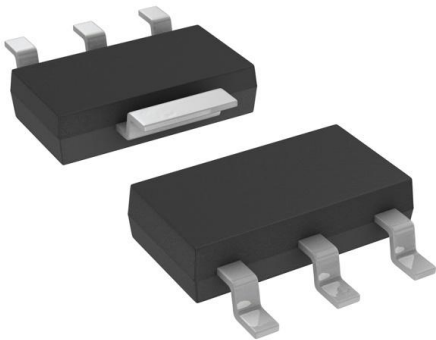


STN3NF06L Datasheet

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<https://www.DiGi-Electronics.com>

| | |
|------------------------------|---|
| DiGi Electronics Part Number | STN3NF06L-DG |
| Manufacturer | STMicroelectronics |
| Manufacturer Product Number | STN3NF06L |
| Description | MOSFET N-CH 60V 4A SOT223 |
| Detailed Description | N-Channel 60 V 4A (Tc) 3.3W (Tc) Surface Mount SO T-223 |

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Manufacturer Product Number:

STN3NF06L

Series:

STripFET™ II

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

60 V

Drive Voltage (Max Rds On, Min Rds On):

5V, 10V

Vgs(th) (Max) @ Id:

2.8V @ 250µA

Vgs (Max):

±16V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

SOT-223

Base Product Number:

STN3

Manufacturer:

STMicroelectronics

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

4A (Tc)

Rds On (Max) @ Id, Vgs:

100mOhm @ 1.5A, 10V

Gate Charge (Qg) (Max) @ Vgs:

9 nC @ 5 V

Input Capacitance (Ciss) (Max) @ Vds:

340 pF @ 25 V

Power Dissipation (Max):

3.3W (Tc)

Mounting Type:

Surface Mount

Package / Case:

TO-261-4, TO-261AA

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

N-channel 60 V, 0.07 Ω typ., 4 A STripFET™ II Power MOSFET in a SOT-223 package

Datasheet - production data

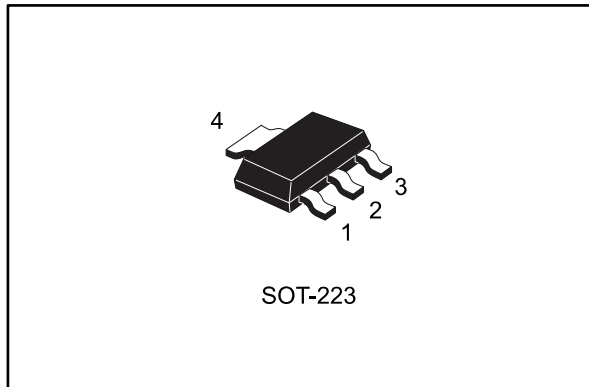
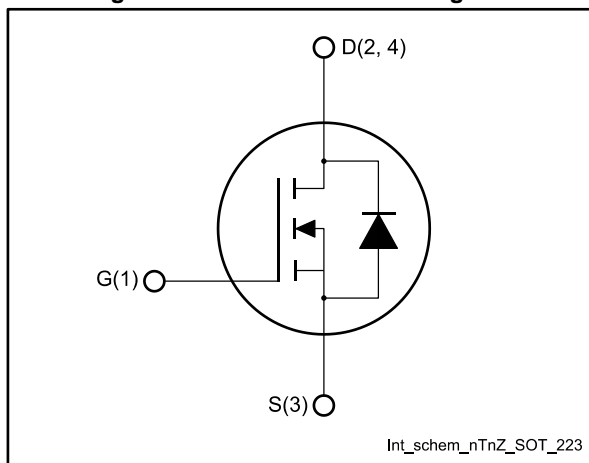


Figure 1: Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D |
|------------|-----------------|--------------------------|----------------|
| STN3NF06L | 60 V | 0.1 Ω | 4 A |

- Exceptional dv/dt capability
- 100% avalanche tested
- Low threshold drive

Applications

- Switching applications

Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process is specifically designed to minimize input capacitance and gate charge. It is therefore ideal as a primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer applications. It is also suitable for any application with low gate charge drive requirements.

Table 1: Device summary

| Order code | Marking | Package | Packing |
|------------|---------|---------|---------------|
| STN3NF06L | 3NF06L | SOT-223 | Tape and reel |

Contents

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| 2 | Electrical characteristics | 4 |
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| 3 | Test circuits | 8 |
| 4 | Package information | 9 |
| | 4.1 SOT-223 package information | 9 |
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1 Electrical ratings

Table 2: Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|---|-------------|------------------|
| V_{DS} | Drain-source voltage | 60 | V |
| V_{GS} | Gate-source voltage | ± 16 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_c = 25\text{ }^\circ\text{C}$ | 4 | A |
| I_D | Drain current (continuous) at $T_c = 100\text{ }^\circ\text{C}$ | 2.9 | A |
| $I_{DM}^{(2)}$ | Drain current (pulsed) | 16 | A |
| P_{TOT} | Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$ | 3.3 | W |
| $dv/dt^{(3)}$ | Peak diode recovery voltage slope | 10 | V/ns |
| $E_{AS}^{(4)}$ | Single pulse avalanche energy | 200 | mJ |
| T_j | Operating junction temperature range | - 55 to 150 | $^\circ\text{C}$ |
| T_{stg} | Storage temperature range | | |

Notes:

(1)Current limited by the package.

(2)Pulse width limited by safe operating area.

(3) $I_{SD} \leq 3\text{ A}$, $di/dt \leq 150\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$

(4)Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 4\text{ A}$, $V_{DD} = 30\text{ V}$

Table 3: Thermal data

| Symbol | Parameter | Value | Unit |
|---------------|--|-------|---------------------------|
| $R_{thj-pcb}$ | Thermal resistance junction-pcb ⁽¹⁾ | 38 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-pcb}$ | Thermal resistance junction-pcb ⁽²⁾ | 100 | $^\circ\text{C}/\text{W}$ |

Notes:

(1)When Mounted on FR-4 board 1 inch² pad, 2 oz. of Cu and $t < 10\text{ s}$.

(2)When mounted on minimum recommended footprint.

2 Electrical characteristics

$T_C = 25\text{ °C}$ unless otherwise specified

Table 4: On/off-state

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|---|------|-------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$ | 60 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$ | | | 1 | μA |
| | | $V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$ $T_C = 125\text{ °C}^{(1)}$ | | | 10 | μA |
| I_{GSS} | Gate body leakage current | $V_{DS} = 0\text{ V}$, $V_{GS} = \pm 16\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 1 | | 2.8 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$, $I_D = 1.5\text{ A}$ | | 0.07 | 0.10 | Ω |
| | | $V_{GS} = 5\text{ V}$, $I_D = 1.5\text{ A}$ | | 0.085 | 0.12 | Ω |

Notes:

⁽¹⁾Defined by design, not subject to production test.

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 340 | | pF |
| C_{oss} | Output capacitance | | - | 63 | | pF |
| C_{riss} | Reverse transfer capacitance | | - | 30 | | pF |
| Q_g | Total gate charge | $V_{DD} = 48\text{ V}$, $I_D = 3\text{ A}$ $V_{GS} = 0\text{ to }5\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior") | - | 7 | 9 | nC |
| Q_{gs} | Gate-source charge | | - | 1.5 | | nC |
| Q_{gd} | Gate-drain charge | | - | 2.8 | | nC |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 30\text{ V}$, $I_D = 1.5\text{ A}$, $R_G = 4.7\text{ }\Omega$ $V_{GS} = 5\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform") | - | 9 | - | ns |
| t_r | Rise time | | - | 25 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 20 | - | ns |
| t_f | Fall time | | - | 10 | - | ns |

STN3NF06L

Electrical characteristics

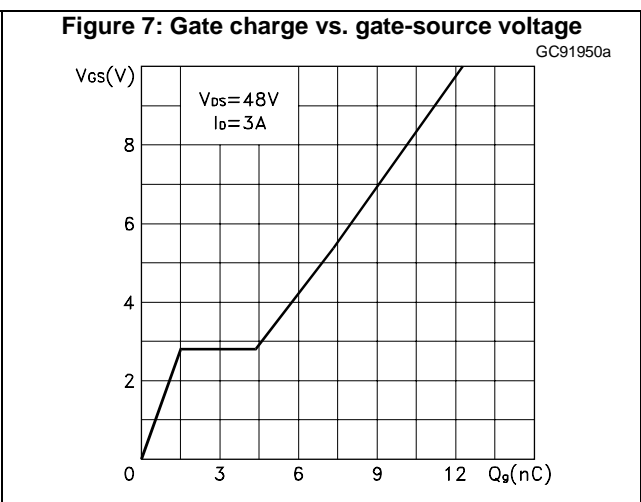
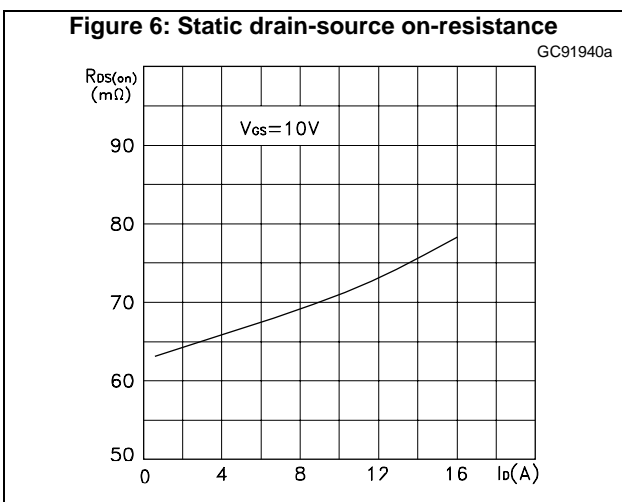
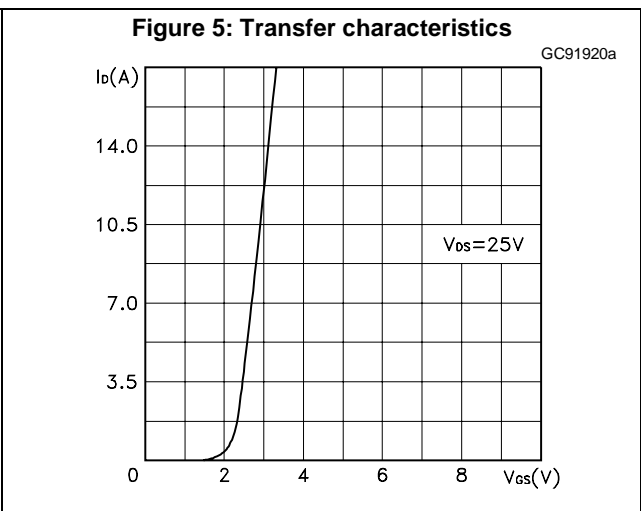
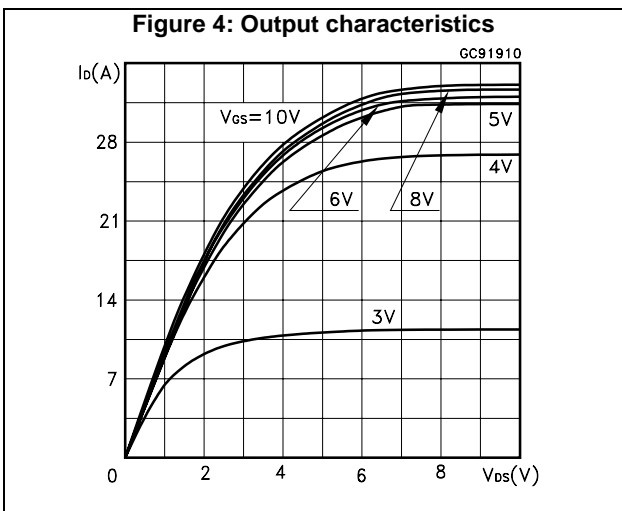
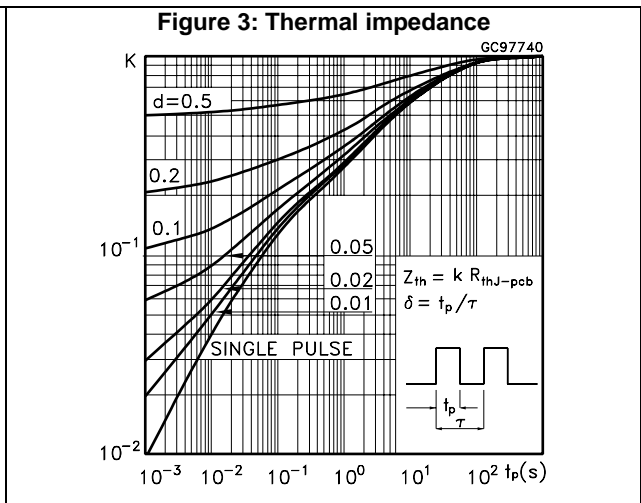
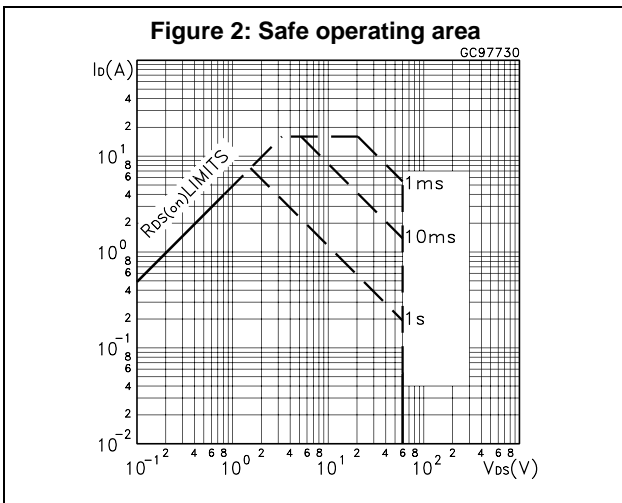
Table 7: Source-drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|--|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $I_{SD} = 4 \text{ A}$, $V_{GS} = 0 \text{ V}$ | - | | 1.5 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 4 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 25 \text{ V}$, $T_j = 150 \text{ }^\circ\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times") | - | 50 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 88 | | nC |
| I_{RRM} | Reverse recovery current | | - | 3.5 | | A |

Notes:

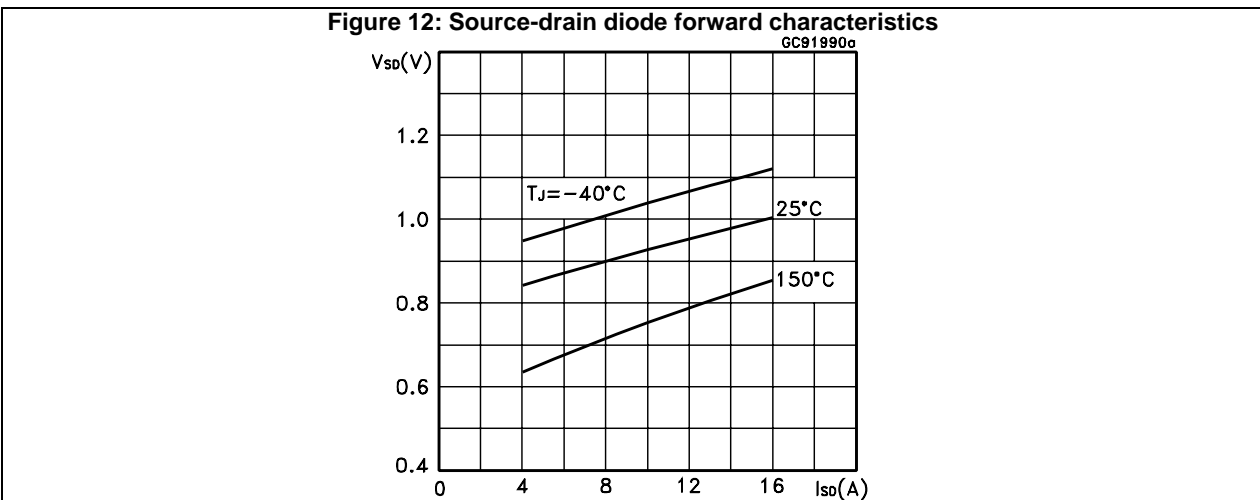
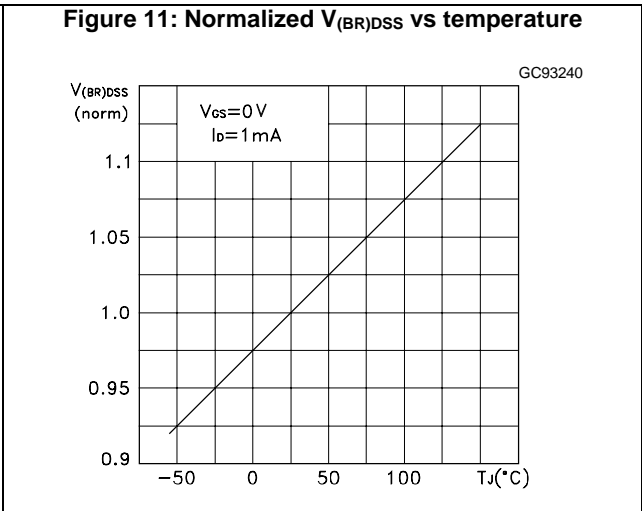
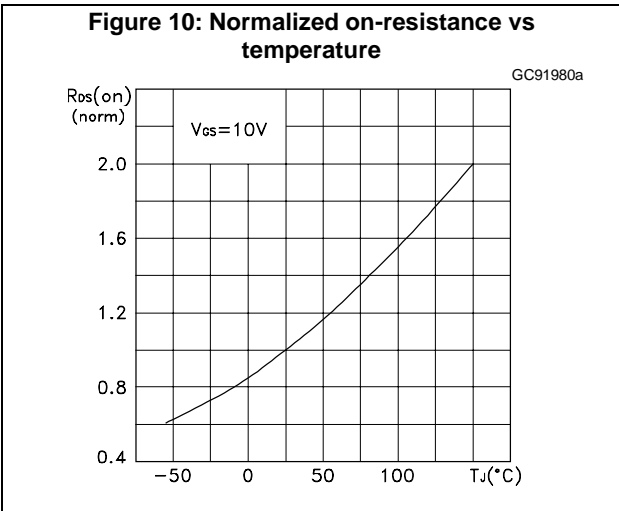
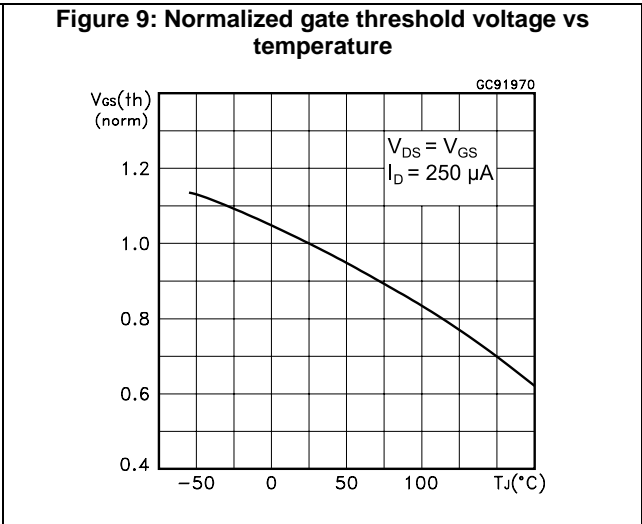
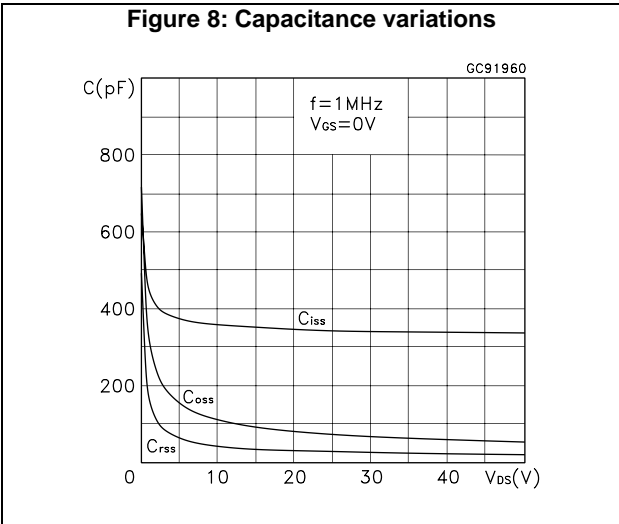
⁽¹⁾Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)



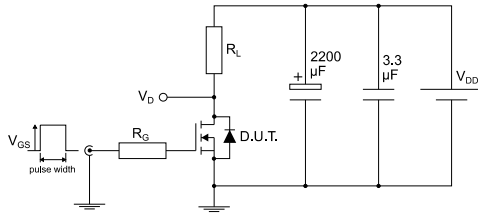
STN3NF06L

Electrical characteristics



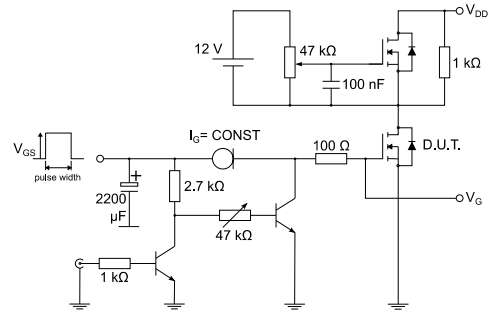
3 Test circuits

Figure 13: Test circuit for resistive load switching times



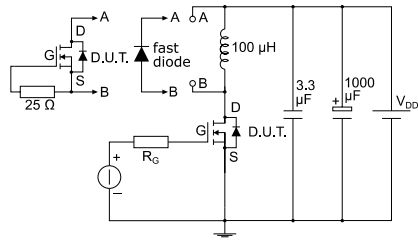
AM01468v1

Figure 14: Test circuit for gate charge behavior



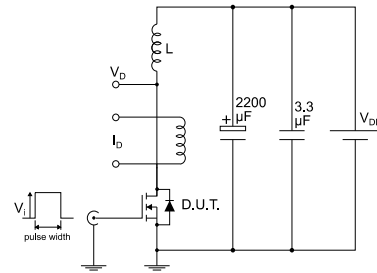
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Figure 15: Test circuit for inductive load switching and diode recovery times



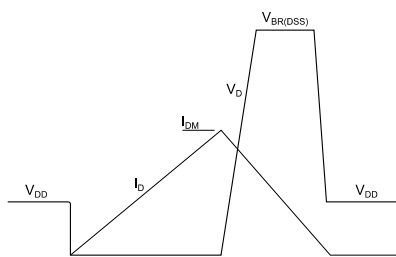
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Figure 16: Unclamped inductive load test circuit



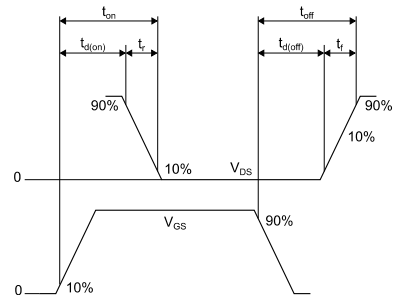
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Figure 17: Unclamped inductive waveform



AM01472v1

Figure 18: Switching time waveform



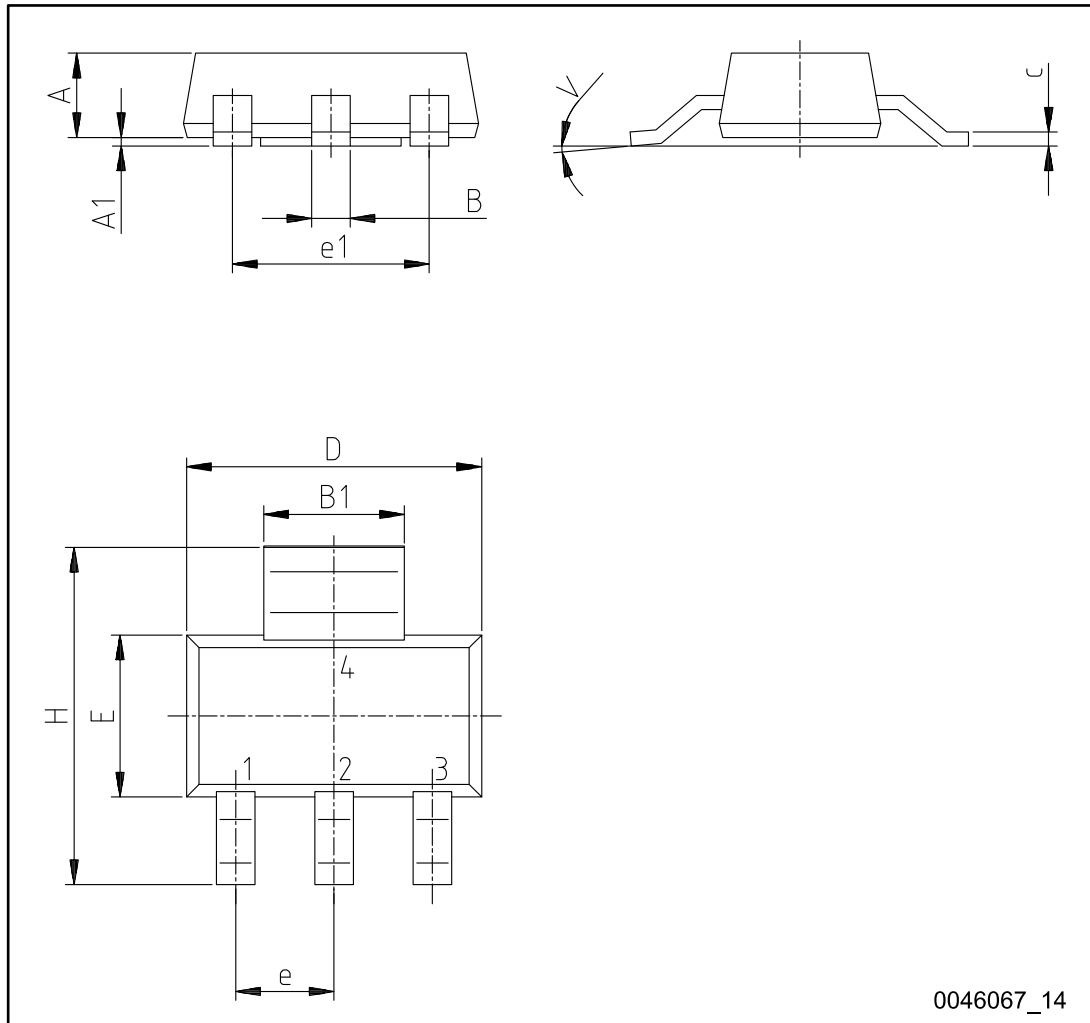
AM01473v1

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

4.1 SOT-223 package information

Figure 19: SOT-223 package outline



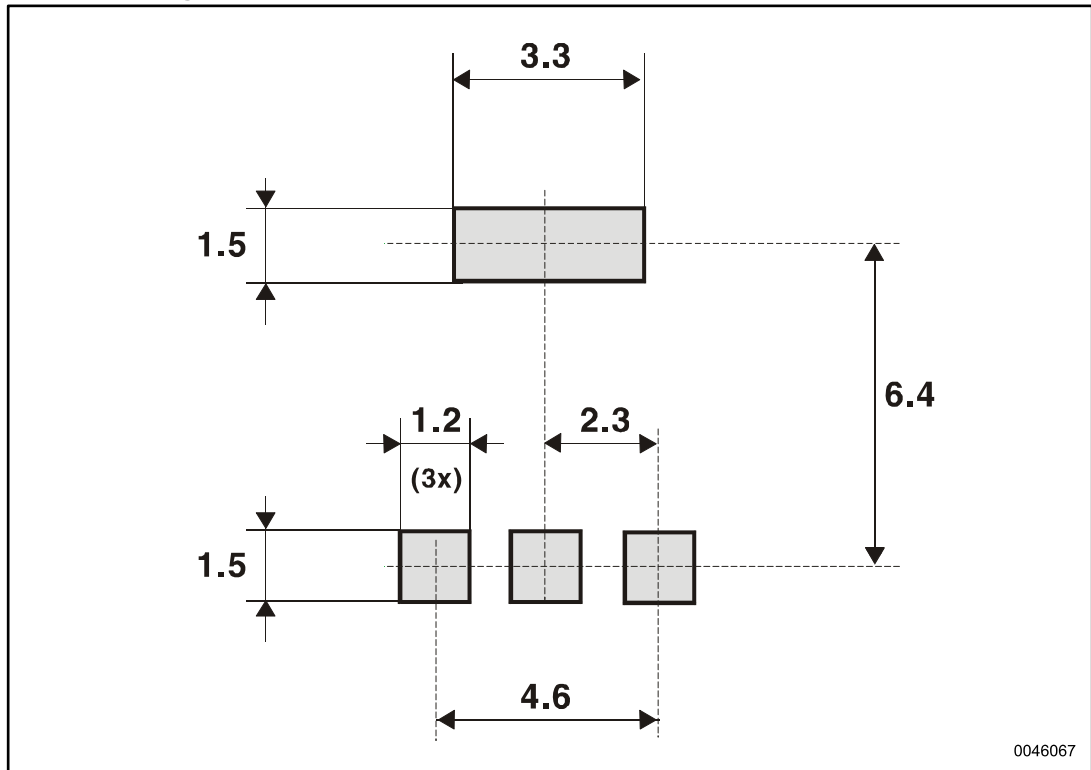
Package information

STN3NF06L

Table 8: SOT-223 package mechanical data

| Dim. | mm | | |
|------|------|------|------|
| | Min. | Typ. | Max. |
| A | | | 1.8 |
| A1 | 0.02 | | 0.1 |
| B | 0.6 | 0.7 | 0.85 |
| B1 | 2.9 | 3 | 3.15 |
| c | 0.24 | 0.26 | 0.35 |
| D | 6.3 | 6.5 | 6.7 |
| e | | 2.3 | |
| e1 | | 4.6 | |
| E | 3.3 | 3.5 | 3.7 |
| H | 6.7 | 7.0 | 7.3 |
| V | | | 10° |

Figure 20: SOT-223 recommended footprint (dimensions are in mm)



5 Revision history

Table 9: Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 21-Jun-2004 | 5 | Complete version. |
| 04-Oct-2006 | 6 | New template, no content change. |
| 01-Feb-2007 | 7 | Typo mistake on Table 2. |
| 12-Jun-2008 | 8 | Corrected marking on Table 1 |
| 03-Jul-2017 | 9 | Modified internal schematic diagram on cover page. Updated Section 4: "Package information" . Minor text changes. |

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