

N-channel 30 V, 2.8 mΩ typ., 80 A STripFET™ H7 Power MOSFET plus monolithic Schottky in a DPAK package

Datasheet - production data

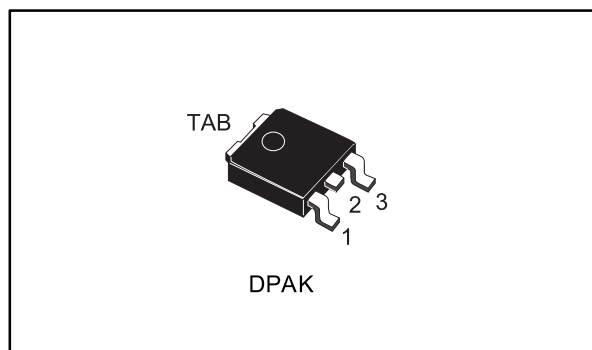
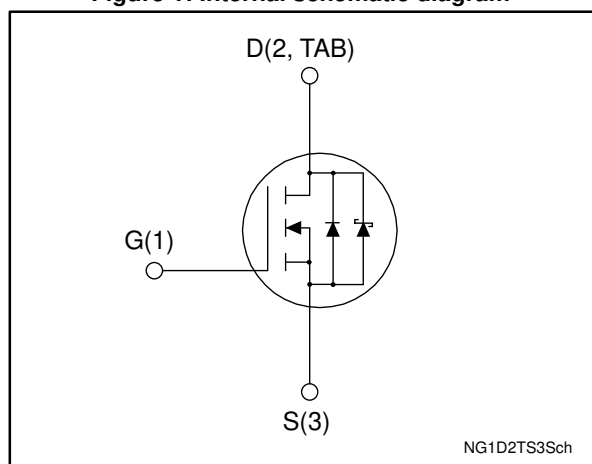


Figure 1: Internal schematic diagram



Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D | P _{TOT} |
|--------------|-----------------|--------------------------|----------------|------------------|
| STD90NS3LLH7 | 30 V | 3.4 mΩ | 80 A | 57 W |

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Embedded Schottky diode

Applications

- Switching applications

Description

This device exhibits low on-state resistance and capacitance for improved conduction and switching performance.

Table 1: Device summary

| Order code | Marking | Package | Packing |
|--------------|-----------|---------|---------------|
| STD90NS3LLH7 | 90NS3LLH7 | DPAK | Tape and reel |

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1 Electrical ratings

Table 2: Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-------------------|---|------------|------------------|
| V_{DS} | Drain-source voltage | 30 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 80 | A |
| | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 65 | A |
| $I_{DM}^{(1)(2)}$ | Drain current (pulsed) | 320 | A |
| $P_{TOT}^{(1)}$ | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 57 | W |
| T_{stg} | Storage temperature | -55 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature | | |

Notes:

⁽¹⁾This value is rated according to R_{thj-c} and limited by wire bonding

⁽²⁾Pulse width limited by safe operating area.

Table 3: Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|--------------------------------------|-------|--------------------|
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb max | 50 | $^\circ\text{C/W}$ |
| $R_{thj-case}$ | Thermal resistance junction-case max | 2.2 | |

Notes:

⁽¹⁾When mounted on a 1 inch², FR-4 board, 2oz Cu

2 Electrical characteristics

(T_C = 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 = 1 mA, V _{GS} = 0 V | 30 | | | V |
| I _{DSS} | Zero gate voltage drain current | V _{GS} = 0 V, V _{DS} = 24 V | | | 500 | μA |
| I _{GSS} | Gate-body leakage current | V _{GS} = ±20 V, V _{DS} = 0 V | | | ±100 | nA |
| V _{GS(th)} | Gate threshold voltage | V _{DS} = V _{GS} , I _D = 1 mA | 1.2 | | | V |
| R _{DS(on)} | Static drain-source on-resistance | V _{GS} = 10 V, I _D = 40 A | | 2.8 | 3.4 | mΩ |
| | | V _{GS} = 4.5 V, I _D = 40 A | | 4.1 | 5.3 | mΩ |

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-------------------|------------------------------|---|------|------|------|------|
| C _{iss} | Input capacitance | V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0 V | - | 2110 | - | pF |
| C _{oss} | Output capacitance | | - | 640 | - | |
| C _{riss} | Reverse transfer capacitance | | - | 42 | - | |
| Q _g | Total gate charge | V _{DD} = 15 V, I _D = 80 A, V _{GS} = 4.5 V (see Figure 13 : "Test circuit for gate charge behavior") | - | 13.7 | - | nC |
| Q _{gs} | Gate-source charge | | - | 7.5 | - | |
| Q _{gd} | Gate-drain charge | | - | 3.3 | - | |
| R _g | Gate input resistance | f = 1 MHz, gate DC; Bias = 0, test signal level = 20 mV, I _D = 0 A | 0.4 | 0.7 | 2 | Ω |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------|---------------------|--|------|------|------|------|
| t _{d(on)} | Turn-on delay time | V _{DD} = 15 V, I _D = 40 A, R _G = 4.7 Ω, V _{GS} = 4.5 V (see Figure 12 : "Test circuit for resistive load switching times" and Figure 17 : "Switching time waveform") | - | 26.4 | - | ns |
| t _r | Rise time | | - | 10.4 | - | |
| t _{d(off)} | Turn-off delay time | | - | 31.8 | - | |
| t _f | Fall time | | - | 12.5 | - | |

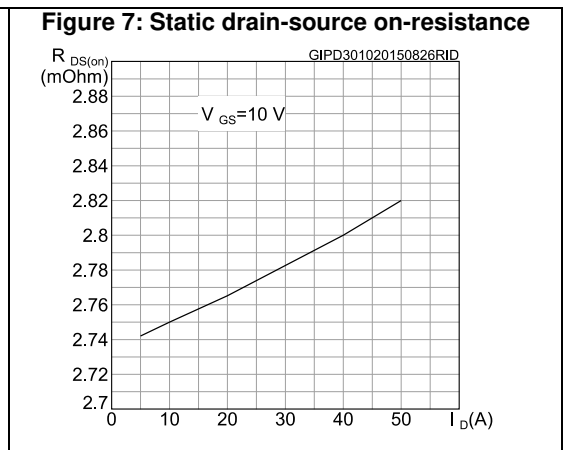
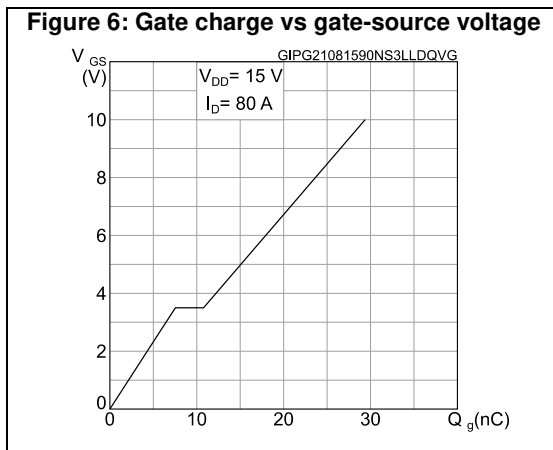
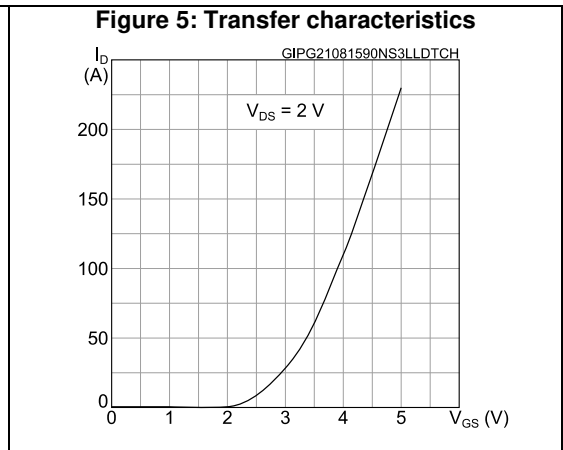
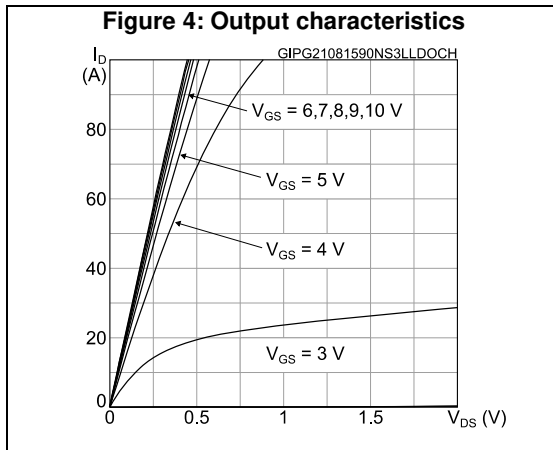
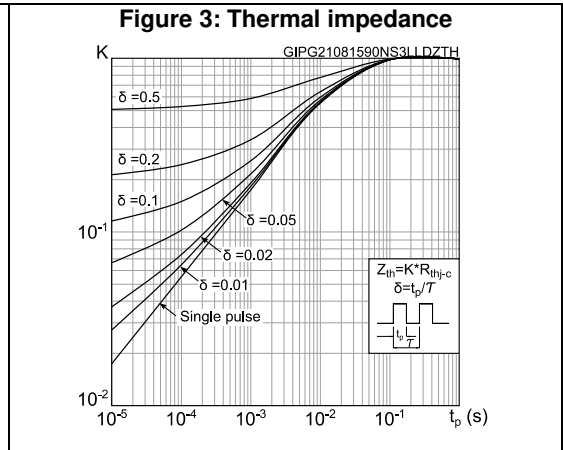
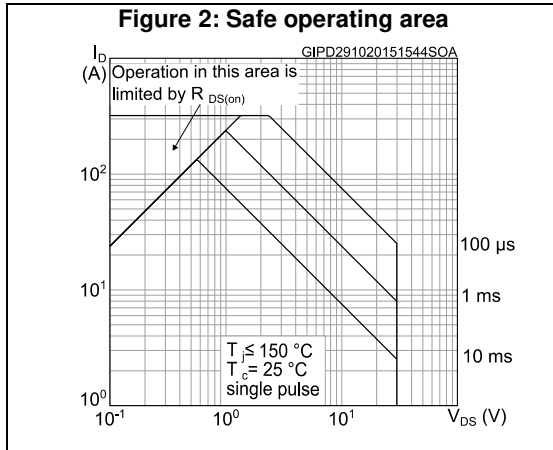
Table 7: Source drain diode

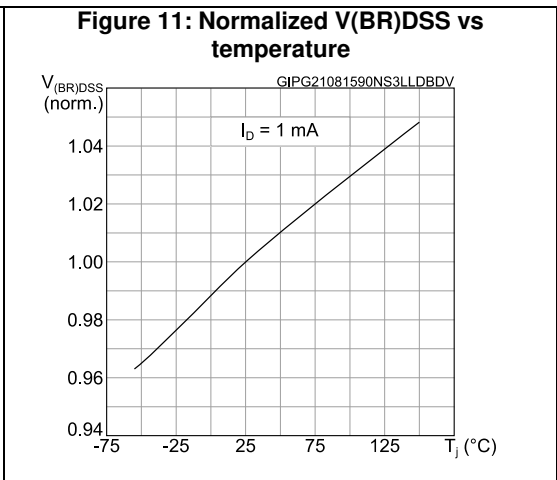
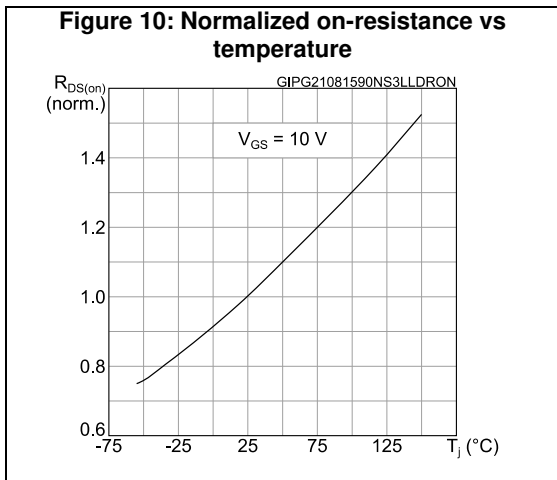
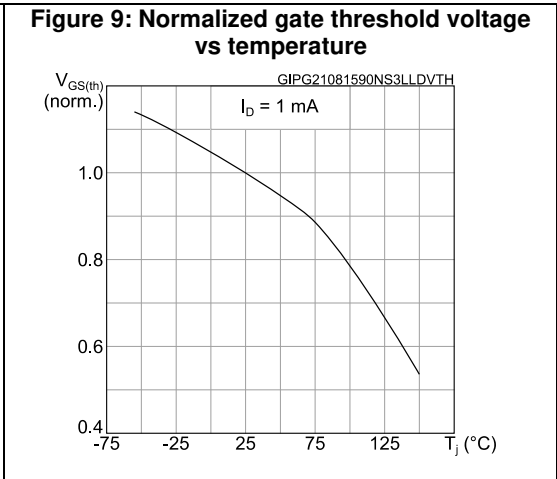
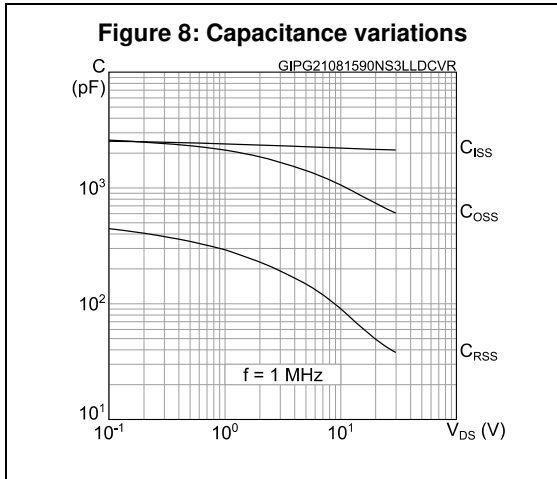
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------------------------|--------------------------|--|------|------|------|------|
| V _{SD} ⁽¹⁾ | Forward on voltage | I _{SD} = 2 A, V _{GS} = 0 V | - | 0.4 | 0.7 | V |
| t _{rr} | Reverse recovery time | I _D = 40 A, di/dt = 100 A/μs, V _{DD} = 20 V (see Figure 14 : "Test circuit for inductive load switching and diode recovery times") | - | 35.2 | | ns |
| Q _{rr} | Reverse recovery charge | | - | 26.4 | | nC |
| I _{RRM} | Reverse recovery current | | - | 1.5 | | A |

Notes:

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

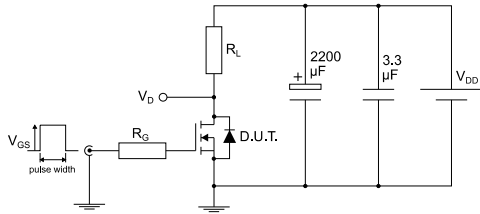
2.1 Electrical characteristics (curves)





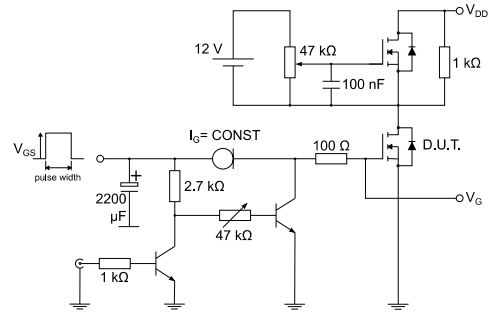
3 Test circuits

Figure 12: Test circuit for resistive load switching times



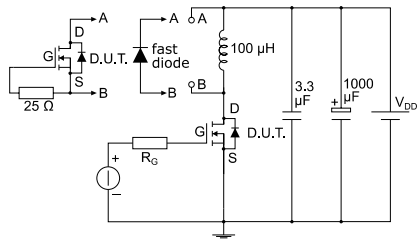
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Figure 13: Test circuit for gate charge behavior



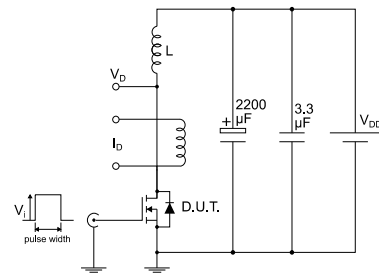
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Figure 14: Test circuit for inductive load switching and diode recovery times



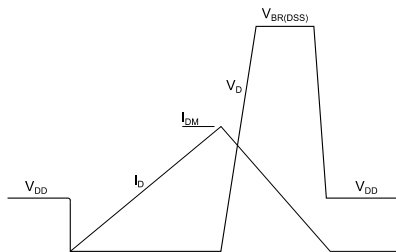
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Figure 15: Unclamped inductive load test circuit



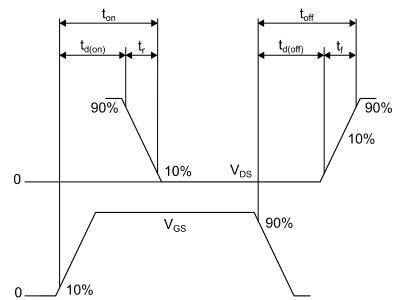
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Figure 16: Unclamped inductive waveform



AM01472v1

Figure 17: 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 DPAK (TO-252) type A package information

Figure 18: DPAK (TO-252) type A package outline

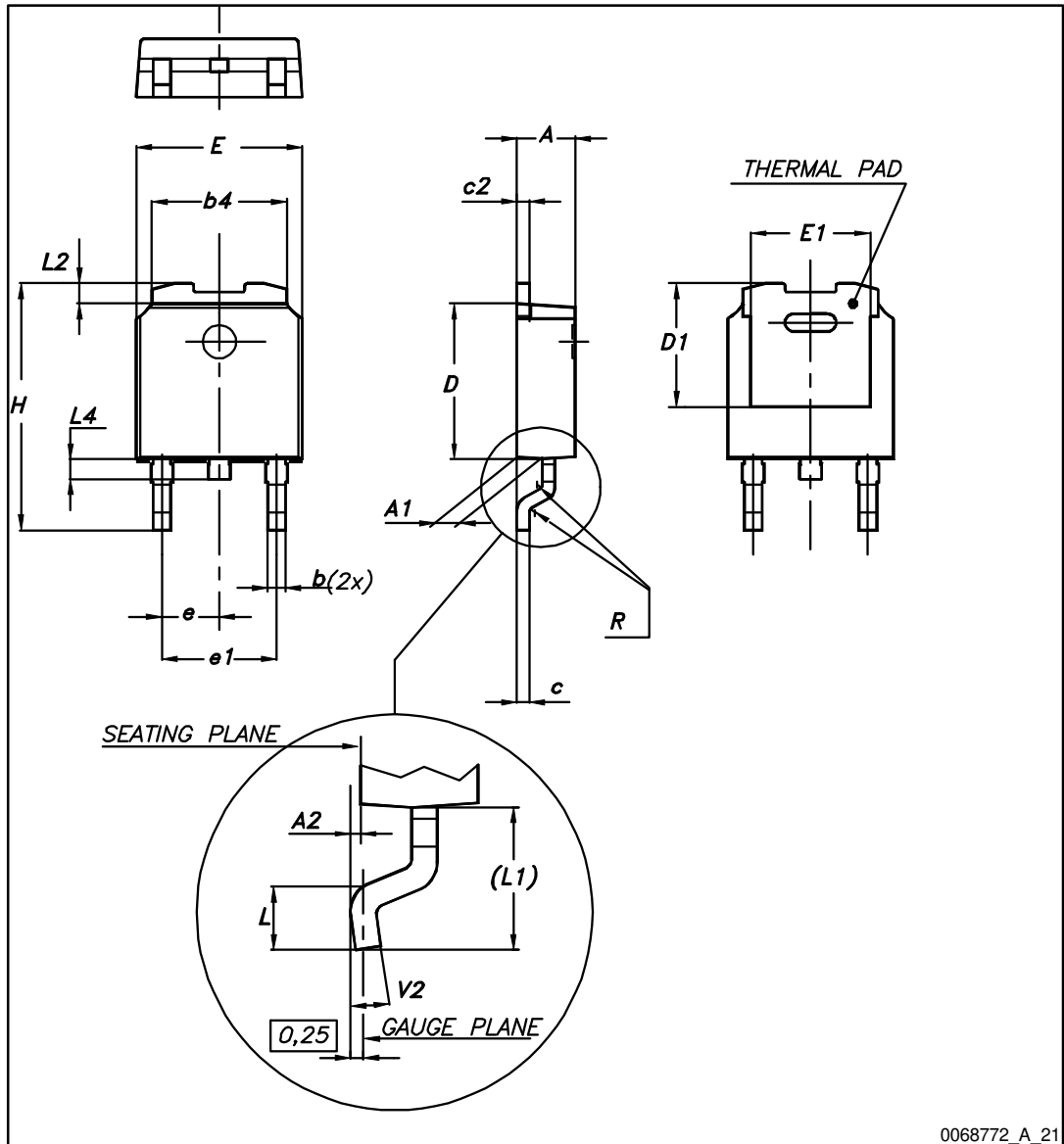
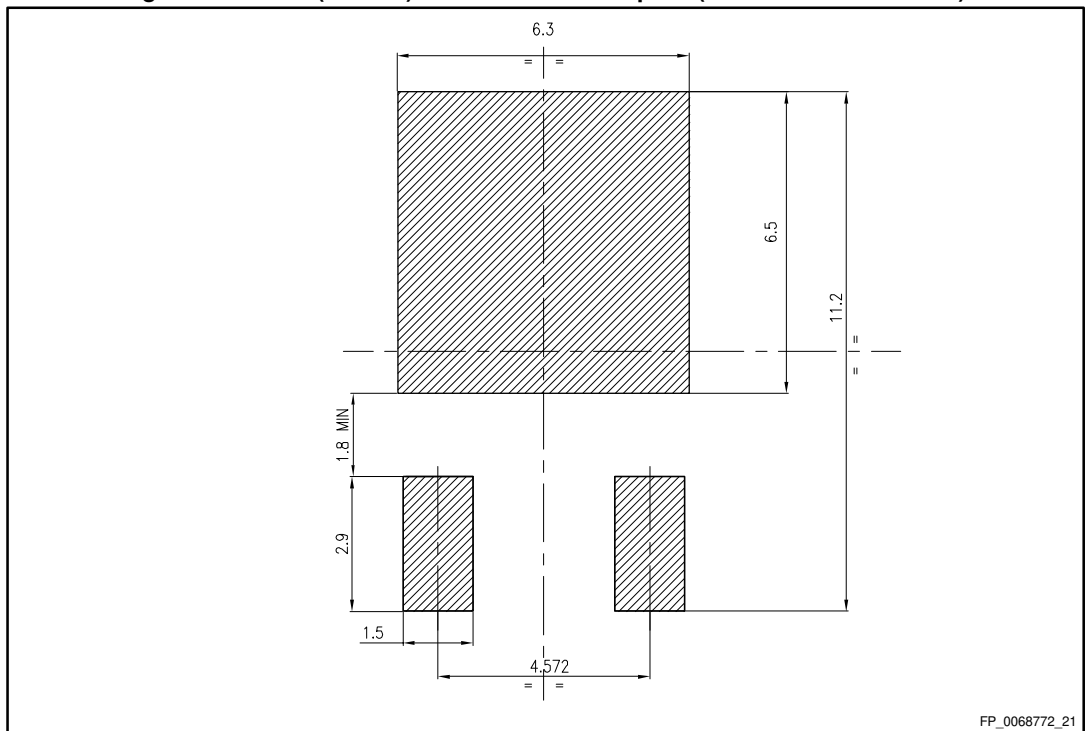


Table 8: DPAK (TO-252) type A mechanical data

| Dim. | mm | | |
|------|------|------|-------|
| | Min. | Typ. | Max. |
| A | 2.20 | | 2.40 |
| A1 | 0.90 | | 1.10 |
| A2 | 0.03 | | 0.23 |
| b | 0.64 | | 0.90 |
| b4 | 5.20 | | 5.40 |
| c | 0.45 | | 0.60 |
| c2 | 0.48 | | 0.60 |
| D | 6.00 | | 6.20 |
| D1 | 4.95 | 5.10 | 5.25 |
| E | 6.40 | | 6.60 |
| E1 | 4.60 | 4.70 | 4.80 |
| e | 2.16 | 2.28 | 2.40 |
| e1 | 4.40 | | 4.60 |
| H | 9.35 | | 10.10 |
| L | 1.00 | | 1.50 |
| (L1) | 2.60 | 2.80 | 3.00 |
| L2 | 0.65 | 0.80 | 0.95 |
| L4 | 0.60 | | 1.00 |
| R | | 0.20 | |
| V2 | 0° | | 8° |

Figure 19: DPAK (TO-252) recommended footprint (dimensions are in mm)



4.2 DPAK (TO-252) packing information

Figure 20: DPAK (TO-252) tape outline

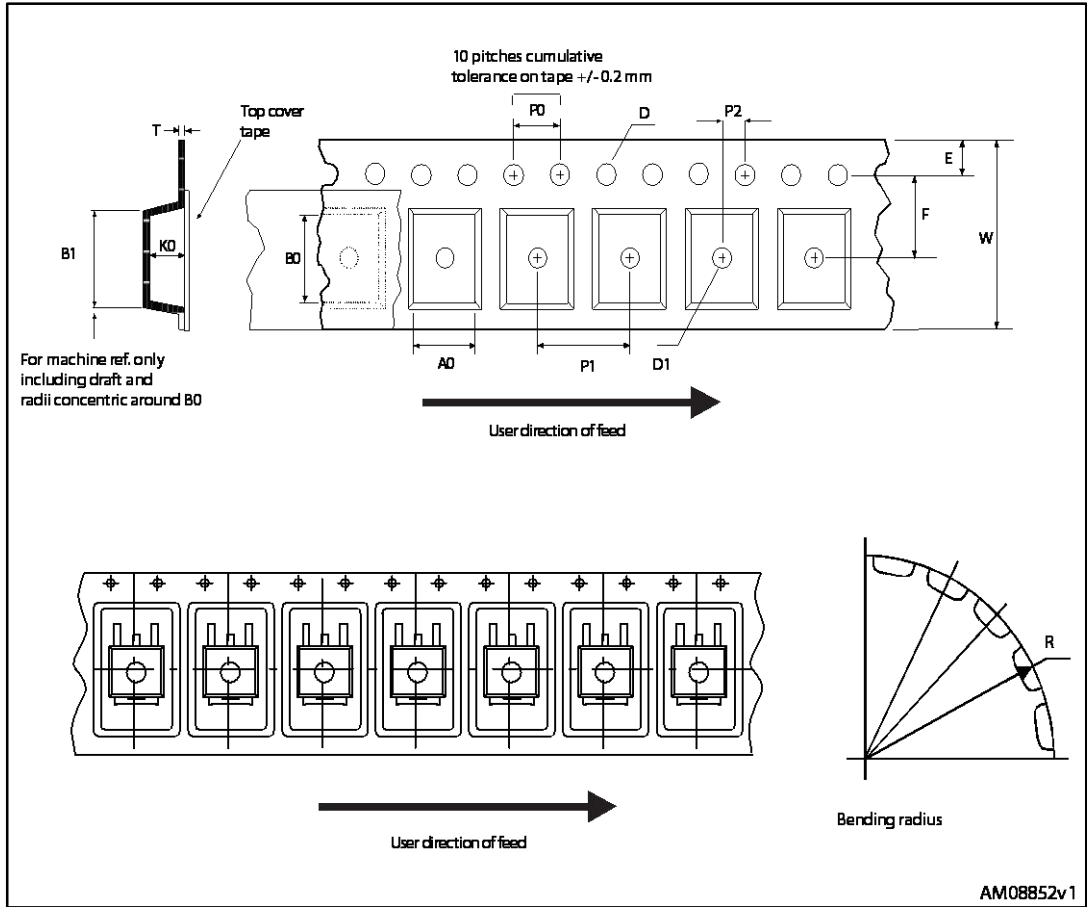


Figure 21: DPAK (TO-252) reel outline

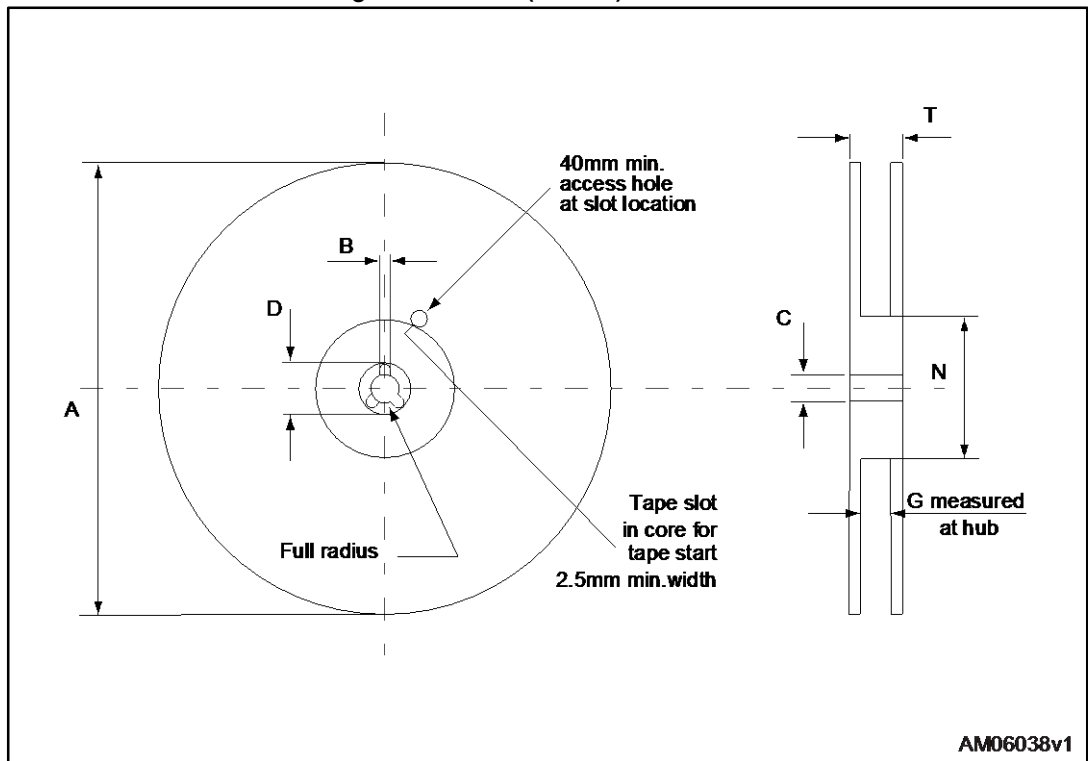


Table 9: DPAK (TO-252) tape and reel mechanical data

| Tape | | | Reel | | |
|------|------|------|-----------|------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| A0 | 6.8 | 7 | A | | 330 |
| B0 | 10.4 | 10.6 | B | 1.5 | |
| B1 | | 12.1 | C | 12.8 | 13.2 |
| D | 1.5 | 1.6 | D | 20.2 | |
| D1 | 1.5 | | G | 16.4 | 18.4 |
| E | 1.65 | 1.85 | N | 50 | |
| F | 7.4 | 7.6 | T | | 22.4 |
| K0 | 2.55 | 2.75 | | | |
| P0 | 3.9 | 4.1 | Base qty. | | 2500 |
| P1 | 7.9 | 8.1 | Bulk qty. | | 2500 |
| P2 | 1.9 | 2.1 | | | |
| R | 40 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 15.7 | 16.3 | | | |

5 Revision history

Table 10: Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 17-Apr-2014 | 1 | First release. |
| 07-Sep-2015 | 2 | Text and formatting changes throughout document Removed all TO-220 (STP90NS3LLH7) package references and data On cover page: - updated title and Features In section Electrical ratings updated table Absolute maximum ratings In section Electrical characteristics - updated and renamed table Static (was On /off states) - updated tables Dynamic and Source drain diode Added section Electrical characteristics (curves) Updated and renamed section Package information (was Package mechanical data) |
| 29-Oct-2015 | 3 | Updated title and features in cover page. Updated Table 2: "Absolute maximum ratings", Table 5: "Dynamic" and Figure 2: "Safe operating area". Minor text changes. |
| 10-Feb-2016 | 4 | Document status promoted from preliminary to production data. |

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