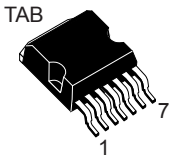
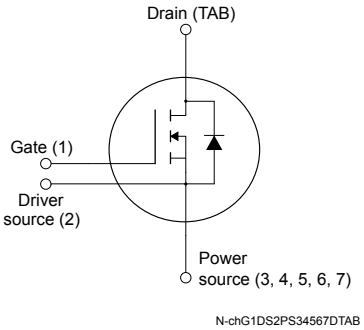
# SCT070H120G3AG

Datasheet

## Automotive-grade silicon carbide Power MOSFET 1200 V, 63 mΩ typ., 30 A in an H²PAK-7 package




**H²PAK-7**




## Features

| Order code | $V_{DS}$ | $R_{DS(on)}$ typ. | $I_D$ |
|---|---|---|---|
| SCT070H120G3AG | 1200 V | 63 mΩ | 30 A |

- AEC-Q101 qualified
- Very low $R_{DS(on)}$ over the entire temperature range
- High speed switching performances
- Very fast and robust intrinsic body diode
- Source sensing pin for increased efficiency

## Applications

- Main inverter (electric traction)
- DC/DC converter for EV/HEV
- On board charger (OBC)

## Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 3rd generation SiC MOSFET technology. The device features a very low $R_{DS(on)}$ over the entire temperature range combined with low capacitances and very high switching operations, which improve application performance in frequency, energy efficiency, system size and weight reduction.

| Product status link |
|---|
| SCT070H120G3AG |

| Product summary | |
|---|---|
| **Order code** | SCT070H120G3AG |
| **Marking** | 70H120G3AG |
| **Package** | H²PAK-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 operating values) | -5 to 18 | |
| | Gate-source transient voltage, $t_p$ < 1 µs, t ≤ 10 hours over lifetime | -11 to 25 | |
| $I_D$(1) | Drain current (continuous) at $T_C$ = 25 °C | 30 | A |
| | Drain current (continuous) at $T_C$ = 100 °C | 25 | |
| $I_{DM}$(2) | Drain current (pulsed) | 100 | A |
| $P_{TOT}$ | Total power dissipation at $T_C$ = 25 °C | 223 | W |
| $T_{stg}$ | Storage temperature range | -55 to 175 | °C |
| $T_J$ | Operating junction temperature range | | °C |

1. *$I_D$ is limited by package.*
2. *Pulse width is limited by safe operating area.*

**Table 2. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thJC}$ | Thermal resistance, junction-to-case | 0.67 | °C/W |
| $R_{thJA}$ | Thermal resistance, junction-to-ambient | 50 | °C/W |

# 2 Electrical characteristics

$T_C$ = 25 °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 V, $I_D$ = 1 mA | 1200 | | | V |
| $I_{DSS}$ | Zero gate voltage drain current | $V_{GS}$ = 0 V, $V_{DS}$ = 1200 V | | | 10 | µA |
| $I_{GSS}$ | Gate-body leakage current | $V_{DS}$ = 0 V, $V_{GS}$ = -10 to 22 V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 1 mA | 1.8 | 3.0 | 4.2 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS}$ = 15 V, $I_D$ = 15 A | | 78 | | mΩ |
| | | $V_{GS}$ = 18 V, $I_D$ = 15 A | | 63 | 87 | |
| | | $V_{GS}$ = 18 V, $I_D$ = 15 A, $T_J$ = 175 °C | | 120 | | |

**Table 4. Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 850 V, f = 1 MHz, $V_{GS}$ = 0 V | - | 900 | - | pF |
| $C_{oss}$ | Output capacitance | | - | 40 | - | pF |
| $C_{rss}$ | Reverse transfer capacitance | | - | 5 | - | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 850 V, $V_{GS}$ = -5 to 18 V, $I_D$ = 15 A | - | 37 | - | nC |
| $Q_{gs}$ | Gate-source charge | | - | 11 | - | nC |
| $Q_{gd}$ | Gate-drain charge | | - | 14 | - | nC |
| $R_g$ | Gate input resistance | f = 1 MHz, $I_D$ = 0 A | - | 1.3 | - | Ω |

**Table 5. Switching energy (inductive load)**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $E_{on}$ | Turn-on switching energy | $V_{DD}$ = 850 V, $I_D$ = 15 A, $R_{G(ON)}$ = 22 Ω, $R_{G(OFF)}$ = 5.6 Ω, $V_{GS}$ = -5 V to 18 V | - | 260 | - | µJ |
| $E_{off}$ | Turn-off switching energy | | - | 63 | - | µJ |

**Table 6. Switching times**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}$ = 850 V, $I_D$ = 15 A,$R_{G(ON)}$ = 22 Ω, $R_{G(OFF)}$ = 5.6 Ω, $V_{GS}$ = -5 to 18 V | - | 18.7 | - | ns |
| $t_r$ | Rise time | | - | 26.6 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 17.6 | - | ns |
| $t_f$ | Fall time | | - | 9.9 | - | ns |

**Table 7. Reverse SiC diode characteristics**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$(1) | Continuous diode forward current | $T_C$ = 25 °C | - | | 30 | A |
| | | $T_C$ = 100 °C | - | | 22 | |
| $V_{SD}$ | Diode forward voltage | $I_{SD}$ = 15 A, $V_{GS}$ = 0 V | - | 2.8 | | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 15 A, di/dt = 1000 A/µs, $V_{DD}$ = 850 V, $V_{GS}$ = -5 V | - | 12 | | ns |
| $Q_{rr}$ | Reverse recovery charge | | - | 60 | | nC |
| $I_{RRM}$ | Reverse recovery current | | - | 9 | | A |

1. *$I_{SD}$ is limited by package.*

## 2.1 Electrical characteristics (curves)

**Figure 1. Safe operating area**

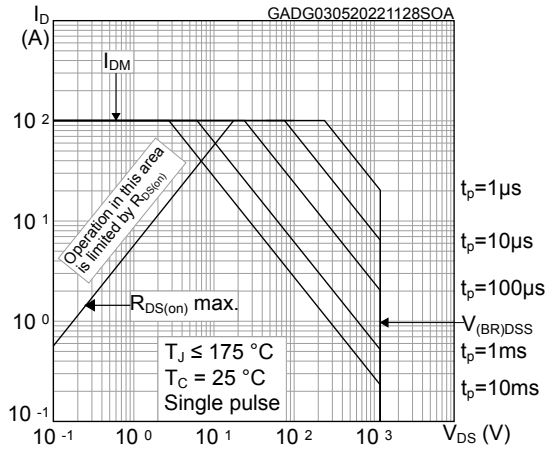



**Figure 2. Maximum transient thermal impedance**

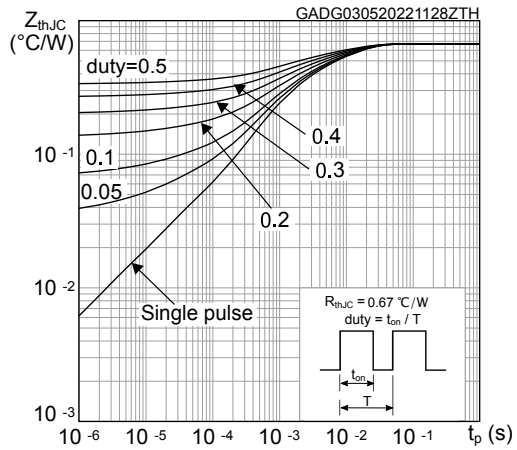



**Figure 3. Typical output characteristics ($T_J$ = 25 °C)**

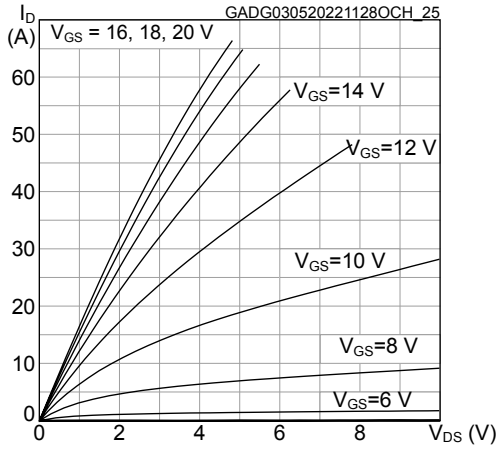



**Figure 4. Typical output characteristics ($T_J$ = 175 °C)**

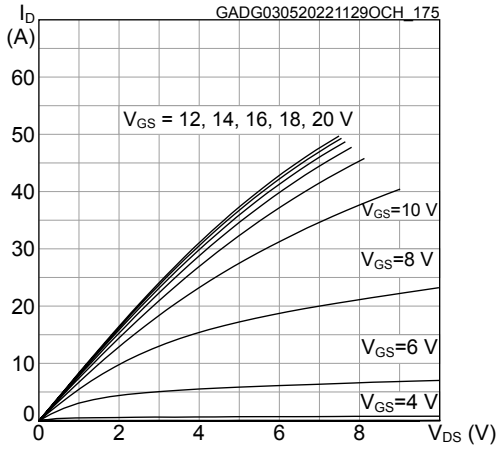



**Figure 5. Typical transfer characteristics**

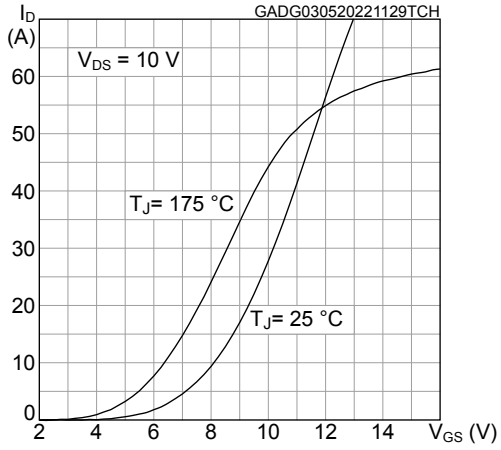



**Figure 6. Total power dissipation**

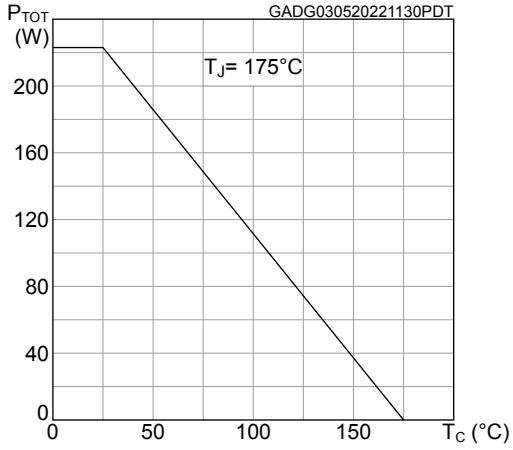


**Figure 7. Typical gate charge characteristics**

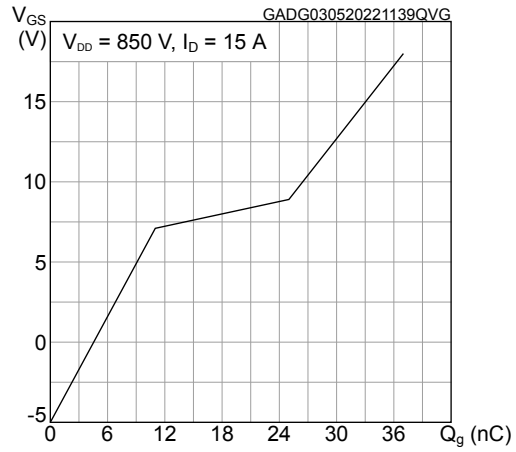



**Figure 8. Typical capacitance characteristics**

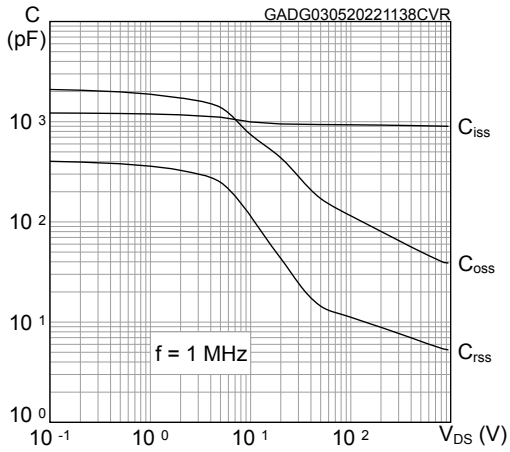



**Figure 9. Typical switching energy vs drain current**

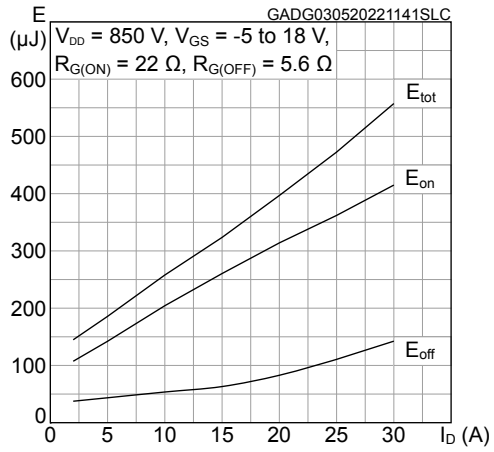



**Figure 10. Typical switching energy vs supply voltage**

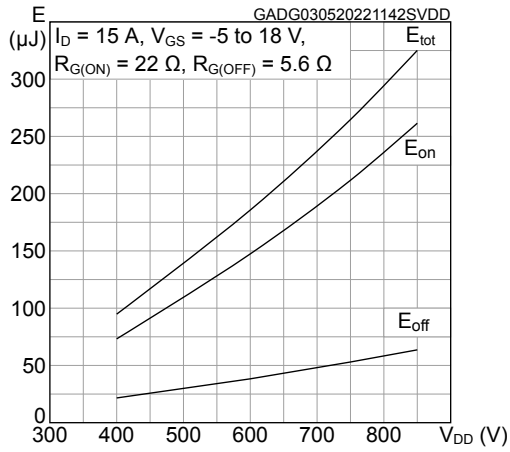



**Figure 11. Normalized breakdown voltage vs temperature**

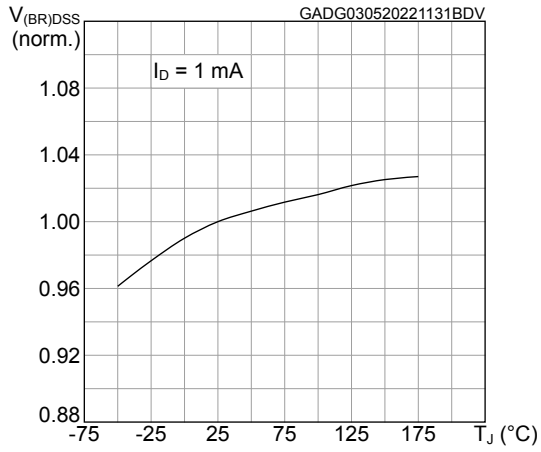



**Figure 12. Normalized gate threshold vs temperature**

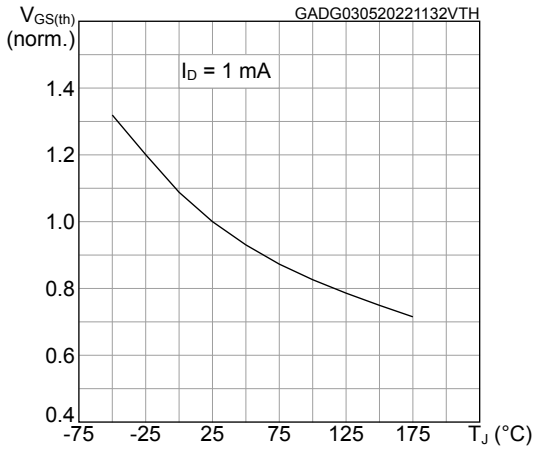


**Figure 13. Normalized on-resistance vs temperature**

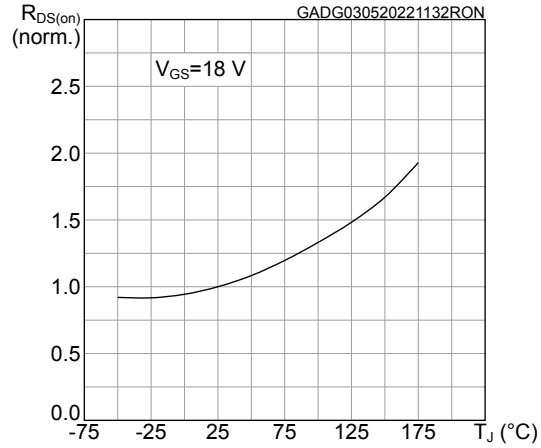



**Figure 14. Typical reverse conduction characteristics ($T_J$ = 25 °C)**

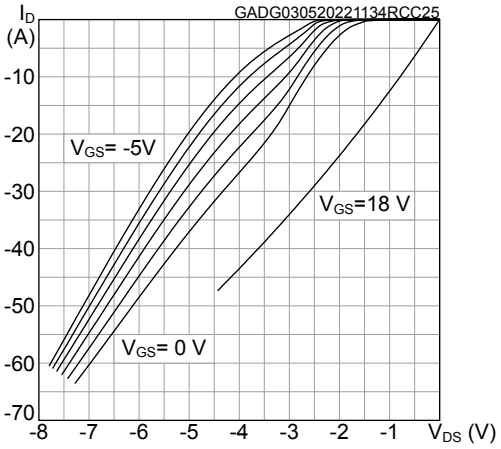
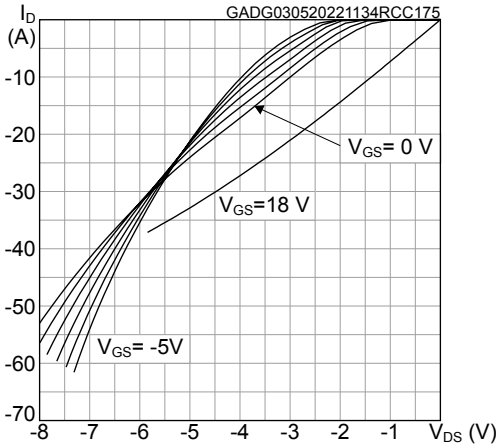



**Figure 15. Typical reverse conduction characteristics ($T_J$ = 175 °C)**



# 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 16. **H²PAK-7 package outline**

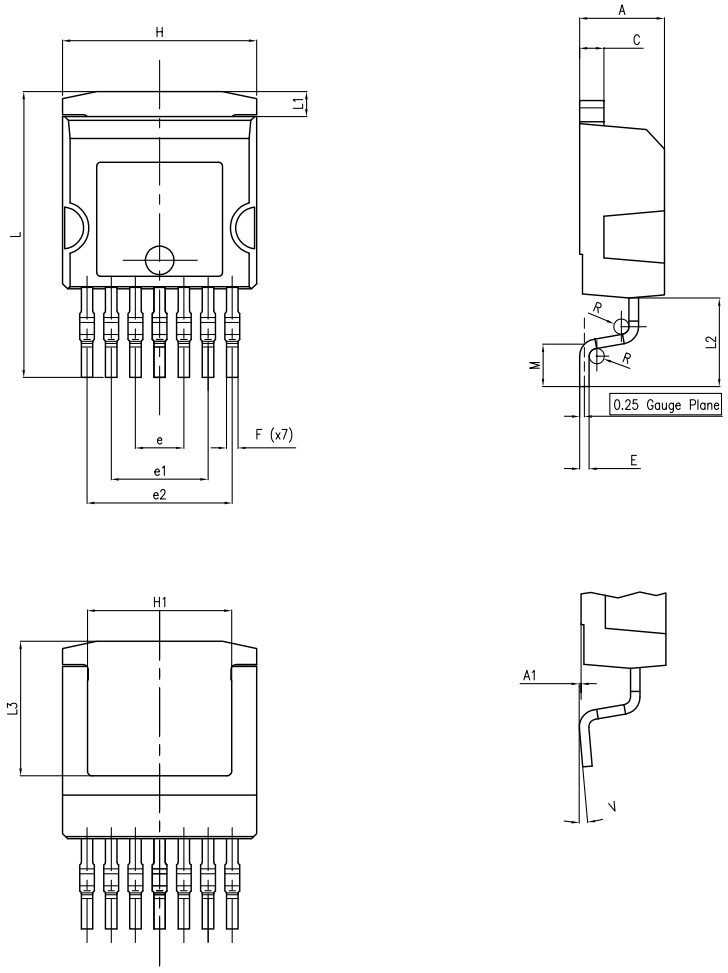



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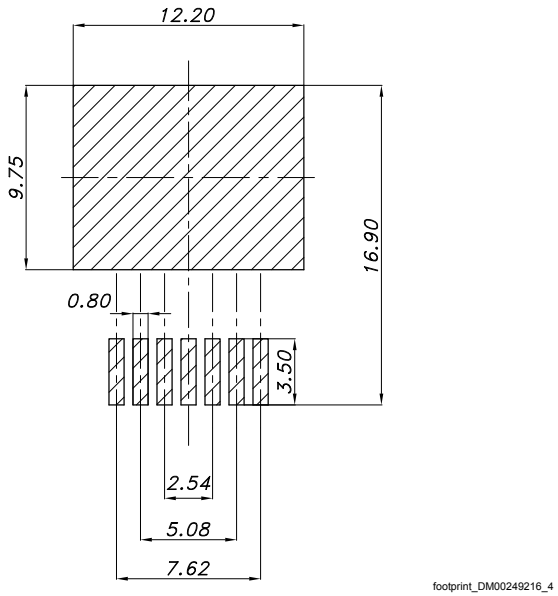
Table 8. **H²PAK-7 package mechanical data**

| 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 17. **H²PAK-7 recommended footprint**




*Note: Dimensions are in mm.*

## 3.2 Packing information

Figure 18. **Tape outline**

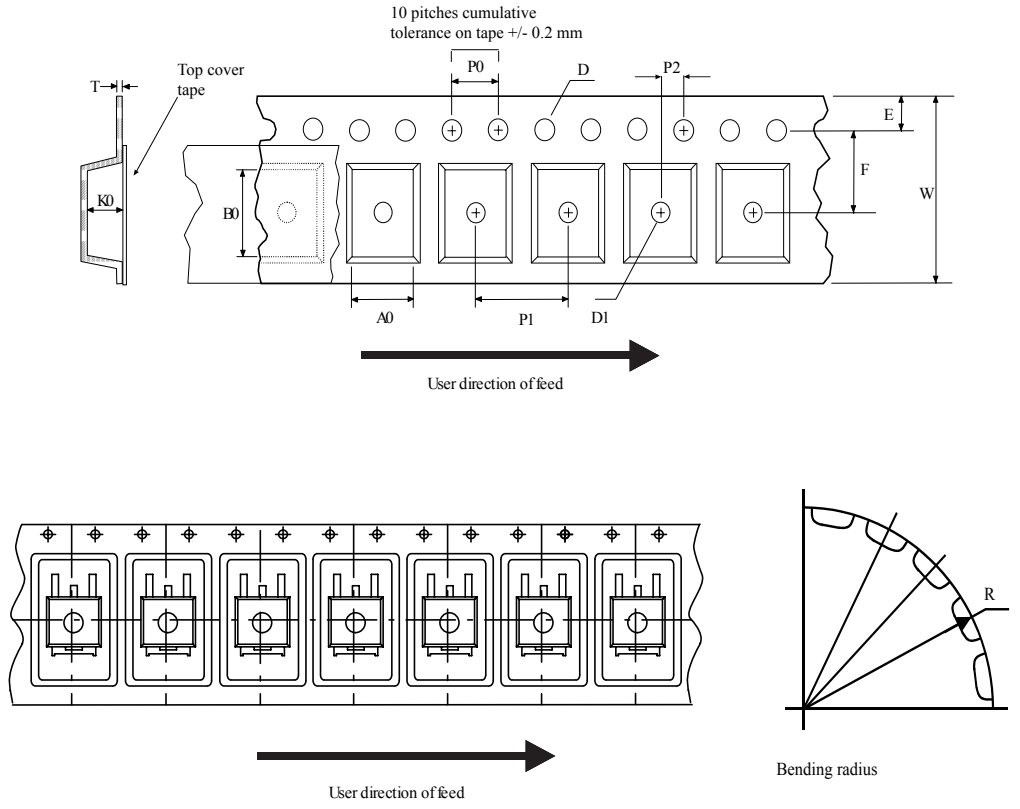



Figure 19. **Reel outline**

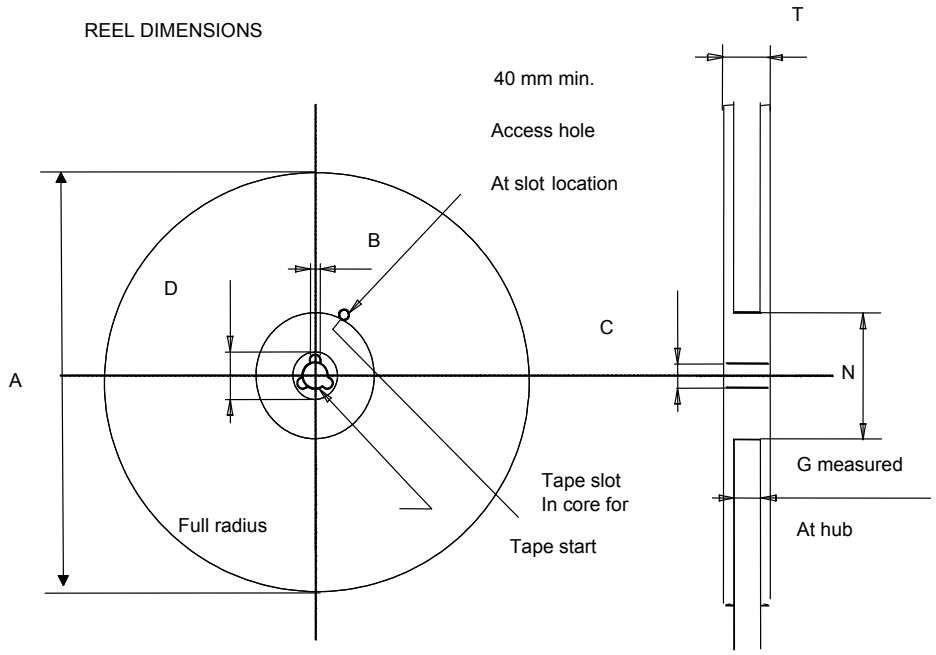


Table 9. **Tape and reel mechanical data**

| 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 | Revision | Changes |
|---|---|---|
| 04-May-2022 | 1 | First release. |
| 14-Jun-2022 | 2 | Modified Figure 7. Typical gate charge characteristics, Figure 9. Typical switching energy vs drain current and Figure 10. Typical switching energy vs supply voltage. |

# Contents