



STGB20NB37LZ

N-CHANNEL CLAMPED 20A - D²PAK INTERNALLY CLAMPED PowerMESH™ IGBT

| TYPE | V _{CES} | V _{CE(sat)} | I _c |
|--------------|------------------|----------------------|----------------|
| STGB20NB37LZ | CLAMPED | < 2.0 V | 20 A |

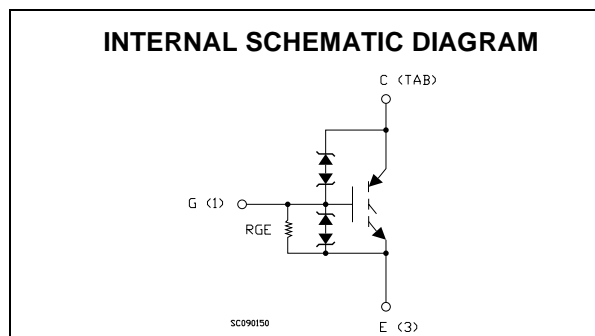
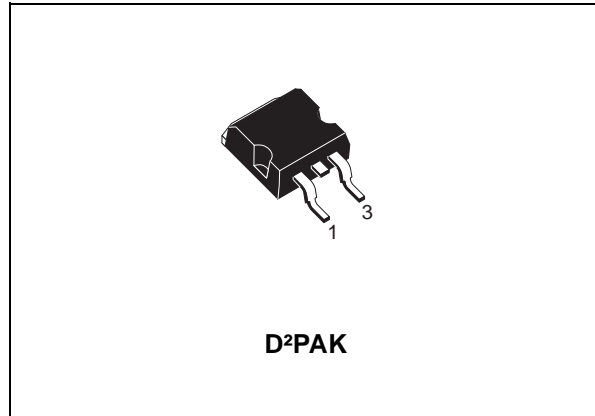
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE
- ADD SUFFIX "T4" FOR ORDERING IN TAPE & REEL

DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies an ESD protection.

APPLICATIONS

- AUTOMOTIVE IGNITION



ORDERING INFORMATION

| SALES TYPE | MARKING | PACKAGE | PACKAGING |
|----------------|------------|--------------------|-------------|
| STGB20NB37LZT4 | GB20NB37LZ | D ² PAK | TAPE & REEL |

STGB20NB37LZ

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-------------------------|---|------------|------|
| V_{CES} | Collector-Emitter Voltage ($V_{GS} = 0$) | CLAMPED | V |
| V_{ECR} | Emitter-Collector Voltage | 20 | V |
| V_{GE} | Gate-Emitter Voltage | CLAMPED | V |
| I_C | Collector Current (continuous) at $T_C = 25^\circ\text{C}$ | 40 | A |
| I_C | Collector Current (continuous) at $T_C = 100^\circ\text{C}$ | 20 | A |
| $I_{CM} (\blacksquare)$ | Collector Current (pulsed) | 80 | A |
| E_{as} | Single Pulse Energy $T_c = 25^\circ\text{C}$ | 700 | mJ |
| P_{TOT} | Total Dissipation at $T_C = 25^\circ\text{C}$ | 200 | W |
| | Derating Factor | 1.33 | W/°C |
| E_{SD} | ESD (Human Body Model) | 8 | KV |
| T_{stg} | Storage Temperature | -55 to 175 | °C |
| T_j | Max. Operating Junction Temperature | | |

(■) Pulse width limited by safe operating area

THERMAL DATA

| | | | |
|-----------|---|------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 0.75 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 62.5 | °C/W |

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED) OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---|--|-----------|-----------|------------|---------------|
| $BV_{(CES)}$ | Clamped Voltage | $I_C = 2\text{ mA}, V_{GE} = 0, T_C = -40^\circ\text{C}$ | | 405 | | V |
| | | $I_C = 2\text{ mA}, V_{GE} = 0, T_C = 25^\circ\text{C}$ | 375 | 400 | 425 | V |
| | | $I_C = 2\text{ mA}, V_{GE} = 0, T_C = 150^\circ\text{C}$ | | 395 | | V |
| $BV_{(ECR)}$ | Emitter Collector Break-down Voltage | $I_C = 75\text{ mA}, T_C = 25^\circ\text{C}$ | 20 | 28 | | V |
| BV_{GE} | Gate Emitter Break-down Voltage | $I_G = \pm 2\text{ mA}$ | 12 | 14 | 16 | V |
| I_{CES} | Collector cut-off Current ($V_{GE} = 0$) | $V_{CE} = 15\text{ V}, V_{GE} = 0, T_C = 150^\circ\text{C}$ | | | 10 | μA |
| | | $V_{CE} = 200\text{ V}, V_{GE} = 0, T_C = 150^\circ\text{C}$ | | | 100 | μA |
| I_{GES} | Gate-Emitter Leakage Current ($V_{CE} = 0$) | $V_{GE} = \pm 10\text{ V}, V_{CE} = 0$ | ± 300 | ± 660 | ± 1000 | μA |
| R_{GE} | Gate Emitter Resistance | | 10 | 15 | 30 | K Ω |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|---|------|------|------|------|
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{CE} = V_{GE}, I_C = 250\mu\text{A}, T_C = -40^\circ\text{C}$ | 1.2 | | | V |
| | | $V_{CE} = V_{GE}, I_C = 250\mu\text{A}, T_C = 25^\circ\text{C}$ | 1 | 1.4 | 2 | V |
| | | $V_{CE} = V_{GE}, I_C = 250\mu\text{A}, T_C = 150^\circ\text{C}$ | 0.6 | | | V |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage | $V_{CE} = 4.5\text{ V}, I_C = 10\text{ A}, T_C = 25^\circ\text{C}$ | | 1.1 | 1.8 | V |
| | | $V_{CE} = 4.5\text{ V}, I_C = 10\text{ A}, T_C = 150^\circ\text{C}$ | | 1.0 | 1.7 | V |
| | | $V_{CE} = 4.5\text{ V}, I_C = 20\text{ A}, T_C = 25^\circ\text{C}$ | | 1.35 | 2.0 | V |
| | | $V_{CE} = 4.5\text{ V}, I_C = 20\text{ A}, T_C = 150^\circ\text{C}$ | | 1.25 | 2.0 | V |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|---|------|------|------|------|
| g_{fs} (1) | Forward Transconductance | $V_{CE} = 25 \text{ V}$, $I_C = 20 \text{ A}$ | | 35 | | S |
| C_{ies} | Input Capacitance | $V_{CE} = 25 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GE} = 0$ | | 2300 | | pF |
| C_{oes} | Output Capacitance | | | 165 | | pF |
| C_{res} | Reverse Transfer Capacitance | | | 28 | | pF |
| Q_g | Gate Charge | $V_{CE} = 280 \text{ V}$, $I_C = 20 \text{ A}$, $V_{GE} = 5 \text{ V}$ | | 51 | | nC |

FUNCTIONAL CHARACTERISTICS

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-------------------------------------|---|------|------|------|------|
| II | Latching Current | $V_{Clamp} = 250 \text{ V}$, $T_C = 125 \text{ }^\circ\text{C}$ $R_{GOFF} = 1 \text{ K}\Omega$, $V_{GE} = 4.5 \text{ V}$ | | 40 | | A |
| U.I.S. | Functional Test Open Secondary Coil | $R_{GOFF} = 1 \text{ K}\Omega$, $L = 1.6 \text{ mH}$, $T_C = 125 \text{ }^\circ\text{C}$ | | 20 | | A |

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|--|------|------|------|------------------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC} = 250 \text{ V}$, $I_C = 20 \text{ A}$ $R_G = 1 \text{ K}\Omega$, $V_{GE} = 4.5 \text{ V}$ | | 2.3 | | μs |
| t_r | Rise Time | | | 0.6 | | μs |
| $(di/dt)_{on}$ | Turn-on Current Slope | $V_{CC} = 250 \text{ V}$, $I_C = 20 \text{ A}$ $R_G = 1 \text{ K}\Omega$, $V_{GE} = 4.5 \text{ V}$ | | 550 | | A/ μs |
| Eon | Turn-on Switching Losses | $V_{CC} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $T_C = 25 \text{ }^\circ\text{C}$ $R_G = 1 \text{ K}\Omega$, $V_{GE} = 4.5 \text{ V}$, $T_C = 150 \text{ }^\circ\text{C}$ | | 8.8 | | mJ |
| | | | | 9.2 | | mJ |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------|-------------------------|--|------|------|------|---------------|
| t_c | Cross-over Time | $V_{CC} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $R_{GE} = 1 \text{ K}\Omega$, $V_{GE} = 4.5 \text{ V}$ | | 4.8 | | μs |
| $t_r(V_{off})$ | Off Voltage Rise Time | | | 2.6 | | μs |
| $t_{d(off)}$ | Delay Time | | | 2.0 | | μs |
| t_f | Fall Time | | | 11.5 | | μs |
| $E_{off(**)}$ | Turn-off Switching Loss | | | 11.8 | | mJ |
| t_c | Cross-over Time | $V_{CC} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $R_{GE} = 1 \text{ K}\Omega$, $V_{GE} = 4.5 \text{ V}$ $T_j = 125 \text{ }^\circ\text{C}$ | | 7.8 | | μs |
| $t_r(V_{off})$ | Off Voltage Rise Time | | | 3.5 | | μs |
| $t_{d(off)}$ | Delay Time | | | 3.9 | | μs |
| t_f | Fall Time | | | 12.0 | | μs |
| $E_{off(**)}$ | Turn-off Switching Loss | | | 17.8 | | mJ |

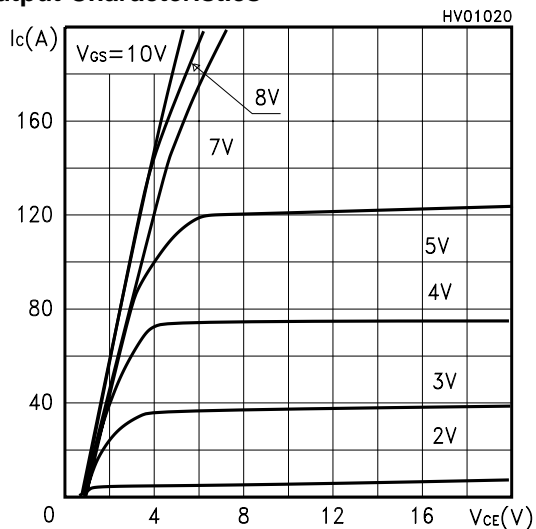
(1) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

(*) Pulse width limited by max. junction temperature.

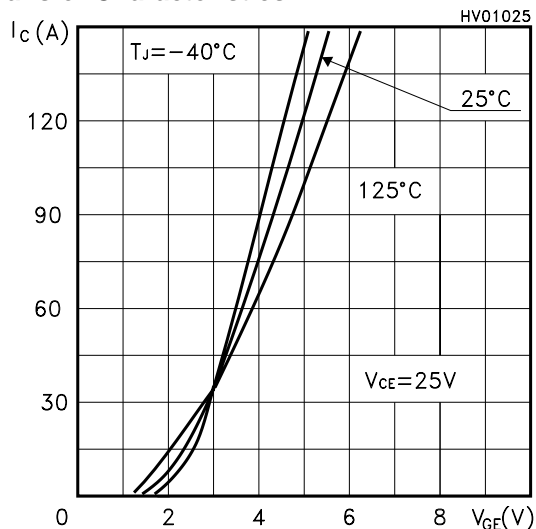
(**) Losses Include Also the Tail

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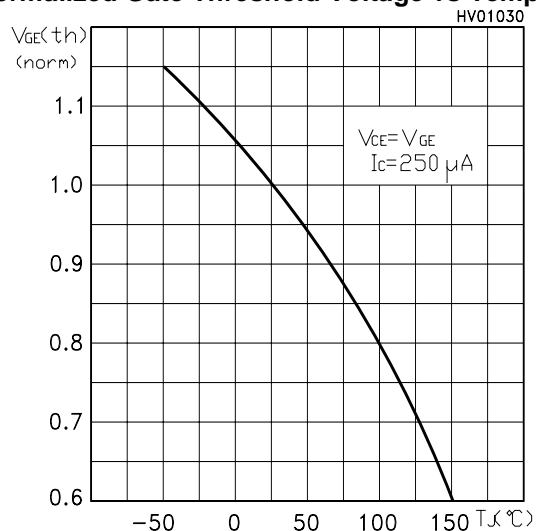
Output Characteristics



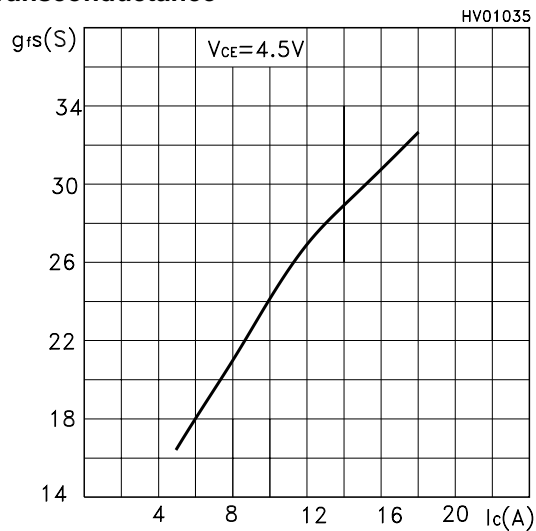
Transfer Characteristics



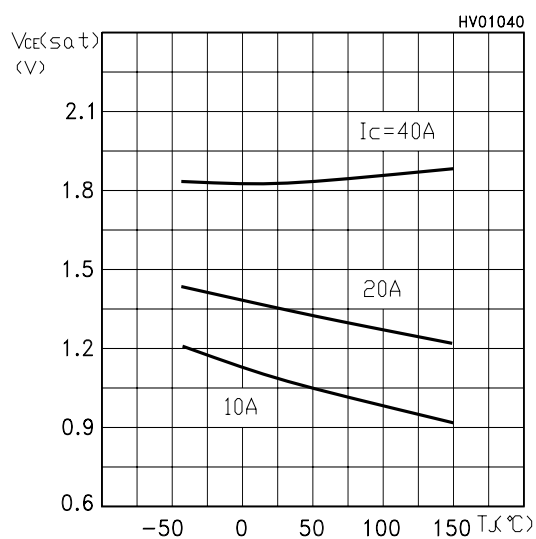
Normalized Gate Threshold Voltage vs Temp.



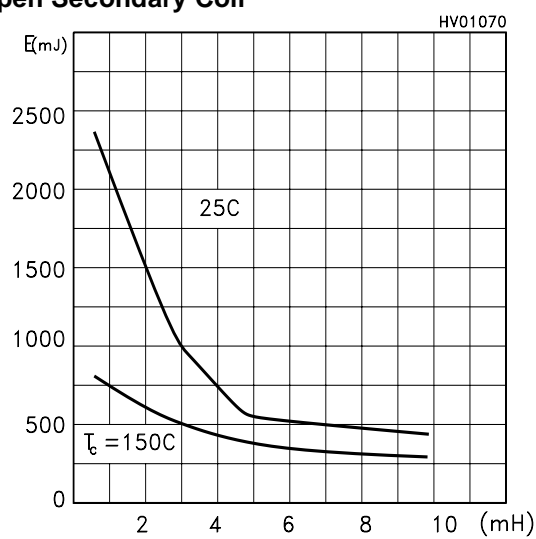
Transconductance



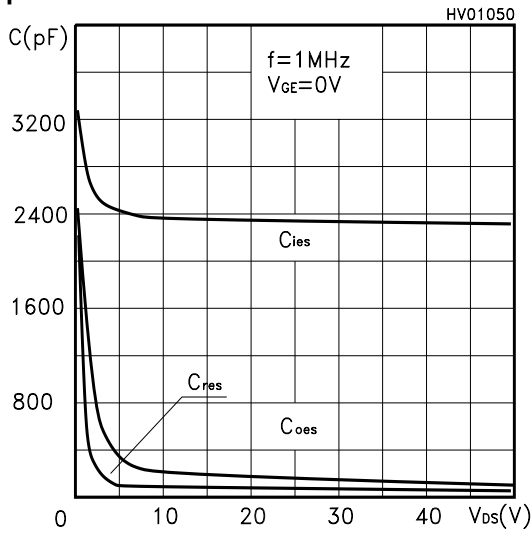
Collector-Emitter On Voltage vs Temperature



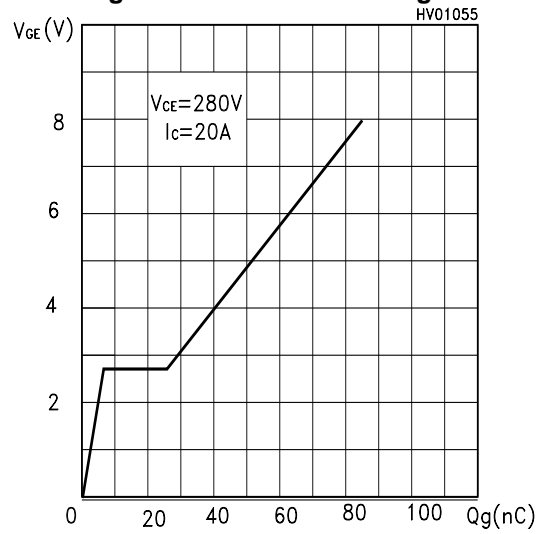
Self Clamped Inductive Switching Energy vs Open Secondary Coil



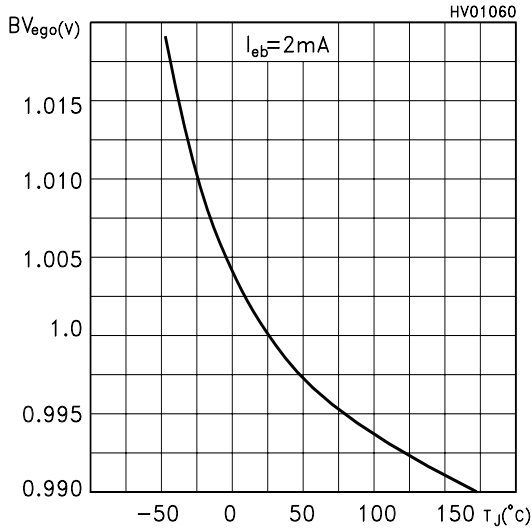
Capacitance Variations



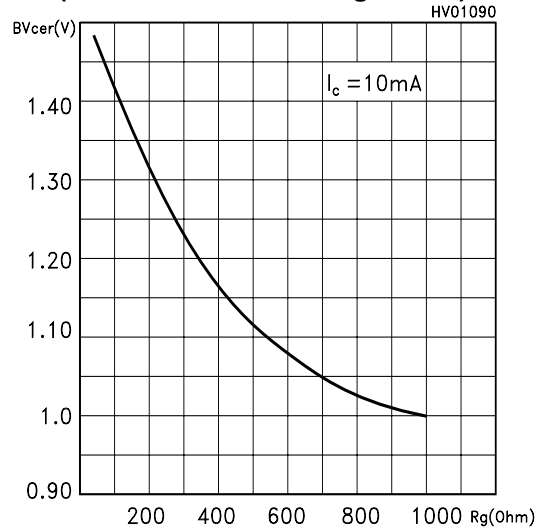
Gate Charge vs Gate-Emitter Voltage



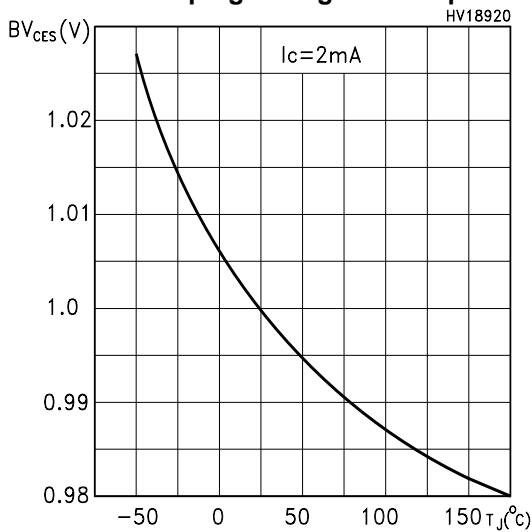
Normalized B_{VGE0} (Zener Gate-Emitter) vs Temperature



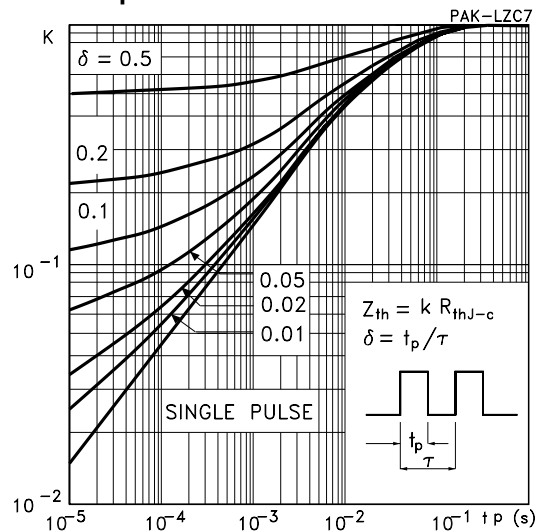
Normalized Clamping Voltage vs Gate Resistance (Inductive Switch Configuration)



Normalized Clamping Voltage vs Temperature

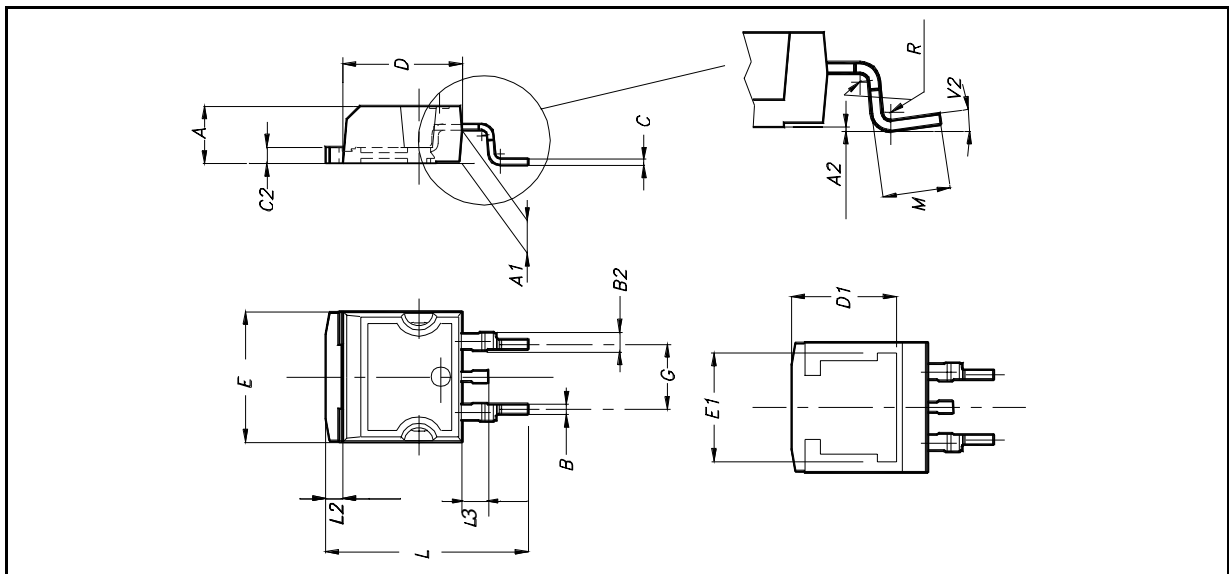


Thermal Impedance

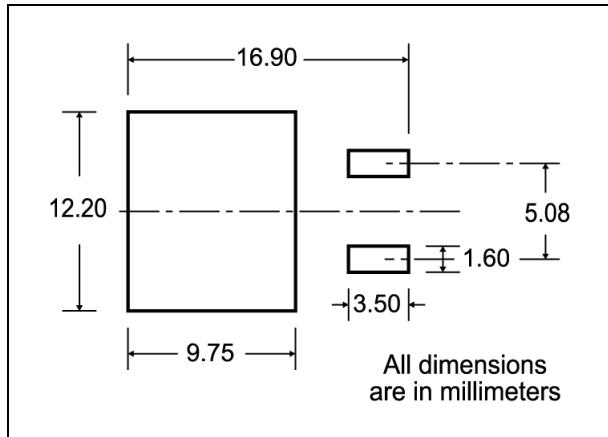


D²PAK MECHANICAL DATA

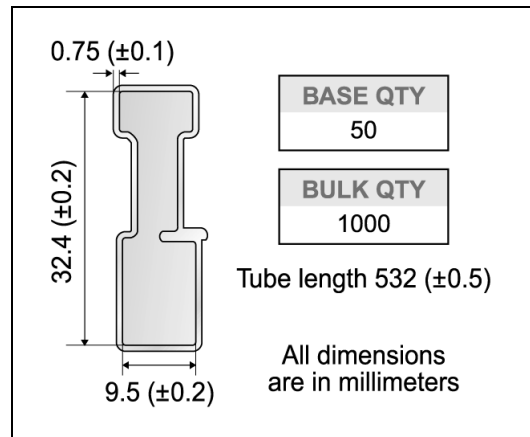
| DIM. | mm. | | | inch | | |
|------|------|-----|-------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | | 8 | | | 0.315 | |
| E | 10 | | 10.4 | 0.393 | | |
| E1 | | 8.5 | | | 0.334 | |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.590 | | 0.625 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.068 |
| M | 2.4 | | 3.2 | 0.094 | | 0.126 |
| R | | 0.4 | | | 0.015 | |
| V2 | 0° | | 8° | | | |



D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

Diagram showing the tape mechanical data. It includes a circular view of the tape with dimensions A, B, C, D, and a full radius. A 40 mm min. access hole is shown at the slot location. A tape slot in the core for tape start is shown with a 2.5 mm min. width. A side view shows dimensions T, C, N, and G measured at the hub.

TAPE MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|--------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A0 | 10.5 | 10.7 | 0.413 | 0.421 |
| B0 | 15.7 | 15.9 | 0.618 | 0.626 |
| D | 1.5 | 1.6 | 0.059 | 0.063 |
| D1 | 1.59 | 1.61 | 0.062 | 0.063 |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 11.4 | 11.6 | 0.449 | 0.456 |
| K0 | 4.8 | 5.0 | 0.189 | 0.197 |
| P0 | 3.9 | 4.1 | 0.153 | 0.161 |
| P1 | 11.9 | 12.1 | 0.468 | 0.476 |
| P2 | 1.9 | 2.1 | 0.075 | 0.082 |
| R | 50 | | 1.574 | |
| T | 0.25 | 0.35 | 0.0098 | 0.0137 |
| W | 23.7 | 24.3 | 0.933 | 0.956 |

REEL MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|-------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A | | 330 | | 12.992 |
| B | 1.5 | | 0.059 | |
| C | 12.8 | 13.2 | 0.504 | 0.520 |
| D | 20.2 | | 0.795 | |
| G | 24.4 | 26.4 | 0.960 | 1.039 |
| N | 100 | | 3.937 | |
| T | | 30.4 | | 1.197 |

| BASE QTY | BULK QTY |
|----------|----------|
| 1000 | 1000 |

Diagram showing the reel mechanical data. It includes a side view of the reel with dimensions K₀, T, D, P₂, P₀, E, F, W, B₀, D₁, A₀, P₁, and Center line of cavity. A note indicates 10 pitches cumulative tolerance on tape +/- 0.2 mm. A top view shows dimensions TRL, FEED DIRECTION, and Bending radius R min.

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[IHW20N65R5XKSA1](#) [IDW40E65D2FKSA1](#)