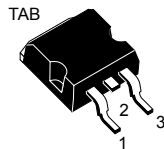
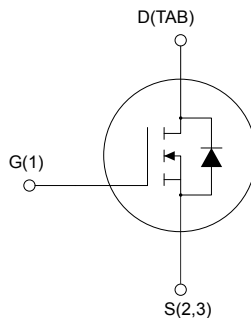


Silicon carbide Power MOSFET 1200 V, 13 A, 500 mΩ (typ., $T_J=25\text{ °C}$), in an H²PAK-2 package


 H²PAK-2


NCHG1DTABS23


Product status link
[SCT10N120H](#)
Product summary

Order code	SCT10N120H
Marking	SCT10N120
Package	H ² PAK-2
Packing	Tape and reel

Features

- Very tight variation of on-resistance vs temperature
- Very high operating temperature capability ($T_J = 175\text{ °C}$)
- Very fast and robust intrinsic body diode
- Low capacitance

Application

- High voltage DC-DC converters
- Switch mode power supplies

Description

This silicon carbide Power MOSFET is produced exploiting the advanced, innovative properties of wide bandgap materials. This results in unsurpassed on-resistance per unit area and very good switching performance almost independent of temperature. The outstanding thermal properties of the SiC material allow designers to use an industry-standard outline with significantly improved thermal capability. These features render the device perfectly suitable for high-efficiency and high power density applications.

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 25	V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	13	A
I_D	Drain current (continuous) at $T_C = 100\text{ °C}$	10	A
$I_{DM}^{(1)}$	Drain current (pulsed)	30	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ °C}$	130	W
T_{stg}	Storage temperature range	-55 to 175	°C
T_j	Operating junction temperature range		°C

1. Pulse width limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.17	°C/W
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	40	°C/W

1. When mounted on 1 inch² FR-4 board, 2 oz Cu.

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	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	1200			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$			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	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1.8	3.5		V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 20\text{ V}$, $I_D = 6\text{ A}$		500	690	$\text{m}\Omega$
		$V_{GS} = 20\text{ V}$, $I_D = 6\text{ A}$, $T_J = 150\text{ °C}$		520		$\text{m}\Omega$
		$V_{GS} = 20\text{ V}$, $I_D = 6\text{ A}$, $T_J = 175\text{ °C}$		540		$\text{m}\Omega$

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 400\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	290	-	pF
C_{oss}	Output capacitance		-	30	-	pF
C_{rss}	Reverse transfer capacitance		-	9	-	pF
Q_g	Total gate charge	$V_{DD} = 800\text{ V}$, $I_D = 6\text{ A}$, $V_{GS} = 0\text{ to }20\text{ V}$	-	22	-	nC
Q_{gs}	Gate-source charge		-	3	-	nC
Q_{gd}	Gate-drain charge		-	10	-	nC
R_g	Gate input resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	8	-	Ω

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 6\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$	-	90	-	μJ
E_{off}	Turn-off switching energy		-	30	-	μJ
E_{on}	Turn-on switching energy	$V_{DD} = 800\text{ V}$, $I_D = 6\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GS} = -5\text{ to }20\text{ V}$ $T_J = 150\text{ °C}$	-	104	-	μJ
E_{off}	Turn-off switching energy		-	33	-	μJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 800\text{ V}$, $I_D = 6\text{ A}$, $R_G = 10\ \Omega$, $V_{GS} = -5\text{ to }20\text{ V}$	-	7	-	ns
t_f	Fall time		-	17	-	ns
$t_{d(off)}$	Turn-off delay time		-	14	-	ns
t_r	Rise time		-	12	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
V_{SD}	Diode forward voltage	$I_F = 6\text{ A}$, $V_{GS} = 0\text{ V}$	-	2.5	-	V
t_{rr}	Reverse recovery time	$I_{SD} = 6\text{ A}$, $di/dt = 2000\text{ A}/\mu\text{s}$ $V_{DD} = 800\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	16	-	ns
Q_{rr}	Reverse recovery charge		-	107	-	nC
I_{RRM}	Reverse recovery current		-	12	-	A

2.1 Electrical characteristics curves

Figure 1. Normalized thermal impedance

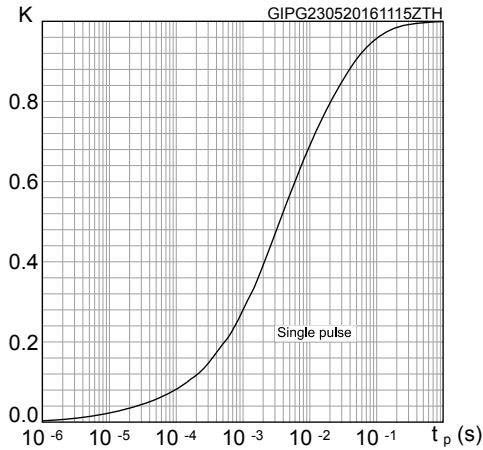


Figure 2. Output characteristics ($T_J = 25^\circ\text{C}$)

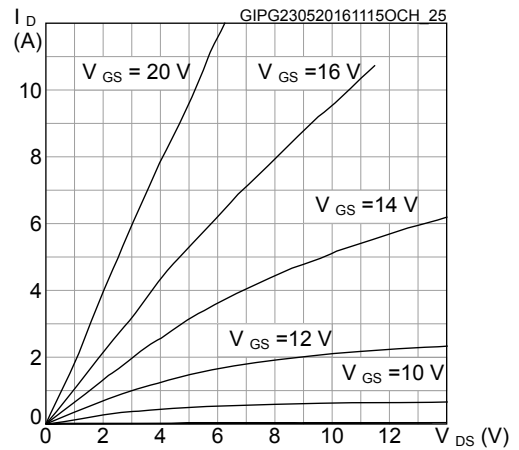


Figure 3. Output characteristics ($T_J = 150^\circ\text{C}$)

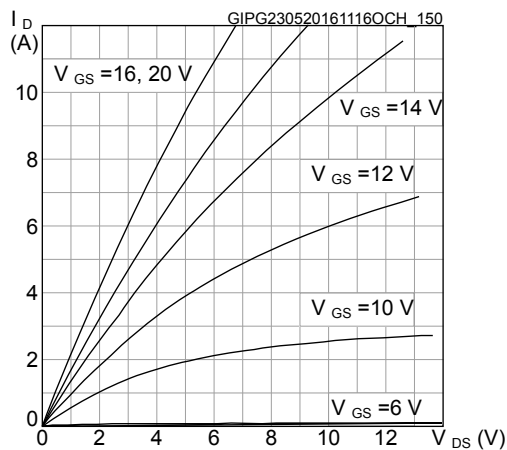


Figure 4. Transfer characteristics

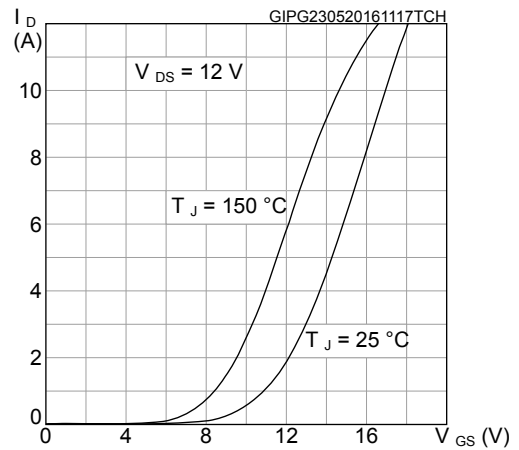


Figure 5. Total power dissipation

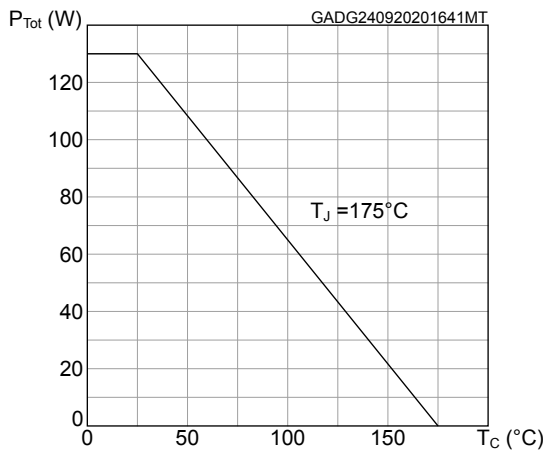


Figure 6. Gate charge vs gate-source voltage

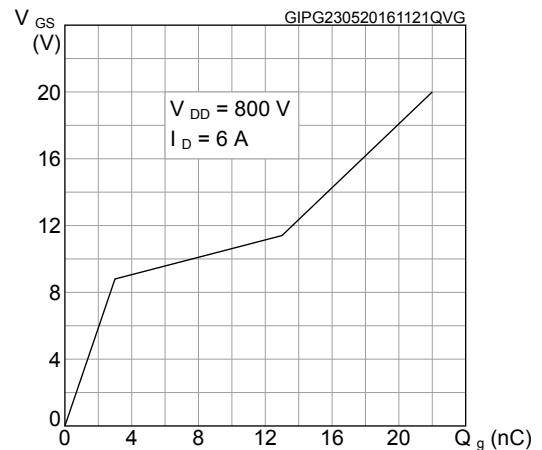


Figure 7. Capacitance variations

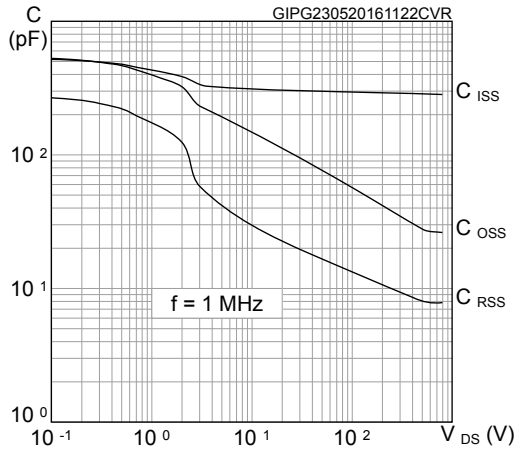


Figure 8. Switching energy vs. drain current

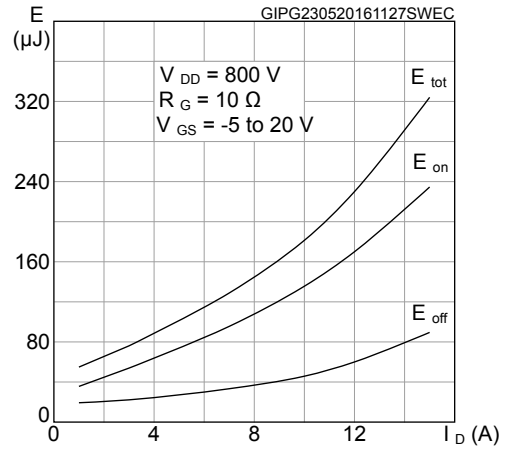


Figure 9. Switching energy vs. junction temperature

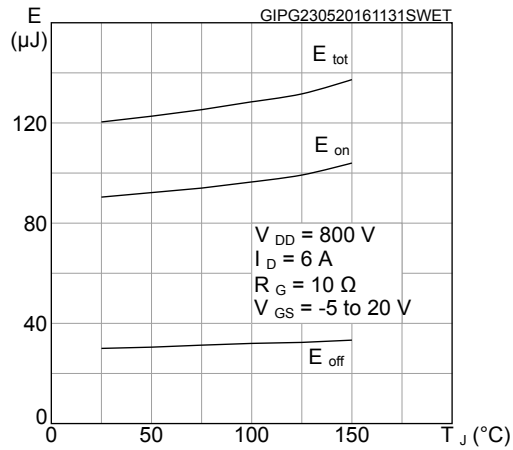


Figure 10. Normalized $V_{(BR)DSS}$ vs. temperature

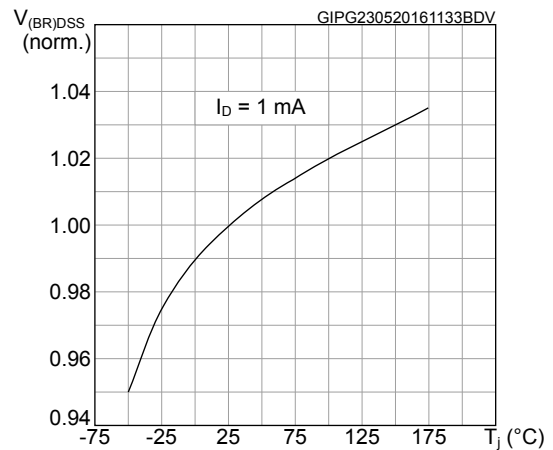


Figure 11. Normalized gate threshold voltage vs. temperature

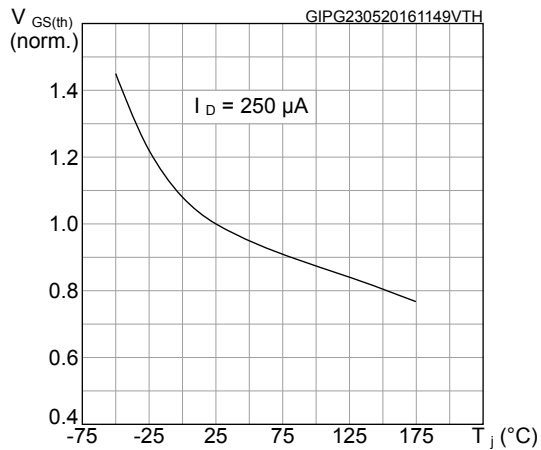


Figure 12. Normalized on-resistance vs. temperature

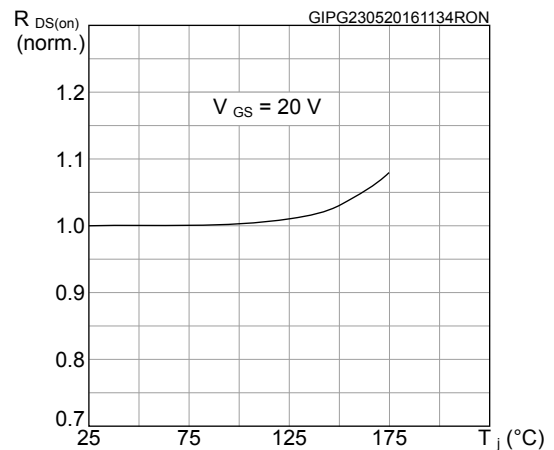


Figure 13. Body diode characteristics ($T_J = -50\text{ }^\circ\text{C}$)

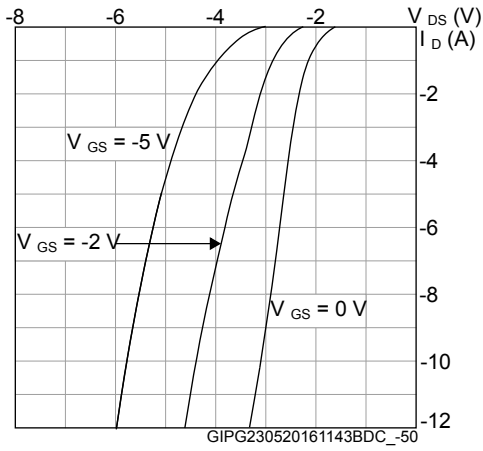


Figure 14. Body diode characteristics ($T_J = 25\text{ }^\circ\text{C}$)

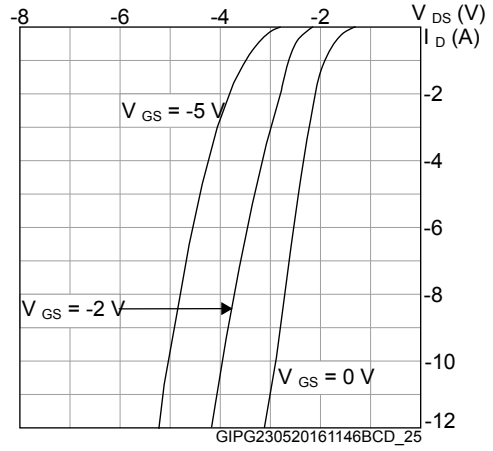


Figure 15. Body diode characteristics ($T_J = 150\text{ }^\circ\text{C}$)

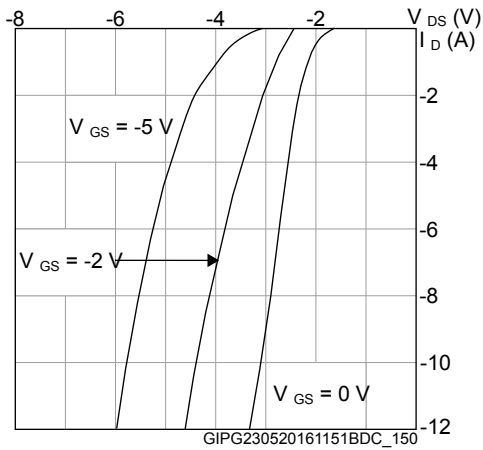


Figure 16. 3rd quadrant characteristics ($T_J = -50\text{ }^\circ\text{C}$)

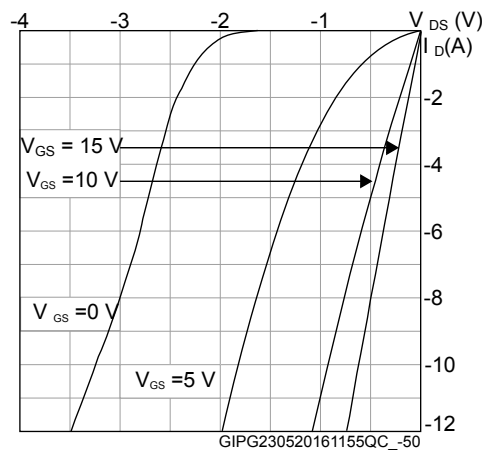


Figure 17. 3rd quadrant characteristics ($T_J = 25\text{ }^\circ\text{C}$)

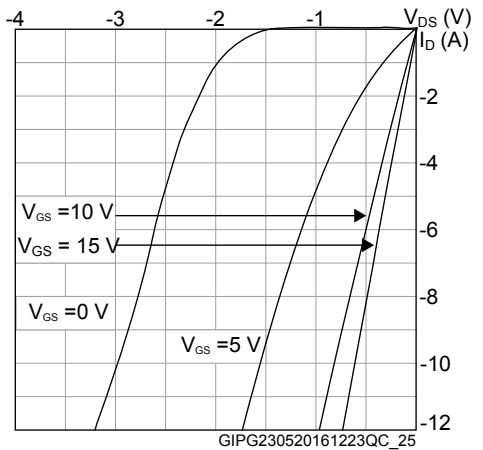
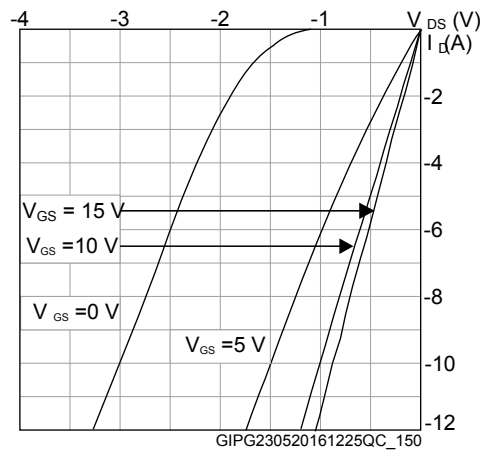
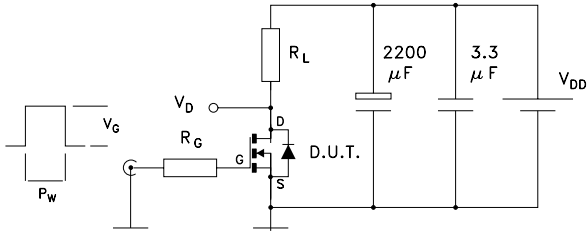


Figure 18. 3rd quadrant characteristics ($T_J = 150\text{ }^\circ\text{C}$)



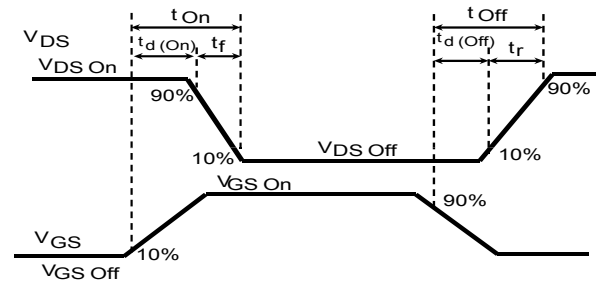
3 Test circuits

Figure 19. Switching test waveforms for transition times



GIPD101020141511FSR

Figure 20. Clamped inductive switching waveform



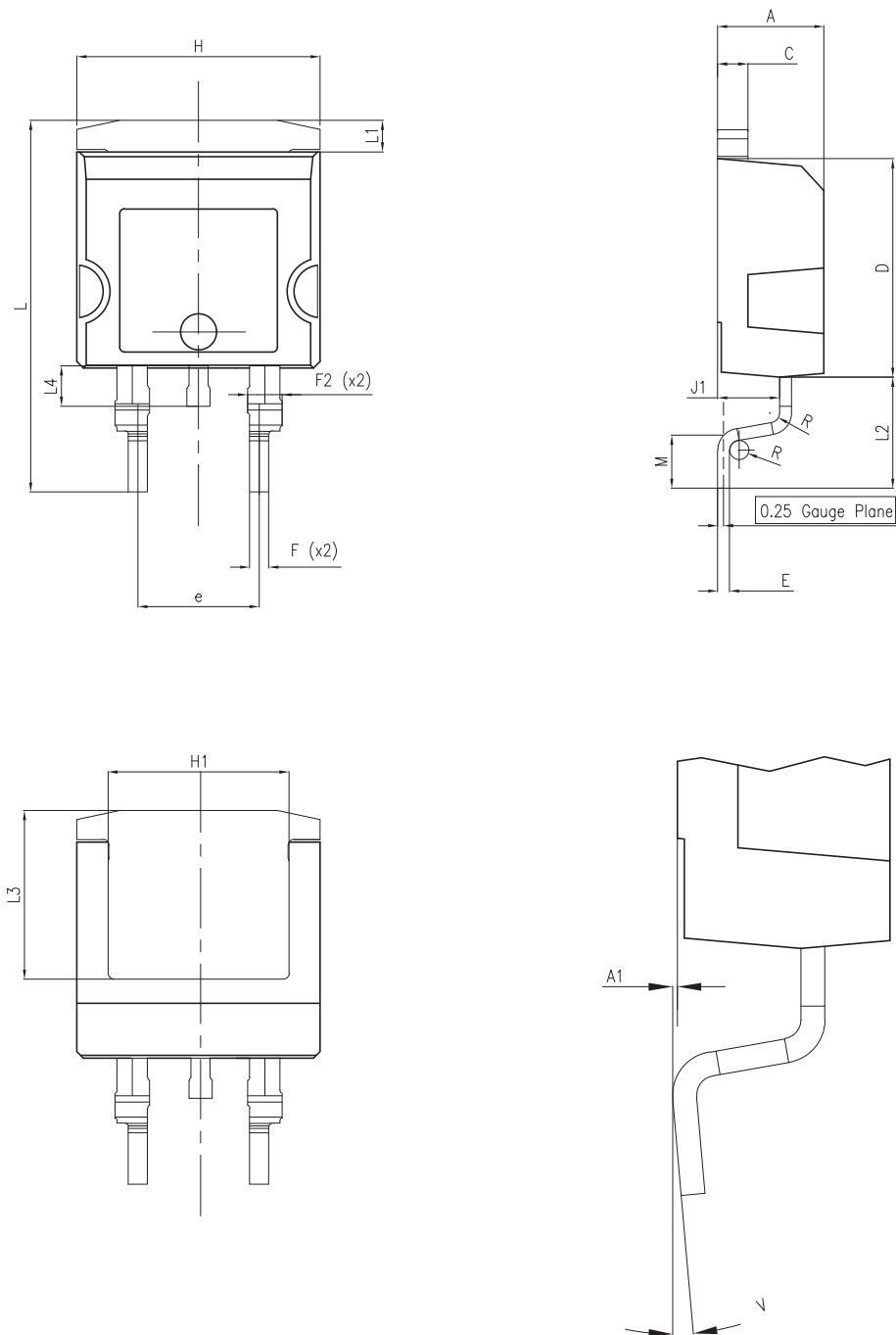
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4 Package information

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 H²PAK-2 package information

Figure 21. H²PAK-2 package outline

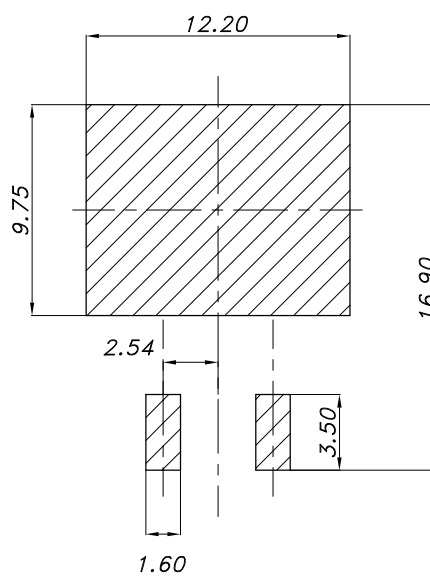


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Table 8. H²PAK-2 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
D	8.95		9.35
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
F2	1.14		1.70
H	10.00		10.40
H1	7.40	-	7.80
J1	2.49		2.69
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.50		1.70
M	2.60		2.90
R	0.20		0.60
V	0°		8°

Figure 22. H²PAK-2 recommended footprint

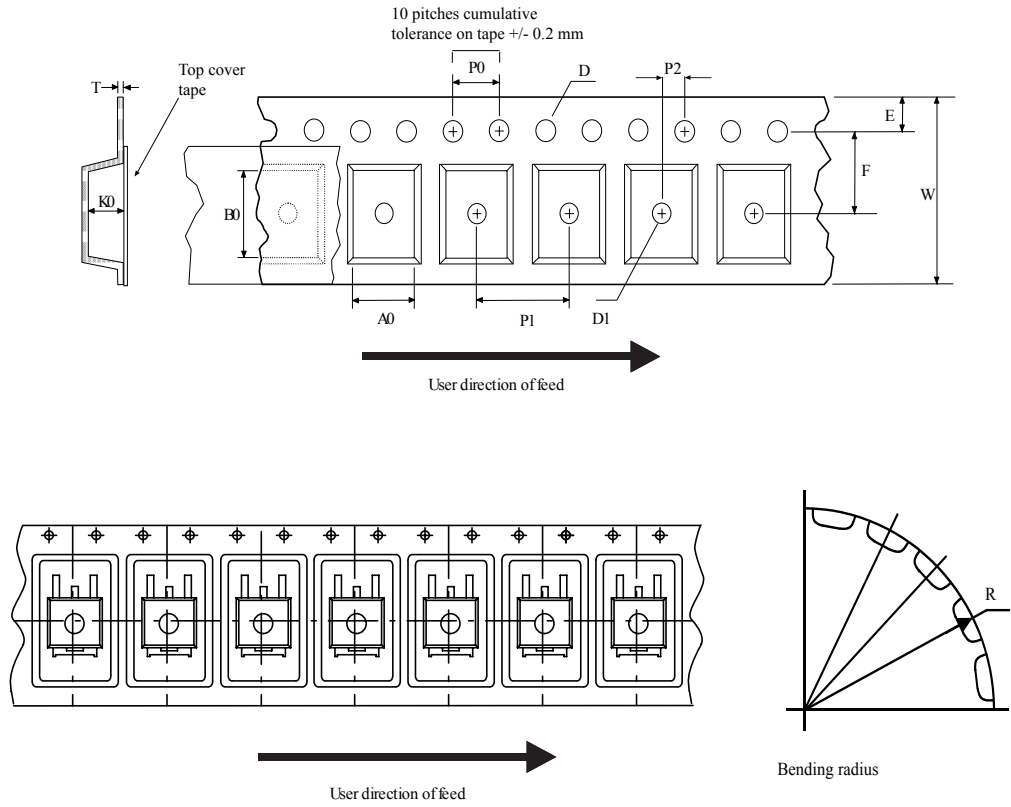


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Note: Dimensions are in mm.

4.2 Packing information

Figure 23. Tape outline



AM08852v2

Figure 24. Reel outline

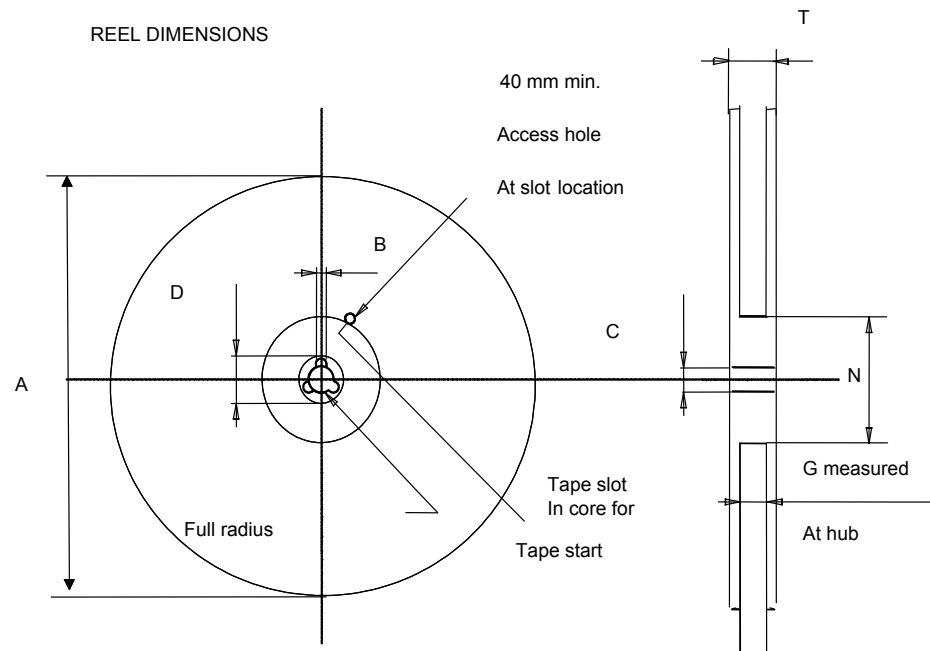


Table 9. Tape and reel mechanical data

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
05-Oct-2020	1	First release

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