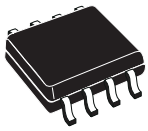
# STS10N3LH5

## N-channel 30 V, 0.019 Ω, 10 A, SO-8 STripFET™ V Power MOSFET

## Features

| Type | $V_{DSS}$ | $R_{DS(on)}$ max | $I_D$ |
|---|---|---|---|
| STS10N3LH5 | 30 V | 0.021 Ω | 10 A |

- $R_{DS(on)}$ * $Q_g$ industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- Very low switching gate charge
- High avalanche ruggedness
- Low gate drive power losses



SO-8

## Application

- Switching applications

## Description

This STripFET™V Power MOSFET technology is among the latest improvements, which have been especially tailored to achieve very low on-state resistance providing also one of the best-in-class FOM.

**Figure 1. Internal schematic diagram**

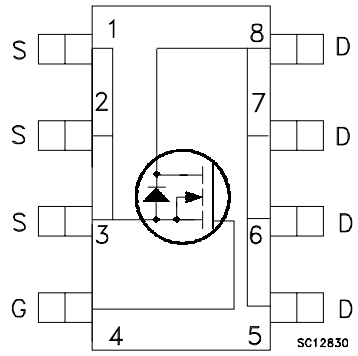



**Table 1. Device summary**

| Order codes | Marking | Package | Packaging |
|---|---|---|---|
| STS10N3LH5 | 10D3L | SO-8 | Tape and reel |

# Contents

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage ($V_{GS}$ = 0) | 30 | V |
| $V_{GS}$ | Gate-Source voltage | ± 22 | V |
| $I_D$ (1) | Drain current (continuous) at $T_C$ = 25 °C | 10 | A |
| $I_D$ | Drain current (continuous) at $T_C$ = 100 °C | 7 | A |
| $I_{DM}$ (2) | Drain current (pulsed) | 40 | A |
| $P_{TOT}$ | Total dissipation at $T_C$ = 25 °C | 2.5 | W |
| | Derating factor | 0.02 | W/°C |
| $E_{AS}$ (3) | Single pulse avalanche energy | 50 | mJ |
| $T_J$<br>$T_{stg}$ | Operating junction temperature<br>Storage temperature | - 55 to 150 | °C |

1. Limited by wire bonding
2. Pulse width limited by safe operating area
3. Starting $T_J$ = 25 °C, $I_D$ = 21 A, L= 0.2 mH

**Table 3. Thermal resistance**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thJC}$ | Thermal resistance junction-case max | 50 | °C/W |
| $R_{thJA}$ | Thermal resistance junction-case max | 100 | °C/W |
| $T_J$ | Maximum lead temperature for soldering purpose | 275 | °C |

# 2 Electrical characteristics

($T_{CASE}$ = 25 °C unless otherwise specified)

**Table 4. Static**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source breakdown Voltage | $I_D$ = 250 µA, $V_{GS}$= 0 | 30 | | | V |
| $I_{DSS}$ | Zero gate voltage drain current ($V_{GS}$ = 0) | $V_{DS}$ = 30 V<br>$V_{DS}$ = 30 V, Tc = 125 °C | | | 1<br>10 | µA<br>µA |
| $I_{GSS}$ | Gate body leakage current ($V_{DS}$ = 0) | $V_{GS}$ = ± 22 V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 1 | | | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS}$ = 10 V, $I_D$= 5 A | | 0.019 | 0.021 | Ω |
| | | $V_{GS}$ = 4.5 V, $I_D$= 5 A | | 0.023 | 0.028 | Ω |

**Table 5. Dynamic**

| Symbol | Parameter | Test conditions | Min | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$<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 | - | 475<br>97<br>19 | - | pF<br>pF<br>pF |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total gate charge<br>Gate-source charge<br>Gate-drain charge | $V_{DD}$ = 15 V, $I_D$ = 10 A<br>$V_{GS}$ = 5 V<br>*(Figure 14)* | - | 4.6<br>1.7<br>1.9 | - | nC<br>nC<br>nC |
| $Q_{gs1}$<br>$Q_{gs2}$ | Pre $V_{th}$ gate-to-source charge<br>Post $V_{th}$ gate-to-source charge | $V_{DD}$ = 15 V, $I_D$ = 10A<br>$V_{GS}$ = 5 V<br>*(Figure 19)* | - | 0.67<br>0.84 | - | nC<br>nC |
| $R_G$ | Gate input resistance | f = 1 MHz gate bias<br>Bias = 0 test signal level = 20 mV<br>open drain | - | 2.5 | - | Ω |

**Table 6. Switching on/off (resistive load)**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$<br>$t_r$ | Turn-on delay time<br>Rise time | $V_{DD}$ = 15 V, $I_D$ = 5 A,<br>$R_G$ = 4.7 Ω, $V_{GS}$ = 10 V<br>*(Figure 13 and Figure 18)* | - | 4<br>22 | - | ns<br>ns |
| $t_{d(off)}$<br>$t_f$ | Turn-off delay time<br>Fall time | $V_{DD}$ = 15 V, $I_D$ = 5 A,<br>$R_G$ = 4.7 Ω, $V_{GS}$ = 10 V<br>*(Figure 13 and Figure 18)* | - | 13<br>2.8 | - | ns<br>ns |

**Table 7. Source drain diode**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ (1) | Source-drain current<br>Source-drain current (pulsed) | | - | | 10<br>40 | A<br>A |
| $V_{SD}$ | Forward on voltage | $I_{SD}$ = 5 A, $V_{GS}$ = 0 | - | | 1.1 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse recovery time<br>Reverse recovery charge<br>Reverse recovery current | $I_{SD}$ = 10 A, $V_{DD}$ = 25 V<br>di/dt = 100 A/µs,<br>*(Figure 15)* | - | 16.2<br>7.8<br>1 | | ns<br>nC<br>A |

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

## 2.1 Electrical characteristics (curves)

**Figure 2. Safe operating area**

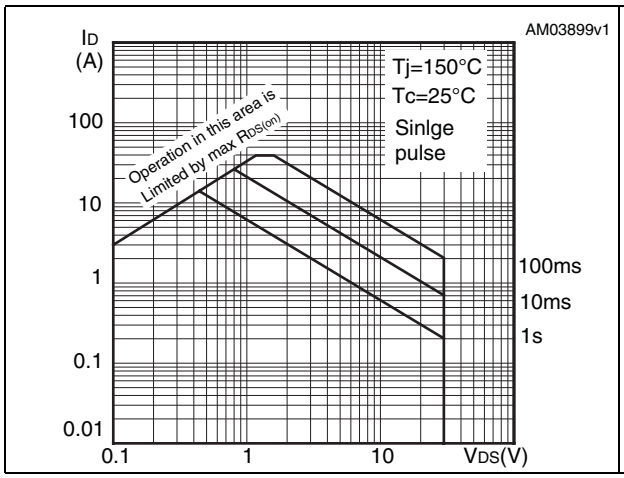



**Figure 3. Thermal impedance**

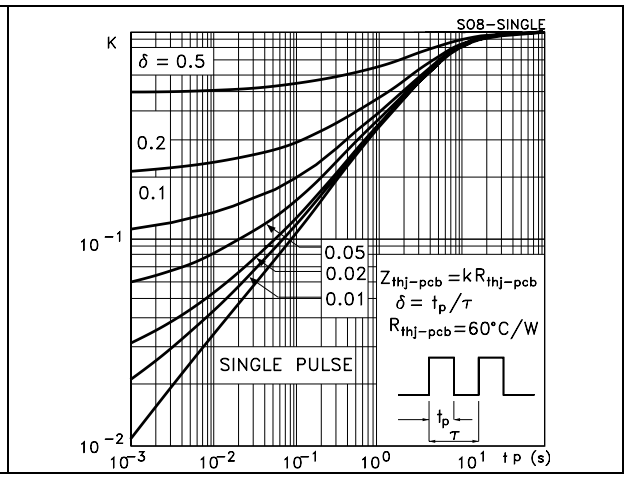



**Figure 4. Output characteristics**

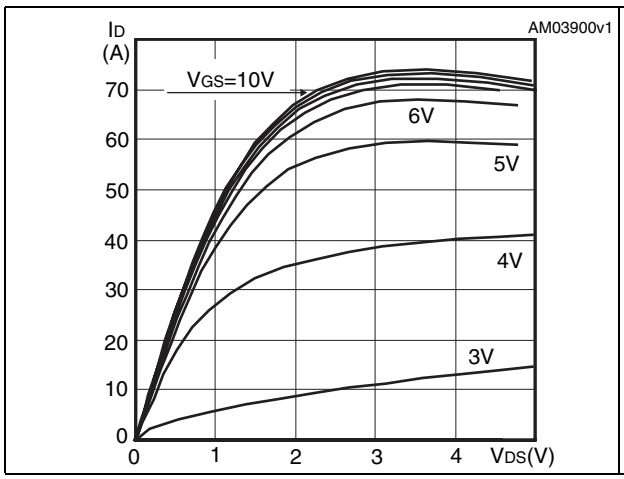



**Figure 5. Transfer characteristics**

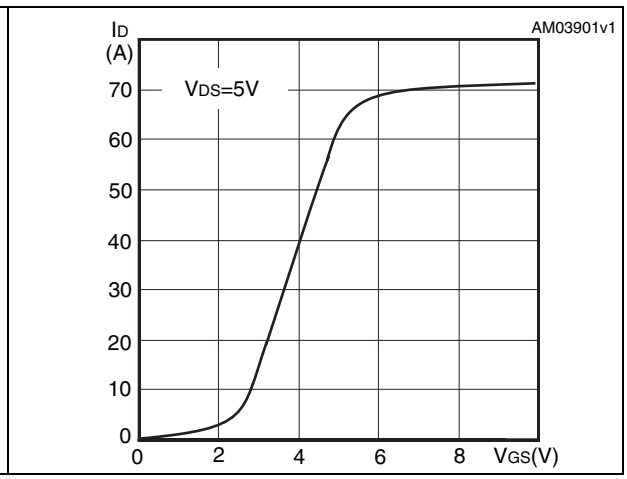



**Figure 6. Normalized $BV_{DSS}$ vs temperature**

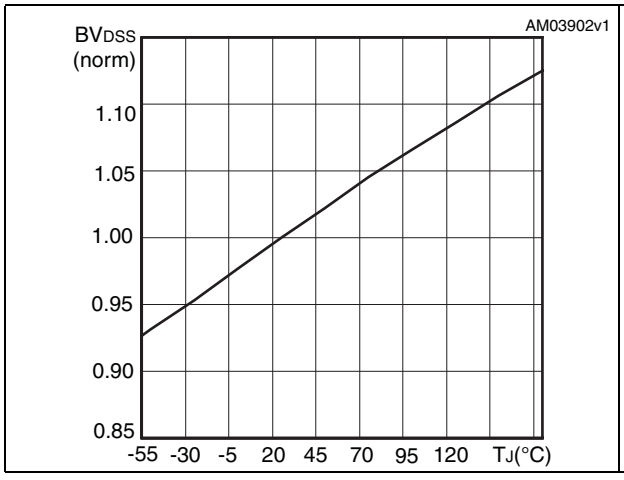



**Figure 7. Static drain-source on resistance**

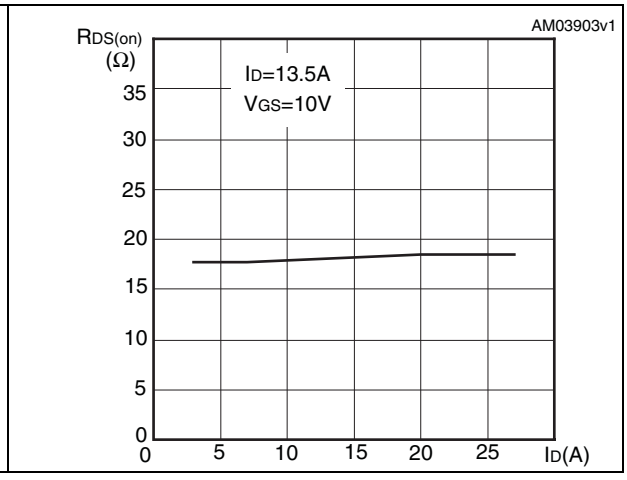


**Figure 8. Gate charge vs gate-source voltage**

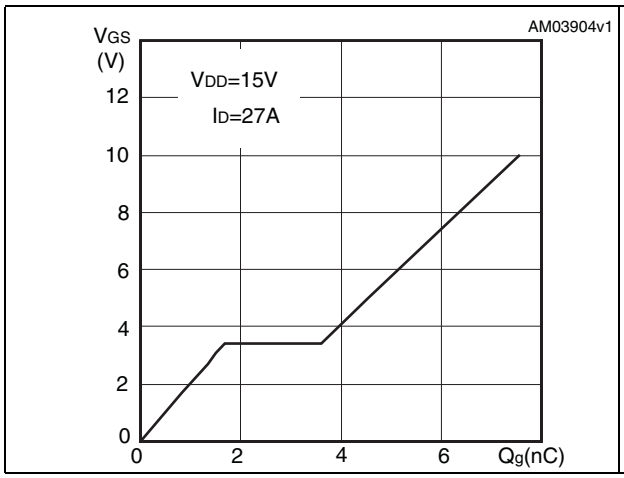



**Figure 9. Capacitance variations**

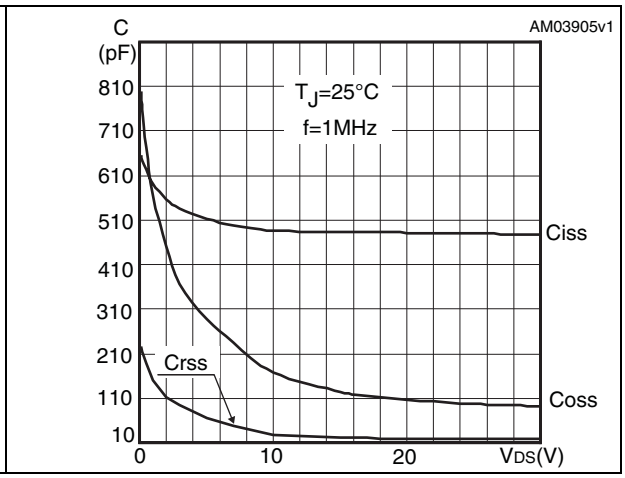



**Figure 10. Normalized gate threshold voltage vs temperature**

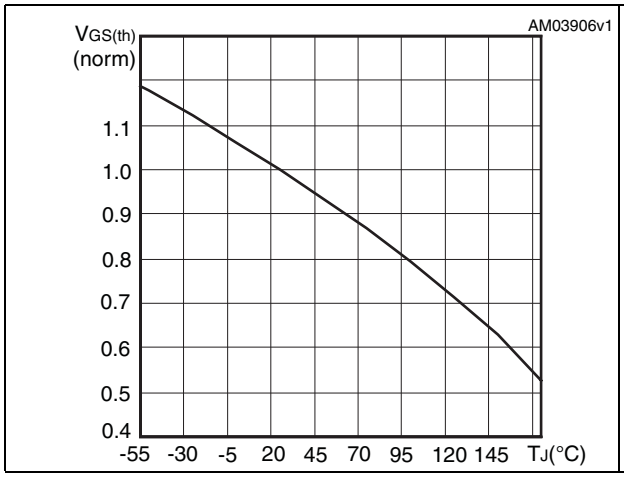



**Figure 11. Normalized on resistance vs temperature**

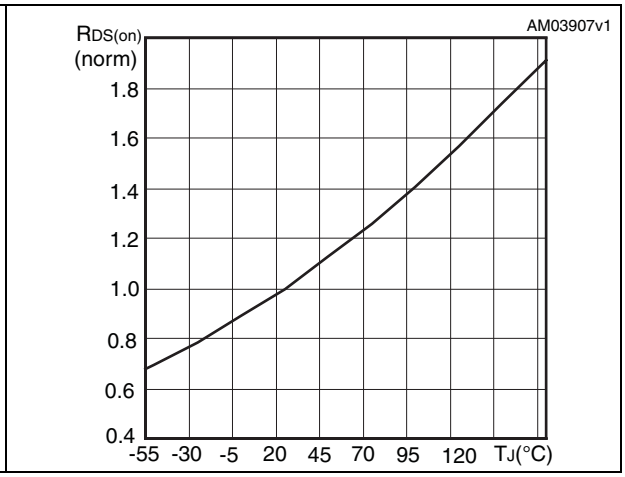
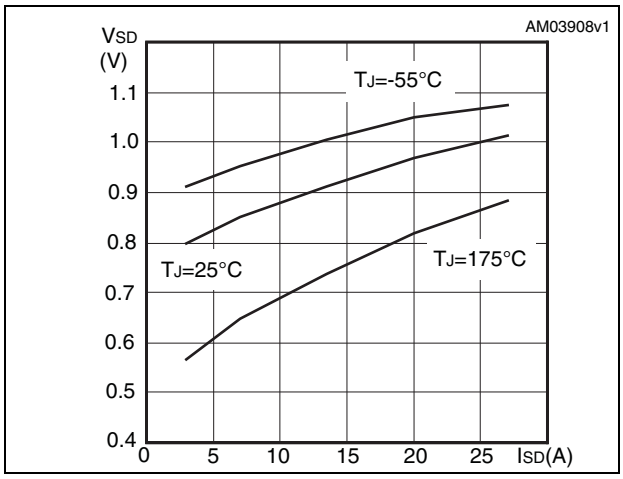



**Figure 12. Source-drain diode forward characteristics**



# 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**

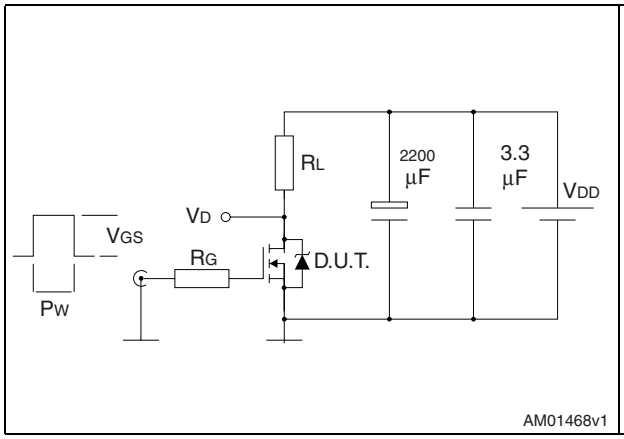



**Figure 14. Gate charge test circuit**

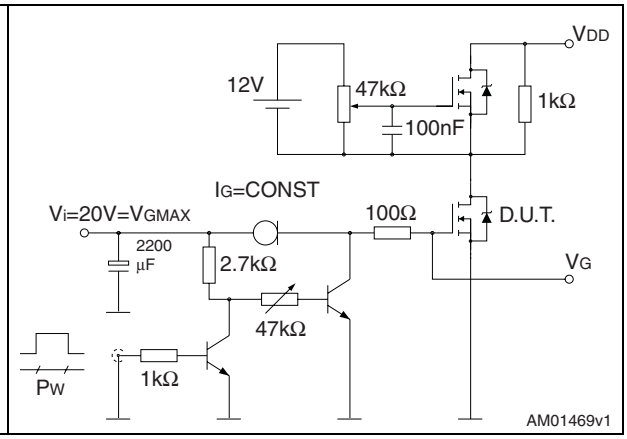



**Figure 15. Test circuit for inductive load switching and diode recovery times**

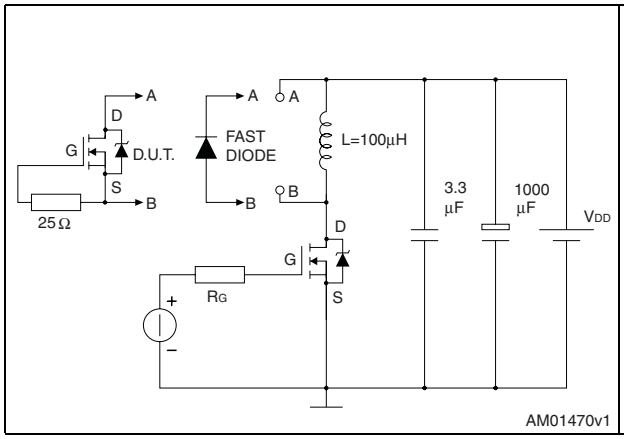



**Figure 16. Unclamped inductive load test circuit**

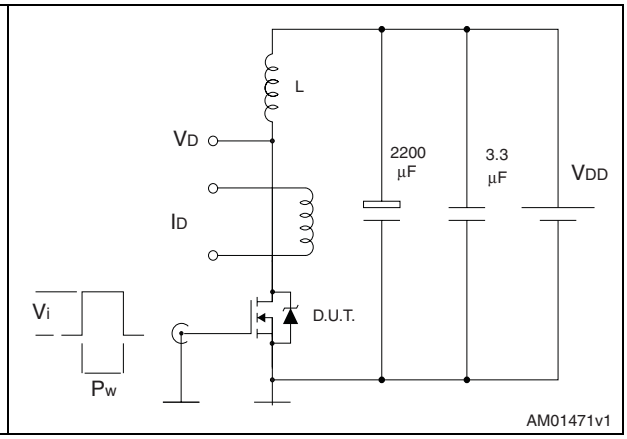



**Figure 17. Unclamped inductive waveform**

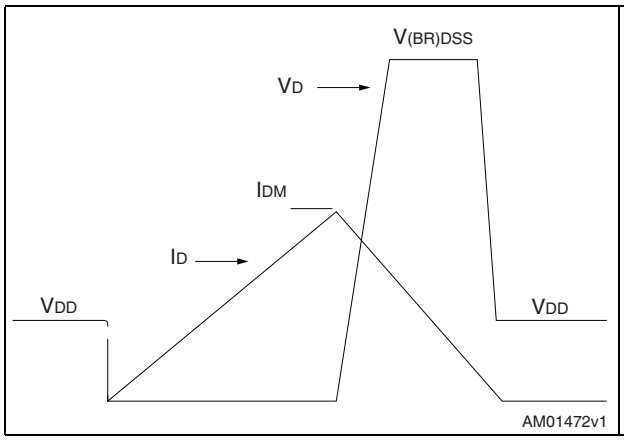



**Figure 18. Switching time waveform**

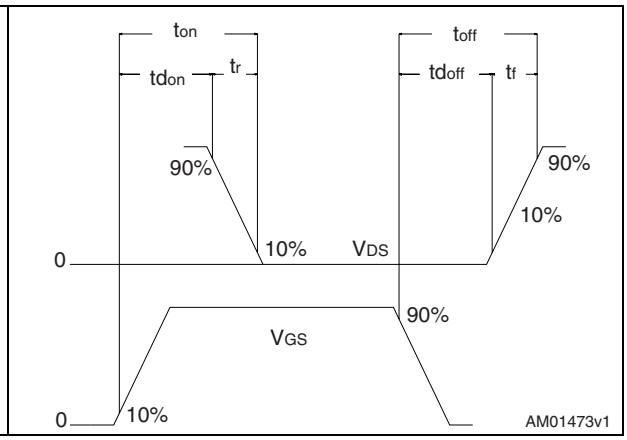
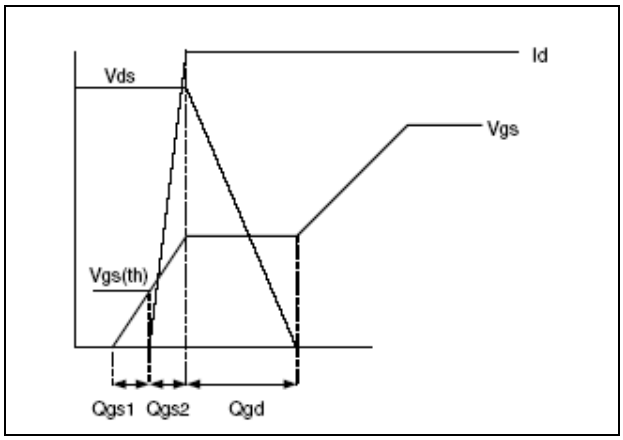


**Figure 19. Gate charge waveform**



# 4 Package mechanical data

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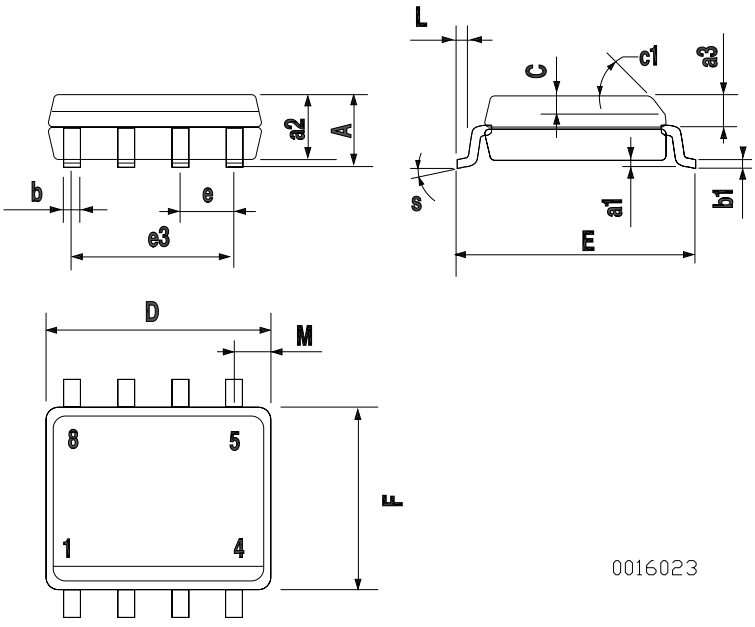
## SO-8 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.25 | 0.003 | | 0.009 |
| a2 | | | 1.65 | | | 0.064 |
| a3 | 0.65 | | 0.85 | 0.025 | | 0.033 |
| b | 0.35 | | 0.48 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | 0.25 | | 0.5 | 0.010 | | 0.019 |
| c1 | 45 (typ.) | | | | | |
| D | 4.8 | | 5.0 | 0.188 | | 0.196 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 3.81 | | | 0.150 | |
| F | 3.8 | | 4.0 | 0.14 | | 0.157 |
| L | 0.4 | | 1.27 | 0.015 | | 0.050 |
| M | | | 0.6 | | | 0.023 |
| S | 8 (max.) | | | | | |



# 5 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 06-May-2009 | 1 | First release |

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