



STB55NF03L

N-CHANNEL 30V - 0.01 Ω - 55A D²PAK STripFET™ POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STB55NF03L | 30 V | < 0.013 Ω | 55 A |

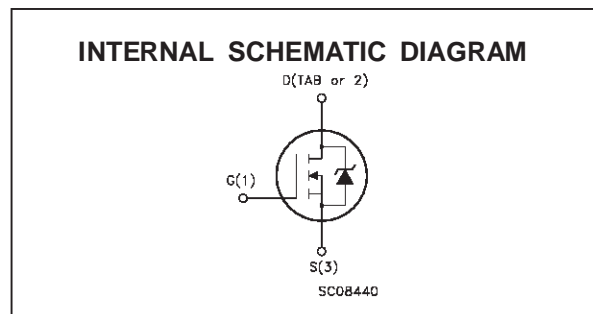
- TYPICAL R_{DS(on)} = 0.01 Ω
- OPTIMIZED FOR HIGH SWITCHING OPERATIONS
- LOW GATE CHARGE
- LOGIC LEVEL GATE DRIVE

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

- LOW VOLTAGE DC-DC CONVERTERS
- HIGH CURRENT, HIGH SPEED SWITCHING
- HIGH EFFICIENCY SWITCHING CIRCUITS



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 30 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 k Ω) | 30 | V |
| V _{GS} | Gate-source Voltage | \pm 20 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 55 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 39 | A |
| I _{DM} (•) | Drain Current (pulsed) | 220 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 80 | W |
| | Derating Factor | 0.53 | W/°C |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | 175 | °C |

(•) Pulse width limited by safe operating area

STB55NF03L

THERMAL DATA

| | | | | |
|----------------|--|-----|-------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case | Max | 1.875 | $^{\circ}C/W$ |
| $R_{thj-amb}$ | 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 | $I_D = 250 \mu A$ $V_{GS} = 0$ | 30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$ | | | 1 10 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 20 V$ | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|---|------|---------------|----------------|----------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 250 \mu A$ | 1 | | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10V$ $I_D = 27.5 A$ $V_{GS} = 4.5V$ $I_D = 27.5 A$ | | 0.01 0.015 | 0.013 0.021 | Ω Ω |
| $I_{D(on)}$ | On State Drain Current | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$ | 55 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|--|------|------|------|------|
| $g_{fs} (*)$ | Forward Transconductance | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 27.5 A$ | | 40 | | S |
| C_{iss} | Input Capacitance | $V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$ | | 1450 | | pF |
| C_{oss} | Output Capacitance | | | 390 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 150 | | pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 15\text{ V}$ $I_D = 27.5\text{ A}$ | | 25 | | ns |
| t_r | Rise Time | $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, see fig. 3) | | 280 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 24\text{ V}$ $I_D = 55\text{ A}$ $V_{GS} = 4.5\text{ V}$ | | 25 | 35 | nC |
| Q_{gs} | Gate-Source Charge | | | 11 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 12 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(off)}$ | Turn-off Delay Time | $V_{DD} = 15\text{ V}$ $I_D = 27.5\text{ A}$ | | 40 | | ns |
| t_f | Fall Time | $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, see fig. 3) | | 60 | | ns |

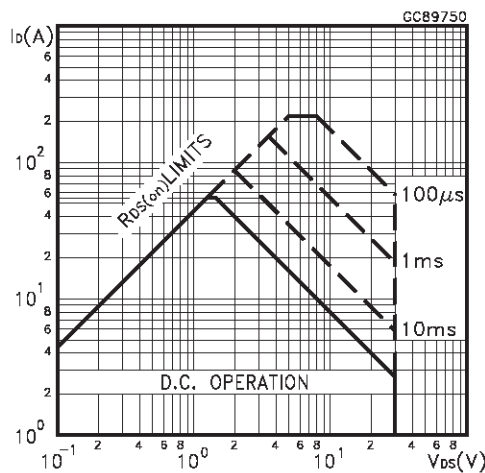
SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain Current | | | | 55 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 220 | A |
| $V_{SD}(\ast)$ | Forward On Voltage | $I_{SD} = 55\text{ A}$ $V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 55\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, fig. 5) | | 45 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 52 | | nC |
| I_{RRM} | Reverse Recovery Current | | | 2.3 | | A |

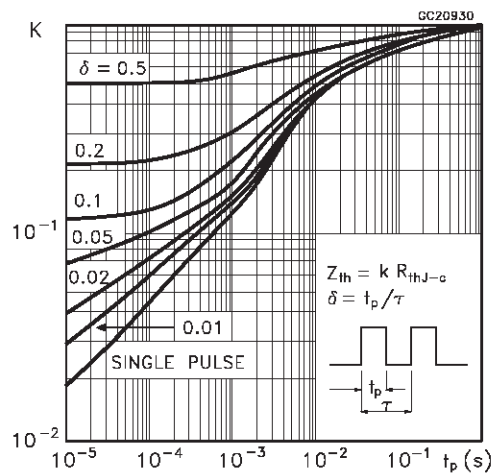
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

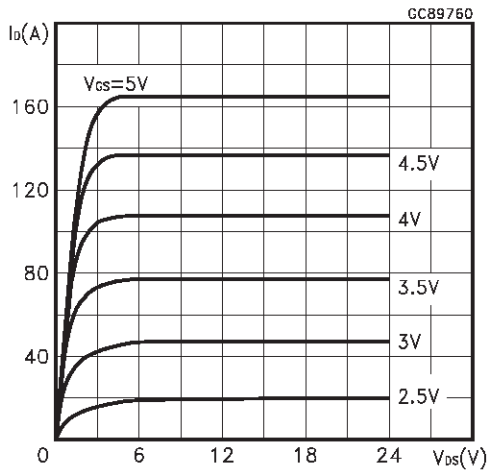
Safe Operating Area



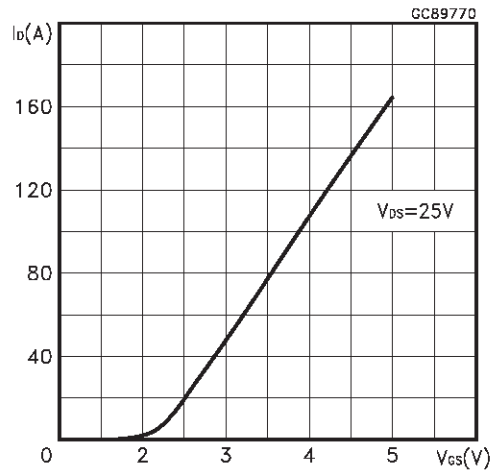
Thermal Impedance



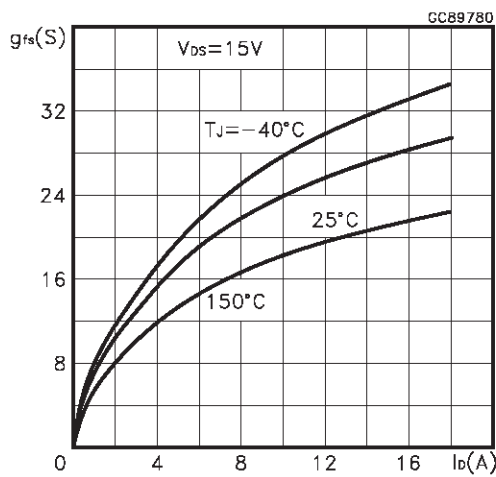
Output Characteristics



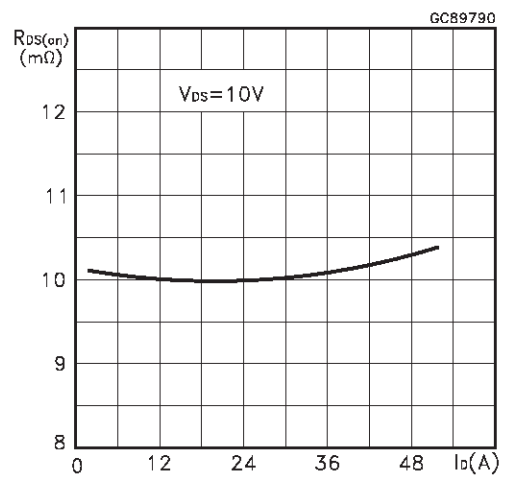
Transfer Characteristics



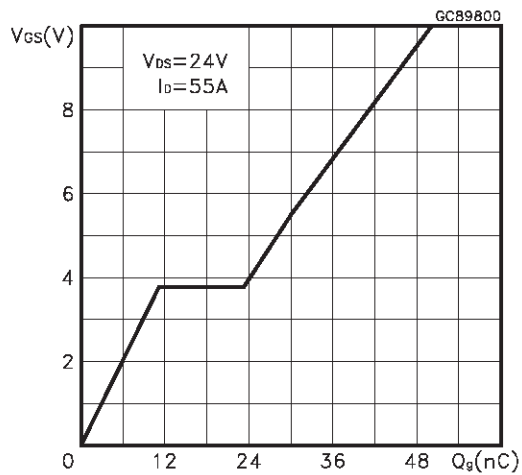
Transconductance



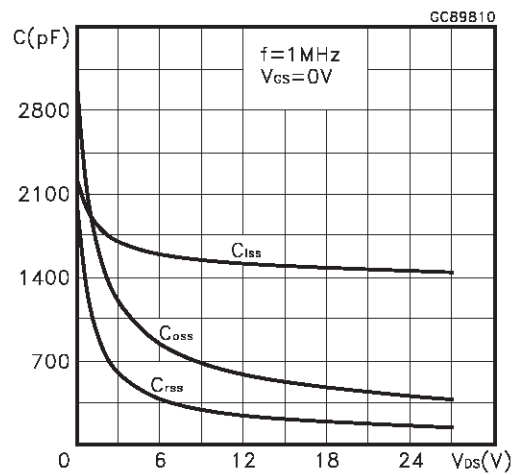
Static Drain-source On Resistance



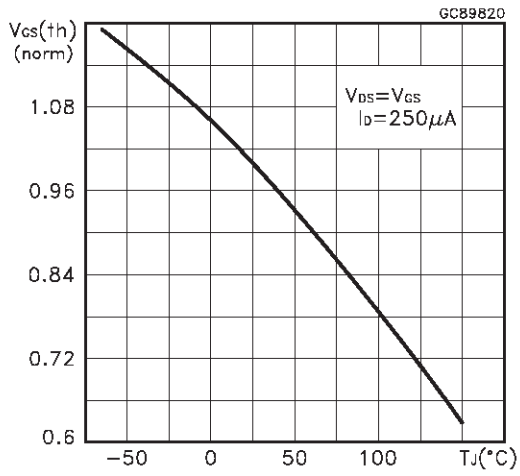
Gate Charge vs Gate-source Voltage



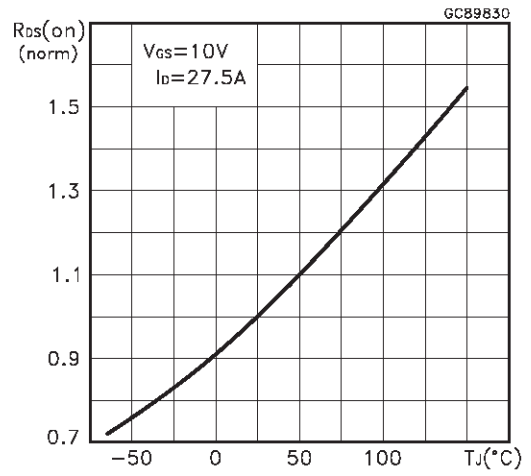
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

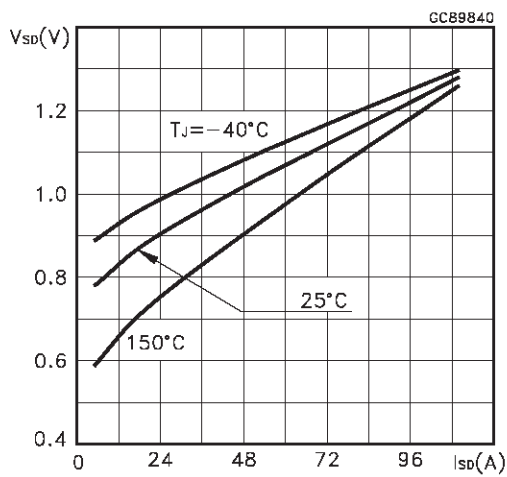


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform

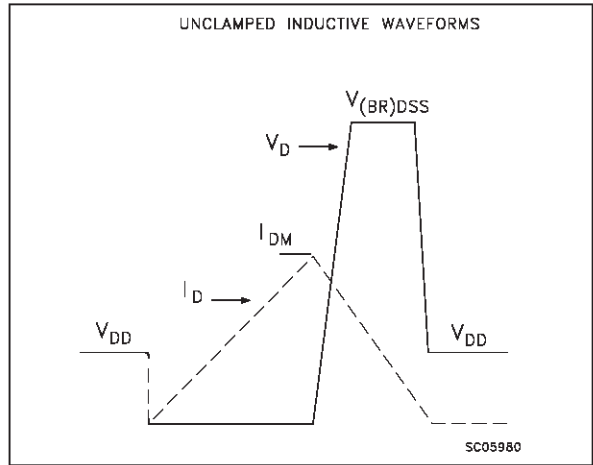


Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

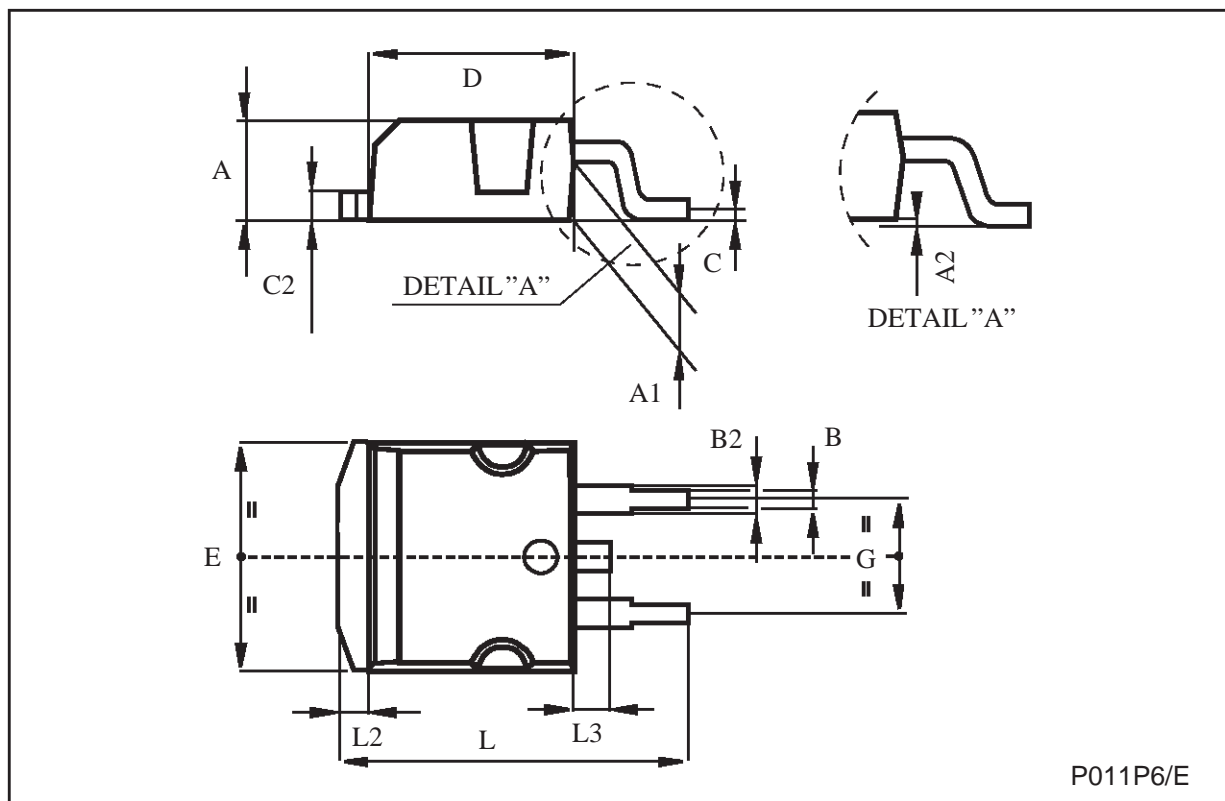


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D²PAK) 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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