



STB120NF10 STP120NF10

N-CHANNEL 100V - 0.009 Ω - 120A D²PAK/TO-220 STripFET™ II POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STB120NF10 | 100 V | < 0.0105 Ω | 120 A |
| STP120NF10 | 100 V | < 0.0105 Ω | 120 A |

- TYPICAL R_{DS(on)} = 0.009 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 MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize the on-resistance. It is therefore suitable as primary switch in advanced high-efficiency, high-frequency isolated DC-DC converters for Telecom and Computer applications. It is also intended for any applications with low gate drive requirements.

APPLICATIONS

- AUDIO AMPLIFIERS
- POWER TOOLS

Ordering Information

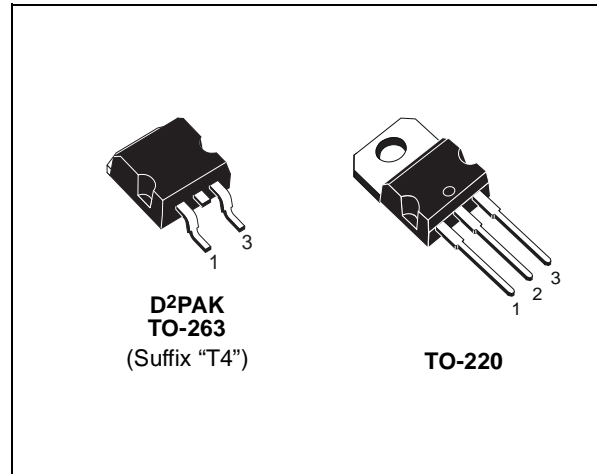
| SALES TYPE | MARKING | PACKAGE | PACKAGING |
|------------|----------|---------|-------------|
| STB120NF10 | B120NF10 | TO-263 | TAPE & REEL |
| STP120NF10 | P120NF10 | TO-220 | TUBE |

ABSOLUTE MAXIMUM RATINGS

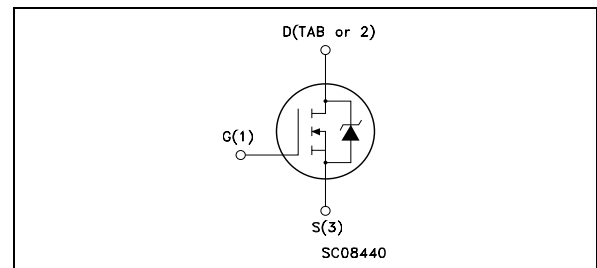
| Symbol | Parameter | Value | Unit |
|---------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 100 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 100 | V |
| V _{GS} | Gate- source Voltage | ± 20 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 120 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 85 | A |
| I _{DM} (●) | Drain Current (pulsed) | 480 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 312 | W |
| | Derating Factor | 2.08 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 10 | V/ns |
| E _{AS} (2) | Single Pulse Avalanche Energy | 550 | mJ |
| T _{stg} | Storage Temperature | -55 to 175 | °C |
| T _j | Operating Junction Temperature | | |

(●) Pulse width limited by safe operating area.

(1) I_{SD} ≤ 120A, di/dt ≤ 300A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}
 (2) Starting T_j = 25 °C, I_D = 60A, V_{DD} = 50V



INTERNAL SCHEMATIC DIAGRAM



STB120NF10 STP120NF10

THERMAL DATA

| | | | | |
|----------------|--|-----|------|------|
| Rthj-case | Thermal Resistance Junction-case | Max | 0.48 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |
| T _I | Maximum Lead Temperature For Soldering Purpose | | 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 | 100 | | | 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} = ± 20 V | | | ±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 | 2 | | 4 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 60 A | | 0.009 | 0.0105 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} = 15 V I _D = 60 A | | TBD | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V f = 1 MHz V _{GS} = 0 | | 5200 | | pF |
| C _{oss} | Output Capacitance | | | 785 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 325 | | 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 | $V_{DD} = 50\text{ V}$ $I_D = 60\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3) | | 25 90 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD}=80\text{ V}$ $I_D=120\text{ A}$ $V_{GS}=10\text{ V}$ | | 172 32 64 | 233 | nC nC nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------------------|--|------|-----------|------|----------|
| $t_{d(off)}$ t_f | Turn-off Delay Time Fall Time | $V_{DD} = 50\text{ V}$ $I_D = 60\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3) | | 132 68 | | ns ns |

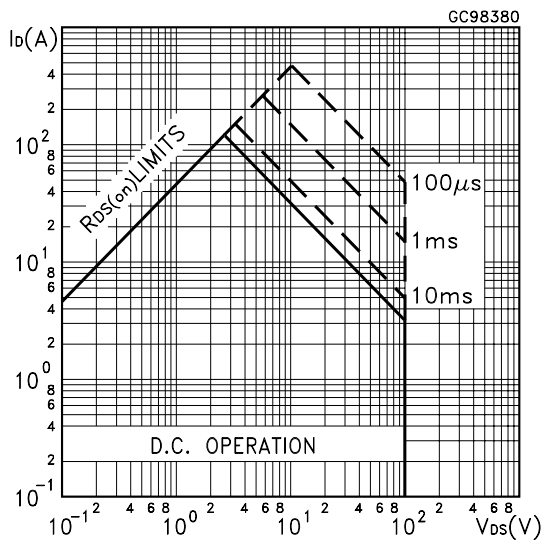
SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|------------------|------------|---------------|
| I_{SD} $I_{SDM} (\bullet)$ | Source-drain Current Source-drain Current (pulsed) | | | | 120 480 | A A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 120\text{ A}$ $V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 120\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 40\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 152 760 10 | | ns nC A |

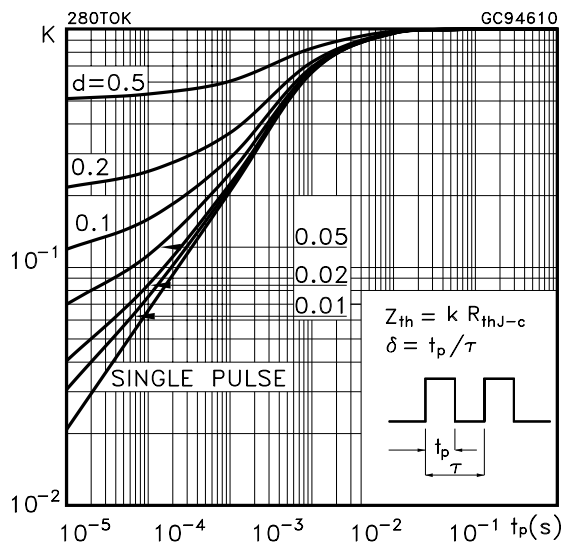
(*)Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

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

Safe Operating Area

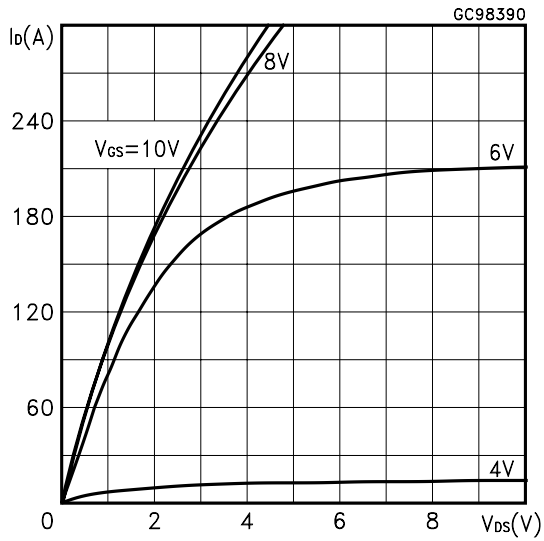


Thermal Impedance

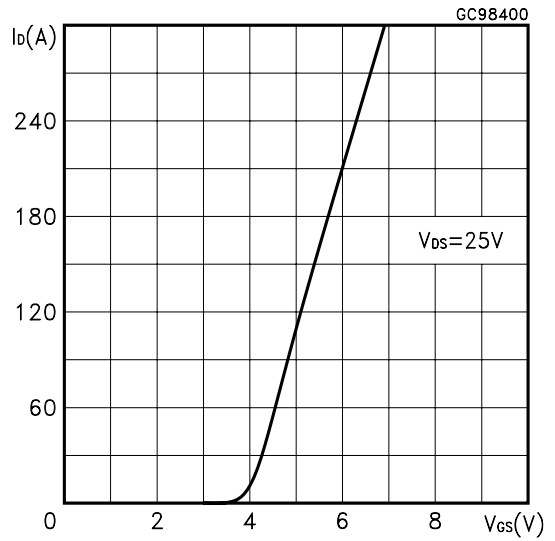


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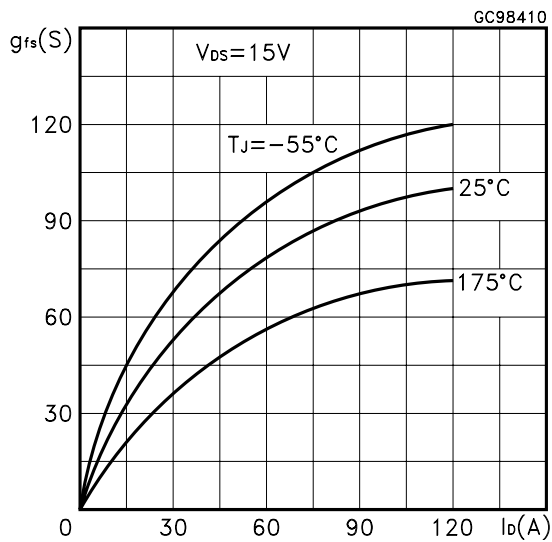
Output Characteristics



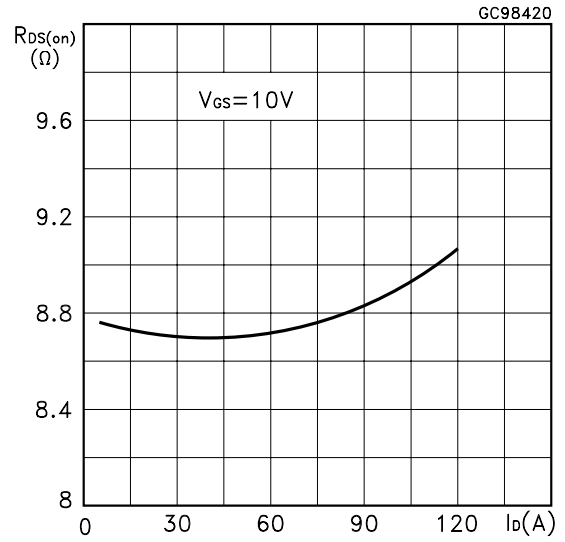
Transfer Characteristics



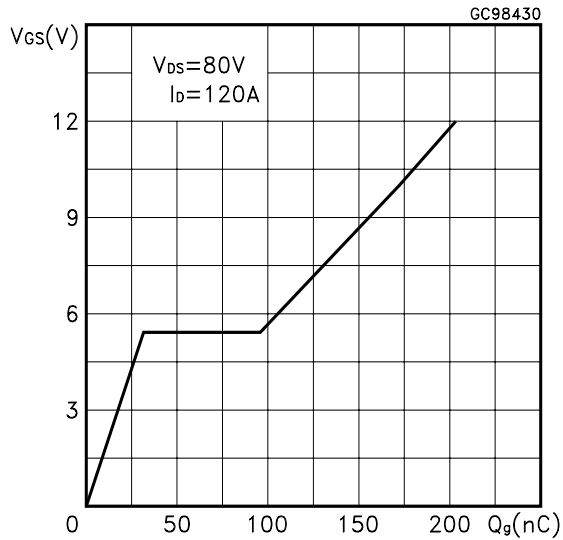
Transconductance



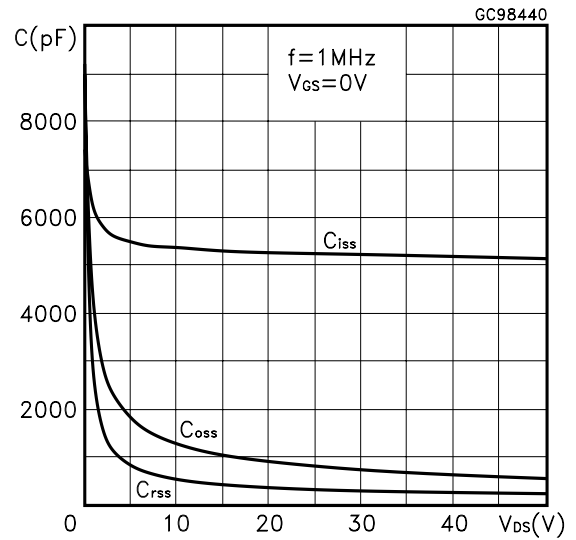
Static Drain-source On Resistance



Gate Charge vs Gate-source Voltage

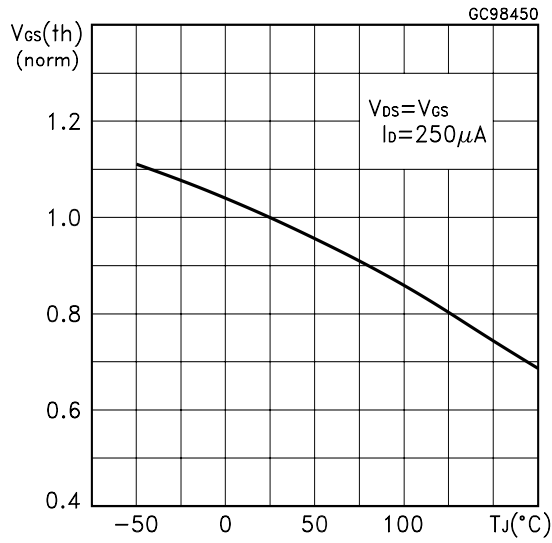


Capacitance Variations

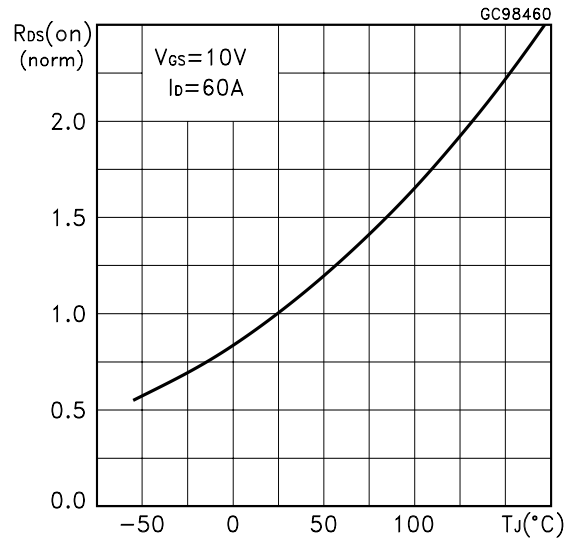


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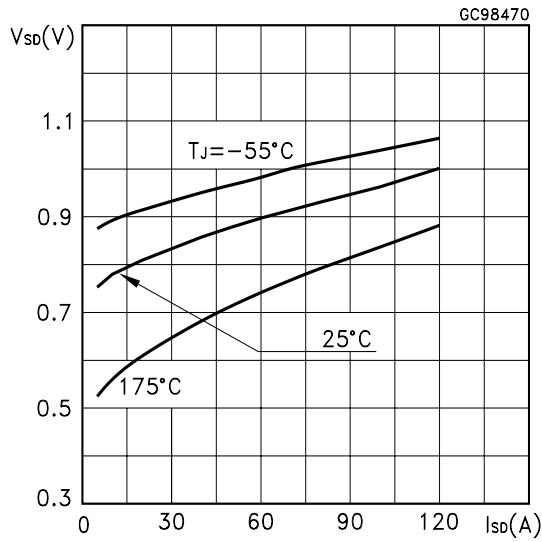
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature

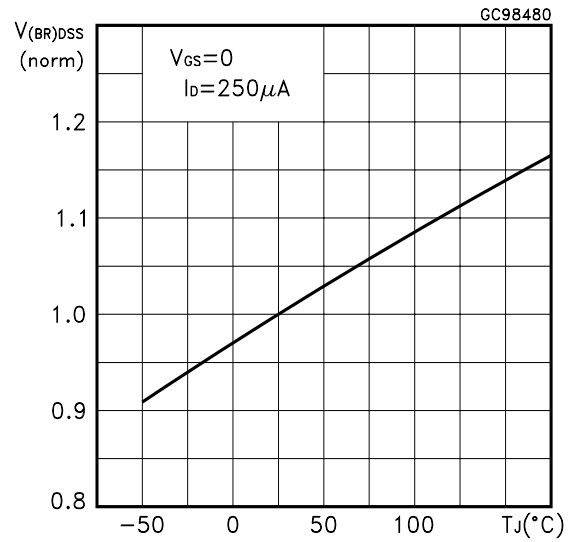


Fig. 1: Unclamped Inductive Load Test Circuit

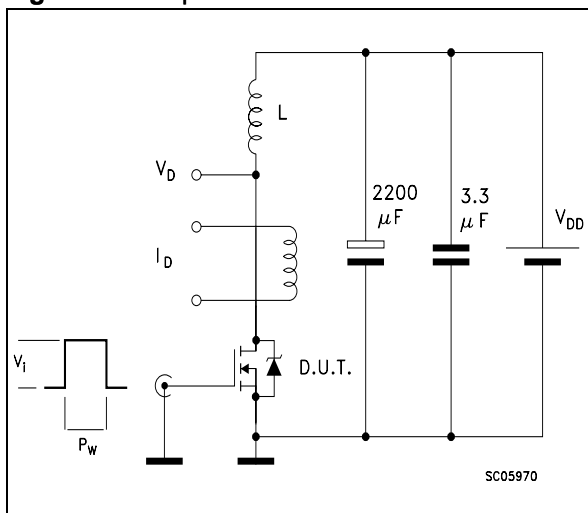


Fig. 2: Unclamped Inductive Waveform

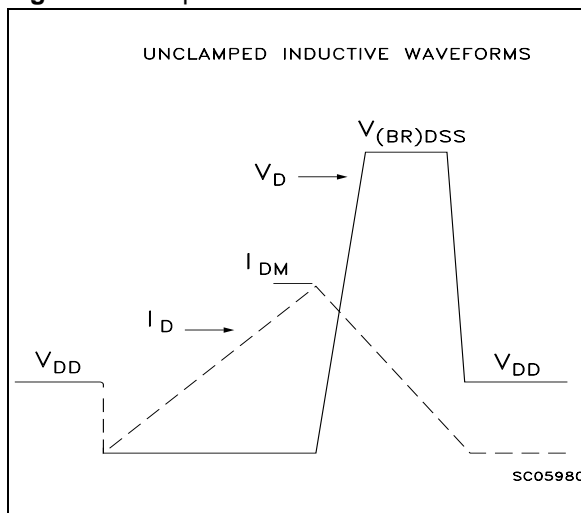


Fig. 3: Switching Times Test Circuits For Resistive Load

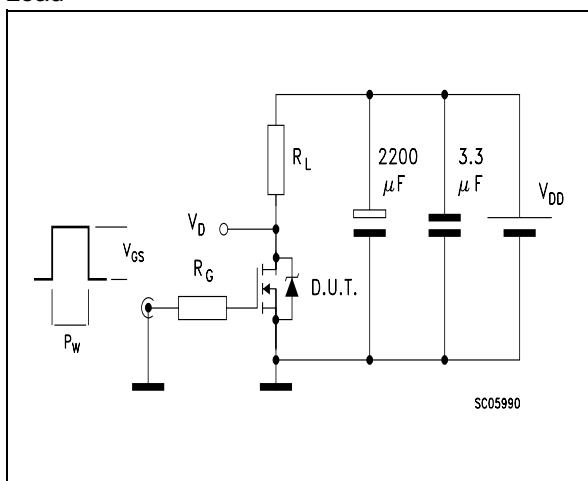


Fig. 4: Gate Charge test Circuit

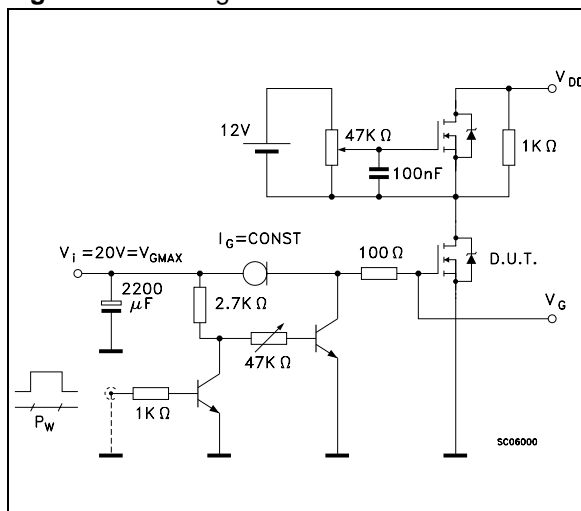
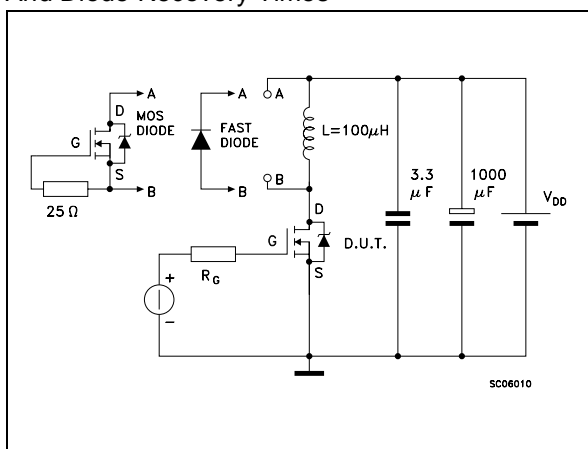
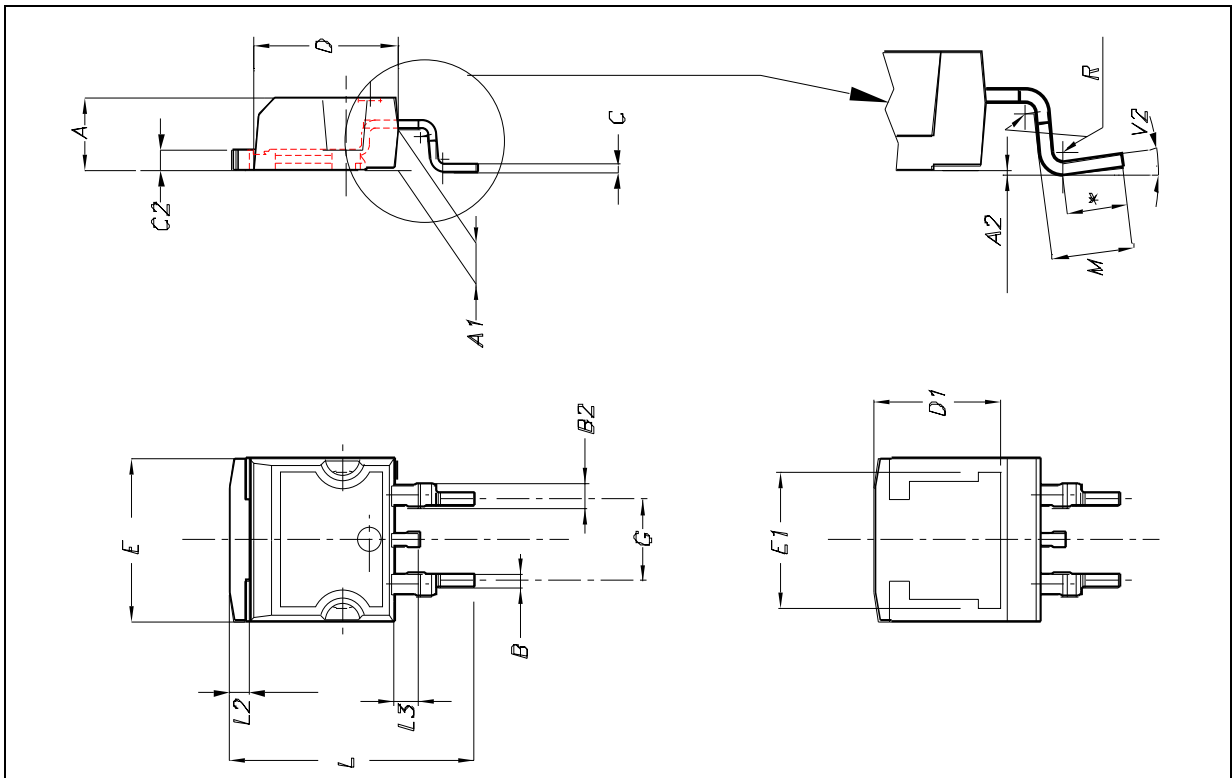


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



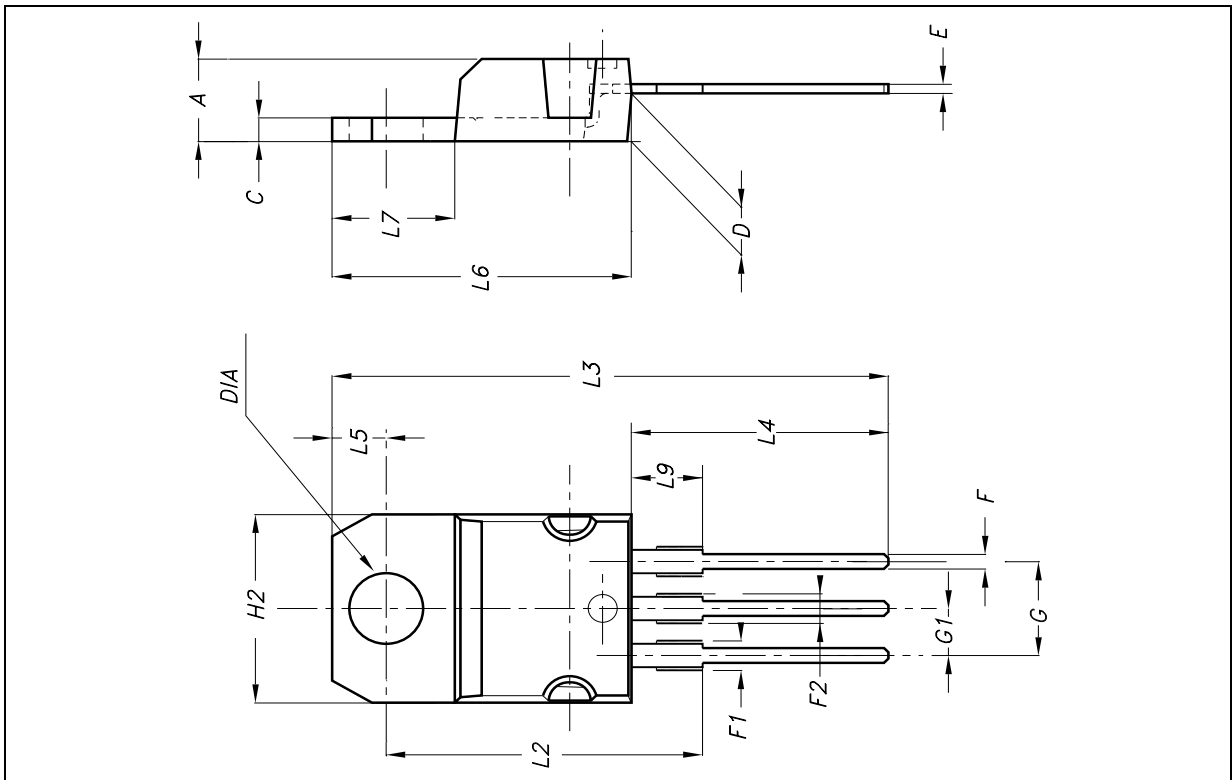
D²PAK MECHANICAL DATA

| 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° |

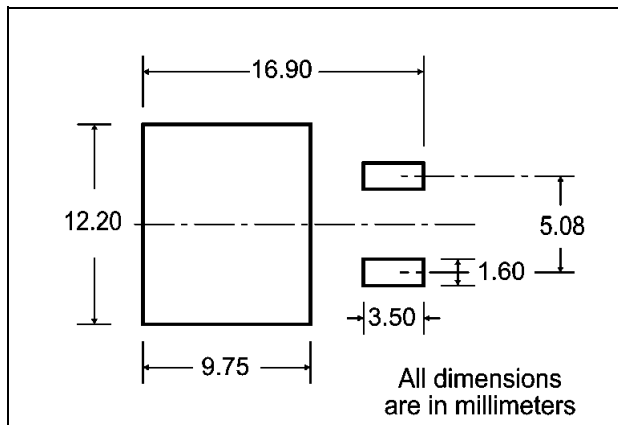


TO-220 MECHANICAL DATA

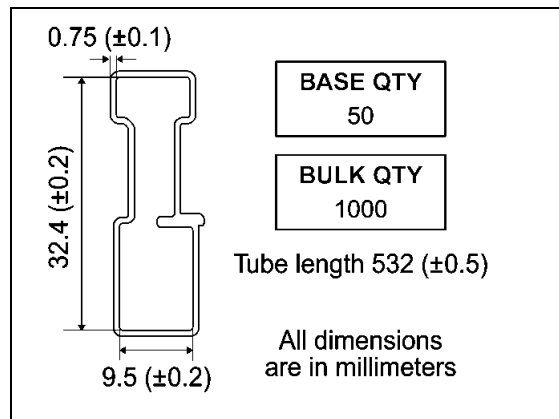
| DIM. | mm. | | | inch. | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | TYP. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 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 to the start of the tape slot is B. The distance from the center to the end of the tape slot is C. The distance from the center to the hub is N. The distance from the center to the edge of the tape is G, measured at the hub. The distance from the center to the edge of the reel is T. The distance from the center to the edge of the reel is 40 mm min. Access hole at slot location.

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, P0, E, F, W, B0, D1, A0, P1, and P2. The center line of the cavity is shown. The distance from the center line to the edge of the tape is T. The distance from the center line to the edge of the tape is 10 pitches cumulative tolerance on tape +/- 0.2 mm. The distance from the center line to the edge of the tape is R min. The distance from the center line to the edge of the tape is Bending radius. The distance from the center line to the edge of the tape is FEED DIRECTION.

* on sales type



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