

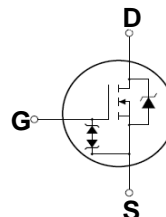
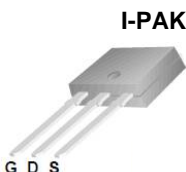
Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- Halogen free package
- JEDEC Qualification
- Improved ESD performance

$$V_{DSS} = 440 \text{ V @ } T_{jmax}$$

$$I_D = 3.4 \text{ A}$$

$$R_{DS(on)} = 1.6 \text{ } \Omega \text{ (max) @ } V_{GS} = 10 \text{ V}$$



| Device | Package | Marking | Remark |
|---------------------|-------------|---------------------|--------------|
| TMD5N40ZG/TMU5N40ZG | D-PAK/I-PAK | TMD5N40ZG/TMU5N40ZG | Halogen Free |

Absolute Maximum Ratings

| Parameter | Symbol | TMD5N40ZG/TMU5N40ZG | Unit |
|---|----------------|------------------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 400 | V |
| Gate-Source Voltage | V_{GS} | ± 30 | V |
| Continuous Drain Current | I_D | $T_C = 25 \text{ }^\circ\text{C}$ | 3.4* |
| | | $T_C = 100 \text{ }^\circ\text{C}$ | 2.15* |
| Pulsed Drain Current (Note 1) | I_{DM} | 13.6* | A |
| Single Pulse Avalanche Energy (Note 2) | E_{AS} | 165 | mJ |
| Repetitive Avalanche Current (Note 1) | I_{AR} | 3.4 | A |
| Repetitive Avalanche Energy (Note 1) | E_{AR} | 5.0 | mJ |
| Power Dissipation | P_D | $T_C = 25 \text{ }^\circ\text{C}$ | 50 |
| | | Derate above 25 $^\circ\text{C}$ | 0.4 |
| Peak Diode Recovery dv/dt (Note 3) | dv/dt | 4.5 | V/ns |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55~150 | $^\circ\text{C}$ |
| Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | T_L | 300 | $^\circ\text{C}$ |

* Limited only by maximum junction temperature

Thermal Characteristics

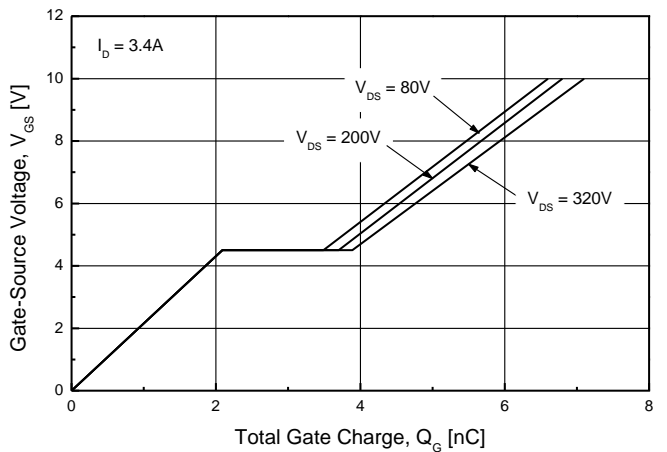
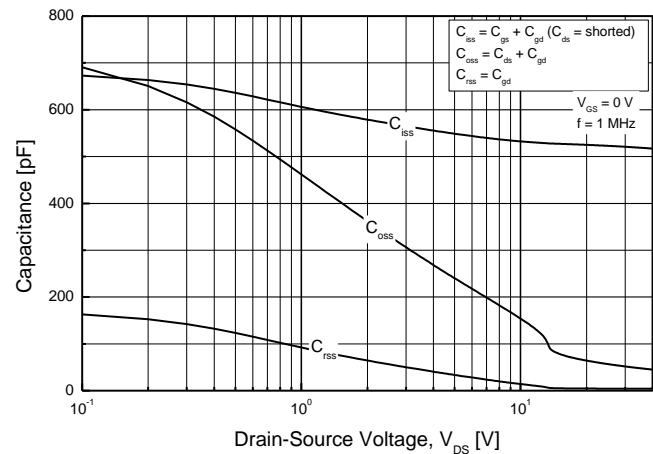
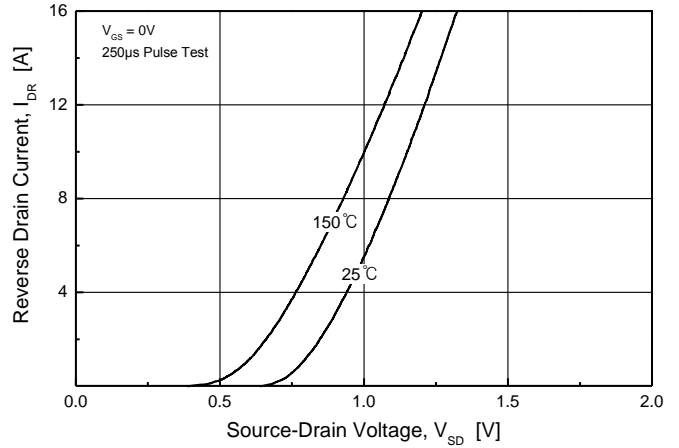
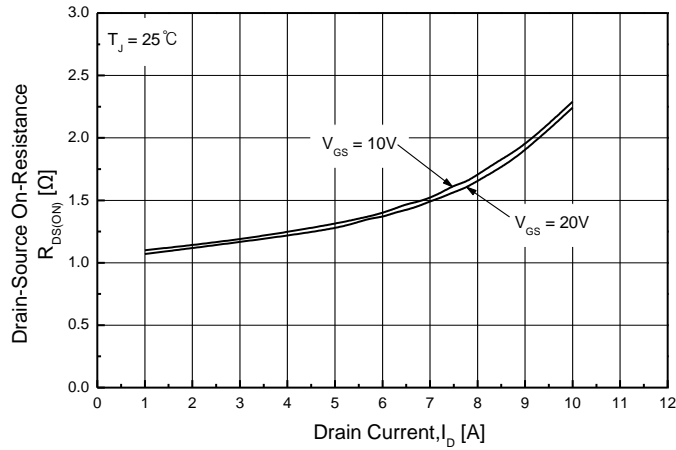
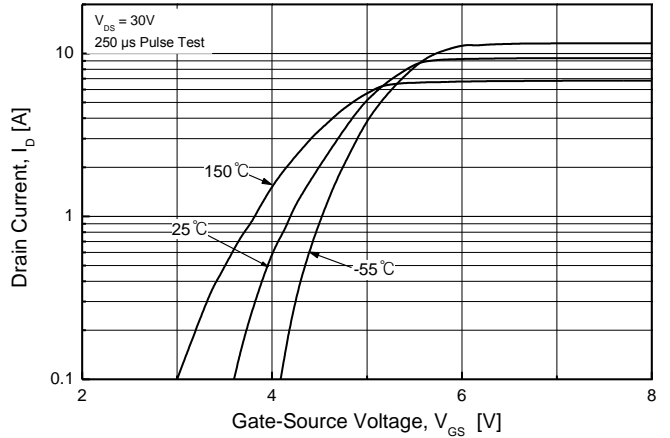
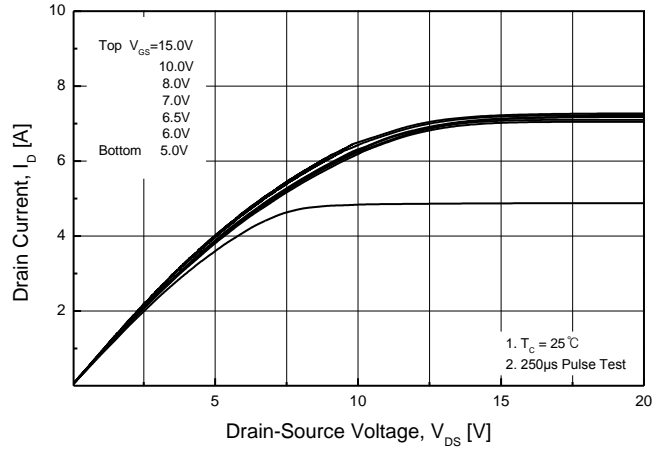
| Parameter | Symbol | TMD5N40ZG/TMU5N40ZG | Unit |
|---|-----------------|---------------------|--------------------|
| Maximum Thermal resistance, Junction-to-Case | $R_{\theta JC}$ | 2.5 | $^\circ\text{C/W}$ |
| Maximum Thermal resistance, Junction-to-Ambient | $R_{\theta JA}$ | 110 | $^\circ\text{C/W}$ |

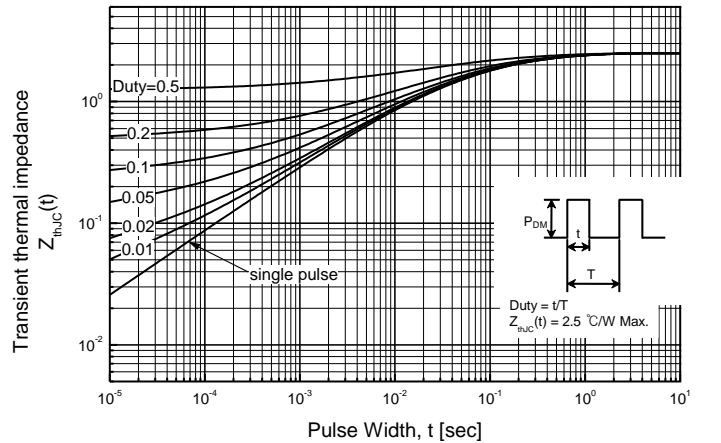
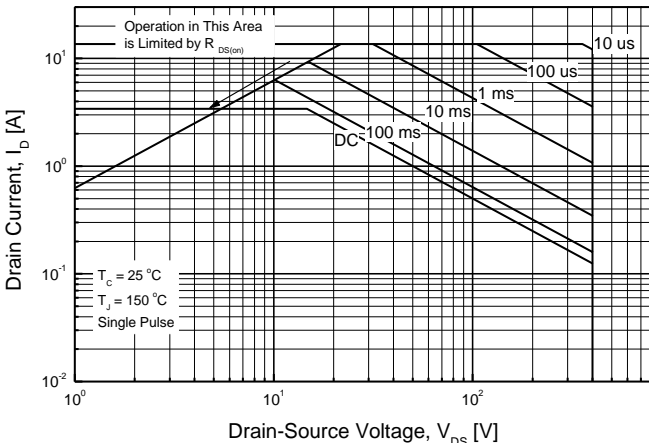
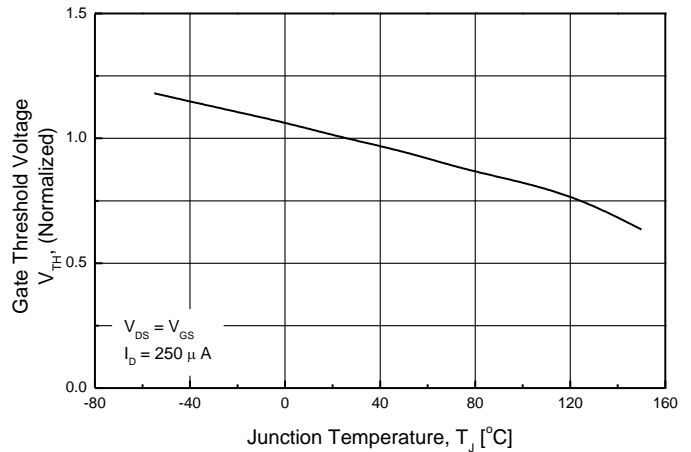
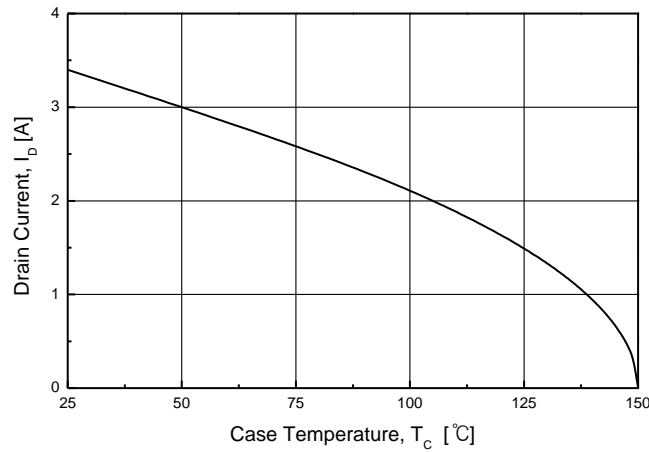
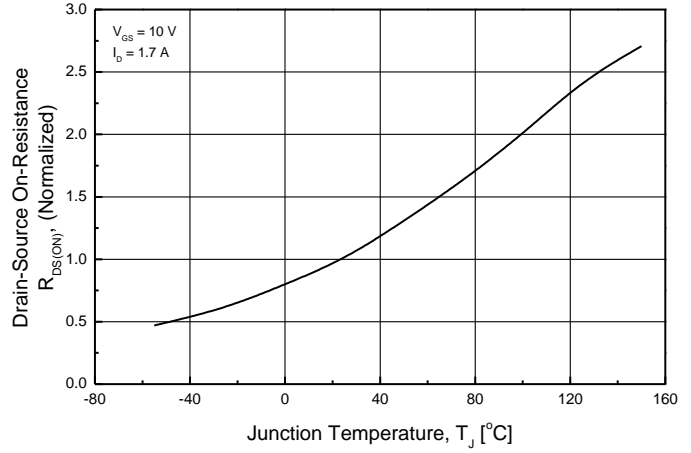
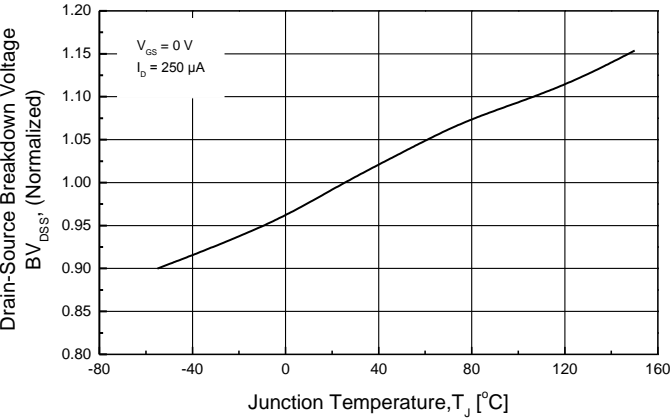
Electrical Characteristics : $T_C=25^\circ\text{C}$, unless otherwise noted

| Parameter | Symbol | Test condition | Min | Typ | Max | Units |
|---|--------------|---|-----|-----|------|---------------|
| OFF | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 400 | -- | -- | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 320\text{ V}, T_C = 125^\circ\text{C}$ | -- | -- | 10 | μA |
| Forward Gate-Source Leakage Current | I_{GSSF} | $V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | 100 | μA |
| Reverse Gate-Source Leakage Current | I_{GSSR} | $V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | -100 | μA |
| ON | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 2 | -- | 4 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 1.7\text{ A}$ | -- | 1.2 | 1.6 | Ω |
| Forward Transconductance ^(Note 4) | g_{FS} | $V_{DS} = 30\text{ V}, I_D = 1.7\text{ A}$ | -- | 7 | -- | S |
| DYNAMIC | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$ | -- | 522 | -- | pF |
| Output Capacitance | C_{oss} | | -- | 56 | -- | pF |
| Reverse Transfer Capacitance | C_{rss} | | -- | 4.3 | -- | pF |
| SWITCHING | | | | | | |
| Turn-On Delay Time ^(Note 4,5) | $t_{d(on)}$ | $V_{DD} = 200\text{ V}, I_D = 3.4\text{ A},$ $R_G = 25\ \Omega$ | -- | 12 | -- | ns |
| Turn-On Rise Time ^(Note 4,5) | t_r | | -- | 10 | -- | ns |
| Turn-Off Delay Time ^(Note 4,5) | $t_{d(off)}$ | | -- | 38 | -- | ns |
| Turn-Off Fall Time ^(Note 4,5) | t_f | | -- | 9 | -- | ns |
| Total Gate Charge ^(Note 4,5) | Q_g | $V_{DS} = 320\text{ V}, I_D = 3.4\text{ A},$ $V_{GS} = 10\text{ V}$ | -- | 7.1 | -- | nC |
| Gate-Source Charge ^(Note 4,5) | Q_{gs} | | -- | 2.2 | -- | nC |
| Gate-Drain Charge ^(Note 4,5) | Q_{gd} | | -- | 1.7 | -- | nC |
| SOURCE DRAIN DIODE | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | I_S | --- | -- | -- | 3.4 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | I_{SM} | --- | -- | -- | 13.6 | A |
| Drain-Source Diode Forward Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 3.4\text{ A}$ | -- | -- | 1.5 | V |
| Reverse Recovery Time ^(Note 4) | t_{rr} | $V_{GS} = 0\text{ V}, I_S = 3.4\text{ A}$ $di_F / dt = 100\text{ A}/\mu\text{s}$ | -- | 185 | -- | ns |
| Reverse Recovery Charge ^(Note 4) | Q_{rr} | | -- | 0.8 | -- | μC |

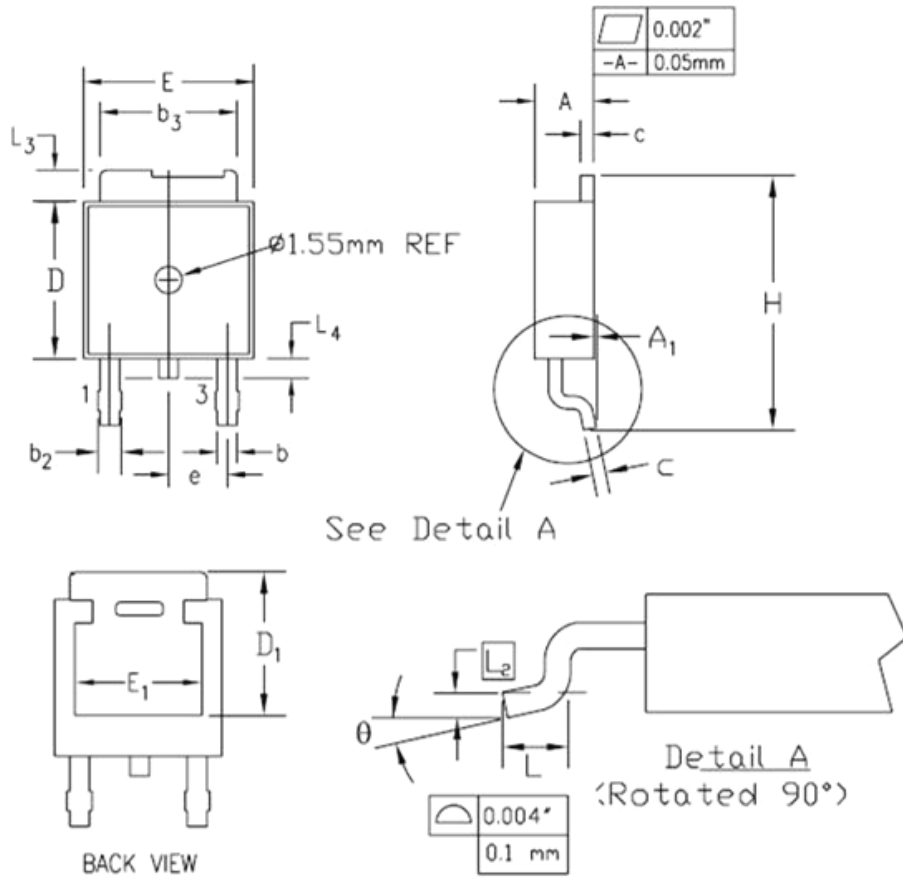
Note :

1. Repeated rating : Pulse width limited by safe operating area
2. $L=25\text{mH}, I_{AS}=3.4\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD} \leq 3.4\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DS}$, Starting $T_J=25^\circ\text{C}$
4. Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics



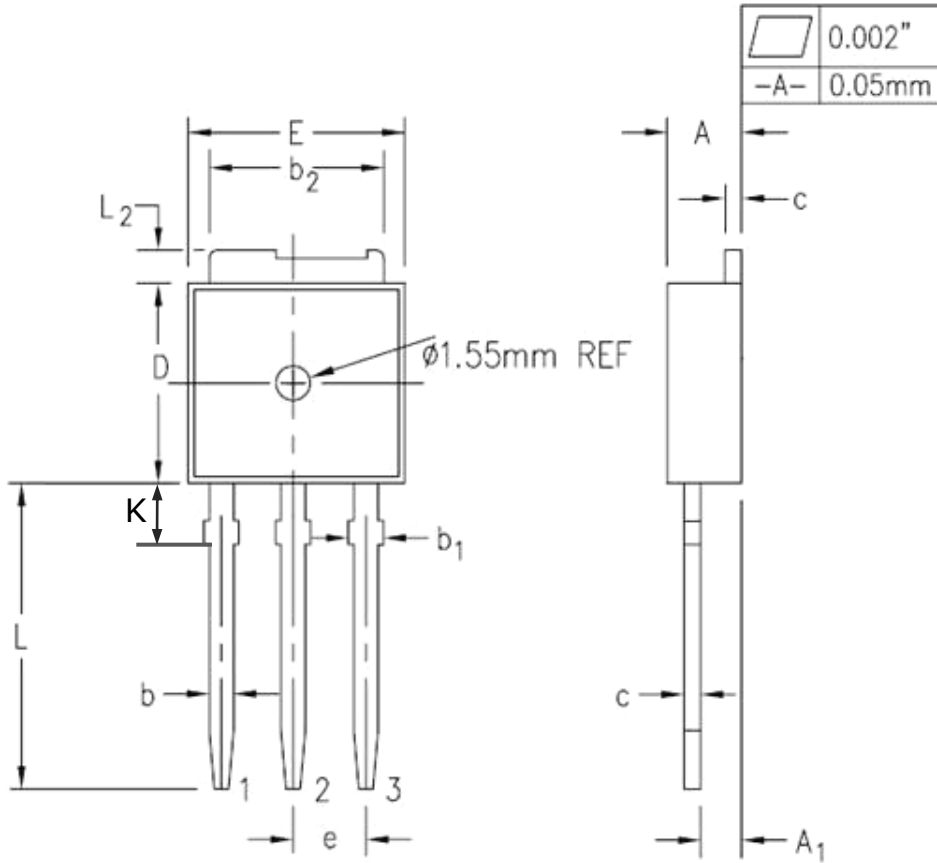


TO-252 (D-PAK) MECHANICAL DATA



| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|----------------|-----------|-------|-------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 0.086 | 0.094 | 2.19 | 2.38 | |
| A ₁ | — | 0.005 | — | 0.13 | |
| b | 0.025 | 0.035 | 0.64 | 0.89 | |
| b ₂ | 0.033 | 0.045 | 0.84 | 1.14 | |
| b ₃ | 0.205 | 0.215 | 5.21 | 5.46 | |
| c | 0.018 | 0.024 | 0.46 | 0.61 | |
| D | 0.235 | 0.245 | 5.97 | 6.22 | |
| D ₁ | 0.205 | — | 5.21 | — | 2 |
| E | 0.250 | 0.265 | 6.35 | 6.73 | |
| E ₁ | 0.190 | — | 4.83 | — | 2 |
| e | 0.090 BSC | | 2.29 BSC | | |
| H | 0.380 | 0.410 | 9.65 | 10.41 | |
| L | 0.055 | 0.070 | 1.40 | 1.78 | 4 |
| L ₂ | 0.020 BSC | | 0.51 BSC | | |
| L ₃ | 0.035 | 0.050 | 0.89 | 1.27 | |
| L ₄ | 0.025 | 0.040 | 0.64 | 1.01 | 3 |
| θ | 0° | 8° | 0° | 8° | |

TO-251 (I-PAK) MECHANICAL DATA



| SYMBOL | INCHES | | MILIMETERS | | NOTES |
|--------|------------|-------|------------|------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 0.086 | 0.094 | 2.19 | 2.39 | |
| A1 | 0.040 | 0.045 | 1.02 | 1.14 | |
| b | 0.025 | 0.035 | 0.64 | 0.89 | |
| b1 | 0.037 | 0.045 | 0.95 | 1.14 | |
| b2 | 0.205 | 0.215 | 5.21 | 5.46 | |
| c | 0.018 | 0.023 | 0.46 | 0.58 | |
| D | 0.235 | 0.245 | 5.97 | 6.22 | |
| E | 0.250 | 0.265 | 6.35 | 6.73 | |
| e | 0.090 TYP. | | 2.28 TYP. | | |
| L | 0.350 | 0.380 | 8.89 | 9.65 | |
| L2 | 0.035 | 0.050 | 0.89 | 1.27 | |
| K | 0.079 | 0.096 | 2.00 | 2.44 | |