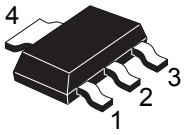
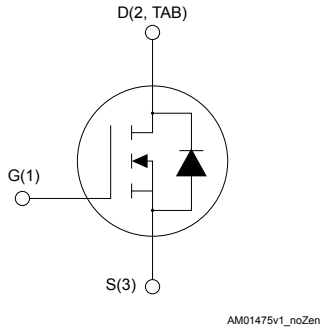
# N-channel 100 V, 230 mΩ typ., 2.4 A STripFET II Power MOSFET in a SOT-223 package




SOT-223




## Features

| Order code | $V_{DS}$ | $R_{DS(on)}$ max. | $I_D$ |
|---|---|---|---|
| STN2NF10 | 100 V | 260 mΩ | 2.4 A |

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

## Applications

- Switching application
- DC-DC converters

## Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

| Product status link |
|---|
| STN2NF10 |

| Product summary | |
|---|---|
| **Order code** | STN2NF10 |
| **Marking** | N2NF10 |
| **Package** | SOT-223 |
| **Packing** | Tape and reel |

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage | 100 | V |
| $V_{GS}$ | Gate-source voltage | ±20 | V |
| $I_D$ | Drain current (continuous) at $T_C$ = 25 °C | 2.4 | A |
| | Drain current (continuous) at $T_C$ = 100 °C | 1.5 | |
| $I_{DM}$(1) | Drain current (pulsed) | 17 | A |
| $P_{TOT}$ | Total power dissipation at $T_C$ = 25 °C | 3.3 | W |
| dv/dt(2) | Peak diode recovery voltage slope | 30 | V/ns |
| $E_{AS}$(3) | Single-pulse avalanche energy | 200 | mJ |
| $T_{stg}$ | Storage temperature range | -55 to 150 | °C |
| $T_J$ | Operating junction temperature range | | °C |

1. *Pulse width limited by safe operating area.*
2. *$I_{SD}$ ≤ 2.4 A, di/dt ≤ 500 A/µs, $V_{DD}$ = 80 V.*
3. *$I_{AS}$ = 2.4 A, $V_{DD}$ = 30 V, $R_G$ = 4.7 Ω.*

**Table 2. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thJA}$(1) | Thermal resistance, junction-to-ambient | 38 | °C/W |

1. *When mounted on a standard 1 inch$^2$ area of FR-4 PCB with 2-oz copper.*

# 2 Electrical characteristics

$T_C$ = 25 °C unless otherwise specified.

**Table 3. On/off states**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 100 | | | V |
| $I_{DSS}$ | Zero gate voltage drain current | $V_{GS}$ = 0 V, $V_{DS}$ = 100 V | | | 1 | µA |
| | | $V_{GS}$ = 0 V, $V_{DS}$ = 100 V, $T_C$ = 125 °C(1) | | | 10 | |
| | | $V_{GS}$ = 0 V, $V_{DS}$ = 30 V, $T_C$=125 °C(1) | | | 1 | |
| $I_{GSS}$ | Gate-body leakage current | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2 | | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS}$ = 10 V, $I_D$ = 1.2 A | | 230 | 260 | mΩ |

1. *Specified by design, not tested in production.*

**Table 4. Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 25 V, f = 1 MHz, $V_{GS}$ = 0 V | - | 280 | | pF |
| $C_{oss}$ | Output capacitance | | - | 45 | | pF |
| $C_{rss}$ | Reverse transfer capacitance | | - | 20 | | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 80 V, $I_D$ = 2.4 A, $V_{GS}$ = 0 to 10 V (see Figure 13. Test circuit for gate charge behavior) | - | 10 | 14(1) | nC |
| $Q_{gs}$ | Gate-source charge | | - | 2.5 | | nC |
| $Q_{gd}$ | Gate-drain charge | | - | 4 | | nC |

1. *Specified by design, not tested in production.*

**Table 5. Switching times**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}$ = 50 V, $I_D$ = 2.4 A, $R_G$ = 4.7 Ω, $V_{GS}$ = 10 V (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform) | - | 6 | - | ns |
| $t_r$ | Rise time | | - | 10 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 20 | - | ns |
| $t_f$ | Fall time | | - | 3 | - | ns |

**Table 6. Source-drain diode**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$ | Source-drain current | | - | | 2.4 | A |
| $I_{SDM}$(1) | Source-drain current (pulsed) | | - | | 17 | A |
| $V_{SD}$(2) | Forward on voltage | $I_{SD}$ = 2.4 A, $V_{GS}$ = 0 V | - | | 1.2 | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 2.4 A, di/dt = 100 A/µs, | - | 70 | | ns |
| $Q_{rr}$ | Reverse recovery charge | $V_{DD}$ = 10 V, $T_J$ = 150 °C | - | 175 | | nC |
| $I_{RRM}$ | Reverse recovery current | (see Figure 14. Test circuit for inductive load switching and diode recovery times) | - | 5 | | A |

1. *Pulse width limited by safe operating area.*
2. *Pulsed: pulse duration = 300 µs, duty cycle 1.5%.*

## 2.1 Electrical characteristics (curves)

**Figure 1. Safe operating area**

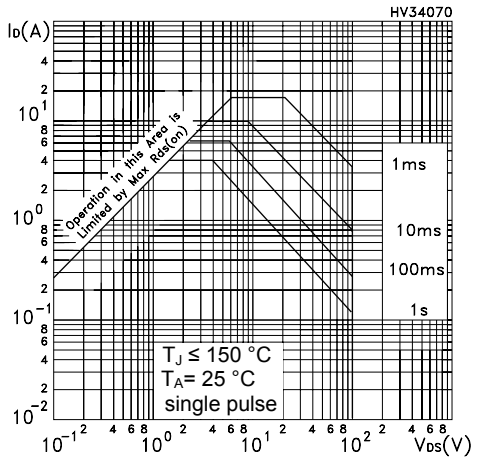



**Figure 2. Thermal impedance**

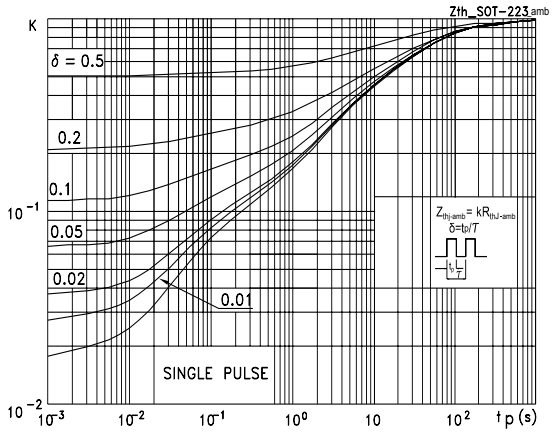



**Figure 3. Output characteristics**

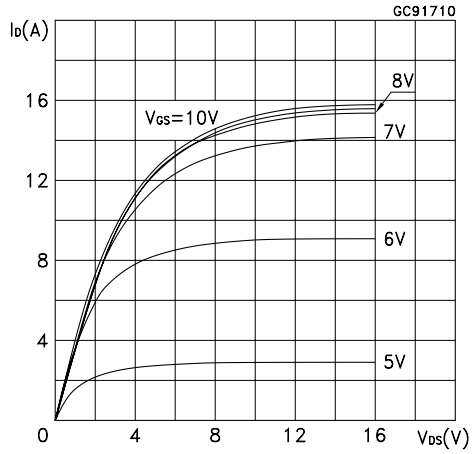



**Figure 4. Transfer characteristics**

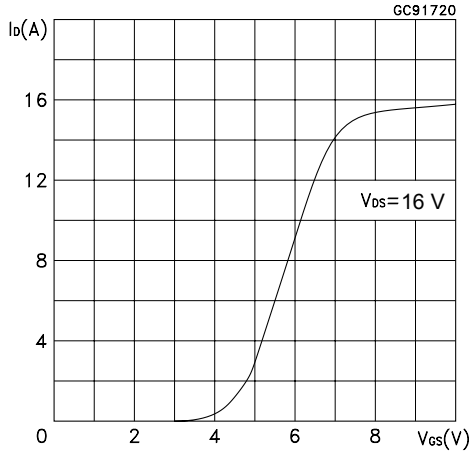



**Figure 5. Static drain-source on-resistance**

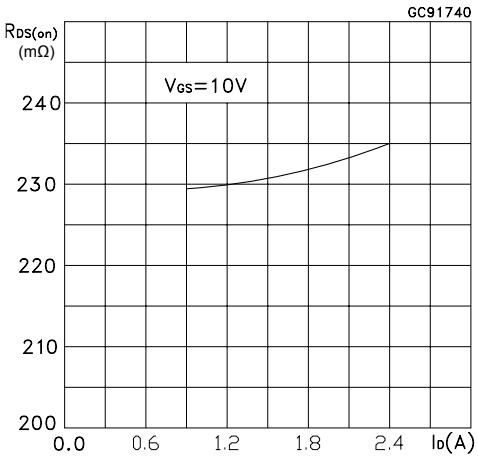



**Figure 6. Gate charge vs gate-source voltage**

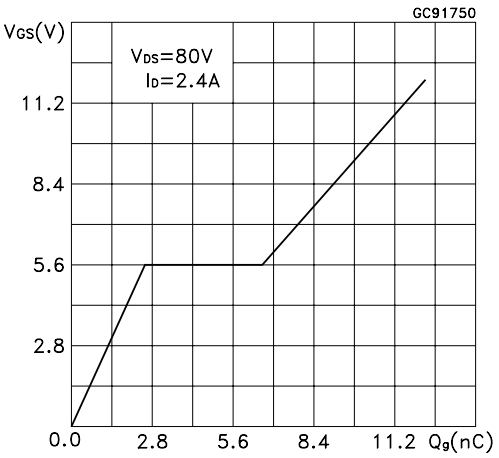


**Figure 7. Capacitance variations**

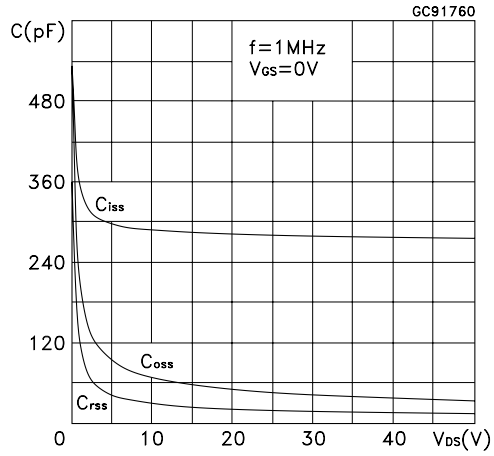



**Figure 8. Normalized gate threshold voltage vs temperature**

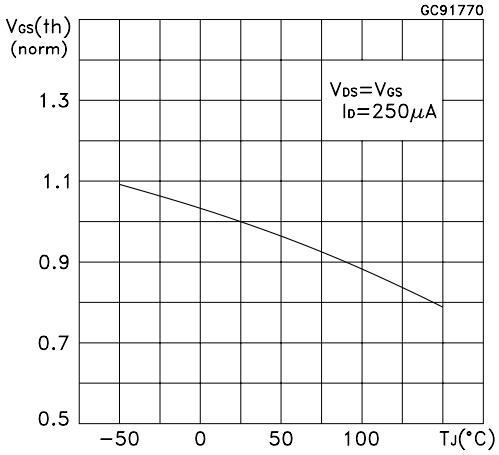



**Figure 9. Normalized on-resistance vs temperature**

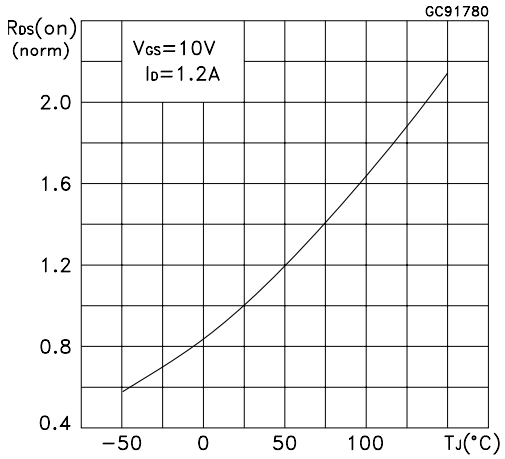



**Figure 10. Typical reverse diode forward characteristics**

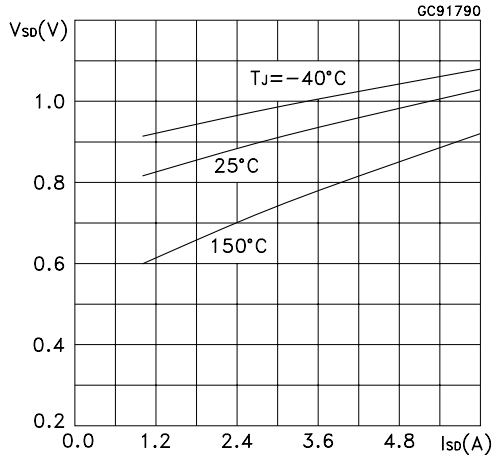
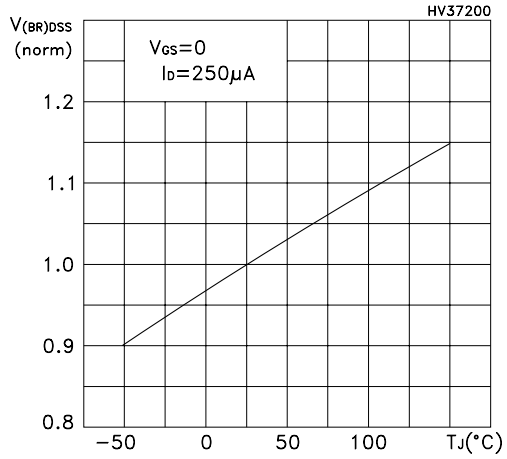



**Figure 11. Normalized $V_{(BR)DSS}$ vs temperature**



# 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**

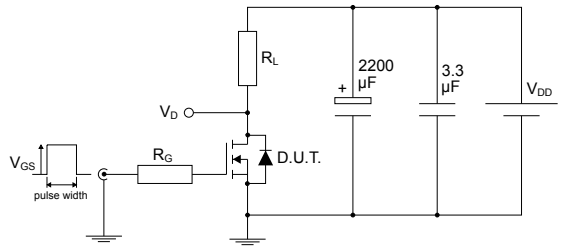



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**Figure 13. Test circuit for gate charge behavior**

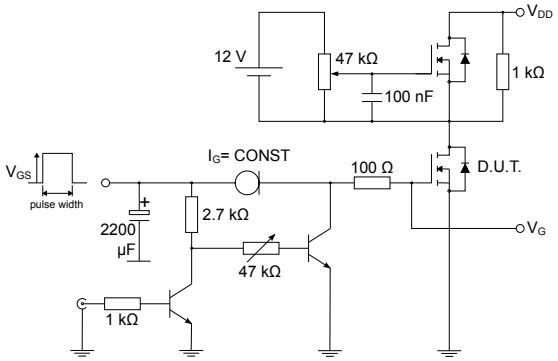


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**Figure 14. Test circuit for inductive load switching and diode recovery times**

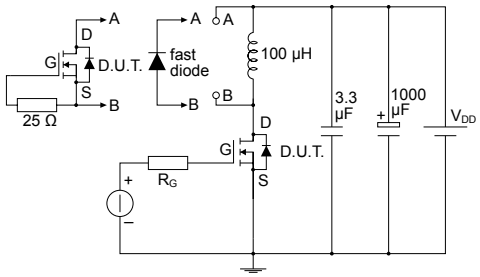


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**Figure 15. Unclamped inductive load test circuit**

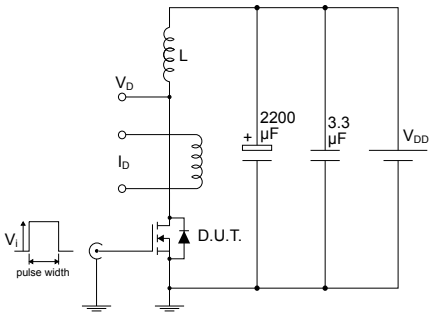


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**Figure 16. Unclamped inductive waveform**

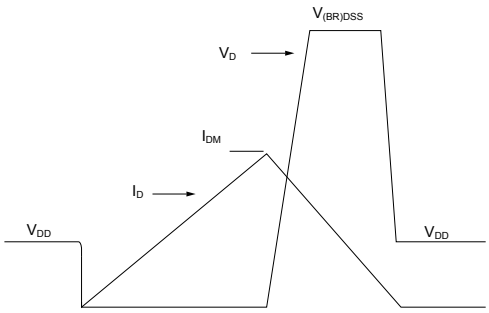


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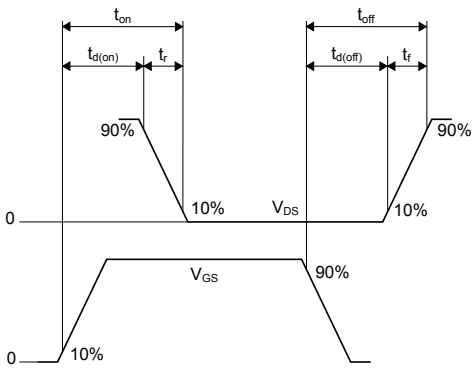
**Figure 17. Switching time waveform**




AM01473v1

# 4 Package information

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 18. **SOT-223 package outline**

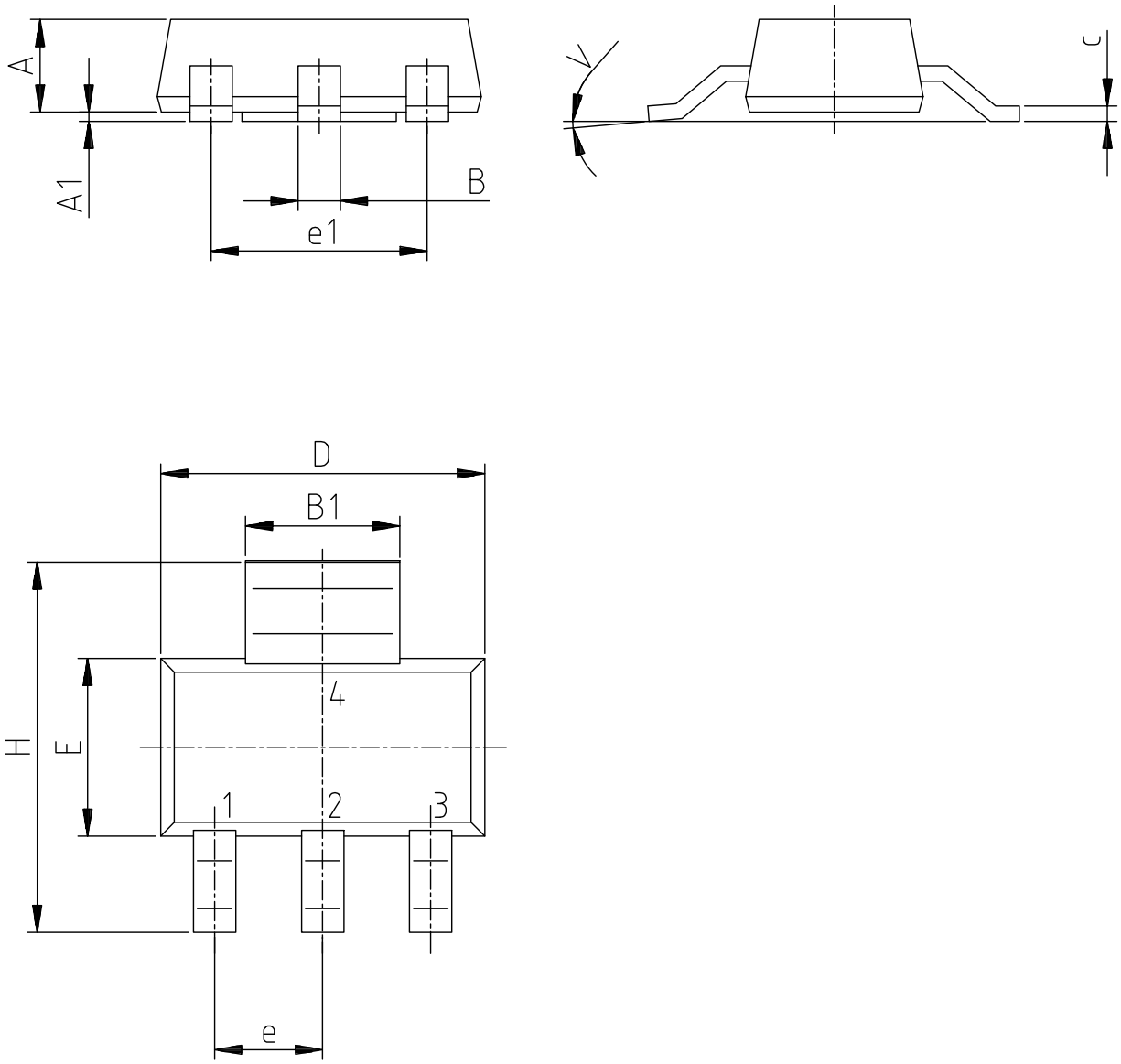
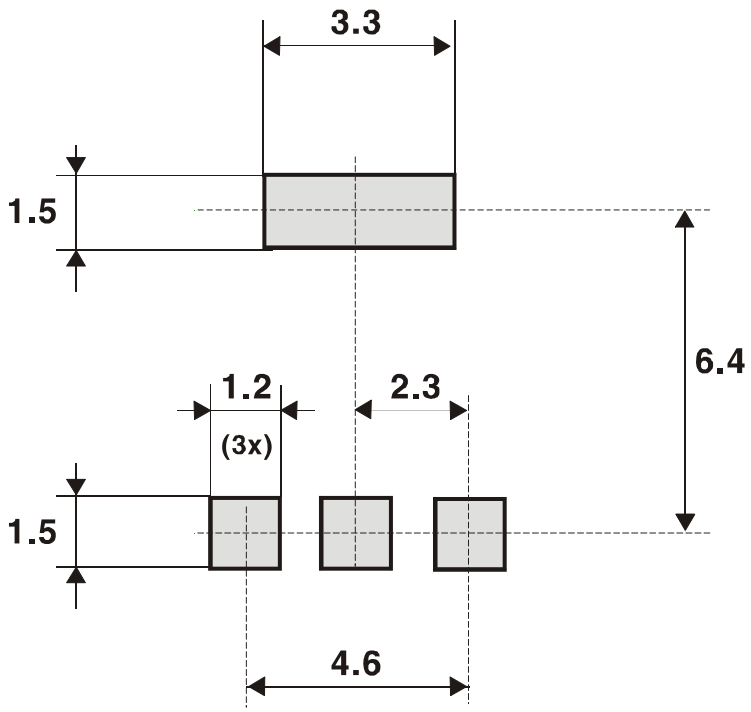


Table 7. **SOT-223 package mechanical data**

| Dim. | mm | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | | | 1.8 |
| 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 | 7.3 |
| V | | | 10 deg |
| A1 | 0.02 | | 0.1 |

Figure 19. **SOT-223 recommended footprint (dimensions are in mm)**



## 4.2 SOT-223 packing information

Figure 20. **SOT-223 tape outline**

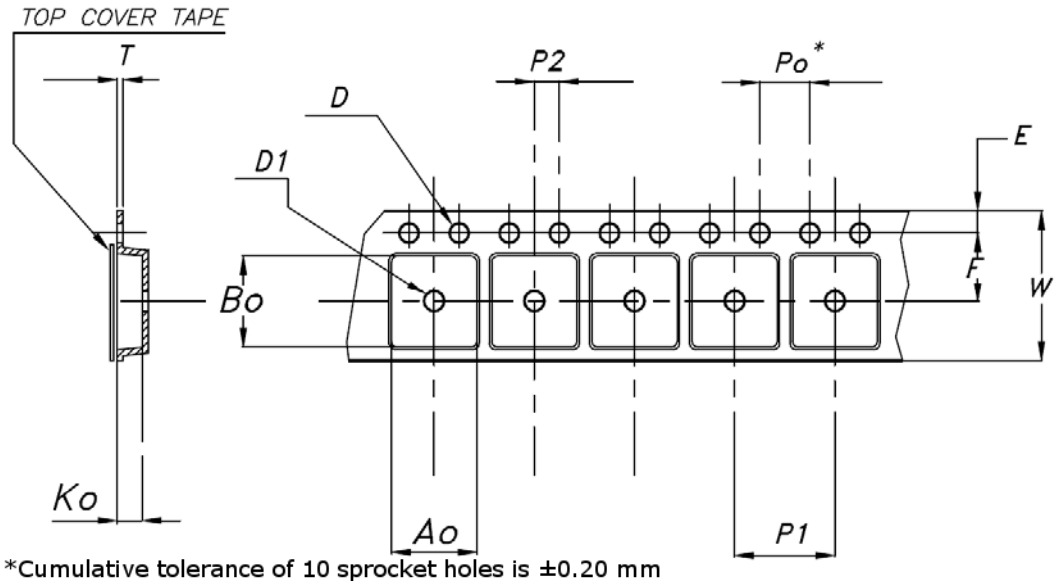



Figure 21. **SOT-223 reel outline**

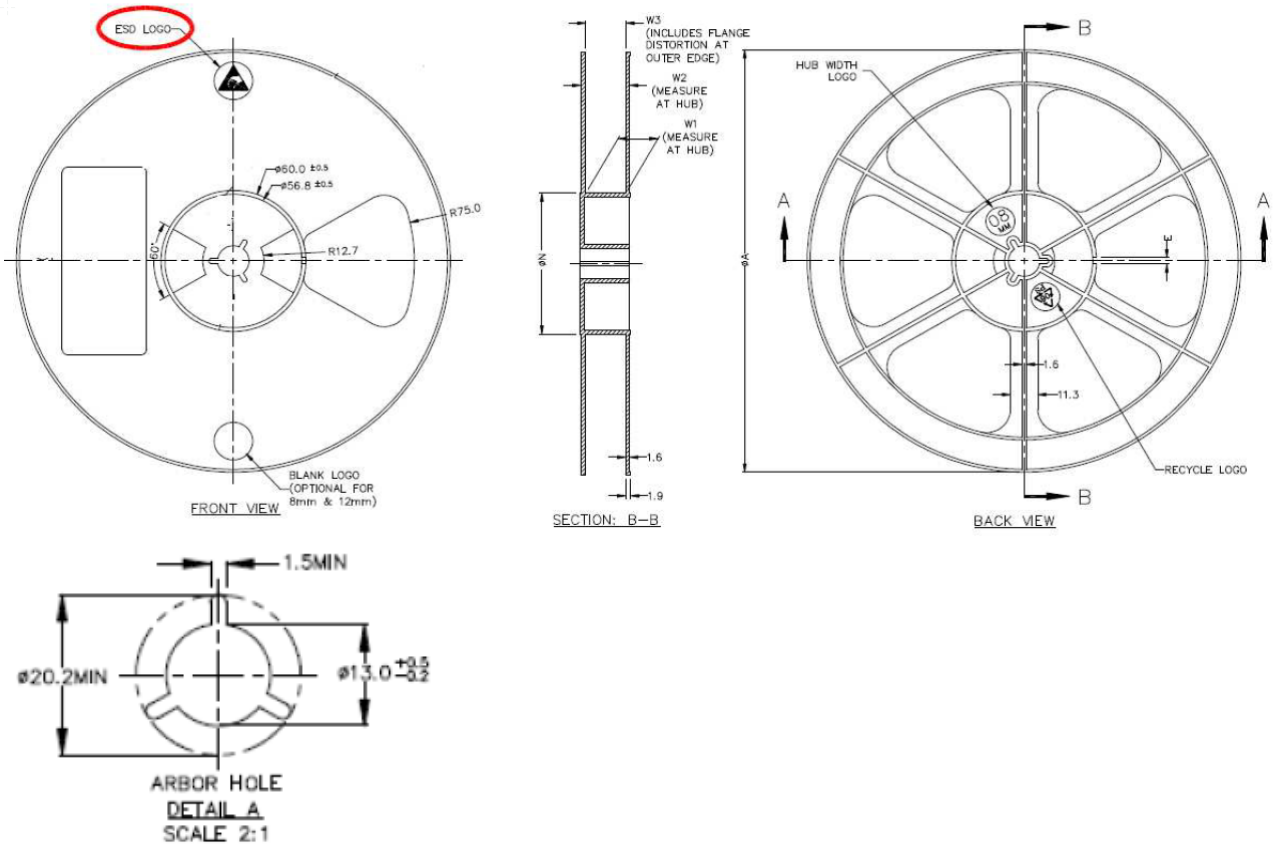


Table 8. **SOT-223 tape and reel mechanical data**

| Tape | | | | Tape | | |
|---|---|---|---|---|---|---|
| Dim. | mm | | | Dim. | mm | |
| | Min. | Typ. | Max. | | Min. | Max. |
| A0 | 6.75 | 6.85 | 6.95 | A | | 180 |
| B0 | 7.30 | 7.40 | 7.50 | N | 60 | |
| K0 | 1.80 | 1.90 | 2.00 | W1 | | 12.4 |
| F | 5.40 | 5.50 | 5.60 | W2 | | 18.4 |
| E | 1.65 | 1.75 | 1.85 | W3 | 11.9 | 15.4 |
| W | 11.7 | 12.0 | 12.3 | | | |
| P2 | 1.90 | 2.00 | 2.10 | Base quantity pcs | | 1000 |
| P0 | 3.90 | 4.00 | 4.10 | Bulk quantity pcs | | 1000 |
| P1 | 7.90 | 8.00 | 8.10 | | | |
| T | 0.25 | 0.30 | 0.35 | | | |
| DΦ | 1.50 | 1.55 | 1.60 | | | |
| D1Φ | 1.50 | 1.60 | 1.70 | | | |

## Revision history

Table 9. **Document revision history**

| Date | Version | Changes |
|---|---|---|
| 14-Sep-2006 | 4 | The document has been reformatted |
| 29-Mar-2007 | 5 | *Figure 1* has been updated |
| 04-Apr-2007 | 6 | New test condition for $I_{DSS}$ on *Table 3* |
| 10-Jun-2026 | 7 | Updated Section 2.1: Electrical characteristics (curves) and Section 4: Package information.<br>Minor text changes. |

# Contents

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