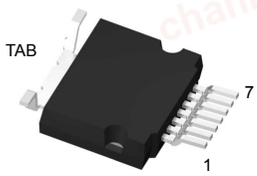
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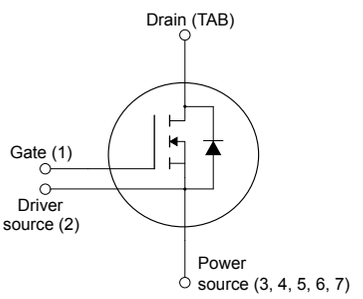
SCT011HU75G3AG

Datasheet

Automotive-grade silicon carbide Power MOSFET 750 V, 11.4 mΩ typ., 110 A in an HU3PAK package



HU3PAK



Features

Order code	V_{DS}	$R_{DS(on)}$ typ.	I_D
SCT011HU75G3AG	750 V	11.4 mΩ	110 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
SCT011HU75G3AG

Product summary	
Order code	SCT011HU75G3AG
Top-side marking	11HU75G3AG
Back-side marking	SCT11HU75G3A
Package	HU3PAK
Packing	Tape and reel

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	750	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	110	A
	Drain current (continuous) at T_C = 100 °C	110	
I_{DM}(2)	Drain current (pulsed)	532	A
P_{TOT}	Total power dissipation at T_C = 25 °C	652	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	0.23	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	50	°C/W

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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	750			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 750 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	3.2	4.2	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 18 V, I_D = 80 A		11.4	15	mΩ
		V_{GS} = 15 V, I_D = 80 A		14.2		
		V_{GS} = 18 V, I_D = 80 A, T_J = 175 °C		17.1		
		V_{GS} = 15 V, I_D = 80 A, T_J = 175 °C		18.9		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 400 V, f = 1 MHz, V_{GS} = 0 V	-	3860	-	pF
C_{oss}	Output capacitance		-	300	-	pF
C_{rss}	Reverse transfer capacitance		-	31	-	pF
Q_g	Total gate charge	V_{DD} = 400 V, V_{GS} = -5 to 18 V, I_D = 50 A	-	154	-	nC
Q_{gs}	Gate-source charge		-	53.5	-	nC
Q_{gd}	Gate-drain charge		-	38	-	nC
R_g	Gate input resistance	f = 1 MHz, I_D = 0 A	-	1.2	-	Ω

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	V_{DD} = 400 V, I_D = 50 A, R_G = 2.2 Ω, V_{GS} = -5 to 18 V	-	184	-	µJ
E_{off}	Turn-off switching energy		-	114	-	µJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 400 V, I_D = 50 A, R_G = 2.2 Ω, V_{GS} = -5 to 18 V	-	23	-	ns
t_r	Rise time		-	11	-	ns
$t_{d(off)}$	Turn-off delay time		-	42	-	ns
t_f	Fall time		-	9	-	ns

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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	-		110	A
		T_C = 100 °C	-		110	
V_{SD}	Diode forward voltage	I_{SD} = 50 A, V_{GS} = 0 V	-	2.6		V
t_{rr}	Reverse recovery time	I_{SD} = 50 A, di/dt = 1 kA/µs, V_{DD} = 400 V, V_{GS} = -5 V	-	22		ns
Q_{rr}	Reverse recovery charge		-	186		nC
I_{RRM}	Reverse recovery current		-	14		A

1. *Limited by bonding wires.*

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2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

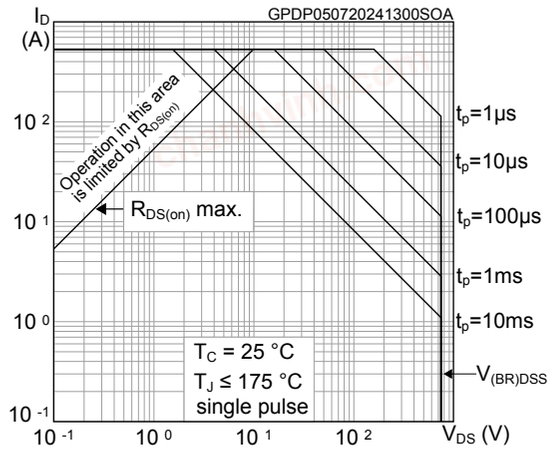


Figure 2. Maximum transient thermal impedance

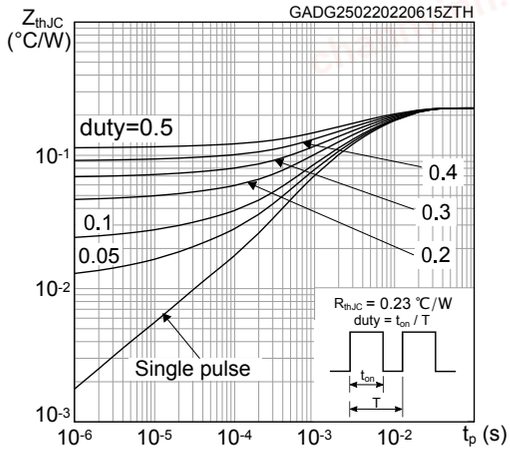


Figure 3. Typical output characteristics (T_J = 25 °C)

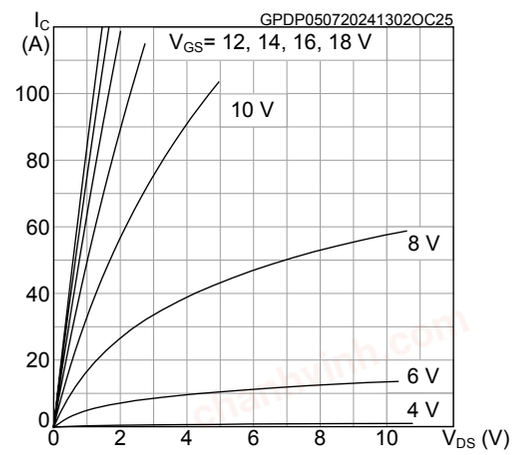


Figure 4. Typical output characteristics (T_J = 175 °C)

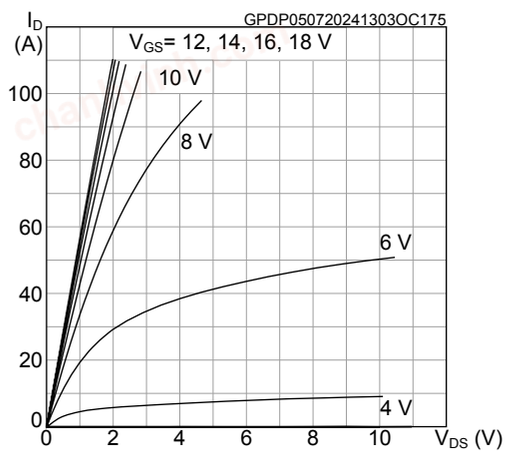


Figure 5. Typical transfer characteristics

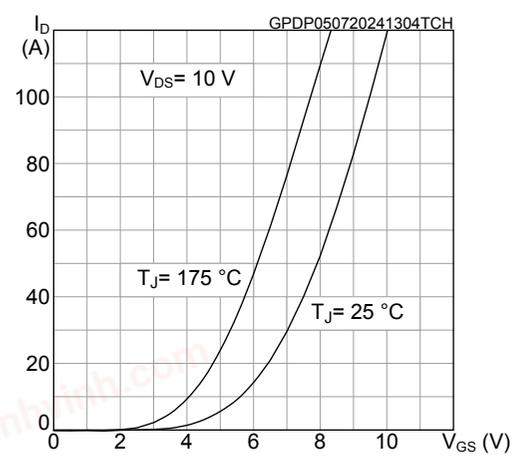
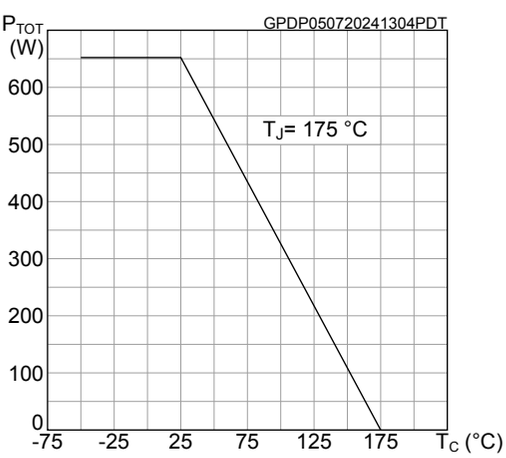


Figure 6. Total power dissipation



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Figure 7. Maximum continuous drain current vs case temperature

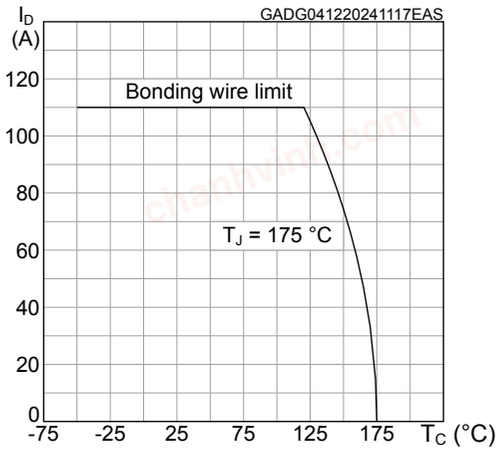


Figure 8. Normalized breakdown voltage vs temperature

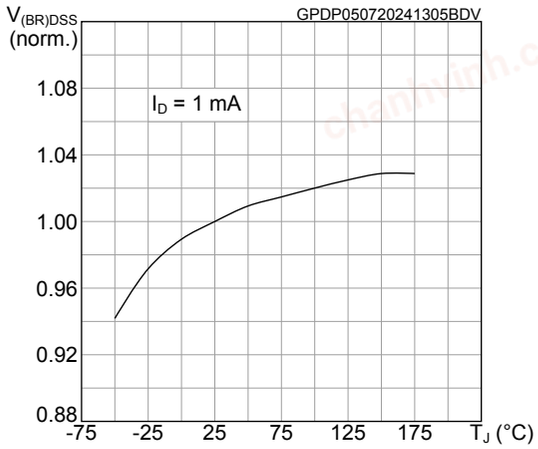


Figure 9. Normalized gate threshold vs temperature

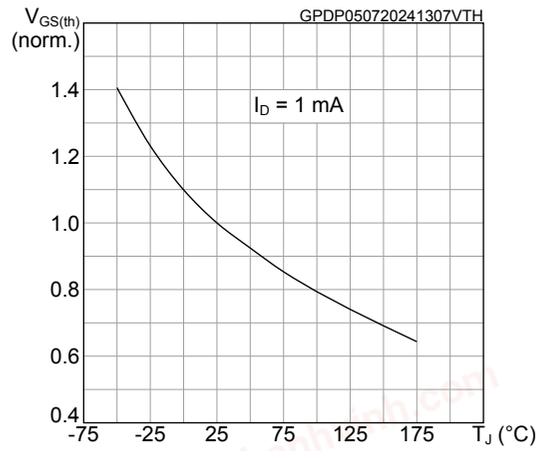


Figure 10. Normalized on-resistance vs temperature

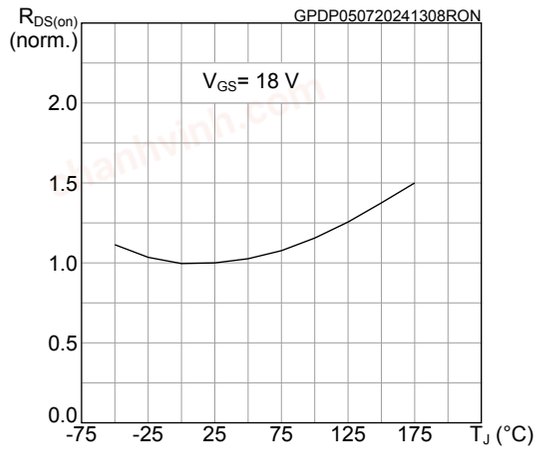


Figure 11. Typical reverse diode characteristics (T_J = 25 °C)

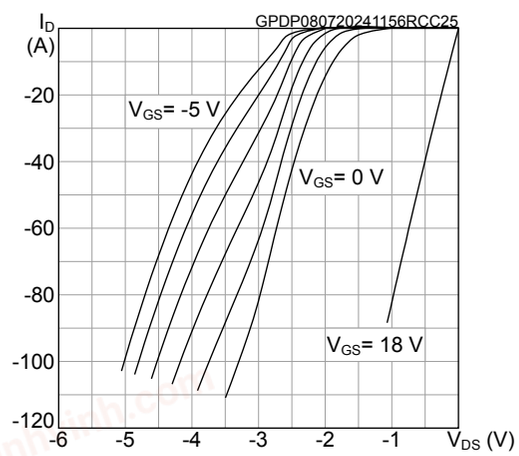
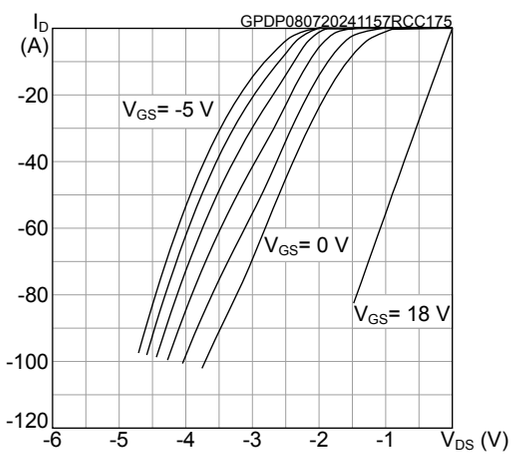


Figure 12. Typical reverse diode characteristics (T_J = 175 °C)



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Figure 13. Typical capacitance characteristics

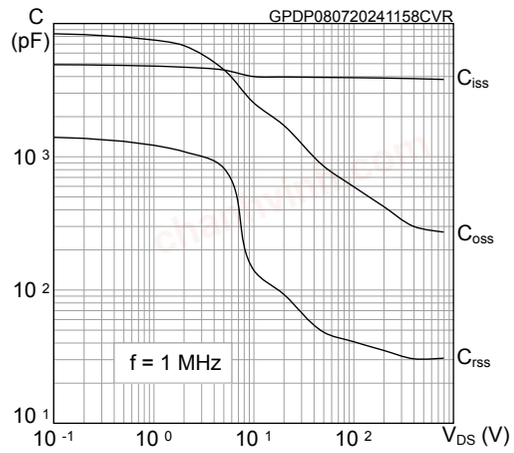


Figure 14. Typical gate charge characteristics

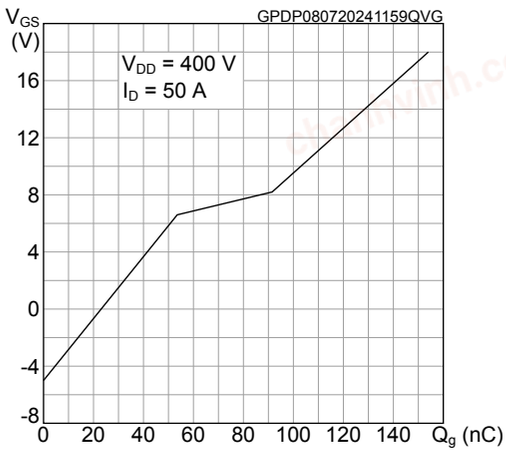


Figure 15. Typical switching energy vs drain current

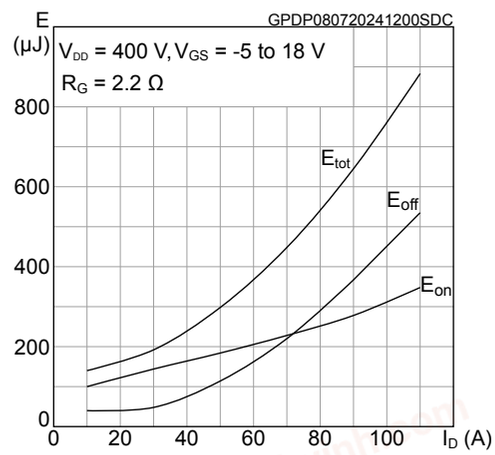


Figure 16. Typical switching energy vs supply voltage

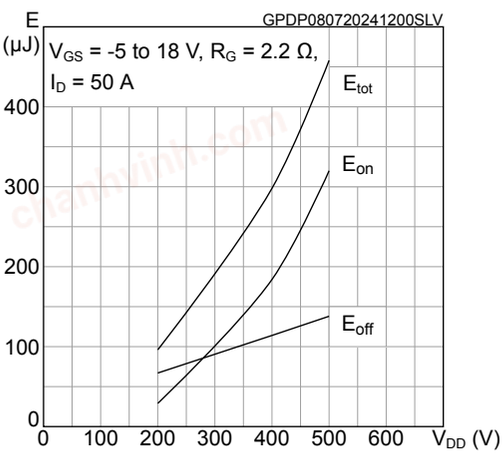


Figure 17. Typical switching energy vs gate resistance

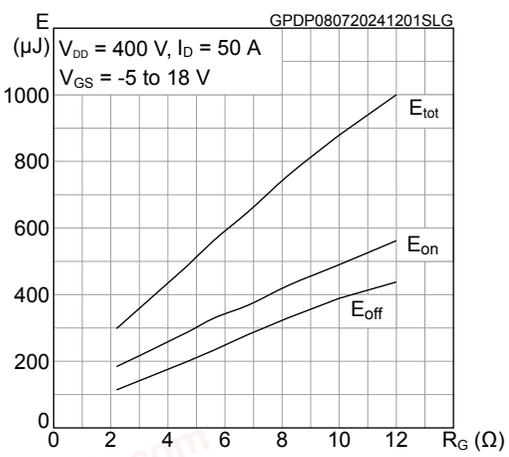
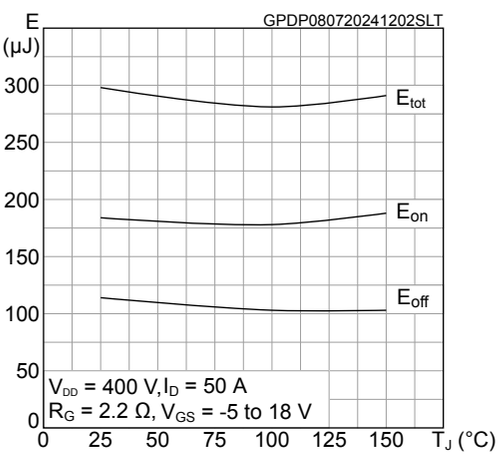


Figure 18. Typical switching energy vs temperature



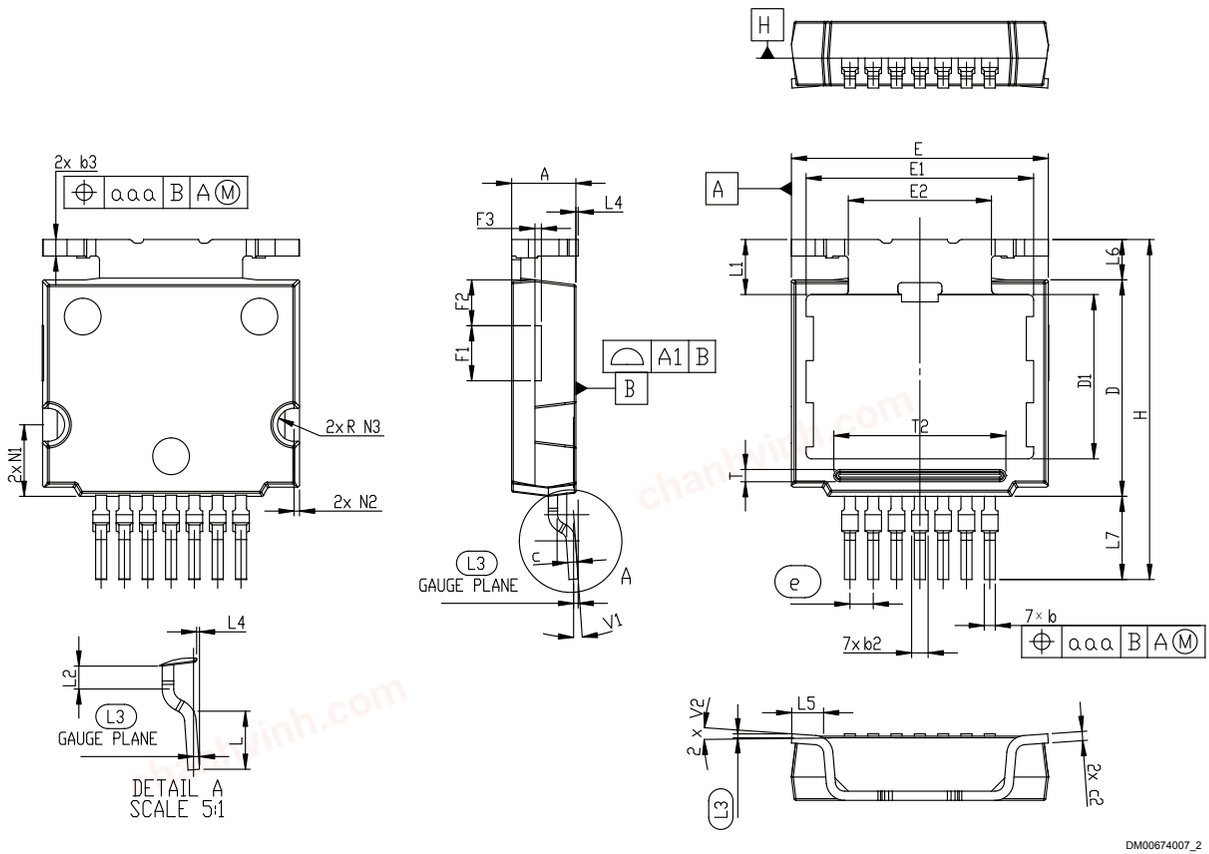
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3 Package information

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



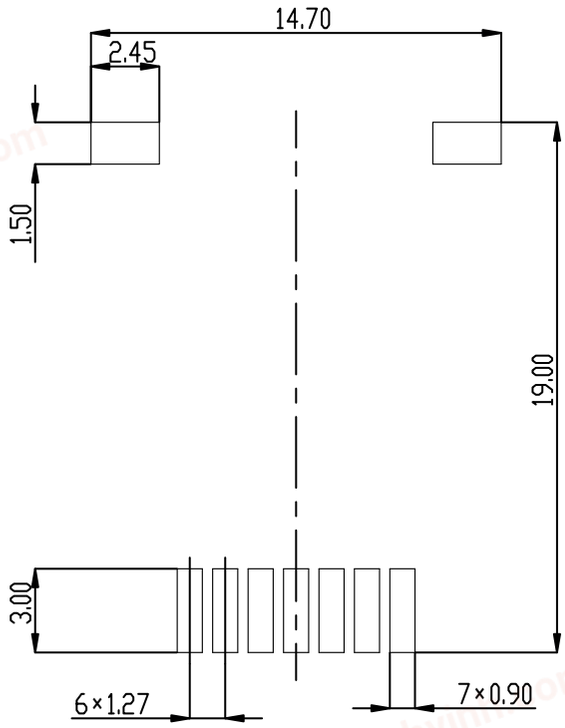
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Table 8. **HU3PAK package mechanical data**

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 °

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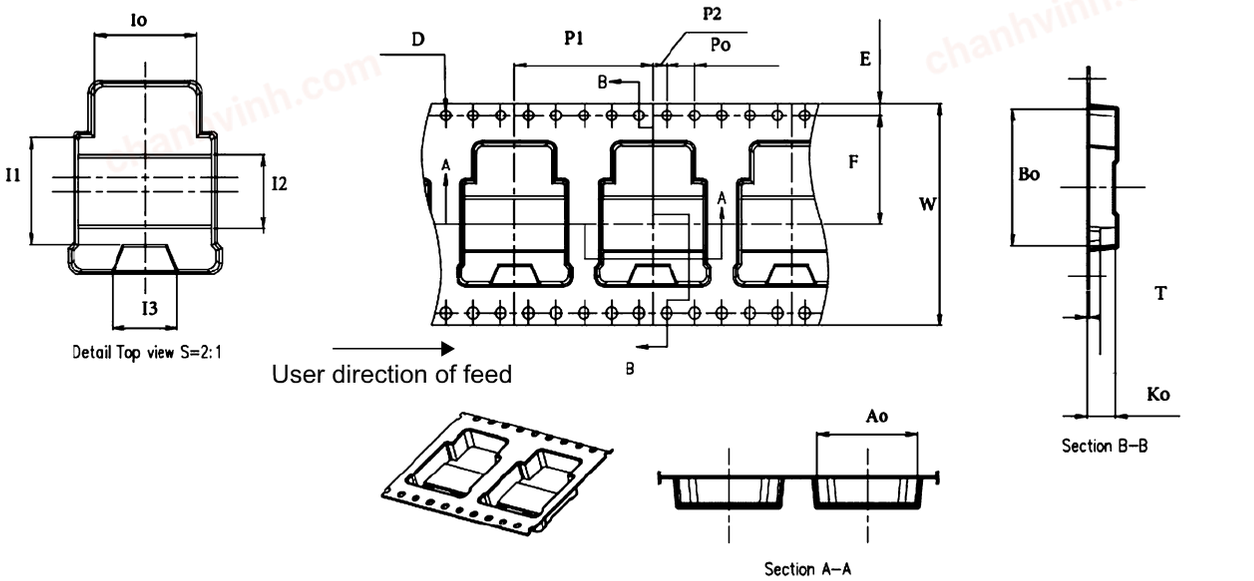
Figure 20. **HU3PAK recommended footprint (dimensions in mm)**



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3.2 HU3PAK packing information

Figure 21. **HU3PAK carrier tape outline**



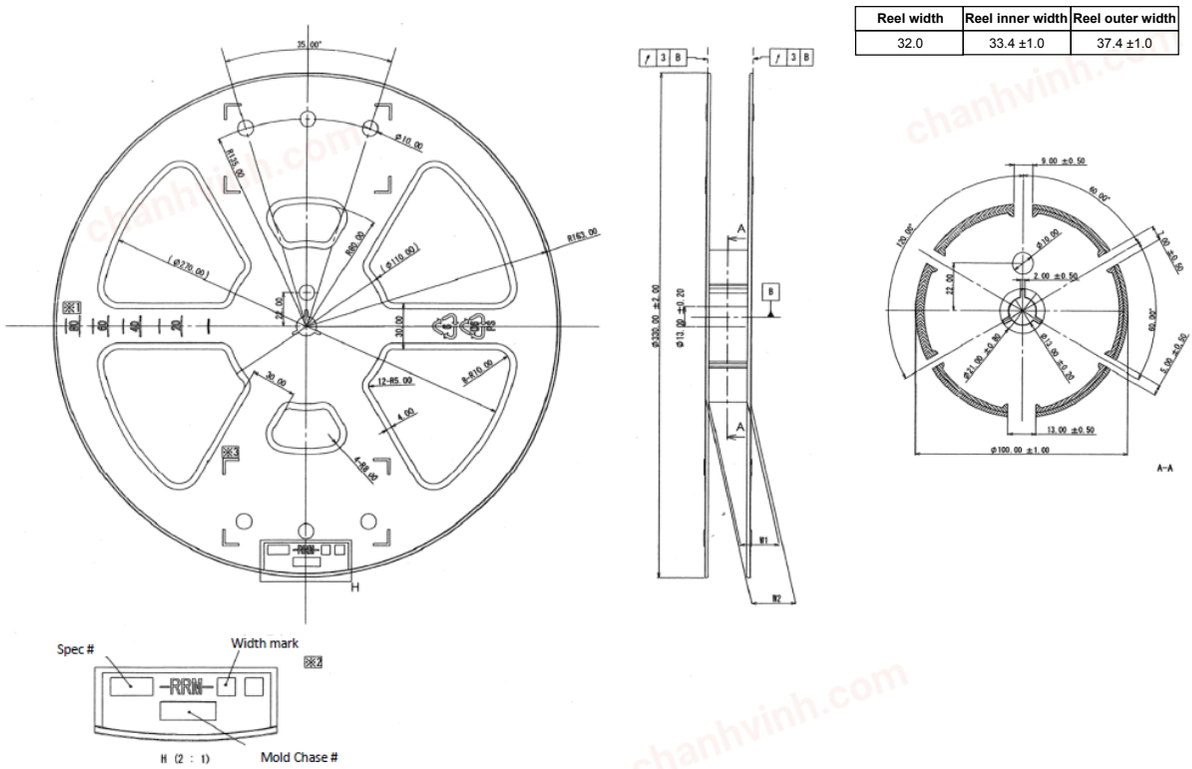
DM00345054_3

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

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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

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Revision history

Table 10. **Document revision history**

Date	Revision	Changes
19-Apr-2022	1	First release.
12-Jul-2024	2	Modified *Table 1. Absolute maximum ratings*, *Table 3. On/off states*, *Table 4. Dynamic*, *Table 5. Switching energy (inductive load)*, *Table 6. Switching times* and *Table 7. Reverse SiC diode characteristics*. Updated *Section 2.1: Electrical characteristics (curves)*. Minor text changes.
11-Dec-2024	3	Updated Section Device summary on cover page. Added Figure 7. Maximum continuous drain current vs case temperature. Minor text changes.

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