



# STB24NF10

## N - CHANNEL 100V - 0.07Ω - 24A TO-263 LOW GATE CHARGE STripFET™ POWER MOSFET

PRELIMINARY DATA

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STB24NF10 | 100 V            | < 0.077 Ω           | 24 A           |

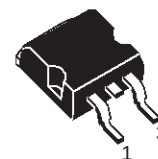
- TYPICAL R<sub>DS(on)</sub> = 0.07 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263)  
POWER PACKAGE IN TAPE & REEL  
(SUFFIX "T4")

### DESCRIPTION

This MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize 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.

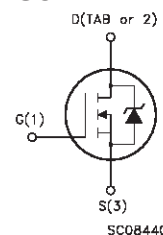
### APPLICATIONS

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



**D<sup>2</sup>PAK  
TO-263**  
(Suffix "T4")

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| 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 kΩ)         | 100        | V    |
| V <sub>GS</sub>     | Gate-source Voltage                                   | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 24         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 15         | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                | 96         | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C           | 80         | W    |
|                     | Derating Factor                                       | 0.53       | W/°C |
| dv/dt(1)            | Peak Diode Recovery voltage slope                     | 9          | V/ns |
| E <sub>AS</sub> (2) | Single Pulse Avalanche Energy                         | 75         | mJ   |
| T <sub>stg</sub>    | Storage Temperature                                   | -65 to 175 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   | 175        | °C   |

(•) Pulse width limited by safe operating area

(2) starting T<sub>j</sub> = 25 °C, I<sub>b</sub> = 24A, V<sub>DD</sub> = 50V

(1) I<sub>SD</sub> ≤ 24 A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMA</sub>

## STB24NF10

### THERMAL DATA

|                |                                                |     |      |               |
|----------------|------------------------------------------------|-----|------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 1.87 | $^{\circ}C/W$ |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient            | Max | 62.5 | $^{\circ}C/W$ |
| $T_l$          | Maximum Lead Temperature For Soldering Purpose |     | 300  | $^{\circ}C$   |

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}C$ unless otherwise specified)

#### OFF

| Symbol        | Parameter                                        | Test Conditions                                                                   | Min. | Typ. | Max.      | Unit               |
|---------------|--------------------------------------------------|-----------------------------------------------------------------------------------|------|------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 250 \mu A$ $V_{GS} = 0$                                                    | 100  |      |           | V                  |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$ |      |      | 1<br>10   | $\mu A$<br>$\mu A$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20 V$                                                               |      |      | $\pm 100$ | nA                 |

#### ON (\*)

| Symbol       | Parameter                         | Test Conditions                                              | Min. | Typ. | Max.  | Unit     |
|--------------|-----------------------------------|--------------------------------------------------------------|------|------|-------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250 \mu A$                          | 2    | 3    | 4     | V        |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10 V$ $I_D = 12 A$                                 |      | 0.07 | 0.077 | $\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10 V$ | 24   |      |       | A        |

#### DYNAMIC

| Symbol                              | Parameter                                                               | Test Conditions                                        | Min. | Typ.             | Max. | Unit           |
|-------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|------|------------------|------|----------------|
| $g_{fs} (*)$                        | Forward Transconductance                                                | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 12 A$ |      | 20               |      | S              |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$               |      | 870<br>125<br>52 |      | pF<br>pF<br>pF |

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

| Symbol      | Parameter          | Test Conditions                                                            | Min. | Typ. | Max. | Unit |
|-------------|--------------------|----------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 50\text{ V}$ $I_D = 12\text{ A}$                                 |      | 58   |      | ns   |
| $t_r$       | Rise Time          | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, see fig. 3) |      | 45   |      | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 80\text{ V}$ $I_D = 24\text{ A}$ $V_{GS} = 10\text{ V}$          |      | 30   |      | nC   |
| $Q_{gs}$    | Gate-Source Charge |                                                                            |      | 6    |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |                                                                            |      | 10   |      | nC   |

**SWITCHING OFF**

| Symbol       | Parameter             | Test Conditions                                                            | Min. | Typ. | Max. | Unit |
|--------------|-----------------------|----------------------------------------------------------------------------|------|------|------|------|
| $t_{d(off)}$ | Turn-off Delay Time   | $V_{DD} = 27\text{ V}$ $I_D = 12\text{ A}$                                 |      | 49   |      | ns   |
| $t_f$        | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, see fig. 3) |      | 17   |      | ns   |
| $t_{d(off)}$ | Off-voltage Rise Time | $V_{clamp} = 80\text{ V}$ $I_D = 24\text{ A}$                              |      | 43   |      | ns   |
| $t_f$        | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$                                 |      | 36   |      | ns   |
| $t_c$        | Cross-over Time       | (Inductive Load, see fig. 5)                                               |      | 39   |      | ns   |

**SOURCE DRAIN DIODE**

| Symbol             | Parameter                     | Test Conditions                                                                                                                                     | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{SD}$           | Source-drain Current          |                                                                                                                                                     |      |      | 24   | A    |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) |                                                                                                                                                     |      |      | 96   | A    |
| $V_{SD} (*)$       | Forward On Voltage            | $I_{SD} = 24\text{ A}$ $V_{GS} = 0$                                                                                                                 |      |      | 1.5  | V    |
| $t_{rr}$           | Reverse Recovery Time         | $I_{SD} = 24\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 50\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$<br>(see test circuit, fig. 5) |      | 100  |      | ns   |
| $Q_{rr}$           | Reverse Recovery Charge       |                                                                                                                                                     |      | 375  |      | nC   |
| $I_{RRM}$          | Reverse Recovery Current      |                                                                                                                                                     |      | 7.5  |      | A    |

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

(\bullet) Pulse width limited by safe operating area

Fig. 1: Unclamped Inductive Load Test Circuit

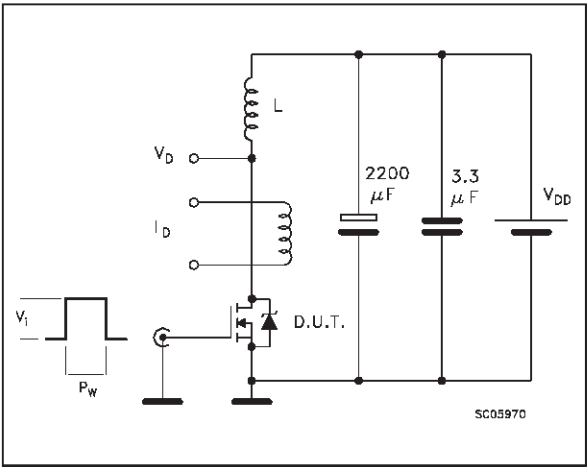


Fig. 2: Unclamped Inductive Waveform

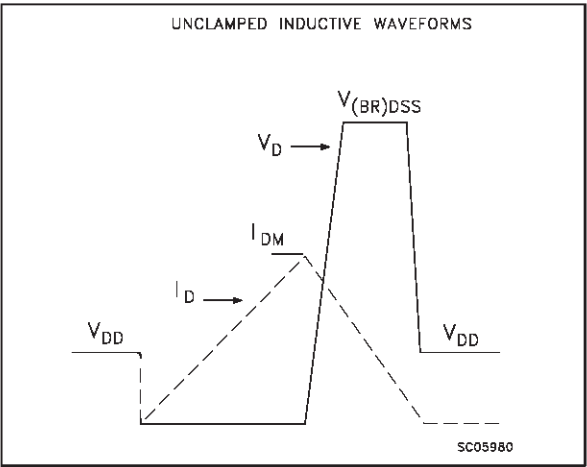


Fig. 3: Switching Times Test Circuits For Resistive Load

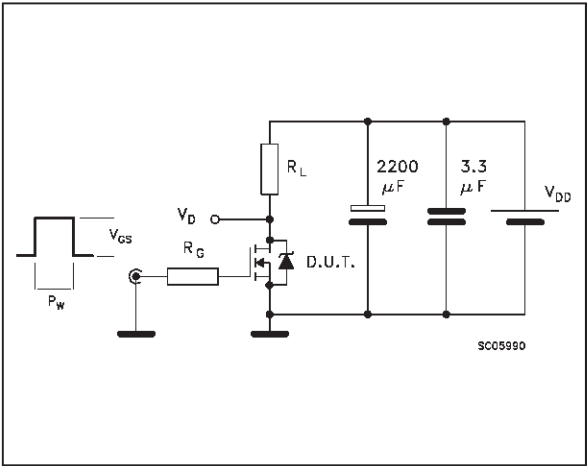


Fig. 4: Gate Charge test Circuit

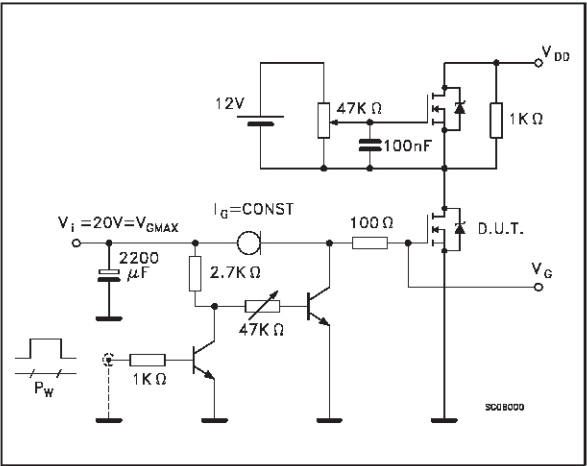
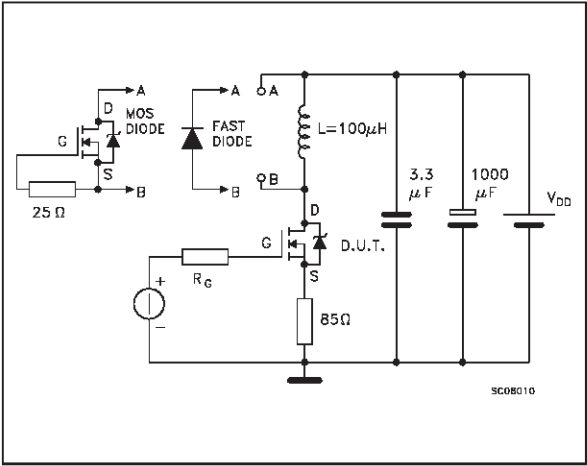
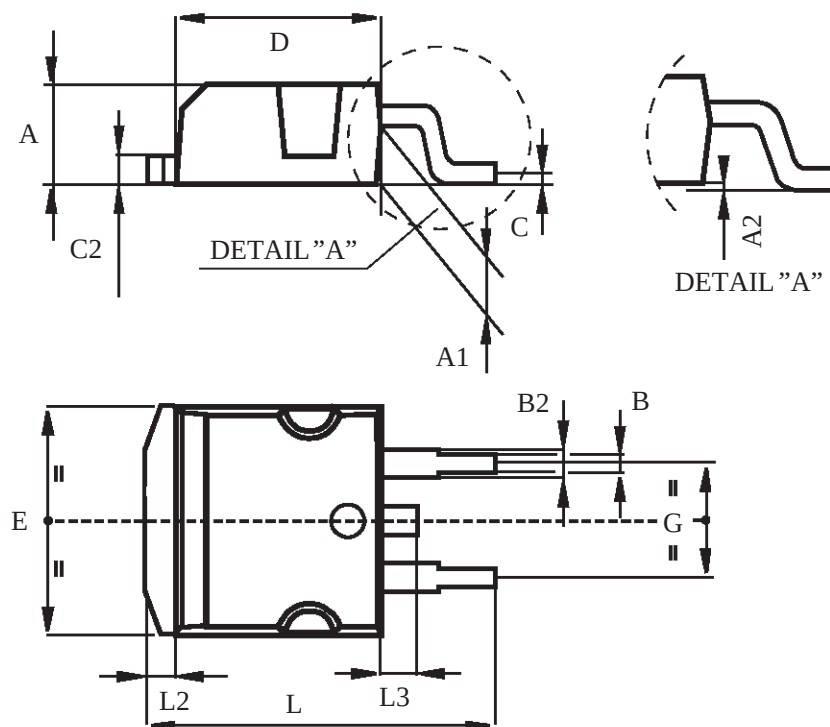


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D<sup>2</sup>PAK) 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 |
| 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   | 1.21 |      | 1.36  | 0.047 |      | 0.053 |
| D    | 8.95 |      | 9.35  | 0.352 |      | 0.368 |
| E    | 10   |      | 10.4  | 0.393 |      | 0.409 |
| G    | 4.88 |      | 5.28  | 0.192 |      | 0.208 |
| L    | 15   |      | 15.85 | 0.590 |      | 0.624 |
| L2   | 1.27 |      | 1.4   | 0.050 |      | 0.055 |
| L3   | 1.4  |      | 1.75  | 0.055 |      | 0.068 |



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