



STL100NH3LL

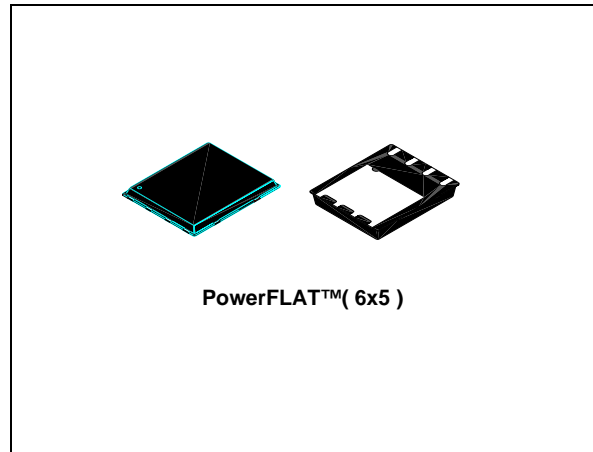
N-channel 30 V - 0.0032 Ω - 25 A - PowerFLAT™ (6x5)
STripFET™ III Power MOSFET

Features

| Type | V _{DSS} | R _{DS(on)} max | I _D |
|-------------|------------------|----------------------------|--------------------|
| STL100NH3LL | 30 V | <0.0035 Ω | 25A ⁽¹⁾ |

1. The value is rated according R_{thj-pcb}

- Improved die-to-footprint ratio
- Very low profile package (1 mm max)
- Very low thermal resistance
- Conduction losses reduced
- Switching losses reduced



Application

- Switching applications

Description

This series utilizes the last advanced design rules of ST's proprietary STripFET™ technology. This process complete to unique metallization technique realised the most advanced low voltage Power MOSFET in PowerFLAT™(6x5). The chip-scaled PowerFLAT™ package allows a significant board space saving, still boosting the performance.

Figure 1. Internal schematic diagram

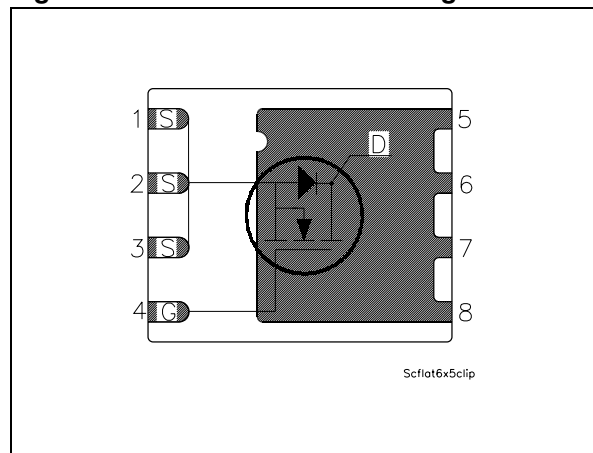


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|-------------|-----------|------------------|---------------|
| STL100NH3LL | L100NH3LL | PowerFLAT™ (6x5) | 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 ($V_{GS} = 0$) | 30 | V |
| $V_{GS}^{(1)}$ | Gate-source voltage | ± 16 | V |
| $V_{GS}^{(2)}$ | Gate-source voltage | ± 18 | V |
| $I_D^{(3)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 100 | A |
| $I_D^{(3)}$ | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 71 | A |
| $I_D^{(5)}$ | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 15.6 | A |
| $I_{DM}^{(4)}$ | Drain current (pulsed) | 100 | A |
| $I_D^{(5)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 25 | A |
| $P_{TOT}^{(3)}$ | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 80 | W |
| $P_{TOT}^{(5)}$ | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 4 | W |
| | Derating factor | 0.03 | W/ $^\circ\text{C}$ |
| T_J T_{stg} | Operating junction temperature Storage temperature | -55 to 150 | $^\circ\text{C}$ |

1. Continuous mode
2. Guaranteed for test time $\leq 15\text{ms}$
3. The value is rated according R_{thj-c}
4. Pulse width limited by safe operating area
5. The value is rated according $R_{thj-pcb}$

Table 3. Thermal resistance

| Symbol | Parameter | Value | Unit |
|---------------------|---|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case (drain) (steady state) | 1.56 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-ambient | 31.3 | $^\circ\text{C}/\text{W}$ |

1. When mounted on FR-4 board of 1inch^2 , 2oz Cu, $t < 10\text{ sec}$

Table 4. Avalanche data

| Symbol | Parameter | Value | Unit |
|----------|--|-------|------|
| I_{AV} | Not-repetitive avalanche current | 7.5 | A |
| E_{AS} | Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 7.5\text{ A}$) | 150 | mJ |

2 Electrical characteristics

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

Table 5. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|--|--|------|-----------------|-----------------|----------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $I_D = 250 \mu A, V_{GS} = 0$ | 30 | | | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS} = 0$) | $V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating} @ 125^{\circ}C$ | | | 1 10 | μA μA |
| I_{GSS} | Gate body leakage current ($V_{DS} = 0$) | $V_{GS} = \pm 16 V$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 250 \mu A$ | 1 | | 2.5 | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS} = 10 V, I_D = 12.5 A$ $V_{GS} = 4.5 V, I_D = 12.5 A$ | | 0.0032 0.004 | 0.0035 0.005 | Ω Ω |

Table 6. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|------------------------------|--|------|------|------|----------|
| $g_{fs}^{(1)}$ | Forward transconductance | $V_{DS} = 10 V, I_D = 12.5 A$ | | 30 | | S |
| C_{iss} | Input capacitance | $V_{DS} = 25 V, f = 1 \text{ MHz},$ $V_{GS} = 0$ | | 4450 | | pF |
| C_{oss} | Output capacitance | | | 655 | | pF |
| C_{rss} | Reverse transfer capacitance | | | 50 | | pF |
| Q_g | Total gate charge | $V_{DD} = 15 V, I_D = 25 A$ $V_{GS} = 4.5 V$ <i>(see Figure 8)</i> | | 30 | 40 | nC |
| Q_{gs} | Gate-source charge | | | 12.5 | | nC |
| Q_{gd} | Gate-drain charge | | | 10 | | nC |
| R_G | Gate input resistance | f=1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain | 1 | 2 | 3 | Ω |

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

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}=15\text{ V}$, $I_D=12.5\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (see Figure 14) | | 18 | | ns |
| t_r | Rise time | | | 50 | | ns |
| $t_{d(off)}$ | Turn-off delay time | | | 75 | | ns |
| t_f | Fall time | | | 8 | | ns |

Table 8. Source drain diode

| Symbol | Parameter | Test conditions | Min | Typ. | Max | Unit |
|-----------------|-------------------------------|--|-----|------|-----|------|
| I_{SD} | Source-drain current | | | | 25 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | | | 100 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD}=25\text{ A}$, $V_{GS}=0$ | | | 1.3 | V |
| t_{rr} | Reverse recovery time | $I_{SD}=25\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=25\text{ V}$, $T_j=150\text{ }^\circ\text{C}$ | | 32 | | ns |
| Q_{rr} | Reverse recovery charge | | | 34 | | nC |
| I_{RRM} | Reverse recovery current | | | 2.1 | | 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 2. Safe operating area

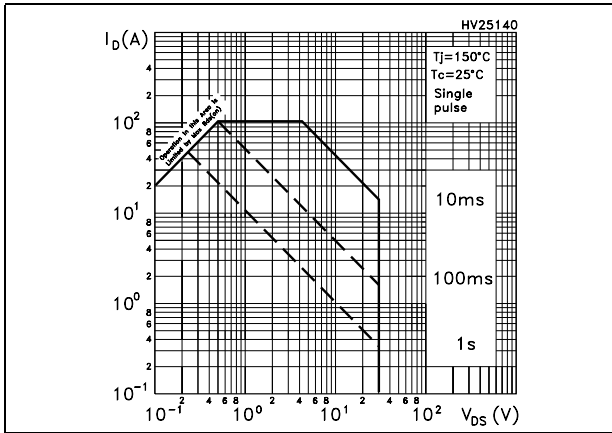


Figure 3. Thermal impedance

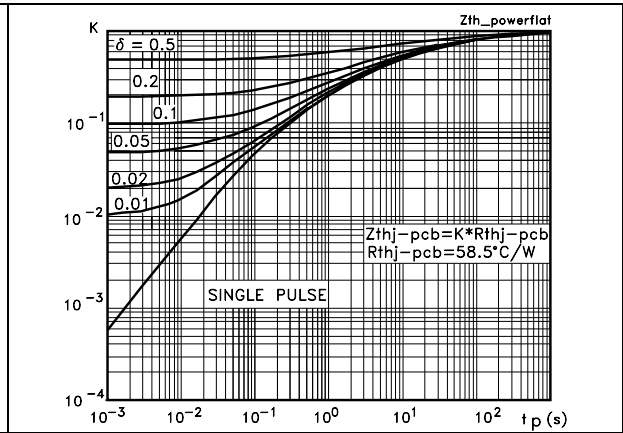


Figure 4. Output characteristics

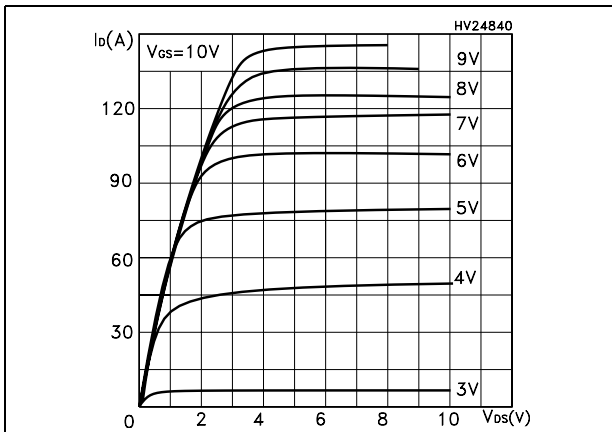


Figure 5. Transfer characteristics

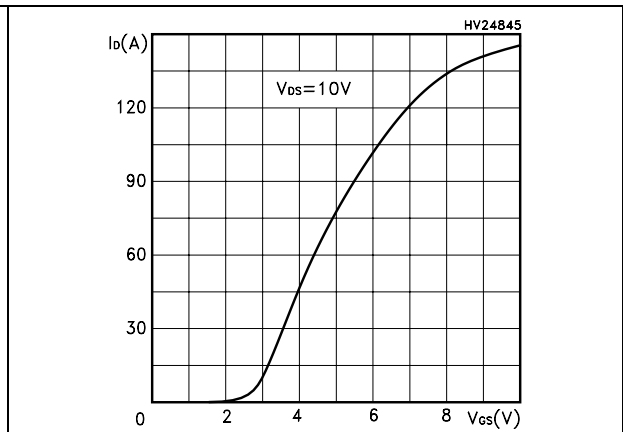


Figure 6. Transconductance

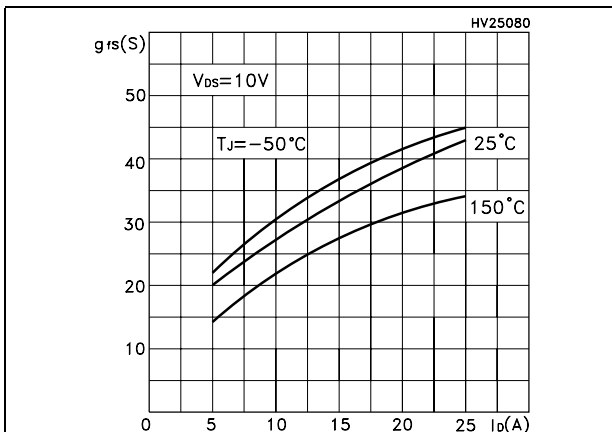


Figure 7. Static drain-source on resistance

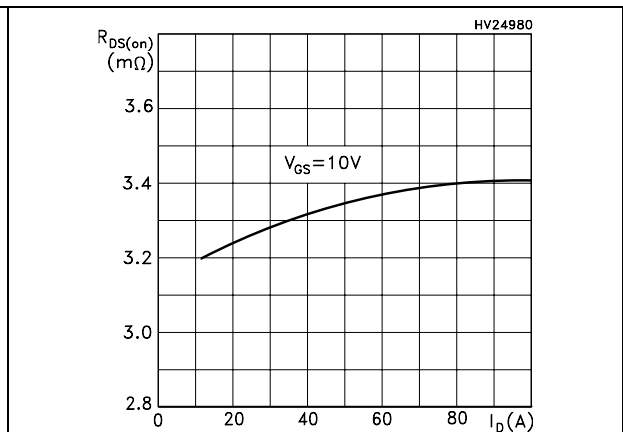


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

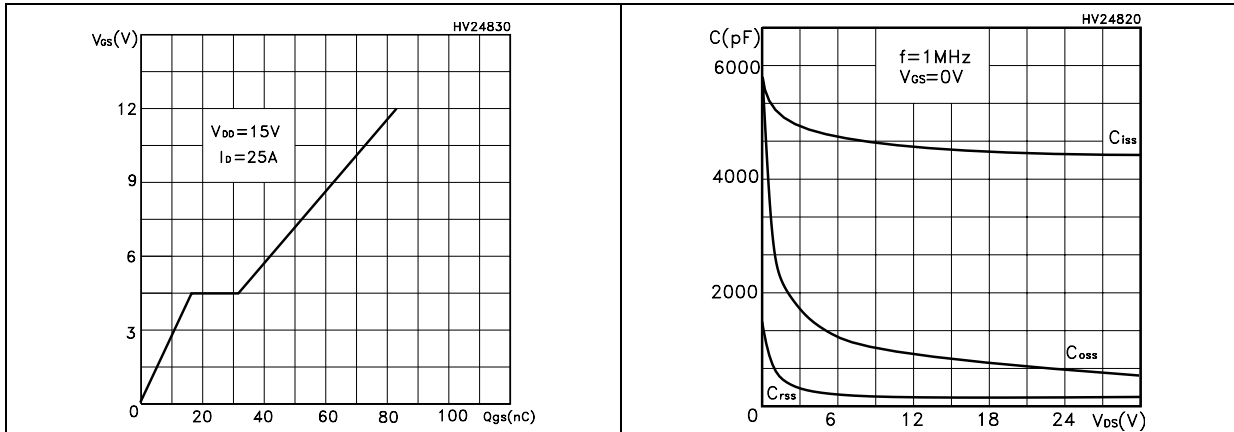


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

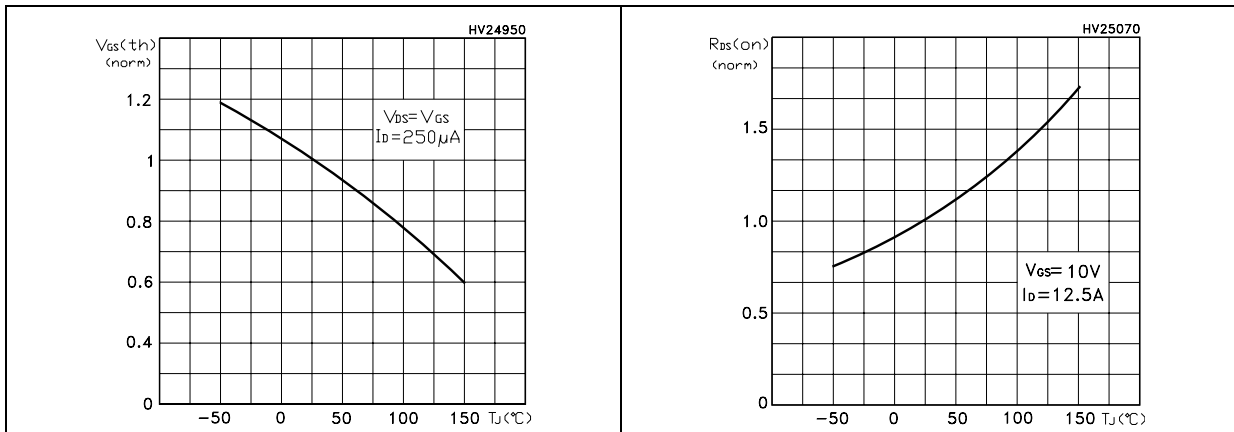
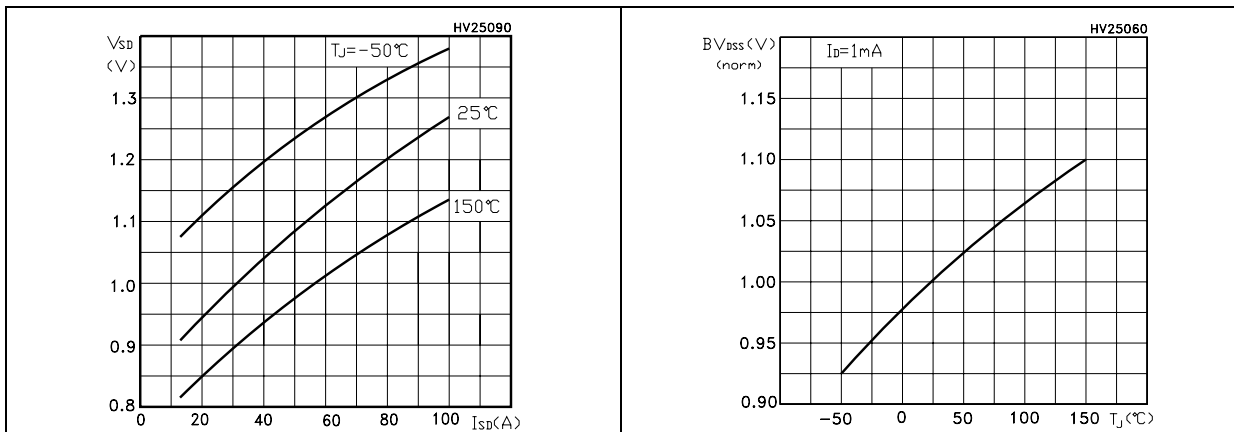


Figure 12. Source-drain diode forward characteristics Figure 13. Normalized $B_{V_{DS}}$ vs temperature



3 Test circuit

Figure 14. Switching times test circuit for resistive load

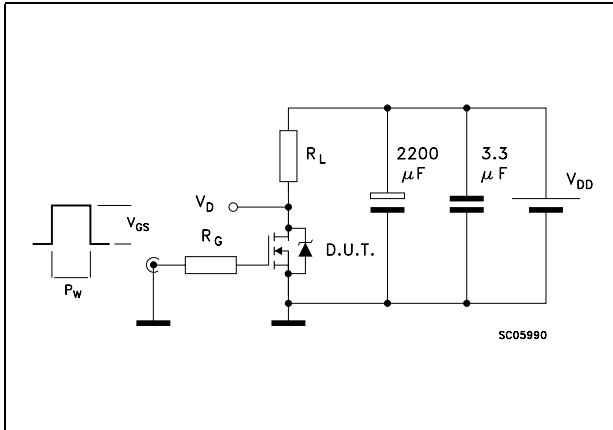


Figure 15. Gate charge test circuit

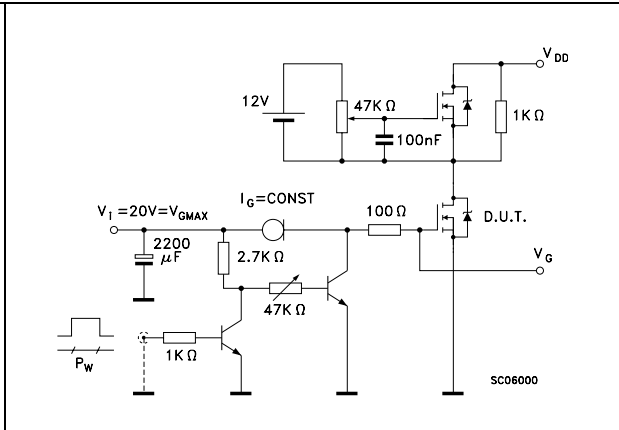


Figure 16. Test circuit for inductive load switching and diode recovery times

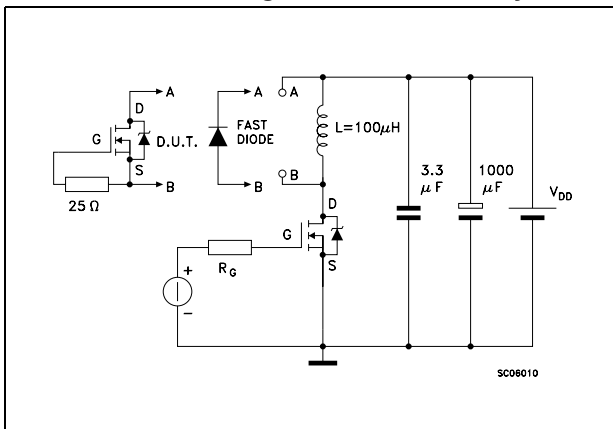


Figure 17. Unclamped inductive load test circuit

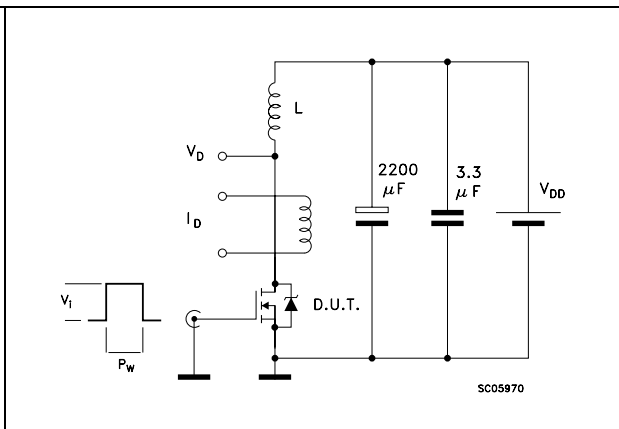


Figure 18. Unclamped inductive waveform

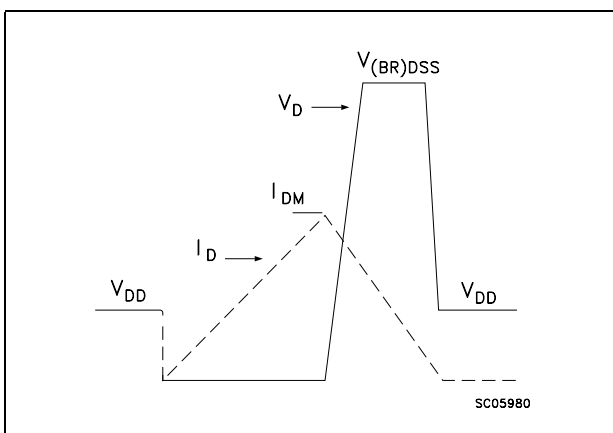
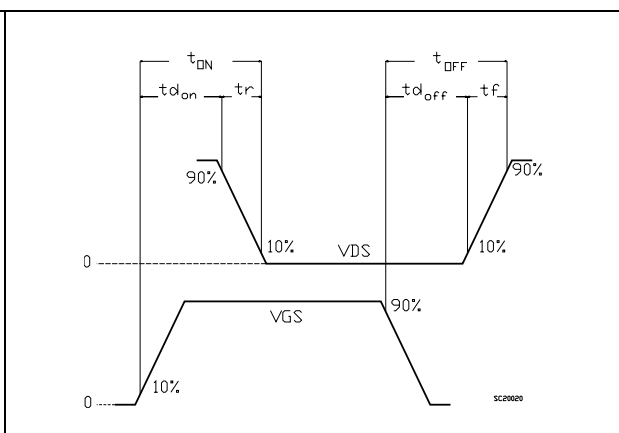


Figure 19. Switching time waveform

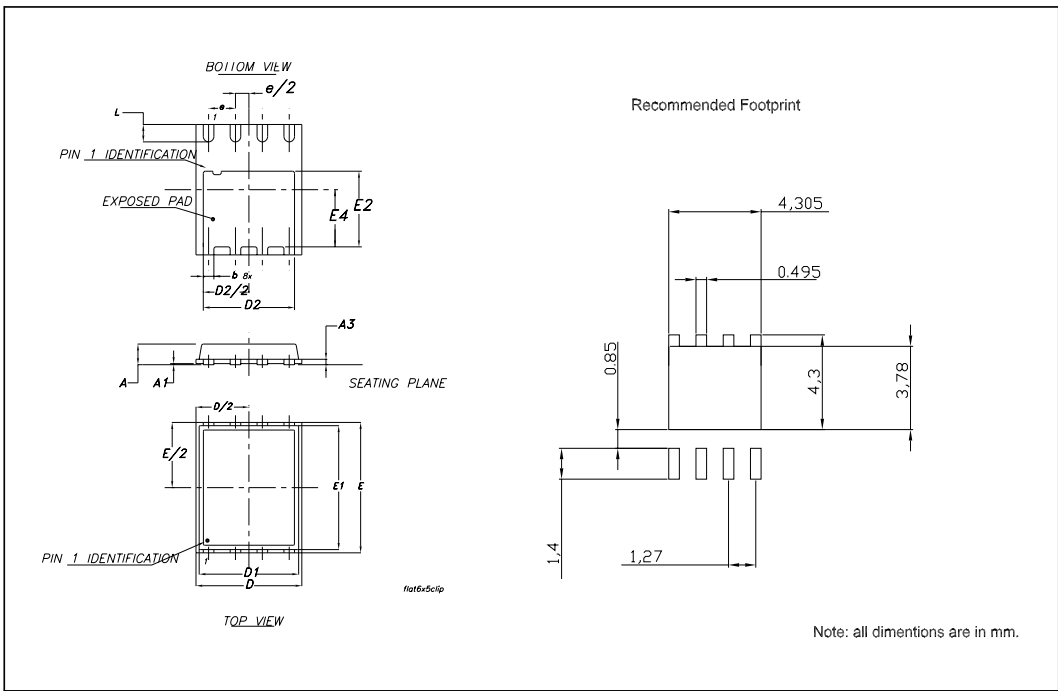


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

PowerFLAT™ (6x5) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|------|------|-------|--------|--------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 0.80 | 0.83 | 0.93 | 0.031 | 0.032 | 0.036 |
| A1 | | 0.02 | 0.05 | | 0.0007 | 0.0019 |
| A3 | | 0.20 | | | 0.007 | |
| b | 0.35 | 0.40 | 0.47 | 0.013 | 0.015 | 0.018 |
| D | | 5.00 | | | 0.196 | |
| D1 | | 4.75 | | | 0.187 | |
| D2 | 4.15 | 4.20 | 4.25 | 0.163 | 0.165 | 0.167 |
| E | | 6.00 | | | 0.236 | |
| E1 | | 5.75 | | | 0.226 | |
| E2 | 3.43 | 3.48 | 3.53 | 0.135 | 0.137 | 0.139 |
| E4 | 2.58 | 2.63 | 2.68 | | 0.103 | 0.105 |
| e | | 1.27 | | | 0.050 | |
| L | 0.70 | 0.80 | 0.90 | 0.027 | 0.031 | 0.035 |



5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 18-Apr-2005 | 1 | First Release |
| 20-Jun-2005 | 2 | Updated mechanical data |
| 22-Jun-2005 | 3 | New Rg value on Table 7 |
| 10-Oct-2005 | 4 | Inserted ecopack indication |
| 09-Jan-2006 | 5 | New footprint |
| 08-Mar-2006 | 6 | New template |
| 29-Jun-2006 | 7 | Modified curves, see Figure 2 and Figure 3 |
| 04-Sep-2006 | 8 | The document has been reformatted, no content change |
| 04-Jan-2007 | 9 | New updated on Table 2 |
| 10-Dec-2007 | 10 | Updated data on Table 4: Avalanche data |
| 20-Mar-2008 | 11 | New V _{GS} max. value inserted on Table 4: Avalanche data |

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