



STV270N4F3

N-channel 40 V, 1.25 mΩ, 270 A, PowerSO-10
STripFET™ III Power MOSFET

Features

| Type | V _{DSS} | R _{DS(on) max} | I _D (1) |
|------------|------------------|-------------------------|--------------------|
| STV270N4F3 | 40 V | < 1.5 mΩ | 270 A |

1. Current limited by package

- Conduction losses reduced
- Low profile, very low parasitic inductance

Applications

- Switching application

Description

This STripFET™ III Power MOSFET technology is among the latest improvements, which have been especially tailored to minimize on-state resistance providing superior switching performances.

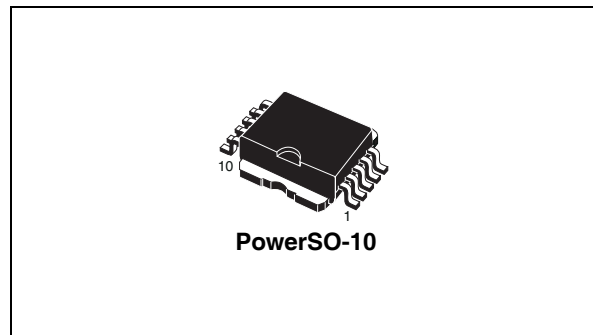


Figure 1. Internal schematic diagram and connection diagram (top view)

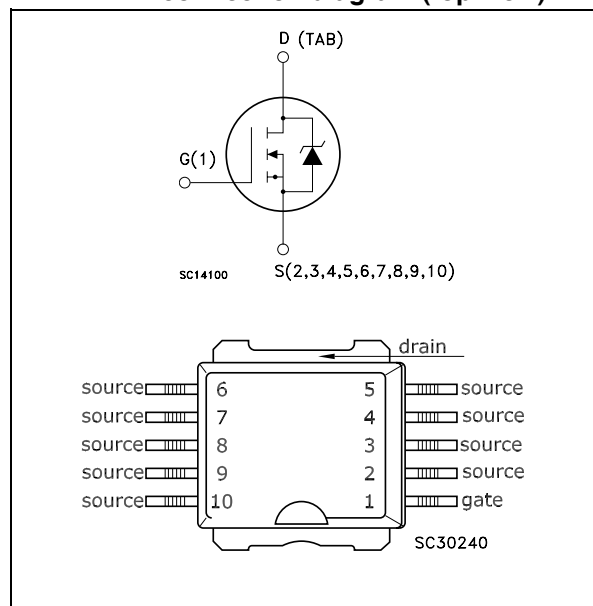


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|------------|---------------|
| STV270N4F3 | 270N4F3 | PowerSO-10 | Tape and reel |

Contents

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------------|---|------------|---------------------|
| V_{DS} | Drain-source voltage ($V_{GS} = 0$) | 40 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 270 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 220 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 1080 | A |
| $P_{TOT}^{(2)}$ | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 300 | W |
| | Derating factor | 2 | W/ $^\circ\text{C}$ |
| $E_{AS}^{(3)}$ | Single pulse avalanche energy | 1000 | mJ |
| T_{stg} | Storage temperature | -55 to 175 | $^\circ\text{C}$ |
| T_j | Operating junction temperature | | |

1. Current limited by package
2. This value is rated according to R_{thj-c}
3. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 80\text{ A}$, $V_{DD} = 32\text{ V}$

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|--------------------------------------|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 0.5 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb max | 35 | $^\circ\text{C}/\text{W}$ |

1. When mounted on 1 inch² FR-4 2 oz Cu.

2 Electrical characteristics

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

Table 4. On /off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|--|------|------|-----------|----------|
| V _{(BR)DSS} | Drain-source breakdown voltage | I _D = 250 μA, V _{GS} = 0 | 40 | | | V |
| I _{DSS} | Zero gate voltage drain current (V _{GS} = 0) | V _{DS} = Max rating, V _{DS} = Max rating, T _c = 125 °C | | | 10 100 | μA μA |
| I _{GSS} | Gate body leakage current (V _{DS} = 0) | V _{DS} = ± 20 V | | | ±200 | 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 = 80 A | | 1.25 | 1.5 | mΩ |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--|---|---|------|--------------------|------|----------------|
| g _{fs} (1) | Forward transconductance | V _{DS} = 10 V, I _D = 100 A | - | 200 | | S |
| C _{iss} C _{oss} C _{rss} | Input capacitance Output capacitance Reverse transfer capacitance | V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0 | - | 7500 1900 50 | | pF pF pF |
| Q _g Q _{gs} Q _{gd} | Total gate charge Gate-source charge Gate-drain charge | V _{DD} = 20 V, I _D = 160 A, V _{GS} = 10 V <i>Figure 14</i> | - | 110 30 25 | 150 | nC nC nC |

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

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------------------------|----------------------------------|--|------|-----------|------|----------|
| t _{d(on)} t _r | Turn-on delay time Rise time | V _{DD} = 20 V, I _D = 80 A R _G = 4.7 Ω, V _{GS} = 10 V <i>Figure 13</i> | - | 25 180 | - | ns ns |
| t _{d(off)} t _f | Turn-off delay time Fall time | V _{DD} = 20 V, I _D = 80 A R _G = 4.7 Ω, V _{GS} = 10 V, <i>Figure 13</i> | - | 110 45 | - | ns ns |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain current | | - | | 270 | A |
| $I_{SD}^{(1)}$ | Source-drain current (pulsed) | | - | | 1080 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 80 \text{ A}, V_{GS} = 0$ | - | | 1.3 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 160 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ | - | 70 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 32 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$ | - | 225 | | nC |
| I_{RRM} | Reverse recovery current | Figure 15 | - | 3.2 | | A |

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

2.1 Electrical characteristics

Figure 2. Safe operating area

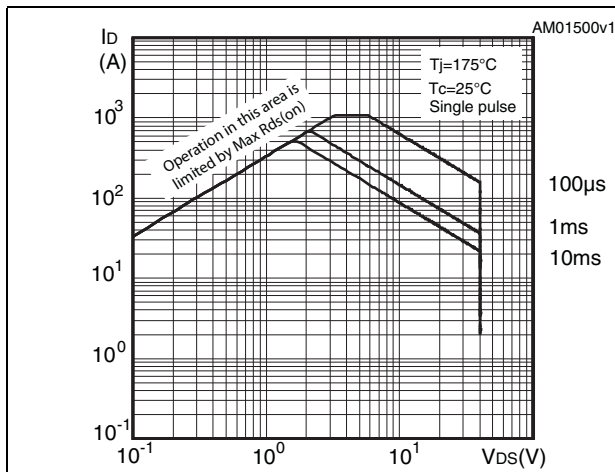


Figure 3. Thermal impedance

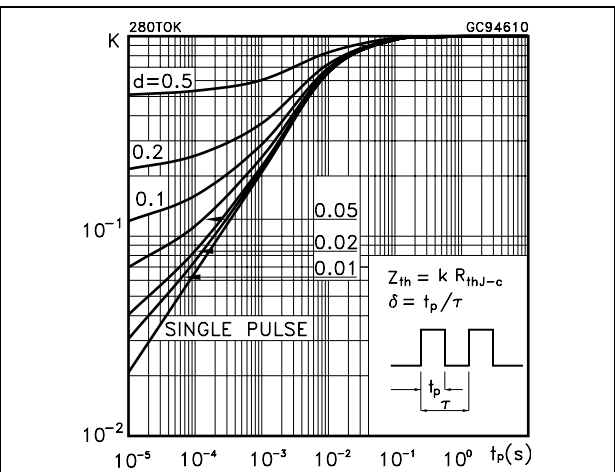


Figure 4. Output characteristics

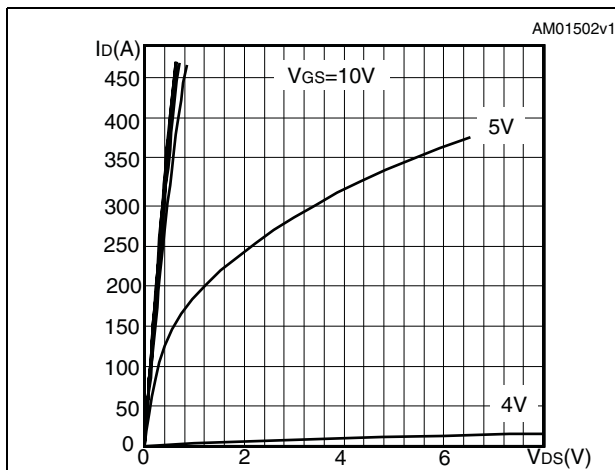


Figure 5. Transfer characteristics

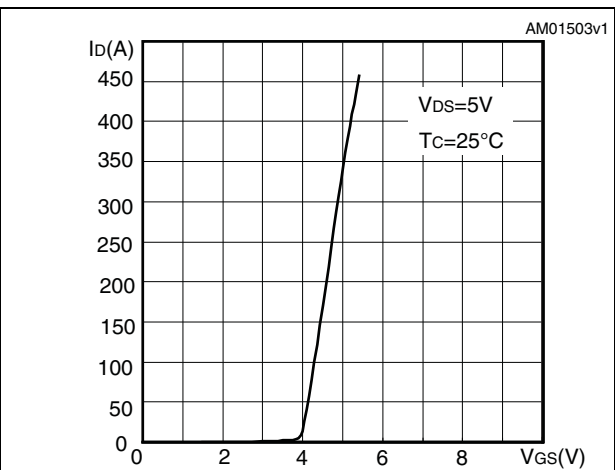


Figure 6. Static drain-source on resistance

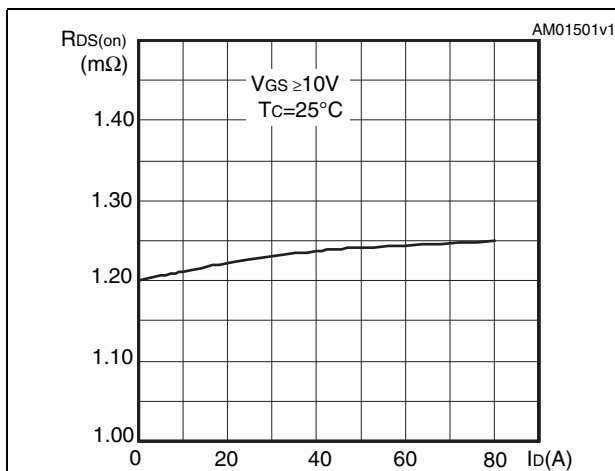


Figure 7. Normalized BV_{DSS} vs temperature

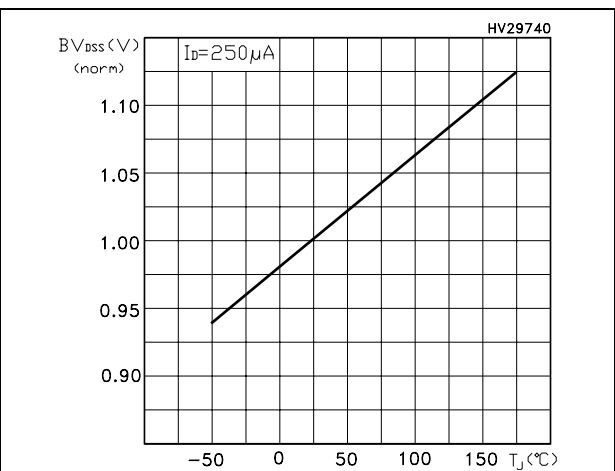


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

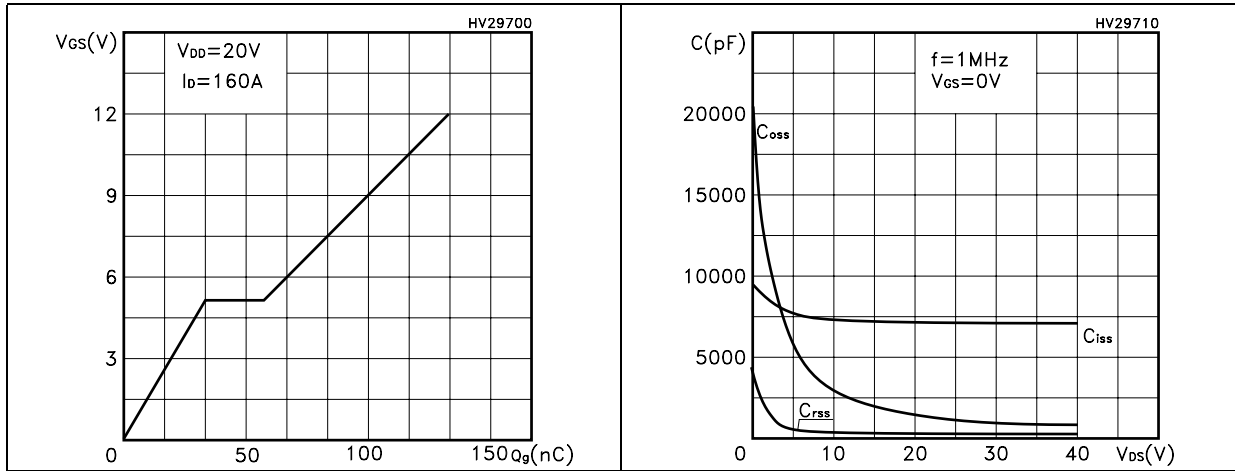


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

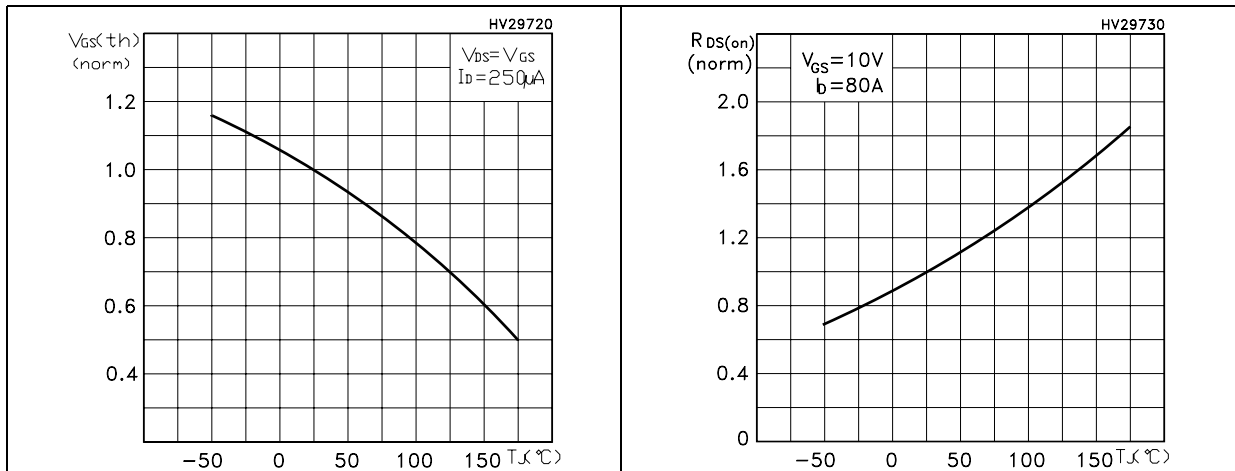
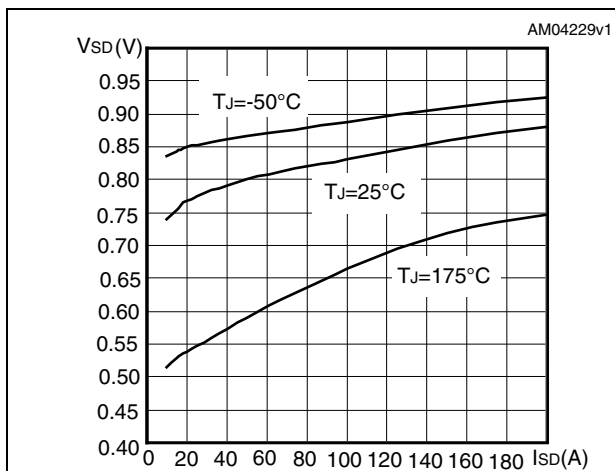


Figure 12. Source-drain diode forward characteristics



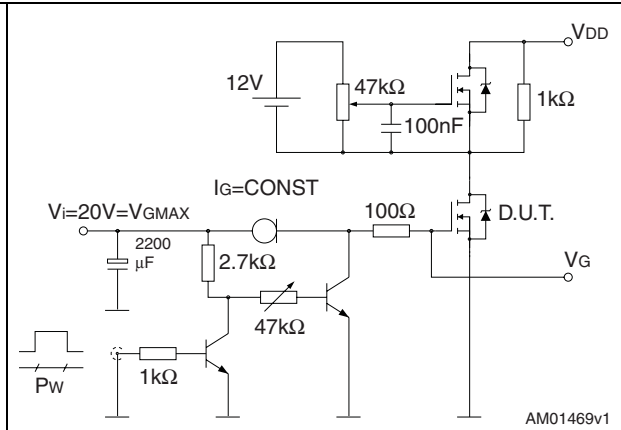
3 Test circuits

Figure 13. Switching times test circuit for resistive load



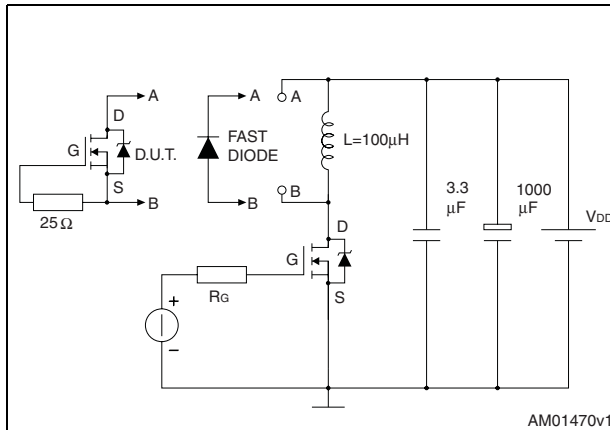
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Figure 14. Gate charge test circuit



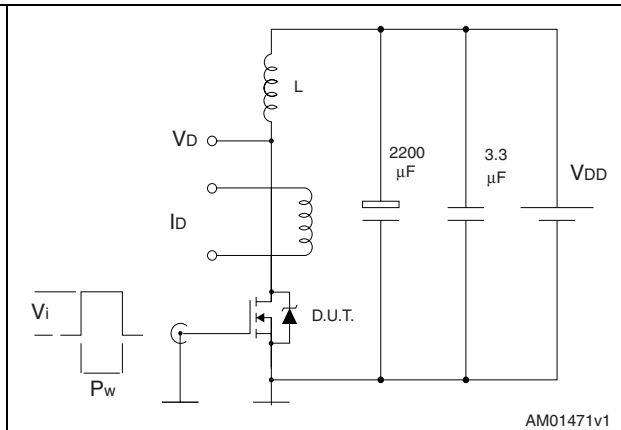
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Figure 15. Test circuit for inductive load switching and diode recovery times



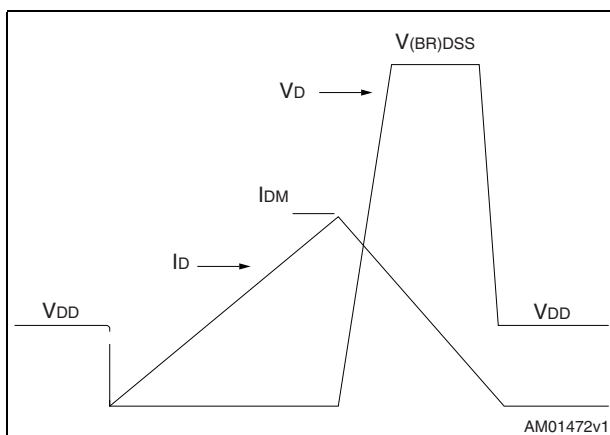
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Figure 16. Unclamped inductive load test circuit



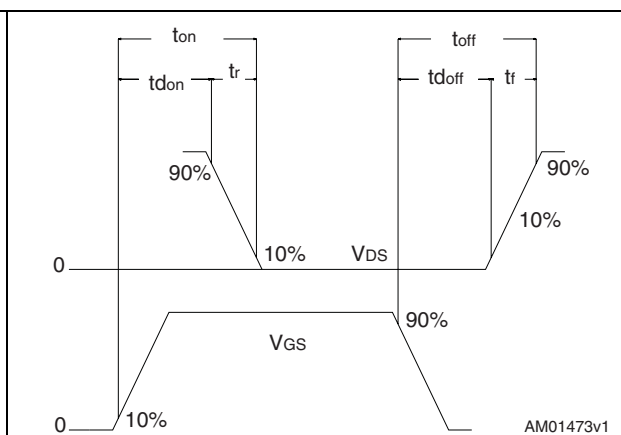
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



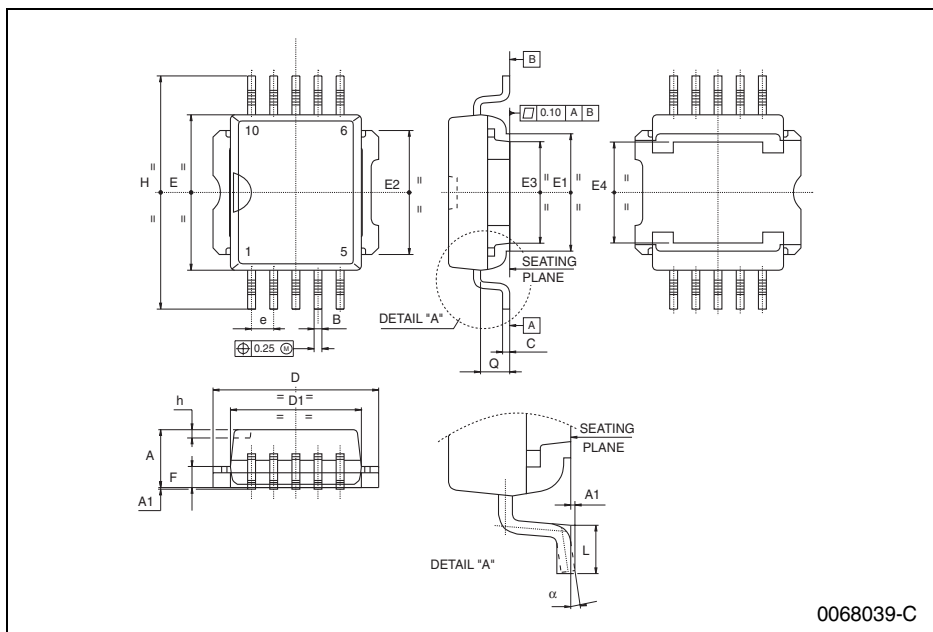
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4 Package mechanical data

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.

PowerSO-10 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|----------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 3.35 | | 3.65 | 0.132 | | 0.144 |
| A1 | 0.00 | | 0.10 | 0.000 | | 0.004 |
| B | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C | 0.35 | | 0.55 | 0.013 | | 0.022 |
| D | 9.40 | | 9.60 | 0.370 | | 0.378 |
| D1 | 7.40 | | 7.60 | 0.291 | | 0.300 |
| e | | 1.27 | | | 0.050 | |
| E | 9.30 | | 9.50 | 0.366 | | 0.374 |
| E1 | 7.20 | | 7.40 | 0.283 | | 0.291 |
| E2 | 7.20 | | 7.60 | 0.283 | | 0.300 |
| E3 | 6.10 | | 6.35 | 0.240 | | 0.250 |
| E4 | 5.90 | | 6.10 | 0.232 | | 0.240 |
| F | 1.25 | | 1.35 | 0.049 | | 0.053 |
| h | | 0.50 | | | 0.002 | |
| H | 13.80 | | 14.40 | 0.543 | | 0.567 |
| L | 1.20 | | 1.80 | 0.047 | | 0.071 |
| q | | 1.70 | | | 0.067 | |
| α | 0° | | 8° | | | |



5 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 25-Oct-2007 | 1 | Initial release |
| 03-Apr-2008 | 2 | I_D value has been updated. |
| 01-Oct-2008 | 3 | Document status promoted from preliminary data to datasheet |
| 09-Mar-2009 | 4 | $R_{thj-pcb}$ value has been changed in Table 3: Thermal data . |
| 05-May-2009 | 5 | Changed: Description and Figure 12: Source-drain diode forward characteristics |
| 17-Jun-2009 | 6 | Corrected typing error on cover page |

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