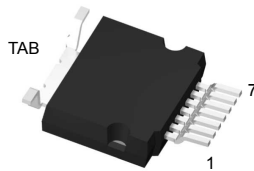
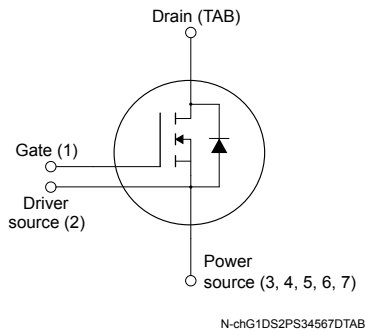


## Automotive-grade silicon carbide Power MOSFET 750 V, 11.4 mΩ typ., 110 A in an HU3PAK package




HU3PAK


**Product status link**
[SCT011HU75G3AG](#)
**Product summary**

<b>Order code</b>	SCT011HU75G3AG
<b>Marking</b>	SCT01175G3AG
<b>Package</b>	HU3PAK
<b>Packing</b>	Tape and reel

### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> typ.	I <sub>D</sub>
SCT011HU75G3AG	750 V	11.4 mΩ	110 A

- AEC-Q101 qualified 
- Very low R<sub>DS(on)</sub> over the entire temperature range
- High speed switching performances
- Very fast and robust intrinsic body diode
- Source sensing pin for increased efficiency

### Applications

- Main inverter (electric traction)
- DC/DC converter for EV/HEV
- On board charger (OBC)

### Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 3<sup>rd</sup> generation SiC MOSFET technology. The device features a very low R<sub>DS(on)</sub> 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.

# 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, $t_p < 1 \mu s$ , $t \leq 10$ hours over lifetime	-11 to 25	
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25 \text{ }^\circ\text{C}$	110	A
	Drain current (continuous) at $T_C = 100 \text{ }^\circ\text{C}$	110	
$I_{DM}^{(2)}$	Drain current (pulsed)	532	A
$P_{TOT}$	Total power dissipation at $T_C = 25 \text{ }^\circ\text{C}$	652	W
$T_{stg}$	Storage temperature range	-55 to 175	$^\circ\text{C}$
$T_J$	Operating junction temperature range		$^\circ\text{C}$

- $I_D$  is limited by package.
- 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	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal resistance, junction-to-ambient	50	$^\circ\text{C}/\text{W}$

## 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	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	750			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 750\text{ V}$			10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ to }22\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	1.8	3.2	4.2	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 18\text{ V}, I_D = 80\text{ A}$		11.4	15	m $\Omega$
		$V_{GS} = 15\text{ V}, I_D = 80\text{ A}$		14.2		
		$V_{GS} = 18\text{ V}, I_D = 80\text{ A}, T_J = 175\text{ °C}$		17.1		
		$V_{GS} = 15\text{ V}, I_D = 80\text{ A}, T_J = 175\text{ °C}$		18.9		

**Table 4. Dynamic**

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

**Table 5. Switching energy (inductive load)**

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

**Table 6. Switching times**

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

**Table 7. Reverse SiC diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Continuous diode forward current	$T_C = 25\text{ }^\circ\text{C}$	-		110	A
		$T_C = 100\text{ }^\circ\text{C}$	-		110	
$V_{SD}$	Diode forward voltage	$I_{SD} = 50\text{ A}$ , $V_{GS} = 0\text{ V}$	-	2.6		V
$t_{rr}$	Reverse recovery time	$I_{SD} = 50\text{ A}$ , $di/dt = 1\text{ kA}/\mu\text{s}$ , $V_{DD} = 400\text{ V}$ , $V_{GS} = -5\text{ V}$	-	22		ns
$Q_{rr}$	Reverse recovery charge		-	186		nC
$I_{RRM}$	Reverse recovery current		-	14		A

1.  $I_{SD}$  is limited by package.

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

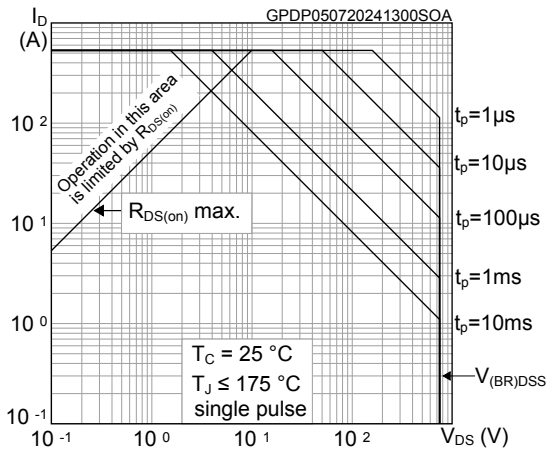


Figure 2. Maximum transient thermal impedance

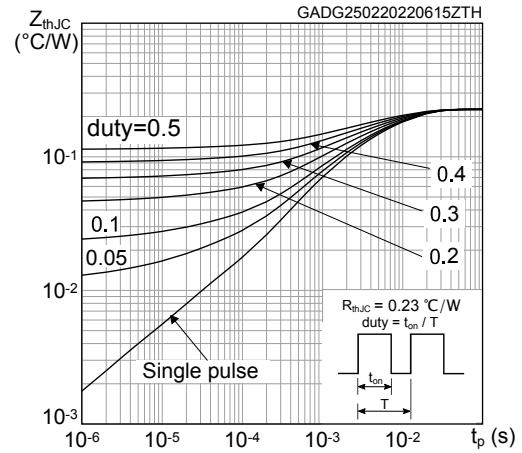


Figure 3. Typical output characteristics ( $T_J = 25\text{ °C}$ )

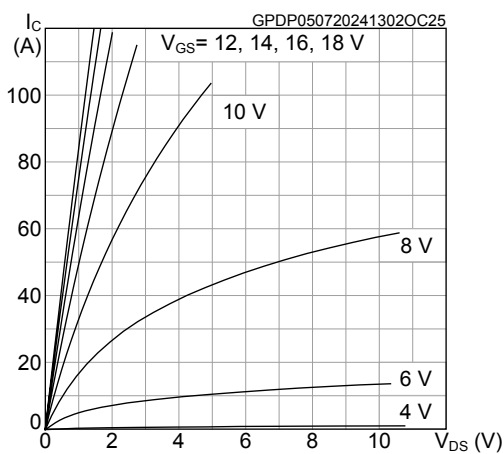


Figure 4. Typical output characteristics ( $T_J = 175\text{ °C}$ )

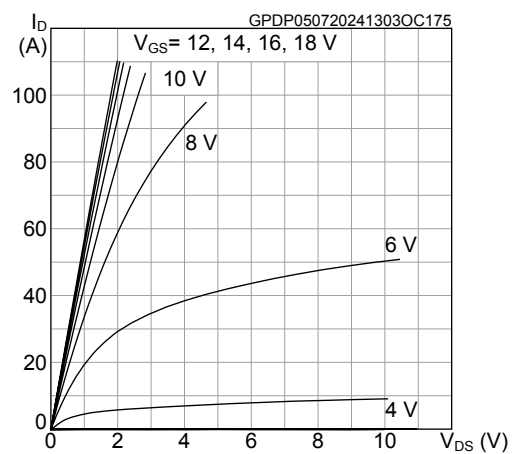


Figure 5. Typical transfer characteristics

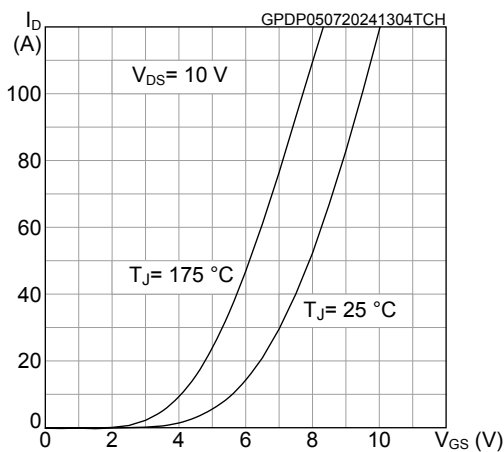
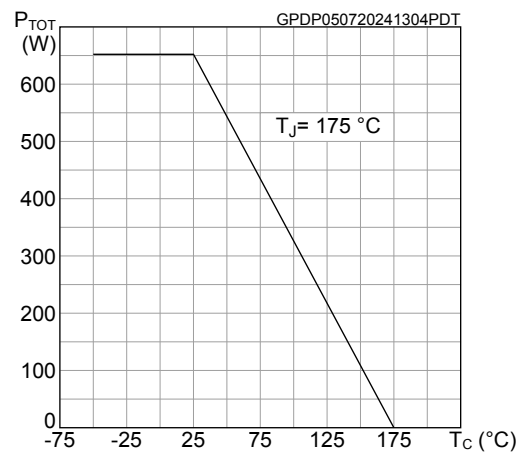


Figure 6. Total power dissipation



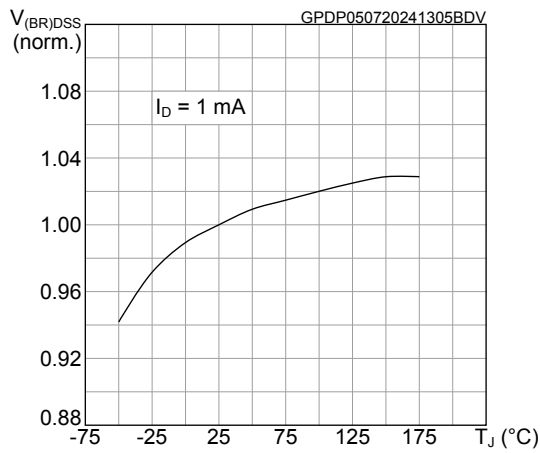
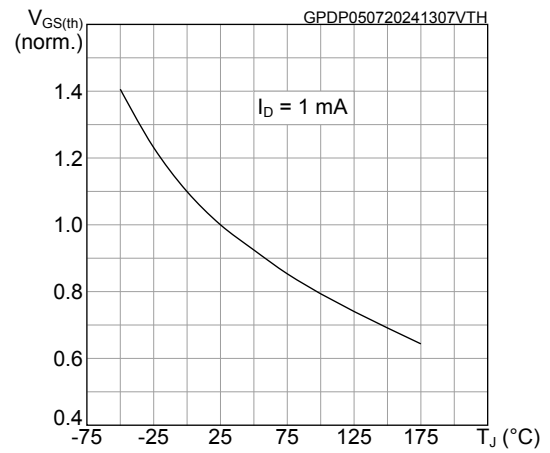
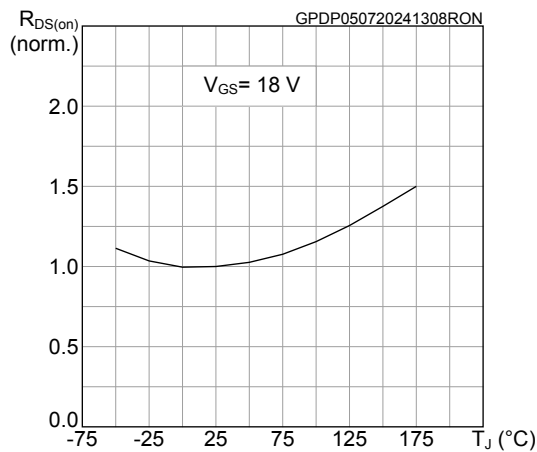
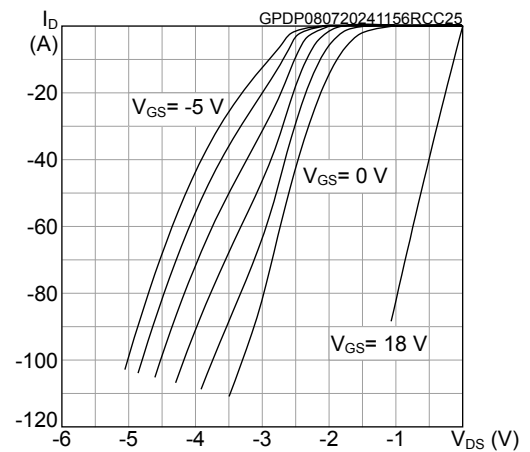
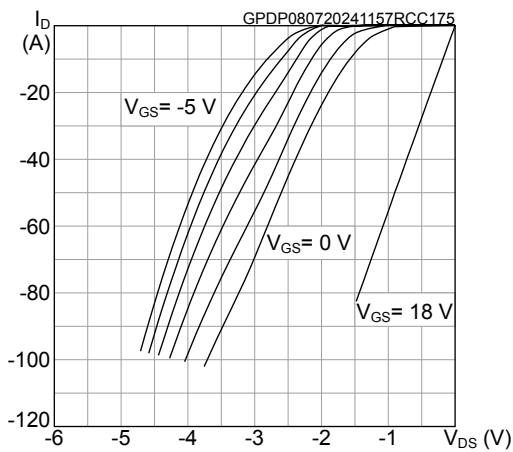
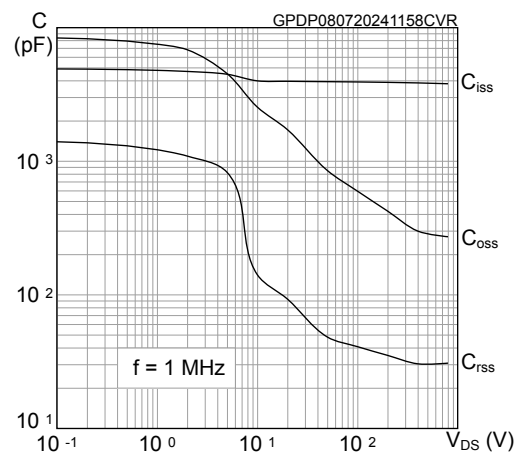
**Figure 7. Normalized breakdown voltage vs temperature**

**Figure 8. Normalized gate threshold vs temperature**

**Figure 9. Normalized on-resistance vs temperature**

**Figure 10. Typical reverse diode characteristics (T\_J = 25 °C)**

**Figure 11. Typical reverse diode characteristics (T\_J = 175 °C)**

**Figure 12. Typical capacitance characteristics**


Figure 13. Typical gate charge characteristics

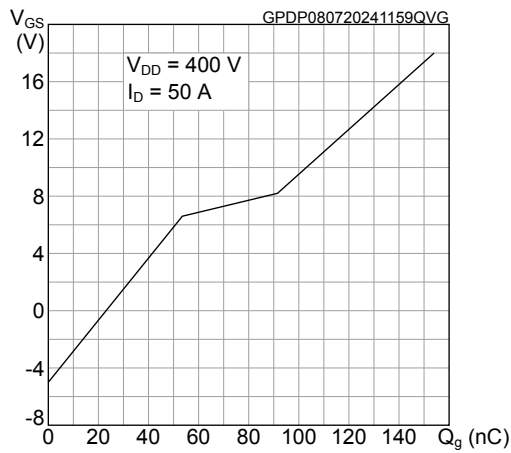


Figure 14. Typical switching energy vs drain current

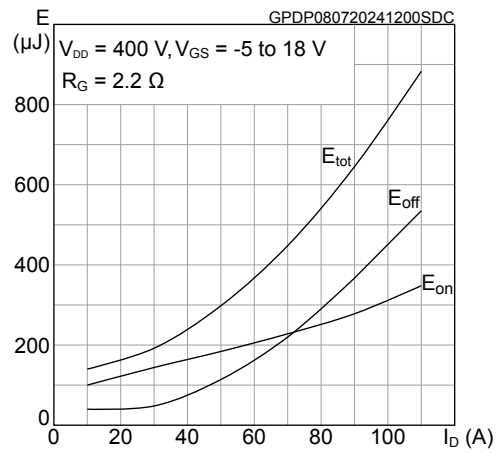


Figure 15. Typical switching energy vs supply voltage

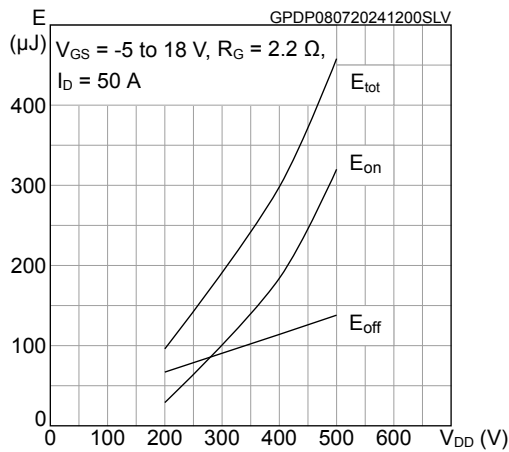


Figure 16. Typical switching energy vs gate resistance

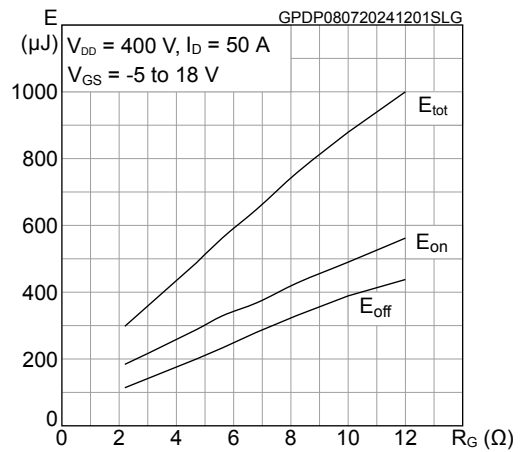
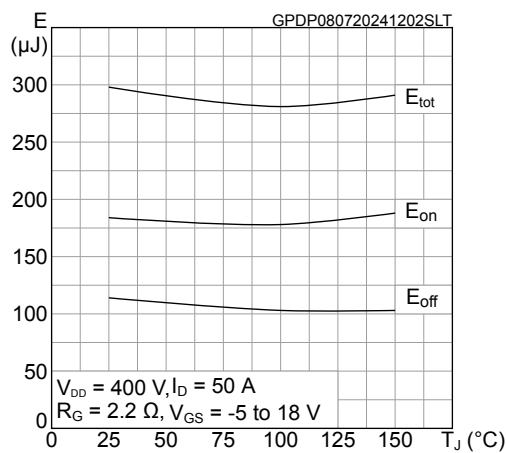


Figure 17. Typical switching energy vs temperature

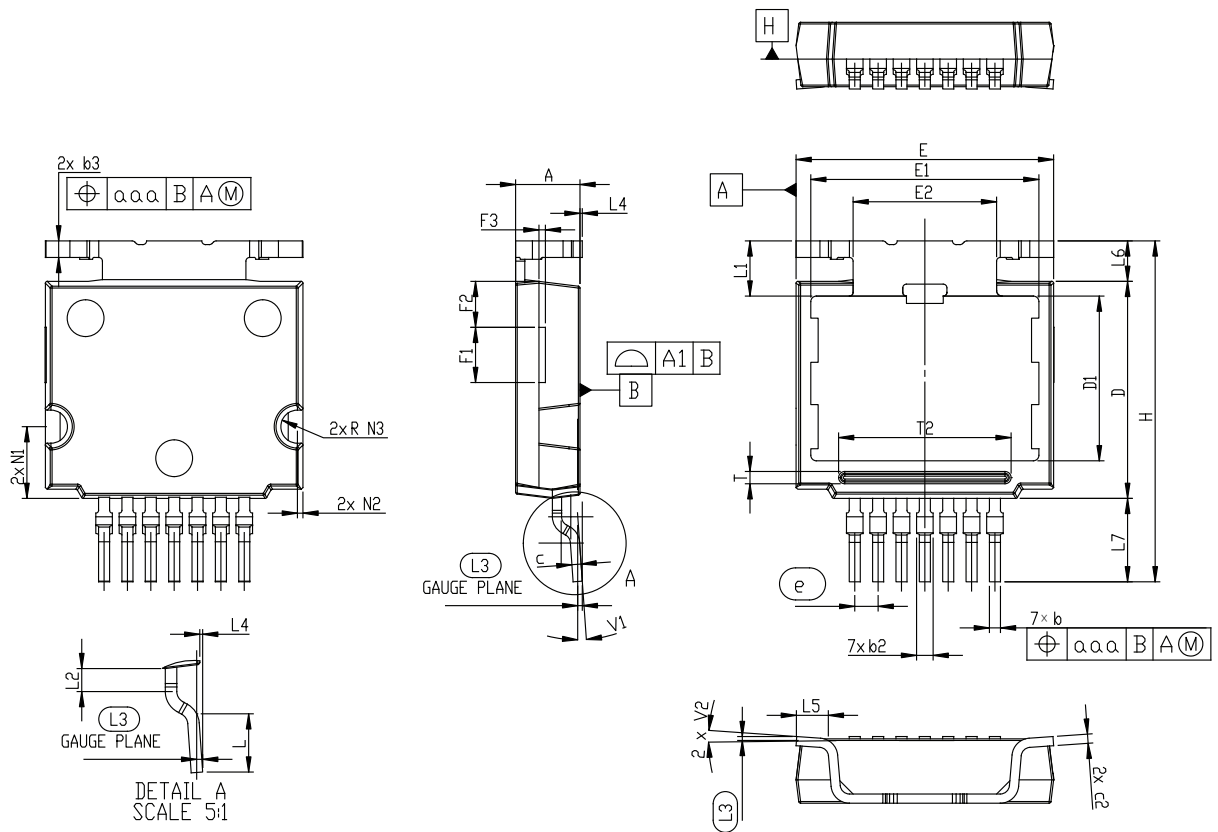


### 3 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 HU3PAK package information

Figure 18. HU3PAK package outline



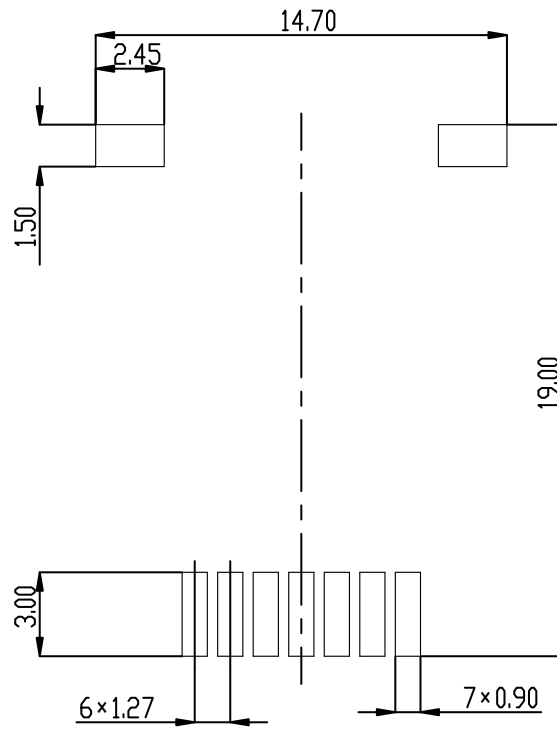
DM00674007\_2



**Table 8. HU3PAK package mechanical data**

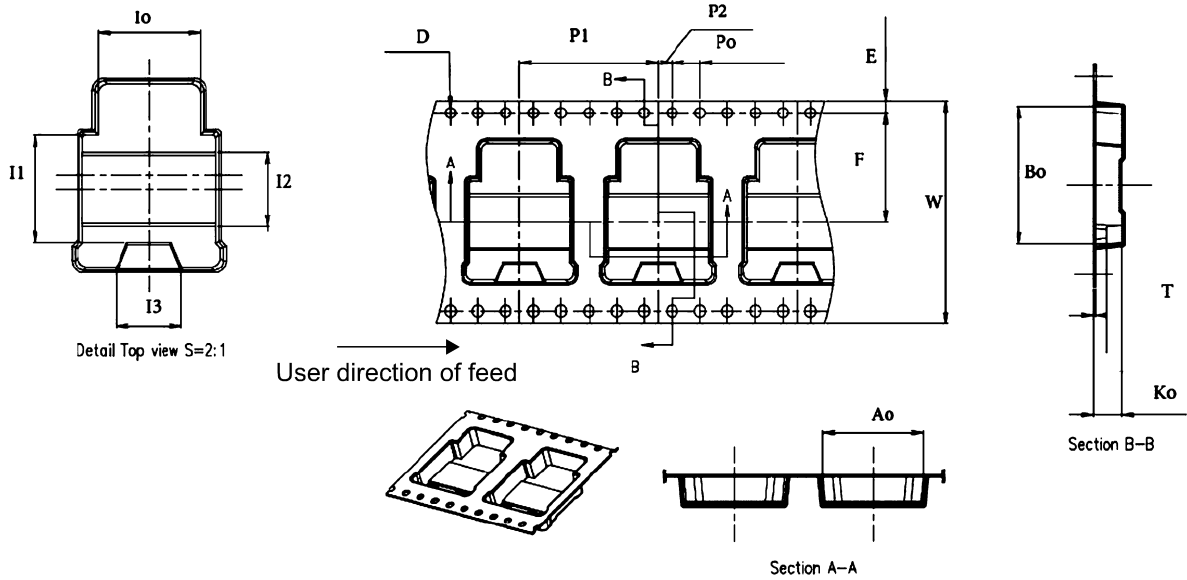
Ref.	Dimensions		
	mm		
	Min.	Typ.	Max.
A	3.40	3.50	3.60
A1		0.05	
b	0.50	0.60	0.70
b2	0.50	0.70	1.00
b3	0.80	0.90	1.00
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	8.80	8.955	9.10
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	7.75	7.80	7.85
e		1.27	
H	18.00	18.58	19.00
aaa		0.10	
L	2.40	2.52	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 19. HU3PAK recommended footprint (dimensions in mm)



### 3.2 HU3PAK packing information

Figure 20. HU3PAK carrier tape outline

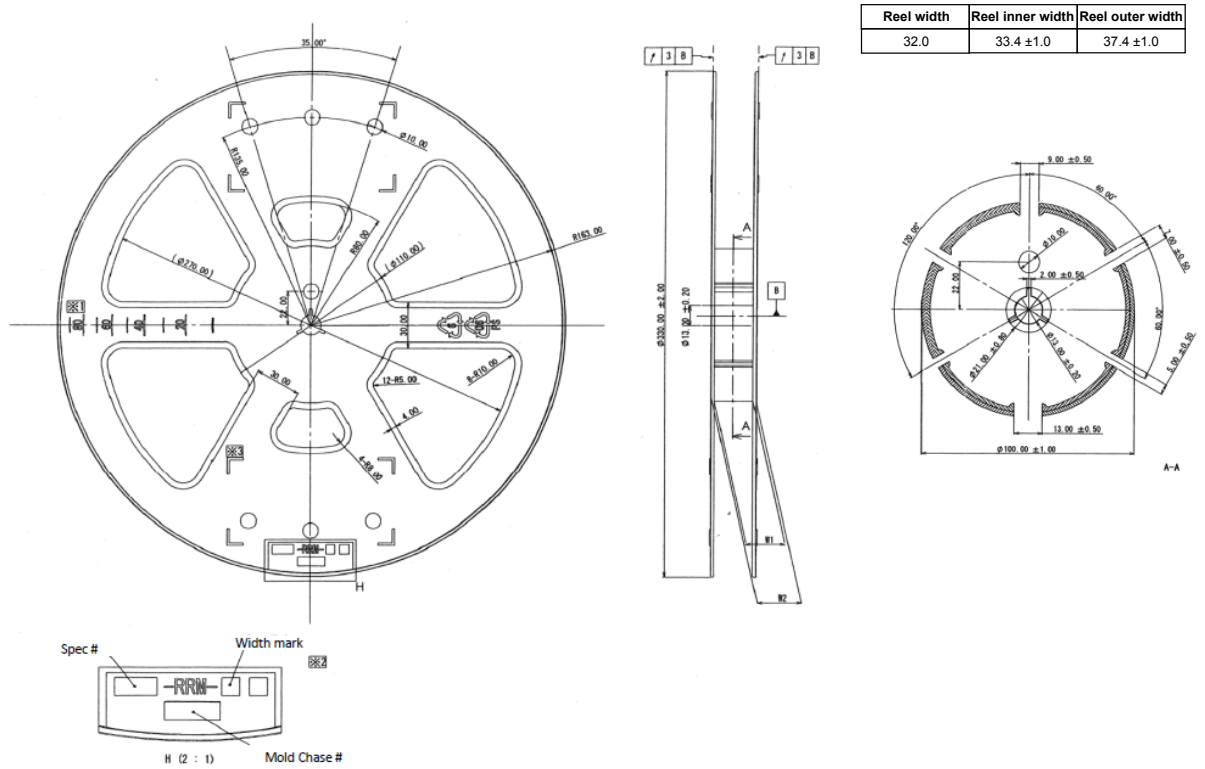


DM00345054\_3

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

Figure 21. 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
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.

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