



STB36NF06L STP36NF06L

N-CHANNEL 60V - 0.032 Ω - 30A D²PAK/TO-220 STripFET™ II POWER MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STB36NF06L | 60 V | < 0.040 Ω | 30 A |
| STP36NF06L | 60 V | < 0.040 Ω | 30 A |

- TYPICAL R_{DS(on)} = 0.032 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION
- SURFACE-MOUNTING D²PAK (TO-263) POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")

DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- POWER TOOLS
- AUTOMOTIVE ENVIRONMENT

Ordering Information

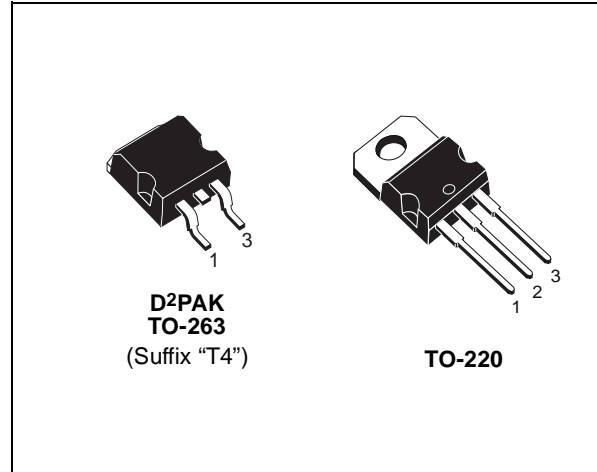
| SALES TYPE | MARKING | PACKAGE | PACKAGING |
|------------|------------|---------|-------------|
| STB36NF06L | STB36NF06L | TO-263 | TAPE & REEL |
| STP36NF06L | STP36NF06L | TO-220 | TUBE |

ABSOLUTE MAXIMUM RATINGS

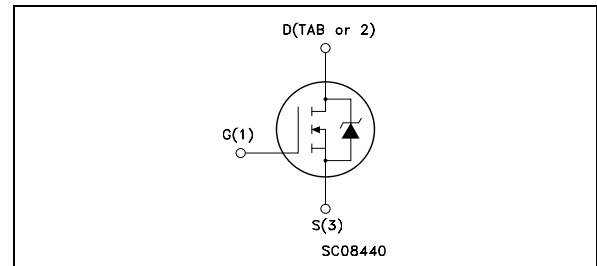
| Symbol | Parameter | Value | Unit |
|---------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 60 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 60 | V |
| V _{GS} | Gate- source Voltage | ± 18 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 30 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 21 | A |
| I _{DM} (●) | Drain Current (pulsed) | 120 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 70 | W |
| | Derating Factor | 0.47 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 10 | V/ns |
| E _{AS} (2) | Single Pulse Avalanche Energy | 235 | mJ |
| T _{stg} | Storage Temperature | -55 to 175 | °C |
| T _j | Operating Junction Temperature | | |

(●) Pulse width limited by safe operating area.

(1) I_{SD} ≤ 30A, di/dt ≤ 200A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}
 (2) Starting T_j = 25 °C, I_D = 15A, V_{DD} = 30V



INTERNAL SCHEMATIC DIAGRAM



STB36NF06L STP36NF06L

THERMAL DATA

| | | | | |
|----------------|--|-----|------|------|
| Rthj-case | Thermal Resistance Junction-case | Max | 2.14 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |
| T _l | Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10 sec) | Max | 300 | °C |

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED) OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|---|------|------|---------|----------|
| V _{(BR)DSS} | Drain-source Breakdown Voltage | I _D = 250 μA, V _{GS} = 0 | 60 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating T _C = 125°C | | | 1 10 | μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 18V | | | ±100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---|------|-------|----------------|--------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 250 μA | 1 | | | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 15 A V _{GS} = 5 V I _D = 15 A | | 0.032 | 0.040 0.048 | Ω Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} = 25 V I _D = 15 A | | 20 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V f = 1 MHz V _{GS} = 0 | | 660 | | pF |
| C _{oss} | Output Capacitance | | | 180 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 70 | | pF |

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ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|---|------|----------------|------|----------------|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{DD} = 30\text{ V}$ $I_D = 15\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3) | | 11 80 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 30\text{ V}$ $I_D = 30\text{ A}$ $V_{GS} = 10\text{ V}$ | | 13 4.5 8 | 17.5 | nC nC nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------------------|---|------|----------|------|----------|
| $t_{d(off)}$ t_f | Turn-off Delay Time Fall Time | $V_{DD} = 30\text{ V}$ $I_D = 15\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3) | | 20 13 | | ns ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|---|------|----------------|-----------|---------------|
| I_{SD} $I_{SDM} (\bullet)$ | Source-drain Current Source-drain Current (pulsed) | | | | 30 120 | A A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 30\text{ A}$ $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 30\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 55 108 4 | | ns nC A |

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

(\bullet) Pulse width limited by safe operating area.

Fig. 1: Unclamped Inductive Load Test Circuit

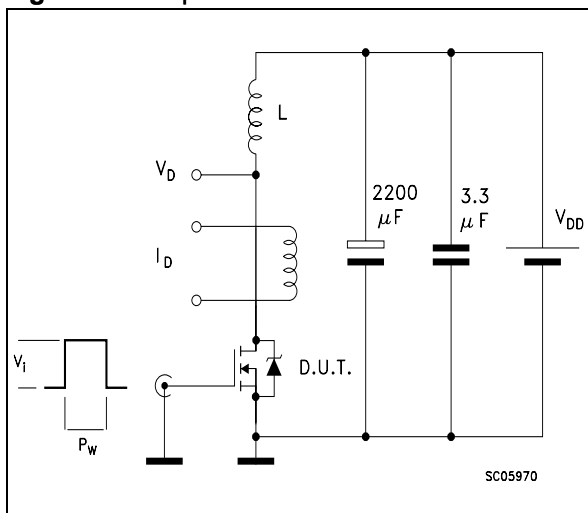


Fig. 2: Unclamped Inductive Waveform

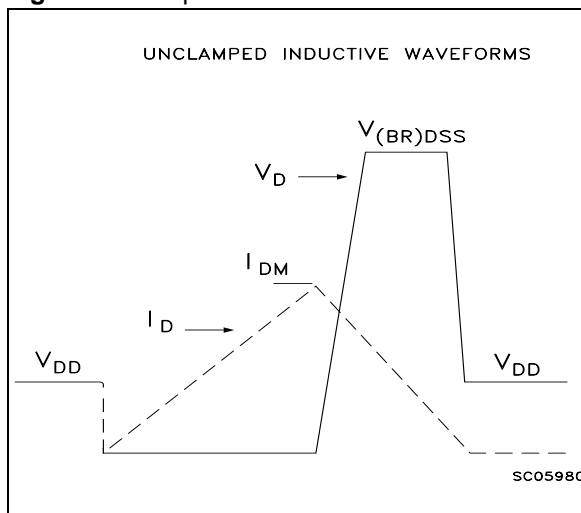


Fig. 3: Switching Times Test Circuits For Resistive Load

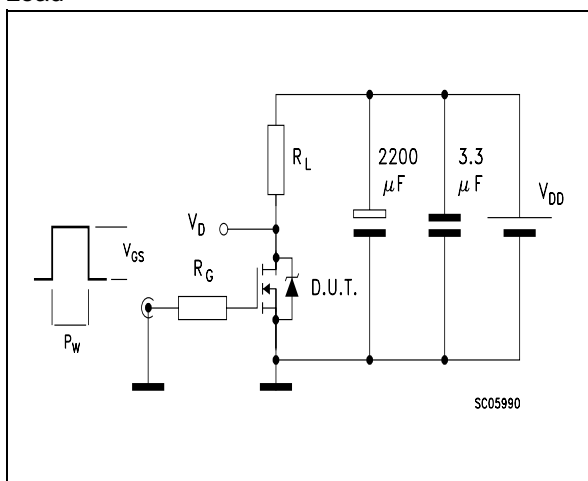


Fig. 4: Gate Charge test Circuit

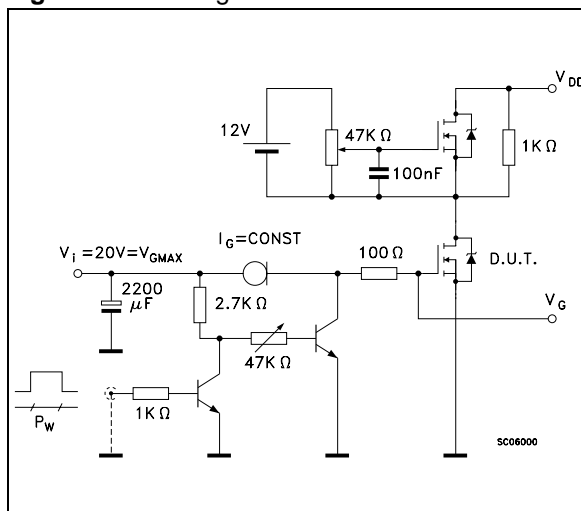
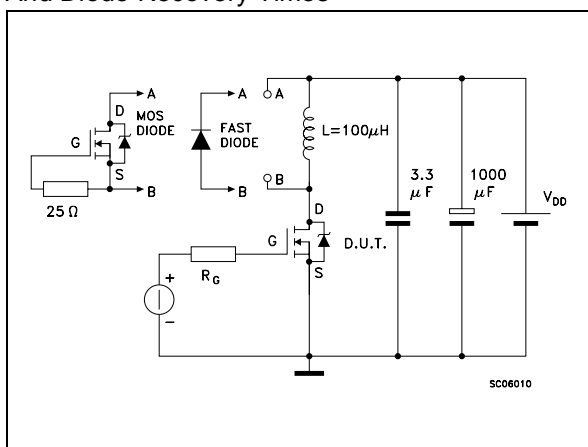
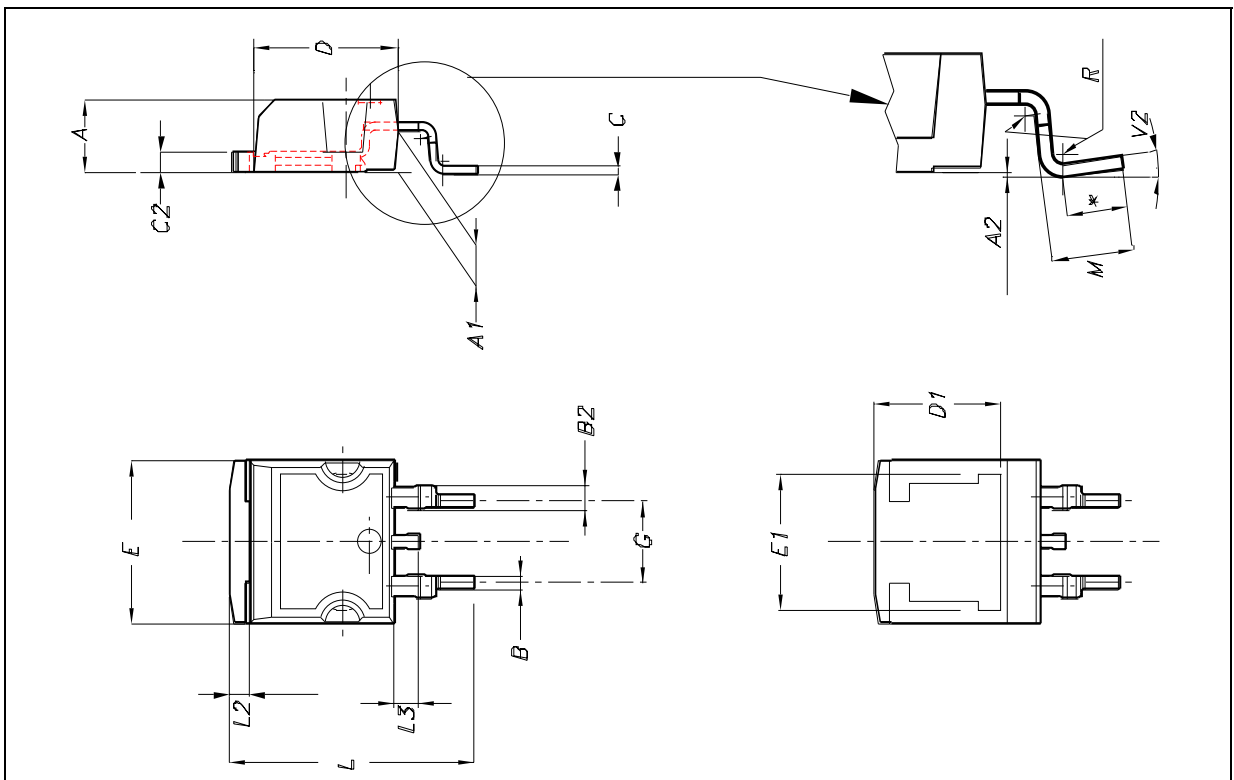


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



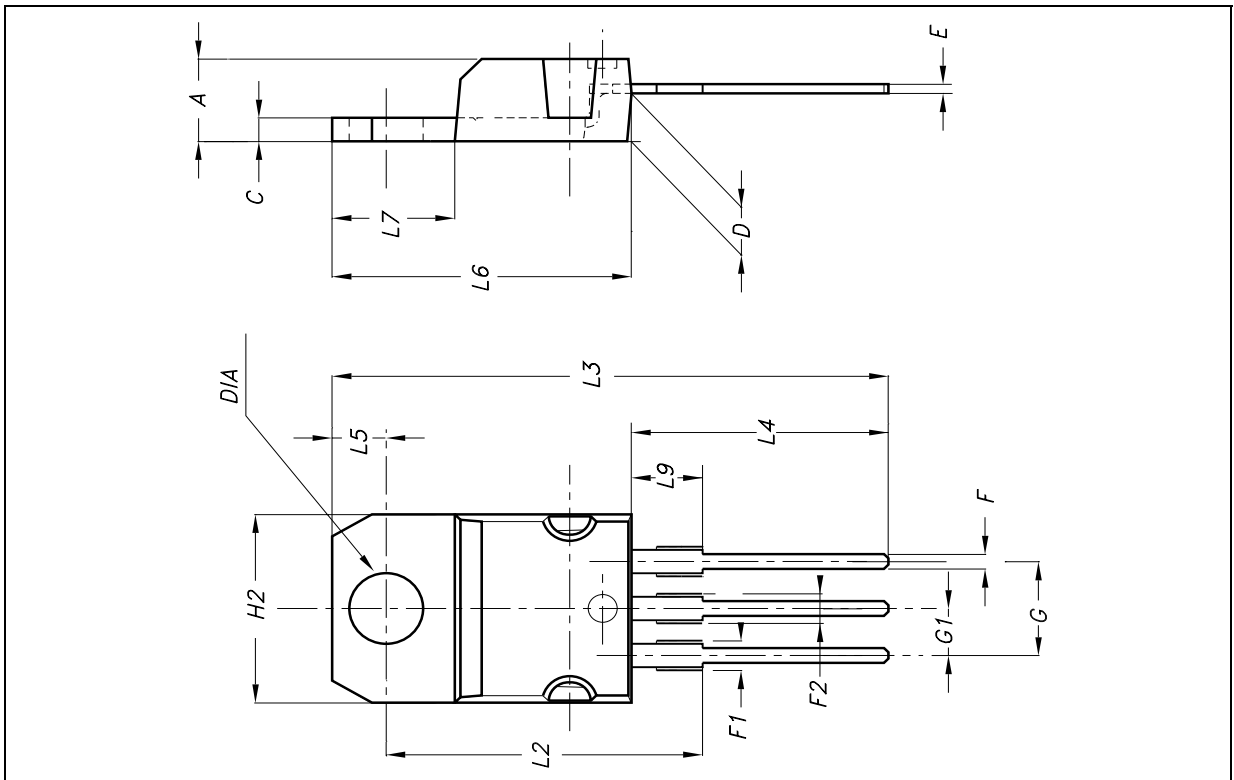
D²PAK MECHANICAL DATA

| DIM. | mm. | | | inch. | | |
|------|------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | TYP. |
| 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 | 0.028 | | 0.037 |
| B2 | 1.14 | | 1.7 | 0.045 | | 0.067 |
| C | 0.45 | | 0.6 | 0.018 | | 0.024 |
| C2 | 1.21 | | 1.36 | 0.048 | | 0.054 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | | 8 | | | 0.315 | |
| E | 10 | | 10.4 | 0.394 | | 0.409 |
| E1 | | 8.5 | | | 0.334 | |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.591 | | 0.624 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.069 |
| M | 2.4 | | 3.2 | 0.094 | | 0.126 |
| R | | 0.4 | | | 0.015 | |
| V2 | 0° | | 8° | 0° | | 8° |

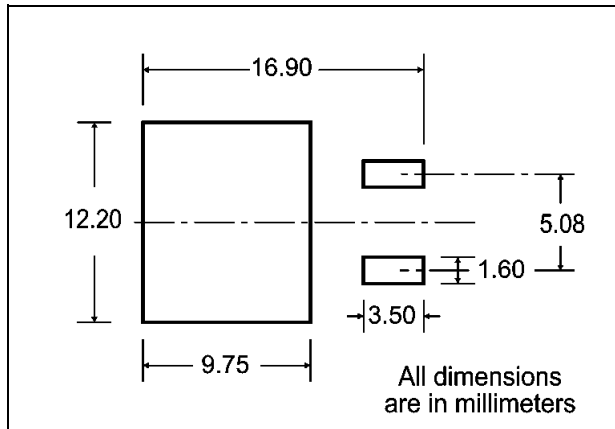


TO-220 MECHANICAL DATA

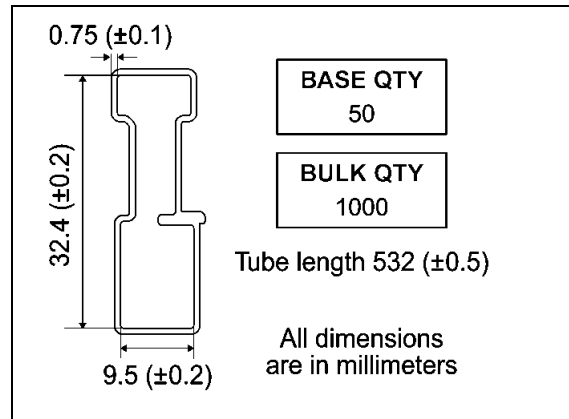
| DIM. | mm. | | | inch. | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | TYP. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.40 | | 2.70 | 0.094 | | 0.106 |
| H2 | 10 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.40 | | | 0.645 | |
| L3 | | 28.90 | | | 1.137 | |
| L4 | 13 | | 14 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.20 | | 6.60 | 0.244 | | 0.260 |
| L9 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| DIA | 3.75 | | 3.85 | 0.147 | | 0.151 |



D2PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

Diagram showing the tape and reel shipment details. The top view shows a circular reel with a diameter of A. The tape slot in the core has a width of 2.5 mm min. and a full radius. The distance from the center of the reel to the start of the tape slot is B. The distance from the center of the reel to the center of the tape slot is D. The distance from the center of the reel to the center of the tape slot is also labeled as 40 mm min. Access hole at slot location. The side view shows the tape thickness T, the distance from the center of the reel to the center of the tape slot C, and the distance from the center of the reel to the center of the tape slot N. The distance from the center of the reel to the center of the tape slot is also labeled as G measured at hub.

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 |

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 |

Diagram showing the tape mechanical data. The top view shows the tape with dimensions K0, D, P2, P0, E, F, W, B0, D1, A0, P1, and Center line of cavity. The distance from the center of the cavity to the center of the tape slot is labeled as 10 pitches cumulative tolerance on tape +/- 0.2 mm. The side view shows the tape thickness T, the distance from the center of the cavity to the center of the tape slot K0, and the distance from the center of the cavity to the center of the tape slot D. The distance from the center of the cavity to the center of the tape slot is also labeled as P2. The distance from the center of the cavity to the center of the tape slot is also labeled as P0. The distance from the center of the cavity to the center of the tape slot is also labeled as E. The distance from the center of the cavity to the center of the tape slot is also labeled as F. The distance from the center of the cavity to the center of the tape slot is also labeled as W. The distance from the center of the cavity to the center of the tape slot is also labeled as B0. The distance from the center of the cavity to the center of the tape slot is also labeled as D1. The distance from the center of the cavity to the center of the tape slot is also labeled as A0. The distance from the center of the cavity to the center of the tape slot is also labeled as P1. The distance from the center of the cavity to the center of the tape slot is also labeled as Center line of cavity. The bottom view shows the tape with dimensions TRL, FEED DIRECTION, and Bending radius R min.

* on sales type



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