

Silicon carbide Power MOSFET 1200V, 36A 70mΩ (typ. $T_J = 25^\circ\text{C}$) in H²PAK-7L package

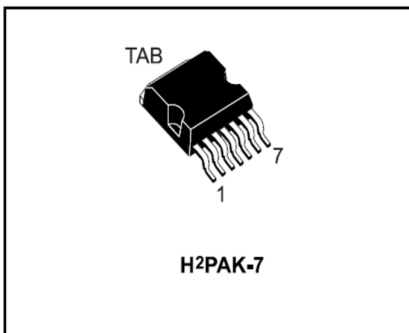
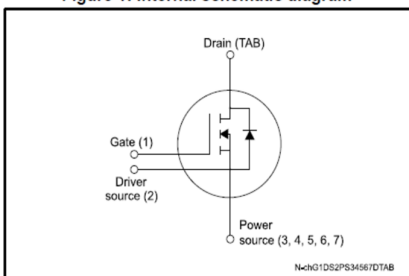


Figure 1: Internal schematic diagram


Maturity status link

SCTH40N120G2V-7

Device summary

Order code	SCTH40N120G2V-7
Marking	SCT40N120G2V
Package	H ² PAK
Packing	T&R

Features

Order code	V_{DS}	$R_{DS(on)}$ Typ	I_D
SCTH40N120G2V-7	1200V	70 mΩ	36 A

- Very high operating junction temperature capability ($T_J = 175^\circ\text{C}$)
- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Source Kelvin pin for increased efficiency

Applications

- Charger
- Power supply for Renewable energy systems
- High frequency DC-DC converters

Description

This silicon carbide Power MOSFET 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 losses are almost independent of junction temperature

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	
	Gate-source voltage (recommended operational values)	-5 to +18	
I _D	Drain current (continuous) at TC = 25 °C	36	A
	Drain current (continuous) at TC = 100 °C	25	
I _{D(1)}	Drain current (pulsed)	100	A
P _{TOT}	Total dissipation at TC = 25 °C	238	W
T _J	Operating junction temperature range	-55 to 175	°C
T _{stg}	Storage 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	0.63	°C/W
R _{thj-amb}	Thermal resistance junction-ambient	40	°C/W

2 Electrical characteristics

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

Table 3. On /off-states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	1200			V
I_{DSS}	Zero-gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 1200\text{ V}$			10	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 1200\text{ V}$, $T_J = 150\text{ °C}$		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	2.45	4.8	V
$R_{DS(on)}$		$V_{GS} = 18\text{ V}$, $I_D = 50\text{ A}$		70	100	$\text{m}\Omega$
$R_{DS(on)}$		$V_{GS} = 18\text{ V}$, $I_D = 20\text{ A}$, $T_J = 175\text{ °C}$		154		$\text{m}\Omega$

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_{rss}	Reverse transfer capacitance		-	15	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1	-	Ω
Q_g	Total gate charge	$V_{DD} = 800\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = -5\text{ to }+18\text{ V}$	-	61	-	nC
Q_{gs}	Gate-source charge		-	13	-	nC
Q_{gd}	Gate-drain charge		-	25	-	nC

Table 5. Switching energy

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

Table 6. Switching times

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

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	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.7\Omega$, $di/dt = 2000\text{A}/\mu\text{s}$, $V_{GS} = -5\text{V to } +18\text{V}$	-	15	-	ns
Q_{rr}	Reverse recovery charge		-	77	-	nC
I_{RRM}	Reverse recovery current		-	9	-	A

2 Electrical characteristics

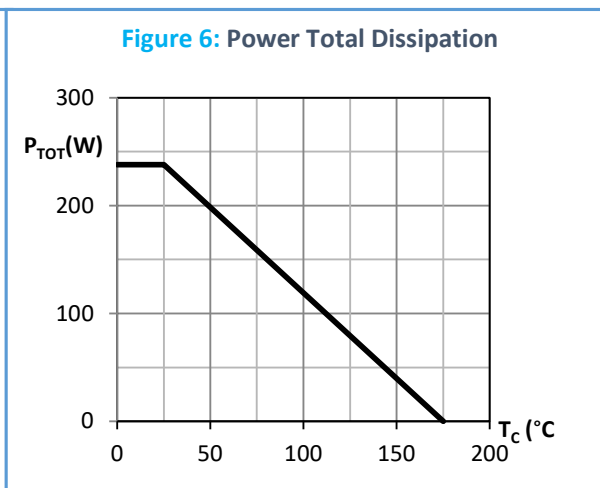
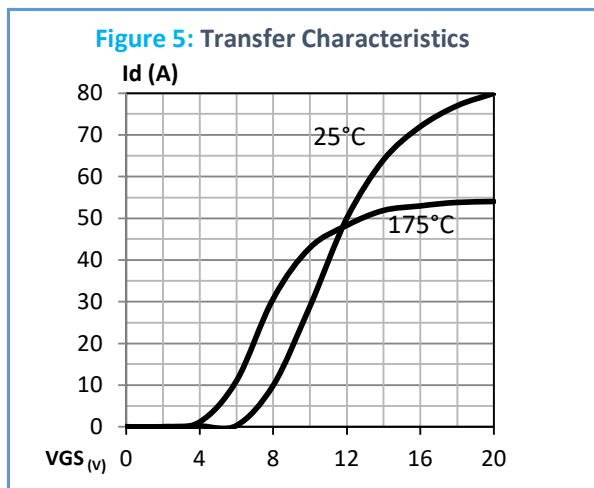
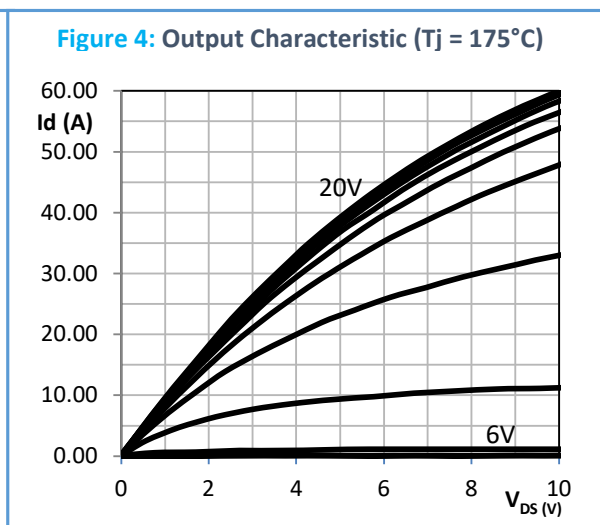
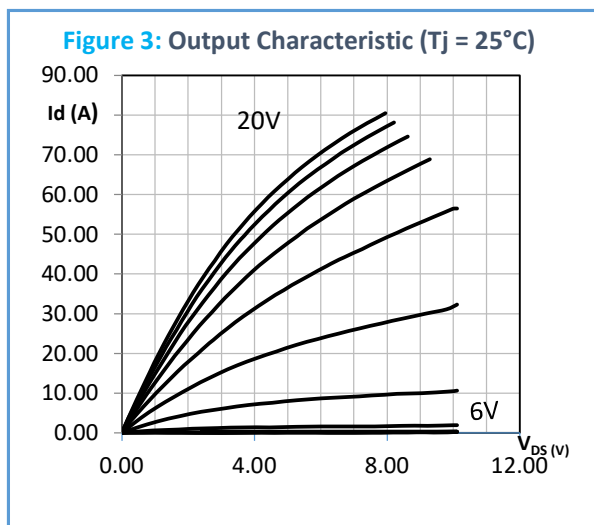
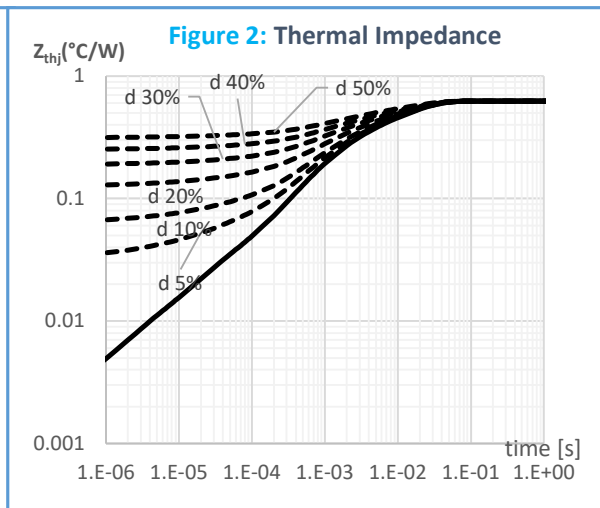
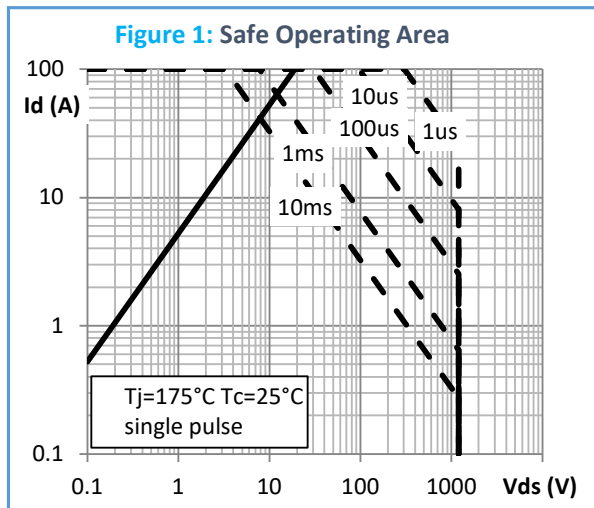


Figure 7: Gate Charge vs. Gate Source

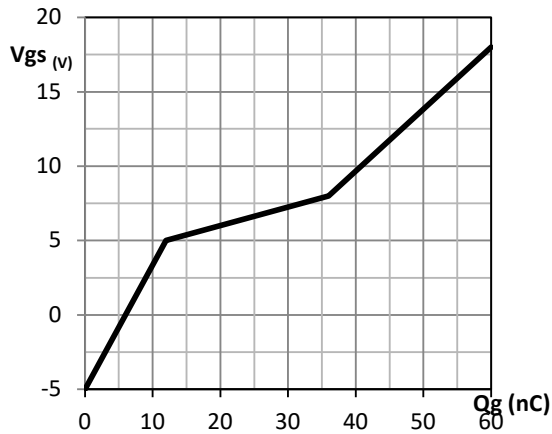


Figure 8: Typical capacitances

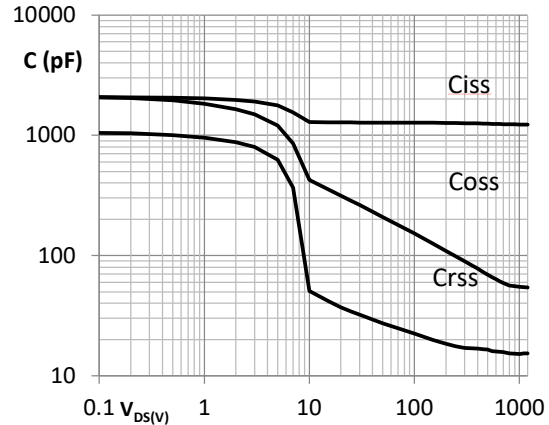


Figure 9: Switching Energy vs. Drain

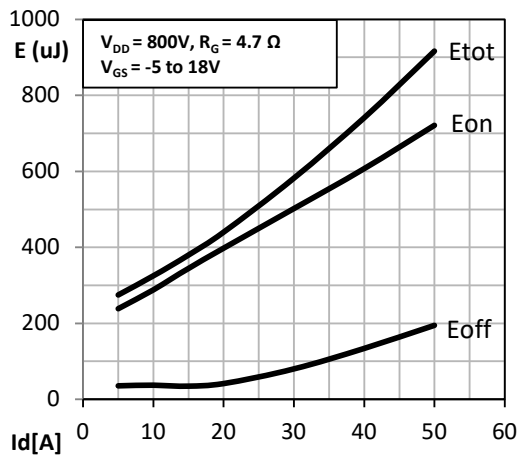


Figure 10: Switching Energy vs. Junction Temp.

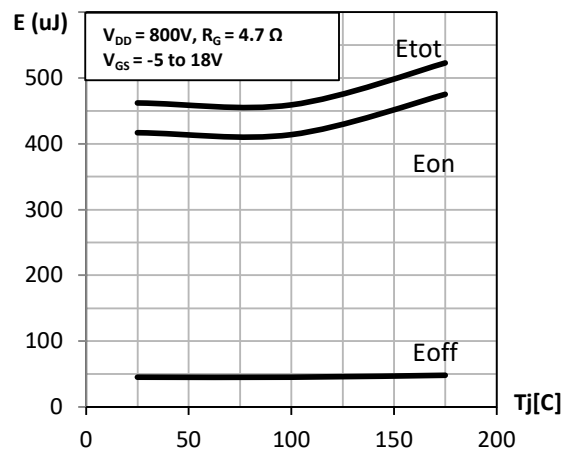


Figure 11: Normalized $V(BR)_{DSS}$ vs. Temp.

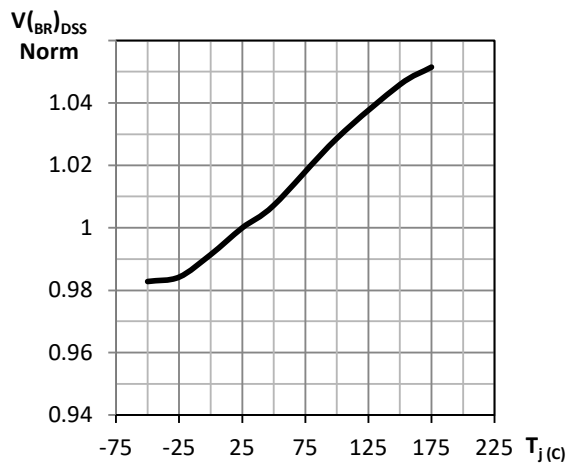


Figure 12: Normalized V_{th} voltage vs. Temp.

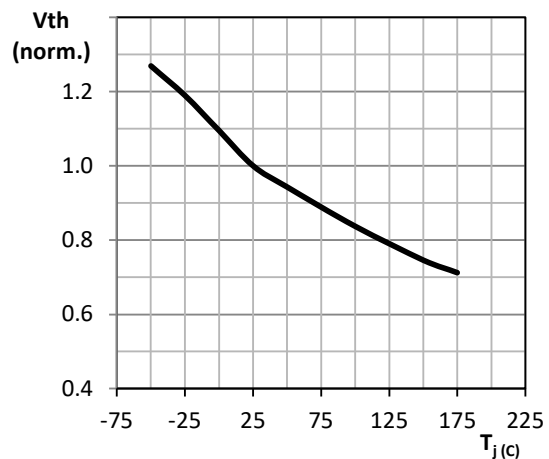


Figure 13: Normalized On-Resistance vs. Temp.

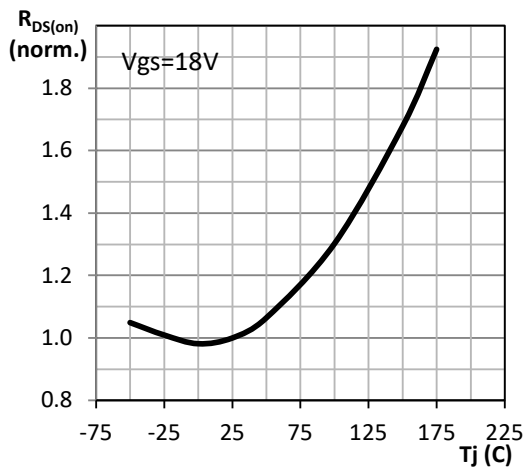


Figure 14: On-Resistance vs. Temp.

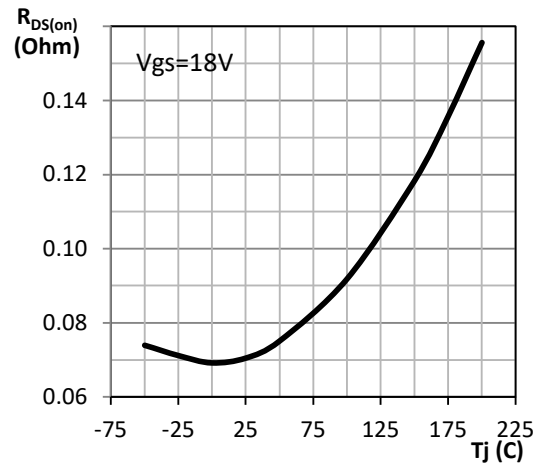


Figure 15: Reverse Conduction Characteristic(Tj=25°C)

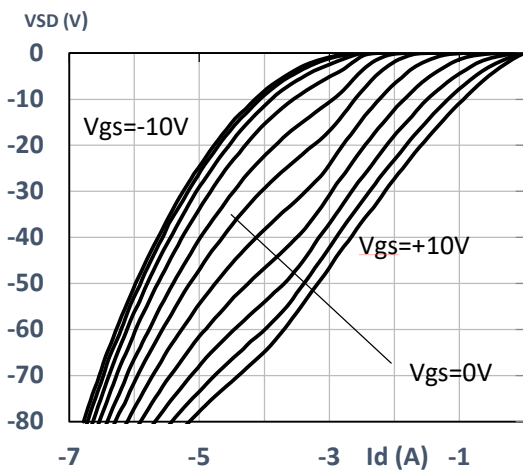
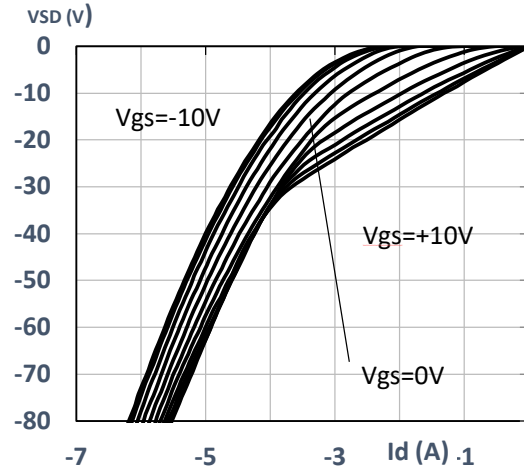


Figure 16: Reverse Conduction Characteristic(Tj=175°C)

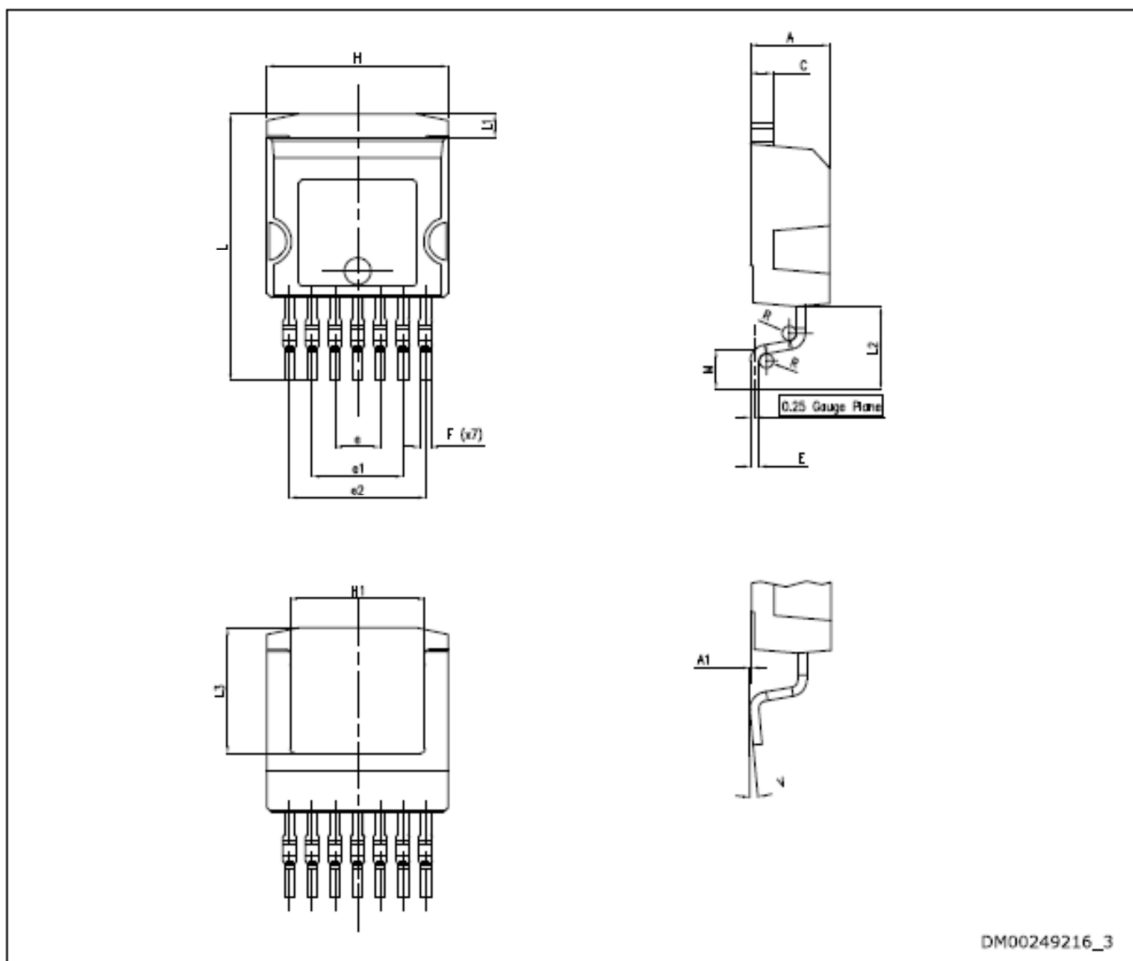


3 Package information

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

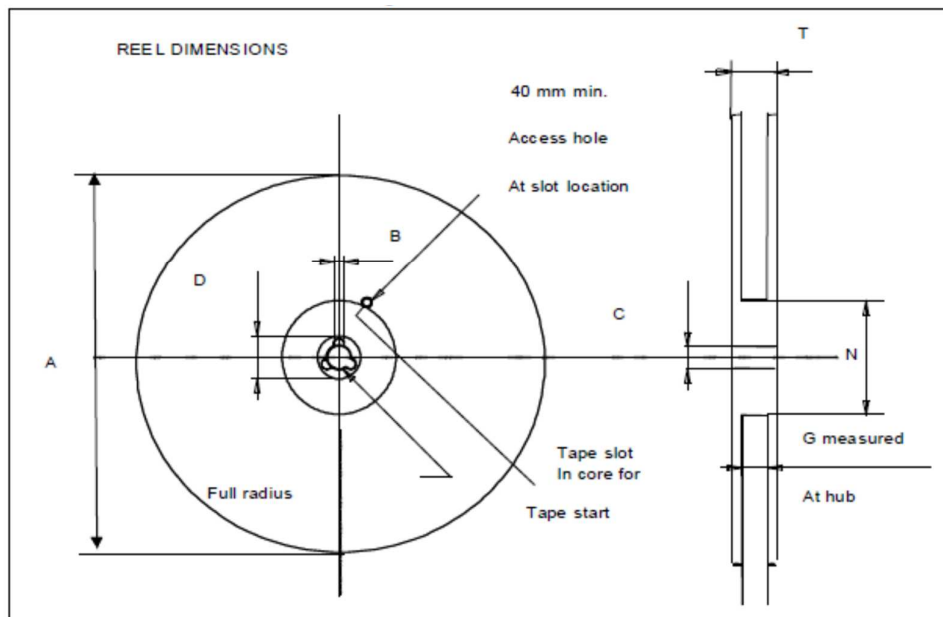
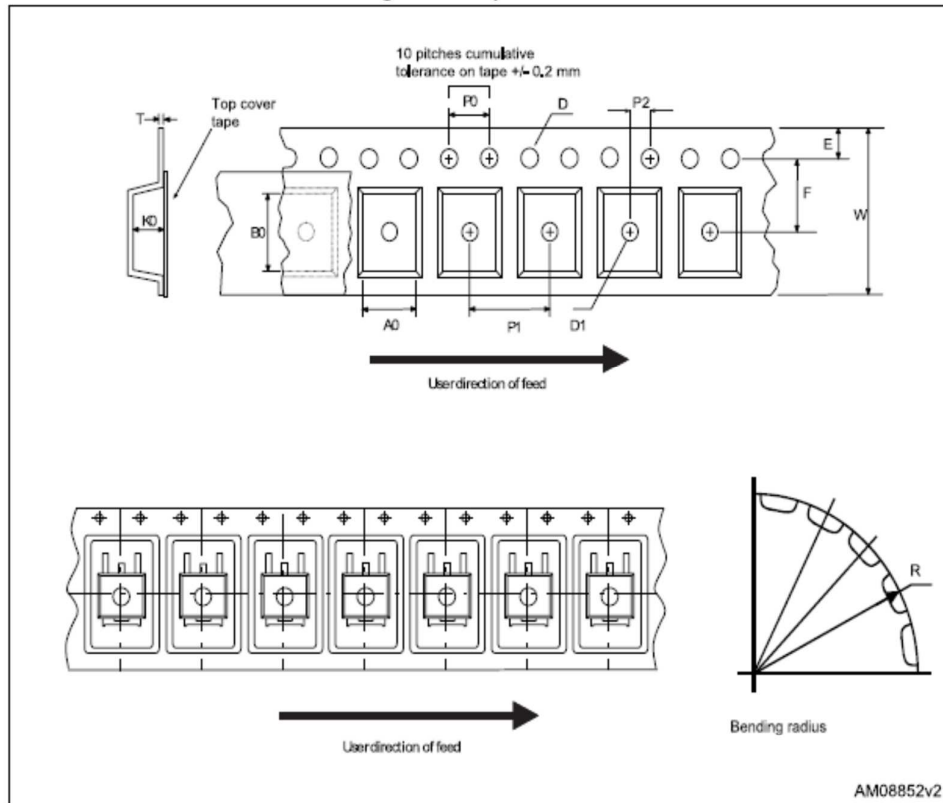
Figure 17. H²PAK-7 package outline



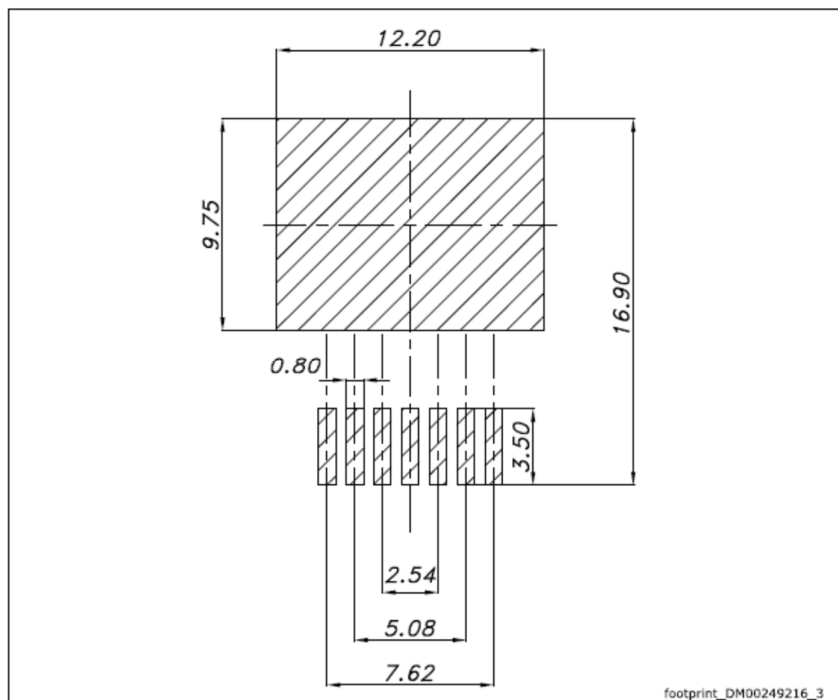
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3.2 H²PAK-7 packing information

Figure 18. 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 9. Document revision history

Date	Revision	Changes
April -2021	2.5	Update



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