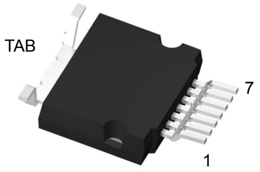
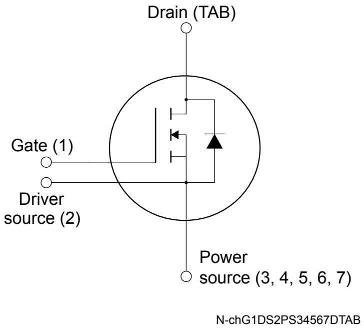
SCT025HU120G3AG

Datasheet

Automotive-grade silicon carbide Power MOSFET 1200 V, 27 mΩ typ., 60 A in an HU3PAK package



HU3PAK



Features

Order code	V_{DS}	$R_{DS(on)}$ typ.	I_D
SCT025HU120G3AG	1200 V	27 mΩ	60 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

- DC/DC converter for EV/HEV
- Main inverter (electric traction)
- 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
SCT025HU120G3AG

Product summary	
Order code	SCT025HU120G3AG
Top-side marking	25HU12AG
Back-side marking	25HU120G3AG
Package	HU3PAK
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	Drain current (continuous) at T_C = 25 °C	60(1)	A
	Drain current (continuous) at T_C = 100 °C	58	
I_{DM}(2)	Drain current (pulsed)	232	A
P_{TOT}	Total power dissipation at T_C = 25 °C	375	W
T_{stg}	Storage temperature range	-55 to 175	°C
T_J	Operating junction temperature range		°C

1. *Limited by bonding wires.*
2. *Pulse width is limited by safe operating area.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.4	°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 = 5 mA	1.8	3.0	4.2	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 15 V, I_D = 25 A		32		mΩ
		V_{GS} = 18 V, I_D = 25 A		27	37	
		V_{GS} = 18 V, I_D = 25 A, T_J = 175 °C		48.5		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 800 V, f = 1 MHz, V_{GS} = 0 V	-	1990	-	pF
C_{oss}	Output capacitance		-	102	-	pF
C_{rss}	Reverse transfer capacitance		-	12	-	pF
Q_g	Total gate charge	V_{DD} = 800 V, V_{GS} = -5 to 18 V, I_D = 25 A	-	73	-	nC
Q_{gs}	Gate-source charge		-	23.5	-	nC
Q_{gd}	Gate-drain charge		-	23.5	-	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} = 800 V, I_D = 25 A, R_G = 15 Ω, V_{GS} = -5 to 18 V	-	378	-	µJ
E_{off}	Turn-off switching energy		-	305	-	µJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 800 V, I_D = 25 A, R_G = 15 Ω, V_{GS} = -5 to 18 V	-	23	-	ns
t_r	Rise time		-	27	-	ns
$t_{d(off)}$	Turn-off delay time		-	48	-	ns
t_f	Fall time		-	25	-	ns

Table 7. **Reverse SiC diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Continuous diode forward current	T_C = 25 °C	-		60[1]	A
		T_C = 100 °C	-		58	
V_{SD}	Diode forward voltage	I_{SD} = 25 A, V_{GS} = 0 V	-	2.7		V
t_{rr}	Reverse recovery time	I_{SD} = 25 A, di/dt = 1000 A/µs, V_{DD} = 800 V, V_{GS} = -5 V	-	16.8		ns
Q_{rr}	Reverse recovery charge		-	117		nC
I_{RRM}	Reverse recovery current		-	12		A

1. *Limited by bonding wires.*

2.1 Electrical characteristics (curves)

Figure 1. **Safe operating area**

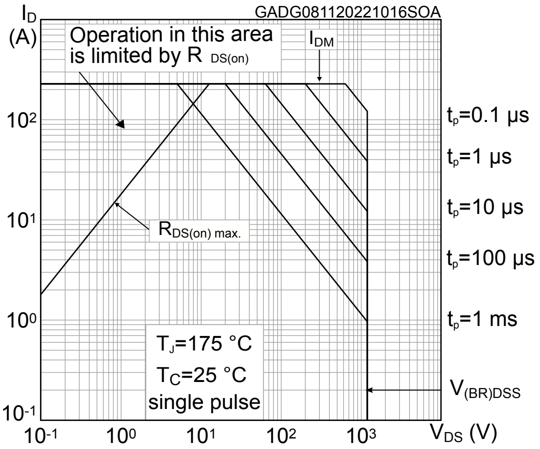


Figure 2. **Maximum transient thermal impedance**

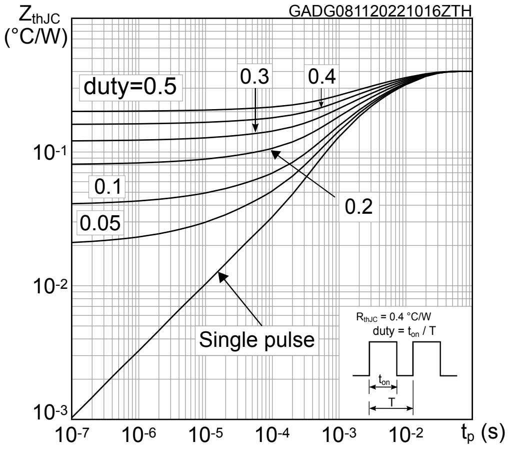


Figure 3. **Typical output characteristics (T_J = 25 °C)**

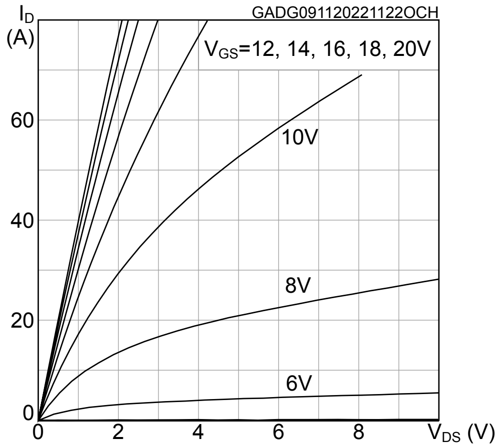


Figure 4. **Typical output characteristics (T_J = 175 °C)**

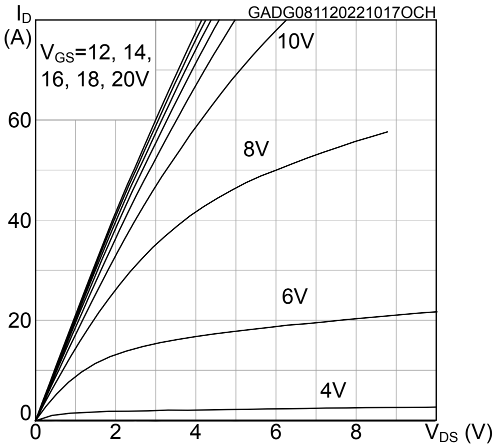


Figure 5. **Typical transfer characteristics**

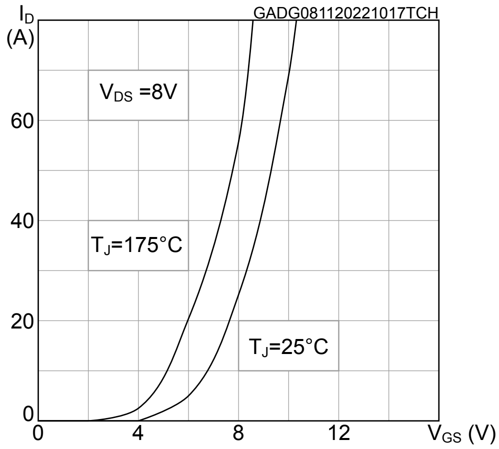


Figure 6. **Total power dissipation**

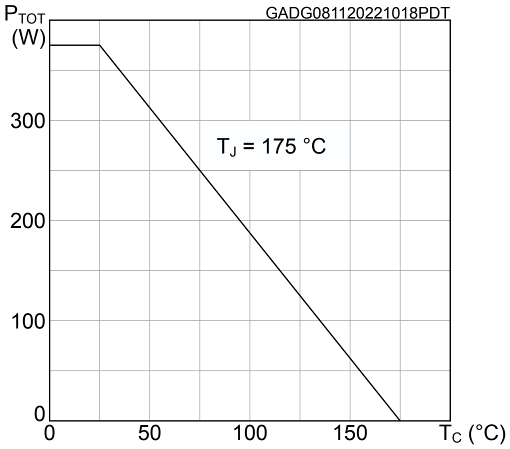


Figure 7. Maximum continuous drain current vs case temperature

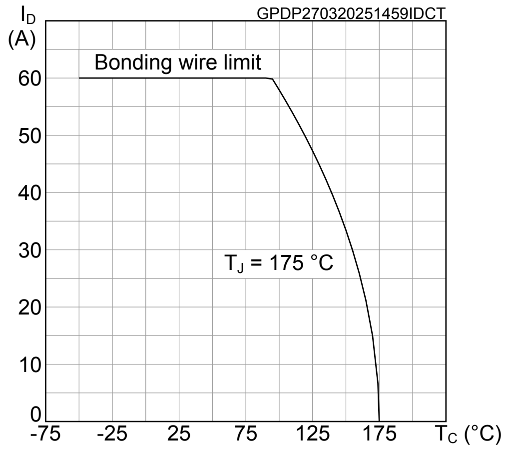


Figure 8. Typical gate charge characteristics

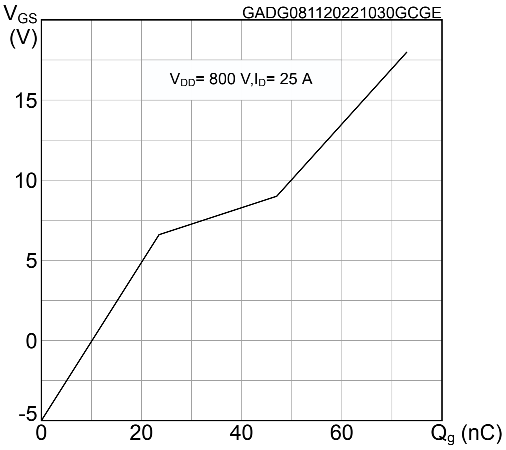


Figure 9. Typical capacitance characteristics

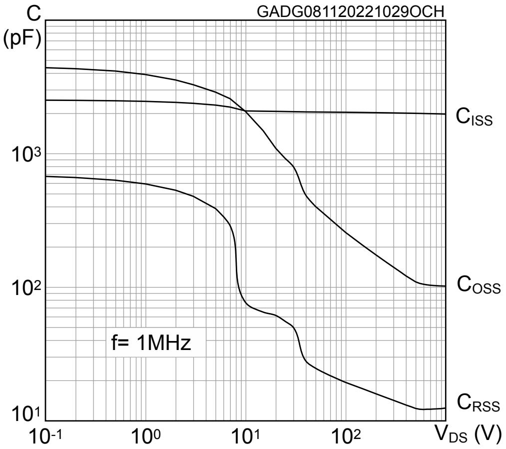


Figure 10. Typical switching energy vs R_g

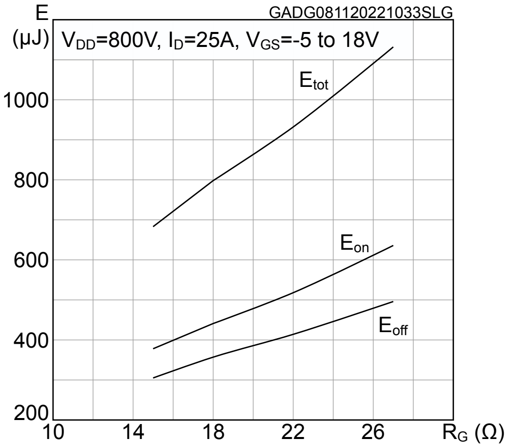


Figure 11. Typical switching energy vs supply voltage

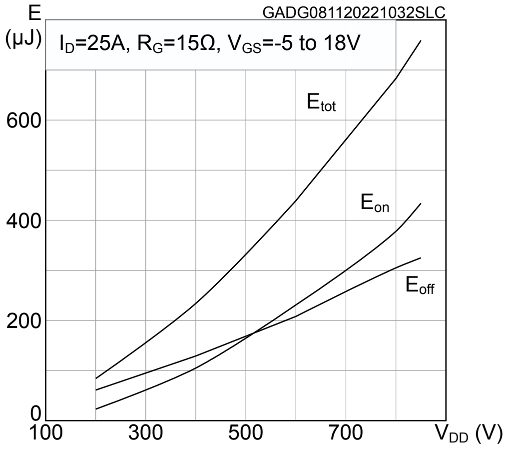
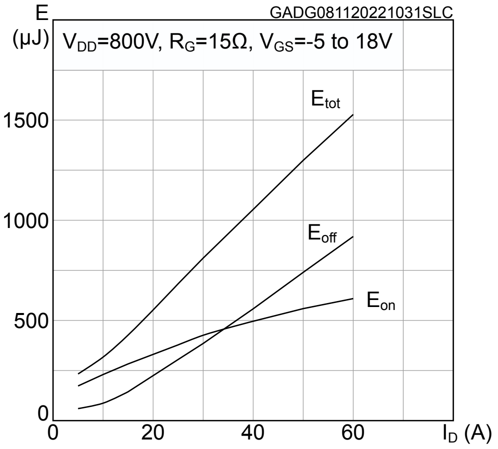


Figure 12. Typical switching energy vs drain current



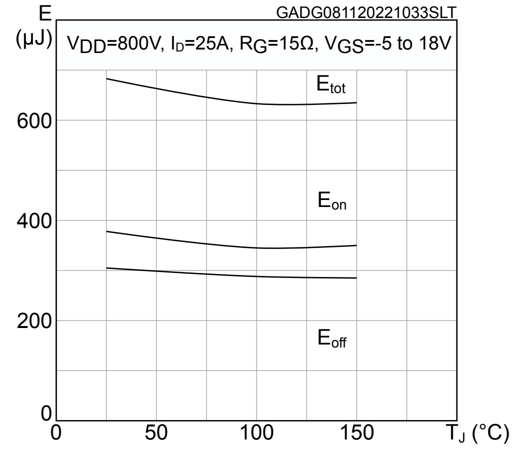


Figure 13. Typical switching energy vs temperature

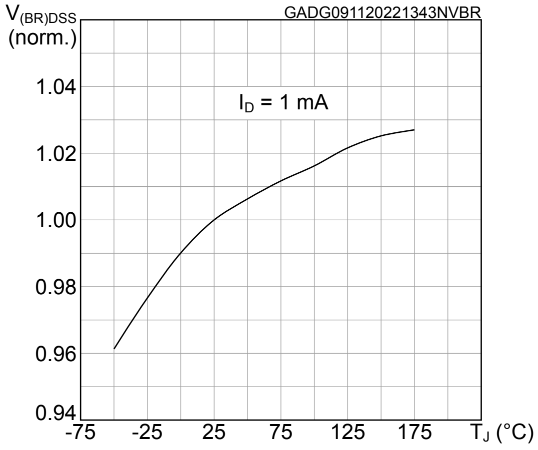


Figure 14. Normalized breakdown voltage vs temperature

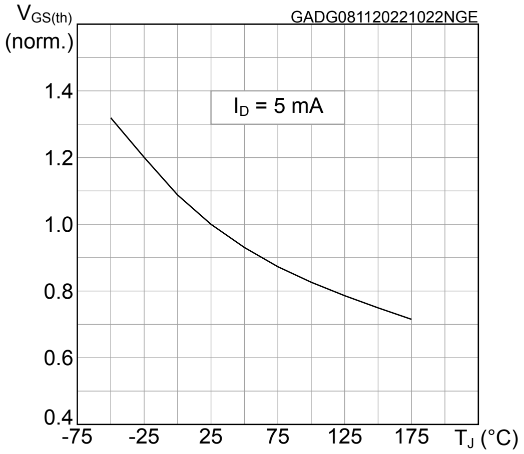


Figure 15. Normalized gate threshold vs temperature

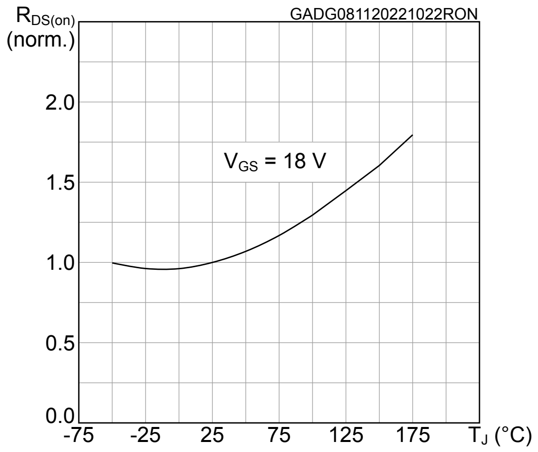


Figure 16. Normalized on-resistance vs temperature

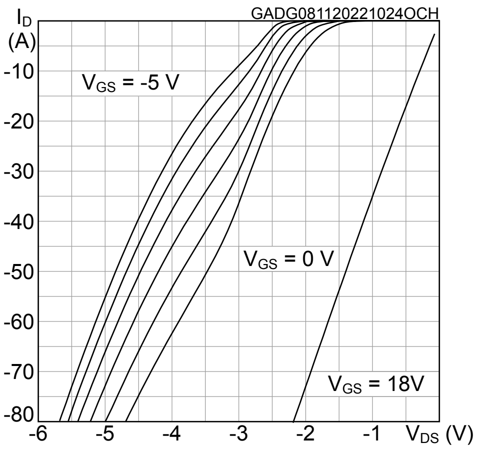


Figure 17. Typical reverse conduction characteristics (T_J = 25 °C)

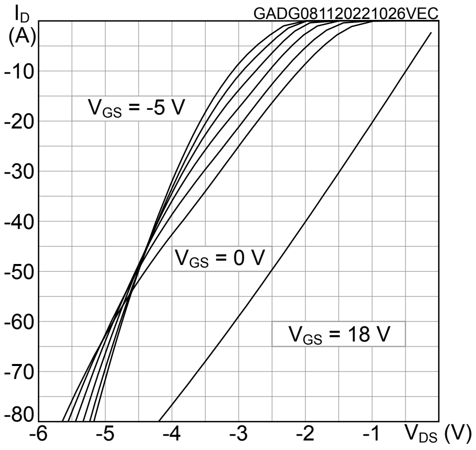


Figure 18. Typical reverse conduction characteristics (T_J = 175 °C)

3 Package information

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 HU3PAK package information

Figure 19. **HU3PAK package outline**

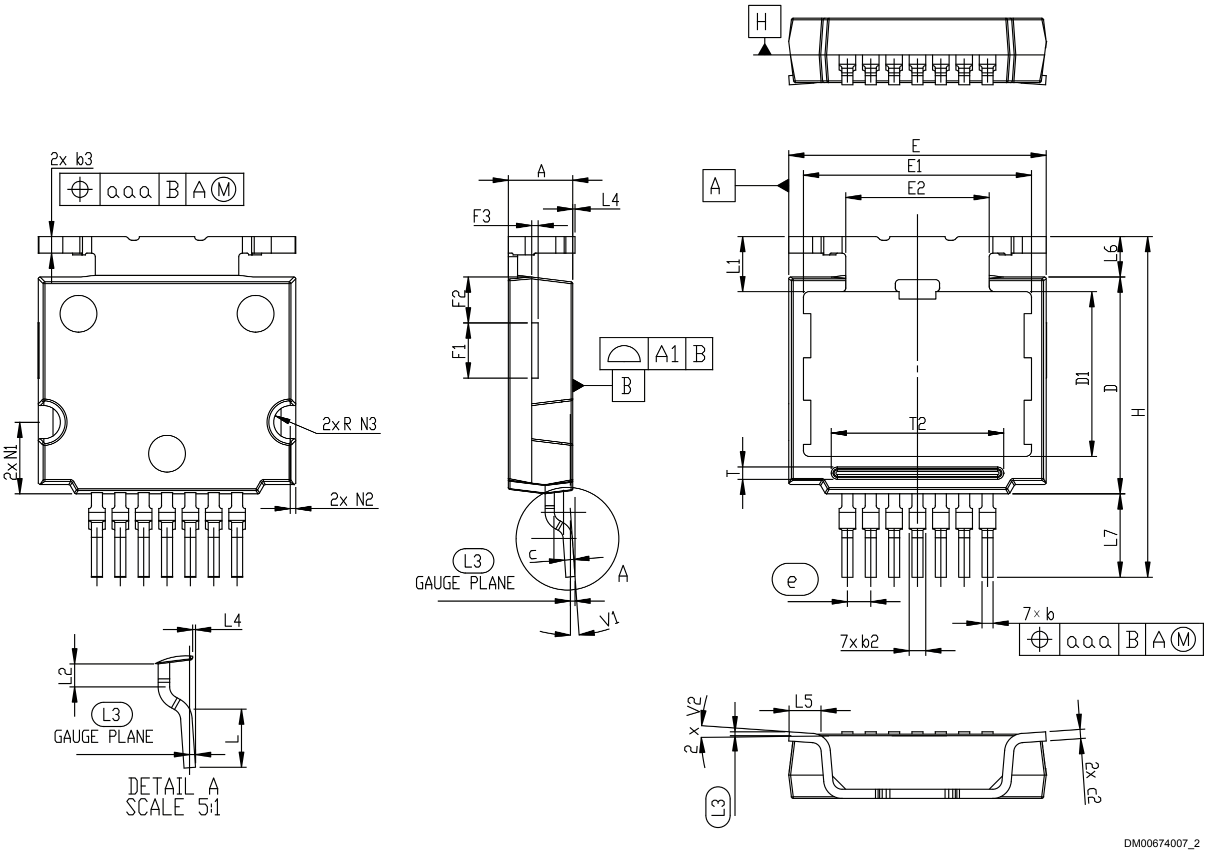
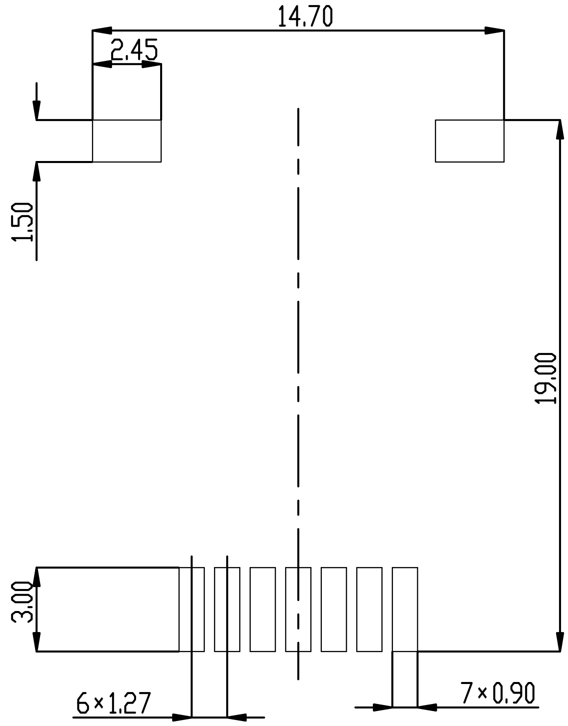


Table 8. **HU3PAK package mechanical data**

Ref.	Dimensions		
	mm		
	Min.	Typ.	Max.
A	3.40	3.50	3.60
A1		0.05	
b	0.50	0.60	0.70
b2	0.50	0.70	1.00
b3	0.80	0.90	1.00
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	8.80	8.955	9.10
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	7.75	7.80	7.85
e		1.27	
H	18.00	18.58	19.00
aaa		0.10	
L	2.40	2.52	2.60
L1		3.05	
L2	0.90	1.00	1.10
L3		0.26	
L4	0.075	0.125	0.175
L5	1.83	1.93	2.03
L6	2.14	2.24	2.34
L7	4.44	4.54	4.64
F1	2.90	3.00	3.10
F2	2.40	2.50	2.60
F3	0.25	0.35	0.45
N1	3.80	3.90	4.00
N2	0.25	0.30	0.45
N3	0.80	0.90	1.00
T	0.50	0.67	0.70
T2	9.18	9.38	9.43
V1		0 °	8 °
V2		0 °	8 °

Figure 20. **HU3PAK recommended footprint (dimensions in mm)**



3.2 HU3PAK packing information

Figure 21. **HU3PAK carrier tape outline**

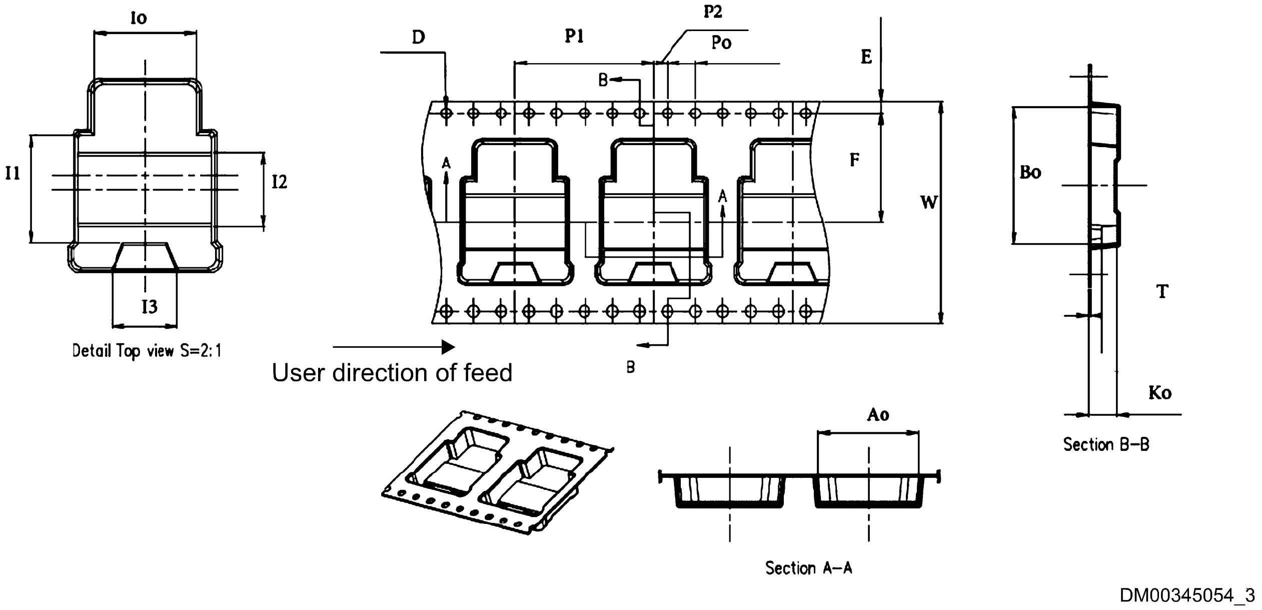
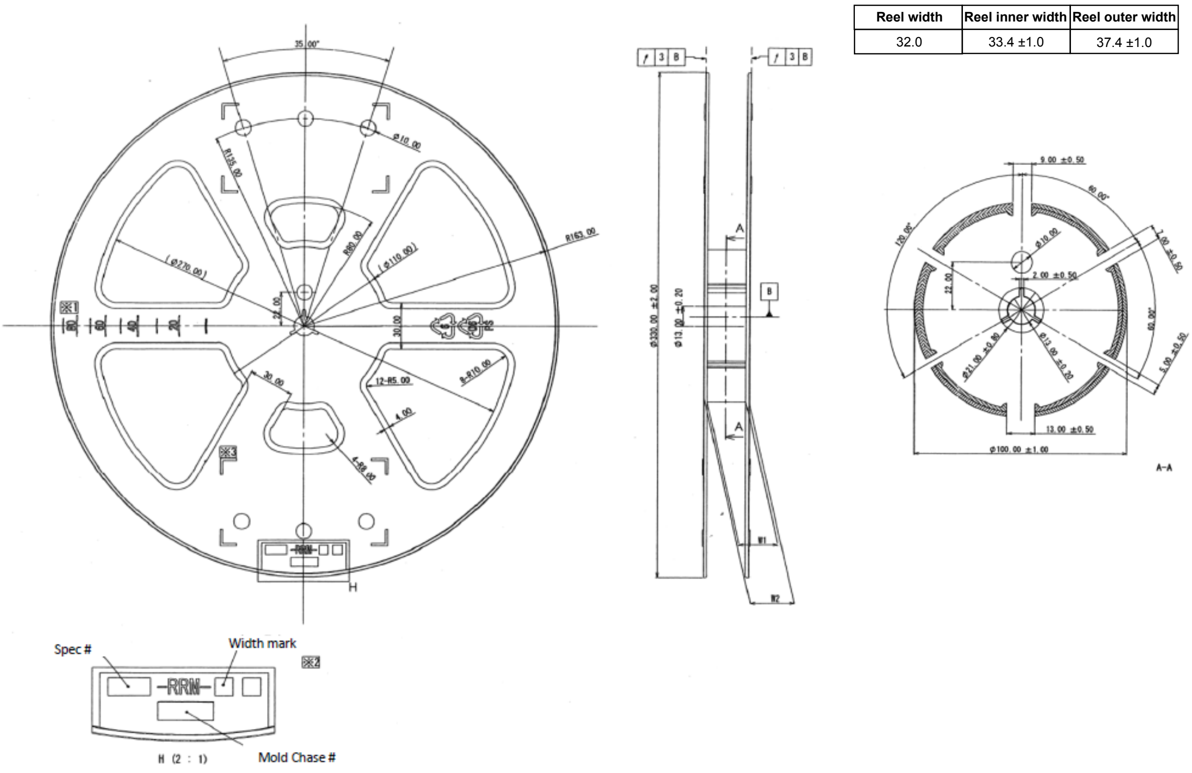


Table 9. HU3PAK tape mechanical data

Dimension	Value
	mm
A0	14.40 ±0.10
B0	19.70
D	1.50 ±0.10
E	1.75 ±0.10
F	15.65 ±0.10
I0	11.00
I1	11.60 ±0.10
I2	8.00
I3	7.00
K0	4.20
P0	4.00 ±0.10
P1	20.00 ±0.10
P2	2.00 ±0.10
T	0.40 ±0.50
W	32.00 ±0.30

Figure 22. HU3PAK reel outline (dimensions are in mm)



Reel width	Reel inner width	Reel outer width
32.0	33.4 ±1.0	37.4 ±1.0

DM00345054_3_reel

Revision history

Table 10. **Document revision history**

Date	Revision	Changes
16-Jan-2023	1	First release.
28-Mar-2025	2	Updated title, Section Features and Section Product status link / summary on cover page. Updated Table 1. Absolute maximum ratings and Table 7. Reverse SiC diode characteristics. Added Figure 7. Maximum continuous drain current vs case temperature. Minor text changes.

Contents

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