



# STB14NF10 STP14NF10 STP14NF10FP

N-CHANNEL 100V - 0.115  $\Omega$  - 15A TO-220/TO-220FP/D<sup>2</sup>PAK  
LOW GATE CHARGE STripFET™ II POWER MOSFET

| TYPE        | V <sub>DS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-------------|-----------------|---------------------|----------------|
| STB14NF10   | 100 V           | <0.13 $\Omega$      | 15 A           |
| STP14NF10   | 100 V           | <0.13 $\Omega$      | 15 A           |
| STP14NF10FP | 100 V           | <0.13 $\Omega$      | 10 A           |

- TYPICAL R<sub>DS(on)</sub> = 0.115  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263)  
POWER PACKAGE IN TUBE (NO SUFFIX) OR  
IN TAPE & REEL (SUFFIX "T4")

## DESCRIPTION

This MOSFET series realized with STMicroelectronics unique STripFET™ process has specifically been designed to minimize input capacitance and gate charge. 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.

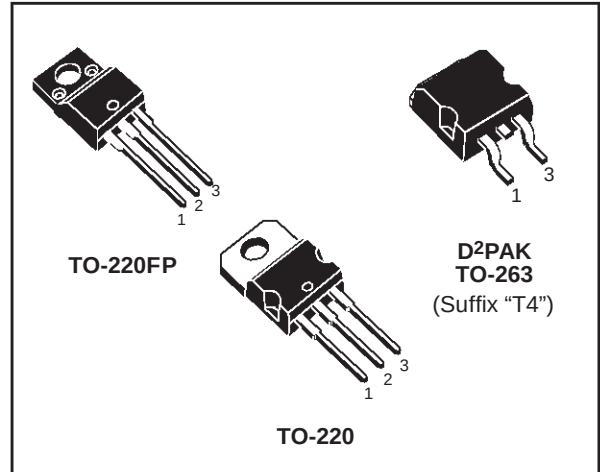
## APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- UPS AND MOTOR CONTROL

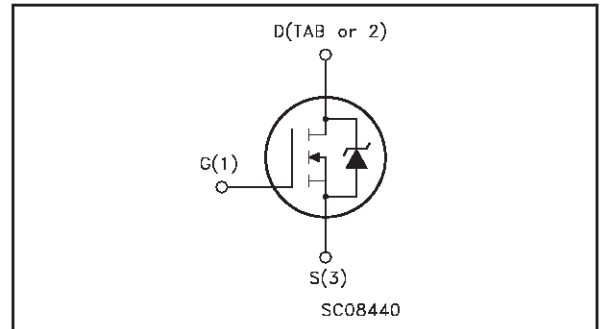
## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value                  |             | Unit |
|---------------------|-------------------------------------------------------|------------------------|-------------|------|
|                     |                                                       | STB14NF10<br>STP14NF10 | STP14NF10FP |      |
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 100                    |             | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ ) | 100                    |             | V    |
| V <sub>GS</sub>     | Gate- source Voltage                                  | $\pm 20$               |             | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 25°C   | 15                     | 10          | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 100°C  | 10                     | 6.3         | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)                                | 60                     | 40          | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C            | 60                     | 25          | W    |
|                     | Derating Factor                                       | 0.4                    | 0.17        | W/°C |
| dv/dt (1)           | Peak Diode Recovery voltage slope                     | 9                      |             | V/ns |
| E <sub>AS</sub> (2) | Single Pulse Avalanche Energy                         | 70                     |             | mJ   |
| V <sub>ISO</sub>    | Insulation Withstand Voltage (DC)                     | -----                  | 2000        | V    |
| T <sub>stg</sub>    | Storage Temperature                                   | -55 to 175             |             | °C   |
| T <sub>j</sub>      | Operating Junction Temperature                        |                        |             |      |

(●) Pulse width limited by safe operating area.



## INTERNAL SCHEMATIC DIAGRAM



(1) I<sub>SD</sub> ≤ 14A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>  
(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 15A, V<sub>DD</sub> = 50V

**STB14NF10 STP14NF10 STP14NF10FP****THERMAL DATA**

|                                        |                                                                                       |     | D <sup>2</sup> PAK<br>TO-220 | TO-220FP |            |
|----------------------------------------|---------------------------------------------------------------------------------------|-----|------------------------------|----------|------------|
| R <sub>thj-case</sub>                  | Thermal Resistance Junction-case                                                      | Max | 2.5                          | 6        | °C/W       |
| R <sub>thj-amb</sub><br>T <sub>I</sub> | Thermal Resistance Junction-ambient<br>Maximum Lead Temperature For Soldering Purpose | Max | 62.5<br>300                  |          | °C/W<br>°C |

**ELECTRICAL CHARACTERISTICS** (T<sub>case</sub> = 25 °C unless otherwise specified)**OFF**

| Symbol               | Parameter                                             | Test Conditions                                                                     | Min. | Typ. | Max.    | Unit     |
|----------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|---------|----------|
| V <sub>(BR)DSS</sub> | Drain-source Breakdown Voltage                        | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0                                        | 100  |      |         | V        |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0) | V <sub>DS</sub> = Max Rating<br>V <sub>DS</sub> = Max Rating T <sub>C</sub> = 125°C |      |      | 1<br>10 | μA<br>μA |
| I <sub>GSS</sub>     | Gate-body Leakage Current (V <sub>DS</sub> = 0)       | V <sub>GS</sub> = ± 20 V                                                            |      |      | ±100    | nA       |

**ON (\*)**

| Symbol              | Parameter                         | Test Conditions                                           | Min. | Typ.  | Max. | Unit |
|---------------------|-----------------------------------|-----------------------------------------------------------|------|-------|------|------|
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA | 2    | 3     | 4    | V    |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10 V I <sub>D</sub> = 7 A               |      | 0.115 | 0.13 | Ω    |

**DYNAMIC**

| Symbol                                                   | Parameter                                                               | Test Conditions                                       | Min. | Typ.            | Max. | Unit           |
|----------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------|------|-----------------|------|----------------|
| g <sub>fs</sub> (*)                                      | Forward Transconductance                                                | V <sub>DS</sub> = 15 V I <sub>D</sub> = 7 A           |      | 20              |      | S              |
| C <sub>iss</sub><br>C <sub>oss</sub><br>C <sub>rss</sub> | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0 |      | 460<br>70<br>30 |      | pF<br>pF<br>pF |

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

| Symbol                        | Parameter                                                    | Test Conditions                                                                                                       | Min. | Typ.               | Max. | Unit           |
|-------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------|--------------------|------|----------------|
| $t_{d(on)}$<br>$t_r$          | Turn-on Delay Time<br>Rise Time                              | $V_{DD} = 50\text{ V}$ $I_D = 7\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, Figure 3) |      | 16<br>25           |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 80\text{ V}$ $I_D = 12\text{ A}$ $V_{GS} = 10\text{ V}$                                                     |      | 15.5<br>3.7<br>4.7 | 21   | nC<br>nC<br>nC |

**SWITCHING OFF**

| Symbol                | Parameter                        | Test Conditions                                                                                                         | Min. | Typ.    | Max. | Unit     |
|-----------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|------|---------|------|----------|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD} = 50\text{ V}$ $I_D = 7\text{ A}$<br>$R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$<br>(Resistive Load, Figure 3) |      | 32<br>8 |      | ns<br>ns |

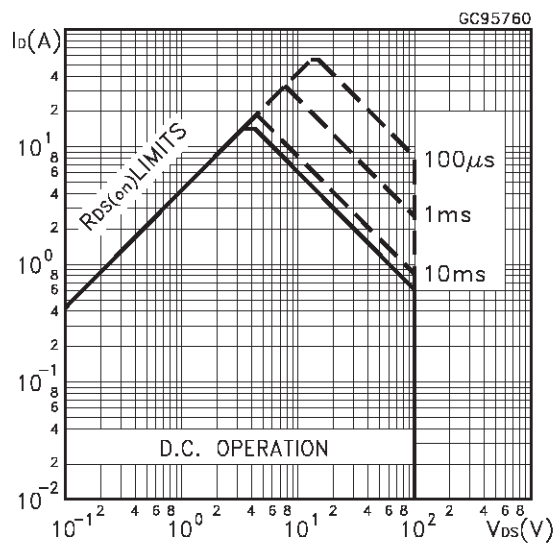
**SOURCE DRAIN DIODE**

| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                               | Min. | Typ.           | Max.     | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------|----------------|----------|---------------|
| $I_{SD}$<br>$I_{SDM} (\bullet)$   | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                               |      |                | 15<br>60 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 14\text{ A}$ $V_{GS} = 0$                                                                                                           |      |                | 1.5      | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 14\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 50\text{ V}$ $T_j = 150^\circ\text{C}$<br>(see test circuit, Figure 5) |      | 90<br>230<br>5 |          | ns<br>nC<br>A |

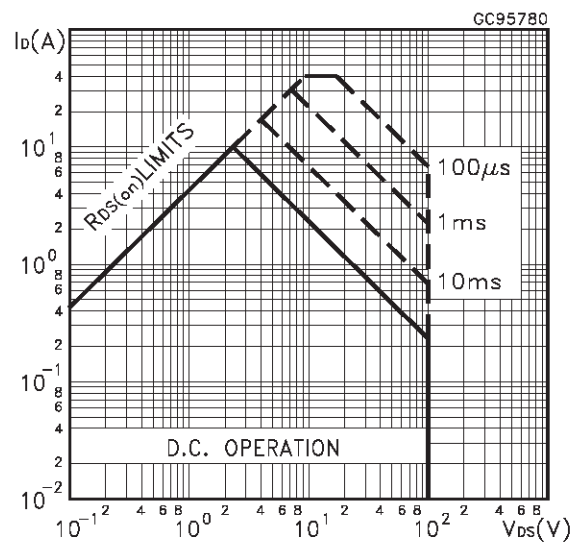
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

(•) Pulse width limited by safe operating area.

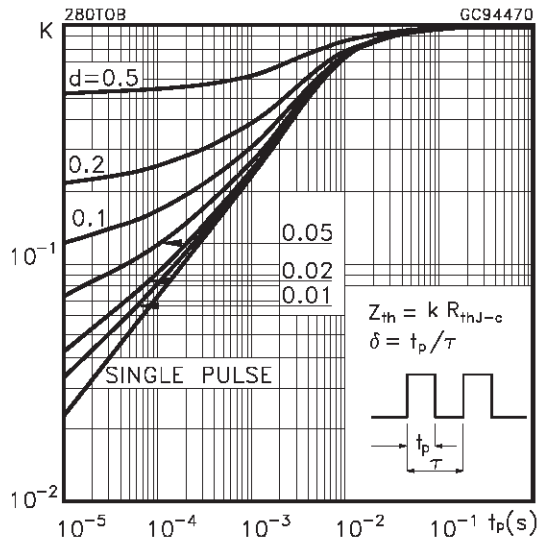
Safe Operating Area for TO-220



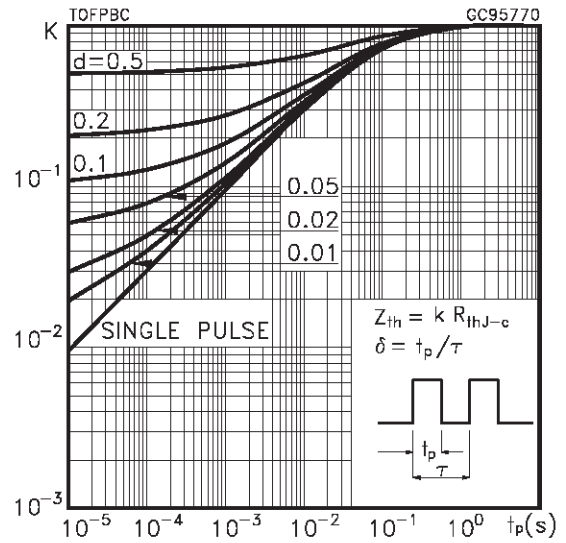
Safe Operating Area for TO-220FP



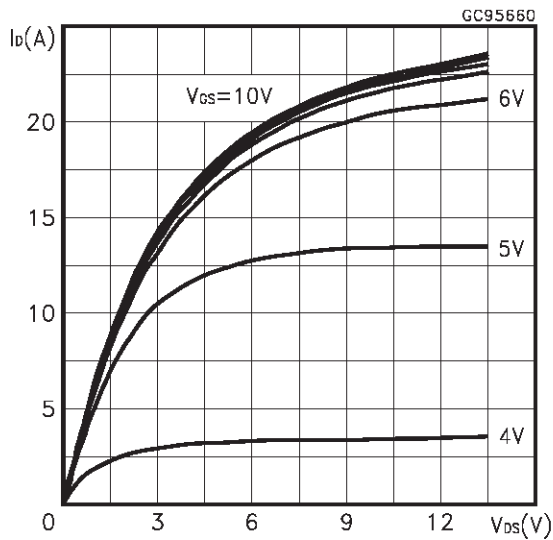
Thermal Impedance



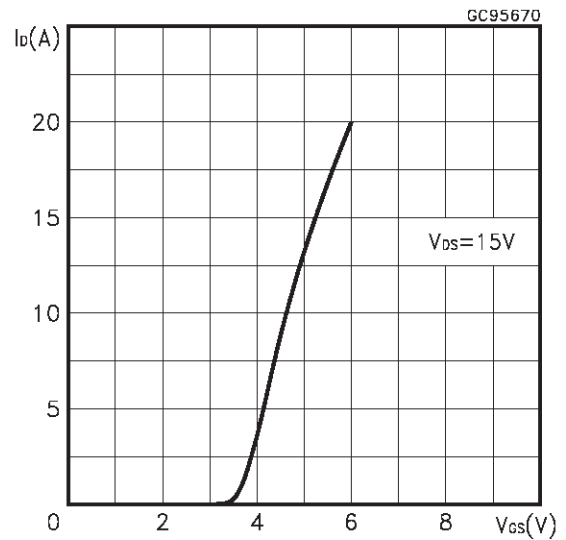
Thermal Impedance for TO-220FP



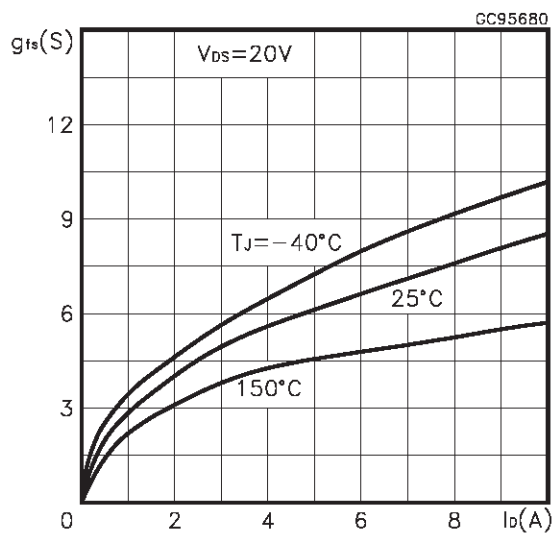
Output Characteristics



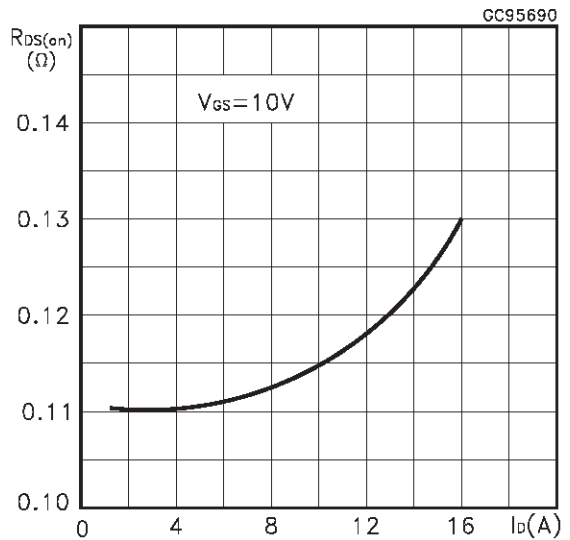
Transfer Characteristics



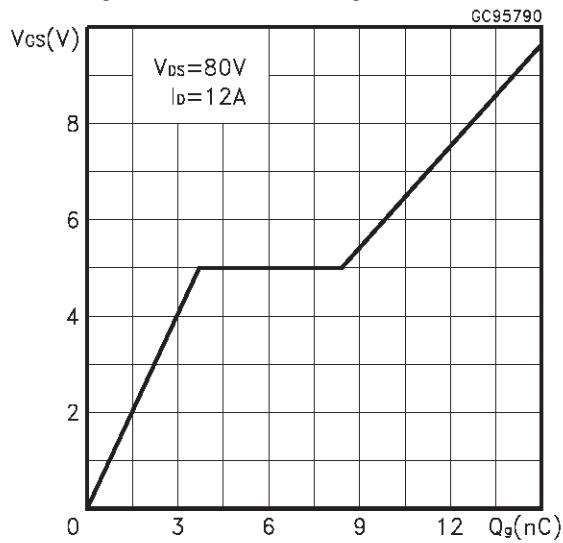
Transconductance



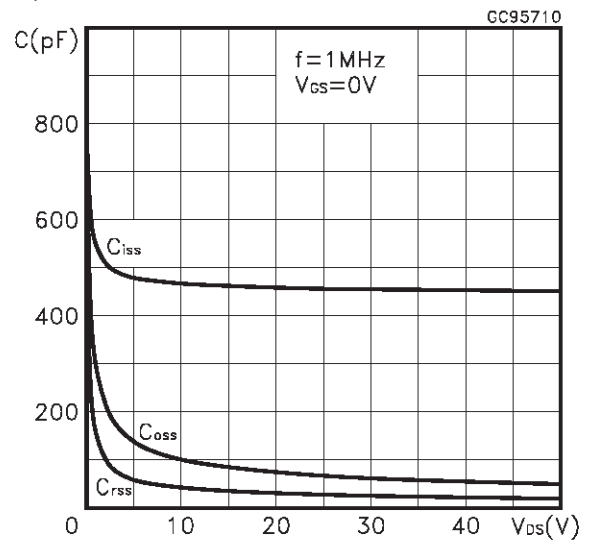
Static Drain-source On Resistance



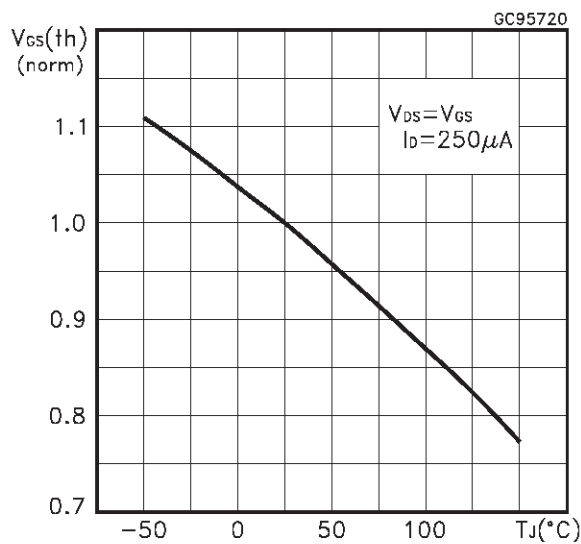
Gate Charge vs Gate-source Voltage



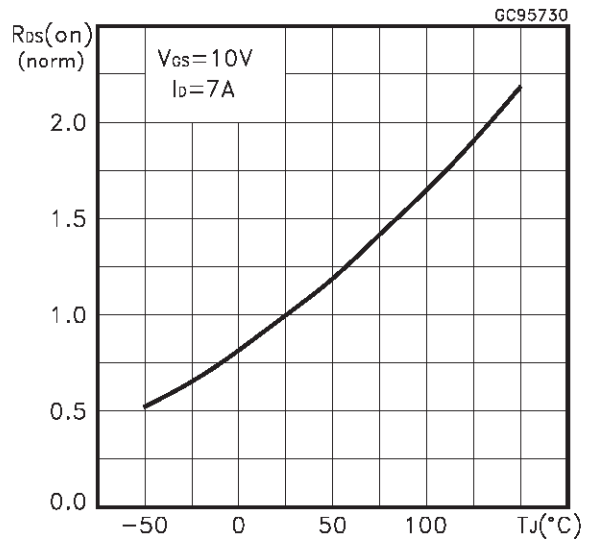
Capacitance Variations



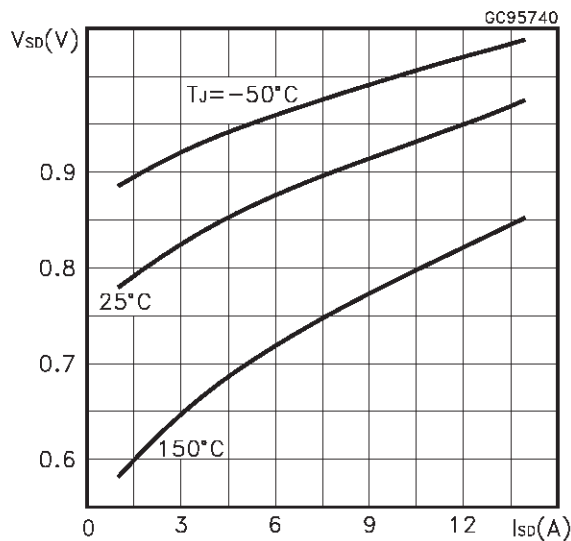
Normalized Gate Threshold Voltage vs Temperature



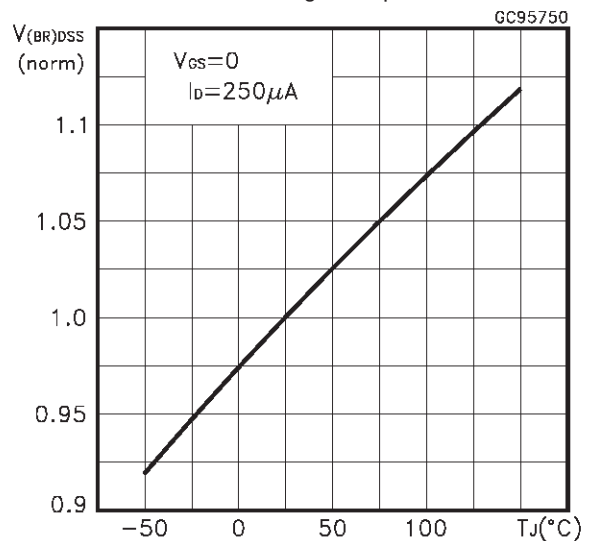
Normalized on Resistance vs Temperature



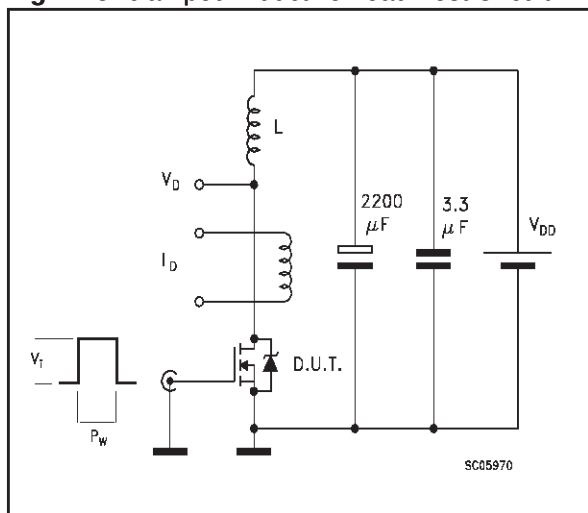
Source-drain Diode Forward Characteristics



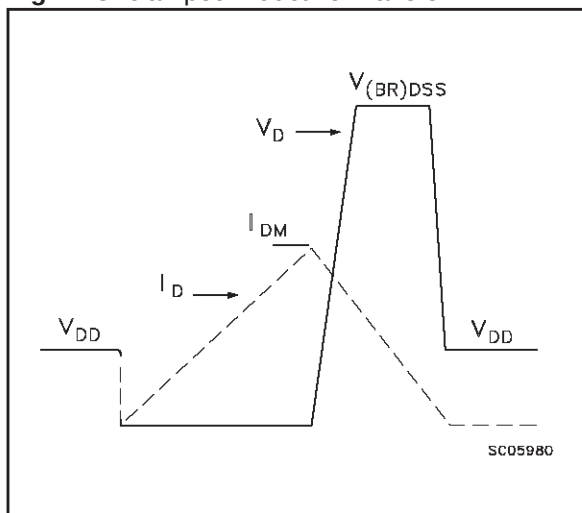
Normalized Breakdown Voltage Temperature



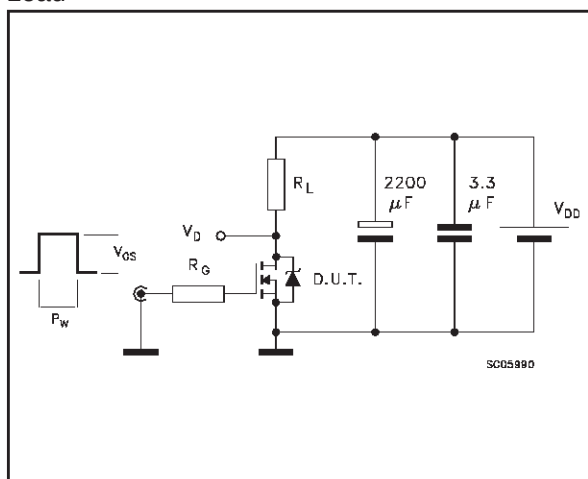
**Fig. 1: Unclamped Inductive Load Test Circuit**



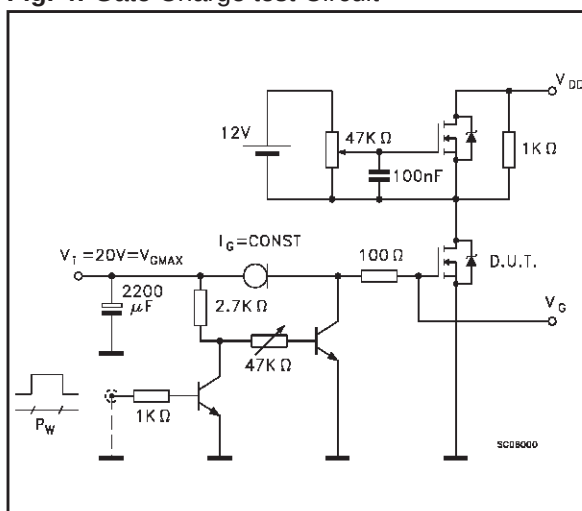
**Fig. 2: Unclamped Inductive Waveform**



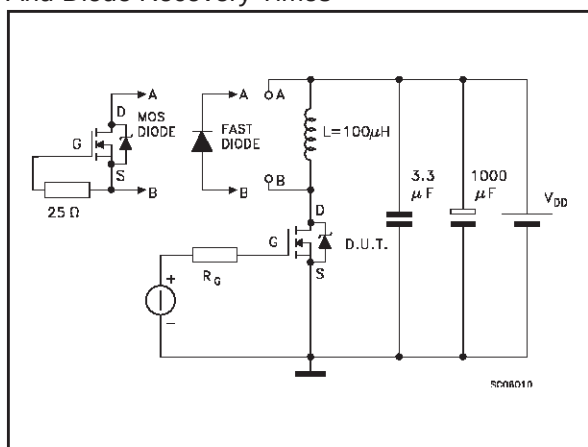
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

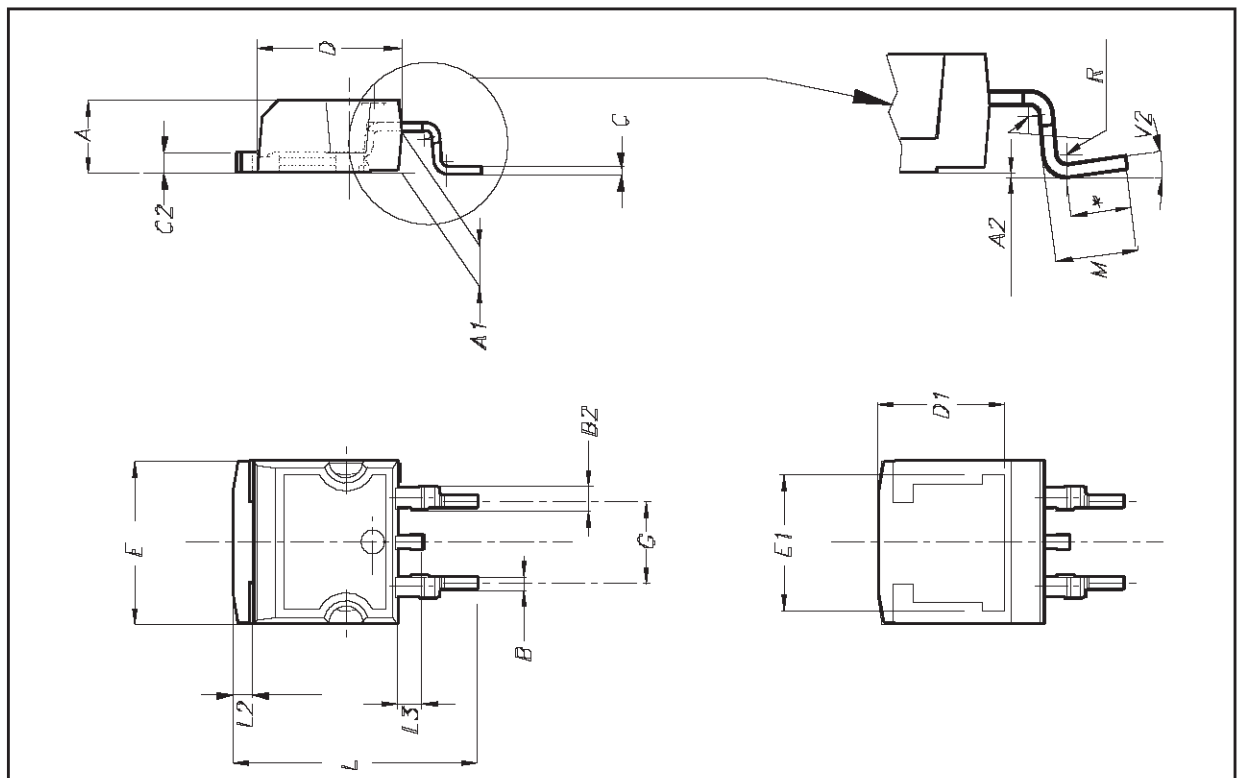


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



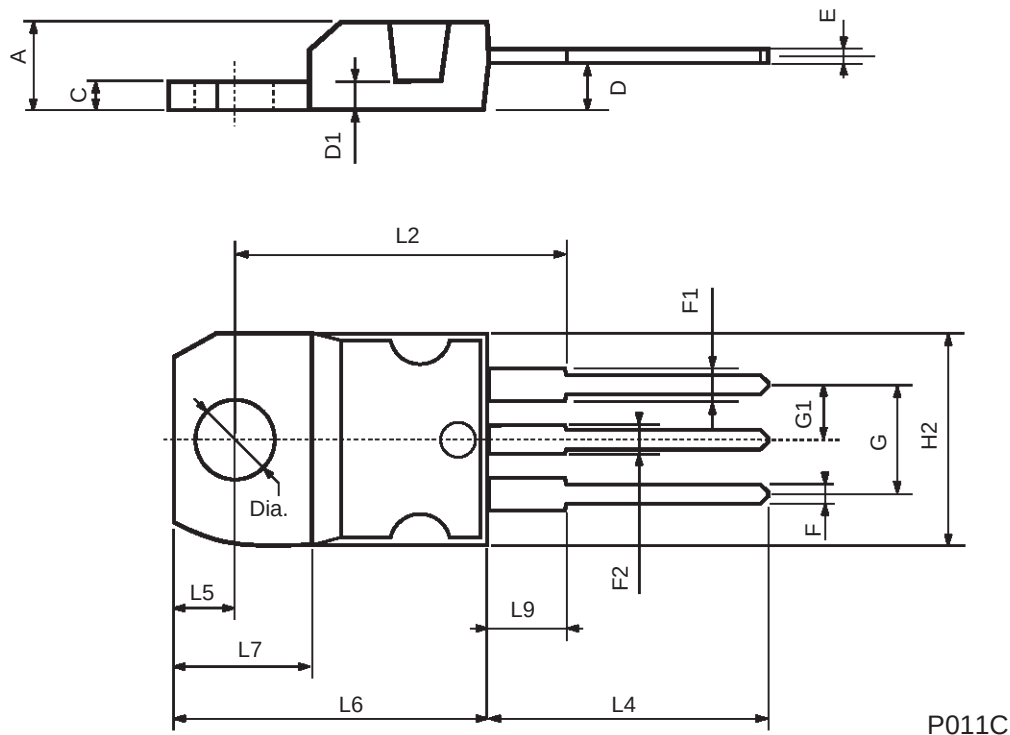
D<sup>2</sup>PAK MECHANICAL DATA

| 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  |       |       | 0.016 |       |
| V2   | 0°   |      | 8°    | 0°    |       | 8°    |



TO-220 MECHANICAL DATA

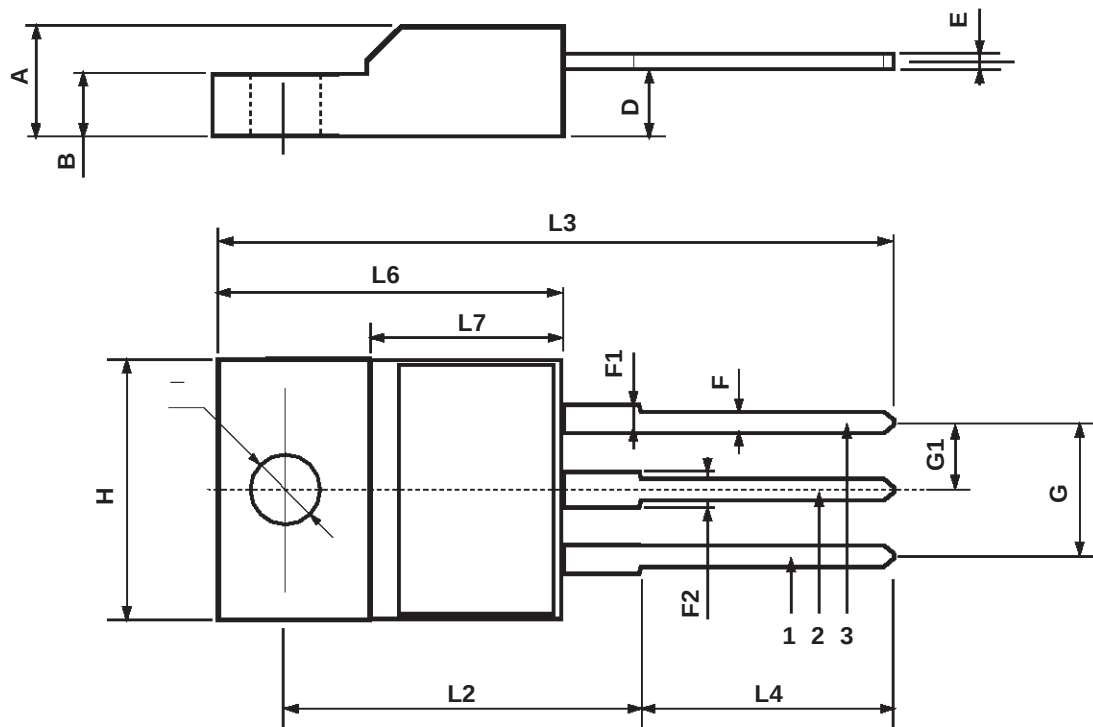
| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| 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   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



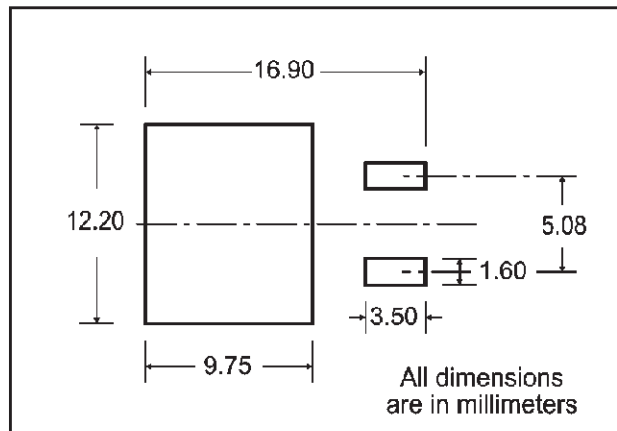


## TO-220FP MECHANICAL DATA

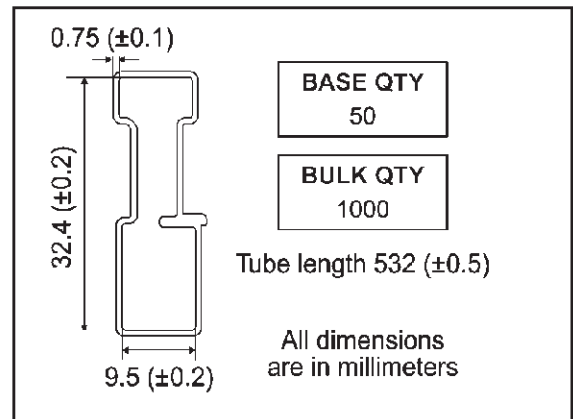
| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |      | 4.6  | 0.173 |       | 0.181 |
| B    | 2.5  |      | 2.7  | 0.098 |       | 0.106 |
| D    | 2.5  |      | 2.75 | 0.098 |       | 0.108 |
| E    | 0.45 |      | 0.7  | 0.017 |       | 0.027 |
| F    | 0.75 |      | 1    | 0.030 |       | 0.039 |
| F1   | 1.15 |      | 1.7  | 0.045 |       | 0.067 |
| F2   | 1.15 |      | 1.7  | 0.045 |       | 0.067 |
| G    | 4.95 |      | 5.2  | 0.195 |       | 0.204 |
| G1   | 2.4  |      | 2.7  | 0.094 |       | 0.106 |
| H    | 10   |      | 10.4 | 0.393 |       | 0.409 |
| L2   |      | 16   |      |       | 0.630 |       |
| L3   | 28.6 |      | 30.6 | 1.126 |       | 1.204 |
| L4   | 9.8  |      | 10.6 | 0.385 |       | 0.417 |
| L6   | 15.9 |      | 16.4 | 0.626 |       | 0.645 |
| L7   | 9    |      | 9.3  | 0.354 |       | 0.366 |
| Ø    | 3    |      | 3.2  | 0.118 |       | 0.126 |



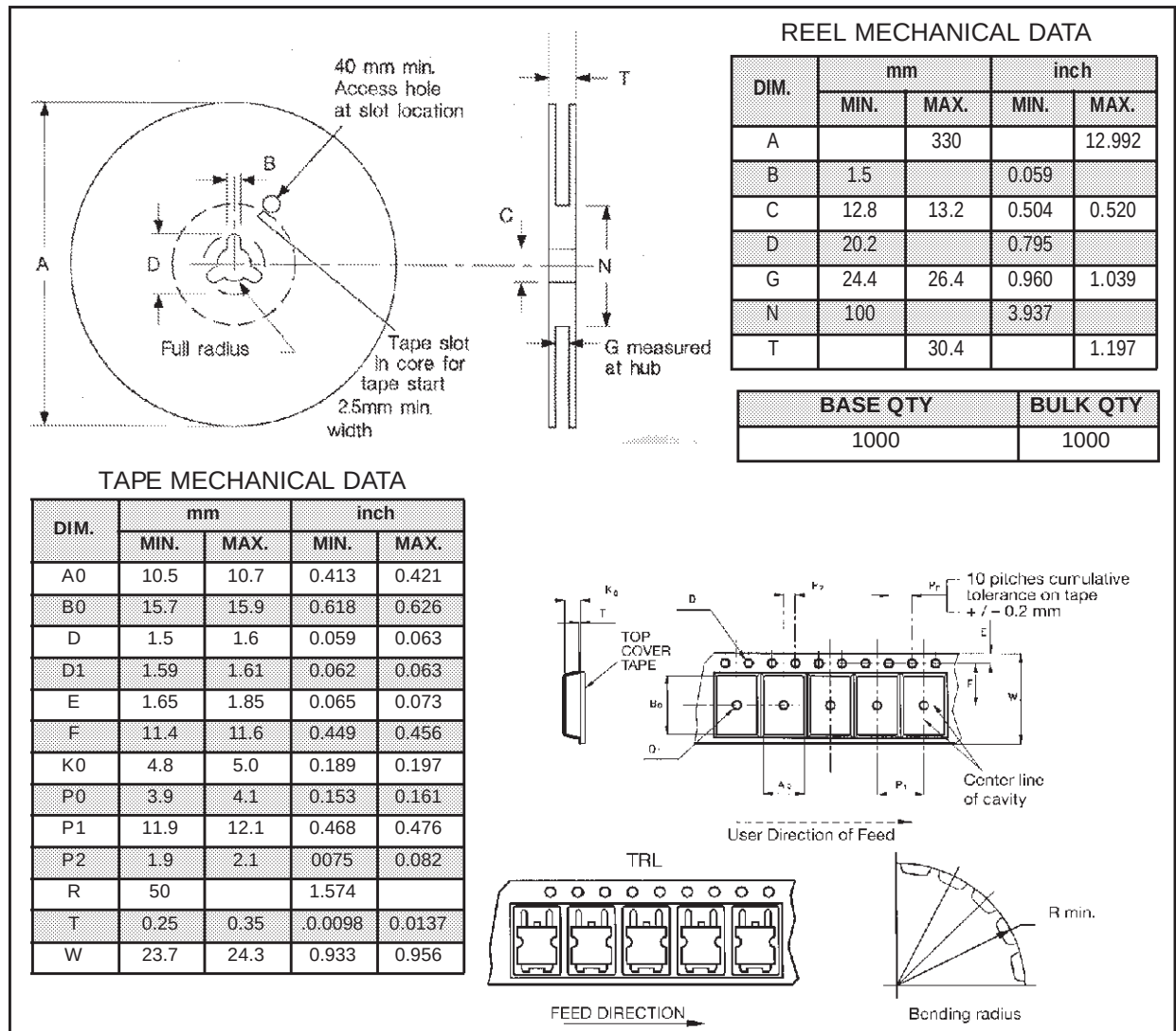
## D2PAK FOOTPRINT



## TUBE SHIPMENT (no suffix)\*



## TAPE AND REEL SHIPMENT (suffix "T4")\*



\* on sales type

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is registered trademark of STMicroelectronics  
® 2002 STMicroelectronics - All Rights Reserved

All other names are the property of their respective owners.

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>