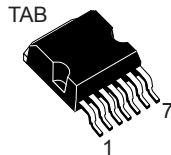
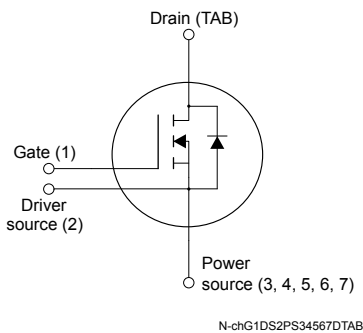


Silicon carbide Power MOSFET 650 V, 110 A, 18 mΩ (typ., T_J = 25 °C) in an H²PAK-7 package


H²PAK-7

Product status link
[SCTH90N65G2V-7](#)
Product summary

Order code	SCTH90N65G2V-7
Marking	SCT90N65G2V
Package	H ² PAK-7
Packing	Tape and reel

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
SCTH90N65G2V-7	650 V	24 mΩ	110 A

- Very high operating junction temperature capability (T_J = 175 °C)
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitances

Applications

- Switching applications
- Power supply for energy systems
- High frequency DC-DC converters

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.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	650	V
V_{GS}	Gate-source voltage	-10 to 22	V
	Gate-source voltage (recommended operating values)	-5 to +18	
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	110	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	90	
$I_{DM}^{(1)}$	Drain current (pulsed)	220	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	330	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
$R_{thj-case}$	Thermal resistance junction-case	0.45	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	40	°C/W

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	650			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$			10	μA
		$V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 150\text{ °C}$		10		
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	3.2	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 18\text{ V}$, $I_D = 50\text{ A}$		18	24	m Ω
		$V_{GS} = 18\text{ V}$, $I_D = 50\text{ A}$, $T_J = 175\text{ °C}$		25		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	3500	-	pF
C_{oss}	Output capacitance		-	350	-	pF
C_{riss}	Reverse transfer capacitance		-	53	-	pF
Q_g	Total gate charge	$V_{DD} = 400\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 0\text{ V to }20\text{ V}$	-	160	-	nC
Q_{gs}	Gate-source charge		-	37	-	nC
Q_{gd}	Gate-drain charge		-	47	-	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	$V_{GS} = -5\text{ to }18\text{ V}$, $V_{DD} = 400\text{ V}$, $I_D = 50\text{ A}$, $R_G = 2.2\text{ }\Omega$	-	180	-	μJ
E_{off}	Turn-off switching energy		-	200	-	
E_{on}	Turn-on switching energy	$V_{DD} = 400\text{ V}$, $I_D = 50\text{ A}$, $R_G = 2.2\text{ }\Omega$, $V_{GS} = -5\text{ to }18\text{ V}$, $T_J = 150\text{ °C}$	-	150	-	
E_{off}	Turn-off switching energy		-	180	-	

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$, $I_D = 50\text{ A}$, $R_G = 2.2\ \Omega$, $V_{GS} = -5\text{ V to }18\text{ V}$	-	26	-	ns
t_f	Fall time		-	16	-	ns
$t_{d(off)}$	Turn-off delay time		-	58	-	ns
t_r	Rise time		-	38	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD}	Forward on voltage	$I_F = 30\text{ A}$, $V_{GS} = 0\text{ V}$	-	2.5	-	V
t_{rr}	Reverse recovery time	$I_F = 50\text{ A}$, $di/dt = 4000\text{ A}/\mu\text{s}$, $V_{DD} = 400\text{ V}$	-	17	-	ns
Q_{rr}	Reverse recovery charge		-	308	-	nC
I_{RRM}	Reverse recovery current		-	30	-	A

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

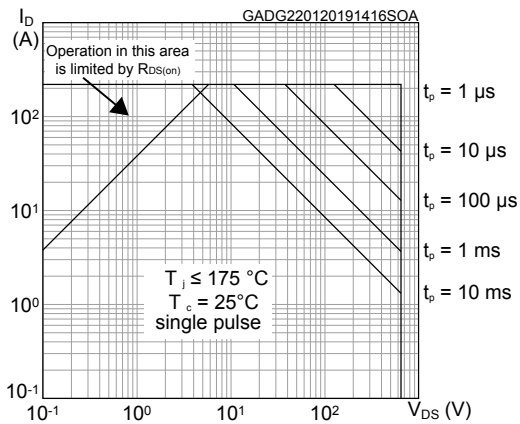


Figure 2. Thermal impedance

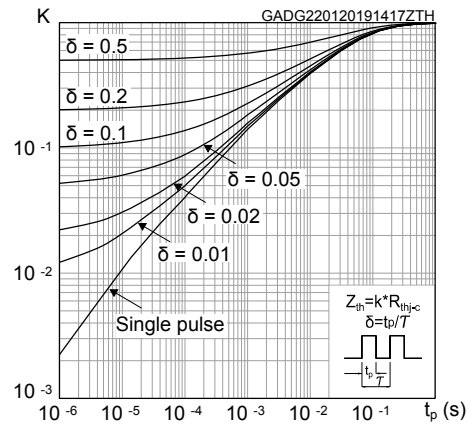


Figure 3. Output characteristics

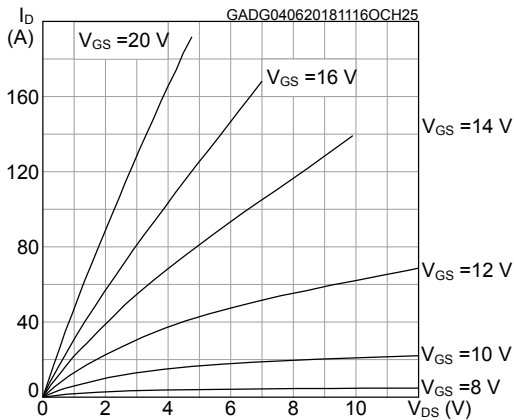


Figure 4. Transfer characteristics

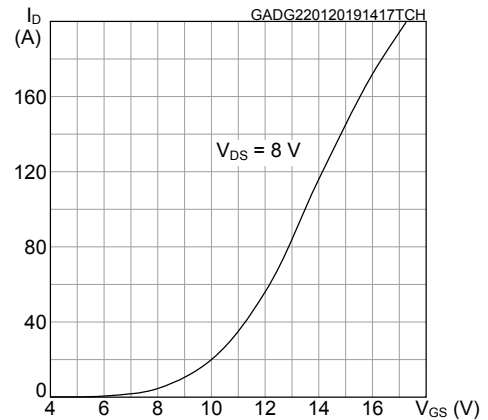


Figure 5. Total power dissipation

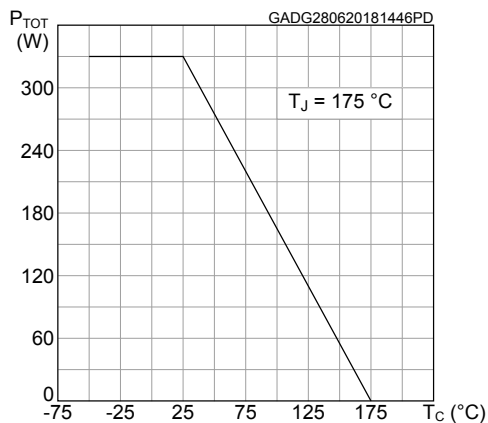


Figure 6. Gate charge vs gate-source voltage

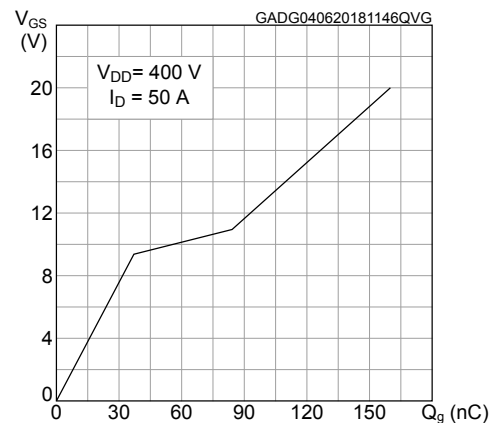


Figure 7. Capacitance variations

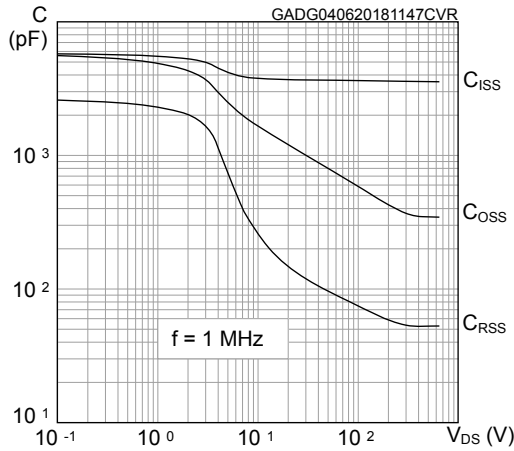


Figure 8. Switching energy vs drain current

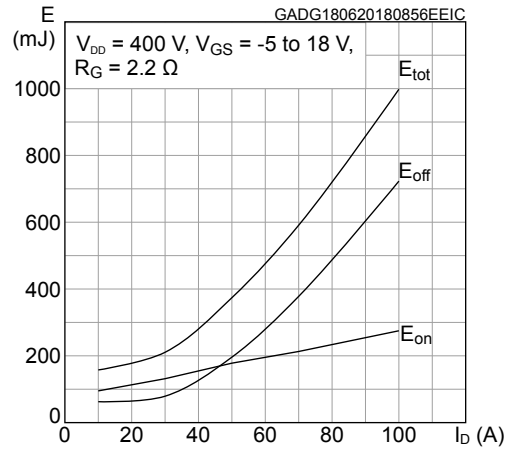


Figure 9. Switching energy vs temperature

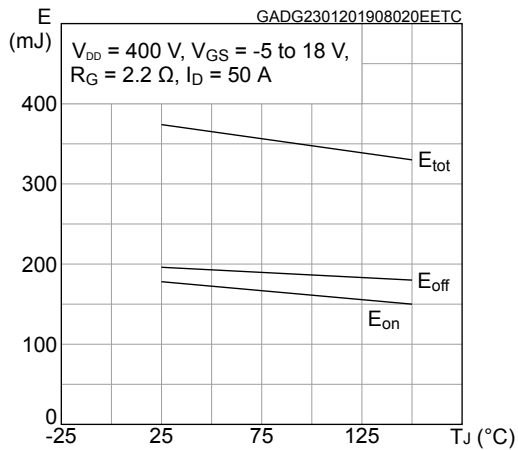


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

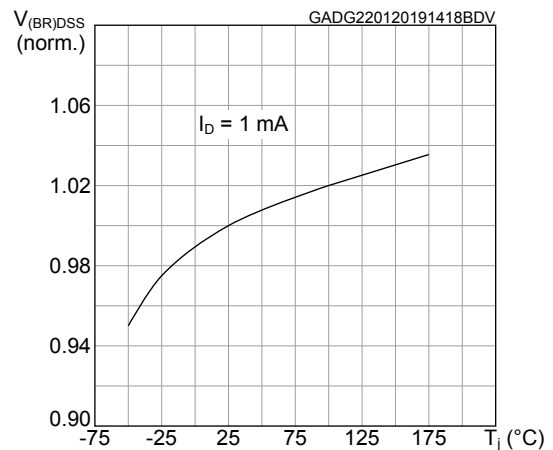


Figure 11. Normalized gate threshold voltage vs temperature

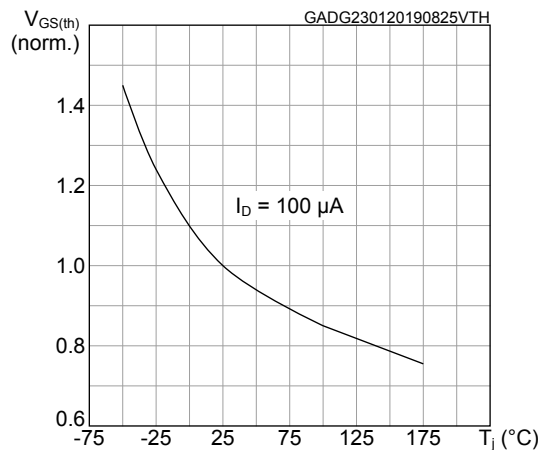


Figure 12. Normalized on-resistance vs temperature

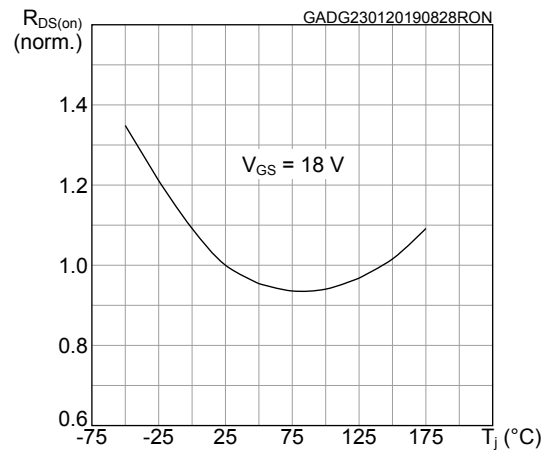
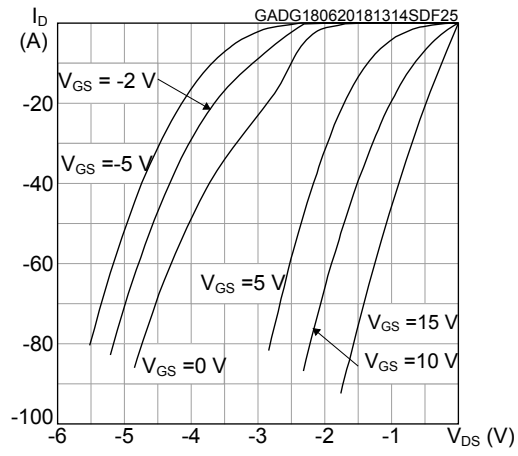


Figure 13. Reverse conduction characteristics ($T_J = 25\text{ }^\circ\text{C}$)



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 14. H²PAK-7 package outline

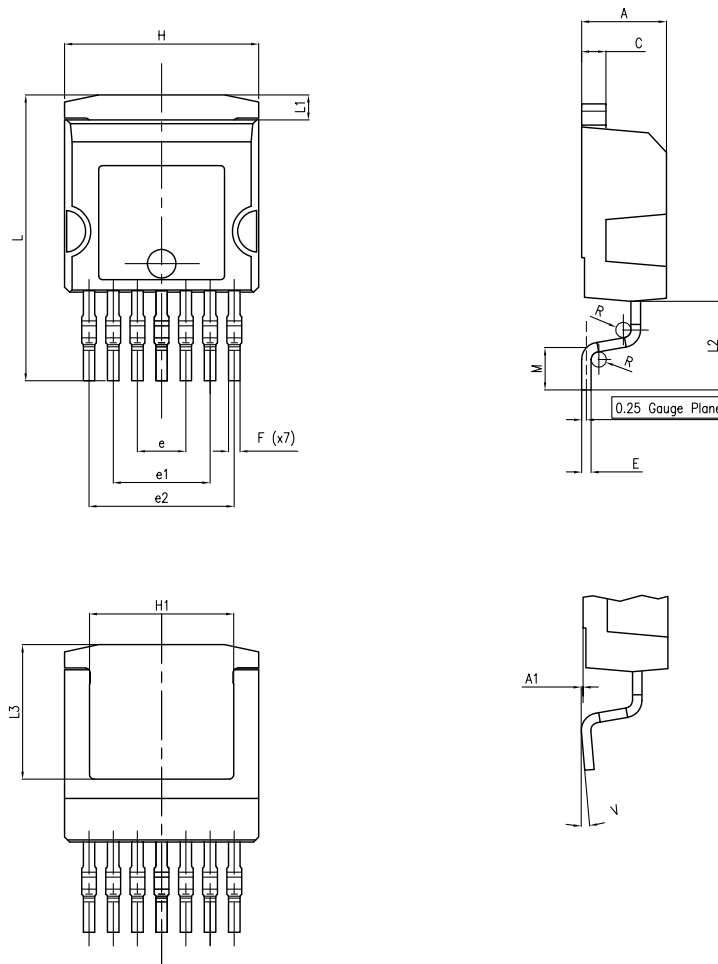
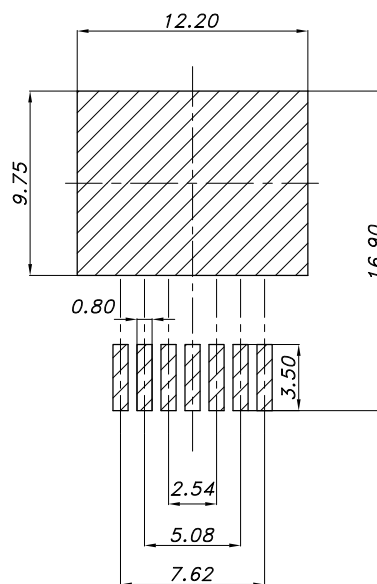


Table 8. H²PAK-7 package mechanical data

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 15. H²PAK-7 recommended footprint

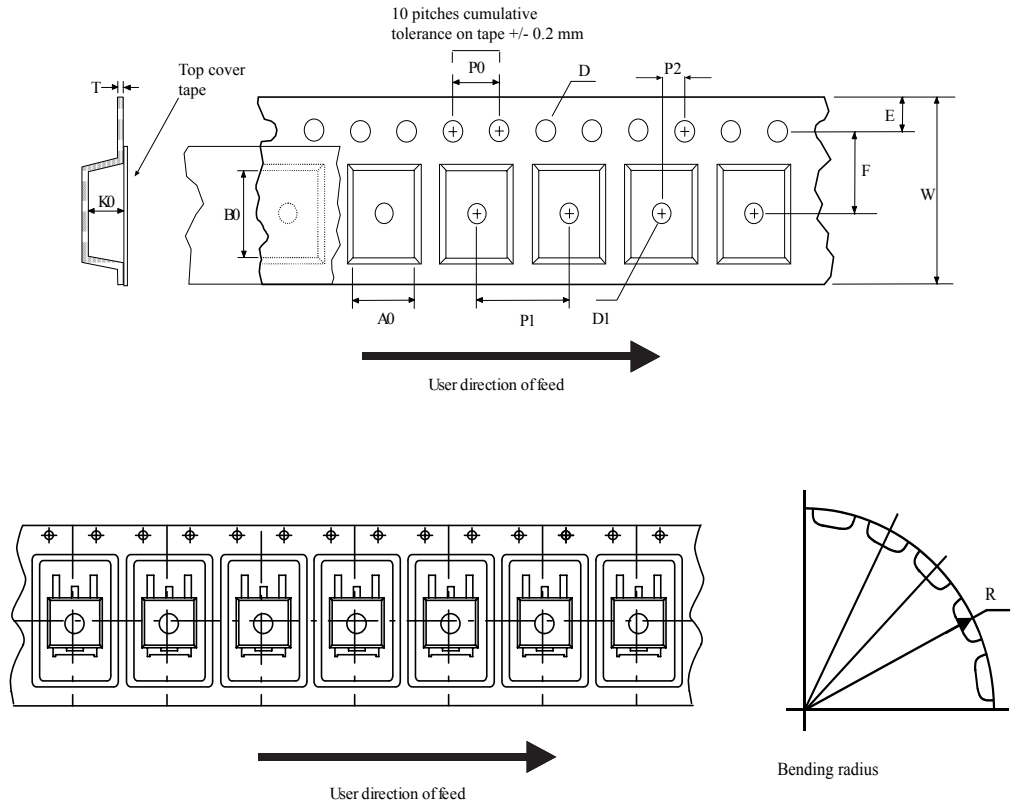


footprint_DM00249216_4

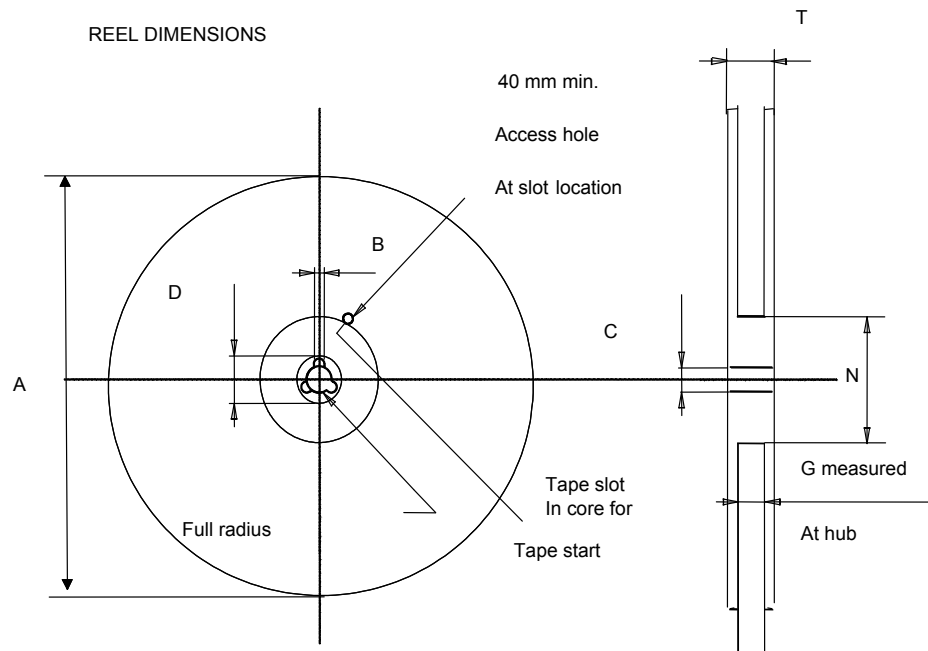
Note: Dimensions are in mm.

3.2 Packing information

Figure 16. Tape outline



AM08852v2

Figure 17. Reel outline

Table 9. Tape and reel mechanical data

Dim.	Tape		Dim.	Reel	
	mm			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
30-Mar-2017	1	First release
28-Jun-2018	2	Updated cover page. Updated <i>Section 2 Electrical characteristics</i> and <i>Section 3 Package information</i> . Minor text changes.
22-Jan-2019	3	Updated title and features on cover page. Updated Table 1. Absolute maximum ratings . Updated Section 2 Electrical characteristics and Section 2.1 Electrical characteristics (curves) . Minor text changes

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