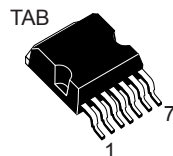
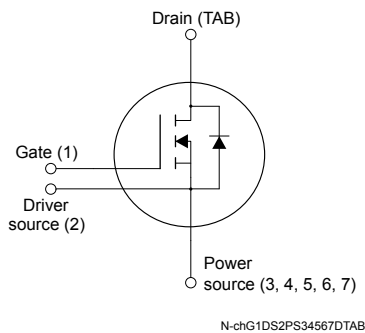


Silicon carbide Power MOSFET 1200 V, 62 mΩ typ., 36 A in an H²PAK-7 package

H²PAK-7

Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D |
|-----------------|-----------------|--------------------------|----------------|
| SCTH40N120G2V-7 | 1200 V | 100 mΩ | 36 A |

- Very high operating junction temperature capability (T_J = 175 °C)
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Source Kelvin pin for increased efficiency

Applications

- Switching mode power supply
- DC-DC converters
- Industrial motor control

Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2nd generation SiC MOSFET technology. The device features remarkably low on-resistance per unit area and very good switching performance. The variation of switching loss is almost independent of junction temperature.

Product status link
[SCTH40N120G2V-7](#)
Product summary

| | |
|-------------------|----------------------|
| Order code | SCTH40N120G2V-7 |
| Marking | SCT40N120G2V |
| Package | H ² PAK-7 |
| Packing | Tape and reel |

1 Electrical ratings

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|--|------------|------|
| V_{DS} | Drain-source voltage | 1200 | V |
| V_{GS} | Gate-source voltage | -10 to 22 | V |
| | Gate-source voltage (recommended operational values) | -5 to 18 | |
| I_D | Drain current (continuous) at $T_C = 25\text{ °C}$ | 36 | A |
| | Drain current (continuous) at $T_C = 100\text{ °C}$ | 25 | |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 100 | A |
| P_{TOT} | Total power dissipation at $T_C = 25\text{ °C}$ | 238 | W |
| T_{stg} | Storage temperature range | -55 to 175 | °C |
| T_J | Operating junction temperature range | | °C |

1. Pulse width is limited by safe operating area.

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|---|-------|------|
| R_{thJC} | Thermal resistance, junction-to-case | 0.63 | °C/W |
| R_{thJA} | Thermal resistance, junction-to-ambient | 40 | °C/W |

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Table 3. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|--|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$ | 1200 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$, $V_{DS} = 1200\text{ V}$ | | | 10 | μA |
| I_{GSS} | Gate-body leakage current | $V_{DS} = 0\text{ V}$, $V_{GS} = -10\text{ to }22\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$ | 1.9 | 2.45 | 4.9 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 18\text{ V}$, $I_D = 20\text{ A}$ | | 62 | 100 | m Ω |
| | | $V_{GS} = 18\text{ V}$, $I_D = 20\text{ A}$, $T_J = 175\text{ }^\circ\text{C}$ | | 120 | | |

Table 4. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|---|------|------|------|----------|
| C_{iss} | Input capacitance | $V_{DS} = 800\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 1233 | - | pF |
| C_{oss} | Output capacitance | | - | 56 | - | pF |
| C_{riss} | Reverse transfer capacitance | | - | 15 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 800\text{ V}$, $V_{GS} = -5\text{ to }18\text{ V}$, $I_D = 20\text{ A}$ | - | 61 | - | nC |
| Q_{gs} | Gate-source charge | | - | 13 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 25 | - | nC |
| R_g | Gate input resistance | $f = 1\text{ MHz}$, $I_D = 0\text{ A}$ | - | 1 | - | Ω |

Table 5. Switching energy (inductive load)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|---------------------------|---|------|------|------|---------------|
| E_{on} | Turn-on switching energy | $V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, | - | 398 | - | μJ |
| E_{off} | Turn-off switching energy | $R_G = 4.7\text{ }\Omega$, $V_{GS} = -5\text{ V to }18\text{ V}$ | - | 42 | - | μJ |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = -5\text{ to }18\text{ V}$ | - | 12.9 | - | ns |
| t_r | Rise time | | - | 9.8 | - | |
| $t_{d(off)}$ | Turn-off delay time | | - | 21.8 | - | |
| t_f | Fall time | | - | 7.7 | - | |

Table 7. Reverse SiC diode characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|--------------------------|---|------|------|------|------|
| V_{SD} | Diode forward voltage | $I_{SD} = 20\text{ A}$, $V_{GS} = 0\text{ V}$ | - | 3.3 | - | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 20\text{ A}$, $di/dt = 2000\text{ A}/\mu\text{s}$, $V_{DD} = 800\text{ V}$ | - | 15 | - | ns |
| Q_{rr} | Reverse recovery charge | | - | 77 | - | nC |
| I_{RRM} | Reverse recovery current | | - | 9 | - | A |

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

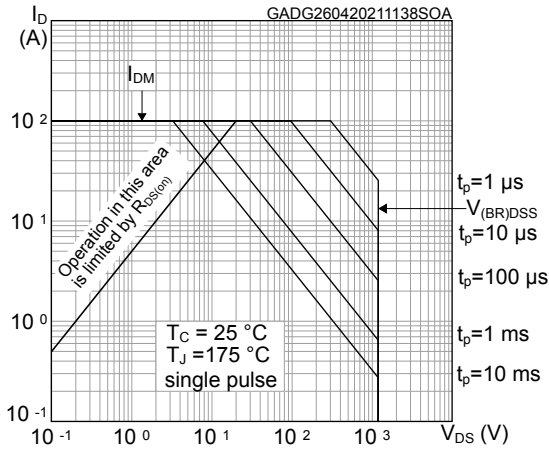


Figure 2. Maximum transient thermal impedance

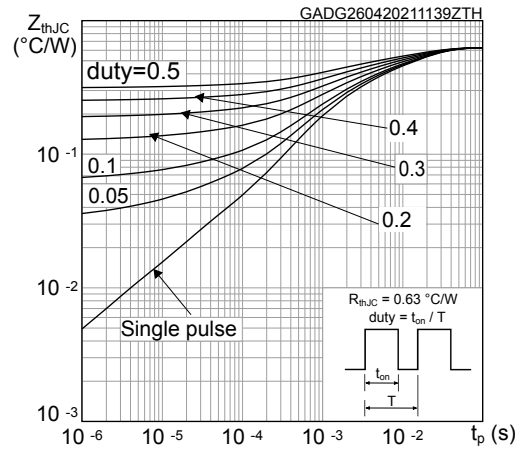


Figure 3. Typical output characteristics (T_J = 25 °C)

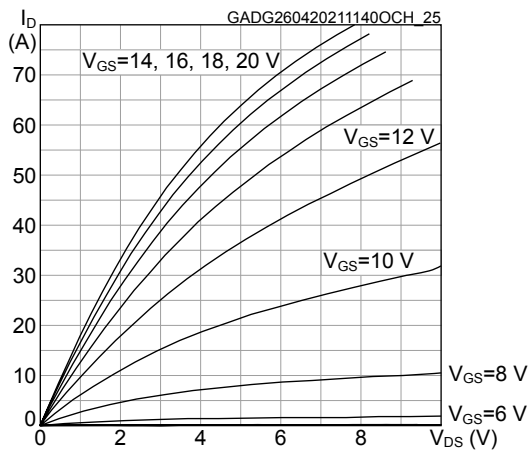


Figure 4. Typical output characteristics (T_J = 175 °C)

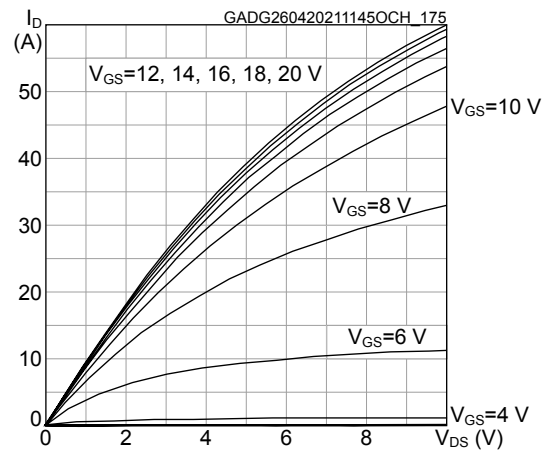


Figure 5. Typical transfer characteristics

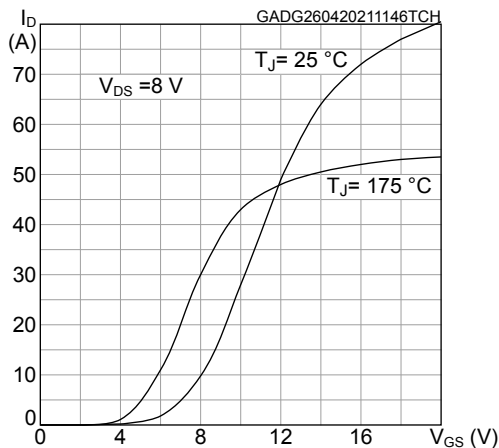


Figure 6. Total power dissipation

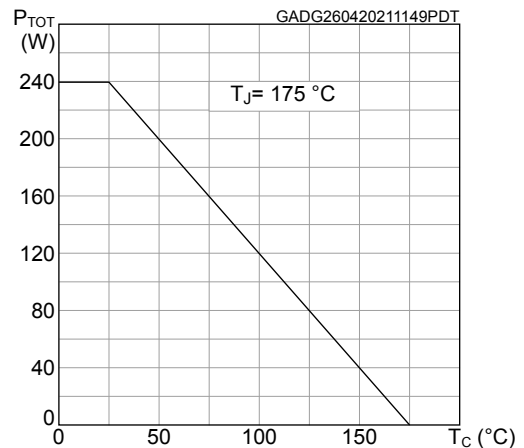


Figure 7. Typical gate charge vs gate-source voltage

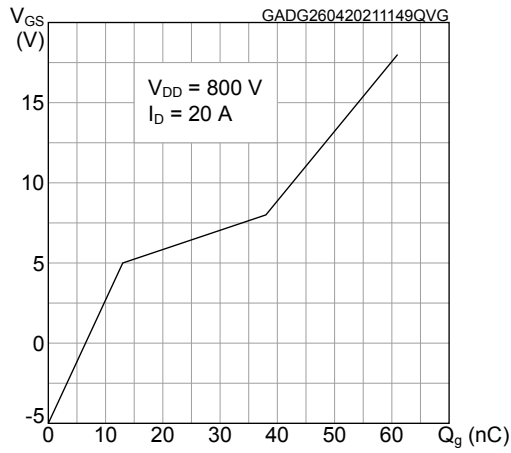


Figure 8. Typical capacitance variations

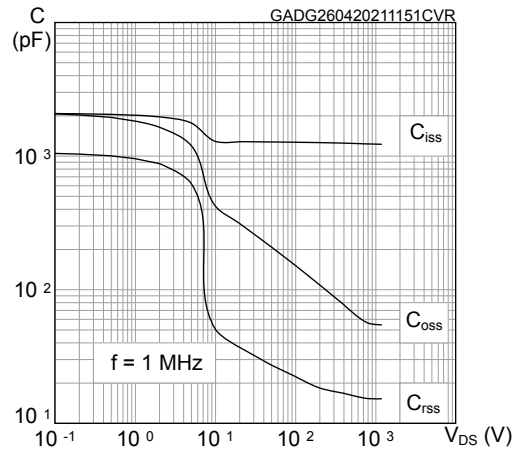


Figure 9. Typical switching energy vs drain current

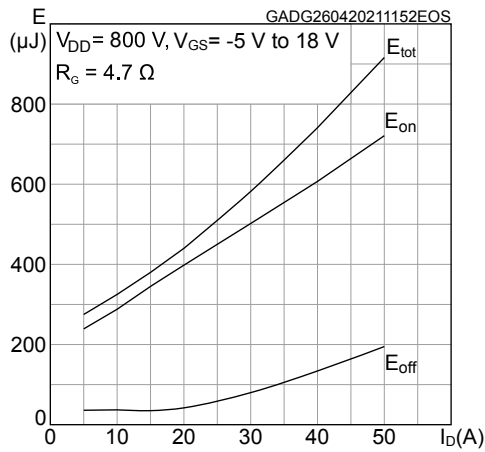


Figure 10. Typical switching energy vs temperature

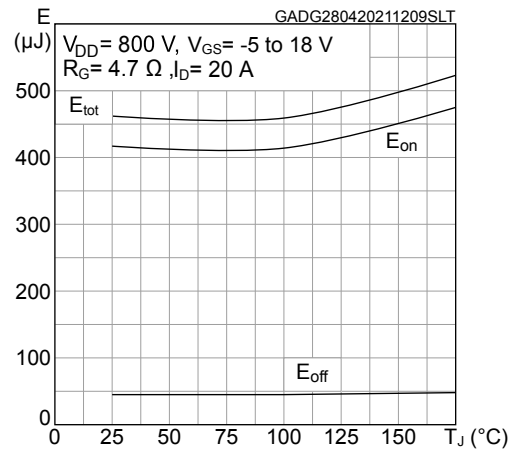


Figure 11. Normalized breakdown voltage vs temperature

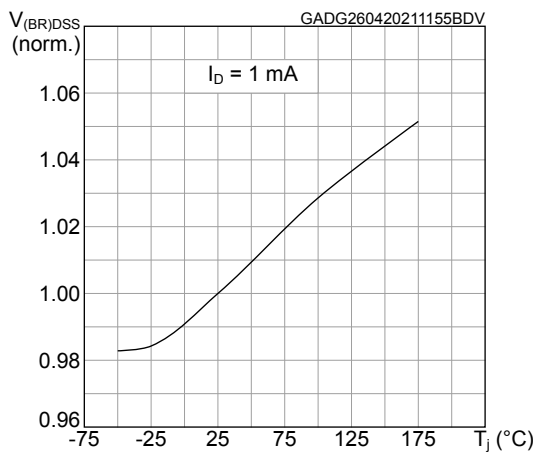


Figure 12. Normalized gate threshold vs temperature

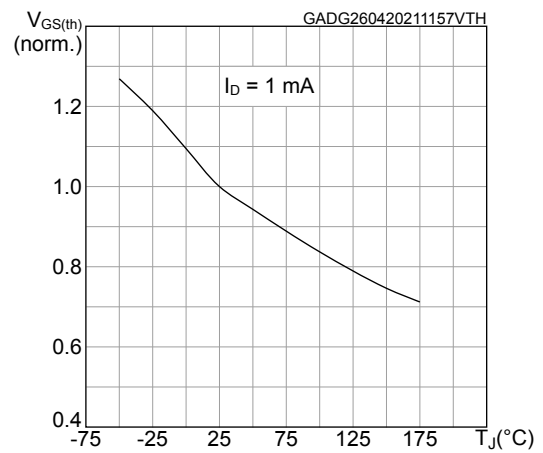


Figure 13. Normalized on-resistance vs temperature

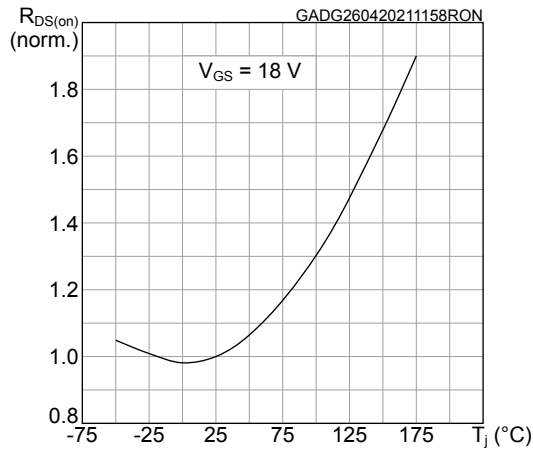


Figure 14. Typical reverse conduction characteristics ($T_J = 25\text{ °C}$)

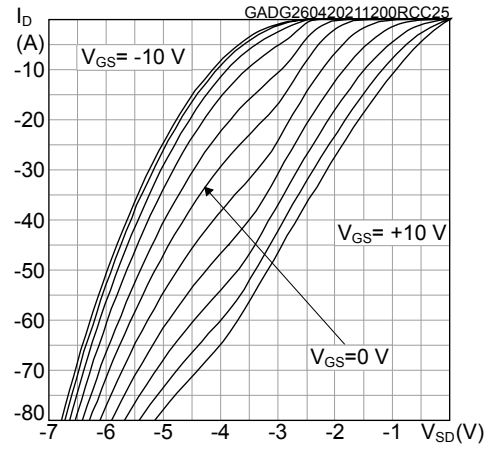


Figure 15. Typical reverse conduction characteristics ($T_J = 175\text{ °C}$)

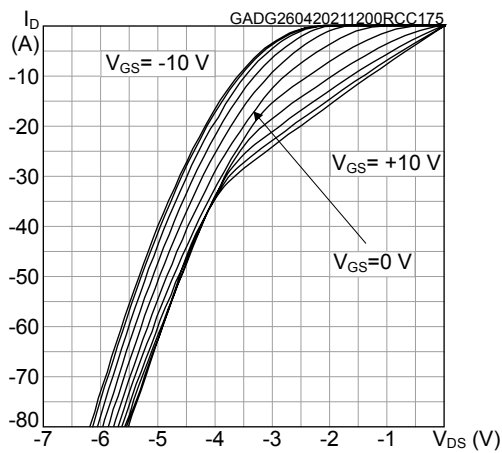
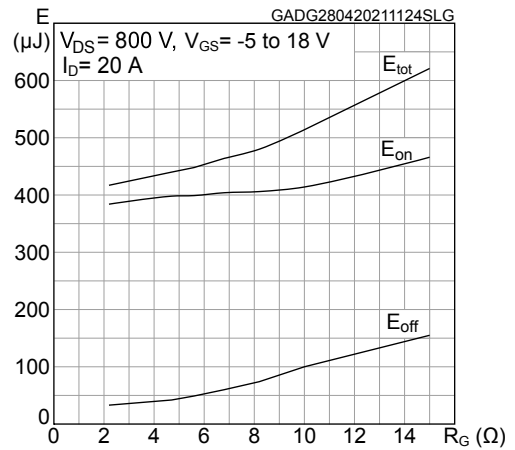


Figure 16. Typical switching energy vs gate resistance



3 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.

3.1 H²PAK-7 package information

Figure 17. H²PAK-7 package outline

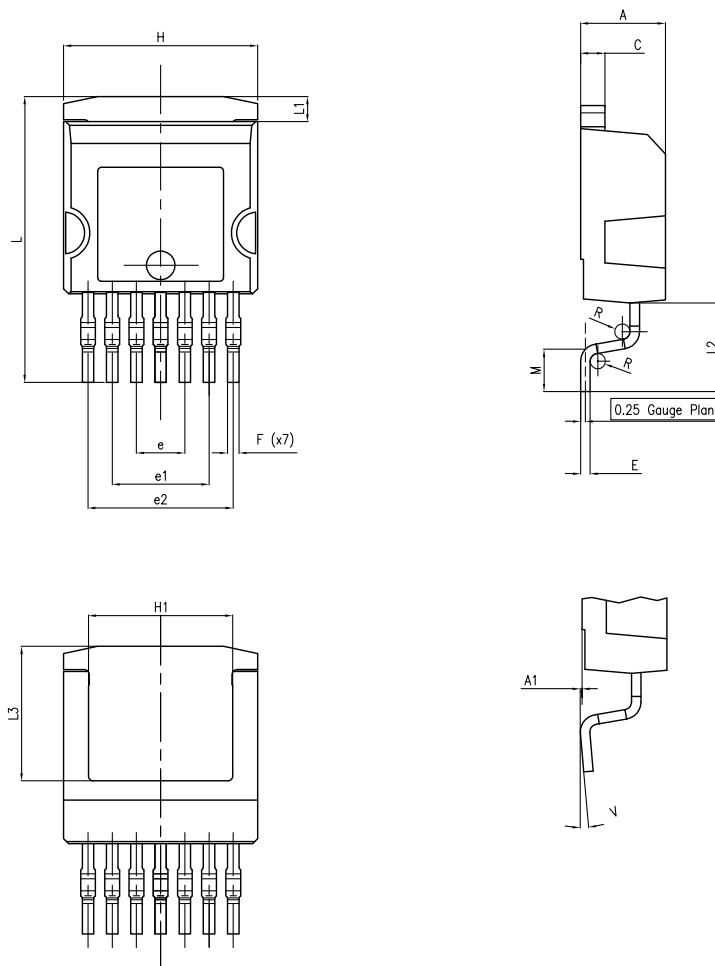
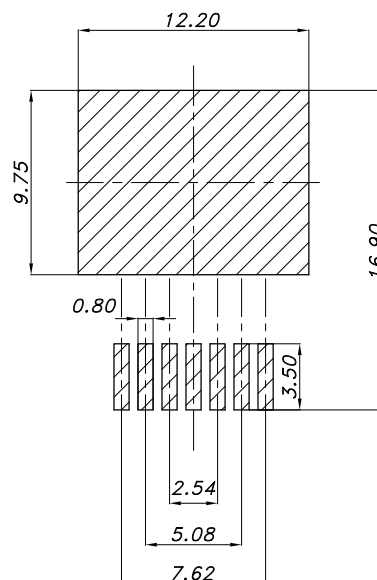


Table 8. H²PAK-7 package mechanical data

| Dim. | mm | |
|------|-------|-------|
| | Min. | Max. |
| A | 4.30 | 4.80 |
| A1 | 0.03 | 0.20 |
| C | 1.17 | 1.37 |
| e | 2.34 | 2.74 |
| e1 | 4.88 | 5.28 |
| e2 | 7.42 | 7.82 |
| E | 0.45 | 0.60 |
| F | 0.50 | 0.70 |
| H | 10.00 | 10.40 |
| H1 | 7.40 | 7.60 |
| L | 14.75 | 15.25 |
| L1 | 1.27 | 1.40 |
| L2 | 4.35 | 4.95 |
| L3 | 6.85 | 7.25 |
| M | 1.90 | 2.50 |
| R | 0.20 | 0.60 |
| V | 0° | 8° |

Figure 18. H²PAK-7 recommended footprint

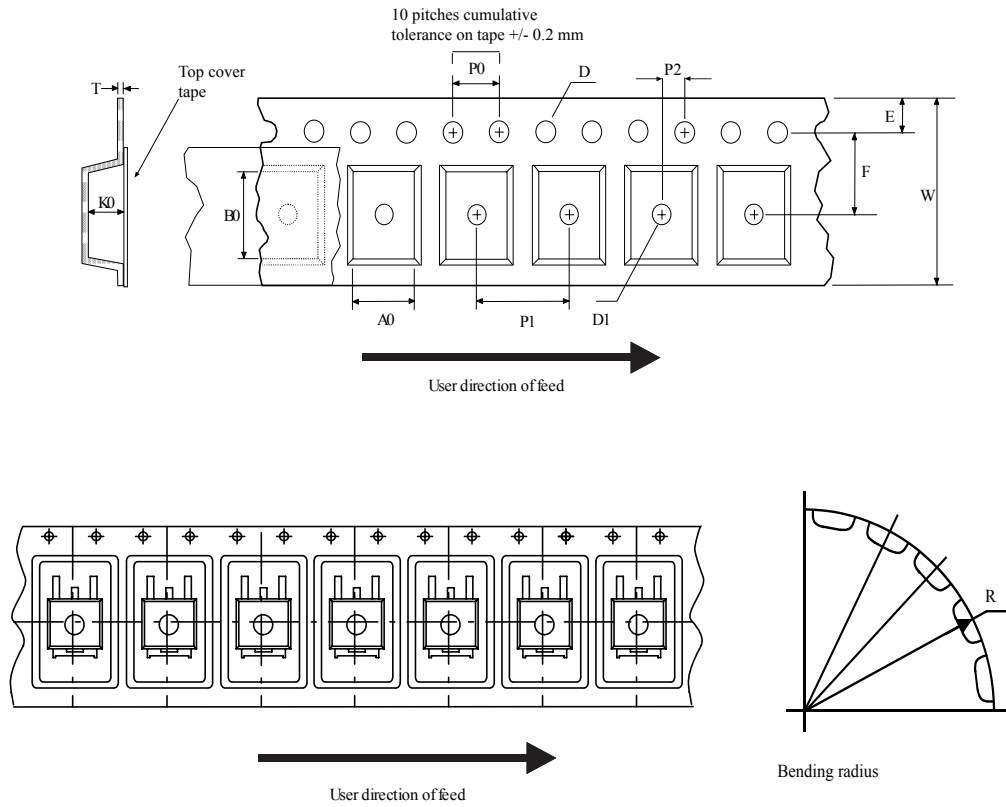


footprint_DM00249216_4

Note: Dimensions are in mm.

3.2 Packing information

Figure 19. Tape outline



AM08852v2

Figure 20. Reel outline

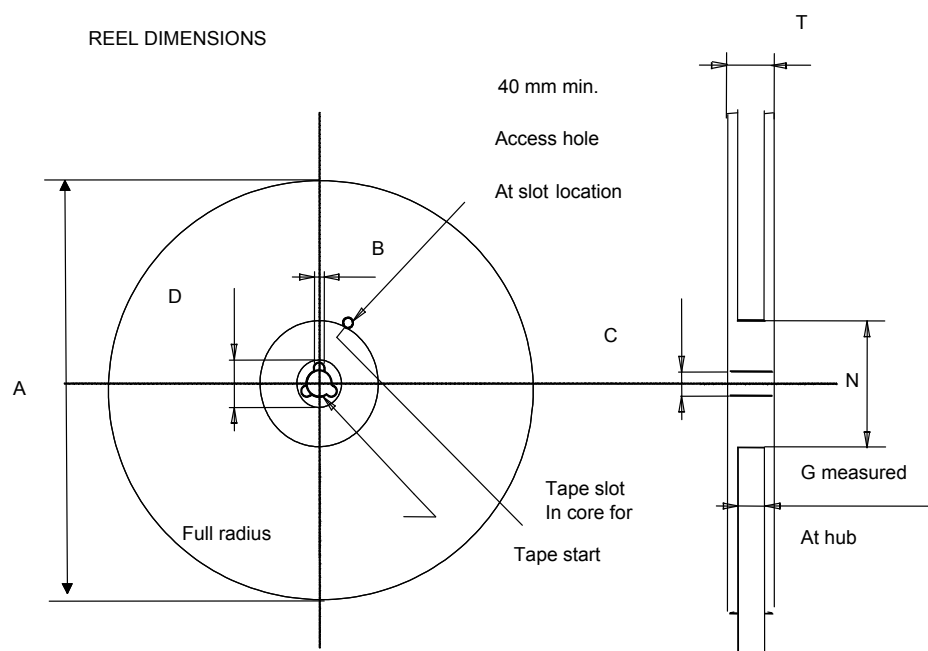


Table 9. Tape and reel mechanical data

| Tape | | | Reel | | |
|------|------|------|---------------|------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| A0 | 10.5 | 10.7 | A | | 330 |
| B0 | 15.7 | 15.9 | B | 1.5 | |
| D | 1.5 | 1.6 | C | 12.8 | 13.2 |
| D1 | 1.59 | 1.61 | D | 20.2 | |
| E | 1.65 | 1.85 | G | 24.4 | 26.4 |
| F | 11.4 | 11.6 | N | 100 | |
| K0 | 4.8 | 5.0 | T | | 30.4 |
| P0 | 3.9 | 4.1 | | | |
| P1 | 11.9 | 12.1 | Base quantity | | 1000 |
| P2 | 1.9 | 2.1 | Bulk quantity | | 1000 |
| R | 50 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 23.7 | 24.3 | | | |

Revision history

Table 10. Document revision history

| Date | Version | Changes |
|-------------|---------|---|
| 28-Apr-2021 | 1 | First release. |
| 13-Jul-2021 | 2 | Updated title in cover page. Updated Table 3. On/off states. |

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