

Automotive-grade N-channel 60 V, 21 mΩ typ., 8 A STripFET™ F6 Power MOSFET in an SO-8 package

Datasheet - production data

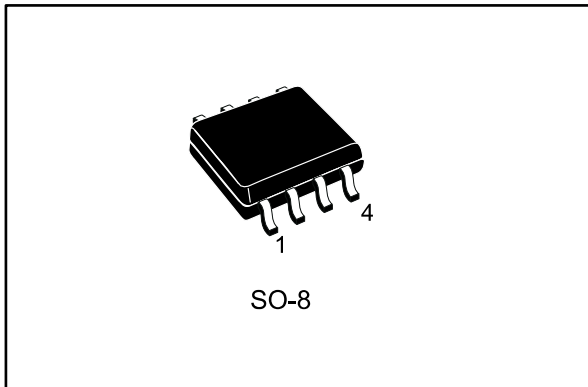
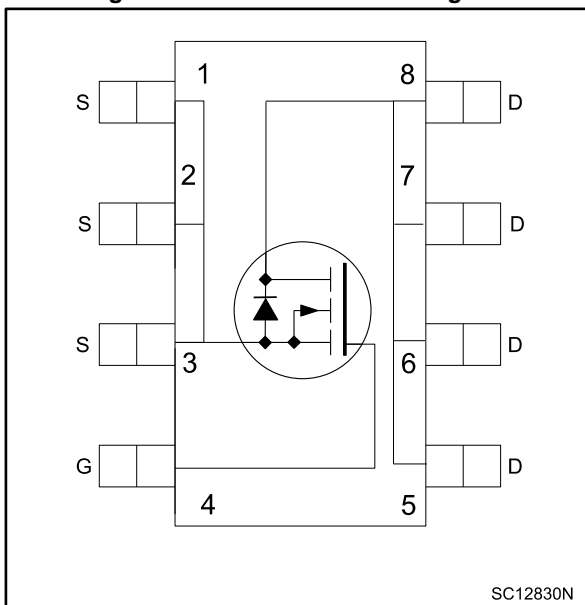


Figure 1: Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D | P _{TOT} |
|-------------|-----------------|--------------------------|----------------|------------------|
| STS8N6LF6AG | 60 V | 24 mΩ | 8 A | 3.2 W |

- AEC-Q101 qualified
- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss
- Logic level



Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low R_{DS(on)} in all packages.

Table 1: Device summary

| Order code | Marking | Package | Packing |
|-------------|---------|---------|---------------|
| STS8N6LF6AG | 8N6LF6 | SO-8 | Tape and reel |

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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 | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_{amb} = 25\text{ }^\circ\text{C}$ | 8 | A |
| | Drain current (continuous) at $T_{amb} = 100\text{ }^\circ\text{C}$ | 5.8 | |
| $I_{DM}^{(2)}$ | Drain current (pulsed) | 32 | A |
| P_{TOT} | Total dissipation at $T_{amb} = 25\text{ }^\circ\text{C}$ | 3.2 | W |
| T_{stg} | Storage temperature range | -55 to 175 | $^\circ\text{C}$ |
| T_j | Operating junction temperature range | | |

Notes:

⁽¹⁾When mounted on a 1-inch² FR-4, 2 Oz copper board, $t < 10\text{ s}$.

⁽²⁾Pulse width is limited by safe operating area

Table 3: Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|-------------------------------------|-------|---------------------------|
| $R_{thj-amb}^{(1)}$ | Thermal resistance junction-ambient | 47 | $^\circ\text{C}/\text{W}$ |

Notes:

⁽¹⁾When mounted on a 1-inch² FR-4, 2 Oz copper board, $t < 10\text{ s}$.

Table 4: Avalanche characteristics

| Symbol | Parameter | Value | Unit |
|----------------|-----------------------------------|-------|------|
| I_{AV} | Avalanche current, not repetitive | 6 | A |
| $E_{AS}^{(1)}$ | Single pulse avalanche energy | 72 | mJ |

Notes:

⁽¹⁾Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 43.5\text{ V}$.

2 Electrical characteristics

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

Table 5: Static

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------------------------------|---|------|------|-----------|---------------|
| $V_{(\text{BR})\text{DSS}}$ | Drain-source breakdown voltage | $V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$ | 60 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 60\text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate-body leakage current | $V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$ | | | ± 100 | nA |
| $V_{\text{GS(th)}}$ | Gate threshold voltage | $V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$ | 1 | | 2.5 | V |
| $R_{\text{DS(on)}}$ | Static drain-source on-resistance | $V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 4\text{ A}$ | | 21 | 24 | m Ω |
| | | $V_{\text{GS}} = 4.5\text{ V}$, $I_{\text{D}} = 4\text{ A}$ | | 22 | 26 | |

Table 6: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | $V_{\text{DS}} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$ | - | 1340 | - | pF |
| C_{oss} | Output capacitance | | - | 90 | - | |
| C_{rss} | Reverse transfer capacitance | | - | 60 | - | |
| Q_{g} | Total gate charge | $V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 8\text{ A}$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior") | - | 27 | - | nC |
| Q_{gs} | Gate-source charge | | - | 4.6 | - | |
| Q_{gd} | Gate-drain charge | | - | 4.3 | - | |

Table 7: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------|---------------------|---|------|------|------|------|
| $t_{\text{d(on)}}$ | Turn-on delay time | $V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 4\text{ A}$, $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform") | - | 9.6 | - | ns |
| t_{r} | Rise time | | - | 20 | - | |
| $t_{\text{d(off)}}$ | Turn-off delay time | | - | 56 | - | |
| t_{f} | Fall time | | - | 7 | - | |

Table 8: Source-drain diode

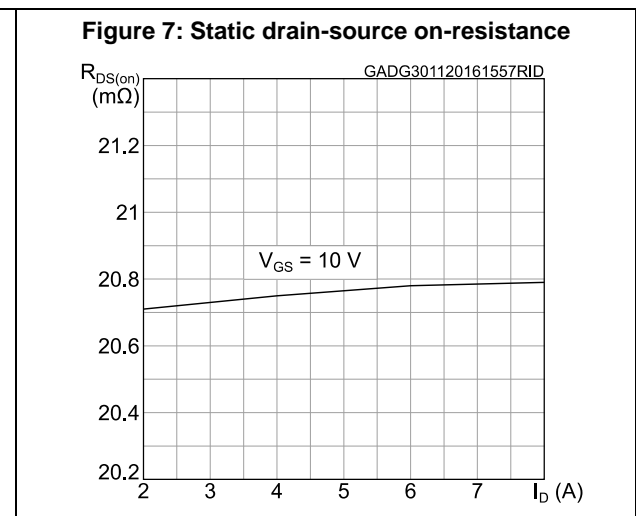
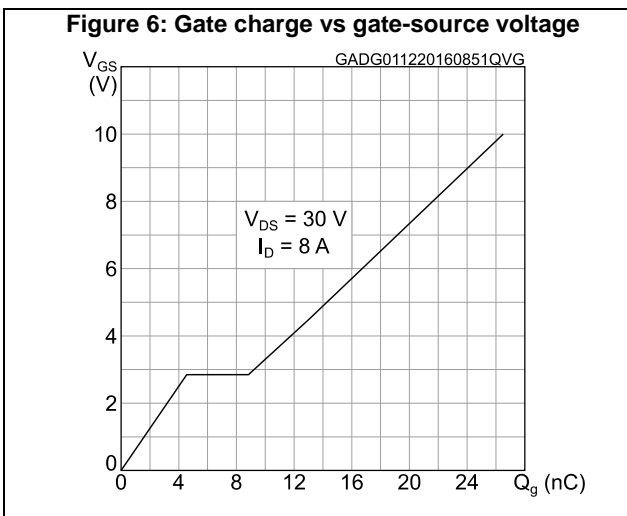
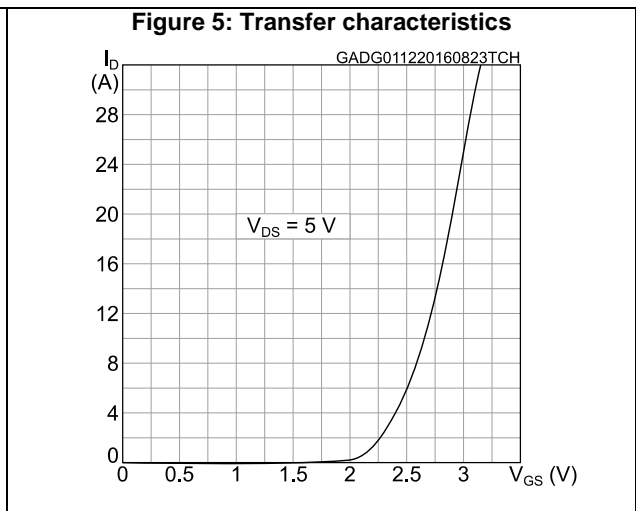
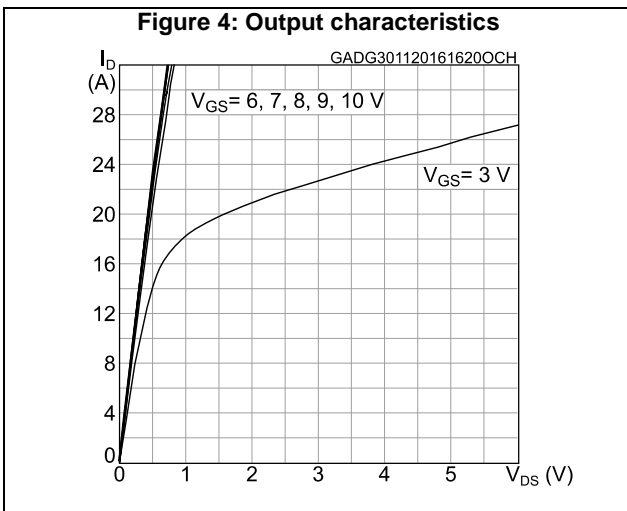
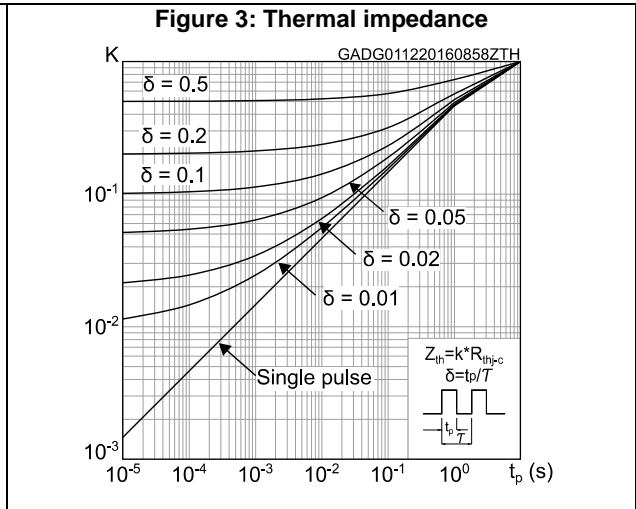
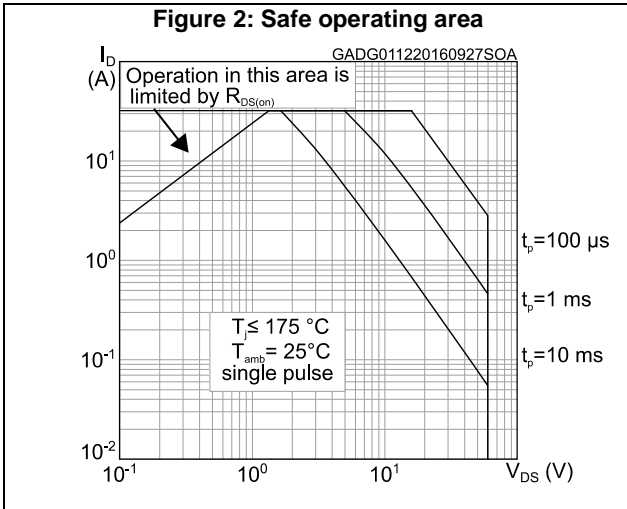
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain current | | - | | 8 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 32 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $V_{GS} = 0\text{ V}$, $I_{SD} = 8\text{ A}$ | - | | 1.3 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 48\text{ V}$, $T_j = 25\text{ °C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times") | - | 22.5 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 22.2 | | nC |
| I_{RRM} | Reverse recovery current | | - | 2.0 | | A |

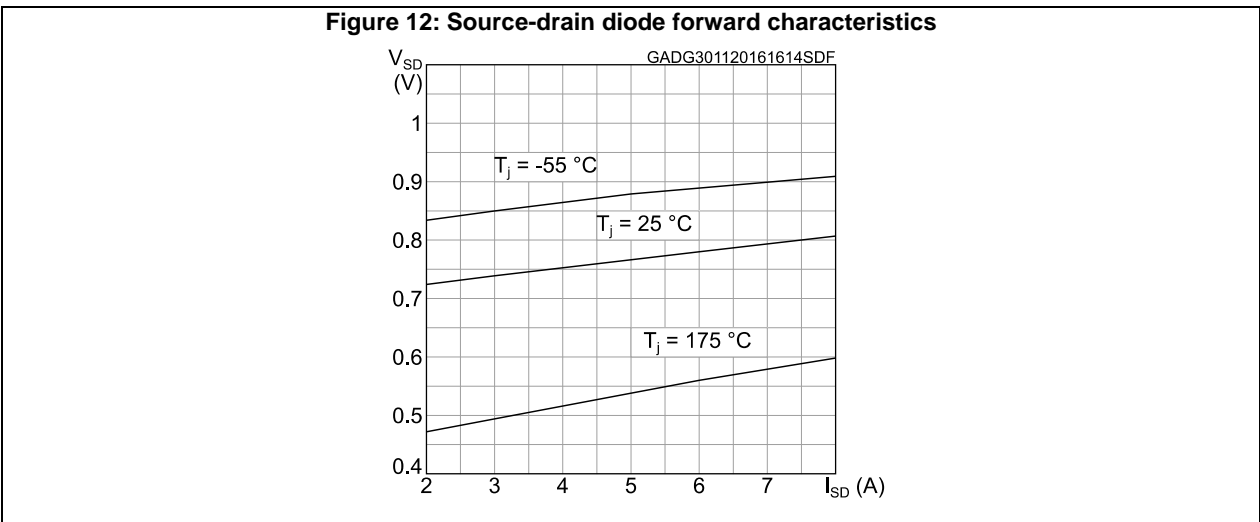
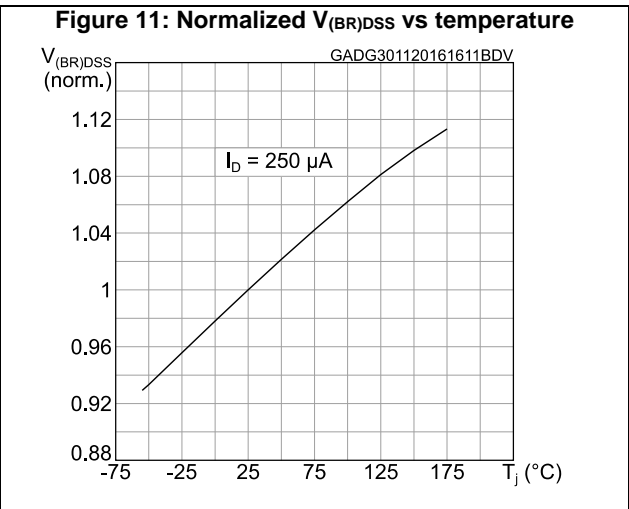
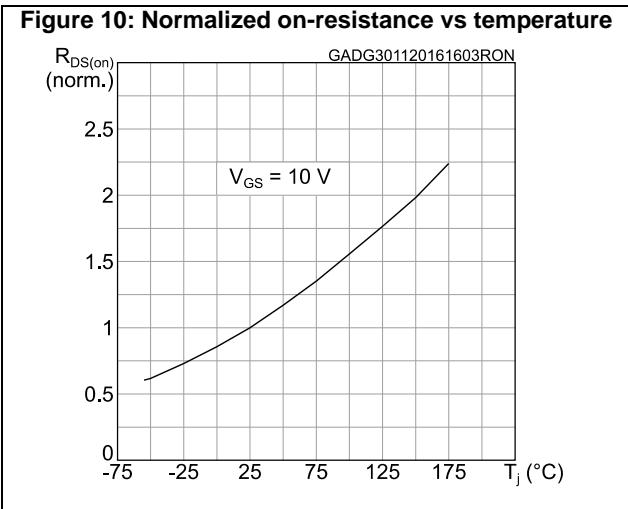
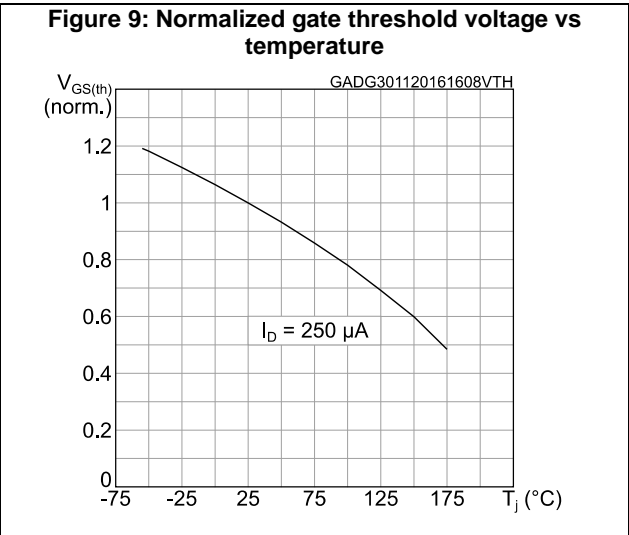
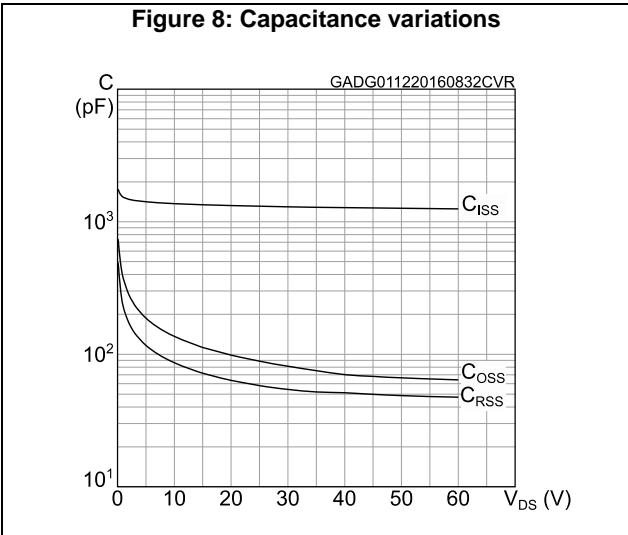
Notes:

(1)Pulse width is limited by safe operating area.

(2)Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

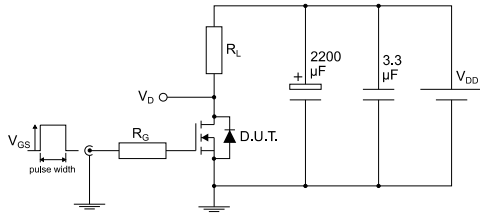
2.1 Electrical characteristics (curves)





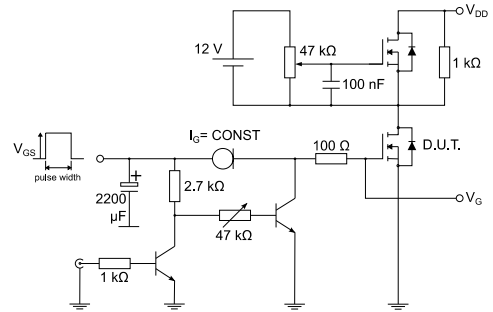
3 Test circuits

Figure 13: Test circuit for resistive load switching times



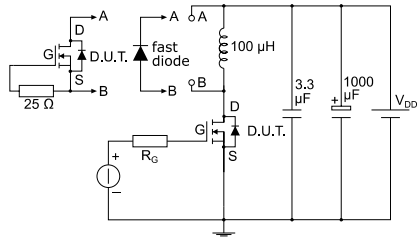
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Figure 14: Test circuit for gate charge behavior



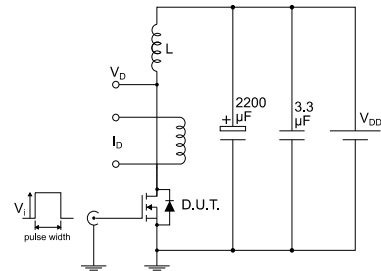
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Figure 15: Test circuit for inductive load switching and diode recovery times



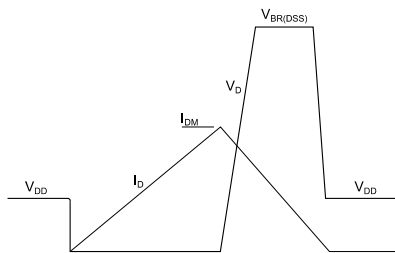
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Figure 16: Unclamped inductive load test circuit



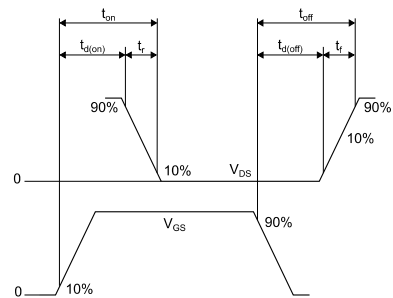
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Figure 17: Unclamped inductive waveform



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 SO-8 package information

Figure 19: SO-8 package outline

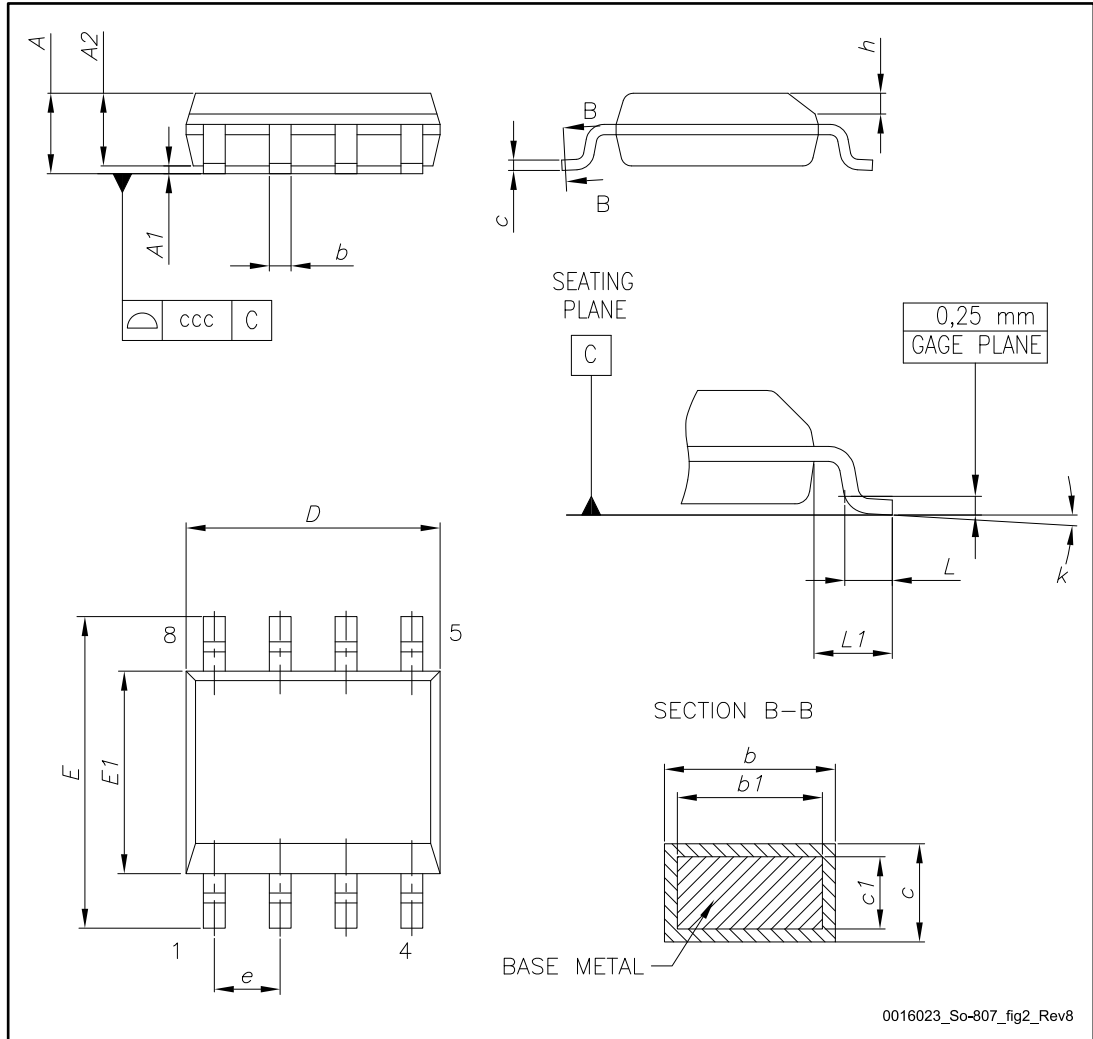
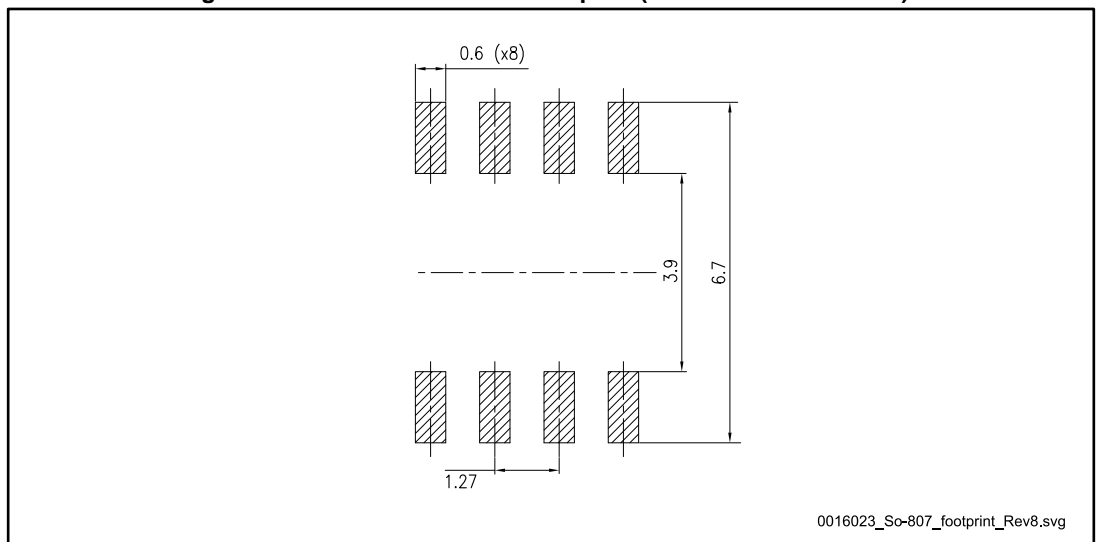


Table 9: SO-8 mechanical data

| Dim. | mm | | |
|------|------|------|------|
| | Min. | Typ. | Max. |
| A | | | 1.75 |
| A1 | 0.10 | | 0.25 |
| A2 | 1.25 | | |
| b | 0.31 | | 0.51 |
| b1 | 0.28 | | 0.48 |
| c | 0.10 | | 0.25 |
| c1 | 0.10 | | 0.23 |
| D | 4.80 | 4.90 | 5.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | | 1.27 | |
| h | 0.25 | | 0.50 |
| L | 0.40 | | 1.27 |
| L1 | | 1.04 | |
| L2 | | 0.25 | |
| k | 0° | | 8° |
| ccc | | | 0.10 |

Figure 20: SO-8 recommended footprint (dimensions are in mm)



4.2 SO-8 packing information

Figure 21: SO-8 tape and reel dimensions

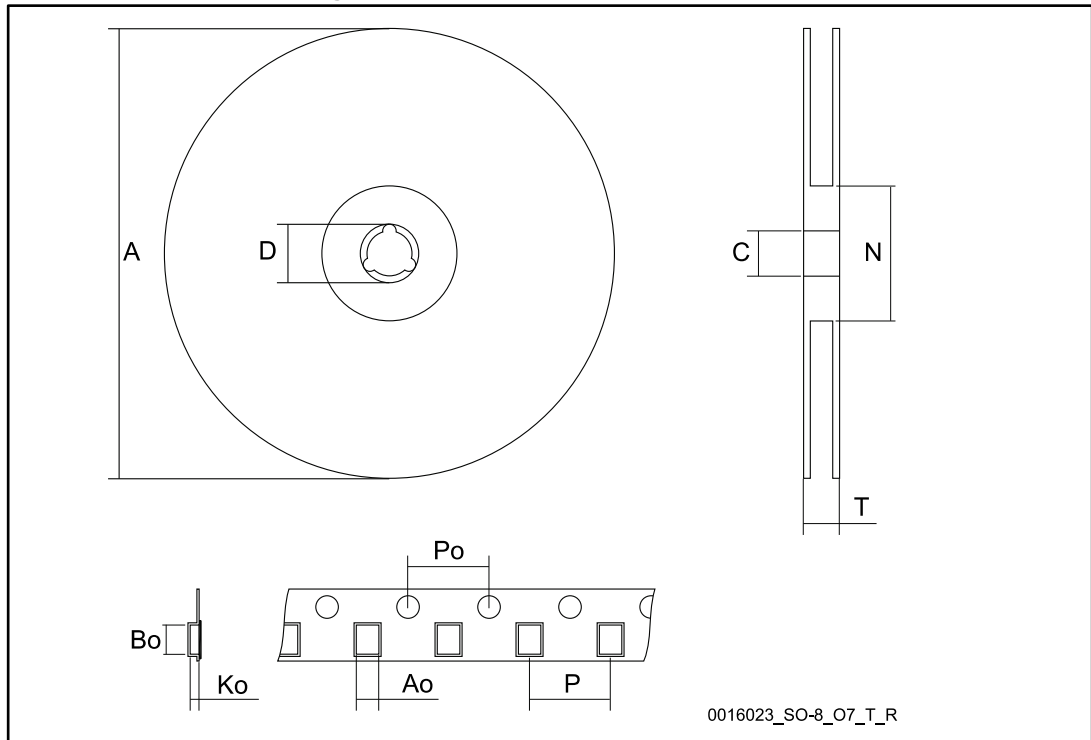


Table 10: SO-8 tape and reel mechanical data

| Dim. | mm | | |
|------|------|------|------|
| | Min. | Typ. | Max. |
| A | | | 330 |
| C | 12.8 | | 13.2 |
| D | 20.2 | | |
| N | 60 | | |
| T | | | 22.4 |
| Ao | 8.1 | - | 8.5 |
| Bo | 5.5 | | 5.9 |
| Ko | 2.1 | | 2.3 |
| Po | 3.9 | | 4.1 |
| P | 7.9 | | 8.1 |

5 Revision history

Table 11: Document revision history

| Date | Revision | Changes |
|-------------|----------|---------------|
| 24-Jan-2017 | 1 | First release |

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