



# STB80NF55-06

N - CHANNEL 55V - 0.005Ω - 80A TO-262/TO-263  
STripFET™ POWER MOSFET

## PRELIMINARY DATA

| TYPE         | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|--------------|------------------|---------------------|----------------|
| STB80NF55-06 | 55 V             | < 0.0065 Ω          | 80 A           |

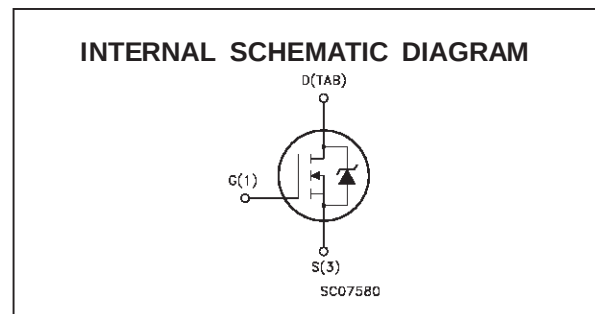
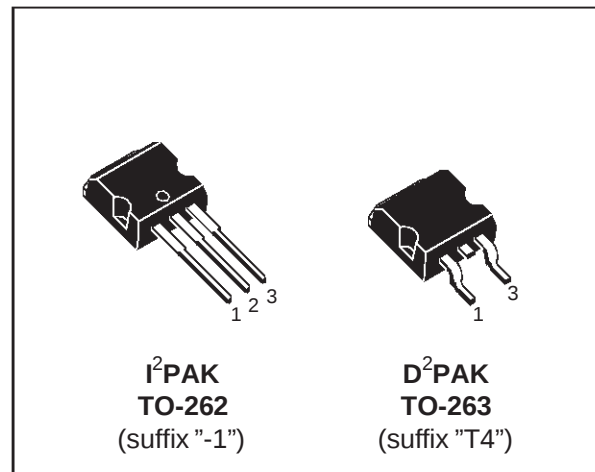
- TYPICAL R<sub>DS(on)</sub> = 0.005 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION
- THROUGH-HOLE I<sup>2</sup>PAK (TO-262) POWER PACKAGE IN TUBE (SUFFIX "-1")\
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263) POWER PACKAGE IN TUBE (NO SUFFIX) OR IN TAPE & 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

- SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC CONVERTERS
- AUTOMOTIVE ENVIRONMENT



## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 55         | V    |
| V <sub>DGR</sub>    | Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)         | 55         | V    |
| V <sub>GS</sub>     | Gate-source Voltage                                   | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 80         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 57         | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                | 320        | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C           | 210        | W    |
|                     | Derating Factor                                       | 1.43       | W/°C |
| dv/dt               | Peak Diode Recovery voltage slope                     | 7          | V/ns |
| 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

(1) I<sub>SD</sub> ≤ 80 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

## THERMAL DATA

|                |                                                |     |      |               |
|----------------|------------------------------------------------|-----|------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 0.7  | $^{\circ}C/W$ |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient            | Max | 62.5 | $^{\circ}C/W$ |
| $R_{thc-sink}$ | Thermal Resistance Case-sink                   | Typ | 0.5  | $^{\circ}C/W$ |
| $T_I$          | Maximum Lead Temperature For Soldering Purpose |     | 300  | $^{\circ}C$   |

## AVALANCHE CHARACTERISTICS

| Symbol   | Parameter                                                                                        | Max Value | Unit |
|----------|--------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)               | 80        | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 30 V$ ) | 650       | mJ   |

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                   | $I_D = 250 \mu A$ $V_{GS} = 0$                                                    | 55   |      |           | 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 | $V_{GS} = 10V$ $I_D = 40 A$                                  |      | 0.005 | 0.0065 | $\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10 V$ | 80   |       |        | A        |

## DYNAMIC

| Symbol                              | Parameter                                                               | Test Conditions                                        | Min. | Typ.                | Max. | Unit           |
|-------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|------|---------------------|------|----------------|
| $g_{fs} (*)$                        | Forward Transconductance                                                | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 40 A$ |      | 50                  |      | S              |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$               |      | 8000<br>1100<br>220 |      | 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 | $V_{DD} = 27\text{ V}$ $I_D = 40\text{ A}$                                 |      | 35   |      | ns   |
| $t_r$       | Rise Time          | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, see fig. 3) |      | 240  |      | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 44\text{ V}$ $I_D = 80\text{ A}$ $V_{GS} = 10\text{ V}$          |      | 178  | 230  | nC   |
| $Q_{gs}$    | Gate-Source Charge |                                                                            |      | 29   |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |                                                                            |      | 61   |      | nC   |

**SWITCHING OFF**

| Symbol        | Parameter             | Test Conditions                                                            | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|----------------------------------------------------------------------------|------|------|------|------|
| $t_{d(off)}$  | Turn-off Delay Time   | $V_{DD} = 27\text{ V}$ $I_D = 40\text{ A}$                                 |      | 260  |      | ns   |
| $t_f$         | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, see fig. 3) |      | 80   |      | ns   |
| $t_{d(off)}$  | Turn-off Delay Time   | $V_{DD} = 44\text{ V}$ $I_D = 80\text{ A}$                                 |      | 225  |      | ns   |
| $t_{r(voff)}$ | Off-voltage Rise Time | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$                                 |      | 55   |      | ns   |
| $t_f$         | Fall Time             | (Inductive Load, see fig. 5)                                               |      | 145  |      | ns   |
| $t_c$         | Cross-over Time       |                                                                            |      | 205  |      | ns   |

**SOURCE DRAIN DIODE**

| Symbol             | Parameter                     | Test Conditions                                                                                                                                     | Min. | Typ. | Max. | Unit          |
|--------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{SD}$           | Source-drain Current          |                                                                                                                                                     |      |      | 80   | A             |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) |                                                                                                                                                     |      |      | 320  | A             |
| $V_{SD} (*)$       | Forward On Voltage            | $I_{SD} = 80\text{ A}$ $V_{GS} = 0$                                                                                                                 |      |      | 1.5  | V             |
| $t_{rr}$           | Reverse Recovery Time         | $I_{SD} = 80\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 20\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$<br>(see test circuit, fig. 5) |      | 80   |      | ns            |
| $Q_{rr}$           | Reverse Recovery Charge       |                                                                                                                                                     |      | 0.24 |      | $\mu\text{C}$ |
| $I_{RRM}$          | Reverse Recovery Current      |                                                                                                                                                     |      | 6    |      | 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



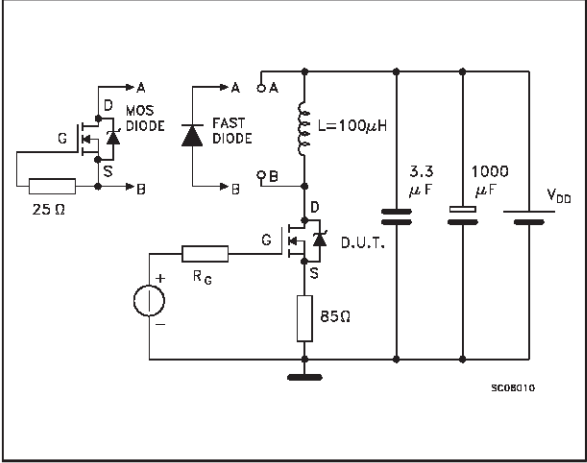
Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

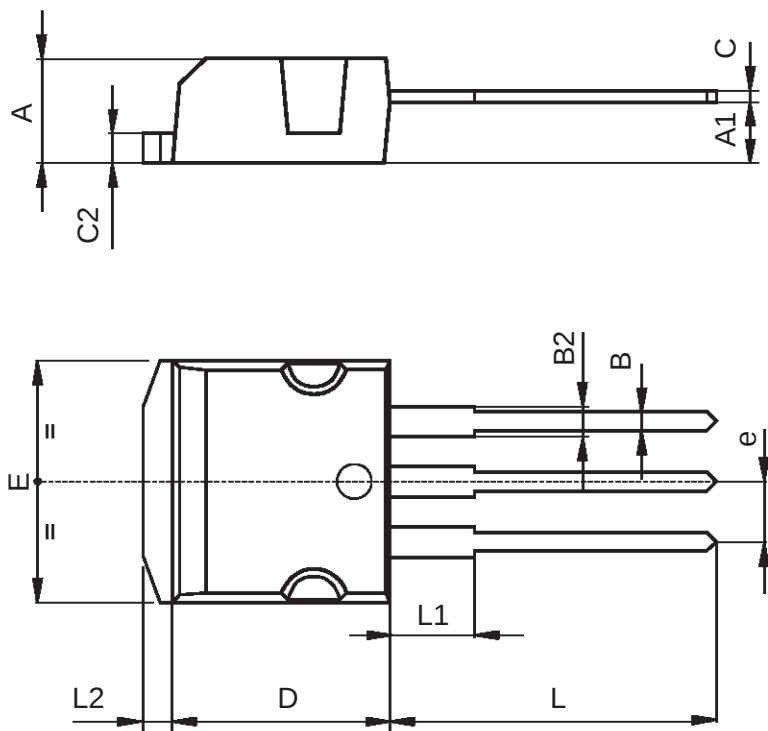


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-262 (I<sup>2</sup>PAK) MECHANICAL DATA

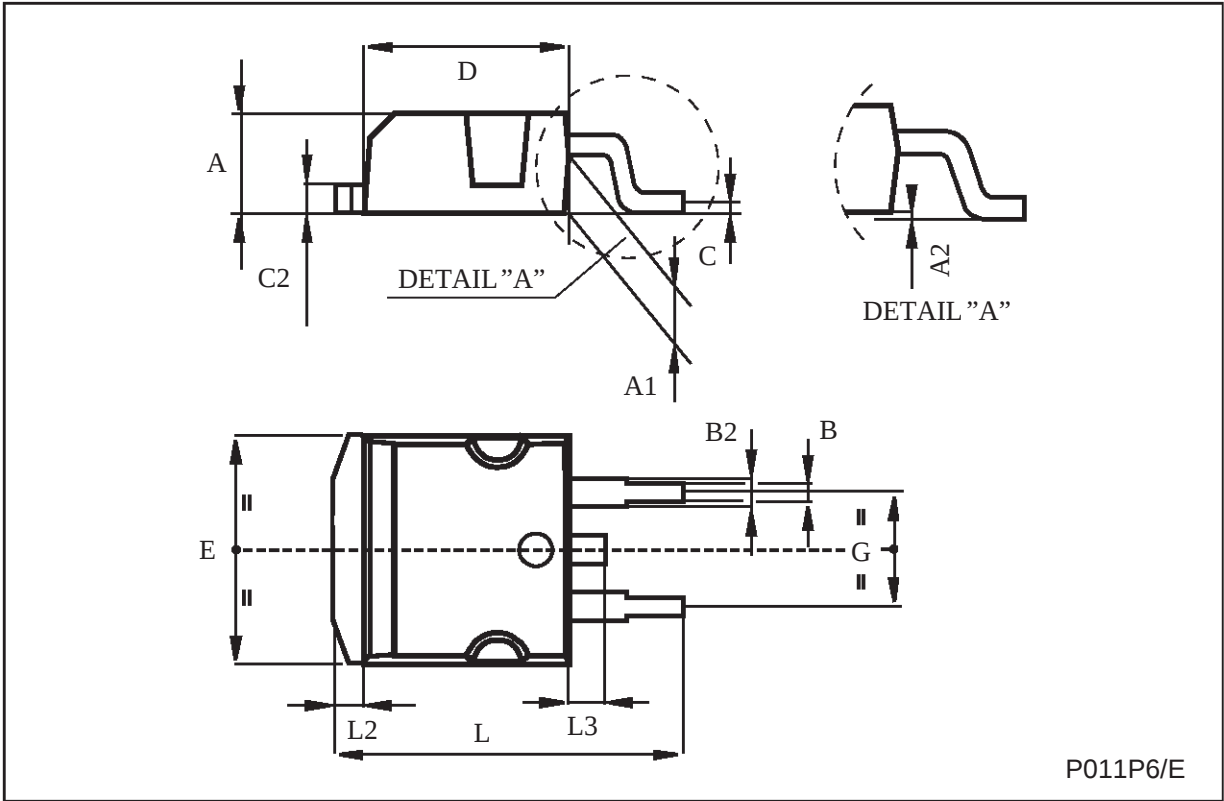
| DIM. | mm   |      |      | inch  |      |       |
|------|------|------|------|-------|------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP. | MAX.  |
| A    | 4.4  |      | 4.6  | 0.173 |      | 0.181 |
| A1   | 2.49 |      | 2.69 | 0.098 |      | 0.106 |
| B    | 0.7  |      | 0.93 | 0.027 |      | 0.036 |
| B2   | 1.14 |      | 1.7  | 0.044 |      | 0.067 |
| C    | 0.45 |      | 0.6  | 0.017 |      | 0.023 |
| C2   | 1.23 |      | 1.36 | 0.048 |      | 0.053 |
| D    | 8.95 |      | 9.35 | 0.352 |      | 0.368 |
| e    | 2.4  |      | 2.7  | 0.094 |      | 0.106 |
| E    | 10   |      | 10.4 | 0.393 |      | 0.409 |
| L    | 13.1 |      | 13.6 | 0.515 |      | 0.531 |
| L1   | 3.48 |      | 3.78 | 0.137 |      | 0.149 |
| L2   | 1.27 |      | 1.4  | 0.050 |      | 0.055 |



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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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