



STI55NF03L

N-channel 30 V, 0.01 Ω , 55 A, I²PAK
STripFET™ II Power MOSFET

Features

| Type | V _{DSS} | R _{DS(on)} max | I _D |
|------------|------------------|-------------------------|----------------|
| STI55NF03L | 30 V | < 0.013 Ω | 55 A |

- Optimized for high switching operation
- Low gate charge
- Logic level gate drive

Application

- Switching applications
 - Automotive

Description

This Power MOSFET is the latest development of STMicroelectronics unique “single feature size” strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps allowing remarkable manufacturing reproducibility.

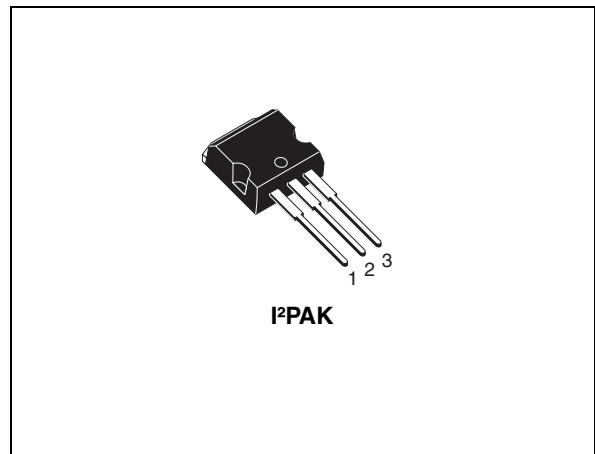


Figure 1. Internal schematic diagram

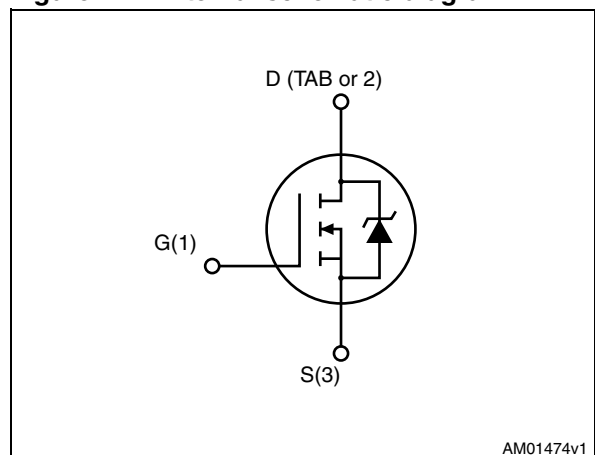


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|--------------------|-----------|
| STI55NF03L | 55NF03L | I ² PAK | Tube |

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} | Gate-source voltage | ± 16 | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 55 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 39 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 220 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 80 | W |
| | Derating factor | 0.53 | W/ $^\circ\text{C}$ |
| $E_{AS}^{(2)}$ | Single pulse avalanche energy | 120 | mJ |
| T_{stg} | Storage temperature | - 60 to 175 | $^\circ\text{C}$ |
| T_j | Max. operating junction temperature | | |

1. Pulse width limited by safe operating area
2. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 32.5\text{ A}$, $V_{DD} = 45\text{ V}$

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|----------------|--|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 1.875 | $^\circ\text{C}/\text{W}$ |
| R_{thj-a} | Thermal resistance junction-ambient max | 62.5 | $^\circ\text{C}/\text{W}$ |
| T_l | Maximum lead temperature for soldering purpose | 300 | $^\circ\text{C}$ |

2 Electrical characteristics

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

Table 4. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|---|---|------|---------------|---------------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown voltage | $I_D = 250\ \mu\text{A}$, $V_{GS} = 0$ | 30 | | | V |
| I_{DSS} | Zero gate voltage Drain current ($V_{GS} = 0$) | $V_{DS} = \text{max rating}$ $V_{DS} = \text{max rating}$, $T_C = 125\text{ °C}$ | | | 1 10 | μA μA |
| I_{GSS} | Gate-body leakage current ($V_{DS} = 0$) | $V_{GS} = \pm 16\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$ | 1.5 | | 2.5 | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS} = 10\text{ V}$, $I_D = 27.5\text{ A}$ $V_{GS} = 4.5\text{ V}$, $I_D = 27.5\text{ A}$ | | 0.01 0.013 | 0.013 0.02 | Ω |

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|---------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | | | 1265 | | pF |
| C_{oss} | Output capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$ | | 435 | | pF |
| C_{rss} | Reverse transfer capacitance | | | 115 | | pF |
| Q_g | Total gate charge | $V_{DD} = 24\text{ V}$, $I_D = 55\text{ A}$, | | 20 | 27 | nC |
| Q_{gs} | Gate-source charge | $V_{GS} = 4.5\text{ V}$ | | 7 | | nC |
| Q_{gd} | Gate-drain charge | (see Figure 14) | | 10 | | nC |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------------------|---|------|-----------|------|----------|
| $t_{d(on)}$ t_r | Turn-on delay time Rise time | $V_{DD} = 15\text{ V}$, $I_D = 27.5\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13) | | 28 400 | | ns ns |
| $t_{d(off)}$ t_f | Turn-off-delay time Fall time | $V_{DD} = 15\text{ V}$, $I_D = 27.5\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13) | | 25 50 | | ns ns |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max | Unit |
|-----------------------------------|--|---|------|------------------|-----|---------------|
| I_{SD} | Source-drain current | | | | 55 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | | | 220 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 55\text{ A}$, $V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse recovery time Reverse recovery charge Reverse recovery current | $I_{SD} = 55\text{ A}$, $V_{DD} = 30\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15) | | 70 160 4.5 | | ns nC 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

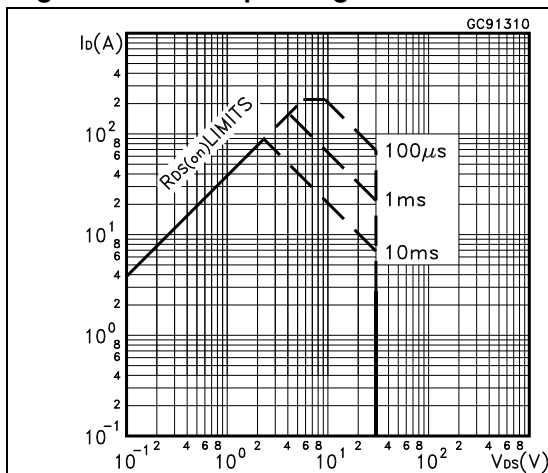


Figure 3. Thermal impedance

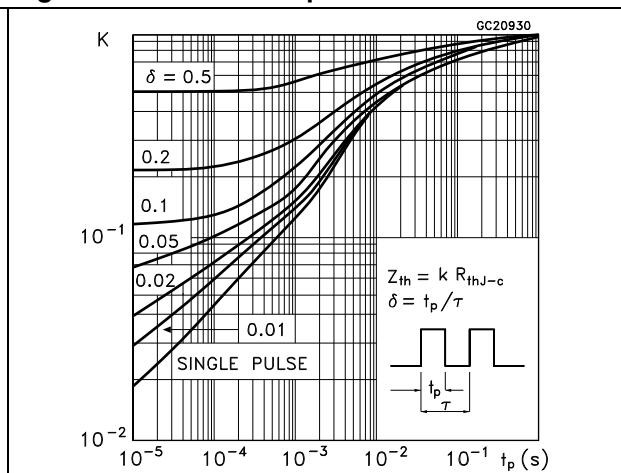


Figure 4. Output characteristics

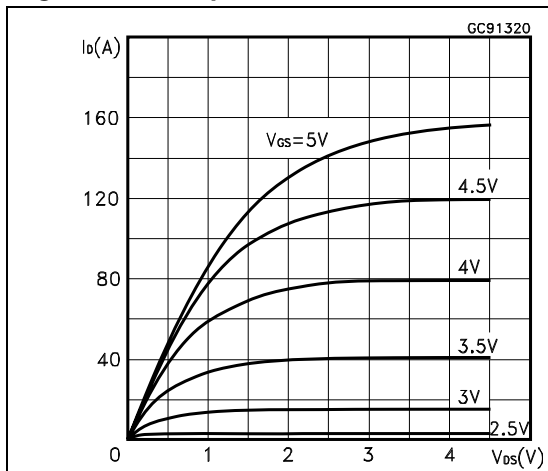


Figure 5. Transfer characteristics

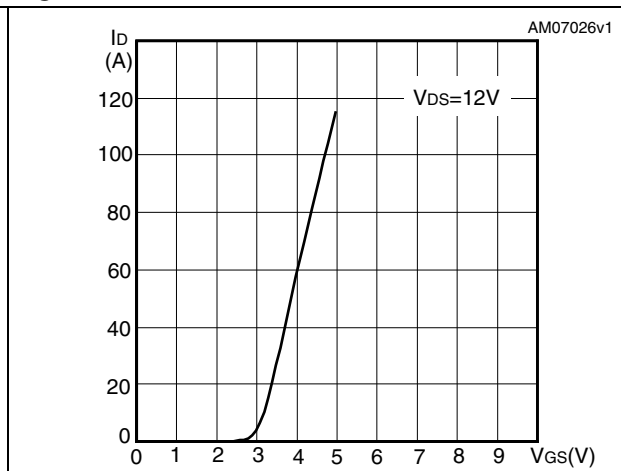


Figure 6. Normalized $B_{V_{DSS}}$ vs temperature

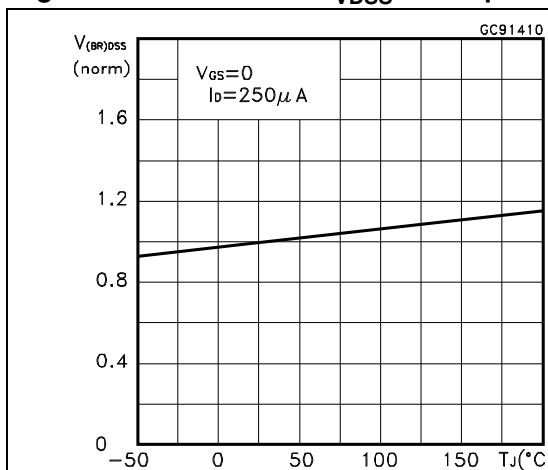


Figure 7. Static drain-source on resistance

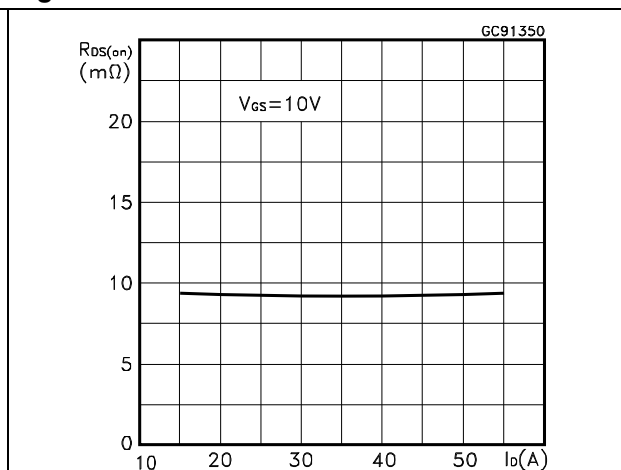


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

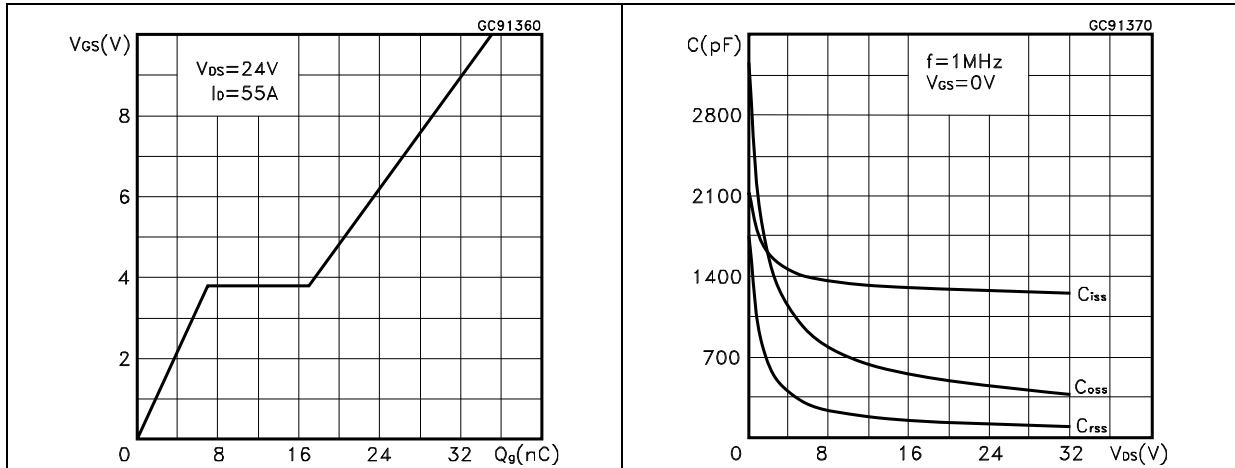


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

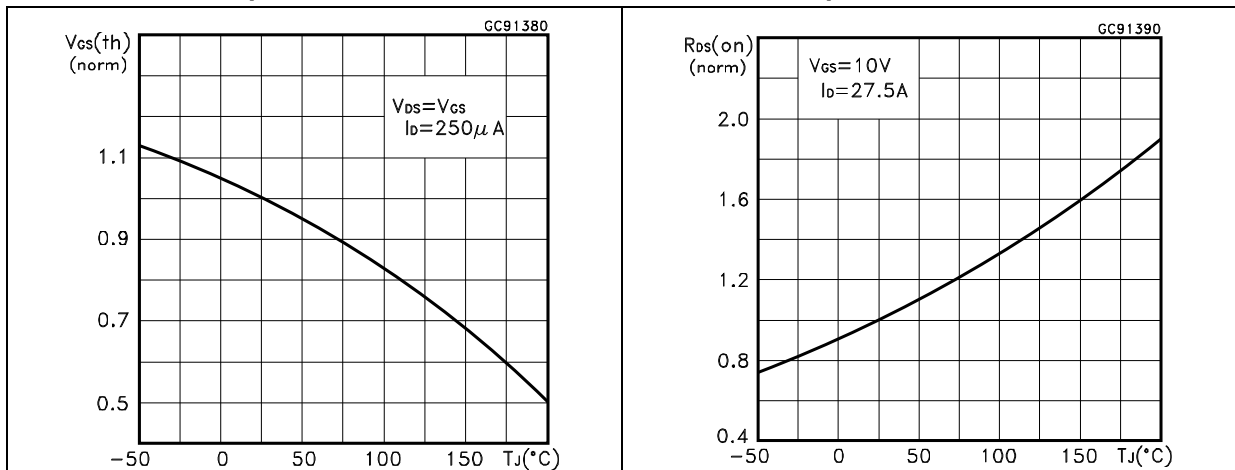
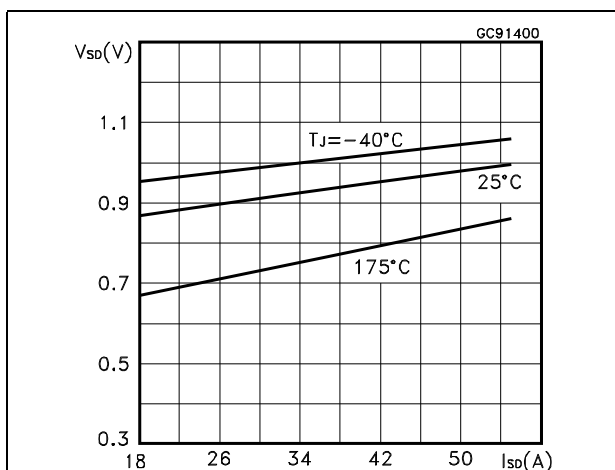
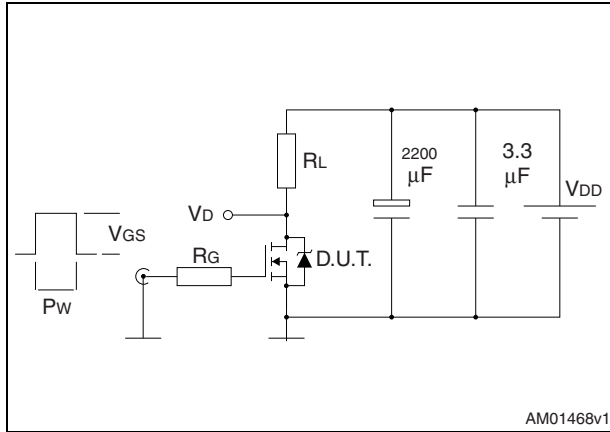


Figure 12. Source-drain diode forward characteristics



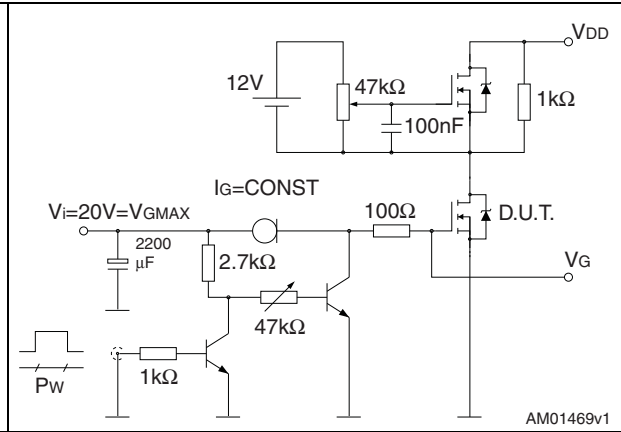
3 Test circuits

Figure 13. Switching times test circuit for resistive load



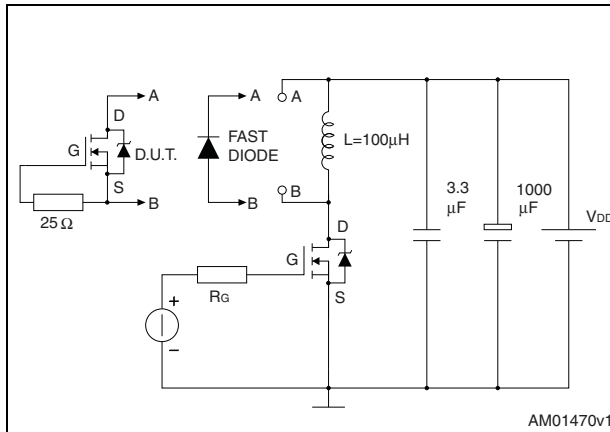
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Figure 14. Gate charge test circuit



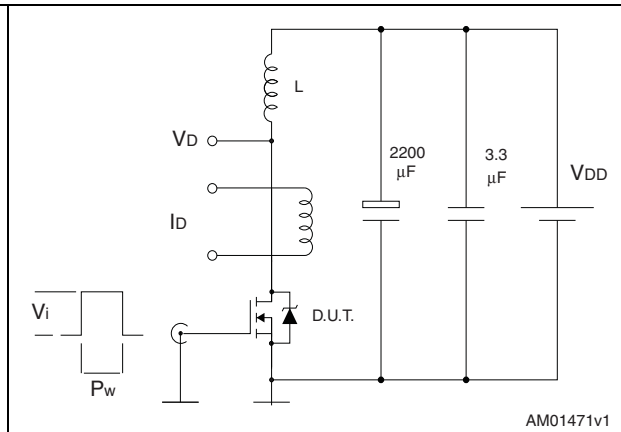
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Figure 15. Test circuit for inductive load switching and diode recovery times



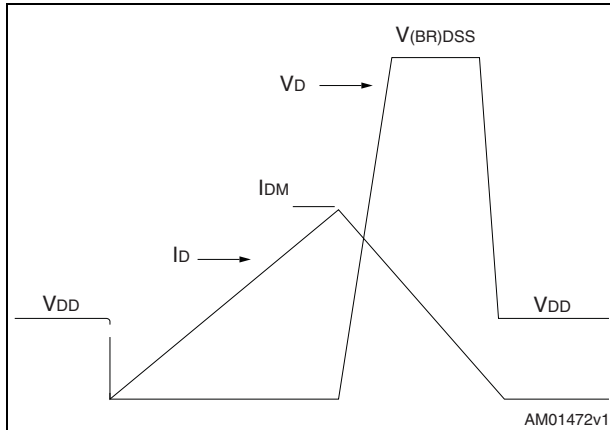
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Figure 16. Unclamped inductive load test circuit



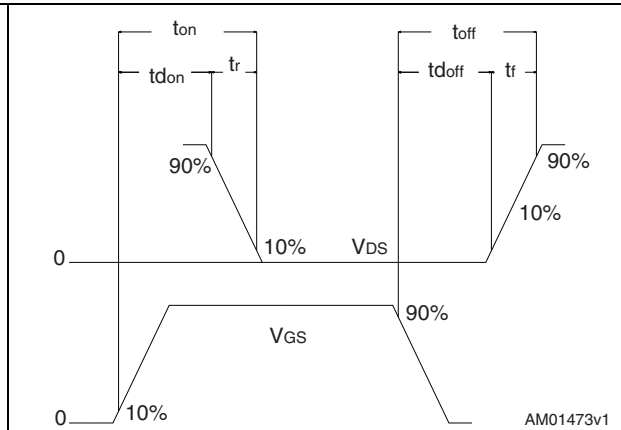
AM01471v1

Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

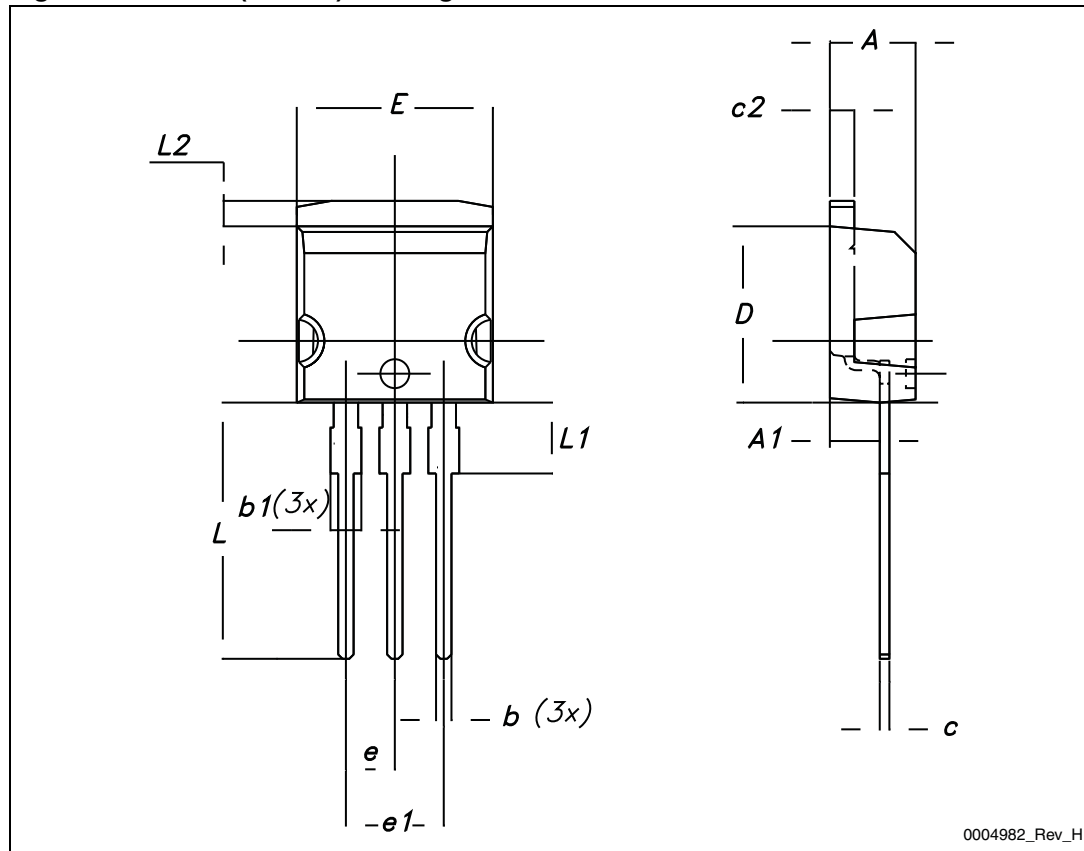
4 Package mechanical data

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.

Table 8. I²PAK (TO-262) mechanical data

| DIM. | mm. | | |
|------|------|-----|-------|
| | min. | typ | max. |
| A | 4.40 | | 4.60 |
| A1 | 2.40 | | 2.72 |
| b | 0.61 | | 0.88 |
| b1 | 1.14 | | 1.70 |
| c | 0.49 | | 0.70 |
| c2 | 1.23 | | 1.32 |
| D | 8.95 | | 9.35 |
| e | 2.40 | | 2.70 |
| e1 | 4.95 | | 5.15 |
| E | 10 | | 10.40 |
| L | 13 | | 14 |
| L1 | 3.50 | | 3.93 |
| L2 | 1.27 | | 1.40 |

Figure 19. I²PAK (TO-262) drawing



5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|---------------|
| 18-May-2011 | 1 | First release |

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