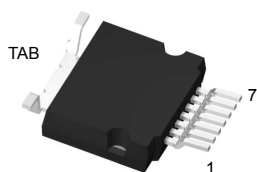
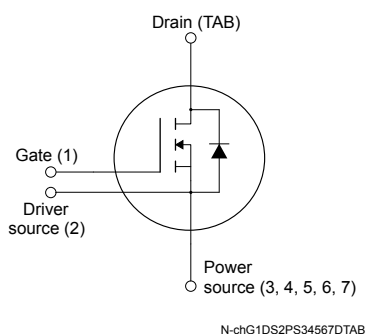


Automotive-grade silicon carbide Power MOSFET 1200 V, 63 mΩ typ., 30 A in an HU3PAK package



HU3PAK



Features

Order code	V_{DS}	$R_{DS(on)}$ typ.	I_D
SCT070HU120G3AG	1200 V	63 mΩ	30 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

[SCT070HU120G3AG](#)

Product summary

Order code	SCT070HU120G3AG
Top-side marking	70HU12AG
Back-side marking	70HU120G3AG
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, $t_p < 1 \mu s$, $t \leq 10$ hours over lifetime	-11 to 25	
I_D	Drain current (continuous) at $T_C = 25^\circ C$	30 ⁽¹⁾	A
	Drain current (continuous) at $T_C = 100^\circ C$	28	
$I_{DM}^{(2)}$	Drain current (pulsed)	114	A
P_{TOT}	Total power dissipation at $T_C = 25^\circ C$	223	W
T_{stg}	Storage temperature range	-55 to 175	$^\circ C$
T_J	Operating junction temperature range		$^\circ C$

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	0.67	$^\circ C/W$
R_{thJA}	Thermal resistance, junction-to-ambient	50	$^\circ C/W$

2 Electrical characteristics

$T_C = 25\text{ }^{\circ}\text{C}$ 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
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	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	1.8	3.0	4.2	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 15\text{ V}$, $I_D = 15\text{ A}$		78		m Ω
		$V_{GS} = 18\text{ V}$, $I_D = 15\text{ A}$		63	87	
		$V_{GS} = 18\text{ V}$, $I_D = 15\text{ A}$, $T_J = 175\text{ }^{\circ}\text{C}$		120		

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 850\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	900	-	pF
C_{oss}	Output capacitance		-	40	-	pF
C_{rss}	Reverse transfer capacitance		-	5	-	pF
Q_g	Total gate charge	$V_{DD} = 850\text{ V}$, $V_{GS} = -5\text{ to }18\text{ V}$, $I_D = 15\text{ A}$	-	37	-	nC
Q_{gs}	Gate-source charge		-	11	-	nC
Q_{gd}	Gate-drain charge		-	14	-	nC
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	1.5	-	Ω

Table 5. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	$V_{DD} = 850\text{ V}$, $I_D = 15\text{ A}$, $R_G = 2.2\text{ }\Omega$,	-	176	-	μJ
E_{off}	Turn-off switching energy	$V_{GS} = -5\text{ V to }18\text{ V}$	-	34	-	μJ

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 850\text{ V}$, $I_D = 15\text{ A}$, $R_{G(ON)} = 22\text{ }\Omega$, $R_{G(OFF)} = 5.6\text{ }\Omega$, $V_{GS} = -5\text{ to }18\text{ V}$	-	18.7	-	ns
t_r	Rise time		-	26.6	-	ns
$t_{d(off)}$	Turn-off delay time		-	17.6	-	ns
t_f	Fall time		-	9.9	-	ns

Table 7. Reverse SiC diode characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Continuous diode forward current	$T_C = 25\text{ }^{\circ}\text{C}$	-		30 ⁽¹⁾	A
		$T_C = 100\text{ }^{\circ}\text{C}$	-		26	
V_{SD}	Diode forward voltage	$I_{SD} = 15\text{ A}$, $V_{GS} = 0\text{ V}$	-	3		V
t_{rr}	Reverse recovery time	$I_{SD} = 15\text{ A}$, $di/dt = 1000\text{ A}/\mu\text{s}$, $V_{DD} = 850\text{ V}$, $V_{GS} = -5\text{ V}$	-	12		ns
Q_{rr}	Reverse recovery charge		-	60		nC
I_{RRM}	Reverse recovery current		-	9		A

1. Limited by bonding wires.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

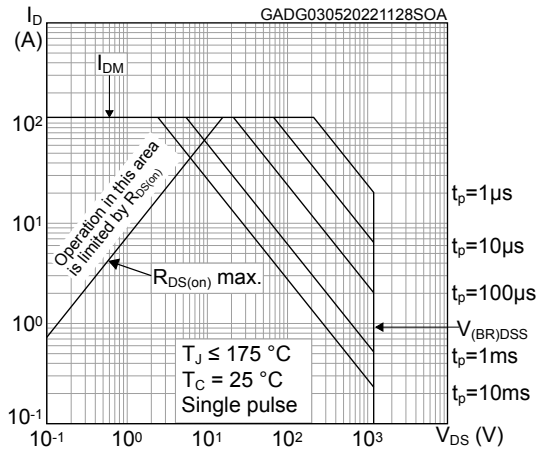


Figure 2. Maximum transient thermal impedance

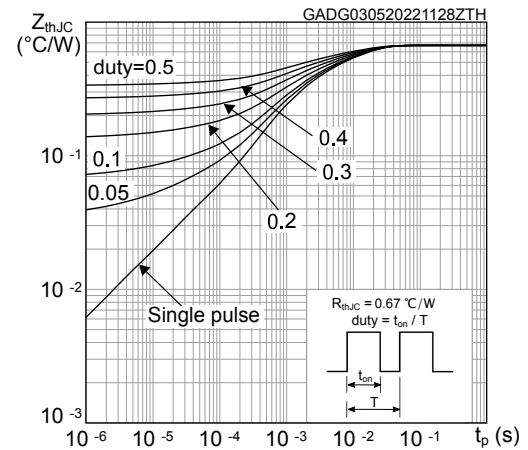


Figure 3. Typical output characteristics ($T_J = 25\text{ °C}$)

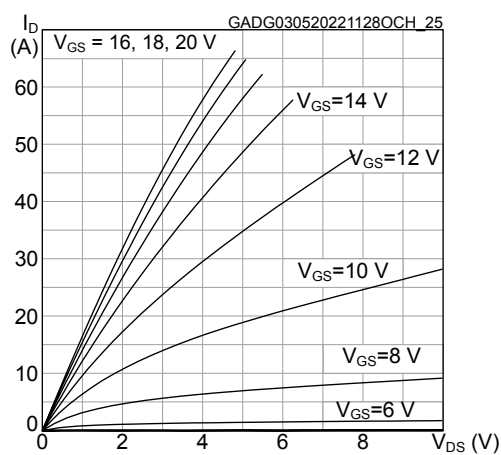


Figure 4. Typical output characteristics ($T_J = 175\text{ °C}$)

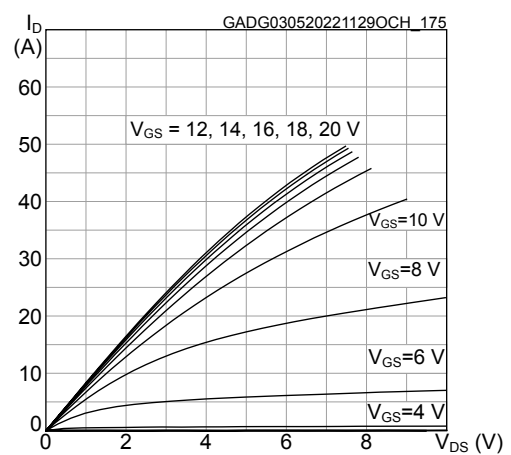


Figure 5. Typical transfer characteristics

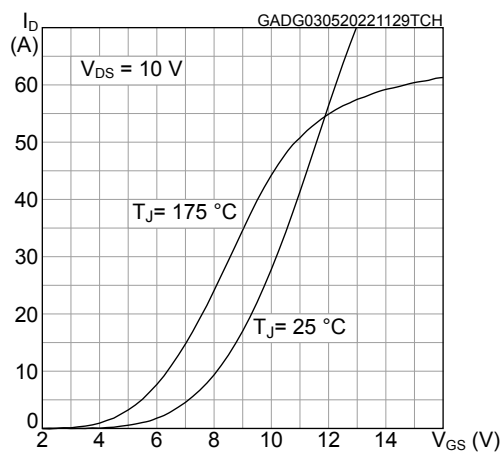


Figure 6. Maximum continuous drain current vs case temperature

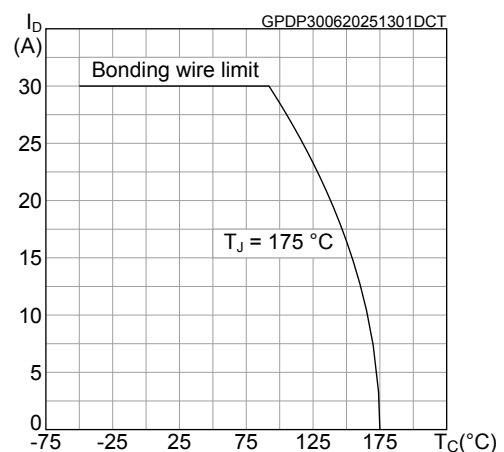


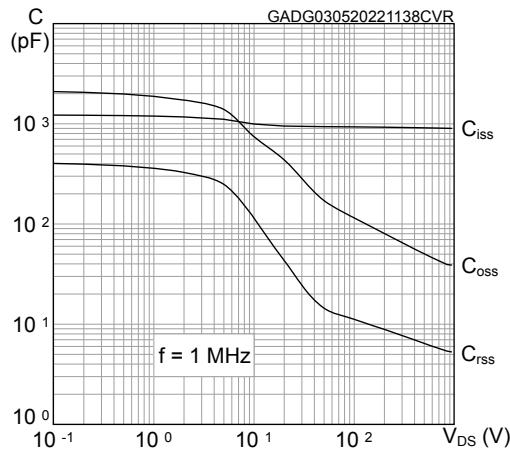
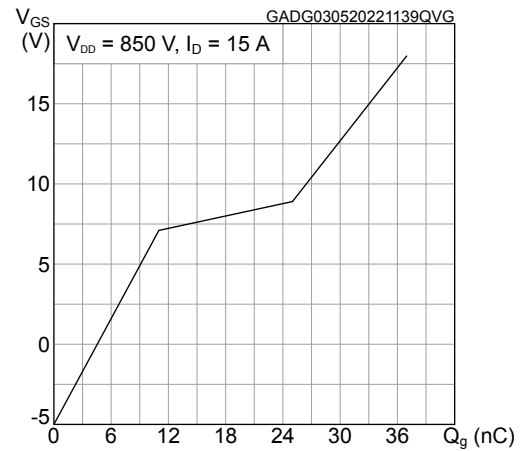
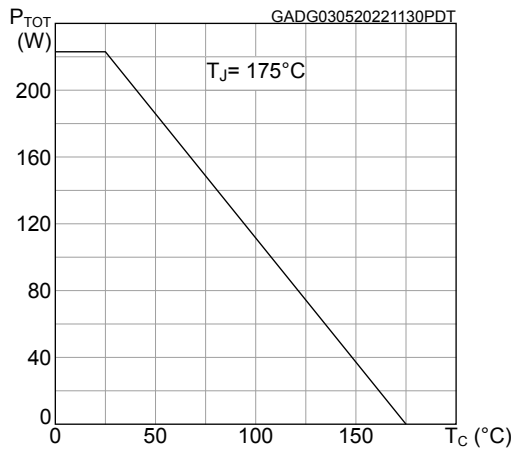
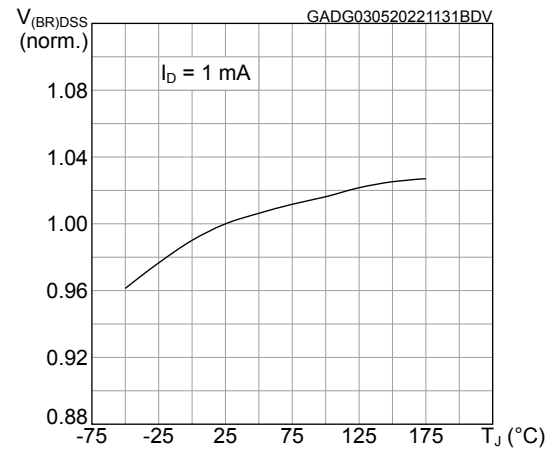
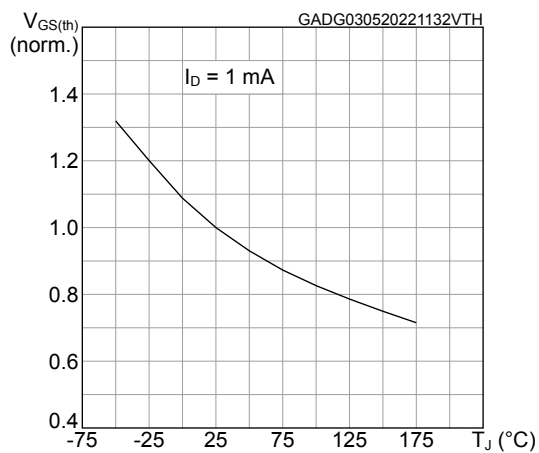
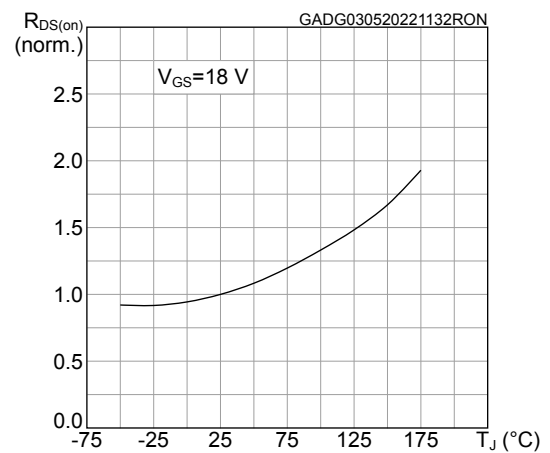
Figure 7. Typical capacitance characteristics

Figure 8. Typical gate charge characteristics

Figure 9. Total power dissipation

Figure 10. Normalized breakdown voltage vs temperature

Figure 11. Normalized gate threshold vs temperature

Figure 12. Normalized on-resistance vs temperature


Figure 13. Typical switching energy vs drain current

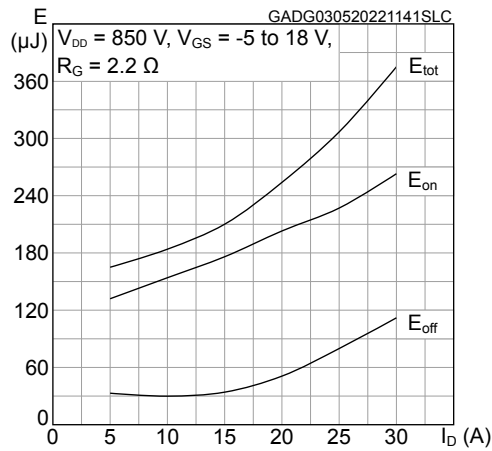


Figure 14. Typical switching energy vs supply voltage

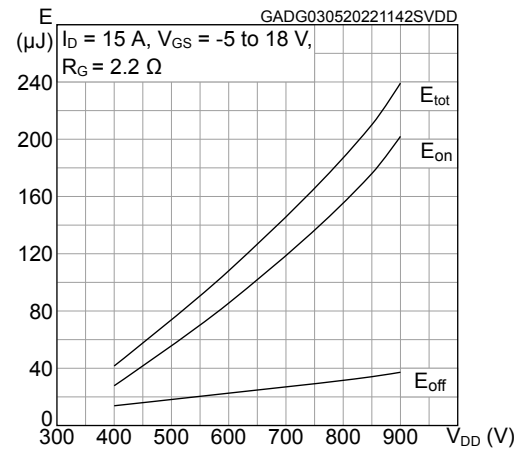


Figure 15. Typical switching energy vs gate resistance

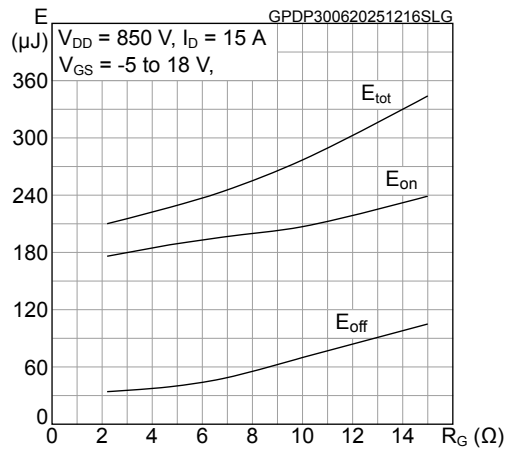


Figure 16. Typical switching energy vs temperature

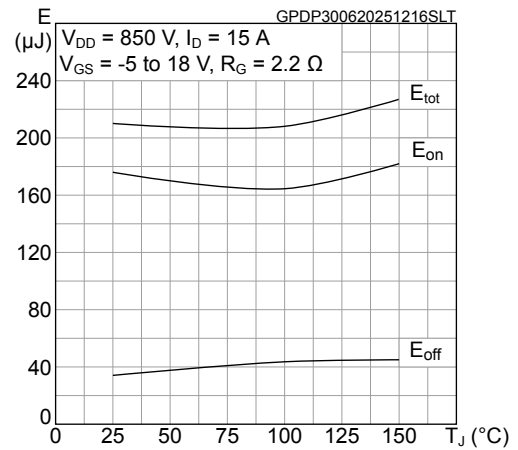


Figure 17. Typical reverse conduction characteristics (T_J = 25 °C)

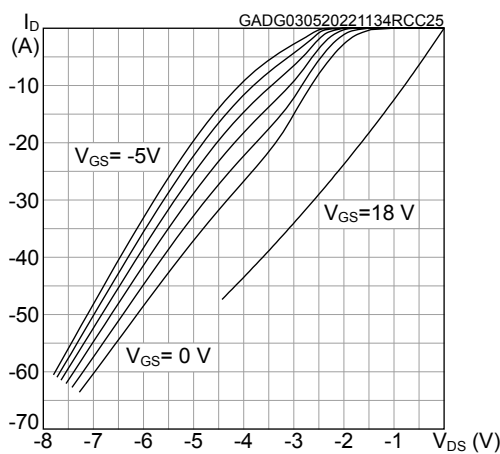
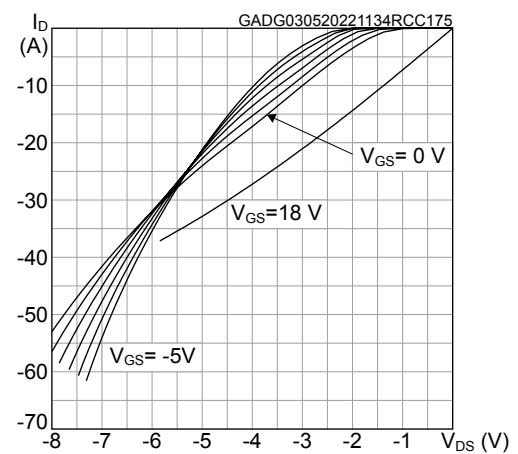


Figure 18. Typical reverse conduction characteristics (T_J = 175 °C)

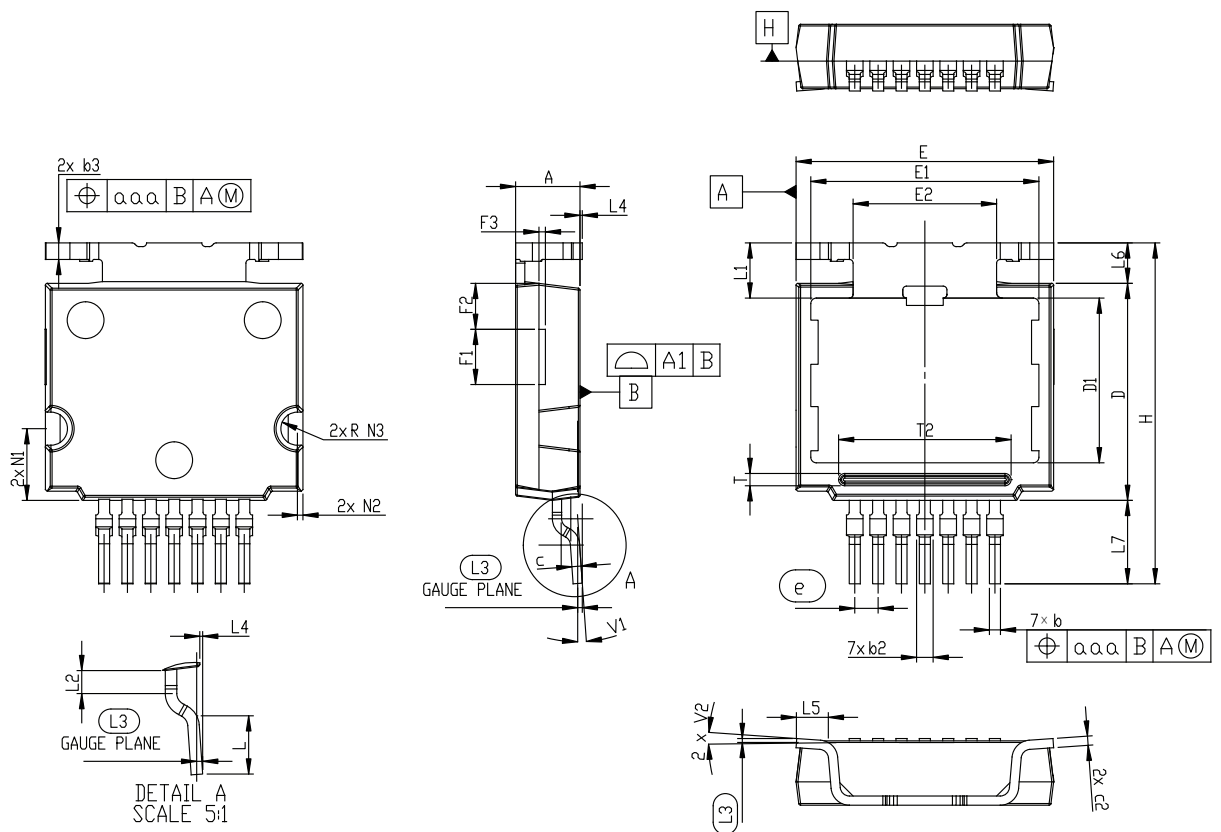


3 Package information

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

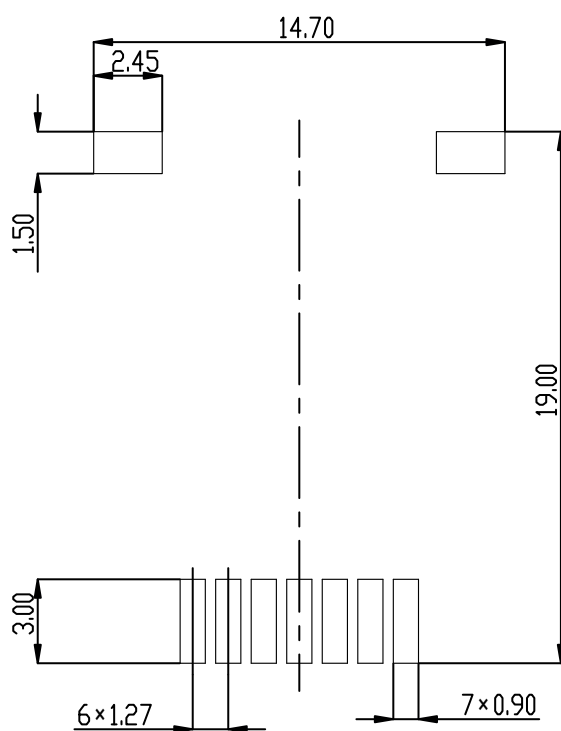


DM00674007_2

Table 8. HU3PAK package mechanical data

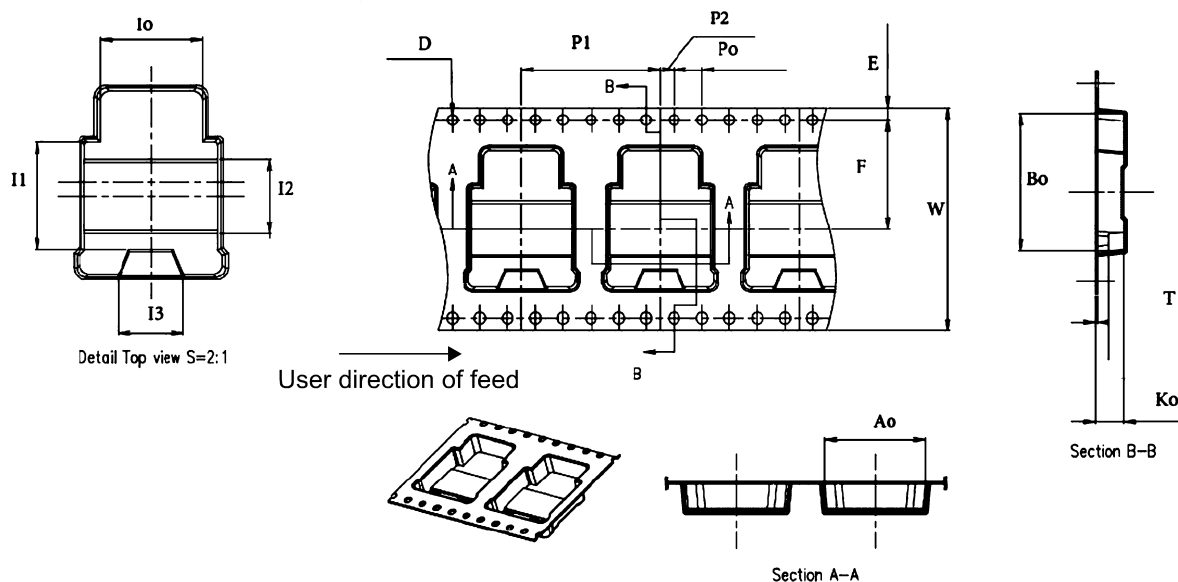
Ref.	Dimensions		
	mm		
	Min.	Typ.	Max.
A	3.40	3.50	3.60
A1		0.05	
b	0.50	0.60	0.70
b2	0.50	0.70	1.00
b3	0.80	0.90	1.00
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	8.80	8.955	9.10
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	7.75	7.80	7.85
e		1.27	
H	18.00	18.58	19.00
aaa		0.10	
L	2.40	2.52	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



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

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

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Revision history

Table 10. Document revision history

Date	Revision	Changes
13-Jun-2022	1	First release.
14-Apr-2023	2	Updated <i>Table 4. Dynamic</i> . Updated <i>Table 7. Reverse SiC diode characteristics</i> .
01-Jul-2025	3	Updated Product summary , Table 1. Absolute maximum ratings , Table 5. Switching energy (inductive load) and Table 7. Reverse SiC diode characteristics . Updated Section 2.1: Electrical characteristics (curves) . Minor text changes.

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