject to production testing.
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Independent of operating temperature.

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.

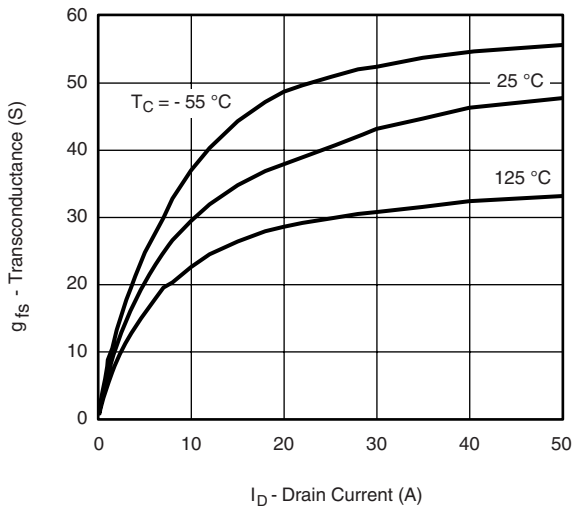
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



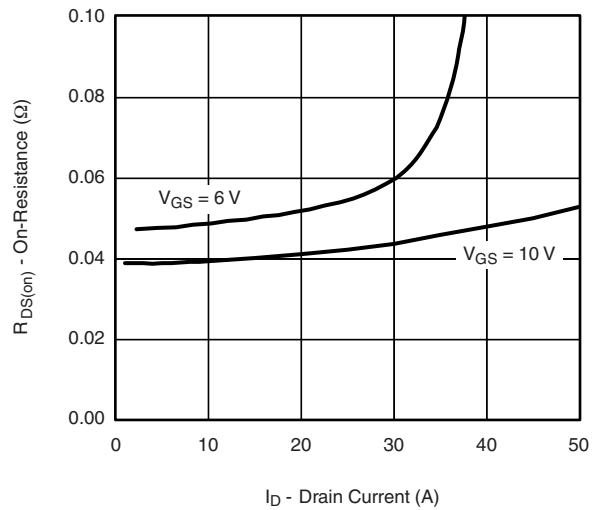
Output Characteristics



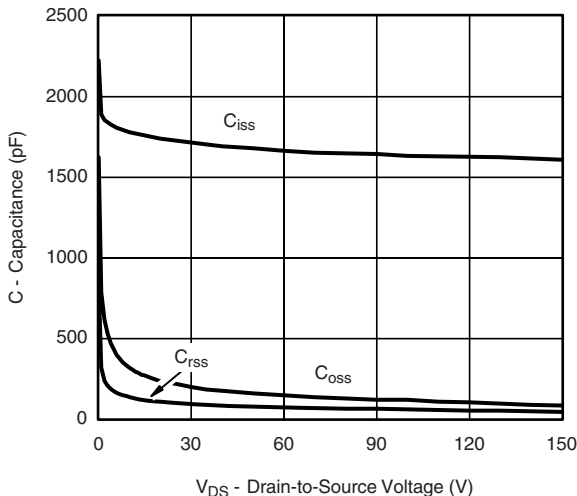
Transfer Characteristics



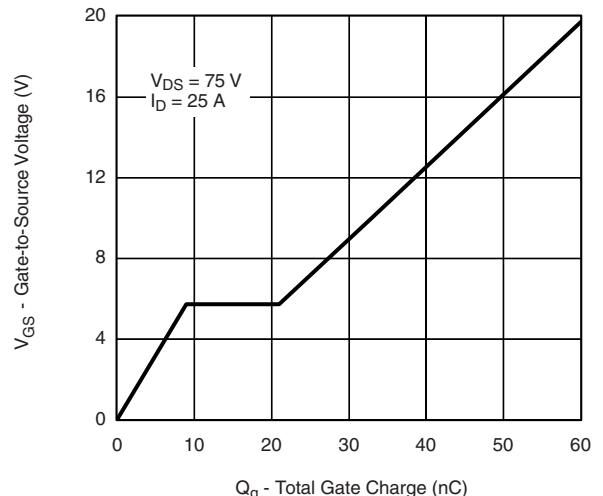
Transconductance



On-Resistance vs. Drain Current

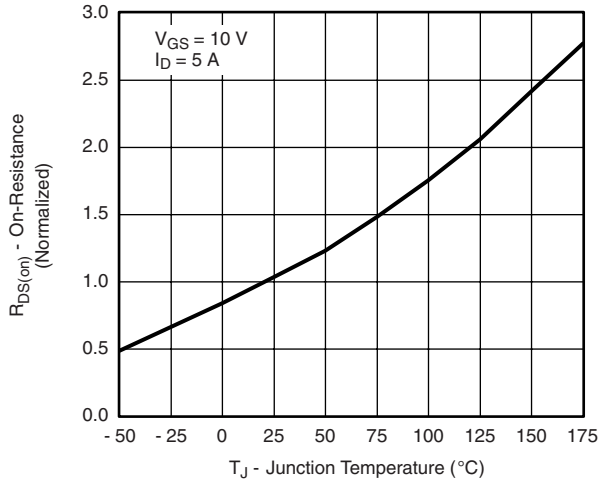


Capacitance

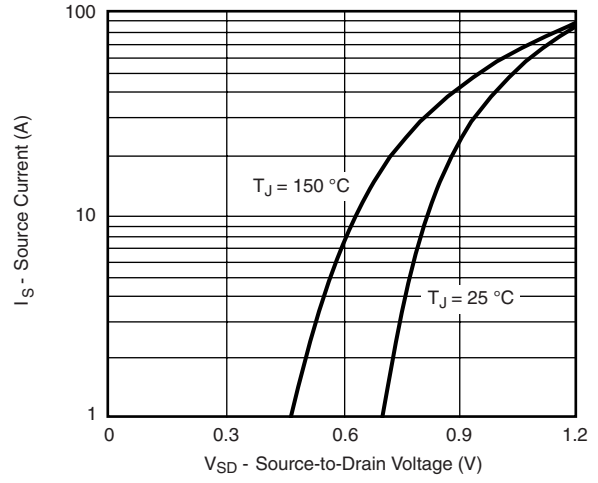


Gate Charge

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

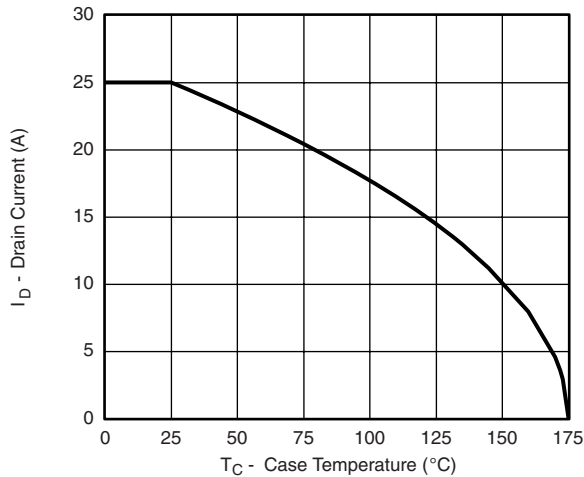


On-Resistance vs. Junction Temperature

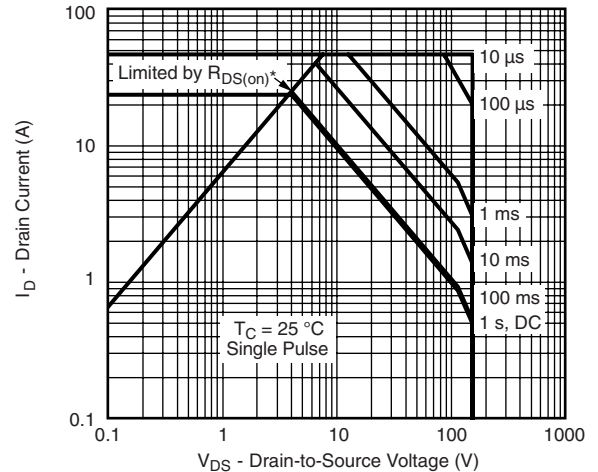


Source-Drain Diode Forward Voltage

THERMAL RATINGS



Maximum Avalanche Drain Current vs. Case Temperature



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



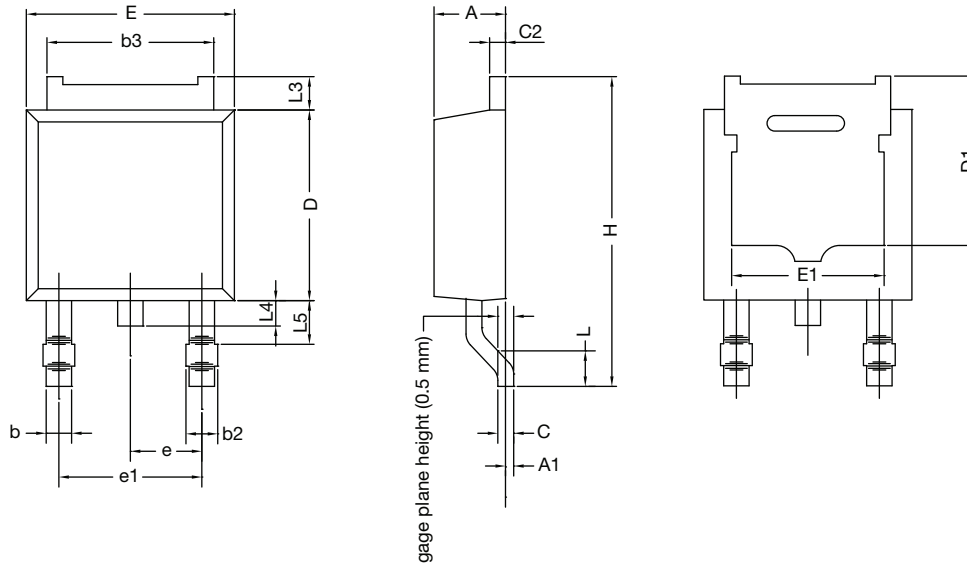
Normalized Thermal Transient Impedance, Junction-to-Case

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TO-252AA Case Outline

VERSION 1: FACILITY CODE = Y



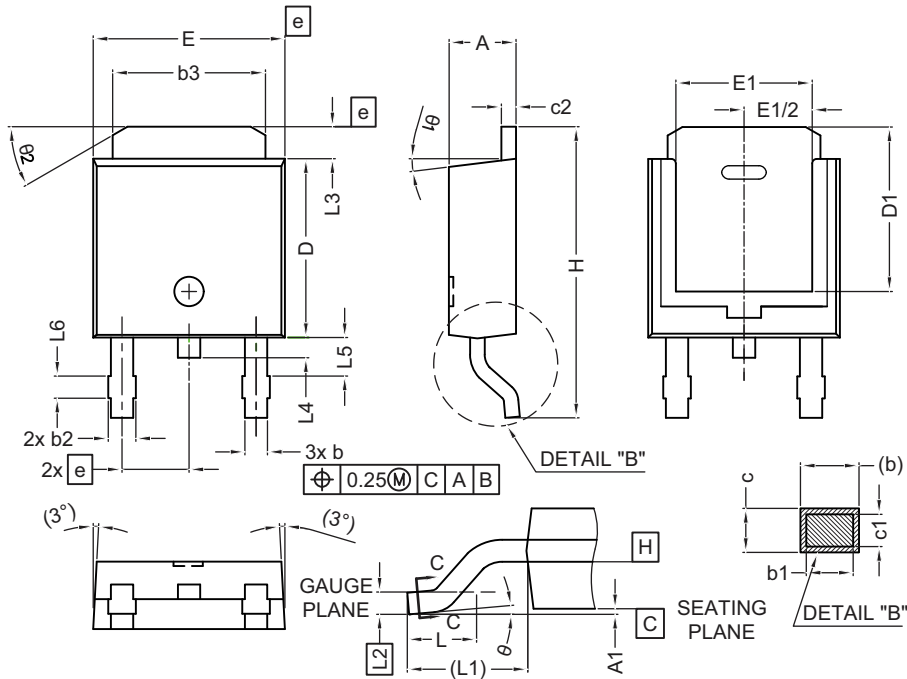
| DIM. | MILLIMETERS | |
|------|-------------|-------|
| | MIN. | MAX. |
| A | 2.18 | 2.38 |
| A1 | - | 0.127 |
| b | 0.64 | 0.88 |
| b2 | 0.76 | 1.14 |
| b3 | 4.95 | 5.46 |
| C | 0.46 | 0.61 |
| C2 | 0.46 | 0.89 |
| D | 5.97 | 6.22 |
| D1 | 4.10 | - |
| E | 6.35 | 6.73 |
| E1 | 4.32 | - |
| H | 9.40 | 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



| MILLIMETERS | | |
|-------------|----------|-------|
| DIM. | 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 |

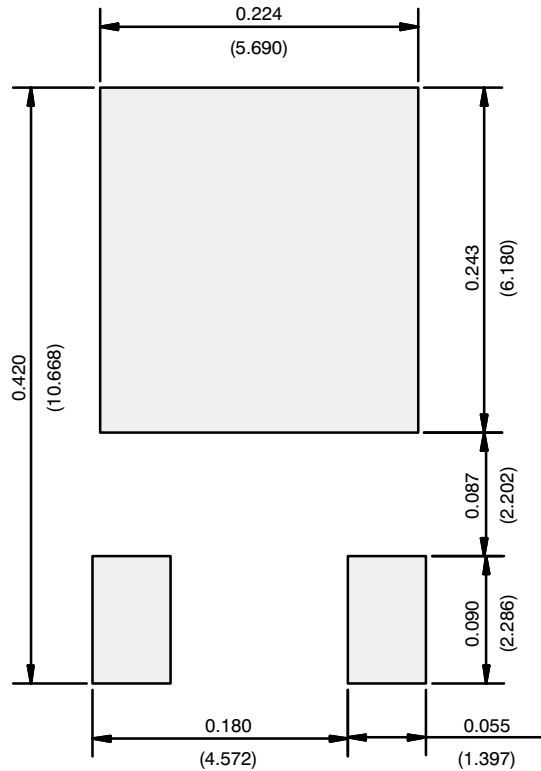
| MILLIMETERS | | |
|-------------|-----------|------|
| DIM. | MIN. | MAX. |
| L | 1.50 | 1.78 |
| L1 | 2.74 ref. | |
| L2 | 0.51 BSC | |
| L3 | 0.89 | 1.27 |
| L4 | - | 1.02 |
| L5 | 1.14 | 1.49 |
| L6 | 0.65 | 0.85 |
| θ | 0° | 10° |
| θ1 | 0° | 15° |
| θ2 | 25° | 35° |

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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